FENAMIDONE (264)

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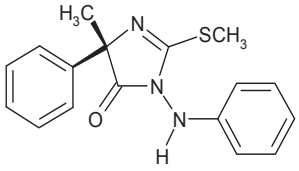
EXPLANATION

Fenamidone is a broad-spectrum fungicide belonging to the imidazolinone group. The compound was evaluated the first time by the 2013 JMPR for toxicology where an ADI of 0–0.03 mg/kg bw and an ARfD of 1 mg/kg bw was allocated. The evaluation for residues was scheduled for the 2014 JMPR.

The current Meeting received information on physical and chemical properties, metabolism studies on plants and animals, analytical methods, supervised trials data, processing studies as well as use patterns.

IDENTITY

Fenamidone (RPA 407213) is the S-enantiomer of the stereoisomeric molecule RPA 405803 with the chiral centre in the 5-position. The S-isomer has been shown to be the biologically active enantiomer.

Common name:	Fenamidone
Chemical name:	
IUPAC:	(*S*)-5-Methyl-2-methylthio-5-phenyl-3-(phenylamino)-3,5-dihydro-4H-imidazol-4-one
CA:	(5*S*)-3,5-dihydro-5-methyl-2-(methylthio)-5-phenyl-3-(phenylamino)-4H-imidazol-4-one
CAS number:	161326-34-7
Molecular formula:	$C_{17}H_{17}N_3OS$
Structural formula:	
Molecular mass:	311.4
Minimum purity:	Active substance (ai) manufactured 975 g/kg

Formulations

Fenamidone is available in numerous commercial formulations in different types (SC, WG, WP-soluble bag) in many countries.

PHYSICAL AND CHEMICAL PROPERTIES

Fenamidone is a thermally stable solid. The compound is poorly soluble in water and soluble in toluene, dichloromethane and acetone. It is stable at pH 5 and pH 7 and hydrolyses under acidic or alkaline conditions, is not explosive and not self-igniting. For details see Table 1.

Table 1 Physical and chemical properties of fenamidone

Property	Findings	Report, Bayer reference
Active ingredient		
Melting point	137 °C	R003094, M-163995-01-1

Property	Findings		Report, Bayer reference
Decomposition	At about 240 °C		R003102, M-164004-01-1
Relative density	1.29		R003094, M-163995-01-1
Vapour pressure	33 °C	1.48×10^{-6} Pa	R003104, M-164006-01-1
	41 °C	5.95×10^{-6} Pa	
	49 °C	2.28×10^{-5} Pa	
	25 °C (calculated) 20 °C (calculated)	3.4×10^{-7} Pa 1.32×10^{-7} Pa	
Henry's law constant	0.5×10^{-5} Pa m^3/mol (20 °C)		R003104, M-164006-01-1
Physical state, colour	White woolly powder		R003094, M-163995-01-1
Odour	No characteristic odour		R003094, M-163995-01-1
Solubility in water	7.8 mg/L (20 °C), pH 4–10 has no significant effect on water solubility		R003098, M-164000-01-1 R004781, M-166509-01-1
Solubility in organic solvents (20 °C)	Acetone	*ca.* 250 g/L	R003098, M-164000-01-1
	Acetonitrile	86.1 g/L	
	Dichloromethane	*ca.* 330 g/L	
	Ethyl acetate	105.7 g/L	
	n-Heptane	0.3 g/L	
	Toluene	40.1 g/L	
	Methanol	43.1 g/L	
	n-Octanol	9.7 g/L	
Partition coefficient	Log P_{ow} = 2.8 (20 °C)		R003100, M-164002-01-1
Hydrolysis rate		DT_{50} (days)	R003342, M-164512-01-1
	pH 4	41.7	
	pH 5	222	
	pH 7	411	
	pH 9	27.6	
	Fenamidone is stable at pH 5 and pH 7 and was hydro-lysed at pH 4 and pH 9. Major hydrolysis products: —RPA 410193 at pH 4 —RPA 413350 & RPA 412708 at pH 9.		
Photochemical degradation	[C-phenyl-UL-^{14}C]-fenamidone DT_{50} = 25.7 hours, corresponding to 5 days Florida summer sunlight. Major metabolites: RPA 412708 & RPA 410193 [N-phenyl-UL-^{14}C]-fenamidone DT_{50} = 29.5 hours, corresponding to 5.8 days of Florida summer sunlight. Major metabolite: RPA418915 (but < 10%)		R006697, M-173299-01-1 R005035, M-170334-01-1
Quantum yield	Quantum yield (Φ): 3.38×10^{-2} Theoretical environmental half-life ranged from 25843 hours in July to approximately 1.2×10^{9} hours in December.		CR&D/CRLD/AN/9716610, M-164514-01-1
Dissociation constant	Not ionisable in water At pH 4: neutral fenamidone (modelling)		R003096, M-163997-02-1 C026172, M-210906-01-1
Flammability	Not classified as highly flammable		R003437, M-164707-01-1
Auto-flammability	No self-ignition temperature observed up to 400 °C		R003437, M-164707-01-1
Explosive properties	No danger of explosion		R003437, M-164707-01-1
Oxidising properties	No oxidizing properties under test conditions		R005016, M-170307-02-1 C026164, M-210891-01-1
Technical material			
Physical state, colour	White to cream fine powder		R003094, M-163995-01-1
Odour	No characteristic odour		R003094, M-163995-01-1

METABOLISM AND ENVIRONMENTAL FATE

Fenamidone active substance as defined by the ISO common name and the CA name is the S-enantiomer of the stereoisomeric molecule RPA405803 with the chiral centre in the 5-position of the dihydro-imidazolone ring. This S-enantiomer has been shown to be the biologically (fungicidally) active enantiomer. The minimum purity of fenamidone in the technical substance is 975 g/kg.

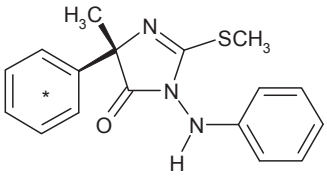
The chiral carbon atom in the 5-position of the dihydro-imidazolone ring is substituted by 4 non-hydrogen substituents, i.e., by an amino, carbonyl, methyl and phenyl group. Prerequisite for isomerisation/racemisation of this type of centre of chirality is the presence of a hydrogen atom as a substituent that can be split off easily. In fenamidone, no hydrogen is linked to the chiral centre.

Therefore, racemisation is chemically not possible and the configuration and the optical purity, respectively, established by synthesis (5*S*, ee > 99%) does not change afterwards.

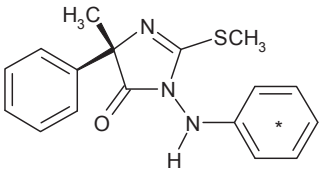
All fenamidone studies on metabolism, residues and toxicology were conducted with this pure S-enantiomer as test substance. Accompanying analysis was usually conducted using achiral methods without the possibility to examine a potential isomerisation/racemisation during the interaction with animal, plant and environmental matrices. In order to investigate this possibility a study (M-173254-01-1) was performed using chiral HPLC analysis of different samples out of "nature-of-residue" studies on soil metabolism, water-sediment, hydrolysis, aqueous and soil photolysis as well as metabolism on lettuce, grape, potato and rat (ADME) and on the livestock animals hen and goat. In no case, there was any evidence of enantiomerization or racemization of the parent substance and its metabolites during metabolic conversions or physico-chemical degradation.

The metabolism and distribution of fenamidone in plants and animals was investigated using the ^{14}C-labelled test materials as shown below.

[C-phenyl-UL-^{14}C]-fenamidone



[N-phenyl-UL-^{14}C]-fenamidone

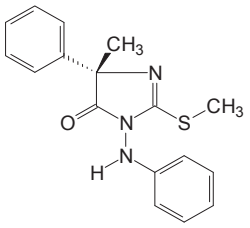


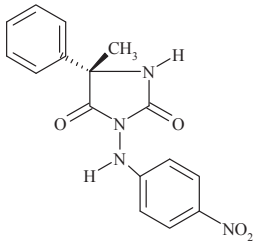
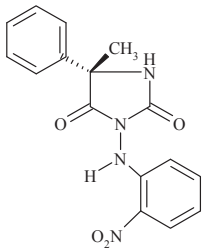
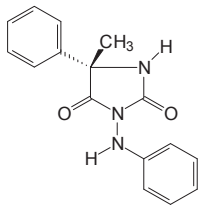
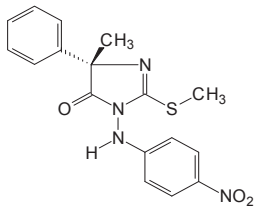
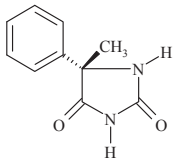
* Denotes position of ^{14}C-label

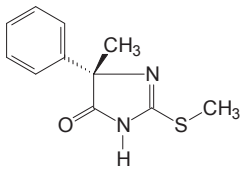
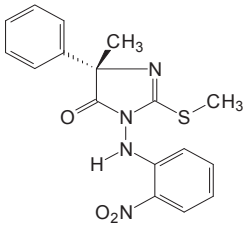
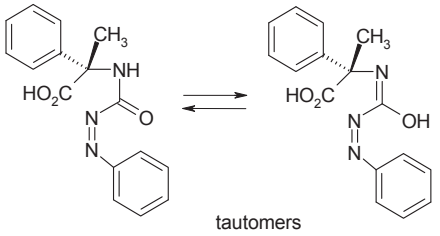
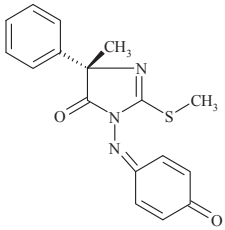
Chemical names, structures and code names of metabolites and degradation products of fenamidone are summarized in Table 2. Compounds are referred to primarily by the code number of the S-enantiomer, with the code of the corresponding racemic compound additionally mentioned.

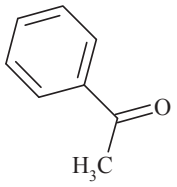
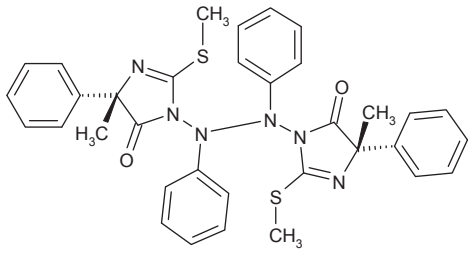
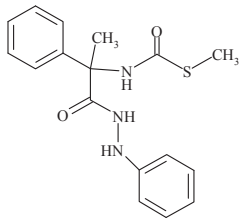
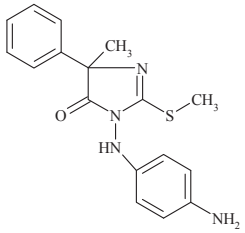
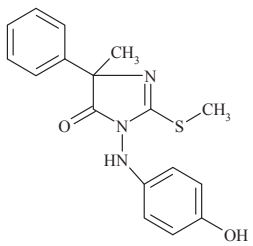
Racemic compounds are generally used as reference standards in metabolism/degradation and residue studies. Nevertheless, the codes for the S-enantiomer were frequently used below for describing the metabolites, because their enantiomeric stability in the S-configuration has been demonstrated.

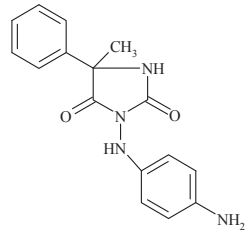
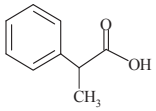
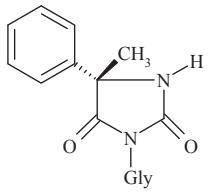
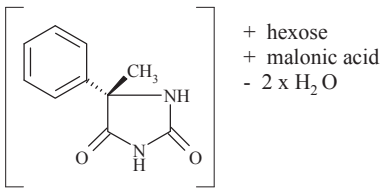
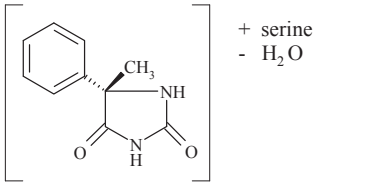
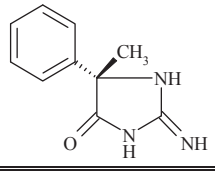
Table 2 Code names, chemical names and structures of fenamidone related substances

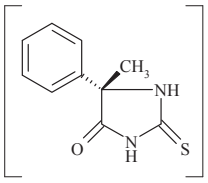
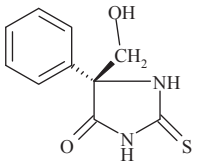
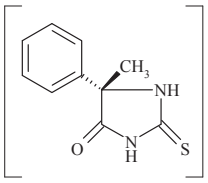
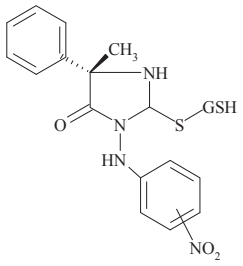
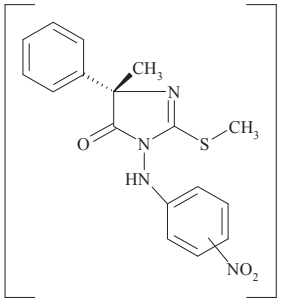
No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
ai	**FENAMIDONE** (parent substance)  (5S)-5-methyl-2-methylthio-5-phenyl-3-(phenylamino) -3,5-dihydro-4H-imidazol-4-one (IUPAC) 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-5-phenyl-3-(phenylamino)-, (5*S*) (CAS) CAS No.: 161326-34-7 (S-Enantiomer) 151022-37-6 (Racemate)	$C_{17}H_{17}N_3OS$ 311.4 g mol^{-1} S-Enantiomer: RPA 407213 AE C649693 RPA 410287 BCS-AB63420 <u>Racemate</u>: RPA 405803 AE C643114	Active substance Rat Plants Rotated crops Livestock Soil Water
1	RPA 221607	$C_{16}H_{14}N_4O_4$ 326.3 g mol^{-1} S-Enantiomer: RPA 221607 AE 0591776 BCS-AX84896 2,4-imidazolidinedione,	Soil, aerobic Carrot Rotational crops: Swiss chard

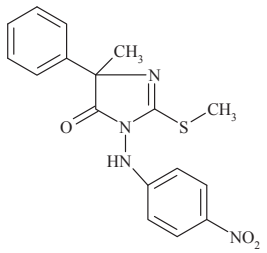
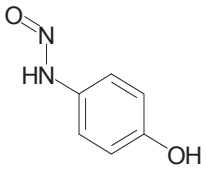
No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
	 (5*S*)-5-methyl-3-[(4-nitrophenyl)amino]-5-phenyl- 2,4-imidazolidinedione (IUPAC) CAS No.: N/A (S-Enantiomer) N/A (Racemate)	5-methyl-3[(4nitrophenyl)-amino]-5-phenyl-, (5*S*)- <u>Racemate</u>: RPA 409446 AE 0591779	
2	RPA 221701  (5*S*)-5-methyl-3-[(2-nitrophenyl)amino]-5-phenyl- 2,4-imidazolidinedione (IUPAC) CAS No.: N/A (S-Enantiomer) N/A (Racemate)	$C_{16}H_{14}N_4O_4$ 326.3 g mol^{-1} S-Enantiomer: RPA 221701 AE 0591777 BCS-AX84897 2,4-imidazolidinedione, 5-methyl-3-[(2-nitrophenyl)-amino]-5-phenyl-, (5*S*)- <u>Racemate</u>: RPA 410995 AE 0591778	Soil, aerobic Carrot Rotational crops: Turnip, Swiss chard
3	RPA 410193  (*S*)-5-Methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (IUPAC) 2,4-Imidazolidinedione, 5-methyl-5-phenyl-3-(phenylamino)-, (5*S*)-) (CAS) CAS No.: 332855-88-6 (S-Enantiomer) 153969-11-0 (Racemate)	$C_{16}H_{15}N_3O_3$ 281.3 g mol^{-1} S-Enantiomer: RPA 410193 AE 0540049 BCS-AX71129 Diketo-fenamidone (DK-Fen) <u>Racemate</u>: RPA 405862 AE C650488	Soil, aerobic Soil, photolysis Hydrolysis, abiotic Photolysis, buffer Vine grapes, Lettuce, Tomato, Potato, Carrot Hen
4	RPA 411639  (5*S*)-5-methyl-2-(methylthio)-3-(4-nitrophenyl)amino)-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC) 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-3-[(4-nitrophenyl)amino]-5-phenyl-, (5*S*) (CAS) CAS No.: 776299-39-9 (S-Enantiomer) 151022-56-9 (Racemate)	$C_{17}H_{16}N_4O_3S$ 356.4 g mol^{-1} S-Enantiomer: RPA 411639 AE 0540054 BCS-AX71134 <u>Racemate</u>: RPA 406012 AE 0540056	Soil, aerobic Carrot Rotational crops: Turnip, Swiss chard Rat (postulated intermediate)
5	RPA 412636  (*S*)-5-methyl-5-phenyl-2,4-imidazolidine-dione (IUPAC)	$C_{10}H_{10}N_2O_2$ 190.2 g mol^{-1} S-Enantiomer: RPA 412636 AE 0540051 BCS-AX71131 “ fenamidone-hydantoin” Desanilino-diketo-	Soil, aerobic Soil, photolysis Water / sediment Lettuce, Potato, Rotational crops: Wheat, Turnip,

No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
	2,4-imidazolidinedione, 5-methyl-5-phenyl-, (5*S*) (CAS) CAS No.: 27539-12-4 (S-Enantiomer) 6843-49-8 (Racemate)	fenamidone (DADK-Fen) Racemate: RPA 717879 AE C415557	Swiss chard Rat, Goat, Hen
6	RPA 412708  (5*S*)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (IUPAC) 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-5-phenyl-, (5*S*)- (CAS) CAS No.: 332855-82-0 (S-Enantiomer) 151023-66-4 (Racemate)	$C_{11}H_{12}N_2OS$ 220.9 g mol^{-1} S-Enantiomer: RPA 412708 AE 0540050 BCS-AX71130 Desanilino-fenamidone (DA-Fen) Racemate: RPA 408056 AE 0540057	Soil, aerobic Soil, photolysis Hydrolysis, abiotic Photolysis, buffer Photolysis, nat. water Water / sediment Lettuce, Potato Rat, Goat, Hen
7	RPA 413255  (5S)-5-methyl-2-(methylthio)-3-(2-nitrophenyl)amino)-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC) 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-3-[(2-nitrophenyl)amino]-5-phenyl-, (5*S*) (CAS) CAS No.: 776299-40-2 (S-Enantiomer) 151022-56-9 (Racemate)	$C_{17}H_{16}N_4O_3S$ 356.4 g mol^{-1} S-Enantiomer: RPA 413255 AE 0540053 BCS-AX71133 Racemate: RPA 410914 AE 0540055	Soil, aerobic Soil, photolysis Carrot Rotational crops: Turnip, Swiss chard
8	RPA 413350  tautomers 2-phenyl-N-{[(E)-phenyldiazenyl]carbonyl}-D-alanine (IUPAC) benzeneacetic acid, □-methyl □[[phenylazo)] carbonyl]-amino]-, (□S)- (CAS) CAS No.: 775326-19-7 (S-Enantiomer) N/A (Racemate)	$C_{16}H_{15}N3O_3$ 297.3 g mol^{-1} S-Enantiomer: RPA 413350 AE 0540052 BCS-AX71132 Racemate: RPA 409344 AE 0841910	Hydrolysis, abiotic
9	RPA 418915  (5*S*)-5-methyl-2-(methylthio)-3-[(4-oxo-2,5-cyclohexadien-1-ylidene)amino]-5-phenyl-3,5-dihydro-4*H*-imidazol-4-one (IUPAC) CAS No.: N/A (S-Enantiomer) N/A (Racemate)	$C_{17}H_{15}N_3O_2S$ 325.4 g mol^{-1} S-Enantiomer: RPA 418915 AE R418915 BCS-AZ94979 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-3-[(4-oxo-2,5-cyclohexadien-1-yl)-amino]-5-phenyl-, (5*S*)	Aqueous photolysis, buffer
10	Acetophenone	C_8H_8O 120.2 g mol^{-1}	Photolysis, nat. water

No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
	 1-phenylethanone (IUPAC) ethanone, 1-phenyl- (CAS) CAS No.: 98-86-2	AE C419259	
11	BCS-CV62706  (5S,5'S)-3,3'-(1,2-diphenylhydrazine-1,2-diyl)bis[5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro-4H-imidazol-4-one] (IUPAC) CAS No.: N/A	$C_{34}H_{32}N_6O_2S_2$ 620.8 g mol^{-1} S,S-Enantiomer: RPA: None AE: None BCS-CV62706 "Dimer" "Hedgehog 4"	Soil, aerobic Carrot
12	**RPA 407599** (only racemic code available)  [1-phenyl-1-(N'-phenylhydrazinocarbonyl)-ethyl]-thiocarbamic acid methyl ester (IUPAC) benzeneacetic acid, α-methyl-α- [[methylthio)-carbonyl]amino]-, 2-phenylhydrazide (CAS) CAS No.: N/A (S-Enantiomer) N/A (Racemate)	$C_{17}H_{19}N_3O_2S$ 329.42 g mol^{-1}	Tomato
13	**RPA 409352** (only racemic code available)  5-methyl-2-(methylthio)-3-[(4-aminophenyl)amino]- 5-phenyl-3,5dihydro-4*H*-imidazole-4-one (IUPAC) 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-3-[(4-aminophenyl)amino]-5-phenyl (CAS) CAS No.: N/A	$C_{17}H_{18}N_4OS$ 326.42 g mol^{-1}	Rat (major, also conjugate with glucuronic acid) Goat
14	**RPA 409361,** AE 0540047, (only racemic code available) 	$C_{17}H_{17}N_3O_2S$ 327.41 g mol^{-1}	Rat (major, also conjugate with glucuronic acid) Hen, Goat (OH-position undefined) as aglycon and glucoside conjugate

No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
	5-methyl-2-(methylthio)-3-[(4-hydroxyphenyl)amino]-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC) 4*H*-imidazol-4-one, 3,5-dihydro-5-methyl-2-(methylthio)-3-[(4-hydroxyphenyl)amino]-5-phenyl (CAS) CAS No.: N/A		
15	**RPA 409445,** AE 0652676, (only racemic code available)  5-methyl-3-[(4-aminophenyl)amino]-5-phenyl- 2,4-imidazolidinedione (IUPAC) 2,4-imidazolidinedione, 5-methyl-3-[(4-aminophenyl)amino]-5-phenyl- (CAS) CAS No.: N/A	$C_{16}H_{16}N_4O_2$ 296.33 g mol^{-1}	Rat (major in conjugated form) Hen (minor)
16	2-Phenyl-propionic acid  Configuration in plants not known CAS No.: 492-37-5	$C_9H_{10}O_2$ 150.18 g mol^{-1} P2	Rotational crops: Wheat, Turnip, Swiss chard
17	Hydantoin glycoside  (*S*)-5-methyl-5-phenyl-2,4-imidazolidine-dione-3-N-glycoside	$C_{16}H_{20}N_2O_8$ 368.35 g mol^{-1} P7	Rotational crops: Wheat, Turnip, Swiss chard Rat (only aglycon)
18	Hydantoin malonyl glycoside  + hexose + malonic acid - 2 x H_2O Appears as S-enantiomer in plants, exact structure not known CAS No.: N/A	P9	Rotational crops: Wheat, Turnip, Swiss chard
19	Hydantoin serine  + serine - H_2O Appears as S-enantiomer in plants, exact structure not known CAS No.: N/A	P4	Rotational crops: Wheat, Turnip, Swiss chard
20	imino hydantoin 	$C_{10}H_{11}N_3O$ 189.22 g mol^{-1} P5	Rotational crops: Wheat, Turnip, Swiss chard

No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
	(5*S*)-2-imino-5-methyl-5-phenylimidazolidin-4-one CAS No.: N/A		
21	Thiohydantoin serine  + serine - H_2O Appears as S-enantiomer in plants, exact structure not known CAS No.: N/A	P6	Rotational crops: Wheat, Swiss chard
22	Hydroxmethyl thiohydantoine  (5*R*)-5-(hydroxymethyl)-5-phenyl-2-thioxoimidazolidin-4-one (IUPAC) CAS No.: N/A	$C_{10}H_{10}N_2O_2S$ 222.27 g mol^{-1} P13	Rotational crops: Wheat, Swiss chard
23	Thiohydantoin glycoside  + hexose - H_2O Appears as S-enantiomer in plants, exact structure not known CAS No.: N/A	P8	Rotational crops: Wheat, Turnip, Swiss chard
24	Nitro-GSH  Appears as S-enantiomer in plants, exact structure not known CAS No.: N/A	A7	Rotational corps: Swiss chard (GSH: glutathionate conjugate)
25	Hydroxy-nitro-malonyl-glycoside  + O + malonic acid + hexose - 2 x H_2O Appears as S-enantiomer in plants, exact structure not known CAS No.: N/A	A8	Rotational crops: Turnip
26	**RPA 411639** (only racemic code available)	$C_{17}H_{16}N_4O_3S$ 356.41 g mol^{-1}	Carrot

No.	Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
	 5-methyl-2-(methylsulfanyl)-3-[(4-nitrophenyl)amino]-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC) CAS No.: N/A		
27	UMET/10  4-(nitrosoamino)phenol (IUPAC)	$C_6H_6N_2O$ 138.13 g mol^{-1}	Rat

Animal metabolism

The metabolism of fenamidone has been studied in laboratory rats, lactating goats and laying hens.

Table 3 Characterization of radio-labelled test materials of fenamidone

	[C-Phenyl-UL-^{14}C]-fenamidone, reference	[N-Phenyl-UL-^{14}C]-fenamidone, reference
Studies on goats	643724, M-183880-01-1	684088, M-183833-01-1
Studies on hens	643735, M-183883-01-1	684090, M-183837-01-1
Radiochemical purity	99.5% (HPLC), 98.7% (TLC)	100% (HPLC), 98.2% (TLC)
Specific activity	1.41 GBq/mM, 38 mCi/mM	1.37 GBq/mM, 37 mCi/mM

Rats

Rat metabolism studies were evaluated by the WHO Core Assessment Group of the 2013 JMPR and are summarized as follows: In experiments conducted in rats using [^{14}C]fenamidone labelled at either the C-phenyl or N-phenyl part of the molecule, the time to reach the maximum plasma concentration of radioactivity was 2 hours after a single oral dose of 3 mg/kg bw and 26 hours after a single oral dose of 300 mg/kg bw. Gastrointestinal absorption was greater than 80%. Radioactivity distributed to most tissues, with no evidence of accumulation. Relatively high concentrations of radioactivity (approximately 400 times higher than that in plasma) were detected in the thyroid following dosing with C-phenyl- but not N- phenyl-labelled fenamidone, suggesting the distribution of a radiolabelled metabolite to the thyroid. Fenamidone undergoes extensive metabolism in the rat by phase I (oxidation, reduction and hydrolysis) and phase II reactions (conjugation). The plasma elimination half-life was at least 60 hours. More than 20 metabolites were detected in rat excreta, with the majority of radioactivity excreted in the faeces (up to approximately 90% of the administered dose) and the remainder in urine. Mass balance data indicated that the majority of radioactivity (> 80%) was eliminated within 48 hours of dosing.

Lactating goats

Burri (1999) investigated the fate of fenamidone following repeated oral administration to the lactating goat in two separate studies (643724, M-183880-01-1 and 684088, M-183833-01-1, see Table 3).

Two dose levels were used for each label position, with one lactating Saanen goat being used per dose and label. The dose levels were 1.0 ppm and 10.4 ppm for [C-phenyl-UL-^{14}C]-fenamidone and 1.5 ppm and 11.5 ppm for [N-phenyl-UL-^{14}C]-fenamidone in the diet. Dosing was performed twice daily by capsule during seven consecutive days. Goats were sacrificed at 22 hours after the last

(14th) administration. Milk, urine and faeces were sampled during the course of the study and liver, kidney, muscles and fat were obtained after the end of the experiment. The total radioactive residues (TRR) were determined by LSC in liquid matrices after solubilisation, in solid matrices by combustion. The samples were prepared as follows:

Milk

Studies 643724 and 684088*:* Radioactivity in the milk was determined by LSC after solubilisation. The milk was defatted by centrifugation. The defatted milk was de-proteinised by adding acetone (1 + 4, v/v). After shaking for 30 min. at room temperature, an incubation for 16 hours at about 4 °C and centrifugation, the supernatant was removed and the pellet was further extracted twice with acetone, twice with acetone/water (1 + 1, v/v) and once with methanol/water (C-phenyl-label: 1 + 1, v/v; N-phenyl-label: 2 + 8, v/v). The remaining non-extracted radioactivity was determined by combustion. The five fractions (whey) were pooled for partitioning. The whey was concentrated to about 800 mL at 35 °C. Thereafter, the whey was partitioned twice with dichloromethane, once with ethyl acetate and twice with acidic ethyl acetate (pH 1–2). The radioactivity in the milk fat was determined by combustion.

Liver and kidney

Study 643724*:* The tissue was homogenized and extracted once with acetonitrile, twice with acetonitrile/water (1 + 1, v/v), twice with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Additionally, acidic (2 × methanol/0.2 M HCl, 8 + 2, v/v) and basic extractions (methanol/0.5 M NH_4OH, 8 + 2, v/v) were performed. Radioactivity in each extract was measured after centrifugation. Thereafter, a Soxhlet extraction in methanol/water (8 + 2, v/v) for 16 hours was performed. Liver and kidney were further extracted with Tris buffer (0.1 M), incubated in pronase/Tris buffer and extracted with Tris buffer. The remaining non-extracted radioactivity was determined by combustion. For liver, hydrolysis was performed in 2 M HCl at 70 °C for approximately 16 hours.

Study 684088*:* The tissue was incubated in pronase/phosphate buffer for 6 h at 40 °C and then methanol was added to facilitate precipitation of the tissue. Thereafter, the tissue was extracted three times with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Radioactivity in each extract was measured after centrifugation. Thereafter, a Soxhlet extraction in methanol/water (1 + 1, v/v) at 70 °C for 16 hours was performed. The remaining non-extracted radioactivity was determined by combustion.

Muscle

Study 643724*:* The tissue was extracted (1–3 mL solvent per g tissue) once with acetonitrile, twice with acetonitrile/water (1 + 1, v/v), once with methanol/water (1 + 1, v/v), followed by a Soxhlet extraction in methanol/water (8 + 2, v/v) for 16 hours. Due to the low radioactivity amounts, the muscle extracts were not further worked up.

Study 684088*:* The tissue was homogenised for radioactivity determination. Due to low radioactivity amounts no extraction of muscle tissue was performed.

Fat, omental and perirenal

Study 643724*:* Samples were extracted twice with dichloromethane and once with dichloromethane/ethanol (1 + 1, v/v).

Study 684088*:* Samples were extracted twice with dichloromethane, once with dichloromethane/ethanol (1 + 1, v/v) and once again with dichloromethane. A further extraction with hexane was performed. The remaining tissue was extracted three times with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Thereafter, the residue was incubated with pronase/phosphate buffer for 6 h at 40 °C, three times extracted with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Thereafter, a Soxhlet extraction in methanol/water (1 + 1, v/v) at about 70 °C for 16 hours was performed.

Faeces

Studies 643724 and 684088*:* Samples collected from 24 to 48 hours and from 144 to 168 hours after the first administration were extracted once with acetonitrile, twice with acetonitrile/water (1 + 1, v/v) and three times with methanol/water (1 + 1, v/v), followed by a Soxhlet extraction in methanol/water (8 + 2, v/v). Extractions were performed as described for organs/tissues.

After extraction, the remaining solid was dried, and aliquots were combusted to obtain material balances of radioactivity for each examined sample. The extracts were partitioned further with different solvents and analysed by HPLC, TLC and LC-MS to determine the metabolic profiles. The TRR in mg/kg as parent equivalents in goat milk are shown in Table 4.

Table 4 TRR in goat milk following oral administration of [^{14}C]fenamidone for 7 days.

Time (hours) after		TRR [a] in mg/kg as parent eq			
		C-phenyl-label		N-phenyl-label	
First admin.	Last admin.	Low dose	High dose	Low dose	High dose
0–8	8	< 0.001	0.008	0.003	0.012
8–24	16	0.001	0.012	0.003	0.014
24–32	8	0.001	0.018	0.004	0.025
32–48	16	0.001	0.015	0.004	0.020
48–56	8	0.001	0.018	0.005	0.015
56–72	16	0.002	0.016	0.006	0.019
72–80	8	0.001	0.018	0.005	0.022
80–96	16	0.002	0.016	0.005	0.015
96–104	8	0.001	0.018	0.004	0.020
104–120	16	0.001	0.017	0.005	0.016
120–128	8	0.001	0.016	0.005	0.013
128–144	16	0.002	0.016	0.004	0.015
144–152	8	0.001	0.020	0.004	0.019
152–168	16	0.001	0.016	0.004	0.014
168–174	22	0.001	0.011	0.002	0.006

[a] Values corrected for background

The balance of the applied radioactivity and the excretion pattern of the lactating goats treated with radiolabelled fenamidone are presented in Table 5. At sacrifice, at both dose levels and with both labels, small amounts of radioactivity (totally 0.6 to 1.0% of the administered radioactivity) were detected in edible organs/tissues and blood. The ratio of residues in high dose to low dose animals was approximately 10, reflecting the ratio of the doses (see Table 6).

Table 5 Balance of radioactivity in goats following oral administration of [^{14}C]fenamidone for 7 days

Matrix	% TAR			
	C-phenyl-label		N-phenyl-label	
	Low dose	High dose	Low dose	High dose
Urine (0–174 hours)	26	17	40	36
Faeces (0–174 hours)	75	80	45	52
Milk (0–174 hours)	0.1	0.1	0.2	0.1
Cage wash	0.9	1.3	5.0	1.1
Total excreted	102	99	91	90
Total in edible tissues/organs	1.0	1.0	0.6	0.7
Gastro-intestinal tract (GIT)	2.9	2.3	1.1	0.2
Total	106	102	92	90

Table 6 TRR in goat tissues and blood following oral administration of [^{14}C]fenamidone for 7 days

Matrix	TRR (mg parent eq/kg) [a]			
	C-phenyl-label		N-phenyl-label	
	Low dose	High dose	Low dose	High dose
Liver	0.077	0.94	0.061	0.68
Kidney	0.013	0.12	0.007	0.08
Muscle	0.002	0.02	< 0.001	0.006
Fat	0.003	0.02	0.002	0.02

Matrix	TRR (mg parent eq/kg) [a]			
	C-phenyl-label		N-phenyl-label	
	Low dose	High dose	Low dose	High dose
Blood	0.005	0.09	0.009	0.054

[a] Values corrected for background

The distribution of TRR in goat matrices following treatment at the high dose with [^{14}C]fenamidone is summarised in Tables 7 (milk and fat) and 8 (liver and kidney). The majority of the TRR could be extracted using organic solvents, Soxhlet extraction, pronase incubation (liver and kidney) and hydrolysis (liver). The characterization and identification of metabolites was carried out with matrices of the high dosed goats only. Due to low TRR in muscle, no extraction of the tissue was performed in case of the N-phenyl-label study. In case of the C-phenyl-label study, the muscle was extracted but the extracts were not further worked up due to the low radioactivity amounts. The total extracted radioactivity amounted to 63.6% (0.01 mg eq/kg) of the TRR. The radioactivity remaining in the muscle was 36.4% of the TRR (0.006 mg eq/kg).

Table 7 Characterization and identification of radioactivity in goat milk and fat (high dose)

Component/fraction	Milk				Fat, omental and perirenal			
	C-phenyl-label		N-phenyl-label		C-phenyl-label		N-phenyl-label	
	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Fenamidone	0.001	0.7	ND	ND	0.013	53	ND	ND
RPA 409445	< 0.001	0.7	ND	ND	ND	ND	ND	ND
RPA 412708	0.001	1.7	ND	ND	ND	ND	ND	ND
RPA 412636	0.002	11.1	ND	ND	ND	ND	ND	ND
OH-fenamidone	0.001	1.0	0.001	1.9	ND	ND	ND	ND
OH-RPA 412708	< 0.001	1.0	ND	ND	ND	ND	ND	ND
Unidentified metabolites (number)	0.011 (16)	68 (16)	0.012 (13)	84 (13)	0.005 (9)	24 (9)	0.004 (4)	25 (4)
Sub-total	0.013	84	0.013	86	0.018	76	0.004	25
Extracted, but not characterized					0.001	6.4	0.016 [b]	75 [b]
Total extracted ^{14}C	0.013 [a]	84 [a]	0.013 [a]	86 [a]	0.019	83	0.02	100

[a] Total in the whey
[b] Assumed to be related to non-fat tissue

Table 8 Characterization and identification of radioactivity in goat liver and kidney (high dose)

Component/fraction	Liver				Kidney			
	C-phenyl-label		N-phenyl-label		C-phenyl-label		N-phenyl-label	
	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Fenamidone	0.003	0.3	ND	ND	0.001	0.6	ND	ND
RPA 409445	ND	ND	ND	ND	ND	ND	ND	ND
RPA 412708	ND	ND	ND	ND	0.001	0.9	ND	ND
RPA 412636	0.055	5.9	ND	ND	0.018	15	ND	ND
OH-fenamidone	0.011	1.2	0.039	5.6	0.004	4.0	0.004	4.3
OH-RPA 412708	0.004	0.4	ND	ND	0.003	2.9	ND	ND
Unidentified metabolites (number)	0.149 (10)	16 (10)	0.607 (5)	87 (5)	0.061 (9)	49 (9)	0.070 (7)	81 (7)
Sub-total	0.222	24	0.646	92	0.088	72	0.074	86
Extracted, but not characterized	0.062	6.7	0.013	1.9	0.011	8.2	0.003	3.2
After pronase incubation	0.439	47	ND	ND	0.021	18	ND	ND
After hydrolysis	0.148	16	ND	ND	ND	ND	ND	ND
Total extracted ^{14}C	0.87	93	0.66	94	0.12	98	0.077	89

Laying hens

Burri (1999) investigated the fate of fenamidone following repeated oral administration to the laying hen in two separate studies (643735, M-183883-01-1 and 684090, M-183837-01-1, see Table 3).

Two dose levels were used for each label position, with one group of five white leghorn hybrid hens being used per dose level and label. Two groups of hens were orally dosed daily by

capsule with [C-phenyl-UL-^{14}C]-fenamidone at doses of 1.3 ppm and 13.8 ppm in the diet for fourteen consecutive days. Two other groups of hens were similarly dosed with [N-phenyl-UL-^{14}C]-fenamidone at doses of 1.0 ppm and 9.8 ppm in the diet for fourteen consecutive days. The concentration profiles of radioactivity in eggs as well as the excretion patterns via excreta were followed. The hens were sacrificed at approximately 24 hours after the last (14th) dose and blood, plasma, liver, muscle, fat and skin were collected. The TRR were determined by LSC in liquid matrices after solubilisation, in solid matrices by combustion. The samples were prepared as follows:

Eggs

Study 643735*:* The egg samples (white and yolk) were de-proteinised by adding acetone (1 + 2 or 1 + 4, v/v). Following centrifugation, the supernatant was removed and the pellet extracted once with acetone. Further extraction steps with acetonitrile/water (1 + 1, v/v) and methanol/water (2 + 8, v/v) as well as a Soxhlet extraction in methanol/water (8 + 2, v/v) were performed. The egg yolk of the high dose group was further extracted with Tris buffer (0.1 M), incubated in pronase/Tris buffer and extracted with Tris buffer. The remaining non-extractable radioactivity was determined by combustion. Due to the low radioactivity amounts, the low dose egg yolk and egg white samples were not further worked up.

Study 684090*:* Egg white and egg yolk of eggs between 144 and 168 hours as well as 312 and 336 hours after the first administration was pooled per time point and group and radioactivity was re-determined. These pools were used for further work-up. Due to the low radioactivity amounts, the high dose egg white samples, the low dose egg yolk and egg white samples were not analysed. The egg yolk samples were de-proteinised by adding acetone (1 + 4, v/v). After shaking for 30 min at room temperature, the samples were left for 16 hours at about 4 °C. Following centrifugation (10 min at 1600 g), the supernatant was removed and the pellet extracted once with acetone. Further extraction steps with acetone/water (1 + 1, v/v) and methanol/water (1 + 1, v/v) as well as a Soxhlet extraction in methanol/water (1 + 1, v/v) were performed.

Muscle

Study 643735*:* The tissue was homogenised for radioactivity determination. Thereafter, the samples were pooled and extracted (high dose group only). The extractions were performed with acetonitrile, methanol and methanol/water in different ratios. Muscle tissue was extracted once with acetonitrile, twice with acetonitrile/water (1 + 1, v/v), twice with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Radioactivity in each extract was measured after centrifugation. Additionally, a Soxhlet extraction in methanol/water (8 + 2, v/v) for 16 hours was performed.

Study 684090*:* The tissue was homogenised for radioactivity determination. Due to low radioactivity amounts no extraction of muscle tissue was performed.

Liver

Study 643735*:* The tissue was homogenised for radioactivity determination, pooled per group and extracted. The extractions were performed with acetonitrile, methanol and methanol/water in different ratios. Liver tissue was extracted once with acetonitrile, twice with acetonitrile/water (1 + 1, v/v), twice with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Radioactivity in each extract was measured after centrifugation. Additionally, a Soxhlet extraction in methanol/water (8 + 2, v/v) for 16 hours was performed. The liver tissue of the high dose group was additionally extracted/incubated with Tris buffer and pronase.

Study 684090*:* The organs were homogenised for radioactivity determination. Thereafter, the liver tissue was pooled per group and extracted by incubation with pronase for 6 hours at 40 °C. Thereafter, the tissue was further extracted three times with methanol/water (1+1, v/v) and twice with methanol/water (2 + 8, v/v). Radioactivity in each extract was measured after centrifugation. Additionally, a Soxhlet extraction in methanol/water (1 + 1, v/v) at about 80 °C for 16 hours was performed. Finally, the residual sample was hydrolysed in 1 N HCl at 70 °C for approximately 16 hours.

Fat and skin

Study 643735: The tissues were extracted as follows: twice with dichloromethane, once with dichloromethane/acetone (1 + 1, v/v), once with acetone, twice with acetonitrile/water (1 + 1, v/v). Additionally, the skin sample was extracted with methanol/water (2 + 8, v/v) followed by a Soxhlet extraction in methanol/water (8 + 2, v/v).

Study 684090: The tissue was extracted as follows: twice with dichloromethane, twice with dichloromethane/ethanol (1 + 1, v/v), three time with methanol/water (1 + 1, v/v) and once with methanol/water (2 + 8, v/v). Thereafter, the tissue was extracted by incubation with pronase for approximately 16 hours at 40 °C. Thereafter, the tissue was further extracted twice with methanol/water (1 + 1, v/v).

Excreta

Individual excreta samples from the respective time intervals were homogenised in water (1 + 1, w/v) and the radioactivity determined in subsamples by combustion.

Studies 643735 and 684090: The excreta samples collected from 96 to 120 hours and from 312 to 336 hours after the first administration were pooled by time point and by group and were extracted once with acetonitrile, twice with acetonitrile/water (1 + 1, v/v), with methanol/water and water, followed by a Soxhlet extraction in methanol/water (8 + 2, v/v).

After extraction, the remaining solid was dried, and aliquots were combusted to obtain material balances of radioactivity for each examined sample. The extracts were partitioned further with different solvents and analysed by HPLC and as far as appropriate by TLC and LC-MS to determine the metabolic profiles. The TRRs in mg/kg (as parent equivalents) in eggs after administration of radiolabelled fenamidone are shown in Table 9. At the plateau after 9 days, the residues in egg yolk were about 7 times (C-label) higher than in the egg white.

Table 9 TRR in eggs following oral administration of [^{14}C]fenamidone for 14 days.

Day	TRR [a] in mg/kg as parent eq							
	C-phenyl-label				N-phenyl-label			
	Low dose		High dose		Low dose		High dose	
	White	Yolk	White	Yolk	White	Yolk	White	Yolk
1	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
2	0.001	0.001	0.004	0.009	< 0.001	< 0.001	0.005	0.002
3	0.001	0.003	0.008	0.021	0.001	0.001	0.005	0.023
4	0.001	0.007	0.011	0.043	0.001	0.003	0.005	0.045
5	0.001	0.008	0.012	0.077	0.001	0.005	0.004	0.072
6	0.002	0.010	0.016	0.095	0.001	0.007	0.004	0.090
7	0.002	0.009	0.018	0.105	0.001	0.008	0.004	0.098
8	0.001	0.010	0.015	0.120	0.001	0.008	0.003	0.100
9	< 0.001	0.010	0.016	0.119	0.001	0.009	0.004	0.097
10	0.001	0.010	0.020	0.122	0.001	0.009	0.004	0.097
11	0.002	0.012	0.018	0.129	0.001	0.009	0.004	0.087
12	0.003	0.013	0.018	0.131	0.001	0.009	0.005	0.094
13	0.002	0.013	0.019	0.135	0.001	0.009	0.006	0.098
14	0.001	0.011	0.020	0.144	0.001	0.009	0.005	0.099

[a] Mean of 5 birds, values corrected for backgrounds obtained from untreated hens

As shown in Table 10, the overall recoveries of radioactivity were > 91% of the total applied radioactivity (TAR) for the low and high dose groups, respectively. The majority of the radioactivity was in excreta (approximately 90% TAR). All eggs together contained 0.1% of the dose administered, most of which was retained in the yolk. At sacrifice, at both dose levels and in both labels, negligible amounts of radioactivity (0.1% of TAR) were detected in edible organs/tissues and blood. The ratio of residues in high dose to low dose animals ranged from 5 to 16 (see Table 11). The major amounts of radioactivity in the excreta could be extracted. Table 13 shows the results for the low dose (C-phenyl label only) and the high dose samples (both labels).

Table 10 Balance of radioactivity following oral administration of [^{14}C]fenamidone for to laying hens

Matrix	% TAR [a]			
	C-phenyl-label		N-phenyl-label	
	Low dose	High dose	Low dose	High dose
Excreta, 0–336 hours	91	89	91	94
Cage wash	1.3	2.0	2.0	1.5
Total excreted	92	91	93	96
Eggs, 0–336 hours	0.1	0.1	0.1	0.1
Total in edible tissues/organs [b]	< 0.1	< 0.1	< 0.1	< 0.1
Total	92	91	93	96

[a] Mean of 5 animals
[b] Liver, muscle, fat, skin, blood, developing eggs

Table 11 TRR in hen tissues and blood following oral administration of [^{14}C]fenamidone for 14 days

	TRR (mg parent eq/kg) [a]			
Matrix	C-phenyl-label		N-phenyl-label	
	Low dose	High dose	Low dose	High dose
Liver	0.013	0.160	0.005	0.051
Muscle	< 0.001	0.010	< 0.001	0.002
Fat	< 0.001	0.014	< 0.001	0.005
Skin	0.002	0.019	0.001	0.016
Blood	0.004	0.049	0.002	0.022
Plasma	0.002	0.021	< 0.001	0.006
Developing eggs (white)	0.001	0.016	0.001	0.005
Developing eggs (yolk)	0.013	0.149	0.009	0.095

[a] Mean of 5 animals, values corrected for background

Table 12 Extraction of radioactivity from excreta following oral administration of [^{14}C]fenamidone

	C-phenyl-label				N-phenyl-label	
Time, hours	Low dose		High dose		High dose	
	% TRR	% TAR	% TRR	% TAR	% TRR	% TAR
96–120	83	6.1	83	5.5	85	6.1
312–336	80	6.1	85	5.8	80	5.7

In the excreta extracts of the C-phenyl-label groups, at least sixteen radioactive fractions were found, in amounts ranging from < 0.1% to 1.9% of the TAR (low dose) and < 0.1% to 1.8% (high dose). Fenamidone was detected in small amounts (0.1–0.2% TAR low and high dose). RPA 409445, RPA 412708, RPA 412636 and hydroxy-RPA 412708 were found in minor amounts (< 0.1 to 0.6% TAR). Hydroxy-fenamidone was found in amounts of 1.3 to 1.9% of the TAR. Unknown fractions occurred at levels up to 1.6% TAR. The excreta extracts from the N-phenyl-label application (high dose only) showed at least nine radioactive fractions ranging from < 0.1% to 1.6% of the TAR. The parent compound occurred in a minor amount of 0.1% of the TAR. Hydroxy-fenamidone was found in a maximal amount of 1.1%. Unknown metabolite fractions occurred in maximal amounts of 1.6% of the radioactivity administered.

The characterization of the TRR and identification of metabolites (components) in eggs and edible tissues was carried out for the high dose samples only. The findings are summarized in Table 13 for egg white and egg yolk and in Table 14 for liver, fat and skin.

Table 13 Characterization and identification of radioactivity in eggs (high dose)

Component/fraction	Egg white		Egg yolk							
	C-phenyl-label (312–336 h)		C-phenyl-label (96–120 h)		N-phenyl-label (144–168 h)		C-phenyl-label (312–336 h)		N-phenyl-label (312–336 h)	
	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Fenamidone	ND	ND	ND	ND	ND	ND	0.014	11	ND	ND
RPA 409445	ND	ND	0.004	3.4	ND	ND	0.003	2.7	ND	ND
RPA 412708	0.001	2.9	0.028	25	ND	ND	0.022	17	ND	ND
RPA 412636	0.011	74	0.008	8.3	ND	ND	0.014	11	ND	ND

Component/fraction	Egg white		Egg yolk							
	C-phenyl-label (312–336 h)		C-phenyl-label (96–120 h)		N-phenyl-label (144–168 h)		C-phenyl-label (312–336 h)		N-phenyl-label (312–336 h)	
	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
OH-fenamidone	ND	ND	0.007	6.8	0.005	5.1	0.008	7.0	0.013	12
OH-RPA 412708	ND	ND	0.004	2.8	ND	ND	0.002	2.0	ND	ND
Metabolites unidentified (n)	0.001 (1)	7.6 (1)	0.04 [a] (9)	37 (9)	0.051 [b] (2)	48 (2)	0.037 [c] (8)	31 (8)	0.045 [d] (2)	44 (2)
Sub-total	0.013	84	0.091	83	0.056	53	0.1	81	0.058	56
Non-characterized	0.002	16	0.006	5.1			0.008	6.6		
Soxhlet extract	–	–	–	–	0.011	11	–	–	0.012	12
Hexane phase	–	–	–	–	0.001	1.3	–	–	0.002	1.7
Aqueous phase	–	–	–	–	0.021	20	–	–	0.015	15
Pronase incubation	ND	ND	0.015	12.7	–	–	0.019	15	–	–
Total extracted ^{14}C	0.015	100	0.11	101	0.09	85	0.13	102	0.09	85

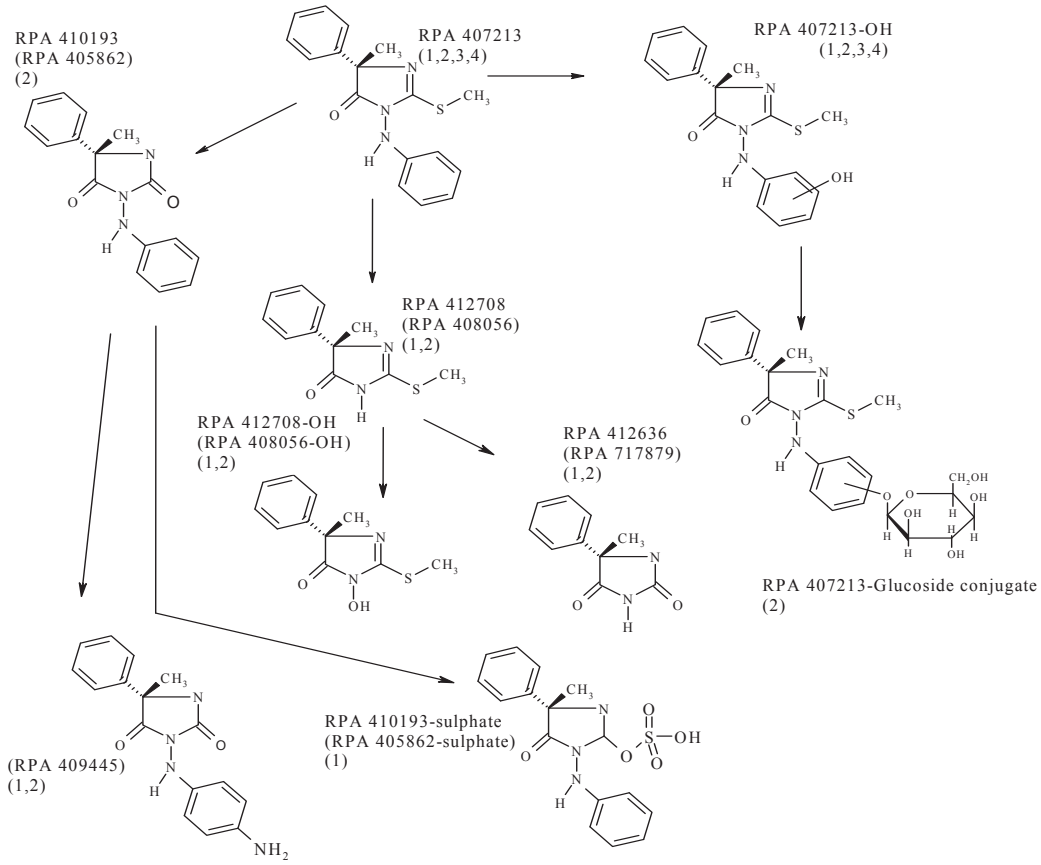
– Not carried out
ND not detected
[a] range: 0.001–0.01 mg eq/kg
[b] range: 0.009–0.042 mg eq/kg
[c] range: 0.001–0.015 mg eq/kg
[d] range: 0.002–0.043 mg eq/kg

Table 14 Characterization and identification of radioactivity in tissues (high dose)

Component/fraction	Liver				Fat		Skin	
	C-phenyl-label		N-phenyl-label		C-phenyl-label		C-phenyl-label	
	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Fenamidone	0.003	1.7	ND	ND	< 0.001	4.6	0.002	14
RPA 409445	ND	ND	ND	ND	0.003	26	ND	ND
RPA 412708	0.002	1.3	ND	ND	ND	ND	ND	ND
RPA 412636	0.023	15	ND	ND	ND	ND	0.002	16
OH-fenamidone	ND	ND	ND	ND	ND	ND	ND	ND
OH-RPA 412708	< 0.001	0.3	ND	ND	ND	ND	ND	ND
Fenamidone Glu [a]	0.009	5.8	ND	ND	ND	ND	ND	ND
Unidentified metabolites (n)	0.072 [b] (6)	47 (6)	0.035 [c] (2)	68 (2)	0.006 (1)	60 (1)	0.006 (2)	38 (2)
Subtotal	0.11	72	0.035	68	0.009	90	0.01	68
Non-characterized	0.013	9.0			0.001	6.5	0.003	22
Soxhlet extracted	–	–	0.002	4.2	–	–	–	–
Hydrolysis extract	–	–	0.001	1.2	–	–	–	–
Hexane phase	–	–	0.000	0.4	–	–	–	–
Aqueous phase	–	–	ND	ND	–	–	–	–
Organic phase	–	–	0.01	21	–	–	–	–
Pronase incubation	0.027	18	–	–	ND	ND	ND	ND
Total extracted ^{14}C	0.15	98	0.048	94	0.01	97	0.013	90

– Not carried out
ND not detected
[a] Fenamidone glucoside
[b] range: < 0.001–0.057 mg eq/kg
[c] range: 0.002–0.033 mg eq/kg

Fenamidone is extensively metabolised in animals. The metabolic profiles differ quantitatively between the species investigated, but qualitatively there are no major differences. The routes and metabolites in animals are consistent across the studies. Figure 1 presents the proposed metabolic pathway for fenamidone in livestock.



(1) In goats dosed with [C-phenyl-UL-^{14}C]-fenamidone
(2) In hens dosed with [C-phenyl-UL-^{14}C]-fenamidone
(3) In goats dosed with [N-phenyl-UL-^{14}C]-fenamidone
(4) In hens dosed with [N-phenyl-UL-^{14}C]-fenamidone

Figure 1 Proposed metabolic pathway of fenamidone in livestock.

Metabolite codes in parentheses are the numbers for the racemic compounds, as used in the original study report. The metabolites have been shown to be present as the S-enantiomers.

Plant metabolism

The metabolism of fenamidone has been studied in grapes, tomatoes, lettuce, carrots and potatoes. The test material used in the studies is characterized in Table 15.

Table 15 Characterization of radio-labelled test material

	[C-phenyl-UL-^{14}C]-fenamidone			[N-phenyl-UL-^{14}C]-fenamidone		
Crop	Report, Bayer reference	Radiochem. Purity [a], %	Spec. activity, MBq/mg	Report, Bayer reference	Radiochem. Purity [a], %	Spec. activity, MBq/mg
Grape	655266, M-183815-01-1	≥ 98.7	1.25	–	–	–
Tomato	10616, M-173256-01-1	99.6	2.51	10616, M-173256-01-1	99.7	2.51
Lettuce	10617, M-173236-01-1	98.5	2.53	10617, M-173236-01-1	98.6	2.55
Potato	10615, M-173249-02-1	99.6 [b] 100 [c]	2.50 [b] 3.27 [c]	10615, M-173249-02-1	99.7 [b] 100 [c]	2.53 [b] 2.95 [c]
Carrot	–	–	–	MEF-06/243 M-275069-02-1	99	3.7

[a] by HPLC, TLC
[b] Outdoor experiment
[c] Indoor experiment

Grapes

The metabolism of fenamidone in grapes was investigated by Voelkel in 1999 (655266, M-183815-01-1). C-phenyl-^{14}C-fenamidone alone was used in this study. Grape vine plants (Pinot Noir variety) were treated with four foliar applications of C-phenyl-^{14}C-fenamidone during the course of berry growth and maturation to a total application of 1.65 kg ai/ha. The details of grape vine treatment are given in Table 16.

Table 16 Timing and details of grape vine treatments with [^{14}C]fenamidone

Treatment	Rate, g ai/ha	Timing	Growth stage
1	505	136 days before harvest	Before flowering Flower buds starting to separate
2	485	100 days before harvest, 36 days following first treatment	80% flower hoods fallen, Young fruits starting to swell
3	504	78 days before harvest, 58 days following first treatment	Well-formed bunches start to hang
4	156	24 days before harvest, 112 days following first treatment	Beginning of maturation

Before treatment the soil surface around the base of each vine as well as the adjoining vine plants were protected with plastic sheeting so as to prevent loss of the radioactive material into the surrounding environment and, therefore, potential uptake by the roots of the vine plants. At harvest, 24 days following the last treatment, all remaining grape bunches on the vines were removed. Prior to processing, all bunches were washed using water, followed by aqueous methanol and finally methanol. The grapes were then removed from the stems and then, following chilling to reduce enzyme activity, separated into skin, pips and pulp. All samples were assayed for TRR by LSC, either directly or following processing and sample combustion.

The individual components of the grape bunches were subjected to a succession of solvent partition and extraction procedures culminating in enzyme treatment followed by harsh hydrolytic conditions, the last being used to investigate the small amounts of unextracted radioactive residue. The extracts obtained were subjected to TLC as well as HPLC in order to investigate the extracted components of the residue. Selected extracts were then analysed using LC/MS to obtain structural information with regard to those components resolved by the chromatography used. The distribution of radioactivity in the washes and various grape bunch parts and for the grapes for the pre-harvest and for the mature harvest samples is shown in Table 17.

Table 17 Distribution of radioactive residues in the pre-harvest and mature grapes

Sampling date	Pre-harvest grape bunches (prior of last application)				Mature harvest grape bunches (24 days after fourth treatment)			
Samples	Whole bunches Incl. washes & stems		Grapes Without washes & stems		Whole bunches Incl. washes & stems		Grapes Without washes & stems	
	mg/kg [a]	% TRR	mg/kg [a]	% TRR	mg/kg [a]	% TRR	mg/kg [a]	% TRR
Surface wash	0.79	45	–	–	0.40	34	–	–
Stems	0.27	16	–	–	0.22	19	–	–
Skin	0.28	16	0.3	41	0.25	21	0.27	44
Pulp	0.295	17	0.32	44	0.27	22	0.29	47
Pips	0.11	6.3	0.12	16	0.048	4.1	0.052	8.6
Total	1.7	100	0.74	100	1.2	100	0.61	100

[a] mg parent eq/kg

Similar results for the distribution of radioactivity were obtained for the pre-harvested grapes and the mature harvest grapes. The major part of the radioactivity associated with the grape bunches could be extracted and represented 89.1% of the TRR (including the washes) for mature harvest grape bunches. The non-extracted radioactivity was confined mainly to the stem, skin and pips and some effort was made to release it for further analysis. The procedures used included enzyme treatment, followed by acid and alkali hydrolysis. Table 18 shows the metabolites identified and components resolved in mature harvest grapes from vines treated four times to a total of a nominal 1.65 kg fenamidone/ha. The extracted radioactivity from each grape bunch part as well as the washes were

separately analysed by HPLC. Parent compound was the only component detected in the washings demonstrating the stability of fenamidone on the surface of the grape bunches when exposed to field conditions. Results for the stem, skin, pips and pulp extracts showed the presence of two major components, which were indicated to be parent compound and the metabolite RPA 410193. In addition to fenamidone and RPA 410193 up to eleven additional radioactive components were detected in the plant fractions. Individually these radioactive components did not exceed 4.2% of the TRR in the mature grapes. Despite this, attempts were made to obtain additional information regarding the structure of two of the components in the most abundance (M1 at 4.2% TRR and M2 at 3.4% of the TRR). From the evidence obtained, it is suggested that M1 may be hydroxylated RPA 410193, and M2 may be hydroxylated parent compound. In both cases it was reasonable to assume that the hydroxylation has taken place in the amino-phenyl ring and that the basic ring structure of the parent compound remained intact.

