FLUSILAZOLE (165)

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EXPLANATION

Flusilazole was listed for the Periodic Re-Evaluation Program at the 38th Session of the CCPR for periodic review for toxicology and residues by the 2007 JMPR. Flusilazole was previously evaluated by the JMPR for residues in 1989, 1990, 1991 and 1993. Toxicology was reviewed in 1989 and 1995, an ADI of 0-0.001 mg/kg bw was established in 1989 and confirmed in 1995.

The manufacturer submitted information on physical and chemical properties, plant and animal metabolism (), environmental fate, analytical methods, storage stability, use pattern, supervised field trials, fate of residues during processing, farm animal feeding studies, and national maximum residue limits. The supervised trial information included data on pome fruit (apples and pears), stone fruit (apricots, nectarines, and peaches), grapes, bananas, cucumbers, sweet corn, soybeans, sugar beet, cereal grains (barley, rye, wheat, rice and maize) and oilseeds (rape seed and sunflower seed).

IDENTITY

ISO common name: flusilazole

Chemical name:

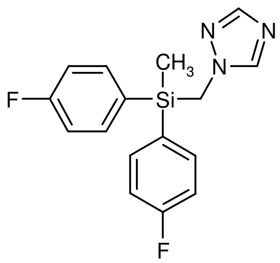
IUPAC: bis(4-fluorophenyl)(methyl)(1H-1,2,4-triazol-l-ylmethyl)silane

CA: 1-[[bis(4-fluorophenyl)methyl)silyl]methyl]-1*H*-1,2,4-triazole

CAS No.: 85509-19-9

Synonyms: DPX-H6573
IN-H6573

Structural formula:



Molecular formula: $C_{16}H_{15}F_2N_3Si$

Molecular weight: 315.4 g/mol

PHYSICAL AND CHEMICAL PROPERTIES

Property	Description or result	Reference
Physical state	Crystalline solid	Powley, C.R., 1988 DuPont Report No. H6573.B
Colour	White	Powley, C.R., 1988 DuPont Report No. H6573.B
Odour	None	Powley, C.R., 1988 DuPont Report No. H6573.B
Melting point	53.2 ± 0.06 °C	Reynolds, O., 1999 DuPont Report No. DuPont-2664
Density	1.312 ± 0.002 g/cm^3 (relative density)	Reynolds, O., 1999

Property	Description or result	Reference
		DuPont Report No. DuPont-2665
pH	5.9 (slurry in water)	Powley, C.R., 1988 DuPont Report No. H6573.B
Vapour pressure	2.9×10^{-7} mm Hg (at 25 °C)	Barefoot, A.C, and Troup-Mayforth, M.A., 1988. DuPont Report No. AMR 1201-88
Henry's law constant	2.7×10^{-4} Pa-m^3 mol^{-1} (25 °C)	Barefoot, A.C, and Troup-Mayforth, M.A., 1988. DuPont Report No. AMR 1201-88
Octanol-water partition coefficient	log K_{ow} = 3.81 at 20 °C pH 5 log K_{ow} = 3.87 at 20 °C pH 7 log K_{ow} = 3.81 at 20 °C pH 9	Reynolds, O., 1999 DuPont Report No. Dupont-2663
Solubility in water	40.2 ± 0.99 mg/L at 20 °C in de-ionized water	Reynolds, O., 1999 DuPont Report No. Dupont-2666
Solubility in organic solvents	6.713 g/L at 20 °C in n-heptane > 250 g/L at 20 °C in acetone, ethyl acetate, methylene chloride, 1-octanol, toluene, and *o*-xylene	Craig, W.B and Clipston, A.S. 2005. DuPont Report No. DuPont-16267
Hydrolysis	Stable at 25 °C at pH 5, 7, and 9	Cadwgan, G. E., 1983 DuPont Report No. AMR-159-83
Photolysis	Photodegradation not detected	Carter, L., 1984. DuPont Report No. AMR-393-85 RV 1; Leach, D.C., 1988. DuPont Report No. AMR-1236-88
Dissociation constant	2.5 ± 0.09	Powley, C.R., 1988 DuPont Report No. H6573.B
Stability	Stable at normal and elevated temperatures (54 °C), stable to iron and aluminium at ambient temperature, and stable to iron (II) acetate and aluminium acetate at ambient temperatures for a period of two weeks.	Hahn, J.A., 2005. DuPont Report No. DuPont-16534
Flammability	Non-flammable	Gravell, R.L., 1999. DuPont Report No. AMR 3338-95
Auto-flammability	Flusilazole melts below 140 °C oven temperature required to perform this test.	Gravell, R.L., 1999. DuPont Report No. AMR 3338-95
Explosive properties	Not sensitive to thermal or impact stimuli	Gravell, R.L., 1999. DuPont Report No. AMR 3338-95
Oxidising/reducing properties	Not an oxidizer	Gravell, R.L., 1999. DuPont Report No. AMR 3338-95
Spectral data	MS (EI) Characteristic *m/z*: 315 (M^+), 233 (base peak), 300, 220	Schmuckler, M.E., 1999. DuPont Report No. Dupont-2352
	^{1}H-NMR (in d6-acetone) Chemical shift (ppm): 0.74 (singlet), 4.45 (singlet), 7.16 (multiplet), 7.64 (multiplet), 7.75 (singlet), 8.11 (singlet)	Schmuckler, M.E., 1999. DuPont Report No. Dupont-2352

