

PENTHIOPYRAD (253)

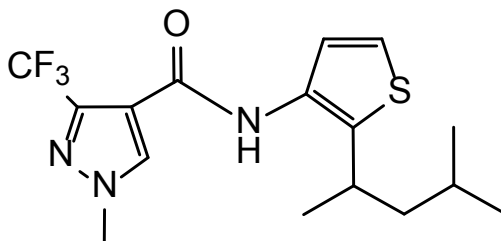
The first draft was prepared by Mr Christian Sieke, Federal Institute for Risk Assessment, Berlin, Germany

EXPLANATION

Penthiopyrad is a carboxamide fungicide used to control a broad spectrum of diseases on large variety of crops. Penthiopyrad inhibits fungal respiration by binding to mitochondrial respiratory complex II. It was considered for the first time by the 2011 JMPR for toxicology, establishing an acceptable daily intake (ADI) of 0–0.1 mg/kg bw and an acute reference dose (ARfD) of 1 mg/kg bw.

IDENTITY

ISO common name	Penthiopyrad
Chemical name	
IUPAC	(RS)-N-[2-(1,3-dimethylbutyl)-3-thienyl]-1-methyl-3-(trifluoromethyl) pyrazole-4-carboxamide
CA	N-[2-(1,3-dimethylbutyl)-3-thienyl]-1-methyl-3-(trifluoromethyl)-1H-pyrazole-4-carboxamide (9CI)
CIPAC No.	not attributed
CAS No.	183675-82-3
Structural formula	



Molecular formula	C ₁₆ H ₂₀ F ₃ N ₃ OS
Molecular mass	359.4 g/mol

Specifications

Specifications for penthiopyrad were not yet developed by FAO.

PHYSICAL AND CHEMICAL PROPERTIES

Table 1 Physical and chemical properties

Property	Results	Method (test material)	Reference
Melting point	381.9 K (= 108.7 °C)	OECD 102 (EEC A.1) pure active ingredient (99.9%)	Tognucci A, 1999, PTHIO_001
Boiling point	No boiling before decomposition observed	OECD 103 pure active ingredient (99.9%)	Tognucci A, 1999, PTHIO_002
Temperature of decomposition or sublimation	> 250 °C colour change > 314 °C degradation clearly observable	OECD 103 pure active ingredient (99.9%)	Tognucci A, 1999, PTHIO_002
Relative density	1.256 g per cm ³	OECD 109 (EEC A.3) pure active ingredient. (99.9%)	Badt-Tognucci, A, 2007, PTHIO_003
Vapour pressure	Penthiopyrad 3.7 × 10 ⁻³ Pa at 70 °C 8.04 × 10 ⁻³ Pa at 80 °C 3.61 × 10 ⁻² Pa at 90 °C 6.43 × 10 ⁻⁶ kPa at 25 °C (calculated)	OECD 104 pure active ingredient (99.9%)	Tognucci, A, 1999, PTHIO_004
	DM-PCA ≤ 6.8 × 10 ⁻⁵ Pa at 80 °C	OECD 104 pure ingredient (99.7%)	Matsumoto, T, 2006, PTHIO_005
	PCA 1.6 × 10 ⁻³ Pa at 50 °C 1.6 × 10 ⁻² Pa at 60 °C 5.5 × 10 ⁻² Pa at 70 °C 8.9 × 10 ⁻⁶ Pa at 25 °C (calculated)	OECD 104 pure ingredient (99.7%)	Weissenfeld M, 2008, PTHIO_006
	at pH 4: 4.152 × 10 ⁻⁴ Pa m ³ mol ⁻¹ at 25 °C at pH 5: 1.40 × 10 ⁻⁴ Pa m ³ mol ⁻¹ at 25 °C at pH 7: 7.66 × 10 ⁻³ Pa m ³ mol ⁻¹ at 25 °C at pH 10: 6.36 × 10 ⁻³ Pa m ³ mol ⁻¹ at 25 °C	OECD 105 Pure active ingredient (99.8%)	Labano S, 2009, PTHIO_007
Physical state	Pure: solid (powder)	visual pure active ingredient (99.8%)	Tomiya K, 2008, PTHIO_008
	Techn.: solid (powder)	visual technical active ingredient (98.6%)	Tomiya K, 2008, PTHIO_009
Colour	Pure: white	visual pure active ingredient (99.8%)	Tomiya K, 2008, PTHIO_010
	Techn.: white	visual technical active ingredient (98.6%)	Tomiya K, 2008, PTHIO_011
Odour	Pure: odourless	olfactoric pure active ingredient (99.8%)	Tomiya K, 2008, PTHIO_012
	Techn.: odourless	olfactoric technical active ingredient (98.6%)	Tomiya K, 2008, PTHIO_013

Property	Results	Method (test material)	Reference
Spectra active substance	UV absorption: characteristics at 20 °C: acidic solution (pH 0.8) $\lambda_{\max} = 226 \text{ nm}$, $\epsilon = 14460 \text{ L.mol}^{-1}.\text{cm}^{-1}$. neutral solution (pH 7.4) $\lambda_{\max} = 226 \text{ nm}$, $\epsilon = 14492 \text{ L.mol}^{-1}.\text{cm}^{-1}$. basic solution (pH 13.1) apparent $\lambda_{\max} = 227 \text{ nm}$ but artefact caused by the absorption of solvent, ϵ : n.a.	OECD 101 pure active ingredient (99.8%)	Badt-Tognucci, A, 2007, PTHIO_014
Solubility in water including effect of pH	Penthiopyrad At 20 °C: at pH 4: 2.535 mg/L at pH 7: 1.375 mg/L at pH 10: 1.657 mg/L At 30 °C: at pH 7: 1.426 mg/L At 20 °C: at pH 5: $7.53 \times 10 \text{ mg/L}$	OECD 105 pure active ingredient (99.6%), batch no. 2000111 batch no. OS-770	Franke J, 2008, PTHIO_015 Tognucci A, 1999, PTHIO_016
	DM-PCA At 30 °C: At pH 7: 8240 mg/L	Flask method Pure ingredient (99.7%)	Matsumoto, T, 2006, PTHIO_017
	PCA At 20 °C: In HCl (1N): 1438.7 mg/L In NaOH (1N): 171.8 g/kg	OECD 105 Pure ingredient (99.1%)	Weissenfeld M, 2008, PTHIO_018
Solubility in organic solvents	At $20 \pm 0.5 \text{ °C}$: Methanol: 402 g/L Ethanol: 234.5 g/L Acetone: 557 g/L Ethylacetate: 349 g/L Hexane: 0.75 g/L Heptane: 0.74 g/L Xylene: 42.7 g/L Toluene: 67.0 g/L Dichloromethane: 531 g/L	OECD 105 pure active ingredient (99.8%)	Tognucci A, 1999, PTHIO_016
Partition coefficient n-octanol / water	Penthiopyrad log P_{ow} : 4.36 at 20 °C and pH 4 log P_{ow} : 4.62 at 20 °C and pH 7 log P_{ow} : 4.43 at 30 °C and pH 7 log P_{ow} : 4.54 at 20 °C and pH 10	OECD 107 pure active ingredient (98.6%)	Franke J, 2008, PTHIO_019
	DM-PCA log P_{ow} : 1.42 at 25 °C and pH 2	OECD 107 pure ingredient (99.7%)	Matsumoto, T, 2006, PTHIO_020
	PCA log P_{ow} : 0.9 at 25 °C and pH 2	OECD 107 pure ingredient (99.9%)	Furutani, E, 2006, PTHIO_021
	PAM log P_{ow} : < 0.5 at 25 °C and pH 7	OECD 107 pure ingredient (99.9%)	Furutani, E, 2006, PTHIO_022
	753-A-OH log P_{ow} : 2.4 at 25 °C and pH 7	OECD 107 pure ingredient (98.6%)	Furutani, E, 2006, PTHIO_023
Hydrolysis rate	Hydrolytically stable during 5 days at pH 4, 7 and 9 at 50 °C.	OECD 111 pure active ingredient (99.9%)	Tognucci A, 1999, PTHIO_024

Property	Results	Method (test material)	Reference
Photochemical degradation	Photolytically stable during 15 days at 25 °C and pH 7.	OECD 101 radiolabelled pure active ingredient (99.9%)	Burgener A, 1999, PTHIO_025
Quantum yield	Not applicable		
Dissociation constant	$pK_a = 10.0 \pm 0.16$	OECD 112 Pure active ingredient (99.9%)	Tognucci, A, 1999, PTHIO_026

Hydrolysis of penthiopyrad

Hydrolysis studies were carried out by Adam, D (2006, PTHIO_027). A mixture of ^{14}C -penthiopyrad (mixture of two radiolabels ^{14}C -pyrazole and ^{14}C -thienyl) was investigated in aqueous buffer solutions at three pH values and at different temperatures to simulate processing practice. The solutions were incubated at pH 4, 5 and 6 at temperatures of 90, 100 and 120 °C, respectively, for 20 or 60 minutes.

The solutions were analysed by HPLC and TLC before and after incubation. The nature of degradates by means of high performance liquid chromatography (HPLC) and thin layer chromatography (TLC).

A summary of the results is presented in the following table:

Table 2 Summary of radioactive residues in reaction mixtures treated with a mixture of ^{14}C -pyrazole and ^{14}C -thienyl labelled penthiopyrad

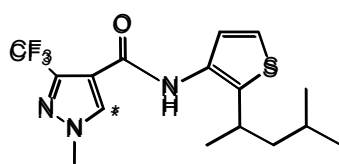
T (°C)	Duration (min)	pH	Replicate	Before incubation % of nominal	After incubation % of nominal
90	20	4	A	100	103
			B	101	100
			Mean	100	102
100	60	5	A	101	101
			B	99	103
			Mean	100	102
120	20	6	A	100	99
			B	100	100
			Mean	100	100

Formulations

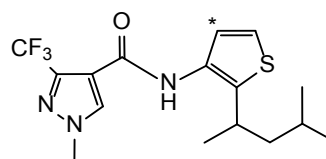
Penthiopyrad is registered as SC, WG and EC formulations in Canada and the USA on a large variety of crops including pome fruit, various vegetables, cereals, oilseeds and pulses. The active substance is applied late in the growing season normally with PHIs of 30 days or less.

METABOLISM AND ENVIRONMENTAL FATE

Metabolism studies were conducted using [^{14}C -pyrazole]-penthiopyrad (P-label) and [^{14}C -thienyl]-penthiopyrad (T-label). The position of the label for both substances is presented in the following figure:



* position of label

Figure 1 [^{14}C -pyrazole]-
penthiopyrad (P-label)

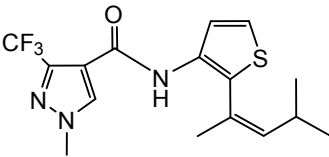
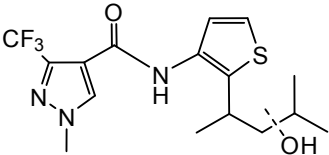
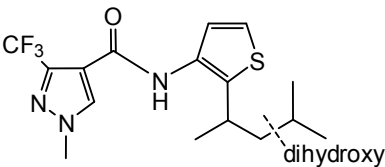
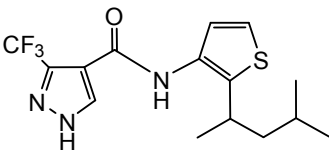
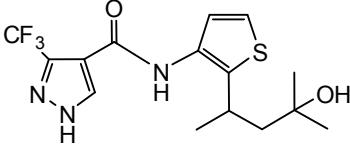
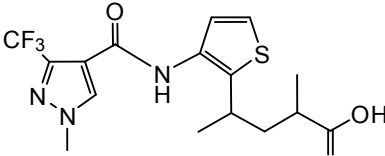
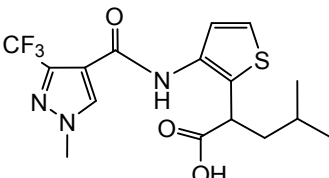
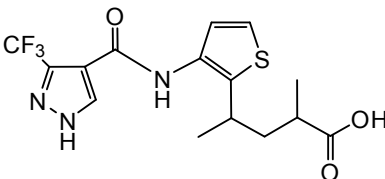
* position of label

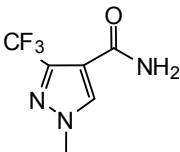
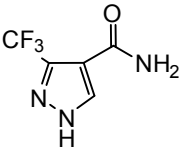
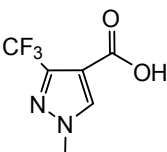
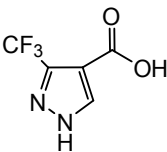
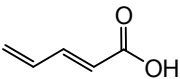
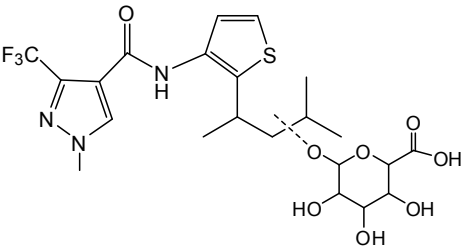
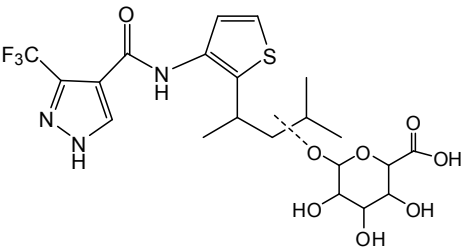
Figure 2 [^{14}C -thienyl]-
penthiopyrad (T-label)

Chemical names, structures and code names of metabolites and degradation products of penthiopyrad are shown below.

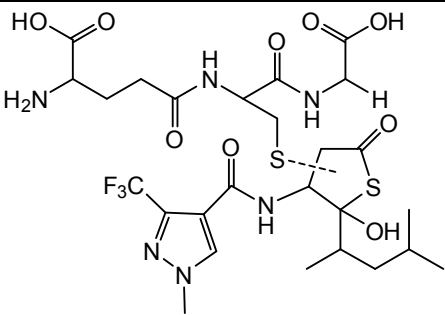
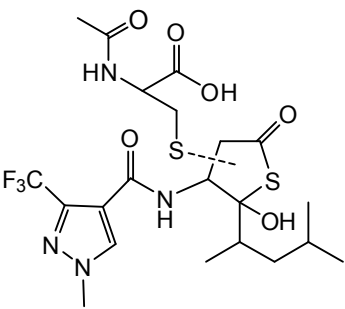
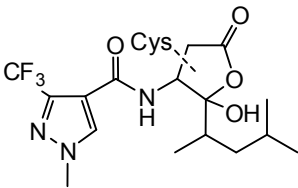
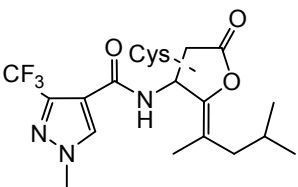
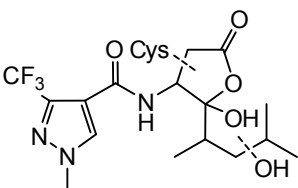
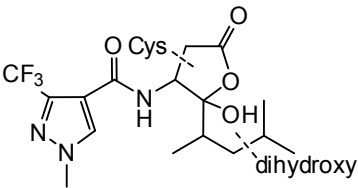
Table 3 Known metabolites of penthiopyrad

Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
Penthiopyrad MTF-753 DPX-LEM17	(RS)-N-[2-(1,3-dimethylbutyl)-3-thienyl]-1-methyl-3-(trifluoromethyl) pyrazole-4-carboxamide CAS No.: 183675-82-3 Formula: $\text{C}_{16}\text{H}_{20}\text{F}_3\text{N}_3\text{O}_3\text{S}$ M.W.: 359.42		Parent molecule.
753-T-DO IN-PGH58	N-[5-hydroxy-5-(1,3-dimethylbutyl)-2-oxo-2,5-dihydrothiophen-4-yl]-1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: $\text{C}_{16}\text{H}_{20}\text{F}_3\text{N}_3\text{O}_3\text{S}$ M.W.: 391.41		E-fate: soil, aquatic aerobic. Metabolism: plant, rat, goat, hen.
753-F-DO IN-PGH59	N-[5-hydroxy-5-(1,3-dimethylbutyl)-2-oxo-2,5-dihydrofuran-4-yl]-1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: $\text{C}_{16}\text{H}_{20}\text{F}_3\text{N}_3\text{O}_4$ M.W.: 375.34		E-fate: soil, soil photolysis, aquatic aerobic. Metabolism: plant, rat, goat, hen.
753-A-OH IN-PGH53	N-[2-(3-hydroxy-1,3-dimethylbutyl) thiophen-3-yl]-1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: $\text{C}_{16}\text{H}_{20}\text{F}_3\text{N}_3\text{O}_2\text{S}$ M.W.: 375.42		E-fate: soil, aquatic aerobic. Metabolism: plant, rat, goat, hen.
753-A-OH isomer (M12)	N-[2-(1-hydroxymethyl-1,3-dimethylbutyl)thiophen-3-yl]-1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: $\text{C}_{16}\text{H}_{20}\text{F}_3\text{N}_3\text{O}_2\text{S}$ M.W.: 375.41		E-fate: soil.

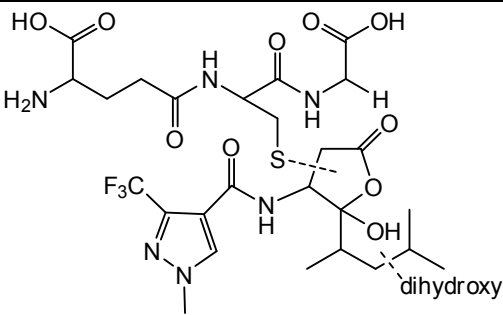
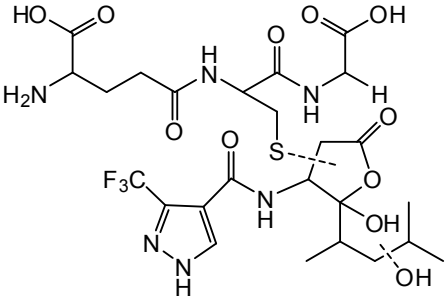
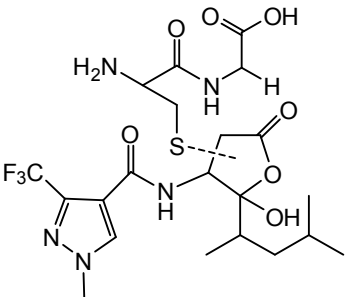
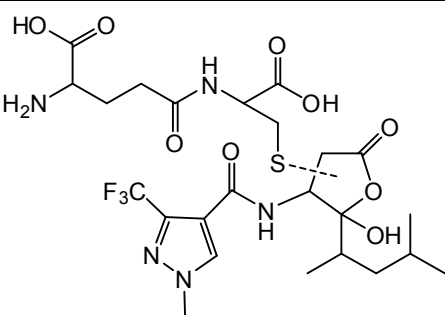
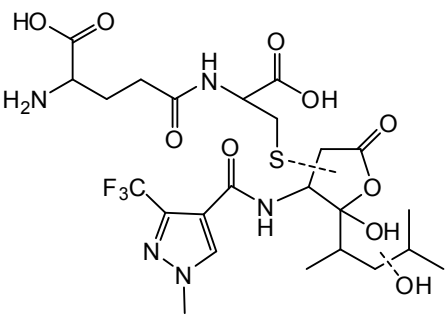
Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
dehydro-753-A-OH	N-[2-(1,3-dimethylbutenyl)thiophen-3-yl]-1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: C ₁₆ H ₁₈ F ₃ N ₃ OS M.W.: 357.39	 Note: the position of the double bond on the alkyl-chain is not definite.	Metabolism: rat.
hydroxy-MTF-753 (753-A-OH isomer)	N-[2-(3,4-dihydroxy-1,3-dimethylbutyl)thiophen-3-yl]-1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: C ₁₆ H ₂₀ F ₃ N ₃ O ₃ S M.W.: 375.41		Metabolism: rat, goat and hen.
dihydroxy-MTF-753	CAS No.: n.a. Formula: C ₁₆ H ₂₀ F ₃ N ₃ O ₃ S M.W.: 391.41		Metabolism: hen.
DM-753 IN-PGH60	N-[2-(1,3-dimethylbutyl)thiophen-3-yl]-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: C ₁₅ H ₁₈ F ₃ N ₃ OS M.W.: 345.39		Metabolism: plant, rat, goat.
DM-753-A-OH	N-[2-(3-hydroxy-1,3-dimethylbutyl)thiophen-3-yl]-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: C ₁₅ H ₁₈ F ₃ N ₃ O ₂ S M.W.: 361.39		Metabolism: plant, rat.
753-A-COOH	2-methyl-4-{3-[(1-methyl-3-trifluoromethyl-1H-pyrazole-4-carbonyl)amino]thiophen-2-yl}pentanoic acid CAS No.: n.a. Formula: C ₁₆ H ₁₈ F ₃ N ₃ O ₃ S M.W.: 389.40		Metabolism: rat.
753-A-COOH isomer (M11)	3-methyl-1-{3-[(1-methyl-3-trifluoromethyl-1H-pyrazole-4-carbonyl)amino]thiophen-2-yl}pentanoic acid CAS No.: n.a. Formula: C ₁₆ H ₁₈ F ₃ N ₃ O ₃ S M.W.: 389.40		E-fate: soil, soil photolysis.
DM-753-A-COOH	2-methyl-4-{3-[(3-trifluoromethyl-1H-pyrazole-4-carbonyl)amino]thiophen-2-yl}pentanoic acid CAS No.: n.a. Formula: C ₁₅ H ₁₆ F ₃ N ₃ O ₃ S		Metabolism: rat.

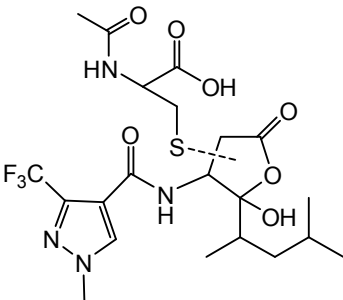
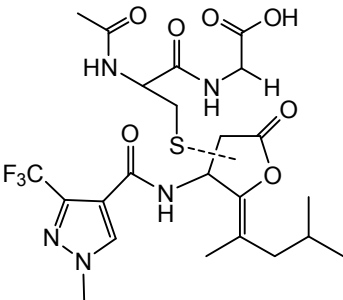
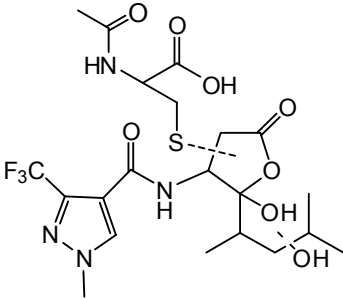
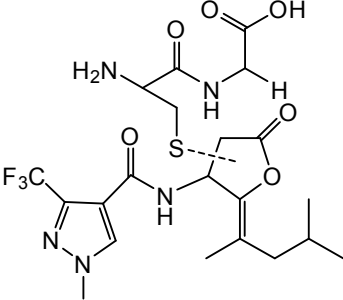
Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
	M.W.: 375.37		
PAM IN-PGH45	1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: C ₆ H ₆ F ₃ N ₃ O M.W.: 193.13		E-fate: soil, soil photolysis, aquatic aerobic. Metabolism: plant, rat, goat, hen.
DM-PAM IN-PGH32	3-trifluoromethyl-1H-pyrazole-4-carboxamide CAS No.: n.a. Formula: C ₅ H ₄ F ₃ N ₃ O M.W.: 179.10		Metabolism: plant, rat, goat, hen.
PCA IN-MR507	1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxylic acid CAS No.: 113100-53-1 Formula: C ₆ H ₅ F ₃ N ₂ O ₂ M.W.: 194.11		E-fate: soil, soil photolysis, aquatic aerobic. Metabolism: plant, rat, goat, hen.
DM-PCA IN-DRJ75	3-trifluoromethyl-1H-pyrazole-4-carboxylic acid CAS No.: 543739-84-0 Formula: C ₅ H ₃ F ₃ N ₂ O ₂ M.W.: 180.08		E-fate: soil, aquatic aerobic. Metabolism: plant, rat, goat.
PDA	2,4-pentadienoic acid CAS No.: n.a. Formula: C ₅ H ₆ O ₂ M.W.: 98.10		Metabolism: rat.
hydroxy- MTF-753- glucuronide	CAS No.: n.a. Formula: C ₂₂ H ₂₈ F ₃ N ₃ O ₆ S M.W.: 551.53		Metabolism: rat.
hydroxy-DM- MTF-753 glucuronide	CAS No.: n.a. Formula: C ₂₃ H ₂₆ F ₃ N ₃ O ₈ S M.W.: 537.51		Metabolism: rat.

Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
hydroxy-DM- MTF-753- glucoside	CAS No.: n.a. Formula: $C_{21}H_{28}F_3N_3O_7S$ M.W.: 523.52		Metabolism: plant.
hydroxy- MTF-753- malonyl- glucoside	CAS No.: n.a. Formula: $C_{25}H_{32}F_3N_3O_{19}S$ M.W.: 623.607		Metabolism: plant.
hydroxy-DM- MTF-753- malonyl- glucoside	CAS No.: n.a. Formula: $C_{24}H_{30}F_3N_3O_{10}S$ M.W.: 609.580		Metabolism: plant.
cys-T-DO	CAS No.: n.a. Formula: $C_{19}H_{26}F_3N_4O_5S_2$ M.W.: 511.57		Metabolism: goat and hen.
hydroxy-cys- T-DO	CAS No.: n.a. Formula: $C_{19}H_{27}F_3N_4O_6S_2$ M.W.: 528.57		Metabolism: rat.
dihydroxy- cys-T-DO	CAS No.: n.a. Formula: $C_{19}H_{27}F_3N_4O_7S_2$ M.W.: 544.57		Metabolism: goat and hen.

Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
GSH-T-DO	CAS No.: n.a. Formula: $C_{26}H_{37}F_3N_6O_9S_2$ M.W.: 698.73		Metabolism: rat.
N-acetyl-cys-T-DO	CAS No.: n.a. Formula: $C_{21}H_{29}F_3N_4O_6S_2$ M.W.: 554.60		Metabolism: rat.
cys-F-DO	CAS No.: n.a. Formula: $C_{19}H_{27}F_3N_4O_6S$ M.W.: 496.50		Metabolism: rat, goat and hen.
dehydro-cys-F-DO	CAS No.: n.a. Formula: $C_{19}H_{25}F_3N_4O_5S$ M.W.: 478.49	 Note: the position of the double bond on the alkyl-chain is not definite.	Metabolism: rat, goat and hen.
hydroxy-cys-F-DO	CAS No.: n.a. Formula: $C_{19}H_{27}F_3N_4O_7S$ M.W.: 512.50		Metabolism: rat, goat and hen.
dihydroxy-cys-F-DO	CAS No.: n.a. Formula: $C_{19}H_{27}F_3N_4O_8S$ M.W.: 528.50		Metabolism: goat and hen.

Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
DM-cys-F-DO	CAS No.: n.a. Formula: $C_{18}H_{25}F_3N_4O_6S$ M.W.: 482.47		Metabolism: rat.
hydroxy-DM-cys-F-DO	CAS No.: n.a. Formula: $C_{18}H_{25}F_3N_4O_7S$ M.W.: 498.47		Metabolism: rat.
GSH-F-DO	CAS No.: n.a. Formula: $C_{26}H_{37}F_3N_6O_{10}S$ M.W.: 682.67		Metabolism: rat.
dehydro-GSH-F-DO	CAS No.: n.a. Formula: $C_{26}H_{35}F_3N_6O_9S$ M.W.: 664.66	 Note: the position of the double bond on the alkyl-chain is not definitive.	Metabolism: rat.
hydroxy-GSH-F-DO	CAS No.: n.a. Formula: $C_{26}H_{37}F_3N_6O_{11}S$ M.W.: 698.67		Metabolism: rat.

Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
dihydroxy- GSH-F-DO	CAS No.: n.a. Formula: $C_{26}H_{37}F_3N_6O_{12}S$ M.W.: 714.67		Metabolism: rat.
DM-hydroxy- GSH-F-DO	CAS No.: n.a. Formula: $C_{25}H_{35}F_3N_6O_{11}S$ M.W.: 684.64		Metabolism: rat.
cys-gly-F-DO	CAS No.: n.a. Formula: $C_{21}H_{30}F_3N_5O_7S$ M.W.: 553.55		Metabolism: rat.
cys-glu-F-DO	CAS No.: n.a. Formula: $C_{24}H_{34}F_3N_5O_9S$ M.W.: 625.63		Metabolism: rat.
hydroxy-cys- glu-F-DO	CAS No.: n.a. Formula: $C_{24}H_{34}F_3N_5O_{10}S$ M.W.: 641.61		Metabolism: rat.

Code Names MCAG DuPont	Chemical Abstracts Name (IUPAC Name)	Structure	Where found
N-acetyl-cys- F-DO	CAS No.: n.a. Formula: $C_{21}H_{29}F_3N_4O_7S$ M.W.: 538.54		Metabolism: rat.
dehydro-gly- N-acetyl-cys- F-DO	CAS No.: n.a. Formula: $C_{23}H_{30}F_3N_5O_7S$ M.W.: 577.57	 Note: the position of the double bond on the alkyl-chain is not definitive.	Metabolism: rat.
hydroxy-N- acetyl-cys-F- DO	CAS No.: n.a. Formula: $C_{21}H_{29}F_3N_4O_8S$ M.W.: 554.54		Metabolism: rat.
dehydro-cys- gly-F-DO	CAS No.: n.a. Formula: $C_{21}H_{28}F_3N_5O_6S$ M.W.: 535.54	 Note: the position of the double bond on the alkyl-chain is not definitive.	Metabolism: rat.

Animal metabolism

The Meeting received metabolism studies on laboratory animals, poultry and lactating goats using the P- and the T-label of penthiopyrad.

The metabolism of penthiopyrad in livestock animals was extensive, leaving numerous single metabolites present at levels below 10% of the TRR. In most cases radioactivity could not be attributed to specific reference compounds since individual levels were below the limit required for identification.

Identified metabolites were normally PAM and PCA or 753-F-DO and 753-A-OH; the latter mostly conjugated with cysteine and/or hydroxylated. Parent penthiopyrad was found in few matrices and only being present at very low amounts far below 10% of the TRR.

In general the metabolic pathway of penthiopyrad was comparable between ruminants and hens, although the amount of unchanged penthiopyrad was slightly higher in poultry.

Laboratory animals

In the 2011 JMPR Report the following conclusions were drawn by WHO for the metabolism of penthiopyrad in rats:

The absorption, distribution, metabolism and excretion of penthiopyrad were investigated in rats. ¹⁴C-labelled penthiopyrad was rapidly and extensively absorbed from the gastrointestinal tract of rats following oral dosing. The extent of absorption was approximately 80–90% of the administered dose, independent of dose and sex. Very little penthiopyrad was retained in the tissues. Faecal excretion was the primary route of elimination, and excretion was rapid, with the majority excreted by all routes 24 hours after dosing (74.8–85.0%).

Extensive metabolism occurred at numerous positions within the molecule, including thienyl ring oxidation and conjugation with glutathione, thienyl ring opening, N-demethylation and alkyl side-chain hydroxylation, followed by oxidation to carboxylic acids and glucuronidation. The most abundant metabolite in both urine and faeces was formed as the result of N-demethylation and oxidation of the methyl moiety of the alkyl side-chain. The most abundant metabolites found in bile were formed as a result of thienyl ring oxidation to 753-F-DO, followed by its conjugation with glutathione and the catabolism of this product. Other significant metabolites in bile were glucuronic acid conjugates of the intermediate demethylated and hydroxylated metabolites. Four metabolites containing the pyrazole moiety following cleavage from the thienyl moiety were excreted in both urine and faeces. The two acids, 1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxylic acid (PCA) and 3-trifluoromethyl-1H-pyrazole-4-carboxylic acid (DM-PCA), are likely formed by amide hydrolysis from 1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide (PAM) and DM-PAM. PAM and subsequent metabolites account for less than 1% of the administered dose. The thienyl ring appears to be completely degraded.

Lactating goats

In a study by Burri, R, (2009, PTHIO_028) [pyrazole-¹⁴C]-penthiopyrad or [thienyl-¹⁴C]-penthiopyrad was administered orally to two lactating goats at rates equivalent to 20 ppm diet in two daily doses for seven consecutive days. The concentration profiles of radioactivity in milk, blood and plasma as well as the excretion patterns via urine and faeces were followed. The goats were sacrificed at approximately 6 hours after the last (14th) administration and liver, kidney, muscle, fat, blood and bile were collected. The effective doses based on the actual amount of consumed diet were 21.8 ppm diet for the P-label and 14.6 ppm diet for the T-label.

Analysis of the total radioactive residues (TRR) was carried out using liquid scintillation counting (LSC).

Milk was separated by centrifugation into skim milk and milk fat and analysed by HPLC and TLC.

Liver, kidney and muscle were extracted on three times with acetonitrile and twice with acetonitrile/purified water (4+1, v/v). Because still significant amounts remained after extraction, a pronase incubation and a Soxhlet extraction at elevated temperature in methanol were performed, followed by hydrolysis of the pellet in 2N HCl. After partitioning against hexane and dichloromethane (liver, kidney) or ethyl acetate (muscle), the organic extracts were analysed by HPLC/TLC.

Fat was pooled and extracted three times with dichloromethane. The dichloromethane extracts were pooled and radioassayed. The sample was additionally extracted twice with methanol followed by a Soxhlet extraction in methanol.

The total radioactive residues (TRR) found in milk and tissues, are summarized in Table 4 and Table 5.

Table 4 TRR in milk of lactating goats - recovery of administered doses of [^{14}C]penthiopyrad

Time period after first admin. (hours)	P-label mg eq/kg	T-label mg eq/kg
Prior to admin.	0.002	0.001
0–16	0.010	0.008
16–24	0.023	0.016
24–40	0.038	0.024
40–48	0.039	0.029
48–64	0.052	0.031
64–72	0.067	0.030
72–88	0.059	0.037
88–96	0.046	0.041
96–112	0.062	0.043
112–120	0.065	0.038
120–136	0.060	0.041
136–144	0.055	0.035
144–160	0.078	0.033
160–166	0.062	0.032

Table 5 TRR in tissues of lactating goats - recovery of administered doses of [^{14}C]penthiopyrad

	P-label % Total dose	P-label mg eq/kg	T-label % Total dose	T-label mg eq/kg
Liver	0.36	1.9	0.33	0.99
Kidney	0.01	0.33	0.01	0.11
Muscle	0.21	0.038	0.13	0.011
Fat	0.05	0.028	0.05	0.015
Total	0.63		0.52	

The main objective of this study was to characterize the radioactivity in the different tissues and investigate the mass balance in livestock animals.

For milk the last sample ((160–166 hours) was selected for detailed analysis. The distribution of radiolabel between the fat, extracted whey (skimmed milk) and protein pellet (post-extraction solids) for both labels is presented in Table 6.

Table 6 Overview of characterisation of radioactive residues in goat milk

	P-label (21.8 ppm)		T-label (14.6 ppm)	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total in fat	5.0	0.003	18.3	0.006

	P-label (21.8 ppm)		T-label (14.6 ppm)	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total in whey	93.9	0.058	55.2	0.018
Total dichloromethane	66.9	0.042	35.9	0.011
U1	7.4	0.005		
U2	7.2	0.004		
U3	12.7	0.008		
U4	9.0	0.006		
U5			22.0	0.007
U6	9.6	0.006		
U7			13.9	0.004
PAM	21.1	0.013		
Aqueous phase	26.9	0.017	14.4	0.005
0.12 PCA R _f =	6.2	0.004		
0.27 PAM R _f =	9.5	0.006		
U8	11.3	0.007		
Soxhlet (methanol)	–	–	5.0	0.002
Unextracted	1.2	0.001	26.5	0.008
Total in milk	100.0	0.062	100.0	0.032

– = not applicable

U: unknown metabolite

Extractability of residues in liver was lower than for milk. Following sequential extractions 47.4% and 68.2% remained unextractable for the P-label and T-label respectively.

A complex pattern of chromatographic peaks was observed, 10 of those were quantified below 0.034 mg eq/kg. Co-chromatography of metabolites with reference compounds was used to attribute penthiopyrad, DM-753, 753-FDO, 753-TDO, PAM and PCA in the P-label. A summary of the characterized residues is presented in Table 7.

Table 7 Overview of characterization of radioactive residues in goat liver

	P-label (21.8 ppm)		T-label (14.6 ppm)	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total hexane	2.3	0.044	14.3	0.14
Total dichloromethane	17.4	0.33	5.2	0.051
Penthiopyrad	2.0	0.037		
DM-753	0.7	0.013		
753-T-DO	1.1	0.020		
PCA	1.3	0.024		
PAM	2.8	0.053		
753-F-DO	1.1	0.02		
753-A-OH	–	–	0.5	0.005
U1+U2	1.3	0.024		
U3+U4	1.6	0.028		

	P-label (21.8 ppm)		T-label (14.6 ppm)	
	% TRR	mg eq/kg	% TRR	mg eq/kg
U5	1.0	0.02		
U6	1.0	0.018	9 unknowns	
U7	1.5	0.027	each less than 0.01 mg eq/kg	
U8	2.2	0.041		
Total aqueous	32.9	0.62	12.3	0.12
PCA (13.5 min)	7.5	0.14		
U9	1.8	0.033		
U10	1.7	0.033		
U11	1.9	0.035	18 unknowns; one unknown at 1.4% and	
U12	1.6	0.031	0.014 mg eq/kg TRR.	
U13	2.3	0.043	All other unknowns less than 0.01 mg eq/kg	
U14	3.2	0.059		
U15	1.9	0.036		
U16	1.8	0.034		
U17	1.5	0.028		
U18	2.2	0.042		
U19	5.4	0.101		
Total extracted	52.6	0.99	31.8	0.31
Released by pronase	17.9	0.34	31.1	0.31
Released by hydrolysis	14.2	0.27	18.8	0.19
Unextracted	15.3	0.29	18.3	0.18
Total in liver	100.0	1.9	100.0	0.99

U: unknown metabolite

For kidney 76.4% TRR and 65.3% of the TRR were extracted for the P-label and T-label, respectively. PAM was the major component in kidney accounting for 18.6% TRR (0.062 mg eq/kg). PCA was also identified by co-chromatography on HPLC and TLC and quantified at 12.5% TRR (0.041 mg eq/kg). All radioactive residues in the T-label sample were present at less than 0.01 mg eq/kg (see Table 8).

Table 8 Overview of characterization and identification of radioactive residues in goat kidney

	P-label (21.8 ppm)		T-label (14.6 ppm)	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Hexane phase	1.4	0.004	7.9	0.009
Total dichloromethane	31.1	0.1	18.6	0.021
753-A-OH			2.5	0.003
PCA	12.5	0.041		
PAM	18.6	0.062		
12 unknowns (each < 0.01 mg eq/kg)			16.1	0.018
Total aqueous	43.9	0.15	38.7	0.044
Penthiopyrad	3.4	0.011		

	P-label (21.8 ppm)		T-label (14.6 ppm)	
	% TRR	mg eq/kg	% TRR	mg eq/kg
753-A-OH			3.2	0.004
U1	5.4	0.018		
U2	3.0	0.010		
U3	5.2	0.017		
U4	4.0	0.013		
U5	4.7	0.016		
U6	6.2	0.021		
U7	7.3	0.024		
U8	4.6	0.015		
7 unknowns (each ≤ 0.01 mg eq/kg)			35.5	0.04
Total extracted	76.4	0.25	65.3	0.074
Released by hydrolysis	13.0	0.043	17.2	0.019
Unextracted	10.6	0.035	17.5	0.020
Total in kidney	100.0	0.33	100.0	0.11

U: unknown metabolite

In muscle and fat total radioactive residues were present at concentrations of 0.038 mg eq/kg for the P-label and 0.011 mg eq/kg for the T-label and of 0.028 mg eq/kg for the P-label and 0.015 mg eq/kg for the T-label, respectively. Only the P-label was further investigated for both tissues.

In muscle PAM was the major residue accounting for a total of 51.1% of the TRR (44.3% TRR in the dichloromethane and 7.8% of the TRR in the aqueous phase) (see Table 9).

In fat the major component was penthiopyrad with 0.009 mg eq/kg. A component co-chromatographed with PAM, being present at 12.1% of the TRR (0.003 mg eq/kg) (see Table 10).

Table 9 Overview of characterisation and identification of radioactive residues in goat muscle

	P-label (21.8 ppm)	
	% TRR	mg eq/kg
Hexane phase	13.8	0.005
Total dichloromethane	45.7	0.017
PAM	44.3	0.016
U1	1.4	0.001
Total aqueous	23.7	0.009
PAM	7.8	0.003
PCA	6.8	0.003
U2	9.1	0.003
Total extracted	83.1	0.032
Unextracted	16.9	0.006
Total in muscle	100.0	0.038

U: unknown metabolite

Table 10 Overview of characterisation and identification of radioactive residues in goat fat

	P-label (21.8 ppm)	
	% TRR	mg eq/kg
Hexane phase	5.9	0.002
Total acetonitrile	55.6	0.016
Penthiopyrad	32.4	0.009
PAM	12.1	0.003
U1	3.2	0.001
U2	5.7	0.002
U3	2.2	0.001
Total extracted	73.0	0.020
Unextracted	27.0	0.008
Total in fat	100.0	0.028

U: unknown metabolite

A second goat metabolism study was undertaken by Marin, J (2009, PTHIO_029) to further elucidate the metabolic pathway and the nature of the residues in liver and kidney. Two lactating goats were administered either [pyrazole-¹⁴C]- or [thienyl-¹⁴C]-penthiopyrad at 10 ppm in the diet with a single daily dose over five consecutive days. The goats were sacrificed 20–21 hours after the last administration and liver, kidney, muscle, fat, blood and bile were sampled.

Total radioactive residues (TRR) were determined by liquid scintillation counting after solubilisation or by direct liquid scintillation counting for skim milk, milk fat, blood, cage wash and urine samples. Milk was centrifuged to obtain skimmed milk and milk fat. TRR levels found in milk other matrices are summarized in Table 11 and Table 12.

Table 11 Overview of TRR level in goats milk

	Whole Milk	
Sampling	P-label 10 ppm (mg eq/kg)	T-label 10 ppm (mg eq/kg)
Day 1	0.009	0.017
Day 2	0.030	0.054
Day 3	0.035	0.072
Day 4	0.036	0.055
Day 5	0.031	0.032
Day 6 am	0.040	0.039

Table 12 Overview of TRR level in goats tissues

Tissue	P-label 10 ppm (mg eq/kg)	T-label 10 ppm (mg eq/kg)
Liver	0.74	0.66
Kidney	0.15	0.17
Loin Muscle	0.024	0.012
Flank Muscle	0.025	0.020
Renal Fat	0.019	0.013
Omental Fat	0.016	0.018
Subcutaneous Fat	0.022	0.014

Tissue	P-label 10 ppm (mg eq/kg)	T-label 10 ppm (mg eq/kg)
Blood	0.055	0.051
Bile	5.8	7.3

For characterization, tissues and milk were extracted twice with acetone/water, unextracted residues were afterwards measured by combustion. As appropriate, pronase, acid and base digestions were used to release radioactivity remaining. Extracts were chromatographed on HPLC and compared to unlabelled reference compounds and radiolabelled conjugates.

In liver solvent extraction released approx. 40% of the TRR. The identification of the radioactivity revealed numerous metabolites for both labels present at levels of < 10% of the TRR (0.069 mg eq/kg or less) each. Only hydroxy-MTF-753 was found in the T-label above 10% of the TRR (10.3%) (see Table 13).

To increase the extraction rate protease, acid and base hydrolysis were performed, resulting in a spectrum of low level metabolites (see Table 14 and Table 15).

Table 13 Characterization of residues in goat liver following solvent extraction

P-label 10 ppm			T-label 10 ppm		
Identity	mg eq/kg	% TRR	Identity	mg eq/kg	% TRR
DM-PAM	0.007	0.88	Polar metabolites	0.014	2.10
PAM	0.017	2.14	dihydroxy-cys-F-DO isomer ^a	0.013	1.95
dihydroxy-cys-F-DO isomer ^a	0.016	2.02	dihydroxy-cys-F-DO isomer ^a	0.015	2.25
dihydroxy-cys-F-DO isomer ^a	0.015	1.89	hydroxy-cys-F-DO	0.014	2.10
hydroxy-cys-F-DO	0.014	1.76	dihydroxy-cys-T-DO	0.018	2.69
cys-T-DO-isomer ^a	0.042	5.29	cys-T-DO-isomer ^a	0.013	1.95
cys-T-DO-isomer ^a	0.017	2.14	cys-T-DO-isomer ^a	0.045	6.74
dihydroxy-MTF-753 + hydroxy-MTF-753	0.031	3.90	hydroxy-MTF-753	0.069	10.33
cys-F-DO isomer ^a	0.027	3.40	cys-F-DO-isomer ^a	0.016	2.40
cys-F-DO isomer ^a	0.028	3.53	cys-F-DO-isomer ^a	0.031	4.64
dehydro-cys-F-DO	0.036	4.53	dehydro-cys-FDO	0.009	1.35
753-A-OH	0.011	1.39	753-A-OH	0.012	1.80
U1	0.015	1.89	Unknown (40.75min)	0.006	0.90
PTU + MTF-753	0.011	1.39	MTF-753	0.005	0.75
Sum of unassigned chromatographic peaks	0.019	2.39	Sum of unassigned chromatographic peaks	0.019	2.84
Total extracted	0.321	40.4	Total extracted	0.283	42.4
Total protease digest	0.066	8.3	Total protease digest	0.083	12.4
Total acid digest	0.250	31.5	Total acid digest	0.146	21.9
Total base digest	0.147	18.5	Total base digest	0.138	20.7

P-label 10 ppm			T-label 10 ppm		
Identity	mg eq/kg	% TRR	Identity	mg eq/kg	% TRR
Total recovered	0.784	98.7	Total recovered	0.650	97.3

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

Table 14 Characterization of residues in protease and acid digests of P-label liver (10 ppm)

Identity	Protease Digest		Acid Digest	
	mg eq/kg	% TRR	mg eq/kg	% TRR
U2	–	–	0.019	2.39
DM-PAM	0.001	0.13	–	–
PCA (unconfirmed)	–	–	0.101	12.72
PAM	0.005	0.63	0.063	7.93
dihydroxy-cys-F-DO isomer ^a	0.011	1.39	–	–
dihydroxy-cys-F-DO isomer ^a	–	–	0.002	0.25
hydroxy-cys-F-DO	0.006	0.76	0.005	0.63
cys-T-DO-isomer ^a	0.008	1.01	0.003	0.38
cys-T-DO-isomer ^a	–	–	0.010	1.26
dihydroxy-MTF-753 + hydroxy-MTF-753	0.009	1.13	0.008	1.01
cys-F-DO isomer ^a	0.002	0.25	0.019	2.39
cys-F-DO isomer ^a	0.001	0.13	0.012	1.51
dehydro-cys-F-DO	0.002	0.25	–	–
753-A-OH	0.001	0.13	–	–
U3	–	–	–	–
PTU + MTF-753	–	–	–	–
Sum of unassigned chromatographic peaks	0.020	2.5	0.008	1.01
Total	0.066	8.3	0.250	31.5

Unconfirmed PCA was identified based on analytical retention time

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

Table 15 Characterization residues in protease and acid digests of T-label liver

Identity	Protease Digest		Acid Digest	
	mg eq/kg	% TRR	mg eq/kg	% TRR
U4	0.007	1.05	0.012	1.80
U5	0.005	0.75	–	–
dihydroxy-cys-F-DO isomer ^a	–	–	–	–
dihydroxy-cys-F-DO isomer ^a	0.005	0.75	0.009	1.35
hydroxy-cys-F-DO	–	–	–	–
dihydroxy-cys-T-DO	0.021	3.14	0.014	2.10
cys-T-DO-isomer ^a	–	–	0.016	2.40
cys-T-DO-isomer ^a	0.004	0.60	0.014	2.10
hydroxy-MTF-753	0.008	1.20	0.014	2.10
cys-F-DO isomer ^a	0.003	0.45	0.015	2.25
cys-F-DO isomer ^a	0.002	0.30	0.009	1.35
dehydro-cys-F-DO	0.002	0.30	0.008	1.20
753-A-OH	–	–	–	–
U6	0.001	0.15	–	–

	Protease Digest		Acid Digest	
Identity	mg eq/kg	% TRR	mg eq/kg	% TRR
MTF-753	–	–	–	–
Sum of unassigned chromatographic peaks	0.025	3.74	0.035	5.24
Total	0.083	12.4	0.146	21.9

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

For kidney the extraction rates were 64.5% of the TRR for the P-label and 48.5% of the TRR for the T-label. Most of the unextracted radioactivity was released after using pronase, acid and base digestion.

Following solvent extraction most of the radioactivity was identified as numerous metabolites below 10% of the TRR (0.017 mg eq/kg and less) each. In the T-label PAM and the dihydroxy-cys-F-DO isomer were present at amounts of 10.3% and 11% of the TRR, respectively (see Table 16).

After hydrolysis of the kidney a large number of metabolites at individual levels all below 4% of the TRR (0.006 mg eq/kg or less) were found (see Table 17 and Table 18).

Table 16 Characterisation of residues in goat kidney following solvent extraction

P-label (10 ppm)			T-label (10 ppm)		
Identity	mg eq/kg	% TRR	Identity	mg eq/kg	% TRR
Extracted in acetone/water	0.1	64.5	Extracted in acetone/water	0.083	48.5
DM-PAM	0.007	4.52	Polar fraction	0.004	2.34
PAM	0.016	10.3	U1	0.003	1.75
dihydroxy-cys-F-DO isomer	0.017	11.0	U2	0.003	1.75
hydroxy-cys-F-DO	0.009	5.81	U3	0.004	2.34
dihydroxy-cys-T-DO	0.008	5.16	dihydroxy-cys-F-DO isomer (a)	0.007	4.09
cys-T-DO isomer	0.007	4.52	dihydroxy-cys-F-DO isomer (a)	0.007	4.09
dihydroxy-MTF-753	0.008	5.16	hydroxy-cys-F-DO	0.007	4.09
hydroxy-MTF-753	0.009	5.81	dihydroxy-cys-TDO	0.007	4.09
cys-F-DO isomer	0.007	4.52	cys-TDO isomer (a)	0.004	2.34
dehydro-cys-F-DO + A-OH	0.013	8.39	cys-TDO isomer (a)	0.005	2.92
U4	0.003	1.94	dihydroxy-MTF-753	0.007	4.09
penthiopyrad	0.002	1.29	hydroxy-MTF-753	0.006	3.51
Sum of unassigned chromatographic peaks	0.008	5.16	cys-F-DO isomer	0.003	1.75
			cys-F-DO isomer	0.007	4.09
			dehydro-cys-F-DO + A-OH	0.003	1.75
			U5	0.003	1.75
			penthiopyrad	0.001	0.58
			Sum of unassigned chromatographic peaks	0.006	3.51
Total in protease digest	0.019	12.3	Total in protease digest	0.034	19.9
Total in acid digest	0.022	14.2	Total in acid digest	0.032	18.7
Unextracted	0.009	5.8	Unextracted	0.027	15.8
Total	0.15	96.8	Total	0.176	102.9

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

Table 17 Characterisation of residues in protease and acid digests of P-label kidney

	Protease Digest		Acid Digest	
Identity	mg eq/kg	% TRR	mg eq/kg	% TRR

	Protease Digest		Acid Digest	
Identity	mg eq/kg	% TRR	mg eq/kg	% TRR
U6	–	–	0.001	0.65
PAM	0.002	1.29	0.004	2.58
dihydroxy-cys-F-DO isomer	–	–	0.001	0.65
hydroxy-cys-F-DO	0.002	1.29	0.001	0.65
dihydroxy-cys-T-DO	0.003	1.94	–	–
cys-T-DO-isomer	0.002	1.29	–	–
dihydroxy-MTF-753	0.001	0.65	0.001	0.65
cys-F-DO isomer	–	–	0.002	1.29
dehydro-cys-F-DO + A-OH	–	–	0.001	1.29
Sum of unassigned chromatographic peaks	0.009	5.81	0.011	7.09
Total	0.019	12.3	0.022	14.2

U: unidentified metabolite

Table 18 Characterization residues in protease and acid digests of T-label kidney

	Protease Digest		Acid Digest	
Identity	mg eq/kg	% TRR	mg eq/kg	% TRR
U7	0.004	2.34	0.004	2.34
U8	0.005	2.92	0.001	0.58
dihydroxy-cys-F-DO isomer ^a	–	–	0.001	0.58
dihydroxy-cys-F-DO isomer ^a	0.006	3.51	0.002	1.17
hydroxy-cys-F-DO	0.002	1.17	0.002	1.17
dihydroxy-cys-T-DO	0.003	1.75	0.003	1.75
cys-T-DO-isomer ^a	0.004	2.34	0.002	1.17
cys-T-DO-isomer ^a	–	–	0.002	1.17
hydroxy-MTF-753	0.001	0.58	0.003	1.75
cys-F-DO isomer ^a	0.001	0.58	0.002	1.17
cys-F-DO isomer ^a	–	–	0.002	1.17
dehydro-cys-F-DO + A-OH	0.001	0.58	–	–
U9	–	–	0.001	0.58
Sum of unassigned chromatographic peaks	0.007	4.09	0.007	4.09
Total	0.034	19.88	0.032	18.7

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

In milk (3 day milk) 93% of the TRR was released by solvent extraction. As main metabolite PAM was identified amounting to 30% of the TRR (0.013 mg eq/kg) for the P-label, followed by the cys-T-DO-isomer with 16.3% of the TRR (0.007 mg eq/kg). For the T-label metabolisation was more extensive, resulting numerous metabolites, each being present at levels of 8.4% of the TRR or less (0.008 mg eq/kg or less).

Table 19 Characterisation radioactive residues in milk

P-label			T-label		
Identity	mg eq/kg	% TRR	Identity	mg eq/kg	% TRR

P-label			T-label		
Identity	mg eq/kg	% TRR	Identity	mg eq/kg	% TRR
DM-PAM	0.003	6.98	A	0.008	8.42
PAM	0.013	30.23			
dihydroxy-cys-F-DO isomer ^a	0.001	2.33	dihydroxy-cys-F-DO isomer ^a		
dihydroxy-cys-F-DO isomer ^a	0.001	2.33	dihydroxy-cys-F-DO isomer ^a	0.005	5.26
hydroxy-cys-F-DO	0.003	6.98	hydroxy-cys-F-DO	0.004	4.21
dihydroxy-cys-TDO	0.002	4.65	dihydroxy-cys-TDO	0.004	4.21
cys-TDO isomer	0.007	16.28	cys-TDO isomer ^a	0.005	5.26
dihydroxy-MTF-753 + hydroxy-MTF-753	0.004	9.30	cys-TDO isomer ^a	0.007	7.37
cys-F-DO isomer	0.003	6.98	dihydroxy-MTF-753	0.005	5.26
Dehydro-cys-F-DO	0.003	6.98	hydroxy-MTF-753		
			cys-F-DO isomer ^a	0.008	8.42
			cys-F-DO isomer ^a	0.005	5.26
			dehydro-cys-F-DO	0.006	6.32
			A-OH	0.002	2.11
Total identified	0.040	93.0	Total identified	0.051	53.26
Unidentified extracted	–	–	Unidentified extracted	0.015	15.8
Unidentified in digest	–	–	Unidentified in digest	0.021	22.1
Unextracted	–	–	Unextracted	–	–
Total	0.040	93.0	Total	0.095	100

^a isomeric constitution not identifiable by mass spectrometry

In muscle total radioactivity was 0.02 mg eq/kg. Extraction of composite loin and flank muscle samples with acetone/water yielded 76.9% and 58.8% of the TRR for the P- and T-label respectively. Identification of the radioactivity gave PAM (0.012 mg eq/kg equivalent to 46% TRR) and DM-PAM (0.003 mg eq/kg equivalent to 11.5% TRR) as metabolites from the P-label. For the T-label residues were too low for identification.

For fat the TRR was approximately 0.02 mg eq/kg for each of the labels. Extraction of composite fat samples yielded 84.2% TRR and 57.1% TRR for the P- and T-label, respectively. Analysis of the P-label extract showed DM-PAM, PAM and penthiopyrad in concentrations up to 0.005 mg eq/kg. For the T-label residues were too low for identification.

A proposed metabolic pathway of penthiopyrad in ruminants is presented in Figure 1.

concentrated, and re-dissolved in hexane. The hexane phase was then partitioned with acetonitrile and acetonitrile/purified water (1:1, v/v; fat only).

Table 20 Total radioactive residues in egg white and egg yolk

Time after	Egg white	Egg white	Egg yolk	Egg yolk
1 st admin.	P-label (11.7 ppm)	T-label (12.4 ppm)	P-label (11.7 ppm)	T-label (12.4 ppm)
(hours)	mg eq/kg	mg eq/kg	mg eq/kg	mg eq/kg
0–24	0.002	0.002	0.001	0.001
24–48	0.035	0.029	0.016	0.007
48–72	0.049	0.032	0.049	0.033
72–96	0.047	0.045	0.1	0.068
96–120	0.05	0.037	0.15	0.14
120–144	0.046	0.04	0.19	0.21
144–168	0.05	0.041	0.22	0.26
168–192	0.049	0.039	0.23	0.31
192–216	0.043	0.039	0.24	0.33
216–240	0.06	0.05	0.22	0.35
240–264	0.052	0.043	0.24	0.34
264–288	0.052	0.043	0.26	0.37
288–312	0.053	0.042	0.27	0.37
312–318	0.049	0.041	0.28	0.35

Table 21 Total radioactive residues in hen tissues and whole eggs

Tissue	Mean	Mean
	P-label (11.7 ppm)	T-label (12.4 ppm)
	mg eq/kg	mg eq/kg
Blood	0.52	0.52
Fat	0.021	0.049
Liver	0.63	0.68
Muscle	0.052	0.038
Blood Plasma	0.13	0.13
Skin	0.053	0.059
Whole Egg calculated 7 day	0.095	0.11
Whole Egg calculated 13 day	0.12	0.13

For egg white PAM was identified as the major metabolite for the P-label, giving residues of 49.8% of the TRR in the organic phase after 144–168 h of dosing (0.025 mg eq/kg). In egg white after 288–312 h of dosing PAM was present in the organic phase with 24.6% of the TRR and in the aqueous phase with additional 16.5% of the TRR (0.009 mg eq/kg). In addition DM-PAM was identified in the aqueous phase with 18.7% of the TRR (0.01 mg eq/kg) (see Table 22).

For the T-label the total rate of identification was relatively low with 30.2% of the TRR (0.012 mg eq/kg) for egg white after 144–168 h and 37.1% of the TRR (0.016 mg eq/kg) for egg white after 288–312 h. The only metabolites identified were unchanged penthiopyrad (1.3–2.0% TRR, 0.001 mg eq/kg) and 753-A-OH (6.7–6.2% TRR, 0.003 mg eq/kg) (see Table 23).

Table 22 Characterization of radioactive residues in egg white (P-label at 11.7 ppm)

	Egg white 144–168 h		Egg white 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total organic phase	60.4	0.030	47.2	0.025

	Egg white 144–168 h		Egg white 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Penthiopyrad	2.7	0.001	3.3	0.002
753-A-OH	–	–	4.8	0.003
PAM	49.8	0.025	24.6	0.013
U3	4.2	0.002	5.2	0.003
U4	–	–	4.1	0.002
U5	–	–	5.2	0.003
U6	3.7	0.002	–	–
Total aqueous phase	33.4	0.017	45.9	0.024
PAM	Not performed	Not performed	16.5	0.009
DM-PAM	Not performed	Not performed	18.7	0.010
U1	Not performed	Not performed	8.1	0.004
U4	Not performed	Not performed	2.6	0.001
Total extracted	93.8	0.047	93.0	0.049
Unextracted	6.2	0.003	7.0	0.004
Total recovered	100.0	0.050	100.0	0.053

U: unidentified metabolite

Table 23 Characterization of radioactive residues in egg white (T-label at 12.4 ppm)

	Egg white 144–168 h		Egg white 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total organic phase	30.2	0.012	37.1	0.016
Penthiopyrad	1.3	0.001	2.0	0.001
753-A-OH	6.7	0.003	6.2	0.003
Sum of unassigned chromatographic peaks	at least 9 peaks HPLC Rt 9–25.3 min	all less than 0.001	at least 9 peaks HPLC Rt 9–25.3 min	all less than 0.002
Total aqueous phase	26.9	0.011	24.6	0.01
Total extracted	57.1	0.023	61.7	0.026
Unextracted	42.9	0.018	38.3	0.016
Total recovered	100.0	0.041	100.0	0.042

U: unidentified metabolite

In egg yolks identification of the radioactivity in the organic phase revealed for the P-label unchanged parent penthiopyrad at levels of 7.0% and 11.7% of the TRR (0.015 and 0.031 mg eq/kg). In addition PAM was found as major metabolite present at amounts of 23.6% and 28.4% of the TRR (0.052 and 0.07 mg eq/kg). In the aqueous phase additional PAM and DM-PAM were identified at lower amounts of 2.7% TRR (0.007 mg eq/kg) and 3.1% TRR (0.008 mg eq/kg), respectively. Hydrolysis of the unextracted residue released additional 2.9% of the TRR (0.008 mg eq/kg) as penthiopyrad and 10% of the TRR (0.027 mg eq/kg) as PAM (see Table 24 and Table 25).

Table 24 Characterization of radioactive residues in egg yolk (P-label 11.7 ppm)

	Egg yolk 144–168 h		Egg yolk 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total organic phase	40.4	0.089	40.1	0.11
Penthiopyrad	7.0	0.015	11.7	0.031
PAM	23.6	0.052	28.4	0.075

	Egg yolk 144–168 h		Egg yolk 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
U2	6.3	0.014	–	–
U3	3.5	0.008	–	–
Total aqueous phase	9.4	0.021	11.7	0.031
PAM	Not performed	Not performed	2.7	0.007
DM-PAM	Not performed	Not performed	3.1	0.008
3 unassigned chromatographic peaks	Not performed	Not performed	5.9	0.016
Total extracted	49.8	0.11	51.9	0.14
Unextracted	50.2	0.11	48.1	0.13
Total	100.0	0.22	100.0	0.27

U: unidentified metabolite

Table 25 Characterization of unextracted radioactive residues in egg yolk after hydrolysis (P-label 12.4 ppm)

	Egg yolk 144–168 h		Egg yolk 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Organic after hydrolysis	26.6	0.059	23.6	0.063
Penthiopyrad	Not performed	Not performed	2.9	0.008
PAM	Not performed	Not performed	10.0	0.027
4 unassigned analytical peaks	Not performed	Not performed	< 3.7%	< 0.01
Aqueous after hydrolysis	5.1	0.011	2.4	0.006
Total released on hydrolysis	31.7	0.070	26.0	0.069
Unextracted	18.5	0.041	22.1	0.056
Total	50.2	0.11	48.1	0.13

U: unidentified metabolite

The investigation of egg yolk after administration of the T-label gave a broad pattern of breakdown products all present at levels below 10% of the TRR (0.021 mg eq/kg or less) each. The only substance identified was unchanged parent substance with 2.2% of the TRR (0.006 mg eq/kg). After hydrolysis some additional penthiopyrad could be released, giving total levels of 9.4% TRR (0.035 mg eq/kg). No further metabolites were identified (see Tables 26 and 27).

Table 26 Characterization of radioactive residues in egg yolk (T-label 11.7 ppm)

	Egg yolk 144–168 h		Egg yolk 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Total organic phase	50.3	0.13	52.5	0.19
Penthiopyrad	2.2	0.006	–	–
U2	1.4	0.004	4.6	0.017
U3	8.1	0.021	7.2	0.026
U4	–	–	3.8	0.014
U5	7.9	0.021	7.3	0.027
U6	4.5	0.012	–	–
U7	3.2	0.008	–	–
U8	–	–	5.7	0.021

	Egg yolk 144–168 h		Egg yolk 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
U9	4.4	0.011	–	–
U10	3.9	0.010	6.6	0.024
U11	2.8	0.007	–	–
U12	2.4	0.006	7.3	0.027
U13	3.9	0.010	–	–
U14	5.7	0.015	9.9	0.036
Total aqueous phase	7.6	0.020	5.8	0.021
Total extracted	57.9	0.15	58.3	0.21
Unextracted	42.1	0.11	41.7	0.15
Total	100.0	0.26	100.0	0.37

U: unidentified metabolite

Table 27 Characterization of unextracted radioactive residues in egg yolk after hydrolysis (T-label 12.4 ppm)

	Egg yolk 144–168 h		Egg yolk 288–312 h	
	% TRR	mg eq/kg	% TRR	mg eq/kg
Organic after hydrolysis	11.4	0.030	14.9	0.055
Penthiopyrad	Not performed	Not performed	9.4	0.035
U1	Not performed	Not performed	1.5	0.005
U3	Not performed	Not performed	1.5	0.005
U4	Not performed	Not performed	2.0	0.007
U5	Not performed	Not performed	0.6	0.002
Aqueous after hydrolysis	15.4	0.040	15.4	0.056
Total released on hydrolysis	26.7	0.070	30.3	0.11
Unextracted	15.4	0.040	11.4	0.042
Total	42.1	0.11	41.7	0.15

U: unidentified metabolite

For hen liver solvent extraction released 66.3% of the TRR for the P-label (0.42 mg eq/kg) and 56.6% of the TRR for the T-label (0.39 mg eq/kg).

The identification of the extracts following administration of the P-label showed numerous metabolites present at individual levels of 12.5% of the TRR and less (0.079 mg eq/kg and less). The only substances identified were PCA with 1.4% TRR (0.009 mg eq/kg) and PAM with 7.9% TRR (0.05 mg eq/kg) (see Table 28).

The major part of the unextracted radioactivity could be released by hydrolysis. Again PCA and PAM were the only structures identified with an additional amount of 2.0% TRR (0.012 mg eq/kg) and 6.8% TRR (0.043 mg eq/kg), respectively (see Table 29).

For the T-label also a very broad metabolic pattern was found, but none of the individual substances could be identified. After hydrolysis of the unextracted residue 6.2% of the TRR remained in the final residue. Characterization of the radioactivity gave a distribution of 25.0% TRR in the organic phase plus additional 4.3% TRR after hydrolysis and 31.5% in the aqueous phase plus additional 30.1% TRR after hydrolysis.

Table 28 Characterization of radioactive residues in hens' liver (P-label 11.7 ppm)

	% TRR	mg eq/kg
Total organic phase	33.1	0.21
Total hexane phase	19.4	0.12
U1	3.0	0.019
U2	2.9	0.019
U3	2.0	0.012
U4	2.1	0.013
9 unassigned chromatographic peaks	0.7–1.4	0.004–0.009
Total dichloromethane phase	13.7	0.087
PCA	1.4	0.009
PAM	5.5	0.035
9 unassigned chromatographic peaks	0.3–1.3	0.002–0.008
Total aqueous phase	33.2	0.21
PAM	2.4	0.015
U5	12.5	0.079
U6	2.7	0.017
U7	3.7	0.023
U8	3.6	0.023
5 unassigned chromatographic peaks	0.9–2.2	0.006–0.014
Total extracted	66.3	0.42
Unextracted	33.7	0.21
Total in liver	100.0	0.63

U: unidentified metabolite

Table 29 Characterization of unextracted radioactive residues in hen liver after hydrolysis (P-label 12.4 ppm)

	% TRR	mg eq/kg
Total released on hydrolysis	31.9	0.20
Total organic phase	9.0	0.057
PCA	2.0	0.012
PAM	4.9	0.031
2 unassigned chromatographic peaks	1.0, 1.1	0.006, 0.007
Total aqueous phase	20.2	0.13
PAM	1.9	0.012
U1	0.8	0.005
U2	0.7	0.005
U3	6.9	0.044
U4	2.7	0.017
U5	2.4	0.015
U6	4.8	0.030
Unextracted	1.7	0.011
Total	33.7	0.21

U: unidentified metabolite

A second study to investigate the metabolism of penthiopyrad in laying hens' livers and eggs was conducted by Marin, J (2009, PTHIO_031). This study was also performed with [pyrazole-¹⁴C]-penthiopyrad (P-label) and [thienyl-¹⁴C]-penthiopyrad (T-label), which were administered orally as

capsules to two separate groups of five hens once per day for 7 consecutive days at a rate of 10 ppm diet (approx. 0.85 mg/kg bw and day). Eggs were collected twice daily and immediately before sacrifice (23–24 h after the final dose). The entire liver, sub-samples of two types of muscles (breast and thigh), two types of fat (omental and subcutaneous) and the contents of the GI tracts were sampled.

Total radioactive residues (TRR) were determined by liquid scintillation counting after homogenisation and solubilisation or by direct liquid scintillation counting.

Portions of liver were extracted with acetone/water (4:1) and analysed by HPLC. In the second extraction set, samples after extraction with acetone/water were subjected to protease, acid and base hydrolysis. The post-extraction solids (PES) were analysed by combustion analysis.

Eggs were extracted with water and acetonitrile or with water and acetone (day 8, P-label only). The extracts were concentrated and analysed by HPLC (UV, RD and MS) against reference substances.

Total radioactive residues in eggs increased over the whole study period reaching a plateau at day 7. Overall radioactivity was found at levels up to 0.094 mg eq/kg parent equivalents. In tissues highest radioactivity was found in liver with 0.24 mg eq/kg parent eq. for the P-label and 0.35 mg eq/kg parent eq. for the T-label. Residues in muscle and fat were 0.014 to 0.022 mg eq/kg parent eq. for both labels (see Table 30 and Table 31).

Most of the radioactivity administered was recovered from the excreta and cage wash (84% for the P-label and 85% for the T-label) and the GI tract (2.05% for the P-label and 2.12% for the T-label).

Table 30 Mean total radioactive residues in whole eggs

Time Point	P-Label at 10 ppm (mg eq/kg)	T-Label at 10 ppm (mg eq/kg)
Day 1 AM pre dose	< 0.001	< 0.001
Day 1 PM	< 0.001	< 0.001
Day 2 AM	< 0.001	0.010
Day 2 PM	0.013	0.012
Day 3 AM	0.028	0.023
Day 3 PM	0.029	0.028
Day 4 AM	–	–
Day 4 PM	0.038	0.041
Day 5 AM	0.043	0.049
Day 5 PM	0.047	0.060
Day 6 AM	0.048	0.066
Day 6 PM	0.056	0.075
Day 7 AM	0.062	0.082
Day 7 PM	–	0.094
Day 8 AM	0.062	0.088

Table 31 Total radioactive residues in hen tissues

Tissue	P-label at 10 ppm (mg eq/kg)	T-label at 10 ppm (mg eq/kg)
Liver (% total dose)	0.24	0.35

Tissue	P-label at 10 ppm (mg eq/kg)	T-label at 10 ppm (mg eq/kg)
Thigh Muscle	0.022	0.020
Breast Muscle	0.020	0.014
Omental Fat	0.015	0.020
Subcutaneous Fat	0.014	0.018
Egg average (% total dose)	0.035	0.042

In liver solvent extraction, protease digestion and acid digestion all showed a broad pattern of metabolites all being present at individual amounts of < 10% TRR for both labels. PAM was the major metabolites in hens liver for the P-label with a total of 0.046 mg eq/kg parent equivalents (18.9% of the TRR). For the T-label dihydroxy-cys-T-DO was identified at a total of 0.042 mg eq/kg parent equivalents (12.2% of the TRR). All findings for both labels are summarised in Tables 32 and 33.

Table 32 Characterization of extracted residues in hen liver following solvent extraction, protease and acid digestion (P-label 10 ppm)

	Solvent extract		Protease digestion		Acid digestion		Total	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
DM-PAM	0.005	2.07	–	–	–	–	0.005	2.07
PAM	0.009	3.72	0.001	0.41	0.036	14.8	0.046	18.93
dihydroxy-cys-F-DO isomer ^a	0.005	2.07	0.005	2.07	–	–	0.01	4.14
dihydroxy-cys-F-DO isomer ^a	0.006	2.48	0.003	1.24	–	–	0.009	3.72
hydroxy-cys-F-DO	0.009	3.72	0.003	1.24	0.001	0.41	0.013	5.37
dihydroxy-cys-T-DO	0.008	3.31	0.008	3.31	0.003	1.24	0.019	7.86
cys-T-DO isomer ^a	0.010	4.13	–	–	0.003	1.24	0.013	5.37
cys-T-DO isomer ^a	0.013	5.37	0.006	2.48	0.007	2.89	0.026	10.74
hydroxy-MTF-753	0.008	3.31	0.002	0.83	0.002	0.83	0.012	4.97
cys-F-DO isomer ^a	0.004	1.65	0.001	0.41	0.004	1.65	0.009	3.72
cys-F-DO isomer ^a	0.006	2.48	–	–	0.002	0.83	0.008	3.31
U1	–	–	–	–	0.003	1.24	0.003	1.24
Unassigned	0.026	10.7	0.006	2.48	0.006	2.48	0.036	15.66
Total	0.10	41.7	0.035	14.5	0.067	27.7	0.20	83.9

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

Table 33 Characterization of extracted residues in hen liver following solvent extraction, protease and acid digestion (T-label 10 ppm)

	Solvent extract		Protease digestion		Acid digestion		Total	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
dihydroxy-cys-F-DO isomer ^a	0.007	2.04	0.005	1.46	0.002	0.58	0.014	4.08

	Solvent extract		Protease digestion		Acid digestion		Total	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
dihydroxy-cys-F-DO isomer ^a	0.013	3.79	0.002	0.58	0.001	0.29	0.016	4.66
hydroxy-cys-F-DO	0.012	3.50	0.003	0.87	0.003	0.87	0.018	5.24
dihydroxy-cys-T-DO	0.033	9.62	0.006	1.75	0.003	0.87	0.042	12.24
cys-T-DO isomer ^a	0.011	3.21	0.005	1.46	0.006	1.75	0.022	6.42
cys-T-DO isomer ^a	0.022	6.41	0.004	1.17	0.004	1.17	0.030	8.75
hydroxy-MTF-753	0.014	4.08	0.001	0.29	0.007	2.11	0.022	6.42
cys-F-DO isomer ^a	0.008	2.33	0.001	0.29	0.009	2.62	0.017	5.24
cys-F-DO isomer ^a	0.012	3.50	0.001	0.29	0.011	3.21	0.024	7.0
dehydro-cys-F-DO	0.010	2.92	0.001	0.29	–	–	0.011	3.21
U1	0.003	0.87	–	–	–	–	0.003	0.87
U2	0.003	0.87	–	–	–	–	0.003	0.87
U3	–	–	0.003	0.87	–	–	0.003	0.87
Polar metabolites	–	–	0.004	1.17	0.006	1.75	0.01	2.92
Unassigned	0.025	7.29	0.011	3.21	0.016	4.66	0.052	15.16
Total	0.18	51.6	0.047	13.7	0.068	19.8	0.29	85.1

U: unidentified metabolite

^a isomeric constitution not identifiable by mass spectrometry

For eggs the identification of the radioactivity also revealed a broad pattern of metabolites all being present below 0.01 mg eq/kg (less than 16% of the TRR) each. PAM was the major residue (0.007 ppm, 11.3% TRR), followed by DM-PAM (0.004 ppm, 6.5% TRR). Hydrolysis released some additional radioactivity, resulting in various chromatographic peaks present at levels too low of identification. Only two major peaks were found which could be attributed to PAM without confirmation, giving additional 0.01 mg eq/kg for the P-label and 0.008 mg eq/kg for the T-label (see Table 34).

Table 34 Characterisation of extracted residues in hen eggs

P-label (10 ppm)			T-label (10 ppm)		
P-label egg components	mg eq/kg	% TRR	T-label egg components	mg eq/kg	% TRR
Total Extracted	0.035	56.5	Total Extracted	0.025	30.9
DM-PAM	0.004	6.45	dihydroxy-MTF-753	0.002	2.47
PAM	0.007	11.3	hydroxy-MTF-753	0.002	2.47
cys-T-DO isomer	0.003	4.8	753-F-DO	0.001	1.23
Dihydroxy-MTF-753	0.003	4.8	penthiopyrad	0.001	1.23
cys-FDO isomer ^a	0.001	1.6	U1	0.001	1.23
cys-FDO isomer ^a	0.001	1.6	U2	0.002	2.47
unassigned	0.016	25.8	unassigned	0.016	19.8

After short PHIs rinseable residues mainly contained unchanged parent substance. In the plant extracts a complex pattern of metabolites were identified, mainly at individual amounts of less than 10% of the TRR. Other metabolites frequently found were PAM and PCA. A proposal for a metabolic pathway of penthiopyrad in plants is presented in Figure 3.

Grapes

For grapes Baker, FC (2006, PTHIO_114) investigated the metabolism of penthiopyrad using a 1:1 mixture of P- and T-labelled active substance. The active substance was sprayed to two plots of grapevines with rates of 0.4 kg ai/ha each. The corresponding days after treatment (DATs) were 30 or 60 days. Samples included grape bunches, leaves, stems and roots.

Grape berries were divided into two groups. Treated grapes and leaves from Group I were rinsed twice with methanol/water (7/3, v/v) while treated berries from Group II were not rinsed. Group I rinsed grapes were directly homogenised while Group II grape berries were homogenised and the juice was separated by centrifugation and filtering. Rinsed leaves were homogenised in the presence of dry ice.

The rinsed grape berries and pomace were extracted with methanol and methanol/water (7/3 v/v). DAT 60 grapes and pomace were additionally extracted using methanol/hydrochloric acid 0.2N (1/1 v/v). The rinsed leaves were extracted with methanol/water (7/3 v/v) followed by methanol/hydrochloric acid 0.2N (1/1 v/v). The leaf post-extraction solids (PES) were further extracted with methanol/water (1/1 v/v) reflux, methanol/hydrochloric acid 0.2N (1/1 v/v) reflux, cellulase hydrolysis and protease hydrolysis. The leaf rinses and methanol/water extracts were partitioned into an organic phase and an aqueous phase. The aqueous phase was then hydrolysed using concentrated hydrochloric acid.

TRR levels found in the samples are presented in Table 35.

Table 35 Total radioactive residues in grapes treated with P- and T-labelled penthiopyrad

	30 day PHI		30 day PHI		60 day PHI		60 day PHI	
	Group I (Rinsed)		Group II (Unrinsed)		Group I (Rinsed)		Group II (Unrinsed)	
	mg eq/kg	%TRR	mg eq/kg	%TRR	mg eq/kg	%TRR	mg eq/kg	%TRR
Grape berries total	0.20	100	0.24	100	0.083	100	0.21	100
Rinses	0.048	23.5	na	na	0.010	12	na	na
Rinsed berries	0.16	76.5	na	na	0.073	88	na	na
Juice	na	na	0.13	55.2	na	na	0.12	56.7
Pomace	na	na	0.11	44.8	na	na	0.091	43.3
Leaves total	5.1	100	na	na	3.35	100	na	na
Rinses	3.1	60.8	na	na	1.37	40.9	na	na
Rinsed leaves	2.0	39.2	na	na	1.98	59.1	na	na

na: not analysed

Table 36 Extractability of grapes and grape leaves treated with P- and T-labelled penthiopyrad

	Grapes				Leaves			
	30 day PHI		60 day PHI		30 day PHI		60 day PHI	
	mg/ kg	% TRR	mg/ kg	% TRR	mg/ kg	% TRR	mg/ kg	% TRR

np: not performed
nd not detected (< 0.001 mg eq/kg)

An unidentified chromatographic peak denoted as U20 accounted for 0.082 and 0.148 mg eq/kg in the two groups of grapes respectively. Two-dimensional TLC indicated that at least six components were contained in this peak. Acid hydrolysis resulted in the formation of 753-A-OH as the main component.