Table 18 Metabolites identified and components resolved in mature harvest grapes matrices.

Component	Stems		Skin		Pips		Pulp		Washes		Total	
	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR	mg/kg	%TRR
Extracted												
Parent (RPA 407213)	0.095	8.0	0.061	5.1	0.004	0.3	0.098	8.2	0.404	34.0	0.662	56
RPA 410193	0.018	1.5	0.065	5.4	0.014	1.2	0.107	9.0	ND	ND	0.204	17
M1 (RPA 410193-OH) [a]	0.009	0.8	0.023	1.9	0.003	0.2	0.015	1.2	ND	ND	0.050	4.2
M2 (RPA 407213-OH)[a]	0.012	1.0	0.018	1.5	0.001	0.1	0.009	0.8	ND	ND	0.040	3.4
M3[b]	0.005	0.5	0.015	1.2	ND	ND	0.018	1.5	ND	ND	0.038	3.2
M4	0.009	0.8	ND	ND	0.001	0.1	ND	ND	ND	ND	0.010	0.9
M5	< 0.001	< 0.1	ND	ND	ND	ND	ND	ND	ND	ND	< 0.001	< 0.1
M6	ND	ND	0.011	1.0	0.001	0.1	0.006	0.5	ND	ND	0.029	2.4
M7	0.003	0.2	0.009	0.7	ND	ND	ND	ND	ND	ND	0.011	0.9
M8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
M9	0.002	0.2	ND	ND	ND	ND	0.003	0.3	ND	ND	0.005	0.5
M10	0.003	0.2	ND	ND	ND	ND	ND	ND	ND	ND	0.003	0.2
M11	< 0.001	< 0.1	0.003	0.2	ND	ND	0.005	0.4	ND	ND	0.008	0.6
Extracted Subtotal	0.166	14	0.205	17	0.024	2.0	0.261	22	0.404	34	1.060	89
Non-extracted Subtotal	0.056	4.67	0.045	3.79	0.024	2.05	0.005	0.039	< 0.001	0.00	0.13	10.9
Released after protease treatment	0.008	0.68	0.004	0.30	< 0.001	0.04	0.001	< 0.11	NA	NA	0.013	1.1
Released after 'harsh' extractions [c]	0.006	0.54	0.003	0.23	< 0.001	0.03	0.002	0.13	NA	NA	0.011	0.9
Released after hydrolysis [d]	0.01	0.84	0.007	0.62	0.01	0.83	0.002	0.17	NA	NA	0.029	2.5
Non-released Radioactivity	0.031	2.61	0.031	2.64	0.014	1.16	< 0.001	0.03	NA	NA	0.077	6.5
Total	0.22	19	0.25	21	0.048	4.1	0.27	22	0.40	34	1.2	100

[a] Tentative identity
[b] Possibly comprising two components
[c] Solids successively suspended in 0.1 M HCl and 0.1 N NaOH
[d] Solids successively refluxed with 6 M HCl and 6 M NaOH
ND not detected (or below the LOQ)NA not applicable

The metabolism of fenamidone in field grown grapes is mainly characterised by the formation of RPA 410193, i.e. loss of the thiomethyl group and formation of an imidazolidinedione. Some evidence was obtained to suggest that hydroxylation of parent compound as well of the major metabolite, RPA 410193 also occurred. The number of other metabolites detected, albeit at very low levels, demonstrated the further metabolism of fenamidone. With regard to the TRR in the grapes in excess of 80% was accounted for in terms of identified and tentatively identified metabolites. Figure 2 shows the proposed metabolic pathway for fenamidone in grapes.

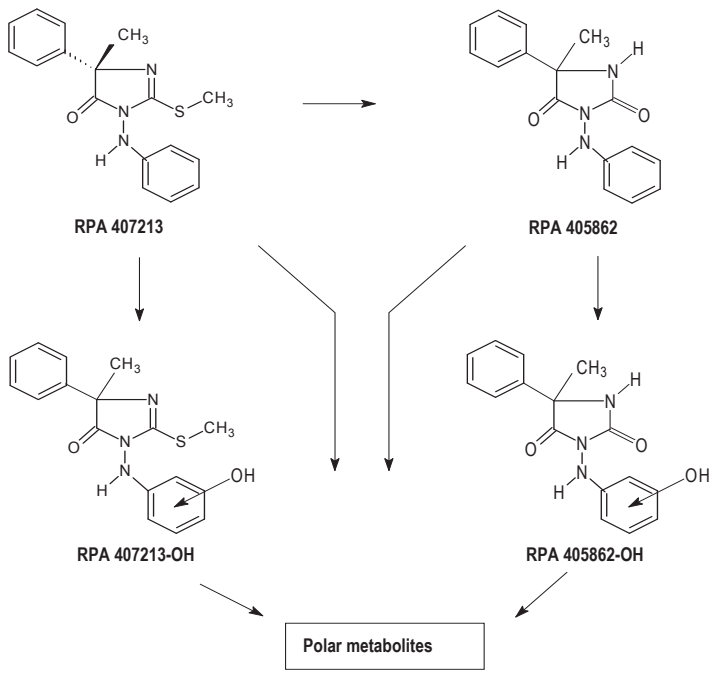


Figure 2 Proposed metabolic pathway for fenamidone (RPA 407213) in grapes

Metabolite codes in this pathway are the numbers for the racemic reference compounds, as used in the original study report. In an additional study, it has been shown that all metabolites and degradation products were formed as the S-enantiomers.

Tomato

The metabolism of fenamidone in tomatoes was investigated by Oliver in 1999 (10616, M-173256-01-1) on the variety "Gardeners Delight" following treatment with [^{14}C]fenamidone at a cumulative rate equivalent to 1.5 kg ai/ha. This was applied in three foliar spray treatments, each of 0.5 kg ai/ha, during the course of fruit growth. Untreated control plants were grown among the treated plants and also at some distance from the treated plants. Both labels, C-phenyl and N-phenyl, were used separately to study the metabolism of the molecule. For each treatment fenamidone was formulated as a 10% EC. The crop was grown to maturity under glass and was sampled at two interim time points and at maturity. There was an interval of 7 days between the last application and harvest. Following harvest, the fruits were picked, weighed fresh, rinsed with acetonitrile and then frozen prior to further analysis. The frozen fruits were then homogenised and extracted with acetonitrile. The rinses and extracts were concentrated prior to analysis by HPLC in order to establish the quantitative and qualitative nature of the residue. Selected representative extracts were cleaned-up using C_{18} solid phase extraction cartridges and analysed using LC-MS/MS to obtain confirmation of the identities indicated by HPLC.

The distribution of radioactivity and the calculated TRR for the treated plants are shown in Table 19. For both labels, extraction efficiencies of 87.1% and 91.8% were achieved. The components of the TRR at final harvest are summarised in Tables 20.

Table 19 Characterisation of radioactivity in tomato fruits 7 days after 3rd treatment

^{14}C-Label	Acetonitrile rinses		Acetonitrile extracts		Unextracted		TRR
	mg/kg [a]	% TRR	mg/kg [a]	% TRR	mg/kg [a]	% TRR	mg/kg [a]
C-Phenyl	0.06	31	0.105	57	0.024	13	0.19
N-Phenyl	0.085	41	0.105	51	0.017	8.2	0.21

[a] mg parent eq/kg

Table 20 Identification of residues in [^{14}C]fenamidone treated tomatoes

Component	C-phenyl label		N-phenyl label	
	mg parent eq/kg	% TRR	mg parent eq/kg	% TRR
Polar unknowns [a]	0.017 (6)	9.7	0.009 (4)	4.7
Fenamidone	0.12	66	0.16	76
RPA 410193	0.017	9.4	0.019	9.3
RPA 407599	0.004	2.3	0.004	2.1
Non-polar unknowns	< 0.001	0.2	< 0.001	0.1
Unextracted	0.024	13	0.017	8.2
Total	0.185	100	0.21	100

[a] Numbers in brackets indicate the number of components present.

The metabolic profile obtained with each label was similar. Parent fenamidone was the major component present, with significant amounts of RPA 410193 along with a number of minor components. A metabolic pathway for fenamidone metabolism in tomato is proposed in Figure 3.

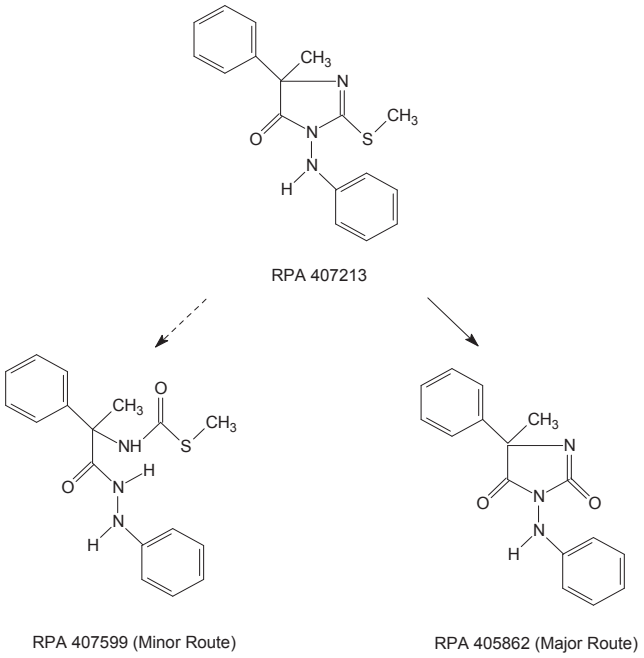


Figure 3 Proposed metabolic pathway for fenamidone (RPA 407213) in tomato

Metabolite codes in this pathway are the numbers for the racemic reference compounds, as used in the original study report. In an additional study, it has been shown that all metabolites and degradation products were formed as the S-enantiomers.

Lettuce

The metabolism of fenamidone on iceberg lettuce was investigated by Oliver and Clarke in 1999 (10617, M-173236-01-1) using [^{14}C]fenamidone labelled on two positions. Fenamidone was applied to lettuces in a 10% EC formulation. Four foliar spray applications were made at the nominal field rate of 0.4 kg ai/ha, the total treatment rates achieved over four applications were 1.4 kg ai/ha for the C-phenyl and the N-phenyl treated lettuces. The plants were grown to maturity outdoors, under ambient environmental conditions. After final harvest, 7 days after the fourth application, the outer wrapper leaves were separated from the lettuce heads. The wrapper leaves were rinsed with acetonitrile. Both plant parts were frozen, then homogenised and extracted by maceration with acetonitrile, methanol/water and acetonitrile/water. Aliquots of the dry extracted residue were combusted to determine the amount of unextracted radioactivity.

Table 21 shows the TRR in the different plant parts at harvest, seven days after 4th application. The acetonitrile rinses and combined plant extracts were subjected to quantitative and qualitative analysis by reverse-phase HPLC and normal phase TLC. Metabolite identification was confirmed by LC-MS. The principal components of the TRR are given in Table 22.

Table 21 Distribution of radioactivity in lettuce at final harvest 7 days after 4th treatment

^{14}C-Label	Plant part	TRR, mg/kg	Rinse, %	Extracted, %	Unextracted, %
	Wrapper leaves	12	9.2	86	4.5
C-phenyl	Heads	0.29	NA	94	6.5
	Whole lettuce	9.3	9.1	86	4.5
	Wrapper leaves	12	13	81	6.0
N-phenyl	Heads	0.21	NA	94	6.5
	Whole lettuce	9.0	12.7	81	6.0

NA: not applicable

Table 22 Identification of residues at final harvest in lettuces

	C-phenyl label			N-phenyl label		
Component	Heads,	Wrapper leaves	Whole lettuce,	Heads	Wrapper leaves,	Whole lettuce
	mg/kg (%TRR)	mg/kg (%TRR)	mg/kg (%TRR)	mg/kg (%TRR)	mg/kg (%TRR)	mg/kg (%TRR)
Polar multi-component	0.043 (15)	0.36 (2.9)	0.28 (3.0)	0.04 (17)	0.24 (2.1)	0.19 (2.1)
Fenamidone	0.21 (70)	11 (92)	8.6 (92)	0.16 (73)	11 (91)	8.2 (91)
RPA410193	0.008 (0.26)	0.08 (0.65)	0.06 (0.66)	0.007 (3.2)	0.07 (0.57)	0.053 (0.59)
RPA412636	0.008 (2.7)	ND	0.002 (0.02)	ND	ND	ND
Glucoside conjugates [a]	0.008 (2.9)	ND	0.002 (0.02)	ND	ND	ND
Unextracted	0.02 (6.5)	0.56 (4.5)	0.42 (4.5)	0.014 (6.5)	0.69 (6.0)	0.54 (6.0)

[a] RPA 412708 and fenamidone glucoside conjugate eluted from HPLC column with same retention time

The metabolic profile obtained with each label was similar. The major component in each crop part was parent fenamidone. The remaining extracted radioactivity was comprised of RPA 410193 and multiple unidentified polar components. In addition, trace levels of RPA 412636 and a glucoside conjugate of fenamidone were present in extracts from the C-phenyl-label treatment. A metabolic pathway for fenamidone metabolism in lettuce is proposed in Figure 4.

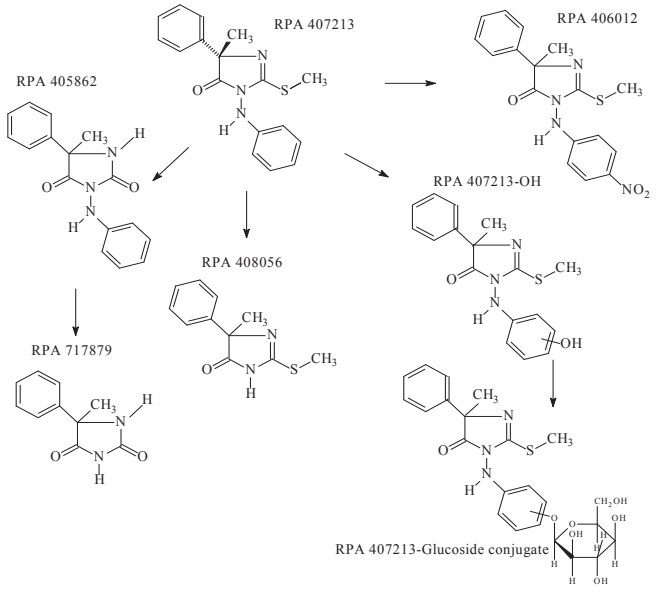


Figure 4 Proposed metabolic pathway for fenamidone (RPA 407213) in lettuce

Metabolite codes in this pathway are the numbers for the racemic reference compounds, as used in the original study report. In an additional study, it has been shown that all metabolites and degradation products were formed as the S-enantiomers.

Potato

An outdoor study was conducted by Clark in 1999 on potatoes (10615, M-173249-02-1) using N-phenyl and C-phenyl-[^{14}C]fenamidone in order to investigate plant metabolism. Three foliar spray applications were made each at the nominal field rate of 0.5 kg ai/ha. The total treatment rates achieved over three applications were 1.30 kg ai/ha and 1.36 kg ai/ha for the C-phenyl and N-phenyl label respectively. The potatoes were grown to maturity outdoors, under ambient environmental conditions. After final harvest, 14 days after the third application, the haulm was separated from the tubers. The tubers were rinsed with water and peeled. All plant parts were frozen, then homogenised and extracted by maceration with acetonitrile, acetonitrile/water and methanol. Aliquots of the dry extracted residue were combusted to determine the amount of unextracted radioactivity. The TRR are given in Table 23. Following concentration, the combined plant extracts were subjected to quantitative and qualitative analysis by HPLC and TLC, employing certified reference standards as retention time and relative front markers. The compound identification was confirmed by LC-MS/MS for parent, RPA 412636 and RPA 412708. The principal components of the TRR are given in Table 24. All concentration data are given in mg parent eq/kg.

Table 23 Potato TRR at final harvest, 14 days after 3rd application.

^{14}C-Label	Plant part	TRR, mg/kg	% Extracted	% Unextracted
C-phenyl	Tubers (peeled)	0.08	76	24
	Peel	0.12	66	34
	Whole tubers	0.09	73	27
	Haulm	6.6	77	23
N-phenyl	Tubers (peeled)	0.06	46	55
	Peel	0.032	48	53
	Whole tubers	0.038	46	54
	Haulm	5.9	78	22

Table 24 Distribution of metabolites in mature potatoes treated by ^{14}C-labelled fenamidone

	C-phenyl label							
Component/fraction	Peeled tuber		Peel		Whole tuber		Haulm	
	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR	mg/kg	% TRR
Fenamidone	< 0.001	0.2	0.008	6.7	0.002	2.3	3.4	51
RPA412708 [a]	0.005	6.4	0.007	5.8	0.006	6.4	0.13	2.0
RPA410193	ND	–	0.001	0.8	< 0.001	0.3	0.062	0.9
RPA412636 [a]	0.004	5.5	0.009	7.4	0.005	6.3	ND	–
Unknown 1	ND	–	0.009	7.4	0.002	2.5	ND	–
Unretained metabolites (polar unknowns)	0.037	46	0.027	23	0.034	40	1.5	22
Retained metabolites (non-polar unknowns + RPA 409446)	ND	–	0.001	2.1	< 0.001	0.7	ND	–
Procedural losses	0.014	17	0.014	12	0.014	16	< 0.001	–
Unextracted radioactivity	0.019	24	0.040	34	0.023	27	1.5	23
Total	0.08	100	0.12	100	0.09	101	6.6	100
	N-phenyl label							
Fenamidone	ND	–	0.004	12	0.002	5.8	4.1	69
RPA 410193	ND	–	< 0.001	0.3	< 0.001	0.2	0.06	1.0
Unknown 1	ND	–	0.001	4.4	0.001	2.1	ND	–
Unretained metabolites (polar unknowns)	0.021	34	0.007	21	0.012	31	0.46	7.7
Retained metabolites (non-polar unknowns + RPA 409446)	ND	–	0.002	6.4	0.001	3.1	ND	–
Procedural losses	0.007	12	0.001	3.1	0.003	8.5	< 0.001	< 0.1
Unextracted radioactivity	0.033	55	0.017	53	0.020	54	1.3	22
Total	0.06	101	0.032	100	0.04	105	5.9	100

[a] C-phenyl specific metabolites

An additional indoor experiment was carried out in order to determine the nature of the major unidentified polar component of the potato tuber TRR which was unretained on the initial reversed-phase HPLC. Two post emergence applications, one of C-phenyl-[^{14}C: ^{13}C]fenamidone (4:1) at a treatment rate of 1.6 kg ai/ha, the other of N-phenyl-[^{14}C: ^{13}C]-fenamidone (4:1) at a treatment rate of 1.4 kg ai/ha were made to separate groups of potato plants grown in pots under greenhouse conditions. The treatment solutions were applied to the haulm (cut stem, mature and immature leaves) and at the soil surface surrounding the base of the stem to try to maximise the incurred TRR, and reproduce the field situation as far as practicable. These plants were grown to maturity and then harvested. The resultant potato tubers were rinsed with water and homogenised. Representative subsamples were extracted by maceration with acetone/water. The TRR for greenhouse grown potato tubers are summarised in Table 25.

As previously, the TRR for greenhouse grown tubers was also low. HPLC analysis of extracts from greenhouse grown potato tubers was carried out. These were shown to have similar profiles to those previously obtained from field grown potato tubers, for both labels. The C-phenyl-[^{14}C, ^{13}C]fenamidone treated tuber extract was subjected to solid phase extraction (SPE) to separate the polar residue from the parent compound. The appropriate fractions were concentrated and analysed using a second HPLC method to retain and resolve individual polar components. This method resolved the previously unretained material, corresponding to that which accounted for 39.5% TRR (0.034 mg/kg) in extracts derived from C-phenyl-fenamidone treated field grown potato tubers, into nine discrete entities (Table 26) confirming its multicomponent nature.

Table 25 TRR in whole potato tubers (grown indoors)

Labels	TRR, mg parent eq/kg	TRR extracted, %	TRR unextracted, %
C-Phenyl-[^{14}C, ^{13}C]	0.023	33	67
N-Phenyl-[^{14}C, ^{13}C]	0.006	25	75

Table 26 Composition of polar material in C-phenyl treated potato tubers

Tubers	Concentration, mg parent eq/kg									
	P1	P2	P3	P4	P5	P6	P7	P8	P9	Total
Greenhouse [a]	< 0.001	0.001	0.001	< 0.001	0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.005
Field grown	0.001	0.008	0.008	0.002	0.006	0.001	0.001	0.002	0.004	0.034

[a] Treated with C-phenyl-[^{14}C : ^{13}C]--fenamidone (4 : 1) P1–P9: Individual polar fractions

Additional analysis indicated that P3 and P4 are likely to be RPA 412636 conjugates, which hydrolyse to release free RPA 412636. Thus, a further 0.01 mg/kg (11.5% TRR) of the C-phenyl-fenamidone treated field grown potato tubers extractable radioactive residue was characterised as being conjugated RPA 412636. The total amount of RPA 412636 found in treated potato tuber extracts as free or conjugated material was 0.015 mg/kg (17.8% TRR).

The N-phenyl-[^{14}C, ^{13}C]-fenamidone treated tuber extract concentrate was also analysed on the second HPLC system. The resulting chromatogram showed the presence of four peaks of polar origin. Therefore, the polar material, which accounted for 30.8% TRR (0.012 mg/kg) in extracts derived from N-phenyl-fenamidone treated field grown potato tubers, is postulated to be composed of at least four discrete entities, as presented in Table 27.

Table 27 Composition of polar material in N-phenyl treated potato tubers

Sample	Concentration, mg parent eq/kg				
	PA	PB	PC	PD	Total
Greenhouse grown potato tubers [a]	< 0.001	< 0.001	< 0.001	< 0.001	0.001
Field grown potato tubers	0.004	0.003	0.002	0.003	0.012

[a] Treated with N-phenyl-[^{14}C : ^{13}C]-fenamidone (4 : 1)
PA–PD: Individual polar fractions

The presence of fewer polar entities in sample extracts derived from N-phenyl-fenamidone compared to C-phenyl-fenamidone treated potato tubers is due to the position of the ^{14}C-radiolabel. Cleavage of the N-N bond during potato metabolism of N-phenyl-fenamidone results in loss of non-radiolabelled RPA 412636 and RPA 412708. This process is likely to be accompanied by formation of radiolabelled aniline analogues. These are known to bind to plant matrices and are likely to contribute to the 53.9% (0.02 mg/kg) unextracted radioactive residue for N-phenyl-fenamidone treated tubers, compared to the 26.8% (0.023 mg/kg) unextracted radioactive residue for C-phenyl-fenamidone treated tubers.

In summary, the TRR found in potato tubers treated with fenamidone at 3 × 0.5 kg ai/ha and grown to maturity were very low (0.09 mg/kg and 0.04 mg/kg for the C-phenyl- and N-phenyl-label, respectively). Parent fenamidone accounted for 2.3 to 6 % (0.002 mg/kg) of TRR. The metabolites RPA 412708 and RPA 412636, each accounting for 6% of TRR and very low in absolute concentration (0.005–0.006 mg/kg) were identified. Because these metabolites were also identified as soil metabolites, it is assumed that they were formed in the soil and taken up directly from the soil. Furthermore, about 40% (C-phenyl-label) or 31% (N-phenyl-label) of TRR could be characterized as polar material. Figure 5 shows the proposed metabolic pathway for fenamidone in potatoes.

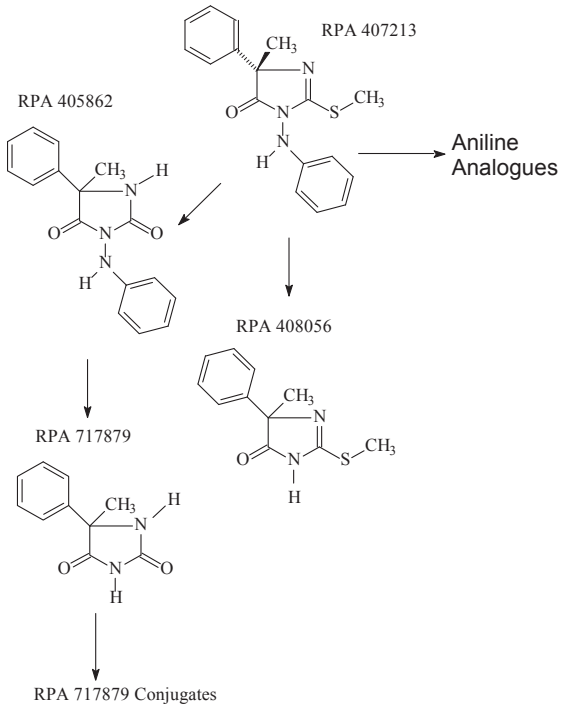


Figure 5 Proposed metabolic pathway for fenamidone (RPA 407213) in potatoes

Metabolite codes in this pathway are the numbers for the racemic reference compounds, as used in the original study report. In an additional study, it has been shown that all metabolites and degradation products were formed as the S-enantiomers.

Carrots

The metabolism of fenamidone was investigated in carrots grown outdoors under ambient conditions (Sur, 2006; MEF-06/243, M-275069-02-1). The test material was [N-phenyl-UL-^{14}C]-fenamidone. The test material was applied three times as an SC 500 formulation at a rate of 0.3 kg ai/ha, giving a seasonal application rate of 0.9 kg ai/ha. The first application was made pre-emergence (one week after sowing), followed by two foliar applications to the emerged crop, 8 and 14 weeks after sowing.

Carrot leaves and roots were harvested at maturity, 14 days after the last application. The TRR found in the fractions are summarised in Table 28.

Table 28 TRR in carrots following application of [N-phenyl-UL-^{14}C]-fenamidone

Plant part	TRR, mg fenamidone eq/kg	% Extracted	% Unextracted
Leaves	30.5	99.7	0.33
Roots	0.04	93	7.3

The majority of the radioactivity (between 81.3% and 98.7% of the TRR) was effectively extracted at ambient temperature with acetonitrile/water using a high-speed blender. After evaporation of the combined extracts of leaves, the radioactivity was partitioned between a dichloromethane and an aqueous phase. Only 1.2% of the TRR remained in the aqueous phase, whereas 97.5% of TRR was found in the organic phase. For roots, the combined acetonitrile/water extracts were simply concentrated without partitioning.

The leaf solids still contained 0.41 mg/kg (1.3% of TRR). A two-step microwave-assisted extraction, with neutral and acidic solvent then yielded the final post-extraction solids (PES), which contained only 0.104 mg/kg (0.33% of TRR). The radioactive residue in the root solids was already very low (0.008 mg/kg, 18.7% of TRR). After the same microwave extraction procedure, only 0.003 mg/kg (7.25% of TRR) remained in the final post-extraction solids (PES).

The extracts were analysed by HPLC or TLC for quantification of the parent compound and metabolites. These were identified by co-chromatography with radiolabelled or non-radiolabelled reference compounds and/or by mass spectroscopy. The distribution of radioactivity in identified or characterised components is summarised in Table 29.

Table 29 Distribution of radioactivity in carrots after treatment with [N-phenyl-UL-^{14}C]-fenamidone

Fraction/component	Leaves		Roots	
	mg/kg	% TRR	mg/kg	% TRR
Fenamidone	27	89	0.012	29
RPA 411639	1.4	4.5	NA	NA
RPA 410193	0.48	1.6	0.003	7.2
RPA 413255	0.13	0.44	0.008	19
RPA 221701	0.056	0.19	0.002	5.4
Fenamidone dimer	0.050	0.17	ND	ND
RPA 221607	0.039	0.13	0.002	5.2
Carbohydrates	0.14	0.45	NA	NA
Total identified	29	96	0.027	65
Total characterised	1.03	3.3	0.010	27
Total extracted	30	100	0.037	93
Post extraction solids (PES)	0.104	0.33	0.003	7.3
Total	31	100	0.04	100

NA not applicable or not analysed
ND not detected

The residue in both leaves and roots consisted predominantly of unchanged fenamidone. The metabolic pattern showed that the three rings of fenamidone remain intact with no intermediate metabolites resulting from cleavage on the N-phenyl ring, although there was clear evidence for degradation of the N-phenyl ring and re-incorporation of the $^{14}CO_2$ in the plant leaves in the form of radiolabelled glucose. Aniline, the three isomer aminophenols (2-, 3-, 4-aminophenol) and 2- and 4-nitroaniline or conjugates thereof were specifically included as targets for analysis, but were not detected in either leaves or roots. A minor metabolic reaction was the nitration of the N-phenyl ring in the 2- and 4-positions to produce RPA 413255 and RPA 411639, respectively. A further route of degradation was hydrolysis of the N=C bond of the imidazolinone ring leading to the metabolites RPA 410193, RPA 221701, and RPA 221607 by replacement of the thiomethyl substituent by a carbonyl group. Figure 6 shows the proposed metabolic pathway for fenamidone in carrots.

Overall, the five plant metabolism studies submitted provide a clear understanding of the fate of the fenamidone in plants, both the C-phenyl and N-phenyl portions. The metabolic profiles differ

quantitatively between the plant species, but qualitatively there are no major differences; the routes and products of metabolism in plants are consistent across the studies. The overall metabolic pathway is consistent between the different crop categories fruits and fruiting vegetables, leafy vegetables, root and tuber vegetables. Parent fenamidone forms the largest part of the residue and the only significant metabolite is RPA 410193, diketo-fenamidone, formed by oxidative hydrolysis of the thiomethyl side chain.

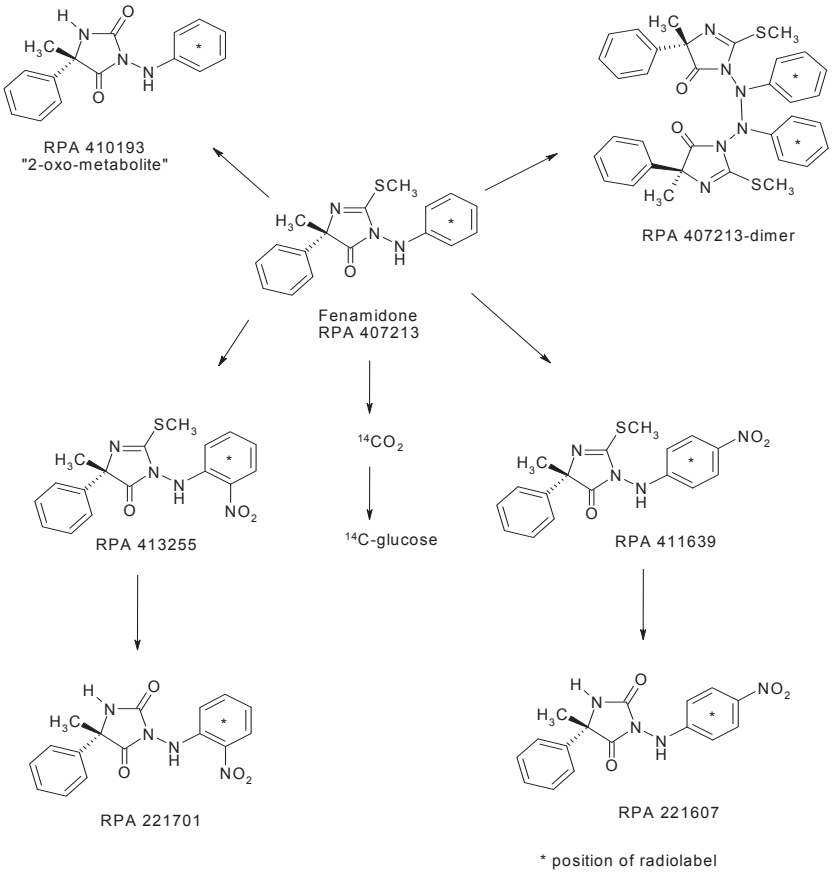


Figure 6 Proposed metabolic pathway for fenamidone in carrots

Metabolite codes in this pathway are the numbers for the racemic reference compounds, as used in the original study report. In an additional study, it has been shown that all metabolites and degradation products were formed as the S-enantiomers.

Environmental fate in soil and water-sediment systems

The FAO Manual (FAO, 2009) explained the data requirements for studies of environmental fate. The focus should be on those aspects that are most relevant to MRL setting. For fenamidone, supervised residue trials data were received for foliar spray on permanent crops and on annual crops. A further application is on cotton seed as in furrow treatment. Therefore, according to the FAO manual, studies on the aerobic degradation in soil, photolysis, hydrolysis, rotational crops (confined, field) and field dissipation were evaluated. For information on hydrolysis and photolysis see also chapter "Physical and chemical properties", Table 1. The fate and behaviour of fenamidone in soils was investigated using fenamidone radio-labelled in two different positions, [C-phenyl-UL-^{14}C]- and [N-phenyl-UL-^{14}C]-fenamidone.

Aerobic degradation in soil

The route of aerobic degradation of fenamidone has been investigated in three soils: a clay loam (Loam by USDA classification; Simmonds and Burr, 1999; Report 201609, M-173243-01-1), a sandy loam and a loam (Burr and Bullus, 2000; Report 202200, M-240551-01-1). Fenamidone radio-labelled in two different positions, [C-phenyl-UL-^{14}C]-fenamidone and [N-phenyl-UL-^{14}C]-fenamidone, was applied separately to the clay loam and sandy loam soils, only [C-phenyl-UL-^{14}C]-fenamidone was applied to the loam. The clay loam was treated at a rate equivalent to 1.6 kg ai/ha, the sandy loam and loam at rates equivalent to 1.2 kg ai/ha. The samples were also connected to a series of traps to retain any volatiles. Throughout the 365-day duration of the studies, the soil samples were maintained in the dark at 20 ± 2 °C and at known moisture contents.

Good overall radiochemical balances were obtained in each case; 94% to 97% of TAR at day 0, 92% to 99% of TAR at mean, over all incubation intervals. Fenamidone was rapidly metabolised in the three soils to two major metabolites, RPA 412708 and RPA 412636, both observed only from the C-phenyl treatment. RPA 411639 and RPA 413255 were observed as minor metabolites in the clay loam and loam, and at higher levels in the sandy loam, where two other major metabolites were found, RPA 221607 and RPA 221701. There were no unique metabolites observed from the N-phenyl label. Levels of volatile radioactivity remained quite low, < 10% of the TAR after 365 days. Unextracted radioactivity increased with time, reaching 31% and 46% for the C-phenyl-label and N-phenyl-label respectively in the clay loam, 14% and 26% respectively in the sandy loam and 21% for the N-phenyl-label in the loam. Various unknown metabolites were formed, which could be separated into numerous individual components, none of which reached a significant level (< 8% of TAR) and consequently the unknown components were not considered to contain any major metabolites. The composition of radioactivity is summarized in Tables 30 to 34.

Table 30 Composition of radioactivity in a clay loam soil by HPLC (C-phenyl-fenamidone)

Time, days	% TAR								
	% Extracted	Fenamidone	Unknown [a] (group 1)	RPA 412636	RPA 412708	RPA 411639	RPA 413255	Unknown [a] (group 2)	Others (< 5% each)
0	97	97	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1	92	88	0.09	0.26	3.4	0.00	0.00	0.00	0.25
3	88	75	0.46	1.5	7.8	0.00	0.48	1.9	0.94
7	77	50	1.1	2.6	13	1.3	2.0	6.1	1.5
14	66	24	2.1	7.1	15	4.9	7.9	1.5	4.1
28	63	12	2.3	11	14	4.8	7.9	5.8	4.5
64	52	4.3	3.6	12	8.7	4.7	5.8	8.8	4.0
90	55	3.3	3.1	14	6.1	4.1	4.8	8.6	10
120	53	2.6	3.3	19	5.4	3.9	5.3	6.3	7.8
182	56	2.3	5.7	19	3.5	2.2	3.7	11	8.5
273	48	2.1	4.8	18	1.9	1.3	3.2	8.2	8.4
365	50	1.6	6.2	23	1.2	0.44	1.7	6.7	8.4

[a] Two groups of unknown metabolites: polar (group 1) and non-polar (group 2)

Table 31 Composition of radioactivity in a clay loam soil by HPLC (N-phenyl-fenamidone)

Time, days	% TAR						
	% Extracted	Fenamidone	Unknown [a] (group 1)	RPA 411639	RPA 413255	Unknown [a] (group 2)	Others (< 5% each)
0	98	98	0.00	0.00	0.00	0.00	0.00
1	88	84	0.54	0.87	0.00	1.9	0.62
3	82	77	0.95	2.1	0.58	1.1	1.2
7	69	59	1.4	2.3	1.9	2.3	1.5
14	55	35	3.1	4.4	5.8	4.4	2.0
28	43	17	3.8	5.4	7.9	7.3	1.8
64	39	5.0	2.8	6.8	9.6	10	4.5
90	36	4.3	3.4	5.5	6.9	11	5.7

Time, days	% TAR						
	% Extracted	Fenamidone	Unknown [a] (group 1)	RPA 411639	RPA 413255	Unknown [a] (group 2)	Others (< 5% each)
120	33	2.9	4.4	3.9	5.7	9.9	5.9
182	34	2.7	5.9	3.0	4.4	11	6.5
273	29	2.6	4.5	2.7	4.2	9.0	6.0
365	32	2.1	2.9	1.9	3.9	12	9.2

[a] Two groups of unknown metabolites: polar (group 1) and non-polar (group 2)

Table 32 Composition of radioactivity in a sandy loam soil by HPLC (C-phenyl-fenamidone)

Time, days	% TAR										
	% Extracted	Fenamidone	RPA 412636	RPA 412708	RPA 410193	RPA 409446	RPA 410995	RPA 411639	RPA 413255	Late group	Others [a]
0	98	98	ND	ND	ND	ND	ND	ND	ND	ND	ND
1	92	78	ND	9.2	ND	ND	ND	ND	ND	5.3	ND
3	93	52	6.0	6.1	2.4	ND	ND	3.2	3.3	16	3.3
7	92	35	10	6.8	1.5	ND	ND	5.3	4.6	24	4.6
14	92	25	10	13	1.1	0.31	0.56	7.8	8.4	20	4.8
28	91	15	20	8.6	0.94	0.70	0.53	7.6	9.4	22	6.1
56	87	12	33	5.9	2.6	5.9	3.2	7.1	11	2.3	4.4
121	84	7.6	28	1.3	2.1	9.2	7.0	4.2	6.4	10	7.5
181	81	4.3	33	0.57	1.5	9.8	9.5	1.7	4.1	13	3.6
272	80	3.7	30	2.0	1.6	7.6	6.7	1.9	3.4	16	7.7
365	76	3.4	35	1.0	1.5	8.4	8.7	1.3	2.4	9.4	4.8

[a] Up to 11 components, each < 5% of applied radioactivity

Table 33 Composition of radioactivity in a sandy loam soil by HPLC (N-phenyl-fenamidone)

Time, days	% TAR								
	% Extracted	Fenamidone	RPA 410193	RPA 409446	RPA 410995	RPA 411639	RPA 413255	Late group	Others [a]
0	98	98	ND	ND	ND	ND	ND	ND	ND
1	93	80	ND	ND	ND	ND	ND	13	ND
3	86	50	2.3	0.17	0.04	3.1	4.0	22	3.9
7	85	40	2.5	ND	ND	5.3	6.4	27	4.3
14	80	33	1.3	ND	ND	8.0	7.1	29	1.9
28	77	19	0.11	0.35	0.09	8.7	9.7	35	4.3
56	71	14	2.3	6.8	6.2	12	12	13	4.7
121	71	11	3.1	9.1	7.4	6.2	8.9	15	9.4
181	66	6.7	2.1	13	12	4.1	7.1	19	3.2
272	63	5.8	1.8	10	8.3	3.2	5.3	21	7.4
365	62	4.0	2.2	9.4	9.3	1.4	3.7	28	3.8

[a] Up to 12 components, each < 5% of applied radioactivity

Table 34 Composition of radioactivity in a loam soil by HPLC (C-phenyl-fenamidone)

Time, days	% TAR									
	% Extracted	Fenamidone	RPA 412636	RPA 412708	RPA 410193	RPA 409446	RPA 411639	RPA 413255	Late group	Others [a]
0	94	94	ND	ND	ND	ND	ND	ND	ND	ND
1	90	90	ND	ND	ND	ND	ND	ND	ND	ND
3	89	73	0.38	4.2	0.40	ND	ND	0.32	10	0.16
7	85	52	2.3	7.0	0.26	ND	0.34	2.1	21	0.10
14	84	29	2.0	17	ND	ND	2.5	4.5	26	2.3
28	80	23	6.7	14	0.13	ND	0.27	2.2	30	4.1
56	71	11	10	17	0.19	ND	5.7	5.9	15	4.9

Time, days	% TAR									
	% Extracted	Fenamidone	RPA 412636	RPA 412708	RPA 410193	RPA 409446	RPA 411639	RPA 413255	Late group	Others [a]
121	49	7.7	11	11	0.14	0.11	1.9	3.2	19	13
181	63	2.8	13	13	0.07	ND	1.1	2.5	19	11
272	66	1.7	22	12	ND	ND	0.75	3.0	9.1	17
365	58	2.7	21	10	ND	ND	0.21	1.9	8.6	14

[a] Up to 7 components, each < 8% of TAR

Under aerobic conditions, fenamidone was rapidly metabolised by three significant degradation routes. In the first route of degradation two major metabolites, RPA 412708 and RPA 412636 are formed. RPA 412708 is formed through the loss of the aniline ring. This is followed by further degradation with hydrolysis and the loss of the S-methyl group to form RPA 412636. In addition RPA 407213 was transformed by nitro addition in the 2 or 4 position to form RPA 411639 and RPA 413255. Mineralisation of both C-phenyl and N-phenyl rings resulted in the evolution of carbon dioxide. No unique metabolites were observed from N-phenyl labelled fenamidone. The proposed principal degradation pathways are presented in Figure 7.

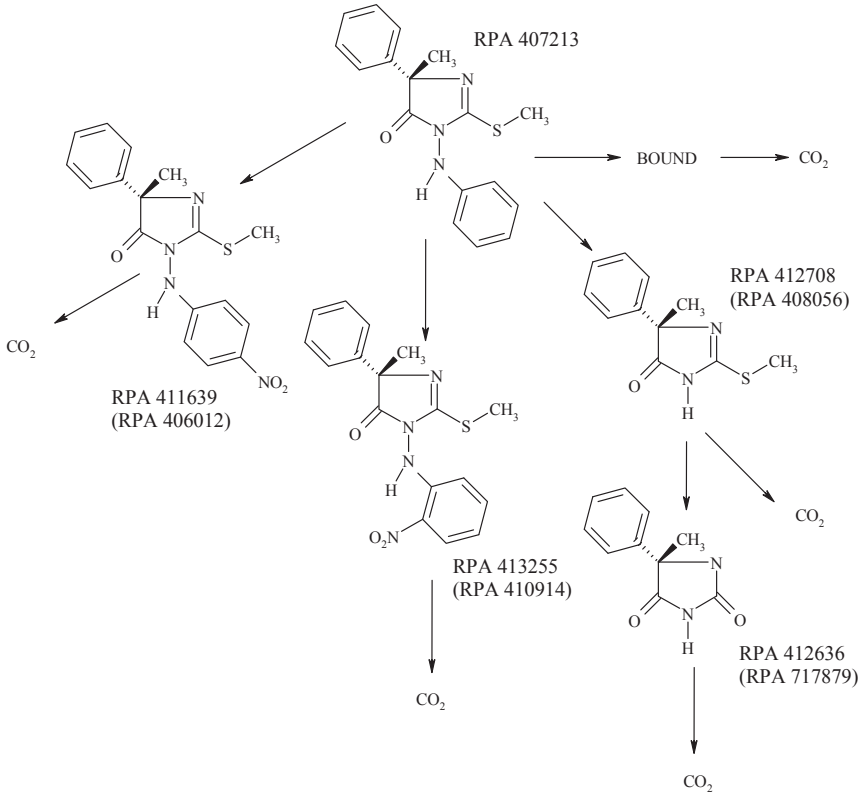


Figure 7 Proposed degradation pathways for fenamidone in aerobic soil

Metabolite codes in brackets are the numbers for the racemic compounds, as used in the original study report. The metabolites have been shown to be present as the S-enantiomers.

Soil photolysis

The photolytic degradation of fenamidone has been studied on a sandy loam soil. Two studies have been conducted, one with C-phenyl fenamidone (Burr and McDonald, 1999; Report 201428, M-173233-01-1) and the other with N-phenyl fenamidone (Burr, 1999; Report 202094, M-173271-01-1).

Portions of the soil, at a moisture content equivalent to 75% of the 1/3 bar moisture holding capacity, were surface treated with radio-labelled fenamidone to achieve an application rate

approximately equal to a cumulative field application rate of 1.5 kg ai/ha. The samples were placed inside glass incubation units fitted with quartz glass lids and aerobically incubated at 20 ± 1 °C. Irradiated samples were exposed to an artificial xenon light source (290 to 800 nm) for 13.3 or 12.7 hours each day (for the C-phenyl-label and N-phenyl-label, respectively), the equivalent of 1 day of natural summer sunlight. Non-irradiated control samples were incubated in continuous darkness. Trap solutions (ethylene glycol and potassium hydroxide) were connected to the incubation units to retain any volatile degradates.

At intervals up to 30 days after treatment, duplicate samples were removed for analysis. Good radiochemical balances were achieved for both the irradiated and non-irradiated soil (94.9 to 96.0% of TAR). In the C-phenyl-labelled experiment, over the 30-day study duration, carbon dioxide accounted for 2.3% and 8.1% of TAR in the irradiated and non-irradiated soils, respectively. Unextracted radioactivity accounted for 10% and 15% of TAR, respectively. In the N-phenyl-labelled experiment, the corresponding values were, respectively, 3.6%, 4.2%, 9.6% and 13%. Fenamidone was rapidly degraded in both irradiated and non-irradiated soils, by the end of the study reaching mean values of approximately 26% and 10.6% of TAR respectively in the C-phenyl labelled study and 31% and 17% of TAR in the N-phenyl labelled study. The degradates present in the irradiated and non-irradiated soils showed no significant differences. The composition of radioactivity is summarized in Tables 35 and 36.

Table 35 Composition of radioactivity by HPLC (C-phenyl-fenamidone)

Time, days	% TAR							
	Fenamidone	RPA 412636	RPA 412708	RPA 409445	RPA 410193	RPA 411639	Minor [a] unknowns	Total late eluting
	Irradiated							
0	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	73	0.97	4.6	0.00	0.59	0.53	0.85	6.4
5	65	0.98	10	0.69	1.04	0.72	1.6	8.5
9	49	4.7	16	2.5	1.8	0.92	3.2	11
15	37	9.4	12	2.4	1.8	0.69	2.6	15
21	33	9.6	15	1.9	1.5	0.48	3.4	15
30	26	12	17	2.7	1.9	0.53	5.0	18
	Non-irradiated							
0	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	63	3.2	2.9	0.67	0.70	0.72	0.54	12
5	46	2.4	11	1.3	0.81	0.68	1.4	19
9	30	4.6	20	2.4	0.61	0.73	2.9	25
15	23	7.3	12	2.1	1.1	0.68	3.6	27
21	14	10	9.0	0.68	2.4	0.16	5.0	26
30	11	9.6	12	1.3	1.7	0.46	7.9	29

[a] Up to 6 peaks each < 4% of TAR

Table 36 Composition of radioactivity by HPLC (N-phenyl-fenamidone)

Time, days	% TAR					
	Fenamidone	RPA 410193	RPA 411639	RPA 413255	Total unknowns [a]	Total late eluting
	Irradiated					
0	99	0.0	0.0	0.0	0.0	0.0
2	79	2.0	1.9	3.6	0.8	9.1
5	67	2.5	2.6	4.7	1.7	11
9	57	3.9	3.1	4.1	3.7	13
15	46	5.1	2.2	6.1	7.5	16
21	43	7.6	3.7	4.7	7.8	12
30	31	7.4	2.5	5.0	7.3	20
	Non-irradiated					
0	99	0.0	0.0	0.0	0.0	0.0

Time, days	% TAR					
	Fenamidone	RPA 410193	RPA 411639	RPA 413255	Total unknowns [a]	Total late eluting
2	74	2.2	1.3	2.6	1.1	13
5	58	3.0	1.7	3.6	1.5	19
9	55	2.3	1.0	3.2	3.5	23
15	24	0.29	3.0	5.5	7.9	32
21	16	0.43	0.47	5.6	7.6	35
30	17	1.0	1.3	6.7	7.9	37

[a] With RRT < 1.0, up to 9 peaks (C-phenyl label) and 5 peaks (N-phenyl label) each < 5% of TAR.

Fenamidone was readily degraded under both irradiated and non-irradiated soil conditions and it is concluded that photolytic processes do not contribute significantly to the degradation of fenamidone applied to the soil surface. Two major metabolites, RPA 412708 and RPA 412636, were observed, together with a large number of minor metabolites, each less than 5% of TAR, with similar quantities in both irradiated and non-irradiated conditions. Mineralisation of the C-phenyl ring resulted in the formation of carbon dioxide. The proposed photolytic degradation pathway for fenamidone in soil is presented in Figure 8.

With regard of the route of degradation in soil it can be concluded, that the degradation of fenamidone primarily proceeds by the action of aerobic soil microorganisms. Irradiation with sunlight does not influence the degradation pathway.

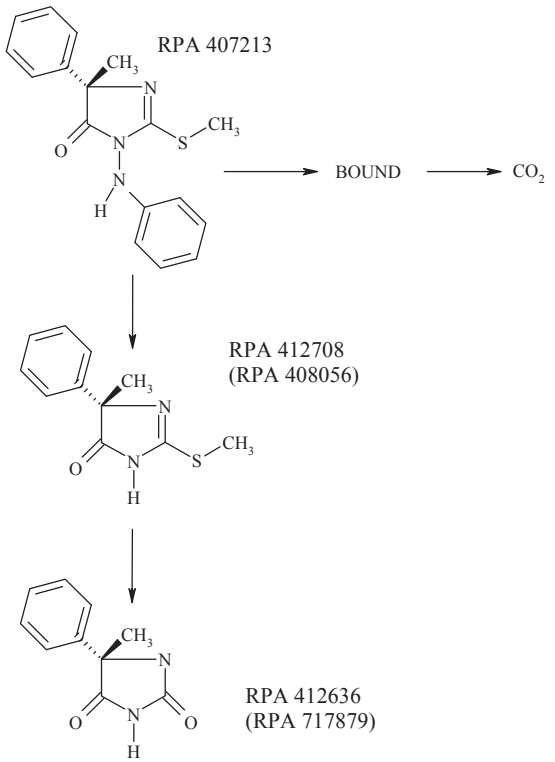


Figure 8 Proposed degradation pathway for fenamidone in soil under dark and irradiated conditions

Metabolite codes in parentheses are the numbers for the racemic compounds, as used in the original study report. The metabolites have been shown to be present as the S-enantiomers.

Rate of aerobic degradation in soil

A laboratory study has been conducted (Simmonds and Burr, 1999; Report 201610, M-173246-01-1) in which the rate of degradation of [C-phenyl-UL-^{14}C]-fenamidone under aerobic conditions has been

investigated in three soils incubated for 6 months at 20 °C and one soil for 12 months at 10 °C in the dark. A high pH calcareous silty clay loam, a sandy loam and a clay loam were all incubated at 20 ± 2 °C, and a different clay loam was incubated at 10 ± 2 °C, to cover a range of pH, organic matter and clay content. Throughout the study, the moisture content of the soils was maintained at approximately 45% of the maximum water holding capacity. The soils were treated at a nominal application rate of 1.6 kg ai/ha. Volatile traps were attached to the samples flask to retain any volatile metabolites. At intervals during the study samples were removed for analysis. The overall mean recoveries were good, ranging from 93% to 96% of TAR. Fenamidone was rapidly metabolised. The abundance and distribution of metabolites was consistent with the aerobic soil degradation study report above. The DT_{50} and DT_{90} values obtained for fenamidone and for the metabolites RPA 412708, RPA 411639 and RPA 413255 are presented in Table 37 for the soils incubated at 20 °C and 10 °C (in the dark). All values calculated using a kinetic modelling program (KIM).

Table 37 DT_{50} and DT_{90} values for soils incubated at 20 °C and 10 °C

Compound/soil	T, °C	DT_{50}, days	DT_{90}, days	Fit
Fenamidone				
Silty clay loam	20	4.5	17.2	–0.9981
Sandy loam	20	3.1	19.8	–0.9999
Clay loam	20	0.9	5.1	–0.9986
RPA 412708				
Silty clay loam	20	214	Not calculated	–0.9857
Sandy loam	20	28.4	177	–0.9947
Clay loam	20	18	60	–0.9810
RPA 413255				
Silty clay loam	20	139	Not calculated	–0.9956
RPA 411639				
Silty clay loam	20	52.2	313	–0.9747
Fenamidone		22.7	97	–0.9994
Clay loam	10			
RPA 412708		195	475	–0.9898
Clay loam	10			

The rate of degradation of fenamidone and metabolites in a clay loam, a sandy loam and a loam soil at 20 °C were also determined in the two aerobic soil degradation studies (Simmonds and Burr, 1999; Report 201609, M-173243-01-1; Burr and Bullus, 2000; Report 202200, M-240551-01-1). All values calculated using a kinetic modelling program (KIM) are shown in Table 38.

Table 38 DT_{50} and DT_{90} values for soil incubated at 20 °C (from aerobic degradation studies)

Compound/soil	Label	DT_{50}, days	DT_{90}, days	Fit
Fenamidone				
Clay loam	C-phenyl	7.1	29.3	0.99950
	N-phenyl	9.6	39.1	0.99950
Sandy loam	C-phenyl	3.5	68.6	0.99862
	N-phenyl	3.7	115.6	0.99649
Loam	C-phenyl	7.8	81.5	0.99550
RPA 412708				
Clay loam	C-phenyl	55	300	0.99870
	N-phenyl	–	–	–
RPA 413255				
Clay loam	C-phenyl	135	394	0.97980
	N-phenyl	120	Not calculated	0.98630
RPA 411639				
Clay loam	C-phenyl	124	643	0.99550
	N-phenyl	129	Not calculated	0.99350

In summary, under aerobic conditions, fenamidone was rapidly degraded at 20 °C in all tested soils leading to the formation of two major metabolites RPA 408065 and RPA 412636. The DT_{50s} ranged from 0.9 to 9.6 days. The rate of degradation was slower at 10 °C (DT_{50} 22.7 days).

Field dissipation

The behaviour of fenamidone was investigated at four field sites in Europe, in Italy, France, Germany and the UK (Wicks, 1999; Report 202140, Bayer reference M-183886-01-1). Fenamidone formulated as a suspension concentrate was sprayed onto a smooth seed bed at a nominal rate of 1.6 kg ai/ha, before growing grass cover. Irrigation water was applied to the treated plots as required so that precipitation plus irrigation was usually in excess of historical average precipitation. Soil samples from different depths to a maximum of 0.6 m below the surface were then collected at regular intervals up to 12 months and analysed for fenamidone, RPA 411639, RPA 413255, RPA 412708 and RPA 412636 using LC-MS/MS. The LOQ of each compound in soil was 0.005 mg/kg. Residues of the five analytes at each of the four test sites are presented in Table 39. The calculated DT_{50} and DT_{90} values for the four sites are presented in Table 40.

Table 39 Residues of fenamidone and metabolites in field soils at four different locations

Time, days	Residue, g/ha				
	Fenamidone	RPA 411639	RPA 413255	RPA 412708	RPA 412636
Bologna, Italy, clay loam					
0	889	< LOQ	< LOQ	ND	ND
3	884	36	40	29	< LOQ
7	1135	94	89	76	39
14	552	110	110	69	33
30	96	53	57	57	46
60	< LOQ	37	45	55	61
122	< LOQ	13	19	< LOQ	28
179	ND	10	23	< LOQ	17
260	ND	< LOQ	10	ND	< LOQ
Chazay, France, clay loam					
0	840	< LOQ	< LOQ	ND	ND
3	1105	42	36	43	35
7	368	38	34	27	47
14	88	42	28	63	101
30	< LOQ	12	17	11	52
56	< LOQ	12	26	12	77
119	< LOQ	< LOQ	< LOQ	< LOQ	20
182	ND	< LOQ	9	ND	< LOQ
261	ND	ND	11	ND	< LOQ
Goch, Germany, silt loam					
0	1226	< LOQ	< LOQ	ND	ND
3	742	< LOQ	< LOQ	45	< LOQ
7	642	< LOQ	< LOQ	122	< LOQ
14	186	< LOQ	13	214	34
31	60	< LOQ	< LOQ	103	68
60	< LOQ	< LOQ	< LOQ	24	74
126	< LOQ	< LOQ	< LOQ	< LOQ	57
190	ND	ND	ND	ND	43
288	ND	ND	ND	ND	32
Manningtree, UK, sandy loam					
0	1720	< LOQ	< LOQ	n/d	n/d
3	1071	28	29	20	16
7	1010	145	57	28	54
15	778	122	69	28	72
32	14	62	65	30	41
77	< LOQ	37	85	21	109
126	< LOQ	17	56	12	89
182	ND	< LOQ	15	< LOQ	40
275	ND	ND	21	ND	47

< LOQ = mean residue value was below the limit of quantification (9 g/ha)

Table 40 Residue decline results for fenamidone in field soils

Location	r^2	DT_{50}, days	Confidence interval	DT_{90}, days	Confidence interval
Bologna, Italy	0.82	14.3	11.6–17.0	47.4	38.5–56.3
Chazay, France	0.94	3.7	3.3–4.2	12.4	10.9–13.9
Goch, Germany	0.97	7.7	7.1–8.3	25.5	23.5–27.4
Manningtree, UK	0.85	8.5	6.9–10.1	28.2	22.9–33.5
Mean		8.5		28.4	

The data from the field study were analysed under a separate study (Reinken, 2002; Report OE02/062, M-210997-02-01). Environmental conditions like fluctuating soil moisture and soil temperature have a significant impact on the degradation of plant protection products under outdoor conditions. In order to achieve a comparability of half-lives or rate constants observed at various field locations the measured field data were analysed employing a normalisation procedure. In the original study reports the estimation of first-order dissipation half-lives was based only on standard kinetic modelling which does not take into account the specific soil-climate conditions at the different field sites.

Standardised transformation rates of fenamidone and the four principal metabolites (RPA 412708, RPA 412636, RPA 411639 & RPA 413255) were investigated in this study by a detailed kinetic analysis based on the reported field residue data using a special computer program. A mathematical model was employed able to describe the observed time-dependent field concentrations based on a first-order kinetic scheme, a reference soil temperature of 20 °C and a reference soil moisture of 100% FC (field capacity). The evaluation method accounted for effects of daily changing temperature and moisture according to established model assumptions.

The agreement of measured and calculated concentrations was good, with coefficients of determination (r^2) between 0.86 and 0.96. Normalised half-life values and DT_{50} values and field capacity for fenamidone and metabolites are given for each field site in Table 41 (all average values are calculated as geometric means). The degradation of fenamidone at reference conditions (20 °C and 100% field capacity) was consistent between the individual sites, giving half-lives between 4 and 7 days. Normalised half-life values for the four metabolites were also very similar across the sites. The representative average half-lives were 5 days for fenamidone, 12 days for RPA 412708, 47 days for RPA 412636, 21 days for RPA 411639 and 43 days for RPA 413255. The calculated half-lives ($t_{1/2}$) are identical to first-order DT_{50} values.

Table 41 Standard first order dissipation rates (SFO) and DT_{50} values at 20 °C

Location	Fenamidone		RPA 412708		RPA 412636		RPA 411639		RPA 413255	
	SFO, $days^{-1}$	DT_{50}, days	SFO, $days^{-1}$	DT_{50}, days	SFO, $days^{-1}$	DT_{50}, days	SFO, $days^{-1}$	DT_{50}, Days	SFO, $days^{-1}$	DT_{50}, Days
Bologna	0.09492	7.3	0.04165	19.6	0.02237	31.0	0.02720	25.5	0.01922	36.1
Chazay	0.18140	3.8	0.07256	9.6	0.02605	26.6	0.02832	24.5	0.01360	510
Goch	0.17386	4.0	0.06383	10.9	0.00823	84.2	0.0400	17.3	0.02000	34.7
Manningtree	0.13354	5.2	0.06958	10.0	0.01002	69.2	0.04237	16.4	0.01274	54.4
Geom. mean	0.14140	4.9	0.06053	11.5	0.01481	46.8	0.03380	20.5	0.01607	43.1

In summary, field dissipation studies were undertaken at four sites in Europe using clay loam, silt loam and sandy loam soils. In all cases dissipation of fenamidone was rapid with a mean half live of 5 days. Half-lives for the metabolites were 12 days for RPA 412708, 47 days for RPA 412636, 21 days for RPA 411639 and 43 days for RPA 413255.