Property	Description or result	Reference
	IR (Br pellet) Absorption bands (cm^{-1}): 3129, 3021, 2962, 1587, 1501, 1165, 827, 771	Schmuckler, M.E., 1999. DuPont Report No. Dupont-2352
	UV/VIS Absorption maximum (λ_{max}): 206 nm (pH 7); 202 nm (pH < 2 and pH > 10) Molar extinction coefficient (ε, L/mol.cm): 21200 (log ε = 4.33) in acidic solution (pH < 2), 20900 log ε = 4.32) in neutral solution (pH 7), 21600 log ε = 4.33) in basic solution (pH > 10)	Perkins, D.L., 1999. DuPont Report No. DuPont-2266
Minimum purity	92.5% (technical material)	Not provided
Main impurities	Data not provided	

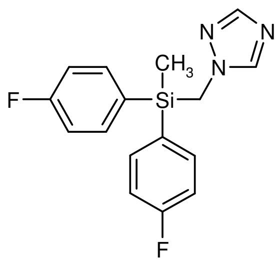
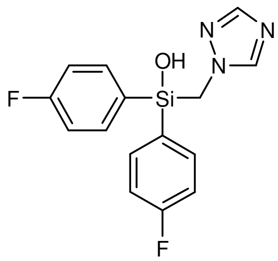
FORMULATIONS

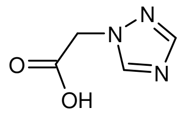
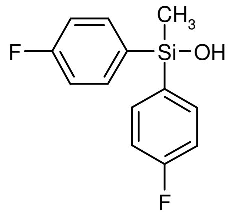
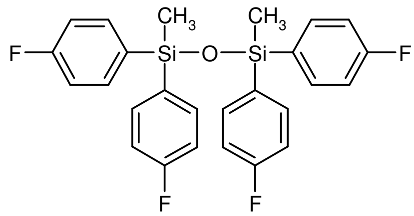
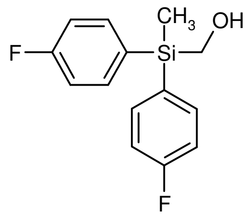
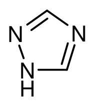
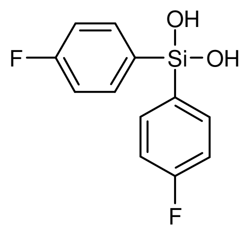
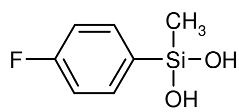
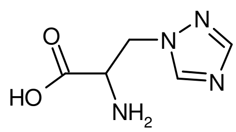
The formulations of flusilazole include EC (emulsifiable concentrate), EW (emulsion, oil in water), SC (suspension concentrate), SE (suspo-emulsion), TC (technical material), WG (water dispersible) and WP (wettable powder).