[illegible]

	Grapes Group I			Grapes Group2			Leaves
	Rinses	Rinsed grapes	Total	Juice	Pomace	Total	
	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)
Penthiopyrad	11.3 (0.023)	9.3 (0.019)	20.6 (0.042)	n.d.	17.4 (0.042)	17.4 (0.042)	16.8 (0.858)
PAM	1.0 (0.002)	7.8 (0.016)	8.8 (0.018)	3.3 (0.008))	0.4 (0.001)	3.7 (0.009)	11.7 (0.599)
PCA	1.0 (0.002)	1.0 (0.002)	2.0 (0.004)	1.7 (0.004)	0.4 (0.001)	2.1 (0.005)	6.4 (0.327)
753-A-OH	0.5 (0.001)	2.9 (0.006)	3.4 (0.007)	0.8 (0.002)	2.5 (0.006)	3.3 (0.008)	2.5 (0.128)
753-F-DO	1.5 (0.003)	1.0 (0.002)	2.5 (0.005)	n.d.	0.8 (0.002)	0.8 (0.002)	3.4 (0.174)
DM-753	n.d.	0.5 (0.001)	0.5 (0.001)	n.d.	n.d.	n.d.	0.2 (0.010)
753-T-DO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.8 (0.041)
U20	0.5 (0.001)	19.6 (0.040)	20.1 (0.041)	23.2 (0.056)	7.5 (0.018)	30.7 (0.074)	6.1 (0.312)
non polar	2.5 (0.005)	n.d.	2.5 (0.005)	n.d.	0.8 (0.002)	0.8 (0.002)	5.6 (0.291)
polar	1.0 (0.002)	7.4 (0.015)	8.4 (0.017)	10.4 (0.025)	0.8 (0.002)	11.2 (0.027)	9.0 (0.460)
Minor metabolites	0.5 (0.001)	11.8 (0.024)	12.3 (0.025) a	10.0 (0.024)	4.5 (0.011)	14.5 (0.035) b	26.7 (1.364)
not attributed	3.7 (0.008)	5.4 (0.011)	9.1 (0.019)	5.8 (0.014)	4.3 (0.010)	10.1 (0.024)	0.7 (0.036)
Unextracted	not applicable	6.4 (0.013)	6.4 (0.013)	not applicable	9.1 (0.022)	9.1 (0.022)	2.7 (0.138)
Total	23.5 (0.048)	73.1 (0.15)	96.6 (0.197)	55.2 (0.13)	48.5 (0.12)	103.7 (0.25)	92.7 (4.7)

n.d. not detected (< 0.001 mg eq/kg)

^a Minor metabolites: U19 (8.0 % TRR, 0.028 mg eq/kg), U24 (6.3 % TRR, 0.022 mg eq/kg)

^b Minor metabolites: U11 (6.5 % TRR, 0.028 mg eq/kg), U12 (6.0 % TRR, 0.026 mg eq/kg), U25 (2.8 % TRR, 0.012 mg eq/kg), U28 (0.9 % TRR, 0.004 mg eq/kg)

U: unidentified metabolite

Table 38 Metabolism of [¹⁴C]penthiopyrad in grape plants treated at 60 day PHI

	Grapes Group I			Grapes Group 2			Leaves
	Rinses	Rinsed grapes	Total	Juice	Pomace	Total	
	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)
Penthiopyrad	2.4 (0.002)	2.4 (0.002)	4.8 (0.004)	n.d.	4.3 (0.009)	4.3 (0.009)	5.0 (0.17)
PAM	1.2 (0.001)	12.0 (0.010)	13.3 (0.011)	3.3 (0.007)	0.5 (0.001)	3.8 (0.008)	14.1 (0.47)
PCA	1.2 (0.001)	2.4 (0.002)	3.6 (0.003)	1.9 (0.004)	0.5 (0.001)	2.4 (0.005)	10.8 (0.36)
753-A-OH	n.d.	4.8 (0.004)	4.8 (0.004)	0.5 (0.001)	3.3 (0.007)	3.8 (0.008)	1.2 (0.039)
753-F-DO	1.2 (0.001)	1.2 (0.001)	2.4 (0.002)	n.d.	1.0 (0.002)	1.0 (0.002)	3.7 (0.12)
DM-753	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.
753-T-DO	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.6 (0.021)
U20	n.d.	28.9 (0.024)	28.9 (0.024)	19.5 (0.041)	8.1 (0.017)	27.6 (0.058)	10.4 (0.35)

	Grapes Group 1			Grapes Group 2			Leaves
	Rinses	Rinsed grapes	Total	Juice	Pomace	Total	
	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)	% TRR (mg eq/kg)
non polar	n.d.	n.d.	n.d.	0.5 (0.001)	1.0 (0.002)	1.4 (0.003)	6.7 (0.22)
polar	1.2 (0.001)	13.3 (0.011)	14.5 (0.012)	9.5 (0.020)	1.0 (0.002)	10.5 (0.022)	15.5 (0.52)
Minor metabolites	n.d.	6.0 (0.005)	6.0 (0.005) ^a	18.6 (0.039)	5.7 (0.012)	24.4 (0.051) ^b	21.2 (0.71)
not attributed	4.8 (0.004)	9.6 (0.008)	14.5 (0.012)	2.9 (0.006)	8.6 (0.018)	11.4 (0.024)	2.1 (0.069)
Unextracted	not applicable	10.8 (0.009)	10.8 (0.009)	not applicable	11.9 (0.025)	11.9 (0.025)	6.0 (0.20)
Total	12.0 (0.010)	91.5 (0.076)	103.5 (0.086)	56.7 (0.12)	45.7 (0.096)	102.4 (0.22)	97.3 (3.26)

n.d. not detected (< 0.001 mg eq/kg)

^a Minor metabolites: U23 (6.0 % TRR, 0.0005 mg eq/kg)

^b Minor metabolites: U11 (7.7 % TRR, 0.016 mg eq/kg), U17 (1.9 % TRR, 0.0004 mg eq/kg), U19 (5.2 % TRR, 0.011 mg eq/kg), U22 (3.4 % TRR, 0.0007 mg eq/kg), U23 (6.2 % TRR, 0.013 mg eq/kg)

U: unidentified metabolite

Cabbage

The metabolism of penthiopyrad in cabbage was investigated by Baker, F.C. (2009, PTHIO_032). A 1:1 mixture of P- and T-labelled active substance was sprayed as a SC formulation to cabbage plants 21 days before harvest. One plot was treated once at a rate equivalent to 200 g ai/ha and another plot once at 1000 g ai/ha. Outer leaves, inner heads and roots were sampled separately.

For the analysis the outer leaves were removed manually and then rinsed once with water and once with methanol/water (7/3 v/v). The rinsed outer leaves and the heads were extracted twice with methanol/water (7/3, v/v). The outer leaves were further extracted twice using methanol/hydrochloric acid 0.1 N (1/1 v/v). TRR levels found in the samples are presented in Table 39.

Table 39 Total radioactive residues in cabbage treated with P- and T-labelled penthiopyrad

	200 g ai/ha		1000 g ai/ha	
	mg eq/kg	% TRR	mg eq/kg	% TRR
Outer Leaves	1.4	93.5	7.9	95.9
Heads	0.045	6.5	0.16	4.1
Whole cabbage	0.48	100	2.6	100

After mechanical removal of the outer leaves these leaves as well as the inner head were rinsed and subsequently extracted as described above. Approximately 40% of the TRR in the outer leaves and 10% of the TRR in the inner head could be rinsed. The major part of the radioactivity was extracted from the samples, leaving unextracted radioactivity at less than 10% of the TRR. The amount of radioactivity in the rinse as well as the extract is presented in Table 40.

Table 40 Extraction of TRR in cabbage treated with P- and T-labelled penthiopyrad

	200 g ai/ha		1000 g ai/ha	
	mg eq/kg	% TRR	mg eq/kg	% TRR
Outer leaves				
Rinse 1 (water)	0.26	15.9	1.3	15.9
Rinse 2 (methanol/water)	0.23	28.5	2.3	28.5
Extract 1 (methanol/water)	0.70	49.9	3.7	46.9
Extract 2 (methanol/0.1N HCl)	0.067	4.8	0.32	4.1
Unextracted	0.14	9.7	0.79	9.9
Total recovered	1.4	97.9	8.3	105.2
Total residue TRR	1.41	100.0	7.93	100.0
Inner head				
Rinse 1 (water)	0.003	6.7	0.004	2.6
Rinse 2 (methanol/water)	0.002	4.4	0.008	5.2
Extract 1 (methanol/water)	0.031	68.9	0.12	75.5
Extract 2 (methanol/0.1N HCl)	0.003	6.7	na	na
Unextracted	0.004	8.9	0.013	8.4
Total recovered	0.043	95.6	0.14	91.6
Total residue TRR	0.045	100.0	0.16	100.0

The identification of the rinses and the extracts showed penthiopyrad as the major residue in both fractions, amounting 20.4% of the TRR for the low and 34.0% of the TRR for the high application rate. A further metabolite present in amounts above 10% of the TRR was identified as PAM (10.4–10.7% of the TRR). In Table 41 an overview of all metabolites identified is presented.

Table 41 Identification of radioactive residues in cabbage treated with P- and T-labelled penthiopyrad

	200 g ai/ha			1000 g ai/ha		
	% TRR (mg eq/kg)			% TRR (mg eq/kg)		
	Rinses	Extract	Total	Rinses	Extract	Total
Penthiopyrad	12.9 (0.061)	7.5 (0.036)	20.4 (0.097)	22.8 (0.59)	11.2 (0.29)	34.0 (0.88)
Unassigned chromatographic peaks	1.3 (0.006)	nd	1.3 (0.006)	1.9 (0.050)	0.7 (0.016)	2.6 (0.066)
DM-753	nd	0.2 (0.001)	0.2 (0.001)	Nd	0.5 (0.014)	0.5 (0.014)
U30	0.4 (0.002)	2.8 (0.013)	3.2 (0.015)	0.7 (0.019)	1.9 (0.048)	2.6 (0.067)
753-F-DO	1.2 (0.006)	0.7 (0.003)	1.9 (0.009)	2.2 (0.056)	0.8 (0.021)	3.0 (0.077)
753-A-OH (attentively)	0.2 (0.001)	2.3 (0.011)	2.5 (0.012)	0.2 (0.002)	1.4 (0.040)	1.6 (0.042)

	200 g ai/ha			1000 g ai/ha		
	% TRR (mg eq/kg)			% TRR (mg eq/kg)		
	Rinses	Extract	Total	Rinses	Extract	Total
assigned)						
U20	0.6 (0.003)	13.5 (0.064)	14.1 (0.067)	0.6 (0.014)	10.4 (0.27)	11.0 (0.28)
PCA	2.9 (0.014)	7.0 (0.33)	9.9 (0.047)	1.1 (0.029)	3.5 (0.090)	4.6 (0.12)
PAM	2.5 (0.012)	8.2 (0.039)	10.7 (0.051)	2.4 (0.061)	8.0 (0.21)	10.4 (0.27)
DM-PAM (attentively assigned)	1.5 (0.007)	nd	1.5 (0.007)	0.9 (0.023)	1.8 (0.047)	2.7 (0.070)
Polar region	0.4 (0.002)	2.8 (0.013)	3.2 (0.015)	0.3 (0.007)	1.7 (0.041)	2.0 (0.051)
Not resolved or losses			10.9 (0.052)			15.2 (0.39)
Unextracted		8.4 (0.040)	8.4 (0.040)		4.6 (0.119)	4.6 (0.12)
Total	32.2 (0.15)	56.0 (0.27)	88.2 (0.42)	42.8 (1.1)	52.0 (1.3)	94.8 (2.4)

nd: not detected (< 0.001 mg eq/kg)

attentively assigned: solely confirmed by chromatographic retention time

U: unidentified metabolite

Tomatoes

In a study conducted by Baker, FC (2006, PTHIO_033) field grown tomato plants were treated with [¹⁴C]penthiopyrad (1:1 mixture of P- and T-label) as a SC formulation, 21 days before normal harvest. One plot was treated once at a rate 300 g ai/ha and another plot once at 1500 g ai/ha. Tomatoes were sampled 14–21 days after treatment, the leaves 21 days after treatment.

Harvested tomatoes were separated in two groups. Group I tomatoes were surface rinsed and then extracted; Group II tomatoes were converted to juice and pomace to obtain basic information on the distribution of the residues during processing.

Group I tomatoes, leaves, stems and roots were rinsed with methanol/water (7/3, v/v). Treated Group II tomatoes were rinsed with water. Group I rinsed tomatoes were homogenised in a cutter-mixer in the presence of dry ice. Group II rinsed tomatoes were homogenised and the juice was separated by centrifugation and filtering.

An overview of the total radioactive residues recovered is summarized in Table 42.

Table 42 Total radioactive residues in tomatoes treated with P- and T-labelled penthiopyrad

	300 g ai/ha				1500 g ai/ha			
	Group I		Group II		Group I		Group II	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
14 DAT harvest								
Tomato rinses	0.005	35.7	0.009	37.5	0.35	75.9	0.096	32.7
Rinsed tomato	0.009	64.3	na	na	0.11	24.1	na	na
Juice	na	na	0.008	33.3	na	na	0.049	16.7
Pomace	na	na	0.007	29.2	na	na	0.15	50.6

	300 g ai/ha				1500 g ai/ha			
	Group I		Group II		Group I		Group II	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
Tomato total	0.014	100	0.024	100	0.46	100	0.29	100
21 DAT harvest								
Tomato rinses	0.011	50.0	0.004	23.5	0.19	67.6	0.030	30.6
Rinsed Tomato	0.011	50.0	na	na	0.091	32.4	na	na
Juice	na	na	0.006	35.3	Na	na	0.027	27.6
Pomace	na	na	0.007	41.2	Na	na	0.041	41.8
Tomato total	0.022	100	0.017	100	0.28	100	0.098	100
Leaf rinses	0.38	59.1	na	na	3.7	77.3	na	na
Rinsed leaves	0.27	40.9	na	na	1.1	22.7	na	na
Leaves total	0.65	100	na	na	4.8	100	na	na

na: not analysed

The 14 DAT tomatoes treated with 300 g ai/ha were not extracted because of the low total radioactive residues (< 0.01 mg eq/kg) after rinsing.

Methanol extracted 91.7% of the available radiocarbon from rinsed 14 DAT tomatoes treated at 1500 g ai/ha. After rinsing and extraction 2% TRR remained unextracted in the post extraction solids.

In the 21 DAT tomatoes treated with 300 g ai/ha 0.002 mg eq/kg, 9.1% TRR remained unextracted after rinsing and extraction with methanol. Unextracted residues in 21 DAT tomatoes (1500 g ai/ha) were 0.014 mg eq/kg, 5% TRR. The recovery of radioactivity in the rinses, extracts and non-extractable fractions for both harvest periods and both dose levels are summarised in Table 43.

Table 43 Extraction of TRR in tomatoes treated with P- and T-labelled penthiopyrad

	300 g ai/ha				1500 g ai/ha			
	Group I		Group II		Group I		Group II	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
14 DAT harvest								
Tomato rinses	0.005	35.7	0.009	37.5	0.35	75.9	0.096	32.7
Tomato juice	na	na	na	na	Na	na	0.049	16.7
Methanol extract 1	na	na	na	na	0.090	19.7	0.11	37.4
Methanol extract 2	na	na	na	na	0.011	2.4	0.022	7.5
Post	na	na	na	na	0.009	2.0	0.018	6.1

	300 g ai/ha				1500 g ai/ha			
	Group I		Group II		Group I		Group II	
	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR	mg eq/kg	% TRR
extraction solids								
Tomato total	0.014	100	0.024	100	0.46	100	0.3	100.4
21 DAT harvest								
Tomato rinses	0.011	50.0	0.004	23.5	0.19	67.6	0.030	30.6
Tomato juice	na	na	0.007	41.2	na	na	0.027	27.6
Methanol extract 1	0.007	31.8	0.004	23.5	0.069	24.6	0.029	29.6
Methanol extract 2	0.001	4.5	0.001	5.9	0.009	3.2	0.006	6.1
Post extraction solids	0.002	9.1	0.001	5.9	0.014	5.0	0.004	4.1
Tomato total	0.021	95.4	0.017	100	0.28	100.4	0.096	98.0

na: not analysed

The low total radioactive residues in the low rate samples were not further identified. In the high rate sample rinse and extract parent penthiopyrad was identified as major residue, being present at approximately 45% of the TRR after 14 days. Additional metabolites were found, but their individual amounts were below 10% of the TRR. An overview of all substances identified in tomatoes is presented in Table 44.

Table 44 Identification of radioactive residues in tomatoes treated with P- and T-labelled penthiopyrad

	14 DAT—Group I tomatoes in % TRR (mg eq/kg)			14 DAT—Group II tomatoes in % TRR (mg eq/kg)			
	Rinses	Rinsed tomato	Total tomato	Rinses	Juice	Pomace	Total tomato
Tomatoes (1500 g ai/ha)							
Penthiopyrad	35.7 (0.16)	9.4 (0.043)	45.1 (0.21)	17.3 (0.051)	nd	28.9 (0.085)	46.2 (0.14)
PAM	3.1 (0.014)	1.3 (0.006)	4.4 (0.020)	4.4 (0.013)	1.4 (0.004)	0.3 (0.001)	6.1 (0.018)
PCA	2.6 (0.012)	1.3 (0.006)	3.9 (0.018)	3.1 (0.009)	4.1 (0.012)	0.3 (0.001)	7.5 (0.022)
753-A-OH	nd	nd	nd	nd	nd	0.7 (0.002)	0.7 (0.002)
753-F-DO	3.9 (0.018)	0.2 (0.001)	4.1 (0.019)	2.0 (0.006)	0.3 (0.001)	0.7 (0.002)	3.0 (0.009)
U20	2.0 (0.009)	3.1 (0.014)	5.1 (0.023)	0.3 (0.001)	3.7 (0.011)	0.7 (0.002)	4.7 (0.014)
Polar	0.9	2.2	3.1	1.0	3.4	Nd	4.4

	14 DAT—Group I tomatoes in % TRR (mg eq/kg)			14 DAT—Group II tomatoes in % TRR (mg eq/kg)			
	Rinses	Rinsed tomato	Total tomato	Rinses	Juice	Pomace	Total tomato
	(0.004)	(0.010)	(0.014)	(0.003)	(0.010)		(0.013)
Total characterised	48.2 (0.22)	17.5 (0.080)	65.7 (0.30)	28.1 (0.083)	12.9 (0.038)	31.6 (0.093)	72.6 (0.21)
Sum of minor metabolites	11.2 (0.051)	1.8 (0.008)	13.0 (0.059)	nd	nd	Nd	nd
Not resolved + losses	16.5 (0.075)	2.8 (0.013)	19.3 (0.088)	4.6 (0.014)	3.8 (0.011)	13.3 (0.039)	21.7 (0.064)
Unextracted	na	2.0 (0.009)	2.0 (0.009)	na	na	6.1 (0.018)	6.1 (0.018)
Total	75.9 (0.35)	24.1 (0.11)	100.0 (0.46)	32.7 (0.096)	16.7 (0.049)	51.0 (0.15)	100.4 (0.3)

nd: not detected

na: not analysed

U: unidentified metabolite

In the 21 DAT tomato samples penthiopyrad was the major analyte at both treatment levels accounting for 22.7% and 38.4% TRR. The 21 DAT tomatoes (300 g ai/ha) contained PCA and PAM at levels of 0.001 mg eq/kg each.

The 21 d 5× tomatoes contained the metabolites PCA (4.3% TRR, 0.012 mg eq/kg) and PAM (6.4% TRR, 0.018 mg eq/kg). No other metabolites were detected above 0.01 mg eq/kg.

In leaves penthiopyrad was the major residue, ranging from 37.2% TRR to 55.3% TRR following treatment at 300 g ai/ha or 1500 g ai/ha, respectively (0.241–2.675 mg eq/kg). The identified metabolites were PCA (8.2% TRR or 0.053 mg eq/kg and 2.9% TRR or 0.140 mg eq/kg), PAM (4.2–4.9% TRR or 0.027–0.238 mg eq/kg) and 753-F-DO (2.2–4.5% TRR or 0.014–220 mg eq/kg) following treatment at 300 g/ ai/ha or 1500 g/ ai/ha, respectively.

The processing of tomatoes from Group 2 into pomace and juice showed parent penthiopyrad being the only residue present in pomace. In juice PAM and PCA were found, but the individual levels were below 0.01 mg eq/kg for each metabolite.

Wheat

Baker FC (2009, PTHIO_034) investigated the metabolism of penthiopyrad in wheat plants. An SC formulation with radiolabelled penthiopyrad (1:1 mixture of P- and T-label) was sprayed twice each at a rate of 250 g/ ai/ha or 750 g/ ai/ha. The growth stages at application were at stem elongation and the end of flowering (BBCH 59). Forage (DAT 7 after 1st application), hay (DAT 5 after 2nd application), wheat straw and grain (DAT 32 after 2nd application) were analysed HPLC.

Unextracted radioactivity in hay, grain and straw were further extracted with methanol/ HCl (0.1 N), methanol/ NaOH (0.1 N). The grain residue was hydrolysed with dextranase/β-amylase and refluxed with HCl (1 N). An overview on the TRR levels found and the extractability of the radioactive residues is presented in Table 45.

Table 45 Total radioactive residues and extractability in wheat matrices treated with P- and T-labelled penthiopyrad

	2× 250 g/ ai/ha		2× 750 g/ ai/ha	
	mg eq/kg	% TRR	mg eq/kg	% TRR

	2× 250 g/ ai/ha		2× 750 g/ ai/ha	
	mg eq/kg	% TRR	mg eq/kg	% TRR
Forage TRR	6.5		22.1	
Methanol	56.0	91.4%	20.8	94.1%
Methanol/Water	0.34	5.2%	0.78	3.5%
Unextracted (PES):	0.22	3.4%	0.53	2.4%
Extracted + Unextracted:	6.5	100.0%	22.1	100.0%
Hay TRR by combustion	4.3		17.8	
Methanol	3.4	80.1%	14.6	81.9%
Methanol/Water	0.17	4.0%	0.66	3.7%
Methanol/HCl 0.1N	0.064	1.5%	0.23	1.3%
THF	0.034	0.8%	0.11	0.6%
Methanol/NaOH 0.1N	0.14	3.3%	0.45	2.5%
Unextracted (PES):	0.14	3.2%	0.48	2.7%
Extracted + Unextracted:	4.0	92.9%	16.5	92.6%
Straw TRR by combustion	9.2		43.7	
Methanol	6.8	73.5%	30.5	69.8%
Methanol/Water	1.1	12.2%	4.9	11.2%
Methanol/HCl 0.1N	0.34	3.7%	1.4	3.1%
Methanol/NaOH 0.1N	0.67	7.2%	2.8	5.4%
Unextracted (PES):	0.53	5.8%	2.1	4.9%
Extracted + Unextracted:	9.4	102.3%	41.6	95.3%
Grain TRR by combustion	0.3		0.75	
Methanol/Water	0.17	57.5%	0.45	60.1%
Methanol	0.007	2.4%	0.016	2.1%
Methanol/HCl 0.1N	0.020	6.8%	0.046	6.1%
Methanol/NaOH 0.1N	0.032	10.8%	0.079	10.5%
Dextranase + β -Amylase	0.046	15.5%	0.16	21.0%
HCl reflux	0.040	13.5%	0.062	8.2%
Unextracted	0.022	7.4%	0.053	7.0%
Extracted + Unextracted:	0.34	114.9%	0.87	116.1%

In forage and hay treated with the 2× 250 g/ ai/ha rate, penthiopyrad was the major component amounting to 76.5% of the TRR in forage and 43.6% of the TRR in hay. Further metabolites could be identified (PAM, PCA, 753-F-DO, 753-T-DO and 753-A-OH), but the individual amounts were all below 10% of the TRR each. The results of identified metabolites are summarised in Table 46.

For wheat hay unextracted residues were additionally treated with acidic and basic hydrolysis. In total additional 5.6% of the TRR could be released. Identification revealed mainly PAM (0.6% of the TRR) and PCA (0.1% of the TRR). Further peaks were characterised, but could not be attributed to a reference compound.

Table 46 Identification of radioactive residues in wheat forage and hay treated with P- and T-labelled penthiopyrad

	Forage (2× 250 g/ ai/ha, after 1 st appl.)			Hay (2× 250 g/ ai/ha, after 2 nd appl.)		
	Organic	Aqueous	Total	Organic	Aqueous	Total
	mg eq/kg	mg eq/kg	% TRR	mg eq/kg	mg eq/kg	% TRR
PAM		0.097	1.5	0.021	0.16	4.3
PCA	0.065		1.0	0.070	0.10	3.9

	Forage (2× 250 g/ ai/ha, after 1 st appl.)			Hay (2× 250 g/ ai/ha, after 2 nd appl.)		
	Organic	Aqueous	Total	Organic	Aqueous	Total
	mg eq/kg	mg eq/kg	% TRR	mg eq/kg	mg eq/kg	% TRR
753-F-DO	0.069		1.1	0.15	0.28	4.1
753-T-DO				0.11	0.008	2.7
Penthiopyrad	4.5	0.49	76.6	1.9	0.018	43.6
U5			1.4		0.085	2.0
U6				0.020	0.077	2.3
U10 (DM-PCA attentively assigned)		0.017	0.3			
U18	0.040	0.13	2.7	0.022	0.17	4.3
U20		0.27	4.1	0.11	0.22	7.5
U24 (753-A-OH attentively assigned)	0.039		0.6	0.042	0.040	1.9
U30				0.039	0.011	1.2
U37				0.018	0.013	0.7
9 unassigned chromatographic peaks	0.15	0.34	7.4	0.15	0.091	5.5
Organic Solvent Phase Total:	4.9		74.6	2.6		60.4%
Aqueous Phase Total:		1.4	22.0		1.0	23.7%
Total Extracted:	6.3		96.6	3.6		84.1%

Tentatively assigned: solely confirmed by chromatographic retention time

U: unidentified metabolite

In wheat straw, as in wheat forage and hay, the major component (19.3% TRR, 1.78 mg eq/kg) was penthiopyrad. The largest single metabolite was PCA which accounted for 8.7% (0.802 mg eq/kg) in straw. 753-F-DO accounted for 6.4% followed by PAM (5.9%) and 753-A-OH (4.7%). Hydrolysis of the unidentified radioactivity followed by LC-MS analysis revealed mainly the malonyl glucoside of an isomer of 753-A-OH. In addition, PCA and PAM could be released. In the unextracted residue harsh treatment using acidic and basic hydrolysis released an additional 10.9% TRR. Besides PAM and PCA no additional metabolites could be identified.

In the wheat grain penthiopyrad was the largest single component accounting for 7.8% TRR. Metabolites PAM and PCA accounted for 3.7% TRR each. Further analysis of the unextracted radioactivity in grain showed a large number of components, which were all less than 0.01 mg eq/kg. Dextranase/amylase treatment released 15% TRR (0.046 mg eq/kg).

An overview of the identified metabolites in the extracts of straw and grain is presented in Table 47.

Table 47 Identification of radioactive residues in wheat straw and grain treated with P- and T-labelled penthiopyrad

	Straw (2× 250 g/ ai/ha, after 2 nd appl.)			Grain (2× 250 g/ ai/ha, after 2 nd appl.)		
	Organic	Aqueous	Total	Organic	Aqueous	Total
	mg eq/kg	mg eq/kg	% TRR	mg eq/kg	mg eq/kg	% TRR
Penthiopyrad	1.7	0.079	19.3	0.023		7.8
PAM		0.55	5.9	0.011		3.7
PCA	0.38	0.43	8.7	0.011		3.7
753-F-DO	0.46	0.14	6.4	0.005		1.6
753-T-DO	0.37	0.030	4.3			
U4		0.17	1.9		0.020	6.8
U5				0.002		0.7

	Straw (2× 250 g/ ai/ha, after 2 nd appl.)			Grain (2× 250 g/ ai/ha, after 2 nd appl.)		
	Organic	Aqueous	Total	Organic	Aqueous	Total
	mg eq/kg	mg eq/kg	% TRR	mg eq/kg	mg eq/kg	% TRR
U6		0.37	4.1			
U8				0.010	0.008	6.1
U10 (DM-PCA attentively assigned)					0.005	1.7
U13					0.013	4.4
U16	0.11	0.68	8.6	0.007	0.017	8.2
U20	0.18	0.7	9.5	0.019	0.003	7.5
U24 (753-A-OH attentively assigned)		0.19	2.1	0.001		0.3
U30	0.096	0.060	1.6			
U37	0.042	0.082	1.4			
9 unassigned chromatographic peaks	0.46	0.40	9.3	0.020	0.006	8.8
Organic Solvent Phase Total	4.0		43.7	0.11		36.8
Aqueous Phase Total		3.9	41.9		0.072	24.3
Total Extracted	7.9		85.6	0.18		61.1

Tentatively assigned: solely confirmed by chromatographic retention time

U: unidentified metabolite

Rape seed (canola)

The metabolism of penthiopyrad in rape seed was investigated by Baker, FC (2009, PTHIO_035). Field grown rapeseed plants were treated twice with [¹⁴C]penthiopyrad (1:1 mixture of P- and T-label) at a rate of 400 g/ ai/ha each: one treatment after stem elongation and the second toward the end of flowering. Rape forage was collected 14 days after the first application. Seeds were harvested from mature plants 34 days after the second application.

Samples were extracted with methanol followed by methanol/water (7/3, v/v) and ethyl acetate. The residue was analysed by HPLC and co-chromatography with reference compounds was performed. Unextracted radioactivity in seeds was additionally treated with acidic/basic hydrolysis and enzymes.

An overview of the TRR and the radioactivity released by extraction and hydrolysis is presented in Table 48.

Table 48 Total radioactive residues and extractability in canola matrices treated with P- and T-labelled penthiopyrad

	Forage (400 g ai/ha)		Seeds (2× 400 g ai/ha)	
	mg eq/kg	% TRR	mg eq/kg	% TRR
TRR measured	12.2	100	0.14	100
Total Neutral Extraction	11.1	91.5	0.085	61.2%
Methanol	10.8	88.6	0.044	31.7%
Methanol/Water	0.35	2.9	0.008	5.8%
Ethyl Acetate	–	–	0.033	23.7%
Total released from PES	–	–	0.056	40.3%
Methanol/HCl 0.1N	–	–	0.013	9.4%
Methanol/NaOH 0.1N	–	–	0.006	4.3%
Tetrahydrofuran	–	–	0.001	0.7%
Protease Digestion	–	–	0.015	10.8%

	Forage (400 g ai/ha)		Seeds (2× 400 g ai/ha)	
	mg eq/kg	% TRR	mg eq/kg	% TRR
Acetone Wash	–	–	0.001	0.7%
Dextranase/Amylase	–	–	0.002	1.4%
24% KOH	–	–	0.018	12.9%
Unextracted	0.73	6.0	0.007	5.0%
Total extracted	11.9	97.5	0.15	106.5%

For forage, the analysis of the methanol extract showed 753-A-OH malonyl glucoside (24.8% TRR, 3.022 mg eq/kg) as major residue. Unchanged penthiopyrad was found at 11.4% of the TRR (11.4% TRR, 1.387 mg eq/kg). Other metabolites were all below 10% of the TRR each. A summary of the characterised and identified metabolites is presented in Table 49.

Table 49 Identification of radioactive residues in canola forage treated with P- and T-labelled penthiopyrad

HPLC of ethyl acetate phase	mg eq/kg	% TRR	Comments
Code			
PAM	0.16	1.3	
PCA	0.062	0.5	
Penthiopyrad	1.4	11.4	
DM-A-OH Malonyl Glucoside	1.1	8.9	
753-A-OH Malonyl Glucoside	3.0	24.8	
U19	0.15	1.2	
U20	0.24	2.4	3 components separated by LC/MS
U22	0.35	2.9	2 components separated by LC/MS
U27	0.33	2.7	3 components separated by LC/MS
U29	0.33	2.7	2 components separated by LC/MS
U32	0.21	1.7	
U34	0.44	3.6	2 components separated by LC/MS
U36	0.098	0.8	
U39	0.19	1.6	
U42	0.15	1.2	
U5	0.36	3.0	1 major component separated by LC/MS
U47	0.24	2.0	
U48	0.75	6.2	2 components separated by LC/MS
Minor baseline components (~ 8)	0.56	4.6	
Organic Solvent Phase Total:	10.2	83.5	

U: unidentified metabolite

The identification of radioactivity in the organic extract showed very low amounts of metabolites. Only penthiopyrad and PCA were found at the LOQ of 0.001 mg eq/kg (0.7% TRR). Approximately 27.3% of the TRR (0.038 mg eq/kg) was attributed to natural lipids.

In the aqueous phase DM-PAM and PAM were attributed to two chromatographic peaks at levels of 5.0% TRR (0.007 mg eq/kg) and 7.9% TRR (0.011 mg eq/kg), respectively. PCA was found at lower amount with 2.2% TRR (0.003 mg eq/kg).

A summary of the characterisation and identification of the extracted radioactivity is presented in Table 50.

Table 50 Identification of radioactive residues in rape seeds treated with P- and T-labelled penthiopyrad

Fraction	mg eq/kg	% TRR
Organic Solvent Phase Total	0.008	5.8%
Penthiopyrad	0.001	0.7%
PCA	0.001	0.7%
U20	0.001	0.7%
U24	0.001	0.7%
U27	0.001	0.7%
U30	0.001	0.7%
Minor baseline components	0.002	1.4%
TLC of Hexane Phase		
Natural Products (Lipids)	0.038	27.3%
Aqueous Phase Total	0.039	28.1%
PCA	0.003	2.2%
U6 (DM-PAM attentively assigned)	0.007	5.0%
U9 (PAM attentively assigned)	0.011	7.9%
U12	0.003	2.2%
U18	0.003	2.2%
U19	0.002	1.4%
U20	0.005	3.6%
U24	0.001	0.7%
U27	0.001	0.7%
Minor baseline components (approximately 14 minor components, none > 0.01 ppm)	0.003	2.2%
Total Extracted	0.085	61.2%

Tentatively assigned: solely confirmed by chromatographic retention time

U: unidentified metabolite

Penthiopyrad

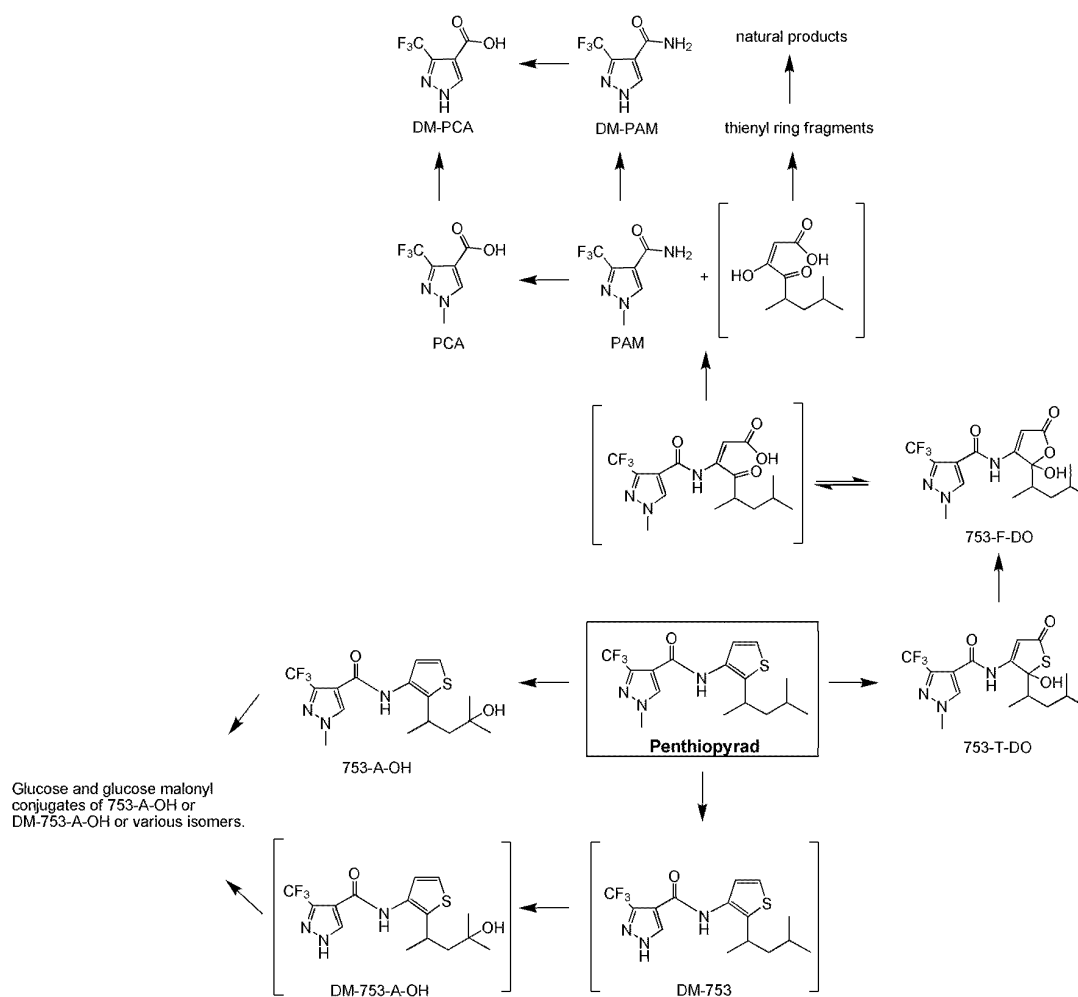


Figure 3 Proposed metabolic pathway of penthiopyrad in plants

Environmental fate in soil

For the investigation of the environmental fate of penthiopyrad the Meeting received studies on photolysis on soil, the aerobic soil metabolism and the behaviour in confined and field rotational crops.

Soil photolysis of penthiopyrad was relatively quick with less than 50% remaining after three days. Within 15 days 4.1% of the initial concentration was recovered from the soil. Main degradation products were PAM and PCA.

In soil the metabolism was more or less comparable to the plant metabolism. In nearly all samples PAM, PCA, 753-A-OH and 753-F-DO were found at levels of 2–10% of the applied dose. DM-PCA was identified as major residue in most samples, although still being present at levels below 10% of the applied dose (in two samples up to 16.8 and 28% of the applied dose). Depending on the soil type remaining levels of penthiopyrad were between 11.1 and 77.8% of the applied dose. Estimated half-life times (1st order kinetics) were between 65 to 356 days.

Confined rotational crop studies revealed a strong degradation in follow crops. Although TRR levels up to 0.1 mg/kg in green plant parts and 0.728 mg/kg in straw were found, identification of the radioactivity showed numerous compound below the limit for identification. Traces of penthiopyrad in wheat chaff and of PCA, 753-A-OH and DM-PCA in other crops were detected.

In field rotational crop studies quantifiable residues were mainly found for DM-PCA and at lower levels for PCA.

Photolysis on soil

The photodegradation of [^{14}C]penthiopyrad (P and T labels) on the soil surface was investigated under artificial sunlight (Mamouni, A, 2008, PTHIO_045). The two labels of the test item were applied as a mixture to a thin layer of 2 mm of a sandy loam soil on glass dishes. The actual concentration applied was 96 μg per 12.5 cm^2 soil sample, equivalent to a field rate of 800 g/ ai/ha. The 15 days of irradiation corresponded to about 29 days of midsummer sunlight at latitude 50°N and 27 days at latitudes 30–40°N.

The soil moisture was maintained at 75% field capacity at a temperature of 22.7 ± 1.2 °C (irradiated) and 20.2 ± 0.7 °C (dark control). Irradiated and dark control samples were taken at a range of intervals during the 15 days irradiation/incubation periods.

In irradiated samples degradation of penthiopyrad was observed, mainly forming PAM and PCA. After 10 days the parent substance was nearly completely degraded, contribution 4.3% to the TRR. A summary of the metabolic spectrum of irradiated and dark samples is presented in the following table:

Table 51 Soil photolysis of penthiopyrad

Days after application	% applied radioactivity											
	Penthiopyrad	PAM	PCA	753-F-DO	U1	U8	U11	U12	U13	$^{14}\text{CO}_2$	Not extracted	Total Recovery
Irradiated												
0	98.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	np	0.1	98.4
1	70.3	6.3	5.3	1.8	2.1	0.4	0.0	0.0	0.0	3.6	3.9	97.9
3	44.6	13.8	9.7	3.0	2.3	1.6	1.9	0.0	0.0	9.1	6.9	97.3
5	37.0	7.5	13.9	2.9	2.2	1.4	1.8	1.6	1.0	11.0	8.9	95.8
7	12.3	24.2	22.7	1.6	1.5	0.0	1.2	0.0	0.0	17.1	10.3	95.2
10	4.3	26.7	20.2	2.2	0.0	0.0	0.8	0.0	0.0	24.1	12.3	95.8
15	4.1	24.0	17.8	3.7	0.0	0.0	0.7	0.0	0.0	25.8	11.6	94.5
Dark												
0	98.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	np	0.1	98.4
1	94.8	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	< 0.1	0.8	95.6
3	94.6	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	n.d.	0.1	1.1	95.9
5	np	np	np	np	np	np	np	np	np	np	np	np
7	93.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	2.8	96.6
10	90.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5	4.5	95.7
15	92.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.6	3.4	96.0

np not performed

n.d. not detected

U: unidentified metabolite

Soil metabolism*Aerobic soil metabolism*

The aerobic soil metabolism of penthiopyrad was investigated in several soil types using [^{14}C]penthiopyrad radiolabelled in the P- and T-position of the molecule. Penthiopyrad showed a moderate degradation, mainly giving PAM, PCA and DM-PCA as degradation products. Further metabolites identified were 753-A-OH, 753-F-DO and 753-T-DO. An proposal of a metabolic pathway is presented in Figure 4.

Ref: Mamouni, A, (2008, PTHIO_046) & Gassen, M (2009, PTHIO_047)

Test material: [^{14}C]penthiopyrad (P- and T-label) Dose rate: 0.36 mg/kg each
 Duration: 161 days Temp: 10 °C
 Moisture: 29.6% maximum holding capacity Soil: Oakville, sandy clay loam
 pH: 5.2 Organic carbon: 1.29%
 Half-life (parent): 356 days (1st order) ^{14}C accountability: 99–101.8%
 % penthiopyrad remaining: 77.2% after 120 days (mean of P- and T-label)
 % mineralisation: 1.2% after 120 days (mean of P- and T-label)
 % unextracted: 7.1% after 161 days (mean of P- and T-label)

Metabolites	Max (% TRR)	Day
PAM (P-label)	2.1	161
PCA (P-label)	not detected	161
DM-PCA (P-label)	3.4	161
753-A-OH (mean of P- and T-label)	1.0	90
753-F-DO (mean of P- and T-label)	1.7	90
753-T-DO (mean of P- and T-label)	5.1	120
M11 (mean of P- and T-label)	1.5	161
M12 (mean of P- and T-label)	3.0	90
M20 (mean of P- and T-label)	1.5	62

Ref: Mamouni, A, (2008, PTHIO_046) & Gassen, M (2009, PTHIO_047)

Test material: [^{14}C]penthiopyrad (P- and T-label) Dose rate: 0.36 mg/kg each
 Duration: 161 days Temp: 20 °C
 Moisture: 29.6% maximum holding capacity Soil: Oakville, sandy clay loam
 pH: 5.2 Organic carbon: 1.29%
 Half-life (parent): 154 days (1st order) ^{14}C accountability: 95.9–100.4 %
 % penthiopyrad remaining: 54.8% after 161 days (mean of P- and T-label)
 % mineralisation: 4.4% after 161 days (mean of P- and T-label)
 % unextracted: 14% after 120 days (mean of P- and T-label)

Metabolites	Max (%TRR)	Day
PAM (P-label)	3.0	161
PCA (P-label)	3.0	161
DM-PCA (P-label)	6.6	161
753-A-OH (mean of P- and T-label)	1.1	14
753-F-DO (mean of P- and T-label)	2.4	90
753-T-DO (mean of P- and T-label)	7.6	161
M9 (mean of P- and T-label)	1.4	28
M11 (mean of P- and T-label)	1.2	120
M12 (mean of P- and T-label)	3.5	161

M20 (mean of P- and T-label) 1.9 161

Ref: Mamouni, A, (2008, PTHIO_046) & Gassen, M (2009, PTHIO_047)

Test material: [¹⁴C]penthiopyrad (P- and T-label) Dose rate: 0.36 mg/kg each

Duration: 161 days Temp: 20 °C

Moisture: 63.1% maximum holding capacity Soil: Senozan, silt loam

pH: 6.6 Organic carbon: 1.02%

Half-life (parent): 78.5 days (1st order) ¹⁴C accountability: 94.1–104.1%

% penthiopyrad remaining: 31.2% after 161 days (mean of P- and T-label)

% mineralisation: 8.4% after 161 days (mean of P- and T-label)

% unextracted: 25.6% after 161 days (mean of P- and T-label)

Metabolites	Max (%TRR)	Day
PAM (P-label)	2.3	161
PCA (P-label)	2.4	161
DM-PCA (P-label)	16.8	120
753-A-OH (mean of P- and T-label)	7.0	62
753-F-DO (mean of P- and T-label)	1.8	90
753-T-DO (mean of P- and T-label)	2.2	120
M9 (mean of P- and T-label)	2.9	161
M10 (mean of P- and T-label)	2.0	120
M11 (mean of P- and T-label)	4.1	161
M12 (mean of P- and T-label)	2.4	161
M20 (mean of P- and T-label)	1.6	161

Ref: Mamouni, A, (2008, PTHIO_046) & Gassen, M (2009, PTHIO_047)

Test material: [¹⁴C]penthiopyrad (P- and T-label) Dose rate: 0.36 mg/kg each

Duration: 161 days Temp: 20 °C

Moisture: 67.6% maximum holding capacity Soil: Gartenacker, loam

pH: 7.3 Organic carbon: 1.7%

Half-life (parent): 65 days (1st order) ¹⁴C accountability: 90.9–101.3%

% penthiopyrad remaining: 11.1% after 161 days (mean of P- and T-label)

% mineralisation: 13.3% after 161 days (mean of P- and T-label)

% unextracted: 34.2% after 161 days (mean of P- and T-label)

Metabolites	Max (%TRR)	Day
DM-PCA (P-label)	28.0	161
753-A-OH (mean of P- and T-label)	4.6	28
753-F-DO (mean of P- and T-label)	1.1	120
753-T-DO (mean of P- and T-label)	2.7	28
M9 (mean of P- and T-label)	2.9	90
M10 (mean of P- and T-label)	1.6	90
M11 (mean of P- and T-label)	4.8	120
M12 (mean of P- and T-label)	2.0	90
M13 (mean of P- and T-label)	1.1	62

Ref: Mamouni, A, (2008, PTHIO_046) & Gassen, M (2009, PTHIO_047)

Test material: [¹⁴C]penthiopyrad (P- and T-label) Dose rate: 0.36 mg/kg each

Duration: 161 days Temp: 20 °C

Moisture: 27.7% maximum holding capacity Soil: Bruisyard, sandy clay loam

pH: 7.3

Organic carbon: 1.92%

Half-life (parent): 354 days (1st order)¹⁴C accountability: 98.5–102%

% penthiopyrad remaining: 77.8% after 161 days (mean of P- and T-label)

% mineralisation: 1.4% after 161 days (mean of P- and T-label)

% unextracted: 10.5% after 120 days (mean of P- and T-label)

Metabolites	Max (%TRR)	Day
PCA (P-label)	2.0	62
DM-PCA (P-label)	3.3	161
753-A-OH (mean of P- and T-label)	4.7	161
753-F-DO (mean of P- and T-label)	1.0	62
753-T-DO (mean of P- and T-label)	1.2	62, 120
M9 (mean of P- and T-label)	1.1	120
M18 (mean of P- and T-label)	1.0	90

Ref: Mamouni, A, (2008, PTHIO_048) & Gassen, M (2009, PTHIO_049, PTHIO_050)

Test material: [¹⁴C]penthiopyrad (P- and T-label)

Dose rate: 0.36 mg/kg each

Duration: 360 days

Temp: 20 °C

Moisture: 40.97% maximum holding capacity

Soil: Waddesdon 2, sandy loam

pH: 4.5

Organic carbon: 0.4 %

Half-life (parent): 102 days (1st order)¹⁴C accountability: 93.3–99.5%

% penthiopyrad remaining: 21.3% after 360 days (mean of P- and T-label)

% mineralisation: 24% after 360 days (mean of P- and T-label)

% unextracted: 35.5% after 269 days (mean of P- and T-label)

Metabolites	Max (%TRR)	Day
PAM (P-label)	3.9	90
PCA (P-label)	0.4	360
DM-PCA (P-label)	9.1	269
753-A-OH (mean of P- and T-label)	0.9	90
753-F-DO (mean of P- and T-label)	4.3	90
753-T-DO (mean of P- and T-label)	4.4	90
M9 (mean of P- and T-label)	1.7	360
M10 (mean of P- and T-label)	traces	360
M11 (mean of P- and T-label)	2.0	155
M12 (mean of P- and T-label)	1.8	155

Ref: Satsuma, K (2005, PTHO_051)

Test material: [¹⁴C]penthiopyrad (P- and T-label)

Dose rate: 1.5 mg/kg each

Duration: 196 days

Temp: 25 °C

Moisture: 71.96% maximum holding capacity

Soil: Nagano, clay loam

pH: 4.5

Organic carbon: 0.4 %

Half-life (parent): 135 days (1st order)¹⁴C accountability: 49.9–102.5%

% penthiopyrad remaining: 34.4% after 196 days (T-label), 35.6% after 196 days (P-label)

% mineralisation: 19.2% after 196 days (T-label), 15.7% after 196 days (P-label)

% unextracted: 26.8% after 196 days (T-label), 23.2% after 196 days (P-label)

Metabolites	Max (%TRR)	Day
DM-PCA (P-label)	7.2	140
753-F-DO (P-label)	1.6	168
753-F-DO (T-label)	1.9	196

753-T-DO (P-label)

1.4

28

753-T-DO (T-label)

1.6

28

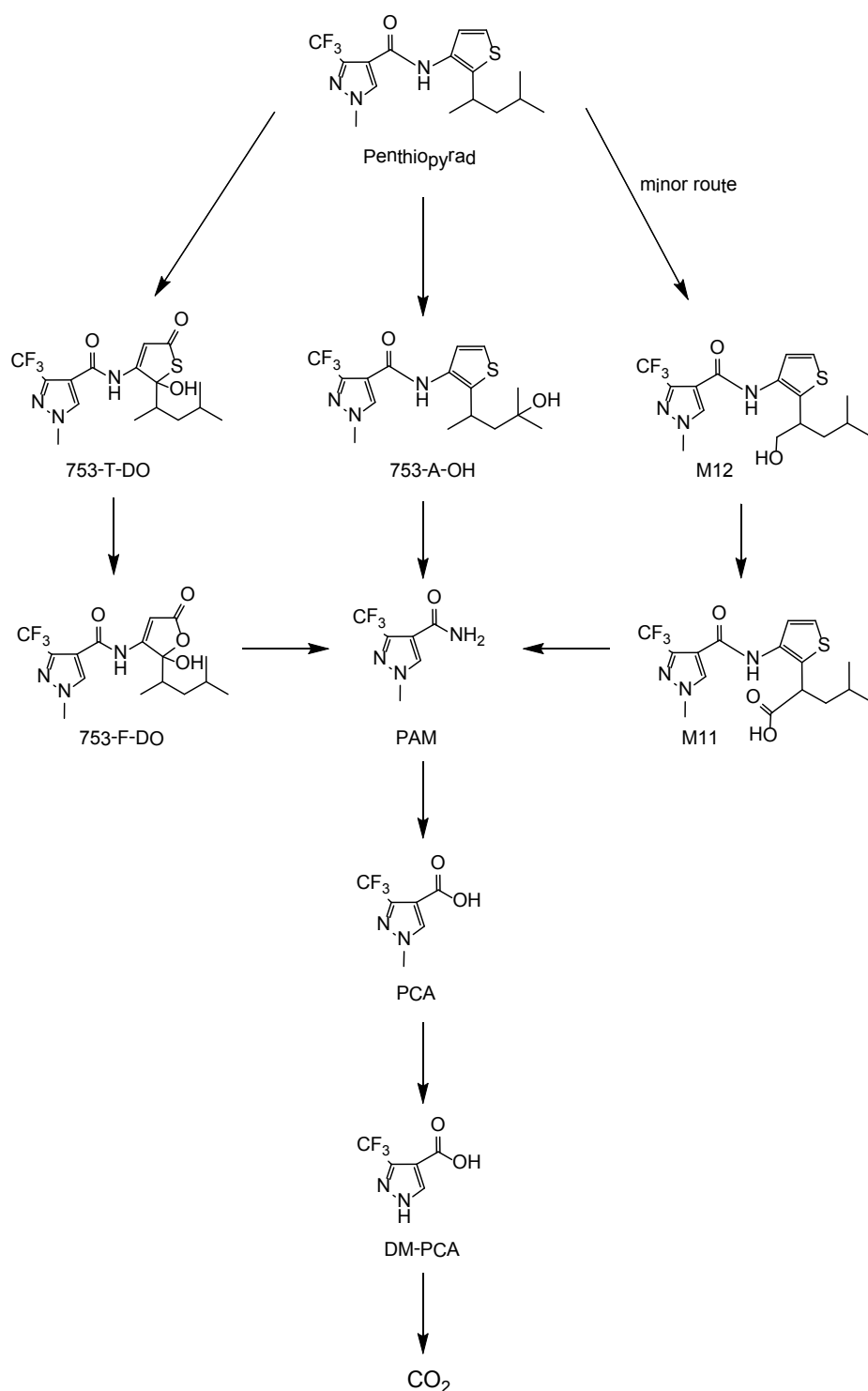


Figure 4 Proposed aerobic metabolic pathway of penthiopyrad in soil

Confined rotational crop studies

The metabolic fate of penthiopyrad in rotational crops was investigated by Walther, D (2009, PTHIO_036). Spinach/lettuce (as leafy vegetables), radish (as root crop) and summer/winter wheat

(as small grain crop) were grown under confined conditions as model crops. The [^{14}C]penthiopyrad, a mixture of both pyrazole-label (P-label) and thienyl-label (T-label) formulated as a suspension concentrate, was applied to the soil surface by spraying. The applications were conducted at a rate of 0.8 kg ai/ha. The treated soil was aged for three periods before planting to simulate rotational planting schemes: 30 days to simulate a crop failure, 120 days simulating planting of a second crop in the same year and 360 days simulating a yearly rotational crop cycle.

The crops were harvested after emergence (when sufficient material was available). Additionally, raw agricultural commodities for human and livestock feed plant parts were harvested as immature (pre-harvest) and mature crops.

The measurement of total radioactivity present was conducted by combustion analysis. For identification of the radioactivity, the samples were extracted at room temperature with solvents or solvents systems of various polarity: 1) hexane, once; 2) acetonitrile, once or twice; 3) methanol, up to 4 times; 4) methanol/water (1:1, v/v), up to 3 times and pooled. Some pooled extracts were selected and the organic solvent evaporated. The remaining aqueous phase was diluted with water and acidified to pH 2 with 1.0 M HCl. The acidic extracts were partitioned up to three times with ethyl acetate. Identification of radioactivity was achieved by analysis with HPLC in comparison to standard substances.

In Table 52 the TRR found in the various samples is summarized.

Table 52 Total radioactive residues in rotational crops after treatment with P- and T-labelled penthiopyrad

Interval	TRR in mg/kg parent eq.		
	Emergence	Pre-Harvest	Mature plants
Spinach, leaves			
30 d	0.051	0.105	0.059
120 d	0.033	0.024	0.033
360 d	0.016	0.022	0.016
Lettuce, leaves			
30 d	0.049	0.049	0.068
Radish, roots			
30 d	0.014	0.011	0.026
120 d	0.005	0.007	0.007
360 d	0.003	0.005	0.005
Radish, tops and leaves			
30 d	0.079	0.036	0.079
120 d	0.006	0.013	0.016
360 d	0.014	0.013	0.018
Wheat, forage			
30 d	0.281	0.210	—
120 d	0.138	0.059	—
360 d	0.054	0.065	—
Wheat, straw			
30 d	—	—	0.728

Interval	TRR in mg/kg parent eq.		
	Emergence	Pre-Harvest	Mature plants
120 d	–	–	0.158
360 d	–	–	0.086
Wheat, chaff			
30 d	–	–	0.367
120 d	–	–	0.061
360 d	–	–	0.023
Wheat, grain			
30 d	–	–	0.023
120 d	–	–	0.015
360 d	–	–	0.003

Identification of radioactivity was performed for samples with TRR levels above 0.01 mg/kg parent equivalents. In summary the rate of identification was low, showing mainly 753-A-OH as residue present. Parent penthiopyrad was found in chaff samples from 30 day crops rotation. In addition PCA and DM-PAM were identified in some of the samples. An overview about the characterised and identified radioactivity is presented in the tables below.

Table 53 Identification of radioactive residues in rotational crops after 30 day plant back interval

Metabolite	30 day interval, residue in mg/kg									
	Spinach leaves	Lettuce leaves	Radish root	Wheat chaff	Wheat grain	Radish leaves	Wheat forage	Wheat straw	Wheat chaff	Wheat grain
Emergence										
Penthiopyrad										
753-A-OH ^a										
U1 ^b	0.022	0.023				0.024	0.075			
Total Extracted	0.043	0.033	0.011	–	–	0.073	0.248	–	–	–
Pre-Harvest										
PCA ^a	0.039									
U1 ^b		0.018					0.106			
Total Extracted	0.090	0.033	0.007	–	–	0.029	0.175	–	–	–
Mature plants										
Penthiopyrad				0.020						
PCA ^a	0.012			0.014						
753-A-OH ^a				0.012				0.116		
U1 ^b	0.023			0.106		0.034		0.124	0.106	
DM-PAM				0.012						
U5				0.014						

Metabolite	30 day interval, residue in mg/kg									
	Spinach leaves	Lettuce leaves	Radish root	Wheat chaff	Wheat grain	Radish leaves	Wheat forage	Wheat straw	Wheat chaff	Wheat grain
U6				0.014						
Total Extracted	0.049	0.041	0.015	0.232	0.023	0.063	–	0.419	0.232	0.023

^a Given in mg metabolite/kg plant part and corrected for the specific activity for one label.

^b U1 is a polar containing up to 14 components.

Table 54 Identification of radioactive residues in rotational crops after 120 and 360 day plant back intervals

Metabolite	120 day interval, residue in mg/kg		360 day interval, residue in mg/kg	
	Spinach leaves	Wheat chaff	Wheat forage	Wheat straw
Emergence				
753-A-OH ^a	0.024			
U1 ^b				
Total Extracted	0.025	–	0.045	–
Pre-Harvest				
U1 ^b			0.024	
Total Extracted	0.018	–	0.047	–
Mature plants				
U1 ^b				0.065
Total Extracted	0.023	0.024	–	0.065

^a Given in mg metabolite/kg plant part and corrected for the specific activity for one label.

^b U1 is a polar containing up to 14 components.

Additional information are available from soil extracts. At all sampling intervals (1 to 469 days after treatment) unchanged penthiopyrad was the major residue, declining from 1.437 mg/kg (99.1% TRR) to a plateau of 0.018–0.023 mg/kg (18.4–41.9% TRR) after 124 days till the end of the study. Identified metabolites stayed at low levels with 753-A-OH being the major structure with a maximum of 0.019 mg/kg (15.2% TRR) after 33 days. Most of the radioactivity became unextracted, leaving a total of 0.096 mg/kg (72.5% TRR) unextracted after 469 days. The results of the analysis of soil samples are presented in Table 55.

Table 55 Identification of radioactive residues in soil

Soil Plot I (0–30 cm)	Days after treatment						
	1	33	58	124	376	433	469
Identified metabolites, mg/kg (% TRR)							
Penthiopyrad	1.437 (99.1)	0.031 (24.8)	0.046 (57.8)	0.019 (41.9)	0.023 (34.5)	0.019 (25.4)	0.018 (18.4)
PCA	< 0.001 (< 0.1)	< 0.001 (< 0.1)	0.003 (2.9)	< 0.001 (< 0.1)	< 0.001 (< 0.1)	< 0.001 (< 0.1)	< 0.001 (< 0.1)

Soil Plot I (0–30 cm)	Days after treatment						
	1	33	58	124	376	433	469
DM-PCA	< 0.001 (< 0.1)	0.0010 (5.1)	0.009 (8.0)	0.003 (4.1)	< 0.001 (< 0.1)	< 0.001 (< 0.1)	< 0.001 (< 0.1)
753-A-OH	< 0.001 (< 0.1)	0.019 (15.2)	0.004 (4.8)	0.002 (3.8)	0.005 (6.8)	< 0.001 (< 0.1)	< 0.001 (< 0.1)
Unidentified metabolites, mg/kg (% TRR)							
Unknown total	< 0.001 (< 0.1)	0.048 (38.0)	0.003 (4.0)	0.005 (11.3)	< 0.001 (< 0.1)	0.009 (11.8)	0.009 (9.1)
Amount of extracted and unextracted, mg/kg (% TRR)							
Extracted	1.861 (99.1)	0.129 (83.1)	0.258 (77.5)	0.172 (61.1)	0.049 (41.3)	0.053 (37.3)	0.036 (27.5)
Unextracted	0.016 (0.9)	0.026 (16.9)	0.075 (22.5)	0.110 (38.9)	0.069 (58.7)	0.089 (62.7)	0.096 (72.5)
Totals, mg/kg (% TRR)							
Total recovery ^a	1.877 (100.0)	0.155 (100.0)	0.334 (100.0)	0.282 (100.0)	0.118 (100.0)	0.143 (100.0)	0.133 (100.0)

^a Total recovery is the total extracted + remaining unextracted ¹⁴C-residues

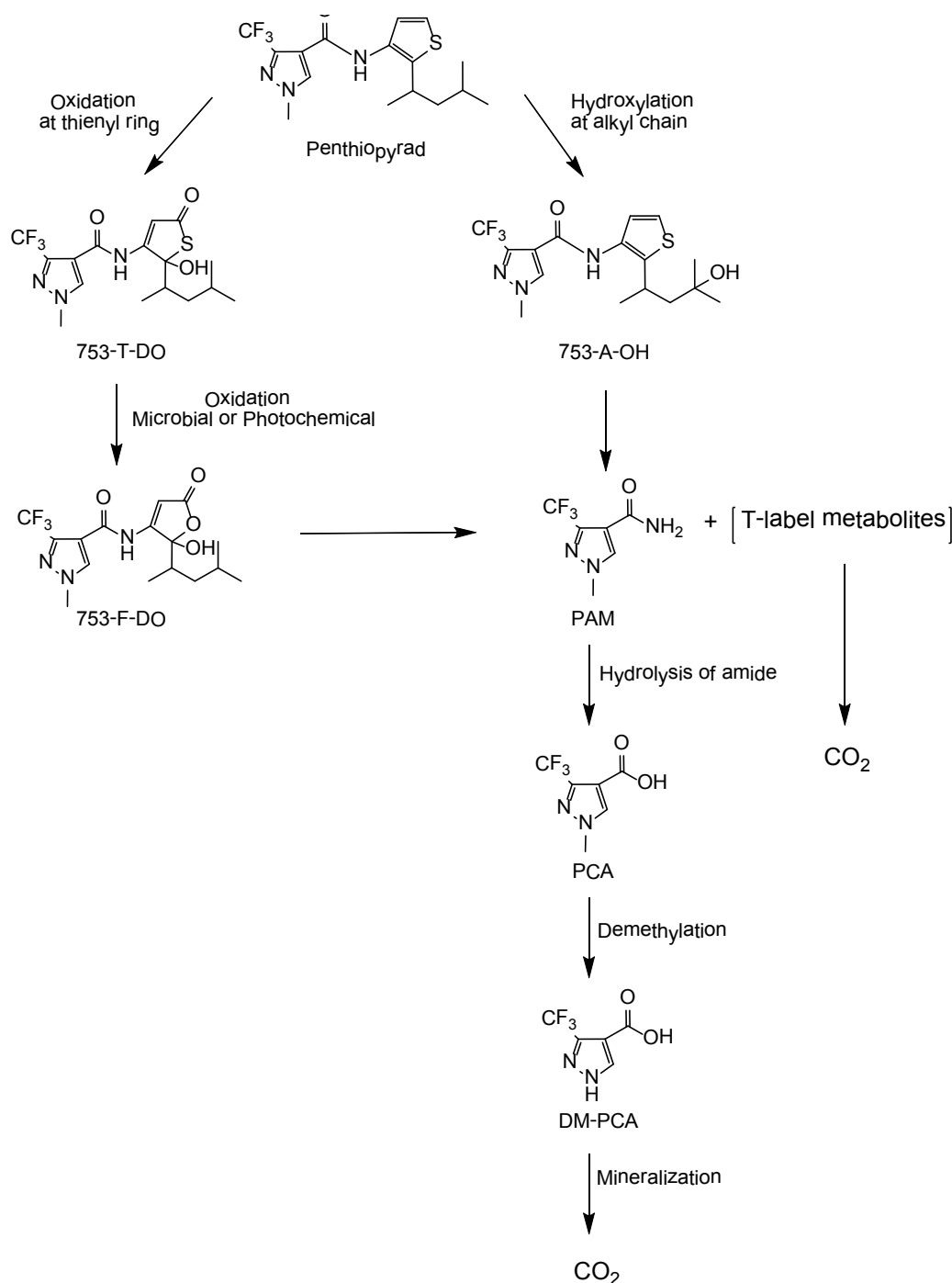


Figure 5 Proposed metabolic pathway of penthiopyrad in rotational crops

Field crop rotation studies

For the investigation of residues in follow crops under field conditions several trials conducted in Europe and in the United States of America were submitted.

In a study conducted by Old, J (2009, PTHIO_041, PTHIO_042) cucumbers in Southern Europe (Site 1) and barley in Northern Europe (Site 2) were treated with penthiopyrad at rates of 2×0.4 kg ai/ha. For cucumbers treatment occurred 6 and 1 day before harvest, for barley at BBC 39 and 69. After removal of the primary crops radish (Site 1 + 2), lettuce (Site 1), spinach (Site 2), wheat (Site 1) and Barley (Site 2) were planted at a target plant back intervals of 30, 60, 120 and 365 days.

All samples were analysed for parent penthiopyrad and its metabolites PAM, PCA, DM-PCA, 753-A-OH and 753-F-DO. An overview of the results is presented in Table 56.

Table 56 Residues of penthiopyrad and its metabolites in rotational crops under field condition in Europe

Crop	Plantback interval (days)	Commodity	Residue in mg/kg (extrapolated below LOQ)					
			Penthiopyrad	PAM	753-A-OH	PCA	DM-PCA	753-F-DO
Site 1: Spain, Los Palacios, Andalacia, 2007, 2× 0.4 kg ai/ha to cucumbers (6 and 1 day before harvest)								
Lettuce	30	50% mature	< 0.01	< 0.01	< 0.01	0.016	0.1	< 0.01
		mature	< 0.01	< 0.01	< 0.01	0.012	< 0.05 (0.03)	< 0.01
	65	50% mature	< 0.01	< 0.01	< 0.01	< 0.01 (0.008)	0.075	< 0.01
		mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05 (0.03)	< 0.01
	122	50% mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05 (0.03)	< 0.01
		mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01
Radish	30	Tops	< 0.01	< 0.01	< 0.01	< 0.01 (0.003)	0.03	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	65	Tops	< 0.01	< 0.01	< 0.01	< 0.01	0.049	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	122	Tops	< 0.01	< 0.01	< 0.01	< 0.01	0.033	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Wheat	30	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05 (0.04)	0.33	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	0.05	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	0.1	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	65	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05 (0.02)	0.16	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05 (0.04)	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	0.15	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01 (0.004)	< 0.01
	122	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05 (0.04)	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05 (0.03)	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	0.051	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	366	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05 (0.02)	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Crop	Plantback interval (days)	Commodity	Residue in mg/kg (extrapolated below LOQ)					
			Penthiopyrad	PAM	753-A-OH	PCA	DM-PCA	753-F-DO
Site 2: UK, Tranent, Scotland, 2× 0.4 kg ai/ha to barley (BBCH 39 and 69)								
Spinach	32	50% mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01
		mature	< 0.01 (0.004)	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01
	62	50% mature	0.011	< 0.01 (0.004)	< 0.01	< 0.01	< 0.05	< 0.01
		mature	< 0.01 (0.006)	< 0.01	< 0.01	< 0.01	< 0.05	< 0.01
	122	50% mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05 (0.02)	< 0.01
		mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.05 (0.03)	< 0.01
Radish	32	Tops	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01 (0.008)	< 0.01
		Roots	< 0.01 (0.005)	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	62	Tops	< 0.01 (0.004)	< 0.01	< 0.01	< 0.01	< 0.01 (0.009)	< 0.01
		Roots	0.017	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	122	Tops	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Barley	32	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05 (0.02)	< 0.05	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	62	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	122	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	402	Whole plant	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Hay	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
		Straw	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05 (0.02)	< 0.05
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

50% mature: approximately 50% of the crop were at a stage of commercial harvest

A second study on the behaviour of penthiopyrad in follow crops under field conditions was conducted by Shepard E (2009, PTHIO_043, PTHIO_044) in the United States of America and in Canada. In a total of six supervised trials radish, lettuce and wheat were planted as rotational crops with plant back intervals of 30, 60 and 365 days. Application rate were 4× 0.245 kg ai/ha for a total

annual rate of 0.98–1.05 kg ai/ha. Samples were analysed for residues of parent penthiopyrad, PAM, PCA, 753-A-OH, DM-PCA and 753-F-DO. The results of the field trials are presented in Table 57.

Table 57 Residues of penthiopyrad and its metabolites in rotational crops under field condition in the United States and Canada

Crop	Plant back interval (days)	Commodity	Residue in mg/kg					
			Penthiopyrad	PAM	753-A-OH	PCA	DM-PCA	753-F- DO
Trial 01, USA (Florida)								
Lettuce	30	50% mature	< 0.01	0.03	< 0.01	0.012	0.055	< 0.01
		mature	< 0.01	0.01	< 0.01	< 0.01 (0.005)	0.03	< 0.01
	60	50% mature	< 0.01	< 0.01 (0.008)	< 0.01	< 0.01	0.01	< 0.01
		mature	< 0.01	< 0.01 (0.005)	< 0.01	< 0.01	< 0.01 (0.008)	< 0.01
	336	50% mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		mature	Not sampled					
Radish	30	Tops	< 0.01	0.064	< 0.01	< 0.01	0.049	< 0.01
		Roots	< 0.01	< 0.01 (0.009)	< 0.01	< 0.01	< 0.01 (0.006)	< 0.01
	60		Not sampled					
	336	Tops	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trial 02, USA (California)								
Lettuce	30	50% mature	< 0.01	< 0.01	< 0.01	< 0.01	0.018	< 0.01
		mature	< 0.01	< 0.01	< 0.01	< 0.01	0.015	< 0.01
	60	50% mature	< 0.01	< 0.01 (0.003)	< 0.01	< 0.01 (0.007)	0.038	< 0.01
		mature	< 0.01	< 0.01	< 0.01	< 0.01	0.025	< 0.01
	300	50% mature	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01 (0.009)	< 0.01
		mature	< 0.01	< 0.01	< 0.01	< 0.01	0.015	< 0.01
Radish	30	Tops	< 0.01	0.055	< 0.01	< 0.01	0.087	< 0.01
		Roots	< 0.01	< 0.01 (0.003)	< 0.01	< 0.01 (0.007)	0.011	< 0.01
	60	Tops	< 0.01	0.01	< 0.01	< 0.01	0.04	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01 (0.004)	< 0.01	< 0.01
	300	Tops	< 0.01	0.019	< 0.01	< 0.01	0.043	< 0.01

Crop	Plant back interval (days)	Commodity	Residue in mg/kg					
			Penthiopyrad	PAM	753-A-OH	PCA	DM-PCA	753-F-DO
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trial 03, USA (Iowa)								
Wheat	30	Forage	< 0.01	< 0.01	< 0.01	< 0.01	0.017	< 0.01
		Hay	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Straw	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	60	Forage	< 0.01	< 0.01	< 0.01	< 0.01	0.036	< 0.01
		Hay	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Straw	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	381	Forage	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Hay	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Straw	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trial 04, Canada (Ontario)								
Wheat	31	Forage	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
		Hay	< 0.01	< 0.01	< 0.01	< 0.01	0.02	< 0.01
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Straw	< 0.01	< 0.01	< 0.01	< 0.01	0.05	< 0.01
	62	Forage	< 0.01	< 0.01	< 0.01	< 0.01	0.049	< 0.01
		Hay	< 0.01	< 0.01	< 0.01	< 0.01	0.03	< 0.01
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Straw	< 0.01	< 0.01	< 0.01	< 0.01	0.071	< 0.01
	380	Forage	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Hay	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Grain	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Straw	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Trial 05, Canada (Ontario)								
Radish	8	Tops	< 0.01	< 0.01 (0.009)	< 0.01	< 0.01 (0.007)	0.12	< 0.01
		Roots	0.019	< 0.01	< 0.01	< 0.01 (0.008)	0.011	< 0.01
	60	Tops	< 0.01	< 0.01	< 0.01	< 0.01	0.074	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

Crop	Plant back interval (days)	Commodity	Residue in mg/kg					
			Penthiopyrad	PAM	753-A-OH	PCA	DM-PCA	753-F-DO
							(0.006)	
Trial 06, USA (New York)								
Radish	30	Tops	< 0.01	< 0.01 (0.008)	< 0.01	< 0.01	0.029	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	60	Tops	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
		Roots	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01

50% mature: approximately 50% of the crop were at a stage of commercial harvest

Field dissipation studies

Field dissipation studies for penthiopyrad and DM-PCA were not submitted to the Meeting. However confined and field rotational crop studies suggest that no significant uptake of residues from soil into succeeding crops occurs.

RESIDUE ANALYSIS

Analytical methods

A number of analytical methods have been reported for the analysis of penthiopyrad, PAM, PCA, 753-A-OH, 753-F-DO and DM-PCA in plant and animal matrices. The basic approach employs extraction by homogenisation with acetone/water or acetonitrile/water. After partitioning against an organic solvent (normally ethyl acetate) the extract cleaned with GPC or directly used for analysis. Residues are determined by liquid chromatography (LC) in combination with tandem mass spectroscopy (MS/MS). Validated LOQs for all analytes were 0.01 mg/kg for plant and animal matrices.

For the application of multi-residue methods the DFG S-19 was tested with satisfactory recoveries for parent penthiopyrad. The metabolites PCA, PAM and DM-PCA can not be analysed with acceptable recoveries by the DFG S-19 method.

Samples of plant origin

Reference: Rzepka, S (2008, PTHIO_052), Rzepka, S (2008, PTHIO_053), Daneva, E (2009, PTHIO_054), Mayer, M (2009, PTHIO_055)

Method: DFG Method S19

Commodities: Oranges, grapes, oilseed rape, wheat (straw)

Analytes: penthiopyrad, PAM, PCA, 753-A-OH, DM-PCA

LOQ: 0.01 mg/kg

Determination: LC-MS/MS

Description: Specimen material was extracted with acetone. Water was added before-hand in an amount that takes full account of the natural water content of the specimen so that during extraction the acetone/water ratio remains constant at 2:1 v/v. For liquid-liquid partition ethyl

acetate/cyclohexane (1:1, v/v) and sodium chloride were added and after repeated mixing excess water was separated. The oil seed rape (seeds) sample material was mixed intensely with synthetic calcium silicate after addition of acetone and acetonitrile.

The extract was evaporated and an aliquot of the remaining residue of the organic phase was cleaned up by gel permeation chromatography (GPC) using a mixture of ethyl acetate/ cyclohexane (1:1, v/v) as eluent. The residue-containing fraction was concentrated and analysed for residues of penthiopyrad and its metabolites (PCA, 753-A-OH, PAM and DM-PCA) using LC-MS/MS.

Table 58 Recoveries of penthiopyrad and its metabolites in samples of plant origin (DFG Method S19)

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Wheat, straw	penthiopyrad	0.01	5	89	11	Rzepka, S (2008, PTHIO_052)
		0.1	5	87	5.1	
	753-A-OH	0.01	5	105	12	
		0.1	5	100	6.3	
	PAM	0.01	5	91	1.8	
		0.1	5	91	5.3	
	PCA	0.01	5	np	—	
		0.1	5	np	—	
	DM-PCA	0.01	5	0	—	
		0.1	5	4	1.5	
Oilseed rape	penthiopyrad	0.01	5	97	5.2	Rzepka, S (2008, PTHIO_053)
		0.1	5	102	11	
	753-A-OH	0.01	5	94	6.0	
		0.1	5	99	6.2	
	PAM	0.01	5	74	7.6	
		0.1	5	73	6.6	
	PCA	0.01	5	0	—	
		0.1	5	2	2.5	
	DM-PCA	0.01	5	0	—	
		0.1	5	0	—	
Orange, whole fruits	penthiopyrad	0.01	5	100	6.5	Daneva, E (2009, PTHIO_054)
		0.1	5	89	3.7	
	753-A-OH	0.01	5	107	8.9	
		0.1	5	101	9.3	
	PAM	0.01	5	92	12	
		0.1	5	78	3.6	
	PCA	0.01	5	43	27	
		0.1	5	3	0.5	
	DM-PCA	0.01	5	0	—	
		0.1	5	0	—	
Grapes	penthiopyrad	0.01	5	97	5.4	Daneva, E (2009, PTHIO_054)
		0.1	5	89	2.7	
	753-A-OH	0.01	5	90	9.9	
		0.1	5	80	7.5	
	PAM	0.01	5	89	7.2	
		0.1	5	90	2.9	
	PCA	0.01	5	0	—	
		0.1	5	4	0.7	
	DM-PCA	0.01	5	0	—	
		0.1	5	2	1.1	
Wheat, straw	penthiopyrad	0.01	5	83	4.3	Mayer, M (2009, PTHIO_055)
		0.1	5	89	4.8	
	753-A-OH	0.01	5	70	5.4	Independent

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
PAM	0.1	5	84	9.6	6	laboratory validation
	0.01	5	70	6.1	9	
	0.1	5	72	2.3	3	
Grapes	penthiopyrad	0.01	5	89	5.8	Mayer, M (2009, PTHIO_055)
		0.1	5	99	3.1	
	753-A-OH	0.01	5	87	4.2	Independent laboratory validation
		0.1	5	90	2.6	
	PAM	0.01	5	80	5.7	
		0.1	5	87	2.6	

n.a. not analysed

Reference: Ballard, TD (2009, PTHIO_056)

Method: United States Food and Drug Administration (FDA) Multiresidue Method (MRM)

Description: This study evaluated the capability of the FDA MRM protocols to analyze residues of penthiopyrad and its metabolites in non-fatty and fatty-food. This evaluation of penthiopyrad and its metabolites was conducted in accordance with the FDA Decision Tree for multi-residue testing, and it was also used as a guide to direct the analyst to the most appropriate Pesticide Analytical Manual I protocols for the chemical being tested according to the results obtained as each protocol is completed.

Protocol A: No response to fluorescence detection.

Protocol B: No chromatography after methylation.

Protocol C: This protocol evaluates penthiopyrad and its four metabolites using three GC detection systems; one specific DG-17 and two nonspecific DG-1 and DG-7. For the Module DG1 and DG7 the data collection system was set so that 0.15 ng of chlorpyrifos gave a 50% full-scale deflection (FSD) response. For the Module DG17 the data collection system was set so that 1.5 ng of chlorpyrifos gave a 50% FSD response:

Protocol D: This protocol includes methods, which are generally applicable to non-ionic chemicals, which are detectable by electron capture, nitrogen, and/or phosphorus-selective detectors. Furthermore, the methods of protocol D are applicable to a variety of crops, grouped into non-fatty foods for purposes of the Multiresidue Testing requirements. Parent penthiopyrad showed no acceptable recovery, ranging from 69–228% without cleanup and less than 1% with Florosil cleanup. PCA and PAM gave satisfactory recoveries (82–128%), however no Clean-Up using Florosil was investigated.