Hydrolytic degradation

The hydrolytic degradation of fenamidone was examined by Corgier and Turier (1996; Report 442527, M-164512-01-1). [C-phenyl-UL-^{14}C]-fenamidone was used as test material in aqueous buffered solutions at pH values of 4, 5, 7 and 9 under sterile conditions at 25 °C and at an initial concentration of 3.9 mg/L. Duplicate samples were taken for analysis at intervals up to 31 days. In addition, two samples at each pH were attached to suitable trapping solutions and removed after 35 days. Recovery of radioactivity ranged from 96.2 to 102.3% with a mean value of 100.3 ± 0.9%.

No volatile compounds were found in the traps at any pH. Sterility of the samples was maintained throughout the incubation. During the course of the test, the concentration of fenamidone decreased and other compounds were detected. Table 42 presents the amounts of fenamidone and its main hydrolysis products occurring during the study.

Table 42 Hydrolytic degradation of fenamidone at different pH values

pH	Sampling time, days	Residue, % TAR				
		Fenamidone	RPA 410193	RPA 413350	RPA 412708	Unknown
4	0	100	0.0			
	5	92	8.4			
	10	85	15			
	14	80	20			
	19	70	26			
	25	67	33			
	31	60	39			
5	0	100	0.0			
	5	98	1.7			
	10	97	2.6			
	14	96	3.4			
	19	94	4.4			
	25	92	5.7			
	31	91	6.9			
7	0	100		0.0		
	5	100		0.0		
	10	98		1.1		
	14	98		1.3		
	19	97		2.1		
	25	96		2.5		
	31	95		2.9		
9	0	100	0.0	0.0	0.0	0.0
	5	95	0.0	4.6	0.0	0.0
	10	82	1.2	12	3.3	0.0
	14	73	1.7	17	4.6	0.7
	19	66	2.2	24	5.9	1.3
	25	56	3.1	28	7.9	3.4
	31	47	3.8	32	10	4.6

Hydrolytic degradation of fenamidone was shown to follow pseudo-first-order reaction kinetics resulting in three major hydrolysis products that exceeded 10% of TAR; RPA 410193 at pH 4, RPA 413350 and RPA 412708 at pH 9. Fenamidone is considered stable at pH 5 and 7 (less than 10% degradation after one month), but half-lives could be estimated at these pH values. The hydrolytic degradation characteristics are presented in Table 43.

Table 43 Rates of hydrolytic degradation of fenamidone at different pH values

pH	r^2	K, day^{-1}	DT_{50}, days
4	0.993	–0.0166	42
5	0.981	–0.0031	222
7	0.942	–0.0017	411
9	0.991	–0.0251	28

In summary, fenamidone can be considered to be stable at pH 5 and 7. The compound is hydrolysed at pH 4 and 9 with DT_{50} values of 42 and 28 days respectively. A proposed degradation pathway is given in Figure 9.

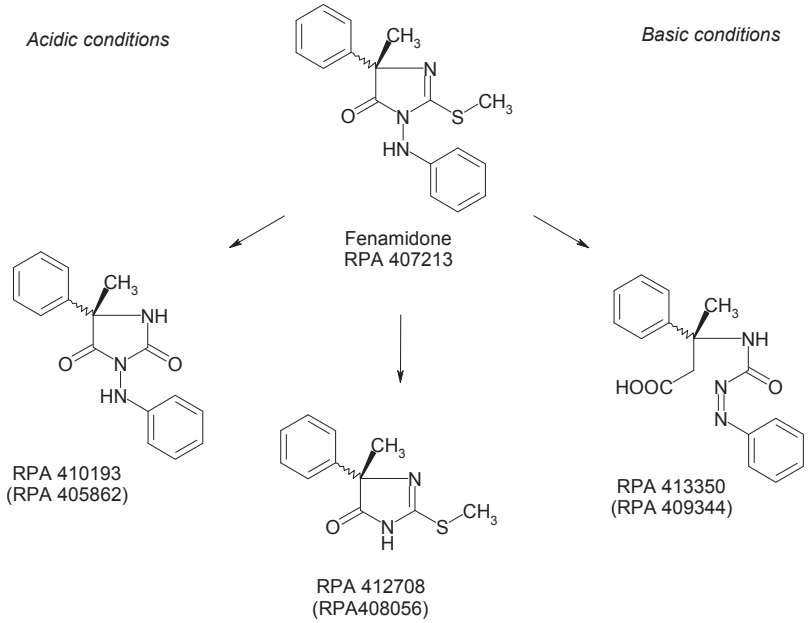


Figure 9 Proposed hydrolytic degradation pathway for fenamidone (RPA 407213)

Metabolite codes in parentheses are the numbers for the racemic compounds, as used in the original study report. The metabolites have been shown to be present as the S-enantiomers.

Residues in rotational crops

Confined radio-labelled succeeding crop studies

Three confined rotational crop studies have been conducted, one in 2001 and two in 2013. The first study was conducted by McMillan-Staff *et al*. in 2001 (report C010569 with amendments C021273 and C021274, M-199243-03-1). The quantity and nature of the residues in following crops were investigated after application of [C-phenyl-UL-^{14}C]-fenamidone to bare sandy loam soil at an application rate equivalent to 2.02 kg ai/ha (exception: 1.6 kg ai/ha for the 30 and 120 day lettuce). Representative rotational crops, a leafy crop (lettuce), a root crop (turnip) and a grain crop (barley), were sown after ageing periods of 30, 120 (lettuce, turnip), 150 (barley) and 365 days. The rotational crops were grown outdoors in circular vessels 80 cm in diameter and 60 cm deep. The treatment was applied to the surface of each treated vessel and crops planted after the specified intervals. Plant samples were harvested at maturity; interim immature samples were also taken and analysed. At harvest, the lettuce and barley were cut at ground level and only the parts above the soil analysed, the turnips were harvested intact and then divided into leaf and root. The plant parts were homogenised and analysed. Extracts containing sufficient radioactivity were characterised by HPLC, TLC and LC-MS as appropriate.

The highest residues in all the plant commodities were found at the 30-day planting interval. Residues after 120/150 and 365 days were significantly lower. The proportions of the radioactivity extracted, identified and characterised in each of the plant commodities are summarised in Table 44 and the nature of the extractable radioactivity is presented in Table 45.

Table 44 Distribution of TRR in plants at harvest

Interval, days	Plant part	TRR, mg/kg	% TRR					
			Washings	Extracted	Un-extracted	Total identified	Total characterised	Total identified and characterised
30	Lettuce	0.72	2.6	80	20	55	20	75
	Turnip top	1.02	–	93	6.7	62	20	82
	Turnip root	0.25	19	62	19	46	1.1	47
	Barley chaff	7.19	–	91	9.0	79	5.1	84

Interval, days	Plant part	TRR, mg/kg	% TRR					
			Washings	Extracted	Un-extracted	Total identified	Total characterised	Total identified and characterised
	Barley grain	1.34	–	88	12	75	1.4	76
	Barley straw	7.05	–	82	18	63	–	63
120	Lettuce	0.14	–	69	31	67	2.3	69
	Turnip top	0.43	–	76	24	63	12	76
	Turnip root	0.15	0.99	80	19	80	–	80
150	Barley chaff	0.35	–	84	15	65	–	65
	Barley grain	0.07	–	66	34	66	–	66
	Barley straw	0.60	–	73	27	54	–	54
365	Lettuce	0.12	5.4	76	19	74	–	74
	Turnip top	0.18	–	86	14	70	16	86
	Turnip root	0.14	27	30	43	28	1.3	30
	Barley chaff	0.39	–	81	19	57	3.4	60
	Barley grain	0.09	–	73	27	74	–	74
	Barley straw	0.77	–	80	20	68	–	68

Table 45 Characterisation of radioactivity in plants at harvest

Interval days	Plant part	Radioactivity, % TRR (mg/kg in parentheses)									
		Unretained [a]	Slightly Retained [b]	Unknown 5	Unknown 6	RPA 412708 Conjugate	RPA 412636	RPA 412708	RPA 410193	Polar unknowns < 10%	Non-polar unknowns < 10%
30	Lettuce	4.5 (0.033)	2.9 (0.021)	10 (0.075)	0.54 (0.004)	22 (0.16)	18 (0.13)	5.7 (0.041)	2.1 (0.015)	0.29 (0.002)	8.7 (0.063)
	Turnip top	24 (0.25)		7.4 (0.075)	11 (0.12)	34 (0.34)	3.5 (0.036)				1.1 (0.011)
	Turnip root	3.6 (0.009)	26 (0.065)	0.41 (0.001)		7.8 (0.02)	8.4 (0.021)				0.7 (0.002)
	Barley chaff	48 (3.46)		0.66 (0.05)		28 (1.98)	3.5 (0.25)			3.1 (0.24)	1.1 (0.082)
	Barley grain	55 (0.74)	0.73 (0.01)			17 (0.23)	2.0 (0.027)				1.4 (0.018)
	Barley straw	34 (2.4)					29 (2.04)				
120	Lettuce	0.00 (0.0)	3.9 (0.005)	2.3 (0.003)		41 (0.056)	20 (0.028)	1.3 (0.002)			
	Turnip top	10 (0.045)		9.8 (0.043)	2.4 (0.01)	47 (0.21)	5.7 (0.025)				
	Turnip root	41 (0.06)	13 (0.02)			19 (0.03)	7.5 (0.011)				
150	Barley chaff	3.4 (0.012)	15 (0.054)			32 (0.11)	11 (0.039)	2.8 (0.01)			
	Barley grain	30 (0.021)	18 (0.013)			14 (0.01)	3.1 (0.002)				
	Barley straw	3.5 (0.021)	6.8 (0.04)			38 (0.23)	6.3 (0.038)				
365	Lettuce	9.9 (0.012)				44 (0.052)	20 (0.024)				
	Turnip top		13 (0.023)	16 (0.03)		46 (0.09)	11 (0.02)				
	Turnip root		4.1 (0.006)	1.3 (0.002)		19 (0.026)	5.3 (0.007)				
	Barley chaff		7.0 (0.027)	3.4 (0.013)		37 (0.14)	13 (0.051)				
	Barley grain		34 (0.031)			33 (0.03)	5.9 (0.005)				
	Barley straw					56 (0.43)	12 (0.094)				

[a] Unretained compounds
[b] Slightly retained compounds

The profile of identified and characterised components was similar in each of the crops and at each planting interval. RPA 412636 and a conjugate of RPA 412708 were the major components in all crop parts, unconjugated RPA 412708 was also detected in some plant parts. The RPA 412708 conjugate was putatively identified as the glucoside conjugate in many samples. Additional work proposed the presence of amino acids in two regions ("unretained compounds" and "slightly retained compounds" in Table 45), these were classified as tentatively identified in the plants and demonstrate that fenamidone residues were reincorporated into natural occurring compounds in the plant. Two distinct unknowns (U5 and U6) were characterised and a number of polar and non-polar components were also detected. No parent fenamidone was detected in any plant part.

Two further confined rotational crop studies have been conducted with radiolabelled fenamidone (C-phenyl label: Bongartz and Miebach, 2013, report M1301876-6, M-447085-01-1, M-447085-02-1; N-phenyl label: Bongartz and Miebach, 2013, report M1301877-7, M-451106-01-1). The quantity and nature of the residues in following crops were investigated after single applications of C-phenyl-UL-$^{14}C/^{13}C_6$]-fenamidone (referred as C-phenyl label) and [aniline-UL-$^{14}C/^{13}C_6$]-fenamidone (referred as N-phenyl label) to bare sandy loam soils at application rates of 0.97 kg ai/ha for the C-phenyl label and 0.96 kg ai/ha for the N-phenyl label. Representative rotational crops, a leafy crop (Swiss chard), a root crop (turnip) and a cereal crop (wheat), were sown after ageing periods of 30, 191 and 324 days.

The rotational crops were grown outdoors in 1 m^2 planting containers. The treatment was applied to the surface of each treated vessel and crops planted after the specified intervals. The application to the soil and the ageing of the soil (0 to 30 days after soil treatment) were conducted in the outdoor "vegetation area", the plant cultivation took place under artificial temperature and light conditions in a greenhouse. At harvest, the Swiss chard and wheat were cut at ground level and only the parts above the soil analysed, the turnips were harvested intact and then divided into leaf and root. The plant parts were homogenised and analysed as follows:

Conventional extraction and sample preparation of all plant parts (RAC):

Aliquots of the homogenised samples were extracted 3 × with acetonitrile/water (8/2, v/v) and 1 × with pure acetonitrile. The extraction steps were conducted using a homogeniser. The residues were air-dried and weighed yielding the solids. The TRR of each RAC was calculated from the specific radioactivity of the test compound, the amount of the sample used for extraction and the sum of radioactivity, measured in the extracts and the remaining solids. The combined and concentrated conventional extracts were subjected to HPLC analysis. Significant losses of radioactivity during the concentration process or radioactivity in the distillates were not observed. Recoveries of the concentration processes ranged from 95.6% to 103%.

Exhaustive extraction of solids:

Depending on the amount of residues in the solids of the conventional extraction, an exhaustive extraction was performed with 1 × acetonitrile/water (1/1, v/v) and 1 × with acetonitrile/water (1/1, v/v) plus formic acid. The exhaustive extracts were concentrated and analysed by HPLC. Significant losses of radioactivity during the concentration process or radioactivity in the distillates were not observed. Recoveries of the concentration processes ranged from 95.5% to 104%.

Enzyme digestion of solids 2 of wheat grain (1st rotation) after exhaustive extraction with microwave assistance:

Further characterisation of the solids 2 of wheat grain was performed by an enzyme digestion with diastase followed by a partition of the digestion solution against ethyl acetate. After partition, the aqueous phase was concentrated and further analysed by HPLC.

Hydrolysis of fenamidone-hydantoin-conjugates to fenamidone-hydantoin (P10):

The hydrolysis of fenamidone-hydantoin-conjugates to fenamidone-hydantoin was investigated under extreme conditions with hydrochloric acid and sodium hydroxide at 100 °C for at least 1 h and resulted into multiple degradation products or non-reproducible results. Therefore the hydrolysis was

performed according to the residue method 00863. Representative conventional extracts of the first and second rotation were hydrolysed under mild acidic conditions with formic acid for approx. 2 hours at 70 °C.

Extracts containing sufficient radioactivity were characterised by HPLC, TLC and LC-MS as appropriate. The TRR found in each crop part are presented in Table 46. The highest residues in all the plant commodities were found at the 30-day planting interval for both labels, with the exception of wheat straw treated with the phenyl label, where higher residues were found at the second rotation (191 days). In general, residues after 191 and 324 days were significantly lower. The proportions of the radioactivity extracted, identified and characterised in each of the plant commodities are summarised in Tables 47 (C-phenyl label) and 48 (N-phenyl label). The nature of the extracted radioactivity is shown in Tables 49 and 50. In general, the TRR in the plants were significantly higher in the C-phenyl label study compared with the N-phenyl label study, primarily because of the higher uptake of C-phenyl label-specific metabolites from the soil following soil cleavage of the parent compound. For both labels, the majority of the radioactivity was extracted in the initial extraction, with the exception of wheat grain. Extraction of the remaining residues was performed with exhaustive extraction techniques, using elevated temperature conditions (microwave) and where required enzyme digestion. Parent compound and non-label-specific metabolites were isolated from crop extracts and their identities confirmed by spectroscopic methods.

The extracted residues were systematically analysed for the presence of potentially released aniline. In the extract of Swiss chard (TRR: 0.13 mg eq/kg) rotated after application of aniline-labelled fenamidone to soil, no aniline could be detected.

Table 46 TRR in plant commodities of rotational crops

Plant part	TRR, mg eq/kg					
	30 day PBI [a]		191 day PBI		324 day PBI	
	C-phenyl	N-phenyl	C-phenyl	N-phenyl	C-phenyl	N-phenyl
Wheat forage	0.50	0.04	0.20	0.02	0.10	0.02
Wheat hay	2.24	0.32	0.92	0.08	0.41	0.08
Wheat straw	1.00	0.27	1.67	0.09	0.43	0.08
Wheat grain	0.09	0.03	0.07	0.01	0.03	0.01
Turnip leaves	1.00	0.04	0.18	0.02	0.39	0.02
Turnip roots	0.07	0.01	0.02	0.01	0.03	0.01
Swiss chard (intermediate)	0.67	0.06	0.14	0.02	0.15	0.01
Swiss chard (at maturity)	0.95	0.13	0.27	0.03	0.12	0.01

[a] PBI Plant back interval

Table 47 TRR in plants at harvest following application of [C-phenyl-UL-$^{14}C/^{13}C_6$]-fenamidone

Interval, days	Plant part	TRR, mg eq/kg	% TRR					
			Initial extract	Exhaustive extracts + digests	Un-extracted	Total identified	Total characterised	Total identified and characterised
30	Wheat forage	0.50	90	–	9.8	84	6.5	90
	Wheat hay	2.24	67	26	7.4	83	9.3	93
	Wheat straw	1.00	66	24	9.5	88	2.7	91
	Wheat grain	0.09	27	72	1.2	83	16	99
	Turnip leaves	1.00	93	4.2	2.5	94	3.2	98
	Turnip roots	0.07	89	–	11	84	4.5	89
	Swiss chard (intermediate)	0.67	93	–	6.8	89	4.5	93
	Swiss chard (maturity)	0.95	91	8.7	3.0	92	4.9	97
191	Wheat forage	0.20	93	–	7.4	90	2.2	93
	Wheat hay	0.92	73	22	5.3	92	3.2	95
	Wheat straw	1.67	77	18	4.4	92	3.4	96
	Wheat grain	0.07	21	40	7.0	90	2.6	93
	Turnip leaves	0.18	95	–	5.5	92	2.3	95
	Turnip roots	0.02	85	–	15	79	6.2	85
	Swiss chard (intermediate)	0.14	94	–	6.4	92	1.6	94

Interval, days	Plant part	TRR, mg eq/kg	% TRR					
			Initial extract	Exhaustive extracts + digests	Un-extracted	Total identified	Total characterised	Total identified and characterised
	Swiss chard (maturity)	0.27	92	–	8.0	89	2.7	92
324	Wheat forage	0.095	90	–	9.6	90	–	90
	Wheat hay	0.41	74	18	8.1	90	2.2	92
	Wheat straw	0.43	71	20	8.8	90	1.1	91
	Wheat grain	0.03	28	37	35	27	39	65
	Turnip leaves	0.39	96	–	4.4	93	2.9	96
	Turnip roots	0.03	82	–	18	78	4.5	82
	Swiss chard (intermediate)	0.15	92	–	8.2	90	2.3	92
	Swiss chard (maturity)	0.12	94	–	6.0	89	5.0	94

Table 48 TRR in plants at harvest following application of [N-phenyl-UL-$^{14}C/^{13}C_6$]-fenamidone

Interval, days	Plant part	TRR, mg eq/kg	% TRR					
			Initial extract	Exhaustive extracts + digests	Un-extracted	Total identified	Total characterised	Total identified and characterised
30	Wheat forage	0.04	63	28	9.4	27	64	91
	Wheat hay	0.32	47	40	13	40	48	87
	Wheat straw	0.27	50	35	15	47	38	85
	Wheat grain	0.03	–	65	2.5	–	98	98
	Turnip leaves	0.04	78	–	22	32	46	78
	Turnip roots	0.01	77	–	23	17	60	77
	Swiss chard (intermediate)	0.06	67	23	10	34	56	90
	Swiss chard (maturity)	0.13	62	25	13	36	51	87
191	Wheat forage	0.02	66	–	34	5.5	61	66
	Wheat hay	0.08	48	36	16	25	59	84
	Wheat straw	0.09	54	34	11	23	66	89
	Wheat grain	0.01	9.5	–	91	–	9.5	9.5
	Turnip leaves	0.02	78	–	22	17	61	78
	Turnip roots	0.01	62	–	38	–	62	62
	Swiss chard (intermediate)	0.02	62	–	38	31	31	62
	Swiss chard (maturity)	0.03	56	29	15	26	59	85
324	Wheat forage	0.02	67	–	33	27	39	67
	Wheat hay	0.08	47	34	20	17	63	80
	Wheat straw	0.08	44	33	23	16	61	77
	Wheat grain	0.01	–	31	69	–	31	31
	Turnip leaves	0.02	73	–	27	17	56	73
	Turnip roots	0.01	–	–	–	–	–	–
	Swiss chard (intermediate)	0.01	55	–	45	–	55	55
	Swiss chard (maturity)	0.01	67	–	33	–	67	67

Table 49 Characterization of radioactivity in plants at harvest following application of [C-phenyl-UL-$^{14}C/^{13}C_6$]-fenamidone

Compound/fraction	Wheat forage	Wheat hay	Wheat straw	Wheat grain	Turnip leaves	Turnip roots	Swiss chard (intermediate)	Swiss chard (mature)
Fenamidone-	C-phenyl label, interval 30 days,% TRR (mg/kg in parentheses)							
2-phenyl-propionic acid (P2)	5.7 (0.028)	1.2 (0.027)	2.5 (0.025)	58 (0.051)	7.1 (0.071)	29 (0.022)	3.7 (0.025)	3.7 (0.035)
-hydantoin-serine	2.3	0.4	0.6	ND	30	4.0	1.1	1.7

Compound/fraction	Wheat forage	Wheat hay	Wheat straw	Wheat grain	Turnip leaves	Turnip roots	Swiss chard (intermediate)	Swiss chard (mature)
(P4)	(0.012)	(0.009)	(0.006)		(0.29)	(0.003)	(0.007)	(0.017)
-imino-hydantoin (P5)	8.3 (0.041)	15 (0.34)	15 (0.147)	3.7 (0.003)	2.2 (0.022)	9.6 (0.007)	3.8 (0.026)	5.9 (0.056)
-thiohydantoin-serine (P6)	1.1 (0.005)	2.8 (0.062)	4.2 (0.042)	1.0 (0.001)	4.7 (0.047)	ND	2.9 (0.019)	2.6 (0.025)
-hydantoin-glucoside (P7)	45 (0.22)	46 (1.02)	51 (0.51)	19 (0.017)	31 (0.31)	11 (0.008)	35 (0.23)	36 (0.34)
-thiohydantoin-glycoside (P8)	2.5 (0.013)	3.1 (0.069)	1.6 (0.016)	ND	5.8 (0.058)	ND	2.1 (0.014)	3.2 (0.03)
-hydantoin-malonyl-glucoside (P9)	1.5 (0.008)	2.5 (0.057)	1.6 (0.016)	ND	3.5 (0.03)	ND	16 (0.11)	22 (0.2)
-hydantoin (P10), (RPA 412636)	15 (0.072)	8.7 (0.19)	11 (0.11)	1.5 (0.001)	6.6 (0.066)	29 (0.021)	21 (0.14)	14 (0.13)
-hydroxymethyl-thiohydantoin (P13)	1.5 (0.007)	1.8 (0.04)	0.5 (0.005)	ND	2.9 (0.029)	0.5 (< 0.001)	0.9 (0.006)	1.3 (0.012)
-nitro-GSH (P14)	1.0 (0.005)	1.5 (0.032)	ND	ND	–	–	1.9 (0.013)	2.1 (0.02)
-hydroxy-nitro-malonyl-glycoside (P16)	ND	0.4 (0.009)	ND	ND	0.6 (0.006)	ND	–	–
-desthiomethyl-2-nitro (P17)	0.2 (0.001)	ND	0.3 (0.003)	ND	–	–	0.2 (0.001)	0.2 (0.002)
Parent and -4-nitro (P19)	–	–	–	–	–	–	–	0.2 (0.002)
-2-nitro (P20)	0.2 (0.001)	0.2 (0.005)	0.2 (0.002)	ND	0.1 (0.001)	0.6 (< 0.001)	–	0.1 (0.001)
Sum total unknowns <10%	6.4 (0.032)	9.2 (0.21)	2.6 (0.21)	16.2 (0.014)[a]	3.1 (0.031)	4.4 (0.005)	4.5 (0.03)	4.9 (0.047)
Fenamidone-	C-phenyl label, interval 191 days,% TRR (mg/kg in parentheses)							
2-phenyl-propionic acid (P2)	1.9 (0.004)	3.0 (0.028)	1.3 (0.022)	73 (0.05)	9.6 (0.017)	28 (0.005)	ND	3.2 (0.009)
-hydantoin-serine (P4)	0.8 (0002)	0.6 (0.005)	1.2 (0.02)	ND	39 (0.071)	6.9 (0.001)	–	–
-imino-hydantoin (P5)	11 (0.022)	17 (0.15)	19 (0.32)	ND	2.7 (0.005)	4.5 (0.001)	2.8 (0.004)	1.9 (0.005)
-thiohydantoin-serine (P6)	–	–	–	–	–	–	0.8 (0.001)	4.2 (0.011)
-hydantoin-glucoside (P7)	57 (0.11)	61 (0.56)	56 (0.93)	13 (0.009)	26 (0.047)	4.3 (0.001)	41 (0.06)	38 (0.104)
-thiohydantoin-glycoside (P8)	1.0 (0.002)	1.2 (0.011)	1.5 (0.025)	1.1 (0.001)	2.3 (0.004)	0.8 (< 0.001)	0.6 (0.001)	0.6 (0.002)
-hydantoin-malonyl-glucoside (P9)	2.1 (0.004)	1.6 (0.015)	2.2 (0.037)	0.4 (< 0.001)	2.8 (0.005)	1.0 (< 0.001)	40 (0.06)	38 (0.103)
-hydantoin (P10) (RPA 412636)	16 (0.03)	5.9 (0.06)	8.7 (0.15)	2.4 (0.002)	7.4 (0.013)	32 (0.005)	5.8 (0.008)	2.2 (0.006)
-hydroxymethyl-thiohydantoin (P13)	0.7 (0.001)	1.0 (0.009)	0.7 (0.011)	ND	2.5 (0.005)	1.3 (< 0.001)	0.8 (0.001)	0.8 (0.002)
-nitro-GSH (P14)	ND	ND	0.9 (0.015)	ND	–	–	0.5 (0.001)	0.3 (0.001)
-hydroxy-nitro-malonyl-glycoside (P16)	ND	ND	0.4 (0.006)	ND	0.2 (< 0.001)	ND	–	–
-desthiomethyl-2-nitro (P17)	ND	ND	0.3 (0.005)	ND	–	–	–	–
Parent and -4-nitro (P19)	–	–	–	–	–	–	–	–
-2-nitro (P20)	ND	0.7	0.1	ND	ND	0.8	–	–

Compound/fraction	Wheat forage	Wheat hay	Wheat straw	Wheat grain	Turnip leaves	Turnip roots	Swiss chard (intermediate)	Swiss chard (mature)
		(0.007)	(0.002)			(< 0.001)		
Sum total unknowns <10%	0.21 (0.004)	3.2 (0.029)	3.4 (0.056)	2.6 (0.002)	0.23 (0.004)	6.1 (0.002)	1.6 (0.003)	2.7 (0.008)
Fenamidone-	C-phenyl label, interval 324 days,% TRR (mg/kg in parentheses)							
2-phenyl-propionic acid (P2)	4.8 (0.005)	2.9 (0.012)	3.7 (0.016)	15 (0.004)	9.1 (0.035)	36 (0.011)	2.0 (0.003)	1.6 (0.002)
-hydantoin-serine (P4)	–	–	–	–	34 (0.13)	7.5 (0.002)	2.0 (0.003)	1.0 (0.001)
-imino-hydantoin (P5)	7.6 (0.007)	15 (0.06)	11 (0.05)	–	3.2 (0.012)	6.9 (0.002)	2.9 (0.004)	1.2 (0.002)
-thiohydantoin-serine (P6)	–	2.5 (0.01)	2.9 (0.013)	–	–	–	1.1 (0.002)	3.0 (0.004)
-hydantoin-glucoside (P7)	63 (0.06)	60 (0.24)	62 (0.27)	9.4 (0.003)	34 (0.13)	3.9 (0.001)	59 (0.09)	49 (0.06)
-thiohydantoin-glycoside (P8)	1.4 (0.001)	0.8 (0.003)	0.9 (0.004)	1.3 (< 0.001)	3.2 (0.012)	–	0.6 (0.001)	2.5 (0.003)
-hydantoin-malonyl-glucoside (P9)	1.1 (0.001)	1.3 (0.005)	0.8 (0.004)	–	4.3 (0.017)	–	17 (0.026)	25 (0.031)
-hydantoin (P10) (RPA 412636)	13 (0.012)	6.6 (0.027)	7.5 (0.032)	–	3.2 (0.013)	23 (0.007)	3.9 (0.006)	4.4 (0.005)
–hydroxymethyl-thiohydantoin (P13)	–	0.7 (0.003)	0.5 (0.002)	–	2.0 (0.008)	–	1.3 (0.002)	1.4 (0.002)
-nitro-GSH (P14)	–	–	–	–	–	–	–	–
-hydroxy-nitro-malonyl-glycoside (P16)	–	–	–	–	0.6 (0.002)	–	–	–
-desthiomethyl-2-nitro (P17)	–	–	0.3 (0.001)	–	–	–	–	–
Parent and -4-nitro (P19)	–	–	–	–	–	–	–	–
-2-nitro (P20)	–	–	0.1 (0.001)	–	–	–	–	–
Sum total unknowns <10%	–	2.2 (0.009)	1.1 (0.005)	1.6 (< 0.001)	3.0 (0.012)	4.5 (0.001)	2.2 (0.004)	5.0 (0.007)

[a] Incorporated CO_2 (characterized by enzymatic digestion)

Parent compound was detected together with fenamidone-4-nitro in one region of the conventional extract of Swiss chard of the first rotation at maturity, only. The region amounted to 0.002 mg/kg (0.2% of TRR). The major metabolites were fenamidone-hydantoin (RPA 412636) and its conjugates fenamidone-hydantoin-glucoside, fenamidone-hydantoin-serine and fenamidone-hydantoin-malonyl-glycoside. These metabolites represented in sum approx. 50 to 70% of the TRR in the plants of all rotations, except wheat grain and turnip roots. 2-phenyl-propionic acid was detected in higher amounts in these plants and ranged from approx.15 to 73% of the TRR. Another important metabolite in wheat was fenamidone-imino-hydantoin and amounted up to approx. 19% of the TRR in wheat straw.

Table 50 Characterization of radioactivity in plants at harvest, [N-phenyl-UL-$^{14}C/^{13}C_6$]-fenamidone

Compound/fraction	Wheat forage	Wheat hay	Wheat straw	Wheat grain	Turnip leaves	Turnip roots	Swiss chard (intermediate)	Swiss chard (mature)
Fenamidone-	N-phenyl label, interval 30 days,% TRR (mg/kg in parentheses)							
-nitro-GSH (A7)	3.2 (0.001)	1.4 (0.004)	–	–	3.3 (0.001)	–	18 (0.01)	20 (0.03)
-hydroxy-malonyl-	3.5 (0.001)	1.9 (0.006)	2.1 (0.006)	–	14 (0.005)	–	1.1 (0.001)	2.4 (0.003)

Compound/fraction	Wheat forage	Wheat hay	Wheat straw	Wheat grain	Turnip leaves	Turnip roots	Swiss chard (intermediate)	Swiss chard (mature)
glycoside (A8)								
-desthiomethyl (A9)	1.3 (< 0.001)	–	–	–	0.8 (< 0.001)	–	3.0 (0.002)	2.5 (0.003)
-desthiomethyl-4-nitro (A10)	2.9 (0.001)	3.7 (0.01)	3.5 (0.009)	–	1.9 (0.001)	–	2.7 (0.002)	2.1 (0.003)
-desthiomethyl-2-nitro (A11)	5.1 (0.002)	9.7 (0.03)	15 (0.04)	–	1.7 (0.001)	6.7 (0.001)	5.2 (0.003)	5.2 (0.006)
Parent and -4-nitro (A13)	2.6 (0.001)	6.8 (0.02)	5.2 (0.01)	–	3.5 (0.001)	3.7 (< 0.001)	1.9 (0.001)	2.5 (0.003)
-2-nitro (A14)	8.2 (0.003)	16 (0.05)	22 (0.06)	–	6.7 (0.003)	6.9 (0.001)	2.1 (0.001)	1.2 (0.001)
Unknown (A1)	14 (0.005)	3.0 (0.009)	12 (0.03)	–	7.1 (0.003)	43 (0.005)	5.2 (0.003)	4.2 (0.005)
Unknown (A2)	–	0.5 (0.002)	–	56 (0.02)	1.2 (< 0.001)	–	0.5 (< 0.001)	0.9 (0.001)
Unknown (A3)	8.2 (0.003)	12 (0.04)	12 (0.03)	–	–	–	7.8 (0.005)	11 (0.01)
Unknown (A4)	9.2 (0.003)	12 (0.04)	11 (0.03)	9.7 (0.003)	1.6 (0.001)	–	7.3 (0.004)	3.8 (0.005)
Unknown (A6)	9.1 (0.003)	11 (0.035)	2.5 (0.007)	–	2.4 (0.001)	–	5.8 (0.004)	6.4 (0.008)
Unknown (A12)	1.0 (< 0.001)	–	–	–	2.4 (0.001)	16.8 (0.002)	0.7 (< 0.001)	1.5 (0.002)
Unknown (A-Gr-1)	7.1 (0.003)–	–	–	–	6.3 (0.002)	–	3.0 (0.002)	1.9 (0.002)
Sum total unknowns < 10%	16 (0.005)	9.7 (0.03)	–	32 (0.01)[a]	25 (0.01)	–	26 (0.02)	22 (0.03)
Fenamidone-	N-phenyl label, interval 191 days,% TRR (mg/kg in parentheses)							
-nitro-GSH (A7)	–	–	–	–	3.3 (0.001)	–	31 (0.006)	7.9 (0.003)
-hydroxyl-malonyl-glycoside (A8)	–	2.9 (0.002)	3.1 (0.002)	–	14 (0.003)	–	–	–
-desthiomethyl (A9)	–	–	–	–	–	–	–	–
-desthiomethyl-4-nitro (A10)	–	–	1.6 (0.001)	–	–	–	–	–
-desthiomethyl-2-nitro (A11)	–	9.6 (0.007)	12 (0.01)	–	–	–	–	10.5 (0.004)
Parent and -4-nitro (A13)	–	1.8 (0.001)	–	–	–	–	–	3.5 (0.001)
-2-nitro (A14)	5.5 (0.001)	10 (0.008)	5.6 (0.005)	–	–	–	–	4.4 (0.002)
Unknown (A1)	35 (0.006)	11 (0.008)	10 (0.009)	–	20 (0.004)	–	25 (0.005)	20 (0.007)
Unknown (A2)	–	–	9.3 (0.008)	–	6.6 (0.001)	–	–	–
Unknown (A3)	–	–	–	–	–	–	–	–
Unknown (A4)	4.2 (0.001)	5.2 (0.004)	6.6 (0.006)	–	–	–	–	2.4 (0.001)
Unknown (A6)	–	–	–	–	–	–	–	–
Unknown (A12)	–	–	–	–	–	–	–	–
Unknown (A-Gr-1)	22 (0.004)	7.4 (0.006)	36 (0.03)	–	14 (0.003)	–	–	–
Sum total unknowns < 10%	–	36 (0.03)	3.7 (0.003)	9.5 (0.001)	21 (0.005)	62 (0.004)	5.6 (0.001)	37 (0.01)
Fenamidone-	N-phenyl label, interval 324 days,% TRR (mg/kg in parentheses)							
-nitro-GSH (A7)	–	–	–	–	4.0 (0.001)	–	–	–
-hydroxy-malonyl-	–	2.7 (0.002)	2.0 (0.002)	–	13 (0.003)	–	–	–

Compound/fraction	Wheat forage	Wheat hay	Wheat straw	Wheat grain	Turnip leaves	Turnip roots	Swiss chard (intermediate)	Swiss chard (mature)
glycoside (A8)								
-desthiomethyl (A9)	–	–	–	–	–	–	–	–
-desthiomethyl-4-nitro (A10)	–	2.6 (0.002)	1.0 (0.001)	–	–	–	–	–
-desthiomethyl-2-nitro (A11)	17 (0.003)	8.9 (0.007)	7.7 (0.006)	–	–	–	–	–
Parent and -4-nitro (A13)	–	–	0.8 (0.001)	–	–	–	–	–
-2-nitro (A14)	10 (0.001)	2.9 (0.002)	4.7 (0.004)	–	–	–	–	–
Unknown (A1)	20 (0.003)	6.1 (0.005)	7.0 (0.005)	–	12 (0.002)	–	–	–
Unknown (A2)	–	4.7 (0.004)	7.0 (0.005)	–	8.6 (0.002)	–	–	–
Unknown (A3)	–	–	–	–	–	–	–	–
Unknown (A4)	–	9.4 (0.008)	–	–	3.3 (0.001)	–	–	–
Unknown (A6)	–	–	–	–	–	–	–	–
Unknown (A12)	–	–	–	–	–	–	–	–
Unknown (A-Gr-1)	12 (0.002)	9.2 (0.007)	13 (0.01)	–	13 (0.003)	–	–	–
Sum total unknowns < 10%	7.7 (0.001)	34 (0.03)	33 (0.03)	31 (0.004)	19 (0.006)	–	55 (0.007)	67 (0.007)

[a] Incorporated CO_2 (characterized by enzymatic digestion)

Low amounts of parent compound and fenamidone-4-nitro were detected together in one region of the conventional extracts, mainly in crops of the first rotation. The region amounted from < 0.001 mg/kg (3.7% of TRR) for turnip roots (1st rotation) to 0.02 mg/kg (6.8% of TRR) for wheat hay (1st rotation). Parent compound, fenamidone-desthiomethyl-2-nitro, fenamidone-desthiomethyl-4-nitro and fenamidone-2-nitro were prominent in the conventional extracts of the non-edible parts of wheat and amounted to ≤ 0.06 mg/kg. Fenamidone-nitro-GSH was a prominent metabolite in Swiss chard and amounted to ≤ 0.03 mg/kg.

In contrast to the earlier study, where the major components of the residue in succeeding crops were RPA 410193, RPA 412636, RPA 412708 and RPA 412708 conjugate, neither RPA 410193 nor RPA 412708 but fenamidone-hydantoin (RPA 412636) were found in the two newer studies. No nitro products were seen in the earlier study, whereas this route of metabolism is significant in the two newer studies. The following metabolic reactions were observed:

- Electrophilic nitration in the aniline ring of parent compound forming fenamidone-2-nitro and fenamidone-4-nitro (most likely in the soil)
- Conjugation with hexose and malonic acid after electrophilic nitration in the aniline ring and hydroxylation of the molecule forming fenamidone-hydroxy-nitro-malonyl-glycoside
- Nucleophilic substitution of methyl mercaptane in the imidazolinone ring of fenamidone-2-nitro by addition of water forming fenamidone-desthiomethyl-2- nitro
- Conjugation with glutathione after electrophilic nitration in the aniline ring of parent and nucleophilic substitution of methyl mercaptane forming fenamidone-nitro-GSH
- Cleavage of the aniline moiety of fenamidone-desthiomethyl-2-nitro forming fenamidone-hydantoin (most likely in the soil)
- Conjugation of fenamidone-hydantoin with glucose, hexose plus malonic acid and serine forming fenamidone-hydantoin-glucoside, fenamidone-hydantoin-malonyl-glycoside and fenamidone-hydantoin-serine

- Addition of ammonia by simultaneous elimination of water in the hydantoin ring forming fenamidone-imino-hydantoin
- Degradation of fenamidone-hydantoin to 2-phenyl-propionic acid
- Cleavage of the aniline moiety of parent compound followed by conjugation with hexose or serine forming fenamidone-thiohydantoin-glycoside and fenamidone-thiohydantoin-serine
- Cleavage of the aniline moiety of parent compound followed by hydroxylation of the methyl group of the imidazolinone ring forming fenamidone-hydroxymethyl-thiohydantoin
- Mineralisation of parent compound leading to carbon dioxide. Carbon dioxide was incorporated into natural compounds (e.g. starch).

Proposed degradation pathways for both the phenyl- and alanine-labelled forms of fenamidone in succeeding crops are presented in Figures 10 and 11.

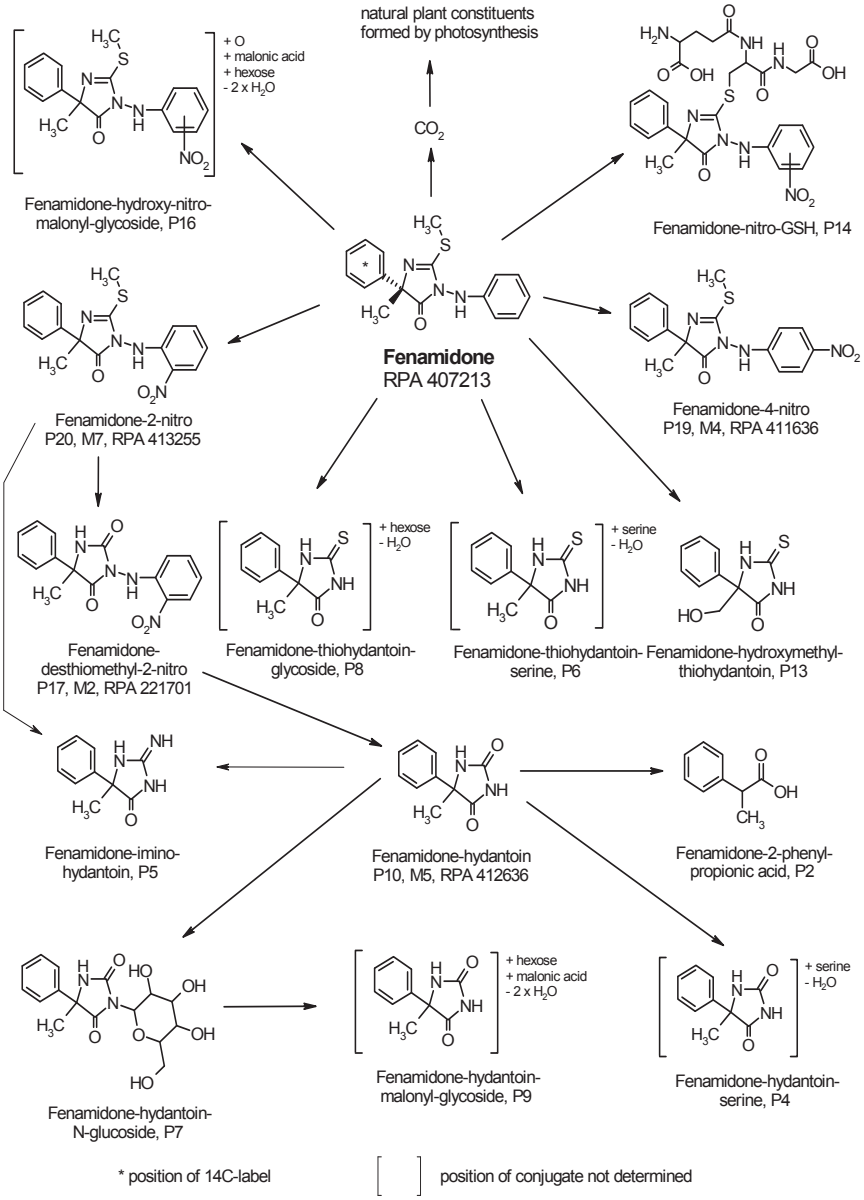


Figure 10 Proposed metabolic pathway of C-phenyl-^{14}C-fenamidone in succeeding crops

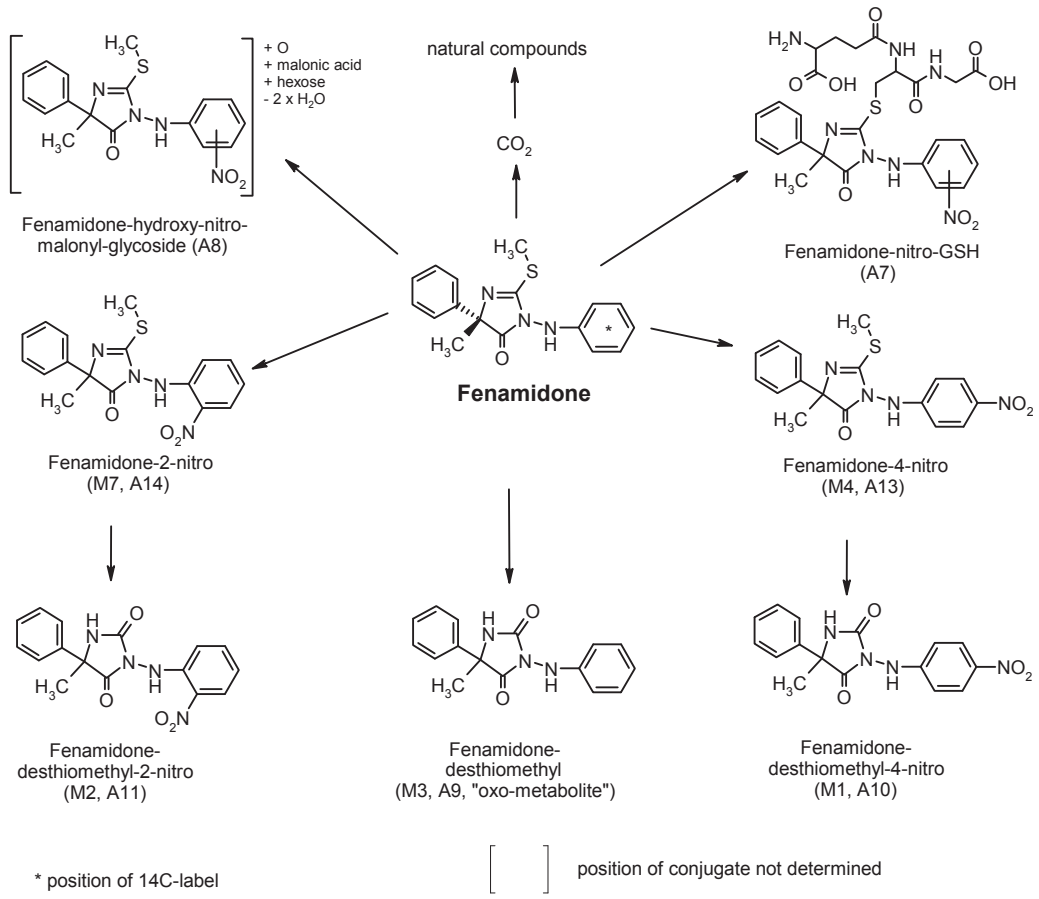


Figure 11 Proposed metabolic pathway of N-phenyl-^{14}C-fenamidone in succeeding crops

Field succeeding crop studies

Seven field succeeding studies were carried out, one in Europe and six in the USA. Rotational crops were cereals (wheat, maize), fruiting vegetables (sweet corn) root and tuber vegetables (turnip, radish) leafy vegetables (lettuce, spinach), pulses (soya bean, dry) and strawberries.

Study by Cavaillé, 2006; Report RA-2750/03, M-274302-01-1

Two field rotational crop trials with fenamidone have been conducted in Northern Europe, one in the UK and one in Germany. Six spray applications were made to target crops of potatoes, using fenamidone as SC formulation at a rate of 0.15 kg ai/ha. Rotational crops of wheat, turnip and lettuce were grown. Three plant back intervals of 30, 180 and 365 days were investigated. Samples of wheat forage, wheat grain, wheat straw, turnip leaf, turnip root and lettuce head were analysed at harvest for residues of fenamidone and its metabolites (RPA 410193, RPA 412636, RPA 412708 and RPA 412708 conjugate). The days after the last treatment of the previous crop ranged in the UK trial from 265 to 617 days for wheat forage, 361 to 719 days for wheat grain and straw, from 300 to 449 days for turnip leaf and root and from 118 to 449 days for lettuce head. In the German trial, the days after the last treatment of the previous crop ranged from 245 to 419 days for wheat forage, 354 to 740 days for wheat grain and straw, from 110 to 445 days for turnip leaf and root and from 83 to 419 days for lettuce head. In all samples, the residues were for all analytes lower than the LOQ of 0.01 mg/kg, with the exception of two wheat straw samples and one lettuce sample with residues of RPA 412708 conjugate at 0.01 mg/kg.

Samples were stored deep-frozen for periods up to 316 days for fenamidone and its metabolites (RPA 410193, RPA 412636 and RPA 412708), except for lettuce samples in the first rotation where the maximum storage interval was 480 days and for turnip in the first rotation where

the maximum storage interval was 463 days. It has been shown that fenamidone and its metabolites are stable for at least 12 months in stored frozen samples of potato (tuber), wheat (grain, hay, straw, forage) and leaf lettuce. The stability of fenamidone and its main plant metabolite RPA 410193 was demonstrated on strawberries over 18 months (M-247921-01-1) which is a representative commodity with high water content. Therefore the storage period of leaf samples (lettuce and turnip) is well covered by appropriate storage data.

Study by Norris, 2001; Report B003034, M-238683-01-1

A crop rotation study with fenamidone has been conducted in the USA. Two field rotational crop trials were conducted in California and Washington. Six broadcast applications were made to bare soil, using fenamidone as SC formulation at a rate of 0.2 kg ai/ha. Rotational crops of wheat, radish and spinach were grown. Two plant-back periods were investigated: 28/30 days and 201/234 days. Radish roots and tops, spinach leaves, and wheat forage (immature), hay, straw and grain, were harvested at maturity and analysed for residues of fenamidone, RPA 412636, RPA 412708, and RPA 410193. No measurable residues were found in any of the rotational crop fractions from the Washington site. However, measurable residues of RPA 412636 were found in many of the fractions from the California site (see Table 51). The maximum storage interval from harvest to extraction was 269 days. Adequate storage stability data are available to support the storage conditions and intervals.

Table 51 Residues of fenamidone and metabolites in rotated crops in California (two treated plots)

Plant material	Plant back interval [a]	DAT [b]	Residues, mg/kg			
			Fenamidone	RPA 410193	RPA 412636	RPA 412708
Spinach leaf	28	76	< 0.02	< 0.02	0.071	< 0.02
			< 0.02	< 0.02	0.12	< 0.02
	201	264	< 0.02	< 0.02	< 0.02	< 0.02
			< 0.02	< 0.02	< 0.02	< 0.02
Radish tops	28	76	< 0.02	< 0.02	0.022	< 0.02
			< 0.02	< 0.02	0.044	< 0.02
	201	264	< 0.02	< 0.02	< 0.02	< 0.02
			< 0.02	< 0.02	< 0.02	< 0.02
Radish roots	28	76	< 0.02	< 0.02	0.039	< 0.02
			< 0.02	< 0.02	< 0.02	< 0.02
	201	264	< 0.02	< 0.02	< 0.02	< 0.02
			< 0.02	< 0.02	< 0.02	< 0.02
Wheat forage	28	76	< 0.02	< 0.02	0.026	< 0.02
			< 0.02	< 0.02	0.028	< 0.02
	201	264	< 0.02	< 0.02	0.093	< 0.02
			< 0.02	< 0.02	0.075	< 0.02
Wheat hay	28	131	< 0.02	< 0.02	0.054	< 0.02
			< 0.02	< 0.02	0.036	< 0.02
	201	280	< 0.02	< 0.02	0.39	< 0.02
			< 0.02	< 0.02	0.45	< 0.02
Wheat straw	28	278	< 0.02	< 0.02	0.10	< 0.02
			< 0.02	< 0.02	0.076	< 0.02
	201	311	< 0.02	< 0.02	0.27	< 0.02
			< 0.02	< 0.02	0.17	< 0.02
Wheat grain	28	278	< 0.02	< 0.02	0.061	< 0.02
			< 0.02	< 0.02	< 0.02	< 0.02
	201	311	< 0.02	< 0.02	< 0.02	< 0.02
			< 0.02	< 0.02	< 0.02	< 0.02

[a] Plant back interval: days between last treatment and planting or sowing
[b] DAT: days after last treatment of previous crop

Study by Mackie, 2001; Report B003122, M-238779-01-1

A field rotational crop study has been conducted on wheat in the USA. Twenty-two field trials were conducted during the 1999/2000 growing season. A single application of fenamidone was made to bare soil as SC formulation at a rate of 1.2 kg ai/ha. Application was 30 ± 1 day before planting at test sites growing winter wheat varieties or spring wheat varieties that are seeded in the fall. Wheat forage,

hay, grain, and straw samples were collected at normal commercial harvest and analysed for fenamidone, RPA 412708, RPA 410193 and RPA 412636. The results are shown in Table 52. The maximum storage interval from harvest to extraction was 358 days. Adequate storage stability data are available to support the storage conditions and intervals.

Table 52 Residues of fenamidone and metabolites in rotated crops (wheat)

Trial	Plant back interval	Plant part	Residue, mg/kg			
			Fenamidone	RPA 412708	RPA 410193	RPA 412636
18273-01 Lucama, USA	31	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.03
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-02 Proctor, USA	30	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-03 Carlyle, USA	29	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-04 Bagley, USA	30	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.04
		Straw	< 0.02	< 0.02	< 0.02	0.03
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-05 York, USA	195	Forage	< 0.02	< 0.02	< 0.02	0.07
		Hay	< 0.02	< 0.02	< 0.02	0.05
		Straw	< 0.02	< 0.02	< 0.02	0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-06 Colony, USA	28	Forage	< 0.02	< 0.02	< 0.02	0.05
		Hay	< 0.02	< 0.02	< 0.02	0.32
		Straw	< 0.02	< 0.02	< 0.02	0.08
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-07 Conklin, USA	30	Forage	< 0.02	< 0.02	< 0.02	0.02
		Hay	< 0.02	< 0.02	< 0.02	< 0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-08 Uvalde, USA	87	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.10
		Straw	< 0.02	< 0.02	< 0.02	0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-09 Velva, USA	213	Forage	< 0.02	< 0.02	< 0.02	0.02
		Hay	< 0.02	< 0.02	< 0.02	< 0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-10 Velva, USA	213	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	< 0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-11 Velva, USA	217	Forage	< 0.02	< 0.02	< 0.02	0.03
		Hay	< 0.02	< 0.02	< 0.02	0.16
		Straw	< 0.02	< 0.02	< 0.02	0.03
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-12 Britton, USA	224	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	< 0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-13 Britton, USA	224	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	< 0.02
		Straw	< 0.02	< 0.02	< 0.02	< 0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-14 Colony, USA	30	Forage	< 0.02	< 0.02	< 0.02	0.03
		Hay	< 0.02	< 0.02	< 0.02	< 0.02
		Straw	< 0.02	< 0.02	< 0.02	0.02

Trial	Plant back interval	Plant part	Residue, mg/kg			
			Fenamidone	RPA 412708	RPA 410193	RPA 412636
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-15 Lamed, USA	29	Forage	< 0.02	< 0.02	< 0.02	0.02
		Hay	< 0.02	< 0.02	< 0.02	0.04
		Straw	< 0.02	< 0.02	< 0.02	0.20
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-16 Lamed, USA	30	Forage	< 0.02	< 0.02	< 0.02	0.03
		Hay	< 0.02	< 0.02	< 0.02	0.26
		Straw	< 0.02	< 0.02	< 0.02	0.03
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-17 Plainview, USA	29	Forage	< 0.02	0.04	< 0.02	< 0.02
		Hay	< 0.02	0.02	< 0.02	0.07
		Straw	< 0.02	< 0.02	< 0.02	0.02
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-18 Las Cruces, USA	30	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.07
		Straw	< 0.02	< 0.02	< 0.02	0.04
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-19 Levelland, USA	29	Forage	< 0.02	< 0.02	< 0.02	0.02
		Hay	< 0.02	< 0.02	< 0.02	0.02
		Straw	< 0.02	< 0.02	< 0.02	0.05
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-20 Ephrata, USA	30	Forage	< 0.02	0.07	< 0.02	0.03
		Hay	< 0.02	< 0.02	< 0.02	0.03
		Straw	< 0.02	< 0.02	< 0.02	0.04
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-21 Porterville, USA	30	Forage	< 0.02	< 0.02	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.07
		Straw	< 0.02	< 0.02	< 0.02	0.07
		Grain	< 0.02	< 0.02	< 0.02	< 0.02
18273-22 Watsonville, USA	30	Forage	< 0.02	0.04	< 0.02	< 0.02
		Hay	< 0.02	< 0.02	< 0.02	0.05
		Straw	< 0.02	< 0.02	< 0.02	0.04
		Grain	< 0.02	< 0.02	< 0.02	< 0.02

Study by Beedle and Harbin, 2004; Report 201165, M-242538-01-1

A field rotational crop study has been conducted on strawberries in the USA. Eight field trials were conducted in 2003. Four broadcast foliar applications of fenamidone were made to the primary crop (a leafy vegetable, cucurbit or fruiting vegetable) as SC formulation at a rate of 0.3 kg ai/ha, and with 4–5 days between applications. The primary crop was tilled into the ground at least 2 days after the final application, and strawberries were planted as a rotational crop 28 to 30 days after the last application of the previous crop. Strawberries were collected at normal harvest. The residues of fenamidone and its metabolites RPA 412708, RPA 410193 and RPA 412636 were quantitated in strawberries by LC-MS/MS with an LOQ of 0.02 mg/kg. In all eight trials, no residues of fenamidone, RPA 412708, RPA 410193 and RPA 412636 greater than the LOQ of 0.02 mg/kg were observed in strawberries as rotational crop. The maximum storage interval from harvest to extraction was 294 days. Adequate storage stability data are available to support the storage conditions and intervals.

Further to the studies described above, field rotational crop studies have been conducted in the USA with sweet corn, maize and soya beans. The samples were analysed for fenamidone as well as for the sum of RPA 412636 and RPA 412708 (measured as RPA 412636) by LC-MS/MS. The results (mean of two field samples) are summarized in Table 53.

Study by Hartz and Helfrich, 2008; Report RARPY018, M-305323-01-1

A field rotational crop study has been conducted on sweet corn in the USA. Twelve field trials were conducted during the 2007 growing season. Three applications of fenamidone were made to bare soil as a SC formulation at a target rate of 0.3 kg ai/ha, and with 5–9 days between applications. The soil was tilled after the third application to simulate a failed crop and sweet corn was then planted with a

target planting interval of 25 to 30 days. Sweet corn forage and kernel plus cob with husks removed were collected at normal commercial harvest (BBCH 73–79). Stover (fodder) was collected at BBCH 89. All the samples were analysed for fenamidone as well as for RPA 412636 and RPA 412708 (measured as RPA 412636). The results are summarized in Table 53. The maximum storage interval from harvest to extraction was 344 days. Adequate storage stability data are available to support the storage conditions and intervals.

Study by Hartz and Helfrich, 2008; Report RARPY021, M-305368-01-1

A field rotational crop study has been conducted on maize in the USA. Nine field trials were conducted during the 2007 growing season. Three applications of fenamidone were made to bare soil as SC formulation at a target rate of 0.3 kg ai/ha, and with 5–8 days between applications. The soil was tilled after the third application to simulate a failed crop and maize was then planted with a target planting interval of 25 to 30 days. Maize forage was collected at BBCH 85–87. Grain and stover (fodder) were collected at BBCH 89 (normal commercial harvest). All the samples were analysed for fenamidone as well as for RPA 412636 and RPA 412708 (measured as RPA 412636). The results are summarized in Table 53. The maximum storage interval from harvest to extraction was 336 days. Adequate storage stability data are available to support the storage conditions and intervals.

Study by Hartz, 2008; Report RARPY017, M-305308-01-1

A field rotational crop study has been conducted on soya beans in the USA. Eleven field trials were conducted during the 2007 growing season. Three applications of fenamidone were made to bare soil as SC formulation at a target rate of 0.3 kg ai/ha, and with 5–10 days between applications. The soil was tilled after the third application to simulate a failed crop. Soya bean was then sown with an interval of 25 to 30 days. Soya forage and hay were collected at BBCH 65–74. Soya bean seed (grain) was collected at BBCH 89 (normal commercial harvest). All the samples were analysed for fenamidone as well as for RPA 412636 and RPA 412708 (measured as RPA 412636). The results are summarized in Table 53. The maximum storage interval from harvest to extraction was 337 days. Adequate storage stability data are available to support the storage conditions and intervals.