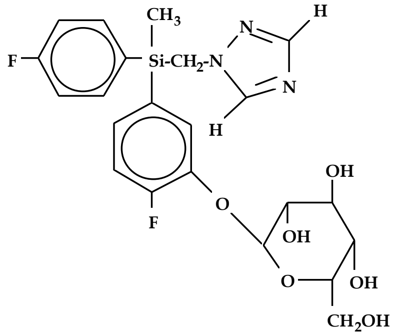
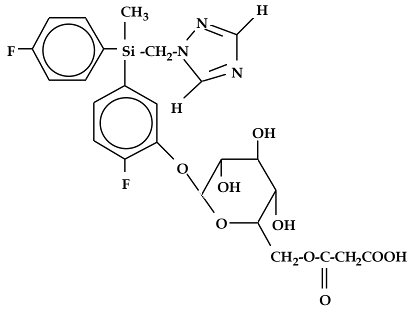
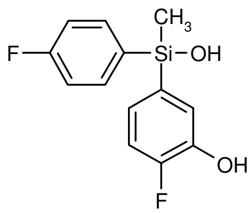
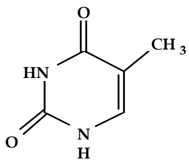
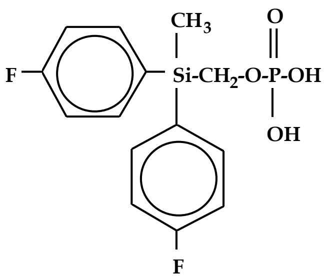
METABOLISM AND ENVIRONMENTAL FATE

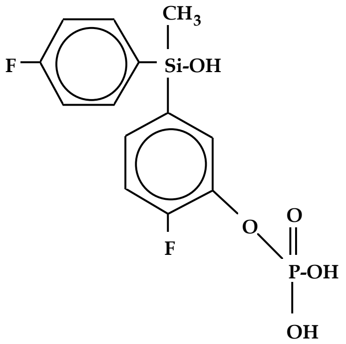
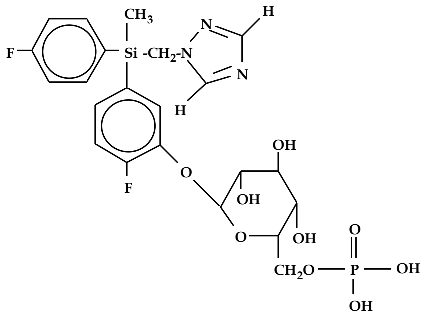
Table 1 below shows compounds (including their CAS name, manufacturer code number, structure, molecular formula, molecular weight, and CAS number if available) found in flusilazole metabolism and/or environmental fate studies.

Table 1. Flusilazole and its metabolites/degradation products observed in metabolism and/or environmental fate studies

Code number	CAS name (CAS no.) Structural formula Molecular weight (g/mol)	Structure	Observed in:
Flusilazole DPX-H6573	1[[Bis(4-fluorophenyl)methylsilyl] methyl]-1H-1,2,4-triazole (85509-19-9) $C_{16}H_{15}F_2N_3Si$ 315.4		
IN-A7634	Bis(4-fluorophenyl) (1H-1,2,4-triazol-1-yl)silanol $C_{15}H_{13}F_2N_3OSi$ 317.4		grapes

Code number	CAS name (CAS no.) Structural formula Molecular weight (g/mol)	Structure	Observed in:
IN-D8722	1H-1,2,4-triazole-1-acetic acid $C_4H_5N_3O_2$ 127.1		wheat
IN-F7321	[Bis(4-fluorophenyl)methyl] silanol $C_{13}H_{12}F_2OSi$ 250.3		rats goat hens apples wheat grapes soil
IN-G7072	1,3-Dimethyl-1,1,3,3-tetrakis(4-fluorophenyl) disiloxane $C_{26}H_{22}F_4OSi_2$ 482.6		rats goat wheat sugar beet
IN-H7169	[Bis(4-fluorophenyl)methylsilyl] methanol $C_{14}H_{14}F_2OSi$ 264.3		rats goat hens apples grapes
IN-H9933	1H-1,2,4-Triazole (288-88-0) $C_2H_3N_3$ 69.1		rats goat hens
IN-T7866	Bis(4-fluorophenyl)silanediol $C_{12}H_{10}F_2O_2Si$ 252.3		grapes
IN-V5771	[(4-Fluorophenyl)methyl]silanediol $C_7H_9FO_2Si$ 172.2		hens apples grapes
IN-V9462	3-(1H-1,2,4-triazol-1-yl)alanine (86362-20-1) $C_5H_8N_4O_2$ 156.1		apples wheat grapes