Protocol E: Protocol E includes methods, which are generally applicable to relatively nonpolar chemicals, although many chemicals can be recovered through this method. The methods described by Protocol E, are applicable to non-fatty foods. This protocol consists of recovery through a Florisil cleanup and recovery through complete method. Neither penthiopyrad nor its metabolites can be analysed with this protocol.

Protocol F: Protocol F includes methods, which are generally applicable to relatively nonpolar chemicals, although many chemicals can be recovered through this method. The methods described by Protocol F are applicable to fatty foods. This protocol consists of recovery through a FlorisilR clean-up and recovery through complete method. PAM was the only compound which showed sufficient sensitivity, however since PAM was not recovered through the C1 or C2 Florisil cleanup procedures, the testing was terminated.

Reference: Bell, A (2008, PTHIO_057), Stry, JJ (2009, PTHIO_058), Stry, JJ (2009, PTHIO_059), Sadgrove, L (2009, PTHIO_060, ILV)

Method: CEMR 3727

Commodities: Almonds (nutmeat and hulls), apples (fruits, dry pomace and juice), beans, cherry, cucumber, grapes (dry pomace, fruits, juice and raisins), lettuce, melon (peel and pulp), oilseed rape (seeds, oil and press cake), oranges, peach, peanuts (nutmeat, hay and meal, refined oil), peas (dry seeds, hay and vines), pecans (nutmeat), plums (fruits and prunes), potatoes, radish roots, sunflower oil, wheat (forage, grain and straw)

Analytes: penthiopyrad (m/z 358 → 149), PAM (m/z 194 → 174), PCA (m/z 193 → 109), 753-A-OH (m/z 374 → 224), 753-F-DO (m/z 374 → 193), DM-PCA (m/z 179 → 159)

LOQ: 0.01 mg/kg (except for dry grape pomace, pea hay & vines, peanut hay, rapeseed press cake, wheat forage & straw: LOQ = 0.05 mg/kg)

Determination: LC-MS/MS

Description: The samples are extracted with acetonitrile/water (4:1, v/v). After centrifugation and removal of the organic solvent, the aqueous layer is acidified with hydrochloric acid in order to hydrolyse conjugates, and then partitioned with ethyl acetate. The ethyl acetate phase is then evaporated and the extract is re-dissolved in methanol/deionised water (50:50, v/v) for LC-MS/MS analysis. Quantitation is performed by the external standardisation with bracketing standards.

Table 59 Recoveries of penthiopyrad and its metabolites in samples of plant origin (CEMR 3727)

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Oil seed rape	Penthiopyrad	0.01	4	90	12.1	Bell, A 2008 (PTHIO_057)
		0.1	5	81	1.1	
	PCA	0.01	5	91	6.3	
		0.1	5	95	3.6	
	PAM	0.01	5	86	9.5	
		0.1	5	89	9.0	
	753-A-OH	0.01	5	107	1.0	
		0.1	5	93	2.5	
	753-F-DO	0.01	5	102	4.2	
		0.1	5	96	2.5	
	DM-PCA	0.01	5	96	2.5	
		0.1	5	95	3.2	
Sunflower oil	Penthiopyrad	0.01	5	88	2.6	Bell, A 2008 (PTHIO_057)
		0.1	5	83	4.1	
	PCA	0.01	5	95	3.6	
		0.1	5	92	4.4	
	PAM	0.01	5	91	8.8	
		0.1	5	95	7.4	
	753-A-OH	0.01	5	84	2.7	
		0.1	5	84	3.8	
	753-F-DO	0.01	5	95	2.8	
		0.1	5	91	2.7	
	DM-PCA	0.01	5	99	3.5	
		0.1	5	97	3.8	
Oranges	Penthiopyrad	0.01	5	87	10.2	Bell, A 2008 (PTHIO_057)
		0.1	4	89	4.9	
	PCA	0.01	5	99	3.1	
		0.1	4	95	4.2	
	PAM	0.01	5	87	3.2	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
753-A-OH	0.1	4	87	5.7	7	
	0.01	5	95	3.7	4	
753-F-DO	0.1	5	100	10.6	11	
	0.01	5	95	5.4	6	
DM-PCA	0.1	5	92	2.5	3	
	0.01	5	105	3.7	4	
	0.1	5	96	12.4	13	
Grapes						Bell, A 2008 (PTHIO_057)
Penthiopyrad	0.01	5	98	4.7	5	
	0.1	5	99	2.8	3	
PCA	0.01	5	97	7.4	8	
	0.1	5	98	6.4	7	
PAM	0.01	5	91	4.3	5	
	0.1	5	96	4.4	5	
753-A-OH	0.01	5	102	4.1	4	
	0.1	5	101	3.7	4	
753-F-DO	0.01	5	103	2.9	3	
	0.1	4	100	4.0	4	
DM-PCA	0.01	5	92	6.4	7	
	0.1	5	99	6.2	6	
Pea hay						Bell, A 2008 (PTHIO_057)
Penthiopyrad	0.05	5	82	4.8	6	
	0.5	5	76	1.8	2	
PCA	0.05	5	85	6.4	8	
	0.5	5	81	6.0	7	
PAM	0.05	5	92	8.6	9	
	0.5	5	82	3.5	4	
753-A-OH	0.05	5	81	1.3	2	
	0.5	5	79	1.7	2	
753-F-DO	0.05	5	83	1.5	2	
	0.5	5	81	1.9	2	
DM-PCA	0.05	5	82	6.4	8	
	0.5	5	89	5.7	6	
Lettuce						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	79	4.0	5	
	0.1	5	76	4.4	6	
PCA	0.01	5	89	2.2	2	
	0.1	5	90	3.0	3	
PAM	0.01	5	109	3.5	3	
	0.1	5	85	3.7	4	
753-A-OH	0.01	5	96	3.0	3	
	0.1	5	93	3.1	3	
753-F-DO	0.01	5	88	1.2	1	
	0.1	5	84	1.8	2	
DM-PCA	0.01	5	94	4.2	4	
	0.1	5	100	7.1	7	
Apples						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	85	7.9	9	
	0.1	5	80	8.3	10	
PCA	0.01	5	84	1.9	2	
	0.1	5	70	2.8	4	
PAM	0.01	5	88	5.4	6	
	0.1	5	84	2.5	3	
753-A-OH	0.01	5	103	3.2	3	
	0.1	5	99	5.0	5	
753-F-DO	0.01	5	91	1.3	1	
	0.1	5	89	3.3	4	
DM-PCA	0.01	5	87	8.4	10	
	0.1	5	114	7.3	6	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Potatoes						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	82	3.2	4	
	0.1	5	76	3.2	4	
PCA	0.01	5	85	3.7	4	
	0.1	5	87	1.5	2	
PAM	0.01	5	89	2.0	2	
	0.1	5	84	5.5	6	
753-A-OH	0.01	5	106	5.0	5	
	0.1	5	91	2.7	3	
753-F-DO	0.01	5	85	1.3	2	
	0.1	5	78	1.9	3	
DM-PCA	0.01	5	95	8.9	9	
	0.1	5	101	3.5	4	
Grapes						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	86	7.6	9	
	0.1	5	80	7.0	9	
PCA	0.01	5	81	5.7	7	
	0.1	5	85	10.2	12	
PAM	0.01	5	80	4.3	5	
	0.1	5	80	8.8	11	
753-A-OH	0.01	5	83	3.9	5	
	0.1	5	82	4.1	5	
753-F-DO	0.01	5	n.a.	n.a.	n.a.	
	0.1	5	n.a.	n.a.	n.a.	
DM-PCA	0.01	5	94	5.2	6	
	0.1	5	85	8.1	10	
Dried beans						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	100	3.4	3	
	0.1	5	98	0.8	1	
PCA	0.01	5	92	6.7	7	
	0.1	5	97	3.1	3	
PAM	0.01	5	86	4.5	5	
	0.1	5	100	5.3	5	
753-A-OH	0.01	5	90	3.7	4	
	0.1	5	101	7.5	7	
753-F-DO	0.01	5	79	1.9	2	
	0.1	5	85	3.9	5	
DM-PCA	0.01	5	86	3.8	4	
	0.1	5	95	5.0	5	
Dry grape pomace						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.05	5	97	6.1	6	
	0.1	5	97	3.5	4	
PCA	0.05	5	90	3.9	4	
	0.1	5	73	5.9	8	
PAM	0.05	5	71	2.2	3	
	0.1	5	71	1.3	2	
753-A-OH	0.05	5	96	4.9	5	
	0.1	5	95	12	13	
753-F-DO	0.05	5	103	3.7	4	
	0.1	5	97	3.5	4	
DM-PCA	0.05	5	88	2.9	3	
	0.1	5	82	5.9	7	
Grape juice						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	95	2.9	3	
	0.1	5	83	1.6	2	
PCA	0.01	5	73	5.5	8	
	0.1	5	82	3.3	4	
PAM	0.01	5	87	6.3	7	
	0.1	5	76	2.8	4	
753-A-OH	0.01	5	94	1.6	2	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
753-F-DO	0.1	5	86	4.5	5	
	0.01	5	96	4.3	5	
	0.1	5	97	3.3	3	
DM-PCA	0.01	5	93	1.7	2	
	0.1	5	85	3.5	4	
Raisins						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	78	3.3	4	
	0.1	5	75	1.4	2	
PCA	0.01	5	101	5.3	5	
	0.1	5	73	3.0	4	
PAM	0.01	5	82	3.7	5	
	0.1	5	76	2.8	4	
753-A-OH	0.01	5	90	4.0	4	
	0.1	5	77	2.6	3	
753-F-DO	0.01	5	83	2.2	3	
	0.1	5	84	1.7	2	
DM-PCA	0.01	5	87	3.3	4	
	0.1	5	86	2.4	3	
Oilseed rape						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	96	5.4	6	
	0.1	5	85	3.7	4	
PCA	0.01	5	91	9.2	10	
	0.1	5	108	9.3	9	
PAM	0.01	5	80	4.2	5	
	0.1	5	80	1.4	2	
753-A-OH	0.01	5	100	3.1	3	
	0.1	5	93	3.0	3	
753-F-DO	0.01	5	106	3.6	3	
	0.1	5	99	5.9	6	
DM-PCA	0.01	5	106	1.9	2	
	0.1	5	117	7.9	7	
Rapeseed oil						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	98.3	2.3	2	
	0.1	5	88.4	5.1	6	
PCA	0.01	5	87.3	3.8	4	
	0.1	5	89.2	4.7	5	
PAM	0.01	5	102	6.3	6	
	0.1	5	104	5.3	5	
753-A-OH	0.01	5	101	3.5	4	
	0.1	5	92.3	5.8	6	
753-F-DO	0.01	5	107	3.2	3	
	0.1	5	107	8.4	8	
DM-PCA	0.01	5	97	1.9	2	
	0.1	5	99	5.1	5	
Wheat grain						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.01	5	99	2.2	2	
	0.1	5	95	4.3	5	
PCA	0.01	5	79	4.0	5	
	0.1	5	72	3.1	4	
PAM	0.01	5	93	4.0	4	
	0.1	5	94	5.8	6	
753-A-OH	0.01	5	90	1.6	2	
	0.1	5	86	4.8	6	
753-F-DO	0.01	5	96	3.1	3	
	0.1	5	100	4.3	4	
DM-PCA	0.01	5	85	4.7	6	
	0.1	5	83	2.4	3	
Wheat straw						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.05	5	85	9.0	11	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
PCA	0.1	5	84	4.0	5	
	0.05	5	86	3.1	4	
	0.1	5	85	0.7	1	
PAM	0.05	5	86	4.0	5	
	0.1	5	81	2.5	3	
753-A-OH	0.05	5	81	5.2	7	
	0.1	5	77	3.9	5	
753-F-DO	0.05	5	84	4.7	6	
	0.1	5	73	2.8	4	
DM-PCA	0.05	5	86	1.9	2	
	0.1	5	88	3.6	4	
Wheat forage						Stry, JJ 2009 (PTHIO_058)
Penthiopyrad	0.05	5	85	2.7	3	
	0.1	5	85	3.7	4	
PCA	0.05	5	92	3.7	4	
	0.1	5	96	7.3	8	
PAM	0.05	5	84	2.4	3	
	0.1	5	88	6.1	7	
753-A-OH	0.05	5	91	3.9	4	
	0.1	5	90	3.6	4	
753-F-DO	0.05	5	86	2.8	3	
	0.1	5	96	3.8	4	
DM-PCA	0.05	5	91	3.2	4	
	0.1	5	93	4.2	5	
Prunes						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	103	3.7	4	
	0.1	4	102	6.0	6	
PCA	0.01	4	109	8.4	8	
	0.1	4	106	3.1	3	
PAM	0.01	4	101	5.7	6	
	0.1	4	103	5.3	5	
753-A-OH	0.01	4	106	4.9	5	
	0.1	4	110	3.1	3	
753-F-DO	0.01	4	110	4.8	4	
	0.1	4	117	4.4	4	
DM-PCA	0.01	4	92	16	17	
	0.1	4	102	3.5	3	
Cucumber						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	93	3.8	4	
	0.1	4	99	5.6	6	
PCA	0.01	4	81	9.6	12	
	0.1	4	101	1.8	2	
PAM	0.01	4	95	2.1	2	
	0.1	4	102	6.7	7	
753-A-OH	0.01	4	93	4.7	5	
	0.1	4	101	5.2	5	
753-F-DO	0.01	4	101	3.1	3	
	0.1	4	105	5.3	5	
DM-PCA	0.01	4	93	4.0	4	
	0.1	4	99	3.9	4	
Melon pulp						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	100	1.3	1	
	0.1	4	93	2.4	3	
PCA	0.01	4	87	7.7	9	
	0.1	4	90	2.0	2	
PAM	0.01	4	80	1.0	1	
	0.1	4	84	1.7	2	
753-A-OH	0.01	4	98	2.9	3	
	0.1	4	93	2.7	3	
753-F-DO	0.01	4	100	3.1	3	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
DM-PCA	0.1	4	94	2.7	3	
	0.01	4	93	1.4	2	
	0.1	4	91	2.8	3	
Melon peel						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	104	2.8	3	
	0.1	4	105	4.5	4	
PCA	0.01	4	93	6.0	7	
	0.1	4	117	4.1	4	
PAM	0.01	4	93	2.9	3	
	0.1	4	103	3.5	3	
753-A-OH	0.01	4	106	2.2	2	
	0.1	4	110	5.4	5	
753-F-DO	0.01	4	114	2.5	2	
	0.1	4	115	4.3	4	
DM-PCA	0.01	4	103	4.2	4	
	0.1	4	108	1.7	2	
Almond nutmeat						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	69	2.6	4	
	0.1	4	80	2.6	3	
PCA	0.01	4	100	12	12	
	0.1	4	101	6.5	6	
PAM	0.01	4	93	3.7	4	
	0.1	4	102	5.8	6	
753-A-OH	0.01	4	74	6.2	8	
	0.1	4	96	3.5	4	
753-F-DO	0.01	4	88	16	18	
	0.1	4	91	2.6	3	
DM-PCA	0.01	4	99	2.5	3	
	0.1	4	94	12	12	
Almond hulls						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	85	4.6	5	
	0.1	4	77	4.8	6	
PCA	0.01	4	96	12	12	
	0.1	4	85	11	13	
PAM	0.01	4	76	4.2	6	
	0.1	4	75	4.0	5	
753-A-OH	0.01	4	84	4.0	5	
	0.1	4	85	5.2	6	
753-F-DO	0.01	4	81	6.0	7	
	0.1	4	80	5.1	6	
DM-PCA	0.01	4	79	13	16	
	0.1	4	75	4.9	7	
Pecan nutmeat						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	85	2.7	3	
	0.1	4	83	2.7	3	
PCA	0.01	4	79	8.3	11	
	0.1	4	89	1.6	2	
PAM	0.01	4	86	5.2	6	
	0.1	4	88	2.2	3	
753-A-OH	0.01	4	88	4.9	6	
	0.1	4	89	2.5	3	
753-F-DO	0.01	4	94	4.1	4	
	0.1	4	96	3.7	4	
DM-PCA	0.01	4	89	6.8	8	
	0.1	4	80	1.7	2	
Apples						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	94	5	6	
	0.1	4	90	3	4	
PCA	0.01	4	96	16	16	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
PAM	0.1 0.01	4 4	95 74	3 8	4 11	
753-A-OH	0.1 0.01	4 4	86 100	5 7	6 7	
753-F-DO	0.1 0.01	4 4	95 101	3 8	3 8	
DM-PCA	0.1 0.01	4 4	95 93	2 4	2 5	
	0.1	4	95	4	4	
Peach						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01 0.1	4 4	95 91	5.1 6.1	5 7	
PCA	0.01 0.1	4 4	95 101	11 3.2	12 3	
PAM	0.01 0.1	4 4	92 97	5.1 9.1	6 9	
753-A-OH	0.01 0.1	4 4	99 106	4.9 3.5	5 3	
753-F-DO	0.01 0.1	4 4	102 104	4.8 4.4	5 4	
DM-PCA	0.01 0.1	4 4	93 102	7.8 2.5	8 3	
Plum						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01 0.1	4 4	106 103	4.0 2.2	4 2	
PCA	0.01 0.1	4 4	103 114	4.2 3.2	4 3	
PAM	0.01 0.1	4 4	103 102	3.1 2.4	3 2	
753-A-OH	0.01 0.1	4 4	114 112	3.2 2.1	3 2	
753-F-DO	0.01 0.1	4 4	115 115	4.1 1.4	4 1	
DM-PCA	0.01 0.1	4 4	107 110	5.0 2.4	4.7 2.2	
Sweet cherry						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01 0.1	4 4	100 97	6.5 5.9	7 6	
PCA	0.01 0.1	4 4	98 123	10 2.0	10 2	
PAM	0.01 0.1	4 4	88 107	2.8 0.9	3 1	
753-A-OH	0.01 0.1	4 4	105 117	8.7 4.6	8 4	
753-F-DO	0.01 0.1	4 4	105 116	9.2 5.6	9 5	
DM-PCA	0.01 0.1	4 4	98 120	5.7 4.1	6 3	
Apple dry pomace						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01 0.1	4 4	98 94	2.6 3.0	3 3	
PCA	0.01 0.1	4 4	92 95	11 3.2	12 3	
PAM	0.01 0.1	4 4	83 82	4.7 2.2	6 3	
753-A-OH	0.01 0.1	4 4	97 96	1.5 2.9	2 3	
753-F-DO	0.01 0.1	4 4	91 89	2.1 2.2	2 2	
DM-PCA	0.01	4	91	1.3	1	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
	0.1	4	92	2.0	2	
Apple juice						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	88	3.0	3	
	0.1	4	79	6.6	8	
PCA	0.01	4	79	11	14	
	0.1	4	90	9.2	10	
PAM	0.01	4	70	5.5	8	
	0.1	4	81	6.6	8	
753-A-OH	0.01	4	91	2.5	3	
	0.1	4	91	6.8	7	
753-F-DO	0.01	4	92	5.4	6	
	0.1	4	89	7.2	8	
DM-PCA	0.01	4	90	5.7	6	
	0.1	4	91	6.5	7	
Pea vine						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	82	4.6	6	
	0.1	4	84	6.7	8	
PCA	0.01	4	90	8.5	9	
	0.1	4	88	5.3	6	
PAM	0.01	4	87	11	12	
	0.1	4	82	6.0	7	
753-A-OH	0.01	4	98	7.8	8	
	0.1	4	95	5.9	6	
753-F-DO	0.01	4	108	9.0	8	
	0.1	4	106	7.4	7	
DM-PCA	0.01	4	72	8.1	11	
	0.1	4	86	4.5	5	
Pea hay						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.05	4	73	1.8	3	
	0.5	4	76	2.9	4	
PCA	0.05	4	83	3.4	4	
	0.5	4	93	1.9	2	
PAM	0.05	4	85	3.7	4	
	0.5	4	82	2.4	3	
753-A-OH	0.05	4	83	2.1	3	
	0.5	4	90	4.6	5	
753-F-DO	0.05	4	79	1.3	2	
	0.5	4	90	2.5	3	
DM-PCA	0.05	4	74	3.7	5	
	0.5	4	101	3.2	3	
Pea dry seed						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	104	8.4	8	
	0.1	4	94	6.2	7	
PCA	0.01	4	92	5.8	6	
	0.1	4	88	5.7	7	
PAM	0.01	4	96	8.1	9	
	0.1	4	89	5.5	6	
753-A-OH	0.01	4	87	5.7	6	
	0.1	4	85	4.1	5	
753-F-DO	0.01	4	115	8.7	8	
	0.1	4	106	6.2	6	
DM-PCA	0.01	4	84	7.7	9	
	0.1	4	85	6.3	7	
Bean dry seed						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	89	4.2	5	
	0.1	4	81	4.3	5	
PCA	0.01	4	76	1.1	2	
	0.1	4	77	3.8	5	
PAM	0.01	4	87	5.4	6	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
753-A-OH	0.1	4	83	3.7	5	
	0.01	4	87	3.3	4	
	0.1	4	85	4.1	5	
753-F-DO	0.01	4	96	3.9	4	
	0.1	4	90	4.1	5	
DM-PCA	0.01	4	89	5.3	6	
	0.1	4	79	3.5	4	
Lettuce						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	84	5.1	6	
	0.1	4	69	7.9	11	
PCA	0.01	4	90	4.1	5	
	0.1	4	79	6.8	9	
PAM	0.01	4	82	3.0	4	
	0.1	4	70	6.7	10	
753-A-OH	0.01	4	91	3.8	4	
	0.1	4	79	7.2	9	
753-F-DO	0.01	4	102	3.0	3	
	0.1	4	85	8.1	10	
DM-PCA	0.01	4	86	6.5	8	
	0.1	4	77	7.3	10	
Radish roots						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	91	3.7	4	
	0.1	4	90	2.7	3	
PCA	0.01	4	83	2.3	3	
	0.1	4	82	0.7	1	
PAM	0.01	4	79	5.3	7	
	0.1	4	78	3.3	4	
753-A-OH	0.01	4	88	2.9	3	
	0.1	4	90	1.4	2	
753-F-DO	0.01	4	96	3.9	4	
	0.1	4	92	1.0	1	
DM-PCA	0.01	4	111	4.4	4	
	0.1	4	83	0.5	1	
Oilseed rape						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.01	4	94	3.1	3	
	0.1	4	96	5.1	6	
PCA	0.01	4	103	2.6	3	
	0.1	4	96	5.6	6	
PAM	0.01	4	97	3.9	4	
	0.1	4	107	4.3	4	
753-A-OH	0.01	4	93	1.4	2	
	0.1	4	102	3.9	4	
753-F-DO	0.01	4	84	6.9	8	
	0.1	4	97	2.4	2	
DM-PCA	0.01	4	84	4.6	6	
	0.1	4	100	5.7	6	
Rapeseed press cake						Stry, JJ 2009 (PTHIO_059)
Penthiopyrad	0.05	4	97	4	4	
	0.5	4	94	3	4	
PCA	0.05	4	87	3	3	
	0.5	4	87	1	2	
PAM	0.05	4	94	6	6	
	0.5	4	91	3	3	
753-A-OH	0.05	4	97	4	4	
	0.5	4	100	4	4	
753-F-DO	0.05	4	89	8	7	
	0.5	4	94	3	3	
DM-PCA	0.05	4	94	3	3	
	0.5	4	98	2	2	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Peanut nutmeat Penthiopyrad PCA PAM 753-A-OH 753-F-DO DM-PCA	0.01	4	97	1.0	1	Stry, JJ 2009 (PTHIO_059)
	0.1	4	99	8.9	9	
	0.01	4	81	6.3	8	
	0.1	4	89	4.0	5	
	0.01	4	93	3.7	4	
	0.1	4	96	5.9	6	
	0.01	4	98	4.3	4	
	0.1	4	112	7.9	7	
	0.01	4	99	12	12	
	0.1	4	113	10	9	
	0.01	4	78	7.1	9	
	0.1	4	111	7.4	7	
Peanut hay Penthiopyrad PCA PAM 753-A-OH 753-F-DO DM-PCA	0.05	4	107	8.1	8	Stry, JJ 2009 (PTHIO_059)
	0.5	4	108	7.3	7	
	0.05	4	106	3.8	4	
	0.5	4	94	2.4	3	
	0.05	4	112	4.7	4	
	0.5	4	97	2.2	2	
	0.05	4	100	3.7	4	
	0.5	4	97	3.7	4	
	0.05	4	102	3.9	4	
	0.5	4	93	6.4	7	
	0.05	4	104	3.7	4	
	0.5	4	97	2.8	3	
Peanut meal Penthiopyrad PCA PAM 753-A-OH 753-F-DO DM-PCA	0.01	4	98	5.0	5	Stry, JJ 2009 (PTHIO_059)
	0.1	4	107	6.6	6	
	0.01	4	80	8.3	10	
	0.1	4	82	3.6	4	
	0.01	4	87	4.3	5	
	0.1	4	92	5.5	6	
	0.01	4	109	10	9	
	0.1	4	97	3.7	4	
	0.01	4	102	3.9	4	
	0.1	4	124	7.0	6	
	0.01	4	80	6.9	9	
	0.1	4	82	6.0	7	
Peanut refined oil Penthiopyrad PCA PAM 753-A-OH 753-F-DO DM-PCA	0.01	4	98	6.9	7	Stry, JJ 2009 (PTHIO_059)
	0.1	4	93	5.2	6	
	0.01	4	96	5.7	6	
	0.1	4	95	3.4	4	
	0.01	4	100	8.7	9	
	0.1	4	94	3.9	4	
	0.01	4	112	8.5	8	
	0.1	4	109	5.8	5	
	0.01	4	105	11	10	
	0.1	4	98	5.7	6	
	0.01	4	106	8.0	8	
	0.1	4	103	3.0	3	
Grapes Penthiopyrad PCA PAM 753-A-OH	0.01	4	101	0.6	1	Stry, JJ 2009 (PTHIO_059)
	0.1	4	94	0.7	1	
	0.01	4	95	7.9	8	
	0.1	4	100	4.7	5	
	0.01	4	81	3.0	4	
	0.1	4	86	2.7	3	
753-A-OH	0.01	4	104	2.4	2	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
753-F-DO	0.1	4	99	2.8	3	
	0.01	4	106	3.8	4	
	0.1	4	99	3.6	4	
DM-PCA	0.01	4	94	2.1	2	
	0.1	4	101	2.8	3	
Pea hay						Sadgrove, L 2009 (PTHIO_060) Independent laboratory validation
Penthiopyrad	0.05	5	79	3.2	4	
	0.5	5	78	1.3	2	
PCA	0.05	5	76	2.5	3	
	0.5	5	90	4.5	5	
PAM	0.05	5	86	8.4	10	
	0.5	5	81	3.2	4	
753-A-OH	0.05	5	77	2.5	3	
	0.5	5	83	2.1	3	
DM-PCA	0.05	5	83	4.1	5	
	0.5	5	92	5.0	5	
Oilseed rape						Sadgrove, L 2009 (PTHIO_060) Independent laboratory validation
Penthiopyrad	0.01	5	88	6.6	8	
	0.1	5	82	7.0	9	
PCA	0.01	5	83	7.7	9	
	0.1	5	81	2.6	3	
PAM	0.01	5	86	9.0	11	
	0.1	5	74	6.0	8	
753-A-OH	0.01	5	87	4.4	5	
	0.1	5	92	2.7	3	
DM-PCA	0.01	5	98	2.1	2	
	0.1	5	87	3.2	4	
Grapes						Sadgrove, L 2009 (PTHIO_060) Independent laboratory validation
Penthiopyrad	0.01	5	83	3.5	4	
	0.1	5	88	3.1	4	
PCA	0.01	5	98	8.5	9	
	0.1	5	90	3.8	4	
PAM	0.01	5	88	8.7	10	
	0.1	5	82	3.2	4	
753-A-OH	0.01	5	83	5.9	7	
	0.1	5	94	2.7	3	
DM-PCA	0.01	5	92	6.6	7	
	0.1	5	95	2.8	3	

n.a. not analysed

Samples of animal origin

Reference: Class, T (2009, PTHIO_061), Meyer, M (2009, PTHIO_055, ILV)

Method: DFG Method S19

Commodities: milk, liver, meat, eggs

Analytes: penthiopyrad, PAM, 753-A-OH

LOQ: 0.01 mg/kg

Determination: LC-MS/MS

Description: Specimen material was extracted with acetone. Water was added before-hand in an amount that takes full account of the natural water content of the specimen so that during extraction the acetone/water ratio remains constant at 2:1 v/v. For liquid-liquid partition ethyl acetate/cyclohexane (1:1, v/v) and sodium chloride were added and after repeated mixing excess

water was separated. The oil seed rape (seeds) sample material was mixed vigorously with synthetic calcium silicate after addition of acetone and acetonitrile.

The solution was evaporated and an aliquot of the remaining residue of the organic phase was cleaned up by gel permeation chromatography (GPC) using a mixture of ethyl acetate/ cyclohexane (1:1, v/v) as eluent. The residue-containing fraction was concentrated and analysed for residues of penthiopyrad and its metabolites (PCA, 753-A-OH, PAM and DM-PCA) using LC-MS/MS.

Table 60 Recoveries of penthiopyrad and its metabolites in samples of animal origin (DFG Method S19)

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Milk	Penthiopyrad	0.01	5	94	4.7	Class, T, 2009 (PTHIO_061)
		0.1	5	92	5.5	
	PAM	0.01	5	84	2.5	
		0.1	5	76	8.3	
	753-A-OH	0.01	5	96	6.7	
		0.1	5	93	8.3	
Liver	Penthiopyrad	0.01	5	98	8.8	Class, T, 2009 (PTHIO_061)
		0.1	5	96	4.8	
	PAM	0.01	5	97	1.9	
		0.1	5	96	1.9	
	753-A-OH	0.01	5	103	17	
		0.1	5	100	10	
Meat	Penthiopyrad	0.01	5	96	6.7	Class, T, 2009 (PTHIO_061)
		0.1	5	84	10	
	PAM	0.01	5	101	2.0	
		0.1	5	95	4.7	
	753-A-OH	0.01	5	105	3.1	
		0.1	5	97	9.7	
Eggs	Penthiopyrad	0.01	5	83	13	Class, T, 2009 (PTHIO_061)
		0.1	5	83	4.1	
	PAM	0.01	5	86	7.7	
		0.1	5	85	5.1	
	753-A-OH	0.01	5	76	8.3	
		0.1	5	73	3.6	
Milk	Penthiopyrad	0.01	5	80	4.1	Meyer, M 2009 (PTHIO_055)
		0.1	5	83	1.4	
	PAM	0.01	5	86	2.1	Independent laboratory validation
		0.1	5	85	1.6	
	753-A-OH	0.01	5	85	2.0	
		0.1	5	90	1.3	
Liver	Penthiopyrad	0.01	5	75	3.8	Meyer, M 2009 (PTHIO_055)
		0.1	5	70	4.8	
	PAM	0.01	5	85	5.6	Independent laboratory validation
		0.1	5	85	5.0	
	753-A-OH	0.01	5	73	1.6	
		0.1	5	80	4.5	
Eggs	Penthiopyrad	0.01	5	89	1.8	Meyer, M 2009 (PTHIO_055)
		0.1	5	88	1.4	
	PAM	0.01	5	96	1.3	Independent
		0.1	5	97	2.5	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
753-A-OH	0.01	5	74	7.0	9	laboratory validation
	0.1	5	87	3.4	4	

Reference: Airs, D (2008, PTHIO_062), Airs, D (2008, PTHIO_063), Oliver-Kang, J (2008, PTHIO_064), Oliver-Kang, J (2008, PTHIO_065), Class, T (2009, PTHIO_066, ILV)

Method: LDA0082, LDA0083 and CEMR-3657

Commodities: milk, liver (bovine, poultry), meat/muscle (bovine, poultry), eggs, skin/fat (bovine, poultry)

Analytes: penthiopyrad, PAM, 753-A-OH

LOQ: 0.01 mg/kg

Determination: LC-MS/MS

Description: The analytical methods LDA0082, LDA0083 and CEMR-3657 involve the extraction of samples with acetone/water (80:20, v/v). After centrifugation and removal of the organic solvent the aqueous layer was acidified with concentrated hydrochloric acid in order to hydrolyse the conjugates, and then partitioned twice with ethyl acetate. For the analytical method CEMR-3574 the milk samples were extracted with acetone. Then, after centrifugation and removal of the organic solvent, the aqueous layer was acidified with formic acid and partitioned with ethyl acetate. In all methods the combined ethyl acetate phase was evaporated and the extract re-dissolved in methanol/deionised water (50:50, v/v) for LC-MS/MS analysis. For the CEMR-3657, quantitation was performed by the external standardisation with matrix-matched bracketing standards, and for CEMR-3574 quantitation was performed by the external standardisation with bracketing standards.

Table 61 Recoveries of penthiopyrad and its metabolites in samples of animal origin (LDA0082, LDA0083 and CEMR-3657)

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Poultry liver Penthiopyrad PAM PCA 753-A-OH	0.01	5	77	3.0	4	Airs, D 2008 (PTHIO_062)
	1.0	5	81	6.9	9	
	0.01	5	81	11	14	
	1.0	5	79	7.4	9	
	0.01	5	86	10	12	
	1.0	5	89	4.7	5	
	0.01	5	74	5.3	7	
	1.0	5	83	7.3	9	
Poultry muscle Penthiopyrad PAM PCA 753-A-OH	0.01	5	84	9.1	11	Airs, D 2008 (PTHIO_062)
	1.0	5	92	8.2	9	
	0.01	5	96	7.1	8	
	1.0	5	89	10	12	
	0.01	5	88	6.8	8	
	1.0	5	93	7.4	8	
	0.01	5	97	9.1	9	
	1.0	5	89	5.5	6	
Poultry skin/fat Penthiopyrad PAM PCA	0.01	5	90	8.6	10	Airs, D 2008 (PTHIO_062)
	1.0	5	101	8.0	8	
	0.01	5	101	6.5	7	
	1.0	5	96	5.3	6	
	0.01	5	97	9.4	10	
	1.0	5	95	0.8	1	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
753-A-OH	0.01 1.0	5 5	106 96	2.9 7.0	3 7	
Poultry abdominal fat Penthiopyrad	0.01 1.0	5 5	92 93	8.0 4.3	9 5	Airs, D 2008 (PTHIO_062)
PAM	0.01 1.0	5 5	81 94	9.8 7.8	12 8	
PCA	0.01 1.0	5 5	84 95	8.8 10	11 11	
753-A-OH	0.01 1.0	5 5	93 99	9.0 3.8	10 4	
Eggs Penthiopyrad	0.01 1.0	5 5	101 96	4.0 6.3	4 7	Airs, D 2008 (PTHIO_062)
PAM	0.01 1.0	5 5	94 100	11 5.5	11 6	
PCA	0.01 1.0	5 5	102 89	7.4 11	7 13	
753-A-OH	0.01 1.0	5 5	103 104	5.2 4.5	5 4	
Bovine liver Penthiopyrad	0.01 1.0	5 5	98 93	8.5 9.0	9 10	Airs, D 2008 (PTHIO_063)
PAM	0.01 1.0	5 5	98 93	11 6.9	12 7	
PCA	0.01 1.0	5 5	103 98	5.5 5.3	5 5	
753-A-OH	0.01 1.0	5 5	99 96	5.8 11	6 12	
Bovine muscle Penthiopyrad	0.01 1.0	5 5	93 85	7.3 7.7	7.8 9.1	Airs, D 2008 (PTHIO_063)
PAM	0.01 1.0	5 5	104 87	7.3 4.1	7.1 4.7	
PCA	0.01 1.0	5 5	101 98	9.3 7.8	9.1 8.0	
753-A-OH	0.01 1.0	5 5	89 90	8.8 9.3	9.9 10	
Bovine kidney Penthiopyrad	0.01 1.0	5 5	92 84	2.3 5.7	3 7	Airs, D 2008 (PTHIO_063)
PAM	0.01 1.0	5 5	81 99	12 9.1	15 9	
PCA	0.01 1.0	5 5	102 93	6.1 4.3	6 5	
753-A-OH	0.01 1.0	5 5	86 90	9.4 4.0	11 5	
Bovine fat Penthiopyrad	0.01 1.0	5 5	96 91	10 13	11 15	Airs, D 2008 (PTHIO_063)
PAM	0.01 1.0	5 5	91 89	16 13	17 15	
PCA	0.01 1.0	5 5	101 92	7.4 7.6	7 8	
753-A-OH	0.01 1.0	5 5	95 85	10 10	11 12	
Milk Penthiopyrad	0.01	5	93	7.4	8	Airs, D 2008

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
PAM PCA 753-A-OH	1.0	5	101	5.8	6	(PTHIO_063)
	0.01	5	87	12	14	
	1.0	5	99	7.2	7	
	0.01	5	90	14	16	
	1.0	5	99	6.1	6	
	0.01	5	88	5.1	6	
	1.0	5	101	7.1	7	
Milk Penthiopyrad PAM PCA 753-A-OH	0.01	5	97	6.2	6	Oliver-Kang, J, 2008 (PTHIO_064)
	0.025	5	93	5.0	5	
	0.1	5	92	2.5	3	
	0.25	5	89	5.7	6	
	0.01	5	91	5.8	6	
	0.025	5	86	5.1	6	
	0.1	5	89	2.3	3	
	0.25	5	87	2.3	3	
	0.01	5	89	9.6	11	
	0.025	5	88	5.8	7	
	0.1	5	87	1.7	2	
	0.25	5	91	1.9	2	
	0.01	5	96	4.1	4	
	0.025	5	99	6.5	7	
	0.1	5	92	1.8	2	
	0.25	5	88	2.6	3	
Bovine muscle Penthiopyrad PAM PCA 753-A-OH	0.01	7	96	13	14	Oliver-Kang, J, 2008 (PTHIO_065)
	0.1	5	88	7.4	8	
	0.01	7	73	3.4	5	
	0.1	5	72	1.7	2	
	0.01	7	92	2.9	3	
	0.1	5	81	2.5	3	
	0.01	7	101	8.0	8	
	0.1	5	87	7.4	9	
Bovine kidney Penthiopyrad PAM PCA 753-A-OH	0.01	7	105	6.6	6	Oliver-Kang, J, 2008 (PTHIO_065)
	0.1	5	103	3.3	3	
	0.01	7	96	5.4	6	
	0.1	5	96	3.9	4	
	0.01	7	95	7.3	8	
	0.1	5	98	3.7	4	
	0.01	7	110	5.4	5	
	0.1	5	104	5.7	6	
Bovine liver Penthiopyrad PAM PCA 753-A-OH	0.01	7	99	8.1	8	Oliver-Kang, J, 2008 (PTHIO_065)
	0.03	5	102	12	11	
	0.1	5	94	7.8	8	
	0.5	5	89	4.1	5	
	0.01	7	85	4.3	5	
	0.03	5	94	2.0	2	
	0.1	5	79	3.0	4	
	0.5	5	88	3.0	3	
	0.01	7	96	4.0	4	
	0.03	5	96	2.9	3	
	0.1	5	92	2.7	3	
	0.5	5	91	2.3	3	
	0.01	7	99	6.0	6	
	0.03	5	96	3.7	4	
	0.1	5	93	4.9	5	
	0.5	5	76	1.9	3	

Matrix/Analyte	Fortification levels (mg/kg)	No.	Mean recovery (%)	Standard deviation (%)	Relative standard deviation (%)	Reference (Author, Year)
Bovine fat	Penthiopyrad	0.01	7	82	8.4	Oliver-Kang, J, 2008 (PTHIO_065)
		0.1	5	84	8.6	
	PAM	0.01	7	93	12	
		0.1	5	100	4.1	
	PCA	0.01	7	102	10	
		0.1	5	90	7.7	
	753-A-OH	0.01	7	98	3.8	
		0.1	5	93	11	
Milk	Penthiopyrad	0.01	5	94	6.5	Class, T 2009 (PTHIO_066)
		1.0	5	88	5.3	
	PAM	0.01	5	93	3.7	Independent laboratory validation
		1.0	5	82	4.9	
	753-A-OH	0.01	5	95	10	
		1.0	5	82	6.5	
Eggs	Penthiopyrad	0.01	5	92	8.3	Class, T 2009 (PTHIO_066)
		1.0	5	103	10	
	PAM	0.01	5	89	8.0	Independent laboratory validation
		1.0	5	93	6.5	
	753-A-OH	0.01	5	93	4.6	
		1.0	5	86	9.5	
Bovine liver	Penthiopyrad	0.01	5	93	1.8	Class, T 2009 (PTHIO_066)
		1.0	5	103	5.1	
	PAM	0.01	5	83	2.5	Independent laboratory validation
		1.0	5	92	3.7	
	753-A-OH	0.01	5	93	1.9	
		1.0	5	99	8.9	

Stability of pesticides in stored analytical samples

The storage stability of penthiopyrad and its metabolites PAM, PCA, 753-A-OH, 753-F-DO and DM-PCA has been investigated in various matrices for a storage period of up to 18 months. Beyond the expected variation in view of the number of samples no significant degradation was observed in plant matrices.

For animal matrices the storage stability was investigated only for milk for a period of more than one month. Within 6 months no degradation was observed in milk. Bovine and poultry tissues and eggs showed no degradation of residues within one month, an interval that covers the storage durations reported in animal metabolism and livestock feeding studies.

Reference: Cairns, SD, 2009 and 2001 (PTHIO_037 and PTHIO_038)

Commodities: grapes (fruits, juice, raisins and dry pomace), wheat (grain, straw and forage), rape (seed and oil), lettuce, apples, potatoes and dry beans

Analytes: penthiopyrad, PAM, 753-A-OH, 753-F-DO, PCA, DM-PCA

Material and Method: Test samples were stored over a period up to 12 months during which they were kept in a frozen condition (approximately -20 °C) pending analysis. All samples were homogenised and fortified with a concentration equal to 0.2 mg/kg for each analyte per container. After the listed intervals the samples were analysed and compared to freshly fortified samples.

Reference: Rodgers, M, 2009 (PTHIO_039)

Commodities: poultry liver, muscle, skin/fat, fat and eggs

Analytes: penthiopyrad, PAM, 753-A-OH, PCA

Material and Method: Test samples were stored over a period up to 1 month during which they were kept in a frozen condition (approximately -20 °C) pending analysis. All samples were homogenised and fortified with a concentration equal to either 0.01 mg/kg or 0.1 mg/kg for each analyte. Remaining residues between the first and second analysis were compared for storage stability.

Reference: Rawle, NW, 2008 (PTHIO_040)

Commodities: bovine milk

Analytes: penthiopyrad, PAM, 753-A-OH, PCA

Material and Method: Milk samples collected during the dosing period were stored over a period up to 6 months during which they were kept in a frozen condition (approximately -20 °C) pending analysis. After the listed intervals the samples were analysed and compared for storage stability.

Table 62 Freezer storage stability of penthiopyrad, PAM, 753-A-OH, 753-F-DO, PCA and DM-PCA residues in plant and animal commodities

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
Lettuce	penthiopyrad	0 1 3 6 12 18	73, 93 96, 87 91, 93 86, 79 93, 79 87, 84	Not applicable 92 92 83 95 86	88, 74 82, 73 86, 71 74, 80 72, 76	83 81 77 79 77 74	Cairns, SD, 2009 and 2001
	PAM	0 1 3 6 12 18	Not applicable Not applicable 99, 100 100, 98 73, 71 90, 103 82, 77	Not applicable 99 99 72 97 80	92, 96 87, 89 84, 86 67, 66 87, 82 76, 67	94 88 85 67 85 72	(PTHIO_037 and PTHIO_038)
	753-A-OH	0 1 3 6 12 18	Not applicable Not applicable 110, 113 105, 108 93, 113 108, 113 72, 69	Not applicable 112 106 103 111 71	107, 113 96, 103 90, 87 94, 82 84, 84 67, 61	110 100 89 88 84 64	
	753-F-DO	0 1 3 6 12 18	Not applicable Not applicable 103, 99 100, 100 95, 97 96, 109 90, 89	Not applicable 101 100 96 103 90	97, 94 96, 94 99, 100 99, 102 91, 91 80, 82	96 95 99 100 91 81	
	PCA	0 1 3 6 12 18	Not applicable Not applicable 110, 104 100, 103 102, 102 117, 104 93, 82	Not applicable 107 101 102 111 87	102, 98 100, 97 101, 92 98, 93 83, 87 86, 76	100 98 97 96 85 81	
	DM-PCA	0	Not	Not applicable	72, 95	83	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
		1 3 6 12 18	applicable 103, 97 106, 105 78, 98 99, 103 78, 80	100 106 88 101 79	76, 71 98, 97 89, 92 90, 95 78, 75	74 97 90 92 77	
Apple	penthiopyrad	0 1 week 1 3 6 12 18	Not applicable applicable 78, 87 85, 87 98, 67 102, 92 72, 72 75, 83	Not applicable 82 86 83 97 72 79	48, 48 84, 53 74, 81 73, 65 90, 96 71, 73 85, 83	48 69 78 69 93 72 84	
	PAM	0 1 week 1 3 6 12 18	Not applicable applicable 90, 92 89, 88 99, 95 97, 96 103, 100 77, 72	Not applicable 91 89 97 96 102 75	86, 83 97, 92 93, 89 103, 104 93, 97 85, 89 74, 70	85 94 91 104 95 87 72	
	753-A-OH	0 1 week 1 3 6 12 18	Not applicable applicable 104, 104 106, 107 115, 121 108, 101 94, 96 85, 76	Not applicable 104 107 118 105 95 81	106, 105 112, 111 108, 108 117, 102 101, 104 76, 83 71, 70	106 112 108 110 103 80 70	
	753-F-DO	0 1 week 1 3 6 12 18	Not applicable applicable 93, 92 95, 95 105, 101 104, 101 94, 98 83, 88	Not applicable 93 95 103 103 96 91	89, 89 95, 90 94, 93 109, 98 109, 112 82, 90 86, 90	89 93 94 104 111 86 88	
	PCA	0 1 week 1 3 6 12 18	Not applicable applicable 93, 92 97, 96 109, 100 94, 98 96, 89 102, 92	Not applicable 92 97 105 96 93 97	91, 93 93, 95 100, 99 113, 117 86, 99 88, 94 88, 96	92 94 99 115 93 91 92	
	DM-PCA	0 1 week 1 3 6 12 18	Not applicable applicable 89, 91 101, 98 105, 87 110, 98 96, 88 75, 67	Not applicable 91 99 96 104 92 71	101, 107 89, 91 106, 101 98, 94 109, 111 97, 93 71, 73	104 90 104 96 110 95 72	
Potato	penthiopyrad	0 1 3	Not applicable applicable 54, 69	Not applicable 62 100	86, 85 79, 90 95, 79	86 84 87	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
		6 12 18	98, 101 96, 101 96, 101 100, 95	98.5 84.7 97.5	96, 98 79, 70 100, 115	97 75 108	
	PAM	0 1 3 6 12 18	Not applicable 88 84, 92 83, 97 97, 100 103, 110 91, 88	Not applicable 88 90 98 107 90	88, 88 93, 94 73, 92 96, 95 93, 83 88, 90	88 93 82 96 88 89	
	753-A-OH	0 1 3 6 12 18	Not applicable 103 98, 108 112, 115 103, 98 99, 98 98, 100	Not applicable 103 114 101 97 99	97, 93 98, 104 97, 95 97, 103 79, 81 101, 113	95 101 96 100 80 107	
	753-F-DO	0 1 3 6 12 18	Not applicable 93 92, 95 96, 101 102, 102 83, 91 86, 87	Not applicable 93 99 102 87 86	93, 89 92, 97 99, 97 109, 119 79, 80 82, 88	91 95 98 114 80 85	
	PCA	0 1 3 6 12 18	Not applicable 96 93, 98 99, 92 97, 102 102, 100 107, 97	Not applicable 96 96 100 101 102	86, 81 94, 97 102, 86 95, 103 83, 83 107, 123	83 95 94 99 83 115	
	DM-PCA	0 1 3 6 12 18	Not applicable 90 91, 88 110, 97 86, 87 101, 99 73, 68	Not applicable 90 104 86 100 71	94, 83 93, 99 111, 90 103, 102 84, 87 87, 93	88 96 101 103 100, 86 71, 90	
Grapes	penthiopyrad	0 1 3 6 12 18	Not applicable 93 96, 90 97, 97 81, 99 93, 111 71, 72	Not applicable 93 97 90 102 71	93, 91 98, 97 98, 105 75, 72 85, 83 73, 75	92 97 102 73 84 74	
	PAM	0 1 3 6 12 18	Not applicable 90 92, 89 87, 89 96, 92 100, 119 88, 83	Not applicable 90 88 94 109 86	105, 114 99, 109 101, 99 73, 84 85, 91 78, 79	110 104 100 78 88 78	
	753-A-OH	0 1 3	Not applicable 110 117, 103	Not applicable 110 101	100, 98 101, 112 104, 105	99 107 105	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
		6 12 18	101, 101 99, 102 91, 102 79, 77	101 97 78	88, 88 87, 85 72, 70	88 86 71	
	753-F-DO	0 1 3 6 12 18	Not performed	Not performed	Not performed	Not performed	
	PCA	0 1 3 6 12 18	Not applicable 115, 93 92, 91 109, 114 108, 114 80, 77	Not applicable 104 91 112 111 79	91, 88 98, 124 104, 93 89, 93 89, 94 88, 78	89 111 98 91 92 83	
	DM-PCA	0 1 3 6 12 18	Not applicable 106, 94 95, 87 88, 97 98, 106 75, 73	Not applicable 100 91 93 89 74	104, 97 94, 125 90, 99 92, 90 88, 90 76, 82	101 110 95 91 102 80	
Dry beans	penthiopyrad	0 1 3 6 12 18	Not applicable 78, 81 81, 96 91, 102 94, 98 100, 87	Not applicable 80 89 96 96 94	87, 82 80, 79 89, 83 90, 74 93, 99 100, 103	85 79 86 82 96 102	
	PAM	0 1 3 6 12 18	Not applicable 90, 92 85, 96 86, 93 82, 88 87, 82	Not applicable 91 91 89 85 85	85, 89 100, 96 89, 81 70, 62 80, 87 81, 101	87 98 85 66 84 91	
	753-A-OH	0 1 3 6 12 18	Not applicable 103, 108 80, 89 101, 109 95, 102 90, 82	Not applicable 106 85 105 98 93	88, 83 101, 100 80, 74 102, 82 101, 99 97, 93	86 101 77 92 100 95	
	753-F-DO	0 1 3 6 12 18	Not applicable 88, 91 86, 96 77, 91 93, 97 103, 100	Not applicable 100 91 84 95 101	82, 80 88, 92 91, 86 82, 65 81, 98 99, 100	81 90 89 74 90 100	
	PCA	0 1 3 6	Not applicable 79, 88 74, 86	Not applicable 84 80 83	86, 81 86, 82 72, 70 79, 61	83 84 71 70	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
		12 18	72, 93 86, 94 97, 76	90 87	86, 90 87, 90	88 89	
	DM-PCA	0 1 3 6 12 18	Not applicable 77, 81 83, 88 76, 90 84, 88 83, 69	Not applicable 79 85 83 86 76	92, 85 85, 83 81, 75 79, 61 90, 89 82, 87	88.6 84.2 78.0 70.4 89.6 84.3	
Grape pomace dry	penthiopyrad	0 1 week 1 3 6 12 18	Not applicable 91, 102 86, 90 105, 113 102, 101 95, 99 105, 78	Not applicable 97 88 109 102 97 91	37, 96 101, 96 90, 80 106, 110 95, 93 98, 122 85, 110	66 98 85 108 94 110 97	
	PAM	0 1 week 1 3 6 12 18	Not applicable 75, 89 81, 80 101, 99 108, 109 88, 94 90, 73	Not applicable 82 80 100 109 91 82	71, 93 82, 80 79, 77 104, 105 87, 99 87, 79 83, 84	82 81 78 105 93 83 83	
	753-A-OH	0 1 week 1 3 6 12 18	Not applicable 99, 104 81, 90 82, 81 112, 112 76, 86 107, 78	Not applicable 102 85 82 112 81 93	85, 102 103, 104 88, 82 84, 89 100, 97 82, 78 85, 108	93 104 85 86 98 80 96	
	753-F-DO	0 1 week 1 3 6 12 18	Not applicable 89, 94 102, 110 132, 130 130, 125 122, 118 94, 80	Not applicable 92 106 131 128 120 87	101, 113 97, 93 100, 99 109, 108 100, 100 101, 100 83, 89	107 95 100 109 100 101 86	
	PCA	0 1 week 1 3 6 12 18	Not applicable 72, 77 72, 73 73, 76 90, 80 79, 89 70, 65	Not applicable 75 73 75 85 84 68	84, 84 75, 76 70, 66 73, 64 75, 73 71, 77 63, 68	84 75 68 69 74 74 65	
	DM-PCA	0 1 week 1 3 6 12 18	Not applicable 86, 84 91, 101 113, 106 129, 131 109, 117	Not applicable 85 96 110 130 113 98	89.3, 89.5 85, 81 97, 91 103, 103 97, 107 106, 95 79, 94	89.4 83 94 103 102 101 87	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
			105, 92				
Grape juice	penthiopyrad	0	Not applicable	Not applicable	92, 103	98	
		1	Not applicable	96	101, 87	94	
		3	90, 101	104	101, 105	103	
		6	108, 100	73	72, 74	73	
		12	72, 75	75	72, 79	75	
		18	84, 67	84	79, 80	78	
			86, 82				
	PAM	0	Not applicable	Not applicable	77, 88	83	
		1	Not applicable	87	92, 80	86	
		3	86, 89	93	104, 101	103	
		6	96, 91	83	81, 85	83	
		12	79, 86	81	81, 84	82	
		18	80, 83	80	85, 90	87	
			77, 83				
	753-A-OH	0	Not applicable	Not applicable	87, 98	93	
		1	Not applicable	93	92, 86	89	
		3	91, 94	96	103, 106	105	
		6	102, 90	90	97, 99	98	
		12	88, 91	76	80, 81	80	
		18	75, 77	79	85, 86	86	
			79, 79				
	753-F-DO	0	Not applicable	Not applicable	86, 96	91	
		1	Not applicable	87	95, 82	88	
		3	85, 89	99	122, 124	123	
		6	105, 93	92	94, 99	97	
		12	91, 93	81	89, 89	89	
		18	83, 79	92	103, 100	102	
			92, 92				
	PCA	0	Not applicable	Not applicable	80, 88	84	
		1	Not applicable	94	99, 90	94	
		3	88, 99	98	111, 104	108	
		6	96, 100	91	89, 95	92	
		12	92, 91	90	83, 90	87	
		18	90, 91	77	79, 77	78	
			77				
	DM-PCA	0	Not applicable	Not applicable	86, 93	90	
		1	Not applicable	101	94, 86	90	
		3	99, 104	110	134, 123	129	
		6	114, 106	98	96, 101	99	
		12	99, 98	91	83, 81	82	
		18	92, 91	95	90, 94	92	
			92, 99				
Raisins	penthiopyrad	0	Not applicable	Not applicable	81, 79	80	
		1	Not applicable	78	78, 72	75	
		3	78, 78	75	92, 97	94	
		6	74, 76	70	66, 70	68	
		12	77, 63	67	70, 58	64	
		18	68, 66	71	85, 84	84	
			65, 77				
	PAM	0	Not applicable	Not applicable	80, 76	78	
		1	Not applicable	82	83, 80	81	
		3	79, 85	72	96, 97	96.	
		6	77, 67	73	80, 74	77	
		12	73, 74	77	80, 78	79	
		18	77, 77	70	87, 85	86	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
			63, 76				
	753-A-OH	0 1 3 6 12 18	Not applicable 73, 78 74, 76 69, 65 78, 72 65, 79	Not applicable 76 75 67 75 72	83, 85 83, 91 97, 101 74, 71 81, 78 81, 89	84 87 99 72 79 85	
	753-F-DO	0 1 3 6 12 18	Not applicable 73, 74 81, 81 79, 77 76, 75 60, 74	Not applicable 73 81 78 75 67	82, 79 87, 85 129, 127 82, 85 80, 78 88, 87	81 86 128 84 79 88	
	PCA	0 1 3 6 12 18	Not applicable 84, 91 82, 80 78, 74 83, 75 57, 71	Not applicable 87 81 76 79 64	87, 78 75, 77 96, 105 84, 79 80, 75 89, 86	82 76 101 81 77 87	
	DM-PCA	0 1 3 6 12 18	Not applicable 85, 92 90, 91 91, 89 83, 82 62, 73	Not applicable 89 91 90 83 67	87, 79 80, 85 114, 117 86, 83 88, 80 88, 87	83 83 116 85 84 87	
Wheat grain	penthiopyrad	0 1 3 6 12 18	Not applicable 116, 100 70, 65 73, 71 101, 114 110, 112	Not applicable 108 67 72 108 111	100, 91 104, 107 82, 74 67, 67 91, 96 101, 104	96 106 78 67 94 103	
	PAM	0 1 3 6 12 18	Not applicable 95, 89 101, 90 98, 108 85, 96 102, 96	Not applicable 92 95 103 90 99	92, 88 101, 96 92, 94 97, 107 74, 76 89, 95	90 99 93 102 75 92	
	753-A-OH	0 1 3 6 12 18	Not applicable 98, 95 88, 78 82, 79 110, 116 121, 105	Not applicable 97 83 80 113 113	91, 88 107, 98 82, 85 70, 69 89, 97 101, 103	89 102 84 70 93 102	
	753-F-DO	0 1 3 6 12 18	Not applicable 102, 101 91, 84 109, 106 111, 115	Not applicable 102 87 108 113 923	106, 103 110, 101 76, 77 81, 85 80, 86 84, 85	105 106 77 83 83 84	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
			95, 91				
	PCA	0 1 3 6 12 18	Not applicable Not applicable 94, 93 90, 74 89, 88 87, 105 82, 83	Not applicable 93 82 88 96 82	94, 88 106, 92 83, 76 79, 77 72, 74 70, 68	91 99 80 78 73 69	
	DM-PCA	0 1 3 6 12 18	Not applicable Not applicable 107, 101 98, 85 100, 94 91, 106 95, 91	Not applicable 104 91 97 99 93	106, 103 107, 102 83, 87 79, 77 73, 71 74, 75	105 105 85 78 72 75	
Wheat straw	penthiopyrad	0 1 4 6 12 18	Not applicable Not applicable 92, 87 84, 101 74, 95 112, 112 71, 74	Not applicable 89 93 85 112 73	78, 88 83, 84 76, 81 67, 67 91, 96 101, 104	83 84 78 67 94 103	
	PAM	0 1 4 6 12 18	Not applicable Not applicable 89, 95 93, 105 98, 90 113, 112 81, 82	Not applicable 92 99 94 113 81	89, 93 92, 84 83, 93 69, 69.6 76, 89 69, 73	91 88 88 69 83 71	
	753-A-OH	0 1 4 6 12 18	Not applicable Not applicable 96, 97 88, 91 83, 77 162, 164 126, 137	Not applicable 97 89 80 163 132	90, 96 76, 77 84, 84 70, 69 89, 97 101, 103	93 77 84 70 93 102	
	753-F-DO	0 1 4 6 12 18	Not applicable Not applicable 105, 99 105, 118 103, 100 132, 121 97, 99	Not applicable 102 112 101 127 98	84, 94 95, 92 83, 90 68, 75 72, 80 65, 67	89 93 87 71 76 76	
	PCA	0 1 4 6 12 18	Not applicable Not applicable 94, 95 99, 77 90, 89 96, 98 106, 113	Not applicable 95 88 89 97 110	90, 95 90, 87 72, 78 56, 63 69, 80 77, 94	93 88 75 59 74 85	
	DM-PCA	0 1 4 6 12 18	Not applicable Not applicable 108, 108 104, 115 98, 95 104, 100	Not applicable 108 110 96 102 96	89, 98 102, 100 88, 94 59, 60 65, 78 69, 78	93 101 91 60 72 73	

Penthiopyrad

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
			97, 96				
Wheat forage	penthiopyrad	0	Not applicable	Not applicable	81, 74	78	
		1		72	72, 79	76	
		3	74, 71	78	84, 78	81	
		6	78, 78	81	84, 84	84	
		12	85, 78	80	94, 72	83	
		18	76, 83 84, 86	85	78, 82	80	
	PAM	0	Not applicable	Not applicable	89, 87	88	
		1		78	88, 93	91	
		3	75, 81	90	87, 89	88	
		6	91, 89	105	97, 105	101	
		12	103, 107	80	84, 87	86	
		18	71, 89 80, 92	91	74, 83	79	
	753-A-OH	0	Not applicable	Not applicable	96, 92	94	
		1		78	81, 83	82	
		3	81, 76	83	93, 88	91	
		6	85, 82	88	80, 87	84	
		12	89, 87	83	99, 85	92	
		18	80, 87 98, 95	97	86, 88	87	
	753-F-DO	0	Not applicable	Not applicable	108, 102	105	
		1		89	88, 105	97	
		3	91, 87	95	95, 95	95	
		6	95, 95	97	86, 89	87	
		12	99, 95	95	98, 83	91	
		18	91, 99 84, 87	86	82, 88	85	
	PCA	0	Not applicable	Not applicable	101, 96	98	
		1		82	86, 95.0	90	
		3	84, 79	92	92, 88	90	
		6	91, 92	98	92, 90	91	
		12	101, 94	97	103, 94	98	
		18	95, 100 108, 109	109	88, 93	90	
	DM-PCA	0	Not applicable	Not applicable	109, 108	109	
		1		91	95, 103	98.9	
		3	91, 91	94	90, 85	87.9	
		6	97, 91	104	93, 87	90.2	
		12	105, 102	102	90, 87	88.3	
		18	102, 102 114, 124	119	98, 97	97.7	
Rapeseed oil	penthiopyrad	0	Not applicable	Not applicable	99, 98	99	
		1		90	79, 73	76	
		3	86, 93	97	9, 97	94	
		6	98, 96	92	101, 98	100	
		12	93, 91	87	77, 89	83	
		18	87, 87 89, 94	91	86, 91	88	
	PAM	0	Not applicable	Not applicable	99, 102	101	
		1		92	80, 77	79	
		3	90, 93	98	89, 94	91	
		6	102, 94	85	83, 82	83	
		12	83, 87	85	85, 87	86	
		18	82, 88	102	87, 95	91	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
			102, 102				
	753-A-OH	0 1 3 6 12 18	Not applicable Not applicable 90, 90 105, 102 107, 98 84, 82 100, 99	Not applicable 90 104 102 83 99	95, 97 81, 78 89, 100 101, 99 75, 86 96, 107	96 80 94 100 80 102	
	753-F-DO	0 1 3 6 12 18	Not applicable Not applicable 84, 87 84, 86 84, 81 76, 81 92, 79	Not applicable 86 85 82 79 85	98, 101 80, 78 83, 87 99, 92 77, 83 82, 82	99 79 85 95 80 82	
	PCA	0 1 3 6 12 18	Not applicable Not applicable 91, 100 93, 78 80, 81 89, 82 89, 98	Not applicable 96 86 80 85 93	97, 96 84, 79 84, 88 76, 78 72, 86 76, 85	97 82 86 77 79 81	
	DM-PCA	0 1 3 6 12 18	Not applicable Not applicable 91, 90 88, 82 87, 78 85, 82 96, 88	Not applicable 91 85 83 83 92	100, 103 86, 80 77, 85 99, 95 67, 78 81, 80	102 83 81 97 73 80	
Oilseed rape seeds	penthiopyrad	0 1 3 6 12 18	Not applicable Not applicable 109, 95 91, 93 84, 77 99, 101 104, 114	Not applicable 102 92 81 100 109	99, 99 106, 102 91, 96 87, 91 99, 103 101, 103	99 104 94 89 101 102	
	PAM	0 1 3 6 12 18	Not applicable Not applicable 93, 90 90, 89 86, 82 85, 86 82, 86	Not applicable 91 90 84 85 84	88, 86 81, 83 92, 101 85, 87 107, 92 80, 77	87 82 96 86 99 79	
	753-A-OH	0 1 3 6 12 18	Not applicable Not applicable 100, 105 94, 93 105, 98 99, 96 113, 111	Not applicable 102 94 101 97 112	95, 106 105, 103 85, 94 97, 101 87, 104 101, 98	101 104 90 99 95 99	
	753-F-DO	0 1 3 6 12 18	Not applicable Not applicable 86, 92 86, 86 84, 80 100, 71	Not applicable 89 86 82 85 89	98, 97 92, 91 86, 98 92, 97 104, 118 92, 92	97 92 92 94 111 92	

Penthiopyrad

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
			88, 91				
	PCA	0 1 3 6 12 18	Not applicable Not applicable 100, 94 85, 88 89, 87 75, 67 98, 96	Not applicable 97 86 88 71 97	99, 99 103, 102 85, 93 97, 91 82, 75 95, 98	99 103 89 94 78 97	
	DM-PCA	0 1 3 6 12 18	Not applicable Not applicable 84, 91 97, 98 92, 86 84, 81 84, 91	Not applicable 87 97 89 82 88	99, 94 89, 86 97, 105 95, 95 82, 90 92, 113	97 88 101 95 86 103	
Poultry liver,	penthiopyrad	0 1	104 94	Not applicable	Not performed	Not performed	Rodgers, M, 2009
0.01 mg/kg fortification	753-A-OH	0 1	85 110	Not applicable	Not performed	Not performed	(PTHIO_039)
	PAM	0 1	104 94	Not applicable	Not performed	Not performed	
	PCA	0 1	85 110	Not applicable	Not performed	Not performed	
Poultry liver,	penthiopyrad	0 1	96 108	Not applicable	Not performed	Not performed	
0.1 mg/kg fortification	753-A-OH	0 1	74 106	Not applicable	Not performed	Not performed	
	PAM	0 1	96 108	Not applicable	Not performed	Not performed	
	PCA	0 1	74 106	Not applicable	Not performed	Not performed	
Poultry muscle,	penthiopyrad	0 1	96 108	Not applicable	Not performed	Not performed	
0.01 mg/kg fortification	753-A-OH	0 1	72 94	Not applicable	Not performed	Not performed	
	PAM	0 1	96 108	Not applicable	Not performed	Not performed	
	PCA	0 1	72 94	Not applicable	Not performed	Not performed	
Poultry muscle,	penthiopyrad	0 1	90 102	Not applicable	Not performed	Not performed	
0.1 mg/kg fortification	753-A-OH	0 1	70 91	Not applicable	Not performed	Not performed	
	PAM	0 1	90 102	Not applicable	Not performed	Not performed	
	PCA	0 1	70 91	Not applicable	Not performed	Not performed	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
Poultry skin/fat,	penthiopyrad	0 1	87 105	Not applicable	Not performed	Not performed	
0.01 mg/kg fortification	753-A-OH	0 1	84 107	Not applicable	Not performed	Not performed	
	PAM	0 1	87 105	Not applicable	Not performed	Not performed	
	PCA	0 1	84 107	Not applicable	Not performed	Not performed	
Poultry skin/fat,	penthiopyrad	0 1	95 108	Not applicable	Not performed	Not performed	
0.1 mg/kg fortification	753-A-OH	0 1	81 98	Not applicable	Not performed	Not performed	
	PAM	0 1	95 108	Not applicable	Not performed	Not performed	
	PCA	0 1	81 98	Not applicable	Not performed	Not performed	
Poultry fat,	penthiopyrad	0 1	82 110	Not applicable	Not performed	Not performed	
0.01 mg/kg fortification	753-A-OH	0 1	105 109	Not applicable	Not performed	Not performed	
	PAM	0 1	82 110	Not applicable	Not performed	Not performed	
	PCA	0 1	105 109	Not applicable	Not performed	Not performed	
Poultry fat,	penthiopyrad	0 1	92 110	Not applicable	Not performed	Not performed	
0.1 mg/kg fortification	753-A-OH	0 1	110 106	Not applicable	Not performed	Not performed	
	PAM	0 1	92 110	Not applicable	Not performed	Not performed	
	PCA	0 1	110 106	Not applicable	Not performed	Not performed	
Eggs,	penthiopyrad	0 1	90 102	Not applicable	Not performed	Not performed	
0.01 mg/kg fortification	753-A-OH	0 1	97 103	Not applicable	Not performed	Not performed	
	PAM	0 1	90 102	Not applicable	Not performed	Not performed	
	PCA	0 1	97 103	Not applicable	Not performed	Not performed	
Eggs,	penthiopyrad	0 1	104 95	Not applicable	Not performed	Not performed	
0.1 mg/kg fortification	753-A-OH	0 1	81 110	Not applicable	Not performed	Not performed	
	PAM	0 1	104 95	Not applicable	Not performed	Not performed	

Matrix	Analyte	Storage interval (months)	Residues remained in stored samples fortified at 0.2 mg/kg as % nominal level		Mean procedural recovery of samples fresh fortified at 0.2 mg/kg in %		Reference (Author, Year)
			measured	mean	measured	mean	
	PCA	0 1	81 110	Not applicable	Not performed	Not performed	
Bovine milk,	penthiopyrad	0 1 2 6	70, 66 74, 78 84, 79 93, 84	68 76 82 89	70, 75 79, 81 82, 84 92, 93	73 80 83 93	Rawle, NW 2008 (PTHIO_040)
	753-A-OH	0 1 2 6	83, 84 80, 81 84, 80 90, 85	84 81 82 88	90, 102 82, 80 87, 93 85, 92	96 81 90 89	
	PAM	0 1 2 6	72, 72 75, 75 90, 88 93, 84	72 75 89 88.5	76, 75 79, 80 71, 77 89, 88	76 80 74 89	
	PCA	0 1 2 6	88, 86 90, 88 93, 93 89, 88	87 89 93 88.5	95, 95 88, 89 88, 98 88, 91	95 89 93 90	

USE PATTERN

Penthiopyrad is a non-systemic protectant fungicide. The Meeting received numerous uses involving foliar spray applications mainly before harvest.

Table 63 List of registered uses

Crop	Country	Application detail					
		Form	Type	kg ai/ha	L/ha	No.	Pre harvest interval (PHI) in days
Alfalfa	USA	EC	foliar spray (F)	0.36	min. 140	2 (max. 0.72 kg ai/ha and year)	14
Alfalfa	Canada	SC	foliar spray (F)	0.35	min. 110	2 (max. 0.7 kg ai/ha and year)	14
Almonds	USA	SC	foliar spray (F)	0.26	min. 140	3 (max. 0.78 kg ai/ha and year)	150
Barley	USA	EC	foliar spray (F)	0.36 (up to BBCH 59)	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Barley	Canada	EC	foliar spray (F)	0.35 (up to BBCH 59)	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Beans	Canada	SC	foliar spray (F)	0.45	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Beans (legume vegetables)	USA	SC	foliar spray (F)	0.39	min. 140	3 (max. 0.94 kg ai/ha and year)	7
Berries (strawberry, blueberry)	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	0
Blueberry	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	42
Blueberry	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Brassica, head and stem (cabbage, broccoli, cauliflower)	USA	SC	foliar spray (F)	0.39	min. 140	3 (max. 0.94 kg ai/ha and year)	7
Brassica, leafy vegetables (cabbage, broccoli, cauliflower, mustard)	USA	EC	foliar spray (F)	0.45	min. 140	3 (max. 1.1 kg ai/ha and year)	0

Crop	Country	Application detail					
		Form	Type	kg ai/ha	L/ha	No.	Pre harvest interval (PHI) in days
greens)							
Brassica, leafy vegetables (cabbage, broccoli, cauliflower, mustard greens)	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Bulb vegetables (green and dry)	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	3
Bulb vegetables (green and dry)	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	3
Carrot	USA	SC	foliar spray (F)	0.39	min. 140	2 (max. 0.78 kg ai/ha and year)	0
Celery	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	3
Celery	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	3
Cotton	USA	EC	in-furrow + foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	21
Cucurbits (cucumbers, melons, watermelon, squashes)	USA	EC	foliar spray (F)	0.24	min. 140	4 (max. 1 kg ai/ha and year)	1
Cucurbits (cucumbers, melons, watermelon, squashes)	Canada	SC	foliar spray (F)	0.3	min. 110	4 (max. 1 kg ai/ha and year)	1
Filberts (= hazelnuts)	USA	SC	foliar spray (F)	0.26	min. 140	3 (max. 0.78 kg ai/ha and year)	120
Fruiting vegetables	USA	EC	foliar spray (F+G)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	0
Fruiting vegetables	Canada	SC	foliar spray (F+G)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Fruiting vegetables (except tomato)	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	3
Garlic (dry)	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	7
Leafy vegetables (lettuce, celery, spinach)	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	3
Leafy vegetables (lettuce, celery, spinach)	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	3
Leek	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	14
Legume vegetables (succulent shelled or podded)	USA	EC	foliar spray (F)	0.45	min. 140	3 (max. 1.1 kg ai/ha and year)	0
Legume vegetables (succulent shelled or podded)	Canada	SC	foliar spray (F)	0.45	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Maize	USA	EC	foliar spray (F)	0.36	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage) 7 (grain/stover)
Maize	Canada	EC	foliar spray (F)	0.35	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) 30 (grain/stover)
Oats	USA	EC	foliar spray (F)	0.36 (up to BBCH 59)	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Oats	Canada	EC	foliar spray (F)	0.35 (up to BBCH 59)	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Oilseed rape (canola)	USA	EC	foliar spray (F)	0.3	min. 140	3 (max. 0.61 kg ai/ha and year)	21
Oilseed rape (canola)	Canada	EC	foliar spray (F)	0.3	min. 110	2 (max. 0.6 kg ai/ha and year)	21
Onion (dry)	USA	SC	foliar	0.31	min.	3 (max. 0.94 kg ai/ha and year)	7

Crop	Country	Application detail					
		Form	Type	kg ai/ha	L/ha	No.	Pre harvest interval (PHI) in days
			spray (F)		140	and year)	
Onion (green)	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	14
Parsnips	USA	SC	foliar spray (F)	0.39	min. 140	2 (max. 0.78 kg ai/ha and year)	10
Peanut	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	14
Peanut	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	14
Pistachio	USA	SC	foliar spray (F)	0.26	min. 140	3 (max. 0.78 kg ai/ha and year)	14
Pome fruits	USA	EC	foliar spray (F)	0.3	min. 140	4 (max. 0.91 kg ai/ha and year)	28
Pome fruits	Canada	SC	foliar spray (F)	0.3	min. 110	3 (max. 0.9 kg ai/ha and year)	28
Potato, Yams	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	7
Pulses (except soya beans)	USA	EC	foliar spray (F)	0.3	min. 140	3 (max. 0.61 kg ai/ha and year)	0 (vine/hay) 21 (seeds)
Pulses (except soya beans)	Canada	EC	foliar spray (F)	0.35	min. 110	2 (max. 0.6 kg ai/ha and year)	21
Rhubarb	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	3
Rhubarb	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	3
Root and tuber vegetables (except sugar beets, potatoes and carrots)	USA	EC	foliar spray (F)	0.36	min. 140	3 (max. 1.1 kg ai/ha and year)	7
Root and tuber vegetables (except sugar beets, potatoes and carrots)	Canada	EC	foliar spray (F)	0.35	min. 110	3 (max. 1 kg ai/ha and year)	7
Root and tuber vegetables (except sugar beets and potatoes)	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 0.9 kg ai/ha and year)	0
Root vegetables (except sugar beets and potatoes)	USA	EC	foliar spray (F)	0.45	min. 140	3 (max. 0.91 kg ai/ha and year)	0
Rye	USA	EC	foliar spray (F)	0.36 (up to BBCH 59)	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Rye	Canada	EC	foliar spray (F)	0.35 (up to BBCH 59)	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Shallots	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	14
Sorghum	Canada	EC	foliar spray (F)	0.35	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) 30 (grain/stover)
Sorghum, Millet	USA	EC	foliar spray (F)	0.36	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage/hay) 30 (grain/stover)
Soya beans	USA	EC	foliar spray (F)	0.45	min. 140	3 (max. 0.91 kg ai/ha and year)	0 (forage/hay) 14 (seeds)
Soya beans	Canada	SC	foliar spray (F)	0.45	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Stone fruits	USA	EC	foliar spray (F)	0.3	min. 140	4 (max. 0.91 kg ai/ha and year)	0
Stone fruits	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 0.9 kg ai/ha and year)	0
Strawberry	Canada	SC	foliar spray (F)	0.35	min. 110	3 (max. 1.1 kg ai/ha and year)	0
Sugar beet	USA	EC	foliar spray (F)	0.45	min. 140	3 (max. 0.91 kg ai/ha and year)	0 (forage) 7 (turnip)
Sugar beet	Canada	EC	foliar spray (F)	0.3	min. 110	3 (max. 0.9 kg ai/ha and year)	7 (forage) 7 (turnip)

Crop	Country	Application detail					
		Form	Type	kg ai/ha	L/ha	No.	Pre harvest interval (PHI) in days
Sunflower	USA	EC	foliar spray (F)	0.45	min. 140	3 (max. 0.91 kg ai/ha and year)	14
Sunflower	Canada	EC	foliar spray (F)	0.35	min. 110	3 (max. 0.9 kg ai/ha and year)	14
Sweet corn	USA	EC	foliar spray (F)	0.36	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage) 7 (grain/stover)
Sweet corn	Canada	EC	foliar spray (F)	0.35	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) 30 (grain/stover)
Tomato	USA	SC	foliar spray (F)	0.31	min. 140	3 (max. 0.94 kg ai/ha and year)	0
Tree nuts (almond, hazelnut, chestnut, walnut)	Canada	SC	foliar spray (F)	0.3	min. 110	3 (max. 0.9 kg ai/ha and year)	14
Tree nuts (incl. Pistachios)	USA	EC	foliar spray (F)	0.3	min. 140	4 (max. 0.91 kg ai/ha and year)	14
Wheat, Triticale	USA	EC	foliar spray (F)	0.36 (up to BBCH 59)	min. 140	2 (max. 0.71 kg ai/ha and year)	0 (forage/hay) F (grain/straw)
Wheat, Triticale	Canada	EC	foliar spray (F)	0.35 (up to BBCH 59)	min. 110	2 (max. 0.7 kg ai/ha and year)	0 (forage/hay) F (grain/straw)

F = field use

G = glasshouse use

In Canada and the USA general label restrictions on rotational crops apply; thereby, not allowing the planting of crops without authorised uses of penthiopyrad within 120 days after treatment.

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

Residue levels were reported as measured. Application rates were always reported as penthiopyrad. When residues were not detected they are shown as below the LOQ, e.g., < 0.01 mg/kg. Residues, application rates and spray concentrations have generally been rounded to two significant figures. HR and STMR values from the trials conducted according to maximum GAP have been used for the estimation of maximum residue levels. These results are underlined.

Laboratory reports included method validation including batch recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates of analyses or duration of residue sample storage were also provided. Field reports provided data on the sprayers used and their calibration, plot size, residue sample size and sampling date. Although trials included control plots, no control data are recorded in the tables except where residues in control samples exceeded the LOQ. Residue data are recorded unadjusted for % recovery.