Table 53 Residues of fenamidone, RPA 412636 and RPA 412708 in rotated crops

Rotated crop	Trial, location	Plant back interval, days	Commodity	Fenamidone, mg/kg	412636 + 412708, mg/kg [a]
Sweet corn	RP021-07RA, Germansville, USA	30	Forage	< 0.02	0.03
			Stover	< 0.02	0.09
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP022-07RA, North Rose, USA	25	Forage	< 0.02	0.04
			Stover	< 0.02	0.07
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP023-07RA, Athens, USA	28	Forage	< 0.02	0.10
			Stover	< 0.02	0.29
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP024-07RA, High Springs, USA	30	Forage	< 0.02	< 0.02
			Stover	< 0.02	0.03
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP025-07RA, New Holland, USA	26	Forage	< 0.02	0.02
			Stover	< 0.02	0.04
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP026-07RA, Richwood, USA	27	Forage	< 0.02	0.03
			Stover	< 0.02	< 0.02
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP027-07RA, Richland, USA	30	Forage	< 0.02	< 0.02
			Stover	< 0.02	< 0.02
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP028-07RA, Gardner, USA	28	Forage	< 0.02	< 0.02
			Stover	< 0.02	0.04
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP029-07RA, Geneva, USA	25	Forage	< 0.02	< 0.02
			Stover	< 0.02	< 0.02
			Kernels plus cob without husk	< 0.02	< 0.02

Rotated crop	Trial, location	Plant back interval, days	Commodity	Fenamidone, mg/kg	412636 + 412708, mg/kg [a]
Sweet corn	RP030-07RA, Hickman, USA	28	Forage	< 0.02	0.07
			Stover	< 0.02	0.11
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP031-07RA, Rupert, USA	29	Forage	< 0.02	0.02
			Stover	< 0.02	0.08
			Kernels plus cob without husk	< 0.02	< 0.02
Sweet corn	RP032-07RA, Cornelius, USA	28	Forage	< 0.02	< 0.02
			Stover	< 0.02	0.02
			Kernels plus cob without husk	< 0.02	< 0.02
Maize (Field corn)	RP035-07RA, North Rose, USA	25	Forage	< 0.02	0.02
			Stover	< 0.02	0.02
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP036-07RA, Athens, USA	28	Forage	< 0.02	0.21
			Stover	< 0.02	0.05
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP037-07RA, Richwood, USA	27	Forage	< 0.02	0.02
			Stover	< 0.02	0.05
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP040-07RA, Richland, USA	26	Forage	< 0.02	< 0.02
			Stover	< 0.02	< 0.02
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP041-07RA, Rockwood, USA	27	Forage	< 0.02	0.02
			Stover	< 0.02	< 0.02
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP042-07RA, Clarence, USA	25	Forage	< 0.02	0.04
			Stover	< 0.02	0.02
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP043-07RA, Campbell, USA	28	Forage	< 0.02	< 0.02
			Stover	< 0.02	< 0.02
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP048-07RA, Springfield, USA	24	Forage	< 0.02	< 0.02
			Stover	< 0.02	< 0.02
			Grain	< 0.02	< 0.02
Maize (Field corn)	RP054-07RA, East Bernard, USA	28	Forage	< 0.02	0.04
			Stover	< 0.02	0.13
			Grain	< 0.02	< 0.02
Soya bean	RP001-07RA, Athens, USA	28	Forage	< 0.02	0.05
			Hay	< 0.02	0.07
			Seed	< 0.02	< 0.02
Soya bean	RP002-07RA, Suffolk, USA	30	Forage	< 0.02	< 0.02
			Seed	< 0.02	< 0.02
Soya bean	RP003-07RA, Newport, USA	25	Forage	< 0.02	< 0.02
			Hay	< 0.02	0.02
			Seed	< 0.02	< 0.02
Soya bean	RP004-07RA, Proctor, USA	30	Forage	< 0.02	< 0.02
			Hay	< 0.02	< 0.02
			Seed	< 0.02	< 0.02
Soya bean	RP005-07RA, Cheneyville, USA	26	Forage	< 0.02	< 0.02
			Hay	< 0.02	0.03
			Seed	< 0.02	< 0.02
Soya bean	RP007-07RA, Carlyle, USA	29	Forage	< 0.02	0.05
			Hay	< 0.02	0.05
			Seed	< 0.02	< 0.02
Soya bean	RP008-07RA, New Holland, USA	25	Forage	< 0.02	0.04
			Hay	< 0.02	0.06
			Seed	< 0.02	< 0.02
Soya bean	RP010-07RA, Richland, USA	25	Seed	< 0.02	< 0.02
Soya bean	RP012-07RA, York, USA	26	Forage	< 0.02	0.03
			Hay	< 0.02	0.05
			Seed	< 0.02	< 0.02
Soya bean	RP015-07RA,	26	Forage	< 0.02	< 0.02

Rotated crop	Trial, location	Plant back interval, days	Commodity	Fenamidone, mg/kg	412636 + 412708, mg/kg [a]
	Sheridan, USA		Hay	< 0.02	0.02
			Seed	< 0.02	< 0.02
Soya bean	RP020-07RA, Breslau, USA	27	Forage	< 0.02	0.08
			Hay	< 0.02	0.14
			Seed	< 0.02	< 0.02

[a] Sum of RPA 412636 and RPA 412708, measured as RPA 412636

In summary, after application of 0.9–1.2 kg ai/ha to the bare soil, in the following crops no residues of fenamidone were found at or above the LOQ of 0.02 mg/kg in human food but metabolites as RPA412708 and RPA412636 occurred in commodities that may be used as animal feeds. The sum of RPA412708 and RPA412636 reached up to 0.14 in soya bean hay, 0.29 mg/kg in sweet corn stover and 0.21 mg/kg in field corn forage; RPA412636 occurred up to 0.07 mg/kg in wheat forage, 0.27 mg/kg in wheat straw and 0.45 mg/kg in wheat hay.

RESIDUE ANALYSIS

Analytical methods

The Meeting received descriptions and validation data for analytical methods for residues of fenamidone and its relevant metabolites RPA 410193, RPA 412708 and RPA 17879 in plant and animal commodities. Residue analytical methods rely on GC with NP-detection, GC-MS or LC-MS/MS. Typical LOQs achieved for plant and animal commodities fall in the range of 0.01–0.02 mg/kg. Methods have been subjected to independent laboratory validation (ILV). The methods described briefly below have been used for the analysis of the samples generated during the supervised field trials, processing fraction studies and storage stability investigations (report number in brackets).

Plant commodities

Method number AR 150-97, M-165219-01-1

Validation: Report No. 98-139 (R004058), M-165838-01-1

Radiovalidation: Report No. 99-82 (R004785), M-166513-01-1

ILV: Report No. 99-23 (R005021), M-170314-01-1

Analytes: Fenamidone, RPA 410193

LOQ: 0.02 mg/kg (GC-NPD, GC-MS), 0.01 mg/kg (LC-MS/MS)

Description: Fenamidone and RPA 410193 residues are extracted from homogenized sample by acetone / water. The raw extract is purified using a polystyrene-divinylbenzene cartridge SPE followed by an aminopropyl (NH_2) SPE cartridge. Quantification was by GC-NPD, GC-MS or LC-MS/MS.

Residue trials: Grapes (97–579, 97–580, 97–581, 97–582, 97–636, 97–687, 97–742, 98–561, 98–562, 98–563, 98–631, 98–690, 98–721, R.19/00, R.20/00, R.33/01, R.34/01, R.48/01), Bulb onions (R.75/02, R.82/02, R.83/02), Melons (00–535, 00–536, 02 R 655, 02 R 656), Cucumbers (02 R 651, 02 R 653), Watermelons (UNESP RA-944/05, UNESP RA-945/05, UNESP RA-946/05), Lettuce (98–514, 99–506), Potatoes (97–555, 97–556, 97–557, 97–558, 97–691, 97–745, 98–525, 98–526, 98–527, 98–635, 98–669, 98–688, 98–700, 99–648, 99–664, R.23/01, R.32/01, R.50/01).

Method number 00868, M-229394-01-1

Validation: Report No. P 1980 G, M-370932-01-1

Analytes: Fenamidone, RPA 410193

LOQ: 0.01 mg/kg (LC-MS/MS)

Description: Fenamidone and RPA 410193 residues are extracted by homogenisation with acetone / water. After centrifugation an aliquot was concentrated to the aqueous remainder and dissolved in acidified acetonitrile/water. Quantification was by LC-MS/MS.

Residue trials: Grapes (09–2179, 09–2180), Strawberries (09–2169), Leek (RA–2682/03), Bulb onion (RA-2683/03), Witloof chicory (RA-2566/04, 08-2205), Head cabbage (RA-2900/03, RA-2901/03), Cauliflower (RA-2902/03, RA-2903/03), Melons (RA-2536/05), Cucumbers (RA 2648/03, RA 2540/04), Tomatoes (09–2235, 09–3235, RA–2541/05), Potatoes (09–2170), Lettuce (RA-2542/04, RA-2518/05, RA-2519/05, RA-2553/06, 09–2158, 09–2159, 09–2216)

Method number RPAC 45683, M-238850-01-1, method appended, p. 99

Validation: Report No. 019-056 (B003198), M-238850-01-1

Analytes: Fenamidone, RPA 410193, RPA 412636, RPA 412708

LOQ: 0.02 mg/kg (LC-MS/MS)

Description Method analogue to AR 150-97

Method number unknown, M-238851-01-1, method appended, p. 48

Validation: Report No. B003199, M-238851-01-1

Radiovalidation: Report No. 019-057 (B003200), M-238852-01-1

Analytes: Fenamidone, RPA 410193, RPA 412636, RPA 412708

LOQ: 0.02 mg/kg (LC-MS/MS)

Description Method analogue to AR 150-97

Residue trials: Ginseng (09800), Lima beans (09530), Snap beans (08895)

Method number RPAC 45911, M-238680-01-1 (method appended, p. 199)

Analytes: Fenamidone, RPA 412636, RPA 410193 (412708), RPA 410193

LOQ: 0.02 mg/kg (LC-MS/MS)

Description: Fenamidone, RPA 412636, RPA 412708 and RPA 410193 are extracted from homogenized sample matrix by accelerated solvent extraction (ASE) with acetone / water at enhanced temperature conditions. After dilution with water and filtration, quantification was by LC-MS/MS.

Residue trials: Onions (98W14461), Green onions (98W14461), Cabbage and broccoli (201225), Melons (99W14488), Cucumbers (99W14486), Summer squash (99W14487), Peppers (201227), Tomatoes (99W17533), Lettuce (00W13043, 00W14459), Mustard greens (201226), Spinach (201214), Carrots (08524), Potatoes (99W17534, 01AC05), Celery (201214), Sunflower seed (07999) and storage stability study EC-99-448

Method number RPAC 45952, M-240317-01-1

Analytes: Fenamidone, RPA 410193 (RPA 412708), RPA 412636

LOQ: 0.02 mg/kg (LC-MS/MS)

Description: Fenamidone and metabolites are extracted from homogenized sample matrix by accelerated solvent extraction (ASE) with acetone / water at enhanced temperature conditions. After dilution with acetone extracts were cleaned up on a laboratory packed column containing carbon, silica and alumina. Final extracts are quantified by LC-MS/MS.

Residue trials: Cotton seed and by-products (201163)

Method number 01163, M-354028-01-1

Validation: Bayer Ref: M-449868-01-1

Analytes: Fenamidone, RPA 410193

LOQ: 0.01 mg/kg (LC-MS/MS)

Description: Modified QuEChERS method for crop matrices. Water is added to the sample material depending on its moisture content. Residues of fenamidone and RPA 410193 are extracted from sample material by vigorous shaking with acetonitrile. For liquid-liquid partition and phase separation, salt (magnesium sulphate, sodium chloride, sodium citrate and sodium hydrogen citrate) is added to the homogenate and the sample is shaken again. After centrifugation an aliquot of the upper organic phase is diluted with acetonitrile/water. This final extract is quantified by LC-MS/MS.

Residue trials: Grapes (10–2010, 10–2011), Strawberries (10–2014, 11–2004, 12–2039), Tomatoes (10–2013), Lettuce (10–2012), Potatoes (10–2065), Witloof chicory (10–2040)

Method number 00862, Bayer Reference: M-255146-01-1

Analytes: Fenamidone, RPA 410193, RPA 412636 and RPA 412708

LOQ: 0.01 mg/kg (LC-MS/MS)

Description: Fenamidone, RPA 410193, RPA 412636 and RPA 412708 are extracted from crop materials using acetone/water in a high-speed blender. After centrifuging, the supernatant is removed and the solids re-extracted with acetone/water. An aliquot of the combined supernatants is concentrated to the aqueous phase and adjusted to volume with acidified water, then filtered for analysis by LC/MS/MS.

Study: Rotational crops; turnip, lettuce, wheat (RA-2750/03)

Method number 00863, Bayer Reference: M-274241-01-1

Analytes: RPA 412708 conjugate

LOQ: 0.01 mg/kg (LC-MS/MS)

Description: RPA 412708 conjugate is extracted from samples with acetone: water (5:1 v/v) twice, the samples blended in a blender and centrifuged. The supernatant is removed, further acetone added and concentrated to an aqueous remainder using a sample concentrator. Formic acid is added and the sample heated in an oven for 2 hours at 70 °C to hydrolyse. Subsamples of the hydrolysed extracts are mixed with acetonitrile or water, filtered (0.2 µm filter) and analysed by LC-MS/MS.

Study: Rotational crops; turnip, lettuce, wheat (RA-2750/03)

Animal commodities

Method number AR 200-99, M-166398-01-1

Validation: Report No. 99-95, M-183960-01-1

Analytes: Fenamidone, RPA 412708, RPA 412636

LOQ: 0.01 mg/kg (GC-NPD)

Description: Residues of fenamidone, RPA412708 and RPA412636 are extracted from milk samples by homogenisation with acetonitrile. The extracts are purified using an octadecyl cartridge. Final determination of residues is by GC on a semi-capillary column, using a thermionic detector and quantification against external standards.

Residue trials: Milk (00W25043)

Method number AR 178-98, M-166460-01-1

ILV: Report No. 99-52, M-183964-01-1

Analytes: Fenamidone, RPA 412708, RPA 412636

LOQ: 0.05 mg/kg (GC-NPD)

Description: Residues of fenamidone, RPA412708 and RPA412636 are extracted from animal products by homogenisation with acetonitrile. The extracts are purified using a polystyrene divinylbenzene cartridge followed by an aminopropyl cartridge. For kidney, whole egg and muscle, final determination of residues is by gas chromatography on a semi-capillary column, using a thermionic detector and quantification against external standards. For liver, final determination of residues is by GC-MS and quantification against external standards.

Residue trials: Animal products (00W25043)

Multi-residue methods

Plant material: Method number DFG S19, M-368426-01-1

Validation: Report No. R&D/CRLD/AN/9915480, M-166310-01-1

Analytes: Fenamidone, RPA410193

LOQ: 0.01 mg/kg (GC-MS)

Description: Residues of fenamidone and RPA410193 are extracted from the plant samples by homogenisation with water / acetone, then partition into ethyl acetate / cyclohexane. The organic extracts are cleaned up by fractionation using gel-permeation chromatography, followed by purification using a silica column. Final determination of residues is by GC-MS, monitoring three ions per analyte for determination and confirmation.

Animal products: Method number 01323, M-410297-01-1

ILV: Report No. 2011/0107/01, M-440254-01-1

Analyte: Fenamidone, RPA 412708 and RPA 412636

LOQ: 0.01 mg/kg (LC-MS/MS)

Description: QuEChERS multi residue method for animal matrices: For milk, residues of fenamidone, RPA 412708 and RPA 412636 are extracted by vigorous shaking with acetonitrile. Salts (magnesium sulphate, sodium chloride, sodium citrate and sodium hydrogen citrate) are added and the sample is shaken again. A portion of the acetonitrile layer is transferred to a dispersive SPE clean-up tube, shaken and centrifuged before aliquots of the supernatant are acidified for determination of fenamidone, RPA 412708 and RPA 412636 by LC-MS/MS). RPA 412636 is determined separately from fenamidone and RPA 412708.

For eggs, muscle, liver and kidney, residues of fenamidone, RPA 412708 and RPA 412636 are extracted by vigorous shaking with acetonitrile (and homogenisation for muscle, liver and kidney). Salts (magnesium sulphate, sodium chloride, sodium citrate and sodium hydrogen citrate) are added and the sample is shaken again. Fat is frozen out of the extract before a portion of the acetonitrile layer is transferred to a dispersive SPE clean-up tube, shaken and centrifuged before aliquots of the supernatant are acidified for determination of fenamidone, RPA 412708 and RPA 412636 by LC-MS/MS as for milk.

For fat, samples are melted (60 °C) and partitioned with water and acetonitrile. After re-melting, salts (magnesium sulphate, sodium chloride, sodium citrate and sodium hydrogen citrate) are added and the sample is shaken again. Fat is frozen out of the extract before a portion of the acetonitrile layer is transferred to a dispersive SPE clean-up tube, shaken and centrifuged before aliquots of the supernatant are acidified for determination of fenamidone, RPA 412708 and RPA 412636 by LC-MS/MS as for milk.

Validation data for the methods described above are available from specific method validation studies or from residue studies where specific method validation recovery experiments were performed separate from routine sample analysis. These method recovery data, for plant and animal commodities are summarised in Table 54.

Table 54 Method recovery data of fenamidone and metabolites in plants and animal products

Commodity	Analytes	Fortification, mg/kg	n	Recovery, %			Method	Reference
				Range	Mean	RSD		
Plant commodities								
Grapes	Fenamidone	0.02	1	117	117	–	AR 150-97	97-580 M-165259-01-1
	RPA 410193	0.02	1	89	89	–		
Grapes	Fenamidone	0.2	1	93	93	–	AR 150-97	97-581 M-165494-01-1
	RPA 410193	0.2	1	116	116	–		
Grapes	Fenamidone	0.02	5	70–77	73	3.5	AR 150-97	97-582 M-165735-01-2
	RPA 410193	0.02	5	73–114	96	19		
Grapes	Fenamidone	0.1, 0.4	2	70, 80	75	–	AR 150-97	97-636 M-165270-01-1
	RPA 410193	0.1, 0.4	2	94, 100	97	–		
Grapes	Fenamidone	0.02	2	90, 99	95	–	AR 150-97	97-687 M-165275-01-1
	RPA 410193	0.02	2	98, 103	101	–		
Grapes	Fenamidone	0.02	2	99, 97	98	–	AR 150-97	97-742 M-165477-01-1
	RPA 410193	0.02	2	102, 101	102	–		
Grapes	Fenamidone	0.02–0.1	3	82–102	91	11	AR 150-97	98-563 M-166547-01-1
	RPA 410193	0.02–0.1	3	92–101	96	4.9		
Grapes	Fenamidone	0.02–0.5	9	84–96	92	4.7	AR 150-97 (R003696)	R.19/00, R.20/00, R.33/01, R.34/01 M-285309-01-1, M-285311-01-1, M-285002-01-1, M-285003-01-1
Grapes	RPA 410193	0.02–0.10	6	91–101	95	3.5	AR 150-97 (R003696)	R.33/01, R.34/01 M-285002-01-1, M-285003-01-1
Grapes	Fenamidone	0.02–0.10	6	96–100	97	1.6	AR 150-97 (R003696)	R.48.01 M-285004-01-1
	RPA 410193	0.02–0.10	6	91–101	95	3.5		
Onion (bulb)	Fenamidone	0.02–0.3	6	87–109	97	9.2	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	102–110	106	3.2		
Onion (bulb)	Fenamidone	0.02–0.3	6	87–109	97	8.7	RPAC 45911	98W14461 M-238680-01-1
	RPA 410193	0.02–0.3	6	99–104	101	2.3		
Onion (green)	Fenamidone	0.02–0.3	6	83–110	96	10		
	RPA 410193	0.02–0.3	6	106–119	110	5.3		
Onion (bulb)	Fenamidone	0.02–0.08	6	80–94	89	6.5	AR 150-97 (R003696)	R.75/02, R.82/02, R.83/02 M-285013-01-1, M-284950-01-1, M-284958-01-1
	RPA 410193	0.02–0.08	6	78–87	81	4.3		
Cabbage	Fenamidone	0.01–1.5	12	93–108	102	5.6	00868	RA-2900/03, RA-2901/03 M-248911-01-1, M-248027-01-1
	RPA 410193	0.01–1.5	12	92–109	100	4.9		
Head cabbage with wrapper leaves	Fenamidone	0.02–1.0	11	84–152	100	18	RPAC 45911	201225 M-243561-01-3
	RPA 410193	0.02–1.0	11	81–111	102	8.9		
Head cabbage w/o wrapper leaves	Fenamidone	0.02–1.0	8	87–121	105	14	RPAC 45911	201225 M-243561-01-3
	RPA 410193	0.02–1.0	8	107–118	112	3.7		
Cauliflower	Fenamidone	0.01–1.0	7	88–104	97	5.8	00868	RA-2902/03, RA-2903/03 M-247895-01-1, M-247987-01-1
	RPA 410193	0.01–1.0	7	85–104	98	6.8		
Broccoli	Fenamidone	0.02–5.0	10	62–112	87	20	RPAC 45911	201225 M-243561-01-3
	RPA 410193	0.02–5.0	9	74–116	97	14		
Melon (fruit)	Fenamidone	0.02–0.2	9	74–132	101	17	AR 150-97	00-535 M-205672-01-1
	RPA 410193	0.02–0.2	9	88–132	111	12		
Melon (fruit)	Fenamidone	0.02	10	71–116	87	15	AR 150-97	02 R 655 M-219005-01-1
	RPA 410193	0.02	10	93–114	103	6.5		
Melon (peel)	Fenamidone	0.02	7	71–102	86	14		
	RPA 4101933	0.02	7	84–107	95	10		
Melon (pulp)	Fenamidone	0.02	6	85–110	98	10		
	RPA 410193	0.02	6	93–112	102	7.5		

Commodity	Analytes	Fortification, mg/kg	n	Recovery, %			Method	Reference
				Range	Mean	RSD		
Melon (fruit)	Fenamidone	0.01–0.1	6	97–101	99	1.7	00868	RA-2536/05 M-279019-01-1
	RPA 410193	0.01–0.1	6	98–103	101	1.9		
Melon (fruit)	Fenamidone	0.02–0.30	6	84–95	89	4.3	RPAC 45911	99W14488 M-240409-01-1
	RPA 410193	0.02–0.30	6	111–118	114	2.3		
Cucumber (fruit)	Fenamidone	0.02–0.30	6	97–114	104	6.3	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.30	6	107–120	112	4.7		
Cucumber (fruit)	Fenamidone	0.01–0.1	10	89–105	101	6.3	00868	RA 2648/03 M-235795-01-1
	RPA 410193	0.01–0.1	10	91–102	95	3.6		
Cucumber (fruit)	Fenamidone	0.02–0.30	6	113–120	117	2.0	RPAC 45911	99W14486 M-240408-01-1
	RPA 410193	0.02–0.30	6	125–134	129	2.7		
Squash (fruit)	Fenamidone	0.02–1.0	6	96–113	107	5.6	RPAC 45911	99W14487 M-240407-01-1
	RPA 410193	0.02–1.0	6	99–115	107	5.3		
Watermelon (whole fruit)	Fenamidone	0.02–0.80	15	87–98	91	3.3	AR 150-97 (R003696)	UNESP RA-944/05, UNESP RA-945/05, UNESP RA-946/05 M-276178-01-1, M-276180-01-1, M-276183-01-1
	RPA 410193	0.02–0.80	15	85–93	89	3.1		
Pepper	Fenamidone	0.02–3.0	13	73–107	88	10	RPAC 45911	201227 M-260625-01-1
	RPA 410193	0.02–0.50	11	97–117	109	6.6		
Tomato (fruit)	Fenamidone	0.02–0.30	6	80–107	96	9.8	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.30	6	93–106	100	5.4		
Tomato (paste)	Fenamidone	0.02–0.30	6	75–96	84	10	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.30	6	108–128	115	7.1		
Tomato (puree)	Fenamidone	0.02–0.30	6	68–94	78	14	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.30	6	117–128	121	3.7		
Tomato (fruit)	Fenamidone	0.01–0.1	3	97–104	101	2.9	00868	RA-2541/05 M-279022-01-1
	RPA 410193	0.01–0.1	3	104–113	107	3.6		
Lettuce	Fenamidone	0.02–0.10	9	99–102	101	0.9	AR 150-97	98-139 M-165838-01-1
	RPA 410193	0.02–0.10	9	91–99	95	4.2		
Lettuce	Fenamidone	0.02–0.30	6	87–112	98	11.4	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.30	6	96–103	99	2.6		
Lettuce	Fenamidone	0.01–5.0	11	92–121	105	6.9	00868	RA-2542/04 M-265329-01-1
	RPA 410193	0.01–5.0	11	74–111	100	10		
Lettuce	Fenamidone	0.02–1.0	6	102–109	105	2.8	RPAC 45911	00W13043 M-238774-01-1
	RPA 410193	0.02–1.0	6	98–108	102	3.4		
Mustard greens	Fenamidone	0.02–40	11	73–117	93	14	RPAC 45911	201226 M-260567-01-1
	RPA 410193	0.02–0.50	9	99–115	107	6.2		
Spinach	Fenamidone	0.02–30	11	74–119	99	16	RPAC 45911	201214 M-242541-01-1
	RPA 410193	0.02–0.30	12	69–114	95	14		
Lima beans (succ.) w/o pods	Fenamidone	0.02–2.0	12	77–110	90	12.5		09530
	RPA 410193	0.02–2.0	12	84–119	100	9		IR4 submission
Snap beans, pods w/seed	Fenamidone	0.02–2.0	9	101–116	111	4.6		08895
	RPA 410193	0.02–2.0	9	83–107	94	8.4		IR4 submission
Snap beans, plants w/pods	Fenamidone	0.2–40	12	101–117	108	5.8		08895
	RPA 410193	0.2–2.0	9	80–105	91	10.8		IR4 submission
Carrot	Fenamidone	0.02–2.0	12	74–107	89	11	RPAC 45911	08524 M-278032-01-1
	RPA 410193	0.02–2.0	12	80–114	94	9.3		
Potato (chips, crisps)	Fenamidone	0.02–0.3	12	84–111	95	11	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	12	86–120	101	9.6		
Potato (flakes)	Fenamidone	0.02–0.3	6	87–95	92	3.7	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	103–119	108	6.2		
Potato (tubers)	Fenamidone	0.02–0.3	6	87–109	96	10	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	102–111	107	3.0		
Potato (wet peel)	Fenamidone	0.02–0.3	6	92–113	100	9.9	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	101–117	107	6.3		
Potato (foliage)	Fenamidone	0.02	2	84, 86	85	–	AR 150-97	97-555 M-165234-01-1
	RPA 410193	0.02	2	82, 86	84	–		

Commodity	Analytes	Fortification, mg/kg	n	Recovery, %			Method	Reference
				Range	Mean	RSD		
Potato (tubers)	Fenamidone	0.02–0.2	3	99–113	105	6.7		
	RPA 410193	0.02–0.2	3	85–100	93	8.2		
Potato (tubers)	Fenamidone	0.02	2	83, 85	84	–	AR 150-97	97-556 M-165225-01-1
	RPA 410193	0.02	2	84, 102	93	–		
Potato (tubers)	Fenamidone	0.02	4	71–96	85	12	AR 150-97	97-691 M-165758-01-1
	RPA 410193	0.02	4	76–113	96	18		
Potato (tubers)	Fenamidone	0.02–0.04	4	75–94	82	10	AR 150-97	97-745 M-165485-01-1
	RPA 410193	0.02–0.04	4	92–114	106	9.6		
Potato (peel)	Fenamidone	0.02–0.04	4	72–86	80	8.9		
	RPA 410193	0.02–0.04	4	88–108	99	9.9		
Potato (peeled tubers)	Fenamidone	0.02–0.04	5	71–84	79	6.8		
	RPA 410193	0.02–0.04	5	81–120	103	14		
Potato (foliage)	Fenamidone	0.20–4.0	5	68–102	82	21	AR 150-97	98-527 M-166545-01-1
	RPA 410193	0.20–0.4	5	82–115	104	13		
Potato (tubers)	Fenamidone	0.005–0.025	20	72–111	92	12		
	RPA 410193	0.005–0.025	20	67–108	83	15		
Potato (tubers)	Fenamidone	0.005	8	68–109	89	19	AR 150-97	98-669 M-166638-01-1
	RPA 410193	0.005	8	43–101	69	27		
Potato (peel)	Fenamidone	0.005	3	70–107	90	21		
	RPA 410193	0.005	3	56–72	66	13		
Potato (peeled tubers)	Fenamidone	0.005	3	66–79	71	9.5		
	RPA 410193	0.005	3	46–61	52	15		
Potato (tubers)	Fenamidone	0.02–0.20	8	74–103	94	10	RPAC 45911	01AC05 M-394609-01-1
	RPA 410193	0.02–0.20	8	86–108	94	7.5		
Potato (tubers)	Fenamidone	0.02–0.20	10	85–92	88	3.0	AR 150-97 (R003696)	UNESP RA-1066/06, UNESP RA-1067/06, UNESP RA-1068/06, UNESP RA-1069/06 M-279947-02-1, M-279942-02-1, M-279946-02-1, M-279941-02-1
	RPA 410193	0.02–0.20	10	85–93	89	2.9		
Ginseng (roots)	Fenamidone	0.02–2.0	9	97–116	104	5.9		09800 M-393676-01-1
	RPA 410193	0.02–2.0	9	89–117	101	9.2		
Witloof (leaves)	Fenamidone	0.01–0.1	7	105–109	107	1.4	00868	RA-2566/04 M-256652-01-1
	RPA 410193	0.01–0.1	7	89–105	98	7.0		
Witloof (roots)	Fenamidone	0.01–1.0	8	100–109	104	3.5		
	RPA 410193	0.01–1.0	8	87–108	98	7.8		
Witloof (leaves)	Fenamidone	0.01–1.0	10	95–107	99	4.3	00868	08-2205 M-363750-03-1
	RPA 410193	0.01–1.0	10	81–92	87	4.6		
Witloof (roots)	Fenamidone	0.01–1.0	10	96–103	100	2.4		
	RPA 410193	0.01–1.0	10	83–94	89	5.1		
Witloof (leaves)	Fenamidone	0.01–0.50	7	75–98	88	10.3	01163	10-2040 M-420668-01-1
	RPA 410193	0.01–0.50	7	74–96	85	8.6		
Witloof (roots)	Fenamidone	0.01–0.50	7	88–108	97	7.0		
	RPA 410193	0.01–0.50	7	80–106	94	9.1		
Celery (whole plant w/o roots)	Fenamidone	0.02–20	14	63–120	97	16	RPAC 45911	201214 M-242541-01-1
	RPA 410193	0.02–0.20	15	94–119	109	6.5		
Celery (stalks trimmed)	Fenamidone	0.02–10	14	77–120	94	13		
	RPA 410193	0.02–0.20	11	91–120	106	9.4		
Wheat (forage)	Fenamidone	0.02–0.3	6	75–105	87	14	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	108–117	112	3.0		
Wheat (grain)	Fenamidone	0.02–0.3	6	86–107	95	9.7	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	87–104	97	6.3		
Wheat (hay)	Fenamidone	0.02–0.3	6	68–99	83	15	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	98–110	105	4.6		
Wheat (straw)	Fenamidone	0.02–0.3	6	77–89	85	5.4	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	80–95	88	5.9		
Cotton	Fenamidone	0.02–0.3	6	72–88	81	8.0	RPAC	EC-99-448

Commodity	Analytes	Fortification, mg/kg	n	Recovery, %			Method	Reference
				Range	Mean	RSD		
(gin by-products)	RPA 410193	0.02–0.3	6	121–130	125	2.5	45911	M-238849-01-1
Cotton (hulls)	Fenamidone	0.02–0.3	6	82–123	100	15	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	108–125	118	4.9		
Cotton (meal)	Fenamidone	0.02–0.3	6	81–94	89	5.3	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	68–119	104	19		
Cotton (oil)	Fenamidone	0.02–0.3	6	93–102	97	3.4	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	116–124	120	2.7		
Cotton (seed)	Fenamidone	0.02–0.3	6	78–88	84	4.3	RPAC 45911	EC-99-448 M-238849-01-1
	RPA 410193	0.02–0.3	6	101–118	108	5.1		
Sunflower (seed)	Fenamidone	0.02–0.20	9	72–82	78	4.3	RPAC 45911	07999 M-251287-02-1
	RPA 410193	0.02–0.20	9	81–94	87	5.6		
Animal commodities								
Milk	Fenamidone	0.05–0.5	10	72–100	89	9.8	AR 200-99	99-68 M-166398-01-1
	RPA 412708	0.05–0.5	9	57–104	89	17		
	RPA 412636	0.05–0.5	10	64–108	95	15		
Whole egg	Fenamidone	0.05–0.5	10	67–88	80	7.3	AR 178-98	98-150 M-166460-01-1
	RPA 412708	0.05–0.5	10	76–96	90	6.9		
	RPA 412636	0.05–0.5	10	87–115	97	7.9		
Meat (beef)	Fenamidone	0.05–0.5	10	66–86	80	8.7	AR 178-98	98-150 M-166460-01-1
	RPA 412708	0.05–0.5	10	67–93	82	11		
	RPA 412636	0.05–0.5	10	84–107	94	7.7		
Kidney	Fenamidone	0.05–0.5	10	68–87	76	7.1	AR 178-98	98-150 M-166460-01-1
	RPA 412708	0.05–0.5	10	67–90	82	9.6		
	RPA 412636	0.05–0.5	10	86–106	96	6.5		
Liver	Fenamidone	0.05–0.5	10	66–79	73	5.7	AR 178-98	98-150 M-166460-01-1
	RPA 412708	0.05–0.5	10	78–110	98	12		
	RPA 412636	0.05–0.5	10	96–117	108	7.0		

Stability of residues in stored analytical samples

Information was received on the freezer storage stability of fenamidone residues and its metabolites in plant commodities. The storage stability data for fenamidone and RPA 410193 in grapes, potatoes, lettuce, strawberries and turnips are descripted as follows. The results are shown in Table 55.

Grapes, potatoes, lettuce

Reference: Kieken and Queyrel, 1999 (report R&D/CRLD/AN/mr/9915970, M-166527-01-1), Kieken and Queyrel, 2000 (report R&D/CRLD/AN/mba/0015230, M-183934-01-1)

Method: AR 150-97, GC-NPD, LOQ 0.02 mg/kg for both fenamidone and RPA 410193

Description: Untreated control samples were fortified with fenamidone and its metabolite RPA 410193 at a concentration of 0.2 mg/kg and then frozen below–20 °C. Samples were analysed immediately after fortification (0 day) and after storage intervals up to 1 year (12 or 13 months). At each interval, two stored samples were analysed, with one or more procedural recovery samples (control samples spiked just before analysis at 0.2 mg/kg).

Strawberries

Reference: Uceda, 2005 (report 03-21, M-247921-01-1)

Method: AR 306-03, GC-MS, LOQ 0.01 mg/kg

Description: Samples of strawberries were fortified with fenamidone and RPA 405682 at a level of 0.1 mg/kg. The samples were stored in glass bottles at about –18 °C or below and were analysed at nominal storage intervals of 0, 4, 14 and 18 months.

Turnips

Reference: Cavaillé, 2007 (report MR-07/232, M-286141-01-1

Method: 00868, LC-MS/MS, LOQ 0.01 mg/kg

Description: Turnip root samples were fortified with fenamidone or RPA 404862 at a level of 0.2 mg/kg. The samples were stored in plastic containers at about –18 °C or below and were analysed at nominal storage intervals of 0, 2, 6 and 12 months. Procedural recovery experiments were conducted at all storage intervals by spiking control samples of turnip with a mixture of fenamidone and RPA 410193 at a level of 0.2 mg/kg. Additional recoveries for both analytes at 0.01 mg/kg were also performed at the 0 and 12 month intervals.

Table 55 Storage stability data for fenamidone and RPA 410193 in berries and rooting vegetables

	Fenamidone					RPA 410193				
Time, month	Procedural recovery, %		Residue, mg/kg		% Remaining	Procedural recovery, %		Residue, mg/kg		% Remaining
	Individual	Mean	Individual	Mean		Individual	Mean	Individual	Mean	
Grapes (Report R&D/CRLD/AN/mr/9915970, Bayer reference M-166527-01-1)										
0	95, 82	89	0.18, 0.20	0.19	100	93, 96	95	0.22, 0.20	0.21	100
1	107	107	0.22, 0.22	0.22	115	97	97	0.19, 0.19	0.19	89
4	102	102	0.18, 0.20	0.19	98	115	115	0.21, 0.21	0.21	98
8	108	108	0.18, 0.18	0.18	92	84	84	0.17, 0.21	0.19	88
12	99, 104	102	0.22, 0.22	0.22	114	97, 106	102	0.22, 0.19	0.20	96
Potatoes (Report R&D/CRLD/AN/mr/9915970, Bayer reference M-166527-01-1)										
0	89, 75	82	0.16, 0.14	0.15	100	75, 70	73	0.18, 0.17	0.18	100
1	79	79	0.19, 0.18	0.18	121	89	89	0.19, 0.2	0.19	109
3	84	84	0.15, 0.15	0.15	103	72	72	0.15, 0.15	0.15	84
8	93, 80	87	0.17, 0.16	0.17	111	92, 77	85	0.17, 0.12	0.14	81
12	70, 97	84	0.17, 0.18	0.18	120	68, 94	81	0.16, 0.18	0.17	98
Lettuce (Reports R&D/CRLD/AN/mr/9915970, Bayer reference M-166527-01-1 and R&D/CRLD/AN/mba/0015230, Bayer reference M-183934-01-1										
0	69, 93, 89, 103	89	0.18, 0.19	0.18	100	96, 91	94	0.22, 0.21	0.22	100
2	86, 75	81	0.20, 0.20	0.20	111	95	95	0.15, 0.15	0.15	69
5	86, 95	91	0.21, 0.22	0.21	117	103, 94	99	0.18, 0.21	0.19	88
9	82, 95	89	0.20, 0.19	0.19	106	83, 89	86	0.21, 0.19	0.20	94
13	99, 88	94	0.16, 0.16	0.16	89	101, 82	92	0.21, 0.21	0.21	96
Strawberries (Report 03-21, Bayer reference M-247921-01-1).										
0	85, 89	87	0.09, 0.09	0.09	100	97, 96	97	0.1, 0.1	0.1	100
4	70, 105	88	0.08, 0.06, 0.11	0.083	93	97	97	0.07, 0.08	0.075	75
14	99	99	0.09, 0.09	0.09	100	82	82	0.10, 0.07	0.085	85
18	105, 106	106	0.07, 0.08	0.08	89	90, 84	87	0.07, 0.09	0.08	80
Turnips (Cavaillé, 2007, Report MR-07/232, Bayer reference M-286141-01-1)										
0	100, 99, 90	96	0.19, 0.21	0.2	100	88, 87, 86	87	0.16, 0.16, 0.15	0.16	100
2	96, 98	97	0.19, 0.19	0.19	95	96, 98	97	0.16, 0.17	0.16	104
6	100, 97	99	0.2, 0.19	0.2	99	99, 96	98	0.19, 0.18	0.18	117
12	99, 98, 100	99	0.19, 0.19	0.19	96	97, 94, 97	96	0.18, 0.18, 0.17	0.18	111

The stability of fenamidone and its metabolites RPA 410193, RPA 412636 and RPA 412708 were examined in nineteen crop commodities. Raw and processed commodities were included: bulb onion, cotton gin trash, cotton hulls, cotton meal, cotton oil, cotton seed, cucumber, leaf lettuce, potato chips (crisps), potato flakes, potato tubers, potato wet peel, tomato fruit, tomato paste, tomato puree, wheat forage, wheat grain, wheat hay, and wheat straw. The study is descripted as follows below. The results are shown in Table 56 for fenamidone and RPA 412636, and in Table 57 for RPA 412708 and RPA 410193.

Various commodities

Reference: Hudson and Carringer, 2001 (report EC-99-448, M-238849-01-1)

Method: RPAC 45911, LC-MS/MS, LOQ 0.02 mg/kg for each analyte

Description: Untreated control samples were fortified with fenamidone, RPA 412636, RPA 412708 and RPA 410193 at a concentration of 0.3 mg/kg and then frozen below –20 °C. Each analyte was fortified into separate control samples. All matrices were analysed for 12 months stability with the exception of cotton. Cotton matrices were analysed from 1 to 6 months. At each interval, two stored samples were analysed, with a procedural recovery sample (control sample spiked just before analysis at 0.2 mg/kg).

Table 56 Storage stability data for fenamidone and RPA 412636 in plant commodities

Interval, month	Fenamidone				RPA 412636			
	Procedural recovery, %	Residues, mg/kg		% Remaining	Procedural recovery, %	Residues, mg/kg		% Remaining
		Individual	Mean			Individual	Mean	
Onion, bulb								
0	88	0.268, 0.276	0.27	100	94	0.274, 0.286	0.28	100
1	91	0.263, 0.278	0.27	99	77	0.212, 0.209	0.21	75
3	101	0.304, 0.290	0.3	109	115	0.330, 0.345	0.34	121
6	100	0.272, 0.281	0.28	102	99	0.285, 0.274	0.28	100
9	66	0.190, 0.207	0.2	73	106	0.304, 0.303	0.30	108
12	82	0.236, 0.247	0.24	89	108	0.316, 0.305	0.31	111
Cotton seed								
0	83	0.244, 0.235	0.24	100	107	0.311, 0.327	0.32	100
1	86	0.234, 0.256	0.25	102	91	0.254, 0.235	0.25	77
6	41	0.145, 0.121	0.13	56	128	0.321, 0.363 [a]	0.34 [a]	107 [a]
Cotton gin trash								
0	75	0.225, 0.210	0.22	100	121	0.327, 0.313	0.32	100
6	111	0.306, 0.300	0.30	139	118	0.336, 0.310	0.32	101
Cotton hulls								
0	79	0.244, 0.242	0.24	100	95	0.287, 0.280	0.28	100
1	76	0.209, 0.209	0.21	86	104	0.259, 0.216	0.24	84
3	100	0.264, 0.232	0.25	102	91	0.296, 0.312	0.30	107
6	96	0.250, 0.248	0.25	102	115	0.307, 0.303	0.31	108
Cotton meal								
0	98	0.289, 0.275	0.28	100	104	0.309, 0.313	0.31	100
1	85	0.240, 0.254	0.25	88	81	0.231, 0.248	0.24	77
3	89	0.228, 0.241	0.24	83	101	0.300, 0.279	0.29	93
6	62	0.217, 0.212	0.22	76	90	0.230, 0.262	0.25	79
Cotton oil								
0	99	0.295, 0.299	0.3	100	118	0.338, 0.331	0.33	100
1	91	0.244, 0.276	0.26	88	109	0.297, 0.298	0.3	89
Cucumber								
0	113	0.329, 0.330	0.33	100	120	0.358, 0.355	0.36	100
1	102	0.181, 0.211	0.2	59	101	0.299, 0.308	0.30	85
3	111	0.289, 0.282	0.29	87	106	0.328, 0.335	0.33	93
6	110	0.246, 0.249	0.25	75	83	0.243, 0.236	0.24	67
14	98	0.260, 0.240	0.25	76	102	0.351, 0.319	0.33	94
Lettuce								
0	79	0.234, 0.247	0.24	100	84	0.255, 0.247	0.25	100
1	82	0.242, 0.220	0.23	96	96	0.311, 0.341	0.33	130
3	79	0.214, 0.222	0.22	91	103	0.303, 0.287	0.3	118
6	98	0.277, 0.305	0.29	121	98	0.283, 0.288	0.29	114
9	99	0.264, 0.201	0.23	97	137	0.369, 0.363	0.37	146
12	82	0.217, 0.210	0.21	89	102	0.307, 0.295	0.30	120
Potato tubers								
0	87	0.240, n/a	0.24	100	83	0.249, 0.264	0.26	100
1	75	0.198, 0.204	0.20	84	99	0.300, 0.322	0.31	121
3	106	0.258, 0.269	0.26	110	97	0.271, 0.264	0.27	104
6	112	0.331, 0.315	0.32	135	106	0.303, 0.292	0.3	116
9	83	0.205, 0.207	0.21	86	113	0.321, 0.323	0.32	126
12	92	0.249, 0.244	0.25	103	110	0.319, 0.319	0.32	124
Potato wet peel								
0	88	0.260, 0.261	0.26	100	87	0.244, 0.247	0.25	100
1	73	0.189, 0.194	0.19	74	90	0.350, 0.275	0.31	127

Interval, month	Fenamidone				RPA 412636			
	Procedural recovery, %	Residues, mg/kg		% Remaining	Procedural recovery, %	Residues, mg/kg		% Remaining
		Individual	Mean			Individual	Mean	
3	74	0.215, 0.207	0.21	81	105	0.304, 0.295	0.30	122
6	96	0.268, 0.277	0.27	105	91	0.278, 0.296	0.29	117
9	113	0.272, 0.281	0.28	106	127	0.363, 0.351	0.36	145
12	81	0.226, 0.209	0.22	83	105	0.302, 0.291	0.3	121
Potato chips (crisps)								
0	70	0.198, 0.185	0.19	100	75	0.239, 0.269	0.25	100
1	81	0.206, 0.213	0.21	109	93	0.256, 0.263	0.26	102
3	101	0.256, 0.242	0.25	130	96	0.257, 0.259	0.26	102
6	83	0.189, 0.197	0.19	101	81	0.215, 0.215	0.22	85
12	93	0.222, 0.226	0.22	117	101	0.242, 0.220	0.23	91
Potato flakes								
0	105	0.323, 0.330	0.33	100	93	0.302, 0.277	0.29	100
1	88	0.308, 0.313	0.31	95	75	0.271, 0.227	0.25	86
3	90	0.259, n/a	0.26	79	101	0.298, 0.301	0.30	103
6	92	0.270, 0.257	0.26	81	86	0.264, 0.257	0.26	90
9	78	0.294, 0.334	0.31	96	158	0.478, 0.500	0.49	169
12	77	0.248, 0.240	0.24	75	95	0.298, 0.274	0.29	99
Tomato fruit								
0	81	0.265, 0.247	0.26	100	95	0.278, 0.303	0.29	100
1	104	0.323, 0.280	0.30	118	70	0.204, 0.211	0.21	71
3	70	0.214, 0.231	0.22	87	97	0.281, 0.286	0.28	98
6	94	0.295, 0.290	0.29	114	73	0.243, 0.245	0.24	84
9	86	0.249, 0.255	0.25	98	122	0.379, 0.377	0.38	130
12	79	0.266, 0.257	0.26	102	109	0.325, 0.322	0.32	111
Tomato paste								
0	75	0.320, 0.283	0.30	100	94	0.274, 0.285	0.28	100
1	105	0.302, 0.301	0.30	100	98	0.221, 0.243	0.23	83
3	92	0.202, 0.238	0.22	73	91	0.247, 0.238	0.24	87
6	73	0.162, 0.189	0.18	58	83	0.172, 0.241	0.21	74
12	91	0.246, 0.226	0.24	78	80	0.254, 0.254	0.25	91
Tomato puree								
0	78	0.239, 0.239	0.24	100	126	0.369, 0.376	0.37	100
1	107	0.309, 0.327	0.32	133	101	0.271, 0.294	0.28	76
3	105	0.318, 0.329	0.32	135	93	0.276, 0.274	0.27	74
12	97	0.287, 0.260	0.27	114	98	0.259, 0.273	0.27	74
Wheat forage								
0	78	0.256, 0.234	0.25	100	119	0.357, 0.356	0.36	100
1	101	0.282, 0.291	0.29	117	101	0.289, 0.300	0.3	83
3	105	0.315, 0.316	0.32	129	119	0.336, 0.338	0.34	95
6	79	0.224, 0.219	0.22	90	107	0.316, 0.302	0.31	87
12	81	0.240, 0.202	0.22	90	80	0.234, 0.258	0.25	69
Wheat grain								
0	76	0.247, 0.222	0.24	100	95	0.282, 0.301	0.29	100
1	105	0.299, 0.294	0.3	126	115	0.332, 0.312	0.32	110
3	98	0.281, 0.292	0.29	122	110	0.330, 0.300	0.315	108
6	92	0.225, 0.224	0.23	96	103	0.300, 0.291	0.3	101
12	91	0.279, 0.268	0.27	117	99	0.273, 0.316	0.3	101
Wheat hay								
0	87	0.243, 0.265	0.25	100	118	0.359, 0.356	0.36	100
1	83	0.255, 0.260	0.26	101	97	0.295, 0.288	0.29	82
3	108	0.298, 0.295	0.3	117	Residues	in control	-	-
6	81	0.237, 0.215	0.23	89	92	0.293, 0.285	0.29	80
12	87	0.220, 0.211	0.22	85	97	0.204, 0.269	0.24	66
Wheat straw								
0	91	0.247, 0.266	0.26	100	92	0.255, 0.256	0.26	100
1	93	0.237, 0.272	0.26	99	103	0.270, 0.264	0.27	105
3	103	0.308, 0.333	0.32	125	103	0.266, 0.266	0.27	105
6	94	0.228, 0.245	0.24	92	101	0.259, 0.278	0.27	105
12	89	0.257, 0.252	0.25	99	73	0.217, 0.230	0.22	87

[a] Obtained by calculation using the recovery values

Table 57 Storage stability data for RPA 412708 and RPA 410193 in plant commodities

Interval, month	RPA 412708				RPA 410193			
	Procedural recovery, %	Residues, mg/kg		% Remaining	Procedural recovery, %	Residues, mg/kg		% Remaining
		Individual	Mean			Individual	Mean	
Onion, bulb								
0	113	0.339, 0.335	0.34	100	104	0.313, 0.315	0.31	100
1	113	0.331, 0.326	0.33	97	100	0.276, 0.276	0.28	88
3	96	0.288, 0.296	0.29	87	102	0.295, 0.294	0.295	94
6	85	0.281, 0.267	0.27	81	88	0.244, 0.235	0.24	76
9	116	0.302, 0.278	0.29	86	89	0.263, 0.264	0.26	84
12	100	0.262, 0.267	0.265	78	88	0.257, 0.260	0.26	82
Cotton seed								
0	80	0.232, 0.246	0.24	100	118	0.331, 0.333	0.33	100
1	92	0.274, 0.269	0.27	114	119	0.353, 0.348	0.35	106
6	100	0.282, 0.294	0.29	121	81	0.233, 0.234	0.23	70
Cotton gin trash								
0	83	0.254, 0.245	0.25	100	120	0.357, 0.359	0.36	100
6	95	0.282, 0.273	0.28	111	73	0.223, 0.219	0.22	62
Cotton hulls								
0	96	0.284, 0.261	0.26	100	91	0.269, 0.291	0.28	100
1	100	0.246, 0.270	0.26	99	106	0.298, 0.299	0.3	107
3	106	0.311, 0.306	0.31	118	110	0.313, 0.306	0.31	111
6	92	0.259, 0.250	0.26	98	98	0.289, 0.276	0.28	101
Cotton meal								
0	100	0.260, 0.253	0.26	100	115	0.338, 0.355	0.35	100
1	97	0.292, 0.277	0.29	111	98	0.279, 0.282	0.28	81
3	100	0.270, 0.272	0.27	106	91	0.312, 0.310	0.31	90
6	89	0.257, 0.228	0.24	95	88	0.277, 0.276	0.28	80
Cotton oil								
0	115	0.330, 0.319	0.325	100	121	0.369, 0.351	0.36	100
1	110	0.305, 0.301	0.30	93	110	0.325, 0.307	0.32	88
Cucumber								
0	114	0.330, 0.319	0.325	100	105	0.318, 0.324	0.32	100
1	108	0.308, 0.277	0.29	90	120	0.275, 0.287	0.28	88
3	122	0.349, 0.356	0.35	109	116	0.326, 0.308	0.32	99
6	81	0.211, 0.204	0.21	64	106	0.241, 0.258	0.25	78
14	122	0.353, 0.340	0.35	107	107	0.255, 0.271	0.26	82
Lettuce								
0	102	0.304, 0.312	0.31	100	110	0.311, 0.296	0.30	93
1	88	0.256, 0.251	0.25	82	105	0.295, 0.289	0.29	90
3	98	0.286, 0.273	0.28	91	100	0.331, 0.317	0.32	100
6	101	0.279, 0.278	0.28	90	107	0.334, 0.330	0.33	102
9	104	0.306, 0.280	0.29	95	117	0.279, 0.257	0.27	82
12	99	0.291, 0.280	0.29	93	89	0.311, 0.296	0.30	93
Potato tubers								
0	99	0.298, 0.306	0.30	100	102	0.310, 0.307	0.31	100
1	78	0.230, 0.228	0.23	77	86	0.221, 0.227	0.22	73
3	101	0.269, 0.265	0.27	90	100	0.294, 0.283	0.29	94
6	107	0.305, 0.312	0.31	103	84	0.246, 0.236	0.24	78
9	118	0.342, 0.346	0.34	113	98	0.240, 0.288	0.26	86
12	119	0.358, 0.305	0.33	110	101	0.307, 0.306	0.31	99
Potato wet peel								
0	104	0.310, 0.310	0.31	100	104	0.309, 0.308	0.31	100
1	78	0.207, 0.213	0.21	68	82	0.235, 0.228	0.23	75
3	100	0.297, 0.297	0.3	96	102	0.305, 0.305	0.305	99
6	94	0.267, 0.264	0.27	86	110	0.315, 0.311	0.31	101
9	112	0.325, 0.329	0.33	105	121	0.330, 0.325	0.33	106
12	115	0.316, 0.309	0.31	101	97	0.283, 0.286	0.285	92
Potato chips (crisps)								
0	77	0.255, 0.257	0.26	100	96	0.293, 0.288	0.29	100
1	97	0.269, 0.257	0.26	100	97	0.270, 0.275	0.27	94
3	106	0.273, 0.271	0.27	106	106	0.265, 0.277	0.27	94
6	90	0.238	0.24	93	85	0.211, 0.197	0.20	70

Interval, month	RPA 412708				RPA 410193			
	Procedural recovery, %	Residues, mg/kg		% Remaining	Procedural recovery, %	Residues, mg/kg		% Remaining
		Individual	Mean			Individual	Mean	
12	91	0.266, 0.234	0.25	98	90	0.264, 0.238	0.25	86
Potato flakes								
0	111	0.326, 0.316	0.32	100	107	0.313, 0.318	0.32	100
1	100	0.285, 0.289	0.29	89	85	0.240, 0.251	0.25	78
3	88	0.274, 0.278	0.28	86	91	0.266, 0.266	0.27	84
6	97	0.290, 0.299	0.295	92	95	0.210, 0.271	0.24	76
9	186	0.559, 0.454	0.51	158	117	0.315, 0.323	0.32	101
12	105	0.335, 0.334	0.335	104	87	0.281, 0.270	0.28	87
Tomato fruit								
0	106	0.307, 0.304	0.31	100	110	0.339, 0.345	0.34	100
1	129	0.365, 0.381	0.37	122	101	0.314, 0.657[a]	0.31	92
3	99	0.276, 0.279	0.28	91	102	0.302, 0.303	0.30	88
6	66	0.184, 0.207	0.2	64	95	0.298, 0.297	0.3	87
9	98	0.290, 0.300	0.295	97	108	0.340, 0.356	0.35	102
12	96	0.283, 0.279	0.28	92	88	0.261, 0.290	0.28	81
Tomato paste								
0	86	0.275, 0.276	0.28	100	106	0.336, 0.309	0.32	100
1	91	0.244, 0.216	0.23	83	108	0.261, 0.252	0.26	80
3	86	0.257, 0.243	0.25	91	93	0.260, 0.253	0.26	80
6	76	0.211, 0.165	0.19	68	64	0.178, 0.155	0.17	52
12	88	0.214, 0.238	0.23	82	91	0.276, 0.279	0.28	86
Tomato puree								
0	96	0.288, 0.293	0.29	100	124	0.373, 0.385	0.38	100
1	102	0.291, 0.233	0.26	90	108	0.317, 0.318	0.32	84
3	97	0.278, 0.289	0.28	98	106	0.316, 0.317	0.32	84
12	89	0.255, 0.217	0.24	81	99	0.255, 0.244	0.25	66
Wheat forage								
0	107	0.319, 0.311	0.315	100	129	0.393, 0.410	0.40	100
1	109	0.292, 0.288	0.29	92	63	0.176, 0.178	0.18	44
3	106	0.298, 0.297	0.3	94	121	0.351, 0.356	0.35	88
6	103	0.256, 0.257	0.26	81	77	0.306, 0.297	0.30	75
12	95	0.235, 0.236	0.24	75	91	0.260, 0.269	0.265	66
Wheat grain								
0	92	0.279, 0.265	0.27	100	95	0.258, 0.299	0.28	100
1	108	0.298, 0.279	0.29	106	117	0.303, 0.331	0.32	114
3	102	0.276, 0.284	0.28	103	106	0.285, 0.287	0.29	103
6	115	0.273, 0.289	0.28	103	95	0.246, 0.220	0.23	84
12	94	0.259, 0.271	0.265	97	95	0.270, 0.284	0.28	100
Wheat hay								
0	104	0.376, 0.392	0.38	100	122	0.376, 0.392	0.38	100
1	98	0.265, 0.271	0.27	70	125	0.343, 0.337	0.34	89
3	91	0.283, 0.285	0.28	74	105	0.321, 0.302	0.31	81
6	90	0.259, 0.247	0.25	66	88	0.276, 0.259	0.27	70
12	90	0.231, 0.219	0.225	59	96	0.243, 0.245	0.24	64
Wheat straw								
0	95	0.268, 0.287	0.28	100	106	0.314, 0.301	0.31	100
1	113	0.288, 0.306	0.3	107	136	0.360, 0.382	0.37	121
3	102	0.289, 0.305	0.3	107	112	0.315, 0.305	0.31	101
6	94	0.272, 0.229	0.25	90	92	0.268, 0.256	0.26	85
12	84	0.219, 0.208	0.21	77	89	0.216, 0.240	0.23	74

[a] Unexplained high value not included in calculation of mean (possible fortification error)

The stability of incurred fenamidone residues was examined in tomatoes over a 21-month period after harvest under freezer conditions. Residues of RPA 410193 were below 0.01 mg/kg in all the samples, so it was not possible to assess its stability. The study is described below (see Table 58).

Reference: Schulte, 2011 (report MR-11/028, M-404654-02-1)

Method: 00868, LC-MS/MS, LOQ 0.01 mg/kg for each analyte

Description: Incurred fenamidone residues in tomato fruits ranged from 0.05 to 0.38 mg/kg at the first analysis made 17 months after sampling. The samples were analysed again at nominal storage intervals of 14–21 months after sampling (2–4 months after initial analysis). Procedural recovery experiments were conducted at all storage intervals by spiking control samples of tomato at levels of 0.01 to 1.0 mg/kg. Residues in the control samples were all < 0.01 mg/kg.

Table 58 Storage stability data of incurred fenamidone residues in tomato

Interval month	Procedural recovery, %		Fenamidone residues, mg/kg (Percentage remaining)					Mean %
	Individual	Mean						
Trial 09-2235-02								
Initial residues	74, 81, 88, 89, 87, 89, 84, 85, 105, 112	89.4	0.13	0.38	0.16	0.15	0.08	100
2	82, 98, 93, 95	92	0.12 (92)	0.42 (111)	0.17 (106)	0.16 (107)	0.08 (100)	103
4	96, 97	97	0.13 (100)	0.41 (108)	0.13 (81)	0.12 (80)	0.08 (100)	94
Trial 09-2235-03								
Initial residues	74, 81, 88, 89, 87, 89, 84, 85, 105, 112	89.4	0.05	0.07	0.08	0.10	0.05	100
2	82, 98, 93, 95	92	0.05 (100)	0.07 (100)	0.08 (100)	0.09 (90)	0.04 (80)	94
4	96, 97	97	0.06 (120)	0.08 (114)	0.09 (113)	0.11 (110)	0.05 (100)	111

In summary, residues of fenamidone, RPA412636, RPA412708 and RPA410193 stored under freezer conditions at–20 °C are stable for at least 12 months in a wide range of raw and processed crop matrices, including examples of high-water and high-starch crops and for at least 6 months in cotton products (high oil content). Residues of fenamidone and RPA410193 are stable in high-acid commodities (strawberry) for at least 18 months.

USE PATTERN

The fungicide fenamidone is registered in many countries for control of diseases on a large variety of crops. Fenamidone is applied either as solo product or in combinations with other active substances as propamocarb, mancozeb, iprovalicarb and fosetyl-Al. The information available to the Meeting on registered uses on berries, vegetables and on oil seed is summarized in Table 59 and refers for application rates etc. to fenamidone only. The manufacturer submitted labels for all fenamidone uses.