Code number	CAS name (CAS no.) Structural formula Molecular weight (g/mol)	Structure	Observed in:
IN-3733	[2-Fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazole-1-ylmethyl) silyl]phenyl]-β-D-glucopyranoside $C_{22}H_{25}F_2N_3O_6Si$ 493.5		wheat
IN-37722	2-Fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazol-1-ylmethyl)silyl] phenol $C_{16}H_{15}F_2N_3OSi$ 331.4		wheat sugar beet
IN-37735	Mono[6-deoxy-2-0-[2-fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazol-1-ylmethyl) silyl]phenyl]-β-D-glucopyranos-6-yl] propanedioate $C_{25}H_{27}F_2N_3O_9Si$ 579.6		wheat
IN-37738	2-Fluoro-5-[(4-fluorophenyl) (hydroxy) (methyl) silyl] phenol $C_{13}H_{12}F_2O_2Si$ 266.3		hens wheat
Not available	5-Methyl-2,4(1H,3H)-pyrimidin $C_5H_6N_2O_2$ 126.1		hens
Not available	[Bis(4-fluorophenyl)methysilyl] methyl phosphate $C_{14}H_{15}F_2O_4PSi$ 344.32		hens

Code number	CAS name (CAS no.) Structural formula Molecular weight (g/mol)	Structure	Observed in:
Not available	2-Fluoro-5-[(4-fluorophenyl) (hydroxy) (methyl) silyl] phenyl phosphate $C_{13}H_{13}F_2O_5PSi$ 346.3		hens
Not available	[2-Fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazole-1-ylmethyl) silyl]phenyl]-β-D-glucopyranoside 6-phosphate $C_{22}H_{26}F_2N_3O_9PSi$ 573.5		hens

In metabolism studies, flusilazole was labelled with ^{14}C uniformly in the phenyl ring ([phenyl (U)-^{14}C]flusilazole) or at one site in the triazole ring ([triazole-3-^{14}C]flusilazole).

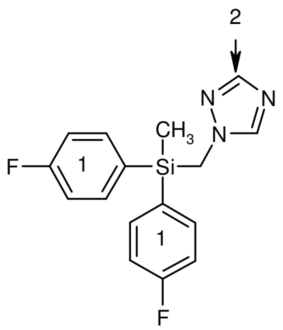


Figure 1. Positions of ^{14}C labels in (1) uniformly labelled flusilazole in the phenyl ring: [phenyl (U)-^{14}C]flusilazole and (2) flusilazole labelled in the triazole ring: [triazole-3-^{14}C]flusilazole

Animal metabolism

The Meeting received information on the fate of flusilazole administered orally to rats (Anderson *et al.*, 1986a), lactating goats (Anderson, 1984, 1986b) and laying hens (Lin, 1988a; Lin, 1988b; Lin, 1988c; Lin, 1988d; and Smyser, 1990).

Rats

The tissue residues and excretion of [phenyl (U)-^{14}C] flusilazole or [triazole-3-^{14}C]flusilazole were analyzed in groups of two male and two female rats after single oral doses at low levels (8 mg/kg) with and without preconditioning, and at the exaggerated levels of 200 or 224 mg/kg (single dose only). Each compound was dissolved in a mixture of corn oil/ethanol (9:1, v/v) prepared immediately before administration.

Flusilazole was rapidly excreted, such that after 48 h, 50 – 65% (phenyl-labelled) and more than 90% (triazole-labelled) of the administered compound was excreted. By 168 h, 78 – 96% of the dose was excreted by the rats dosed with phenyl-labelled flusilazole and 93 – 99% of the triazole label was excreted.

Flusilazole is extensively metabolized and excreted. A considerable proportion (2 – 10%) was found to be excreted from the GI tract unchanged. Eight metabolites were identified. In addition to unchanged flusilazole, the major metabolites identified in urine and faecal samples were IN-F7321, IN-H7169 and its glucuronide, IN-H9933 and IN-G7072.

It was demonstrated that the cleavage and rapid excretion of IN-H9933 (1H-1,2,4 triazole) was the primary step in the metabolism of flusilazole in rats. The silane molecule may then be excreted or further metabolized to non-polar fatty acid metabolites, β-D-gluco-pyranuronic acid conjugate and may in addition further degrade to more polar molecules.