Penthiopyrad—supervised residue trials

Commodity	Indoor/ Outdoor	Treatment	Countries	Table No.
Pome fruit	outdoor	foliar spray	Canada, France, Germany, Greece, Hungary, Italy, Spain, USA	64
Cherries	outdoor	foliar spray	Canada, USA	65
Peaches	outdoor	foliar spray	Canada, USA	66
Plums	outdoor	foliar spray	Canada, USA	67
Strawberries	outdoor	foliar spray	Canada, USA	68

Commodity	Indoor/ Outdoor	Treatment	Countries	Table No.
Bulb onions	outdoor	foliar spray	Canada, USA	69
Green onions	outdoor	foliar spray	Canada, USA	70
Broccoli	outdoor	foliar spray	Canada, USA	71
Cauliflower	outdoor	foliar spray	Canada, USA	72
Cabbage	outdoor	foliar spray	Canada, USA	73
Summer squash (courgettes)	indoor and outdoor	foliar spray	Canada, France, Greece, Italy, Spain, USA	74
Cucumbers	indoor and outdoor	foliar spray	Belgium, Canada, France, Greece, Italy, Spain, USA	75
Melons	outdoor	foliar spray	Canada, USA	76
Winter squash	outdoor	foliar spray	Canada, USA	77
Bell peppers	indoor and outdoor	foliar spray	Canada, France, Greece, Italy, Spain, USA	78
Non-bell peppers	outdoor	foliar spray	Canada, USA	79
Sweet corn	outdoor	foliar spray	Canada, USA	80
Tomatoes	indoor and outdoor	foliar spray	Belgium, Canada, France, Greece, Italy, Spain, USA	81
Head lettuce	outdoor	foliar spray	Canada, USA	82
Leaf lettuce	outdoor	foliar spray	Canada, USA	83
Mustard greens	outdoor	foliar spray	Canada, USA	84
Spinach	outdoor	foliar spray	Canada, USA	85
Turnip greens	outdoor	foliar spray	Canada, USA	86
Celery	outdoor	foliar spray	Canada, USA	87
Beans (legume vegetables)	outdoor	foliar spray	Canada, USA	88
Peas (legume vegetables)	outdoor	foliar spray	Canada, USA	89
Beans (pulses)	outdoor	foliar spray	Canada, USA	90
Peas (pulses)	outdoor	foliar spray	Canada, USA	91
Soya beans	outdoor	foliar spray	Canada, USA	92
Carrots	outdoor	foliar spray	Canada, USA	93
Potatoes	outdoor	foliar spray	Canada, USA	94
Radish	outdoor	foliar spray	Canada, USA	95
Sugar beets	outdoor	in furrow and foliar spray	Canada, USA	96
Barley	outdoor	foliar spray	Canada, France, Germany, Hungary, UK, USA	97
Maize	outdoor	foliar spray	Canada, USA	98
Sorghum	outdoor	foliar spray	Canada, USA	99
Wheat	outdoor	foliar spray	Canada, France, Germany, Hungary, UK, USA	100
Almonds	outdoor	foliar spray	USA	101

Commodity	Indoor/ Outdoor	Treatment	Countries	Table No.
Pecan	outdoor	foliar spray	USA	102
Cotton	outdoor	in furrow and foliar spray	USA	103
Rape seed	outdoor	foliar spray	Canada, France, Germany, Hungary, UK, USA	104
Peanuts	outdoor	foliar spray	USA	105
Sunflowers	outdoor	foliar spray	Canada, France, Germany, Hungary, UK, USA	106
Alfalfa forage and hay	outdoor	foliar spray	Canada, USA	107
Pea vines and hay	outdoor	foliar spray	Canada, USA	108
Soya bean forage and hay	outdoor	foliar spray	Canada, USA	109
Barley forage	outdoor	foliar spray	France, Germany, UK	110
Barley hay	outdoor	foliar spray	Canada, USA	111
Maize forage	outdoor	foliar spray	Canada, USA	112
Sorghum forage	outdoor	foliar spray	USA	113
Wheat forage	outdoor	foliar spray	Canada, France, Germany, UK, USA	114
Barley straw	outdoor	foliar spray	Canada, France, Germany, Hungary, UK, USA	115
Maize stover	outdoor	foliar spray	Canada, USA	116
Sorghum stover	outdoor	foliar spray	USA	117
Wheat straw	outdoor	foliar spray	Canada, France, Germany, Hungary, UK, USA	118
Sugar beet leaves and tops	outdoor	foliar spray	Canada, USA	119
Rape forage	outdoor	foliar spray	France, Hungary, UK	120
Peanut hay	outdoor	foliar spray	USA	121
Sunflower forage	outdoor	foliar spray	France, Germany, Hungary	122
Almond hulls	outdoor	foliar spray	USA	123
Cotton by-products	outdoor	in furrow and foliar spray	USA	124

Table 64 Residues in pome fruit following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
Germany, Sornzig 2007 (Apple, Spartan) PTHIO_074	3	0.24 0.24 0.23	0.02 0.02 0.02	21	0.2	0.01	< 0.01	0.045	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
Hungary, Agárd 2007 (Apple, Jonathan) PTHIO_074	3	0.23 0.23 0.23	0.02 0.02 0.02	28	0.019	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (North), Herlies 2007 (Apple, Corail) PTHIO_074 Reverse decline	3	0.22 0.23 0.22	0.02 0.02 0.02	0 ^a 0 7	0.33 0.66 0.55	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
	3	0.22 0.23 0.23	0.02 0.02 0.02	14	0.36	0.012	< 0.01	0.011	< 0.01	< 0.01	
	3	0.22 0.22 0.22	0.02 0.02 0.02	22	0.17	< 0.01	< 0.01	0.012	< 0.01	< 0.01	
	3	0.22 0.23 0.23	0.02 0.02 0.02	29	0.037	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Pommnitz 2007 (Pear, Williams Christ) PTHIO_074 Reverse decline	3	0.23 0.23 0.22	0.02 0.02 0.02	0 ^a 0 7	0.049 0.29 0.15	< 0.01 < 0.01 < 0.01	0.011 0.012 0.012	< 0.01 < 0.01 0.021	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
	3	0.23 0.22 0.24	0.02 0.02 0.02	14	0.11	< 0.01	0.012	< 0.01	< 0.01	< 0.01	
	3	0.24 0.22 0.22	0.02 0.02 0.02	22	0.044	< 0.01	0.012	< 0.01	< 0.01	< 0.01	
	3	0.24 0.23 0.22	0.02 0.02 0.02	29	0.025	< 0.01	0.011	< 0.01	< 0.01	< 0.01	
France (North), Herlies 2007 (Pear, Angelys) PTHIO_074 Reverse decline	3	0.22 0.22 0.22	0.02 0.02 0.02	0 ^a 0 7	0.6 0.76 0.75	< 0.01 < 0.01 0.01	< 0.01 < 0.01 0.01	< 0.01 0.012 0.012	0.01 0.013 0.013	< 0.01 < 0.01 < 0.01	
	3	0.22 0.22 0.22	0.02 0.02 0.02	14	0.41	0.013	0.011	0.027	0.018	< 0.01	
	3	0.23 0.22 0.22	0.02 0.02 0.02	22	0.057	< 0.01	< 0.01	0.019	< 0.01	< 0.01	
	3	0.22 0.22 0.22	0.02 0.02 0.02	29	0.032	< 0.01	< 0.01	0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
France (North), Herlies 2008 (Apple, Corail) PTHIO_074	3	0.22 0.23 0.23	0.02 0.02 0.02	21	0.083	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Sornzig 2008 (Apple, James Grieve) PTHIO_074 Reverse decline	3	0.22 0.23 0.23	0.02 0.02 0.02	0 ^a 0 7	0.08 0.29 0.12	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
	3	0.24 0.23 0.24	0.02 0.02 0.02	14	0.12	< 0.01	< 0.01	0.01	< 0.01	< 0.01	
	3	0.24 0.24 0.22	0.02 0.02 0.02	22	0.059	< 0.01	< 0.01	0.011	< 0.01	< 0.01	
	3	0.24 0.24 0.24	0.02 0.02 0.02	29	0.033	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (North), Herlies 2008 (Pear, Conference) PTHIO_074	3	0.23 0.22 0.23	0.02 0.02 0.02	21	0.074	< 0.01	< 0.01	0.024	< 0.01	< 0.01	
Germany, Ablass 2008 (Pear, Williams Christ) PTHIO_074	3	0.22 0.23 0.22	0.02 0.02 0.02	21	0.037	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Casalnoceto 2007 (Apple, Golden) PTHIO_074 Reverse decline	3	0.22 0.23 0.22	0.01 0.01 0.01	0 ^a 0 7	0.2 0.28 0.065	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
	3	0.22 0.22 0.23	0.01 0.01 0.01	14	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.22 0.22 0.22	0.01 0.01 0.01	21	0.1	< 0.01	< 0.01	0.01	< 0.01	< 0.01	
	3	0.22 0.22 0.22	0.01 0.01 0.01	28	0.054	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Arbeca 2007 (Apple,	3	0.22 0.22 0.22	0.01 0.01 0.01	0 ^a 0 7	0.09 0.15 0.22	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 0.011	< 0.01 < 0.01 < 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
Golden) PTHIO_074	3	0.22 0.22 0.23	0.01 0.01 0.01	14	0.17	< 0.01	< 0.01	< 0.01	0.011	< 0.01	
	3	0.22 0.22 0.22	0.01 0.01 0.01	21	0.064	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.22 0.23 0.22	0.01 0.01 0.01	28	0.04	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Platani 2007 (Apple, Granny Smith) PTHIO_074	3	0.22 0.23 0.23	0.02 0.02 0.02	21	0.028	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Casalnoceto 2007 (Pear, Santa Maria) PTHIO_074	3	0.21 0.22 0.22	0.01 0.01 0.01	20	0.11	< 0.01	0.018	0.015	< 0.01	< 0.01	
France (South), Rochemaure 2007 (Pear, Madame Ballet) PTHIO_074	3	0.22 0.22 0.22	0.02 0.02 0.02	21	0.026	< 0.01	0.011	< 0.01	< 0.01	< 0.01	
Spain, Torregrossa 2008 (Apple, Brookfield) PTHIO_074	3	0.23 0.23 0.23	0.02 0.02 0.02	21	0.033	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Casalnoceto 2008 (Apple, Golden) PTHIO_074 Reverse decline	3	0.23 0.23 0.23	0.02 0.02 0.02	0 ^a 0 7	0.13 0.25 0.11	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
	3	0.23 0.22 0.23	0.02 0.02 0.02	14	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.23 0.23 0.22	0.02 0.02 0.02	21	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.23 0.23 0.22	0.02 0.02 0.02	28	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Casalnoceto 2008 (Pear, 074)	3	0.22 0.22 0.22	0.02 0.02 0.02	0 ^a 0 7	0.051 0.026 0.016	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
Santa Maria) PTHIO_074 Reverse decline	3	0.23 0.22 0.22	0.02 0.02 0.02	14	0.024	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.22 0.23 0.22	0.02 0.02 0.02	21	0.022	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.23 0.22 0.22	0.02 0.02 0.02	28	0.014	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Le Tremblay 2008 (Pear, Louise Bonne) PTHIO_074 Reverse decline	3	0.23 0.23 0.23	0.02 0.02 0.02	0 ^a 0 7	0.081 0.13 0.095	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 0.016	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
	3	0.22 0.23 0.23	0.02 0.02 0.02	14	0.031	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.22 0.23 0.23	0.02 0.02 0.02	21	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.22 0.23 0.23	0.02 0.02 0.02	28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (NY), North Rose 2007 (Apple, Ida Red) PTHIO_075	3	0.31	0.03	28 28	0.11 0.13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.12 Total: 0.14
USA (PA), Hereford 2007 (Apple, Starkrimson Red Delicious) PTHIO_075	3	0.31	0.02	28 28	0.12 0.14	0.012 0.014	< 0.01 < 0.01	0.012 0.013	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.13 Total: 0.15
USA (PA), Berwick 2007 (Apple, Cortland) PTHIO_075	3	0.3100.3 0.31	0.03 0.03 0.03	28 28	0.23 0.18	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.21 Total: 0.22
USA (VA), Crozet 2007 (Apple, Fuji) PTHIO_075	3	0.3 0.3100.3	0.02 0.02 0.02	28 28	0.076 0.076	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.076 Total: 0.095

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (OR), Hood River 2007 (Apple, Jonagold) PTHIO_075	3	0.31 0.3100.3	0.03 0.03 0.03	28 28	0.12 0.11	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.12 Total: 0.13
Canada, Penticton 2007 (Apple, Gala) PTHIO_075	3	0.31	0.04	29 29	0.22 0.23	< 0.01 < 0.01	< 0.01 < 0.01	0.018 0.017	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.23 Total: 0.24
USA (NY), North Rose 2007 (Pear, Bosc) PTHIO_075	3	0.31	0.03	28 28	0.11 0.083	< 0.01 < 0.01	< 0.01 < 0.01	0.013 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.097 Total: 0.12
USA (MN), Paynesville 2007 (Pear, Parker) PTHIO_075	3	0.31	0.03	28 28	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Beamsville 2007 (Pear, Bosc PTHIO_075	3	0.3	0.03	28 28	0.23 0.26	0.012 0.013	< 0.01 < 0.01	0.017 0.017	0.011 0.013	< 0.01 < 0.01	Parent: 0.25 Total: 0.27
Canada, Jordan Station 2007 (Pear, Bosc) PTHIO_075	3	0.3 0.31 0.3	0.03 0.03 0.03	29 29	0.18 0.19	0.02 0.02	< 0.01 < 0.01	0.017 0.018	0.015 0.016	< 0.01 < 0.01	Parent: 0.19 Total: 0.22
Canada, London 2007 (Pear, Bosc) PTHIO_075	3	0.3	0.04	27 27	0.2 0.16	0.011 < 0.01	< 0.01 < 0.01	0.023 0.02	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.18 Total: 0.2
USA (CA), Madera 2007 (Pear, Asian Hogai) PTHIO_075	3	0.31	0.03	28 28	0.063 0.065	0.013 0.015	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.064 Total: 0.09
USA (CA), Lindsay 2007 (Pear, Olympic) PTHIO_075	3	0.31 0.31 0.31	0.03 0.02 0.02	28 28	0.11 0.12	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.12 Total: 0.13

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
USA (WA), Ephrata 2007 (Pear, Concord) PTHIO_075	3	0.31	0.03	28 28	0.15 0.18	0.012 0.012	< 0.01 < 0.01	0.039 0.041	0.014 0.015	< 0.01 < 0.01	Parent: 0.17 Total: 0.19
USA (OR), Hood River 2007 (Pear, Red Clapp) PTHIO_075	3	0.31	0.03	28 28	0.044 0.026	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.035 Total: 0.054
Canada, Penticton 2007 (Pear, Bartlett) PTHIO_075	3	0.31	0.04	29 29	0.25 0.19	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.22 Total: 0.24
USA (NY), North Rose 2007 (Apple, Ida Red) PTHIO_103	3	0.31	0.03	28	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.14 Total: 0.16
USA (MI), Conklin 2007 (Apple, Idared) PTHIO_103	3	0.3	0.03	28	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.12 Total: 0.14
USA (ID), Weiser 2007 (Apple, Law Rome) PTHIO_103	3	0.31	0.03	28	0.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.23 Total: 0.25

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 65 Residues in cherries following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
USA (OH), Marysville 2007 (Gold) PTHIO_076	3	0.29 0.29 0.3	0.03 0.03 0.03	Pitted fruits 0 0 whole fruits 0 0	0.85 0.74	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.44 Total: 0.80

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (CA), Kerman 2007 (Brooks) PTHIO_076	3	0.31 0.31 0.3	0.04 0.04 0.04	Pitted fruits 0 0 whole fruits 0 0	0.93 1.1 0.83 0.97	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.054 0.049 0.048 0.044	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.9 Total: 1.0
USA (WA), Zillah 2007 (Vans) PTHIO_076	3	0.29 0.3 0.3	0.03 0.03 0.03	Pitted fruits 0 0 whole fruits 0 0	1.4 1.4 1.3 1.2	0.011 0.012 0.01 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.087 0.085 0.075 0.072	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 1.3 Total: 1.4
USA (OR), Dallas 2007 (Royal Ann) PTHIO_076	3	0.32 0.3 0.3	0.03 0.03 0.03	Pitted fruits 0 0 whole fruits 0 0	1.1 0.91 1.0 0.91	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.04 0.028 0.035 0.025	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.96 Total: 1.0
USA (NY), Sodus 2007 (Mont Morency) PTHIO_076	3	0.31 0.31 0.3	0.03 0.03 0.03	Pitted fruits 0 0 whole fruits 0 0	1.4 1.1 1.2 0.99	0.016 0.016 0.014 0.013	< 0.01 < 0.01 < 0.01 < 0.01	0.052 0.052 0.045 0.045	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 1.2 Total: 1.3
USA (MI), Shelby 2007 (Mont Morency) PTHIO_076	3	0.29	0.03	Pitted fruits 0 0 whole fruits 0 0	0.66 0.73 0.36 0.4	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.024 0.029 0.013 0.016	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.38 Total: 0.71

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
Canada, St. Catharines 2007 (Montmercy) PTHIO_076	3	0.3	0.03	Pitted fruits							Parent: 1.1 Total: 1.3
				0	1.4	0.016	< 0.01	0.093	< 0.01	< 0.01	
				0	1.1	0.015	< 0.01	0.092	< 0.01	< 0.01	
				whole fruits							
				0	1.3	0.015	< 0.01	0.085	< 0.01	< 0.01	
				0	0.89	0.013	< 0.01	0.077	< 0.01	< 0.01	
USA (UT), Perry 2007 (Mont Morency) PTHIO_076	3	0.3 0.3 0.3	0.02 0.02 0.02	Pitted fruits							Parent: 1.6 Total: 1.8
				0	1.8	0.013	< 0.01	0.11	< 0.01	< 0.01	
				0	1.8	0.014	< 0.01	0.13	< 0.01	< 0.01	
				whole fruits							
				0	1.6	0.012	< 0.01	0.1	< 0.01	< 0.01	
				0	1.6	0.013	< 0.01	0.12	< 0.01	< 0.01	
USA (WA), Othello 2007 (Mont Morency) PTHIO_076	3	0.31	0.03	Pitted fruits							Parent: 1.7 Total: 1.9
				0	1.9	0.016	< 0.01	0.066	0.011	< 0.01	
				0	1.8	0.015	< 0.01	0.063	< 0.01	< 0.01	
				whole fruits							
				0	1.8	0.015	< 0.01	0.061	0.01	< 0.01	
				0	1.6	0.014	< 0.01	0.057	< 0.01	< 0.01	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 66 Residues in peaches following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			PHI	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (NY), Alton 2007 (Gold Nine) PTHIO_076	3	0.31 0.3 0.31	0.03 0.03 0.03	Pitted fruits							Parent: 0.61 Total: 0.67
				0	0.7	< 0.01	< 0.01	0.024	< 0.01	< 0.01	
				0	0.6	< 0.01	< 0.01	0.019	< 0.01	< 0.01	
				whole fruits							
				0	0.64	< 0.01	< 0.01	0.022	< 0.01	< 0.01	
				0	0.57	< 0.01	< 0.01	0.018	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			PHI	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (SC), Batesburg 2007 (Coronet) PTHIO_076	3	0.31 0.31 0.3	0.02 0.02 0.02	Pitted fruits							Parent: 0.47 Total: 0.60
				0	0.71	< 0.01	< 0.01	0.041	< 0.01	< 0.01	
				0	0.45	< 0.01	< 0.01	0.03	< 0.01	< 0.01	
				whole fruits							
				0	0.58	< 0.01	< 0.01	0.034	< 0.01	< 0.01	
				0	0.35	< 0.01	< 0.01	0.024	< 0.01	< 0.01	
USA (VA), Crouzet 2007 (Encore) PTHIO_076	3	0.29	0.05	Pitted fruits							Parent: 0.35 Total: 0.40
				0	0.22	< 0.01	< 0.01	0.014	< 0.01	< 0.01	
				0	0.54	0.01	< 0.01	0.028	< 0.01	< 0.01	
				whole fruits							
				0	0.2	< 0.01	< 0.01	0.013	< 0.01	< 0.01	
				0	0.49	< 0.01	< 0.01	0.025	< 0.01	< 0.01	
USA (GA), Plains 2007 (Redskin) PTHIO_076	3	0.3	0.02	Pitted fruits							Parent: 0.56 Total: 0.63
				0	0.58	< 0.01	< 0.01	0.031	< 0.01	< 0.01	
				0	0.65	< 0.01	< 0.01	0.034	< 0.01	< 0.01	
				whole fruits							
				0	0.52	< 0.01	< 0.01	0.028	< 0.01	< 0.01	
				0	0.59	< 0.01	< 0.01	0.031	< 0.01	< 0.01	
USA (MI), Conklin 2007 (Red Haven)	3	0.31	0.04	Pitted fruits							Parent: 0.7 Total: 0.76
				0	0.62	< 0.01	< 0.01	0.033	< 0.01	< 0.01	
				0	0.87	< 0.01	< 0.01	0.044	< 0.01	< 0.01	
				whole fruits							
				0	0.58	< 0.01	< 0.01	0.031	< 0.01	< 0.01	
				0	0.82	< 0.01	< 0.01	0.042	< 0.01	< 0.01	
Canada, Jordan Station 2007 (Harrow Diamond) PTHIO_076	3	0.31 0.31 0.32	0.03 0.04 0.03	Pitted fruits							Parent: 0.69 Total: 0.73
				0	0.76	0.01	< 0.01	0.027	< 0.01	< 0.01	
				0	0.67	< 0.01	< 0.01	0.025	< 0.01	< 0.01	
				whole fruits							
				0	0.71	< 0.01	< 0.01	0.025	< 0.01	< 0.01	
				0	0.66	< 0.01	< 0.01	0.024	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			PHI	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
Canada, Jordan Station 2007 (Vivid) PTHIO_076	3	0.32 0.31 0.31	0.03	Pitted fruits							Parent: 0.44 Total: 0.54
				0	0.42	< 0.01	< 0.01	0.028	< 0.01	< 0.01	
				0	0.62	< 0.01	< 0.01	0.02	< 0.01	< 0.01	
				whole fruits							
				0	0.34	< 0.01	< 0.01	0.022	< 0.01	< 0.01	
				0	0.53	< 0.01	< 0.01	0.017	< 0.01	< 0.01	
Canada, Arkona 2007 (Vivid) PTHIO_076	3	0.31	0.04	Pitted fruits							Parent: 0.58 Total: 0.67
				0	0.66	< 0.01	< 0.01	0.027	< 0.01	< 0.01	
				0	0.64	< 0.01	< 0.01	0.028	< 0.01	< 0.01	
				whole fruits							
				0	0.59	< 0.01	< 0.01	0.024	< 0.01	< 0.01	
				0	0.57	< 0.01	< 0.01	0.025	< 0.01	< 0.01	
USA (TX), Vernon 2007 (Alberta) PTHIO_076	3	0.31	0.03	Pitted fruits							Parent: 1.4 Total: 1.6
				0	1.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	1.7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				whole fruits							
				0	1.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	1.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (CA), Sanger 2007 (White Lady) PTHIO_076	3	0.03	0.03	Pitted fruits							Parent: 0.18 Total: 0.20
				0	0.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				whole fruits							
				0	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (CA), Hickman 2007 (Summerset) PTHIO_076	3	0.32 0.3 0.31	0.03 0.02 0.02	Pitted fruits							Parent: 0.61 Total: 0.71
				0	0.68	< 0.01	< 0.01	0.026	< 0.01	< 0.01	
				0	0.71	< 0.01	< 0.01	0.025	< 0.01	< 0.01	
				whole fruits							
				0	0.56	< 0.01	< 0.01	0.022	< 0.01	< 0.01	
				0	0.67	< 0.01	< 0.01	0.024	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			PHI	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (CA), Madera 2007 (Angelas) PTHIO_076	3	0.31	0.03	Pitted fruits							Parent: 0.28 Total: 0.31
				0 ^a	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0 ^a	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.39	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.072	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				whole fruits							
				0 ^a	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0 ^a	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.36	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.26	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.26	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.069	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Summerland 2007 (Cresthaven) PTHIO_076	3	0.3	0.04	Pitted fruits							Parent: 0.2 Total: 0.32
		0.31	0.04	0	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.31	0.04	0	0.42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				whole fruits							
				0	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.27	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

Table 67 Residues in plums following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Wolfville 2007 (Empress) PTHIO_076	3	0.31	0.03	Pitted fruits 0 ^a 0 whole fruits 0 ^a 0	0.095 0.073 0.09 0.07	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.08 Total: 0.10
USA (MI), Hart 2007 (Stanley) PTHIO_076	3	0.29 0.29 0.3	0.03	Pitted fruits 0 0 whole fruits 0 0	0.3 0.14 0.21 0.094	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.15 Total: 0.24
Canada, Beamsville 2007 (Victory) PTHIO_076	3	0.31 0.32 0.31	0.03	Pitted fruits 0 0 whole fruits 0 0	0.3 0.33 0.27 0.3	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.29 Total: 0.33
Canada, Arkona 2007 (Stanley) PTHIO_076	3	0.3 0.31 0.31	0.04	Pitted fruits 0 0 whole fruits 0 0	0.78 0.84 0.74 0.8	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.015 0.013 0.014 0.012	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.77 Total: 0.83
USA (CA), Sanger 2007 (Catalina) PTHIO_076	3	0.3	0.05	Pitted fruits 0 0 whole fruits 0 0	0.046 0.061 0.043 0.058	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.51 Total: 0.072

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Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Hickman 2007 (Grand Rosa) PTHIO_076	3	0.32 0.3100.3	0.02 0.02 0.02	Pitted fruits 0 0 whole fruits 0 0	 0.074 0.086 0.073 0.084	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.076 Total: 0.099
USA (CA), Fresno 2007 (Flavor Rich) PTHIO_076	3	0.3 0.29 0.3	0.03 0.02 0.03	Pitted fruits 0 0 whole fruits 0 0	 0.094 0.11 0.08 0.097	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.089 Total: 0.12
USA (CA), Sanger 2007 (Angeleno) PTHIO_076	3	0.3 0.3 0.3	0.05 0.03 0.03	Pitted fruits 0 0 whole fruits 0 0	 0.048 0.05 0.046 0.048	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.047 Total: 0.068
USA (ID), Payette 2007 (Empress) PTHIO_076	3	0.3 0.31 0.31	0.03 0.03 0.03	Pitted fruits 0 0 whole fruits 0 0	 0.12 0.13 0.12 0.13	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.13 Total: 0.14
USA (OR), Dallas 2007 (Moyer) PTHIO_076	3	0.31 0.31 0.3	0.04 0.04 0.03	Pitted fruits 0 0 whole fruits 0 0	 0.093 0.13 0.089 0.12	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.11 Total: 0.13

DAT: days after final treatment

[illegible]

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2008 (Hamlet) PTHIO_081	3	0.36	0.18	3	0.33	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.36 Total: 0.37
		0.34	0.17	3	0.38	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.18								
Canada, Thorndale 2008 (212- Arsenal) PTHIO_081	3	0.35	0.14	3	0.066	0.012	0.031	< 0.01	< 0.01	< 0.01	Parent: 0.065 Total: 0.085
		0.37	0.14	3	0.063	< 0.01	0.022	< 0.01	< 0.01	< 0.01	
		0.36	0.16								
Canada, Lakeside 2008 (Arsenal) PTHIO_081	3	0.36	0.14	3	0.06	< 0.01	0.013	< 0.01	< 0.01	< 0.01	Parent: 0.05 Total: 0.068
		0.35	0.14	3	0.039	< 0.01	0.011	< 0.01	< 0.01	< 0.01	
		0.34	0.14								
USA (TX), Uvalde 2008 (Texas Early White) PTHIO_081	3	0.36	0.15	3	0.092	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.13 Total: 0.14
				3	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (TX), Levelland 2008 (Yellow Spanisch) PTHIO_081	3	0.35	0.13	3	0.064	< 0.01	0.017	< 0.01	< 0.01	< 0.01	Parent: 0.064 Total: 0.082
		0.36	0.13	3	0.063	< 0.01	0.018	< 0.01	< 0.01	< 0.01	
		0.37	0.13								
USA (CA), Fresno 2008 (Gunnison F1) PTHIO_081	3	0.36	0.04	3	< 0.01	< 0.01	0.034	< 0.01	< 0.01	< 0.01	Parent: 0.01 Total: 0.029
				3	0.01	< 0.01	0.043	< 0.01	< 0.01	< 0.01	
USA (CA), Hughson 2008 (Ringmaster) PTHIO_081	3	0.35	0.13	3	0.018	< 0.01	0.027	< 0.01	< 0.01	< 0.01	Parent: 0.014 Total: 0.033
		0.36	0.13	3	< 0.01	< 0.01	0.016	< 0.01	< 0.01	< 0.01	
		0.36	0.13								
USA (ID), Jerome 2008 (Harmony) PTHIO_081	3	0.35	0.16	7	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.043 Total: 0.062
		0.34	0.16	7	0.036	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.16								

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 70 Residues in green onions following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg, ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg, ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, St. Marc-sur- Richelieu 2008 (Long White Tokyo) PTHIO_081	3	0.36 0.34 0.34	0.18 0.18 0.18	0 ^a	0.045	0.017	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.86 Total: 1.2
				0 ^a	0.045	0.017	< 0.01	< 0.01	< 0.01	< 0.01	
				0	1.3	0.019	0.011	< 0.01	0.014	< 0.01	
				0	1.4	0.025	0.013	< 0.01	0.017	< 0.01	
				1	1.1	0.025	0.013	< 0.01	0.012	< 0.01	
				1	1.0	0.022	0.014	< 0.01	0.014	< 0.01	
				3	1.0	0.028	0.015	< 0.01	0.015	< 0.01	
				3	0.71	0.021	0.011	< 0.01	0.011	< 0.01	
				7	0.27	0.028	0.016	< 0.01	< 0.01	< 0.01	
				7	0.24	0.029	0.016	< 0.01	< 0.01	< 0.01	
				10	0.2	0.041	0.017	< 0.01	0.01	< 0.01	
				10	0.19	0.04	0.018	< 0.01	0.01	< 0.01	
Canada, Branchton 2008 (Lisbon) PTHIO_081	3	0.36 0.36 0.39	0.18 0.18 0.19	3	0.21	0.062	0.016	< 0.01	< 0.01	0.029	Parent: 0.23 Total: 0.35
				3	0.24	0.077	0.018	< 0.01	< 0.01	0.034	
USA (TX), East Bernard 2008 (Evergreen White Bunching) PTHIO_081	3	0.36	0.16	3	0.21	0.24	0.11	< 0.01	0.018	0.01	Parent: 0.21 Total: 0.68
				3	0.21	0.27	0.11	0.01	0.018	0.012	
USA (CA), Fresno 2008 (White Spear) PTHIO_081	3	0.35	0.04	3	0.54	0.062	0.012	< 0.01	0.035	< 0.01	Parent: 0.55 Total: 0.67
				3	0.55	0.067	0.028	< 0.01	0.036	< 0.01	
USA (CA), Hickman 2008 (Southport White 404) PTHIO_081	3	0.36 0.35 0.35	0.13 0.12 0.13	3	0.85	0.088	0.048	< 0.01	0.043	0.011	Parent: 0.93 Total: 1.1
				3	1.0	0.11	0.05	< 0.01	0.049	0.012	
USA (CA), Sanger 2008 (Southport White 404) PTHIO_081	3	0.36	0.04	3	1.8	0.15	0.055	< 0.01	0.079	0.017	Parent: 1.8 Total: 2.0
				3	1.7	0.14	0.046	< 0.01	0.083	0.015	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 71 Residues in broccoli following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (NY), Alton 2009 (Blue Wind) PTHIO_082	3	0.16	0.06	0	0.55	< 0.01	0.12	< 0.01	0.024	< 0.01	Parent: 0.65 Total: 0.67
		0.45	0.16	0	0.75	< 0.01	0.11	< 0.01	0.032	< 0.01	
		0.47	0.17	edible part							
				0	1.0	< 0.01	0.13	< 0.01	0.092	< 0.01	
USA (OH), Richwood 2009 (Premium Crop) PTHIO_082	3	0.16	0.1	0	2.0	< 0.01	0.12	< 0.01	0.033	< 0.01	Parent: 1.9 Total: 1.9
		0.47	0.28	0	1.8	0.01	0.12	< 0.01	0.038	< 0.01	
		0.46	0.28	edible part							
				0	1.7	0.011	0.12	< 0.01	0.048	< 0.01	
Canada, Branchton 2009 (Diplomat) PTHIO_082	3	0.15	0.02	0	2.2	0.014	0.099	< 0.01	0.061	< 0.01	Parent: 2.4 Total: 2.4
		0.45	0.05	0	2.5	0.018	0.1	< 0.01	0.058	< 0.01	
		0.47	0.05								
USA (CA), Porterville 2009 (Heritage) PTHIO_082	3	0.15	0.06	0	1.8	0.02	0.097	< 0.01	0.083	< 0.01	Parent: 1.4 Total: 1.4
		0.45	0.17	0	0.97	0.01	0.078	< 0.01	0.061	< 0.01	
		0.45	0.17	edible part							
				0	0.54	< 0.01	0.097	< 0.01	0.068	< 0.01	
USA (CA), Madera 2009 (Heritage) PTHIO_082	3	0.16	0.06	0	0.64	< 0.01	0.046	< 0.01	0.015	< 0.01	Parent: 0.87 Total: 0.89
		0.46	0.17	0	1.1	0.01	0.06	0.011	0.018	< 0.01	
		0.46	0.17								
USA (AZ), Yuma 2009 (General) PTHIO_082	3	0.16	0.09	0	1.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 1.4 Total: 1.4
		0.46	0.25	0	1.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.46	0.25								
USA (CA), Sanger 2009 (Magic Green) PTHIO_082	3	0.16	0.03	0 ^a	1.8	0.012	0.033	< 0.01	0.035	< 0.01	Parent: 1.9 Total: 1.9
		0.45	0.07	0 ^a	1.8	0.013	0.033	< 0.01	0.034	< 0.01	
		0.45	0.07	0	1.7	0.012	0.029	< 0.01	0.032	< 0.01	
				0	2.0	0.015	0.033	0.01	0.041	< 0.01	
				3	1.7	0.013	0.047	< 0.01	0.047	< 0.01	
				3	1.3	0.012	0.038	< 0.01	0.037	< 0.01	
				7	1.5	0.023	0.065	0.014	0.045	< 0.01	
				7	1.4	0.024	0.066	0.013	0.047	< 0.01	
				10	1.4	0.018	0.068	0.01	0.028	< 0.01	
				10	1.1	0.019	0.077	0.012	0.029	< 0.01	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 72 Residues in cauliflower following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, St. Marc-sur- Richilieu 2009 (Fremont) PTHIO_082	3	0.15 0.45 0.47	0.33 0.96 0.96	0 0	0.56 0.45	< 0.01 < 0.01	0.015 0.014	< 0.01 < 0.01	0.01 0.014	< 0.01 < 0.01	Parent: 0.51 Total: 0.52
USA (CA), Corning 2009 (Acclaim) PTHIO_082	3	0.16 0.46 0.46	0.09 0.25 0.25	0 0	0.12 0.099	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.11 Total: 0.13
USA (OR), Hillboro 2009 (Nome) PTHIO_082	3	0.16 0.46 0.46	0.05 0.15 0.15	0 0	0.59 0.4	< 0.01 < 0.01	0.014 0.012	< 0.01 < 0.01	0.013 0.01	< 0.01 < 0.01	Parent: 0.5 Total: 0.51

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 73 Residues in cabbage following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (NY), Alton 2009 (Early green) PTHIO_082	3	0.16 0.46 0.46	0.06 0.16 0.16	0 0 w/o wrapper leaves 0 0	2.3 2.2 0.058 0.044	0.054 0.076 < 0.01 < 0.01	0.037 0.037 0.026 0.019	0.015 0.023 < 0.01 < 0.01	0.05 0.05 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 2.3 Total: 2.4
Canada, Berwick 2009 (Discovery) PTHIO_082	3	0.16 0.46 0.46	0.06 0.19 0.18	0 0	0.022 0.026	< 0.01 < 0.01	0.018 0.017	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.024 Total: 0.043
USA (GA), Athens 2009 (Bonnies Best Hybrid) PTHIO_082	3	0.16 0.46 0.46	0.08 0.2 0.21	0 0	1.4 1.5	0.018 0.017	0.04 0.045	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01	Parent: 1.5 Total: 1.5
USA (FL), Hobe Sound 2009 (Bravo) PTHIO_082	3	0.16 0.46 0.47	0.07 0.19 0.19	0 0	1.4 1.1	0.021 < 0.01	0.093 0.06	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 1.3 Total: 1.3

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

Table 74 Residues in courgettes and summer squash following foliar application of penthiopyrad

[illegible]

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
Spain, Los Palacios 2008 (Jedida) PTHIO_071	2	0.2 0.59	0.04 0.04	0 ^a	0.021	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.29	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.23	< 0.01	< 0.01	0.01	< 0.01	< 0.01	
				7	0.046	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.012	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Pernes-les- Fontaines 2008 (Cora) PTHIO_071	2	0.19 0.59	0.04 0.04	0 ^a	0.014	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.083	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.13	< 0.01	< 0.01	0.01	< 0.01	< 0.01	
				7	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (North), Baisieux 2008 (Cora) PTHIO_071	2	0.2 0.6	0.04 0.04	1	0.38	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Mediglia 2008 (Altea) PTHIO_071	2	0.2 0.58	0.04 0.04	1	0.46	< 0.01	< 0.01	0.014	< 0.01	< 0.01	
Outdoor											
Spain, Agudulce 2008 (Nieve) PTHIO_072	2	0.2 0.6	0.04 0.04	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01< 0.01	< 0.01< 0.01	< 0.01	
				0	0.36	< 0.01	< 0.01			< 0.01	
	2	0.2 0.6	0.04 0.04	1	0.37	< 0.01	< 0.01	0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	3	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	7	0.017	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Reverse decline	2	0.2 0.59	0.04 0.04	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Utrera 2008 (Zedide) PTHIO_072	2	0.2 0.6	0.04 0.04	1	0.17	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Nea Magnisia 2008 (Lorea) PTHIO_072	2	0.19 0.6	0.04 0.04	0 ^a	0.029	< 0.01	< 0.01	< 0.01< 0.01	< 0.01< 0.01	< 0.01	
				0	0.2	< 0.01	< 0.01			< 0.01	
	2	0.19 0.58	0.04 0.04	1	0.28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	3	0.075	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Reverse decline	2	0.19 0.6	0.04 0.04	7	0.024	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
	2	0.2 0.59	0.04 0.04		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.01	
Italy, Poasco San Donato 2008 (President) PTHIO_072	2	0.19 0.58	0.04 0.04	1	0.48	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (NY), North Rose 2007 (Zucchini Select) PTHIO_073	4	0.25	0.11	1 1	0.16 0.092	< 0.01 < 0.01	< 0.01 < 0.01	0.015 < 0.01	< 0.01< 0.01	< 0.01 < 0.01	Parent: 0.13 Total: 0.15
USA (IA), Richland 2007 (Crookneck) PTHIO_073	4	0.25	0.08	1 1	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	< 0.01 < 0.01	Parent: 0.01 Total: 0.029
Canada, Branchton 2007 (Senator) PTHIO_073	4	0.25 0.27 0.26 0.26	0.07 0.08 0.07 0.07	1 1	0.21 0.15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	0.012 0.011	Parent: 0.18 Total: 0.2
Canada, Branchton 2007 (Zucchini Select) PTHIO_073	4	0.25 0.24 0.25 0.25	0.08 0.08 0.08 0.08	1 1	0.24 0.14	< 0.01 < 0.01	< 0.01 < 0.01	0.023 < 0.01	< 0.01< 0.01	< 0.01 < 0.01	Parent: 0.19 Total: 0.21

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 75 Residues in cucumbers following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
Protected											
Italy, Triginto die Mediglia 2007 (Edona) PTHIO_071	2	0.2 0.59	0.04 0.04	0 ^a 0 1 3 7 14	0.011 0.2 0.13 0.031 0.018 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 0.026 0.024 0.02 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
Spain, Lleida 2007 (Sol Verde) PTHIO_071	2	0.2 0.59	0.04 0.04	1	0.076	< 0.01	< 0.01	0.013	< 0.01	< 0.01	
Spain, Los Palacios 2007 (Edona) PTHIO_071	2	0.2 0.59	0.04 0.04	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.23	< 0.01	< 0.01	0.015	< 0.01	< 0.01	
				1	0.098	< 0.01	< 0.01	0.038	< 0.01	< 0.01	
				3	0.041	< 0.01	< 0.01	0.021	< 0.01	< 0.01	
				7	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Lucenay 2007 (Loustik) PTHIO_071	2	0.19 0.59	0.04 0.04	1	0.089	< 0.01	< 0.01	0.016	< 0.01	< 0.01	
Greece, Nea Magnisia 2007 (Luberon) PTHIO_071	2	0.2 0.6	0.04 0.04	1	0.29	< 0.01	< 0.01	0.065	< 0.01	< 0.01	
Spain, Los Palacios 2008 (Suso) PTHIO_071	2	0.2 0.6	0.04 0.04	0 ^a	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.15	< 0.01	< 0.01	0.018	< 0.01	< 0.01	
				1	0.16	< 0.01	< 0.01	0.029	< 0.01	< 0.01	
				3	0.058	< 0.01	< 0.01	0.019	< 0.01	< 0.01	
				7	0.017	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Belgium, Ingelmunster 2008 (Aviance) PTHIO_071	2	0.2 0.58	0.04 0.04	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.093	< 0.01	< 0.01	0.019	< 0.01	< 0.01	
				3	0.053	< 0.01	< 0.01	0.013	< 0.01	< 0.01	
				7	0.025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Nea Magnisia 2008 (803) PTHIO_071	2	0.2 0.6	0.04 0.04	1	0.15	< 0.01	< 0.01	0.04	< 0.01	< 0.01	
Italy, Mediglia 2008 (Edona) PTHIO_071	2	0.2 0.6	0.04 0.04	1	0.3	< 0.01	< 0.01	0.033	< 0.01	< 0.01	
Outdoor											
Italy, Alba Adriatica 2007 (Lunga) PTHIO_072	2	0.2 0.6	0.04 0.04	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.61	0.04 0.04	0	0.4	< 0.01	< 0.01	0.059	< 0.01	< 0.01	
Reverse decline	2	0.2 0.6	0.04 0.04	1	0.12	< 0.01	< 0.01	0.033	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	3	0.013	< 0.01	0.014	0.014	< 0.01	< 0.01	

[illegible]

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
USA (IA), Richland 2007 (Stra. S. ght 9) PTHIO_073	4	0.25	0.08	0 ^a	0.035	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.029 Total: 0.048
				0 ^a	0.067	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.19	< 0.01	< 0.01	0.015	< 0.01	< 0.01	
				1	0.034	< 0.01	< 0.01	0.021	< 0.01	< 0.01	
				1	0.024	< 0.01	< 0.01	0.013	< 0.01	< 0.01	
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Branchton 2007 (Eclipse) PTHIO_073	4	0.26	0.07	1	0.062	< 0.01	0.01	< 0.01	< 0.01	< 0.01	Parent: 0.065 Total: 0.084
		0.26	0.07	1	0.068	< 0.01	0.01			< 0.01	
		0.25	0.07								
		0.24	0.07								
Canada, Branchton 2007 (Market More) PTHIO_073	4	0.26	0.07	1	0.13	< 0.01	0.032	< 0.01	< 0.01	< 0.01	Parent: 0.11 Total: 0.13
		0.25	0.07	1	0.088	< 0.01	0.031			< 0.01	
		0.25	0.07								
		0.26	0.07								
USA (TX), Raymond-ville 2007 (Dasher II) PTHIO_073	4	0.26	0.07	1	0.077	< 0.01	0.017	< 0.01	< 0.01	< 0.01	Parent: 0.086 Total: 0.10
		0.25	0.07	1	0.094	< 0.01	0.014			< 0.01	
		0.26	0.07								
		0.26	0.07								
Canada, Abbotsford 2007 (Jackson Supreme F1) PTHIO_073	4	0.25	0.06	1	0.11	0.01	0.013	0.017	< 0.01	< 0.01	Parent: 0.012 Total: 0.031
				1	0.13	< 0.01	0.01	0.011		< 0.01	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 76 Residues in melons following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/h		parent	PAM	PCA	753- A-OH	753-F- DO	DM- PCA	
USA (NJ), Baptistown 2007 (Gold Star) PTHIO_073	4	0.25 0.25 0.25 0.26	0.07 0.07 0.07 0.07	Pulp							Parent: 0.22
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel							
				1	0.45	0.018	< 0.01	0.019	0.019	0.011	Total (whole fruit): 0.24
				1	0.45	0.016	< 0.01	0.017	0.016	< 0.01	
				Fruit (calc.)							
				1	0.23	0.013	< 0.01	0.014	0.013	0.01	
USA (IA), Richland 2007 (Delicious 51) PTHIO_073	4	0.25 0.25 0.26 0.25	0.08 0.08 0.09 0.08	Pulp							Parent: 0.17
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel							
				1	0.21	< 0.01	< 0.01	0.02	< 0.01	< 0.01	Total (whole fruit): 0.18
				1	0.31	< 0.01	< 0.01	0.021	< 0.01	< 0.01	
				Fruit (calc.)							
				1	0.14	< 0.01	< 0.01	0.016	< 0.01	< 0.01	
Canada, Branchton 2007 (Earli Queen) PTHIO_073	4	0.24 0.25 0.25 0.25	0.07 0.07 0.07 0.07	Pulp							Parent: 0.27
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel							
				1	0.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (whole fruit): 0.28
				1	0.34	< 0.01	0.01	< 0.01	< 0.01	< 0.01	
				Fruit (calc.)							
				1	0.27	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Branchton 2007 (Primo) PTHIO_073	4	0.25	0.07	Pulp							Parent: 0.18
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel							
				1	0.27	< 0.01	0.013	0.01	< 0.01	< 0.01	Total (whole fruit): 0.19
				1	0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Fruit (calc.)							
				1	0.2	< 0.01	0.01	< 0.01	< 0.01	< 0.01	
				1	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/h		parent	PAM	PCA	753- A-OH	753-F- DO	DM- PCA	
USA (TX), Raymond-ville 2007 (Ma.s.n- stream) PTHIO_073	4	0.25	0.07	Pulp 1 1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.098
					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel 1 1	0.12	0.014	0.019	< 0.01	0.011	< 0.01	Total (whole fruit): 0.12
					0.16	0.019	0.023	< 0.01	0.017	< 0.01	
				Fruit (calc.) 1 1	0.086	0.011	0.015	< 0.01	0.009	< 0.01	
					0.11	0.015	0.021	< 0.01	0.014	< 0.01	
USA (CA), Fresno 2007 (Athena) PTHIO_073	4	0.05	0.06	Pulp 1 1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.26
					< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel 1 1	1.1	0.071	0.059	0.019	0.078	< 0.01	Total (whole fruit): 0.30
					0.51	0.036	0.034	< 0.01	0.029	< 0.01	
				Fruit (calc.) 1 1	0.35	0.039	0.034	0.01	0.028	< 0.01	
					0.16	0.014	0.014	< 0.01	0.012	< 0.01	
USA (CA), Sanger 2007 (Hale's Best Jumbo) PTHIO_073	4	0.25	0.05	Pulp 1 1	< 0.01	< 0.01	0.012	< 0.01	< 0.01	< 0.01	Parent: 0.17
					< 0.01	< 0.01	0.018	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel 1 1	0.39	0.026	0.03	< 0.01	0.016	< 0.01	Total (whole fruit): 0.19
					0.42	0.029	0.032	< 0.01	0.015	< 0.01	
				Fruit (calc.) 1 1	0.17	0.014	0.039	< 0.01	0.01	< 0.01	
					0.16	0.014	0.059	< 0.01	0.01	< 0.01	
USA (CA), Porterville 2007 (Cantaloupe Top Mark) PTHIO_073	4	0.25	0.07	Pulp 1 1	< 0.01	< 0.01	0.011	< 0.01	< 0.01	< 0.01	Parent: 0.26
					< 0.01	< 0.01	0.013	< 0.01	< 0.01	< 0.01	Total (pulp): < 0.01
				Peel 1 1	0.3	0.016	0.016	0.01	0.011	< 0.01	Total (whole fruit): 0.29
					0.89	0.032	0.03	0.025	0.029	< 0.01	
				Fruit (calc.) 1 1	0.17	0.011	0.025	< 0.01	< 0.01	< 0.01	
					0.35	0.023	0.038	0.013	0.014	< 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 77 Residues in winter squash following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
USA (Bumpass) 2007 (Prolific) PTHIO_073	4	0.26 0.25 0.27 0.27	0.09 0.08 0.09 0.09	1 1	0.059 0.075	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	< 0.01 < 0.01	Parent: 0.067 Total (whole fruit): 0.086
USA (FL), Bradenton 2007 (Enterprise) PTHIO_073	4	0.25 0.24 0.24 0.24	0.05 0.05 0.05 0.05	1 1	0.17 0.19	0.019 0.017	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	0.018 0.016	Parent: 0.18 Total (whole fruit): 0.21
USA (KS), Gardner 2007 (Black Beauty) PTHIO_073	4	0.25	0.07	1 1	0.12 0.12	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	0.044 0.045	Parent: 0.12 Total (whole fruit): 0.14
USA (CA), Fresno 2007 (Jackpot F1) PTHIO_073	4	0.25	0.06	1 1	0.25 0.16	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	0.01 < 0.01	< 0.01< 0.01	< 0.01 < 0.01	Parent: 0.21 Total (whole fruit): 0.22
Canada, Abbotsford 2007 (Noche F1) PTHIO_073	4	0.25 0.26 0.26 0.25	0.06 0.06 0.06 0.06	1 1	0.11 0.098	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	< 0.01 < 0.01	Parent: 0.10 Total (whole fruit): 0.12

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 78 Residues in bell peppers following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
Protected											
Italy, Casteldidone 2009 (Comune) PTHIO_070	2	0.2 0.59	0.04 0.04	1	0.65	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Lleida 2009 (Lamuro) PTHIO_070	2	0.2 0.61	0.04 0.04	1	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Berja 2009 (Fire Flame) PTHIO_070 Reverse decline	2	0.2 0.59	0.04 0.04	0 ^a 0	0.075 0.4	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01< 0.01	< 0.01< 0.01	< 0.01 < 0.01	
	2	0.2 0.59	0.04 0.04	1	0.53	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.59	0.04 0.04	3	0.69	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application		DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA	
	2	0.2 0.59	0.04 0.04	7	0.27	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.61	0.04 0.04	14	0.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
France (South), Pact 2009 (Hannibal) PTHIO_070	2	0.2 0.61	0.04 0.04	1	0.53	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Chalkidona 2009 (Magnisias) PTHIO_070	2	0.2 0.61	0.04 0.04	1	0.5	< 0.01	< 0.01	0.01	< 0.01	< 0.01
Greece, Nea Magnisia 2009 (Raikon) PTHIO_070	2	0.2 0.59	0.04 0.04	1	0.63	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
Italy, Poirino 2009 (Sienor Quadrato Carmagnola) PTHIO_070 Reverse decline	2	0.2 0.61	0.04 0.04	0 ^a 0	0.029 0.15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
	2	0.21 0.6	0.04 0.04	1	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.6	0.04 0.04	3	0.077	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.59	0.04 0.04	7	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.61	0.04 0.04	14	0.1	< 0.01	< 0.01	0.01	< 0.01	< 0.01
France (North), St. Denis En Val 2009 (Starter) PTHIO_070 Reverse decline	2	0.2 0.6	0.04 0.04	0 ^a 0	0.12 0.52	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
	2	0.2 0.6	0.04 0.04	1	0.43	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.6	0.04 0.04	3	0.29	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.6	0.04 0.04	7	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.21 0.61	0.04 0.04	14	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
France (North), Olivet 2009 (Norene) PTHIO_070	2	0.2 0.61	0.04 0.04	0 ^a 0	0.087 0.58	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
	2	0.21 0.6	0.04 0.04	1	0.64	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.6	0.04 0.04	3	0.55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.61	0.04 0.04	7	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
	2	0.2 0.6	0.04 0.04	14	0.62	< 0.01	< 0.01	0.011	< 0.01	< 0.01

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b	
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM- PCA		
Outdoor												
USA (GA), Chula 2008 (Excursion) PTHIO_069	3	0.36	0.13	0	0.15	< 0.01	< 0.01	0.011	< 0.01	< 0.01	Parent: 0.19 Total: 0.20	
		0.35	0.12		0.22	< 0.01	< 0.01	0.014	< 0.01	< 0.01		
		0.36	0.12									
USA (FL), Hobe Sound 2008 (Revolution) PTHIO_069	3	0.36	0.1	0	0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.21 Total: 0.22	
		0.36	0.1		0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
		0.36	0.09									
USA (IA), Richland 2008 (California Wonder) PTHIO_069	3	0.35	0.18	0 ^a	0.027	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.15 Total: 0.16	
				0 ^a	0.018	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				0	0.072	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				0	0.091	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				1	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				1	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				3	0.09	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				3	0.099	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				7	0.078	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				7	0.085	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				10	0.059	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
				10	0.069	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
Canada, St. Marc-sur- Richilieu 2008 (Bell Boy) PTHIO_069	3	0.35	0.14	0	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.18 Total: 0.2	
		0.37	0.14		0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
		0.35	0.14									
Canada, Branchton 2008 (Socrates) PTHIO_069	3	0.35	0.18	0	0.91	0.012	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.77 Total: 0.79	
		0.35	0.18		0.63	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
		0.36	0.18									
Canada, Branchton 2008 (Red Knight) PTHIO_069	3	0.39	0.2	0	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.19 Total: 0.20	
		0.36	0.18		0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
		0.36	0.18									
Canada, Thorndale 2008 (Aristole) PTHIO_069	3	0.36	0.14	0	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.17 Total: 0.19	
		0.36	0.14		0.2	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
		0.35	0.14									
Canada, Lakeside 2008 (Aristole) PTHIO_069	3	0.36	0.14	0	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.17 Total: 0.18	
		0.35	0.14		0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01
		0.38	0.14									
USA (TX), Raymondville 2008 (Camelot)	3	0.36	0.12	0	0.14	< 0.01	< 0.01	0.011	< 0.01	< 0.01	Parent: 0.15 Total: 0.16	
				0	0.15	< 0.01	< 0.01	0.012	< 0.01	< 0.01		

DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (MN), Paynesville 2008 (Conchos) PTHIO_069	3	0.36	208	0 0	0.54 0.6	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.57 Total: 0.59
Canada, St. Marc- sur-Richilieu 2008 (Jalapeno) PTHIO_069	3	0.35	250	0 0	0.37 0.34	0.012 0.01	< 0.01 < 0.01	0.037 0.032	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.36 Total: 0.38
Canada, St. Marc- sur-Richilieu 2008 (Hungarian Hot Wax) PTHIO_069	3	0.36 0.36 0.35	259 262 253	0 0	0.91 0.51	0.015 < 0.01	< 0.01 < 0.01	0.027 0.015	0.028 0.015	< 0.01 < 0.01	Parent: 0.71 Total: 0.73
Canada, Branchton 2008 (Inferno) PTHIO_069	3	0.38 0.37 0.33	200 200 200	0 0	0.36 0.3	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.33 Total: 0.35
Canada, Branchton 2008 (Budapest) PTHIO_069	3	0.36 0.37 0.37	200 200 200	0 0	0.16 0.18	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.17 Total: 0.19
Canada, Thorndale 2008 (Hungarian Wax) PTHIO_069	3	0.36 0.36 0.35	250 250 250	0 0	1.7 1.4	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 1.6 Total: 1.6
USA (TX), Claude 2008 (TAM Jalapeno) PTHIO_069	3	0.36 0.35 0.36	272 251 250	0 0	0.26 0.55	0.01 0.022	< 0.01 < 0.01	0.026 0.043	0.028 0.055	< 0.01 < 0.01	Parent: 0.41 Total: 0.44

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (PA), Germansville 2009 (Mirai) PTHIO_099	2	0.36	0.11	7	< <u>0.01</u>	< <u>0.01</u>	0.024	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.35	0.11	7	< <u>0.01</u>	< <u>0.01</u>	0.02	< 0.01	< 0.01	< 0.01	
USA (GA), Chula 2009 (Triple Sweet) PTHIO_099	2	0.35	0.12	7	< <u>0.01</u>	< <u>0.01</u>	0.01	< 0.01	< 0.01	0.015	Parent: < 0.01 Total: < 0.01
				7	< <u>0.01</u>	< <u>0.01</u>	0.011	< 0.01	< 0.01	0.013	
USA (FL), Oviedo 2009 (Sugar Buns Hybrid) PTHIO_099	2	0.37	0.13	7	< <u>0.01</u>	< <u>0.01</u>	0.047	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.13	7	< <u>0.01</u>	< <u>0.01</u>	0.05	< 0.01	< 0.01	< 0.01	
Canada, Branchton 2009 (Ambrosia) PTHIO_099	2	0.37	0.18	7	< <u>0.01</u>	< <u>0.01</u>	0.011	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				7	< <u>0.01</u>	< <u>0.01</u>	0.01	< 0.01	< 0.01	< 0.01	
Canada, St. Marc-sur- Richelieu 2009 (Mirai 336) PTHIO_099	2	0.35	0.18	7	< <u>0.01</u>	< <u>0.01</u>	0.019	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.18	7	< <u>0.01</u>	< <u>0.01</u>	0.014	< 0.01	< 0.01	< 0.01	
USA (MN), Paynesville 2009 (Jubilee) PTHIO_099	2	0.37	0.26	7	< <u>0.01</u>	< <u>0.01</u>	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.26	7	< <u>0.01</u>	< <u>0.01</u>	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (KS), Lexena 2009 (Peaches and Cream) PTHIO_099	2	0.36	0.25	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	
				7	< 0.01	< 0.01	0.014	< 0.01	< 0.01	< 0.01	
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	
				10	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Taber 2009 (King Cob) PTHIO_099	2	0.35	0.23	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Live Oak 2009 (Bodacious Sweet) PTHIO_099	2	0.36	0.11	7	< 0.01	< 0.01	< 0.01	0.023	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				7	< 0.01	< 0.01	< 0.01	0.013	< 0.01	< 0.01	
USA (OR), Parkdale 2009 (Serendipity) PTHIO_099	2	0.35	0.19	7	< 0.01	< 0.01	0.015	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.24	7	< 0.01	< 0.01	0.013	< 0.01	< 0.01	< 0.01	
USA (OR), Portland 2009 (Nantasket) PTHIO_099	2	0.35	0.74	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 81 Residues in tomatoes following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
Protected											
France (South), Pact 2007 (Felicia) PTHIO_067	2	0.2 0.58	0.04 0.04	0 ^a	0.096	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.38	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Nea Magnisia 2007 (Primadona) PTHIO_067	2	0.2 0.6	0.04 0.04	1	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
Italy, Mediglia 2007 (Naram) PTHIO_067	2	0.19 0.59	0.04 0.04	0 ^a	0.066	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.27	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.31	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Lleida 2007 (not reported) PTHIO_067	2	0.2 0.59	0.04 0.04	1	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Los Palacios 2007 (Jenaro) PTHIO_067	2	0.2 0.59	0.04 0.04	0 ^a	0.06	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.19	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.24	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Los Palacios 2008 (Hilton) PTHIO_067	2	0.21 0.6	0.04 0.04	1	0.086	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Mediglia 2008 (Birichino) PTHIO_067	2	0.2 0.59	0.04 0.04	0 ^a	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.85	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Nea Magnisia 2008 (Winner F1) PTHIO_067	2	0.2 0.62	0.04 0.04	0 ^a	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.76	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.6	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.76	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.46	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Pact 2008 (Felicia) PTHIO_067	2	0.2 0.6	0.04 0.04	0 ^a	0.045	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.092	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.12	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Belgium, Eemegem 2008 (Growdena) PTHIO_067	2	0.2 0.59	0.04 0.04	0 ^a	0.13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	1.1	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				1	0.65	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	0.58	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.74	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.76	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Belgium, Kools- kamp 2008 (Plaisance) PTHIO_067	2	0.2 0.59	0.04 0.04	1	0.84	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Outdoor											

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
France (South), Vauna-veyes 2007 (Perfect peel) PTHIO_068	2	0.19 0.58	0.04 0.04	1	0.24	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Lleida 2007 (Caramba) PTHIO_068 Reverse decline	2	0.2 0.59	0.04 0.04	0 ^a 0	0.035 0.29	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
	2	0.2 0.59	0.04 0.04	1	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.59	0.04 0.04	3	0.29	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.59	0.04 0.04	7	0.21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.21 0.6	0.04 0.04	14	0.14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Platanos 2007 (Optima) PTHIO_068	2	0.2 0.6	0.04 0.04	1	0.62	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Aguadulce 2007 (Manitu) PTHIO_068 Reverse decline	2	0.2 0.6	0.04 0.04	0 ^a 0	0.057 0.35	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
	2	0.2 0.6	0.04 0.04	1	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	3	0.16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.21 0.59	0.04 0.04	7	0.22	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.19 0.59	0.04 0.04	14	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Santa Cristina 2007 (Perfect peel) PTHIO_068 Reverse decline	2	0.19 0.6	0.04 0.04	0 ^a 0	0.12 0.85	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
	2	0.2 0.6	0.04 0.04	1	0.5	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.19 0.6	0.04 0.04	3	0.082	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.190.61	0.04 0.04	7	0.27	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.59	0.04 0.04	14	0.32	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Vaunaveys 2008 (Perfect peel) PTHIO_068 Reverse decline	2	0.2 0.6	0.04 0.04	0 ^a 0	< 0.01 0.042	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
	2	0.2 0.59	0.04 0.04	1	0.031	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	3	0.18	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	7	0.012	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg _b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
	2	0.2 0.59	0.04 0.04		0.043	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Greece, Chalkidona 2008 (Formula) PTHIO_068	2	0.2 0.63	0.04 0.04	1	0.58	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Spain, Aguadulce 2008 (Manitu) PTHIO_068 Reverse decline	2	0.2 0.6	0.04 0.04	0 ^a 0	< 0.01 0.082	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
	2	0.2 0.6	0.04 0.04	1	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	3	0.11	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.6	0.04 0.04	7	0.078	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.2 0.61	0.04 0.04	14	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Italy, Santa Cristina 2008 (Perfect peel) PTHIO_068	2	0.2 0.6	0.04 0.04	1	0.35	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Berwick 2008 (Scotia) PTHIO_069	3	0.36 0.36 0.35	0.08 0.08 0.09	0 0	0.5 0.31	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.41 Total: 0.42
USA (GA), Chula 2008 (Crista) PTHIO_069	3	0.36 0.36 0.36	0.13 0.12 0.12	0 0	0.24 0.24	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.24 Total: 0.26
USA (FL), Bradenton 2008 (4 FL 47) PTHIO_069	3	0.35 0.35 0.36	0.04 0.04 0.04	0 0	0.43 0.37	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.4 Total: 0.42
USA (FL), Oviedo 2008 (Better Boy) PTHIO_069	3	0.37	0.13	0 0	0.14 0.16	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.15 Total: 0.17
USA (OH), Richwood 2008 (Jet Star) PTHIO_069	3	0.36	0.22	0 ^a 0 ^a 0 0 1 1 3 3 7 7 10 10	0.48 0.38 1.2 0.87 1.1 1.3 1.7 1.1 0.83 0.69 0.58 0.75	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.012 < 0.01 0.012 < 0.01 0.015 0.013	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.012 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.014 < 0.01 0.015 < 0.01 0.015 0.013	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.015 0.015 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.015 0.015 < 0.01	Parent: 1.4 Total: 1.4

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (KS), Lenexa 2008 (Early Girl) PTHIO_069	3	0.36	0.12	0 0	0.46 0.37	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.42 Total: 0.43
Canada, St. Marc-sur- Richelieu 2008 (Big Beet) PTHIO_069	3	0.34 0.38 0.32	0.14 0.14 0.14	0 0	0.11 0.059	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.085 Total: 0.10
Canada, St. Marc-sur- Richelieu 2008 (Mountain Spring) PTHIO_069	3	0.34 0.31 0.4	0.14 0.14 0.14	0 0	0.2 0.17	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.19 Total: 0.20
Canada, Branchton 2008 (TSH 4) PTHIO_069	3	0.37 0.34 0.36	0.18 0.17 0.18	0 0	0.16 0.17	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.17 Total: 0.18
Canada, Branchton 2008 (Heinz- 9553) PTHIO_069	3	0.37 0.36 0.37	0.18 0.18 0.18	0 0	0.26 0.28	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.27 Total: 0.29
Canada, Branchton 2008 (Heinz 9487) PTHIO_069	3	0.36 0.36 0.35	0.18 0.18 0.17	0 0	0.27 0.44	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.36 Total: 0.37
Canada, Thorndale 2008 (H9314) PTHIO_069	3	0.37 0.35 0.36	0.14 0.14 0.14	0 0	0.76 0.64	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.7 Total: 0.72
Canada, Lakeside 2008 (H9314) PTHIO_069	3	0.37 0.36 0.36	0.14 0.14 0.14	0 0	0.30 0.26	< 0.01 < 0.01	0.013 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.28 Total: 0.3
USA (CA), Fresno 2008 (H8004) PTHIO_069	3	0.35 0.35 0.36	0.13 0.13 0.13	0 ^a 0 ^a 0 0 1 1 3 3 7 7 10 10	0.22 0.23 0.42 0.30 0.27 0.27 0.33 0.26 0.23 0.26 0.16 0.2	< 0.01 < 0.01 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.36 Total: 0.38

DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (NY), Lyons 2008 (Ithaca MTO) PTHIO_083	3	0.35	0.13	0 ^a	0.84	0.015	0.012	0.022	0.01	< 0.01	Parent: 0.37 Total: 0.38
		0.36	0.13	0 ^a	0.65	0.013	0.012	0.019	< 0.01	< 0.01	
		0.35	0.13	0	1.4	0.017	0.011	0.035	0.013	< 0.01	
				0	2.9	0.023	0.015	0.04	0.017	< 0.01	
				1	1.3	0.016	0.012	0.041	0.016	< 0.01	
				1	1.6	0.018	0.011	0.035	0.018	< 0.01	
				3	0.29	0.01	< 0.01	0.021	0.01	< 0.01	
				3	0.44	0.01	< 0.01	0.019	0.01	< 0.01	
				7	0.33	0.011	< 0.01	0.013	0.011	< 0.01	
				7	0.26	0.01	< 0.01	0.01	0.01	< 0.01	
				10	0.23	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				10	0.24	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (FL), Bradenton 2008 (Ithaca) PTHIO_083	3	0.36	0.08	3 3 w/o withered leaves 3 3	1.6 2.9 0.94 0.96	0.03 0.043 0.016 0.017	0.037 0.059 0.012 0.013	0.032 0.05 0.029 0.034	0.036 0.06 < 0.01 < 0.01	0.018 0.029 0.017 0.015	Parent: 2.3 Total: 2.3
Canada, St. Marc-sur- Richilieu 2008 (Great Lake) PTHIO_083	3	0.36 0.37 0.32	0.18 0.18 0.18	3 3	0.59 0.39	0.02 0.016	0.017 0.012	0.026 0.024	0.014 < 0.01	< 0.01 < 0.01	Parent: 0.49 Total: 0.52
Canada, Princeton 2008 (Skyline) PTHIO_083	3	0.36 0.34 0.34	0.18 0.17 0.17	3 3 w/o withered leaves 3 3	0.43 0.38 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.01 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.41 Total: 0.42
Canada, Princeton 2008 (Mighty Joe) PTHIO_083	3	0.36 0.35 0.35	0.18 0.17 0.18	3 3	0.36 0.37	< 0.01 < 0.01	< 0.01 < 0.01	0.011 0.012	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.37 Total: 0.38
Canada, Thorndale 2008 (Odyssey) PTHIO_083	3	0.36 0.36 0.35	0.14 0.14 0.14	3 3	3.4 2.2	0.022 0.012	0.025 0.013	0.058 0.036	0.019 0.01	0.012 0.012	Parent: 2.8 Total: 2.8
USA (CA), Fresno 2008 (Diamondback) PTHIO_083	3	0.35	0.12	3 3 w/o withered leaves 3 3	1.6 1.6 0.067 0.025	0.055 0.064 < 0.01 < 0.01	0.04 0.048 < 0.01 < 0.01	0.032 0.035 < 0.01 < 0.01	0.12 0.14 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 1.6 Total: 1.7
USA (CA), Sanger 2008 (Side- Winder) PTHIO_083	3	0.36	0.04	3 3	0.62 0.57	0.049 0.045	0.04 0.033	0.015 0.013	0.12 0.1	< 0.01 < 0.01	Parent: 0.6 Total: 0.68

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Sanger 2008 (HXP- 6203) PTHIO_083	3	0.36	0.04	3 3	0.4 0.34	0.022 0.019	0.024 0.023	0.021 0.017	0.036 0.024	< 0.01 < 0.01	Parent: 0.37 Total: 0.41
USA (CA), Hughson 2008 (Great Lakes 659) PTHIO_083	3	0.35 0.36 0.36	0.13 0.13 0.13	3 3	4.0 2.9	0.047 0.034	0.032 0.025	0.028 0.018	0.032 0.024	< 0.01 < 0.01	Parent: 3.5 Total: 3.5
USA (CA), Guadalupe 2008 (Durango) PTHIO_083	3	0.35	0.13	3 3	1.7 2.3	0.077 0.15	0.057 0.099	0.027 0.039	0.12 0.25	< 0.01 < 0.01	Parent: 2 Total: 2.2
Canada, Surrey 2008 (Eldorado) PTHIO_083	3	0.36 0.35 0.37	0.16 0.19 0.19	3 3	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 83 Residues in leaf lettuce following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (NY), Lyons 2008 (Green Bay) PTHIO_083	3	0.36 0.35 0.36	0.13 0.13 0.13	3 3	1.2 1.1	0.028 0.026	0.019 0.018	0.029 0.025	0.021 0.018	< 0.01 < 0.01	Parent: 1.2 Total: 1.2
USA (FL), Bradenton 2008 (Green Tower) PTHIO_083	3	0.36	0.08	3 3 w/o withered leaves 3 3	1.9 1.7 1.2 1.2	0.13 0.11 0.092 0.096	0.07 0.075 0.029 0.031	0.079 0.067 0.071 0.063	0.017 0.014 < 0.01 < 0.01	0.07 0.065 0.061 0.075	Parent: 1.8 Total: 2.0
Canada, Thorndale 2008 (Grand Rapids M1) PTHIO_083	3	0.35	0.14	3 3	3.3 4.9	0.039 0.041	0.038 0.038	0.075 0.079	0.015 0.017	0.01 0.011	Parent: 4.1 Total: 4.2

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Princeton 2008 (Summer Star) PTHIO_083	3	0.37	0.18	3	1.1	0.15	0.11	0.022	< 0.01	0.15	Parent: 1.1 Total: 1.4
		0.37	0.18	3	1.1	0.14	0.095	0.02	< 0.01	0.12	
		0.36	0.18	w/o withered leaves							
				3	1.0	0.16	0.11	0.03	< 0.01	0.14	
				3	0.95	0.14	0.1	0.026	< 0.01	0.12	
Canada, St. Marc-sur- Richilieu 2008 (Grand Rapids) PTHIO_083	3	0.35	0.15	3	5.7	0.035	0.033	0.055	0.04	0.019	Parent: 5.3 Total: 5.4
		0.34	0.14	3	4.9	0.031	0.026	0.054	0.034	0.015	
		0.33	0.13								
USA (OH), Richwood 2008 (Black Seeded Simpson) PTHIO_083	3	0.36	0.18	0 ^a	1.3	0.023	0.021	0.036	< 0.01	< 0.01	Parent: 11 Total: 11
				0 ^a	2.2	0.033	0.031	0.061	< 0.01	< 0.01	
				0	11	0.036	0.032	0.085	< 0.01	< 0.01	
				0	8.7	0.025	0.023	0.039	< 0.01	< 0.01	
				1	8.6	0.064	0.047	0.086	0.057	< 0.01	
				1	7.8	0.047	0.037	0.068	0.05	< 0.01	
				3	11	0.071	0.048	0.08	0.081	< 0.01	
				3	11	0.063	0.046	0.081	0.062	< 0.01	
				7	2.0	0.03	0.024	0.047	< 0.01	< 0.01	
				7	2.0	0.032	0.029	0.04	< 0.01	< 0.01	
				10	0.87	0.017	0.014	0.028	< 0.01	0.012	
				10	0.74	0.015	0.014	0.028	< 0.01	< 0.01	
USA (CA), Fresno 2008 (Romaine) PTHIO_083	3	0.36	0.13	0 ^a	2.4	0.14	0.05	0.047	0.062	< 0.01	Parent: 4.4 Total: 4.6
		0.35	0.13	0 ^a	2.4	0.13	0.048	0.048	0.056	< 0.01	
		0.35	0.12	0	5.3	0.12	0.045	0.042	0.058	< 0.01	
				0	5.5	0.13	0.048	0.049	0.059	< 0.01	
				1	7.1	0.13	0.053	0.049	0.091	< 0.01	
				1	5.9	0.12	0.05	0.044	0.069	< 0.01	
				3	3.8	0.094	0.053	0.047	0.032	0.011	
				3	4.9	0.15	0.062	0.063	0.042	< 0.01	
				7	1.6	0.094	0.049	0.042	0.019	0.014	
				7	2.5	0.12	0.061	0.051	0.032	0.011	
				10	1.3	0.098	0.039	0.029	0.023	0.014	
				10	1.2	0.091	0.042	0.026	0.022	0.013	
USA (CA), Santa Maria 2008 (Hearts Delight) PTHIO_083	3	0.34	0.13	3	7.4	0.059	0.034	0.052	0.11	< 0.01	Parent: 7.4 Total: 7.5
		0.35	0.12	3	7.4	0.06	0.032	0.055	0.11	< 0.01	
		0.36	0.12	w/o withered leaves							
				3	2.6	0.045	0.015	0.11	< 0.01	< 0.01	
				3	2.4	0.038	0.013	0.099	< 0.01	< 0.01	
USA (CA), Corning 2008 (Tohema) PTHIO_083	3	0.35	0.19	3	2.2	0.017	0.015	0.016	< 0.01	0.018	Parent: 3.5 Total: 3.5
				3	4.8	0.028	0.022	0.022	0.015	0.023	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Sanger 2008 (HMX- 5520) PTHIO_083	3	0.35	0.05	3	2.1	0.18	0.11	0.028	0.18	0.044	Parent: 2.0 Total: 2.3
		0.36	0.04	3	1.8	0.19	0.11	0.035	0.15	0.057	
		0.36	0.04								
USA (CA), Sanger 2008 (Tehama) PTHIO_083	3	0.38	0.04	3	1.7	0.26	0.12	0.08	0.26	0.026	Parent: 1.8 Total: 2.2
		0.36	0.04	3	1.8	0.25	0.12	0.083	0.25	0.027	
		0.36	0.04								
Canada, Abbotsford 2008 (Bergams Green) PTHIO_083	3	0.35	0.16	3	1.2	0.024	0.018	0.015	< 0.01	< 0.01	Parent: 1.2 Total: 1.2
		0.36	0.19	3	1.1	0.028	0.018	0.016	< 0.01	< 0.01	
		0.36	0.19								

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 84 Residues in mustard greens following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Berwick 2009 (Southern Giant Curled) PTHIO_082	3	0.16 0.45 0.45	0.06 0.18 0.18	0 ^a	0.43	0.029	0.032	< 0.01	0.025	0.018	Parent: 23 Total: 23
				0 ^a	0.62	0.023	0.026	< 0.01	0.027	0.012	
				0	26	0.13	0.077	0.26	0.22	0.024	
				0	20	0.11	0.067	0.2	0.16	0.02	
				3	14	0.31	0.13	0.28	0.17	0.058	
				3	14	0.3	0.12	0.23	0.16	0.053	
				7	1.4	0.15	0.075	0.012	0.05	0.069	
				7	1.8	0.15	0.088	0.014	0.071	0.071	
				10	0.65	0.12	0.054	< 0.01	0.023	0.11	
				10	0.68	0.13	0.061	0.01	0.026	0.11	
USA (GA), Athens 2009 (Southern Giant Curled) PTHIO_082	3	0.15	0.07	0	9.3	0.083	0.062	< 0.01	0.2	0.011	Parent: 8.3 Total: 8.4
		0.45	0.2	0	7.2	0.089	0.068	0.01	0.22	0.011	
		0.44	0.21								
USA (NC), Seven Springs 2009 (Southern Giant Curled) PTHIO_082	3	0.16 0.46 0.45	0.08 0.18 0.18	0	27	0.36	0.21	0.089	0.82	0.022	Parent: 30 Total: 30
				0	32	0.4	0.22	0.083	1.2	0.023	
				edible part							
				0	13	0.2	0.088	0.022	0.95	0.013	
				0	19	0.28	0.12	0.044	1.1	0.016	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (FL), Hobe Sound 2009 (Florida Broadleaf) PTHIO_082	3	0.16 0.46 0.46	0.07 0.19 0.19	0 0	9.5 5.7	0.081 0.06	0.045 0.04	0.046 0.037	0.19 0.1	< 0.01 < 0.01	Parent: 7.6 Total: 7.7
USA (LA), Cheneyville 2009 (Florida Broadleaf) PTHIO_082	3	0.15 0.43 0.43	0.02 0.04 0.04	0 0	16 15	0.094 0.088	0.054 0.054	0.016 0.014	0.21 0.11	0.038 0.018	Parent: 16 Total: 16
USA (OH), Richwood 2009 (Southern Giant Curled) PTHIO_082	3	0.16 0.45 0.47	0.1 0.27 0.28	0 0 edible part 0 0	9.0 8.5 3.9 4.6	0.11 0.077 0.079 0.084	0.063 0.047 0.046 0.04	0.021 0.015 < 0.01 < 0.01	0.13 0.12 0.1 0.073	0.01 < 0.01 < 0.01 < 0.01	Parent: 8.8 Total: 8.9
USA (OK), Hinton 2009 (Florida Broadleaf) PTHIO_082	3	0.15 0.44 0.47	0.33 0.92 1.0	0 0	18 16	0.087 0.095	0.065 0.063	0.1 0.089	0.45 0.49	0.011 0.012	Parent: 17 Total: 17
USA (CA), Porterville 2009 (Florida Broadleaf) PTHIO_082	3	0.16 0.44 0.45	0.05 0.15 0.16	0 0 edible part 0 0	8.8 8.6 4.6 4.8	0.11 0.16 0.16 0.14	0.063 0.046 0.04 0.032	0.01 0.013 < 0.01 < 0.01	0.41 0.3 0.18 0.26	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 8.7 Total: 9.0
USA (OR), Hillsboro 2009 (Green Wave) PTHIO_082	3	0.16 0.46 0.47	0.05 0.15 0.16	0 0	9.9 11	0.054 0.06	0.028 0.032	< 0.01 < 0.01	0.091 0.093	< 0.01 < 0.01	Parent: 10 Total: 11

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 85 Residues in spinach following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A- OH	753- F-DO	DM- PCA	
USA (NY), Alton 2008 (Melody) PTHIO_083	3	0.36 0.35 0.36	0.13 0.13 0.13	3 3	2.2 3.2	0.3 0.27	0.15 0.13	0.045 0.044	0.036 0.035	0.016 0.013	Parent: 2.7 Total: 3.2