Table 59 Registered uses of fenamidone

Crop (remarks)	Country	Form.	Application				PHI, Days
			Method	Rate, kg ai/ha	Spray conc. kg ai/hL	No	
Berries and other small fruit							
Grapes	Czech Republic	WG 71.1	Foliar	0.13		3	28
Grapes	Brazil	SC 500	Foliar	0.15		3	7
Grapes	Greece	WG 71.1	Foliar	0.11		2	28
Grapes	Italy	WG 71.1	Foliar	0.13		3	40
Grapes	Romania	WG 71.1	Foliar	0.11		2	28
Grapes	USA	SC 500	Foliar	0.10		3	30
Strawberries (outdoor, just before planting)	Netherlands	WG 66	Dip of plants		0.009	1	35
Strawberries (protected)	Netherlands	WG 66	Drench		0.0045	1	35
Strawberries (protected)	Belgium	WG 66	Drench	0.45		2	35
Strawberries (pre-transplantation dip or post-transplantation drench or spray)	UK	WG 66	Dip or drench + foliar	0.18 + 0.27		1 + 1	35
Bulb vegetables							
Onion, bulb; garlic, shallot, leek	Switzerland	SC 450	Foliar	0.15		3	14
Onion, bulb	Brazil	SC 500	Foliar	0.15		3	7
Onion, bulb	Poland	WG 71.1	Foliar	0.11		2–3	14
Bulb vegetables	Canada	SC 500	Foliar	0.20		4	7
Bulb vegetables	USA	SC 500	Foliar	0.20		4	7

Crop (remarks)	Country	Form.	Application				PHI, Days
			Method	Rate, kg ai/ha	Spray conc. kg ai/hL	No	
Brassica vegetables							
Brassica vegetables	USA	SC 500	Foliar	0.30		3	2
Brassica vegetables	Canada	SC 500	Foliar	0.30		3	2
Cabbages, head; flowerhead brassica	Switzerland	SC 450	Foliar	0.15		3	14
Fruiting vegetables, cucurbits							
Cucumbers, melons, water melons (field and protected)	Greece	WG 71.1	Foliar	0.11		3	3
Cucumbers (field)	Poland	WG 71.1	Foliar	0.11		1–2	3
Cucumbers (protected)	Romania	WG 71.1	Foliar	0.11		3	3
Cucumber, pumpkin, melon, courgette, patisson, rondini	Switzerland	SC 450	Foliar	0.15		3	3
Cucurbits	Canada	SC 500	Foliar	0.20		4	14
Cucurbits	USA	SC 500	Foliar	0.20		4	14
Melons	Brazil	SC 500	Foliar	0.15		3	7
Melons (field and protected)	Italy	WG 71.1	Foliar	0.13		3	15
Watermelons	Brazil	SC 500	Foliar	0.15		3	7
Fruiting vegetables, other than cucurbits							
Aubergine, tomato	Switzerland	SC 450	Foliar	0.15		3	3
Tomato	Brazil	SC 500	Foliar	0.15		3	7
Tomato	Canada	SC 500	Foliar	0.10		6	14
Tomato (field)	Poland	WG 71.1	Foliar	0.11		1–2	7
Tomato (protected)	Poland	WG 71.1	Foliar		0.013	3–5	7
Tomato (field and protected)	Romania	WG 44.4	Foliar	0.11	0.03	1–3	3
Fruiting vegetables, except cucurbits	USA	SC 500	Foliar	0.30		3	14
Leafy vegetables (including brassica leafy vegetables)							
Endive (field)	Netherlands	WG 66	Foliar	0.15		3	14
Endive (protected)	Netherlands	WG 66	Foliar	0.15		3	21/42[a]
Endive, radiccio rosso, (Treatment from 7 days after planting to BBCH 42)	Belgium	WG 66	Foliar	0.15		2	
Lambs lettuce (Treatment from 7 days after planting to BBCH 42)	Belgium	WG 66	Foliar	0.15		2	
Lettuce	Brazil	SC 500	Foliar	0.15		3	7
Lettuce	Greece	WG 71.1	Foliar	0.11		3	14
Lettuce	Italy	WG 71.1	Foliar	0.11		3	15
Lettuce (protected)	Netherlands	WG 66	Foliar	0.15		3	21/42[a]
Lettuce, rucola (field)	Switzerland	SC 450	Foliar	0.15		3	14
Leafy vegetables	USA	SC 500	Foliar	0.30		3	2
Turnip greens	Canada	SC 500	Foliar	0.30		2	2
Legume vegetables							
Succulent beans, except cowpea	Canada	SC 500	Foliar	0.30		3	3
Succulent beans, except cowpea	USA	SC 500	Foliar	0.30		3	3
Root and tuber vegetables							
Carrot	Canada	SC 500	Foliar	0.30		2	14
Carrot	USA	SC 500	Foliar	0.30		3	14
Potato	UK	SC 450	Foliar	0.15		6	7
Potato	Canada	SC 500	Foliar	0.10		6	14
Potato	USA	SC 500	Foliar	0.30		3	14
Potato	Brazil	SC 500	Foliar	0.15		3	7
Potato	Switzerland	SC 450	Foliar	0.15		3	14
Root and tuber vegetables [b], except carrot, potato, sugar beet	USA	SC 500	Foliar	0.30		3	14
Ginseng	USA	SC 500	Foliar	0.30		3	14
Stalk and stem vegetables							
Witloof chicory (hydroponic)	Belgium	WG 66	Dip + Irrigation		0.006 + 0.0006	2	18
Witloof chicory (hydroponic)	Netherlands	WG 66	Irrigation		0.0006	1	
Celery	USA	SC 500	Foliar	0.30		3	2

Crop (remarks)	Country	Form.	Application				PHI, Days
			Method	Rate, kg ai/ha	Spray conc. kg ai/hL	No	
Oilseed							
Cotton	USA	SC 500	In-furrow	0.30		1	
Sunflower	USA	SC 500	Seed treatment	0.19 (kg/100 kg seed)		1	

[a] PHI: 21 days between 21 March and 21 September, 42 days between 22 September and 20 March
[b] Root and tuber vegetables: beet (garden), celeriac, chervil (turnip-rooted), chicory, horseradish, oriental radish, parsley (turnip rooted), parsnip, salsify, turnip

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on supervised field trials for fenamidone uses that produced residues on the following commodities:

Commodity	Group	Table No
Grapes	FB Berries and other small fruits	60
Strawberries	VA Bulb vegetables	61
Leek		62
Onion, bulb		63
Spring onion		64
Cabbage	VB Brassica vegetables	65
Flowerhead brassica		66
Cucumber	VC Fruiting vegetables, Cucurbits	67
Summer squash		68
Melons		69
Watermelon		70
Peppers	VO Fruiting vegetables, other than Cucurbits	71
Tomato		72
Lettuce	VL Leafy vegetables	73
Mustard greens		74
Spinach		75
Lima beans	VP Legume vegetables	76
Snap beans		77
Carrots	VR Root and tuber vegetables	78
Potato		79
Ginseng		80
Witloof chicory (sprouts)	VS Stalk and stem vegetables	81
Celery		82
Cotton seed	SO Oilseed	83
Sunflower seed		84
Snap bean forage	AL Legume animal feeds	85
Cotton fodder, dry	AM Miscellaneous fodder and forage crops	86

In the residue supervised trials tables, where two samples were taken from a single plot, the average value is reported (individual sample results in parentheses). Where results from separate plots with distinguishing characteristics such as different formulations, varieties or treatment schedules were reported, results are listed for each plot. In these cases, the higher residue has been used for calculation purposes. Dates of duration of residue sample storage before analysis were provided. If the duration of samples storage was longer than the covered frozen stability, it is indicated in the text.

Residue values from the trials conducted according to the maximum GAP have been used for the estimation of maximum residue levels. Those results included in the calculations by the OECD MRL-calculator are underlined.

Residues are reported separately for fenamidone (“Fen”) and diketo-fenamidone (RPA 410193). The code name RPA 410193 is used throughout this section, irrespective of what nomenclature (synonyms: AE C650488, RPA 405862, DK-Fen) was used in the residue studies.

For HR and STMR estimation, sums of fenamidone (MW 311.4) and RPA 410193 (MW 281.3), expressed as fenamidone (conversion factor 1.11), are needed. When residues are undetectable in a commodity, the sum of the LOQs of both components is not appropriate for all plant commodities because the days after the last treatment (DALT) differ from 2 days (e. g. lettuce) to 35 days (strawberry). To select the best option, the relative ratio of parent and metabolite was estimated:

Plant commodity	DAT, Days	Samples with measured residues for both analytes (n)	Residue parent ÷ RPA 410193	
			Range	Average
Strawberries	35	3	1–2	1.7
Grapes	28	33	2–8	4.4
Lettuce	21	5	5–16	9
Lettuce	14	3	19–42	27
Peppers	14	1	36	36
Cauliflower	14	1	8	8
Spring onion	7	1	19	19
Potato foliage	7	3	27.5–37	33
Melons, peel	3	5	2.5–23	11
Tomatoes	3	2	18	18
Lettuce	2	9	148–530	306
Mustard greens	2	8	135–710	403
Spinach	2	5	361–1030	659
Celery	2	4	111–220	145

The residues of RPA 410193 are found in the same order of magnitude as the parent in berries harvested 4 to 5 weeks after treatment. In plant commodities harvested at shorter periods (2–21 days), the level of the metabolite is much lower than the parent in most cases. The method for calculation of the total residues of the sum of fenamidone and RPA 410193 is illustrated as follows:

- Plant commodities except for grapes and strawberries

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.02
0.05	< 0.02	0.05
0.42	0.08	0.51[a]

[a] 0.42 + (0.08 × 1.11) = 0.5088

- Grapes and strawberries

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.04
0.05	< 0.02	0.07
0.42	0.08	0.51

Most of the submitted residue supervised trials have been overdosed in terms of the number of applications. The Meeting received additional information and comparative trials on grapes (40 trials) and tomatoes (16 trials). Grapes were treated either 3 × 0.13 kg ai/ha or 7 × 0.12 kg ai/ha and samples were taken at a 28-day PHI. Tomatoes were treated either 3 × 0.15 kg ai/ha or 5 × 0.15 kg ai/ha and harvested at a PHI of 3 days. The results indicate no significant difference between the data sets (Simonin, 2013; M-451095-01-1).

Berries and other small fruits

Grapes

Thirty-five trials on grapes were conducted in Europe (France, Italy, Spain, Portugal, Greece, Germany and Belgium) between 1997 and 2010 by foliar spray. Trials conducted during 1997 and 1998 received seven applications (interval 14 days), whereas trials conducted during 2009 and 2010 received three applications.

Three supervised residue trials were conducted in Brazil in the growing season 1998/99. The maximum period of sample storage at –20 °C was for the Brazilian trials 795 days prior to analysis

(storage stability covered for one year only). Storage stability data on strawberries show that the residues are stable for at least 18 months in an acid content commodity. The results are summarized in Table 60.

Table 60 Residues in grapes from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT Days [a]	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Czech Rep.	WG	0.13			3	28					
97579RS1 Verzenay (51), France, 1997 (Pinot Noir)	WG	0.12	0.04–0.079	156–312	7	0 21 27 41	Grapes	0.66 0.27 0.19 0.08	0.088 0.083 0.067 0.04	0.76 0.36 0.26 0.12	97-579 M-165834-01-1
97579BX1 Prignac et Marcamps (33), France, 1997 (Merlot)	WG	0.12	0.067	185	7	0 21 28 41	Grapes	0.39 0.22 0.13 0.29	0.046 0.054 0.029 0.048	0.44 0.28 0.16 0.34	
97579BX2 Virsac (33), France, 1997 (Merlot)	WG	0.12	0.066	189	7	0 21 28 42	Grapes	0.32 0.18 0.22 0.15	0.038 0.047 0.056 0.05	0.36 0.23 0.28 0.21	
97580RS1, Serzy et Prin (51), France, 1997 (Chardonnay)	WG	0.12	0.036–0.037	327–340	7	31	Grapes	0.08	0.02	0.10	97-580 M-165259-01-1
97581BX1 Vaudelnay (49), France, 1997 (Cabernet)	WG	0.12–0.13	0.041	285–309	7	28 39	Grapes	0.15 0.24	0.038 0.031	0.19 0.27	97-581 M-165494-01-1
97582PTS1, Beaumont en Véron (37), France, 1997 (Cabernet)	WG	0.1–0.17	0.019–0.031	385–861	7	0 21 28 42	Grapes	0.72 0.31 0.23 0.14	0.075 0.059 0.052 0.045	0.80 0.38 0.29 0.19	97-582 M-165735-01-2
97636BO1 Bologna, Italy, 1997 (Chardonnay)	WG	0.12	0.011	1120	7	0 20 30 40	Grapes	0.17 0.13 0.11 0.06	0.045 0.048 0.033 0.023	0.22 0.18 0.15 0.09	97-636 M-165270-01-1
97742GR1 Lalioti, Greece, 1997 (Soultanina)	WG	0.12	0.012	931–1027	7	32 42	Grapes	0.042 0.021	0.036 0.021	0.08 0.04	97-742 M-165477-01-1
97687C1 St Pere Molanta, Spain, 1997 (Mocabeo)	WG	0.13	0.025–0.038	333–500	7	30 40	Grapes	0.10 0.12	0.034 0.042	0.14 0.17	97-687 M-165275-01-1
98561RN1, Vallet (44), France, 1998 (Melon de Bourgogne)	WG	0.13	0.054	246	7	28	Grapes	0.08	0.03	0.11	98-561 M-166547-01-1
	WG	0.13	0.053	246	7	28	Grapes	0.14	0.042	0.19	
98562RN1 Vallet (44), France, 1998 (Cabernet)	WG	0.13	0.058	230	7	24	Grapes	0.15	0.04	0.19	98-562 M-170328-01-1
98562AV1 Séguret (84), France, 1998 (Grenache)	WG	0.13	0.04–0.045	293–330	7	25	Grapes	0.12	0.039	0.16	
98562TL1, Montady (34), France, 1998 (Cinsault)	WG	0.13	0.042	319	7	28	Grapes	0.26	0.071	0.34	
98563BX1 Virsac (33), France, 1998 (Merlot)	WG	0.13	0.07–0.18	114–190	7	0 24 32 45	Grapes	0.23 0.23 0.12 0.18	0.04 0.04 0.022 0.028	0.27 0.27 0.14 0.21	98-563 M-166535-02-1
98563DJ1, Brochon (21), France, 1998 (Pinot Noir)	WG	0.13	0.044–0.067	200–300	7	0 23 31 46	Grapes	0.47 0.27 0.17 0.13	0.076 0.062 0.037 0.036	0.55 0.34 0.21 0.17	

Trial, Location, Country, Year (Variety)	Application					DAT Days [a]	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
98563RS1, Serzy et Prin (51), France, 1998 (Pinot Meunier)	WG	0.12–0.14	0.032	387–435	7	0 21 28 42	Grapes	0.37 0.09 0.12 0.09	0.056 0.028 0.031 0.034	0.43 0.12 0.15 0.13	
98563TL1 Pouzolles (34), France, 1998 (Carignan Noir)	WG	0.13	0.034–0.041	323–388	7	0 21 28 42	Grapes	0.88 0.18 0.13 0.18	0.085 0.048 0.05 0.089	0.97 0.23 0.19 0.28	
98631C1 St Pere Molanta, Spain, 1998 (Macabeo)	WG	0.13	0.017–0.033	400–800	7	0 20 29 41	Grapes	0.56 0.23 0.21 0.12	0.12 0.071 0.068 0.072	0.69 0.31 0.29 0.20	98-631 M-166092-01-1
98690GR1 Korinthos, Greece, 1998 (Soultanina)	WG	0.13–0.14	0.013	995–1029	7	29 40	Grapes	0.06 0.04	0.02 < 0.02	0.08 0.06	98-690 M-166463-01-1
	WG	0.13	0.013	978–1028	7	29 40	Grapes	0.05 0.06	< 0.02 0.02	0.07 0.08	
98721BO1 Bologna, Italy, 1998 (Malvasia Toscana)	WG	0.13	0.012	1120	7	0 20 30 41	Grapes	0.93 0.46 0.26 0.19	0.15 0.13 0.10 0.076	1.1 0.60 0.37 0.27	98-721 M-170375-01-1
	WG	0.13	0.012	1120	7	0 20 30 41	Grapes	0.82 0.39 0.24 0.13	0.13 0.12 0.12 0.073	0.96 0.52 0.37 0.21	
09-2179-01 Saint Nicolas de Bourgueil (37), France, 2009 (Cabernet Franc)	WG	0.13	0.067	200	3	–0 0 21 28 35	Bunches	0.24 0.27 0.21 0.17 0.16	0.04 0.04 0.03 0.02 0.02	0.28 0.31 0.24 0.19 0.18	09-2179 M-404520-01-1
09-2179-02 Sausenheim, Germany, 2009 (Dornfelder)	WG	0.13	0.017	800	3	–0 0 21 28 35	Bunches	0.23 0.44 0.25 0.24 0.26	0.09 0.12 0.08 0.07 0.08	0.33 0.57 0.34 0.32 0.35	
09-2179-03 Emines, Belgium, 2009 (Solaris)	WG	0.13	0.013	1000	3	–0 0 21 28 35	Bunches	0.17 0.24 0.10 0.13 0.10	0.06 0.07 0.03 0.03 0.03	0.24 0.32 0.13 0.16 0.13	
09-2179-04 Steinfeld, Germany, 2009 (Müller-Thurgau)	WG	0.13	0.017	800	3	–0 0 21 28 35	Bunches	0.29 0.63 0.37 0.33 0.26	0.10 0.13 0.11 0.08 0.07	0.40 0.77 0.49 0.42 0.34	
09-2180-01 Graveson (13), France, 2009 (Carignan)	WG	0.13	0.067	200	3	–0 0 21 28 35	Bunches	0.18 0.20 0.15 0.07 0.09	0.03 0.04 0.03 0.02 0.03	0.21 0.24 0.18 0.09 0.12	09-2180 M-404444-01-1
09-2180-02 Rocha Macieira, Portugal, 2009 (Syrah)	WG	0.13	0.013	1000	3	–0 0 21 28 35	Bunches	0.08 0.41 0.29 0.22 0.11	0.01 0.06 0.03 0.03 0.02	0.09 0.48 0.32 0.25 0.13	
09-2180-03 La Fortesa–Piera, Spain, 2009 (Macabeo)	WG	0.13	0.022	600	3	–0 0 21 28 35	Bunches	0.28 0.31 0.31 0.21 0.19	0.05 0.06 0.04 0.04 0.03	0.34 0.38 0.35 0.25 0.22	
09-2180-04 Bologna, Italy, 2009 (Chardonnay)	WG	0.12–0.13	0.013	928–1000	3	–0 0 21 28 35	Bunches	0.17 0.18 0.12 0.09 0.06	0.09 0.11 0.06 0.04 0.03	0.27 0.30 0.19 0.13 0.09	

Trial, Location, Country, Year (Variety)	Application					DAT Days [a]	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
10-2010-01, Athée sur Cher (37), France, 2010 (Chardonnay)	WG	0.13	0.067	200	3	0 28	Bunches	0.22 0.13	0.01 0.02	0.23 0.15	10-2010 M-419813-01-1
10-2010-02 St Nicolas de Bourgueil (37), France, 2010 (Cabernet Franc)	WG	0.13	0.067	200	3	0 28	Bunches	0.38 0.10	0.01 < 0.01	0.39 0.11	
10-2010-03 Roschbach, Germany, 2010 (Müller-Thurgau)	WG	0.13	0.017	800	3	0 28	Bunches	0.29 0.30	0.03 0.04	0.32 0.34	
10-2010-04 Uhldingen–Mühl-dorf, Germany, 2010 (Spätburgunder)	WG	0.13	0.013	1000	3	0 28	Bunches	0.40 0.22	0.03 0.03	0.43 0.25	
10-2011-01, Lentilly (69), France, 2010 (Aligate)	WG	0.13	0.067	200	3	0 28	Bunches	0.51 0.04	0.04 0.02	0.55 0.06	10-2011 M-435899-01-1
10-2011-02, Campo Arcis, Spain, 2010 (Bobal)	WG	0.13	0.013	1000	3	0 28	Bunches	0.33 0.08	0.02 0.01	0.35 0.09	
10-2011-03 Bologna, Italy, 2010 (Moscato)	WG	0.13	0.013	1000	3	0 28	Bunches	0.29 0.06	0.07 0.03	0.37 0.09	
10-2011-04 Ribafria, Portugal, 2010 (Syrah)	WG	0.13	0.027	500	3	0 28	Bunches	0.47 0.28	0.04 0.05	0.51 0.34	
GAP, Brazil	SC	0.15		1000	3	7					
BRA98F25-BE298F25 Indaiatuba—SP, Brazil,1998/99 (Maria)	WG	0.15	0.015	1000	3	7	Bunches	< 0.02			R.19/00 M-285309-01-1
	SC	0.15	0.015	1000	3	7	Bunches	0.02	< 0.02	< 0.04	R.33/01 M-285002-01-1
	WG	0.3	0.03	1000	3	7	Bunches	0.07			R.19/00 M-285309-01-1
	SC	0.3	0.03	1000	3	7	Bunches	0.07	0.04	0.11	R.33/01 M-285002-01-1
BRA98F25-BE198F25 Jundiaí—SP, Brazil, 1998/99 (Niagara)	WG	0.15	0.015	1000	3	1 3 5 7 10	Bunches	0.04 0.04 0.04 0.02 0.03			R.20/00 M-285311-01-1
	SC	0.15	0.015	1000	3	1 3 5 7 10	Bunches	0.04 0.04 0.04 0.02 0.03	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02	0.06 0.06 0.06 0.04 0.05	R.34/01 M-285003-01-1
	WG	0.3	0.03	1000	3	7	Bunches	0.07			R.20/00 M-285311-01-1
	SC	0.3	0.03	1000	3	7	Bunches	0.07	< 0.02	0.09	R.34/01 M-285003-01-1
FD00BRAZ15 Indaiatuba—SP, Brazil, 1998/99 (Niagara)	SC	0.15	0.015	1000	3	7	Bunches	0.03	< 0.02	0.05	R.48/01 M-285004-01-1
	SC	0.3	0.03	1000	3	7	Bunches	0.08	0.03	0.11	

Strawberries

Fifteen trials on strawberries were conducted in Europe (Germany, Belgium, Netherlands and France) between 2004 and 2012. The trials were conducted in indoor strawberry crops, housed under plastic or glass. Two applications by drip irrigation to individual strawberry plants or one drip application

followed by one foliar application were made. In the trials matching Belgium GAP, both drip applications in irrigation water, made 14–26 days apart, were at a rate of 0.45 kg ai/ha. In the trials according to the UK GAP, the two applications were made at an interval of 21–22 days, the first application at 0.18 kg ai/ha (drip) and the second at 0.27 kg ai/ha (foliar spray). The results are summarized in Table 61.

Table 61 Residues in strawberries from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Belgium (protected)	WG	0.45		Both drip	2	35					
11-2004-02 Dorn-Esch, Germany, 2011 (Elsanta Tray)	WG	0.45	0.015	3000	2	28 35 42	Fruit	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.02 <u>< 0.02</u> < 0.02	11-2004 M-445339-01-1
11-2004-03 Villers-Perwin, Belgium, 2011 (Darselect)	WG	0.45	0.0075	6000	2	28 35 42	Fruit	0.02 0.02 0.02	0.01 0.01 0.01	0.03 <u>0.03</u> 0.03	
11-2004-04 Zwaagdijk-Oost, Netherlands, 2011 (Elsanta)	WG	0.45	0.015	3000	2	28 35 42	Fruit	0.01 0.01 0.01	< 0.01 < 0.01 < 0.01	0.02 <u>0.02</u> 0.02	
10-2014-01 Cremery (80), France, 2010 (Darselect)	WG	0.45	0.0009	5000	2	35 42	Fruit	0.02 0.02	0.02 0.02	<u>0.04</u> 0.04	10-2014 M-419363-01-1
10-2014-02 Dorn-Esch, Germany, 2010 (Elsanta Tray)	WG	0.45	0.015	3000	2	28 35 42	Fruit	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.02 <u>< 0.02</u> < 0.02	
10-2014-03 Bossiere, Belgium, 2010 (Darselect)	WG	0.45	0.011	4000	2	28 35 42	Fruit	0.03 <u>0.02</u> 0.02	0.02 0.01 0.01	0.05 <u>0.03</u> 0.03	
10-2014-04 Zwaagdijk-Oost, Netherlands, 2010 (Elsanta)	WG	0.45	0.015	3000	2	28 35 42	Fruit	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 0.01	< 0.02 < 0.02 <u>0.02</u>	
GAP, UK (protected)	WG	1) 0.18 2) 0.27		Drip + foliar spray	2	35					
09-2169-01 Carpentras (84), France, 2009 (Pajaro)	WG	1) 0.18 2) 0.27	1) 0.005 2) 0.054	1) 4000 2) 500	2	28 35 42	Fruit	0.04 0.01 < 0.01	< 0.01 < 0.01 < 0.01	0.05 0.02 < 0.02	09-2169 M-401525-01-1
09-2169-02 Reute, Germany, 2009 (Charlotte)	WG	1) 0.18 2) 0.27	1) 0.005 2) 0.054	1) 4000 2) 500	2	28 34 41	Fruit	0.04 0.02 < 0.01	< 0.01 < 0.01 < 0.01	0.05 0.03 < 0.02	
09-2169-03 Bossiere, Belgium, 2009 (Elsanta)	WG	1) 0.18 2) 0.27	1) 0.005 2) 0.054	1) 4000 2) 500	2	28 35 42	Fruit	< 0.01 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.02 0.02 < 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
09-2169-04 Zwaagdijk, Netherlands, 2009 (Elsanta)	WG	1) 0.18 2) 0.27	1) 0.005 2) 0.054	1) 4000 2) 500	2	28 35 42	Fruit	0.02 0.02 < 0.01	< 0.01 < 0.01 < 0.01	0.03 0.03 < 0.02	
12-2039-01 Monteux (84), France, 2012 (Clery)	WG	1) 0.16 2) 0.27	1) 0.005 2) 0.054	1) 100 mL/plant 2) 500	2	28 35 42	Fruit	0.01 0.01 < 0.01	< 0.01 < 0.01 < 0.01	0.02 0.02 < 0.02	12-2039 M-438111-02-1
12-2039-02 Warmenhuizen, Netherlands, 2012 (Sonata)	WG	1) 0.18 2) 0.27	1) 0.009 2) 0.054	1) 50 mL/plant 2) 500	2	28 35 42	Fruit	0.02 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	0.03 < 0.02 < 0.02	
12-2039-03 Villers-Perwin, Belgium, 2012 (Dorselect)	WG	1) 0.17 2) 0.27	1) 0.006 2) 0.054	1) 70 mL/plant 2) 500	2	28 35 42	Fruit	< 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01	< 0.02 < 0.02 < 0.02	
12-2039-04 Tricht, Netherlands, 2012 (Elsanta)	WG	1) 0.18 2) 0.27	1) 0.009 2) 0.054	1) 50 mL/plant 2) 500	2	28 35 42	Fruit	0.05 0.02 < 0.01	< 0.01 < 0.01 < 0.01	0.06 0.03 < 0.02	

Bulb vegetables

Leek

Five field trials on leek were conducted in Europe (Germany, France and Netherlands) during 2003 (RA-2682/03, M-248031-01-1). Fenamidone was applied by foliar spray four times to leek plants at the rate of 0.15 kg ai/ha. The results are summarized in Table 62.

Table 62 Residues in leek from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT Days	Commodity	Residues, mg/kg		
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, Switzerland	SC	0.15		300	3	14				
R 2003 0473/0, Bornheim, Germany, 2003 (Amundo)	SC	0.015	0.005	300	4	0 14	Stem	0.10 < 0.01	< 0.01 < 0.01	0.1 < 0.01
R 2003 0553/2, Höfchen, Germany, 2003 (Ventura)	SC	0.15	0.05	300	4	0 14	Stem	0.70 0.02	0.02 < 0.01	0.72 0.02
R 2003 0554/0, Zwaagdijk, Netherlands, 2003 (Heracles)	SC	0.15	0.05	300	4	0 14	Stem	0.35 0.07	0.01 < 0.01	0.36 0.07
R 2003 0555/9, Langenfeld, Germany, 2003 (Ventura)	SC	0.15	0.05	300	4	0 14	Stem	0.80 0.05	0.02 < 0.01	0.82 0.05
R 2003 0556/7 Criquebeuf sur Seine, France, 2003 (Maine)	SC	0.15	0.05	300	4	0 14	Stem	0.90 0.13	0.02 < 0.01	0.92 0.13

Onion, bulb

Supervised field residue trials were conducted in Brazil in 2001, in the USA in 1999 and in Europe (Germany, France, Netherlands and the UK) in 2003. In Europe, fenamidone was applied by foliar

spray four times to onion plants at the rate of 0.15 kg ai/ha, whereas the US trials were conducted with 6 × 0.2 kg ai/ha (interval 7 days). The results are summarized in Table 63.

Table 63 Residues in bulb onion from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Switzerland	SC	0.15		500	3	14					
R2003 0474/9 Burscheid, Germany, 2003 (Stuttgarter Riesen)	SC	0.15	0.05	300	4	0 14	Bulb	0.01 < 0.01	< 0.01 < 0.01	0.01 < 0.01	RA-2683/03 M-248949-01-1
R2003 0557/5 Langenfeld, Germany, 2003 (Stuttgarter Riesen)	SC	0.15	0.05	300	4	0 14	Bulb	0.02 < 0.01	< 0.01 < 0.01	0.01 < 0.01	
R2003 0558/3 Epone (78), France, 2003 (Barito)	SC	0.15	0.05	300	4	0 14	Bulb	0.05 0.01	< 0.01 < 0.01	0.05 0.01	
R2003 0559/1 Wieringerwerf, Netherlands, 2003 (Hyskin)	SC	0.15	0.05	300	4	0 14	Bulb	0.06 0.02	< 0.01 < 0.01	0.06 0.02	
R2003 0560/5 Elveden, UK, 2003 (Sherpa)	SC	0.15	0.05	300	4	0 14	Bulb	0.05 0.01	< 0.01 < 0.01	0.05 0.01	
GAP, USA	SC	0.20			4	7					
14461-01 North Rose (NY), USA, 1999 (Crusader)	SC	0.20	0.042	466–489	6	7	Bulb	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	98W14461 M-238680-01-1
14461-02 Arkansaw (WI), USA, 1999 (Walla Walla)	SC	0.20	0.043	463–481	6	7	Bulb	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14461-03 Uvalde (TX), USA, 1999 (Cimmaron)	SC	0.20	0.042	486–489	6	7	Bulb	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14461-06 San Juan Bautista (CA), USA, 1999 (Festival)	SC	0.20	0.04	479–500	6	7	Bulb	0.10 (0.07, 0.13)	< 0.02 (< 0.02, < 0.02)	0.10	
14461-07 Ephrata (WA), USA, 1999 (Apex)	SC	0.20	0.04	459–467	6	7	Bulb	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14461-08 Corvallis (OR), USA, 1999 (Copra)	SC	0.19–0.20	0.04	467–490	6	7	Bulb	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14461-13 Manteca (CA), USA, 1999 (Rio Durado)	SC	0.20	0.043	463–480	6	3 5 7 10 14	Bulb	0.02 < 0.02 0.02 (< 0.02, 0.02) < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 (< 0.02, < 0.02) < 0.02 < 0.02	0.02 < 0.02 0.02 < 0.02 < 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
14461-19 Levelland (TX), USA, 1999 (Candy)	SC	0.20–0.21	0.04–0.086	232–488	6	7	Bulb	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
GAP, Brazil	SC	0.15	0.015	1000	3	7					
ER02BRAF07-3 São José do Rio Pardo—SP, Brazil, 2001 (Baia Dura Horticeres)	SC	0.20	0.02	1000	3	7	Bulb	< 0.02	< 0.02	< 0.02	R.75/02 M-285013-01-1
	SC	0.40	0.04	1000	3	7	Bulb	< 0.02	< 0.02	< 0.02	
ER02BRAF07-1 Paulinia—SP Brazil, 2001 (Baia Periforme)	SC	0.20	0.02	1000	3	7	Bulb	< 0.02	< 0.02	< 0.02	R.82/02 M-284950-01-1
	SC	0.40	0.04	1000	3	7	Bulb	< 0.02	< 0.02	< 0.02	
ER02BRAF07-2 Piedade—SP Brazil, 2001 (Crioula)	SC	0.20	0.02	1000	3	7	Bulb	< 0.02	< 0.02	< 0.02	R.83/02 M-284958-01-1
	SC	0.40	0.04	1000	3	7	Bulb	0.03	< 0.02	0.03	

Spring onion

Four trials on <u>spring onion</u> were conducted in the USA in 1999 (98W14461, M-238680-01-1). Fenamidone was applied by foliar spray to onion plants at the rate of 6 × 0.2 kg ai/ha (interval 7 days). For results see Table 64.

Table 64 Residues in spring onion from trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.2			4	7				
14461-14 Conklin (MI), USA, 1999 (Ishikura Improved)	SC	0.2	0.04	458–471	6	3 5 7 10 14	Plant w/o Roots	0.70 0.39 <u>0.24</u> (0.22, 0.25) 0.15 0.06	< 0.02 < 0.02 < 0.02 (< 0.02, < 0.02) < 0.02 < 0.02	0.70 0.39 <u>0.24</u> 0.15 0.06
14461-16 Kerman (CA), USA, 1999 (Southport 404)	SC	0.2	0.04	467–478	6	7	Plant w/o Roots	<u>0.94</u> (0.77, 1.1)	0.05 (0.03, 0.06)	1.1
14461-17 San Juan Bautista (CA), USA, 1999 (Parade)	SC	0.2	0.04	475–489	6	7	Plant w/o Roots	<u>0.94</u> (0.84, 1.03)	< 0.02 (< 0.02, < 0.02)	0.94
14461-20 Levelland (TX), USA, 1999 (Evergreen White Bunching)	SC	0.2	0.04	468–474	6	7	Plant w/o Roots	<u>0.36</u> (0.41, 0.30)	< 0.02 (< 0.02, < 0.02)	0.36

Brassica vegetables

Cabbage

Field trials on <u>head cabbage</u> were conducted in Europe (Germany, France and Portugal) and in the USA during 2003. In the European trials, fenamidone was sprayed three times at the rate of 0.15 kg ai/ha. In the USA, four applications were made at intervals of 4–5 days, at the rate of 0.28–0.31 kg ai/ha. The results are summarized in Table 65.

Table 65 Residues in cabbage from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT Days	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Switzerland	SC	0.15	0.05	500	3	14					
R2003 1153/2 VechtaHagstedt, Germany, 2003 (Lenox)	SC	0.15	0.05	300	3	0 7 14 21	Head	0.09 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.09 < 0.01 < 0.01 < 0.01	RA-2900/03 M-248911-01-1
R2003 1157/5 WerlWestönnen, Germany, 2003 (Lion)	SC	0.15	0.05	300	3	0 7 14 21	Head	0.08 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.08 < 0.01 < 0.01 < 0.01	
R2003 1158/3 Langenfeld, Germany, 2003 (Atraktion)	SC	0.15	0.05	300	3	0 7 14 22	Head	0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.01 < 0.01 < 0.01 < 0.01	
R2003 1159/1 Leichlingen, Germany, 2003 (Rodeo)	SC	0.15	0.05	300	3	0 7 14 22	Head	0.03 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.03 < 0.01 < 0.01 < 0.01	
R2003 1160/5 Rilly sur Vienne (37), France, 2003 (Impala)	SC	0.15	0.05	250	3	0 8 14 21	Head	0.04 < 0.01 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	0.04 < 0.01 0.01 < 0.01	
R2003 1154/0 Reynies (82), France, 2003 (Rigoletto)	SC	0.15	0.05	300	3	0 7 14 21	Head	0.92 0.18 0.06 0.04	0.04 0.01 < 0.01 < 0.01	0.96 0.19 0.06 0.04	RA-2901/03 M-248027-01-1
R2003 1161/3 Vale Bern Feito, Portugal, 2003 (Merlicias)	SC	0.17	0.05	333	3	0 7 14 21	Head	0.95 0.04 0.02 < 0.01	0.04 < 0.01 < 0.01 < 0.01	0.99 0.04 0.02 < 0.01	
GAP, USA	SC	0.3			3	2					
YW19CB01-YW007-03H York Springs (PA), USA, 2003 (Bonnies Hybrid)	SC	0.3	0.14–0.16	184–210	4	2	Head with wrapper leaves	<u>0.35</u> (0.07, 0.62)	< 0.02 (< 0.02, < 0.02)	0.35	201225 M-243561-01-3
YW19CB01-YW008-03H Tifton (GA), USA, 2003 (Atlantic)	SC	0.3	0.17–0.19	161–176	4	2	Head with wrapper leaves	<u>0.52</u> (0.38, 0.65)	< 0.02 (< 0.02, < 0.02)	0.52	
						2	Head w/o wrapper leaves	0.19 (0.19, 0.19)	< 0.02 (< 0.02, < 0.02)	0.19	
YW19CB01-YW009-03D Molino (FL), USA, 2003 (Bravo)	SC	0.28–0.31	0.14	198–216	4	0 2 3 5 7	Head with wrapper leaves	0.13 (0.09, 0.16) <u>0.10</u> (0.12, 0.07) 0.06 (0.06, 0.05) 0.08 (0.12, 0.05) 0.05 (0.05, 0.05)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.13 0.10 0.06 0.08 0.07	

Trial, Location, Country, Year (Variety)	Application					DAT Days	Commodity	Residues, mg/kg			Reference
	Form	Kg ai/ha	Kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
						2	Head w/o wrapper leaves	0.03 (0.03,< 0.02)	< 0.02 (< 0.02, < 0.02)	0.03	
YW19CB01-YW010-03H Seymour (IL), USA, 2003 (Golden Acre)	SC	0.3	0.2	153–154	4	2	Head with wrapper leaves	0.17 (0.08, 0.26)	< 0.02 (< 0.02, < 0.02)	0.17	
						2	Head w/o wrapper leaves	< 0.02	< 0.02 (< 0.02, < 0.02)	< 0.02	
YW19CB01-YW011-03H Uvalde (TX), USA, 2003 (Blue Thunder)	SC	0.29–0.3	0.14–0.15	198–212	4	2	Head with wrapper leaves	0.22 (0.25, 0.19)	< 0.02 (< 0.02, < 0.02)	0.22	
YW19CB01-YW012-03H Fresno (CA), USA, 2003 (Gazelle)	SC	0.3	0.16–0.17	171–182	4	2	Head with wrapper leaves	0.24 (0.19, 0.28)	< 0.02 (< 0.02, < 0.02)	0.24	
						2	Head w/o wrapper leaves	< 0.02	< 0.02 (< 0.02, < 0.02)	< 0.02	

Flowerhead Brassicas

Field trials on cauliflower were conducted in Europe (Germany, France, Italy and the UK) with 3 × 0.15 kg ai/ha. In the USA, four treatments at a rate of 0.29–0.31 kg ai/ha were made by foliar spray on broccoli at intervals of 4–6 days. The results are summarized in Table 66.

Table 66 Residues in flowerhead brassicas from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP Switzerland	SC	0.15	0.05	300	3	14					
R2003 1155/9 St Lambert des Levees (49), France, 2003 (Thalassa)	SC	0.15	0.06	250	3	0 7	Whole plant	0.95 0.21	0.02 < 0.01	0.97 0.22	RA-2902/03 M-247895-01-1
						14 21	Inflorescence	< 0.01 0.01	< 0.01 < 0.01	< 0.02 0.02	
R2003 1162/1 Langenfeld, Germany, 2003 (Fremont)	SC	0.15	0.05	300	3	0	Whole plant	0.90	0.02	0.92	
						6 14 22	Inflorescence	0.03 < 0.01 0.01	< 0.01 < 0.01 < 0.01	0.04 < 0.02 0.02	
R2003 1164/8 Falkenham, UK, 2003 (Pierrot)	SC	0.15	0.05	300	3	0 7 14 21	Inflorescence	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.02 < 0.02 < 0.02 < 0.02	
R2003 1165/6 Faverolles (80), France, 2003 (Aviso)	SC	0.15	0.05	300	3	0 7 14 21	Inflorescence	< 0.01 < 0.01 < 0.01 < 0.01	< 0.01 < 0.01 < 0.01 < 0.01	< 0.02 < 0.02 < 0.02 < 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
R2003 1156/7 Zapponeta, Italy, 2003 (Verde di Macerata)	SC	0.15	0.05	300	3	0 7 14 21	Inflorescence	0.45 0.06 0.08 0.02	0.05 < 0.01 0.01 < 0.01	0.51 0.07 0.09 0.03	RA-2903/03 M-247987-01-1
R2003 1166/4 St Etienne du Gres (13), France, 2003 (Fremont)	SC	0.15	0.05	300	3	0 7	Whole plant	1.4 0.41	0.16 0.05	1.58 0.47	
						13 21	Inflorescence	< 0.01 < 0.01	< 0.01 < 0.01	< 0.02 < 0.02	
GAP, USA	SC	0.3			3	2					
YW19BR01-YW001-03H Raymondville (TX), USA, 2003 (Green Sprout Calabrese)	SC	0.3–0.31	0.16	189–191	4	2	Inflorescence	1.6 (1.08, 2.05)	< 0.02 (< 0.02, < 0.02)	1.6	201225 M-243561-01-1
YW19BR01-YW002-03-D Fresno (CA), USA, 2003 (Bell Star)	SC	0.29–0.31	0.17	175–179	4	0 2 3 5 7	Inflorescence	0.95 (0.96, 0.94) 0.68 (0.73, 0.63) 0.68 (0.47, 0.88) 0.57 (0.54, 0.59) 0.42 (0.52, 0.32)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.95 0.68 0.68 0.57 0.42	
YW19BR01-YW003-03H Fresno (CA), USA, 2003 (Marathon)	SC	0.3	0.14	208–212	4	2	Inflorescence	1.5 (1.25, 1.66)	< 0.02 (< 0.02, < 0.02)	1.5	
YW19BR01-YW004-03H Porterville (CA), USA, 2003 (Marathon)	SC	0.3–0.31	0.12–0.13	242–244	4	2	Inflorescence	0.51 (0.47, 0.55)	< 0.02 (< 0.02, < 0.02)	0.51	
YW19BR01-YW005-03H Glenn (CA), USA, 2003 (Green Belt)	SC	0.3–0.31	0.14–0.15	206–210	4	2	Inflorescence	0.31 (0.31, 0.31)	< 0.02 (< 0.02, < 0.02)	0.31	
YW19BR01-YW006-03H Hillsboro (OR), USA, 2003 (Packman)	SC	0.29–0.3	0.19–0.2	155–160	4	2	Inflorescence	2.2 (1.71, 2.72)	< 0.02 (< 0.02, < 0.02)	2.2	

Fruiting vegetables, Cucurbits

Cucumber

Nine trials on cucumber performed indoor were conducted in Europe during 2002, 2003 and 2004: two trials in France, three in Spain, two in Italy, one in Greece and one in the Netherlands with 3 × 0.15 kg ai/ha by foliar spray. Nine supervised trials on cucumbers were performed outdoors during 1999 in the USA. Six applications in the range of 0.19–0.215 kg ai/ha at intervals of 3–6 days were made. The results are summarized in Table 67.

Table 67 Residues in cucumber from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Switzerland	WG	0.15			3	3					
02R651-1, La Mojonera, Spain, 2002 (Trópico)	WG	0.15	0.013–0.015	1000–1150	3	0 3	Fruit	0.13 0.12	< 0.02 < 0.02	0.13 0.12	02 R 651 M-234100-01-1
02R651-2 Giovinazzo, Italy, 2002 (Sarig)	WG	0.15	0.03	500	3	0 3	Fruit	0.12 0.10	< 0.02 < 0.02	0.12 0.10	
02R651-3, Zwaagdijk, Netherlands, 2002 (Enduro)	WG	0.15	0.01	1500	3	0 3	Fruit	0.17 0.13	0.05 < 0.02	0.23 0.13	
02R653-1, La Mojonera, Spain, 2002 (Trópico)	WG	0.15	0.013–0.015	1000–1150	3	0 3	Fruit	0.14 0.09	< 0.02 < 0.02	0.14 0.09	02 R 653 M-234103-01-1
02R653-2, Esovalta, Greece, 2002 (722)	WG	0.15	0.015	1000	3	0 3	Fruit	0.02 0.04	< 0.02 < 0.02	0.02 0.04	
02R653-3, Molfetta, Italy, 2002 (Locale Di Polignano)	WG	0.15	0.015	1000	3	0 3	Fruit	0.07 < 0.02	< 0.02 < 0.02	0.07 < 0.02	
R 2003 0275/4, St Jory (31), France, 2003 (Aramon)	WG	0.15	0.015	1000	3	0 3	Fruit	0.03 < 0.01	< 0.01 < 0.01	0.03 < 0.01	RA-2648/03, M-235795-01-1
R 2004 0070 5 Chazay d'Azergues (69), France, 2004 (Gardon)	SC	0.15	0.015	1000	3	0 3	Fruit	0.12 0.10	< 0.01 < 0.01	0.12 0.10	RA-2540/04 M-262524-01-1
R 2004 0367 4 Monte Algaida Sanlucar, Spain, 2004 (Alanis F1)	SC	0.15	0.015	1000	3	0 3	Fruit	0.09 0.04	< 0.01 < 0.01	0.09 0.04	
GAP, USA	SC	0.2			4	14					
14486-01, Clayton (NC), USA, 1999 (Sweet Slice F-1)	SC	0.2–0.21	0.12–0.14	149–176	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	99W14486 M-240408-01-1
14486-02, Lucama (NC), USA, 1999 (National Pickling)	SC	0.2–0.22	0.11	175–195	6	15	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14486-03, Chula (GA), 1999 (Lightning)	SC	0.2	0.11–0.15	130–179	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14486-04, Rose Hill (NC), USA, 1999 (Poinsett)	SC	0.19–0.2	0.14	138–145	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14486-05, Oviedo (FL), USA, 1999 (Poinsett 76)	SC	0.2	0.14	137–142	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14486-06, York (NE), USA, 1999 (Straight Eight)	SC	0.2	0.11	182–189	6	13	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14486-07, Arkansaw (WI), USA, 1999 (Lucky Strike)	SC	0.2	0.1–0.11	185–188	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14486-08, Uvalde (TX), USA, 1999 (Supersett)	SC	0.19–0.2	0.14	136–142	6	14	Fruit	0.02 (0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
14486-09, San Juan Bautista (CA), USA, 1999 (Dasher 11)	SC	0.2	0.12	169–175	6	14	Fruit	0.04 (0.04, 0.03)	< 0.02 (< 0.02, < 0.02)	0.04	

Summer squash

Nine field trials on summer squash were carried out during 1999 in the USA (99W14487, M-240407-01-1). At each trial, six spray applications in the range of 0.19–0.21 kg ai/ha were made at intervals of 4–6 days. The results are summarized in Table 68.

Table 68 Residues in summer squash from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.2			4	14				
14487-01, Germansville (PA), USA, 1999 (Multipik)	SC	0.2–0.21	0.11–0.12	179–185	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
14487-02, Clayton (NC), USA, 1999 (Seneca Prolific F-1)	SC	0.2–0.21	0.12–0.13	163–177	6	7 10 14 17 21	Fruit	< 0.02 < 0.02 < 0.02 (< 0.02, < 0.02) < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 (< 0.02, < 0.02) < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02
14487-03, Lucama (NC), USA, 1999 (Early Prolific Straightneck)	SC	0.2	0.11	175–184	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
14487-04, Chula (GA), USA, 1999 (Dixie Hybrid)	SC	0.2	0.11–0.16	125–176	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
14487-05, Oviedo (FL), USA, 1999 (Yellow Crookneck)	SC	0.19–0.2	0.14	135–142	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
14487-06, Arkansaw (WI), USA, 1999 (Monet)	SC	0.2	0.11	185–189	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
14487-07, Uvalde (TX), USA, 1999 (Multipik F1)	SC	0.2–0.21	0.14	138–144	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
14487-08, San Juan Bautista (CA), USA, 1999 (Golden Summer Crookneck)	SC	0.2	0.11–0.12	168–179	6	14	Fruit	0.06 (0.04, 0.08)	< 0.02 (< 0.02, < 0.02)	0.06
14487-09, Ephrata (WA), USA, 1999 (Black Beauty Zucchini)	SC	0.2–0.21	0.14	141–150	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02

Melons

Twenty trials on melon were conducted in Europe during 2000, 2002 and 2005, six trials in France, six in Spain, six in Italy, one in Greece and one in Portugal. The spray application rates were 3 × 0.14–0.15 kg ai/ha. Twelve trials were conducted outdoors and eight trials conducted indoors. In the indoor trials (02 R 656, M220462-01-1), the samples were stored frozen for about 18 months.

Eight supervised trials on cantaloupe melon were carried out outdoors during 1999 in the USA. Fenamidone was applied six times by foliar spray at rates of 0.19–0.21 kg ai/ha at intervals of 5 days. The results are summarized in Table 69.

Table 69 Residues in melons from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference, remarks
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Switzerland	SC	0.15			3	3					
00535AV1, Isle sur la Sorgues (84), France, 2000 (Presto F1) (Outdoors)	WG	0.14	0.04	333–345	3	0 7 14 18 18 18	Fruit Fruit Fruit Peel Pulp Fruit	0.04 0.03 < 0.02 0.03 < 0.02 0.02	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02 < 0.02	0.04 0.03 < 0.02 0.03 < 0.02 0.02	00-535 M-205672-01-1
00535BX1, Virsac (84), France, 2000 (Cantaloupe charentais) (Outdoors)	WG	0.14	0.04	350	3	0 7 15 21 21 21	Fruit Fruit Fruit Peel Pulp Fruit	0.09 0.04 0.03 0.04 < 0.02 0.02	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02 < 0.02	0.09 0.04 0.03 0.04 < 0.02 0.02	
00536AV1, Robion (84), France, 2000 (Manta) (Outdoors)	WG	0.14	0.014	1000	3	7 7 7 14 14 14	Peel Pulp Fruit Peel Pulp Fruit	0.03 < 0.02 0.02 0.03 < 0.02 0.02	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02 < 0.02	0.03 < 0.02 0.02 0.03 < 0.02 0.02	00-536 M-205151-01-1
00536TL1, Béziers (34), France, 2000 (Amigo) (Outdoors)	WG	0.14	0.04	357	3	7 7 7 14 14 14	Peel Pulp Fruit Peel Pulp Fruit	0.03 < 0.02 0.03 0.05 < 0.02 0.03	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02 < 0.02	0.03 < 0.02 0.03 0.05 < 0.02 0.03	
02R655-1, Alginet, Spain, 2002 (Cantalup) (Outdoors)	WG	0.15	0.019	800	3	0 3 3 3	Fruit Peel Pulp Fruit	< 0.02 < 0.02 < 0.02 <u>< 0.02</u>	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 <u>< 0.02</u> < 0.02	02 R 655 M-219005-01-1
02R655-2, San Giovanni In Persiceto, Italy, 2002 (Calipso) (Outdoors)	WG	0.15	0.025	600	3	0 3 3 3	Fruit Peel Pulp Fruit	0.03 0.09 < 0.02 <u>0.04</u>	< 0.02 < 0.02 < 0.02 < 0.02	0.03 0.09 <u>< 0.02</u> 0.04	
R2005 0299/0 Alginet, Spain, 2005 (Sirio) (Outdoors)	SC	0.15	0.015	1000	3	–0 0 1 3 3 3 7 7 7 14 14 14	Fruit Fruit Fruit Peel Pulp Fruit Peel Pulp Fruit Peel Pulp Fruit	0.02 0.03 0.03 0.04 < 0.01 <u>0.04</u> 0.08 < 0.01 0.02 0.04 < 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	0.02 0.03 0.03 0.04 <u>< 0.01</u> 0.04 0.08 < 0.01 0.02 0.04 < 0.01 0.02	RA-2536/05 M-279019-01-1
R2005 0300/8 Vilanova i la Geltrú, Spain, 2005 (Piel de Sapo) (Outdoors)	SC	0.15	0.015–0.019	800–1000	3	0 0 0 3 3 3 7 7 7	Peel Pulp Fruit Peel Pulp Fruit Peel Pulp Fruit	0.27 < 0.01 0.16 0.23 < 0.01 0.10 0.29 < 0.01 <u>0.12</u>	0.01 < 0.01 < 0.01 0.01 < 0.01 < 0.01 0.01 < 0.01 < 0.01	0.28 < 0.01 0.16 0.24 <u>< 0.01</u> 0.10 0.30 < 0.01 0.12	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference, remarks
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
R2005 0903/0 Licodia Eubea, Italy, 2005 (Helios) (Outdoors)	SC	0.15	0.015–0.25	600–1000	3	–0	Fruit	0.01	< 0.01	0.01	
						0	Fruit	0.02	< 0.01	0.02	
						1	Fruit	0.02	< 0.01	0.02	
						3	Peel	0.09	< 0.01	0.09	
						3	Pulp	< 0.01	< 0.01	< 0.01	
						3	Fruit	0.02	< 0.01	0.02	
						7	Peel	0.05	< 0.01	0.05	
						7	Pulp	< 0.01	< 0.01	< 0.01	
						7	Fruit	0.03	< 0.01	0.03	
						14	Peel	0.04	< 0.01	0.04	
						14	Pulp	< 0.01	< 0.01	< 0.01	
						14	Fruit	0.02	< 0.01	0.02	
R2005 0904/9 Aronas, Greece, 2005 (Velos) (Outdoors)	SC	0.15	0.03	500	3	–0	Fruit	0.04	< 0.01	0.04	
						0	Fruit	0.12	0.01	0.13	
						1	Fruit	0.10	< 0.01	0.10	
						3	Peel	0.57	0.07	0.65	
						3	Pulp	< 0.01	< 0.01	< 0.01	
						3	Fruit	0.08	< 0.01	0.08	
						7	Peel	0.29	0.03	0.32	
						7	Pulp	< 0.01	< 0.01	< 0.01	
						7	Fruit	0.06	< 0.01	0.06	
						14	Peel	0.14	0.02	0.16	
						14	Pulp	< 0.01	< 0.01	< 0.01	
						14	Fruit	0.04	< 0.01	0.04	
R2005 0905/7 Aldeia Gavinha, Portugal, 2005 (Pele de Sapo) (Outdoors)	SC	0.15	0.019	800	3	–0	Fruit	0.02	< 0.01	0.02	
						0	Fruit	0.07	< 0.01	0.07	
						1	Fruit	0.04	< 0.01	0.04	
						3	Peel	0.11	< 0.01	0.11	
						3	Pulp	< 0.01	< 0.01	< 0.01	
						3	Fruit	0.05	< 0.01	0.05	
						7	Peel	0.06	< 0.01	0.06	
						7	Pulp	< 0.01	< 0.01	< 0.01	
						7	Fruit	0.04	< 0.01	0.04	
						14	Peel	0.04	< 0.01	0.04	
						14	Pulp	< 0.01	< 0.01	< 0.01	
						14	Fruit	0.02	< 0.01	0.02	
R2005 0906/5 Manfredonia, Italy, 2005 (Proteo) (Outdoors)	SC	0.15	0.015	1000	3	0	Peel	0.12	< 0.01	0.12	
						0	Pulp	< 0.01	< 0.01	< 0.01	
						0	Fruit	0.05	< 0.01	0.05	
						3	Peel	0.19	0.01	0.20	
						3	Pulp	< 0.01	< 0.01	< 0.01	
						3	Fruit	0.03	< 0.01	0.03	
						7	Peel	0.07	< 0.01	0.08	
						7	Pulp	< 0.01	< 0.01	< 0.01	
						7	Fruit	0.02	< 0.01	0.02	
02R656-1 Puebla de Vicar, Spain, 2002 (Vulcano) (Indoors)	WG	0.15	0.013	1200	3	0	Fruit	< 0.02	< 0.02	< 0.02	02 R 656, M-220462-01-1
						1	Fruit	< 0.02	< 0.02	< 0.02	
						3	Peel	< 0.02	< 0.02	< 0.02	
						3	Pulp	< 0.02	< 0.02	< 0.02	
						3	Fruit	< 0.02	< 0.02	< 0.02	
02R656-2 Puebla de Vicar, Spain, 2002 (Vulcano) (Indoors)	WG	0.15	0.014	1100	3	0	Fruit	0.05	< 0.02	0.05	
						3	Peel	0.07	< 0.02	0.07	
						3	Pulp	< 0.02	< 0.02	< 0.02	
						3	Fruit	0.07	< 0.02	0.07	
02R656-3 Sanlucar de Barrameda, Spain, 2002 (Galia-Hy F1) (Indoors)	WG	0.15	0.015	1000	3	0	Fruit	0.11	< 0.02	0.11	
						1	Fruit	0.11	< 0.02	0.11	
						3	Peel	0.15	< 0.02	0.15	
						3	Pulp	< 0.02	< 0.02	< 0.02	
						3	Fruit	0.09	< 0.02	0.09	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference, remarks
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
02R656-4 Virazeil (47), France, 2002 (Toloza) (Indoors)	WG	0.15	0.06	250	3	0 1 3 3 3	Fruit Fruit Peel Pulp Fruit	0.08 0.12 0.10 < 0.02 <u>0.07</u>	< 0.02 < 0.02 0.04 < 0.02 < 0.02	0.08 0.12 0.14 <u>< 0.02</u> 0.07	
02R656-5 Isle sur la Sorgues (84), France, 2002 (Luna) (Indoors)	WG	0.15	0.03	500	3	0 3 3 3	Fruit Peel Pulp Fruit	< 0.02 0.03 < 0.02 <u>< 0.02</u>	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 0.03 <u>< 0.02</u> < 0.02	
02R656-6 San Giovanni in Persiceto, Italy, 2002 (Harper) (Indoors)	WG	0.15	0.025	600	3	0 1 3 3 3	Fruit Fruit Peel Pulp Fruit	0.03 < 0.02 0.03 < 0.02 <u>< 0.02</u>	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02	0.03 < 0.02 0.03 <u>< 0.02</u> < 0.02	
02R656-7 Giovinazzo, Italy, 2002 (Proteo) (Indoors)	WG	0.15	0.015	1000	3	0 3 3 3	Fruit Peel Pulp Fruit	0.02 0.14 < 0.02 <u>0.03</u>	< 0.02 < 0.02 < 0.02 < 0.02	0.02 0.14 <u>< 0.02</u> 0.03	
02R656-8 Teriizzi, Italy, 2002 (Proteo) (Indoors)	WG	0.15	0.019	800	3	0 3 3 3	Fruit Peel Pulp Fruit	0.04 0.08 < 0.02 <u>0.04</u>	< 0.02 0.03 < 0.02 < 0.02	0.04 0.11 <u>< 0.02</u> 0.04	
GAP, USA	SC	0.2			4	14					
14488-02, Conklin (MI), USA, 1999 (Cantaloupe Superstar)	SC	0.2	0.13–0.14	148–152	6	14	Fruit	0.02 (0.02, 0.02)	< 0.02 (< 0.02, < 0.02)	0.02	99W14488 M-240409-01-1
14488-03, Uvalde (TX), USA, 1999 (Cantaloupe Caravelle)	SC	0.2–0.21	0.14	138–147	6	15	Fruit	< 0.02 (< 0.02 2×)	< 0.02 (< 0.02, < 0.02)	< 0.02	
14488-04, Brookshire (TX), USA, 1999 (Cantaloupe–TAM Uvalde)	SC	0.2	0.12	166–172	6	14	Fruit	0.07 (0.07, 0.07)	< 0.02 (< 0.02, < 0.02)	0.07	
14488-05, San Juan Bautista (CA), USA, 1999 (Cantaloupe - Trooper)	SC	0.2	0.12	168–171	6	13	Fruit	0.06 (0.06, 0.05)	< 0.02 (< 0.02, < 0.02)	0.06	
14488-06, Hamilton (CA), USA, 1999 (Cantaloupe - Spanish Cavaillon)	SC	0.2	0.11–0.13	150–178	6	14	Fruit	0.08 (0.10, 0.08)	< 0.02 (< 0.02, < 0.02)	0.08	
14488-07, Porterville (CA), USA, 1999 (Cantaloupe - Durango)	SC	0.19–0.2	0.13	149–156	6	14	Fruit	0.08 (0.08, 0.08)	< 0.02 (< 0.02, < 0.02)	0.08	
14488-08, San Marcos (CA), USA, 1999 (Cantaloupe Hy Shaw)	SC	0.2 0.2 0.2 0.2 0.295 0.2	0.12–0.18	166–172	6	14	Fruit	0.09 (0.09, 0.09)	< 0.02 (< 0.02, < 0.02)	0.09	
14488-09, Fresno (CA), USA, 1999 (Cantaloupe -Hales Best Jumbo)	SC	0.19–0.2	0.11	183–188	6	14	Fruit	0.04 (0.03, 0.04)	< 0.02 (< 0.02, < 0.02)	0.04	

Watermelons

Three supervised trials on watermelon were carried out in Brazil during 2004. The foliar spray application rates were 5 × 0.15 kg ai/ha or 5 × 0.3 kg ai/ha (interval 7 days). The results are summarized in Table 70.