Lactating goats

Two lactating goats weighing 43 – 46 kg received daily doses of ^{14}C-labelled flusilazole orally by gelatin capsule at a level equivalent to 50 mg/kg in their diet. One lactating goat was dosed daily for 6 consecutive days (phenyl label) and one goat was dosed for 5 consecutive days (triazole label) with 50 mg of ^{14}C-labelled flusilazole. The animals were sacrificed 10 h (phenyl) or 22 h (triazole) after the last dose. All milk, urine and faeces were collected daily during the experiment for characterization and quantitation of residues. Organ and tissue samples (blood, brain, liver, kidney, heart, pancreas, muscle and fat) were collected from both goats for analyses of ^{14}C-flusilazole and its metabolites. No volatile samples were taken in this study. The metabolites were identified by comparison with reference standards using TLC, HPLC or GC-MS analyses.

Table 2 shows recovery of radioactivity from lactating goats after dosing at the equivalent of 50 mg/kg in diet once per day for 5 – 6 consecutive days. The data indicate that bioaccumulation potential for flusilazole residues is low. The chief route of excretion was urinary, but a significant fraction was eliminated in the faeces. Urinary excretion represented 44.7 and 23.3% of the total administered dose for the phenyl- and triazole- dosed goats, respectively. Faecal excretion accounted for 8.1 and 12.8% of the total dose for the phenyl- and triazole-dosed goats, respectively. Total recovery of radioactivity at the time of sacrifice was approximately 61 and 40% for the phenyl and triazole labels, respectively. Radioactivity associated with the carcass and the GI tract contents was not assayed. The lack of material balance is attributed to unexcreted radioactivity associated with the GI tract (not analysed) and radioactivity associated with the carcass.

Total tissue burden accounted for 8.2 and 2.5% of the total administered dose from the phenyl and triazole labels, respectively. For the goat dosed with phenyl-labelled flusilazole, muscle contained 0.05 – 0.07% of the total dose (0.41 – 0.70 mg/kg parent equivalents); liver accounted for 5.3% (13.5 mg/kg); kidney had 1.2% of the dose (8.74 mg/kg); and fat contained 0.15 – 0.50% of the total administered dose (4.07 – 5.15 mg/kg). For the goat dosed with triazole-labelled flusilazole, muscle contained 0.10 – 0.15% of the total dose (0.52 – 0.53 mg/kg parent equivalents); liver accounted for 1.5% (3.54 mg/kg); kidney had 0.05% of the dose (0.75 mg/kg); and fat contained 0.01 – 0.07% of the total administered dose (0.15 – 0.94 mg/kg).

Table 2. Recovery of radioactivity from lactating goats after dosing at the equivalent of 50 mg/kg in diet once per day for 5 – 6 consecutive days

Tissue	Phenyl(U)-^{14}C		Triazole-3-^{14}C	
	mg/kg [a]	% Cumulative Dose	mg/kg [a]	% Cumulative Dose
Urine		44.7		23.3
Faeces		8.1		12.8
Milk	0.09-0.74[b]	0.34	0.36-0.74[b]	1.27
Liver	13.5	5.30	3.54	1.50
Kidney	8.74	1.2	0.75	0.05
Leg muscle	0.41	0.06	0.52	0.10
Loin muscle	0.70	0.07	0.53	0.15
Flank muscle	0.42	0.05	0.53	0.15
Back fat	4.07	0.42	0.94	0.07

Tissue	Phenyl(U)-^{14}C		Triazole-3-^{14}C	
	mg/kg [a]	% Cumulative Dose	mg/kg [a]	% Cumulative Dose
Omental fat	4.49	0.50	0.26	0.07
Renal fat	5.15	0.29	0.26	0.07
Peripheral fat	4.11	0.15	0.15	0.01
Blood	1.67	0.39	0.50	0.20
Total tissues		8.20[c]		2.48 [c]
Total recovery		61.34		39.85

a - Expressed as flusilazole equivalents.

b - Daily PM milking results.

c - Includes brain, heart, gall bladder, spleen and pancreas.

The transfer of radioactive residues to milk and tissues was low. Only 0.34 and 1.3% of the dose was present in milk for the phenyl and triazole labels, respectively. After 6 and 5 consecutive days of dosing, concentrations of total residues in milk were only 0.74 and 0.63 mg/kg (parent equivalents) for the phenyl- and triazole-dosed goats, respectively (see Table 3). Residue levels in milk reached a plateau 2 – 5 days after the initial dose, and did not continue to increase throughout the dosing period.