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A- OH	753- F-DO	DM- PCA	
USA (GA), Chula 2008 (Space F1) PTHIO_083	3	0.36	0.16	3 3 w/o withered leaves 3 3	2.7 2.9 2.4 2.5	0.58 0.58 0.46 0.46	0.37 0.4 0.24 0.3	0.059 0.055 0.038 0.056	0.05 0.056 0.019 0.018	0.54 0.5 0.41 0.46	Parent: 2.8 Total: 3.9
Canada, St. Marc-sur- Richilieu 2008 (Tyee) PTHIO_083	3	0.36 0.36 0.37	0.14 0.14 0.14	3 3	1.4 1.5	0.21 0.2	0.11 0.11	0.04 0.04	0.017 0.02	0.031 0.034	Parent: 1.5 Total: 1.8
Canada, Branchton 2008 (Whale) PTHIO_083	3	0.36 0.35 0.35	0.18 0.180.17	3 3 w/o withered leaves 3 3	0.76 0.85 0.55 0.62	0.075 0.08 0.065 0.063	0.056 0.065 0.053 0.052	0.022 0.026 0.022 0.025	< 0.01 < 0.01 < 0.01 < 0.01	0.019 0.019 0.021 0.018	Parent: 0.81 Total: 0.95
Canada, Thorndale 2008 (Unipack 12 Hybrid) PTHIO_083	3	0.36 0.35 0.36	0.14 0.14 0.14	3 3	6.1 10	0.11 0.12	0.11 0.11	0.038 0.047	0.039 0.061	0.028 0.02	Parent: 8.1 Total: 8.3
USA (TX), Raymondville 2008 (Melody) PTHIO_083	3	0.36	0.13	3 3	13 9.4	0.43 0.4	0.2 0.18	0.056 0.057	0.15 0.095	0.036 0.037	Parent: 11 Total: 12
USA (TX), Uvalde 2008 (Siena) PTHIO_083	3	0.36	0.15	3 3	13 17	0.24 0.22	0.12 0.14	0.035 0.036	0.087 0.12	0.021 0.019	Parent: 15 Total: 15
USA (CA), Santa Maria 2008 (Mizano) PTHIO_083	3	0.35	0.13	3 3 w/o withered leaves 3 3	2.7 2.8 1.8 3.3	0.18 0.18 0.13 0.14	0.062 0.072 0.049 0.053	0.071 0.085 0.17 0.14	0.019 0.018 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 2.8 Total: 3.1
USA (CA), Sanger 2008 (Hybrid 424) PTHIO_083	3	0.36 0.36 0.37	0.04 0.04 0.04	3 3	2.0 2.0	0.5 0.51	0.26 0.25	0.044 0.043	0.24 0.26	0.05 0.065	Parent: 2 Total: 2.9

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A- OH	753- F-DO	DM- PCA	
Canada, Abbotsford 2008 (Unipack 12 F1) PTHIO_083	3	0.37	0.17	3	1.2	0.11	0.075	0.019	0.016	0.02	Parent: 1.2 Total: 1.4
		0.36	0.17	3	1.1	0.11	0.063	0.018	0.016	0.017	
		0.36	0.19								

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 86 Residues in turnip leaves following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (GA), Athens 2009 (Shogoin) PTHIO_088	2	0.46	0.21	0	13	0.054	0.04	0.027	0.2	0.011	Parent: 13 Total: 13
		0.46	0.2	0	13	0.066	0.048	0.038	0.24	0.012	
USA (GA), Chula 2009 (Appin) PTHIO_088	2	0.45	0.15	0	20	0.21	0.074	0.077	0.16	0.084	Parent: 20 Total: 20
		0.46	0.15	0	19	0.2	0.073	0.083	0.17	0.098	
USA (LA), Cheneyville 2009 (Appin) PTHIO_088	2	0.46	0.22	0	27	0.11	0.049	0.026	0.09	0.021	Parent: 23 Total: 23
		0.46	0.24	0	19	0.086	0.043	0.022	0.07	0.018	
USA (IL), Rochelle 2009 (Appin) PTHIO_088	2	0.45	0.97	0	4.3	0.036	0.023	0.01	0.01	< 0.01	Parent: 4.8 Total: 4.9
				0	5.3	0.043	0.03	0.013	0.016	< 0.01	
USA (TX), Uvalde 2009 (Appin) PTHIO_088	2	0.46	0.05	0	4.5	0.026	0.015	0.01	0.13	< 0.01	Parent: 4.0 Total: 4.0
				0	3.5	0.029	0.016	0.014	0.076	< 0.01	
USA (CA), Madera 2009 (Appin) PTHIO_088	2	0.48	0.17	0	7.3	0.15	0.072	0.086	0.18	0.044	Parent: 6.1 Total: 6.4
		0.46	0.17	0	4.9	0.14	0.056	0.06	0.14	0.034	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 87 Residues in celery sticks following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A- OH	753-F- DO	DM- PCA	
USA (FL), Oviedo 2008 (Utah) PTHIO_083	3	0.37	0.13	3 3 trimmed 3 3	5.7 5.8 2.8 4.8	0.19 0.17 0.16 0.16	0.071 0.069 0.059 0.063	0.036 0.033 0.028 0.028	0.01 0.093 0.035 0.043	0.052 0.048 0.052 0.053	Parent: 5.8 Total: 6.1
USA (MI), Lainburg 2008 (Duchess) PTHIO_083	3	0.36 0.36 0.37	0.22 0.22 0.22	3 3	2.9 2.7	0.041 0.039	0.049 0.036	0.013 0.014	0.039 0.034	< 0.01 < 0.01	Parent: 2.8 Total: 2.9
Canada, St. Marc-sur- Richilieu 2008 (Victoria) PTHIO_083	3	0.38 0.36 0.36	0.14 0.14 0.14	3 3	1.9 2.1	0.019 0.018	0.013 0.014	0.012 0.02	0.017 0.018	< 0.01 < 0.01	Parent: 2.0 Total: 2.0
Canada, Branchton 2008 (Sabroso) PTHIO_083	3	0.36 0.35 0.35	0.18 0.18 0.18	2 2 trimmed 2 2	9.1 8.2 9.1 5.4	0.064 0.068 0.057 0.042	0.071 0.065 0.044 0.031	0.02 0.018 0.022 0.015	0.074 0.068 0.055 0.032	0.021 0.023 0.021 0.017	Parent: 8.7 Total: 8.8
Canada, Princeton 2008 (Sabrosa) PTHIO_083	3	0.38 0.35 0.35	0.19 0.17 0.17	3 3	2.6 2.3	0.067 0.068	0.026 0.026	< 0.01 < 0.01	0.012 0.011	0.042 0.042	Parent: 2.5 Total: 2.6
Canada, Thorndale 2008 (Sabro 50) PTHIO_083	3	0.36	0.14	3 3	1.7 1.6	0.015 0.013	0.029 0.03	0.01 < 0.01	0.014 0.012	< 0.01 < 0.01	Parent: 1.7 Total: 1.7
Canada, Lakeside 2008 (Duchess) PTHIO_083	3	0.37 0.36 0.34	0.14 0.14 0.14	3 3	3.8 2.2	0.072 0.048	0.075 0.054	0.021 0.015	0.07 0.046	0.016 0.011	Parent: 3 Total: 3.1
USA (CA), Santa Maria 2008 (Conquistador) PTHIO_083	3	0.35 0.35 0.35	0.13 0.09 0.12	3 3 trimmed 3 3	2.7 3.5 1.3 1.7	0.042 0.041 0.034 0.033	0.03 0.026 0.018 0.017	< 0.01 < 0.01 0.01 0.01	0.043 0.036 0.01 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 3.1 Total: 3.2
USA (CA), Greenfield 2008 (Sonora) PTHIO_083	3	0.360.36 0.36	0.13 0.12 0.12	3 3	2.0 2.2	0.11 0.13	0.059 0.059	0.01 0.011	0.082 0.097	< 0.01 < 0.01	Parent: 2.1 Total: 2.3

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
USA (CA), Hughson 2008 (Conquistador) PTHIO_083	3	0.36	0.13	3 3	5.3 5.3	0.038 0.048	0.034 0.04	0.024 0.027	0.012 0.014	< 0.01 < 0.01	Parent: 5.3 Total: 5.4
USA (CA), Sanger 2008 (Mission) PTHIO_083	3	0.36	0.04	3 3	5.2 5.3	0.18 0.16	0.09 0.1	0.023 0.02	0.15 0.17	< 0.01 < 0.01	Parent: 5.3 Total: 5.6

^a:mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 88 Residues in legume beans following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753-F- DO	DM- PCA	
Succulent beans with pods											
Canada, Berwick 2009 (Provider) PTHIO_084	3	0.16 0.460.45	0.06 0.18 0.18	0 0	0.84 0.7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.023 0.022	Parent: 0.77 Total: 0.79
USA (GA), Chula 2009 (Terminator) PTHIO_084	3	0.16 0.460.46	0.06 0.16 0.16	0 0 w/o tips 0 0	0.97 1.0 0.8 0.92	0.033 0.032 0.033 0.037	0.016 0.014 0.013 0.013	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.041 0.044 0.045 0.06	Parent: 0.99 Total: 1.0
USA (FL), Hobe Sound 2009 (Eliminator) PTHIO_084	3	0.16 0.47 0.47	0.07 0.19 0.19	0 0	0.14 0.17	< 0.01 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.16 Total: 0.18
USA (MN), Paynesville 2009 (Glenoble) PTHIO_084	3	0.15 0.45 0.45	0.11 0.32 0.32	0 0 w/o tips 0 0	1.3 1.7 0.68 0.42	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 1.5 Total: 1.5
USA (KS), Lenexa 2009 (Contender) PTHIO_084	3	0.16 0.46 0.46	0.11 0.33 0.33	0 0	1.0 0.8	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.011 < 0.01	Parent: 0.9 Total: 0.92

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
Canada, Branchton 2009 (Sea Biscuit) PTHIO_084	3	0.16 0.49 0.44	0.02 0.05 0.05	0 0	0.62 0.31	0.014 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.47 Total: 0.49
Canada, St. Marc-sur- Richilieu 2009 (Bronco) PTHIO_084	3	0.16 0.45 0.45	0.32 0.96 0.96	0 0	0.12 0.13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.13 Total: 0.14
USA (OR), Parkdale 2009 (Blue Lake 274) PTHIO_084	3	0.16 0.46 0.48	0.09 0.25 0.25	0 0 w/o tips 0 0	0.46 0.26 0.22 0.26	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.36 Total: 0.38
Succulent beans without pods											
USA (GA), Athens 2009 (Jackson Wonder) PTHIO_084	3	0.16 0.46 0.45	0.07 0.19 0.19	0 0	0.058 0.053	0.01 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.056 Total: 0.075
USA (GA), Chula 2009 (Cangreen) PTHIO_084	3	0.15 0.44 0.45	0.04 0.12 0.12	0 0	0.034 0.036	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.035 Total: 0.054
USA (NC), Seven Springs 2009 (Cangreen) PTHIO_084	3	0.16 0.45 0.45	0.08 0.2 0.19	0 0	0.02 0.029	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.025 Total: 0.043
USA (AL), Auburn 2009 (White Dixie Butter) PTHIO_084	3	0.16 0.46 0.45	0.75 0.75 0.75	0 0	0.094 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.052 Total: 0.071
USA (ND), Gardner 2009 (Tender Green) PTHIO_084	3	0.16 0.48 0.46	0.02 0.05 0.05	0 0	0.026 0.022	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.024 Total: 0.043
USA (CA), Porterville 2009 (Jade) PTHIO_084	3	0.16 0.45 0.47	0.05 0.08 0.16	0 0	0.12 0.13	0.021 0.02	0.034 0.035	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.13 Total: 0.16

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753-F- DO	DM- PCA	
USA (OR), Parkdale 2009 (Blue Lake 274) PTHIO_084	3	0.16 0.45 0.46	0.35 0.94 0.94	0 0	0.01 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.011 Total: 0.029

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 89 Residues in legume peas following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Succulent peas with pods											
USA (KS), Lenexa 2009 (Dwarf Grey Sugar) PTHIO_084	3	0.16 0.46 0.46	0.11 0.32 0.32	0 0	1.5 1.5	0.029 0.028	0.021 0.026	< 0.01 0.012	0.066 0.077	0.013 0.017	Parent: 1.5 Total: 1.6
USA (MN), Paynesville 2009 (Sugar Bon) PTHIO_084	3	0.15 0.45 0.45	0.11 0.32 0.32	0 0 w/o tips 0 0	0.88 0.88 1.7 0.69	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.88 Total: 0.9
USA (OH), Richwood 2009 (Super Sugar Snap) PTHIO_084	3	0.16 0.46 0.45	0.09 0.28 0.28	0 0 w/o tips 0 0	0.85 1.2 0.66 0.63	0.014 0.014 0.013 0.013	0.015 0.013 0.01 0.011	< 0.01 < 0.01 < 0.01 < 0.01	0.033 0.038 0.042 0.044	< 0.01 < 0.01 < 0.01 < 0.01	Parent: 1.0 Total: 1.1
USA (OR), Parkdale 2009 (Progress #4) PTHIO_084	3	0.16 0.46 0.46	0.08 0.25 0.24	0 0 w/o tips 0 0	1.2 1.3 0.95 0.99	0.018 0.017 0.014 0.015	< 0.01 < 0.01 < 0.01 < 0.01	0.014 0.012 < 0.01 0.01	0.067 0.063 0.052 0.065	0.024 0.02 0.022 0.024	Parent: 1.3 Total: 1.3
Succulent peas without pods											
Canada, Berwick 2009 (Laxton’s Progress) PTHIO_084	3	0.16 0.45 0.45	0.06 0.18 0.18	0 0	0.081 0.099	< 0.01 < 0.01	0.012 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.09 Total: 0.11

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (ND), Gardner 2009 (Tender Green) PTHIO_084	3	0.16 0.47 0.46	0.02 0.05 0.05	0 0	0.069 0.064	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.067 Total: 0.085
USA (MN), Geneva 2009 (Knight) PTHIO_084	3	0.16 0.46 0.46	0.1 0.25 0.27	0 0	0.15 0.13	< 0.01 < 0.01	0.025 0.026	< 0.01 < 0.01	< 0.01 < 0.01	0.011 < 0.01	Parent: 0.14 Total: 0.16
Canada, Branchton 2009 (Mr. Big) PTHIO_084	3	0.16 0.46 0.46	0.05 0.15 0.15	0 0	0.073 0.065	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.069 Total: 0.088
Canada, St. Marc-sur- Richilieu 2009 (Spring) PTHIO_084	3	0.16 0.45 0.41	0.32 0.91 0.96	0 0	0.035 0.044	< 0.01 < 0.01	0.016 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.05 Total: 0.068
USA (OR), Parkdale 2009 (Progress #9) PTHIO_084	3	0.16 0.46 0.46	0.08 0.24 0.28	0 0	0.081 0.072	< 0.01 < 0.01	0.016 0.015	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.077 Total: 0.095
USA (OR), Corvallis 2009 (Green Arrow) PTHIO_084	3	0.15 0.47 0.44	0.05 0.17 0.16	0 0	0.042 0.038	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.04 Total: 0.059

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 90 Residues in beans (pulses) following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (MI), Saginaw 2007 (Vista Navy) PTHIO_085	2	0.31	0.19	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.063 0.058	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (MN), Paynesville 2007 (Black Turtle) PTHIO_085	2	0.3	0.2	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2007 (Cranberry) PTHIO_085	2	0.31 0.3	0.16 0.15	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.012 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Branchton 2007 (White Beans) PTHIO_085	2	0.31	0.16	21 21	< 0.01 0.012	< 0.01 < 0.01	0.077 0.089	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.011 Total: 0.03
Canada, Portage la Prairie 2007 (Pintoba) PTHIO_085	2	0.31 0.3	0.16 0.15	21 21	0.036 0.03	< 0.01 < 0.01	0.044 0.038	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.033 Total: 0.052
USA (ND), Velva 2007 (Maverick) PTHIO_085	2	0.31	0.23	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.037 0.034	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Taber 2007 (Great Northern White) PTHIO_085	2	0.3 0.31	0.15 0.15	21 21	0.027 0.025	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.026 Total: 0.045
USA (TX), Levelland 2007 (Vision) PTHIO_085	2	0.31 0.3	0.22 0.22	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ID), Jerome 2007 (Othello Pinto) PTHIO_085	2	0.3	0.18	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.038 0.043	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (CA), Fresno 2007 (Black Eye Peas) PTHIO_085	2	0.3	0.16	21 21	0.18 0.21	0.05 0.055	0.027 0.029	0.011 0.014	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.2 Total: 0.29
USA (WA), Ephrata 2007 (Othello Pinto) PTHIO_085	2	0.3 0.31	0.16 0.16	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.017 0.017	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ND), Gardener 2008	2	0.32 0.31 (SC)	0.23 0.22	20 20	< 0.01 < 0.01	< 0.01 < 0.01	0.022 0.024	< 0.01 < 0.01	< 0.01 < 0.01	0.015 0.018	Parent: < 0.01 Total: < 0.01

^a:mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2007 (DS Admiral) PTHIO_085	2	0.31	0.16	22 22	0.016 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.014 0.013	Parent: 0.014 Total: 0.033
Canada, Portage la Prairie 2007 (DS Admiral) PTHIO_085	2	0.3	0.15	22 22	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ID), Jerome 2007 (Pendelton) PTHIO_085	2	0.3	0.18	21 21	0.012 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.011 Total: 0.03
USA (ID), Payette 2007 (Austrian Winter Peas) PTHIO_085	2	0.31	0.16	21 21	0.056 0.12	0.016 0.018	0.015 0.017	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.088 Total: 0.12
USA (OR), Madras 2007 (Ariel) PTHIO_085	2	0.31	0.18	24 24	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (WA), Ephrata 2007 (Dechutes) PTHIO_085	2	0.31	0.16	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.014 0.015	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (WA), Ephrata 2007 (Tonic) PTHIO_085	2	0.31	0.17	21 21	0.016 0.012	< 0.01 < 0.01	0.074 0.068	< 0.01 < 0.01	< 0.01 < 0.01	0.013 0.012	Parent: 0.014 Total: 0.033
Canada, Portage la Prairie 2007 (DS Admiral) PTHIO_085	2	0.3	0.15	20 20	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Wakaw 2007 (DS Admiral) PTHIO_085	2	0.31 0.3	0.15 0.15	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 0.014	Parent: < 0.01 Total: < 0.01
Canada, Alvera 2007 (DS Admiral) PTHIO_085	2	0.3	0.15	21 21	0.02 0.044	< 0.01 < 0.01	< 0.01 0.012	< 0.01 < 0.01	< 0.01 < 0.01	0.012 0.011	Parent: 0.032 Total: 0.051
Canada, Fort Saskatchewan 2007 (Cooper) PTHIO_085	2	0.31 0.3	0.15 0.15	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (WA), Ephrata 2008 (Kalamo) PTHIO_086	2	0.31 0.30 (SC)	0.16 0.16	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.013 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.012 Total: 0.031
	2	0.31 (EC)	0.16	21 21	0.011 0.013	< 0.01 < 0.01	0.096 0.096	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
Canada, Fort Saskatchewan 2008 (Midas) PTHIO_086	2	0.3 (SC)	0.13	22 22	0.027 0.04	< 0.01 < 0.01	0.015 0.013	< 0.01 < 0.01	< 0.01 < 0.01	0.013 0.013	Parent: 0.034 Total: 0.052
	2	0.31 0.3 (EC)	0.14 0.14	22 22	0.013 0.019	< 0.01 < 0.01	0.04 0.037	< 0.01 < 0.01	< 0.01 < 0.01	0.03 0.032	
Canada, Fort Saskatchewan 2008 (Cooper) PTHIO_086	2	0.31 0.3 (SC)	0.14 0.13	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
	2	0.33 0.31 (EC)	0.14 0.14	21 21	< 0.01 < 0.01	< 0.01 < 0.01	0.012 0.013	< 0.01 < 0.01	< 0.01 < 0.01	0.013 0.014	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 92 Residues in soya beans following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (GA), Athens 2009 (4062885) PTHIO_087	2	0.46	0.21	14 14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (NC), Seven Springs 2009 (DKB-64- 51) PTHIO_087	2	0.45	0.18	14 14	0.041 0.056	0.01 0.012	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.049 Total: 0.069
USA (LA), Cheneyville 2009 (Pioneer 95820) PTHIO_087	2	0.45	0.22	14 14	0.022 0.022	0.012 0.01	0.018 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.022 Total: 0.042
USA (LA), Cheneyville 2009 (Asgrow R4519) PTHIO_087	2	0.46	0.21	15 15	< 0.01 < 0.01	< 0.01 < 0.01	0.011 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (MO), Fisk 2009 (54-17 RR1STS) PTHIO_087	2	0.47	0.25	13 13	< 0.01 0.015	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.013 Total: 0.031
USA (MO), Dudley 2009 (Jake) PTHIO_087	2	0.47	0.25	13 13	0.026 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.022 Total: 0.041
USA (KS), Gardner 2009 (Fontanelle 407NRS) PTHIO_087	2	0.46	0.34	13 13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (IL), Carlyle 2009 (S43-N6) PTHIO_087	2	0.47	0.3	6 6	0.1 0.1	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.1 Total: 0.12
USA (MO), Tipton 2009 (48-24 MorSoy) PTHIO_087	2	0.46	0.16	13 13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (IL), Rochelle 2009 (Pioneer 92 M61) PTHIO_087	2	0.45	0.97	14 14	0.01 0.039	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.025 Total: 0.043
USA (OH), Richwood 2009 (ShurGrow 289RR) PTHIO_087	2	0.45	0.28	14 14	0.01 0.038	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.024 Total: 0.043
USA (NE), Springfield 2009 (NcT 2 A98) PTHIO_087	2	0.46	0.36	14 14	0.04 0.096	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.068 Total: 0.087
USA (IA), Richland 2009 (Pioneer 93B82) PTHIO_087	2	0.45	0.28	14 14	< 0.01 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.014 Total: 0.033
USA (MN), Geneva 2009 (Pioneer 91M80) PTHIO_087	2	0.46	0.26	15 15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (WI), Delavan 2009 (AG 2002 RR) PTHIO_087	2	0.46	0.22	14 14	0.054 0.057	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.056 Total: 0.074
Canada, Thorndale 2009 (Pioneer 91M41) PTHIO_087	2	0.46	0.23	13 13	0.17 0.25	< 0.01 0.013	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.21 Total: 0.23
Canada, St. Marc-sur- Richilieu 2009 (Pro 2590 R) PTHIO_087	2	0.45	0.96	13 13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, St. Marc-sur- Richilieu 2009 (Pro 2590 R) PTHIO_087	2	0.45	0.23	13 13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2009 (RCAT Mirra) PTHIO_087	2	0.45	0.22	13 13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Paris 2009 (91M41) PTHIO_087	2	0.44	0.22	13 13	0.012 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.012 Total: 0.03
Canada, Paris 2009 (DeKalb 2707R2) PTHIO_087	2	0.48	0.24	13 13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 93 Residues in carrot roots following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, New Glasgow 2009 (Sweetness III) PTHIO_088	2	0.43	0.15	0 0	0.088 0.082	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.085 Total: 0.10
USA (FL), Bradenton 2009 (Chantenay) PTHIO_088	2	0.47 0.44	0.12 0.12	0 0	0.13 0.11	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.12 Total: 0.14
USA (OH), Richwood 2009 (Kuroda F1) PTHIO_088	2	0.45	0.28	0 0	0.042 0.06	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.051 Total: 0.07
Canada, St. Marc-sur- Richilieu 2009 (Bolero) PTHIO_088	2	0.45 0.46	0.23 0.23	0 0	0.17 0.16	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.17 Total: 0.18
Canada, Branchton 2009 (Sugar Snax) PTHIO_088 Replicate trials	2	0.46	0.23	0 0	0.36 0.43	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.4 Total: 0.41
	2	0.46 (i.f.)	0.46	0 0	0.72 0.63	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.014 0.013	< 0.01 < 0.01	
		0.46	0.23								

DAT: days after final treatment

[illegible]

Penthiopyrad

1523

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg b		
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA			
USA (GA), Germansville 2008 (Lehigh) PTHIO_089	3	0.36	0.12	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01		
		0.37	0.12	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		0.36	0.12	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		3	0.37	0.19	0a	0.02	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	0.049
			(i.f., EC)		0a	0.024	< 0.01	< 0.01	< 0.01	< 0.01		< 0.01	0.046
				0	0.022	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.042		
	0.36		0.12	0	0.017	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.043		
	0.37		0.12	3	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.056		
				3	0.016	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.056		
				7	0.016	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.046		
				7	0.013	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.057		
				14	0.014	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.038		
				14	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.041		
				21	< 0.01	< 0.01	0.01	< 0.01	< 0.01	< 0.01	0.04		
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.032		
	3	0.36	0.12	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.011		
		0.36	0.12	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.014		
		(EC) 0.37	0.12										
	Canada, New Glasgow 2008 (Carola) PTHIO_089	3	0.34	0.16	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01	
			0.37	0.17	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01		
			0.35	0.17									
3		0.35	0.59	7	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		(i.f., EC)		7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		0.37	0.17										
0.37	0.18												
Canada, New Glasgow 2008 (Shepody) PTHIO_089	3	0.34	0.16	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01		
		0.37	0.17	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		0.35	0.17										
	3	0.35	0.59	7	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		(i.f., EC)		7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01			
		0.37	0.17										
0.37	0.18												

[illegible]

Penthiopyrad

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Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
USA (IA), Richland 2008 (Kennebec) PTHIO_089	3	0.37	0.23	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.35	0.21	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	0.012	
		0.36	0.19								
	3	0.36	0.22	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC)		7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.22								
Canada, Branchton 2008 (Norlands) PTHIO_089	3	0.35	0.09	7	0.037	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.033 Total: 0.051
		0.35	0.09	7	0.028	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.09								
	3	0.34	0.52	7	0.029	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC)		7	0.024	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.09								
	3	0.34	0.09	7	0.014	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.017 Total: 0.036
		0.35	0.09	7	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.09								
Canada, Branchton 2008 (Gold Rush) PTHIO_089	3	0.39	0.6	7	0.038	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC)		7	0.013	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.09								
	3	0.37	0.09								
Canada, Portage la Prairie 2008 (Russet Burbank) PTHIO_089	3	0.36	0.1	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.35	0.1	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.34	0.1								
	3	0.34	0.12	7	0.016	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC)		7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.1								
	3	0.35	0.1								
Canada, Taber 2008 (Russet) PTHIO_089	3	0.36	0.23	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.35	0.23	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.34	0.23								

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Sanger 2008 (Red Lozoda) PTHIO_089	3	0.35	0.11	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.015 Total: 0.034
		0.36	0.04	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.04								
	3	0.35 (EC)	0.04	7	0.014	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.04	7	0.016	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.04								
USA (ID), Jerome 2008 (Ranger) PTHIO_089	3	0.35	0.16	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.014 Total: 0.033
		0.36	0.16	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.16								
	3	0.35 (EC)	0.27	7	0.018	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.16	7	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.16								
3	0.35	0.2	7	< 0.01	< 0.01	0.012	< 0.01	< 0.01	0.031		
	0.34	0.19	7	< 0.01	< 0.01	0.013	< 0.01	< 0.01	0.032		
	(EC)	0.16									
USA (OR), Madras 2008 (Ranger Russett) PTHIO_089	3	0.36	0.19	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.38	0.19	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.19								
	3	0.36 (i.f., EC)	0.25	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.38	0.19	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.19								
USA (ID), Payette 2008 (Norkotah) PTHIO_089	3	0.35	0.15	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.15	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.35	0.15								
	3	0.36 (i.f., EC)	0.25	7	0.019	< 0.01	< 0.01	< 0.01	< 0.01	0.015	
		0.37	0.16	7	0.021	< 0.01	< 0.01	< 0.01	< 0.01	0.015	
		0.36	0.15								
3	0.35	0.15	7	< 0.01	< 0.01	0.021	< 0.01	< 0.01	0.034		
	0.35 (EC)	0.15	7	< 0.01	< 0.01	0.025	< 0.01	< 0.01	0.039		
	0.36	0.16									

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (ID), Payette 2008 (Ranger Russett) PTHIO_089	3	0.35	0.15	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.15	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.15	0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	3	0.36	0.26	0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC)		0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.16	0	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.15	3	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.013	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Abbotsford 2008 (Warba) PTHIO_089	3	0.34	0.21	7	< 0.01	< 0.01	0.014	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.360.33	0.21 0.21	7	< 0.01	< 0.01	0.011	< 0.01	< 0.01	< 0.01	
	3	0.35	0.16	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC) 0.35 0.36	0.22 0.21	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Fort Saskatchewan 2008 (Russet Burbank) PTHIO_089	3	0.35	0.14	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.36	0.14	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.36	0.14								
	3	0.39	0.1	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		(i.f., EC) 0.36 0.36	0.14 0.14	7	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

i.f. = first treatment in-furrow at sowing/planting

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (PA), Germansville 2009 (French Breakfast) PTHIO_088	2	0.46 0.47	0.17 0.18	0 0	1.2 1.1	< 0.01 < 0.01	0.01 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 1.2 Total: 1.2
USA (FL), Brandenton 2009 (Sparkler) PTHIO_088	2	0.44 0.43	0.1 0.1	0 0	0.1 0.17	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.14 Total: 0.15
USA (FL), Hobe Sound 2009 (Escala) PTHIO_088	2	0.46	0.18	0 0	0.9 0.93	< 0.01 < 0.01	0.013 0.014	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.92 Total: 0.93
USA (IL), Rochelle 2009 (Altabelle) PTHIO_088	2	0.45	0.95	0 0	< 0.01 < 0.01	< 0.01 < 0.01	0.011 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, St. Marc-sur- Richilieu 2009 (Monica) PTHIO_088	2	0.44 0.51	0.23 0.22	0 0	0.21 0.23	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.22 Total: 0.24
USA (CA), Hughson 2009 (Cherry Belle) PTHIO_088	2	0.44 0.46	0.05 0.05	0 0	0.34 0.32	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.33 Total: 0.35

DAT: days after final treatment

[illegible]

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Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (MN), Geneva 2009 (Beta 4936R) PTHIO_088	2	0.46 0.44	0.27 0.25	7 7	0.091 0.078	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.085
	2	0.46 (i.f.) 0.44	0.27 0.25	7 7	0.09 0.054	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.10
Canada, Portage la Prairie 2009 (Beta seed) PTHIO_088	2	0.45 0.46	0.21 0.21	7 7	0.016 0.013	< 0.01 < 0.01	0.016 0.017	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.015
	2	0.45 (i.f.) 0.46	0.2 0.21	7 7	0.042 0.03	< 0.01 < 0.01	0.03 0.024	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.033
Canada, Oakville 2009 (Beta seed) PTHIO_088	2	0.46 0.45	0.21 0.2	6 6	0.18 0.19	< 0.01 < 0.01	0.013 0.016	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.19
	2	0.45 (i.f.) 0.46	0.2 0.21	6 6	0.063 0.052	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.20
USA (ND), Carrington 2009 (Betaseed 86RR66) PTHIO_088	2	0.46 0.46	0.25 0.12	6 6	0.18 0.18	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.18
	2	0.45 (i.f.) 0.46	0.49 0.12	6 6	0.18 0.17	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.20
Canada, Taber 2009 (not reported) PTHIO_088	2	0.46	0.3	8 8	0.019 0.018	< 0.01 < 0.01	0.014 0.012	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.019
	2	0.44 (i.f.) 0.46	0.15 0.3	8 8	0.018 0.02	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.037
USA (TX), Levelland 2009 (Phoenix) PTHIO_088	2	0.45	0.24	8 8	0.35 0.19	< 0.01 < 0.01	0.022 0.017	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.27
	2	0.45 (i.f.) 0.45	0.48 0.24	8 8	0.14 0.15	< 0.01 < 0.01	0.013 0.013	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.29
USA (CA), Hickman 2009 (Holly SSN B7R) PTHIO_088	2	0.45	0.05	6 6	0.17 0.095	0.011 < 0.01	0.039 0.039	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.13
	2	0.46 (i.f.) 0.46	0.05 0.05	6 6	0.04 0.049	< 0.01 < 0.01	0.018 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.15
USA (CA), Porterville 2009 (Lockhart Seed Lot 31288) PTHIO_088	2	0.46 0.45	0.18 0.17	8 8	0.091 0.089	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.09
	2	0.45 (i.f.) 0.45	0.24 0.17	8 8	0.03 0.032	< 0.01 < 0.01	0.029 0.026	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Total: 0.11
USA (WA), Ephrata	2	0.45	0.24	7 7	0.026 0.039	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.033

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
2009 (Prozoo – RR) PTHIO_088	2	0.46 (i.f.)	0.33	7	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Total: 0.051
		0.45	0.24	7	0.016	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (ID), Jerome 2009 (Roundup Ready BTSC01 RR07) PTHIO_088	2	0.45	0.22	7	0.058	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.042 Total: 0.06
				7	0.025	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.44 (i.f.)	0.27	7	0.048	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.45	0.22	7	0.046	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

^a:mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

i.f. = first treatment in-furrow at sowing

Table 97 Residues in barley grain following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Aingers Green 2007 (Flagon) PTHIO_078	2	0.25	0.1	36	0.071	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
UK, Tranent 2007 (Oxbridge) PTHIO_078	2	0.26 0.25	0.1 0.1	49	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Machern 2007 (Naomi) PTHIO_078	2	0.25	0.1	54	0.069	< 0.01	0.017	0.011	< 0.01	< 0.01	
UK, Kennoway 2007 (Rebecca) PTHIO_078	2	0.26	0.1	45	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
UK, Harwich 2008 (Flagon) PTHIO_078	2	0.25	0.1	47	0.057	0.025	0.054	0.014	< 0.01	< 0.01	
	2	0.24	0.1	47	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Motterwitz 2008 (Laverda) PTHIO_078	2	0.26 (SC)	0.1	37	0.09	0.01	0.022	0.01	< 0.01	< 0.01	
	2	0.26 0.25 (EC)	0.1 0.1	37	0.071	0.011	0.021	0.017	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
	2	0.24 0.23 (SC)	0.1 0.1	37	0.058	< 0.01	0.016	0.011	< 0.01	< 0.01	
	2	0.26 0.25 (SC)	0.1 0.1	37	0.076	< 0.01	0.016	0.013	< 0.01	< 0.01	
Hungary, Velence 2008 (Nelly) PTHIO_078	2	0.24 0.26 (SC)	0.1 0.1	34	0.071	< 0.01	0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.24 (EC)	0.1 0.1	34	0.12	< 0.01	0.011	0.014	< 0.01	< 0.01	
	2	0.24 0.25 (SC)	0.1 0.1	34	0.089	< 0.01	0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 0.25 (SC)	0.1 0.1	34	0.063	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (North), Senlis le Sec 2008 (Sebastian) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	60	0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 0.25 (EC)	0.1 0.1	60	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 0.25 (SC)	0.1 0.1	60	0.039	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (SC)	0.1 0.1	60	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Charontonay 2008 (Caravan) PTHIO_078	2	0.24 0.26 (SC)	0.1 0.1	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.26 (EC)	0.1 0.1	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 0.26 (SC)	0.1 0.1	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.26 (SC)	0.1 0.1	42	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Hungary, Velence 2008 (Nelly)	2	0.24 0.26 (SC)	0.1 0.1	34	0.077	< 0.01	0.011	0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
PTHIO_078	2	0.25 (EC)	0.1	34	0.1	< 0.01	0.01	0.013	< 0.01	< 0.01	
	2	0.25 0.26 (SC)	0.1 0.1	34	0.059	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (SC)	0.1 0.1	34	0.051	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Pact 2008 (Franzi) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	45	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.26 (EC)	0.1	45	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), St Martin le Chatel 2008 (Platine) PTHIO_078	2	0.25 0.24 (SC)	0.1 0.1	39	0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.24 (EC)	0.1 0.1	39	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), St Jean de Niost 2008 (Ketos) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	35	0.063	< 0.01	< 0.01	0.011	< 0.01	< 0.01	
	2	0.24 0.25 (EC)	0.1 0.1	35	0.053	0.01	< 0.01	0.013	< 0.01	< 0.01	
USA (ND), Northwood 2009 (Pinnacle) PTHIO_079	2	0.36 0.35	0.76 0.74	55 55	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Branchton 2009 (481-6R) PTHIO_079	2	0.35 0.34	0.17 0.17	54 54	0.12 0.1	0.015 0.015	0.029 0.029	< 0.01 < 0.01	0.13 0.12	0.014 0.013	Parent: 0.11 Total: 0.14
USA (ND), Carrington 2009 (Pinnacle) PTHIO_079	2	0.37 0.36	0.2 0.19	62 62	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Carberry 2009 (CDC Bold) PTHIO_079	2	0.35	0.16	59 59	0.01 0.011	< <u>0.01</u> < <u>0.01</u>	0.011 0.011	< 0.01 < 0.01	0.013 0.015	< 0.01 < 0.01	Parent: 0.011 Total: 0.029
Canada, Justice 2009 (CDC Bold) PTHIO_079	2	0.35	0.16	47 47	0.029 0.03	< <u>0.01</u> < <u>0.01</u>	0.01 0.012	< 0.01 < 0.01	0.018 0.02	< 0.01 < 0.01	Parent: 0.03 Total: 0.048

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Alvena 2009 (Copeland) PTHIO_079	2	0.36 0.35	0.18 0.18	49 49	0.021 0.018	< 0.01 < 0.01	0.011 0.01	< 0.01 < 0.01	0.011 0.011	< 0.01 < 0.01	Parent: 0.02 Total: 0.038
Canada, Wakaw 2009 (Copeland) PTHIO_079	2	0.36 0.35	0.18 0.18	49 49	0.025 0.022	< 0.01 < 0.01	0.016 0.014	< 0.01 < 0.01	0.02 0.016	< 0.01 < 0.01	Parent: 0.024 Total: 0.042
Canada, Saskatoon 2009 (CDC Copeland) PTHIO_079	2	0.34	0.17	56 56	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Waldheim 2009 (CDC Copeland) PTHIO_079	2	0.34	0.17	53 53	< 0.01 < 0.01	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Fort Saskatchewan 2009 (Seebee) PTHIO_079	2	0.37 0.36	0.24	69 69	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Fort Saskatchewan 2009 (Seebee) PTHIO_079	2	0.36	0.34	68 68	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Lamont 2009 (Seebee) PTHIO_079	2	0.36	0.24	55 55	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Westlock 2009 (Seebee) PTHIO_079	2	0.36	0.24	60 60	0.01 < 0.01	0.01 < 0.01	0.018 0.015	< 0.01 < 0.01	0.012 0.01	< 0.01 < 0.01	Parent: 0.01 Total: 0.029

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (NY), North Rose 2009 (DeKalb DKC 46-60) PTHIO_100	4	0.35 0.36 0.36 0.35	0.19 0.19 0.19 0.19	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (NC), Seven Springs 2009 (N77-P5) PTHIO_100	4	0.35 0.36 0.34 0.35	0.19 0.28 0.26 0.27	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, St. George 2009 (38M58 RR) PTHIO_100	4	0.37 0.34 0.35 0.34	0.78 0.72 0.75 0.73	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Paris 2009 (DeKalb 3826) PTHIO_100	4	0.34 0.37 0.36 0.35	0.17 0.19 0.18 0.18	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Paris 2009 (DeKalb 4493) PTHIO_100	4	0.37 0.35 0.35 0.35	0.19 0.18 0.17 0.17	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, St. Marc-sur- Richilieu 2009 (N27B G7/CB/LL) PTHIO_100	4	0.34 0.35 0.35 0.35	0.18 0.18 0.18 0.18	6 6	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Thorndale 2009 (Pioneer R38M57) PTHIO_100	4	0.36 0.37 0.36 0.34	0.18 0.18 0.18 0.17	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (IA), Richland 2009 (Pioneer 34R67) PTHIO_100	4	0.36 0.36 0.34 0.36	0.23 0.24 0.22 0.24	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ND), Gardner 2009 (INT 65085R) PTHIO_100	4	0.36	0.19	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (KS), Gardner 2009 (6464 VT3) PTHIO_100	4	0.35 0.35 0.36 0.36	0.24 0.24 0.25 0.25	6 6	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (NE), Springfield 2009 (N38-54) PTHIO_100	4	0.37 0.37 0.37 0.35	0.28 0.28 0.28 0.27	6 6	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (MN), Rice 2009 (DKC 41- 63) PTHIO_100	4	0.36	0.19	7 7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (IL), Carlyle 2009 (8G23) PTHIO_100	4	0.36 0.340.37 0.36	0.14 0.27 0.24 0.23	8 8 AGF 8	< 0.01 < 0.01 0.067	< 0.01 < 0.01 < 0.02	< 0.01 < 0.01 < 0.02	< 0.01 < 0.01 < 0.02	< 0.01 < 0.01 < 0.02	< 0.01 < 0.01 < 0.02	Parent: < 0.01 Total: < 0.01
USA (TX), Uvalde 2009 (DK69) PTHIO_100	4	0.35 0.34 0.35 0.35	0.15 0.15 0.25 0.25	7 7 AGF 7	< 0.01 < 0.01 0.33	< 0.01 < 0.01 0.25	< 0.01 < 0.01 0.18	< 0.01 < 0.01 0.56	< 0.01 < 0.01 < 0.02	< 0.01 < 0.01 < 0.02	Parent: < 0.01 Total: < 0.01

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

AGF = aspirated grain fractions

Table 99 Residues in sorghum grain following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (LA), Cheneyville 2009 (Dyna Gro 780B) PTHIO_079	2	0.34	0.18	30	0.27	0.034	0.044	0.024	0.026	< 0.01	Parent: 0.28 Total: 0.34
		0.36	0.19	30	0.28	0.032	0.048	0.026	0.028	< 0.01	
USA (IA), Richland 2009 (Pioneer 8500) PTHIO_079	2	0.34	0.72	31	0.12	0.011	0.014	0.013	< 0.01	< 0.01	Parent: 0.12 Total: 0.14
		0.35	0.74	31	0.12	0.011	0.013	0.014	< 0.01	< 0.01	
USA (NE), York 2009 (NC+ 6B50) PTHIO_079	2	0.34	0.18	32	0.37	0.028	0.03	0.025	0.032	< 0.01	Parent: 0.39 Total: 0.45
				32	0.41	0.036	0.04	0.032	0.037	< 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment
AGF = aspirated grain fractions

[illegible]

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Peaston 2007 (Robigus) PTHIO_077	2	0.24 0.25	0.1 0.1	63	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Motterwitz 2007 (Schamane) PTHIO_077	2	0.26 0.24	0.1 0.1	44	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Hungary, Velence 2007 (GK Kapos) PTHIO_077	2	0.26	0.1	18	0.081	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (North), Charmée 2007 (Apache) PTHIO_077	2	0.25 0.24	0.1 0.1	44	0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
UK, Peaston 2008 (Consort) PTHIO_077	2	0.25 (SC)	0.1	55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.26 (EC)	0.1 0.1	55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.26 0.27 (SC)	0.1 0.1	55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (SC)	0.1	55	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Motterwitz 2008 (Inspiration) PTHIO_077	2	0.26 0.24 (SC)	0.1 0.1	60	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.26 0.24 (EC)	0.1 0.1	60	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (SC)	0.1	60	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.26 (SC)	0.1	60	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Hungary, Kápolnásnyék 2008 (Petur) PTHIO_077	2	0.26 (SC)	0.1	44	0.015	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.26 (EC)	0.1	44	0.014	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
France (North), Douai 2008 (Bermude) PTHIO_077	2	0.25 (SC)	0.1	58	0.011	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (EC)	0.1	58	0.013	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Charantonay 2008 (Garcia) PTHIO_077	2	0.24 0.25 (SC)	0.1 0.1	49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.25 (EC)	0.1 0.1	49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 0.25 (SC)	0.1 0.1	49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 0.25 (SC)	0.1 0.1	49	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), St Jean di Niost 2008 (Aubusson) PTHIO_077	2	0.24 0.25 (SC)	0.1 0.1	43	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.24 (EC)	0.1	43	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), St Trivier-sur- Moignans 2008 (Aubusson) PTHIO_077	2	0.25 (SC)	0.1	36	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (EC)	0.1	36	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 0.24 (SC)	0.1 0.1	36	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (SC)	0.1	36	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), St Martin le Chatel 2008 (Aubusson) PTHIO_077	2	0.25 (SC)	0.1	47	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
	2	0.25 (EC)	0.1	47	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (GA), Chula 2009 (Pioneer 26RG1) PTHIO_079	2	0.36 0.35	0.18 0.18	35 35	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (MO), Fisk 2009 (Coker 9663) PTHIO_079	2	0.36	0.19	35 35	0.012 0.011	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.011 0.012	< 0.01 < 0.01	Parent: 0.012 Total: 0.03

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2009 (Surge) PTHIO_079	2	0.36 0.35	0.18 0.18	48 48	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.01 0.011	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ND), Northwood 2009 (Divide) PTHIO_079	2	0.36	0.19	55 55	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (KS), Gardner 2009 (Winter Hawk PTHIO_079	2	0.36	0.25	41 41	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (TX), Uvalde 2009 (Fannin) PTHIO_079	2	0.36 0.35	0.26 0.25	42 42	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ND), Carrington 2009 (Glenn) PTHIO_079	2	0.35 0.36	0.75 0.76	62 62	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ND), Velva 2009 (Fuller) PTHIO_079	2	0.36 0.35	0.32 0.31	54 54	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (NE), Grand Island 2009 (Traverse HRS) PTHIO_079	2	0.34	0.18	36 36	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Dundurn 2009 (Infinity) PTHIO_079	2	0.35	0.18	62 62	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Vanscoy 2009 (AC Lillian) PTHIO_079	2	0.35	0.21	55 55	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Taber 2009 (Supurb) PTHIO_079	2	0.34	0.23	51 51	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (OK), Hinton 2009 (Endurance) PTHIO_079	2	0.36	0.28	Grain 63 63 AGF 63	< 0.01 < 0.01 0.16	< 0.01 < 0.01 0.053	< 0.01 < 0.01 0.068	< 0.01 < 0.01 0.025	< 0.01 < 0.01 0.28	< 0.01 0.01 0.054	Parent: < 0.01 Total: < 0.01
USA (OK), Hydro 2009 (OK Bullet) PTHIO_079	2	0.36 0.35	0.18 0.16	50 50	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (KS), Larned 2009 (Jagger) PTHIO_079	2	0.35 0.36	0.19 0.19	45 45	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (TX), Olton 2009 (T2M 111) PTHIO_079	2	0.36 0.35	0.23 0.23	40 40	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (WA), Ephrata 2009 (Nick) PTHIO_079	2	0.36	0.18	57 57	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Carberry 2009 (AC Domain) PTHIO_079	2	0.35	0.16	59 59	0.017 0.02	< 0.01 0.01	0.012 0.013	< 0.01 < 0.01	0.034 0.039	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Justice 2009 (AC Domain) PTHIO_079	2	0.35	0.14	59 59	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Alvena 2009 (Infinity) PTHIO_079	2	0.36 0.35	0.18 0.18	49 49	0.034 0.034	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.024 0.02	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Waldheim 2009 (AC Elsa) PTHIO_079	2	0.35 0.34	0.18 0.17	53 53	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.019 Total: 0.037
Canada, Blaine Lake 2009 (Infinity) PTHIO_079	2	0.34 0.33	0.17 0.17	56 56	0.016 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.011 0.012	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Fort Saskatchewan 2009 (Harvest) PTHIO_079	2	0.36	0.24	69 69	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.034 Total: 0.053
Canada, Fort Saskatchewan 2009 (Harvest) PTHIO_079	2	0.36	0.24	68 68	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	0.013 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Lamont 2009 (Harvest) PTHIO_079	2	0.37 0.35	0.24 0.24	55 55	0.011 < 0.01	0.014 < 0.01	0.01 < 0.01	< 0.01 < 0.01	0.023 0.012	< 0.01 < 0.01	Parent: 0.017 Total: 0.036
Canada, Westlock 2009 (Emagine) PTHIO_079	2	0.36	0.24	60 60	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

AGF: aspirated grain fractions

Table 101 Residues in almond nutmeat following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Kerman 2007 (Nonpareil) PTHIO_090	3	0.31	0.03	14 14	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.01 Total: 0.029
USA (CA), Madera 2007 (Padre) PTHIO_090	3	0.31	0.03	14 14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (CA), Sanger 2007 (Nonpareil) PTHIO_090	3	0.31 0.31 0.3	0.05 0.05 0.05	14 14	0.045 0.028	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.037 Total: 0.056
USA (CA), Hickman 2007 (Carmel) PTHIO_090	3	0.31 0.3 0.3	0.02 0.02 0.02	14 14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Turlock 2007 (Thompson) PTHIO_090	3	0.31	0.03	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.3	0.03	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.3	0.02								
USA (CA), Terra Bella 2007 (Carmel) PTHIO_090	3	0.31	0.02	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 102 Residues in pecan nutmeat following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (GA), Chula 2007 (Sumner) PTHIO_090	3	0.31	0.03	13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (GA), Chula 2007 (Sumner) PTHIO_090	3	0.3	0.02	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (GA), Albany 2007 (Sumner) PTHIO_090	3	0.3	0.02	13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.32	0.02	13	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.31	0.02								
USA (LA), Alexandria 2007 (Creek) PTHIO_090	3	0.31	0.03	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (TX), D'Hanis 2007 (Desirable) PTHIO_090	3	0.3	0.02	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.31	0.03	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.31	0.02								
USA (TX), Anton 2007 (Western Schley) PTHIO_090	3	0.31	0.03	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: < 0.01 Total: < 0.01
		0.32	0.03	14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
		0.31	0.03								

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 103 Residues in cotton seeds following foliar and in-furrow application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (AL), Auburn 2009 (DBPL 555) PTHIO_101	3	0.35 (i.f.) 0.36 0.35	0.27 0.31 0.29	20 20	< 0.01 < 0.01	0.012 0.016	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: 0.036
USA (LA), Cheneyville 2009 (DP 0935 BZRF) PTHIO_101	3	0.34 (i.f.) 0.34 0.36	0.58 0.16 0.17	21 21	0.11 0.17	< 0.01 0.022	0.01 0.024	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01	Parent: 0.14 Total: 0.17
USA (LA), Cheneyville 2009 (Phytogen 375 WRF) PTHIO_101	3	0.35 (i.f.) 0.36 0.36	0.59 0.17 0.16	21 21	0.1 0.081	0.013 0.017	0.011 0.012	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.091 Total: 0.12
USA (MO), Fisk 2009 (DP 164 82RF) PTHIO_101	3	0.35 (i.f.) 0.36 0.37	0.37 0.19 0.2	19 19	< 0.01 < 0.01	0.019 0.017	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: 0.043
USA (TX), Uvalde 2009 (DPL 167 B2RF) PTHIO_101	3	0.37 (i.f.) 0.38 0.36	0.71 0.82 0.77	20 20	0.018 0.054	0.021 0.024	0.016 0.021	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.036 Total: 0.083
USA (TX), Olton 2009 (DP 924) PTHIO_101	3	0.34 (i.f.) 0.35 0.35	0.8 0.22 0.22	21 21	0.11 0.14	0.13 0.13	0.088 0.097	0.035 0.034	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.13 Total: 0.37
USA (TX), Edmonson 2009 (DP 924) PTHIO_101	3	0.36 (i.f.) 0.36 0.35	1.3 0.23 0.22	20 20	0.19 0.27	0.067 0.11	0.044 0.085	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.23 Total: 0.40
USA (TX), Levelland 2009 (FM 9063 B2F) PTHIO_101	3	0.35 (i.f.) 0.35 0.35	0.37 0.19 0.19	21 21	0.13 0.09	0.038 0.027	0.028 0.016	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.11 Total: 0.17
USA (TX), Wolfforth 2009 (3273 B2RF) PTHIO_101	3	0.35 (i.f.) 0.35 0.35	0.37 0.19 0.19	21 21	0.22 0.28	0.054 0.092	0.046 0.064	0.015 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.25 Total: 0.39

i.f. first treatment in-furrow at sowing

[illegible]

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
France (South), Saint Trivier 2008 (Artist) PTHIO_092	1	0.31	0.12	52	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
USA (VA), Bumpass 2007 (KAB-36) PTHIO_093	2	0.3 0.31	0.21 0.22	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (MN), Paynesville 2007 (Croplan Freedom) PTHIO_093	2	0.31 0.3	0.2 0.2	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
Canada, Branchton 2007 (71-45 RR) PTHIO_093	2	0.3	0.15	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (ND), Velva 2007 (5550) PTHIO_093	2	0.31 0.3	0.22 0.24	21 21	0.069 0.12	< 0.01 0.017	0.015 0.021	< 0.01 < 0.01	< 0.01 0.012	< 0.01 < 0.01	Parent: 0.095 Total: 0.12
Canada, Dubdam 2007 (621 Hybrid RR) PTHIO_093	2	0.3 0.29	0.15 0.15	21 21	0.12 0.13	0.013 0.01	0.012 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.13 Total: 0.15
USA (WA), Lake Moses 2007 (71-45 RR) PTHIO_093	2	0.31	0.17	21 21	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (WA), Ephrata 2007 (71-45 RR) PTHIO_093	2	0.31	0.17	21 21	0.027 0.021	0.014 0.012	< 0.01 < 0.01	< 0.01 < 0.01	0.023 0.023	< 0.01 < 0.01	Parent: 0.024 Total: 0.048

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (ID), Jerome 2007 (Phoenix) PTHIO_093	2	0.31 0.3	0.18 0.18	pods with seeds 0 ^a 0 ^a 0 0 7 7 14 14	0.24	0.041	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.081 Total: 0.13
					0.25	0.048	< 0.01	< 0.01	< 0.01	< 0.01	
					7.6	0.059	0.012	0.011	< 0.01	< 0.01	
					6.3	0.043	0.012	< 0.01	< 0.01	< 0.01	
					0.15	0.11	0.014	< 0.01	< 0.01	< 0.01	
					0.17	0.13	0.014	< 0.01	< 0.01	< 0.01	
					0.093	0.11	0.015	< 0.01	< 0.01	< 0.01	
					0.11	0.12	0.014	< 0.01	< 0.01	< 0.01	
				seeds 21 21 28 28	0.066	0.024	0.011	< 0.01	< 0.01	< 0.01	
					0.096	0.021	0.011	< 0.01	< 0.01	< 0.01	
					0.037	0.026	0.011	< 0.01	< 0.01	< 0.01	
					0.057	0.026	0.013	< 0.01	< 0.01	< 0.01	
Canada, Portage la Prairie 2007 (RR 32- 75) PTHIO_093	2	0.3	0.15	22	0.041 0.088	< 0.01 0.01	< 0.01 0.012	< 0.01 0.012	< 0.01 0.012	< 0.01 0.012	Parent: 0.065 Total: 0.083
Canada, Edmonton 2007 (Roundup Ready) PTHIO_093	2	0.31 0.3	0.16 0.15	21	0.018	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.028 Total: 0.046
				21	0.037	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Blaine Lake 2007 (Invigor 5030) PTHIO_093	2	0.3	0.15	21	0.025	0.032	< 0.01	< 0.01	< 0.01	< 0.01	Parent: 0.025 Total: 0.084
				21	0.025	0.031	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Alvena 2007 (IMC 106 RR) PTHIO_093	2	0.29	0.15	21	0.061	0.015	0.014	< 0.01	< 0.01	< 0.01	Parent: 0.054 Total: 0.087
				21	0.047	0.021	0.016	< 0.01	< 0.01	< 0.01	
Canada, Waldeim 2007 (Invigor 5030) PTHIO_093	2	0.3	0.15	21	< 0.01	0.03	0.018	< 0.01	< 0.01	0.015	Parent: < 0.01 Total: 0.073
				21	< 0.01	0.038	0.018	< 0.01	< 0.01	0.014	
Canada, Wakaw 2007 (SP 451 RR) PTHIO_093	2	0.29 0.3	0.15 0.15	21 21	0.013 0.02	0.042 0.041	< 0.01 0.01	< 0.01 0.01	< 0.01 0.01	< 0.01 0.01	Parent: 0.017 Total: 0.094

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Fort Saskatchewan 2007 (46A76 Clearfield) PTHIO_093	2	0.31	0.15	21 21	0.036 0.03	0.03 0.014	0.011 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.033 Total: 0.074
Canada, Fort Saskatchewan 2007 (RR 3275) PTHIO_093	2	0.31	0.15	pods with seeds 0 ^a 0 ^a 0 0 7 7 14 14 seeds 21 21 28 28	1.6 1.7 7.1 7.6 3.7 2.8 1.8 1.9 0.073 0.086 0.011 0.012	0.077 0.071 0.085 0.097 0.21 0.18 0.28 0.27 < 0.01 0.011 < 0.01 < 0.01	0.015 0.015 0.023 0.025 0.054 0.043 0.11 0.099 < 0.01 < 0.01 < 0.01 < 0.01	0.029 0.028 0.041 0.048 0.11 0.025 0.095 0.093 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 0.01 0.025 0.021 0.057 0.055 < 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	Parent: 0.08 Total: 0.099
Canada, Edmonton 2007 (Invigor 5020) PTHIO_093	2	0.31 0.3	0.15 0.15	21	0.055 0.049	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.052 Total: 0.071
Canada, Westlock 2007 (RR 1818) PTHIO_093	2	0.3	0.15	22 22	0.36 0.47	0.014 0.016	0.011 0.011	0.012 0.016	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.42 Total: 0.44
Canada, Portage la Prairie 2008 (93H01) PTHIO_094	2	0.3 0.32	0.13 0.14	21	0.012 < 0.01	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.011 Total: 0.03
	2	0.3 0.31 (EC)	0.13 0.13	21	< 0.01 < 0.01	< 0.01 < 0.01	0.022 0.019	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
USA (WA), Ephrata 2008 (71-45 RR) PTHIO_094	2	0.31	0.16	21	< 0.01 < 0.01	0.042 0.03	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: 0.15
	2	0.3 0.31 (EC)	0.16 0.16	21	< 0.01 < 0.01	0.075 0.08	0.018 0.018	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
Canada, Minto 2008 (5030) PTHIO_094	2	0.3	0.19	20	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
	2	0.31 0.3 (EC)	0.19 0.19	20	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion

Table 105 Residues in peanut seeds following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (VA), Bumpass 2007 (Georgia Green) PTHIO_098	3	0.36 0.37 0.35	0.12 0.12 0.12	14 14	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (SC), Blackville 2007 (Georgia Green) PTHIO_098	3	0.35 0.36 0.36	0.11 0.12 0.12	14 14	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (NC), Pikeville 2007 (Gregory) PTHIO_098	3	0.35 0.36 0.35	0.15 0.15 0.15	13 13	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (GA), Sycamore 2007 (GA-02) PTHIO_098	3	0.36 0.36 0.36	0.19 0.18 0.18	14 14	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
	3	1.8 1.8 1.8	0.95 0.94 0.95	Nutmeat 14 14 14	0.053 0.04 0.06	0.013 0.013 0.014	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	
				Meal 14 14	0.027 0.025	0.021 0.019	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
				Refined oil 14 14	0.071 0.068	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
USA (GA), Chula 2007 (Georgia Green) PTHIO_098	3	0.36 0.36 0.36	0.18 0.19 0.19	14 14	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (GA), Quitman 2007 (Georgia Green) PTHIO_098	3	0.36 0.36 0.36	0.18 0.18 0.19	14	< <u>0.01</u> < <u>0.01</u>	< <u>0.01</u> < <u>0.01</u>	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (GA), Athens 2007 (Georgia Green) PTHIO_098	3	0.35 0.36 0.36	0.13 0.13 0.13	14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (GA), Chula 2007 (GA02C) PTHIO_098	3	0.35	0.09	14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (GA), Montezuma 2007 (Georgia Green) PTHIO_098	3	0.36	0.14	14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (FL), Bradenton 2007 (Georgia Green) PTHIO_098	3	0.37 0.36 0.36	0.08 0.08 0.08	15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (OK), Hinton 2007 (Olin) PTHIO_098	3	0.36 0.35 0.36	0.16 0.16 0.16	15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (TX), Charlotte 2007 (TAM RUN OL-1) PTHIO_098	3	0.36	0.15	15	0.047 0.02	0.013 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.034 Total: 0.055
	3	1.8 1.8 1.8	0.76 0.760.76	Nutmeat 14							
				14	0.11	0.013	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.11	0.011	< 0.01	< 0.01	< 0.01	< 0.01	
					0.12	0.013	0.01	< 0.01	< 0.01	< 0.01	
				Meal 14							
				14	0.039 0.042	0.02 0.023	0.013 0.015	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
				Refined oil 14							
				14	0.19 0.2	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
USA (TX), Levelland 2007 (TAMSPAN 90) PTHIO_098	3	0.36 0.35 0.36	0.15 0.15 0.15	14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 106 Residues in sunflower seeds following foliar application of penthiopyrad

[illegible]

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Germany, Motterwitz 2008 (Sanluka) PTHIO_096	1	0.19	0.08	107	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
France (South), Villebichot 2008 (Extrasol) PTHIO_096	1	0.2	0.08	112	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Germany, Bernburg 2008 (Kronosol) PTHIO_096	1	0.21	0.08	108	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
Canada, Elm Creek 2009 (Viper) PTHIO_097	2	0.47 0.47	0.46 0.23	14	0.087 0.07	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.079 Total: 0.097
USA (ND), Gardner 2009 (IS 8048) PTHIO_097	2	0.45 0.48	0.24 0.2	15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: < 0.01 Total: < 0.01
USA (MN), Geneva 2009 (Pioneer 64 H 41) PTHIO_097	2	0.46 0.46	0.27 0.26	14	0.081 0.12	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.10 Total: 0.12
Canada, Vanscoy 2009 (63A21) PTHIO_097	2	0.46 0.45	0.28 0.27	15	0.5 0.38	0.07 0.068	0.03 0.03	0.027 0.026	0.011 < 0.01	< 0.01 < 0.01	Parent: 0.44 Total: 0.57
Canada, Delisle 2009 (Viper) PTHIO_097	2	0.47 0.45	0.28 0.27	13	0.34 0.34	0.08 0.098	0.035 0.038	< 0.01 0.013	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.34 Total: 0.51
USA (ND); Velva 2009 (8N83SCL) PTHIO_097	2	0.46 0.47	0.24 0.25	14	0.072 0.086	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.079 Total: 0.098
USA (ND), Carrington 2009 (Pioneer) PTHIO_097	2	0.46 0.47	0.16 0.17	14	0.064 0.092	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 0.078 Total: 0.097
USA (OK), Hinton 2009 (8N453DM) PTHIO_097	2	0.46 0.47	0.98 0.99	13	0.69 0.92	0.068 0.074	0.046 0.059	0.047 0.056	0.015 0.02	< 0.01 < 0.01	Parent: 0.81 Total: 0.94

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753-F-DO	DM- PCA	
USA (PA), Germansville 2009 (American 403T) PTHIO_102	2	0.37	0.13	Forage 13 13	0.29	0.069	0.017	< 0.01	< 0.01	< 0.01	Parent (forage): 0.34
					0.39	0.069	0.02	< 0.01	0.012	< 0.01	Total (forage): 0.47
				Hay 13 13	1.9	0.39	0.11	< 0.05	< 0.05	< 0.05	Parent (hay): 1.9
					1.8	0.33	0.11	< 0.05	< 0.05	< 0.05	Total (forage): 2.5
USA (GA), Moultrie 2009 (Bulldog 805) PTHIO_102	2	0.36	0.18	Forage 14 14	0.23	0.12	0.024	< 0.01	0.024	0.015	Parent (forage): 0.23
					0.23	0.12	0.024	< 0.01	0.024	0.014	Total (forage): 0.45
				Hay 14 14	0.6	0.83	0.62	0.08	0.18	0.15	Parent (hay): 0.58
					0.55	1.0	0.69	< 0.05	< 0.05	0.25	Total (forage): 2.3
USA (NE), Springfield 2009 (NE Certified) PTHIO_102	2	0.35	0.27	Forage 13 13	1.2	0.16	0.048	0.024	0.04	0.011	Parent (forage): 1.2
					1.1	0.14	0.041	0.019	0.035	0.01	Total (forage): 1.4
				Hay 13 13	4.8	0.55	0.19	< 0.05	0.05	< 0.05	Parent (hay): 4.9
					4.9	0.55	0.2	< 0.05	0.05	< 0.05	Total (forage): 5.9

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753-F-DO	DM- PCA	
USA (MN), Geneva 2009 (Viking 3000) PTHIO_102	2	0.37 0.36	0.25 0.22	Forage							Parent (forage): 0.74 Total (forage): 0.95 Parent (hay): 1.8 Total (forage): 2.5
				14	0.74	0.12	0.027	< 0.01	0.027	< 0.01	
				14	0.73	0.11	0.026	< 0.01	0.023	< 0.01	
				Hay							
				14	1.8	0.4	0.21	< 0.05	0.58	0.066	
				14	1.7	0.38	0.24	< 0.05	0.66	0.082	
USA (ND), Gardner 2009 (Multi-F- 2) PTHIO_102	2	0.36 0.35	0.26 0.25	Forage							Parent (forage): 1.7 Total (forage): 2.1 Parent (hay): 4.7 Total (forage): 6.4
				0	25	0.11	0.037	0.095	0.051	< 0.01	
				0	27	0.11	0.038	0.092	0.049	< 0.01	
				3	14	0.14	0.08	0.092	0.11	< 0.01	
				3	18	0.15	0.078	0.092	0.11	< 0.01	
				7	5.1	0.24	0.094	0.068	0.062	0.011	
				7	7.8	0.27	0.11	0.081	0.079	0.011	
				14	1.8	0.24	0.051	0.031	0.042	< 0.01	
				14	1.5	0.21	0.045	0.03	0.033	< 0.01	
				Hay							
				0	92	0.79	0.48	0.26	0.23	< 0.05	
				0	57	0.73	0.4	0.36	0.28	< 0.05	
				3	57	0.91	0.48	0.1	0.39	< 0.05	
				3	54	0.81	0.47	0.11	0.14	< 0.05	
				7	15	0.99	0.42	0.066	0.089	0.06	
				7	22	1.4	0.51	0.35	0.26	0.061	
				14	4.5	0.9	0.2	0.08	0.077	< 0.05	
				14	4.8	0.93	0.21	0.094	0.091	< 0.05	
Canada, Portage la Prairie 2009 (Ultrastar) PTHIO_102	2	0.34	0.16	Forage							Parent (forage): 0.25 Total (forage): 0.62 Parent (hay): 0.97 Total (forage): 2.9
				14	0.24	0.2	0.039	< 0.01	0.022	< 0.01	
				14	0.25	0.2	0.039	< 0.01	0.025	< 0.01	
				Hay							
				14	0.73	1.0	0.39	< 0.05	0.47	0.084	
				14	1.2	1.1	0.53	< 0.05	0.64	0.1	
Canada, Portage la Prairie 2009 (Magnum 3801) PTHIO_102	2	0.35	0.16	Forage							Parent (forage): 0.045 Total (forage): 0.21 Parent (hay): 0.28 Total (forage): 1.2
				14	0.056	0.09	0.012	< 0.01	< 0.01	< 0.01	
				14	0.034	0.088	0.014	< 0.01	< 0.01	< 0.01	
				Hay							
				14	0.37	0.61	0.27	< 0.05	0.23	< 0.05	
				14	0.18	0.4	0.22	< 0.05	0.14	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753-F-DO	DM- PCA	
USA (ND), Jamestown 2009 (Multi-F- 2) PTHIO_102	2	0.35 0.36	0.25 0.26	Forage							
				13	3.9	0.37	0.076	0.15	0.049	0.011	Parent (forage): 4.0
				13	4.0	0.37	0.074	0.13	0.046	0.012	Total (forage): 4.6
				Hay							
				13	14	1.4	0.33	0.32	0.081	< 0.05	Parent (hay): 14
				13	13	1.4	0.31	0.26	0.07	< 0.05	Total (forage): 16
USA (ID), Jerome 2009 (Ranger) PTHIO_102	2	0.35	0.18	Forage							
				15	0.025	0.043	0.011	< 0.01	< 0.01	< 0.01	Parent (forage):
				15	0.03	0.035	< 0.01	< 0.01	< 0.01	< 0.01	0.028
				Hay							Total (forage): 0.1
				15	0.08	0.22	0.054	< 0.05	< 0.05	< 0.05	Parent (hay): 0.11
				15	0.14	0.31	0.082	< 0.05	0.058	< 0.05	Total (forage): 0.60
USA (CA), Madera 2009 (Magna 788) PTHIO_102	2	0.36	0.13	Forage							
				14	0.55	0.27	0.041	0.011	0.038	0.026	Parent (forage):
				14	0.6	0.23	0.047	0.013	0.038	0.017	0.58
				Hay							Total (forage): 1.0
				14	1.6	1.0	0.31	< 0.05	< 0.05	0.074	Parent (hay): 1.6
				14	1.5	0.92	0.3	< 0.05	< 0.05	0.076	Total (forage): 3.3
USA (ID), Payette 2009 (Agate) PTHIO_102	2	0.37	0.16	Forage							
				14	0.32	0.23	0.022	0.012	0.023	0.016	Parent (forage):
				14	0.32	0.21	0.023	0.013	0.023	0.012	0.32
				Hay							Total (forage):
				14	1.7	0.84	0.18	< 0.05	< 0.05	< 0.05	0.73
				14	1.8	0.93	0.22	< 0.05	< 0.05	0.05	Parent (hay): 1.8
											Total (forage): 3.4
Canada, Josephburg 2009 (not reported) PTHIO_102	2	0.35	0.28	Forage							
				13	1.3	0.2	0.029	0.022	0.018	< 0.01	Parent (forage): 1.4
				13	1.4	0.25	0.034	0.027	0.021	< 0.01	Total (forage): 1.8
				Hay							
				13	3.1	0.7	0.35	0.054	0.31	0.064	Parent (hay): 3.2
				13	3.3	0.73	0.35	0.056	0.32	0.065	Total (forage): 4.5

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a	
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA		
USA (ID), Jerome 2007 (Pendelton) PTHIO_085	2	0.3	0.18	Hay	19	0.24	0.34	0.06	0.14	< 0.05	Parent (vines): 5.3	
					11	0.23	0.33	0.071	0.14	< 0.05	Total (vines): 5.3	
					Vines	5.8	0.017	0.013	< 0.01	< 0.01	< 0.01	Parent (hay): 15
						4.7	0.015	0.01	< 0.01	< 0.01	< 0.01	Total (hay): 15

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (ID), Payette 2007 (Austrian Winter Peas) PTHIO_085	2	0.31	0.16	Hay 0 0 Vines 0 0	31 28 24 21	0.63 0.42 0.25 0.17	0.44 0.32 0.13 0.09	0.75 0.51 0.082 0.052	0.18 0.13 0.41 0.31	< 0.05 < 0.05 0.012 0.014	Parent (vines): 23 Total (vines): 23 Parent (hay): 30 Total (hay): 30
USA (WA), Ephrata 2007 (Dec0hutes) PTHIO_085	2	0.31	0.16	Hay 0 0 Vines 0 0	14 14 13 11	0.24 0.24 0.073 0.055	0.29 0.29 0.033 0.025	0.17 0.14 0.025 0.022	< 0.05 < 0.05 0.033 0.025	< 0.05 < 0.05 < 0.01 < 0.01	Parent (vines): 12 Total (vines): 12 Parent (hay): 14 Total (hay): 14
USA (WA), Ephrata 2007 (Tonic) PTHIO_085	2	0.31	0.17	Hay 0 ^a 0 ^a 0 0 7 7 14 14 21 21 28 28 Vines 0 ^a 0 ^a 0 0 7 7 14 14 21 21 28 28	0.53 0.51 6.5 7.5 4.1 3.4 7.3 8.5 9.6 9.1 7.4 7.1 0.25 0.17 3.8 3.3 5.9 5.3 4.9 5.6 4.5 4.7 4.1 3.1	0.064 0.08 0.21 0.2 0.32 0.23 0.48 0.6 0.77 0.73 0.95 0.79 0.015 0.012 0.013 0.012 0.28 0.21 0.42 0.4 0.59 0.65 0.69 0.54	0.064 0.1 0.28 0.28 0.26 0.21 0.41 0.48 0.68 0.65 0.83 0.72 0.012 0.01 0.012 0.01 0.24 0.19 0.36 0.4 0.44 0.48 0.59 0.44	< 0.05 < 0.05 0.13 0.13 0.18 0.12 0.26 0.36 0.42 0.44 0.56 0.43 0.011 < 0.01 0.017 0.01 0.11 0.092 0.095 0.11 0.089 0.091 0.095 0.093	< 0.05 < 0.05 0.074 0.071 0.1 0.091 0.12 0.11 0.13 0.13 0.14 0.15 < 0.01 < 0.01 < 0.01 < 0.01 0.27 0.17 0.32 0.37 0.37 0.41 0.35 0.27	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.013 0.013 0.013 0.015 0.016 0.015	Parent (vines): 5.6 Total (vines): 6.1 Parent (hay): 9.4 Total (hay): 11
USA (WA), Ephrata 2008 (Kalamo) PTHIO_086	2	0.31 0.30 (SC)	0.16 0.16	Hay 0 0 Vines 0 0	8.8 14 5.5 6.7	0.17 0.17 0.025 0.028	0.21 0.21 0.017 0.017	0.11 0.14 0.019 0.024	0.05 0.05 0.013 0.016	< 0.05 < 0.05 < 0.01 < 0.01	Parent (vines): 6.1 Total (vines): 6.1 Parent (hay): 11

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
	2	0.31 (EC)	0.16								
Canada, Fort Saskatchewan 2008 (Midas) PTHIO_086	2	0.3 (SC)	0.13	Hay							Total (hay): 12
				0	5.0	0.44	0.61	0.23	0.31	< 0.05	
				0	8.5	0.56	0.76	0.28	0.35	< 0.05	
				Vines							
				0	5.0	0.077	0.047	0.069	0.019	< 0.01	
				0	4.2	0.061	0.036	0.055	0.016	< 0.01	
	2	0.31 0.3 (EC)	0.14 0.14	Hay							Parent (vines): 4.5 Total (vines): 4.5 Parent (hay): 8.7 Total (hay): 8.9
				0	9.4	0.15	0.18	0.077	0.21	< 0.05	
				0	8.1	0.13	0.15	0.059	0.17	< 0.05	
				Vines							
				0	4.3	0.017	0.015	0.02	0.016	< 0.01	
				0	4.6	0.02	0.018	0.021	0.018	< 0.01	
	2	0.31 0.3 (EC)	0.14 0.14	Hay							Parent (vines): 6.2 Total (vines): 6.3 Parent (hay): 3.7 Total (hay): 3.9
				0	2.1	0.61	0.42	0.18	0.21	< 0.05	
				0	2.4	0.58	0.4	0.17	0.22	< 0.05	
				Vines							
				0	4.0	0.073	0.052	0.036	0.061	< 0.01	
				0	4.3	0.085	0.061	0.038	0.064	< 0.01	
Canada, Fort Saskatchewan 2008 (Cooper) PTHIO_086	2	0.31 0.3 (SC)	0.14 0.13	Hay							Parent (vines): 6.2 Total (vines): 6.3 Parent (hay): 3.7 Total (hay): 3.9
				0	3.7	0.1	0.096	< 0.05	0.12	< 0.05	
				0	3.7	0.11	0.1	< 0.05	0.11	< 0.05	
				Vines							
				0	4.5	0.017	0.013	0.015	0.013	< 0.01	
				0	4.9	0.017	0.013	0.015	0.013	< 0.01	
	2	0.33 0.31 (EC)	0.14 0.14	Hay							Parent (vines): 6.2 Total (vines): 6.3 Parent (hay): 3.7 Total (hay): 3.9
				0	1.9	0.39	0.26	0.14	0.23	< 0.05	
				0	1.4	0.34	0.23	0.14	0.22	< 0.05	
				Vines							
				0	5.2	0.064	0.027	0.047	0.054	< 0.01	
				0	7.2	0.074	0.029	0.056	0.069	< 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 109 Residues in soya bean forage and hay following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753- F-DO	DM- PCA	
USA (GA), Athens 2009 (4062885) PTHIO_087	2	0.46	0.21	Forage							Parent (vines): 4.1 Total (vines): 4.1
				0	3.9	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	4.3	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Hay							Parent (hay): 11 Total (hay): 11
				0	11	0.25	0.23	< 0.05	0.072	< 0.05	
				0	11	0.23	0.24	0.056	0.09	< 0.05	
USA (LA), Cheneyville 2009 (Pioneer 95820) PTHIO_087	2	0.45	0.22	Forage							Parent (vines): 19 Total (vines): 19
				0	19	0.025	0.018	0.02	0.02	< 0.01	
				0	18	0.02	0.018	0.016	0.023	< 0.01	
				Hay							Parent (hay): 49 Total (hay): 51
				0	43	1.1	0.025	0.57	0.35	0.58	
				0	54	1.3	0.024	0.7	0.48	0.68	
USA (MO), Fisk 2009 (54-17 RR1STS) PTHIO_087	2	0.47	0.25	Forage							Parent (vines): 21 Total (vines): 21
				0	19	0.098	0.072	0.06	0.045	0.017	
				0	22	0.098	0.068	0.06	0.05	0.018	
				Hay							Parent (hay): 123 Total (hay): 125
				0	156	1.4	1.8	0.31	0.85	0.11	
				0	90	1.1	1.7	0.28	0.79	0.088	
USA (MO), Dudley 2009 (Jake) PTHIO_087	2	0.47	0.25	Forage							Parent (vines): 15 Total (vines): 15
				0	15	0.043	0.042	0.04	0.014	< 0.01	
				0	14	0.047	0.04	0.032	0.016	< 0.01	
				Hay							Parent (hay): 59 Total (hay): 61
				0	60	0.76	0.61	0.4	0.15	< 0.05	
				0	58	0.89	0.71	0.45	0.13	0.052	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753- F-DO	DM- PCA	
USA (KS), Gardner 2009 (Fontanelle 407NRS) PTHIO_087	2	0.46	0.34	Forage							Parent (vines): 23 Total (vines): 23 Parent (hay): 100 Total (hay): 100
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	22	0.015	0.015	0.012	0.051	< 0.01	
				3	24	0.018	0.017	0.25	0.049	< 0.01	
				3	10	0.25	0.14	0.28	0.11	0.078	
				6	11	0.33	0.16	0.33	0.12	0.083	
				6	7.2	0.39	0.15	0.22	0.097	0.096	
				10	5.4	0.28	0.1	0.11	0.07	0.069	
				10	2.7	0.23	0.043	0.14	0.052	0.067	
					3.4	0.29	0.053		0.061	0.075	
				Hay							
				0 ^a				< 0.05			
				0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	< 0.05	< 0.05	< 0.05	0.26	< 0.05	< 0.05	
				0	92	0.38	0.33	0.3	0.65	< 0.05	
				3	107	0.36	0.26	0.74	0.83	< 0.05	
				3	50	1.5	0.76	0.69	0.49	0.27	
				6	48	1.4	0.76	0.86	0.47	0.26	
				6	23	1.9	0.65	0.73	0.42	0.29	
				10	20	2.0	0.65	0.3	0.36	0.31	
				10	9.5	1.3	0.27	0.31	0.26	0.2	
					9.7	1.2	0.26		0.26	0.18	
USA (IL), Rochelle 2009 (Pioneer 92 M61) PTHIO_087	2	0.45	0.97	Forage							Parent (vines): 11 Total (vines): 11 Parent (hay): 45 Total (hay): 45
				0							
				0	11	< 0.01	0.062	< 0.01	< 0.01	< 0.01	
					11	< 0.01	0.053	< 0.01	< 0.01	< 0.01	
				Hay							
				0							
USA (OH), Richwood 2009 (ShurGrow 289RR) PTHIO_087	2	0.45	0.28	0	47	< 0.05	0.062	< 0.05	0.065	< 0.05	Parent (hay): 55 Total (hay): 55
				0	43	< 0.05	0.053	< 0.05	0.068	< 0.05	
				Forage							
				0							
				0	13	0.032	0.022	0.018	0.023	0.012	
					14	0.029	0.018	0.018	0.024	0.011	
USA (NE), Springfield 2009 (NcT 2 A98) PTHIO_087	2	0.46	0.36	Hay							Parent (hay): 50 Total (hay): 50
				0							
				0	47	0.12	0.051	< 0.05	0.16	< 0.05	
				0	62	0.13	0.077	0.05	0.16	< 0.05	
				Forage							
				0							
USA (NE), Springfield 2009 (NcT 2 A98) PTHIO_087	2	0.46	0.36	0	16	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	Parent (vines): 16 Total (vines): 16 Parent (hay): 50 Total (hay): 50
				0	15	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Hay							
				0							
				0	52	0.18	0.2	0.14	0.24	< 0.05	
				0	47	0.18	0.2	0.13	0.2	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753- F-DO	DM- PCA	
USA (IA), Richland 2009 (Pioneer 93B82) PTHIO_087	2	0.45	0.28	Forage							Parent (vines): 24 Total (vines): 24
				0	23	0.016	0.021	0.021	< 0.01	< 0.01	
				0	24	0.018	0.025	0.025	< 0.01	< 0.01	Parent (hay): 53 Total (hay): 54
				Hay							
				0	51	0.37	0.51	0.2	0.12	< 0.05	
				0	55	0.37	0.47	0.19	0.2	< 0.05	
				Forage							Parent (vines): 16 Total (vines): 16
				0	17	0.012	0.015	0.014	0.016	< 0.01	
USA (MN), Geneva 2009 (Pioneer 91M80) PTHIO_087	2	0.46	0.26	0	15	0.011	0.012	0.012	0.016	< 0.01	Parent (hay): 48 Total (hay): 48
				Hay							
				0	43	0.25	0.26	0.16	0.11	< 0.05	
				0	52	0.31	0.33	0.18	0.13	< 0.05	
USA (WI), Delavan 2009 (AG 2002 RR) PTHIO_087	2	0.46	0.22	Forage							Parent (vines): 14 Total (vines): 14
				0	14	0.01	0.013	0.011	0.01	< 0.01	
				0	13	0.011	0.013	0.012	0.011	< 0.01	Parent (hay): 54 Total (hay): 55
				Hay							
				0	60	0.38	0.47	0.23	0.15	< 0.05	
				0	48	0.35	0.39	0.19	0.12	< 0.05	
Canada, St. Marc-sur- Richilieu 2009 (Pro 2590 R) PTHIO_087	2	0.45	0.96	Forage							Parent (vines): 4.9 Total (vines): 4.9
				0	3.5	0.012	0.012	< 0.01	0.014	< 0.01	
				0	6.2	0.017	0.014	< 0.01	0.018	< 0.01	Parent (hay): 22 Total (hay): 22
				Hay							
				0	23	0.25	0.45	< 0.05	0.12	< 0.05	
				0	20	0.25	0.44	< 0.05	0.13	< 0.05	
Canada, St. Marc-sur- Richilieu 2009 (Pro 2590 R) PTHIO_087	2	0.45	0.23	Forage							Parent (vines): 6.4 Total (vines): 6.4
				0	6.1	0.04	0.029	0.017	0.028	0.014	
				0	6.6	0.033	0.03	0.017	0.028	0.015	Parent (hay): 33 Total (hay): 33
				Hay							
				0	26	0.42	0.56	0.08	0.17	< 0.05	
				0	39	0.46	0.63	0.094	0.19	0.064	