Table 70 Residues in watermelons from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Brazil	SC	0.15			3	7					
FR04BRA012-C1 Anhembi—SP, Brazil, 2004 (Favorita)	SC	0.15	0.015	1000	5	0 2 5 7 10	Fruit	0.71 0.25 0.15 0.04 < 0.02	0.09 0.10 0.06 < 0.02 < 0.02	0.81 0.36 0.22 0.04 < 0.02	UNESP RA-944/05 M-276178-01-1
		0.3	0.03	1000	5	7	Fruit	0.07	0.02	0.09	
FR04BRA012-P1 Uberlandia—MG, Brazil, 2004 (Perola)	SC	0.15	0.015	1000	5	7	Fruit	0.03	< 0.02	0.03	UNESP RA-945/05 M-276180-01-1
		0.3	0.03	1000	5	7	Fruit	0.07	< 0.02	0.07	
FR04BRA012-P2 Ribeirao Preto—SP, Brazil, 2004 (Perola)	SC	0.15	0.015	1000	5	7	Fruit	0.05	< 0.02	0.05	UNESP RA-946/05 M-276183-01-1
		0.3	0.03	1000	5	7	Fruit	0.08	0.02	0.10	

Fruiting Vegetables other than Cucurbits

Peppers

Six supervised field trials on sweet pepper and three trials on chilli pepper were carried out during 2003 in the USA (201227, M-260625-01-1). At each trial, four foliar spray applications were made at intervals of 4–6 days, at rates in the range of 0.27–0.35 kg ai/ha. The results are summarized in Table 71.

Table 71 Residues in peppers from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			3	14				
YW041-03H, Tifton (GA), USA, 2003 (Sweet pepper, Keystone Bell)	SC	0.3	0.17–0.19	161–176	4	14	Fruit	0.03 (< 0.02, 0.03)	< 0.02 (< 0.02, < 0.02)	0.03
YW042-03D, Molino (FL), USA, 2003 (Sweet pepper, Olympus)	SC	0.29–0.31	0.14–0.15	199–223	4	0 5 10 14 21	Fruit	0.17 (0.13, 0.21) 0.13 (0.11, 0.15) 0.11 (0.11, 0.11) 0.05 (0.05, 0.04) < 0.02 (< 0.02,< 0.02)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.17 0.13 0.11 0.05 < 0.02
YW043-03HA, Stillwell (KS), USA, 2003 (Sweet pepper, California Wonder)	SC	0.27–0.35	0.22–0.24	126–156	4	14	Fruit	0.08 (0.08, 0.07)	< 0.02 (< 0.02, < 0.02)	0.08

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
YW044-03H, East Bernard (TX), USA, 2003 (Sweet pepper, Better Bell)	SC	0.29–0.3	0.17–0.18	161–178	4	14	Fruit	0.08 (0.06, 0.09)	< 0.02 (< 0.02, < 0.02)	0.08
YW045-03H, Fresno (CA), USA, 2003 (Sweet pepper, Emerald Giant Bell)	SC	0.3	0.18–0.2	149–161	4	14	Fruit	0.19 (0.18, 0.20)	< 0.02 (< 0.02, < 0.02)	0.19
YW046-03H, Visalia (CA), USA, 2003 (Sweet pepper, Valiant)	SC	0.3	0.14	210–218	4	14	Fruit	0.07 (0.08 0.06)	< 0.02 (< 0.02, < 0.02)	0.07
YW047-03H, Jerome (ID), USA, 2003 (Chilli pepper, Jalapeno/Tam)	SC	0.3–0.31	0.11	260–272	4	14	Fruit	0.07 (0.07, 0.06)	< 0.02 (< 0.02, < 0.02)	0.07
YW048-03H, Uvalde (TX), USA, 2003 (Chilli pepper, Jalopeno—M)	SC	0.29–0.3	0.14–0.15	196–209	4	13	Fruit	1.45 (1.24, 1.66)	0.04 (0.04, 0.04)	1.5
YW049-03H, Fresno (CA), USA, 2003 (Chilli pepper, Anaheim TMR 23)	SC	0.29–0.3	0.18–0.2	150–161	4	14	Fruit	1.3 (1.47, 1.16)	< 0.02 (< 0.02, < 0.02)	1.3

Tomato

Eight supervised trials on indoor tomatoes and four trials on outdoor tomatoes were conducted in Europe (France, Italy, Spain, Germany and Netherlands) during 2005, 2009 and 2010. Fenamidone was applied by foliar spray three times at a rate of 0.15 kg ai/ha and an interval in the range of 6–7 days. The maximum storage period from harvest to analysis was 512 days.

Seventeen supervised field trials on tomato, including two trials on cherry tomatoes, were carried out during 1999/2000 in the USA (outdoors). Each trial consisted of two plots. The first plot was treated four times at rates in the range of 0.2–0.31 kg ai/ha and intervals of 4–6 days. The second plot of each trial was treated six times at lower rates in the range of 0.19–0.21 kg ai/ha. The results are summarized in Table 72.

Table 72 Residues in tomatoes from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Romania (Indoors)	WG	0.11	0.03	500	3	3					
09-2235-01 Honselersdijk, Netherlands, 2009 (Mecano) (Indoors)	SC	0.13	0.013	1000	3	–0 0 1 3 7	Fruit	0.03 0.05 0.05 0.04 0.01	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.03 0.05 0.05 0.04 0.01	09-2235 M-405712-01-1
09-2235-02 Zapponeta, Italy, 2009 (Foce) (Indoors)	SC	0.13	0.013	1000	3	–0 0 1 3 7	Fruit	0.13 0.38 0.16 0.15 0.08	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.13 0.38 0.16 0.15 0.08	
09-2235-03 Leichlingen, Germany, 2009 (Albis) (Indoors)	SC	0.13	0.017	750	3	–0 0 1 3 7	Fruit	0.05 0.07 0.08 0.10 0.05	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.05 0.07 0.08 0.10 0.05	
09-2235-04 Sta Susanna, Spain, 2009 (Cherry, Phiolin) (Indoors)	SC	0.13–0.14	0.013	1000–1129	3	–0 0 1 3 7	Fruit	0.21 0.28 0.28 0.22 0.15	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.21 0.28 0.28 0.22 0.15	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
10-2013-01 Sta Susanna, Spain, 2010 (Caramba) (Indoors)	SC	0.15–0.16	0.015	1000–1077	3	–0 0 1 3 7	Fruit	0.05 0.09 0.06 0.06 0.09	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.05 0.09 0.06 0.06 0.09	10-2013 M-419802-01-1
10-2013-02 Palidoro-Fiumicino, Italy, 2010 (Ikram) (Indoors)	SC	0.15	0.015	1000	3	–0 0 1 3 7	Fruit	0.06 0.10 0.11 0.11 0.07	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.06 0.10 0.11 0.11 0.07	
10-2013-03 Leichlingen, Germany, 2010 (Albis) (Indoors)	SC	0.15	0.015	1000	3	–0 0 1 3 7	Fruit	0.04 0.06 0.07 0.06 0.06	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.04 0.06 0.07 0.06 0.06	
10-2013-04 Zevenhuizen, Netherlands, 2010 (Cherry, Santa) (Indoors)	SC	0.15	0.015	1000	3	–0 0 1 3 7	Fruit	0.29 0.38 0.38 0.30 0.26	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.29 0.38 0.38 0.30 0.26	
GAP, Switzerland (field)	SC	0.15		500	3	3					
R 2005 0307 5 Lebrija Sevilla, Spain, 2005 (Elegy) (Outdoors)	SC	0.15	0.015	1000	3	–0 0 1 3 7 13	Fruit	0.05 0.12 0.11 0.09 0.09 0.06	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.05 0.12 0.11 0.09 0.09 0.06	RA-2541/05 M-279022-01-1
R2005 0918 9 Molfetta, Italy, 2005 (Candia) (Outdoors)	SC	0.15	0.019	800	3	–0 0 1 3 7 14	Fruit	0.10 0.22 0.21 0.18 0.05 0.06	< 0.01 0.01 0.01 0.01 < 0.01 < 0.01	0.10 0.23 0.22 0.19 0.05 0.06	
R2005 0919 7 Foros de Salvaterra, Portugal, 2005 (H9661) (Outdoors)	SC	0.15	0.019	800	3	–0 0 1 3 7 14	Fruit	0.07 0.10 0.10 0.10 0.08 0.02	< 0.01 < 0.01 < 0.01 < 0.01 < 0.01 < 0.01	0.07 0.10 0.10 0.10 0.08 0.02	
R2005 0920 0 Thina, Greece, 2005 (H9780) (Outdoors)	SC	0.15	0.021	700	3	–0 0 1 3 7 14	Fruit	0.14 0.28 0.34 0.17 0.18 0.08	< 0.01 0.01 0.01 < 0.01 0.01 < 0.01	0.14 0.29 0.35 0.17 0.19 0.08	
GAP, USA	SC	0.3			3	14					
17533-01 North Rose (NY), USA, 1999 (Cherry tomato, Red cherry large)	SC	0.3–0.31	0.11	282–291	4	14	Fruit	0.25 (0.24, 0.25)	< 0.02 (< 0.02, < 0.02)	0.25	99W17533 M-238684-01-1
		0.2	0.072	275–283	6	14	Fruit	0.13 (0.12, 0.13)	< 0.02 (< 0.02, < 0.02)	0.13	
17533-02 Clayton (NC), USA, 1999 (Cherry tomato, Sweetie)	SC	0.21–0.31	0.08–0.12	250–262	4	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.2–0.21	0.08–0.09	246–260	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
17533-04 Lake Jem (FL), USA, 1999 (Tomato, Super sweet 100VF)	SC	0.27–0.3	0.06–0.14	374–457	4	14	Fruit	0.42 (0.56, 0.28)	0.03 (0.03, < 0.02)	0.45	
		0.2	0.045–0.09	384-450	6	15	Fruit	0.37 (0.45, 0.29)	0.03 (0.03, 0.02)	0.40	
17533-05 Oviedo (FL), USA, 1999 (Tomato, Better Boy)	SC	0.3–0.31	0.1	285–298	4	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.2–0.21	0.07	274–375	6	14	Fruit	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17533-06 New Holland (OH), USA, 1999 (Tomato, Heinz H9423)	SC	0.29–0.3	0.14–0.15	193–211	4	14	Fruit	0.09 (0.09, 0.09)	< 0.02 (< 0.02, < 0.02)	0.09	
		0.2	0.09–0.1	193–224	6	14	Fruit	0.14 (0.16, 0.11)	< 0.02 (< 0.02, < 0.02)	0.14	
17533-07 San Juan Bautista (CA), USA, 1999 (Tomato, Brigade)	SC	0.3	0.12	255–259	4	14	Fruit	0.33 (0.35, 0.30)	< 0.02 (< 0.02, < 0.02)	0.33	
		0.2	0.08	255–259	6	14	Fruit	0.21 (0.22, 0.20)	< 0.02 (< 0.02, < 0.02)	0.21	
17533-08 Medera (CA), USA, 1999 (Tomato, Shady Lady)	SC	0.3	0.11	273–283	4	7 14 21 29 35	Fruit	0.24 (0.26, 0.22) 0.10 (0.13, 0.07) 0.06 (0.07, 0.05) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.24 0.10 0.06 < 0.02 < 0.02	
		0.2	0.07–0.08	260–283	6	7 14 21 29 35	Fruit	0.20 (0.27, 0.13) 0.14 (0.13, 0.14) 0.03 (< 0.02, 0.04) 0.03 (0.03, < 0.02) < 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.20 0.14 0.03 0.03 < 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
17533-09 Glenn (CA), USA, 1999 (Tomato, Heinz 8892)	SC	0.3–0.31	0.11–0.13	247–275	4	7 14 21 28 35	Fruit	0.36 (0.35, 0.37) <u>0.47</u> (0.45, 0.48) 0.32 (0.28, 0.36) 0.24 (0.21, 0.26) 0.22 (0.25, 0.18)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.36 <u>0.47</u> 0.32 0.24 0.22	
		0.2	0.07–0.08	245–277	6	7 14 21 28 35	Fruit	0.40 (0.39, 0.40) 0.42 (0.39, 0.44) 0.41 (0.40, 0.41) 0.25 (0.27, 0.22) 0.18 (0.22, 0.13)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.40 0.42 0.41 0.25 0.18	
17533-10, Delevan (CA), USA, 1999 (Tomato, Sun 6200)	SC	0.3	0.11–0.12	249–262	4	14	Fruit	<u>0.40</u> (0.40, 0.39)	< 0.02 (< 0.02, < 0.02)	0.40	
		0.2	0.08–0.09	233–262	6	14	Fruit	0.38 (0.39, 0.37)	< 0.02 (< 0.02, < 0.02)	0.38	
17533-11, Fresno (CA), USA, 1999 (Tomato, Casa del Sol)	SC	0.29–0.3	0.16	182–191	4	14	Fruit	<u>0.34</u> (0.36, 0.31)	< 0.02 (< 0.02, < 0.02)	0.34	
		0.2–0.21	0.11	184–194	6	14	Fruit	0.25 (0.27, 0.23)	< 0.02 (< 0.02, < 0.02)	0.25	
17533-12, Fresno (CA), USA, 1999 (Tomato, Shady Lady)	SC	0.3	0.16	185–188	4	14	Fruit	<u>0.11</u> (0.09, 0.13)	< 0.02 (< 0.02, < 0.02)	0.11	
		0.19–0.2	0.11	183–190	6	14	Fruit	0.14 (0.13, 0.15)	< 0.02 (< 0.02, < 0.02)	0.14	
17533-13 Fresno (CA), 1999 (Tomato, Sweet Chelsea)	SC	0.3	0.16	184–189	4	14	Fruit	<u>0.61</u> (0.68, 0.53)	< 0.02 (< 0.02, < 0.02)	0.61	
		0.19–0.21	0.11	183–193	6	14	Fruit	0.56 (0.48, 0.64)	< 0.02 (< 0.02, < 0.02)	0.56	
17533-14 Manteca (CA), 1999 (Tomato, HP 108)	SC	0.29–0.3	0.07	417–426	4	15	Fruit	<u>0.46</u> (0.46, 0.45)	< 0.02 (< 0.02, < 0.02)	0.46	
		0.19–0.2	0.045	414–424	6	15	Fruit	0.50 (0.53, 0.46)	< 0.02 (< 0.02, < 0.02)	0.50	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
17533-15 Lathrop (CA), USA, 1999 (Tomato, HP 108)	SC	0.29–0.3	0.07	416–426	4	15	Fruit	0.38 (0.36, 0.40)	< 0.02 (< 0.02, < 0.02)	0.38	
		0.19–0.2	0.05	410–428	6	15	Fruit	0.29 (0.29, 0.28)	< 0.02 (< 0.02, < 0.02)	0.29	
17533-16 San Marcos (CA), USA, 1999 (Tomato, Red Pear)	SC	0.29–0.3	0.08	366–374	4	13	Fruit	0.80 (0.82, 0.77)	< 0.02 (< 0.02, < 0.02)	0.80	
		0.19–0.2	0.05–0.07	274–375	6	13	Fruit	0.64 (0.78, 0.49)	< 0.02 (< 0.02, < 0.02)	0.64	
17533-17 Watsonville (CA), USA, 1999 (Tomato, Sunbelt)	SC	0.3–0.31	0.07	426–436	4	14	Fruit	0.07 (0.06, 0.07)	< 0.02 (< 0.02, < 0.02)	0.07	
		0.2	0.05–0.06	314–430	6	14	Fruit	0.08 (0.08, 0.08)	< 0.02 (< 0.02, < 0.02)	0.08	
17533-18 Pikeville (NC), USA, 2000 (Tomato, Celebrity)	SC	0.3–0.31	0.09	327–342	4	14	Fruit	0.07 (0.07, 0.07)	< 0.02 (< 0.02, < 0.02)	0.07	
		0.2–0.21	0.06	321–339	6	14	Fruit	0.05 (0.05, 0.04)	< 0.02 (< 0.02, < 0.02)	0.05	

Leafy vegetables

Lettuce

Supervised trials on indoor lettuce (19) and eighteen trials on field lettuce (18) were conducted in Europe (France, Germany, Belgium, Spain and Netherlands) between 1998 and 2010. Fenamidone was applied three times by foliar spray at a rate in the range of 0.11–0.16 kg ai/ha and an interval in the range of 7–47 days. In the 2004 trials (RA-2542/04 (M-265329-01-1), the maximum storage period from harvest to analysis was 17.5 month.

Eighteen field trials on lettuce were conducted during the year 2000 in the USA (outdoors), nine on open-leaf and nine on head varieties. Fenamidone was applied four times at 7-day intervals to lettuce plants at the rate of about 0.3 kg ai/ha (range: 0.29–0.34 kg ai/ha). The results are shown in Table 73.

Table 73 Residues in lettuce from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Netherlands (indoor)	WG	0.15		500–1000	3	21					
98515OR1 Ouvrouer les champs (45) France 1998 Colette	WG	0.13	0.017	770	3	22	Head	0.17	< 0.02	0.17	98-515 M-165916-01-1
98515TL1 Ricaud (11) France 1998 Sensai	WG	0.13	0.016–0.032	400–800	3	21	Head	0.33	< 0.02	0.33	98-515 M-165916-01-1

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
98516OR1 St Denis en Val (45) France 1998 Colette	WG	0.13	0.026	500	3	0 7 13 20	Head	2.1 1.2 0.67 0.47	0.029 0.031 < 0.02 < 0.02	2.1 1.2 0.67 0.47	98-516 M-165926-01-1
98751AV1 Noves (13) France 1998 Sensai	WG	0.13	0.014–0.017	770–920	3	0 6 13 20	Head	1.5 1.1 0.75 0.70	< 0.02 < 0.02 < 0.02 < 0.02	1.5 1.1 0.75 0.70	98-751 M-166446-01-1
99504OR2 Ouvrouer les champs (45 France 1999 Colette	WG	0.15	0.026	600	3	21	Head	0.26	< 0.02	0.26	99-504 M-233244-01-1
99504TL1 Nohic (82) France 1998 Sensai	WG	0.13	0.027	480	3	18	Head	0.08	< 0.02	0.08	99-504 M-233244-01-1
99505AV1 Noves (13) France 1999 Nalys	WG	0.13	0.017	760	3	0 8 15 22	Head	1.1 0.34 0.17 0.13	< 0.02 < 0.02 < 0.02 < 0.02	1.1 0.34 0.17 0.13	99-505 M-212029-01-1
99505OR1 St. Denis en Val (45) France 1999 Colette	WG	0.13	0.027	500	3	0 7 15 22	Head	1.4 0.83 0.44 0.35	0.021 < 0.02 < 0.02 < 0.02	1.4 0.83 0.44 0.35	99-505 M-212029-01-1
00531RN1 Romille (35) France 2000 Sensai	WG	0.12	0.025	470–500	3	0 8 16 23	Head	1.0 0.82 0.77 0.13	< 0.02 < 0.02 < 0.02 < 0.02	1.0 0.82 0.77 0.13	00-531 M-201397-01-1
00533RN1 St Coulomb (35) France 2000 Angie	WG	0.13	0.025	500–540	3	21	Head	0.31	< 0.02	0.31	00-533 M-201446-01-1
R 2005 0796/8 Chazay D'Azergues (69), France, 2005 (head variety: Access)	WG	0.15	0.03	500	3	–0 0 3 7 14 21	Head	1.5 6.0 2.2 0.85 0.16 < 0.01	0.06 0.39 0.11 0.04 0.01 < 0.01	1.6 6.4 2.3 0.89 0.17 < 0.01	RA-2518/05 M-277879-01-1
R 2006 0279/0 Leichlingen, Germany, 2006 (head variety: Alexandria)	WG	0.15	0.03	500	3	–0 0 7 14 21	Head	2.3 6.4 4.7 2.3 1.6	0.16 0.54 0.35 0.15 0.10	2.5 7.0 5.1 2.5 1.7	RA-2553/06 M-281157-01-1
R 2006 0280/4 Villers–Perwin, Belgium, 2006 (head variety: Pullman)	WG	0.15	0.03	500	3	–0 0 7 14 21	Head	0.60 8.8 0.55 0.12 0.01	0.04 1.1 0.04 < 0.01 < 0.01	0.64 10 0.59 0.12 0.01	
09-2159-01 Meckenbeuren/Liebenau, Germany, 2009 (head variety: Analena)	WG	0.15	0.038	400	3	0 20	Head	6.9 0.02	0.56 < 0.01	7.5 0.02	09-2159 M-404587-01-1
09-2159-02, Lucenay (69), France, 2009 (leaf variety: Matinale)	WG	0.15	0.025	600	3	0 21	Leaves	6.2 0.16	0.63 0.02	6.9 0.18	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
09-2159-03, Bigues i Riells, Spain, 2009 (leaf variety: Batavia)	WG	0.15–0.16	0.03–0.038	400–530	3	0 20	Leaves	10 0.10	1.7 0.01	12 0.11	
09-2159-04, Palidoro Fiumicino, Italy, 2009 (leaf variety: Antony)	WG	0.15	0.03	500	3	0 21	Leaves	13 2.1	2.0 0.45	15 2.6	
09-2159-05, Wervers-hoof, Netherlands, 2009 (head lettuce)	WG	0.15	0.025	600	3	0 21	Head	5.8 0.12	0.55 0.02	6.4 0.14	
09-2159-06, Villers-Perwin, Belgium, 2009 (head variety: Tanex)	WG	0.15	0.03	500	3	0 21	Head	6.8 < 0.01	1.1 < 0.01	8.0 < 0.01	
GAP, Switzerland (field)	SC	0.15			3	14					
98514RN1 Domloup (35), France, 1998 (leaf variety: Enrika)	WG	0.15	0.022	577–626	3	0 7 14 22	Leaves	1.3 0.05 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	1.3 0.05 < 0.02 < 0.02	98-514 M-165908-01-1
98514AV1 Meynes (30), France, 1998 (Grise de Serre)	WG	0.13	0.026	500	3	0 7 13 21	Leaves	0.95 0.29 0.07 0.03	< 0.02 < 0.02 < 0.02 < 0.02	0.95 0.29 0.07 0.03	
99506AM1 Mezerolles (80), France, 1999 (leaf variety: Einstein)	WG	0.13	0.029	442	3	0 8 15 21	Leaves	0.90 0.07 < 0.02 < 0.02	0.03 < 0.02 < 0.02 < 0.02	0.93 0.07 < 0.02 < 0.02	99-506 M-212036-01-1
99506RN1 Romille (35), France, 1999 (Nadine)	WG	0.11–0.14	0.021	505–645	3	0 7 14 21	Leaves	2.8 1.3 < 0.02 < 0.02	0.04 0.04 < 0.02 < 0.02	3.2 1.7 < 0.02 < 0.02	
R 2004 0371/2 Cambridge, UK, 2004 (head variety: Anthem)	SC	0.15	0.038	400	3	0 3 7 14	Head	3.7 4.6 1.3 0.19	0.08 0.22 0.06 0.01	3.8 4.8 1.4 0.20	RA-2542/04 M-265329-01-1
R 2004 0372/0 Fondettes (37), France, 2004 (head variety: Ponchito)	SC	0.15	0.038	400	3	0 3 7 14	Head	4.4 1.4 0.09 0.03	0.11 0.04 < 0.01 < 0.01	4.5 1.4 0.09 0.03	
R 2004 0373/9 Langenfeld, Germany, 2004 (head variety: Ponchito)	SC	0.15	0.038	400	3	0 3 7 14	Head	2.5 0.64 0.33 0.03	0.10 0.02 0.02 < 0.01	2.6 0.66 0.35 0.03	
R 2004 0374/7 Zwaagdijk-Oost, Netherlands, 2004 (head variety: Ponchito, Butterhead)	SC	0.15	0.038	400	3	0 3 7 14	Head	1.9 2.1 1.1 0.41	0.07 0.08 0.04 0.02	2.0 2.2 1.1 0.43	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
R 2005 0797/6 Fondettes (37), France, 2005 (head variety: Estelle)	WG	0.15	0.03	500	3	–0 0 3 7 14 21	Head	0.03 4.2 2.1 0.09 < 0.01 < 0.01	< 0.01 0.38 0.13 < 0.01 < 0.01 < 0.01	0.03 4.6 2.2 0.09 < 0.01 < 0.01	RA-2519/05 M-277880-01-1
R 2005 0798/4 Langenfeld-Reusrath, Germany, 2005 (head variety: Ponchito)	WG	0.15	0.03	500	3	–0 0 3 7 14 21	Head	0.38 4.0 0.67 0.38 0.07 < 0.01	0.03 0.26 0.04 0.03 < 0.01 < 0.01	0.41 4.3 0.71 0.41 0.07 < 0.01	
R 2005 0799/2 Schauernheim, Germany, 2005 (head variety: Naima)	WG	0.15	0.03	500	3	–0 0 3 7 14 21	Head	< 0.01 3.9 1.4 0.24 0.04 < 0.01	< 0.01 0.28 0.08 0.02 < 0.01 < 0.01	< 0.01 4.2 1.5 0.26 0.04 < 0.01	
09-2158-01 Langenfeld-Reusrath, Germany, 2009 (leaf variety: Quintus)	WG	0.15	0.025	600	3	0 14	Leaves	2.1 <u>0.06</u>	0.04 < 0.01	2.1 <u>0.06</u>	09-2158 M-404370-01-1
09-2158-02, Cergy (95), France, 2009 (leaf variety: Quenty)	WG	0.15	0.038	400	3	0 14	Leaves	3.8 <u>0.04</u>	0.08 < 0.01	3.9 <u>0.04</u>	
09-2216-01, Manfredonia, Italy, 2009 (head variety: Iceberg)	SC	0.13	0.016	800	3	0 14	Head	0.25 < 0.01	< 0.01 < 0.01	0.25 < 0.01	09-2216 M-405062-01-1
09-2216-03, Scorbe-Clairvaux, France, 2009 (leaf variety: 9539 bio)	SC	0.13	0.025	500	3	0 14	Leaves	11 <u>0.42</u>	0.42 0.01	12 <u>0.43</u>	
09-2216-04, Vilanova del Vallés, Spain, 2009 (head variety: Dorada de Primavera)	SC	0.13–0.14	0.025–0.03	429–500	3	0 13	Head	2.6 0.04	0.14 < 0.01	2.8 0.04	
10-2012-01, Gava, Spain, 2010 (leaf variety: Murai)	SC	0.15	0.025	600	3	0 14	Leaves	6.5 <u>0.48</u>	0.01 < 0.01	6.5 <u>0.48</u>	10-2012 M-418546-01-1
10-2012-02, Bologna, Italy, 2010 (leaf variety: Perla)	SC	0.15	0.019	800	3	0 14	Leaves	3.3 <u>0.02</u>	0.01 < 0.01	3.3 <u>0.02</u>	
GAP, USA	SC	0.3			3	2					
13043-01, Germansville (PA), USA, 2000 (leaf variety: Slobolt MTO)	SC	0.31–0.315	0.18	169–175	4	2	Leaves	15.9 (17.5, 14.3)	0.03 (0.03, 0.03)	16	00W13043 M-238774-01-1
13043-02, Oviedo (FL), USA, 2000 (leaf variety: Bibb)	SC	0.3	0.18	167–169	4	2	Leaves	11.8 (15.4, 8.15)	0.03 (0.03, 0.02)	12	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
13043-03, Modesto (CA), USA, 2000 (leaf variety: Mardi Gras)	SC	0.3	0.22	138–144	4	0 2 4 6 8	Leaves	8.40 1.00 (1.02, 0.97) 0.44 0.21 0.04	< 0.02 < 0.02 (< 0.02,< 0.02) < 0.02 < 0.02 < 0.02	8.4 1.0 0.44 0.21 0.04	
13043-04, Fresno (CA), USA, 2000 (leaf variety: Waldman's Green)	SC	0.3–0.31	0.21	138–144	4	2	Leaves	3.41 (3.70, 3.12)	< 0.02 (< 0.02,< 0.02)	3.4	
13043-05, Watsonville (CA), USA, 2000 (leaf variety: Athena)	SC	0.3–0.31	0.18	166–171	4	2	Leaves	7.94 (8.26, 7.61)	0.02 (0.02, < 0.02)	8.0	
13043-06, Watsonville (CA), USA, 2000 (leaf variety: Darkland Romaine)	SC	0.3–0.34	0.21	139–156	4	2	Leaves	10.1 (11.9, 8.23)	0.03 (0.03, 0.02)	10	
13043-07, Sprekels (CA), USA, 2000 (leaf variety: Shining Star)	SC	0.3–0.31	0.22	140–144	4	2	Leaves	3.40 (2.97, 3.82)	< 0.02 (< 0.02,< 0.02)	3.4	
13043-08, Santa Maria (CA), USA, 2000 (leaf variety: Betteravia 145 Romaine)	SC	0.3–0.31	0.21	141–147	4	2	Leaves	2.58	< 0.02 (< 0.02,< 0.02)	2.6	
13043-09, Maricopa (AZ), USA, 2000 (leaf variety: Paris Island)	SC	0.29–0.3	0.16	179–184	4	2	Leaves	6.49 (5.18, 7.79)	0.04 (0.03, 0.05)	6.5	
14459-01 Germansville (PA), USA, 2000 (head variety: Ithaca)	SC	0.3–0.31	0.18	172–175	4	2	Head with wrapper	0.82	< 0.02	0.82	00W14459M-238776-01-1
						2	Head w/o wrapper	0.03	< 0.02	0.03	
14459-02 Oviedo (FL), USA, 2000 (head variety: Great Lakes)	SC	0.3–0.31	0.18	167–170	4	2	Head with wrapper	10.7 (9.73, 11.7)	0.03 (0.03, 0.03)	11	
						2	Head w/o wrapper	2.7 (2.90, 2.40)	< 0.02 (< 0.02,< 0.02)	2.7	
14459-03 Hickman (CA), USA, 2000 (head variety: Cowboy)	SC	0.3	0.21	138–142	4	2	Head with wrapper	4.44 (4.77, 4.10)	0.025 (< 0.02,0.03)	4.5	
						2	Head w/o wrapper	0.26[a] (0.26, 0.04)	< 0.02 (< 0.02,< 0.02)	0.26	
14459-04 Fresno (CA), USA, 2000 (head variety: Empire M.I.)	SC	0.3–0.31	0.21	140–142	4	2	Head with wrapper	2.28 (2.45, 2.11)	< 0.02 (< 0.02,< 0.02)	2.3	
						2	Head w/o wrapper	0.04 (0.04, 0.04)	< 0.02 (< 0.02,< 0.02)	0.04	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
14459-05 Watsonville (CA), USA, 2000 (head variety: Salinas)	SC	0.3	0.21	138–142	4	2	Head with wrapper	3.30 (2.50, 4.10)	0.02 (< 0.02, 0.02)	3.3	
						2	Head w/o wrapper	0.03 (0.04, < 0.02)	< 0.02 (< 0.02,< 0.02)	0.03	
14459-06 Watsonville (CA), USA, 2000 (head variety: Prodigy)	SC	0.3–0.31	0.18	168–173	4	2	Head with wrapper	3.9 (3.71, 4.12)	< 0.02 (< 0.02,< 0.02)	3.9	
						2	Head w/o wrapper	0.22 (0.24, 0.19)	< 0.02 (< 0.02,< 0.02)	0.22	
14459-07 Spreckels (CA), USA, 2000 (head variety: Progeny)	SC	0.3–0.31	0.21–0.22	139–143	4	2	Head with wrapper	3.7[a] (0.70, 3.67)	< 0.02 (< 0.02,< 0.02)	3.7	
						2	Head w/o wrapper	4.0 [a] (< 0.02, 4.02)	< 0.02 (< 0.02,< 0.02)	4.0	
14459-08 San Luis Obispo (CA), USA, 2000 (head variety: Bayview)	SC	0.3–0.34	0.22	140–160	4	2	Head with wrapper	3.3 (3.91, 2.65)	< 0.02 (< 0.02,< 0.02)	3.3	
						2	Head w/o wrapper	< 0.02 (< 0.02,< 0.02)	< 0.02 (< 0.02,< 0.02)	< 0.02	
14459-09 Maricopa (AZ), USA, 2000 (head variety: Green Lightning)	SC	0.3	0.16	181–186	4	2	Head with wrapper	8.0 (7.65, 8.36)	0.03 (0.02, 0.03)	8.0	
						2	Head w/o wrapper	1.4 (1.89, 0.86)	< 0.02 (< 0.02,< 0.02)	1.4	

[a] Highest value selected because of the large divergence between duplicate samples.

Mustard greens

Eight supervised trials on mustard greens were carried out during 2003 in the USA (outdoors) (201226, M-260567-01-1). At each trial, four foliar sprays were applied at intervals of 4–5 days, at rates in the range of 0.29–0.32 kg ai/ha. The results are summarized in Table 74.

Table 74 Residues in mustard greens of supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			3	2				
YW033-03D Tifton (GA), USA, 2003 (Broadleaf Mustard)	SC	0.3	0.17–0.19	161–175	4	0	Green leaf	21 (20.7, 21.5)	0.04 (0.03, 0.05)	21
						2		17 (17.3, 16.4)	0.04 (0.04, 0.04)	17
						3		6.1 (6.58, 5.66)	0.03 (0.03, 0.03)	6.2
						5		3.2 (2.92, 3.49)	0.03 (0.03, 0.02)	3.2
						7		2.7 (2.65, 2.82)	0.02 (0.02, 0.02)	2.8
YW034-03H, Suffolk (VA), USA, 2003 (Savannah)	SC	0.3–0.31	0.14–0.15	204–219	4	2	Green leaf	28 (28.5, 28.2)	0.04 (0.03, 0.04)	28
YW035-03H Molino (FL),USA, 2003 (Giant Southern Curled)	SC	0.3–0.32	0.14	203–223	4	2	Green leaf	13 (9.85, 15.2)	0.02 (0.02, 0.02)	13

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
YW036-03H, Newport (AR), USA, 2003 (Florida Broadleaf)	SC	0.3	0.16	186–190	4	2	Green leaf	29 (31.5, 26.7)	0.04 (0.04, 0.04)	29
YW037-03H, Seymour (IL), USA, 2003 (Green Wave)	SC	0.3–0.31	0.17	176–178	4	2	Green leaf	24 (25.1, 23.5)	0.05 (0.04, 0.05)	24
YW038-03H Colony (OK), USA, 2003 (Florida Broadleaf)	SC	0.3–0.31	0.21–0.22	141–143	4	2	Green leaf	28 (24.2, 32.4)	0.21 (0.18, 0.23)	29
YW039-03H, Fresno (CA), USA, 2003 (Florida Broadleaf)	SC	0.3	0.16–0.17	172–182	4	2	Green leaf	11 (9.33, 13.3)	0.06 (0.05, 0.06)	11
YW040-03H, Porterville (CA), USA, 2003 (Florida Broadleaf)	SC	0.3–0.31	0.13–0.14	214–239	4	2	Green leaf	12 (11.8, 11.8)	0.07 (0.07, 0.06)	12

Spinach

Six supervised trials on spinach were carried out during 2003 in the USA (201214, M-242541-01-1). At each trial, four foliar sprays were made at intervals of 3–6 days, at rates in the range of 0.3 kg ai/ha. The results are summarized in Table 75.

Table 75 Residues in spinach from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			3	2				
YW050-03HA, Ruther Glen (VA), USA, 2003 (Melody)	SC	0.3–0.31	0.17	170–174	4	2	Leaves	7.2 (7.44, 7.00)	0.02 (< 0.02, 0.02)	7.2
YW051-03D Molino (FL), USA, 2003 (Bloomsdale Long Standing)	SC	0.3–0.31	0.14	209–223	4	0	Leaves	15 (15.8, 13.7)	0.03 (0.02, 0.03)	15
						2		7.3 (8.62, 6.03)	0.02 (0.02, 0.01)	7.4
						3		5.9 (6.49, 5.33)	0.02 (0.02, 0.02)	5.9
						5		5.1 (5.17, 5.02)	0.02 (0.02, 0.02)	5.1
						7		4.3 (4.64, 3.90)	0.02 (0.02, 0.02)	4.3
YW052-03H, Raymondville (TX), USA, 2003 (612)	SC	0.3–0.31	0.16	188–192	4	2	Leaves	31 (28.7, 32.4)	0.04 (0.03, 0.04)	31
YW053-03H, Jerome (ID), USA, 2003 (Unipack 151)	SC	0.3	0.11–0.12	259–270	4	2	Leaves	11 (9.84, 12.5)	< 0.02 (< 0.02,< 0.02)	11
YW054-03H, Fresno (CA), USA, 2003 (SI-70RZ)	SC	0.3–0.31	0.16–0.17	172–183	4	2	Leaves	23 (23.9, 22.4)	0.03 (0.03, 0.03)	23
YW055-03H, Porterville (CA), USA, 2003 (Shasta)	SC	0.3–0.31	0.13	235–242	4	2	Leaves	21 (21.0, 20.1)	0.02 (0.02, 0.02)	21

Legume vegetables

Lima beans

Eight field trials on lima beans were conducted in the USA (09530, M-489331-01-1). The results are shown in Table 76. At each trial four foliar applications of 0.3 kg ai/ha each plus adjuvant (sticker/spreader) were made. At the NC30 trial, a 5th application was made due to the slow maturation of the lima beans. The applications were timed so that commercially mature succulent lima bean seeds

without pods could be sampled 3–4 days after the final application (at all three Maryland trials the plants with pods on them were harvested 2 days after the final application due to a forecasted heavy rain event). The beans were harvested by hand (either by pulling the entire plant or by handpicking pods in the field). The succulent lima bean seeds were then removed from the pods either by hand or by using a pea sheller.

Table 76 Residues in lima beans from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application			DAT, days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3	3	3				
CA63, Davis, CA, USA, 2008 (LUNA baby)	SC	0.3	4	3	Seeds w/o pods	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
CA64, Parlier, CA, USA, 2008 (Lee)	SC	0.3	4	3	Seeds w/o pods	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
ID10, Kimberly, ID, USA, 2008 (M15)	SC	0.3	4	4	Seeds w/o pods	0.08 (0.07, 0.08)	< 0.02 (< 0.02, < 0.02)	0.08
MD09, Salisbury, MD, USA, 2008 (Eastland)	SC	0.3	4	2	Seeds w/o pods	0.04 (0.04, 0.03)	< 0.02 (< 0.02, < 0.02)	0.04
MD10, Salisbury, MD, USA, 2008 (Thorogreen)	SC	0.3	4	2	Seeds w/o pods	0.08 (0.08, 0.07)	< 0.02 (< 0.02, < 0.02)	0.08
MD24, Salisbury, MD, USA, 2008 (Burpee)	SC	0.3	4	2	Seeds w/o pods	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
NC30, Clinton, NC, USA, 2008 (Fordhook 242)	SC	0.3	5	4	Seeds w/o pods	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
TN10, Crossville, TN, USA, 2008 (Fordhook 242)	SC	0.3	4	3	Seeds w/o pods	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
WI07, Arlington, WI, USA, 2008 (Imperial Kingston)	SC	0.3	4	3	Seeds w/o pods	0.03 (0.02, 0.04)	< 0.02 (< 0.02, < 0.02)	0.03

Common beans

Eight field trials on common beans (snap beans) were conducted in the USA and Canada (08895, M-489329-01-1). The results are shown in Table 77. At all trials, four foliar applications of the test substance were made 6–8 days apart at a rate of approximately 0.3 kg ai/ha (for a total application of 1.2 kg ai/ha). An adjuvant was included in each application. At trial CA86 a fifth foliar application of 0.3 kg ai/ha was made, due to slow maturation of the pods at that site. The applications were timed so that mature snap bean pods with seed could be collected 3–4 days after the final application. Samples were harvested by hand or using clippers/pruners.

Table 77 Residues in common beans from trials with fenamidone

Trial, Location, Country, Year (Variety)	Application			DAT, days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	No			Fen	RPA 410193	Sum
GAP, USA (proposed)	SC	0.3	3	3				
CA86, Holtville, CA, USA, 2008 (Veronica)	SC	0.3	5	3	Pods with seed	1.3 (1.07, 1.52)	< 0.02 (< 0.02, < 0.02)	1.3
FL07, Citra, FL, USA, 2008 (Dusky)	SC	0.3	4	4	Pods with seed	0.11 (0.087, 0.13)	< 0.02 (< 0.02, < 0.02)	0.11
MI08, Holt, MI, USA, 2008 (Ulysses)	SC	0.3	4	3	Pods with seed	0.23 (0.22, 0.23)	< 0.02 (< 0.02, < 0.02)	0.23

Trial, Location, Country, Year (Variety)	Application			DAT, days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	No			Fen	RPA 410193	Sum
NC21, Clinton, NC, USA, 2008 (Ambra)	SC	0.3	4	3	Pods with seed	0.46 (0.45, 0.46)	< 0.02 (< 0.02, < 0.02)	0.46
NY15, Freeville, NY, USA, 2008 (Hystyle)	SC	0.3	4	3	Pods with seed	0.16 (0.16, 0.15)	< 0.02 (< 0.02, < 0.02)	0.16
WA16, Prosser, WA, USA, 2008 (OSU 91G)	SC	0.3	4	3	Pods with seed	0.097 (0.11, 0.084)	< 0.02 (< 0.02, < 0.02)	0.10
WI03, Arlington, WI, USA, 2008 (Hystyle)	SC	0.3	4	3	Pods with seed	0.34 (0.31, 0.37)	< 0.02 (< 0.02, < 0.02)	0.34
WI04, Arlington, WI, USA, 2008 (Hercules)	SC	0.3	4	1	Pods with seed	0.2 (0.20, 0.20)	< 0.02 (< 0.02, < 0.02)	0.20
				3		0.19 (0.18, 0.20)	< 0.02 (< 0.02, < 0.02)	0.19
				7		0.07 (0.071, 0.068)	< 0.02 (< 0.02, < 0.02)	0.07
				13		0.057 (0.059, 0.054)	< 0.02 (< 0.02, < 0.02)	0.06

Root and tuber vegetables

Carrots

Thirteen supervised trials on carrots were carried out in the USA and Canada (08524, M-278032-01-1). At each trial, four foliar spray applications were made at rates in the range of 0.26–0.33 kg ai/ha. Applications were performed at intervals of 6–8 days between the first and second and the third and fourth treatments. There was an extended interval (28 to 104 days) between the second and the third applications. The residue results are summarized in Table 78.

Table 78 Residues in carrots from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT, days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water, L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			3	14				
08524.03-CA03, Salinas, USA (CA), 2003 (Growers Choice)	SC	0.3	0.11–0.12	247–276	4	14	Roots	0.03 (0.03, 0.03)	< 0.02 (< 0.02, < 0.02)	0.03
08524.03-CA04, Holtville, USA (CA), 2003 (Tasty Peel)	SC	0.3–0.31	0.13–0.16	185–232	4	14	Roots	0.02 (0.02, 0.02)	< 0.02 (< 0.02, < 0.02)	0.02
08524.03-CA05, Holtville, USA (CA), 2003 (Caropak)	SC	0.3–0.31	0.13–0.16	189–231	4	14	Roots	0.03 (0.02, 0.04)	< 0.02 (< 0.02, < 0.02)	0.03

Trial, Location, Country, Year (Variety)	Application					DAT, days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water, L/ha	No			Fen	RPA 410193	Sum
08524.03-CA157, Parlier, USA (CA), 2003 (Danver's Half Long 126)	SC	0.3–0.31	0.13	232 - 242	4	3 7 13 20 27	Roots	0.03 (0.03, 0.03) 0.07 (0.07, 0.06) <u>0.11</u> (0.10, 0.11) 0.09 (0.08, 0.10) 0.08 (0.07, 0.09)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.03 0.07 <u>0.11</u> 0.09 0.08
08524.03-FL04, Citra, USA (FL), 2003 (Triple Play 58 SMS)	SC	0.3–0.31	0.16	188–194	4	15	Roots	<u>0.09</u> (0.09, 0.09)	< 0.02 (< 0.02, < 0.02)	0.09
08524.03-MI01, Laingsburg, USA (MI), 2003 (Heritage)	SC	0.3	0.16	186–189	4	3 7 15 22 29	Roots	0.05 (0.05, 0.04) 0.06 (0.06, 0.05) <u>0.06</u> (0.06, 0.05) 0.06 (0.06, 0.05) 0.04 (0.04, 0.03)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	0.05 0.06 <u>0.06</u> 0.06 0.04
08524.03-NJ03, Bridgeton, USA (NJ), 2003 (Nelson F1)	SC	0.29	0.11	254–259	4	13	Roots	<u>0.07</u> (0.06, 0.08)	< 0.02 (< 0.02, < 0.02)	0.07
08524.03-NS04, Somerset Canada (NS), 2003 (Interceptor)	SC	0.3–0.1	0.15	201–207	4	15	Roots	<u>0.03</u> (0.03, 0.03)	< 0.02 (< 0.02, < 0.02)	0.03
08524.03-ON16, Harrow, Canada (ON), 2003 (Cellobunch)	SC	0.29–0.31	0.15	196–204	4	16	Roots	<u>0.05</u> (0.03, 0.06)	< 0.02 (< 0.02, < 0.02)	0.05
08524.03-QC17, L'Assomption, Canada (QC), 2003 (Appaches)	SC	0.26–0.33	0.12	220–280	4	14	Roots	<u>0.05</u> (0.04, 0.05)	< 0.02 (< 0.02, < 0.02)	0.05
08524.03-QC18, St Sabine, Canada (QC), 2003 (Cellobunch)	SC	0.28–0.33	0.12	237–276	4	13	Roots	<u>0.04</u> (0.03, 0.04)	< 0.02 (< 0.02, < 0.02)	0.04
08524.03-TX02, Weslaco, USA (TX), 2003 (Six Pence)	SC	0.3–0.32	0.15	201–216	4	14	Roots	<u>0.06</u> (0.06, 0.05)	< 0.02 (< 0.02, < 0.02)	0.06
08524.03-WA01, Prosser, USA (WA), 2003 (DS 140395)	SC	0.3–0.31	0.13–0.14	224–232	4	14	Roots	<u>0.03</u> (0.03, 0.03)	< 0.02 (< 0.02, < 0.02)	0.03

Ginseng

Five supervised trials on <u>ginseng</u> were carried out in 2007 in the USA and Canada. At each trial, nine applications at rates in the range of 0.29–0.32 kg ai/ha were performed at intervals of 7–15 days

between each foliar application. Samples were prepared by washing the roots with water and drying at 18–46 °C in a commercial drying facility. Samples of washed and dried roots were stored frozen at below –20 ºC for up to 658 days until extraction and analysis. A sufficient stability of fenamidone was demonstrated for up to 650 days using spiked samples. The residue results are shown in Table 79.

Table 79 Residues in ginseng from supervised trials with fenamidone (09800, M-393676-01-1)

Trial, Location, Country, Year	Application					DAT, days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water, L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			3	14				
09800.07-BC04, Sommerland, Canada (BC), 2007	SC	0.30–0.32	0.034	895–942	9	15	Dried roots	0.17 (0.13, 0.21)	< 0.02 (< 0.02, < 0.02)	0.17
09800.07-MI29, Edgar, USA (WI), 2007	SC	0.30–0.32	0.046	653–687	9	14	Dried roots	0.10 (0.11, 0.08)	< 0.02 (< 0.02, < 0.02)	0.10
		0.30–0.31	0.046	642–678	3	14	Dried roots	0.06 (0.06, 0.05)	< 0.02 (< 0.02, < 0.02)	0.06
09800.07-MI30, Nutterville, USA (WI), 2007	SC	0.29–0.32	0.046	627–682	9	14	Dried roots	0.03 (0.02, 0.03)	< 0.02 (< 0.02, < 0.02)	0.03
09800.07-MI31, Mosinee, USA (WI), 2007	SC	0.29–0.31	0.046	635–670	9	14	Dried roots	0.29 (0.24, 0.34)	0.02 (< 0.02, 0.02)	0.31
09800.07-ON10, Otterville, (ON), USA, 2007	SC	0.30–0.31	0.030	1004–1037	9	12	Dried roots	0.35 (0.17, 0.53)	0.02 (< 0.02, 0.02)	0.37

Potato

Twenty-seven supervised trials on potato were conducted in Europe (Belgium, France, Germany, Greece, Italy, The Netherlands, Spain and the UK) between 1997 and 2010. Five, six or twelve foliar spray applications of fenamidone were performed at rates in the range of 0.1–0.16 kg ai/ha and intervals in the range of 7–14 days.

Eighteen supervised trials on potato were carried out during 1999 in the USA and three trials on potato were carried out in 2001 in Canada. In the trials fenamidone was applied either with six treatments at a rate of 0.19–0.23 kg ai/ha or with four applications at a rate of 0.29–0.315 kg ai/ha by foliar spray. Applications were performed at intervals of 3–7 days. All samples except those from the Florida trial (17534-16) were stored frozen for 176 days or less. The samples from trial 17534-16 were stored for 394 days (storage stability covered up to 12 month).

Seven residue trials were conducted in potato during 1998, 1999, 2000 and 2006 in Brazil by foliar spray. In trials performed in 1998, 1999 and 2000, fenamidone was applied three times to potato plants at rates of 0.15 kg ai/ha and 0.3 kg ai/ha on different plots. In trials performed in 2006, fenamidone was applied six times to potato plants at a rate of 0.15 kg ai/ha. The results are summarized in Table 80.

Table 80 Residues in potatoes from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, UK	SC	0.15			6	7					
97555AM1 Barly (80), France, 1997 (Nicolas)	WG	0.15	0.05	300	12	–0 0 7 14	Tuber	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	97-555 M-165234-01-1

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
97556RS1 Sept Saulx (51), France, 1997 (Kaptah Vandel)	WG	0.15	0.06	250	12	7	Tuber	< 0.02	< 0.02	< 0.02	97-556 M-165225-01-1
97557LY1 Pusignan (69), France, 1997 (Monalisa)	WG	0.15	0.045	333	5	–0 0 7 14	Tuber	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02 < 0.02	97-557 M-165261-01-1
97558BX1 Pugnac (33), France, 1997 (Monalisa)	WG	0.15	0.03–0.045	333–466	5	7	Tuber	< 0.02	< 0.02	< 0.02	97-558 M-165265-01-1
97691VI Alginet, Spain, 1997 (Obelix)	WG	0.15	0.015	976–1024	5	7	Tuber	< 0.02	< 0.02	< 0.02	97-691 M-165758-01-1
97745DE1 Winkelsett, Germany, 1997 (Bintje)	WG	0.13–0.15	0.05	300	12	0 7 14	Tuber	< 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02	97-745 M-165485-01-1
97745DE2 Kindenheim, Germany, 1997 (Quarta)	WG	0.15	0.05	300	12	0 7 14	Tuber	< 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02	< 0.02 < 0.02 < 0.02	
98525RS1 Sept Saulx (51) France, 1998 (Kaptah Vandel)	WG	0.15	0.05	309	12	8	Tuber	0.006	< 0.005	0.006	98-525 M-166541-01-1
98526BX1 Pugnac (33), France, 1998 (Lizen)	WG	0.15	0.04	375	5	6	Tuber	< 0.005	< 0.005	< 0.005	98-526 M-166539-01-1
98526LY1 Crémieu (38), France, 1998 (Europa)	WG	0.15	0.04	381	5	7	Tuber	< 0.005	< 0.005	< 0.005	
98527BX1 Virsac (33), France, 1998 (Bintje)	WG	0.15	0.035	435	5	–0 0 7 14	Tuber	< 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005	98-527 M-166545-01-1
98527LY1 Pusignan (69), France, 1998 (Agata)	WG	0.15	0.04	375	5	–0 0 7 14	Tuber	< 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005	
98635V1 Alginet Spain, 1998 (Spunta)	WG	0.14–0.15	0.01	1217–1303	5	–0 0 7 14 21	Tuber	< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005 < 0.005 < 0.005	98-635 M-166577-01-1
98669DE1 Winkelsett, Germany, 1998 (Hansa)	WG	0.14–0.15	0.04	400	12	0 6 13	Tuber	< 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005	98-669 M-166638-01-1
98669DE2 Kindenheim, Germany, 1998 (Quarta)	WG	0.14–0.16	0.05	300	12	0 7 14	Tuber	< 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005	< 0.005 < 0.005 < 0.005	
98688D-B1 Angeren, Netherlands, 1998 (Bintje)	WG	0.15–0.16	0.05	293–323	12	7	Tuber	< 0.005	< 0.005	< 0.005	98-688 M-166537-01-1

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
98700AGS1 Stoney Houghton, UK, 1998 (Cara)	WG	0.15–0.16	0.05	291–318	12	7	Tuber	< 0.005	< 0.005	< 0.005	98-700 M-166903-01-1
99648RS1 France, 1999 (Kaptah Vandel)	WG	0.15	0.06	250	12	7	Tuber	< 0.01	< 0.01	< 0.01	99-648 M-211672-01-1
99664GR1 Avlona Attiki, Greece, 1999 (Naxoy)	WG	0.14–0.15	0.01	1000–1040	5	7	Tuber	< 0.01	< 0.01	< 0.01	99-664 M-191567-01-1
09-2170-01 Bouafle (78), France, 2009 (Amandine)	SC	0.13	0.02	600	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	09-2170 M-405055-01-1
09-2170-02 Burscheid, Germany, 2009 (Laura)	SC	0.13	0.04	300	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
09-2170-03 Ondes (31), France, 2009 (Agata)	SC	0.13	0.04	300	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
09-2170-04 San Jose de la Rinconada, Spain, 2009 (Universal)	SC	0.12–0.13	0.04	283–300	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
09-2170-05 Piacenza, Italy, 2009(Kennebek)	SC	0.13	0.03	400	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
09-2170-06 S. Francisco Alcochete, Portugal, 2009 (Monalisa)	SC	0.13	0.03	400	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
10-2065-01 Vilanova del Vallés, Spain, 2010 (Red-Pontiac)	SC	0.13–0.15	0.03–0.08	200–400	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	10-2065 M-415558-01-1
10-2065-02 Bologna, Italy, 2010 (Vivaldi)	SC	0.15	0.04	400	6	0 7	Tuber	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
GAP, USA / Canada	SC	0.3			3	14					
17534-01 Ephrata (WA), USA, 1999	SC	0.2	0.07	283–293	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	99W17534 M-238825-01-1

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
(Russet Burbank)		0.3–0.31	0.1	283–291	4	7 11 14 17 21	Tuber	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02	
17534-02 Ephrata (WA), USA, 1999 (Russet Burbank)	SC	0.2	0.07	280–291	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.1	282–287	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-03 Jerome (ID), USA, 1999 (Russet Burbank)	SC	0.2	0.07	279–297	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.1–0.11	277–291	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-04 Minidoka (ID), USA, 1999 (Russet Burbank)	SC	0.2–0.21	0.06–0.08	252–363	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3–0.315	0.09	342–352	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-05 Harrah (WA), USA, 1999 (Norkotah E 3)	SC	0.2	0.09–0.11	188–232	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.13–0.15	196–232	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-06 Hermiston (OR), USA, 1999 (Russet Burbank)	SC	0.2–0.215	0.08–0.09	236–247	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.29–0.3	0.12–0.13	236–243	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-07 Comstock Park (MI), USA, 1999 (Dark Red Norland)	SC	0.2	0.07	288–297	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.1	289–297	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-08 Delavan (WI), USA, 1999 (Superior)	SC	0.2	0.06–0.066	304–332	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3–0.31	0.09–0.1	304–332	4	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-09 Fairmount (ND), USA, 1999	SC	0.2	0.07–0.085	236–283	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
(Norland)		0.3	0.11–0.13	234–283	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-10 Campbell (MN), USA, 1999 (Norkotah)	SC	0.2	0.07	283–285	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
	SC	0.3–0.31	0.011	282–284	4	7 11 14 17 21	Tuber	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) <u>< 0.02</u> (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02) < 0.02 (< 0.02, < 0.02)	< 0.02 < 0.02 <u>< 0.02</u> < 0.02 < 0.02	
17534-11 Center (CO), USA, 1999 (Russet Nugget)	SC	0.2	0.07	281	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.011	281	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-12 Monte Vista (CO), USA, 1999 (Centennial)	SC	0.2	0.07	281	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.11	281	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-13 Newell (CA), USA, 1999 (Russet)	SC	0.2–0.21	0.07	268–294	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3–0.31	0.1	280–289	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-14 Salisbury (MD), USA, 1999 (Red Norland, Dark)	SC	0.2–0.21	0.06	329–337	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.3	0.09	326–330	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-15 Jamesville (NC), USA, 1999 (Atlantic)	SC	0.19–0.2	0.07	275–289	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.29–0.3	0.1	277–284	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-16 Oviedo (FL), USA, 1999 (Red Pontiac)	SC	0.2	0.06	324–331	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.29–0.3	0.09	318–327	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-17 North Rose (NY), USA, 1999	SC	0.2–0.21	0.07	276–292	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
(Green Mountain)		0.3–0.31	0.11	277–286	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
17534-18 Exeter (ME), USA, 1999 (FL 1533)	SC	0.2	0.07	289–293	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
		0.29–0.3	0.1	290–293	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
01AC05-01 Yorkton (SK), Canada, 2001 (Norland (Nebraska) Elite 3)	SC	0.2	0.1	200	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	01AC05 M-394609-01-1
		0.29–0.3	0.15	200	4	14	Tuber	<u>< 0.02</u> (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
01AC05-02 Copetown (ON), Canada, 2001 (Red Pontiac)	SC	0.21–0.23	0.085–0.093	250	6	13	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
01AC05-03 St-Paul d'Abbot-sford, (QC), Canada, 2001 (Chieftain)	SC	0.19–0.21	0.082–0.089	235	6	14	Tuber	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02	
GAP, Brazil	SC	0.15			3	7					
BRA98F23-BE298F23 Monte Mor (SP), Brazil, 1998 (Atlantic)	SC	0.15	0.015	1000	3	7	Tuber	< 0.02	< 0.02	< 0.02	R.23/01 M-284927-01-1
		0.3	0.03	1000	3	7	Tuber	< 0.02	< 0.02	< 0.02	
BRA98F23-BE198F23 Paulínia (SP), Brazil, 1999 (Bintje)	SC	0.15	0.015	1000	3	7	Tuber	< 0.02	< 0.02	< 0.02	R.32/01 M-284937-01-1
		0.3	0.03	1000	3	7	Tuber	< 0.02	< 0.02	< 0.02	
FD00BRAZ14 Monte Mor (SP), Brazil, 2000 (Baronesa)	SC	0.15	0.015	1000	3	7	Tuber	< 0.02	< 0.02	< 0.02	R.50/01 M-284944-01-1
		0.3	0.03	1000	3	7	Tuber	< 0.02	< 0.02	< 0.02	
FR06BRA008-P1, Paulínia (SP), Brazil, 2006 (Monalisa)	SC	0.15	0.015	1000	6	7	Tuber	< 0.02	< 0.02	< 0.02	UNESP RA-1066/06 M-279947-02-1
FR06BRA008-P2, Londrina (PR), Brazil, 2006 (Monalisa)	SC	0.15	0.015	1000	6	7	Tuber	< 0.02	< 0.02	< 0.02	UNESP RA-1067/06 M-279942-02-1
FR06BRA008-P3, Ribeirão Preto (SP), Brazil, 2006 (Monalisa)	SC	0.15	0.015	1000	6	7	Tuber	< 0.02	< 0.02	< 0.02	UNESP RA-1068/06 M-279946-02-1
FR06BRA008-P4, Chacara das Flores (RS), Brazil, 2006 (Monalisa)	SC	0.15	0.015	1000	6	7	Tuber	< 0.02	< 0.02	< 0.02	UNESP RA-1069/06 M-279941-02-1

Stalk and stem vegetables

Witloof chicory (sprouts)

Nine indoor residue trials were conducted in Belgium, France, Germany and Netherlands in 2004, 2008 and 2010. In 2004 four residue trials were conducted in Belgium, France and the Netherlands consisting of one application through the irrigation water system at a maximum rate of 0.6 g ai/hL of fenamidone and a water volume of 40 L/m^2, at the commencement of forcing.

In 2008 and 2010 five residue trials were conducted in France, Germany and the Netherlands. These trials were treated twice, one dip application for two minutes in a solution containing 6.0 g ai/hL, immediately after field sampling of the roots. After storage of the roots in a cold room for 3–8 months, a second application was made at the commencement of forcing in the irrigation water system at a maximum rate of 0.6 g ai/hL. Sprout and root samples were taken on day 21 (or 20) after the second application. The results are summarized in Table 81.