Flusilazole was well absorbed and extensively metabolized to more polar compounds, which were rapidly excreted. Urinary excretion was the major route of elimination; only trace amounts of unchanged flusilazole were present. Two major metabolites were detected in the urine from the goat dosed with the phenyl label: IN-F7321 (silanol) and IN-H7169 (and its glucuronide). In addition, trace amounts of disiloxane (IN-G7072), the condensation product of two molecules of IN-F7321, were also present in the urine. These two compounds were considered together in the analyses. Urine from the triazole-dosed goat showed only one metabolite, which was identified as 1H-1,2,4-triazole (IN-H9933).

The composition of the radioactivity after dosing for 5 – 6 consecutive days for tissues of interest is given in Table 4. Percentages of extractable label varied from 89 to > 99% of the total radioactivity in the tissue for the goat dosed with phenyl-labelled flusilazole, and 90 to 94% for the goat dosed with triazole-labelled flusilazole. Flusilazole was extensively metabolized. Except in the liver, unchanged flusilazole accounted for less than 10% of the tissue radioactivity.

Table 3. Recovery of radioactivity and composition of flusilazole and metabolites in milk of lactating goats during dosing at the equivalent of 50 mg/kg in diet once per day for 5 – 6 consecutive days

	Concentration of metabolites as %TRR in milk										
	[Phenyl(U-)^{14}C]flusilazole						[^{14}C-3-triazole]flusilazole				
Day	1	2	3	4	5	6	1	2	3	4	5
TRR[a]	0.11	0.09	0.09	0.27	0.74	0.74	0.36	0.66	0.74	0.74	0.63
Metabolite											
Flusilazole	30	28	30	13	17	13	1	< 1	< 1	< 1)	13
IN-F7321 and IN-G7072	63	63	62	58	34	53	ND	ND	ND	ND	ND
IN-H9933	ND	ND	ND	ND	ND	ND	99	> 99	> 99	> 99	87
Unidentified	< 1	< 1	< 1	< 1	32	6	ND	ND	ND	ND	ND
Polar	7	10	8	28	18	28	--	--	--	--	--

ND = not detected

a - TRR expressed as flusilazole equivalents in mg/kg.

Table 4. Composition of flusilazole and metabolites in tissues from lactating goats after dosing at the equivalent of 50 mg/kg in diet once per day for 5 – 6 consecutive days

	Concentration of metabolites as %TRR[a]									
	Milk [b]		Leg muscle		Liver		Kidney		Back fat	
	P[c]	T[d]	P[c]	T[d]	P[c]	T[d]	P[c]	T[d]	P[c]	T[d]
TRR[a]	0.74	0.74	0.41	0.52	13.5	3.54	8.74	0.75	4.07	0.94
Metabolite										
Flusilazole	13	13	5	< 1	12	76	< 1	< 1	9	< 1
IN-F7321 and IN-G7072	53	ND	23	ND	58	ND	74	ND	73	ND
IN-H9933	ND	87	ND	62	ND	14	ND	72	ND	53
Unidentified	6	ND	1	15	11	1	3	< 1	11	< 1
Polar	28	--	69	11	8	3	20	11	5	15
Not analyzed [e]	--	--	--	2	--	0	--	11	--	24
Total Unextracted	--	--	3	10	11	6	2	7	< 1	7

ND = not detected

a - TRR expressed as flusilazole equivalents in mg/kg.

b - Maximum TRR found in milk during 5-6 days of dosing; concentration of metabolites in milk given for the last day of dosing.

c - [Phenyl(U-)14C]flusilazole.

d - [14C-3-triazole]flusilazole.

e - Includes metabolites in hexane and methylene chloride extracts, which could not be analysed due to large amounts of lipids or low radioactivity.