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

[illegible]

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Harwich 2008 (Flagon) PTHIO_078	2	0.25	0.1	0 ^a	0.11	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	1.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	1.2	< 0.05	0.06	< 0.05	< 0.05	< 0.05	
				14	0.75	< 0.05	0.05	< 0.05	< 0.05	< 0.05	
				21	0.91	0.083	0.13	< 0.05	< 0.05	< 0.05	
				28	0.42	< 0.05	0.084	0.05	< 0.05	< 0.05	
	2	0.24	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	1.8	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.56	0.061	0.079	< 0.05	< 0.05	< 0.05	
				14	0.31	0.069	0.069	< 0.05	< 0.05	< 0.05	
				21	0.23	0.096	0.16	0.063	< 0.05	< 0.05	
				28	0.095	< 0.05	0.071	< 0.05	< 0.05	< 0.05	
Germany, Motterwitz 2008 (Laverda) PTHIO_078	2	0.26 (SC)	0.1	0 ^a	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	3.8	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	2.4	0.066	0.094	< 0.05	< 0.05	< 0.05	
				14	0.65	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.46	< 0.05	0.063	0.081	< 0.05	< 0.05	
				28	0.46	< 0.05	0.068	0.083	< 0.05	< 0.05	
	2	0.26 0.25 (EC)	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	1.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	2.0	0.13	0.15	< 0.05	0.077	< 0.05	
				14	0.48	0.064	0.063	0.09	< 0.05	< 0.05	
				21	0.21	0.077	0.099	0.12	< 0.05	< 0.05	
				28	0.27	< 0.05	0.096	0.11	< 0.05	< 0.05	
	2	0.24 0.23 (SC)	0.1	0 ^a	0.16	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	2.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	1.7	0.11	0.061	< 0.05	0.05	< 0.05	
				14	0.58	0.057	0.05	< 0.05	< 0.05	< 0.05	
				21	0.25	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.20	< 0.05	0.065	0.052	< 0.05	< 0.05	
2	0.26 0.25 (SC)	0.1	0 ^a	0.15	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			0	2.7	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			7	2.2	0.083	0.058	< 0.05	0.051	< 0.05		
			14	0.55	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			21	0.48	< 0.05	0.05	0.081	< 0.05	< 0.05		
			28	0.37	< 0.05	0.058	0.081	< 0.05	< 0.05		
France (South), St Martin le Chatel 2008 (Platine) PTHIO_078	2	0.25 0.24 (SC)	0.1	0 ^a	0.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	3.6	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.82	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.34	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.083	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.095	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 0.24 (EC)	0.1	0 ^a	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	3.8	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.33	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.089	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
France (South), St Jean de Niost 2008 (Ketos) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	0 ^a	0.069	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	2.8	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.63	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.24	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.095	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.24 0.25 (EC)	0.1 0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	3.4	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.49	0.059	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.16	0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.059	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.064	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	

^a before last treatment^b: mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 111 Residues in barley hay following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2009 (481-6R) PTHIO_079	2	0.35 0.34	0.17 0.17	Hay							Parent: 8.2
				0	11	0.88	0.65	0.24	0.15	< 0.05	Total: 9.7
				0	12	1.0	0.83	0.27	0.12	< 0.05	
USA (ND), Carrington 2009 (Pinnacle) PTHIO_079	2	0.37 0.36	0.2 0.19	Hay							Parent: 12
				0	7.2	0.49	0.33	0.2	0.12	< 0.05	Total: 13
				0	6.8	0.46	0.31	0.28	0.17	< 0.05	
Canada, Carberry 2009 (CDC Bold) PTHIO_079	2	0.35	0.16	Hay							Parent: 7
				0	39	0.85	0.43	0.12	2.0	< 0.05	Total: 7.9
				0	41	0.72	0.35	0.1	0.51	< 0.05	
Canada, Justice 2009 (CDC Bold) PTHIO_079	2	0.35	0.16	Hay							Parent: 40
				0	33	1.3	0.79	0.13	2.9	0.091	Total: 41
				0	35	1.2	0.79	0.16	2.4	0.083	
Canada, Alvena 2009 (Copeland) PTHIO_079	2	0.36 0.35	0.18 0.18	Hay							Parent: 34
				0	23	0.67	0.42	0.12	0.09	< 0.05	Total: 36
				0	23	0.79	0.58	0.16	0.07	< 0.05	
Canada, Wakaw 2009 (Copeland) PTHIO_079	2	0.36 0.35	0.18 0.18	Hay							Parent: 23
				0	30	0.64	0.51	0.25	0.19	< 0.05	Total: 24
				0	20	0.74	0.53	0.23	0.096	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Saskatoon 2009 (CDC Copeland) PTHIO_079	2	0.34	0.17	Hay 0 0	17 17	0.082 0.1	0.065 0.099	< 0.05 < 0.05	0.064 < 0.05	< 0.05 < 0.05	Parent: 25 Total: 26
Canada, Waldheim 2009 (CDC Copeland) PTHIO_079	2	0.34	0.17	Hay 0 0	24 31	0.54 0.61	0.22 0.34	0.17 0.19	0.25 0.91	< 0.05 < 0.05	Parent: 17 Total: 17
Canada, Fort Saskatchewan 2009 (Seebee) PTHIO_079	2	0.37 0.36	0.24	Hay 0 0	8.0 9.7	0.5 0.54	0.89 0.99	0.16 0.22	1.3 1.3	0.05 0.052	Parent: 28 Total: 29
Canada, Fort Saskatchewan 2009 (Seebee) PTHIO_079	2	0.36	0.34	Hay 0 0	3.8 3.9	0.18 0.2	0.47 0.46	0.1 0.1	0.55 0.44	< 0.05 < 0.05	Parent: 8.9 Total: 9.8
Canada, Lamont 2009 (Seebee) PTHIO_079	2	0.36	0.24	Hay 0 0	4.9 3.8	0.34 0.26	1.4 1.1	0.25 0.19	0.78 0.79	0.078 0.064	Parent: 3.9 Total: 4.2
Canada, Westlock 2009 (Seebee) PTHIO_079	2	0.36	0.24	Hay 0 0	3.3 1.8	0.21 0.16	0.57 0.44	0.24 0.2	0.47 0.28	0.051 0.056	Parent: 4.4 Total: 4.9

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 112 Residues in maize forage following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (NY), North Rose 2009 (DeKalb DKC 46-60) PTHIO_100	4	0.35 0.36 0.36 0.35	0.19 0.19 0.19 0.19	0 0	4.5 5.9	0.053 0.069	0.078 0.11	0.063 0.083	0.023 0.029	< 0.01 < 0.01	Parent: 5.2 Total: 5.3
USA (NC), Seven Springs 2009 (N77-P5) PTHIO_100	4	0.35 0.36 0.34 0.35	0.19 0.28 0.26 0.27	6 6	0.88 0.94	0.05 0.05	0.053 0.053	0.028 0.037	0.036 0.048	0.03 0.035	Parent: 3.4 Total: 3.4

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, St. George 2009 (38M58 RR) PTHIO_100	4	0.37 0.34 0.35 0.34	0.78 0.72 0.75 0.73	0 0	3.3 3.4	0.015 0.016	0.03 0.03	0.022 0.022	0.015 0.015	< 0.01 < 0.01	Parent: 4.7 Total: 4.7
Canada, Paris 2009 (DeKalb 3826) PTHIO_100	4	0.34 0.37 0.36 0.35	0.17 0.19 0.18 0.18	0 0	4.2 5.2	0.014 0.014	0.021 0.022	< 0.01 < 0.01	0.12 0.11	< 0.01 < 0.01	Parent: 3.6 Total: 3.6
Canada, Paris 2009 (DeKalb 4493) PTHIO_100	4	0.37 0.35 0.35 0.35	0.19 0.18 0.17 0.17	0 0	3.9 3.3	0.013 0.011	0.027 0.021	0.013 < 0.01	0.045 0.032	< 0.01 < 0.01	Parent: 5 Total: 5.1
Canada, St. Marc-sur- Richilieu 2009 (N27B G7/CB/LL) PTHIO_100	4	0.34 0.35 0.35 0.35	0.18 0.18 0.18 0.18	0 0	5.7 4.3	0.035 0.025	0.031 0.022	0.033 0.026	0.024 0.019	< 0.01 < 0.01	Parent: 4.4 Total: 4.4
Canada, Thorndale 2009 (Pioneer R38M57) PTHIO_100	4	0.36 0.37 0.36 0.34	0.18 0.18 0.18 0.17	0 0	4.4 4.4	0.016 0.012	0.022 0.014	< 0.01 < 0.01	0.043 0.043	< 0.01 < 0.01	Parent: 3.7 Total: 3.7
USA (IA), Richland 2009 (Pioneer 34R67) PTHIO_100	4	0.36 0.36 0.34 0.36	0.23 0.24 0.22 0.24	0 0	3.4 4.0	0.014 < 0.01	0.018 0.01	0.016 < 0.01	0.01 < 0.01	< 0.01 < 0.01	Parent: 3.3 Total: 3.4
USA (ND), Gardner 2009 (INT 65085R) PTHIO_100	4	0.36	0.19	0 0	3.2 3.4	0.036 0.04	0.049 0.054	0.036 0.04	0.027 0.029	< 0.01 < 0.01	Parent: 5.2 Total: 5.2
USA (KS), Gardner 2009 (6464 VT3) PTHIO_100	4	0.35 0.35 0.36 0.36	0.24 0.24 0.25 0.25	0 0	5.5 4.9	0.02 0.025	0.035 0.041	0.028 0.027	0.053 0.049	< 0.01 < 0.01	Parent: 4.2 Total: 4.2
USA (NE), Springfield 2009 (N38-54) PTHIO_100	4	0.37 0.37 0.37 0.35	0.28 0.28 0.28 0.27	0 0	4.5 3.9	0.025 0.027	0.037 0.036	0.026 0.023	0.035 0.033	< 0.01 < 0.01	Parent: 2.9 Total: 3.0

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (MN), Rice 2009 (DKC 41- 63) PTHIO_100	4	0.36	0.19	0 0	2.8 2.9	0.068 0.065	0.075 0.063	0.038 0.038	0.019 0.016	< 0.01 < 0.01	Parent: 7.3 Total: 7.3
USA (OH), Richwood 2009 (Shur Grow 686 UT3) PTHIO_100	4	0.35	0.21	0 ^a 0 ^a 0 0 3 3 7 7 10 10	2.5 0.8 8.6 5.9 3.2 3.3 1.4 1.4 2.6 1.1	0.047 0.023 0.05 0.037 0.18 0.19 0.054 0.054 0.066 0.032	0.073 0.042 0.1 0.057 0.2 0.22 0.11 0.1 0.17 0.097	0.03 0.014 0.036 0.038 0.15 0.17 0.041 0.036 0.076 0.036	0.026 0.014 0.027 0.024 0.039 0.045 0.04 0.034 0.098 0.054	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01 0.01 < 0.01 0.018 < 0.01	Parent: 4.8 Total: 4.9
USA (TX), Uvalde 2009 (DK69) PTHIO_100	4	0.35 0.34 0.35 0.35	0.15 0.15 0.25 0.25	0 0	4.1 5.4	0.1 0.1	0.08 0.08	0.17 0.15	< 0.01 < 0.01	< 0.01 < 0.01	Parent: 5.2 Total: 5.3

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 113 Residues in sorghum forage following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (LA), Cheneyville 2009 (Dyna Gro 780B) PTHIO_079	2	0.34 0.36	0.18 0.19	0 0	8.6 6.8	0.11 0.068	0.043 0.037	0.13 0.08	0.12 0.086	< 0.01 < 0.01	Parent: 7.7 Total: 7.9
USA (IA), Richland 2009 (Pioneer 8500) PTHIO_079	2	0.34 0.35	0.72 0.74	0 0	3.8 3.1	0.086 0.054	0.06 0.055	0.093 0.055	0.04 0.024	< 0.01 < 0.01	Parent: 3.5 Total: 3.6
USA (NE), York 2009 (NC+ 6B50) PTHIO_079	2	0.34	0.18	0 0	6.7 5.3	0.095 0.062	0.051 0.04	0.07 0.042	0.05 0.041	< 0.01 < 0.01	Parent: 6 Total: 6.1
USA (GA), Chula 2009 (Pioneer 84G62) PTHIO_079	2	0.36 0.35	0.18 0.19	0 0	6.5 7.2	0.051 0.052	0.032 0.042	0.034 0.039	0.13 0.12	< 0.01 < 0.01	Parent: 6.9 Total: 6.9

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (TX), Uvalde 2009 (A571) PTHIO_079	2	0.36	0.26	0 0	6.8 6.1	0.14 0.12	0.071 0.059	0.21 0.16	0.015 0.014	< 0.01 < 0.01	Parent: 6.5 Total: 6.7
USA (TX), Raymondville 2009 (DKS 3707) PTHIO_079	2	0.37	0.2	0 0	6.8 7.7	0.099 0.12	0.076 0.085	0.15 0.18	0.028 0.033	< 0.01 < 0.01	Parent: 7.3 Total: 7.5
USA (ND), Jamestown 2009 (8500) PTHIO_079	2	0.36	0.19	0 0	14 14	0.072 0.064	0.041 0.036	0.035 0.034	0.27 0.24	< 0.01 < 0.01	Parent: 14 Total: 14
USA (TX), Whitharral 2009 (DeKalb 44 Bronze) PTHIO_079	2	0.35	0.19	0 0	5.6 7.5	0.093 0.11	0.056 0.069	0.071 0.098	0.026 0.033	< 0.01 < 0.01	Parent: 6.6 Total: 6.7
USA (KS), Larned 2009 (DK 537- 07) PTHIO_079	2	0.35 0.36	0.2 0.22	0 0	3.9 3.9	0.018 0.019	0.02 0.023	0.014 0.014	0.035 0.043	< 0.01 < 0.01	Parent: 3.9 Total: 3.9

^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 114 Residues in wheat forage following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Colchester 2007 (Istabraq) PTHIO_077	2	0.25	0.1	0 ^a 0 7 14 21 28	0.02 2.1 0.57 0.54 0.53 0.23	< 0.05 < 0.05 < 0.05 < 0.05 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 0.055 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 0.051	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	
UK, Peaston 2007 (Robigus) PTHIO_077	2	0.24 0.25	0.1 0.1	0 ^a 0 7 14 21 28	0.03 3.7 0.63 0.21 0.17 0.11	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 0.058	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 0.054	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	
UK, Peaston 2008 (Consort) PTHIO_077	2	0.25 (SC)	0.1	0 ^a 0 7 14 21 28	0.13 4.7 0.33 0.22 0.18 0.14	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05 < 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b	
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA		
	2	0.25 0.26 (EC)	0.1	0 ^a	0.02	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				0	4.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				7	0.21	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				14	0.21	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				21	0.14	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				28	0.079	< 0.05	0.052	0.051	< 0.05	< 0.05		
	2	0.26 0.27 (SC)	0.1	0 ^a	0.15	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				0	4.7	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				7	0.38	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				14	0.24	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				21	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				28	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
	2	0.25 (SC)	0.1	0 ^a	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				0	5.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				7	0.6	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				14	0.25	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				21	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				28	0.14	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
Germany, Motterwitz 2008 (Inspiration) PTHIO_077	2	0.26 0.24 (SC)	0.1	0 ^a	0.66	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				0	3.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				7	0.58	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				14	0.25	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				21	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				28	0.067	< 0.05	0.075	0.089	< 0.05	< 0.05		< 0.05
	2	0.26 0.24 (EC)	0.1	0 ^a	0.12	0.08	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				0	2.6	0.075	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				7	0.17	0.069	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				14	0.063	0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				21	< 0.05	0.054	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				28	< 0.05	< 0.05	< 0.05	0.063	< 0.05	< 0.05		< 0.05
	2	0.25 (SC)	0.1	0 ^a	0.42	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				0	3.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				7	0.5	0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				14	0.14	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				21	0.09	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
				28	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		< 0.05
2	0.26 (SC)	0.1	0 ^a	1.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			0	5.6	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			7	0.94	0.051	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			14	0.22	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			21	0.15	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
			28	0.1	< 0.05	< 0.05	0.061	< 0.05	< 0.05	< 0.05		
France (South), St Trivier-sur- Moignans 2008 (Aubusson) PTHIO_077	2	0.25 (SC)	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05		
				0	4.2	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.15	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.12	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.067	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.059	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
	2	0.25 (EC)	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	4.1	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.24	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.057	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.061	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 0.24 (SC)	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	3.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.13	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.06	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.054	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 (SC)	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	3.6	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.08	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
France (South), St Martin le Chatel 2008 (Aubusson) PTHIO_077	2	0.25 (SC)	0.1	0 ^a	0.07	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	2.5	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.29	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.13	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.093	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 (EC)	0.1	0 ^a	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				0	2.9	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				7	0.18	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				14	0.13	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				21	0.081	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
				28	0.065	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
USA (GA), Chula 2009 (Pioneer 26RG1) PTHIO_079	2	0.36 0.35	0.18 0.18	Forage							Parent (forage): 7.6 Total (forage): 8.3 Parent (hay): 17 Total (hay): 21
				0	7.6	0.37	0.14	0.28	0.02	0.012	
				0	7.6	0.34	0.14	0.28	0.017	0.01	
				Hay							
				0	15	2.1	1.1	0.67	0.058	< 0.05	
				0	18	2.9	1.2	0.74	0.067	< 0.05	
USA (MO), Fisk 2009 (Coker 9663) PTHIO_077	2	0.36	0.19	Forage							Parent (forage): 8.5 Total (forage): 8.7 Parent (hay): 19 Total (hay): 20
				0	8.8	0.11	0.064	0.086	0.028	< 0.01	
				0	8.1	0.11	0.071	0.09	0.027	< 0.01	
				Hay							
				0	17	0.46	0.3	0.16	0.071	< 0.05	
				0	21	0.45	0.32	0.17	0.071	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Branchton 2009 (Surge) PTHIO_079	2	0.36 0.35	0.18 0.18	Forage 0 0 Hay 0 0	 5.5 5.7 7.8 7.5	 0.11 0.11 0.97 0.83	 0.066 0.072 0.9 0.75	 0.067 0.071 0.24 0.19	 < 0.01 0.012 0.072 0.07	 < 0.01 < 0.01 < 0.05 < 0.05	Parent (forage): 5.6 Total (forage): 5.8 Parent (hay): 7.7 Total (hay): 9.3
USA (ND), Northwood 2009 (Divide) PTHIO_079	2	0.36	0.19	Forage 0 0 Hay 0 0	 14 14 9.2 13	 0.42 0.39 0.76 0.84	 0.34 0.3 0.53 0.7	 0.51 0.44 0.3 0.45	 < 0.01 < 0.01 < 0.05 0.056	 0.01 < 0.01 < 0.05 < 0.05	Parent (forage): 14 Total (forage): 15 Parent (hay): 11 Total (hay): 13
USA (KS), Gardner 2009 (Winter Hawk) PTHIO_079	2	0.36	0.25	Forage 0 0 Hay 0 0	 10 10 37 33	 0.059 0.059 0.33 0.35	 0.041 0.042 0.18 0.18	 0.041 0.044 0.22 0.21	 0.029 0.028 0.16 0.16	 < 0.01 < 0.01 < 0.05 < 0.05	Parent (forage): 10 Total (forage): 10 Parent (hay): 35 Total (hay): 36
USA (TX), Uvalde 2009 (Fannin) PTHIO_079	2	0.36 0.35	0.26 0.25	Forage 0 0 Hay 0 0	 5.1 6.1 12 16	 0.32 0.29 1.1 1.1	 0.22 0.19 0.61 0.73	 0.23 0.23 0.83 0.7	 0.01 0.012 < 0.05 < 0.05	 < 0.01 < 0.01 < 0.05 < 0.05	Parent (forage): 5.6 Total (forage): 6.2 Parent (hay): 14 Total (hay): 16
USA (ND), Carrington 2009 (Glenn) PTHIO_079	2	0.35 0.36	0.75 0.76	Forage 0 0 Hay 0 0	 13 15 14 10	 0.05 0.053 0.3 0.24	 0.04 0.035 0.23 0.17	 0.021 0.017 0.28 0.18	 < 0.01 < 0.01 0.13 0.12	 < 0.01 < 0.01 < 0.05 < 0.05	Parent (forage): 14 Total (forage): 14 Parent (hay): 12 Total (hay): 13
USA (ND), Velva 2009 (Fuller) PTHIO_079	2	0.36 0.35	0.32 0.31	Forage 0 0 Hay 0 0	 17 14 43 32	 0.16 0.15 0.64 0.61	 0.11 0.1 0.41 0.43	 0.094 0.094 0.4 0.39	 0.012 0.013 0.055 0.064	 0.01 0.013 < 0.05 < 0.05	Parent (forage): 16 Total (forage): 16 Parent (hay): 38 Total (hay): 39

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (NE), Grand Island 2009 (Traverse HRS) PTHIO_079	2	0.34	0.18	Forage 0							Parent (forage): 13
				0	12	0.049	0.037	0.026	0.024	< 0.01	Total (forage): 13
				Hay 0	13	0.042	0.039	0.02	0.025	< 0.01	Parent (hay): 28
				0	31	0.78	0.79	0.46	0.15	< 0.05	Total (hay): 29
Canada, Dundurn 2009 (Infinity) PTHIO_079	2	0.35	0.18	Forage 0 ^a							Parent (forage): 17
				0 ^a	2.0	0.069	0.048	0.056	0.031	< 0.01	Total (forage): 17
				0	1.9	0.061	0.045	0.062	0.026	< 0.01	Parent (hay): 53
				0	16	0.074	0.051	0.053	0.043	< 0.01	Total (hay): 53
				4	17	0.073	0.055	0.078	0.034	< 0.01	
				4	6.3	0.62	0.19	0.68	0.079	0.012	
				7	5.2	0.44	0.16	0.56	0.054	0.011	
				7	3.8	0.71	0.14	0.45	0.1	0.01	
				11	4.4	0.64	0.15	0.63	0.059	0.01	
				11	2.0	0.45	0.08	0.21	0.042	< 0.01	
					2.1	0.56	0.099	0.3	0.043	< 0.01	
				Hay 0							
Canada, Vanscoy 2009 (AC Lillian) PTHIO_079	2	0.35	0.21	Forage 0							Parent (forage): 11
				0	10	0.21	0.072	0.11	0.032	< 0.01	Total (forage): 11
				Hay 0	11	0.22	0.075	0.11	0.033	< 0.01	Parent (hay): 25
				0	26	0.85	0.43	0.49	0.099	< 0.05	Total (hay): 27
Canada, Taber 2009 (Supurb) PTHIO_079	2	0.34	0.23	Forage 0							Parent (forage): 7
				0	7.6	0.13	0.089	0.074	0.013	< 0.01	Total (forage): 7.3
				Hay 0	6.4	0.14	0.091	0.077	0.012	< 0.01	Parent (hay): 19
				0	16	0.39	0.15	0.11	0.073	< 0.05	Total (hay): 20
USA (OK), Hinton 2009 (Endurance) PTHIO_079	2	0.36	0.28	Forage 0							Parent (forage): 8.6
				0	7.2	0.17	0.072	0.066	0.029	< 0.01	Total (forage): 8.9
				Hay 0	10	0.15	0.078	0.091	0.038	< 0.01	Parent (hay): 23
				0	22	0.51	0.58	0.16	0.73	< 0.05	Total (hay): 24
					24	0.55	0.68	0.19	0.69	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (OK), Hydro 2009 (OK Bullet) PTHIO_079	2	0.36 0.35	0.18 0.16	Forage							Parent (forage): 13 Total (forage): 13 Parent (hay): 44 Total (hay): 47
				0							
				0	13	0.21	0.11	0.077	0.044	< 0.01	
				0	12	0.15	0.11	0.076	0.038	< 0.01	
				Hay							
				0							
				0	42	1.4	1.7	0.28	1.5	0.051	
				0	46	1.3	1.2	0.21	2.1	0.05	
USA (KS), Larned 2009 (Jagger) PTHIO_079	2	0.35 0.36	0.19 0.19	Forage							Parent (forage): 5.5 Total (forage): 5.5 Parent (hay): 13 Total (hay): 13
				0							
				0	6.0	0.029	0.034	0.025	< 0.01	< 0.01	
				0	4.9	0.025	0.026	0.02	< 0.01	< 0.01	
				Hay							
				0							
				0	12	0.093	0.12	0.06	< 0.05	< 0.05	
				0	14	0.09	0.12	0.075	< 0.05	< 0.05	
USA (TX), Olton 2009 (T2M 111) PTHIO_079	2	0.36 0.35	0.23 0.23	Forage							Parent (forage): 9.3 Total (forage): 9.5 Parent (hay): 22 Total (hay): 23
				0							
				0	10	0.14	0.092	0.079	0.027	< 0.01	
				0	8.5	0.11	0.093	0.072	0.032	< 0.01	
				Hay							
				0							
				0	21	0.38	0.29	0.22	0.072	< 0.05	
				0	23	0.42	0.35	0.21	0.068	< 0.05	
USA (WA), Ephrata 2009 (Nick) PTHIO_079	2	0.36	0.18	Forage							Parent (forage): 13 Total (forage): 13 Parent (hay): 29 Total (hay): 30
				0							
				0	13	0.065	0.04	0.03	0.02	< 0.01	
				0	12	0.063	0.03	0.04	0.02	< 0.01	
				Hay							
				0							
				0	24	0.59	0.57	0.35	0.07	< 0.05	
				0	33	0.56	0.64	0.32	0.082	< 0.05	
Canada, Carberry 2009 (AC Domain) PTHIO_079	2	0.35	0.16	Forage							Parent (forage): 9.8 Total (forage): 10 Parent (hay): 28 Total (hay): 28
				0							
				0	8.6	0.11	< 0.01	0.087	0.042	< 0.01	
				0	11	0.11	0.067	0.086	0.047	< 0.01	
				Hay							
				0							
				0	26	0.51	0.35	0.12	1.1	< 0.05	
				0	29	0.55	0.3	0.14	0.31	< 0.05	
Canada, Justice 2009 (AC Domain) PTHIO_079	2	0.35	0.14	Forage							Parent (forage): 12 Total (forage): 12 Parent (hay): 27 Total (hay): 28
				0							
				0	11	0.1	0.067	0.06	0.035	< 0.01	
				0	12	0.12	0.075	0.063	0.035	< 0.01	
				Hay							
				0							
				0	27	0.66	0.55	0.093	1.5	< 0.05	
				0	27	0.77	0.58	0.095	2.3	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Alvena 2009 (Infinity) PTHIO_079	2	0.36 0.35	0.18 0.18	Forage							Parent (forage): 14 Total (forage): 14 Parent (hay): 29 Total (hay): 31
				0	14	0.19	0.048	0.11	0.08	< 0.01	
				0	13	0.18	0.048	0.11	0.076	< 0.01	
				Hay							
				0	29	0.76	0.59	0.15	0.2	< 0.05	
				0	29	0.87	0.65	0.19	0.19	< 0.05	
Canada, Waldheim 2009 (AC Elsa) PTHIO_079	2	0.35 0.34	0.18 0.17	Forage							Parent (forage): 8.6 Total (forage): 8.8 Parent (hay): 29 Total (hay): 30
				0	9.2	0.11	0.06	0.047	0.026	< 0.01	
				0	7.9	0.11	0.061	0.053	0.028	< 0.01	
				Hay							
				0	34	0.63	0.2	0.12	0.28	< 0.05	
				0	24	0.59	0.19	0.1	0.25	< 0.05	
Canada, Blaine Lake 2009 (Infinity) PTHIO_079	2	0.34 0.33	0.17 0.17	Forage							Parent (forage): 12 Total (forage): 12 Parent (hay): 30 Total (hay): 30
				0	12	0.013	0.011	0.015	0.018	< 0.01	
				0	11	0.013	< 0.01	0.012	0.012	< 0.01	
				Hay							
				0	27	0.1	0.11	< 0.05	0.24	< 0.05	
				0	33	0.094	0.098	< 0.05	0.24	< 0.05	
Canada, Fort Saskatchewan 2009 (Harvest) PTHIO_079	2	0.36	0.24	Forage							Parent (forage): 9.1 Total (forage): 0.20 Parent (hay): 6.4 Total (hay): 7.1
				0	8.6	0.084	0.051	0.064	0.016	< 0.01	
				0	9.5	0.082	0.055	0.07	0.014	< 0.01	
				Hay							
				0	6.2	0.37	0.7	0.24	1.0	0.05	
				0	6.5	0.46	0.73	0.32	0.99	0.05	
Canada, Fort Saskatchewan 2009 (Harvest) PTHIO_079	2	0.36	0.24	Forage							Parent (forage): 9.6 Total (forage): 9.8 Parent (hay): 4.7 Total (hay): 5.7
				0	8.2	0.088	0.048	0.094	0.017	< 0.01	
				0	11	0.13	0.061	0.11	0.023	< 0.01	
				Hay							
				0	5.2	0.57	0.89	0.59	0.71	0.11	
				0	4.2	0.55	0.97	0.69	0.62	0.083	
Canada, Lamont 2009 (Harvest) PTHIO_079	2	0.37 0.35	0.24 0.24	Forage							Parent (forage): 13 Total (forage): 13 Parent (hay): 4.5 Total (hay): 5.1
				0	12	0.17	0.081	0.16	0.023	< 0.01	
				0	14	0.19	0.087	0.2	0.032	< 0.01	
				Hay							
				0	5.1	0.34	0.62	0.45	0.67	0.053	
				0	3.9	0.34	0.56	0.45	0.59	0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^b
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Westlock 2009 (Emagine) PTHIO_079	2	0.36	0.24	Forage 0							Parent (forage): 10
				0	11	0.072	0.038	0.043	0.064	< 0.01	Total (forage): 10
					9.5	0.073	0.039	0.046	0.064	< 0.01	
				Hay 0							Parent (hay): 7.4
				0	6.9	0.38	0.61	0.25	0.81	0.052	Total (hay): 8.1
					7.9	0.4	0.68	0.27	0.96	0.066	

^a before last treatment^b mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 115 Residues in barley straw following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Aingers Green 2007 (Flagon) PTHIO_078	2	0.25	0.1	36	0.68	< 0.05	0.066	< 0.05	< 0.05	< 0.05	
UK, Tranent 2007 (Oxbridge) PTHIO_078	2	0.26 0.25	0.1 0.1	49	0.15	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Germany, Machern 2007 (Naomi) PTHIO_078	2	0.25	0.1	54	0.28	< 0.05	0.095	< 0.05	< 0.05	< 0.05	
UK, Kennoway 2007 (Rebecca) PTHIO_078	2	0.26	0.1	45	0.051	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
UK, Harwich 2008 (Flagon) PTHIO_078	2	0.25	0.1	47	0.92	0.072	0.27	0.098	< 0.05	< 0.05	
	2	0.24	0.1	47	0.28	0.088	0.41	0.12	< 0.05	< 0.05	
Germany, Motterwitz 2008 (Laverda) PTHIO_078	2	0.26 (SC)	0.1	37	0.35	< 0.05	0.067	0.07	< 0.05	< 0.05	
	2	0.26 0.25 (EC)	0.1 0.1	37	0.15	< 0.05	0.098	0.094	< 0.05	< 0.05	
	2	0.24 0.23 (SC)	0.1 0.1	37	0.34	< 0.05	0.092	0.08	< 0.05	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
	2	0.26 0.25 (SC)	0.1 0.1		0.36	< 0.05	0.092	0.11	< 0.05	< 0.05	
Hungary, Velence 2008 (Nelly) PTHIO_078	2	0.24 0.26 (SC)	0.1 0.1	34	0.19	< 0.05	0.063	< 0.05	< 0.05	< 0.05	
	2	0.25 0.24 (EC)	0.1 0.1	34	0.17	< 0.05	0.081	< 0.05	< 0.05	< 0.05	
	2	0.24 0.25 (SC)	0.1 0.1	34	0.28	< 0.05	0.054	< 0.05	< 0.05	< 0.05	
	2	0.24 0.25 (SC)	0.1 0.1	34	0.16	< 0.05	0.05	< 0.05	< 0.05	< 0.05	
France (North), Senlis le Sec 2008 (Sebastian) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	60	0.084	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.24 0.25 (EC)	0.1 0.1	60	0.22	< 0.05	0.055	< 0.05	< 0.05	< 0.05	
	2	0.24 0.25 (SC)	0.1 0.1	60	0.57	< 0.05	0.063	0.052	< 0.05	< 0.05	
	2	0.25 (SC)	0.1 0.1	60	0.16	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
France (South), Charontonnay 2008 (Caravan) PTHIO_078	2	0.24 0.26 (SC)	0.1 0.1	42	< 0.05	< 0.05	0.051	< 0.05	< 0.05	< 0.05	
	2	0.25 0.26 (EC)	0.1 0.1	42	0.058	< 0.05	0.082	< 0.05	< 0.05	< 0.05	
	2	0.24 0.26 (SC)	0.1 0.1	42	0.11	< 0.05	0.062	< 0.05	< 0.05	< 0.05	
	2	0.25 0.26 (SC)	0.1 0.1	42	0.13	< 0.05	0.058	< 0.05	< 0.05	< 0.05	
Hungary, Velence 2008 (Nelly) PTHIO_078	2	0.24 0.26 (SC)	0.1 0.1	34	0.25	< 0.05	0.072	< 0.05	< 0.05	< 0.05	
	2	0.25 (EC)	0.1	34	0.15	< 0.05	0.08	< 0.05	< 0.05	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
	2	0.25 0.26 (SC)	0.1 0.1		0.13	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 (SC)	0.1 0.1	34	0.19	< 0.05	0.065	< 0.05	< 0.05	< 0.05	
France (South), Pact 2008 (Franzi) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	45	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.26 (EC)	0.1	45	< 0.05	< 0.05	0.067	< 0.05	< 0.05	< 0.05	
France (South), St Martin le Chatel 2008 (Platine) PTHIO_078	2	0.25 0.24 (SC)	0.1 0.1	39	0.11	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 0.24 (EC)	0.1 0.1	39	< 0.05	< 0.05	0.076	0.05	< 0.05	< 0.05	
France (South), St Jean de Niost 2008 (Ketos) PTHIO_078	2	0.24 0.25 (SC)	0.1 0.1	35	0.2	< 0.05	0.051	< 0.05	< 0.05	< 0.05	
	2	0.24 0.25 (EC)	0.1 0.1	35	0.14	< 0.05	0.088	< 0.05	< 0.05	< 0.05	
USA (ND), Northwood 2009 (Pinnacle) PTHIO_079	2	0.36 0.35	0.76 0.74	55 55	0.1 0.11	< <u>0.05</u> < <u>0.05</u>	0.062 0.062	< 0.05 < 0.05	0.064 0.075	< 0.05 < 0.05	Parent: 0.11 Total: 0.2
Canada, Branchton 2009 (481-6R) PTHIO_079	2	0.35 0.34	0.17 0.17	54 54	0.1 0.11	< 0.05 0.05	0.096 0.1	< 0.05 < 0.05	0.21 0.2	< 0.05 0.051	Parent: 0.11 Total: 0.20
USA (ND), Carrington 2009 (Pinnacle) PTHIO_079	2	0.37 0.36	0.2 0.19	62 62	0.12 0.12	< <u>0.05</u> < <u>0.05</u>	< 0.05 < 0.05	0.092 0.079	0.093 0.087	< 0.05 < 0.05	Parent: 0.12 Total: 0.21
Canada, Carberry 2009 (CDC Bold) PTHIO_079	2	0.35	0.16	59 59	0.19 0.19	0.08 0.076	0.15 0.14	< 0.05 < 0.05	0.17 0.16	< 0.05 < 0.05	Parent: 0.19 Total: 0.34
Canada, Justice 2009 (CDC Bold) PTHIO_079	2	0.35	0.16	47 47	0.39 0.4	0.075 0.082	0.15 0.14	< 0.05 < 0.05	0.16 0.17	< 0.05 < 0.05	Parent: 0.40 Total: 0.54

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Alvena 2009 (Copeland) PTHIO_079	2	0.36 0.35	0.18 0.18	49 49	0.27 0.21	0.091 0.076	0.16 0.14	< 0.05 < 0.05	0.24 0.2	< 0.05 < 0.05	Parent: 0.24 Total: 0.40
Canada, Wakaw 2009 (Copeland) PTHIO_079	2	0.36 0.35	0.18 0.18	49 49	0.78 0.62	0.17 0.12	0.29 0.22	< 0.05 < 0.05	0.91 0.66	< 0.05 < 0.05	Parent: 0.70 Total: 0.97
Canada, Saskatoon 2009 (CDC Copeland) PTHIO_079	2	0.34	0.17	56 56	0.1 0.12	< 0.05 < 0.05	0.06 0.067	< 0.05 < 0.05	0.086 0.1	< 0.05 < 0.05	Parent: 0.11 Total: 0.20
Canada, Waldheim 2009 (CDC Copeland) PTHIO_079	2	0.34	0.17	53 53	0.34 0.4	0.12 0.14	0.23 0.28	< 0.05 0.058	0.24 0.28	0.068 0.058	Parent: 0.37 Total: 0.61
Canada, Fort Saskatchewan 2009 (Seebee) PTHIO_079	2	0.37 0.36	0.24	69 69	0.48 0.24	0.17 0.1	0.33 0.19	< 0.05 < 0.05	0.46 0.27	< 0.05 < 0.05	Parent: 0.36 Total: 0.61
Canada, Fort Saskatchewan 2009 (Seebee) PTHIO_079	2	0.36	0.34	68 68	0.23 0.22	0.11 0.1	0.23 0.19	< 0.05 < 0.05	0.2 0.11	0.07 0.068	Parent: 0.23 Total: 0.42
Canada, Lamont 2009 (Seebee) PTHIO_079	2	0.36	0.24	55 55	0.21 0.19	0.12 0.11	0.19 0.17	< 0.05 < 0.05	0.23 0.21	< 0.05 0.05	Parent: 0.2 Total: 0.41
Canada, Westlock 2009 (Seebee) PTHIO_079	2	0.36	0.24	60 60	0.32 0.51	0.18 0.25	0.32 0.38	0.077 0.1	0.24 0.37	0.17 0.2	Parent: 0.42 Total: 0.82

^a:mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 116 Residues in maize stover following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A- OH	753- F-DO	DM- PCA	
USA (NY), North Rose 2009 (DeKalb DKC 46-60) PTHIO_100	4	0.35	0.19	7	5.3	0.14	0.17	0.096	0.061	< 0.01	
		0.36	0.19	7	5.3	0.15	0.18	0.1	0.069	< 0.01	
		0.36	0.19								
		0.35	0.19								
USA (NC), Seven Springs 2009 (N77-P5) PTHIO_100	4	0.35	0.19	6	3.4	0.17	0.24	0.17	0.22	0.04	
		0.36	0.28	6	3.6	0.2	0.29	0.2	0.25	0.04	
		0.34	0.26								
		0.35	0.27								
Canada, St. George 2009 (38M58 RR) PTHIO_100	4	0.37	0.78	8	4.1	0.23	0.2	0.18	0.13	< 0.01	
		0.34	0.72	8	3.8	0.18	0.16	0.15	0.095	< 0.01	
		0.35	0.75								
		0.34	0.73								
Canada, Paris 2009 (DeKalb 3826) PTHIO_100	4	0.34	0.17	7	3.6	0.31	0.21	0.27	0.063	< 0.01	
		0.37	0.19	7	3.4	0.29	0.2	0.26	0.057	< 0.01	
		0.36	0.18								
		0.35	0.18								
Canada, Paris 2009 (DeKalb 4493) PTHIO_100	4	0.37	0.19	7	3.3	0.17	0.14	0.13	0.092	< 0.01	
		0.35	0.18	7	4.0	0.26	0.2	0.21	0.095	< 0.01	
		0.35	0.17								
		0.35	0.17								
Canada, St. Marc-sur- Richilieu 2009 (N27B G7/CB/LL) PTHIO_100	4	0.34	0.18	6	9.0	0.16	0.34	0.087	0.03	< 0.01	
		0.35	0.18	6	9.2	0.15	0.36	0.078	0.03	< 0.01	
		0.35	0.18								
		0.35	0.18								
Canada, Thorndale 2009 (Pioneer R38M57) PTHIO_100	4	0.36	0.18	6	4.4	0.15	0.22	0.075	0.079	< 0.01	
		0.37	0.18	6	3.9	0.15	0.22	0.066	0.065	< 0.01	
		0.36	0.18								
		0.34	0.17								
USA (IA), Richland 2009 (Pioneer 34R67) PTHIO_100	4	0.36	0.23	7	5.7	0.28	0.45	0.13	< 0.01	< 0.01	
		0.36	0.24	7	8.7	0.4	0.57	0.24	0.02	< 0.01	
		0.34	0.22								
		0.36	0.24								
USA (ND), Gardner 2009 (INT 65085R) PTHIO_100	4	0.36	0.19	7	3.9	0.13	0.16	0.066	0.021	< 0.01	
				7	5.2	0.16	0.21	0.097	0.035	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
USA (KS), Gardner 2009 (6464 VT3) PTHIO_100	4	0.35 0.35 0.36 0.36	0.24 0.24 0.25 0.25	6 6	10 8.7	0.51 0.41	0.64 0.52	0.35 0.26	0.47 0.39	< 0.01 < 0.01	
USA (NE), Springfield 2009 (N38-54) PTHIO_100	4	0.37 0.37 0.37 0.35	0.28 0.28 0.28 0.27	6 6	3.4 4.5	0.19 0.29	0.39 0.54	0.18 0.32	0.16 0.23	< 0.01 < 0.01	
USA (MN), Rice 2009 (DKC 41- 63) PTHIO_100	4	0.36	0.19	7 7	5.8 6.2	0.21 0.22	0.35 0.36	0.065 0.075	0.023 0.022	< 0.01 < 0.01	
USA (IL), Carlyle 2009 (8G23) PTHIO_100	4	0.36 0.340.37 0.36	0.14 0.27 0.24 0.23	8 8	5.3 2.6	0.17 0.11	0.15 0.12	0.17 0.075	0.04 0.03	< 0.01 < 0.01	
USA (TX), Uvalde 2009 (DK69) PTHIO_100	4	0.35 0.34 0.35 0.35	0.15 0.15 0.25 0.25	7 7	2.1 2.6	0.45 0.53	0.39 0.45	0.49 0.24	< 0.01 < 0.01	< 0.01 < 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 117 Residues in sorghum stover following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753-A-OH	753-F-DO	DM-PCA	
USA (LA), Cheneyville 2009 (Dyna Gro 780B) PTHIO_079	2	0.34 0.36	0.18 0.19	30 30	0.37 0.51	< 0.05 0.067	0.091 0.18	< 0.05 0.05	0.081 0.16	< 0.05 0.06	Parent: 0.44 Total: 0.55
USA (IA), Richland 2009 (Pioneer 8500) PTHIO_079	2	0.34 0.35	0.72 0.74	31 31	0.58 0.66	0.061 0.083	0.056 0.067	0.05 0.062	< 0.05 0.05	< 0.05 < 0.05	Parent: 0.62 Total: 0.75
USA (NE), York 2009 (NC+ 6B50) PTHIO_079	2	0.34	0.18	32 32	0.66 0.65	0.082 0.1	0.074 0.091	0.053 0.071	< 0.05 0.05	< 0.05 < 0.05	Parent: 0.66 Total: 0.82

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (GA), Chula 2009 (Pioneer 84G62) PTHIO_079	2	0.36 0.35	0.18 0.19	28 28	6.0 4.9	0.27 0.2	0.29 0.26	0.16 0.13	0.49 0.5	0.12 0.11	Parent: 5.5 Total: 5.9
USA (TX), Uvalde 2009 (A571) PTHIO_079	2	0.36	0.26	28 28	0.19 0.19	0.13 0.12	0.069 0.06	0.053 0.058	< 0.05 < 0.05	< 0.05 < 0.05	Parent: 0.19 Total: 0.42
USA (TX), Raymondville 2009 (DKS 3707) PTHIO_079	2	0.37	0.2	29 29	0.21 0.24	0.15 0.17	0.35 0.35	0.071 0.069	0.05 0.05	< 0.05 < 0.05	Parent: 0.23 Total: 0.52
USA (ND), Jamestown 2009 (8500) PTHIO_079	2	0.36	0.19	31 31	2.8 2.1	0.16 0.13	0.1 0.082	0.12 0.1	0.094 0.083	< 0.05 < 0.05	Parent: 2.5 Total: 2.7
USA (TX), Whitharral 2009 (DeKalb 44 Bronze) PTHIO_079	2	0.35	0.19	29 29	0.32 0.32	0.085 0.081	0.057 0.057	< 0.05 < 0.05	< 0.05 < 0.05	< 0.05 < 0.05	Parent: 0.32 Total: 0.47
USA (KS), Larned 2009 (DK 537- 07) PTHIO_079	2	0.35 0.36	0.2 0.22	33 33	0.15 0.12	0.05 < 0.05	0.059 0.051	< 0.05 < 0.05	< 0.05 < 0.05	< 0.05 < 0.05	Parent: 0.14 Total: 0.23

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 118 Residues in wheat straw following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Colchester 2007 (Istabraq) PTHIO_077	2	0.25	0.1	44	0.26	< 0.05	0.076	0.1	< 0.05	< 0.05	
UK, Peaston 2007 (Robigus) PTHIO_077	2	0.24 0.25	0.1 0.1	63	0.059	< 0.05	0.058	0.054	< 0.05	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Germany, Motterwitz 2007 (Schamane) PTHIO_077	2	0.26 0.24	0.1 0.1	44	0.13	< 0.05	0.067	0.082	< 0.05	< 0.05	
Hungary, Velenca 2007 (GK Kapos) PTHIO_077	2	0.26	0.1	18	2.3	0.17	0.27	0.16	0.071	< 0.05	
France (North), Charmée 2007 (Apache) PTHIO_077	2	0.25 0.24	0.1 0.1	44	1.1	< 0.05	0.13	0.39	< 0.05	< 0.05	
UK, Peaston 2008 (Consort) PTHIO_077	2	0.25 (SC)	0.1	55	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 0.26 (EC)	0.1 0.1	55	< 0.05	< 0.05	0.052	0.051	< 0.05	< 0.05	
	2	0.26 0.27 (SC)	0.1 0.1	55	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
	2	0.25 (SC)	0.1	55	0.05	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05	
Germany, Motterwitz 2008 (Inspiration) PTHIO_077	2	0.26 0.24 (SC)	0.1 0.1	60	0.05	< 0.05	0.075	0.089	< 0.05	0.37	
	2	0.26 0.24 (EC)	0.1 0.1	60	< 0.05	< 0.05	0.12	0.17	< 0.05	0.19	
	2	0.25 (SC)	0.1	60	< 0.05	< 0.05	0.065	0.077	< 0.05	0.49	
	2	0.26 (SC)	0.1	60	0.067	< 0.05	0.084	0.16	< 0.05	0.15	
Hungary, Kápolnásnyék 2008 (Petur) PTHIO_077	2	0.26 (SC)	0.1	44	0.32	0.086	< 0.05	0.12	< 0.05	< 0.05	
	2	0.26 (EC)	0.1	44	0.75	< 0.05	0.1	0.15	< 0.05	< 0.05	
France (North), Douai 2008 (Bermude) PTHIO_077	2	0.25 (SC)	0.1	58	0.21	< 0.05	< 0.05	0.28	< 0.05	< 0.05	
	2	0.25 (EC)	0.1	58	0.13	< 0.05	0.14	0.2	< 0.05	0.15	
France (South), Charantonay 2008 (Garcia)	2	0.24 0.25 (SC)	0.1 0.1	49	< 0.05	< 0.05	< 0.05	0.05	< 0.05	< 0.05	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
PTHIO_077	2	0.25 0.25 (EC)	0.1 0.1	49	< 0.05	< 0.05	< 0.05	0.074	< 0.05	< 0.05	
	2	0.24 0.25 (SC)	0.1 0.1	49	0.062	< 0.05	< 0.05	0.052	< 0.05	< 0.05	
	2	0.24 0.25 (SC)	0.1 0.1	49	0.077	< 0.05	< 0.05	0.06	< 0.05	< 0.05	
	2	0.24 0.25 (SC)	0.1 0.1	49	0.077	< 0.05	< 0.05	0.06	< 0.05	< 0.05	
France (South), St Jean di Niost 2008 (Aubusson) PTHIO_077	2	0.24 0.25 (SC)	0.1 0.1	43	< 0.05	< 0.05	< 0.05	0.076	< 0.05	< 0.05	
	2	0.24 (EC)	0.1	43	0.052	< 0.05	< 0.05	0.066	< 0.05	< 0.05	
France (South), St Trivier-sur- Moignans 2008 (Aubusson) PTHIO_077	2	0.25 (SC)	0.1	36	0.12	< 0.05	0.05	0.074	< 0.05	< 0.05	
	2	0.25 (EC)	0.1	36	0.058	< 0.05	0.086	0.063	< 0.05	< 0.05	
	2	0.25 0.24 (SC)	0.1 0.1	36	0.087	< 0.05	0.055	0.063	< 0.05	< 0.05	
	2	0.25 (SC)	0.1	36	0.072	< 0.05	0.08	0.05	< 0.05	< 0.05	
France (South), St Martin le Chatel 2008 (Aubusson) PTHIO_077	2	0.25 (SC)	0.1	47	0.16	< 0.05	0.05	0.096	< 0.05	< 0.05	
	2	0.25 (EC)	0.1	47	0.12	< 0.05	0.1	0.15	< 0.05	< 0.05	
USA (GA), Chula 2009 (Pioneer 26RG1) PTHIO_079	2	0.36 0.35	0.18 0.18	35 35	0.11 0.16	0.05 0.05	0.13 0.14	< 0.05 < 0.05	0.27 0.29	< 0.05 < 0.05	Parent: 0.14 Total: 0.23
USA (MO), Fisk 2009 (Coker 9663) PTHIO_079	2	0.36	0.19	35 35	0.089 0.1	< 0.05 < 0.05	0.083 0.099	< 0.05 < 0.05	0.19 0.21	< 0.05 0.056	Parent: 0.095 Total: 0.19
Canada, Branchton 2009 (Surge) PTHIO_079	2	0.36 0.35	0.18 0.18	48 48	< 0.05 0.051	< 0.05 < 0.05	0.096 0.11	< 0.05 < 0.05	0.18 0.25	0.051 0.053	Parent: 0.051 Total: 0.14

Penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (ND), Northwood 2009 (Divide) PTHIO_079	2	0.36	0.19	55 55	< 0.05 < 0.05	< 0.05 < 0.05	< 0.05 < 0.05	< 0.05 < 0.05	< 0.05 < 0.05	< 0.05 < 0.05	Parent: < 0.05 Total: < 0.1
USA (KS), Gardner 2009 (Winter Hawk) PTHIO_079	2	0.36	0.25	41 41	0.1 0.12	< 0.05 0.05	0.084 0.1	< 0.05 < 0.05	0.31 0.35	< 0.05 < 0.05	Parent: 0.11 Total: 0.2
USA (TX), Uvalde 2009 (Fannin) PTHIO_079	2	0.36 0.35	0.26 0.25	42 42	0.34 0.33	0.18 0.2	0.26 0.21	0.11 0.095	0.062 0.05	< 0.05 < 0.05	Parent: 0.34 Total: 0.69
USA (ND), Carrington 2009 (Glenn) PTHIO_079	2	0.35 0.36	0.75 0.76	62 62	0.082 0.086	< 0.05 < 0.05	0.091 0.097	< 0.05 < 0.05	0.14 0.15	< 0.05 < 0.05	Parent: 0.084 Total: 0.18
USA (ND), Velva 2009 (Fuller) PTHIO_079	2	0.36 0.35	0.32 0.31	54 54	< 0.05 < 0.05	< 0.05 < 0.05	0.077 0.11	< 0.05 < 0.05	0.18 0.24	< 0.05 < 0.05	Parent: < 0.05 Total: < 0.1
USA (NE), Grand Island 2009 (Traverse HRS) PTHIO_079	2	0.34	0.18	36 36	< 0.05 0.058	0.05 < 0.05	0.099 0.084	< 0.05 < 0.05	0.34 0.3	< 0.05 < 0.05	Parent: 0.054 Total: 0.15
Canada, Dundurn 2009 (Infinity) PTHIO_079	2	0.35	0.18	62 62	0.23 0.21	0.15 0.15	0.22 0.22	< 0.05 < 0.05	0.39 0.38	0.18 0.15	Parent: 0.22 Total: 0.5
Canada, Vanscoy 2009 (AC Lillian) PTHIO_079	2	0.35	0.21	55 55	0.16 0.21	0.25 0.26	0.4 0.46	< 0.05 < 0.05	1.6 2.2	0.05 0.05	Parent: 0.19 Total: 0.66
Canada, Taber 2009 (Supurb) PTHIO_079	2	0.34	0.23	51 51	0.085 0.034	0.08 < 0.05	0.13 0.062	< 0.05 < 0.05	0.17 0.075	< 0.05 < 0.05	Parent: 0.06 Total: 0.18
USA (OK), Hinton 2009 (Endurance) PTHIO_079	2	0.36	0.28	63 63	0.17 0.18	0.085 0.1	0.12 0.14	< 0.05 < 0.05	0.4 0.48	0.072 0.097	Parent: 0.18 Total: 0.35

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (OK), Hydro 2009 (OK Bullet) PTHIO_079	2	0.36 0.35	0.18 0.16	50 50	0.12 0.1	0.071 0.054	0.11 0.096	< 0.05 < 0.05	0.34 0.28	< 0.05 < 0.05	Parent: 0.11 Total: 0.23
USA (KS), Larned 2009 (Jagger) PTHIO_079	2	0.35 0.36	0.19 0.19	45 45	0.05 0.066	< 0.05 < 0.05	0.059 0.071	< 0.05 < 0.05	0.066 0.086	< 0.05 < 0.05	Parent: 0.058 Total: 0.15
USA (TX), Olton 2009 (T2M 111) PTHIO_079	2	0.36 0.35	0.23 0.23	40 40	0.12 0.12	< 0.05 < 0.05	0.05 0.05	< 0.05 < 0.05	0.12 0.13	< 0.05 < 0.05	Parent: 0.12 Total: 0.21
USA (WA), Ephrata 2009 (Nick) PTHIO_079	2	0.36	0.18	57 57	0.054 0.051	< 0.05 < 0.05	0.072 0.072	< 0.05 < 0.05	0.34 0.37	< 0.05 < 0.05	Parent: 0.053 Total: 0.15
Canada, Carberry 2009 (AC Domain) PTHIO_079	2	0.35	0.16	59 59	0.14 0.14	0.069 0.069	0.14 0.13	< 0.05 < 0.05	0.46 0.42	< 0.05 < 0.05	Parent: 0.14 Total: 0.27
Canada, Justice 2009 (AC Domain) PTHIO_079	2	0.35	0.14	59 59	0.19 0.19	0.07 0.068	0.18 0.17	< 0.05 < 0.05	0.51 0.5	< 0.05 < 0.05	Parent: 0.19 Total: 0.32
Canada, Alvena 2009 (Infinity) PTHIO_079	2	0.36 0.35	0.18 0.18	49 49	0.44 0.3	0.13 0.087	0.2 0.14	< 0.05 < 0.05	0.76 0.57	< 0.05 < 0.05	Parent: 0.37 Total: 0.57
Canada, Waldheim 2009 (AC Elsa) PTHIO_079	2	0.35 0.34	0.18 0.17	53 53	0.25 0.22	0.057 0.052	0.096 0.084	< 0.05 < 0.05	0.49 0.44	< 0.05 < 0.05	Parent: 0.24 Total: 0.34
Canada, Blaine Lake 2009 (Infinity) PTHIO_079	2	0.34 0.33	0.17 0.17	56 56	0.3 0.3	0.07 0.07	0.079 0.084	< 0.05 < 0.05	0.62 0.61	< 0.05 < 0.05	Parent: 0.3 Total: 0.43
Canada, Fort Saskatchewan 2009 (Harvest) PTHIO_079	2	0.36	0.24	69 69	0.14 0.15	0.091 0.096	0.15 0.16	< 0.05 < 0.05	0.28 0.31	< 0.05 < 0.05	Parent: 0.15 Total: 0.32

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
Canada, Fort Saskatchewan 2009 (Harvest) PTHIO_079	2	0.36	0.24	68 68	0.1 0.076	0.1 0.093	0.19 0.17	< 0.05 < 0.05	0.33 0.28	< 0.05 < 0.05	Parent: 0.088 Total: 0.27
Canada, Lamont 2009 (Harvest) PTHIO_079	2	0.37 0.35	0.24 0.24	55 55	0.1 0.092	0.091 0.081	0.14 0.11	< 0.05 < 0.05	0.25 0.22	< 0.05 < 0.05	Parent: 0.096 Total: 0.26
Canada, Westlock 2009 (Emagine) PTHIO_079	2	0.36	0.24	60 60	0.2 0.24	0.1 0.11	0.24 0.21	< 0.05 < 0.05	0.36 0.37	< 0.05 < 0.05	Parent: 0.22 Total: 0.42

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 119 Residues in sugar beet leaves following foliar and in-furrow application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (ND), Gardner 2009 (Crystal 539 RR) PTHIO_088	2	0.47	0.25	7 7	1.2 0.81	0.19 0.14	0.065 0.052	0.024 0.017	0.016 0.011	0.019 0.014	
	2	0.47 (i.f.) 0.47	0.67 0.25	7 7	0.65 0.73	0.093 0.1	0.036 0.034	0.012 0.013	< 0.01 < 0.01	0.037 0.029	
USA (ND), Northwood 2009 (Betaseed 86RR66) PTHIO_088	2	0.46	0.98	7 7	3.8 3.8	0.13 0.12	0.13 0.11	0.036 0.035	0.03 0.024	< 0.01 < 0.01	
	2	0.46 (i.f.) 0.45	0.49 0.97	7 7	2.4 2.3	0.072 0.074	0.087 0.084	0.023 0.023	0.019 0.022	0.044 0.048	
USA (MN), Geneva 2009 (Beta 4936R) PTHIO_088	2	0.46 0.44	0.27 0.25	7 7	0.74 0.86	0.14 0.15	0.039 0.048	0.01 0.014	0.012 0.012	0.015 0.014	
	2	0.46 (i.f.) 0.44	0.27 0.25	7 7	0.72 0.53	0.07 0.072	0.025 0.026	< 0.01 < 0.01	< 0.01 < 0.01	0.018 0.02	
Canada, Portage la Prairie 2009 (Beta seed) PTHIO_088	2	0.45 0.46	0.21 0.21	7 7	0.18 0.21	0.36 0.34	0.11 0.11	0.05 0.048	< 0.01 < 0.01	0.043 0.051	
	2	0.45 (i.f.) 0.46	0.2 0.21	7 7	0.37 0.31	0.58 0.65	0.15 0.16	0.07 0.067	< 0.01 < 0.01	0.06 0.066	
Canada, Oakville	2	0.46 0.45	0.21 0.2	6 6	4.4 4.0	0.33 0.29	0.088 0.083	0.025 0.022	0.03 0.027	0.03 0.028	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
2009 (Beta seed) PTHIO_088	2	0.45 (i.f.) 0.46	0.2 0.21	6 6	3.7 2.6	0.19 0.19	0.06 0.05	0.017 0.012	0.021 0.024	0.016 0.015	
USA (ND), Carrington 2009 (Betaseed 86RR66) PTHIO_088	2	0.46 0.46	0.25 0.12	6 6	2.5 2.5	0.18 0.19	0.097 0.097	0.04 0.038	0.064 0.057	0.026 0.026	
Canada, Taber 2009 (not reported) PTHIO_088	2	0.46	0.3	8 8	0.74 0.83	0.54 0.68	0.11 0.15	0.086 0.14	< 0.01 < 0.01	0.066 0.067	
USA (TX), Levelland 2009 (Phoenix) PTHIO_088	2	0.45	0.24	8 8	3.5 3.3	0.33 0.27	0.21 0.18	0.12 0.091	0.032 0.032	0.031 0.024	
USA (CA), Hickman 2009 (Holly SSN B7R) PTHIO_088	2	0.45	0.05	6 6	1.0 1.1	1.0 1.1	0.35 0.39	0.29 0.33	0.018 0.019	0.058 0.061	
USA (CA), Porterville 2009 (Lockhart Seed Lot 31288) PTHIO_088	2	0.46 0.45	0.18 0.17	8 8	0.13 0.095	0.32 0.44	0.074 0.08	0.02 0.02	0.01 0.01	0.048 0.059	
USA (WA), Ephrata 2009 (Prozoo – RR) PTHIO_088	2	0.45	0.24	7 7	0.52 0.45	0.12 0.086	0.029 0.026	0.01 0.01	< 0.01 < 0.01	0.018 0.012	
USA (ID), Jerome 2009 (Roundup Ready BTSC01 RR07) PTHIO_088	2	0.45	0.22	7 7	0.24 0.26	0.12 0.11	0.037 0.037	0.021 0.025	< 0.01 < 0.01	0.018 0.21	

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

i.f. = first treatment in-furrow at sowing

Table 120 Residues in oilseed rape forage following foliar application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
UK, Maldon 2007 (Apex) PTHIO_091	1	0.3	0.12	Plant w/o pods							
				0 ^a	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	7.6	< 0.01	< 0.01	0.02	< 0.01	< 0.01	
				7	2.4	0.05	0.03	0.03	0.02	< 0.01	
				14	0.4	0.04	0.03	< 0.01	< 0.01	< 0.01	
				21	0.51	0.04	0.03	< 0.01	< 0.01	< 0.01	
				28	0.14	0.02	< 0.01	< 0.01	< 0.01	< 0.01	
				Pods							
				0 ^a	0.024	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	2.9	< 0.01	< 0.01	0.024	< 0.01	< 0.01	
				7	1.2	0.052	0.016	0.025	0.019	< 0.01	
				14	0.098	0.04	0.012	< 0.01	< 0.01	< 0.01	
				21	0.1	0.038	0.011	< 0.01	< 0.01	< 0.01	
				28	0.13	0.038	< 0.01	< 0.01	< 0.01	< 0.01	
UK, Carberry Mains 2007 (Canberra) PTHIO_091	1	0.29	0.12	Plant w/o pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.86	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.37	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.072	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	0.065	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				28	0.05	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	6.6	< 0.01	< 0.01	0.06	< 0.01	< 0.01	
				7	1.0	0.035	0.017	0.045	< 0.01	< 0.01	
				14	0.12	0.027	0.011	0.01	< 0.01	< 0.01	
				21	0.12	0.041	0.02	< 0.01	< 0.01	< 0.01	
				28	0.03	0.015	< 0.01	< 0.01	< 0.01	< 0.01	
Hungary, Pázmánd 2008 (Catonic) PTHIO_091	1	0.31	0.12	Plant w/o pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.68	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.98	0.02	0.02	0.02	< 0.01	< 0.01	
				14	0.074	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	0.044	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				28	0.02	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.87	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.66	0.026	< 0.01	< 0.01	0.01	< 0.01	
				14	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	0.038	0.041	0.026	0.042	< 0.01	< 0.01	
				28	0.02	0.024	0.044	0.11	< 0.01	< 0.01	

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
France (North), Cavron St. Martin 2008 (Pollen) PTHIO_091	1	0.31	0.12	Plant w/o pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	3.4	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.063	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.03	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				21	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	5.6	< 0.01	< 0.01	0.033	< 0.01	< 0.01	
				7	0.06	0.017	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.014	0.02	< 0.01	< 0.01	< 0.01	< 0.01	
				21	< 0.01	0.019	< 0.01	< 0.01	< 0.01	< 0.01	
				28	< 0.01	0.012	< 0.01	< 0.01	< 0.01	< 0.01	
Hungary, Pázmánd 2008 (Catonic) PTHIO_092	1	0.31	0.12	Plant w/o pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	0.99	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				7	0.22	0.05	0.04	< 0.01	0.02	< 0.01	
				14	0.05	0.02	0.02	< 0.01	< 0.01	< 0.01	
				21	0.05	0.04	0.051	< 0.01	< 0.01	< 0.01	
				28	< 0.01	< 0.01	0.03	< 0.01	< 0.01	< 0.01	
				Pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	4.3	< 0.01	< 0.01	0.01	< 0.01	< 0.01	
				7	0.23	0.024	< 0.01	< 0.01	0.028	< 0.01	
				14	0.14	0.069	0.034	< 0.01	0.024	< 0.01	
				21	0.079	0.043	0.097	0.03	0.024	< 0.01	
				28	0.01	0.013	0.043	0.022	< 0.01	< 0.01	
France (North), Cavron St. Martin 2008 (Pollen) PTHIO_092	1	0.31	0.12	Plant w/o pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	6.6	< 0.01	< 0.01	0.05	< 0.01	< 0.01	
				7	0.64	0.02	< 0.01	< 0.01	< 0.01	< 0.01	
				14	0.03	0.02	< 0.01	< 0.01	< 0.01	< 0.01	
				21	0.02	0.02	< 0.01	< 0.01	< 0.01	< 0.01	
				28	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				Pods							
				0 ^a	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	
				0	17	0.043	0.037	0.16	0.029	< 0.01	
				7	0.085	0.14	0.039	< 0.01	0.03	< 0.01	
				14	0.019	0.092	0.017	< 0.01	< 0.01	< 0.01	
				21	< 0.01	0.074	0.013	< 0.01	< 0.01	< 0.01	
				28	< 0.01	0.071	0.015	< 0.01	< 0.01	< 0.01	

^a mean of replicate samples (if applicable); total residue based on the edible portion
DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg _a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (VA), Bumpass 2007 (Georgia Green) PTHIO_098	3	0.36	0.12	14	1.8	0.18	0.43	< 0.05	0.23	< 0.05	Parent: 1.8 Total: 2.1
		0.37	0.12	14	1.8	0.19	0.45	< 0.05	0.2	< 0.05	
		0.35	0.12								
USA (SC), Blackville 2007 (Georgia Green) PTHIO_098	3	0.35	0.11	14	6.5	0.81	0.56	0.12	0.45	< 0.05	Parent: 7.1 Total: 8.7
		0.36	0.12	14	7.6	0.99	0.66	0.15	0.57	0.05	
		0.36	0.12								
USA (NC), Pikeville 2007 (Gregory) PTHIO_098	3	0.35	0.15	13	17	0.59	0.23	0.21	0.29	< 0.05	Parent: 17 Total: 18
		0.36	0.15	13	16	0.6	0.24	0.22	0.28	< 0.05	
		0.35	0.15								
USA (GA), Sycamore 2007 (GA-02) PTHIO_098	3	0.36	0.19	14	1.7	0.11	< 0.05	< 0.05	0.059	< 0.05	Parent: 1.5 Total: 1.6
		0.36	0.18	14	1.2	0.092	< 0.05	< 0.05	< 0.05	< 0.05	
		0.36	0.18								
	3	1.8	0.95	14	not analysed						
		1.8	0.94	14							
		1.8	0.95								

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (GA), Chula 2007 (Georgia Green) PTHIO_098	3	0.36 0.36 0.36	0.18 0.19 0.19	14 14	5.2 5.6	0.23 0.25	0.17 0.2	0.11 0.11	0.054 0.059	< 0.05 < 0.05	Parent: 8.8 Total: 9.4
USA (GA), Quitman 2007 (Georgia Green) PTHIO_098	3	0.36 0.36 0.36	0.18 0.18 0.19	14 14	8.2 9.4	0.32 0.37	0.23 0.25	0.17 0.18	0.089 0.1	< 0.05 < 0.05	Parent: 6.8 Total: 7.9
USA (GA), Athens 2007 (Georgia Green) PTHIO_098	3	0.35 0.36 0.36	0.13 0.13 0.13	14 14	5.7 7.9	0.54 0.65	0.39 0.47	0.17 0.19	0.21 0.25	< 0.05 < 0.05	Parent: 4.5 Total: 4.9
USA (GA), Chula 2007 (GA02C) PTHIO_098	3	0.35	0.09	14 14	4.5 4.4	0.22 0.21	0.078 0.067	< 0.05 < 0.05	0.11 0.094	< 0.05 < 0.05	Parent: 8.6 Total: 9.1
USA (GA), Montezuma 2007 (Georgia Green) PTHIO_098	3	0.36	0.14	14 14	8.5 8.6	0.32 0.32	0.2 0.18	0.075 0.066	0.3 0.29	< 0.05 < 0.05	Parent: 6.9 Total: 7.3
USA (FL), Bradenton 2007 (Georgia Green) PTHIO_098	3	0.37 0.36 0.36	0.08 0.08 0.08	15 15	7.7 6.1	0.25 0.21	0.11 0.087	0.05 < 0.05	0.2 0.15	< 0.05 < 0.05	Parent: 1.9 Total: 2.1
USA (OK), Hinton 2007 (Olin) PTHIO_098	3	0.36 0.35 0.36	0.16 0.16 0.16	15 15	1.5 2.3	0.1 0.14	0.05 0.068	< 0.05 < 0.05	0.058 0.081	< 0.05 < 0.05	Parent: 2.9 Total: 3.6
USA (TX), Charlotte 2007 (TAM RUN OL-1) PTHIO_098	3	0.36	0.15	15 15	2.6 3.2	0.34 0.38	0.14 0.18	< 0.05 < 0.05	0.097 0.14	< 0.05 < 0.05	Parent: 1.8 Total: 2.0
	3	1.8 1.8 1.8	0.76 0.760.76	not analysed							
USA (TX), Levelland 2007 (TAMSPAN 90) PTHIO_098	3	0.36 0.35 0.36	0.15 0.15 0.15	14 14	1.4 2.1	0.11 0.13	0.14 0.15	0.062 0.069	< 0.05 < 0.05	< 0.05 < 0.05	Parent: 7.1 Total: 8.7

^a: mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

[illegible]

DAT: days after final treatment

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Kerman 2007 (Nonpareil) PTHIO_090	3	0.31	0.03	14 14	1.5 1.9	0.25 0.27	0.28 0.33	0.012 0.038	0.048 0.059	< 0.01 < 0.01	Parent: 1.4 Total: 1.9
USA (CA), Madera 2007 (Padre) PTHIO_090	3	0.31	0.03	14 14	0.99 1.2	0.26 0.33	0.25 0.23	0.039 0.06	0.048 0.06	< 0.01 < 0.01	Parent: 1.1 Total: 1.6
USA (CA), Sanger 2007 (Nonpareil) PTHIO_090	3	0.31 0.31 0.3	0.05 0.05 0.05	14 14	2.6 2.7	0.22 0.25	0.22 0.25	0.04 0.056	0.031 0.037	< 0.01 < 0.01	Parent: 2.7 Total: 3.1
USA (CA), Hickman 2007 (Carmel) PTHIO_090	3	0.31 0.3 0.3	0.02 0.02 0.02	14 14	2.0 2.7	0.3 0.36	0.28 0.38	0.18 0.22	0.057 0.073	< 0.01 < 0.01	Parent: 2.4 Total: 3.0

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (CA), Turlock 2007 (Thompson) PTHIO_090	3	0.31	0.03	14	2.3	0.45	0.46	0.053	0.088	< 0.01	Parent: 2.1 Total: 2.9
		0.3	0.03	14	1.9	0.45	0.42	0.025	0.084	< 0.01	
		0.3	0.02								
USA (CA), Terra Bella 2007 (Carmel) PTHIO_090	3	0.31	0.02	14	0.53	0.11	0.044	0.16	0.028	< 0.01	Parent: 0.68 Total: 0.91
				14	0.72	0.14	0.063	0.19	0.042	< 0.01	

^a: mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

Table 124 Residues in cotton gin by-products following foliar and in-furrow application of penthiopyrad

Location, Year (variety) Reference	Application			DAT	Residues, mg/kg						Selected residue mg/kg ^a
	n	kg ai/ha	kg ai/hL		parent	PAM	PCA	753- A-OH	753- F-DO	DM- PCA	
USA (TX), Edmonson 2009 (DP 924) PTHIO_101	3	0.36	1.3	20	3.1	0.65	0.46	0.34	< 0.05	< 0.05	Parent: 3.6 Total: 4.9
		(i.f.)		20	4.0	0.79	0.57	0.42	< 0.05	< 0.05	
		0.36	0.23								
USA (TX), Levelland 2009 (FM9063B2F) PTHIO_101	3	0.35	0.37	21	2.3	0.37	0.25	0.12	0.051	< 0.05	Parent: 2.3 Total: 3.0
		(i.f.)		21	2.3	0.37	0.24	0.12	0.065	< 0.05	
		0.35	0.19								
USA (TX), Wolfforth 2009 (3273B2RF) PTHIO_101	3	0.35	0.37	21	3.9	0.56	0.43	0.17	0.077	< 0.05	Parent: 3.4 Total: 4.2
		(i.f.)		21	2.8	0.37	0.29	0.12	0.057	< 0.05	
		0.35	0.19								
USA (OK), Hinton 2009 (FM1740B2F) PTHIO_101	3	0.36	0.39	19	5.8	0.62	0.37	0.35	0.088	0.053	Parent: 6.6 Total: 7.8
		(i.f.)		19	7.3	0.73	0.43	0.34	0.1	0.06	
		0.36	0.18								
		0.36	0.25								

^a mean of replicate samples (if applicable); total residue based on the edible portion

DAT: days after final treatment

i.f. = first treatment in-furrow at sowing

FATE OF RESIDUES IN STORAGE AND PROCESSING

Residues after processing

Processing studies are necessary according to the uses and the residues of penthiopyrad on raw agricultural commodities (RAC). The fate of penthiopyrad and its metabolites during processing of RAC was investigated in several major registered crops using important processing procedures.

As a measure for the transfer of residues into processed products, a processing factor was used, which is defined as:

$$PF = \frac{\text{Residue in processed product (mg/kg)}}{\text{Residue in raw agricultural commodity (mg/kg)}}$$

If residues in the RAC were below the LOQ, no processing factor could be derived. In case of residues below the LOQ, but above the LOD in the processed product, the numeric value of the LOQ was used for the calculation. If residues in the processed product were below the LOD, the numeric value of the LOQ was used for the calculation but the PF was expressed as “less than” (e.g. < 0.5).

The calculation of PFs was performed for penthiopyrad and for the sum of penthiopyrad and PAM, expressed as penthiopyrad (referred to as “total”, molecular weight adjustment factor for PAM is 1.86). A summary of all processing factors for penthiopyrad relevant for the estimation of maximum residue levels of the dietary intake is given in Table 137.

Pome fruit

Apple trees in the US were treated with penthiopyrad at rates of 3 × 0.3 kg ai/ha. Samples were collected 28 days after harvest and processed into washed fruit, wet pomace, dry pomace, juice, canned fruit, frozen apple slices and apple sauce.

For juicing washed fruits were crushed, steamed and treated with peptic enzyme, pressed, filtered and finally heated and canned. Apple sauce was processed by coring/peeling, cooking, straining through a pulper, cooking with sugar and finally heating and canning. Washed fruits processed into frozen or canned apple slices were cored/peeled and sliced, steam blanched, blended with sugar and packaged and frozen or steamed and canned. Samples for analyses were collected for each of the steps described.

An overview of residues of penthiopyrad and all metabolites found in processed apple products is presented in Table 125.