Table 81 Residues in witloof chicory from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg			Reference
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum	
GAP, Belgium	WG		0.006 + 0.0006		2	18					
R 2004 0878/1 Zwaag-dijk-Oost, Nether-lands, 2004 (Vintor)	WG		0.0006	400000	1	20	Leaf	< 0.01	< 0.01	< 0.01	RA-2566/04 M-256652-01-1
						20	Root	0.11	< 0.01	0.11	
R 2004 0913/3 St Amand, Belgium, 2004 (Atlas)	WG		0.0006	400000	1	21	Leaf	< 0.01	< 0.01	< 0.01	
						21	Root	0.01	< 0.01	0.01	
R 2004 0914/1 St Amand, Belgium, 2004 (Vintor)	WG		0.0006	400000	1	21	Leaf	< 0.01	< 0.01	< 0.01	
						21	Root	0.02	< 0.01	0.02	
R 2004 0916/8 Fresnoy lès Roye (80), France, 2004 (Passion)	WG		0.0006	400000	1	21	Leaf	< 0.01	< 0.01	< 0.01	
						21	Root	0.81	0.05	0.87	
08-2205-01 Fresnoy lès Roye (80), France, 2008 (Hermes)	WG		0.006[a] 0.0006[b]		2	21	Leaf	< 0.01	< 0.01	< 0.01	08-2205 M-363750-03-1
						21	Root	0.26	0.01	0.27	
08-2205-02, Werdau-Torgau, Germany, 2008 (Atlas)	WG		0.006[a] 0.0006[c]		2	21	Leaf	< 0.01	< 0.01	< 0.01	
						21	Root	0.56	0.03	0.59	
08-2205-03, Zwaag-dijk, Netherlands, 2008 (Atlas)	WG		0.006[a] 0.0006[c]		2	21	Leaf	< 0.01	< 0.01	< 0.01	
						21	Root	0.11	< 0.01	0.11	
10-2040-01, Zwaag-dijk, Netherlands, 2010 (Fakir)	WG		0.006[a] 0.0006[b]		2	21	Leaf	< 0.01	< 0.01	< 0.01	10-2040 M-420668-01-1
						21	Root	0.20	< 0.01	0.20	
10-2040-02, Werdau, Germany, 2010 (Desir)	WG		0.006[a] 0.0006[c]		2	20	Leaf	< 0.01	< 0.01	< 0.01	
						20	Root	0.40	0.01	0.41	

[a] Dip application, roots were dipped for 2 minutes into the application solution and stored in a cold room.
[b] Flooding with treated irrigation water with circulation.
[c] Flooding with treated irrigation water without circulation.

Celery

Six supervised trials on celery were carried out during 2003 in the USA (201214, M-242541-01-1). At each trial, fenamidone was applied by foliar spray at rates of about 0.3 kg ai/ha four times at intervals of 4–6 days. The results are summarized in Table 82.

Table 82 Residues in celery from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			3	2				
YW013-03H Belle Glade (FL), USA, 2003 (683K)	SC	0.29–0.31	0.145–0.17	176–210	4	2	Plant w/o roots	2.3 (2.03, 2.51)	< 0.02 (< 0.02,< 0.02)	2.3
						2	Trimmed stalks	0.32 (0.35, 0.29)	< 0.02 (< 0.02, < 0.02)	0.32
YW014-03H Springfield (NE), USA, 2003 (Golden selfblanching)	SC	0.3	0.2	148–151	4	2	Plant w/o roots	8.8 (8.05, 9.55)	0.04 (0.04, 0.04)	8.8
						2	Trimmed stalks	1.2 (1.09, 1.35)	< 0.02 (< 0.02, < 0.02)	1.2
YW015-03D Porterville (CA), USA, 2003 (Conquistador)	SC	0.3	0.14	212–218	4	0	Plant w/o roots	5.6 (5.33, 5.78)	< 0.02 (< 0.02, < 0.02)	5.6
						2		4.4 (4.67, 4.16)	< 0.02 (< 0.02, < 0.02)	4.4
						3		3.2 (2.83, 3.50)	< 0.02 (< 0.02, < 0.02)	3.2
						5		3.9 (2.21, 5.61)	< 0.02 (< 0.02, < 0.02)	3.9
						7		3.5 (3.66, 3.36)	< 0.02 (< 0.02, < 0.02)	3.5
YW016-03H King City (CA), USA, 2003 (Conquistador)	SC	0.3	0.16	186–192	4	2	Plant w/o roots	4.5 (4.47, 4.44)	0.04 (0.04, 0.03)	4.5
						2	Trimmed stalks	0.06 (0.07, 0.04)	< 0.02 (< 0.02, < 0.02)	0.06
YW017-03H Fresno (CA), USA, 2003 (Conquistador)	SC	0.3	0.14	207–214	4	2	Plant w/o roots	18 (16.8, 19.8)	0.16 (0.13, 0.18)	19
						2	Trimmed stalks	1.1 (0.95, 1.23)	< 0.02 (< 0.02, < 0.02)	1.1
YW018-03H Visalia (CA), USA, 2003 (Matador)	SC	0.3	0.14	211–218	4	2	Plant w/o roots	15 (12.9, 16.5)	0.11 (0.09, 0.13)	15
						2	Trimmed stalks	1.61 (1.53, 1.69)	0.04 (0.04, 0.03)	1.7

Oilseed

Cotton seed

Twelve trials were conducted on cotton in the USA during 2003(201163, M-242540-01-1). In each trial, cotton plants were treated at-planting with a single in-furrow over-the-seed application at a target rate of 0.3 kg ai/ha. Samples of mature cotton were harvested 127–190 days post treatment from each test location by hand or using either stripper or picker harvest equipment. Samples were then ginned to yield undelinted cotton seed. The results are summarized in Table 83.

Table 83 Residues in cotton seed from supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			1					
YW021-03H, Tifton (GA), USA, 2003 (Fibermax 989 RRBT)	SC	0.3	0.955	31	1	154	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW022-03H, Leland (MS), USA, 2003 (FM960BR)	SC	0.29	0.694	42	1	161	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02

Trial, Location, Country, Year (Variety)	Application					DAT days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
YW023-03H, Newport (AR), USA, 2003 (PM 1218 BG/RR)	SC	0.3	0.774	39	1	173	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW024-03H, Proctor (AR), USA, 2003 (DP451 B/RR)	SC	0.3	0.754	40	1	130	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW025-03HA East Bernard (TX), USA, 2003 (DP 555 BG/RR)	SC	0.3	0.792	38	1	127	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW026-03H Levelland (TX), USA, 2003 (PM 2280 BG/RR)	SC	0.3	0.8	38	1	151	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW027-03H Littlefield (TX), USA, 2003 (PM 2280 BG/RR)	SC	0.3	0.795	38	1	178	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW028-03H Colony (OK), 2003(PM 2280 BG/RR)	SC	0.3	0.699	43	1	149	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW029-03H Plainview (TX), USA, 2003 (Paymaster 2344 B/R)	SC	0.3	0.603	49	1	173	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW030-03H Fresno (CA), USA, 2003(Acala Riata RR)	SC	0.31	0.746	41	1	160	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW031-03H Visalia (CA), USA, 2003 (DP6100 R/R Acala)	SC	0.3	0.787	38	1	180	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW032-03H Blythe (CA), USA, 2003 (449 BRR)	SC	0.3	0.777	39	1	190	Undelinted seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02

Sunflower seed

Nine trials with fenamidone on sunflower were conducted in 2009 in the USA (07999, M-251287-02-1). In each trial, one plot was planted with sunflower seeds treated with fenamidone resulting in a rate of 0.19 kg ai/100 kg seed. Two trials included an additional plot planted with seed treated at an exaggerated rate of 0.95 kg ai/100 kg seed. Samples of mature sunflower seed were harvested from each test location 104–146 days after sowing of the treated seed. The maximum storage period from sampling to analysis was 433 days. A sufficient stability of fenamidone and its metabolites was demonstrated for up to 438 days using spiked samples. The results are shown in Table 84.

Table 84 Residues in sunflower seed of supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application			DAT, Days [a]	Commodity	Residues, mg/kg		
	Form	kg ai/100 kg seed	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.19	1					
07999.02-CO15, Ft Collins, USA (CO), 2002 (Triumph 665)	SC	0.19	1	104	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-ND15, Fargo, USA (ND), 2002 (Pioneer 63M80)	SC	0.19	1	145	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
		0.95	1	145	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-ND16, Fargo, USA (ND), 2002 (Pioneer 63M91)	SC	0.19	1	144	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02

Trial, Location, Country, Year (Variety)	Application			DAT, Days [a]	Commodity	Residues, mg/kg		
	Form	kg ai/100 kg seed	No			Fen	RPA 410193	Sum
07999.02-ND17, Fargo, USA (ND), 2002 (Pioneer 63M52)	SC	0.19	1	143	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-ND18, Minot, USA (ND), 2002 (Pioneer 63M80)	SC	0.19	1	120	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-NE04, USA Scottsbluff, (NE), 2002 (IS 6767)	SC	0.19	1	119	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
		0.95	1	119	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-NE05, Scottsbluff, USA (NE), 2002 (IS 4049 AK)	SC	0.19	1	113	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-SD12, Southshore, USA (SD), 2002 (NK231 (F))	SC	0.19	1	146	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
07999.02-SD13, Southshore, USA (SD), 2002 (NK278 (B))	SC	0.19	1	146	Seed	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02

[a] From sowing to sampling

Legume animal feeds

Bean forage (green)

Eight field trials on snap beans were conducted in the USA and Canada (08895, M-489329-01-1). The residues in bean forage are shown in Table 85. At all trials, four foliar applications of the test substance were made 6–8 days apart at a rate of approximately 0.3 kg ai/ha (for a total application of 1.2 kg ai/ha). At trial CA86 a fifth foliar application of 0.3 kg ai/ha was made, due to slow maturation of the pods at that site. Samples were harvested by hand or using clippers/pruners and either placed directly into sample bags or shaken lightly to remove loose soil before being placed in to sample bag. At trial CA86 the samples of plants with pods were sub-sampled by cutting four groups of three plants each into top, middle, and bottom sections and retaining a top, middle, and bottom portion from each group. This subsample was placed into the sample bag and the remaining portions were discarded.

Table 85 Fenamidone residues in bean forage

Trial, Location, Country, Year (Variety)	Application			DALT, days	Commodity	Residues, mg/kg		
	Form	Kg ai/ha	No			Fen	RPA 410193	Sum
GAP, USA (proposed)	SC	0.3	3	3				
CA86, Holtville, CA, USA, 2008 (Veronica)	SC	0.3	5	3	Plant with pods	25 (24, 25)	0.11 (0.11, 0.1)	25
FL07, Citra, FL, USA, 2008 (Dusky)	SC	0.3	4	4	Plant with pods	2.3 (2.0, 2.6)	0.017 (0.015, 0.019)	2.3
MI08, Holt, MI, USA, 2008 (Ulysses)	SC	0.3	4	3	Plant with pods	5.6 (5.78, 5.42)	0.045 (0.046, 0.043)	5.6
NC21, Clinton, NC, USA, 2008 (Ambra)	SC	0.3	4	3	Plant with pods	16 (15.8, 15.9)	0.094 (0.093, 0.094)	16
NY15, Freeville, NY, USA, 2008 (Hystyle)	SC	0.3	4	3	Plant with pods	11 (11.8, 10.2)	0.043 (0.043, 0.042)	11
WA16, Prosser, WA, USA, 2008 (OSU 91G)	SC	0.3	4	3	Plant with pods	4.13 (3.53, 4.73)	0.026 (0.018, 0.029)	4.2
WI03, Arlington, WI, USA, 2008 (Hystyle)	SC	0.3	4	3	Plant with pods	7.6 (7.80, 7.35)	0.031 (0.031, 0.03)	7.6
WI04, Arlington, WI, USA, 2008 (Hercules)	SC	0.3	4	1	Plant with pods	10 (9.89, 10.8)	0.028 (0.025, 0.031)	10
				3		10 (10.6, 9.71)	0.039 (0.038, 0.039)	10

Trial, Location, Country, Year (Variety)	Application			DALT, days	Commodity	Residues, mg/kg		
	Form	Kg ai/ha	No			Fen	RPA 410193	Sum
				7		6.8 (6.68, 6.97)	0.039 (0.042, 0.036)	6.9
				13		4.6 (4.28, 5.00)	0.025 (0.024, 0.026)	4.7

Miscellaneous fodder and forage crops

Cotton fodder, dry

Trials were conducted on cotton in the USA during 2003 (201163, M-242540-01-1). Cotton plants were treated at-planting with a single in-furrow over-the-seed application at a target rate of 0.3 kg ai/ha. Cotton gin by-products (gin trash) were collected from the cotton harvested 127–190 days post treatment mechanically using either a picker or a stripper. Because cotton gin by-products are used as animal feed, the fodder was analysed for residues. The results are summarized in Table 86.

Table 86 Residues in cotton fodder of supervised trials with fenamidone

Trial, Location, Country, Year (Variety)	Application					DAT, Days	Commodity	Residues, mg/kg		
	Form	kg ai/ha	kg ai/hL	Water L/ha	No			Fen	RPA 410193	Sum
GAP, USA	SC	0.3			1					
YW021-03H, Tifton (GA), USA, 2003 (Fibermax 989 RRBT)	SC	0.3	0.955	31	1	154	Cotton gin by-products (picker)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW022-03H, Leland (MS), USA, 2003 (FM960BR)	SC	0.29	0.694	42	1	161	Cotton gin by-products (picker)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW023-03H, Newport (AR), USA, 2003 (PM 1218 BG/RR)	SC	0.3	0.774	39	1	173	Cotton gin by-products (picker)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW025-03HA East Bernard (TX), USA, 2003 (DP 555 BG/RR)	SC	0.3	0.792	38	1	127	Cotton gin by-products (stripper)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW026-03H Levelland (TX), USA, 2003 (PM 2280 BG/RR)	SC	0.3	0.8	38	1	151	Cotton gin by-products (stripper)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02
YW027-03H Littlefield (TX), USA, 2003 (PM 2280 BG/RR)	SC	0.3	0.795	38	1	178	Cotton gin by-products (stripper)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.02

FATE OF RESIDUES IN STORAGE AND PROCESSING

Residues are reported separately for fenamidone ("Fen"), diketo-fenamidone (RPA 410193) and desanilino-fenamidone (RPA 412708). The codes RPA 410193 (synonyms: AE C650488, RPA 405862, DK-Fen) and RPA 412708 (synonyms: AE 050057, RPA 408056, DA-Fen) are used throughout this section, irrespective of what nomenclature was used in the reports.

In processing-nature of residues

To estimate the degradation behaviour of [C-phenyl-UL-^{14}C]-fenamidone during industrial processing or household preparation, the processes of pasteurization (90 °C, 20 min at pH 4), baking, boiling, brewing (100 °C, 60 min at pH 5) and sterilization (120 °C, 20 min at pH 6) were simulated (17581, M-173268-01-1).

The test system consisted of flasks containing approximately 100 mL of buffer maintained at constant temperature and pH for the duration of the simulation. All samples were analysed on the day

of treatment by concurrent radio-detection and LC/MS. The recovery of TAR is summarized in Table 87 and the composition of TRR in Table 88.

Table 87 Recovery of TAR after hydrolysis

Test System	Fraction	% Applied radioactivity	
		0.1 mg/kg Treatment Rate	1.0 mg/kg Treatment Rate
Pasteurisation (90 °C, pH 4)	Sample	98.3	94.0
	Volatiles	0.0	0.0
	Total	98.3	94.0
Baking (100 °C, pH 5)	Sample	104.6	100.3
	Volatiles	0.01	0.00
	Total	104.6	100.3
Sterilisation (Nominal 120 °C, pH 6)	Sample	109	102.4
	Volatiles	0.0	0.0
	Total	109	102.4

Table 88 Degradation products after hydrolysis

Test System	Application Rate (mg/kg)	Replicate	% Applied radioactivity (mg/kg)		
			Fen	RPA 410193	RPA 412708
Pasteurisation (90 °C, pH 4)	0.1	1	98.34 (0.089)	–	–
		2	98.34 (0.089)	–	–
		Mean	98.34 (0.089)	–	–
	1	1	81.96 (0.775)	12.06 (0.114)	–
		2	81.84 (0.774)	12.18 (0.115)	–
		Mean	81.90 (0.77)	12.12 (0.11)	–
Baking (100 °C, pH 5)	0.1	1	104.63 (0.1)	–	–
		2	104.63 (0.1)	–	–
		Mean	104.63 (0.1)	–	–
	1	1	96.32 (0.925)	4.00 (0.038)	–
		2	94.69 (0.909)	5.62 (0.054)	–
		Mean	95.51 (0.92)	4.81 (0.046)	–
Sterilisation (Nominal 120 °C, pH 6)	0.1	1	109.01 (0.098)	–	–
		2	109.01 (0.098)	–	–
		Mean	109.01 (0.098)	–	–
	1	1	96.59 (0.93)	2.73 (0.026)	3.05 (0.029)
		2	95.86 (0.923)	2.28 (0.022)	4.23 (0.041)
		Mean	96.22 (0.93)	2.50 (0.024)	3.64 (0.035)

In processing-effect on the residue level

The Meeting received information on the fate of fenamidone residues during the processing of raw agricultural commodities (RAC) like grapes to juice, must, wine and pomace and tomatoes into juice, paste, ketchup and canned tomatoes. Because the residues of diketo-fenamidone (RPA 410193) are of the same order of magnitude as the parent concentrations in processed products of grapes and tomatoes, the sum of parent and RPA 410193 is calculated as follows:

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.04
< 0.02	0.076	0.10
0.05	< 0.02	0.07
0.53	0.13	0.67[a]

[a] 0.53 + (0.13 × 1.11) = 0.6743

Two processing studies were carried out on potatoes but were only of limited use because the residues in RAC were < LOQ. Further studies conducted on cabbage, broccoli, peppers, mustard greens and spinach investigated the fate of fenamidone and RPA 410193 after cooking.

Processing of grapes

Ten processing trials were conducted in which grapes were processed into red wine; grape juice was also produced in eight of these trials. Sixteen processing trials were conducted in which grapes were processed into white wine; grape juice was also produced in two of these trials. The results and the calculated processing factors (residue in processed commodity ÷ residue in RAC) for MRL setting and dietary intake purposes are presented in Tables 89 and 90. The information submitted on processing procedures is summarized as follows.

Red and white wine

Grape samples (bunches) were processed simulating commercial practices. The grape bunches were crushed and stemmed and the must collected in stainless steel tanks. Pectolytic enzyme was added to the juice of white grapes. Alcoholic fermentation was started by addition of dry active yeast. The fermentation was controlled on a daily basis by measurement of the temperature, density and pH-value. Alcoholic fermentation was considered complete when the must/juice density fell below 1.000. The must (red grapes) was processed to young wine and pomace by use of a water press. Red wine (only) was then subjected to malolactic fermentation. Alcoholic and malolactic fermentation were stopped by addition of potassium metabisulphite and the young wine was subjected to natural clarification, aided by addition of gelatine and potassium metabisulphite and storage for 26–27 days in a cold chamber at about 5–10 °C. Finally the clarified wine was filtered (2.5 and 1.5 µm) and stabilized by addition of potassium metabisulphite. The production of white wine followed similar processes but without malolactic fermentation.

Grape juice

For processing of red grape juice, grape bunches were crushed and stemmed and the crushed samples placed in a saucepan and treated with pectolytic enzyme for two hours at 50–65 °C. Juice was then obtained by pressing the must in a water press. Samples of white grapes were directly processed into juice using a water press. Pectolytic enzyme was added to the juice of white grapes. Samples were stabilized by addition of potassium metabisulphite.

Table 89 Residues of fenamidone in red grapes (RAC and processed fractions)

Country, Year, Trial (Variety)	Commodity/product	Residue, mg/kg			Processing factor		Reference
		Fen	RPA 410193	Sum	Parent	Sum	
France, 1997 97599AV1 (Grenache)	Grapes	0.11	0.026	0.14		–	97-599 M-165500-01-1
	Juice	< 0.02	0.048	0.073		0.52	
	Must	0.28	0.051	0.34	2.55	2.4	
	Pomace	0.38	0.12	0.51	3.45	3.6	
	Wine, alcoholic fermentation	0.047	0.054	0.11		0.79	
	Wine, malolactic fermentation	0.023	0.088	0.12		0.86	
	Red wine	0.022	0.093	0.13		0.93	
France, 1997 97599DJ1 (Pinot noir)	Grapes	0.21	0.038	0.25		–	
	Juice	< 0.02	0.07	0.098		0.39	
	Must	0.11	0.042	0.16	0.52	0.64	
	Pomace	0.42	0.162	0.60	2.0	2.4	
	Wine, alcoholic fermentation	0.043	0.056	0.11		0.44	
	Wine, malolactic fermentation	< 0.02	0.054	0.080		0.32	
	Red wine	< 0.02	0.096	0.13		0.52	
France, 1998 98562AV1 (Grenache)	Grapes	0.12	0.039	0.16		–	98-562 M-170328-01-1
	Juice	< 0.02	0.041	0.065		0.41	
	Must	0.14	0.026	0.17	1.17	1.1	
	Red wine	< 0.02	0.079	0.11		0.65	
France, 1998 98562RN1 (Cabernet)	Grapes	0.15	0.04	0.19		–	
	Juice	< 0.02	0.03	0.053		0.28	
	Must	0.098	0.035	0.14	0.65	0.74	
	Red wine	< 0.02	0.070	0.097		0.51	
France, 1998 98562TL1 (Cinsault)	Grapes	0.27	0.071	0.35		–	
	Juice	0.11	0.15	0.28		0.8	
	Must	0.53	0.13	0.67	1.96	1.9	

Country, Year, Trial (Variety)	Commodity/product	Residue, mg/kg			Processing factor		Reference
		Fen	RPA 410193	Sum	Parent	Sum	
	Red wine	< 0.02	0.076	0.10		0.29	
France, 1999, 99531DJ1-P3 (Pinot noir)	Grapes	0.034	< 0.02	0.054		–	
	Red wine	0.003	0.074	0.085		1.6	
France, 1999, 99531DJ1-P4 (Pinot noir)	Grapes	0.047	< 0.02	0.067		–	
	Red wine	0.004	0.089	0.10		1.5	
France, 1999 99629AV1 (Grenache)	Grapes	0.23	0.049	0.28		–	
	Juice	0.031	0.045	0.081		0.29	
	Must	< 0.01	< 0.01	0.02	< 0.04	0.07	
	Red wine	0.012	0.11	0.13		0.46	
France, 1999 99689RS1 (Pinot noir)	Grapes	0.069	0.021	0.092		–	99-689 M-211689-01-1
	Juice	< 0.01	0.018	0.03		0.33	
	Must	0.063	0.027	0.093	0.91	1.0	
	Red wine	0.005	0.028	0.036		0.39	
France, 1999 99689BX1 (Merlot)	Grapes	0.13	< 0.02	0.15		–	
	Juice	0.012	0.015	0.029		0.19	
	Must	0.17	0.033	0.21	1.31	1.4	
	Red wine	0.015	0.054	0.075		0.5	

Table 90 Residues of fenamidone in white grapes (RAC and processed fractions)

Country, Year, Trial (Variety)	Commodity/product	Residue, mg/kg			Processing factor		Reference
		Fen	RPA 410193	Sum	Parent	Sum	
France, 1997 97599TL1 (Ugni blanc)	Grapes	0.20	0.040	0.24		–	97-599 M-165500-01-1
	Juice	0.021	0.074	0.10		0.42	
	Must	0.055	0.036	0.095	0.275	0.40	
	Pomace	0.084	0.027	0.11	0.42	0.46	
	Wine, alcoholic fermentation	0.026	0.17	0.21		0.88	
	White wine	< 0.02	0.18	0.22		0.92	
Italy, 1998, 98721BO1 (1st trial) (Malvasia Toscana)	Grapes	0.19	0.076	0.27		–	98-721 M-170375-01-1
	White wine	< 0.02	0.15	0.19		0.70	
Italy, 1998, 98721BO1 (2nd trial) (Malvasia Toscana)	Grapes	0.13	0.073	0.21		–	
	White wine	< 0.02	0.17	0.21		1.0	
Italy, 1998, 98730BO1 (Moscato d'Asti)	Grapes	0.064	0.04	0.11		–	98-730 M-238650-01-1
	White wine	< 0.02	0.075	0.10		0.91	
Italy, 1998, 98731BO1 (Pinot bianco)	Grapes	0.36	0.082	0.45		–	98-731 M-170366-01-1
	White wine	0.027	0.34	0.40		0.89	
Italy, 1998, 98736BO1 (Moscato d'Asti)	Grapes	0.052	0.052	0.11		–	98-736 M-166521-01-1
	White wine	< 0.02	< 0.02	0.04		0.36	
Italy, 1998, 98738BO1 (Pinot bianco)	Grapes	0.23	0.18	0.43		–	98-738 M-170371-01-1
	White wine	0.024	0.20	0.25		0.58	
France, 1999, 99531RS1-P3 (Chardonnay)	Grapes	0.034	0.022	0.058		–	99-531 M-189118-01-1
	White wine	< 0.0005	0.034	0.038		0.66	
France, 1999, 99531RS1-P4 (Chardonnay)	Grapes	0.054	0.024	0.081		–	
	White wine	0.0007	0.055	0.062		0.77	
France, 1999, 99629RS1 (Chardonnay)	Grapes	0.093	0.039	0.14		–	99-629 M-189116-01-1
	Juice	0.010	0.024	0.037		0.26	
	Must	0.049	0.027	0.079		0.56	
	White wine	0.0027	0.055	0.064		0.46	
Italy, 1999, 99698BO1-P2 (Garganega)	Grapes	0.030	< 0.02	0.05		–	99-698 M-202647-01-1
	White wine	0.0009	0.056	0.063		1.26	
Italy, 1999, 99698BO1-P3 (Garganega)	Grapes	0.098	0.047	0.15		–	
	White wine	0.0017	0.052	0.059		0.39	
Italy, 1999, 99698BO1-P4 (Garganega)	Grapes	0.049	0.031	0.083		–	
	White wine	0.0034	0.096	0.11		1.3	
Italy, 1999, 99698BO2-P2 (Chardonnay)	Grapes	0.35	0.18	0.55		–	
	White wine	0.064	0.28	0.37		0.67	
Italy, 1999, 99698BO2-P3 (Chardonnay)	Grapes	0.25	0.098	0.36		–	
	White wine	0.022	0.25	0.30		0.83	

Country, Year, Trial (Variety)	Commodity/product	Residue, mg/kg			Processing factor		Reference
		Fen	RPA 410193	Sum	Parent	Sum	
Italy, 1999, 99698BO2-P4 (Chardonnay)	Grapes	0.68	0.19	0.89		–	
	White wine	0.092	0.53	0.68		0.76	
Italy, 1999, 99705BO1 (Malvasia Toscana)	Grapes	0.14	0.037	0.18		–	99-705 M-249144-01-1
	White wine	0.0045	0.11	0.13		0.72	
Italy, 1999, R 1999 0302/2 (Contese)	Grapes (bunches)	0.04	< 0.02	0.06		–	0302-99 RA-3186-99 M-078134-01-1
	Grapes (berries)	0.06	0.02	0.082		1.4	
	Must	0.03	< 0.02	0.05		0.83	
	White wine	< 0.02	0.04	0.064		1.1	

Processing of tomatoes

Three processing studies on tomatoes were submitted. The residues of fenamidone and RPA 410193 as well as processing factors are shown in Table 91. Because the residues increase after processing in tomato puree, ketchup and paste, processing factors were calculated for MRL (parent) and for dietary intake (sum) purposes. Further information on the residue trials and the processing procedures are described below.

Study 1

A first study was conducted in 2000 in Southern France, (99-519, M-206274-01-1). The study contained a single field trial conducted in Southern France to determine the magnitude of residues of fenamidone and its metabolite diketo-fenamidone (RPA 410193) in/on tomato and processed products. Fenamidone was applied to the tomato plants in five foliar applications at the rate of 0.15 kg ai/ha. The fruit samples harvested 3 days after the last application were processed into juice, puree, paste, canned tomatoes and ketchup.

Study 2

A second study was conducted following application of fenamidone in three protected trials conducted in Europe (the Netherlands, Italy and Germany) during 2009 (09-3235, M-406443-02-1).

Fenamidone was applied to tomato plants at a rate of 0.127 kg ai/ha in three spray applications at 7-day intervals between growth stages BBCH 77 to 85 at the three trial sites. Samples of tomato fruit to be processed were harvested 3 days after the last treatment (BBCH 83–89). The processing of the fruit samples into the processed fractions juice, puree and canned tomatoes was performed using methods simulating industrial/household practices.

Tomatoes were washed in water, to produce “washings” and “whole fruit, washed” and left to drain. Cut samples were then heated in water to 80–100 °C in order to prevent enzymatic reactions. After this blanching process, the pulp was passed through a strainer to separate juice from “strain rest” (wet pomace). Sodium chloride was added to the raw juice and taken for the preparation of “raw puree”. Aliquots of the raw puree were placed into cans and pasteurized to give puree. A portion of the “raw juice” was used for processing the canned tomatoes, which were placed in cans and pasteurized. Samples of finished products and intermediate processing fractions were collected for analysis.

Study 3

A third study was conducted in California, USA (98W13074, M-238681-01-1). Field grown tomatoes were treated by foliar spray at 7-day intervals by 6 × 1.0 kg ai/ha. Samples were collected 14 days after the last application. The tomatoes were washed twice, first with tap water, then with chlorinated water. The washed tomatoes were ground and crushed, heated to 96–99 °C and fed into a finisher for separation into wet pomace and juice. The juice was concentrated by vacuum evaporation to produce puree, a sample of which was vacuum condensed to paste. The paste fraction was heated (88–89 °C), packed into cans, sealed and held at filling temperature for 10–28 minutes prior to cooling. Triplicate subsamples of the processed fractions (raw, unwashed tomatoes, tomato puree and tomato paste) were taken and all samples frozen.

Table 91 Residues of fenamidone in processed tomato commodities

RAC / Processed commodity	Residues, mg/kg			Processing factor		Reference, trial
	Fen	RPA 410193	Sum	Parent	Sum	
Tomato fruit	0.05 (0.06, 0.05, 0.04)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.07	–	–	99-519, M-206274-01-1 99519BX1 France
Tomato juice	0.04	< 0.02	0.06	0.8	0.9	
Tomato puree	0.09	0.05	0.15	1.8	2.1	
Tomato ketchup	0.08	0.08	0.17	1.6	2.4	
Tomato paste	0.12	0.14	0.28	2.4	4.0	
Canned tomatoes	< 0.02	< 0.02	< 0.04	< 0.4	< 0.6	
Tomato fruit	0.04	< 0.01	0.05	–	–	09-3235, M-406443-02-1, 09-3235-01 Netherlands
Raw juice	0.04	0.01	0.05	1.0	1.0	
Tomato juice	0.03	< 0.01	0.04	0.8	0.8	
Peel	0.39	< 0.01	0.4	9.8	8.0	
Peeling water	< 0.01	< 0.01	< 0.02	0.3	< 0.4	
Peeled fruit	< 0.01	< 0.01	< 0.02	0.3	< 0.4	
Canned tomatoes	0.01	< 0.01	0.02	0.3	0.4	
Whole fruit, washed	0.04	< 0.01	0.05	1.0	1.0	
Washings	0.01	< 0.01	0.02	0.3	0.4	
Strain rest (pomace, wet)	0.25	0.01	0.26	6.3	5.2	
Raw puree	0.09	0.02	0.11	2.3	2.2	
Tomato puree	0.12	0.03	0.15	3.0	3.0	
Tomato fruit	0.15	< 0.01	0.16	–	–	09-3235, M-406443-02-1, 09-3235-02 Italy
Raw juice	0.10	0.03	0.13	0.7	0.8	
Tomato juice	0.09	0.04	0.13	0.6	0.8	
Peel	1.6	0.02	1.62	10.7	10	
Peeling water	0.06	< 0.01	0.07	0.4	0.4	
Peeled fruit	0.03	< 0.01	0.04	0.2	0.3	
Canned tomatoes	0.05	0.02	0.07	0.3	0.4	
Whole fruit, washed	0.11	< 0.01	0.12	0.7	0.8	
Washings	0.05	< 0.01	0.06	0.3	0.4	
Strain rest (pomace, wet)	0.57	0.05	0.63	3.8	3.9	
Raw puree	0.27	0.04	0.31	1.8	1.9	
Tomato puree	0.17	0.11	0.29	1.1	1.8	
Tomato fruit	0.10	< 0.01	0.11	–	–	09-3235, M-406443-02-1, 09-3235-03 Germany
Raw juice	0.04	< 0.01	0.05	0.4	0.5	
Tomato juice	0.04	0.01	0.05	0.4	0.5	
Peel	0.49	< 0.01	0.5	4.9	4.5	
Peeling water	0.01	< 0.01	0.02	0.1	0.2	
Peeled fruit	< 0.01	< 0.01	< 0.02	0.1	0.2	
Canned tomatoes	0.04	< 0.01	0.05	0.4	0.5	
Whole fruit, washed	0.06	< 0.01	0.07	0.6	0.6	
Washings	0.02	< 0.01	0.03	0.2	0.3	
Strain rest (pomace, wet)	0.45	0.08	0.54	4.5	4.9	
Raw puree	0.08	0.03	0.11	0.8	1.0	
Tomato puree	0.06	0.05	0.12	0.6	1.1	
Tomato fruit	0.43 (0.26, 0.57, 0.45)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.45	–	–	98W13074, M-238681-01-1 USA
Puree	0.75 (0.76, 0.69, 0.79)	0.16 (0.18, 0.14, 0.17)	0.93	1.7	2.1	
Paste	1.15 (1.15, 1.16, 1.14)	0.28 (0.28, 0.27, 0.3)	1.5	2.7	3.3	

Processing of potatoes

The first potato processing study was conducted in Germany (98-699, M-166638-01-1) in which two trials were performed on potato in 1998. Fenamidone was applied to potato plants by twelve foliar applications at the dose rate of 0.14–0.15 kg ai/ha with a spray interval of 7 days and a PHI of 6 days. The harvested potatoes were peeled and the peels collected. The separate samples of peel and peeled

tubers were then homogenised by grinding. No residues above the LOQ of 0.005 mg/kg could be determined in tubers (RAC), peeled tubers and in peel and no processing factors could be calculated.

The second potato processing study was conducted in Washington (USA) in 1998 (98W13063, M-240410-01-1). Potato plants from a single trial received six foliar applications of fenamidone at a rate of ca. 1 kg ai/ha. Tubers were collected 14 days after the last application and processed using procedures that simulated commercial practices. Duplicate treated samples of whole potato tubers, potato flakes, potato chips (crisps) and potato wet peel were collected for analysis. The results are shown in Table 92.

Table 92 Residues of fenamidone in processed potato commodities

RAC / Processed commodity	Residues, mg/kg			Processing factor	
	Fen	RPA 410193	Sum	Parent	Sum
Potato tuber (RAC)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.04	–	–
Potato flakes	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.04	–	–
Potato chips (crisps)	< 0.02 (< 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02)	< 0.04	–	–
Potato wet peel	0.046 (0.049, 0.043)	< 0.02 (< 0.02, < 0.02)	0.066	> 2.3	> 1.7

Washing and cooking of vegetables

Trials were submitted of washing and/or cooking of cabbages, broccoli, peppers, mustard greens and spinach conducted in the USA. The results and the calculated processing factors (for dietary intake purposes only) are presented in Table 93. The information submitted on processing procedures is summarized as follows.

Cooking of cabbage

Bulk samples of cabbage, consisting of composites of at least 12 plants, were taken 2 days following the last application. The outer wrapper leaves were removed from the cabbage heads, which were then washed and cooked as in normal household practice. The outer 3 to 4 leaves were removed and discarded (because there was apparent pest infestation) until a tight head (similar to those sold in the grocery store) was obtained. The heads were rinsed under a stream of cool to lukewarm tap water for 30 sec and allowed to dry for 2 min. The cabbage was cut into smaller pieces and the core and stem ends were removed. Leaves were trimmed if they were discoloured. The cabbage was cooked for 2 min uncovered in water, followed by 8 min of further cooking in the boiling water after covering the pot. The cabbage was strained, allowed to cool, and transferred into a plastic bag for frozen storage up to analysis.

Washing and cooking of broccoli

Bulk samples of broccoli, consisting of composites from at least 12 plants, were collected 2 days following the last application.

To generate washed broccoli, the leaves were removed and discarded but stalks were not trimmed. The heads were rinsed under a stream of cool to lukewarm tap water for 30 sec and allowed to dry for 2 min.

To generate cooked broccoli, the broccoli was trimmed to florets (approximately 15 mm), discarding the stalks. The florets were rinsed under a stream of cool to lukewarm tap water for 30 sec and allowed to dry for 2 min. The florets were then cooked for 8 min uncovered. The florets were strained, allowed to cool, and transferred into a plastic bag for frozen storage up to analysis.

Cooking of peppers

Bulk samples of peppers, consisting of at least 36 fruit from at least 12 plants, were collected 2 days following the last application.

To generate washed peppers, the stem, husk, core and seeds were removed and discarded. The fruit were quartered and rinsed under a stream of cool to lukewarm tap water for 30 sec and allowed to dry for 2 min. The pieces were transferred into a plastic bag for frozen storage.

To generate cooked peppers, the stem, husk, core and seeds were removed and discarded. The fruit were quartered and rinsed under a stream of cool to lukewarm tap water for 30 sec and allowed to dry for 2 min, and cut into strips of approximately 5 mm width. The strips of pepper were cooked in boiling water for 6 to 7 min. The strips were strained, allowed to cool, and transferred into a plastic bag for frozen storage up to analysis.

Cooking of mustard greens

Bulk samples of mustard greens (at least 4 kg, from at least 12 plants) were collected at BBCH 19, 2 days following the last application.

To generate washed mustard greens, the leaves were rinsed in cool to lukewarm tap water in a sink for 30 sec, agitating by hand to ensure that all leaf surfaces were rinsed. The water was drained from the sink, and the rinsing procedure repeated twice more. The leaves were allowed to drain for 2 minutes. The leaves were transferred into a plastic bag for frozen storage.

To generate cooked mustard greens, the leaves were rinsed in cool to lukewarm tap water in a sink for 30 sec, agitating by hand to ensure that all leaf surfaces were rinsed. The water was drained from the sink, and the rinsing procedure repeated twice more. The drained leaves were placed into a pan containing sufficient boiling water to entirely cover the sample, and cooked, covered, with occasional stirring. After 9 minutes cooking, the contents of the pan were strained, allowed to cool, and transferred into a plastic bag for frozen storage.

Cooking of spinach

Bulk samples of spinach were collected 2 days following the last application.

To generate washed spinach, the leaves were washed in a sink and dried in a salad spinner. The leaves were transferred into a plastic bag for frozen storage.

To generate cooked spinach, the leaves were washed in a sink and dried in a salad spinner. The samples were then cooked for 5 minutes and strained, before being allowed to cool and transferred into a plastic bag for frozen storage.

Table 93 Residues of fenamidone in vegetables after cooking

RAC/processed commodity	Residues, mg/kg			Processing Factor (Sum)	Reference
	Fenamidone	RPA 410193	Sum		
Cabbage	0.36 (0.31, 0.44, 0.33)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.36	–	201225, M-243561-01-3, YW19CB01-YW010-03H, USA (IL), 2003
Cooked cabbage	< 0.02 (< 0.02, < 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02, < 0.02)	< 0.02	< 0.06	
Broccoli, untrimmed	0.71 (0.74, 0.69, 0.71)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.71	–	201225, M-243561-01-3, YW19BR01-YW002-03D, USA (CA), 2003
Washed broccoli	0.43 (0.52, 0.36, 0.40)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.43	0.61	
Cooked broccoli [a]	0.97 (0.88, 1.06, 0.96)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.97	1.4	
Peppers	0.62 (0.61, 0.64, 0.61)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.62	–	201227, M-260625-01-1, YW19PP01-YW045-03H, USA (CA), 2003
Washed peppers	0.31 (0.31, 0.28, 0.33)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.31	0.5	
Cooked peppers	0.13 (0.13, 0.14, 0.12)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.13	0.21	
Mustard greens	9.0 (9.25, 9.09, 8.66)	0.04 (0.04, 0.04, 0.04)	9.04	–	201226, M-260567-01-1, YW19MG01-YW035-03H, USA (FL), 2003
Washed mustard greens	7.22 (7.88, 6.49, 7.29)	0.03 (0.03, 0.03, 0.03)	7.25	0.8	
Cooked mustard greens	3.58 (3.83, 3.76, 3.15)	< 0.02 (< 0.02, < 0.02, < 0.02)	3.6	0.4	
Spinach	0.11 (0.11, 0.11, 0.11)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.11	–	201214, M-242541-01-1,

RAC/processed commodity	Residues, mg/kg			Processing Factor (Sum)	Reference
	Fenamidone	RPA 410193	Sum		
Washed spinach	0.06 (0.06, 0.06, 0.05)	< 0.02 (< 0.02, < 0.02, < 0.02)	0.06	0.55	YW19SP01-YW054-03H, USA (CA), 2003
Cooked spinach	< 0.02 (< 0.02, 0.02, < 0.02)	< 0.02 (< 0.02, < 0.02, < 0.02)	< 0.02	< 0.18	

[a] Trimming the broccoli to florets and washing and cooking the florets in water resulted in an increase of the residue.

The best estimates of the processing factors for parent residues (for MRL setting in case of residue increasing) and for the sum of fenamidone and RPA 410193 (for dietary intake) are summarized in Table 94 and 95.

Table 94 Summary of processing factors for fenamidone residues

RAC	Processed commodity	Calculated processing factors	
		Fenamidone	Best estimate
Grapes, red and white	Must	< 0.04, 0.275, 0.52, 0.65, 0.91, 1.17, 1.31, 1.96, 2.55	0.91 (median)
	Pomace, wet	0.42, 2.0, 3.45	2.0 (median)
Tomatoes	Puree	0.6, 1.1, 1.7, 1.8, 3.0	1.7 (median)
	Ketchup	1.6	1.6
	Paste	2.4, 2.7	2.55 (mean)
	Pomace, wet	3.8, 4.5, 6.3	4.5 (median)
Potatoes	Wet peel	>2.3	>2.3

Table 95 Summary of processing factors for sum of fenamidone and diketo-fenamidone

RAC	Processed commodity	Calculated processing factors	
		Sum of fenamidone + RPA 410193	Best estimate
Grapes, red and white	Juice	0.19, 0.26, 0.28, 0.29, 0.33, 0.39, 0.41, 0.42, 0.52, 0.8	0.36 (median)
	Must	0.07, 0.4, 0.56, 0.64, 0.74, 0.83, 1.0, 1.1, 1.4, 1.9, 2.4	0.83 (median)
	Wine, red and white	0.29, 0.36, 0.39, 0.39, 0.46, 0.46, 0.5, 0.51, 0.52, 0.58, 0.65, 0.66, 0.67, 0.7, 0.72, 0.76, 0.77, 0.83, 0.89, 0.91, 0.92, 0.93, 1.0, 1.1, 1.26, 1.3, 1.5, 1.6	0.71 (median)
	Pomace, wet	0.46, 2.4, 3.6	2.4 (median)
Tomatoes	Juice	0.5, 0.8, 0.8, 0.9	0.8 (median)
	Puree	1.1, 1.8, 2.1, 2.1, 3.0	2.1 (median)
	Ketchup	2.4	2.4
	Paste	3.3, 4.0	3.65 (mean)
	Canned tomatoes	0.4, 0.4, 0.5, < 0.6	0.45 (median)
	Pomace, wet	3.9, 4.9, 5.2	4.9 (median)
Potatoes	Wet peel	>1.7	>1.7
Cabbage, broccoli, peppers, spinach, mustard greens	Washed vegetables	0.5, 0.55, 0.61, 0.8	0.58 (median)
	Cooked vegetables	< 0.06, < 0.18, 0.21, 0.4, 1.4	0.21 (median)

RESIDUES IN ANIMAL COMMODITIES

Farm animal feeding studies

Dairy Cattle

One cattle feeding study was conducted (00W25043, M-238835-01-1). Nine lactating Holstein dairy cows were divided into three groups. Animals were treated once daily with gelatine capsules by oral bolus containing fenamidone for 35 consecutive days. One cow was maintained as control. The first group received an amount of fenamidone equivalent to 0.8 ppm, the second was fed 2.4 ppm, and the last group received 8 ppm in the diet. All cows were sacrificed after 35 days of dosing.

Milk samples from study days 18 through 35, the period when residue levels would be at their maximum, were analysed in 29 days or less. Milk samples from the last collection period were analysed 8 days after collection. All tissue samples were analysed within 29 days of collection. Therefore, storage stability data are not necessary.

Milk samples were collected twice daily and composites prepared from the p.m. milks of one day and the a.m. milks of the following day. All samples were frozen at –20 ºC before analysis. Milk samples from study days 18 to 35, the period when residue levels would be at their maximum, were analysed within 29 days of sampling, milk samples from the last collection period were analysed within 8 days of collection. Following oral administration to lactating cows for 35 consecutive days, at all sampling intervals, no residues of fenamidone or the two major metabolites desanilino-diketo-fenamidone (RPA 412636) and desanilino-fenamidone (RPA 412708) were found in any of the whole milk samples (see Table 96). The LOQ for fenamidone and each of its metabolites in milk is 0.01 mg/kg. The limit of detection (LOD) is 1/3 the LOQ or 0.003 mg/kg.

Table 96 Residues in whole milk following 35 days oral administration of fenamidone to dairy cows

Day	Residues, mg/kg (mean of 3 cows)					
	Control			High dose (8 ppm in the diet)		
	Fenamidone	RPA 412636	RPA 412708	Fenamidone	RPA 412636	RPA 412708
–1	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
1	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
4	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
8	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
11	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
15	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
18	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
25	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
28	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003
34	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003	< 0.003

A portion of the day-34 milk from all groups was centrifuged to separate the milk fat for analysis. Analysis of milk samples from the 8 ppm dose group resulted in fenamidone residues below the LOQ (0.01 mg/kg) in every case. Therefore, milk fat samples from the lower dose groups were not prepared.

Samples of liver, kidney, muscle and fat were collected immediately after sacrifice and frozen at –20 °C until analysis. All tissue samples were analysed for fenamidone and the two major metabolites within 29 days of collection. At all sampling intervals, no residues of fenamidone or the two major metabolites were found in any of the tissue or milk fat samples, with the exception of a residue of desanilino-fenamidone (RPA 412708) detected in one milk fat sample in the highest dose group (0.011 mg/kg). Analysis of tissue and milk fat samples from the 8 ppm dose group resulted in fenamidone residues generally below the LOQ (0.05 mg/kg), therefore, tissue samples from the lower dose groups were not analysed. A summary of the results is presented in Table 97.

Table 97 Mean residues in tissues and milk fat following 35 days oral administration to dairy cows

Compound	Residues in mg/kg of 3 cows dosed with 8 ppm in the diet for 35 days				
	Muscle	Liver	Kidney	Fat	Milk fat
Fenamidone	< 0.02 (3)	< 0.02 (3)	< 0.02 (3)	< 0.02 (3)	< 0.003 (3)
RPA 412636	< 0.02 (3)	< 0.02 (3)	< 0.02 (3)	< 0.02 (3)	< 0.003 (3)
RPA 412708	< 0.02 (3)	< 0.02 (3)	< 0.02 (3)	< 0.02 (3)	< 0.01, 0.011, < 0.01

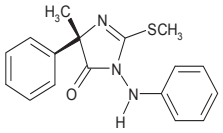
APPRAISAL

Fenamidone is a broad-spectrum fungicide belonging to the imidazolinone group. The compound was evaluated the first time by the 2013 JMPR for toxicology where an ADI of 0–0.03 mg/kg bw and an ARfD of 1 mg/kg bw was allocated. The evaluation for residues was scheduled for the 2014 JMPR.

The current Meeting received information on physical and chemical properties, metabolism studies on animals and plants, environmental fate including rotational crops data, analytical methods, use pattern, supervised trials data, processing and feeding studies.

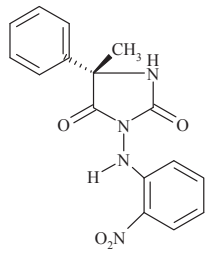
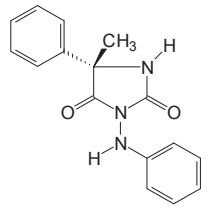
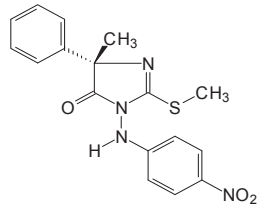
Fenamidone

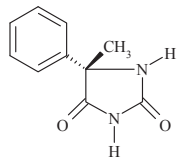
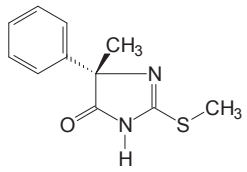
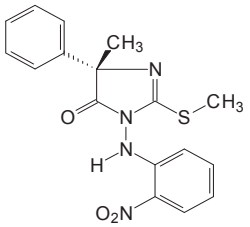
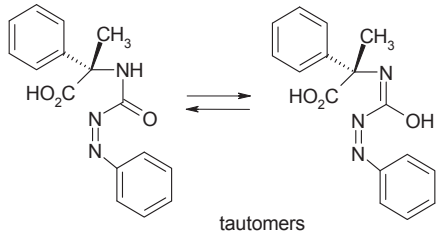
The active substance fenamidone is the S-enantiomer of a stereoisomeric molecule with the chiral centre in the 5-position of the dihydro-imidazolone ring. This S-enantiomer has been shown to be the biologically (fungicidally) active enantiomer.



The chiral carbon atom on the 5-position of the dihydro-imidazolone ring is substituted by 4 non-hydrogen substituents, namely substituted by an amino, carbonyl, methyl and phenyl group. Prerequisite for isomerisation/racemisation of this type of centre of chirality is the presence of a hydrogen atom as a substituent that can be split off easily. In fenamidone, no hydrogen is linked to the chirality centre. Therefore, racemisation is chemically not possible and the configuration and the optical purity, respectively, established by synthesis does not change afterwards. There was also no evidence of enantiomerization or racemization of the parent substance and its metabolites during metabolic conversions in plants and animals or physical-chemical degradation in soil and water.

In this document, the code names of the S-enantiomers were used of the metabolites identified:

Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
RPA 221701  (5*S*)-5-methyl-3-[(2-nitrophenyl)amino]-5-phenyl- 2,4-imidazolidinedione (IUPAC)	$C_{16}H_{14}N_4O_4$ 326.3 g mol^{-1} S-Enantiomer: RPA 221701 AE 0591777 BCS-AX84897 2,4-imidazolidinedione, 5-methyl-3-[(2-nitrophenyl)-amino]-5-phenyl-, (5*S*)- Racemate: RPA 410995 AE 0591778	Soil, aerobic Carrot Rotational crops: Turnip, Swiss chard
RPA 410193  (*S*)-5-Methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (IUPAC)	$C_{16}H_{15}N_3O_3$ 281.3 g mol^{-1} S-Enantiomer: RPA 410193 AE 0540049 BCS-AX71129 Diketo-fenamidone (DK-Fen) Racemate: RPA 405862 AE C650488	Soil, aerobic Soil, photolysis Hydrolysis, abiotic Photolysis, buffer Vine grapes, Lettuce, Tomato, Potato, Carrot Hen
RPA 411639  (5*S*)-5-methyl-2-(methylthio)-3-(4-nitrophenyl)amino)-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC)	$C_{17}H_{16}N_4O_3S$ 356.4 g mol^{-1} S-Enantiomer: RPA 411639 AE 0540054 BCS-AX71134 Racemate: RPA 406012 AE 0540056	Soil, aerobic Carrot Rotational crops: Turnip, Swiss chard Rat (postulated intermediate)
RPA 412636	$C_{10}H_{10}N_2O_2$ 190.2 g mol^{-1}	Soil, aerobic Soil, photolysis

Name, Structure, IUPAC name, CAS name, [CAS number]	Mol. formula, molar mass Other names / codes	Occurrence, Compartment
 (*S*)-5-methyl-5-phenyl-2,4-imidazolidine-dione (IUPAC) 2,4-imidazolidinedione, 5-methyl-5-phenyl-, (5*S*) (CAS)	S-Enantiomer: RPA 412636 AE 0540051 BCS-AX71131 " fenamidone-hydantoin" Desanilino-diketo-fenamidone (DADK-Fen) <u>Racemate</u>: RPA 717879 AE C415557	Water / sediment Lettuce, Potato, Rotational crops: Wheat, Turnip, Swiss chard Rat, Goat, Hen
RPA 412708  (5*S*)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (IUPAC)	$C_{11}H_{12}N_2OS$ 220.9 g mol^{-1} S-Enantiomer: RPA 412708 AE 0540050 BCS-AX71130 Desanilino-fenamidone (DA-Fen) <u>Racemate</u>: RPA 408056 AE 0540057	Soil, aerobic Soil, photolysis Hydrolysis, abiotic Photolysis, buffer Photolysis, nat. water Water / sediment Lettuce, Potato Rat, Goat, Hen
RPA 413255  (5S)-5-methyl-2-(methylthio)-3-(2-nitrophenyl)amino)-5-phenyl-3,5-dihydro-4H-imidazol-4-one (IUPAC)	$C_{17}H_{16}N_4O_3S$ 356.4 g mol^{-1} S-Enantiomer: RPA 413255 AE 0540053 BCS-AX71133 <u>Racemate</u>: RPA 410914 AE 0540055	Soil, aerobic Soil, photolysis Carrot Rotational crops: Turnip, Swiss chard
RPA 413350  2-phenyl-N-{[(E)-phenyldiazenyl]carbonyl}-D-alanine (IUPAC)	$C_{16}H_{15}N3O_3$ 297.3 g mol^{-1} S-Enantiomer: RPA 413350 AE 0540052 BCS-AX71132 <u>Racemate</u>: RPA 409344 AE 0841910	Hydrolysis, abiotic

Animal metabolism

Metabolism studies on <u>rats</u> reviewed by the 2013 JMPR show that fenamidone undergoes extensive metabolism in the rat by phase I (oxidation, reduction and hydrolysis) and phase II reactions (conjugation). The plasma elimination half-life was at least 60 hours. More than 20 metabolites were detected in rat excreta, with the majority of radioactivity excreted in the faeces (up to approximately 90% of the administered dose) and the remainder in urine. Mass balance data indicated that the majority of radioactivity (> 80%) was eliminated within 48 hours of dosing. The metabolites RPA 412636 and RPA 412708 were present in rat urine and rat bile, respectively.

Metabolism studies have been conducted in <u>lactating goats</u>. Two dose levels were used for each label position: 1 ppm and 10.4 ppm in the diet for [C-phenyl-U-^{14}C]-fenamidone and 1.5 ppm and 11.5 ppm in the diet for [N-phenyl-U-^{14}C]-fenamidone. Dosing was performed twice daily by capsule during seven consecutive days. The total administered radioactivity (TAR) was quickly and almost completely eliminated in the excreta. In case of the C-phenyl label, the total excreted residues were 99–102% of TAR (75–80% via faeces, 17–26% via urine, 0.1% via milk). In case of the N-

phenyl label, the total excreted residues were ca. 90% of TAR (45–52% via faeces, 36–40% via urine, 0.1–0.2% via milk). Neither fenamidone nor any of its metabolites accumulated in milk fat or milk proteins. At sacrifice, small amounts of radioactivity (totally 0.6 to 1.0% of TAR) were detected in edible organs/tissues and blood.

Residues in milk and edible tissues of goats were low. RPA 412708 and RPA 412636 were found, as well as hydroxylated fenamidone and hydroxylated RPA 412708. RPA 412636 was the most abundant residue in the goat, reaching after high dose administration 0.055 mg/kg (5.9% TRR) in liver, 0.018 mg/kg (15% TRR) in kidney and 0.002 mg/kg in milk (11% TRR). Fenamidone was identified in fat with 0.013 mg/kg (53% TRR), but was a minor component in milk (0.001 mg/kg, 0.7% TRR), liver (0.003 mg/kg, 0.3% TRR) and kidney (0.001 mg/kg, 0.6% TRR).

Metabolism studies have been conducted in laying hens. Two dose levels were used for each label position: 1.3 ppm and 13.8 ppm in the diet for [C-phenyl-U-^{14}C]-fenamidone and 1.0 ppm and 9.8 ppm in the diet for [N-phenyl-U-^{14}C]-fenamidone. Dosing was performed by administration of one capsule per day during fourteen consecutive days. The TAR was quickly and almost completely eliminated in excreta. The recovery of radioactivity was > 91% of the TAR. The majority of the radioactivity was in excreta (approximately 90% TAR). All of the eggs together contained 0.1% of the dose administered, most of which was retained in the yolk. At sacrifice, at both dose levels and in both labels, very minor amounts of radioactivity (0.1% of TAR) were detected in edible organs/tissues and blood.

Residues in eggs and edible tissues of hens were low. RPA 412636 was a major component in the hen, found at 0.011 mg/kg (74% TRR) in egg white, 0.014 mg/kg in egg yolk (11% TRR), 0.023 mg/kg (15% TRR) in liver and 0.002 mg/kg (16% TRR) in skin after high dose administration. RPA 412708 was the highest residue in the hen, reaching 0.028 mg/kg (25% TRR) in egg yolk but only 0.002 mg/kg (1.3% TRR) in liver. Fenamidone was identified, but was a minor component (egg yolk 0.014 mg/kg, 11% TRR; liver 0.003 mg/kg, 1.7% TRR; fat < 0.001 mg/kg, 4.6% TRR and skin 0.002 mg/kg, 14% TRR).

The Meeting concluded that, in all species investigated, the TAR was quickly and almost completely eliminated in excreta. The metabolic profiles differ quantitatively between the species, but qualitatively there are no major differences; the routes and products of metabolism in animals were consistent across the studies. Fenamidone, RPA 412708 (desanilino-fenamidone) and RPA 412636 (desanilino-diketo-fenamidone) were the components identified.

Plant metabolism

The metabolism of fenamidone has been studied in grapes, tomatoes, lettuce, carrots and potatoes.

Grapes

Following four foliar treatments of [C-phenyl-U-^{14}C]-fenamidone to a total nominal rate of the equivalent of 1.65 kg ai/ha (0.5, 0.49, 0.5 and 0.16 kg ai/ha) to field grown grape vines during the grape berry development period, the terminal residue in the mature harvest grape bunches (1.2 mg eq/kg) was shown to comprise mainly parent compound (56% TRR) and RPA 410193 (17% TRR). The interval between the last application and harvest was 24 days. The major part of the radioactivity associated with the grape bunches could be extracted by methanol/water and represented 89% of the TRR. The non-extracted radioactivity was confined mainly to the stem, skin and pips. Further extraction procedures were made including enzyme treatment followed by acid and alkali hydrolysis (100% TRR).

The metabolism of fenamidone in grapes was characterised by the formation of RPA 410193, i.e. loss of the thiomethyl group and formation of an imidazolidinedione. Some evidence was obtained to suggest that hydroxylation of parent compound (3.4% TRR) as well of RPA 410193 (4.2% TRR) also occurred. A number of other metabolites were detected, albeit polar and at very low levels.

Tomatoes

The metabolism was investigated following three foliar applications of [^{14}C]-fenamidone, each of 0.5 kg ai/ha giving a total nominal application rate of 1.5 kg ai/ha on glasshouse grown tomatoes. Both labels, C-phenyl and N-phenyl, were used separately. At final harvest, 7 days after the last treatment, the TRR in tomato fruits was less than 0.2 mg eq/kg for both labels. About 90% of the TRR was extracted and more than 75% identified.

The major component of the extracted radioactivity in both treatment regimes was unchanged parent accounting for 66–76% TRR. The next largest component was RPA 410193 accounting for 9.3–9.4% TRR. No metabolites were formed at significant levels as a result of cleavage of the two phenyl-rings.

Lettuce

The metabolism was investigated following four foliar applications of [^{14}C]-fenamidone, each of a nominal rate of 0.4 kg ai/ha on outdoor grown iceberg lettuce. Both labels, C-phenyl and N-phenyl, were used separately. At final harvest, 7 days after the last treatment, a total of 93% and 92% of the TRR for the C-phenyl-label and N-phenyl-label treated final harvest lettuces respectively, was identified. The TRR found in the lettuce wrapper leaves (12 mg eq/kg) were significantly higher than that present in the lettuce heads (0.2–0.3 mg eq/kg).

Analysis of the extracted radioactive residues showed the major components of both labels to be parent fenamidone (about 92% TRR in whole lettuce). The remaining extracted radioactivity was comprised of RPA 410193 (0.59–0.66% TRR) and multiple unidentified polar components, which comprised less than 3% TRR in total in whole lettuce. In addition, low levels of RPA 412636 (2.7% TRR) were present in the C-phenyl-label treated lettuce head leaves extracts only.

Potatoes

The metabolism was investigated following three foliar applications of [^{14}C]-fenamidone, each of nominal 0.5 kg ai/ha on outdoor grown potatoes. Both labels, C-phenyl and N-phenyl, were used separately. At final harvest, 14 days after the last treatment, the TRR in the tubers (0.038–0.087 mg eq/kg) was significantly lower than the levels detected in the leafy part of the plant (5.9–6.6 mg eq/kg) with 1.3% of the whole plant TRR being present in the root/tuber. A total of 73% TRR of the intact potato tubers and 77% TRR of the potato haulm could be extracted for C-phenyl-fenamidone treated plants at final harvest. The corresponding values for N-phenyl-fenamidone treated potatoes were 46% and 78% for intact potato tubers and potato haulm respectively.