As shown in Table 3, the percent of radiolabel in the milk accounted for as unchanged flusilazole varied between 13% and 30% for the goat dosed with phenyl-labelled flusilazole, and < 1% and 13% for the goat dosed with triazole-labelled flusilazole. At most, parent represented 0.02% or 0.03% of the administered dose in the milk of goats dosed with phenyl- or triazole-labelled flusilazole, respectively. In the latter, metabolite IN-H9933 (1H-1,2,4-triazole) accounted for 87% to > 99% of the TRR in milk, which represented 0.16 – 0.30% of the administered dose. Metabolites IN-F7321 (silanol) and IN-G7072 (disiloxane) together accounted for 34% to 63% of the TRR in milk from the goat dosed with phenyl-labelled flusilazole, which represented 0.02 – 0.05% of the administered dose. Polar material accounted for 7% to 28% of the radiolabel present in the milk of the goat dosed with phenyl-labelled flusilazole.

Laying hens

Flusilazole, labelled at either the phenyl group or at the triazole group, was administered at 0.36 or 18 mg/day, equivalent to 3 and 150 mg/kg in the diet (both labels). Hens from the low dose group were dosed for 14 days while those from the exaggerated dose group were dosed for 5 days. The hens did not display any visible adverse physiological changes or symptoms of toxicity. Flusilazole had no effect on behaviour, body weight, feed consumption, or egg production.

Approximately 6 h after the last dose, animals were sacrificed. Eggs and excreta were collected over the experimental period; edible tissues and blood were taken for analysis at sacrifice. Residues were determined in eggs, tissues, excreta and blood. Excreta from the hens fed the high (exaggerated) dose of flusilazole were used as the source for the purification and identification of several of the excreted metabolites.

Only the distribution and metabolite profile data for the low-dose groups are presented in detail since the high-dose groups were intended for metabolite isolation and identification. Comparisons between tissue levels and dose levels cannot be made between the 3 and 150 ppm residues levels since the dosing schedules differed (14 days for the 3-ppm group and 4 days for the 150 ppm group). Table 5 shows recovery of radioactivity from laying hens dosed at 3 mg/kg in their diet.

Table 5. Recovery of radioactivity from laying hens following dosing at 3 mg/kg in the diet

Tissue	Phenyl (U)-^{14}C		Triazole-3-^{14}C	
	mg/kg [a]	% Cumulative Dose	mg/kg [a]	% Cumulative Dose
Kidney	0.32	0.09	0.38	0.10
Liver	0.60	0.64	0.38	0.37
Thigh muscle	0.10	0.14	0.33	0.50
Breast muscle	0.07	0.14	0.35	0.77
Fat	0.52	0.37	0.07	0.06
Whole blood	0.11	0.05	0.39	0.15
Egg (at sacrifice)	0.22	1.6	0.26	2.5
Excreta		80.2		80
Total tissues		1.43		1.8
Total recovery		81.6		81.8

a - Expressed as flusilazole equivalents.

In the low-dose groups (both labels), approximately 80% of the total radioactivity was eliminated in the excreta. Elimination of radioactivity in the excreta became steady after 48 h. Residues in edible tissues were low, less than 1% of administered dose. Bioaccumulation potential for flusilazole residues is low.

In hens receiving phenyl-labelled flusilazole, highest residues were found in the liver (0.60 mg/kg flusilazole equivalents), followed by fat (0.52 mg/kg) and kidney (0.32 mg/kg). Residue levels in the muscle were the lowest. Residue levels in the hens dosed with triazole-labelled flusilazole were highest and essentially equal in whole blood (0.39 mg/kg), liver (0.38 mg/kg), kidney (0.38 mg/kg), and breast muscle (0.35 mg/kg) and much lower in fat (0.07 mg/kg). In both labelled groups, the combined residues in edible tissues (liver, kidney, muscle, and fat) represented less than 2.0% of the total dose.

In eggs from hens dosed at 3 mg/kg for 14 days, radioactivity reached a steady state after about 8 days at about 2% of the total radiolabel administered with a plateau residue level of approximately 0.2 mg flusilazole equivalents/kg (both labels).

The distribution of known metabolites and unidentified fractions in the tissue residues appears in Table 6. IN-V5771 (silanediol) was the main metabolite in liver, kidney and muscle of hens dosed with 3-ppm phenyl-labelled flusilazole. IN-F7321 (silanol) was the main residue in the fat and a major one in the liver. Phosphate conjugates with IN-H7169 and IN-37738 were found in liver and kidney.