Table 125 Processing of apples treated with penthiopyrad in the USA with a PHI of 28 days (Shepard, E, 2008, PTHIO_103; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Test 01, USA (NY), North Rose, 2007, Variety: Ida Red, 3× 0.31 kg ai/ha (0.03 kg ai/hL), PHI 28 days									
Fruit (RAC)	0.14	–	< 0.01 (0.005)	0.16	–	< 0.01 (ND)	< 0.01 (0.008)	< 0.01 (0.004)	< 0.01 (ND)
Washed fruit	0.082	0.59	< 0.01 (0.003)	0.1	0.63	< 0.01 (ND)	< 0.01 (0.008)	< 0.01 (ND)	< 0.01 (ND)
Pomace, wet	0.71	5.1	< 0.01 (0.008)	0.73	4.6	< 0.01 (ND)	0.019	< 0.01 (0.008)	< 0.01 (ND)
Pomace, dry	1.4	10	0.02	1.4	8.8	< 0.01 (0.008)	0.05	0.02	< 0.01 (ND)
Canned apple juice	< 0.01 (0.006)	0.07	< 0.01 (0.005)	< 0.02	< 0.13	< 0.01 (0.004)	< 0.01 (0.006)	< 0.01 (0.005)	< 0.01 (ND)
Canned fruit	< 0.01 (ND)	< 0.07	< 0.01 (ND)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Frozen apple slices	< 0.01 (ND)	< 0.07	< 0.01 (ND)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple sauce	< 0.01	< 0.07	< 0.01	< 0.02	< 0.13	< 0.01	< 0.01	< 0.01	< 0.01

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
	(ND)		(ND)			(ND)	(ND)	(ND)	(ND)
Wash water	0.022	0.16	< 0.01 (ND)	0.041	0.26	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Crushed apple	0.25	1.7	< 0.01 (0.006)	0.27	1.7	< 0.01 (ND)	0.013	< 0.01 (0.005)	< 0.01 (ND)
Raw juice	< 0.01 (0.007)	0.07	< 0.01 (0.004)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)
Juice after filtration	< 0.01 (0.006)	0.07	< 0.01 (0.005)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)
Peeled apple without core	< 0.01 (0.004)	0.07	< 0.01 (ND)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple core	0.068	0.49	< 0.01 (0.003)	0.087	0.54	< 0.01 (ND)	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (ND)
Apple peel	0.3	2.1	0.01	0.32	2	< 0.01 (ND)	0.02	< 0.01 (0.009)	< 0.01 (ND)
Peeled, blanched apple without core	< 0.01 (ND)	< 0.07	< 0.01 (ND)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Raw applesauce	< 0.01 (ND)	< 0.07	< 0.01 (ND)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple waste	< 0.01 (0.003)	0.07	< 0.01 (ND)	< 0.02	< 0.13	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Test 02, USA (MI), Conklin, 2007, Variety: Ida Red, 3× 0.3 kg ai/ha (0.03 kg ai/hL), PHI 28 days									
Fruit (RAC)	0.12	-	< 0.01 (0.009)	0.14	-	< 0.01 (ND)	< 0.01 (0.006)	< 0.01 (0.006)	< 0.01 (ND)
Washed fruit	0.084	0.7	< 0.01 (0.006)	0.1	0.71	< 0.01 (ND)	< 0.01 (0.007)	< 0.01 (0.004)	< 0.01 (ND)
Pomace, wet	0.59	4.9	0.01	0.61	4.4	< 0.01 (ND)	0.017	0.014	< 0.01 (ND)
Pomace, dry	0.79	6.6	0.024	0.83	5.9	< 0.01 (0.007)	0.038	0.032	< 0.01 (ND)
Canned apple juice	< 0.01 (0.004)	0.08	< 0.01 (0.006)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Canned fruit	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Frozen apple slices	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple sauce	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Wash water	< 0.01 (0.009)	0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Crushed apple	0.15	1.3	< 0.01 (0.007)	0.17	1.2	< 0.01 (ND)	< 0.01 (0.008)	< 0.01 (0.005)	< 0.01 (ND)
Raw juice	< 0.01 (0.007)	0.08	< 0.01 (0.005)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Juice after filtration	< 0.01 (0.003)	0.08	< 0.01 (0.004)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Peeled apple without core	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple core	0.08	0.67	< 0.01 (0.005)	0.1	0.71	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)
Apple peel	0.24	2	0.012	0.26	1.9	< 0.01 (ND)	0.01	0.014	< 0.01 (ND)
Peeled, blanched apple without core	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Raw applesauce	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple waste	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Test 03, USA (ID), Weiser, 2007, Variety: Law Rome, 3× 0.31 kg ai/ha (0.03 kg ai/hL), PHI 28 days									
Fruit (RAC)	0.23	-	< 0.01	0.25	-	< 0.01	< 0.01	< 0.01	< 0.01 (ND)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
			(0.007)			(ND)	(0.004)	(0.005)	
Washed fruit	0.12	0.52	< 0.01 (0.005)	0.14	0.56	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Pomace, wet	1.5	6.5	0.01	1.5	6	< 0.01 (0.003)	0.01	< 0.01 (0.008)	< 0.01 (ND)
Pomace, dry	2.7	12	0.031	2.8	11	0.01	0.022	0.018	< 0.01 (ND)
Canned apple juice	0.01	0.04	< 0.01 (0.006)	0.029	0.12	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Canned fruit	< 0.01 (ND)	< 0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Frozen apple slices	< 0.01 (ND)	< 0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple sauce	< 0.01 (0.003)	0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Wash water	0.039	0.17	< 0.01 (ND)	0.058	0.23	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Crushed apple	0.019	0.08	< 0.01 (0.006)	0.038	0.15	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Raw juice	0.016	0.07	< 0.01 (0.006)	0.035	0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Juice after filtration	0.011	0.05	< 0.01 (0.006)	0.02	0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Peeled apple without core	< 0.01 (ND)	< 0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple core	0.081	0.35	< 0.01 (ND)	0.1	0.4	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple peel	1.2	5.2	0.016	1.2	4.8	< 0.01 (0.004)	< 0.01 (0.008)	0.01	< 0.01 (ND)
Peeled, blanched apple without core	< 0.01 (0.004)	0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Raw applesauce	< 0.01 (0.005)	0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Apple waste	< 0.01 (0.005)	0.04	< 0.01 (ND)	< 0.02	< 0.08	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg

Plums

The effect of processing on plums was investigated in two supervised field trials in the USA. Application rates were 3× 0.3 kg ai/ha with a PHI of 0 days. Samples of fruits were collected and processed into pitted plums and pitted dried prunes.

In a first step fresh plums were washed and subsequently hand-pitted into pitted plums. A subsample was air-dried to a moisture content of approx. 32–38% (dried pitted prunes).

An overview of residues of penthiopyrad and all metabolites found in processed apple products is presented in Table 126.

Table 126 Processing of plums treated with penthiopyrad in the USA with a PHI of 0 days (Shepard, E, 2008, PTHIO_105; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Test 01, USA (MI), Conklin, 2007, Variety: Vision, 3× 0.3 kg ai/ha (0.04 kg ai/hL), PHI 0 days									
Whole fruit (RAC)	0.12	–	< 0.01 (0.003)	0.14	–	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Pitted fruit	0.12	1	< 0.01 (0.004)	0.14	1	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)
Dried pitted	0.18	1.5	< 0.01	0.2	1.4	< 0.01	< 0.01	< 0.01 (ND)	< 0.01 (ND)

prune			(0.006)			(0.009)	(0.006)		
Test 02, USA (CA), Kerman, 2007, Variety: French, 3×0.3 kg ai/ha (0.02 kg ai/hL), PHI 0 days									
Whole fruit (RAC)	0.1	–	< 0.01 (0.005)	0.12	–	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Pitted fruit	0.1	–	< 0.01 (0.005)	0.12	1	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Dried pitted prune	0.13	1.3	0.01	0.15	1.3	0.012	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg

Tomatoes

In three supervised field trials conducted in Southern Europe field tomatoes were treated twice with application rates of 1.0 and 3.0 kg ai/ha. Samples of fruits were collected after one day and processed into unprocessed tomatoes, washed tomatoes, washing water, juice, wet pomace, dry pomace, puree, paste, ketchup, and canned tomatoes.

For the preparation of tomato juice the tomatoes were washed, crushed (resulting in raw juice and pomace) and the juice was finally pasteurised.

Tomato paste was processed by first crushing the washed fruits. Subsequently the tomatoes were reduced into raw paste and waste. Finally the raw paste was sterilised.

For tomato ketchup the crushed fruits were also reduced into raw puree and waste. The puree was packaged into jars and sterilised as ketchup.

An overview of residues of penthiopyrad and all metabolites found in processed tomato products is presented in Table 127.

Table 127 Processing of tomatoes treated with penthiopyrad in Southern Europe with a PHI of 1 days (Old, J, 2009, PTHIO_104; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Italy, Santa Cristina e Bissone, 2007, Variety: Perfect Peel, 1.0 and 3.0 kg ai/ha, PHI: 1 day									
Fruits (RAC)	0.2	–	< 0.01 (ND)	0.22	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Washed fruits	0.16	0.8	< 0.01 (ND)	0.18	0.82	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Washing water	0.039	0.2	< 0.01 (ND)	0.058	0.26	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Juice	0.038	0.19	< 0.01 (ND)	0.057	0.26	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Pomace, wet	1.1	5.5	< 0.05 (ND)	1.2	5.5	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Pomace, dry	8.5	43	< 0.05 (ND)	8.6	39	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Puree	0.41	2.1	< 0.01 (ND)	0.43	2	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Paste	0.72	3.6	< 0.01 (ND)	0.74	3.4	0.015	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Ketchup	0.38	1.9	< 0.01 (ND)	0.40	1.8	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Canned tomatoes	0.013	0.07	< 0.01 (ND)	0.031	0.14	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Spain, Los Palacios, 2007, Variety: Juncal, 1.0 and 3.0 kg ai/ha, PHI: 1 day									
Fruits (RAC)	0.18	–	< 0.01 (ND)	0.20	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Washed fruits	0.24	1.3	< 0.01 (ND)	0.26	1.3	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Washing water	0.09	0.5	< 0.01 (ND)	0.11	0.55	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Juice	0.048	0.27	< 0.01 (ND)	0.067	0.34	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Pomace, wet	0.91	5.1	< 0.05 (ND)	1.0	5	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Pomace, dry	4.6	26	< 0.05 (0.018)	4.7	24	< 0.05 (0.029)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Puree	0.27	1.5	< 0.01 (0.004)	0.29	1.5	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Paste	< 0.01 (ND)	< 0.06	< 0.01 (ND)	< 0.02	0.1	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Ketchup	0.2	1.1	< 0.01 (ND)	0.22	1.1	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Canned tomatoes	< 0.01 (ND)	< 0.06	< 0.01 (ND)	< 0.02	0.1	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
France (South), Vaunaveys, 2007, Variety: Perfect Peel, 1.0 and 3.0 kg ai/ha, PHI: 1 day									
Fruits (RAC)	0.2	–	< 0.01 (ND)	0.22	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Washed fruits	0.16	0.8	< 0.01 (ND)	0.18	0.82	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Washing water	0.1	0.5	< 0.01 (ND)	0.12	0.55	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Juice	0.094	0.47	< 0.01 (ND)	0.11	0.5	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Pomace, wet	0.85	5	< 0.05 (ND)	0.94	4.3	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Pomace, dry	8.1	41	< 0.05 (0.025)	9.0	41	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Puree	0.43	2.2	< 0.01 (0.006)	0.45	2.0	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Paste	0.76	3.8	0.013	0.78	3.5	0.021	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Ketchup	0.19	0.95	< 0.01 (ND)	0.21	0.95	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Canned tomatoes	0.071	0.36	< 0.01 (ND)	0.08	0.36	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg for all commodities except for pomace (0.017 mg/kg)

Soya beans

In the USA two supervised field trials were conducted at exaggerated rates to investigate the influence of processing on penthiopyrad residues in soya beans. Both trials were conducted with application rates of 2× 2.3 kg ai/ha with a PHI of 6 or 14 days.

The seeds were harvested and processed into meal, hulls and refined oil using common processing techniques.

An overview of residues of penthiopyrad and all metabolites found in processed soya bean products is presented in Table 128.

Table 128 Processing of soya bean treated with penthiopyrad in the USA with a PHI of 6 or 14 days (Shepard, E, 2010, PTHIO_106; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (IL), Carlyle, 2009, Variety: S43-N6, 2× 2.3 kg ai/ha, PHI: 6 days									
Seed (RAC)	0.42	–	< 0.01 (0.008)	0.44	–	< 0.01 (0.008)	0.012	0.013	< 0.01 (ND)
Meal	< 0.05 (ND)	< 0.12	< 0.05 (ND)	< 0.1	0.23	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Hulls	0.21	0.5	< 0.05 (ND)	0.30	0.44	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Refined oil	0.025	0.06	< 0.01 (ND)	0.044	0.1	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
USA (MO), Tipton, 2009, Variety: 48-24 Mor Soy, 2× 2.3 kg ai/ha, PHI: 14 days									
Seed (RAC)	0.057	–	0.01	0.073	–	0.012	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)
Meal	< 0.05 (ND)	< 0.88	< 0.05 (ND)	< 0.1	< 1.4	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Hulls	0.25	4.4	< 0.05 (0.02)	0.34	4.7	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Refined oil	0.11	1.9	< 0.01 (ND)	0.13	1.8	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg for seed and oil, LOD: 0.02 mg/kg for meal and hulls

Potatoes

In the USA two field trials were conducted involving different modes of application to potatoes intended for processing. Each trial consisted of two plots which were either treated “in-furrow” at planting, followed by two foliar applications shortly before harvest or with three foliar sprays. All treatments were conducted with application rates of 1.8 kg ai/ha. One sample of potato tubers following each of the applications was collected after 7 days for further processing.

The raw potato samples were processed into washed tubers, cull tubers, steam-peeled tubers, trim waste/wet peel, abrasion-peeled tubers, potato flakes, potato chips, unpeeled French fries, peeled fries, unpeeled boiled potatoes, peeled boiled potatoes and unpeeled microwaved potatoes.

All processing steps, except boiling and microwaving of potatoes, were performed using common industrial practice. Boiled and peeled potatoes were hand-cooked and hand-peeled.

An overview of residues of penthiopyrad and all metabolites found in processed potato products is presented in Table 129.

Table 129 Processing of potatoes treated with penthiopyrad in the USA with a PHI of 7 days (Rice F, 2009, PTHIO_107; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (ID), Payett, 2008, Variety: Ranger Russet, 3× 1.8 kg ai/ha, PHI: 7 days									
Tubers (RAC)	0.025	–	< 0.01 (ND)	0.044	–	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (0.003)	0.01
Washed tubers	0.03	1.2	< 0.01 (ND)	0.049	1.1	< 0.01 (0.009)	< 0.01 (ND)	< 0.01 (0.005)	0.011
Cull tubers	0.03	1.2	< 0.01 (ND)	0.049	1.1	0.013	< 0.01 (ND)	< 0.01 (0.008)	0.01
Steam-peeled tubers	< 0.01 (0.004)	0.4	< 0.01 (ND)	< 0.02	< 0.45	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (0.006)
Trim waste/ wet waste (steam peeling)	0.084	3.4	< 0.01 (ND)	0.10	2.3	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (ND)
Abrasion-peeled potatoes	< 0.01 (ND)	< 0.4	< 0.01 (ND)	< 0.02	< 0.45	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)
Trim waste/ wet waste (abrasion peeling)	0.081	3.2	< 0.01 (ND)	0.10	2.3	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.007)	< 0.01 (ND)
Potato flakes	< 0.01 (0.006)	0.4	< 0.01 (ND)	< 0.02	< 0.45	0.01	< 0.01 (ND)	< 0.01 (0.005)	0.014
Potato chips	< 0.01 (0.005)	0.4	< 0.01 (ND)	< 0.02	< 0.45	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)	0.012
Unpeeled French fries	0.023	0.92	< 0.01 (ND)	0.041	0.93	0.013	< 0.01 (ND)	< 0.01 (0.008)	0.014
Peeled fries	< 0.01	0.4	< 0.01	< 0.02	< 0.45	< 0.01	< 0.01 (ND)	< 0.01 (ND)	< 0.01

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
	(0.003)		(ND)			(0.004)			(0.007)
Boiled unpeeled potatoes	0.011	0.44	< 0.01 (ND)	0.030	0.68	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.007)
Boiled peeled potatoes	< 0.01 (0.004)	0.4	< 0.01 (ND)	< 0.02	< 0.45	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.009)
Unpeeled microwaved potatoes	0.017	0.68	< 0.01 (ND)	0.036	0.82	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (ND)	0.014
USA (OR), Corvallis, 2008, Variety: Ranger Russet, 1× In-furrow with 1.8 kg ai/ha and 2× 1.8 kg ai/ha foliar spray, PHI: 6 days									
Tubers (RAC)	0.075	–	< 0.01 (0.003)	0.094	–	< 0.01 (0.004)	< 0.01 (0.004)	< 0.01 (0.007)	< 0.01 (0.004)
Washed tubers	0.037	0.49	< 0.01 (ND)	0.056	0.60	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (0.003)	< 0.01 (0.003)
Cull tubers	0.042	0.56	< 0.01 (ND)	0.061	0.65	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (0.006)
Steam-peeled tubers	< 0.01 (ND)	< 0.13	< 0.01 (ND)	< 0.02	< 0.21	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)
Trim waste/ wet waste (steam peeling)	0.32	4.3	< 0.01 (ND)	0.34	3.6	< 0.01 (ND)	< 0.01 (ND)	0.013	< 0.01 (ND)
Abrasion-peeled potatoes	< 0.01 (0.005)	0.13	< 0.01 (ND)	< 0.02	< 0.21	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)
Trim waste/ wet waste (abrasion peeling)	0.16	2.1	< 0.01 (ND)	0.18	1.9	< 0.01 (ND)	< 0.01 (0.004)	0.012	< 0.01 (ND)
Potato flakes	< 0.01 (0.003)	0.13	< 0.01 (0.004)	< 0.02	< 0.21	< 0.01 (0.008)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (0.008)
Potato chips	< 0.01 (0.006)	0.13	< 0.01 (ND)	< 0.02	< 0.21	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)
Unpeeled French fries	0.019	0.25	< 0.01 (ND)	0.038	0.40	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (0.006)
Peeled fries	< 0.01 (ND)	< 0.13	< 0.01 (ND)	< 0.02	< 0.21	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Boiled unpeeled potatoes	0.021	0.28	< 0.01 (ND)	0.040	0.43	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.003)
Boiled peeled potatoes	< 0.01 (ND)	< 0.13	< 0.01 (ND)	< 0.02	< 0.21	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Unpeeled microwaved potatoes	0.039	0.52	< 0.01 (0.003)	0.058	0.62	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (0.005)

ND not detected, LOD: 0.003 mg/kg

Sugar beets

For sugar beets two supervised field trials were conducted in the USA using one treatment “in-furrow” and one foliar spray at rates of 2.3 kg ai/ha each. Mature roots were collected 7 days after the foliar treatment. Samples were shipped under frozen conditions to the processing facility where samples were processed to refined sugar, molasses, and dried pulp using common industrial practice.

An overview of residues of penthiopyrad and all metabolites found in processed sugar beet products is presented in Table 130.

Table 130 Processing of sugar beets treated with penthiopyrad in the USA with a PHI of 7 days (Shepard, E, 2010, PTHIO_108; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (ND), Northwood, 2009, Variety: Betaseed 86RR66, 1× 2.3 kg ai/ha in-furrow plus 1× 2.3 kg ai/ha foliar, PHI: 7 days									
Roots (RAC)	0.12	–	< 0.01	0.14	–	< 0.01	< 0.01 (ND)	< 0.01	< 0.01

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
			(0.005)			(0.006)		(0.003)	(0.004)
Refined sugar	0.016	0.13	< 0.01 (ND)	0.35	2.5	< 0.01 (0.007)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Molasses	0.023	0.19	0.027	0.072	0.51	0.21	< 0.01 (ND)	0.011	0.03
Dried pulp	0.77	6.4	0.011	0.79	5.6	0.011	< 0.01 (0.008)	< 0.01 (0.006)	< 0.01 (ND)
USA (ND), Carrington, 2009, Variety: Betaseed 86RR66, 1× 2.3 kg ai/ha in-furrow plus 1× 2.3 kg ai/ha foliar, PHI: 6 days									
Roots (RAC)	1.4	–	< 0.01 (0.006)	1.4	–	0.015	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (0.004)
Refined sugar	0.25	0.18	< 0.01 (ND)	0.27	0.19	0.01	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Molasses	0.2	0.14	0.045	0.28	0.20	0.42	< 0.01 (ND)	0.013	0.05
Dried pulp	6.8	4.9	0.027	6.9	4.9	0.033	0.011	< 0.01 (0.009)	< 0.01 (0.004)

ND not detected, LOD: 0.003 mg/kg

Barley

Processing of barley was performed to determine the quantitative distribution of residues in various intermediate and end products, to allow the determination of transfer factors. Trials were conducted in Germany and in the UK. All plots were treated with application rates of 2× 0.4 kg ai/ha. At maturity (29–49 days after the final treatment) samples were collected and processed into malt, spent grain, wort, flocs, young beer, spent yeast, beer, abrasion and pot barley following common commercial practice.

An overview of residues of penthiopyrad and all metabolites found in processed barley is presented in Table 131.

Table 131 Processing of barley treated with penthiopyrad in Northern Europe with a PHI of 29–49 days (Old, J, 2009, PTHIO_109; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
UK, Maldon, 2007, Variety: Optic, 2× 0.4 kg ai/ha, PHI:29 days									
Grain (RAC)	0.13	–	0.027	0.18	–	0.042	0.027	0.012	< 0.01 (ND)
Grain after cleaning	0.21	1.6	0.026	0.26	1.4	0.037	0.024	< 0.01 (0.009)	< 0.01 (ND)
Offal after cleaning	0.55	4.2	0.11	0.75	4.2	0.15	0.08	0.059	0.013
Grain after sieving	0.2	1.5	0.022	0.24	1.3	0.028	0.02	< 0.01 (0.009)	< 0.01 (ND)
Malt after drying	0.15	1.2	< 0.01 (0.004)	0.17	0.94	< 0.01 (ND)	0.021	< 0.01 (ND)	< 0.01 (ND)
Malt sprouts	0.18	1.4	0.01	0.20	1.1	0.014	< 0.01 (0.008)	< 0.01 (ND)	< 0.01 (0.006)
Spent grain	0.071	0.55	< 0.01 (ND)	0.090	0.5	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Wort before cooking	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.11	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Flocs (spent hops)	0.057	0.44	< 0.01 (ND)	0.076	0.42	< 0.01 (ND)	< 0.01 (0.009)	< 0.01 (ND)	< 0.01 (ND)
Wort after cooking	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.11	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Young beer	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.11	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Spent yeast	0.017	0.13	< 0.01 (ND)	0.036	0.2	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Beer	< 0.01 (ND)	< 0.08	< 0.01 (ND)	< 0.02	< 0.11	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Abrasion	0.47	3.6	0.11	0.67	3.7	0.1	0.06	0.045	< 0.01

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Pot barley	0.1	0.77	< 0.01 (0.004)	0.12	0.67	< 0.01 (0.004)	0.015	< 0.01 (ND)	< 0.01 (ND)
Germany, Posthausen, 2007, Variety: Tocada, 2× 0.4 kg ai/ha, PHI: 43 days									
Grain (RAC)	0.036	–	0.011	0.056	–	0.01	< 0.01 (0.008)	< 0.01 (ND)	0.033
Grain after cleaning	0.037	1	< 0.01 (0.009)	0.056	1	< 0.01 (0.005)	< 0.01 (0.009)	< 0.01 (ND)	< 0.01 (0.009)
Malt after drying	0.029	0.81	< 0.01 (ND)	0.048	0.86	0.01	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)
Spent grain	0.016	0.44	< 0.01 (ND)	0.035	0.63	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Flocs (spent hops)	0.01	0.27	< 0.01 (ND)	0.029	0.52	0.079	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Young beer	< 0.01 (ND)	< 0.27	< 0.01 (ND)	< 0.02	< 0.36	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Spent yeast	< 0.01 (ND)	< 0.27	< 0.01 (ND)	< 0.02	< 0.36	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Beer	< 0.01 (ND)	< 0.27	< 0.01 (ND)	< 0.02	< 0.36	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Abrasion	0.089	2.5	0.022	0.13	2.3	0.03	0.018	< 0.01 (ND)	0.03
Pot barley	0.019	0.53	< 0.01 (0.004)	0.038	0.68	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)
UK, Tranent, 2007, Variety: Oxbridge, 2× 0.4 kg ai/ha, PHI: 49 days									
Grain (RAC)	< 0.01 (0.009)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (0.004)	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)
Grain after cleaning	< 0.01 (0.009)	–	< 0.01 (0.003)	< 0.02	–	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (ND)
Malt after drying	< 0.01 (0.004)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Spent grain	< 0.01 (0.004)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Flocs (spent hops)	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	0.17	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Young beer	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Spent yeast	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Beer	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Abrasion	0.024	–	< 0.01 (0.006)	0.043	–	< 0.01 (0.007)	< 0.01 (0.009)	< 0.01 (ND)	< 0.01 (ND)
Pot barley	< 0.01 (0.004)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg

Maize

The processing of maize was investigated in two supervised field trials conducted in the USA. Plants were treated with application rates equivalent to 2× 1.8 kg ai/ha. Samples of mature grain were collected after 7 and 8 days and processed into starch, grits, flour, meal and refined oil (wet and dry milled).

An overview of residues of penthiopyrad and all metabolites found in processed maize is presented in Table 132.

Table 132 Processing of maize treated with penthiopyrad in the USA with a PHI of 7 or 8 days (Shepard, E, PTHIO_112); values in brackets were extrapolated below the LOQ

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (IL), Carlyle, 2009, Variety: 8G23, 2× 1.8 kg ai/ha, PHI:8 days									
Grain (RAC)	< 0.01 (0.009)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Starch	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Grits	< 0.01 (0.004)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Flour	< 0.01 (0.008)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Meal	< 0.01 (0.007)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Refined oil (wet milled)	0.039	–	< 0.01 (ND)	0.058	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Refined oil (dry milled)	0.026	–	< 0.01 (ND)	0.045	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
USA (TX), Uvalde, 2009, Variety: DK69 Field corn, 2× 1.8 kg ai/ha, PHI: 7 days									
Grain (RAC)	0.011	–	< 0.01 (0.004)	0.030	–	< 0.01 (0.004)	< 0.01 (0.006)	< 0.01 (ND)	< 0.01 (ND)
Starch	< 0.01 (ND)	< 0.91	< 0.01 (ND)	< 0.02	< 0.67	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Grits	< 0.01 (0.004)	0.91	< 0.01 (ND)	< 0.02	< 0.67	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)
Flour	0.023	2.1	< 0.01 (0.008)	0.042	1.4	< 0.01 (0.005)	0.015	< 0.01 (ND)	< 0.01 (ND)
Meal	0.016	1.5	< 0.01 (0.006)	0.035	1.2	< 0.01 (0.004)	0.014	< 0.01 (ND)	< 0.01 (ND)
Refined oil (wet milled)	0.062	5.6	< 0.01 (ND)	0.081	2.7	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Refined oil (dry milled)	0.049	4.5	< 0.01 (ND)	0.068	2.3	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg

Wheat

For wheat two studies were conducted to investigate the behaviour of penthiopyrad residues during processing.

In the first study by Old J (2009, PHTIO_110) three supervised field trials in Europe were conducted with application rates of 0.38–0.41 kg ai/ha with PHIs of 44 to 63 days. Grain was collected at maturity and processed into flour, bran, dough, bread and germ, involving various degrees of milling from wholemeal to type 550.

The processing was conducted in laboratory scale using appropriate equipment to gain different flour types. The preparation of dough and bread was also conducted in laboratory scale by addition of yeast, tap water and salt.

An overview of residues of penthiopyrad and all metabolites found in processed wheat is presented in Table 133.

Table 133 Processing of wheat treated with penthiopyrad in Northern Europe with a PHI of 44–63 days (Old J, 2009, PTHIO_110; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
UK, Ormiston, 2007, Variety: Robigus, 2× 0.41 kg ai/ha, PHI:63 days									
Grain (RAC)	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF		mg/kg	PF				
Grain after cleaning	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Offal after cleaning	0.023	–	0.077	0.17	–	0.018	< 0.01 (0.009)	< 0.01 (ND)	< 0.01 (0.009)
Straight flour	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Middlings	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Coarse bran	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Total bran	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Low grade meal (toppings)	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Flour type 550	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wholemeal flour	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Dough	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wholemeal bread	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wheat germ	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
France (North), Douai, 2007, Variety: Cap Horn, 2× 0.4 kg ai/ha, PHI: 60 days									
Grain (RAC)	< 0.01 (0.008)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (0.005)	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)
Grain after cleaning	< 0.01 (0.008)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (0.005)	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (ND)
Flour type 550	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wholemeal flour	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wholemeal bread	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wheat germ	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Germany, Motterwitz, 2007, Variety: Schamane, 2× 0.39 kg ai/ha, PHI: 44 days									
Grain (RAC)	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Grain after cleaning	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Flour type 550	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wholemeal flour	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wholemeal bread	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Wheat germ	< 0.05 (ND)	–	< 0.05 (ND)	< 0.1	–	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)

ND not detected, LOD: 0.003 mg/kg for grain, 0.017 mg/kg for processed fractions

In a second study on wheat conducted by Shepard, E (2010, PTHIO_111) two supervised field trials in the USA were treated with application rates of 2× 1.8 kg ai/ha. Samples of mature grain were collected after 42 and 62 days. The grain obtained was processed into bran, flour, middlings, shorts and germs.

An overview of residues of penthiopyrad and all metabolites found in processed wheat is presented in Table 134.

Table 134 Processing of wheat treated with penthiopyrad in the USA with a PHI of 42 and 62 days (Shepard, E., 2010, PTHIO_111; values in brackets were extrapolated below the LOQ)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (ND), Carrington, 2009, Variety: Glenn, 2× 1.8 kg ai/ha, PHI: 62 days									
Grain (RAC)	< 0.01 (0.006)	–	< 0.01 (0.004)	< 0.02	–	< 0.01 (0.007)	< 0.01 (ND)	< 0.01 (0.008)	0.018
Bran	< 0.01 (0.008)	–	< 0.01 (0.007)	< 0.02	–	0.015	< 0.01 (ND)	0.012	0.021
Flour	< 0.01 (ND)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Middlings	< 0.01 (0.004)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (0.003)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)
Shorts	< 0.01 (0.004)	–	< 0.01 (ND)	< 0.02	–	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (0.005)
Germ	0.01	–	< 0.01 (0.005)	0.029	–	0.014	< 0.01 (ND)	0.011	0.018
USA (TX), Uvalde, 2009, Variety: Fannin, 2× 1.8 kg ai/ha, PHI: 42 days									
Grain (RAC)	0.091	–	0.011	0.11	–	0.013	< 0.01 (0.003)	< 0.01 (0.007)	< 0.01 (ND)
Bran	0.16	1.8	0.02	0.20	1.8	0.032	< 0.01 (0.005)	0.017	< 0.01 (0.004)
Flour	0.024	0.26	< 0.01 (ND)	0.043	0.39	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Middlings	0.06	0.66	< 0.01 (0.004)	0.079	0.72	< 0.01 (0.008)	< 0.01 (ND)	< 0.01 (0.005)	< 0.01 (ND)
Shorts	0.11	1.2	< 0.01 (0.008)	0.13	1.2	0.015	< 0.01 (ND)	< 0.01 (0.008)	< 0.01 (ND)
Germ	0.19	2.1	0.013	0.21	1.9	0.021	< 0.01 (0.004)	0.011	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg

Rape seed

The influence of processing on rape seed was investigated in three supervised field trials in Canada and the USA. Rape seed (canola) was treated with application rates of 2 × 1.5 kg ai/ha with a PHI of 21 days. The seeds were collected at the stage of commercial harvest and processed into crude and refined oil using mechanical and solvent extraction. In addition by-products (solvent, soapstock, impurities etc.) were analysed.

An overview of residues of penthiopyrad and all metabolites found in processed rape seed is presented in Table 135.

Table 135 Processing of rape seed (canola) treated with penthiopyrad in the USA with a PHI of 21 days (Thie,l A, 2009, PTHIO_113); values in brackets were extrapolated below the LOQ

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (ND), Northwood, 2007, Variety: Pioneer 45H21, 2× 1.5 kg ai/ha, PHI: 21 days									
Seeds (RAC)	0.19	–	< 0.01 (0.009)	0.21	–	0.034	< 0.01 (ND)	< 0.01 (0.009)	< 0.01 (0.006)
Presscake	0.25	1.3	< 0.05 (ND)	0.34	1.6	< 0.05 (0.04)	< 0.05 (ND)	< 0.05 (0.02)	< 0.05 (ND)
Crude oil (mechanically extracted)	0.37	1.9	< 0.01 (ND)	0.39	1.9	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)
Crude oil (solvent extracted)	0.26	1.4	< 0.01 (ND)	0.28	1.3	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)
Refined oil	0.3	1.6	< 0.01 (ND)	0.32	1.5	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
Solvent extracted meal	0.18	0.95	< 0.05 (ND)	0.27	1.3	0.054	< 0.05 (ND)	< 0.05 (ND)	< 0.01 (ND)
Cleaned seed	0.25	1.3	0.011	0.27	1.3	0.042	< 0.01 (ND)	0.011	< 0.01 (0.007)
Light impurities	8.3	44	0.91	10	48	0.99	0.076	1.5	0.2
Large Screenings	0.64	3.4	0.066	0.76	3.6	0.068	< 0.01 (0.004)	0.07	0.015
Small Screenings	0.51	2.7	0.031	0.57	2.7	0.087	< 0.01 (ND)	0.043	0.014
Flaked seed	0.28	1.5	0.012	0.30	1.4	0.043	< 0.01 (ND)	0.01	< 0.01 (0.008)
Hexane	< 0.01 (ND)	< 0.05	< 0.01 (ND)	< 0.02	< 0.1	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Soapstock	0.14	0.74	< 0.05 (ND)	0.23	1.1	< 0.05 (0.04)	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
USA (WA), Ephrata, 2007, Variety: 71-45RR, 2× 1.5 kg ai/ha, PHI: 21 days									
Seeds (RAC)	0.52	–	0.1	0.71	–	0.079	0.01	0.28	0.03
Presscake	0.14	0.27	< 0.05 (ND)	0.23	0.32	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (0.03)	< 0.05 (ND)
Crude oil (mechanically extracted)	0.41	0.78	< 0.01 (ND)	0.60	0.85	< 0.01 (ND)	< 0.01 (ND)	0.026	< 0.01 (ND)
Crude oil (solvent extracted)	0.28	0.54	< 0.01 (ND)	0.30	0.42	< 0.01 (ND)	< 0.01 (ND)	0.012	< 0.01 (ND)
Refined oil	0.26	0.48	< 0.01 (0.003)	0.28	0.39	< 0.01 (ND)	< 0.01 (ND)	0.012	< 0.01 (ND)
Solvent extracted meal	0.06	0.12	< 0.05 (ND)	0.15	0.21	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (0.03)	< 0.05 (ND)
Cleaned seed	0.18	0.35	0.014	0.21	0.30	0.014	< 0.01 (ND)	0.019	< 0.01 (ND)
Light impurities	9.1	18	1.6	12	17	1.3	0.28	5.1	0.48
Large Screenings	0.77	1.5	0.29	1.3	1.8	0.07	< 0.01 (0.007)	0.19	0.069
Flaked seed	0.14	0.27	0.019	0.18	0.25	0.016	< 0.01 (ND)	0.029	< 0.01 (ND)
Hexane	< 0.01 (ND)	< 0.02	< 0.01 (ND)	< 0.02	< 0.03	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Soapstock	0.14	0.27	< 0.05 (ND)	0.23	0.32	< 0.05 (0.04)	< 0.05 (ND)	< 0.05 (0.02)	< 0.05 (ND)
Canada, Fort Saskatchewan, 2007, Variety: DeKalb 34-55, 2× 1.5 kg ai/ha, PHI: 21 days									
Seeds (RAC)	0.63	–	0.056	0.73	–	0.027	0.014	0.018	< 0.01 (0.003)
Presscake	0.93	1.5	< 0.05 (0.04)	1.0	1.4	0.05	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Crude oil (mechanically extracted)	1.6	2.5	< 0.01 (ND)	1.6	2.2	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Crude oil (solvent extracted)	1.5	2.4	< 0.01 (ND)	1.5	2.1	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Refined oil	1.6	2.5	< 0.01 (ND)	1.6	2.2	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Solvent extracted meal	0.73	1.2	< 0.05 (0.04)	0.82	1.1	0.06	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)
Cleaned seed	0.2	0.32	0.026	0.25	0.34	0.026	< 0.01 (0.005)	< 0.01 (0.004)	< 0.01 (0.005)
Light impurities	33	52	1.4	36	49	0.69	0.33	0.5	0.33
Large Screenings	8.1	13	0.3	8.7	12	0.11	0.061	0.12	0.061
Small Screenings	3.3	5.2	0.18	3.6	4.9	0.06	0.042	0.047	0.042
Flaked seed	0.34	0.54	0.02	0.37	0.51	0.024	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (0.004)

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF		mg/kg	PF				
Hexane	< 0.01 (ND)	< 0.02	< 0.01 (ND)	< 0.02	< 0.03	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Soapstock	0.89	1.4	< 0.05 (ND)	0.98	1.3	0.05	< 0.05 (ND)	< 0.05 (ND)	< 0.05 (ND)

ND not detected, LOD: 0.003 mg/kg except for presscake, meal and soapstock (0.02 mg/kg)

Peanuts

In two field trials on peanuts conducted in the USA by Thiel, A. (2009, PTHIO_098) peanuts were processed into refined oil and meal. The corresponding field trial summary is presented in Table 136.

Table 136 Processing of peanuts treated with penthiopyrad in the USA with a PHI of 12 days (Thiel, A, 2009, PTHIO_098); values in brackets were extrapolated below the LOQ

Matrix	Penthiopyrad		PAM	Total		PCA	753-A-OH	753-F-DO	DM-PCA
	mg/kg	PF	mg/kg	mg/kg	PF	mg/kg	mg/kg	mg/kg	mg/kg
USA (GA), Sycamore, 2009, Variety: GA-02, 3 × 1.8 kg ai/ha, PHI: 14 days									
Nutmeat (RAC)	0.051	–	0.013	0.075	–	< 0.01 (0.004)	< 0.01 (ND)	< 0.01 (0.006)	< 0.01 (ND)
Meal	0.026	0.51	0.02	0.063	0.84	< 0.01 (0.005)	< 0.01 (ND)	< 0.01 (0.007)	< 0.01 (ND)
Refined oil	0.07	1.4	< 0.01 (ND)	0.089	1.2	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.007)	< 0.01 (ND)
USA (TX), Charlotte, 2009, Variety: TAM RUN OL-1, 3 × 1.8 kg ai/ha, PHI: 14 days									
Nutmeat (RAC)	0.011	–	0.012	0.033	–	0.01	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (ND)
Meal	0.041	3.7	0.022	0.082	2.5	0.014	< 0.01 (ND)	< 0.01 (0.006)	< 0.01 (ND)
Refined oil	0.2	18	< 0.01 (ND)	0.22	6.7	< 0.01 (ND)	< 0.01 (ND)	< 0.01 (0.004)	< 0.01 (ND)

ND not detected, LOD: 0.003 mg/kg

Table 137 Summary of processing factors for penthiopyrad and its metabolites in plant commodities

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
Apples	Canned fruit	Penthiopyrad: < 0.04, < 0.07, < 0.08	Penthiopyrad: < 0.07
		Total: < 0.08, < 0.13, < 0.14	Total: < 0.13
	Apple sauce	Penthiopyrad: 0.04, < 0.07, < 0.08	Penthiopyrad: < 0.07
		Total: < 0.08, < 0.13, < 0.14	Total: < 0.13
	Raw juice	Penthiopyrad: 0.07, 0.07, 0.08	Penthiopyrad: 0.07
		Total: < 0.13, < 0.14, 0.14	Total: 0.14
	Pomace, wet	Penthiopyrad: 4.9, 5.1, 6.5	Penthiopyrad: 5.1
		Total: 4.4, 4.6, 6	Total: 4.6
	Pomace, dry	Penthiopyrad: 6.6, 10, 12	Penthiopyrad: 10
		Total: 5.9, 8.8, 11	Total: 8.8
Plums	Pitted fruits	Penthiopyrad: 1, 1	Penthiopyrad: 1
		Total: 1, 1	Total: 1
	Dried pitted prunes	Penthiopyrad: 1.3, 1.5	Penthiopyrad: 1.4
		Total: 1.3, 1.4	Total: 1.4

Penthiopyrad

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
Tomatoes	Juice	Penthiopyrad: 0.19, 0.27, 0.47	Penthiopyrad: 0.27
		Total: 0.26, 0.34, 0.5	Total: 0.34
	Puree	Penthiopyrad: 1.5, 2.1, 2.2	Penthiopyrad: 2.1
		Total: 1.5, 2.0, 2.0	Total: 2.0
	Paste	Penthiopyrad: < 0.06, 3.6, 3.8	Penthiopyrad: 3.6
		Total: 0.1, 3.4, 3.5	Total: 3.4
	Ketchup	Penthiopyrad: 0.95, 1.1, 1.9	Penthiopyrad: 1.1
		Total: 0.95, 1.1, 1.8	Total: 1.1
	Canned fruits	Penthiopyrad: < 0.06, 0.07, 0.36	Penthiopyrad: 0.07
		Total: 0.1, 0.14, 0.36	Total: 0.14
	Pomace, wet	Penthiopyrad: 5, 5.1, 5.5	Penthiopyrad: 5.1
		Total: 4.3, 5.0, 5.5	Total: 5.0
Soya beans	Meal	Penthiopyrad: < 0.12, < 0.88	Penthiopyrad: < 0.5
		Total: 0.23, < 1.4	Total: 0.23
	Hulls	Penthiopyrad: 0.5, 4.4	Penthiopyrad: 2.5
		Total: 0.44, 4.7	Total: 2.5
	Refined oil	Penthiopyrad: 0.06, 1.9	Penthiopyrad: 1
		Total: 0.1, 1.8	Total: 0.95
Potatoes	Steam-peeled tubers	Penthiopyrad: < 0.13, 0.4	Penthiopyrad: 0.26
		Total: < 0.21, < 0.45	Total: < 0.33
	Abrasion-peeled tubers	Penthiopyrad: 0.13, < 0.4	Penthiopyrad: 0.26
		Total: < 0.21, < 0.45	Total: < 0.33
	Potato flakes	Penthiopyrad: 0.13, 0.4	Penthiopyrad: 0.26
		Total: < 0.21, < 0.45	Total: < 0.33
	Potato chips	Penthiopyrad: 0.13, 0.4	Penthiopyrad: 0.26
		Total: < 0.21, < 0.45	Total: < 0.33
	Unpeeled French fries	Penthiopyrad: 0.25, 0.92	Penthiopyrad: 0.58
		Total: 0.40, 0.93	Total: 0.67
	Peeled fries	Penthiopyrad: < 0.13, 0.4	Penthiopyrad: 0.26
		Total: < 0.21, < 0.45	Total: < 0.33
	Boiled unpeeled potatoes	Penthiopyrad: 0.28, 0.44	Penthiopyrad: 0.36
		Total: 0.43, < 0.45	Total: 0.43
	Boiled peeled potatoes	Penthiopyrad: < 0.13, 0.4	Penthiopyrad: 0.26
		Total: < 0.21, < 0.45	Total: < 0.33
	Unpeeled microwaved potatoes	Penthiopyrad: 0.52, 0.68	Penthiopyrad: 0.6
		Total: 0.62, 0.82	Total: 0.72
	Trim waste (steam-	Penthiopyrad: 3.4, 4.3	Penthiopyrad: 3.8

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
	peeling)	Total: 2.3, 3.6	Total: 3.0
	Trim waste (abrasion-peeling)	Penthiopyrad: 2.1, 3.2	Penthiopyrad: 2.6
		Total: 1.9, 2.3	Total: 2.1
Sugar beets	Refined sugar	Penthiopyrad: 0.13, 0.18	Penthiopyrad: 0.16
		Total: 0.27, 0.35	Total: 0.31
	Molasses	Penthiopyrad: 0.14, 0.19	Penthiopyrad: 0.17
		Total: 0.20, 0.51	Total: 0.36
	Dried pulp	Penthiopyrad: 4.9, 6.4	Penthiopyrad: 5.7
		Total: 4.9, 5.6	Total: 5.3
Barley	Spent grain	Penthiopyrad: 0.44, 0.55	Penthiopyrad: 0.5
		Total: 0.5, 0.63	Total: 0.56
	Young beer	Penthiopyrad: < 0.08, < 0.27	Penthiopyrad: < 0.18
		Total: < 0.11, < 0.36	Total: < 0.24
	Beer	Penthiopyrad: < 0.08, < 0.27	Penthiopyrad: < 0.18
		Total: < 0.11, < 0.36	Total: < 0.24
	Pot barley	Penthiopyrad: 0.53, 0.77	Penthiopyrad: 0.65
		Total: 0.67, 0.68	Total: 0.68
	Spent yeast	Penthiopyrad: 0.13, < 0.27	Penthiopyrad: 0.13
		Total: 0.2, < 0.36	Total: 0.28
Maize	Starch	Penthiopyrad: < 0.91	Penthiopyrad: < 0.91
		Total: < 0.67	Total: < 0.67
	Grits	Penthiopyrad: 0.91	Penthiopyrad: 0.91
		Total: < 0.67	Total: < 0.67
	Flour	Penthiopyrad: 2.1	Penthiopyrad: 2.1
		Total: 1.4	Total: 1.4
	Meal	Penthiopyrad: 1.5	Penthiopyrad: 1.5
		Total: 1.2	Total: 1.2
	Refined oil (wet milled)	Penthiopyrad: 5.6	Penthiopyrad: 5.6
		Total: 2.7	Total: 2.7
	Refined oil (dry milled)	Penthiopyrad: 4.5	Penthiopyrad: 4.5
		Total: 2.3	Total: 2.3
Wheat	Bran	Penthiopyrad: 1.8	Penthiopyrad: 1.8
		Total: 1.8	Total: 1.8
	Flour	Penthiopyrad: 0.26	Penthiopyrad: 0.26
		Total: 0.39	Total: 0.39
	Middling	Penthiopyrad: 0.66	Penthiopyrad: 0.66
		Total: 0.72	Total: 0.72
	Shorts	Penthiopyrad: 1.2	Penthiopyrad: 1.2
		Total: 1.2	Total: 1.2

Penthiopyrad

Raw agricultural commodity (RAC)	Processed commodity	Calculated processing factors	Median or best estimate
	Germ	Penthiopyrad: 2.1	Penthiopyrad: 2.1
		Total: 1.9	Total: 1.9
Oilseed rape	Presscake	Penthiopyrad: 0.27, 1.3, 1.5	Penthiopyrad: 1.3
		Total: 0.32, 1.4, 1.6	Total: 1.4
	Crude oil (mechanically extracted)	Penthiopyrad: 0.78, 1.9, 2.5	Penthiopyrad: 1.9
		Total: 0.85, 1.9, 2.2	Total: 2.2
	Crude oil (solvent extracted)	Penthiopyrad: 0.54, 1.4, 2.4	Penthiopyrad: 1.4
		Total: 0.42, 1.3, 2.1	Total: 1.3
	Refined oil	Penthiopyrad: 0.48, 1.6, 2.5	Penthiopyrad: 1.6
		Total: 0.39, 1.5, 2.2	Total: 2.2
	Solvent extracted meal	Penthiopyrad: 0.12, 0.95, 1.2	Penthiopyrad: 0.95
		Total: 0.21, 1.1, 1.3	Total: 1.1
	Cleaned seed	Penthiopyrad: 0.32, 0.35, 1.3	Penthiopyrad: 0.35
		Total: 0.3, 0.34, 1.3	Total: 0.34
	Light impurities	Penthiopyrad: 18, 44, 52	Penthiopyrad: 44
		Total: 17, 48, 49	Total: 49
	Large Screenings	Penthiopyrad: 1.5, 3.4, 13	Penthiopyrad: 3.4
		Total: 1.8, 3.6, 12	Total: 3.6
	Small Screenings	Penthiopyrad: 2.7, 5.2	Penthiopyrad: 3.9
		Total: 2.7, 4.9	Total: 3.8
	Flaked seed	Penthiopyrad: 0.27, 0.54, 1.5	Penthiopyrad: 0.54
		Total: 0.16, 0.51, 1.4	Total: 0.51
	Soapstock	Penthiopyrad: 0.27, 0.74, 1.4	Penthiopyrad: 0.74
		Total: 0.32, 1.1, 1.3	Total: 1.3
Peanuts	Meal	Penthiopyrad: 0.51, 3.7	Penthiopyrad: 2.1
		Total: 0.84, 2.5	Total: 2.7
	Refined oil	Penthiopyrad: 1.4, 18	Penthiopyrad: 9.7
		Total: 1.2, 6.7	Total: 4

RESIDUES IN ANIMAL COMMODITIES***Farm animal feeding studies***

For the estimation of residues of penthiopyrad and its metabolites PAM, PCA and 753-A-OH in animal matrices laying hens and lactating cow feeding studies were submitted to the Meeting.

Lactating cows

Residues in lactating cows were investigated by Rawle, NW (2008, PTHIO_040). Dairy cows were administered penthiopyrad twice daily for at least 28 days. The total dose rates of penthiopyrad per cow per day were 100 mg (1× dose rate, three cows), 300 mg (3× dose rate, three cows) and 1000 mg (10× dose rate, five cows). Based on the average weights of the cows in each dose group,

dose levels were calculated to be 0.15 mg/kg bw/day (1×), 0.48 mg/kg bw/day (3×) and 1.65 mg/kg bw/day (10×), equivalent to 8.4, 21.4 and 74.6 ppm in feed.

Milk samples from each animal were collected twice daily and combined as one pooled sample. Milk from Day 23 was separated into cream and skim milk for separate analysis. Animals were sacrificed within 24 hours after the final dosing and muscle, liver, kidney and three types of fat samples were taken. Two cows of the 10× group were slaughtered three and seven days after the final dose to determine residue levels after cessation of dosing.

Residues of penthiopyrad and its metabolites (PAM, PCA and 753-A-OH) were determined following extraction with acetone/water, hydrolysis of conjugates and partition of all analytes into ethyl acetate. Following solvent exchange, the analytes were measured by LC-MS/MS.

In milk residues of penthiopyrad and its metabolites were below the LOQ of 0.01 mg/kg for the control, 1× and 3× dose groups in all samples. The 10× group gave detectable residues above the LOQ, summarized in Table 142.

Table 138 Residues of penthiopyrad, PAM, PCA and 753-A-OH in whole milk (10× dose group)

Days	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
-7	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
-3	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
-1	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
1	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
3	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
6	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
9	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
12	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	0.01, 0.01, 0.02, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
15	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	0.01, 0.01, 0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
18	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, 0.01, 0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
21	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	0.01, 0.01, 0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
24	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, 0.01, 0.01, < 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
28	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, 0.01, 0.01, < 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
30	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01
34	< 0.01	< 0.01	< 0.01	< 0.01

Samples taken on day 23 from all dose groups were separated in skim milk and cream. For the control, 1× and 3× dose group no residues above the LOQ of 0.01 mg/kg were found in any of the samples. For 10× detectable residues were found, but the levels were near the LOQ (see Table 143).

Table 139 Residues of penthiopyrad, PAM, PCA and 753-A-OH in skim milk and cream (10× dose group)

Matrix	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
Skim milk	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01
Cream	< 0.01, < 0.01, 0.01, 0.01, 0.01 (0.01)	< 0.01, 0.01, 0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01

In bovine tissues residues found are summarized in the following table.

Table 140 Residues in tissues of lactating cows after administration of 0.15 (1×), 0.48 (3×) or 1.65 (10×) mg penthiopyrad per kg bw and day

Matrix	Dose level	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
Liver	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	0.02, 0.01, 0.02 (0.02)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	0.02, 0.03, 0.02 (0.02)	0.04, 0.03, 0.06 (0.04)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
Muscle	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01	0.01, 0.01, 0.02 (0.013)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
Kidney	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01	0.03, 0.02, 0.03 (0.03)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
Subcutaneous fat	1×	< 0.01	< 0.01	< 0.01	< 0.01
	3×	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01
	10×	< 0.01, 0.01 (0.01)	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01
Mesenteric fat	1×	< 0.01, < 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, 0.02, 0.02 (0.02)	< 0.01, 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
Renal fat	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01

Matrix	Dose level	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, 0.01 (0.01)	< 0.01, < 0.01, 0.02 (0.01)	< 0.01, < 0.01, 0.02 (0.01)	< 0.01, < 0.01, < 0.01

Poultry

For laying hens a study conducted by Rodgers M (2009, PTHIO_039) involved administration of penthiopyrad via capsule for 28 consecutive days. Treatment levels were 0.4 (1×), 1.2 (3×) and 4.0 (10×) mg/kg bw/day and were calculated after the study to be equivalent to 5.85, 17.54 and 58.46 ppm in the feed. An additional 12 hens dosed at the 10× level were maintained for depuration. Subgroups of four hens were killed at 7, 14 and 21 days after the final dose administration. During the whole dosing period eggs were collected and after sacrificing the animal (within 6h after the final dosing) analysed with the tissues for residues of penthiopyrad, PAM, PCA and 753-A-OH.

Residues of penthiopyrad and its metabolites were determined by LC-MS/MS following extraction with acetone/water, hydrolysis of conjugates and partition of all analytes into ethyl acetate. Samples were coarsely chopped and mixed before pooling the tissues from each subgroup containing four hens which were then divided into two subsamples.

In eggs residues were generally low. At the high dose level (10×), PAM was quantified in all samples from Day 3 until Day 27 at levels ranging from 0.011 to 0.028 mg/kg. Penthiopyrad was measurable in only 7 of the 48 samples with concentration ranging from 0.011 to 0.016 mg/kg. 753-A-OH was measurable in only 4 of the 48 samples in concentrations ranging from 0.010 to 0.014 mg/kg. PCA was not measurable in any sample and, moreover, was not detected in any sample. In control samples all residues were below the limit of determination (0.005 mg/kg) for all analytes (see Table 141).

Table 141 Residues in eggs of laying hens after administration of 0.4 (1×), 1.2 (3×) or 4.0 (10×) mg penthiopyrad per kg bw and day

Days	Dose level	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
-7	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
-1	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01
1	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01
3	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01

[illegible]

Days	Dose level	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
	10×	< 0.01, < 0.01, < 0.01	0.015, 0.016, 0.018 (0.016)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
25	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, 0.011 (0.01)	0.012, 0.018, 0.014 (0.015)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
27	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	0.016, 0.013, 0.014, 0.017, 0.018, 0.02 (0.016)	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01, < 0.01, < 0.01, < 0.01
30	10×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
32	10×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
34	10×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
38	10×	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01
41	10×	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01	< 0.01, < 0.01
45	10×	< 0.01	< 0.01	< 0.01	< 0.01
48	10×	< 0.01	< 0.01	< 0.01	< 0.01

In poultry tissues residues in the 1× and 3× dose group were all below the LOQ of 0.01 mg/kg. Only the 10× dose group showed residues above the LOQ. All matrices sampled from the animals destined for depuration were below 0.01 mg/kg for all analytes.

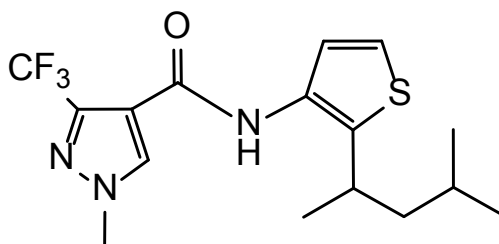
Table 142 Residues in tissues of laying hens after administration of 4.0 (10×) mg penthiopyrad per kg bw and day

Matrix	Dose level	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
Liver	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, 0.021, 0.018 (0.016)	0.017, 0.017, 0.019 (0.018)	< 0.01, 0.01, 0.014 (0.012)	< 0.01, < 0.01, 0.011 (0.01)
Muscle	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, 0.01 (0.01)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
Skin + Fat	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01

Matrix	Dose level	Penthiopyrad in mg/kg (mean)	PAM in mg/kg (mean)	PCA in mg/kg (mean)	753-A-OH in mg/kg (mean)
	10×	< 0.01, 0.016, 0.018 (0.015)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
Abdominal fat	1×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	3×	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01
	10×	0.016, 0.023, 0.036 (0.025)	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01	< 0.01, < 0.01, < 0.01

APPRAISAL

Penthiopyrad (ISO common name) is a carboxamide fungicide used to control a broad spectrum of diseases on large varieties of crops. Penthiopyrad inhibits fungal respiration by binding to mitochondrial respiratory complex II. It was considered for the first time by the 2011 JMPR for toxicology, establishing an acceptable daily intake (ADI) of 0–0.1 mg/kg bw and an acute reference dose (ARfD) of 1 mg/kg bw.

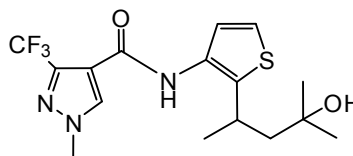


The IUPAC name of penthiopyrad is (RS)-N-[2-(1,3-dimethylbutyl)-3-thienyl]-1-methyl-3-(trifluoromethyl)pyrazole-4-carboxamide and the CA name is N-[2-(1,3-dimethylbutyl)-3-thienyl]-1-methyl-3-(trifluoromethyl)-1H-pyrazole-4-carboxamide (9CI).

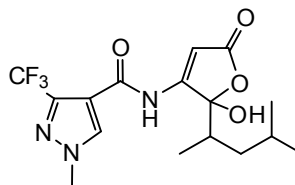
Penthiopyrad labelled either in the pyrazole- (P-label) or thienyl-moiety (T-label) was used in the metabolism and environmental fate studies.

The following abbreviations are used for the metabolites discussed below:

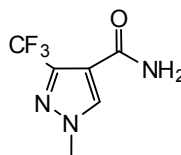
753-A-OH



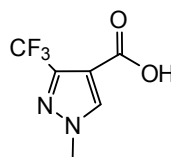
753-F-DO



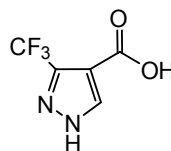
PAM



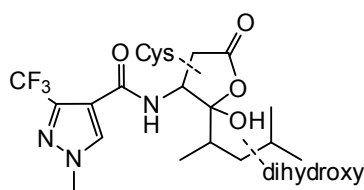
PCA



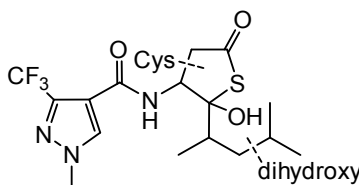
DM-PCA



dihydroxy-cys-F-DO



dihydroxy-cys-T-DO



Animal metabolism

Information was available on metabolism of penthiopyrad in laboratory animals, lactating goats and laying hens.

Rats

In the 2011 JMPR Report on penthiopyrad the following conclusions were drawn by the WHO Experts regarding the metabolism of the active substance in rats:

“The absorption, distribution, metabolism and excretion of penthiopyrad were investigated in rats. ¹⁴C labelled penthiopyrad was rapidly and extensively absorbed from the gastrointestinal tract of rats following oral dosing. The extent of absorption was approximately 80–90% of the administered dose, independent of dose and sex.

Very little penthiopyrad was retained in the tissues.

Faecal excretion was the primary route of elimination, and excretion was rapid, with the majority excreted by all routes 24 hours after dosing (74.8–85.0%).

Extensive metabolism occurred at numerous positions within the molecule, including thienyl ring oxidation and conjugation with glutathione, thienyl ring opening, N-demethylation and alkyl side-chain hydroxylation, followed by oxidation to carboxylic acids and glucuronidation. The most abundant metabolite in both urine and faeces was formed as the result of N-demethylation and oxidation of the methyl moiety of the alkyl side-chain. The most abundant metabolites found in bile were formed as a result of thienyl ring oxidation to 753-F-DO, followed by its conjugation with glutathione and the catabolism of this product. Other significant metabolites in bile were glucuronic acid conjugates of the intermediate demethylated and hydroxylated metabolites. Four metabolites

containing the pyrazole moiety following cleavage from the thienyl moiety were excreted in both urine and faeces. The two acids, 1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxylic acid (PCA) and 3-trifluoromethyl-1H-pyrazole-4-carboxylic acid (DM-PCA) are likely formed by amide hydrolysis from 1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide (PAM) and DM-PAM. PAM and subsequent metabolites account for less than 1% of the administered dose. The thienyl ring appears to be completely degraded.”

Goats

Two studies on metabolism in goats were available. In the first study on lactating goats radiolabelled penthiopyrad was administered at a rate equivalent to 20 ppm in the feed, less than 1% of the total dose was recovered from milk or tissues of the animals. Most of the radioactivity was excreted via faeces and urine.

In muscle and fat TRR levels were 0.011–0.038 mg eq/kg and 0.015–0.028 mg eq/kg, respectively. For muscle only PAM and PCA were identified present at 51% and 7% of the TRR. In fat unchanged penthiopyrad (32% TRR, 0.009 mg eq/kg) and PAM (12% TRR, 0.003 mg eq/kg) were the only structures identified.

For kidney (TRR: 0.11–0.33 mg eq/kg) PAM was the major component for the P-label accounting for 19% of the TRR (0.062 mg eq/kg). Unchanged penthiopyrad was detected in traces only (3% TRR, 0.011 mg eq/kg). For the T-label only 753-A-OH was identified, being present at 6% of the TRR (0.007 mg eq/kg). The remaining radioactivity for both labels could not be attributed to specific reference compounds.

In liver TRR levels were 1.9 mg eq/kg for P- and 0.99 mg eq/kg for the T-label. Of the TRR 2% (0.037 mg eq/kg, T-label only) could be attributed to penthiopyrad. The radioactivity recovered was distributed between numerous analytical peaks accounting less than 10% of the TRR each. Identified metabolites were PAM (3% TRR, 0.053 mg eq/kg), PCA (9% TRR, 0.17 mg eq/kg), 753-F-DO (1% TRR, 0.02 mg eq/kg) and 753-A-OH (0.5% TRR, 0.005 mg eq/kg).

In the second study on lactating goats the animals were administered radiolabelled penthiopyrad at rates equivalent to 10 ppm in the feed. TRR levels found were 0.66–0.74 mg eq/kg in liver, followed by kidney (0.15–0.17 mg eq/kg). In muscle, fat and milk the TRR was between 0.013 to 0.072 mg eq/kg.

In muscle PAM was identified as major metabolite being present at levels of 46% of the TRR (0.012 mg eq/kg). In addition traces of DM-PAM were detected (12% TRR, 0.003 mg eq/kg). In fat only DM-PAM, PAM and penthiopyrad were detected at traces up to 0.005 mg eq/kg.

In milk PAM was the major residue at 30% of the TRR (0.013 mg eq/kg) for the P-label, followed by cys-T-DO-isomer with 16% of the TRR (0.007 mg eq/kg). For the T-label the degradation was more extensive, showing unattributed analytical peaks at levels of 8% of the TRR or less (0.008 mg eq/kg or less) each.

In liver solvent extraction with ACN/water released approx. 40% of the TRR, characterised as numerous unassigned analytical peaks present at < 10% of the TRR each. Only hydroxy-penthiopyrad was found in the T-label sample at or above 10% of the TRR (10% TRR, 0.069 mg eq/kg). Following protease, acid and base hydrolysis 97–99% of the TRR could be released. Identification of the residue again gave mainly unassigned chromatographic peaks quantified at rates of < 4% of the TRR each. Only PCA and PAM were identified at levels of 13% (0.10 mg eq/kg) and 8% (0.063 mg eq/kg) of the TRR, respectively.

For kidney solvent extraction with ACN/water gave numerous single metabolites each below 10% of the TRR (0.017 mg eq/kg and less). For the T-label only PAM and the dihydroxy-cys-F-DO isomer were present at amounts of 10% (0.016 mg eq/kg) and 11% (0.017 mg eq/kg) of the TRR, respectively. After protease, acid and base hydrolysis 97–103% of the TRR were released. A large number of substances at individual levels all below 4% of the TRR (0.006 mg eq/kg or less) were found. Additional major metabolites at levels > 10% of the TRR could not be identified.

Laying hens

For laying hens radiolabelled penthiopyrad equivalent to 10 ppm in the diet was administered for 14 consecutive days. For both the P- and the T-label TRR levels in egg yolk (0.28–0.37 mg eq/kg) were higher than in the egg white (0.05–0.06 mg eq/kg). In tissues TRR levels were 0.021–0.049 mg eq/kg in fat, 0.038–0.052 mg eq/kg in muscle, 0.053–0.059 mg eq/kg in skin and 0.6–0.68 mg eq/kg in liver.

In egg white PAM was the major residue present following administration of the P-label, being present up to 50% of the TRR. Unchanged penthiopyrad was identified in all samples, but near the LOQ (0.001 mg/kg). In addition minor levels of 753-A-OH (5–7% TRR) were found.

For egg yolk PAM was the major residue (24–28% of the TRR) following solvent extraction. Hydrolysis released additional 10% of the TRR as PAM. Penthiopyrad was found at levels of 2–15% of the TRR following hydrolysis. Additional minor metabolites all being present at levels of < 10% of the TRR each could be attributed to known reference substances.

For hens' liver also numerous metabolites were present at individual levels of 13% of the TRR and less (0.079 mg eq/kg and less). The only substances identified were PCA with 1.4% TRR (0.009 mg eq/kg) and PAM with 8% TRR (0.05 mg eq/kg). Following hydrolysis, releasing the major part of the radioactivity, PCA and PAM gave additional amounts of 2% TRR (0.012 mg eq/kg) and 7% TRR (0.043 mg eq/kg), respectively.

In a second study laying hens were administered radiolabelled penthiopyrad equivalent to 10 ppm in the diet. TRR levels found were 0.062–0.094 mg eq/kg in whole eggs, 0.014–0.022 mg eq/kg in muscle, 0.014–0.02 mg eq/kg in fat and 0.24–0.35 mg eq/kg in liver. Further investigation on the nature of residues was performed for eggs and liver only.

For eggs a broad pattern of metabolites all being present below 0.01 mg eq/kg (less than 16% of the TRR) was found. PAM was identified as major residue (0.007 mg eq/kg, 11% TRR) followed by DM-PAM (0.004 mg eq/kg, 7% TRR). Hydrolysis released some additional radioactivity too low for further identification. Only two major chromatographic peaks attributed to PAM were detected, adding 0.01 mg eq/kg for the P-label and 0.008 mg eq/kg for the T-label.

In liver numerous metabolites were found mainly being present at individual levels of < 10% of the TRR for both labels. PAM was the major residue in hens' liver for the P-label with a total amount of 0.046 mg eq/kg parent equivalents (19% of the TRR). For the T-label dihydroxy-cys-T-DO was identified following digestion at a total of 0.042 mg eq/kg parent equivalents (12% of the TRR).

No unchanged penthiopyrad could be identified in hens liver or eggs.

In summary penthiopyrad is effectively degraded in goats and hens into a large number of minor metabolites following hydrolysis, oxidation, N-demethylation and conjugation. Major metabolites were mainly PAM, formed by cleavage of the molecule, or the hydroxylation product 753-A-OH. Unchanged parent substance was found in several samples; however, individual levels were normally below 10% of the TRR. The metabolites dihydroxy-cys-F-DO in goats' kidney (11%TRR, 0.017 mg eq/kg) and dihydroxy-cys-T-DO in hens liver (12%TRR, 0.042 mg eq/kg) were not identified in rats. All other major metabolites identified were also found in rats.

Plant metabolism

The Meeting received plant metabolism studies for penthiopyrad following foliar application to grapes, cabbage, tomatoes, wheat and rape seed using a mixture of both radiolabelled active substances.

Grapes

Two plots of grapes were treated with a 1:1 mixture of P- and T-radiolabelled penthiopyrad at rates equivalent to 0.4 kg ai/ha each. Samples of grapes and leaves were collected after either 30 or 60 days. Total radioactive residues in grapes were 0.20–0.24 mg eq/kg after 30 days and 0.083–0.21 mg eq/kg after 60 days. In leaves TRR levels of 5.1 mg eq/kg were found 30 day after treatment (DAT) and of 3.3 mg eq/kg 60 DAT.

Rinsing of grapes released 24% and 12% of the TRR from 30 DAT and 60 DAT samples, respectively. In the rinse unchanged parent penthiopyrad was the major residue (11% TRR for 30 DAT and 2.4% TRR for 60 DAT). In the rinsed fruits penthiopyrad amounts of 9% TRR for 30 DAT and 2.4% TRR for 60 DAT were found. Besides PAM in grapes after 60 DAT (13% TRR) no further metabolites present at relative amounts > 10 of the TRR were identified. Additional attempts for identification using acid hydrolysis released minor amounts of 753-A-OH.

Cabbage

Cabbage plants were treated with a SC formulation using application rates equivalent to either 0.2 or 1 kg ai/ha. After 21 days samples of outer leaves, inner heads and roots were samples and analysed for residues. Total radioactive residues were 1.4 mg eq/kg and 7.9 mg eq/kg for outer leaves, 0.045 mg eq/kg and 0.16 mg eq/kg for inner heads and 0.48 mg eq/kg and 2.6 mg eq/kg for roots, following the lower or higher application rate, respectively.

Rinsing of the outer leaves recovered 44% of the TRR for both application rates. Rinsing the inner leaves additionally recovered 8–11% of the TRR. In the rinses and extracts of leaves penthiopyrad was identified as the major residue, represent at 20–34% of the TRR. Metabolites DM-753, 753-F-DO, 753-A-OH, PCA and PAM were identified, however only PAM was present at amounts higher than 10% of the TRR (10–11% TRR).

Tomatoes

Field grown tomatoes were treated with a 1:1 mixture of P- or T-radiolabelled penthiopyrad at rates equivalent to either 0.3 kg ai/ha or 1.5 kg ai/ha. Total radioactive residues for the low and high rate plots found in fruits after 14 days were 0.014 mg eq/kg and 0.46 mg eq/kg and after 21 days 0.022 mg eq/kg and 0.28 mg eq/kg, respectively. In leaves (21 DAT) TRR levels of 0.65 mg eq/kg for the low rate and 4.8 mg eq/kg for the high rate samples were found.

Rinsing of fruits treated with the higher application rate recovered 76% of the TRR after 14 days and 68% of the TRR after 21 days. In the 14 DAT samples 45% of the TRR (combined rinse and extract) were identified as penthiopyrad, decreasing to 23–38% TRR after 21 days of the TRR. Other metabolites identified were PAM (4–6% TRR), PCA (4–8% TRR), 753-A-OH (1% TRR) and 753-F-DO (3–4% TRR).

In leaves treated with low or high rates penthiopyrad was the major residue with levels ranging from 37% to 55% (0.24 and 2.7 mg eq/kg), respectively. Identified metabolites were PCA (8% TRR or 0.053 mg eq/kg; 3% TRR or 0.14 mg eq/kg), PAM (4% TRR or 0.027 mg eq/kg; 5% TRR or 0.24 mg eq/kg) and 753-F-DO (2% TRR or 0.014 mg eq/kg; 5% TRR or 0.22 mg/kg).

Wheat

Wheat plants were treated with a 1:1 mixture of P- and T-radiolabelled penthiopyrad in the field at application rates equivalent to 2×0.25 kg ai/ha or 2×0.75 kg ai/ha. The applications were conducted at stem elongation and the end of flowering (BBCH 59). Samples of forage (7 days after 1st application), hay (5 days after 2nd application), wheat and straw (32 days after 2nd application) were collected. TRR levels found were 6.5 mg eq/kg and 22 mg eq/kg for forage, 4.0 mg eq/kg and 17 mg eq/kg for hay, 9.4 mg eq/kg and 42 mg eq/kg for straw and 0.34 mg eq/kg and 0.87 mg eq/kg for grain following low or high rate treatment, respectively. Only low rate samples were further analysed.

In forage and hay unchanged penthiopyrad was the major residue being present at 75% and 44% of the TRR. Other metabolites identified (PAM, PCA, F-DO and 753-T-DO) each amounted less than 5% of the TRR in forage and hay. In straw penthiopyrad also contributed most to the TRR (19%). Identified metabolites were identical to forage and hay; however PCA and PAM were found at slightly higher levels of 9% and 6% of the TRR, respectively.

In grain penthiopyrad was found at 8% of the TRR, representing the major residue. Both PAM and PCA were present at 4% of the TRR. No further metabolites were identified in grain.

Rape seed

Rape seed plants (canola) was treated with a 1:1 mixture of P- or T-radiolabelled penthiopyrad in the field two times with 0.4 kg ai/ha at stem elongation and the end of flowering. Forage was collected 14 days after the first application, mature seeds 34 days after the second application. TRR levels in forage and seeds were 12 mg eq/kg and 0.14 mg eq/kg, respectively.

In forage the major residue was 753-A-OH malonyl glucoside (25% TRR, 3.0 mg eq/kg). Unchanged penthiopyrad was found at 11% of the TRR (1.4 mg eq/kg). Other metabolites were all below 10% of the TRR remained mainly unidentified except PAM (1 % TRR, 0.16 mg eq/kg), PCA (0.5% TRR, 0.062 mg eq/kg) and DM-A-OH malonyl glucoside (9%TRR, 1.1 mg eq/kg).

In seeds penthiopyrad and PCA were identified at the LOQ of 0.001 mg/kg (0.7% TRR) in the organic phase following extraction. Approximately 27% of the TRR (0.038 mg eq/kg) was indistinguishable from natural lipids. In the aqueous phase DM-PAM and PAM were attributed to 2 chromatographic peaks at levels of 5% TRR (0.007 mg eq/kg) and 8% TRR (0.011 mg eq/kg), respectively. Additional PCA was found with 2% TRR (0.003 mg/kg). No further metabolites were identified in the aqueous phase.

Summary

In summary the plant metabolism of penthiopyrad is extensive. Following hydroxylation of the dimethyl-butyl-side chain, 753-A-OH is formed as the first stable intermediate. Subsequently conjugation with glucose or glucose malonyl occurs. In case of a hydroxylation at the thienyl moiety, the metabolite 753-F-DO is formed after substitution of the sulphur by oxygen. This structure is then cleaved, leaving the pyrazole moiety to form PAM, PCA and DM-PCA. All major metabolites identified were also found in rats.

Environmental fate in soil

The Meeting received information on the fate of penthiopyrad after aerobic degradation in soil and after photolysis on the soil surface. In addition, the Meeting received information on the uptake of penthiopyrad soil residues by rotational crops. Experiments were carried out using penthiopyrad ¹⁴C labelled in the pyrazole or thienyl moiety.

In aerobic soil metabolism studies the metabolic pattern was more or less comparable to the plant metabolism. In nearly all samples PAM, PCA, 753-A-OH and 753-F-DO were found at levels of 2–10% of the applied radioactivity (AR). DM-PCA was identified as major residue in most samples, although mainly being present at levels below 10% of the AR after 140–269 days (in two samples up to 17% and 28% of the AR). Depending on the soil type remaining levels of penthiopyrad ranged from 11% to 78% of the AR (161–300 d). Estimated half-life times (1st order kinetics) were between 65 to 356 days for penthiopyrad.

Soil photolysis of penthiopyrad resulted in less than 50% remaining after three days. After 15 days only 4% of the initial concentration of the parent was recovered from the soil. According to the underlying study the irradiation of 15 days corresponds to 29 midsummer days at latitude 50°N. Main degradation products were PAM and PCA with 27% and 23% of the initial activity, respectively.

Residues in rotational crops

In a confined rotational crop study, a 1:1 mixture of P- and T-radiolabelled penthiopyrad was applied to bare soil at a rate equivalent to 0.8 kg ai/ha. Rotational crops (spinach, lettuce, radish and wheat) were sown or planted 30, 120 and 360 days later. Radioactive residues above the LOQ of 0.001 mg eq/kg were found in all samples, ranging from 0.011–0.73 mg eq/kg after the first, 0.005–0.16 mg eq/kg for the second and 0.003–0.086 mg eq/kg after the third rotation.

Identification of radioactivity was performed for samples with TRR levels above 0.01 mg/kg parent equivalents. Although extraction released 50–100% of the TRRs, rates of identification were low, showing 753-A-OH as highest residue present in spinach leaves (0.039 mg eq/kg). Parent penthiopyrad was identified in chaff samples from 30 days crops rotation. In addition PCA and DM-PAM were identified in spinach leaves and chaff (0.012–0.014 mg eq/kg). In other samples the radioactivity was present in polar fractions consisting of at least 14 individual components not further identified.

Field rotation studies reflecting authorised application rates are available from Europe and the USA. In Europe either cucumbers (Southern Europe) or barley (Northern Europe) were treated with two sprayings of 0.4 kg ai/ha each. Lettuce, spinach, radish, wheat and barley were planted as rotational crops. In all samples no residues above the LOQ were found for penthiopyrad except one detect at 0.017 mg/kg in radish roots. PCA and DM-PCA were frequently present in lettuce, radish and wheat, ranging up to 0.16 mg/kg for DM-PCA in wheat forage. PAM, 753-A-OH and 753-F-DO were not found above the LOQs of 0.01–0.05 mg/kg.

In USA trials field crops were treated with application rates of four sprayings with 0.25 kg ai/ha each. Radish, lettuce and wheat were planted as rotational crops and grown to maturity. In none of the samples residues above the LOQ were found for penthiopyrad, 753-A-OH, 753-F-DO and PCA. Several minor results of up to 0.064 mg/kg were found for PAM, while DM-PCA was present in most samples ranging up to 0.12 mg/kg (radish tops).

In soil the degradation pathway is similar to plants, although no conjugates were observed. The translocation of residues into rotational crops was limited mainly to PCA and DM-PCA, latter being found in concentrations up to 0.09 mg/kg in food commodities, but without a tendency for accumulation. Based on the current use pattern from the USA, the submitted field rotation studies provide a realistic estimate for potential residues arising. For penthiopyrad, PAM, 753-A-OH and 753-F-DO no significant uptake via the roots occurred.

Methods of residue analysis

The Meeting received a number of analytical methods have for the analysis of penthiopyrad, PAM, PCA, 753-A-OH, 753-F-DO and DM-PCA in plant and animal matrices. The basic principle employs extraction by homogenisation with acetone/water or acetonitrile/water. After partitioning against an organic solvent (normally ethyl acetate) the extracts were cleaned with GPC or directly used for analysis. Residues are determined by liquid chromatography (LC) in combination with tandem mass spectroscopy (MS/MS). Validated LOQs for all analytes were 0.01 mg/kg for plant and animal matrices.

For the application of multi-residue methods the DFG S-19 was tested with satisfactory recoveries for parent penthiopyrad. The metabolites PAM, PCA and DM-PCA did not give acceptable recoveries using the DFG S-19 method.

Stability of residues in stored analytical samples

The Meeting received information on the storage stability of penthiopyrad, PAM, PCA, 753-A-OH, 753-F-DO and DM-PCA in plant and animal matrices. The results confirmed the stability of residues for all analytes for at least 18 months in plant matrices.

In animal matrices the percentage of recoveries were measured after a period of one month. Within this timeframe, which covers the storage period of animal metabolism and feeding studies submitted, no significant degradation of the analytes was observed. For bovine milk the storage stability of penthiopyrad, 753-A-OH, PAM and PCA was tested for up to 6 months without significant degradation.

Definition of the residue

Livestock animal metabolism studies were conducted on laying hens (10 ppm) and lactating goats (10 and 20 ppm). In lactating goats penthiopyrad was seldom present, normally near the LOQ amounting 2–3% of the TRR in liver and kidney. In fat 32% of the TRR were present as penthiopyrad, however absolute levels were low (0.009 mg eq/kg). The major residue in goats was PAM, being present at 10% TRR in milk, 3% TRR in liver, 19 % TRR in kidney, 8% TRR in muscle and 12% TRR in fat. Except for dihydroxy-cys-F-DO in goats kidney (11%TRR, 0.017 mg eq/kg) other metabolites were only identified at minor levels less than 10% TRR or less than 0.01 mg eq/kg in tissues and milk, even following acidic, basic or enzymic hydrolysis.

For laying hens parent penthiopyrad was only detected in eggs (up to 0.038 mg eq/kg or 15% TRR in egg yolk). The major residue identified was PAM with levels of 50% TRR in egg white, 24% TRR in egg yolk and 15% TRR in liver (sum of extracts). Except for dihydroxy-cys-T-DO found in one hen's liver sample (0.042 mg eq/kg, 12% TRR) all other metabolites were present at less than 10% of the TRR or less than 0.01 mg eq/kg in tissue and eggs even following acidic, basic or enzymic hydrolysis..

The Meeting concluded that penthiopyrad and PAM were the major residues found in all animal matrices. While parent penthiopyrad was more associated with fatty compartments, PAM was the dominant residue found in tissues, milk and eggs. Analytical methods are capable of measuring both analytes.

Concerning the toxicological relevance of penthiopyrad and its metabolites, PAM was identified to be of higher acute toxicity compared to the parent substance. However PAM was also identified in rats and is covered by the toxicological endpoints of the parent penthiopyrad. The major metabolites dihydroxy-cys-F-DO in goats' kidney and dihydroxy-cys-T-DO in hens' liver were not found in the rat. Dihydroxy degradates would be derived from the monohydroxy-F and -T-DO metabolites, which are found in rats and have very little toxicity concern. Any further metabolism would result in non-toxic products and they would be readily excreted in the body. Other metabolites (PCA, 753-F-DO, 753-A-OH and DM-PCA) are also of lower acute toxicity than penthiopyrad.