In potato tubers, parent fenamidone accounted for 2.3 to 6% of TRR (0.002 mg/kg) and two further metabolites were formed: RPA 412708 (desanilino-fenamidone) and RPA 412636 (desanilino-diketo-fenamidone), each accounting for ca. 6% of TRR with low absolute concentrations (0.005–0.006 mg eq/kg). A large portion of the residue was polar in nature and reported to be composed by acid labile conjugates.

Carrots

The metabolism was investigated following three applications of [N-phenyl-U-^{14}C]-fenamidone, each of nominal 0.3 kg ai/ha on outdoor grown carrots. The first application was made pre-emergence followed by two foliar applications. At final harvest, 14 days after the last treatment, the TRR in leaves and roots amounted to 30.5 and 0.04 mg eq/kg, respectively. Therefore, basispetal transport of residues from the treated leaves to the roots was very limited. In leaves, 81% of the radioactivity could be extracted with acetonitrile/water using a high-speed blender and the rest by water/dichloromethane partition. In roots, 93% of the radioactivity was extracted with acetonitrile/water.

Fenamidone accounted in leaves for 89% of the TRR and in roots for 29% of the TRR. Six minor metabolites were identified. No metabolite in the roots exceeded a level of 0.01 mg/kg. Two parallel metabolic reactions were found and a combination thereof. The first reaction was an oxidative hydrolysis of the thiomethyl group at the dihydro imidazole ring to a keto substituent resulting in RPA 410193 (diketo-fenamidone). Another reaction was the nitration of the N-phenyl ring. All metabolites

contained the intact basic structure with the two phenyl rings and the imidazole ring. No cleavage product, such as aniline, aminophenols or nitroanilines was detected. In addition, radiolabelled glucose was found in the leaves resulting from complete mineralization of the fenamidone in the soil and photosynthetic uptake of the formed $^{14}CO_2$ in the plant. Small amounts of a dimer of fenamidone (0.17% of TRR, 0.05 mg/kg) were also detected in leaves.

In summary, the metabolism of fenamidone in plants after foliar application was investigated in three crop categories: fruits and fruiting vegetables, leafy vegetables, root and tuber vegetables. The metabolic pattern was shown to be similar in all these crop groups with the unchanged parent compound being the main compound of the final residue at harvest. The Meeting concluded that after foliar treatment the only significant metabolite in plants was RPA 410193 (diketo-fenamidone), formed by oxidative hydrolysis of the thiomethyl side chain of fenamidone.

Environmental fate

For fenamidone, data were received for foliar spray on permanent crops and on annual crops. A further application is on cotton seed as in furrow treatment. Therefore, according to the FAO manual, studies on the aerobic degradation in soil, photolysis, hydrolysis, rotational crops (confined, field) and field dissipation were evaluated. The fate and behaviour of fenamidone in soils was investigated using fenamidone radio-labelled in two different positions, [C-phenyl-U-^{14}C]- and [N-phenyl-U-^{14}C]-fenamidone.

Degradation in soil, photolysis and hydrolysis

Degradation of fenamidone in soil primarily proceeds by the action of aerobic soil microorganisms. In the first major pathway there is loss of the N-phenyl aniline ring to form RPA 412708, followed by loss of the S-methyl moiety and hydrolysis to form RPA 412636. Two further pathways are the concurrent formation of 2- and 4-nitro compounds by addition to parent to form RPA 413255 and RPA 411639. A further route of degradation results in the formation of numerous minor non-polar components. The rate of degradation tested in silty clay loam, sandy loam and in clay loam, is similar in both C-phenyl and N-phenyl rings with DT50s ranging from 0.9 to 9.6 days in all tested soils at 20 °C. The Meeting concluded that fenamidone was rapidly degraded in soil under aerobic conditions leading to the formation of two major metabolites RPA 412708 and RPA 412636.

Field dissipation studies undertaken at four European sites showed that the average half-lives were 5 days for fenamidone, 12 days for RPA 412708, 21 days for RPA 411639, 43 days for RPA 413255 and 47 days for RPA 412636. It can be concluded that the dissipation of fenamidone was rapid in the field.

The photolytic degradation of fenamidone was investigated on a sandy loam soil for 30 days. Artificial sunlight was provided using an artificial xenon light source for 13 hours each day. The Meeting recognized that photolytic processes do not contribute significantly to the degradation of fenamidone applied to the soil surface.

The hydrolytic degradation of fenamidone was examined in aqueous buffered solutions at pH values of 4, 5, 7 and 9 under sterile conditions at 25 °C. The Meeting recognized that fenamidone was stable at pH 5 and pH 7, but was hydrolysed at pH 4 and pH 9.

Rotational crops

One confined radiolabelled succeeding crop study was conducted in 2001 with [C-phenyl-U-^{14}C]-fenamidone. Following application to the soil at an application rate of 1.6–2.0 kg ai/ha, lettuce, turnip and barley were cultivated after three plant back intervals (30, 120/150 and 365 days). The residues in rotated plants comprised the following major metabolites: RPA 412636 and RPA 412708 and a conjugate thereof. The parent substance could not be detected. Residues of RPA 412636 were in lettuce ca. 20% of TRR at each plant back intervals, in turnip tops 3.5–11% of TRR, in turnip roots 5–8% of TRR and in barley grain 2–6% of TRR. The highest residues of RPA 412636 were found in barley straw with 2.04 mg/kg (29% TRR). RPA 412708 was found in lettuce at a maximum of 5.7% of TRR (0.04 mg/kg).

Two additional confined radiolabelled succeeding crop studies were carried out in 2013. Following application of 0.96 kg ai/ha [N-phenyl-U-^{14}C]-fenamidone and 0.97 kg ai/ha [C-phenyl-U-^{14}C]-fenamidone to the soil, wheat, turnip and Swiss chard were sown and cultivated at three plant back intervals (30, 191 and 324 days after soil treatment). Both labelled forms of fenamidone were rapidly degraded in soil with extensive uptake of the metabolites into the plants. The parent compound was only detected in Swiss chard at 30 days plant back interval, however at a low level amounting to a maximum of 0.002 mg/kg (0.2% of TRR). It was not detected in other crops. The pathway is proposed as follows: Electrophilic nitration of the aniline ring formed fenamidone-2-nitro and fenamidone-4-nitro, most probably in the soil, with RPA 413255 (fenamidone-2-nitro) being further converted to RPA 221701 (fenamidone-desthiomethyl-2-nitro) following nucleophilic substitution and the addition of water. Conjugation with hexose and malonic acid and hydroxylation lead to the formation of fenamidone-hydroxy-nitro-malonyl-glycoside. Further conjugation with glutathione and nucleophilic substitution of methyl mercaptan also lead to the formation of fenamidone-nitro-GSH. In addition to these metabolites, the C-phenyl-labelled compound underwent further degradation of the aniline moiety of fenamidone-desthiomethyl-2-nitro to RPA 412636, again, most likely in the soil. Conjugation of RPA 412636 with glucose, hexose plus malonic acid and serine formed fenamidone-hydantoin-glucoside and fenamidone-hydantoin-serine.

The Meeting concluded that parent fenamidone is quickly degraded in soil or in the follow-on crops, not resulting in residues detected at harvest. Residues of RPA 412636, RPA 412708 and conjugates thereof were the major metabolites in commodities used as animal feed and can also occur in the edible parts of rotational crops.

Seven field succeeding crop studies were conducted, one in Europe and six in the USA. Spray applications near GAP were made to bare soil to simulate a treatment of target crops like potatoes, leafy vegetables or fruiting vegetables. Rotational crops were cereals (wheat, maize), fruiting vegetables (sweet corn) root and tuber vegetables (turnip, radish), leafy vegetables (lettuce, spinach), pulses (soya bean, dry) and strawberries.

After application of 0.9–1.2 kg ai/ha per annum to the bare soil, in the follow-on crops no parent fenamidone or its plant metabolite RPA 410193 was found at or above the LOQ of 0.02 mg/kg.

In plant parts used as human food, RPA 412636 occurred up to maximum single values of 0.04 mg/kg in radish roots, 0.04 mg/kg in radish tops and 0.12 mg/kg in spinach. Residues of RPA 412636 in wheat grain were in 22 field trials < 0.02 mg/kg and in only one trial 0.061 mg/kg.

RPA 412708 and RPA 412636 occurred in commodities that may be used as animal feeds. The sum of RPA 412708 and RPA 412636 reached up to 0.14 mg/kg in soya bean hay, 0.29 mg/kg in sweet corn stover and 0.21 mg/kg in field corn forage; RPA 412636 occurred up to 0.07 mg/kg in wheat forage, 0.27 mg/kg in wheat straw and 0.45 mg/kg in wheat hay.

In conclusion, no residues of fenamidone and RPA 410193 above the LOQ of 0.02 mg/kg would be expected in follow-on crops but residues of the metabolites RPA 412708 and RPA 412636 taken up from the soil occurred in commodities that may be used as human food and animal feed.

Methods of analysis

The Meeting received descriptions and validation data for analytical methods for residues of fenamidone and its relevant metabolites RPA 410193, RPA 412708 and RPA 412636 in plant commodities and for fenamidone, RPA 412708 and RPA 412636 in animal commodities. Residue analytical methods rely on GC with NP-detection, GC-MS or LC-MS/MS. Typical LOQs achieved for plant commodities fall in the range of 0.01–0.02 mg/kg for each analyte. The LOQ for milk was 0.01 mg/kg and for animal products (liver, kidney, muscle, eggs) 0.05 mg/kg for each analyte. Methods have been subjected to independent laboratory validation.

Fenamidone and RPA 410193 were analysed in plant material by the multi method S 19 with an LOQ of 0.01 mg/kg by GC-MS. The QuEChERS multi residue method was used for fenamidone and RPA 410193 in plant matrices as well as for fenamidone and RPA 412708 and RPA 412636 in animal matrices with LOQs of 0.01 mg/kg by LC-MS/MS for each analyte.

Stability of residues in stored analytical samples

The Meeting received storage stability studies under freezer conditions at -20 °C for fenamidone, RPA 412636, RPA 412708 and RPA 410193 for the duration of the storage of 12 months in a wide range of raw and processed crop matrices, including examples of high-water and high-starch crops and for duration of 6 months for cotton products. Furthermore, studies were conducted for fenamidone and RPA 410193 in high-water content commodities for duration of 14 months and in strawberries of 18 months.

The Meeting concluded that residues of fenamidone and RPA 410193 are stable in commodities of high-water content for at least 14 months and in strawberries for at least 18 months. Residues of fenamidone, RPA 412636, RPA 412708 and RPA 410193 are also stable for at least 6 months in high-oil content products.

Because milk and tissue samples of the ruminant feeding study were analysed within 29 days of collection, no storage stability data were submitted.

Definition of the residue

Animal metabolism studies were performed in rats, lactating goats and laying hens. The metabolic behaviour of fenamidone in the rat is summarised by the 2013 JMPR and shows pathways and major components similar to those found in ruminants and poultry. RPA 412636 and RPA 412708 are found in the rat metabolism. RPA 410193, which is a plant metabolite, was not identified in the rat ADME studies. The 2013 Meeting considered the named metabolites as toxicological relevant.

The 2014 JMPR agreed that RPA 410193 is covered by the ADI of the parent fenamidone. The toxicological relevance of RPA 412636 and its precursor RPA 412708, both detected as RPA 412636, were confirmed. RPA 412636 was considered as 10 times more toxic than the parent.

Livestock metabolism studies in goat and hen showed no major differences; the routes and products of metabolism in animals are consistent across the studies. The residues in animal products were low. Fenamidone was identified, reaching 0.013 mg/kg in ruminant fat (53% TRR) and 0.014 mg/kg in egg yolk (11% TRR). RPA 412636 was the most abundant residue in the ruminant, reaching 0.055 mg/kg in liver (5.9% TRR) and 11% TRR in milk (0.002 mg/kg). RPA 412636 was also found in the hen, at 0.011 mg/kg (74% TRR) in egg white and 0.014 mg/kg in egg yolk (11% TRR). RPA 412708 was the most abundant residue in the hen, reaching 0.028 mg/kg in egg yolk and 0.002 mg/kg in liver (25 and 1.3% TRR, respectively).

The Meeting concluded that the residue definition for MRL-setting for animal products should be parent fenamidone. For dietary intake, the residue should be defined as the sum of fenamidone, RPA 412636 and RPA 412708, expressed as fenamidone. Due to the 10-fold higher toxicity, a factor of 10 should be applied.

Fenamidone has a log P_{OW} of 2.8. No residues of fenamidone, RPA 412636 and RPA 412708 could be determined in animal products from the cattle feeding study with the exception of one milk fat sample with 0.011 mg/kg of RPA 412708. In the high dose group of the goat metabolism study, the TRR in muscle were low (0.02 mg eq/kg) and could not further identified. Fenamidone was detected in the fat (53% TRR, 0.013 mg eq/kg). In the high dose group of the egg metabolism study, fenamidone was detected in the yolk (11% TRR, 0.014 mg/kg), but not in the egg white (< 0.001 mg/kg). The Meeting decided that the residue is fat-soluble.

Plant metabolism studies for foliar spray application to the plant provide a clear understanding of the fate of the fenamidone molecule, both the C-phenyl and N-phenyl portions. The overall metabolic pathway is consistent between the different crop groups. Fenamidone forms the largest part of the residue and the only significant metabolite is RPA 410193, which reached a maximum of 17% TRR in grape. RPA 412636 and RPA 412708 reached a maximum of 6.3% TRR (0.005 mg/kg) and 6.4% TRR (0.006 mg/kg) in potato tubers. No other metabolite exceeded 5% TRR in any plant commodity.

The Meeting took into account the possibility of residues of the metabolites RPA 412708 and RPA 412636 in follow-on crops used as human food and/or animal feed. The Meeting concluded to

include both metabolites in the residue definition for estimation of the dietary intake of plant commodities. Because of the10-fold higher toxicity, a factor of 10 should be applied.

The Meeting agreed the following residue definitions:

- Definition of the residue for compliance with the MRL for plant and animal commodities: *Fenamidone.*
- Definition of the residue for estimation of dietary intake for plant commodities: Sum of fenamidone, (S)-5-methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (RPA 410193**)** plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.
- Residue concentration $C_{total} = C_{fenamidone} + C_{RPA\ 410193} + 10 \times (C_{RPA\ 412636} + C_{RPA\ 412708})$
- Definition of the residue for estimation of dietary intake for animal commodities: *Fenamidone plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.*
- Residue concentration $C_{total} = C_{fenamidone} + 10 \times (C_{RPA\ 412636} + C_{RPA\ 412708})$

  The residue is fat-soluble.

Results of supervised residue trials on crops

The Meeting received supervised residue trials data for grapes, strawberries, leek, bulb onion, spring onion, cabbage, flowerhead brassica, melons, watermelons, cucumber, summer squash, peppers, tomato, lettuce, mustard greens, spinach, carrots, potato, ginseng, Witloof chicory, celery, cotton seed, sunflower seed, common bean forage and cotton fodder. If two field samples were taken or results of two replicate plots were submitted, the mean value was calculated for estimation of maximum residue levels. For HR estimation, the highest single value of the trials according to GAP was used. From two or more trials carried out side-by-side the higher residue was chosen.

Residues are reported separately for fenamidone and RPA 410193 only because the soil metabolites RPA 412636 and RPA 412708 are not relevant for foliar treated crops. For HR and STMR estimation, the sum of fenamidone (MW 311.4 g/mol) and RPA 410193 (MW 281.3 g/mol), expressed as fenamidone (conversion factor 1.11), is needed. When residues are undetectable in a commodity, the sum of the LOQs of both components is not appropriate for all plant commodities because the days after the last treatment (DALT) differ from 2 days (e. g. lettuce) to 35 days (strawberry). The residues of RPA 410193 are found in the same order of magnitude as the parent in berries harvested 4 to 5 weeks after treatment. In other plant commodities harvested at shorter PHIs (2–21 days), the level of the metabolite is much lower than the parent in most cases. The method for calculation of the total residues of the sum of fenamidone and RPA 410193 is illustrated as follows:

- Plant commodities except grapes and strawberries

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.02
0.05	< 0.02	0.05
0.42	0.08	0.51[a]

[a] 0.42 + (0.08 × 1.11) = 0.5088

- Grapes and strawberries

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg

< 0.02	< 0.02	< 0.04
0.05	< 0.02	0.07
0.42	0.08	0.51

Trials from the USA or Canada on carrots, potatoes, fruiting—brassica, leafy and legume—as well as stalk and stem vegetables were performed with four instead of three applications and trials on bulb vegetables as well as cucurbits were performed with six instead of four applications. The Meeting accepted the trials as matching the GAP in the USA and Canada since comparative residue trials on grapes and tomatoes as well as decline studies on vegetables indicated that the contribution of two earlier applications to the terminal residue is negligible. The Meeting agreed to use the trials to estimate maximum residue levels.

Rotational crop maximum residue levels, STMRs and HRs

The Meeting noted that no residues of parent fenamidone above the LOQ of 0.02 mg/kg are expected in follow-on crops. It was concluded that the estimation of maximum residue levels is not necessary.

The Meeting recognized that, in commodities used as human food, RPA 412636 were found. The table below shows the highest and the mean residues of two plots found in follow crops as spinach, radish roots and leaves as well as wheat grain after treatment of vegetables with fenamidone at 1.2 kg ai/ha per annum. The Meeting agreed to use the proportionality approach and scaled the residues according to the US GAP of 0.9 kg ai/ha per annum for brassica vegetables, fruiting vegetables, leafy vegetables, root and tuber vegetables and celery. The values measured as RPA 412636 (MW 190.2 g/mol) were expressed as fenamidone (MW 311.4 g/mol) multiplying by 1.64.

		RPA 412636, highest residue, mg/kg			RPA 412636, mean residue, mg/kg		
Treatment, kg ai/ha	Commodity	Measured	Scaled	Calculated as fenamidone eq	Measured	Scaled	Calculated as fenamidone eq
6× 0.2	Spinach	0.12	0.09	0.15	0.096	0.072	0.12
	Radish tops	0.044	0.033	0.054	0.033	0.0275	0.045
	Radish roots	0.039	0.029	0.048	0.03	0.0225	0.037
	Wheat grain	0.061	0.046	0.075			
1× 0.2	Wheat grain				< 0.02		< 0.033 (n = 22)

The Meeting concluded that the contribution of residues of RPA 412636 and RPA 412708 has to be considered for the STMR and HR estimation for annual crops like vegetables and cereals. A factor of 10 is used because of the 10-fold higher toxicity compared to parent.

For brassica vegetables, fruiting vegetables, leafy vegetables, fresh herbs as well as stalk and stem vegetables, the Meeting estimated a rotational crop STMR of 1.2 mg/kg and a rotational crop HR of 1.5 mg/kg, based on the residues analysed in spinach.

For bulb vegetables, root and tuber vegetables as well as their leaves/greens the Meeting estimated a rotational crop STMR of 0.4 mg/kg and an HR of 0.5 mg/kg, respectively.

For cereal grains, residues of RPA 412636 + RPA 412708 were in wheat of 22 field trials as well as of nine trials in maize < 0.033 mg eq/kg and in only one trial 0.075 mg eq/kg. The Meeting agreed to estimate an STMR of 0.33 mg/kg (10 times LOQ) for cereal grains except rice as follow-on crops.

No residues of RPA 412636 or RPA 412708 higher than the LOQ of 0.02 mg/kg occurred in strawberries, sweet corn kernels and soya bean seed grown as follow-on crops. The Meeting concluded that the uptake of substantial concentrations of RPA 412636 or RPA 412708 by strawberry, sweet corn, oil seeds and pulses is negligible. No STMR or HR was recommended.

Grapes

The GAP for fenamidone in Brazil on grapes is foliar spray treatment with 3× 0.13 kg ai/ha and a PHI of 7 days. Three Brazilian trials matching the GAP were submitted. The residues in grape bunches were for parent fenamidone 0.02, 0.03, 0.03 mg/kg and for the sum of fenamidone and RPA 410193 0.04, 0.05, 0.05 mg/kg.

Fenamidone is registered for foliar spray treatment on grapes in the Czech Republic with application at 3 × 0.13 kg ai/ha and a PHI of 28 days. Sixteen European trials according to GAP were conducted in 2009 and 2010 in Belgium, France, Germany, Italy, Portugal and Spain. The residues in grape bunches were for fenamidone (n = 16) 0.04, 0.06, 0.08, 0.09, 0.09, 0.10, 0.13, 0.13, 0.17, 0.21, 0.22, 0.22, 0.26, 0.28, 0.30 and 0.33 mg/kg. The total residues (sum of fenamidone and RPA 410193) were 0.06, 0.09, 0.09, 0.11, 0.12, 0.13, 0.15, 0.16, 0.19, 0.25, 0.25, 0.25, 0.34, 0.34, 0.35 and 0.42 mg/kg.

Based on the European residue data, the Meeting estimated a maximum residue level of 0.6 mg/kg, an STMR of 0.175 mg/kg and an HR of 0.42 mg/kg for fenamidone residues in grapes.

Strawberry

The UK GAP for fenamidone in strawberries is one pre-transplantation treatment (0.18 kg ai/ha) followed by one post-transplantation drench or spray (0.27 kg ai/ha) and a PHI of 35 days.

Eight supervised residue trials were carried out in 2009 and 2012 in Europe in greenhouses. The plants were treated by a drip-irrigation with 0.16–0.18 kg ai/ha followed after 21/22 days by a foliar spray of 0.27 kg ai/ha. The residues were for parent fenamidone < 0.01, < 0.01, 0.01, 0.01, 0.01, 0.02, 0.02, 0.02 mg/kg and for the sum of fenamidone and RPA 410193 < 0.02, < 0.02, 0.02, 0.02, 0.02, 0.03, 0.03, 0.03 mg/kg.

Fenamidone is registered in Belgium in protected strawberries with two drench treatments of 0.45 kg ai/ha and a PHI of 35 days. Seven trials according to Belgium GAP were conducted in 2010/2011. The residues were for parent fenamidone < 0.01 (3), 0.01, 0.02 (3) mg/kg and for the sum of fenamidone and RPA 410193 < 0.02, < 0.02, 0.02, 0.02, 0.03, 0.03, 0.04 mg/kg.

The Meeting agreed to use the data set according to the Belgium GAP and estimated a maximum residue level of 0.04 mg/kg, an STMR of 0.02 mg/kg and an HR of 0.04 mg/kg for fenamidone residues in strawberries.

Bulb vegetables

Fenamidone is registered for bulb vegetables in the USA and Canada with foliar application at 4× 0.2 kg ai/ha and a PHI of 7 days. Field trials on bulb onion (8) and spring onion (4) were carried out in the USA. At each trial, six instead four spray applications of 0.2 kg ai/ha were made. The following residue data were received.

In bulb onion, the fenamidone residues as well as total residues (sum of fenamidone and RPA 410193) were < 0.02 (6), 0.02 and 0.10 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 0.13 mg/kg as HR for the short-term dietary intake assessment instead. The Meeting agreed to extrapolate the residue data from bulb onions to garlic and shallots. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to the STMR and 0.5 mg/kg to the HR.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.15 mg/kg, 0.42 mg/kg and 0.63 mg/kg, respectively, for bulb onion, garlic and shallots.

In spring onion, the fenamidone residues were 0.24, 0.36, 0.94 and 0.94 mg/kg. The corresponding total residues were 0.24, 0.36, 0.94 and 1.1 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 1.2 mg/kg as HR for the short-term dietary intake assessment instead. The Meeting agreed to extrapolate the residue data from spring onion to welsh onion. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to the STMR and 0.5 mg/kg to the HR.

The Meeting estimated a maximum residue level, an STMR and an HR of 3 mg/kg, 1.05 mg/kg and 1.7 mg/kg, respectively, for spring onion and Welsh onion.

The GAP for leek in Switzerland is 3 × 0.15 kg ai/ha and a PHI of 14 days. Four supervised residue trials (France 1, Germany 2 and the Netherlands 1) with 4 × 0.15 kg ai/ha were submitted. At a PHI of 14 days, the residues of fenamidone as well as of the sum of fenamidone and RPA 410193 were 0.02, 0.05, 0.07 and 0.13 mg/kg. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to the STMR and 0.5 mg/kg to the HR.

The Meeting considered four trials on leek as sufficient and estimated a maximum residue level, an STMR and an HR of 0.3 mg/kg, 0.46 mg/kg and 0.63 mg/kg, respectively.

Brassica vegetables

Head cabbage

Fenamidone is registered in Switzerland in head cabbages as foliar spray with 3 × 0.15 kg ai/ha and a PHI of 14 days. Seven European trials (France 2, Germany 4 and Portugal 1) according to the Swiss GAP were submitted. The residues of fenamidone as well as the sum of fenamidone and RPA 410193 were < 0.01 (4), 0.01, 0.02 and 0.06 mg/kg.

The GAP for Brassica vegetables in Canada and the USA is 3 × 0.3 kg ai/ha and a PHI of 2 days. Six trials were conducted in 2003 in the USA with 4× 0.3 kg ai/ha and a PHI of 2 days. In all trials, heads with wrapper leaves were analysed. The residues were for parent fenamidone 0.10, 0.17, 0.22, 0.24, 0.35 and 0.52 mg/kg in cabbage heads with wrapper leaves. Residue data for heads without wrapper leaves were available from four of the six trials. The fenamidone residues as well as the total residues were < 0.02, < 0.02, 0.03 and 0.19 mg/kg.

The Meeting agreed to use the US residue data on cabbage heads with wrapper leaves for MRL estimation and without wrapper leaves for dietary intake purposes. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

The Meeting estimated a maximum residue level of 0.9 mg/kg, an STMR of 1.23 mg/kg and an HR of 1.69 mg/kg.

For livestock dietary burden calculation, the Meeting estimated a median residue of 0.22 mg/kg and a highest residues of 0.52 mg/kg based on the fenamidone data for head cabbage with wrapper leaves.

Flowerhead brassica

The GAP for Brassica vegetables in Canada and the USA is 3 × 0.3 kg ai/ha and a PHI of 2 days. Six trials were conducted in 2003 on broccoli in the USA with 4 × 0.3 kg ai/ha and a PHI of 2 days. The mean residues of two separate field samples were for parent fenamidone as well as the total residues 0.31, 0.51, 0.68, 1.5, 1.6 and 2.2 mg/kg.

The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 2.7 mg/kg as HR for the short-term dietary intake assessment instead. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

The Meeting estimated for fenamidone residues in flowerhead brassica a maximum residue level, an STMR and HR of 4 mg/kg, 2.29 mg/kg and 4.2 mg/kg, respectively.

Fruiting vegetables, cucurbits

The GAP for cucurbits in Canada and the USA is 4 × 0.2 kg ai/ha and a PHI of 14 days. Field trials on cucumber (9), summer squash (9) and cantaloupe melons (8) were carried out during 1999 in the USA. At each trial, six spray applications in the range of 0.19–0.21 kg ai/ha were made at intervals of 3–6 days. The following residue data were received:

- In cucumber, the residues of fenamidone as well as the total residues were < 0.02 (7), 0.02 and 0.04 mg/kg.
- In summer squash, the residues of fenamidone as well as the total residues were < 0.02 (8) and 0.06 mg/kg.
- In cantaloupe melon, the residues for fenamidone as well as the total residues were in whole fruits < 0.02, 0.02, 0.04, 0.06, 0.07, 0.08, 0.08 and 0.09 mg/kg. No data were submitted for the edible part.

The Brazilian GAP for the use of fenamidone in watermelon is 3 × 0.15 kg ai/ha and a PHI of 7 days. Three trials on watermelons were conducted in 2004 in Brazil. The residues were in whole fruits for fenamidone as well as the sum of fenamidone and RPA 410193 were 0.03, 0.04 and 0.05 mg/kg. No residue data for pulp were submitted.

Fenamidone is registered in Switzerland for cucumbers, pumpkins, melons, courgettes, patisson and rondini with three foliar spray treatments of 0.15 kg ai/ha and a PHI of 3 days. Trials on cucumber (9 indoor) and on melons (8 indoor, 8 outdoor) carried out between 2002 and 2005 in European countries according to the GAP were submitted. The following residue data were received:

- In indoor grown cucumber, the residues of fenamidone as well as the total residues were < 0.01, < 0.02, 0.04, 0.04, 0.09, 0.10, 0.10, 0.12 and 0.13 mg/kg.
- In outdoor grown melons, the residues of fenamidone in whole fruits were < 0.02, 0.03, 0.03, 0.04, 0.04, 0.05, 0.08 and 0.12 mg/kg
- In indoor grown melons, the residues of fenamidone in whole fruits were < 0.02, < 0.02, < 0.02, 0.03, 0.04, 0.07, 0.07 and 0.09 mg/kg.
- The corresponding residues of the sum of fenamidone and RPA 410193 in melon pulp were < 0.01 (6) and < 0.02 (10).

The Meeting concluded that the maximum residue level should be based on the critical Swiss GAP. It was noted, that the median of the datasets for cucumber and melons (outdoor and indoor grown) differed by less than five times and agreed to consider a group maximum residue level. In deciding on the data set to use for estimating a group maximum residue level, as a Mann-Whitney U-test indicated that the residue populations for cucumber and melons were not different, it was agreed to combine the results to give a data set for fenamidone residues in whole melons and cucumbers of (n = 25) < 0.01, < 0.02 (5), 0.03 (3), 0.04 (5), 0.05, 0.07, 0.07, 0.08, 0.09, 0.09, 0.10, 0.10, 0.12, 0.12 and 0.13 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

The Meeting estimated for fenamidone residues in fruiting vegetables, cucurbits a maximum residue level of 0.2 mg/kg. Based on the cucumber data, an STMR of 1.29 mg/kg and an HR of 1.63 mg/kg were estimated.

Fruiting vegetables other than cucurbits

The GAP for fruiting vegetables except cucurbits in the USA is 3× 0.3 kg ai/ha and a PHI of 14 days.

Field US trials on sweet pepper (6), chilli pepper (3) and tomatoes (17) according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied. The following residue data were received:

- In sweet pepper, the residues were for fenamidone as well as for the sum of fenamidone and RPA 410193 0.03, 0.05, 0.07, 0.08, 0.08 and 0.19 mg/kg.
- In chilli pepper, the fenamidone residues and the total residues were 0.07, 1.3 and 1.5 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 1.7 mg/kg as HR for the short-term dietary intake assessment instead.

- In tomatoes, the fenamidone residues were < 0.02, < 0.02, 0.07, 0.07, 0.09, 0.10, 0.11, 0.25, 0.33, 0.34, 0.38, 0.40, 0.42, 0.46, 0.47, 0.61 and 0.80 mg/kg. The total residues were (n = 17) < 0.02, < 0.02, 0.07, 0.07, 0.09, 0.10, 0.11, 0.25, 0.33, 0.34, 0.38, 0.45, 0.46, 0.47, 0.40, 0.61 and 0.80 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 0.82 mg/kg as HR for the short-term dietary intake assessment instead.

The Meeting noted that the GAP in the USA was for fruiting vegetables other than cucurbits and considered a group maximum residue level. Furthermore, the Meeting noted that the median of the datasets for sweet pepper and tomatoes differed by less than 5-fold but the median for chilli was 17 times higher than for sweet pepper. The Meeting agreed to consider a group maximum residue level for fruiting vegetables other than cucurbits, except sweet corn, fungi and chilli pepper. In deciding on the data set to use for estimating a group maximum residue level, as a Mann-Whitney U-test indicated that the residue populations for sweet pepper and tomatoes belong to different populations with the highest residues in tomato. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to the STMR and 1.5 mg/kg to the HR.

Based on the tomato residue data, the Meeting estimated a maximum residue level of 1.5 mg/kg, an STMR of 1.53 mg/kg and an HR of 2.32 mg/kg for fruiting vegetables other than cucurbits, except sweet corn, fungi and chilli pepper.

For chilli pepper, the Meeting estimated a maximum residue level of 4 mg/kg, an STMR of 2.5 mg/kg and an HR of 3.2 mg/kg.

The Meeting also decided to estimate a maximum residue for chilli pepper (dried) of 30 mg/kg following application of a default dehydration factor of 7 to the estimated maximum residue level of 4 mg/kg for chilli pepper (7 × 4 = 28 mg/kg). The STMR for residues of fenamidone in chilli peppers (dry) is estimated to be 18 mg/kg (7 × 2.5 = 17.5 mg/kg).

Leafy vegetables

The use of fenamidone in leafy vegetables in the USA is 3 × 0.3 kg ai/ha and a PHI of 2 days and the Meeting looked at the possibility to establish a group MRL. However, the Meeting recognized that the ARfD of 1 mg/kg bw was exceeded for the single commodities, if the highest residue of 32.7 mg/kg (mustard greens) is used as HR and concluded that a group MRL cannot be recommended.

Nine outdoor US trials on head lettuce according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied. The fenamidone residues, as well as the total residues, were: 0.82, 2.3, 3.3, 3.3, 3.7, 3.9, 4.4, 8.0 and 11 mg/kg. The Meeting recognized that one single sample gave higher residues than the HR based on the mean and decided to use this value of 12 mg/kg as HR for the short-term dietary intake assessment instead. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 20 mg/kg, an STMR of 4.9 mg/kg and an HR of 13.5 mg/kg for fenamidone residues in head lettuce.

Nine outdoor US trials on leaf lettuce according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied. The fenamidone residues were 1.0, 2.6, 3.4, 3.4, 6.5, 7.9, 10, 12 and 16 mg/kg. The corresponding total residues were 1.0, 2.6, 3.4, 3.4, 6.5, 8.0, 10, 12 and 16 mg/kg (residue of one duplicate field sample 17.5 mg/kg).

The Meeting noted that the ARfD of 1 mg/kg bw is exceeded for leaf lettuce by the IESTI for children (110% of ARfD) using 17.5 mg/kg as HR and decided that the US dataset is not appropriate to estimate a maximum residue level for leaf lettuce.

Alternative GAP exist for outdoor use in Switzerland with 3 × 0.15 kg ai/ha with a PHI of 14 days. Nine trials on leaf lettuce conducted in Europe were submitted. The fenamidone residues in outdoor leaf lettuce at a PHI of 14 days were < 0.02 (3), 0.02, 0.04, 0.06, 0.07, 0.42 and 0.48 mg/kg. The corresponding total residues were < 0.02 (3), 0.02, 0.04, 0.06, 0.07, 0.43 and 0.48 mg/kg.

Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 0.9 mg/kg, an STMR of 1.24 mg/kg and an HR of 1.98 mg/kg for fenamidone residues in leaf lettuce.

Eight outdoor US trials on mustard greens and six on spinach according to the US GAP were provided. At each outdoor trial, four spray treatments of about 0.3 kg ai/ha were applied.

In mustard greens, the fenamidone residues were 11, 12, 13, 17, 24, 28, 28 and 29 mg/kg. The corresponding total residues were 11, 12, 13, 17, 24, 28, 29 and 29 mg/kg (residue of one duplicate field sample 32.7 mg/kg). In spinach, the fenamidone residues were 7.2, 7.3, 11, 21, 23 and 31 mg/kg. The corresponding total residues were 7.2, 7.4, 11, 21, 23 and 31 mg/kg (residue of one duplicate field sample 32.4 mg/kg).

The similar datasets of mustard greens and spinach were combined for mutual support. The rank order of the combined fenamidone residues in spinach and mustard greens were (n = 14) 7.2, 7.3, 11, 11, 12, 13, 17, 21, 23, 24, 28, 28, 29 and 31 mg/kg. The corresponding total residues were 7.2, 7.4, 11, 11, 12, 13, 17, 21, 23, 24, 28, 29, 29 and 31 mg/kg. The Meeting recognized that one duplicate field sample gave higher residues than the HR based on the mean residues and decided to use this value of 32.7 mg/kg as HR for the short-term dietary intake assessment instead. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

For spinach and mustard greens, the IESTI represented 150% and 170% for children, respectively of the ARfD of 1 mg/kg bw. The Meeting noted that an alternative GAP was not available.

The Meeting estimated a maximum residue level of 60 mg/kg, an STMR of 20 mg/kg and an HR of 34 mg/kg for fenamidone residues in spinach and mustard greens.

Legume vegetables

In the USA and in Canada, fenamidone may be used as foliar spray on succulent beans with 3 × 0.3 kg ai/ha and a PHI of 3 days. Field trials using 4×0.3 kg ai/ha were carried out in the USA for lima beans (8) and seven trials on common beans (7).

In mature succulent lima beans, the fenamidone residues as well as the total residues were in seeds without pods (n = 8) < 0.02 (4), 0.03, 0.04, 0.08 and 0.08 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated for fenamidone residues in beans, shelled a maximum residue level, an STMR and an HR of 0.15 mg/kg, 1.2 mg/kg and 1.58 mg/kg, respectively.

In common beans, the fenamidone residues as well as the total residues were in pods with seeds (n = 7) 0.10, 0.11, 0.16, 0.19, 0.23, 0.34 and 0.46 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated for fenamidone residues in beans, except broad bean and soya bean (green pods and immature seeds) a maximum residue level, an STMR and an HR of 0.8 mg/kg, 1.39 mg/kg and 1.96 mg/kg, respectively.

Root and tuber vegetables

Fenamidone is registered in the USA on the one hand for carrots, ginseng and potatoes and on the other hand for other root and tuber vegetables (garden beet, celeriac, horseradish, parsnips, parsley root, radish, salsify, swedes and turnips) except sugar beet with 3×0.3 kg ai/ha and a PHI of 14 days. Residue data were submitted for the use of fenamidone on carrots, potatoes and ginseng, dry.

Field trials (13) on carrots using approximately 4×0.3 kg ai/ha were carried out in the USA and in Canada. The fenamidone as well as the total residues were (n = 13): 0.02, 0.03, 0.03, 0.03, 0.03, 0.04, 0.05, 0.05, 0.06, 0.06, 0.07, 0.09 and 0.11 mg/kg. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to estimate the STMR and 0.5 mg/kg the HR.

The Meeting estimated a maximum residue level, an STMR and an HR of 0.2 mg/kg, 0.45 mg/kg and 0.61 mg/kg respectively, for carrots.

Field trials (19) on potatoes using approximately 4 × 0.3 kg ai/ha were carried out in the USA and in Canada. The fenamidone as well as the total residues were < 0.02 (19) mg/kg. Furthermore, the contribution in follow-on crops of 0.4 mg/kg has to be added to estimate the STMR and 0.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 0.02* mg/kg for fenamidone residues in potatoes. Taking into account the uptake of RPA 412363 from the soil by rooting vegetables grown as follow-on crops, the Meeting estimated an STMR of 0.4 mg/kg and an HR of 0.5 mg/kg for fenamidone residues in potatoes.

Six supervised trials on ginseng were carried out in 2007 in the USA and Canada. Only one trial was carried according to GAP with 3 × 0.3–0.31 kg ai/ha. At five trials, nine applications with application rates in the range of 0.29–0.32 kg ai/ha were performed at intervals of 7–15 days between each foliar spray. Samples were prepared by washing the roots with water after harvest followed by drying on racks in drying chambers for 14 days at 18–46 °C. The following residue data were received:

- After a treatment with 3 × 0.3–0.31 kg ai/ha, the residue of fenamidone as well as the total residue was 0.06 mg/kg.
- After treatment with 9 × 0.29–0.32 kg ai/ha, the fenamidone residues were 0.03, 0.10, 0.17, 0.29 and 0.35 mg/kg. The corresponding total residues were 0.03, 0.10, 0.17, 0.31 and 0.37 mg/kg and the highest single value from a duplicate field sample was 0.55 mg/kg.

The Meeting noted that only one of the six trials matched the GAP and concluded that the data submitted are insufficient to estimate a separate maximum residue level for ginseng.

Stalk and stem vegetables

Fenamidone is registered in the USA for celery with 3 × 0.3 kg ai/ha and a PHI of 2 days. Six supervised trials on celery were carried out during 2003 in the USA. At each trial, fenamidone was applied by foliar spray at rates of about 0.3 kg ai/ha four times at intervals of 4–6 days. In untrimmed plants without roots, the residues of fenamidone as well as the total residues were at a 2-days PHI (n = 6) 2.3, 4.4, 4.5, 8.8, 15 and 18 mg/kg. In trimmed stalks, the residues were (n = 5) 0.06, 0.32, 1.1, 1.2 and 1.7 mg/kg. Furthermore, the contribution in follow-on crops of 1.2 mg/kg has to be added to estimate the STMR and 1.5 mg/kg the HR.

The Meeting estimated a maximum residue level of 40 mg/kg, an STMR of 2.3 mg/kg and an HR of 3.2 mg/kg for fenamidone residues in celery.

The GAP for Witloof chicory in Belgium is one dip treatment of 0.006 kg ai/hL followed by an irrigation treatment with 0.6 g ai/hL and a PHI of 18 days.

All in all, nine European indoor residue trials were submitted. In 2004 four hydroponic residue trials were conducted in Belgium, France and the Netherlands consisting of one application through the irrigation water system at a maximum rate of 0.6 g ai/hL of fenamidone and a water volume of 40 L/m^2, at the commencement of forcing. The fenamidone residues as well as total residues in sprouts at PHIs of 20/21 days were < 0.01 mg/kg (4).

In 2008 and 2010 five residue trials were conducted in France, Germany and the Netherlands. These trials were treated twice, one dip application for two minutes in a solution containing 6.0 g ai/hL, immediately after field sampling of the roots. After storage of the roots in a cold room for 3–8 months, a second hydroponic application was made at the commencement of forcing in the irrigation water system at a maximum rate of 0.6 g ai/hL. Sprout samples were taken on day 20/21 after the second application. The fenamidone residues as well as total residues in sprouts at PHIs of 20/21 days were < 0.01 mg/kg (5).

The Meeting estimated a maximum residue level of 0.01* mg/kg, an STMR of 0.01 mg/kg and an HR of 0.01 mg/kg for fenamidone residues in Witloof chicory.

Oilseed

Fenamidone is registered in the USA for cotton as in-furrow treatment with 1 × 0.3 kg ai/ha.

Twelve trials were conducted on cotton in the USA during 2003. In each trial, cotton plants were treated at-planting with a single in-furrow over-the-seed application at a rate of 0.3 kg ai/ha. Samples of mature cotton seed were harvested 127–190 days post treatment. The residues of fenamidone as well as the total residues were in seed < 0.02 mg/kg (12).

The Meeting estimated a maximum residue level of 0.02* mg/kg and an STMR of 0.02 mg/kg for fenamidone residues in cotton seed.

The GAP for the use of fenamidone in the USA for sunflower is seed treatment with 0.19 kg/100 kg seed. Nine trials on sunflower were conducted in 2009 in the USA. In each trial, one plot was planted with sunflower seeds treated with fenamidone at a rate of 0.19 kg ai per 100 kg seed. Two trials included an additional plot planted with seed treated at an exaggerated rate of 0.95 kg ai per 100 kg seed. Samples of mature sunflower seed were harvested 104–146 days after sowing of the treated seed. The residues of fenamidone as well as the total residues were in seed < 0.02 mg/kg (9).

The Meeting estimated a maximum residue level of 0.02* mg/kg and an STMR of zero for fenamidone residues in sunflower seed.

Legume animal feed

In the USA and Canada, fenamidone may be used as foliar spray on succulent beans with 3 × 0.3 kg ai/ha and a PHI of 3 days. Seven field trials with 4 × 0.3 kg ai/ha were carried out in the USA on common beans. The fenamidone residues were in plants with pods at a PHI of 3 days 2.3, 4.1, 5.6, 7.6, 10, 11 and 16 mg/kg (fresh weight).

For the calculation of the livestock animal dietary burden, the Meeting estimated a median residue of 7.6 mg/kg and a highest residue of 16 mg/kg bean forage (green).

Cotton fodder, dry

Fenamidone is registered in the USA for cotton as in-furrow treatment with 1 × 0.3 kg ai/ha. Trials were conducted on cotton in the USA during 2003. In each trial, cotton plants were treated at-planting with a single in-furrow over-the-seed application at a rate of 0.3 kg ai/ha. The harvest was 127–178 days post treatment. The residues of fenamidone as well as the total residues were in cotton gin by-products < 0.02 mg/kg (6).

For the calculation of the livestock animal dietary burden, the Meeting estimated 0.02 mg/kg as median residue and highest residue for cotton fodder, dry.

Fate of residues during processing

Nature of residues

To estimate the degradation behaviour of [C-phenyl-U-^{14}C]-fenamidone during industrial processing or household preparation, the processes of pasteurization (90 °C, 20 min at pH 4), baking, boiling, brewing (100 °C, 60 min at pH 5) and sterilization (120 °C, 20 min at pH 6) were simulated.

Degradation of fenamidone was limited and appeared to be dependent on the conditions. The largest extent of degradation was ca. 12% TAR under pasteurisation conditions. RPA 410193 was the only degradate under these conditions. The amounts of RPA 410193 decreased with increasing pH, to 2.5% TAR at pH 6. There was additional degradation to RPA 412708 up to 3.6% TAR at higher temperature (120 °C) and pH (6). This degradation path was not seen at the lower temperatures.

The Meeting concluded that, in addition to the parent fenamidone, the only metabolite to consider for processed products is RPA 410193.

Level of residues

The Meeting received information on the fate of fenamidone residues during the processing of raw agricultural commodities (RAC) like grapes to juice, must, wine and pomace and tomatoes into juice, paste, ketchup and canned tomatoes. Because the residues of RPA 410193 are of the same order of magnitude as the parent concentrations in processed products of grapes and tomatoes, the sum of parent and RPA 410193 is calculated as follows:

Fenamidone, mg/kg	RPA 410193, mg/kg	Total, mg/kg
< 0.02	< 0.02	< 0.04
< 0.02	0.076	0.10
0.05	< 0.02	0.07
0.53	0.13	0.67[a]

[a] 0.53 + (0.13 × 1.11) = 0.6743

Two processing studies were carried out on potatoes but were only of limited use because the residues in RAC were < LOQ. Five further studies conducted on cabbage, broccoli, peppers, mustard greens and spinach investigated the fate of fenamidone and RPA 410193 after washing and cooking. The processing factors were for washed vegetables 0.58 and for cooked vegetables 0.21.

The processing factors for the sum of fenamidone and RPA 410193 obtained in the processing studies and the estimated STMR-P values for dietary intake calculations are summarized below.

Raw agricultural commodity		Processed commodity (food)		
	STMR, mg/kg		Processing factor	STMR-P, mg/kg
Grapes	0.175	Juice	0.36 (median)	0.063
		Must	0.83 (median)	0.145
		Wine	0.71 (median)	0.124
Tomatoes	1.53	Juice	0.8 (median)	1.22
		Puree	2.1 (median)	3.21
		Ketchup	2.4 (single value)	3.67
		Paste	3.65 (mean)	5.58
		Canned fruits	0.45 (median)	0.69

In some tomato processed commodities, the residues increased during processing. For parent fenamidone, the processing factors were 2.55 for paste, 1.7 for puree and 1.6 for ketchup. Based on the recommended MRL of 1.5 mg/kg in fruiting vegetables other than cucurbits, the Meeting estimated maximum residue levels of 4 mg/kg for tomato paste and of 3 mg/kg for tomato puree as well as for ketchup.

The processing factors for parent fenamidone obtained in the processing studies and the median values of fenamidone residues in the RAC (parent only) were used to calculate the residues in the feed items grape pomace, tomato pomace and potato wet peel for animal dietary burden purposes.

Raw agricultural commodity		Processed commodity (feed)		
	Median (mg/kg)		Processing factor	STMR-P (mg/kg)
Grapes	0.15	Pomace, wet	2.0 (median)	0.3
Tomatoes	0.33	Pomace, wet	4.5 (median)	1.49
Potatoes	0.02	Wet peel	> 2.3 (single value)	0.046

The Meeting noted that fenamidone concentrated during processing in grape wet pomace, tomato wet pomace and potato wet peel. Because wet pomace and wet peel are not commodities in the international trade, no maximum residue levels are estimated.

Residues in animal commodities

Farm animal feeding studies

The Meeting received information on the residue levels arising in tissues and milk when three groups of dairy cows were fed with a diet containing 0.8, 2.4 and 8 ppm fenamidone for 35 consecutive days. At the highest dose group, no residues of fenamidone or the two major metabolites RPA 412636 and RPA 412708 were found in any of the tissue or milk fat samples higher than the LOD of 0.003 mg/kg, with the exception that in one milk fat sample, RPA 412708 was detected (0.011 mg/kg).

No poultry feeding study was submitted. In two metabolism studies laying hens were dosed at 13.8 ppm (C-phenyl label) and 9.8 ppm (N-phenyl label) fenamidone in the diet. The maximum residues (sum of fenamidone, RPA 412636 and RPA 412708) were 0.012 mg/kg in egg white, 0.05 mg/kg in egg yolk, 0.028 mg/kg in liver, 0.004 mg/kg in skin and < 0.001 mg/kg in fat.

Estimated dietary burdens of farm animals

Maximum and mean dietary burden calculations for fenamidone are based on the feed items evaluated for cattle and poultry as presented in Annex 6. The calculations were made according to the livestock diets from Australia, the EU, Japan and US-Canada in the OECD feeding table. Furthermore, the Meeting estimated the maximum highest dietary burden for the main metabolites in follow-on crops.

Parent fenamidone in primary commodities

The foliar application of fenamidone to grapes, tomatoes, cabbage, root and tuber vegetables, cotton and sunflower resulted in residues of fenamidone in the following feed items: wet grape pomace, wet tomato pomace, head cabbage, carrot culls, potato culls, potato process waste, turnip roots, swede roots, cassava/tapioca roots, cotton undelinted seed, sunflower seed and cotton fodder, dry. Residue data were also submitted for green bean forage (vines) what is listed as 60–70% of the Australian diet and for beef and dairy cattle and as 20% of the European diet for dairy cattle. Based on the named feed items, the calculated maximum animal dietary burden for dairy or beef cattle was in the USA and Canada 0.13 ppm, in the EU 10 ppm and in Australia 33 ppm. The Meeting noted that the estimated livestock dietary burden (AUS) was up to three times higher than the dose rate in the cow feeding study.

The Meeting recognized that green bean forage (vines) is not used as animal feed in the USA and in Canada but in the EU and in Australia. The Meeting was informed by an official communication of the government of Australia that no fodder crops are imported. Furthermore, the USDA Global Agricultural Trade System database indicates that no animal feed/fodder were exported from the USA to Australia and the EU in 2013. The Meeting concluded that green bean forage is not an exportable commodity and decided to make a refined calculation of the livestock dietary burden without the residues in bean vines (see Annex 6).

In the table below the estimated livestock dietary burden is presented for fenamidone after foliar treatment of plants.

	Livestock dietary burden, fenamidone, ppm of dry matter diet							
	US-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	0.15	0.15	1.0 [a]	0.52	1.0 [a]	0.97[b]	0	0
Dairy cattle	0.13	0.08	0.96	0.49	0.99	0.97	0	0
Poultry–broiler	0	0	0.09	0.04	0	0	0	0
Poultry–layer	0	0	0.27 [c]	0.12 [d]	0	0	0	0

[a] Suitable for MRL estimates for mammalian meat, fat, edible offal and milk.
[b] Suitable for STMR estimates for mammalian meat, edible offal and milk.
[c] Suitable for MRL estimates for eggs, meat, fat and edible offal of poultry.
[d] Suitable for STMR estimates for eggs, meat, fat and edible offal of poultry.

Metabolites in follow-on crops

Rotational crop studies showed that in the follow-on crops an uptake from the soil of the metabolites RPA 412708 and RPA 412636 occurred. Their highest concentrations found in follow-on crops as wheat, sweet corn, maize and soya beans after the treatment of bare soil with fenamidone at 1.2 kg ai/ha per annum were scaled according to the critical US GAP of 0.9 kg ai/ha per annum for brassica vegetables, fruiting vegetables, leafy vegetables, root and tuber vegetables and celery. These residues are extrapolated to similar feed items in the OECD feeding table.

The maximum livestock dietary burden for RPA 412708/RPA 412636 in follow-on crops in the USA and Canada was estimated as follows: Beef cattle 0.088 ppm (as RPA 41236), dairy cattle 0.36 ppm (as RPA 41236), poultry broiler 0 ppm and poultry layer 0 ppm. Expressed as fenamidone equivalents, the burden was for beef cattle 0.14 ppm and for dairy cattle 0.59 ppm.

The Meeting noted that RPA 412708 and RPA 412636 are not found in milk or tissues of dairy cows dosed at 8 ppm fenamidone through normal animal metabolism routes. Therefore, the two metabolites are unlikely to be present after direct administration of much lower levels (maximum livestock dietary burden 0.59 ppm).

The Meeting concluded that it is unlikely that residues of RPA 412708 and RPA 412636 in follow on crops of the uses considered by the JMPR result in residues in animal products.

Animal commodities, MRL estimation

The feeding study with fenamidone in dairy cows was performed at actual dose levels of 0.8, 2.4 and 8 ppm in the diet. At the highest dose group, no residues of fenamidone or of the two major metabolites RPA 412636 and RPA 412708 were found in any of the tissue or milk fat samples (< 0.003 mg/kg, LOD; LOQ 0.01 mg/kg), with the exception that in one milk fat sample RPA 412708 was detected (0.011 mg/kg). The overdosing factor is calculated as about 8 (8 ppm ÷ 1 ppm). Therefore, residues of fenamidone, RPA 412636 and RPA 412708 in cattle tissues and milk arising from a burden of 1 ppm are not expected.

The Meeting estimated maximum residue levels of 0.01* mg/kg for milks, meat from mammals, other than marine mammals (fat), mammalian fat (except milk fat) and edible offal (mammalian). For milk fat, a maximum residue level of 0.02 mg/kg was estimated. The STMRs for milk and milk fat were 0.01 mg/kg and the STMR/HR values for muscle, fat and edible offal were zero.

No poultry feeding study was submitted. In two metabolism studies, laying hens were dosed at 13.8 ppm (C-phenyl label) and 9.8 ppm (N-phenyl label) fenamidone in the diet. The maximum residues (sum of fenamidone, RPA 412636 and RPA 412708) were 0.012 mg/kg in egg white, 0.05 mg/kg in egg yolk and 0.028 mg/kg in liver.

Allowing for the dose rates in the metabolism studies (overdosing factors about 40–50), it can be seen that at the maximum calculated dietary burden for poultry of 0.27 ppm, no residues of fenamidone or any of its metabolites will be found in poultry commodities at or above the LOQ of 0.01 mg/kg.

The Meeting estimated maximum residue levels of 0.01* mg/kg poultry meat, poultry fat, poultry edible offal and eggs. The STMR/HR values for poultry meat, poultry fat, poultry edible offal and eggs are zero.

RECOMMENDATIONS

On the basis of the data from supervised trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits and for IEDI and IESTI assessment.

Definition of the residue for compliance with the MRL for plant and animal commodities: Fenamidone.

Definition of the residue for estimation of dietary intake for plant commodities: Sum of fenamidone, (S)-5-methyl-5-phenyl-3-(phenylamino)- 2,4-imidazolidine-dione (RPA 410193) plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.

Residue concentration Ctotal=Cfenamidone + C RPA 410193 + 10 × (CRPA 412636 + CRPA 412708)

Definition of the residue for estimation of dietary intake for animal commodities: Fenamidone plus 10 × the sum of both (S)-5-methyl-5-phenyl-2,4-imidazolidine-dione (RPA 412636) and (5S)-5-methyl-2-(methylthio)-5-phenyl-3,5-dihydro- 4H-imidazol-4-one (RPA 412708), all calculated as fenamidone.

Residue concentration Ctotal=Cfenamidone + 10 × (CRPA 412636 + CRPA 412708)

The residue is fat-soluble.

MRL recommendations and dietary intake

	Commodity	MRL, mg/kg	STMR or STMR-P	HR or HR-P
CCN	Name	Proposed	mg/kg	mg/kg
VP 0061	Beans, except broad bean and soya bean (green pods and immature seeds)	0.8	1.39	1.96
VP 0062	Beans, shelled	0.15	1.2	1.58
VB 0041	Cabbages, Head	0.9	1.23	1.69
VR 0577	Carrots	0.2	0.45	0.61
VS 0624	Celery	40	2.3	3.2
SO 0691	Cotton seed	0.02*	0.02	
MO 0105	Edible offal (mammalian)	0.01*	0	0
PE 0112	Eggs	0.01*	0	0
VB 0042	Flowerhead brassicas	4	2.29	4.2
VC 0045	Fruiting vegetables, Cucurbits	0.2	1.29	1.63
VO 0050	Fruiting vegetables, other than cucurbits (except chilli pepper, sweet corn and mushrooms)	1.5	1.53	2.32
VA 0381	Garlic	0.15	0.42	0.63
FB 0269	Grapes	0.6	0.175	0.42
JF 0269	Grape juice		0.063	
	Grape must		0.145	
	Grape wine		0.124	
VA 0384	Leek	0.3	0.46	0.63
VL 00482	Lettuce, Head	20	4.9	13.5
VL 00483	Lettuce, Leaf	0.9	1.24	1.98
MF 0100	Mammalian fats (except milk fat)	0.01*	0	0
MM 0095	Meat (from mammals other than marine mammals)	0.01* (fat)	0	0
FM 0183	Milk fats	0.02	0.01	0.01
ML 0106	Milks	0.01*	0.01	0.01
VL 0485	Mustard greens [a]	60	20	34
VA 0385	Onion, Bulb	0.15	0.42	0.63
VA 0287	Onion, Welsh	3	1.05	1.7
VO 0444	Peppers, Chilli	4	2.5	3.2
HS 0444	Peppers, Chilli, dried	30	18	
VR 0589	Potato	0.02*	0.4	0.5
PM 0110	Poultry meat	0.01* (fat)	0	0
PO 0110	Poultry, Edible offal of	0.01*	0	0
PF 0111	Poultry fats	0.01*	0	0
VA 0388	Shallot	0.15	0.42	0.63
VL 0502	Spinach [a]	60	20	34
VA 0389	Spring onion	3	1.05	1.7
FB 0275	Strawberry	0.04	0.02	0.04

	Commodity	MRL, mg/kg	STMR or STMR-P	HR or HR-P
CCN	Name	Proposed	mg/kg	mg/kg
SO 0702	Sunflower seed	0.02*	0	
	Tomato ketchup	3	3.67	
	Tomato paste	4	5.58	
	Tomato puree	3	3.21	
	Tomato canned fruits		0.69	
JF 0448	Tomato juice		1.22	
VS 0469	Witloof chicory (sprouts)	0.01*	0.01	0.01

[a] ARfD exceeded

Additional values to calculate the dietary intake

CCN	Commodity name	STMR or STMR-P, mg/kg	HR or HR-P, mg/kg
VB 0040	Brassica vegetables, except cabbage head and flowerhead brassicas	1.2	1.5
VA0035	Bulb vegetables, except bulb onion, garlic, shallot, spring onion, welsh onion	0.4	0.5
GC 0080	Cereal grains, except rice	0.33	
	Herbs	1.2	1.5
	Leafy vegetables, except lettuce, spinach, mustard greens	1.2	1.5
	Legume vegetables, except beans, shelled and beans (green pods and immature seeds)	1.2	1.5
	Radish leaves, turnip greens, taro leaves, rape greens	0.4	0.5
VR 0075	Root and tuber vegetables, except carrots and potatoes	0.4	0.5
	Stalk and stem vegetables, except celery, Witloof chicory	1.2	1.5

Additional values used to calculate the livestock animal dietary burden

CCN	Commodity name	STMR or STMR-P, mg/kg	HR or HR-P, mg/kg
AL 1030	Bean forage (green)	7.6	16
VB 0041	Cabbages, Head, with wrapper leaves	0.22	0.52
VR 0577	Carrots	0.05	0.11
AM 0691	Cotton fodder, dry	0.02	0.02
	Grape pomace, wet	0.3	
	Potato wet peel	0.046	
	Tomato pomace, wet	1.49	

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Dietary Intakes (IEDIs) of fenamidone were calculated for the 17 GEMS/Food cluster diets using STMRs and STMR-Ps estimated by the current Meeting (Annex 3). The ADI is 0–0.03 mg/kg bw and the calculated IEDIs were 10–60% of the maximum ADI. The Meeting concluded that the long-term intake of residues of fenamidone resulting from the uses considered by the current JMPR is unlikely to present a public health concern.

Short-term intake

The International Estimated Short Term Intake (IESTI) for fenamidone was calculated for food commodities and their processed fractions for which maximum residue levels were estimated and for which consumption data were available. The results are shown in Annex 4.

The Meeting recognized that for leaf lettuce the IESTI calculated according to the maximum GAP exceeded the ARfD of 1 mg/kg bw and used an alternative GAP. For spinach and mustard

greens, the IESTI represented 150% and 170%, respectively of the ARfD of 1 mg/kg bw. The Meeting noted that an alternative GAP was not available. For the other commodities considered by the JMPR, the IESTI represented 0–30% of the ARfD. The Meeting concluded that the short-term intake of residues of fenamidone, when used in ways that have been considered by the JMPR, is unlikely to present a public health concern (except mustard greens and spinach).

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