For MRL compliance and for dietary intake assessment the Meeting recommended use of the sum of penthiopyrad and PAM, expressed as penthiopyrad, in animal matrices. Although the parent substance was found at higher levels in fat than in muscle, the overall residue including PAM was evenly distributed, suggesting that the residue is not fat-soluble.

The fate of penthiopyrad in plants was investigated following foliar application to grapes, cabbage, tomatoes, wheat and rape seed. The parent substance was the major residue, being present at levels of 21% TRR in grapes, 20–34% TRR in cabbage, 45–46% TRR in tomatoes, 19% TRR in wheat grain and 11% TRR in rape seeds. The only other major metabolite found was PAM (14% TRR in grapes, 11% TRR in cabbage, 6% TRR in tomato, 6% TRR in wheat grain and 1% TRR in rape seeds). Further minor metabolites identified (PCA, 753-F-DO, 753-A-OH, DM-PCA) were normally below 10% of the TRR and often below the limit for identification.

Data from supervised field trials confirmed the results of the plant metabolism studies. Parent penthiopyrad was the highest residue of all analytes, followed by PAM and PCA. 753-F-DO and 753-A-OH were normally not present above the LOQ (0.01 mg/kg). DM-PCA was found in soil and may be taken up by following crops, resulting in detectable residues above the LOQ up to 0.09 mg/kg in food items under field conditions. However, DM-PCA is of lower acute toxicity than the parent substance and its residues make an insignificant contribution to the overall exposure compared to penthiopyrad and PAM.

Based on the overall data in plants the Meeting concluded that parent penthiopyrad is a suitable marker substance for compliance of MRLs for plant commodities. Penthiopyrad can be analysed using established analytical methods.

For dietary intake purposes PAM is covered by the toxicological reference values for penthiopyrad. Other metabolites (PCA, 753-F-DO, 753-A-OH and DM-PCA) were of lower acute

toxicity compared to parent penthiopyrad and contributing insignificantly to the overall exposure compared to concentrations found for penthiopyrad and PAM.

The Meeting recommends that for MRL compliance the residue definition for plant commodities should be penthiopyrad. For dietary intake purposes the residue is defined as sum of penthiopyrad and PAM, expressed as penthiopyrad.

Definition of the residue for compliance with MRL for plant commodities: penthiopyrad

Definition of the residue for compliance with MRL for animal commodities and (for the estimation of dietary intake) for plant and animal commodities: sum of penthiopyrad and 1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide (PAM), expressed as penthiopyrad

The residue is not fat-soluble.

Results of supervised residue trials on crops

The Meeting received supervised trial data for applications of penthiopyrad on a range of crops (fruits, vegetables, oilseed and cereal grains), conducted in Europe and North America. The OECD MRL calculator was used as a tool to assist in the estimation of maximum residue levels from the selected residue data set obtained from the supervised residue trials. As a first step, the Meeting reviewed all relevant factors related to each data set in arriving at a best estimate of the maximum residue level using expert judgement. Then the OECD calculator was employed. If the statistical calculation spreadsheet suggested a different value from that recommended by the Meeting, a brief explanation of the deviation was supplied.

In trials where duplicate field samples from replicated or unreplicated plots were taken at each sampling time and analysed separately, the mean sample was taken as the best estimate of the residue from the plot.

Labels (or translation of labels) were available from Japan and the USA, describing the registered uses of penthiopyrad.

Supervised field trial data for penthiopyrad conducted in Europe were submitted for various crops. However authorisations in European Member states are still pending, not allowing an assessment of these field trials.

For dietary intake assessment the residue is defined as the sum of penthiopyrad and PAM, expressed as penthiopyrad (referred to as “total”). Since residue data were expressed in mg of the specific analyte per kg sample, PAM needs to be converted into penthiopyrad equivalents. The corresponding factor is: $\text{PAM} \rightarrow \text{penthiopyrad} = 359.42 \text{ g/mol} \div 193.13 \text{ g/mol} = 1.86$. In supervised field trials PAM residues were normally found at much lower levels than parent penthiopyrad. Therefore no adjustment of PAM or addition of LOQs was conducted, if both analytes were below the LOQ. For all other purposes of calculation < LOQ values were handled as their numeric value (e.g. < 0.01 mg/kg as 0.01 mg/kg).

This is illustrated below:

Penthiopyrad [mg/kg]	PAM [mg/kg]	Total [mg/kg]* (Sum of penthiopyrad and PAM, expressed as penthiopyrad equivalents)
< 0.01	< 0.01	< 0.01
0.1	< 0.01	0.12 ($0.1 + 1.86 \times 0.01$)
< 0.01	0.1	0.2 ($0.01 + 1.86 \times 0.1$)
0.1	0.1	0.29 ($0.1 + 1.86 \times 0.1$)

* rounded to two significant figures above the LOQ

Pome fruits

Penthiopyrad is registered in Canada and the USA for the use on pome fruit at rates of 3–4 × 0.3 kg ai/ha with a PHI of 28 day. Supervised field trials conducted in the USA on apples and pears according to these GAPs were submitted.

Residues of parent penthiopyrad in apple were (n = 17): < 0.01, 0.076, 0.099, 0.12(4), 0.13, 0.14, 0.14, 0.15, 0.16, 0.21, 0.22 and 0.23(3) mg/kg.

The total residues in apples were (n = 17): < 0.01, 0.10, 0.12, 0.13, 0.13, 0.14, 0.14, 0.15, 0.15, 0.16, 0.17, 0.17, 0.22, 0.24, 0.24, 0.25 and 0.26 mg/kg.

Residues of parent penthiopyrad in pears were (n = 10): < 0.01, 0.035, 0.064, 0.097, 0.12, 0.17, 0.18, 0.19, 0.22 and 0.25 mg/kg.

The total residues in pears were (n = 10): < 0.01, 0.05, 0.09, 0.12, 0.13, 0.19, 0.20, 0.22, 0.24 and 0.27 mg/kg.

The Meeting noted that corresponding GAP is for all pome fruits and decided to make recommendations for the whole group. Residues in apples and pears treated according to the US GAP for pome fruits were not significantly different and may be combined.

Residues of parent penthiopyrad in pome fruits were (n = 27): < 0.01, < 0.01, 0.035, 0.064, 0.076, 0.097, 0.099, 0.12(5), 0.13, 0.14, 0.14, 0.15, 0.16, 0.17, 0.18, 0.19, 0.21, 0.22, 0.22, 0.23(3) and 0.25 mg/kg.

The total residues in pome fruits were (n = 27): < 0.01, < 0.01, 0.05, 0.09, 0.10, 0.12, 0.12, 0.13(3), 0.14, 0.14, 0.15, 0.15, 0.16, 0.17, 0.17, 0.19, 0.20, 0.22, 0.22, 0.24(3), 0.25, 0.26 and 0.27 mg/kg.

Based on the combined dataset for apples and pears the Meeting estimated a maximum residue level, an STMR and an HR of 0.4 mg/kg, 0.15 mg/kg and 0.27 mg/kg for penthiopyrad in pome fruits, respectively.

Stone fruits

Residue data were provided to the Meeting from trials in USA on cherries, peaches and plums. GAP for stone fruits is for a maximum of four foliar applications of up to 0.3 kg ai/ha in Canada and for a maximum of three foliar applications of up to 0.35 kg ai/ha in the USA with a PHI of 0 days, respectively.

Residues of parent penthiopyrad in cherries (whole fruits) were (n = 9): 0.38, 0.44, 0.9, 0.96, 1.1, 1.1, 1.3, 1.6 and 1.7 mg/kg.

The total residues in cherries (pitted fruits) were (n = 9): 0.71, 0.8, 1.0, 1.0, 1.3, 1.3, 1.4, 1.8 and 1.9 mg/kg.

Residues of parent penthiopyrad in peaches (whole fruits) were (n = 13): 0.18, 0.2, 0.28, 0.35, 0.44, 0.47, 0.56, 0.58, 0.61, 0.61, 0.69, 0.7 and 1.4 mg/kg.

The total residues in peaches (pitted fruits) were (n = 13): 0.2, 0.31, 0.32, 0.4, 0.54, 0.60, 0.63, 0.67, 0.67, 0.71, 0.73, 0.76 and 1.6 mg/kg.

Residues of parent penthiopyrad in plums (whole fruits) were (n = 12): 0.047, 0.076, 0.08, 0.089, 0.1, 0.11, 0.12, 0.13, 0.15, 0.29, 0.51 and 0.77 mg/kg.

The total residues in plums (pitted fruits) were (n = 12): 0.068, 0.072, 0.099, 0.10, 0.12, 0.12, 0.13, 0.14, 0.14, 0.24, 0.33 and 0.83 mg/kg.

The Meeting noted that the corresponding GAP is for all stone fruits and decided to make recommendations on the whole group. However the Meeting recognized that datasets for individual commodities within the group were significantly different and could not be combined. Therefore recommendations on stone fruits will be based on cherries, representing the commodity resulting in highest residues within the group.

Based on cherries the Meeting estimated a maximum residue level, an STMR and an HR of 4 mg/kg, 1.3 mg/kg and 1.9 mg/kg for stone fruits, respectively.

Strawberries

Penthiopyrad is registered in Canada and the USA for the use on strawberries at rates of 3× 0.36 kg ai/ha with a PHI of 0 day. Supervised field trials conducted in the USA on strawberries according to these GAPs were submitted.

Residues of parent penthiopyrad in strawberry fruits were (n = 9): 0.37, 0.41, 0.46, 0.62, 0.77, 0.87, 1.0, 1.4 and 1.8 mg/kg.

The total residues in strawberry fruits were (n = 9): 0.39, 0.43, 0.47, 0.64, 0.80, 0.89, 1.1, 1.4 and 1.8 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 3 mg/kg, 0.8 mg/kg, and 1.8 mg/kg for penthiopyrad in strawberries, respectively.

Bulb vegetables

Residue data were provided to the Meeting from trials in Canada and the USA on bulb and green onions. GAP for bulb vegetables is for a maximum of three foliar applications of up to 0.36 kg ai/ha with a PHI of 3 days.

Residues of parent penthiopyrad in bulb onions were (n = 11): 0.01, 0.014, 0.043, 0.05, 0.054, 0.064, 0.065, 0.13, 0.14, 0.36 and 0.45 mg/kg.

The total residues in bulb onions were (n = 11): 0.029, 0.033, 0.062, 0.068, 0.072, 0.082, 0.085, 0.14, 0.15, 0.37 and 0.72 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.7 mg/kg, 0.074 mg/kg and 0.72 mg/kg for penthiopyrad in onions, bulb, respectively.

Residues of parent penthiopyrad in onions, green were (n = 6): 0.21, 0.23, 0.55, 0.93, 1.4 and 1.8 mg/kg.

The total residues in onions, green were (n = 6): 0.35, 0.66, 0.68, 1.1, 1.4 and 2.0 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 4 mg/kg, 0.89 mg/kg and 2.0 mg/kg for penthiopyrad in onions, Welsh and spring onions.

Flowerhead brassica

Residue data were provided to the Meeting from trials in Canada and the USA on broccoli and cauliflower. GAP for flowerhead brassica is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in broccoli were (n = 7): 0.65, 0.87, 1.4, 1.4, 1.9, 1.9 and 2.4 mg/kg.

The total residues in broccoli were (n = 7): 0.67, 0.89, 1.4, 1.4, 1.9, 1.9 and 2.4 mg/kg.

Residues of parent penthiopyrad in cauliflower were (n = 3): 0.11, 0.5 and 0.5 mg/kg.

The total residues in cauliflower were (n = 3): 0.13, 0.51 and 0.52 mg/kg.

The Meeting noted that the corresponding GAP is for all flowerhead brassica and decided to make recommendations on the whole group. However the Meeting recognized that datasets for individual commodities within the group were significantly different and could not be combined. Therefore recommendations on flowerhead brassica will be based on broccoli, representing the commodity resulting in highest residues within the group.

Based on broccoli the Meeting estimated a maximum residue level, an STMR and an HR of 5 mg/kg, 1.4 mg/kg and 2.4 mg/kg for penthiopyrad in flowerhead brassicas, respectively.

Cabbages, Head

Residue data were provided to the Meeting from trials in Canada and the USA on head cabbage. GAP for head cabbages is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in head cabbage were (n = 10): 0.024, 0.089, 0.19, 0.22, 0.29, 0.48, 1.0, 1.3, 1.5 and 2.3 mg/kg.

The total residues in head cabbage were (n = 10): 0.043, 0.11, 0.21, 0.24, 0.31, 0.49, 1.0, 1.3, 1.5 and 2.4 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 4 mg/kg, 0.4 mg/kg and 2.4 mg/kg for penthiopyrad in head cabbages, respectively.

Fruiting vegetables, Cucurbits

Residue data were provided to the Meeting from trials in Canada and the USA on summer squash, cucumber, melon and winter squash. GAP in the field for cucurbits (cucumbers, melons, watermelons, squashes) is for a maximum of four foliar applications of up to 0.3 kg ai/ha and a PHI of 1 days.

Residues of parent penthiopyrad in summer squash were (n = 4): 0.01, 0.13, 0.18 and 0.19 mg/kg.

Residues of parent penthiopyrad in cucumber were (n = 10): 0.012, 0.015, 0.029, 0.034, 0.043, 0.047, 0.065, 0.086, 0.11 and 0.13 mg/kg.

Residues of parent penthiopyrad in melon (whole fruit) were (n = 8): 0.098, 0.17, 0.17, 0.18, 0.22, 0.26, 0.26 and 0.27 mg/kg.

Residues of parent penthiopyrad in winter squash were (n = 5): 0.067, 0.1, 0.12, 0.18 and 0.21 mg/kg.

The Meeting noted that Canadian and US GAP are for all members of the cucurbits group and decided to make recommendations for the whole group. Residues of penthiopyrad in summer squash, cucumber, melon, and winter squash (whole fruits) treated according to the US GAP for cucurbits were not significantly different and may be combined.

The combined residues for penthiopyrad in cucurbits (whole fruits) were (n = 27): 0.01, 0.012, 0.015, 0.029, 0.034, 0.043, 0.047, 0.065, 0.067, 0.086, 0.098, 0.1, 0.11, 0.12, 0.13, 0.13, 0.17, 0.17, 0.18(3), 0.19, 0.21, 0.22, 0.26, 0.26 and 0.27 mg/kg.

Based on the combined dataset the Meeting estimated a maximum residue level of 0.5 mg/kg for penthiopyrad in fruiting vegetables, cucurbits.

The total residues in summer squash were (n = 4): 0.029, 0.14, 0.2 and 0.21 mg/kg.

The total residues in cucumber were (n = 10): 0.031, 0.033, 0.048, 0.052, 0.061, 0.066, 0.084, 0.10, 0.13 and 0.15 mg/kg.

The total residues in melon (whole fruit) were (n = 8): 0.12, 0.18, 0.19, 0.19, 0.24, 0.28, 0.29 and 0.3 mg/kg.

The total residues in melon (pulp) were (n = 8): < 0.01(8) mg/kg.

The total residues in winter squash were (n = 5): 0.086, 0.12, 0.14, 0.21 and 0.22 mg/kg.

For dietary intake purposes the Meeting noted that residues in cucurbits, whole fruits and in the pulp (based on melons) differ significantly.

Therefore the Meeting decided to extrapolate all data on whole fruits to cucurbits with edible peel, also accommodating large varieties within the group like pumpkins with edible peel. The combined total residues in cucurbits (whole fruits) were (n = 27): 0.02, 0.025, 0.031, 0.039, 0.044, 0.053, 0.057, 0.075, 0.077, 0.096, 0.11, 0.12, 0.12, 0.13, 0.14, 0.15, 0.18, 0.19(3), 0.2, 0.21, 0.22, 0.24, 0.28, 0.29 and 0.3 mg/kg.

For dietary intake purposes of cucurbits with edible peel, the Meeting estimated an STMR and an HR of 0.13 mg/kg and 0.3 mg/kg, based on the combined dataset for the total residue in all cucurbits (whole fruits).

The Meeting also decided to extrapolate data on melon pulp to the edible portion of all cucurbits with inedible peel, to reflect to the much lower residue situation in these commodities.

For dietary intake purposes of cucurbits with inedible peel, the Meeting estimated an STMR and an HR of 0.01 mg/kg and 0.01 mg/kg, based on the total residue in melon pulp.

Fruiting vegetables, other than cucurbits except sweet corn and mushroom

Residue data were provided to the Meeting from trials in Canada and the USA on peppers (sweet and chilli) and tomatoes. GAP for fruiting vegetables is for a maximum of three foliar applications of up to 0.36 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in sweet peppers were (n = 11): 0.15, 0.15, 0.17, 0.17, 0.18, 0.19, 0.19, 0.21, 0.22, 0.68 and 0.77 mg/kg.

The total residues in sweet peppers were (n = 11): 0.16, 0.16, 0.18, 0.19, 0.2(3), 0.22, 0.23, 0.70 and 0.79 mg/kg.

Residues of parent penthiopyrad in chilli peppers were (n = 9): 0.17, 0.2, 0.33, 0.36, 0.41, 0.57, 0.71, 0.88 and 1.6 mg/kg.

The total residues in chilli peppers were (n = 9): 0.19, 0.23, 0.35, 0.38, 0.43, 0.59, 0.73, 0.92 and 1.6 mg/kg.

Residues of parent penthiopyrad in tomatoes were (n = 20): 0.085, 0.15, 0.16, 0.17, 0.17, 0.18, 0.22, 0.24, 0.25, 0.27, 0.28, 0.36(3), 0.4, 0.41, 0.42, 0.7, 1.3 and 1.4 mg/kg.

The total residues in tomatoes were (n = 20): 0.10, 0.17, 0.17, 0.18, 0.18, 0.2, 0.24, 0.26, 0.27, 0.29, 0.30, 0.37, 0.38, 0.38, 0.42, 0.42, 0.43, 0.72, 1.3, 1.4 mg/kg.

The Meeting noted that the corresponding GAP is for all fruiting vegetables other than cucurbits, except sweet corn and mushroom and decided to make recommendations for the whole group. Based on the Kruskal-Wallis test the dataset for sweet peppers, chilli peppers and tomatoes were not significantly different and may be combined.

Residues of parent penthiopyrad in fruiting vegetables, other than cucurbits except sweet corn and mushroom were (n = 40): 0.085, 0.15(3), 0.16, 0.17(5), 0.18, 0.19(3), 0.2, 0.21, 0.22, 0.22, 0.24, 0.25, 0.27, 0.28, 0.33, 0.36(4), 0.4, 0.41, 0.41, 0.42, 0.57, 0.68, 0.7, 0.71, 0.77, 0.88, 1.3, 1.4 and 1.6 mg/kg.

The total residues in fruiting vegetables, other than cucurbits except sweet corn and fungi were (n = 40): 0.095, 0.16(3), 0.17, 0.18(5), 0.2(4), 0.22, 0.23(3), 0.25, 0.26, 0.28, 0.29, 0.34, 0.37, 0.37, 0.38, 0.38, 0.41, 0.42, 0.43, 0.44, 0.58, 0.69, 0.71, 0.73, 0.78, 0.92, 1.3, 1.4 and 1.6 mg/kg.

Based on the combined dataset for sweet pepper, chilli pepper and tomatoes the Meeting estimated a maximum residue level, an STMR and an HR of 2 mg/kg, 0.27 mg/kg and 1.6 mg/kg for penthiopyrad in fruiting vegetables, other than cucurbits except sweet corn and mushroom, respectively.

The Meeting noted that residues in chilli pepper and in other commodities within the group of fruiting vegetables, except sweet corn and mushroom do not differ significantly. Since the group maximum residue level of 2 mg/kg is expected to provide a reliable estimate for chilli peppers also, the default dehydration factor of 7 for chilli pepper instead of the default factor of 10 for peppers was used to estimate a maximum residue level of 14 mg/kg for dried chilli peppers.

Sweet corn (Corn on the Cob)

For sweet corn GAP is for a maximum of two foliar applications of up to 0.36 kg ai/ha and a PHI of 30 days.

Residues of parent penthiopyrad in sweet corn (corn on the cob) were (n = 11): < 0.01(11) mg/kg.

The total residues in sweet corn (corn on the cob) were (n = 11): < 0.01(11) mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.01 mg/kg, 0.01 mg/kg and 0.02 mg/kg for penthiopyrad in sweet corn (corn on the cob), respectively. The Meeting noted the in maize treated identically as sweet corn following processing finite residues in processed products occur, also precluding a zero-residue situation for sweet corn.

Brassica leafy vegetables

Residue data were provided to the Meeting from trials in Canada and the USA on mustard greens and turnip leaves. GAP from the US for brassica, leafy vegetables is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in mustard greens were (n = 9): 7.6, 8.3, 8.7, 8.75, 11, 16, 17, 23 and 30 mg/kg.

The total residues in mustard greens were (n = 9): 7.7, 8.4, 8.9, 9.0, 11, 16, 17, 23 and 30 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 50 mg/kg, 11 mg/kg and 30 mg/kg for penthiopyrad in mustard greens, respectively.

The Meeting noted that for mustard greens the IESTI exceeds the ARfD by 150%. No alternative GAP for mustard greens is available.

Residues of parent penthiopyrad in turnip greens were (n = 6): 4, 4.8, 6.1, 13, 20 and 23 mg/kg.

The total residues in turnip greens were (n = 6): 4.1, 4.9, 6.4, 13, 20 and 23 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 50 mg/kg, 9.4 mg/kg and 23 mg/kg for penthiopyrad in turnip greens, respectively.

Leafy vegetables, except brassica leafy vegetables

Residue data were provided to the Meeting from trials in Canada and the USA on lettuce and spinach. GAP for leafy vegetables is for a maximum of three foliar applications of up to 0.36 kg ai/ha and a PHI of 3 days.

Residues of parent penthiopyrad in head lettuce were (n = 12): < 0.01, 0.37(3), 0.41, 0.49, 0.6, 1.6, 2.0, 2.3, 2.8 and 3.5 mg/kg.

The total residues in head lettuce were (n = 12): < 0.01, 0.38, 0.38, 0.41, 0.42, 0.52, 0.68, 1.7, 2.2, 2.3, 2.8 and 3.5 mg/kg.

Residues of parent penthiopyrad in leaf lettuce were (n = 12): 1.1, 1.2, 1.2, 1.8, 1.8, 2.0, 3.5, 4.1, 4.4, 5.3, 7.4 and 11 mg/kg.

The total residues in leaf lettuce were (n = 12): 1.2, 1.2, 1.4, 2.0, 2.2, 2.3, 3.5, 4.2, 4.6, 5.4, 7.5 and 11 mg/kg.

Residues of parent penthiopyrad in spinach were (n = 10): 0.81, 1.2 1.5, 2, 2.7, 2.8, 2.8, 8.1, 11 and 15 mg/kg.

The total residues in spinach were (n = 10): 0.95, 1.4, 1.8, 2.9, 3.1, 3.2, 3.9, 8.3, 12 and 15 mg/kg.

The Meeting notes that the corresponding GAP is for all leafy vegetables, except brassica leafy vegetables, and decided to make recommendations on the whole group. However the Meeting recognized that datasets for individual commodities within the group were significantly different and could not be combined. Therefore recommendations on leafy vegetables, except brassica leafy

vegetables, will be based on spinach, representing the commodity resulting in highest residues within the group.

Based on the critical use on spinach the Meeting estimated a maximum residue level, an STMR and an HR of 30 mg/kg, 3.15 mg/kg and 15 mg/kg for penthiopyrad in leafy vegetables, except brassica leafy vegetables, respectively.

Celery

Residue data were provided to the Meeting from trials in Canada and the USA on celery. GAP for celery is for a maximum of three foliar applications of up to 0.36 kg ai/ha and a PHI of 3 days.

Residues of parent penthiopyrad in celery were (n = 11): 1.7, 2, 2.1, 2.5, 2.8, 3, 3.1, 5.3, 5.3, 5.8 and 8.7 mg/kg.

The total residues in celery were (n = 11): 1.7, 2.0, 2.3, 2.6, 2.9, 3.1, 3.2, 5.4, 5.6, 6.1 and 8.8 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 15 mg/kg, 3.1 mg/kg and 8.8 mg/kg for penthiopyrad in celery, respectively.

Legume vegetables, immature with pods

Residue data were provided to the Meeting from trials in Canada and the USA on succulent beans and peas. GAP for legume vegetables is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in green beans with pods were (n = 8): 0.13, 0.16, 0.36, 0.47, 0.77, 0.9, 0.99 and 1.5 mg/kg.

The total residues in green beans with pods were (n = 8): 0.14, 0.17, 0.38, 0.49, 0.79, 0.92, 1.1 and 1.5 mg/kg.

Residues of parent penthiopyrad in green peas with pods were (n = 4): 0.88, 1.0, 1.3 and 1.5 mg/kg.

The total residues in peas with pods were (n = 4): 0.90, 1.1, 1.3 and 1.6 mg/kg.

The Meeting decided that residues in green beans with pods and in green peas with pods are similar and can be combined for mutual support. Residues of parent penthiopyrad in green beans with pods and peas with pods were (n = 12): 0.13, 0.16, 0.36, 0.47, 0.77, 0.88, 0.9, 0.99, 1.0, 1.3, 1.5 and 1.5 mg/kg.

The total residues in green beans with pods and peas with pods were (n = 12): 0.14, 0.178, 0.37, 0.49, 0.78, 0.89, 0.91, 1.1, 1.1, 1.3, 1.5 and 1.6 mg/kg.

Based on the combined dataset of the Meeting estimated a maximum residue level, an STMR and an HR of 3 mg/kg, 0.9 mg/kg and 1.6 mg/kg for penthiopyrad in beans, except broad bean and soya bean (green pods and immature seeds) and in peas (pods and succulent), respectively.

Legume vegetables, shelled

Residue data were provided to the Meeting from trials in Canada and the USA on shelled succulent beans and peas. GAP for legume vegetables is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in shelled beans were (n = 7): 0.011, 0.024, 0.025, 0.035, 0.052 and 0.056, 0.13 mg/kg.

The total residues in shelled beans were (n = 7): 0.029, 0.043, 0.043, 0.054, 0.071, 0.075 and 0.16 mg/kg.

Residues of parent penthiopyrad in shelled peas were (n = 7): 0.04, 0.05, 0.067, 0.069, 0.077, 0.09 and 0.14 mg/kg.

The total residues in shelled peas were (n = 7): 0.059, 0.068, 0.085, 0.088, 0.095, 0.11 and 0.16 mg/kg.

The Meeting decided that residues in shelled beans and in shelled peas without pods are similar and can be combined for mutual support. Residues of parent penthiopyrad in shelled beans and peas without pods were (n = 14): 0.011, 0.024, 0.025, 0.035, 0.04, 0.05, 0.052, 0.056, 0.067, 0.069, 0.077, 0.09, 0.13 and 0.14 mg/kg.

The total residues in shelled beans and peas without pods were (n = 14): 0.021, 0.034, 0.035, 0.045, 0.05, 0.06, 0.062, 0.075, 0.077, 0.079, 0.087, 0.1, 0.15 and 0.16 mg/kg.

Based on the combined dataset the Meeting estimated a maximum residue level, an STMR and an HR of 0.3 mg/kg, 0.0685 mg/kg and 0.16 mg/kg for penthiopyrad in beans, shelled and in peas, shelled, respectively.

Pulses, except soya beans

Residue data were provided to the Meeting from trials in Canada and the USA on beans and peas as pulses. GAP for pulses except soya beans is for a maximum of three foliar applications of up to 0.35 kg ai/ha and a PHI of 21 days.

Residues of parent penthiopyrad in beans were (n = 14): < 0.01(10), 0.011, 0.026, 0.033 and 0.2 mg/kg.

The total residues in beans were (n = 14): < 0.01(10), 0.029, 0.030, 0.045 and 0.29 mg/kg.

Residues of parent penthiopyrad in peas were (n = 14): < 0.01(7), 0.011, 0.012, 0.014, 0.014, 0.032, 0.034 and 0.088 mg/kg.

The total residues in peas were (n = 14): < 0.01(7), 0.030, 0.031, 0.033, 0.033, 0.051, 0.052 and 0.12 mg/kg.

The Meeting noted that corresponding GAP is for all pulses, except soya beans and decided to make recommendations for the whole group. The Meeting also noted that beans and peas treated according to the same GAP result in comparable residues and could be combined.

Combined residues of parent penthiopyrad in beans and peas were (n = 28): < 0.01(17), 0.011, 0.011, 0.012, 0.014, 0.014, 0.026, 0.032, 0.033, 0.034, 0.088 and 0.2 mg/kg.

The total residues in beans and peas were (n = 28): < 0.01(17), 0.029, 0.030, 0.030, 0.031, 0.033, 0.033, 0.045, 0.051, 0.052, 0.12 and 0.29 mg/kg.

Based on the combined dataset of the Meeting estimated a maximum residue level and an STMR of 0.3 mg/kg and 0.01 mg/kg for penthiopyrad in pulses, except soya beans, respectively.

Soya beans

Residue data were provided to the Meeting from trials in Canada and the USA on soya beans. GAP for soya beans is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 14 days.

Residues of parent penthiopyrad in soya beans were (n = 21): < 0.01(9), 0.012, 0.013, 0.014, 0.022, 0.022, 0.024, 0.025, 0.049, 0.056, 0.068, 0.1 and 0.21 mg/kg.

The total residues in soya beans were (n = 21): < 0.01(9), 0.030, 0.031, 0.033, 0.041, 0.042, 0.043, 0.043, 0.069, 0.074, 0.087, 0.12 and 0.23 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 0.3 mg/kg and 0.032 mg/kg for penthiopyrad in soya beans, respectively.

Carrots

Residue data were provided to the Meeting from trials in Canada and the USA on carrots. GAP for carrots in the USA is for a maximum of two foliar applications of up to 0.39 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in carrots were (n = 9): 0.021, 0.025, 0.047, 0.051, 0.071, 0.085, 0.12, 0.1 and, 0.4 mg/kg.

The total residues in carrots were (n = 9): 0.039, 0.044, 0.066, 0.070, 0.09, 0.10, 0.14, 0.18 and 0.41 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.6 mg/kg, 0.09 mg/kg and 0.41 mg/kg for penthiopyrad in carrots, respectively.

Potatoes

Residue data were provided to the Meeting from trials in Canada and the USA on potatoes.

GAP for potatoes in the USA is for a maximum of three foliar applications of up to 0.31 kg ai/ha and a PHI of 7 days.

Residues of parent penthiopyrad in potato tubers were (n = 22): < 0.01(15), 0.011, 0.011, 0.014, 0.015, 0.017, 0.025 and 0.033 mg/kg.

The total residues in potato tubers were (n = 22): < 0.01(15), 0.029, 0.030, 0.033, 0.03, 0.036, 0.044 and 0.051 mg/kg.

The OECD Calculator suggests a maximum residue level of 0.04 mg/kg for penthiopyrad in potatoes; however, a high uncertainty due to the limited number of results above the LOQ was indicated. The Meeting decided to estimate a maximum residue level at the next higher MRL-step of 0.05 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.05 mg/kg, 0.01 mg/kg and 0.051 mg/kg for penthiopyrad in potatoes, respectively.

Radish

Residue data were provided to the Meeting from trials in Canada and the USA on radishes.

GAP for radish in the USA is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days.

Residues of parent penthiopyrad in radish roots were (n = 6): < 0.01, 0.14, 0.22, 0.33, 0.92 and 1.2 mg/kg.

The total residues in radish roots were (n = 6): < 0.01, 0.15, 0.24, 0.35, 0.93 and 1.2 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an HR of 3 mg/kg, 0.305 mg/kg and 1.2 mg/kg for penthiopyrad in radish roots, respectively.

Sugar beet

Residue data were provided to the Meeting from trials in Canada and the USA on sugar beets.

GAP for sugar beets in the USA is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 7 days.

Residues of parent penthiopyrad in sugar beet roots were (n = 12): 0.015, 0.017, 0.019, 0.033, 0.042, 0.085, 0.090, 0.13, 0.18, 0.19, 0.2 and 0.27 mg/kg.

The total residues in sugar beet roots were (n = 12): 0.033, 0.035, 0.037, 0.051, 0.060, 0.1, 0.11, 0.15, 0.20, 0.20, 0.21 and 0.29 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 0.5 mg/kg and 0.105 mg/kg for penthiopyrad in sugar beets, respectively.

Barley and oats

Residue data were provided to the Meeting from trials in Canada and the USA on barley grain. GAP for barley and oats in the USA is for a maximum of two foliar applications before flowering (BBCH 59) of up to 0.36 kg ai/ha without a specified PHI for the grain (covered by growth stage).

Residues of parent penthiopyrad in barley grain were (n = 13): < 0.01(7), 0.01, 0.011, 0.02, 0.024, 0.03 and 0.11 mg/kg.

The total residues in barley grain were (n = 13): < 0.01(7), 0.029, 0.029, 0.038, 0.042, 0.048 and 0.14 mg/kg.

The Meeting recognised that barley and oats share an identical GAP and normally show comparable residues. It was therefore decided to extrapolate residue data from barley to oats.

The Meeting estimated a maximum residue level and an STMR of 0.15 mg/kg and 0.01 mg/kg for penthiopyrad in barley and oats, respectively.

Rye, triticale and wheat

Residue data were provided to the Meeting from trials in Canada and the USA on wheat grain. GAP for rye, triticale and wheat in the USA is for a maximum of two foliar applications before flowering (BBCH 59) of up to 0.36 kg ai/ha without a specified PHI for the grain (covered by growth stage).

Residues of parent penthiopyrad in wheat grain were (n = 29): < 0.01(24), 0.011, 0.012, 0.017, 0.019 and 0.034 mg/kg.

The total residues in wheat grain were (n = 29): < 0.01(24), 0.030, 0.033, 0.036, 0.037 and 0.053, mg/kg.

The Meeting recognised that wheat, triticale and rye share an identical GAP and normally show comparable residues. It was therefore decided to extrapolate residue data from wheat to rye and triticale.

The Meeting estimated a maximum residue level and an STMR of 0.04 mg/kg and 0.01 mg/kg for penthiopyrad in rye, triticale and wheat, respectively.

Maize

Residue data were provided to the Meeting from trials in Canada and the USA on maize. GAP for maize in the USA is for a maximum of two foliar applications of up to 0.36 kg ai/ha and a PHI of 30 days.

Residues of parent penthiopyrad in maize grain were (n = 14): < 0.01(14) mg/kg.

The total residues in maize grain were (n = 14): < 0.01(14) mg/kg.

The Meeting estimated a maximum residue level and an STMR of 0.01 mg/kg and 0.01 mg/kg for penthiopyrad in maize, respectively. The Meeting noted the in maize processing finite residues in processed products occur, precluding a zero-residue situation for maize grain.

Millet and sorghum

Residue data were provided to the Meeting from trials in Canada and the USA on sorghum. GAP for sorghum and millet in the USA is for a maximum of two foliar applications of up to 0.36 kg ai/ha and a PHI of 30 days.

Residues of parent penthiopyrad in sorghum grain were (n = 9): 0.06, 0.093, 0.12, 0.16, 0.18, 0.28, 0.3, 0.39 and 0.43 mg/kg.

The total residues in sorghum grain were (n = 9): 0.084, 0.13, 0.14, 0.2, 0.22, 0.34, 0.4, 0.45 and 0.69 mg/kg.

The Meeting recognised that sorghum and millet share an identical GAP and normally show comparable residues. It was therefore decided to extrapolate residue data from sorghum to millet.

The Meeting estimated a maximum residue level and an STMR of 0.8 mg/kg and 0.22 mg/kg for penthiopyrad in millet and sorghum grain, respectively.

Tree nuts

Residue data were provided to the Meeting from trials in Canada and the USA on almonds and pecans. GAP for tree nuts in the USA is for a maximum of four foliar applications of up to 0.3 kg ai/ha and a PHI of 14 days.

Residues of parent penthiopyrad in almond nutmeat were (n = 6): < 0.01(4), 0.01 and 0.037 mg/kg.

The total residues in almond nutmeat were (n = 6): < 0.01(4), 0.029 and 0.056 mg/kg.

Residues of parent penthiopyrad in pecan nutmeat were (n = 6): < 0.01(6) mg/kg.

The total residues in pecan nutmeat were (n = 6): < 0.01(6) mg/kg.

The Meeting noted that corresponding GAP is for all tree nuts and decided to make recommendations for the whole group. The Meeting concluded that the dataset for almonds and pecan treated according to US GAP for tree nuts are not significantly different and can be combined.

Residues of parent penthiopyrad in almond and pecan nutmeat were (n = 6): < 0.01(10), 0.01 and 0.037 mg/kg.

The total residues in almond and pecan nutmeat were (n = 6): < 0.01(10), 0.02 and 0.047 mg/kg.

Based on the combined dataset of the Meeting estimated a maximum residue level, an STMR and an HR of 0.05 mg/kg, 0.01 mg/kg and 0.047 mg/kg for penthiopyrad in tree nuts, respectively.

Cotton

Residue data were provided to the Meeting from trials in the USA on cotton. GAP for cotton in the USA is one in-furrow spray and a maximum of two foliar applications of up to 0.35 kg ai/ha each and a PHI of 21 days.

Residues of parent penthiopyrad in cotton seeds were (n = 13): < 0.01, < 0.01, 0.011, 0.036, 0.04, 0.091, 0.093, 0.11, 0.13, 0.13, 0.14, 0.23 and 0.25 mg/kg.

The total residues in cotton seeds were (n = 13): 0.035, 0.036, 0.043, 0.060, 0.083, 0.12, 0.17, 0.17, 0.22, 0.22, 0.37, 0.39 and 0.39 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 0.5 mg/kg and 0.17 mg/kg for penthiopyrad in cotton seeds, respectively.

Rape seed

Residue data were provided to the Meeting from trials in Canada and the USA on oilseed rape. GAP for rape seed in the USA is for a maximum of three foliar applications of up to 0.3 kg ai/ha and a PHI of 21 days.

Residues of parent penthiopyrad in rape seed were (n = 21): < 0.01(7), 0.011, 0.017, 0.024, 0.025, 0.028, 0.033, 0.052, 0.054, 0.065, 0.08, 0.081, 0.085, 0.13 and 0.42 mg/kg.

The total residues in rape seeds were (n = 21): < 0.01(5), 0.03, 0.046, 0.048, 0.071, 0.073, 0.074, 0.083, 0.084, 0.087, 0.094, 0.099, 0.12, 0.13, 0.15, 0.15 and 0.44 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 0.5 mg/kg and 0.084 mg/kg for penthiopyrad in rape seed, respectively.

Peanuts

Residue data were provided to the Meeting from trials in the USA on peanuts. GAP for peanuts in the USA is for a maximum of three foliar applications of up to 0.36 kg ai/ha and a PHI of 14 days.

Residues of parent penthiopyrad in peanut nutmeat were (n = 13): < 0.01(12) and 0.034 mg/kg.

The total residues in peanut nutmeat were (n = 13): < 0.01(12) and 0.055 mg/kg.

The OECD Calculator suggests a maximum residue level of 0.04 mg/kg for penthiopyrad in peanuts; however, a high uncertainty due to the limited number of results above the LOQ was indicated. The Meeting decided to estimate a maximum residue level at the next higher MRL-step of 0.05 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 0.05 mg/kg and 0.01 mg/kg for penthiopyrad in peanuts, respectively.

Sunflowers

Residue data were provided to the Meeting from trials in Canada and the USA on sunflowers. GAP for sunflowers in the USA is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 14 days.

Residues of parent penthiopyrad in sunflower seeds were (n = 9): < 0.01, 0.078, 0.079, 0.079, 0.1, 0.28, 0.34, 0.44 and 0.81 mg/kg.

The total residues in sunflower seeds were (n = 9): < 0.01, 0.097, 0.097, 0.098, 0.12, 0.32, 0.51, 0.57 and 0.94 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 1.5 mg/kg and 0.12 mg/kg for penthiopyrad in sunflower seeds, respectively.

Animal feeds

Alfalfa, forage and hay

Residue data were provided to the Meeting from trials in Canada and the USA on alfalfa. GAP for alfalfa in the USA is for a maximum of two foliar applications of up to 0.36 kg ai/ha and a PHI of 14 days.

The total residues in alfalfa forage were (n = 15): 0.1, 0.21, 0.45, 0.47, 0.59, 0.62, 0.7, 0.73, 0.95, 1.0, 1.4, 1.8, 2.0, 2.1 and 4.6 mg/kg.

Residues of parent penthiopyrad in alfalfa hay were (n = 15): 0.11, 0.28, 0.58, 0.77, 0.97, 1.6, 1.6, 1.8, 1.8, 1.9, 3.2, 3.6, 4.7, 4.9 and 14 mg/kg.

The total residues in alfalfa hay were (n = 15): 0.6, 1.2, 1.9, 2.3, 2.5(3), 2.9, 3.3, 3.4, 4.5, 4.9, 5.9, 6.4 and 16 mg/kg.

The Meeting estimated STMR values of 0.73 mg/kg and 2.9 mg/kg and highest residue values of 4.6 mg/kg and 16 mg/kg for alfalfa forage and hay (fresh weight basis), respectively.

The Meeting also estimated a maximum residue level of 20 mg/kg for penthiopyrad in alfalfa fodder (DM basis, 89% dry-matter content).

Pea vines and hay

Residue data were provided to the Meeting from trials in Canada and the USA on pea vines. GAP for peas in the USA are for a maximum of three foliar applications of up to 0.3 kg ai/ha and a PHI of 0 days for vines and hay.

The total residues in pea vines were (n = 7): 4.5, 5.3, 6.1, 6.2, 6.3, 12 and 23 mg/kg.

Residues of parent penthiopyrad in pea hay were (n = 7): 3.7, 8.7, 9.4, 11, 14, 15 and 30 mg/kg.

The total residues in pea hay were (n = 7): 3.9, 8.9, 11, 12, 14, 15 and 31 mg/kg.

The Meeting estimated STMR values of 6.2 mg/kg and 12 mg/kg and highest residue values of 23 mg/kg and 31 mg/kg for pea vines and hay (fresh weight basis), respectively.

The Meeting also estimated a maximum residue level of 60 mg/kg for penthiopyrad in pea hay (DM basis, 88% dry-matter content).

Soya beans, forage and hay

Residue data were provided to the Meeting from trials in Canada and the USA on soya beans. GAP for soya beans in the USA is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days for forage and hay.

The total residues in soya forage were (n = 16): 4.1, 4.9, 6.4, 11, 14, 14, 15, 16(3), 19, 20, 21, 23, 24 and 24 mg/kg.

Residues of parent penthiopyrad in soya hay were (n = 16): 11, 22, 33, 45, 47, 48, 49, 50, 53, 54, 55, 59, 73, 99, 100 and 123 mg/kg.

The total residues in soya hay were (n = 16): 11, 22, 33, 45, 48, 49, 50, 51, 54, 55, 55, 61, 73, 100, 102 and 125 mg/kg.

The Meeting estimated STMR values of 16 mg/kg and 52.5 mg/kg and highest residue values of 24 mg/kg and 125 mg/kg for soya forage and fodder (fresh weight basis), respectively.

The Meeting also estimated a maximum residue level of 200 mg/kg for penthiopyrad in soya bean fodder (DM basis, 85% dry-matter content).

Barley, oats, rye, triticale and wheat—straw, fodder and forage of cereals

GAPs for barley, oats, rye, triticale and wheat in the USA are for a maximum of two foliar applications before flowering (BBCH 59) of up to 0.36 kg ai/ha and a 0 day PHI for the forage/hay and an unspecified PHI for the straw (covered by growth stage).

The Meeting concluded that straw, fodder and forage of barley, oats, rye, triticale and wheat are indistinguishable and result in comparable residues following treatment according to the identical US GAPs for these crops. Therefore all estimations on forage, fodder and straw will be based on the combined residue dataset for these crops and applied to each of them.

The total residues in forage based on wheat trials were (n = 26): 5.5, 5.8, 6.2, 7.3, 8.3, 8.7, 8.8, 8.9, 9.2, 9.5, 9.8, 10(3), 11, 12, 12, 13(4), 14, 14, 15, 16 and 17 mg/kg (fresh weight basis).

Residues of parent penthiopyrad in hay based on barley and wheat trials were (n = 39): 2.6, 3.9, 4.4, 4.5, 4.7, 6.4, 7.0, 7.4, 7.7, 8.2, 8.9, 11, 12, 12, 13, 14, 17, 17, 19, 19, 22, 23, 23, 25, 25, 27, 28(3), 29(3), 30, 34, 35, 38, 40, 44 and 53 mg/kg.

Residues of parent penthiopyrad in straw based on barley and wheat trials were (n = 13): < 0.05, < 0.05, 0.051, 0.053, 0.054, 0.058, 0.06, 0.084, 0.088, 0.095, 0.096, 0.11(5), 0.12, 0.12, 0.14, 0.14, 0.15, 0.18, 0.19(3), 0.2, 0.22, 0.22, 0.23, 0.24, 0.24, 0.3, 0.34, 0.36, 0.37, 0.37, 0.4, 0.42 and 0.7 mg/kg.

The total residues in hay based on barley and wheat trials were (n = 39): 2.9, 4.2, 4.9, 5.1, 5.7, 7.1, 7.9, 8.1, 9.3, 9.7, 9.8, 13(4), 16, 17, 20, 20, 21, 23, 24, 24, 26, 27, 28, 29(3), 30(3), 31, 36, 36, 39, 42, 47 and 54 mg/kg

The total residues in straw based on barley and wheat trials were (n = 39): < 0.1, < 0.1, 0.14, 0.15(3), 0.18, 0.18, 0.19, 0.20(4), 0.21, 0.21, 0.23, 0.23, 0.26, 0.27, 0.27, 0.32, 0.32, 0.34, 0.34, 0.35, 0.40, 0.41, 0.42, 0.42, 0.43, 0.50, 0.54, 0.57, 0.61, 0.61, 0.66, 0.69, 0.81 and 0.97 mg/kg.

The Meeting concluded that residues in hay are significantly higher as in straw and should be used as basis for recommendations on straw, fodder and forage of barley, oats, rye, triticale and wheat.

The Meeting estimated an STMR value of 10 mg/kg and a highest residue value of 17 mg/kg for barley, oats, rye, triticale and wheat forage (fresh weight basis).

The Meeting also estimated a maximum residue level, an STMR value and a highest residue of 80 mg/kg (DM based, 88% dry-matter content), 21 mg/kg (fresh weight basis) and 54 mg/kg (fresh weight basis) for penthiopyrad in barley, oats, rye, triticale and wheat straw and fodder.

Maize, millet and sorghum—forage and fodder

GAP for maize, sorghum and millet in the USA is for a maximum of two foliar applications of up to 0.36 kg ai/ha and a PHI of 0 days for forage and hay and of 30 days for stover.

The total residues in maize forage were (n = 13): 3.0, 3.4, 3.4, 3.6, 3.7, 4.3, 4.4, 4.7, 4.9, 5.1, 5.2, 5.3 and 7.3 mg/kg.

The total residues in sorghum forage were (n = 9): 3.6, 3.9, 6.2, 6.7, 6.7, 7.0, 7.5, 7.9 and 14 mg/kg.

Residues of parent penthiopyrad in sorghum stover were (n = 9): 0.14, 0.19, 0.23, 0.32, 0.44, 0.62, 0.66, 2.5 and 5.5 mg/kg.

The total residues in sorghum stover were (n = 9): 0.23, 0.42, 0.47, 0.52, 0.55, 0.75, 0.82, 2.7 and 5.9 mg/kg.

Supervised field trial data on maize stover from the USA was not conducted according to the submitted GAPs.

The Meeting concluded that forage and fodder of maize, millet and sorghum treated according to identical US GAPs result in comparable residues and may be combined for mutual support. Therefore all estimations on forage and fodder will be based on the combined residue dataset for these crops and applied to each of them.

For forage of maize and stover combined total residues were (n = 22): 3.0, 3.4, 3.4, 3.6, 3.6, 3.7, 3.9, 4.3, 4.4, 4.7, 4.9, 5.1, 5.2, 5.3, 6.2, 6.7, 6.7, 7.0, 7.3, 7.5, 7.9 and 14 mg/kg.

The Meeting estimated an STMR value of 5 mg/kg and a highest residue value of 14 mg/kg for maize, millet and sorghum forage (fresh weight basis).

The Meeting also estimated a maximum residue level, an STMR value and a highest residue of 10 mg/kg (DM basis, 88% dry-matter content), 0.52 mg/kg (fresh weight basis) and 5.9 mg/kg (fresh weight basis) for penthiopyrad in maize, millet and sorghum fodder.

Sugar beet leaves

GAP for sugar beets in the USA is for a maximum of three foliar applications of up to 0.45 kg ai/ha and a PHI of 0 days for the forage. In Canada GAP for sugar beets is for a maximum of three foliar applications of up to 0.3 kg ai/ha and a PHI of 7 days for the forage.

All supervised field trials on sugar beet leaves involve two treatments of 0.45 kg ai/ha and a PHI of 6–8 days. Since neither the Canadian nor the US GAP matched these field trials, the Meeting concluded that for sugar beets leaves no STMR value or highest residue can be estimated.

Oilseed rape forage

GAP for oilseed rape in the USA is for a maximum of three foliar applications of up to 0.3 kg ai/ha and a PHI of 21 days.

Supervised field trial data submitted from Europe involve single treatment at 0.3 kg ai/ha. The Meeting noted that the data submitted involving single application probably underestimates the true

residue situation according to US GAP and concluded that for rape forage no STMR value or highest residue could be estimated.

Peanut hay

GAP for peanuts in the USA is for a maximum of three foliar applications of up to 0.36 kg ai/ha (maximum annual rate in 1.1 kg ai/ha) and a PHI of 14 days.

Residues of parent penthiopyrad in peanut hay were (n = 13): 1.5, 1.8, 1.8, 1.9, 2.9, 4.5, 5.4, 6.8, 6.9, 7.1, 8.6, 8.8 and 17 mg/kg.

The total residues in peanut hay were (n = 13): 1.6, 2.0, 2.1, 2.1, 3.6, 4.9, 5.9, 7.3, 7.9, 8.7, 9.2, 9.4 and 18 mg/kg.

The Meeting estimated a maximum residue level, an STMR and an highest residue of 30 mg/kg (DM basis, 85% dry-matter content), 5.9 mg/kg (fresh weight basis) and 18 mg/kg (fresh weight basis) for penthiopyrad in peanut hay(fresh weight basis), respectively.

Almond hulls

GAP for tree nuts in the USA is for a maximum of four foliar applications of up to 0.3 kg ai/ha and a PHI of 14 days.

Residues of parent penthiopyrad in almond hulls were (n = 6): 0.8, 1.1, 1.4, 2.1, 2.4 and 2.7 mg/kg.

The total residues in almond hulls were (n = 6): 0.91, 1.6, 1.9, 2.9, 3.0 and 3.1 mg/kg.

The Meeting estimated a maximum residue level and an STMR of 6 mg/kg (DM basis, 90% dry-matter content) and 2.4 mg/kg (fresh weight basis) for penthiopyrad in almond hulls, respectively.

Cotton gin trash

GAP for cotton in the USA is for a maximum of three foliar applications of up to 0.35 kg ai/ha and a PHI of 21 days.

The total residues in cotton gin trash were (n = 4): 3.0, 4.2, 4.9 and 7.8 mg/kg.

The Meeting estimated an STMR of 4.55 mg/kg (fresh weight basis) for penthiopyrad in cotton gin trash.

Fate of residues during processing

The Meeting received information on the hydrolysis of radiolabelled penthiopyrad as well as processing studies using unlabelled material on grown residues in apples, plums, tomatoes, soya beans, potatoes, sugar beet, barley, maize, wheat, oilseed rape and peanuts.

In a hydrolysis study using radiolabelled penthiopyrad (1:1 mixture) typical processing conditions were simulated (pH 4,5 and 6 with 90 °C, 100 °C and 120 °C for 20, 60 and 20 minutes). In duplicate samples of sterile buffer solution no degradation of the parent substance was observed.

In the following table all processing factor relevant for the estimation of the dietary intake or recommendation of maximum residue levels for processed commodities are summarized. Processing factors for additional processed products are reported in the corresponding evaluation for penthiopyrad; however no conclusion could be drawn based on this information. If analytes were present below the LOQ in the RAC for specific commodities, no processing factors were derived.

Commodity	Processing factor	Processing factor (median or best estimate)	HR / STMR (mg/kg)	MRL, HR-P / STMR-P (mg/kg)
Apple juice	Total: < 0.13, < 0.14, 0.14	Total: 0.14	STMR: 0.15	STMR-P: 0.021

Commodity	Processing factor	Processing factor (median or best estimate)	HR / STMR (mg/kg)	MRL, HR-P / STMR-P (mg/kg)
Apple pomace (wet)	Total: 4.4, 4.6, 6	Total: 4.6	STMR: 0.15	STMR-P: 0.69
Apple pomace (dry)	Total: 5.9, 8.8, 11	Total: 8.8	STMR: 0.15	STMR-P: 1.3
Prunes	Total: 1.3, 1.4	Total: 1.4	STMR: 1.3 HR: 1.9	STMR-P: 1.8 HR-P: 2.7
Tomato juice	Total: 0.26, 0.34, 0.5	Total: 0.34	STMR: 0.27	STMR-P: 0.092
Tomato puree	Total: 1.5, 2.0, 2.0	Total: 2.0	STMR: 0.27	STMR-P: 0.54
Tomato paste	Total: 0.1, 3.4, 3.5	Total: 3.4	STMR: 0.27	STMR-P: 0.92
Tomato pomace (wet)	Total: 4.3, 5.0, 5.5	Total: 5.0	STMR: 0.27	STMR-P: 1.4
Tomato pomace (dry)	Total: 24, 39, 41	Total: 39	STMR: 0.27	STMR-P: 11
Soya beans, meal	Total: 0.23, <1.4	Total: 0.23	STMR: 0.032	STMR-P: 0.007
Soya beans, hulls	Total: 0.44, 4.7	Total: 2.5	STMR: 0.032	STMR-P: 0.08
Soya beans, refined oil	Total: 0.1, 1.8	Total: 1	STMR: 0.032	STMR-P: 0.032
Peeled potatoes (steam peeled and abrasion peeled)	Total: < 0.21, < 0.45	Total: < 0.33	STMR: 0.01 HR: 0.05	STMR-P: 0.003 HR-P: 0.017
Sugar beet, refined sugar	Total: 0.27, 0.35	Total: 0.31	STMR: 0.105	STMR-P: 0.033
Sugar beet, molasses	Total: 0.20, 0.51	Total: 0.36	STMR: 0.105	STMR-P: 0.038
Sugar beet, dried pulp	Total: 4.9, 5.6	Total: 5.3	STMR: 0.105	STMR-P: 0.56
Barley beer	Total: < 0.11, < 0.36	Total: < 0.24	STMR: 0.01	STMR-P: 0.002
Pot barley	Total: 0.67, 0.68	Total: 0.68	STMR: 0.01	STMR-P: 0.007
Maize flour	Penthiopyrad: 2.1	Penthiopyrad: 2.1	MRL: 0.01	MRL: 0.03
	Total: 1.4	Total: 1.4	STMR: 0.01	STMR-P: 0.014
Maize oil (wet milled)	Penthiopyrad: 5.6	Penthiopyrad: 5.6	MRL: 0.01	MRL: 0.05
	Total: 2.7	Total: 2.7	STMR: 0.01	STMR-P: 0.027
Wheat bran	Penthiopyrad: 1.8	Penthiopyrad: 1.8	MRL: 0.04	MRL: 0.1
	Total: 1.8	Total: 1.8	STMR: 0.01	STMR-P: 0.018
Wheat flour	Total: 0.39	Total: 0.39	STMR: 0.01	STMR-P: 0.004
Wheat germ	Penthiopyrad: 2.1	Penthiopyrad: 2.1	MRL: 0.04	MRL: 0.1
	Total: 1.9	Total: 1.9	STMR: 0.01	STMR-P: 0.019
Oilseed rape crude oil (mechanically extracted)	Penthiopyrad: 0.78, 1.9, 2.5	Penthiopyrad: 1.9	MRL: 0.5	MRL: 1
Oilseed rape refined oil	Penthiopyrad: 0.48, 1.6, 2.5	Penthiopyrad: 1.6	MRL: 0.5	MRL: 1
	Total: 0.39, 1.3, 2.1	Total: 1.3	STMR: 0.084	STMR-P: 0.11
Peanuts, meal	Total: 0.84, 2.5	Total: 1.7	STMR: 0.01	STMR-P: 0.017
Peanut refined oil	Penthiopyrad: 1.4, 18	Penthiopyrad: 9.7	MRL: 0.05	MRL-P: 0.5
	Total: 1.2, 6.7	Total: 4	STMR: 0.01	STMR-P: 0.04

Processing factors, STMR-P, HR-P and, if necessary, maximum residue levels for processed commodities are presented in the table above. Under consideration of penthiopyrad being the major residue in all supervised field trials, the processing factors for the parent substance were selected for the estimations.

For the processing for plums into prunes a processing factor of 1.4 was derived for penthiopyrad. In view of the highest residue of 0.77 mg/kg found in plums, the Meeting concluded that residues in prunes will be covered by the estimated maximum residue level for the stone fruit group.

For maize processed into maize flour and maize oil the Meeting estimated maximum residue levels of 0.05 mg/kg and 0.15 mg/kg, respectively.

For wheat processed into wheat bran and wheat germ the Meeting estimated maximum residue levels of 0.1 mg/kg, respectively.

For rape processed into crude and refined oil the Meeting estimated maximum residue levels of 1 mg/kg, respectively.

Peanuts processed into refined peanut oil show an accumulation of residues exceeding the recommended maximum residue for peanuts of 0.05 mg/kg. Under consideration of the derived processing factor of 9.7 the Meeting recommended a maximum residue level of 0.5 mg/kg for penthiopyrad in peanut oil, edible.

Residues in animal commodities

Livestock dietary burden

The Meeting received feeding studies involving penthiopyrad on lactating cows and laying hens.

Three groups of lactating cows were dosed daily at levels of 8.4, 21.4 and 74.6 ppm dry weight feed (0.15, 0.48 and 1.65 mg/kg bw) for 28 consecutive days. Milk was collected throughout the study and tissues were collected on day 29 within 24 hrs after the last dose.

In milk no residues above the LOQ of 0.01 mg/kg were found for the two lower dose groups. Only the 74.6 ppm dose group contained single positive detects of PAM between 0.01 and 0.02 mg/kg. Separation of milk obtained from high dosed animals into cream and skim milk revealed a slight concentration of parent penthiopyrad in cream (positive detect at 0.01 mg/kg). However, the results were not sufficient to estimate a ratio (< 0.01 to 0.01 mg/kg).

In tissues penthiopyrad was only found for the highest dose group, resulting in residues above the LOQ in liver (0.02–0.03 mg/kg) and fat (0.01–0.02 mg/kg). PAM was present in all dose groups except the lowest, giving residues of 0.01–0.02 mg/kg in liver, < 0.01 mg/kg in muscle, 0.01 mg/kg in kidney and 0.01 mg/kg in fat for the 51.4 ppm dose group and 0.03–0.06 mg/kg in liver, 0.01–0.02 mg/kg in muscle, 0.02–0.03 mg/kg in kidney and 0.01–0.02 mg/kg in fat for the 74.6 ppm dose group.

For laying hens three groups of animals were dosed with rates of 5.85, 17.54 and 58.46 ppm in the dry weight feed (0.4, 1.2 and 1.2 mg/kg bw) for 28 consecutive days. Eggs were collected throughout the study and tissues were collected on day 29 within 6 hrs after the last dose.

In eggs residues were very low showing detectable residues only for the highest dose group. PAM was quantified in all samples from Day 3 until Day 27 at levels ranging from 0.011 to 0.028 mg/kg. Penthiopyrad was measurable in only 7 of the 48 samples with concentration ranging from 0.011 to 0.016 mg/kg.

In tissues again only the highest dose group gave detectable residues above the LOQ. Penthiopyrad was found at levels of < 0.01–0.021 mg/kg in liver, < 0.01 mg/kg in muscle, < 0.01–0.018 mg/kg in skin and 0.016–0.036 mg/kg in fat. PAM was present above the LOQ in liver (0.017–0.019 mg/kg) and in a single sample of muscle (0.01 mg/kg). In other tissues no residues above the LOQ were found.

Estimated maximum and mean dietary burdens of livestock

Dietary burden calculations for beef cattle, dairy cattle, broilers and laying poultry are presented in Annex X. The calculations were made according to the livestock diets from US-Canada, EU, Australia and Japan in the OECD Table (Annex 6 of the 2006 JMPR Report).

	Livestock dietary burden, ACTIVE-SUBSTANCE, ppm of dry matter diet							
	US-Canada		EU		Australia		Japan	
	max.	mean	max.	mean	max.	mean	max.	mean
Beef cattle	12	4.5	56	23	130 ^a	57 ^b	1.9	0.5
Dairy cattle	55	26	43	20	100 ^c	49 ^d	24	7.9

Poultry—broiler	0.2	0.2	0.2	0.2	0.2	0.2	0.8	0.3
Poultry—layer	0.2	0.2	22 ^e	10 ^f	0.2	0.2	0.1	0.1

^a Highest maximum beef or dairy cattle burden suitable for MRL estimates for mammalian meat

^b Highest mean beef or dairy cattle burden suitable for STMR estimates for mammalian meat

^c Highest maximum dairy cattle burden suitable for MRL estimates for milk

^d Highest mean dairy cattle burden suitable for STMR estimates for milk

^e Highest maximum broiler or laying hen burden suitable for MRL estimates for poultry products and eggs

^f Highest mean broiler or laying hen burden suitable for STMR estimates for poultry products and eggs

Animal commodities, MRL estimation

	Feed level (ppm) for eggs and tissues	Total residues (mg/kg)			
		Eggs	Muscle	Liver	Fat
Maximum residue level poultry					
Feeding study	18	< 0.02	< 0.02	< 0.02	< 0.02
	58	0.044	0.029	0.045	0.046
Dietary burden and residue estimate	22	0.023	0.021	0.023	0.023
STMR poultry					
Feeding study	5.9	< 0.02	< 0.02	< 0.02	< 0.02
	18	< 0.02	< 0.02	< 0.02	< 0.02
Dietary burden and residue estimate	10	0.02	0.02	0.02	0.02

For beef and dairy cattle the maximum dietary burden (130 ppm) exceeds the highest dose level of 74.6 ppm in the corresponding lactating cow feeding study. The Meeting concluded that based on the available information no recommendation for residues of penthiopyrad in mammalian tissues and milk can be made.

For poultry the maximum calculated dietary burden resulted in HR values for the sum of penthiopyrad and PAM, expressed as penthiopyrad of 0.023 mg/kg in eggs, 0.021 mg/kg in muscle, 0.023 mg/kg in liver and 0.023 mg/kg in fat.

Correlating to this estimation the Meeting recommended maximum residue levels of 0.03 mg/kg for poultry meat, fat and eggs. The Meeting also decided to extrapolate the data on poultry liver to poultry, edible offal of and also recommended a maximum residue level of 0.03 mg/kg for this commodity.

For dietary intake purposes no residues above the LOQ of 0.02 mg/kg were found in samples collected from animals dosed above and below the calculated mean dietary burden. The Meeting estimated STMR values for poultry meat, fat and edible offal of as well as for eggs of 0.02 mg/kg.

RECOMMENDATIONS

The Meeting estimated the STMR, HR and MRL values shown below.

Definition of the residue for compliance with MRL for plant commodities: *penthiopyrad*.

Definition of the residue for compliance with MRL for animal commodities and for the estimation of dietary intake for plant and animal commodities: *sum of penthiopyrad and 1-methyl-3-trifluoromethyl-1H-pyrazole-4-carboxamide (PAM), expressed as penthiopyrad*.

The residue is not fat-soluble.

Maximum residue levels and dietary intake

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
AL 1020	Alfalfa, fodder	20 (DM)	—	2.9 (fresh weight basis)	16 (fresh weight basis)
AB 0660	Almond hulls	6 (DM)	—	2.4 (fresh weight basis)	3.1 (fresh weight basis)
GC 0640	Barley	0.15	—	0.01	—
AS 0640	Barley, straw and fodder	80 (DM)	—	21 (fresh weight basis)	54 (fresh weight basis)
VP 0061	Beans, except broad bean and soya bean (green pods and immature seeds)	3	—	0.9	1.6
VP 0062	Beans, shelled	0.3	—	0.0685	0.16
VB 0041	Cabbages, head	4	—	0.4	2.4
VR 0577	Carrots	0.6	—	0.09	0.41
VX 0624	Celery	15	—	3.1	8.8
	Cotton gin trash	20 (DM)	—	4.55	—
SO 0691	Cotton seed	0.5	—	0.17	—
HS 0444	Peppers Chili, dried	14	—	See fruiting vegetables, other cucurbits, except sweet corn and mushroom	See fruiting vegetables, other cucurbits, except sweet corn and mushroom
PE 0112	Eggs	0.03	—	0.02	0.023
VB 0042	Flower head brassica	5	—	1.4	2.4
VC 0045	Fruiting vegetables, cucurbits	0.5	—	Edible peel: 0.13 in-edible peel: 0.01	Edible peel: 0.3 in-edible peel: 0.01
VO 0050	Fruiting vegetables, other than cucurbits, except sweet corn and mushroom	2	—	0.27	1.6
VL 0053	Leafy vegetables, except brassica leafy vegetables	30	—	3.15	15
GC 0645	Maize	0.01	—	0.01	—
AS 0645	Maize fodder	10 (DM)	—	0.52 (fresh weight basis)	5.9 (fresh weight basis)
CF 1255	Maize, flour	0.05	—	0.014	—
OC 0645	Maize, oil	0.15	—	0.027	—
GC 0646	Millet	0.8	—	0.22	—
AS 0646	Millet, fodder	10 (DM)	—	0.52 (fresh weight basis)	5.9 (fresh weight basis)
VL 0485	Mustard greens	50 ^a	—	11	30
GC 0647	Oats	0.15	—	0.02	—
AS 0647	Oats, straw and fodder	80 (DM)	—	21 (fresh weight basis)	54 (fresh weight basis)
VA 0385	Onion, bulb	0.7	—	0.074	0.72
VA 0387	Onion, Welsh	4	—	0.89	2.0
AL 0072	Pea hay or fodder	60 (DM)	—	12 (fresh weight basis)	31 (fresh weight basis)
SO 0697	Peanut	0.05	—	0.01	—
OR 0697	Peanut oil, edible	0.5	—	0.04	—
AL 0697	Peanut, fodder	30 (DM)	—	5.9 (fresh weight basis)	18 (fresh weight basis)
VP 0063	Peas (pods and succulent)	3	—	0.9	1.6

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
VP 0064	Peas, shelled	0.3	—	0.0685	0.16
FP 0009	Pome fruits	0.4	—	0.15	0.27
VR 0589	Potato	0.05	—	0.01	0.051
PO 0111	Poultry, edible offal of	0.03	—	0.02	0.023
PF 0111	Poultry, fats	0.03	—	0.02	0.023
PM 0110	Poultry, meat	0.03	—	0.02	0.021
VD 0070	Pulses, except soya beans	0.3	—	0.01	—
VR 0494	Radish	3	—	0.305	1.2
SO 0495	Rape seed	0.5	—	0.084	—
OC 0495	Rape seed oil, crude	1	—	—	—
OR 0495	Rape seed oil, refined	1	—	0.11	—
GC 0650	Rye	0.04	—	0.01	—
AS 0650	Rye, straw and fodder	80 (DM)	—	21 (fresh weight basis)	54 (fresh weight basis)
GC 0651	Sorghum	0.8	—	0.22	—
AS 0651	Sorghum, straw and fodder	10 (DM)	—	0.52 (fresh weight basis)	5.9 (fresh weight basis)
AL 0541	Soya bean fodder	200 (DM)	—	52.5 (fresh weight basis)	125 (fresh weight basis)
VA 0389	Spring onions	4	—	0.89	2.0
FS 0012	Stone fruits	4	—	1.3	1.9
FB 0275	Strawberry	3	—	0.8	1.8
VR 0596	Sugar beet	0.5	—	0.105	—
SO 0702	Sunflower seed	1.5	—	0.12	—
VO 0447	Sweet corn (on the cob)	0.02	—	0.01	0.01
TN 0085	Tree nuts	0.05	—	0.01	0.047
GC 0653	Triticale	0.04	—	0.01	—
AS 0653	Triticale, straw and fodder	80 (DM)	—	21 (fresh weight basis)	54 (fresh weight basis)
VL 0506	Turnip greens	50	—	9.4	23
GC 0654	Wheat	0.04	—	0.01	—
CF 0654	Wheat, bran	0.1	—	0.018	—
CF 1210	Wheat, germ	0.1	—	0.019	—
AS 0654	Wheat, straw and fodder	80 (DM)	—	21 (fresh weight basis)	54 (fresh weight basis)

^a On the basis of information provided to the JMPR it was not possible to conclude from the estimate of short-term intake for Penthiopyrad that the consumption of mustard greens was less than the ARfD.

Dietary intake only

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg	HR, mg/kg
Name		New	Previous		
AL 1021	Alfalfa, forage	—	—	0.73 (fresh weight basis)	4.6 (fresh weight basis)
JF 0226	Apple juice	—	—	0.021	—
AB 0226	Apple pomace, dry	—	—	1.3	—
AB 1230	Apple pomace, wet	—	—	0.69	—
—	Barley, beer	—	—	0.002	—

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg	HR, mg/kg
Name		New	Previous		
	Barley, forage	–	–	10 (fresh weight basis)	17 (fresh weight basis)
	Maize, forage	–	–	5 (fresh weight basis)	14 (fresh weight basis)
	Millet, forage	–	–	5 (fresh weight basis)	14 (fresh weight basis)
	Oats, forage	–	–	10 (fresh weight basis)	17 (fresh weight basis)
AL 0528	Pea vines	–	–	6.2 (fresh weight basis)	23 (fresh weight basis)
	Peanuts, meal	–	–	0.017	–
	Peeled potato	–	–	0.003	0.017
	Pot barley	–	–	0.007	–
DF 0014	Prunes	–	–	1.8	2.7
	Rye, forage	–	–	10 (fresh weight basis)	17 (fresh weight basis)
	Sorghum, forage	–	–	5 (fresh weight basis)	14 (fresh weight basis)
AL 1265	Soya bean forage	–	–	16 (fresh weight basis)	24 (fresh weight basis)
AB 0541	Soya bean, hulls	–	–	0.08 (fresh weight basis)	–
AB 1265	Soya bean, meal	–	–	0.007 (fresh weight basis)	–
OR 0541	Soya bean, refined oil	–	–	0.032	–
AB 0596	Sugar beet, dried pulp	–	–	0.56	–
DM 0596	Sugar beet, molasses	–	–	0.038	–
	Sugar beet, refined sugar	–	–	0.033	–
–	Tomato pomace, dry	–	–	11	–
–	Tomato pomace, wet	–	–	1.4	–
JF 0048	Tomato, juice	–	–	0.092	–
VW 0448	Tomato, paste	–	–	0.92	–
–	Tomato, puree	–	–	0.54	–
	Triticale, forage	–	–	10 (fresh weight basis)	17 (fresh weight basis)
CF 1211	Wheat, flour	–	–	0.004	–
	Wheat, forage	–	–	10 (fresh weight basis)	16 (fresh weight basis)

DIETARY RISK ASSESSMENT

Long-term intake

The WHO Panel of the 2011 Jmpr established an Acceptable Daily Intake (ADI) of 0–0.1 mg/kg bw/day for penthiopyrad.

The evaluation of penthiopyrad resulted in recommendations for MRLs and STMR values for raw and processed commodities. Where data on consumption were available for the listed food commodities, dietary intakes were calculated for the 13 GEMS/Food Consumption Cluster Diets. The results are shown in Annex 3 of the 2012 Report of the Jmpr.

The IEDIs in the thirteen Cluster Diets, based on the estimated STMRs were 0–6% of the maximum ADI (0.1 mg/kg bw). The Meeting concluded that the long-term intake of residues of penthiopyrad from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The WHO Panel of the 2011 JMPR established an Acute Reference Dose (ARfD) of 1 mg/kg bw for penthiopyrad.

For mustard greens, the IESTI represented 150% of the ARfD of 1 mg/kg bw. On the basis of the information provided to the JMPR it was not possible to conclude that the estimate of the short-term intake of penthiopyrad, from the consumption of mustard greens, was less than the ARfD. The Meeting noted that an alternative GAP for mustard greens was not available.

For other commodities the IESTI for penthiopyrad calculated on the basis of the recommendations made by the JMPR represented 0–90% of the ARfD (1 mg/kg bw) for children and 0–90% for the general population.

The Meeting concluded that the short-term intake of residues of penthiopyrad resulting from uses that have been considered by the JMPR (other than mustard greens) is unlikely to present a public health concern.

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PTHIO_040	Rawle, NW	2008	Residues of MTF-753 in milk and edible tissues following oral administration to lactating dairy cattle, CEM Analytical Services Ltd. (CEMAS) , Report No CEMR-3569, GLP, unpublished
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PTHIO_043	Shepard, E	2009	Field crop rotation study with DPX-LEM17 20SC—USA and Canada, 2007/8 (interim report), ABC Laboratories, Inc., DuPont-22836, Interim Report No. 1, GLP, unpublished
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PTHIO_052	Rzepka, S	2008	Assessment of the applicability of DFG Method S 19 for the determination of penthiopyrad (MTF-753) and its metabolites PCA, 753-A-OH and PAM. , Eurofins Analytik GmbH Dr. Specht Laboratories. , Report No.: LKC-0701. , GLP, unpublished
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PTHIO_078	Old, J, & Woodmansey, L	2009	Combined decline and magnitude of residues of penthiopyrad and its metabolites in barley (cereals) following applications of DPX-LEM17 20SC, DPX-LEM17 200 g/L EC, chlorothalonil/ penthiopyrad (DPX-QFA61) SC (250 g/L:100 g/L) and cyproconazole/penthiopyrad (DPX-QEK67) SC (60 g/L:150 g/L) under maximum label rate—France and northern Europe 2007–2008, Charles River Laboratories, DuPont-22358, GLP, unpublished
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PTHIO_082	Shepard, E	2010	Combined decline and magnitude of residues of penthiopyrad and its metabolites in broccoli/cauliflower, cabbage, mustard greens (brassica vegetables) following applications of Penthiopyrad (DPX-LEM17) 200 g/L SC under maximum label rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27258, Revision No. 1, GLP, unpublished
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PTHIO_088	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in carrot, radish, sugar beet and turnip (root and tuber vegetables) following applications of Penthiopyrad (DPX-LEM17) 200 g/L SC or Penthiopyrad (DPX-LEM17) 200 g/L EC under maximum label rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27906, GLP, unpublished
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PTHIO_094	Thiel, A	2009	Magnitude of residues of penthiopyrad and its metabolites in canola (oilseed) following applications of DPX-LEM17 20SC and DPX-LEM17 20EC under maximum label rate - USA and Canada, 2008, ABC Laboratories, Inc., DuPont-24711, GLP, unpublished
PTHIO_095	Old, J & Cairns, S	2009	Magnitude of residues of cyproconazole, penthiopyrad and its metabolites in sunflowers (oilseeds) following applications of Cyproconazole/Penthiopyrad (DPX-QEK67) SC (60 g/L:150 g/L) under maximum label rate—northern Europe 2008, Charles River Laboratories, DuPont-24500, GLP, unpublished
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PTHIO_097	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in sunflower following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC under maximum label rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27969, GLP, unpublished
PTHIO_098	Thiel, A	2009	Magnitude of residues of penthiopyrad and its metabolites in peanuts and their processed fractions following applications of DPX-LEM17 20SC under maximum label rate—USA, 2007, ABC Laboratories, Inc., DuPont-22296, GLP, unpublished
PTHIO_099	Shepard, E	2009	Combined decline and magnitude of residues of penthiopyrad and its metabolites in sweet corn following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC under maximum label rate—USA and Canada, 2009, ABC Laboratories, Inc. (Missouri), DuPont-28056, GLP, unpublished
PTHIO_100	Shepard, E	2010	Combined decline and magnitude of residues of penthiopyrad and its metabolites in field corn following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC under maximum label rate—USA and Canada, 2009, ABC Laboratories, Inc. (Missouri), DuPont-28055, GLP, unpublished
PTHIO_101	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in cotton following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC under maximum label rate - USA, 2009, ABC Laboratories, Inc. (Missouri), DuPont-27905, GLP, unpublished
PTHIO_102	Shepard, E	2010	Combined decline and magnitude of residues of penthiopyrad and its metabolites in alfalfa following applications of Penthiopyrad (DPX-LEM17) 200 g/L SC under maximum label rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27967, GLP, unpublished
PTHIO_103	Shepard, E	2008	Magnitude of residues of penthiopyrad and its metabolites in processed fractions of apples (pome fruit) following applications of DPX-LEM17 20SC under maximum label rate—USA, 2007, ABC Laboratories, Inc., DuPont-22302, GLP, unpublished
PTHIO_104	Old, J, Cairns, S, Hansford, RJ & Hoskins, M	2009	Magnitude of residues of penthiopyrad and its metabolites in processed fractions of field tomatoes (solanaceae—fruiting vegetables) following applications of DPX-LEM17 20SC under maximum label rate—Europe, 2007, Charles River Laboratories, DuPont- 22356, GLP, unpublished
PTHIO_105	Shepard, E	2008	Magnitude of residues of penthiopyrad and its metabolites in processed fractions of plums (stone fruit) following applications of DPX-LEM17 20SC under maximum label rate—USA, 2007, ABC Laboratories, Inc., DuPont-22304, Revision No. 1, GLP, unpublished
PTHIO_106	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in processed commodities of soya beans following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC at an exaggerated rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27965, Revision No. 1, GLP, unpublished
PTHIO_107	Rice F	2009	Magnitude of residues of penthiopyrad and its metabolites in potatoes and potato processed fractions following applications of DPX-LEM17 20SC and 20EC at an exaggerated rate—USA and Canada, 2008, ABC Laboratories, Inc., DuPont-24499, GLP, unpublished
PTHIO_108	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in processed commodities of sugar beets following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC at an exaggerated rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27907, GLP, unpublished

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PTHIO_110	Old, J & Woodmansey, L	2009	Magnitude of residues of penthiopyrad and its metabolites in processed fractions of wheat (cereals) following applications of DPX-LEM17 20SC under maximum label rate—northern Europe, 2007, Charles River Laboratories, DuPont-22390, Revision No. 1, GLP, unpublished
PTHIO_111	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in processed commodities of wheat following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC at an exaggerated rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27270, GLP, unpublished
PTHIO_112	Shepard, E	2010	Magnitude of residues of penthiopyrad and its metabolites in processed commodities of field corn following applications of Penthiopyrad (DPX-LEM17) 200 g/L EC at an exaggerated rate—USA and Canada, 2009, ABC Laboratories, Inc., DuPont-27970, GLP, unpublished
PTHIO_113	Thiel, A	2009	Magnitude of residues of penthiopyrad and its metabolites in processed fractions of canola (oilseed) following applications of DPX-LEM17 20SC under maximum label rate—USA and Canada, 2007, ABC Laboratories, Inc., DuPont-22301, GLP, unpublished
PTHIO_114	Baker, FC & Bautista, A	2006	A metabolism study with [¹⁴ C]pyrazole and [¹⁴ C]thienyl MTF-753 on grapes, PTRL West Inc., Mitsui Chemicals, 1177W-1, GLP, unpublished