Residues identified in the hens dosed with 3-ppm triazole-labelled flusilazole were IN-H9933 (triazole), thymine and flusilazole, with IN-H9933 being the major metabolite in all tissues. Triazole residues ranged from 0.057 mg triazole/kg in liver to undetectable levels in fat. Flusilazole levels ranged from 0.018 mg/kg in kidney to 0.049 mg/kg in fat. No flusilazole was detected in muscle.

Table 6. Metabolite distribution in tissues from laying hens after dosing at 3 mg/kg in the diet

	Concentration of metabolites in mg/kg flusilazole equivalents (%TRR)									
	Breast muscle		Thigh muscle		Liver		Kidney		Fat	
	P [b]	T [c]	P [b]	T [c]	P[b]	T [c]	P [b]	T [c]	P [b]	T [c]
Total residues [a]	0.07 (0.14)	0.35 (0.77)	0.10 (0.14)	0.33 (0.50)	0.60 (0.64)	0.38 (0.37)	0.32 (0.09)	0.38 (0.10)	0.52 (0.37)	0.07 (0.06)
Metabolite										
Flusilazole	< 0.003	< 0.003 (1)	< 0.003	< 0.003	0.010 (2)	0.020	0.004 (1)	0.018 (5)	0.040 (8)	0.049 (68)
IN-F7321	< 0.003	ND	0.005 (5)	ND	0.104 (17)	ND	0.042 (13)	ND	0.428 (82)	ND
IN-37738	< 0.003	ND	< 0.003	ND	0.016 (3)	ND	0.053 (17)	ND	< 0.003	ND
IN-H7169	< 0.003	ND	< 0.003	ND	< 0.003	ND	< 0.003	ND	0.019 (4)	ND
P5 [d]	< 0.003	ND	< 0.003	ND	0.051 (9)	ND	0.021 (7)	ND	< 0.003	ND

	Concentration of metabolites in mg/kg flusilazole equivalents (%TRR)									
	Breast muscle		Thigh muscle		Liver		Kidney		Fat	
	P [b]	T [c]	P [b]	T [c]	P[b]	T [c]	P [b]	T [c]	P [b]	T [c]
IN-H7169-phosphate conjugate	< 0.003	ND	< 0.003	ND	0.019 (3)	ND	0.027 (9)	ND	< 0.003	ND
IN-37738-phosphate conjugate	< 0.003	ND	< 0.003	ND	0.013 (2)	ND	0.030 (9)	ND	< 0.003	ND
IN-V5771	0.057 (88)	ND	0.073 (73)	ND	0.201 (33)	ND	0.093 (29)	ND	0.012 (2)	ND
P11 [d]	< 0.003 (3)	ND	0.003 (3)	ND	0.025 (4)	ND	0.020 (6)	ND	< 0.003	ND
IN-H9933	ND	0.291 (83)	ND	0.248 (75)	ND	0.290 (76)	ND	0.298 (79)	ND	0.010 (14)
Thymine	ND	0.020 (6)	ND	0.036 (11)	ND	0.029 (8)	ND	0.025 (7)	ND	< 0.003 (3)
Lipophilics [d]	< 0.003	ND	< 0.003	ND	0.027 (5)	ND	< 0.003 (1)	ND	0.011 (2)	ND
Other[d]	< 0.003 (2)	(2)	0.003 (3)	(3)	0.034 (6)	(6)	0.024 (8)	(9)	0.013 (2)	(15)
Total Extracted	(93.5)	(91.3)	(85.1)	(89.7)	(83.6)	(95.0)	(110.2)	(105.6)	(106.9)	(102.6)

ND = not detected

a - Expressed as flusilazole equivalents in mg/kg.

b -[Phenyl(U-)^{14}C]flusilazole.

c - [^{14}C-3-triazole]flusilazole.

d - Heterogeneous fractions.

Table 7 shows the composition of the residues at Days 8 and 12 in eggs from hens dosed with both labels. The two major metabolites in eggs from the phenyl label dosed hens were IN-F7321 and IN-V5771. The major metabolite in eggs from the triazole label dosed hens was 1H-1,2,4-triazole (IN-H9933), with much smaller amounts of thymine and unchanged flusilazole. At 12 days, triazole, thymine and flusilazole residues were 0.197, 0.023 and 0.006 mg flusilazole equivalents/kg, respectively. When calculated on a molar equivalent basis, the triazole and thymine residues were 0.043 and 0.009 mg/kg in the 12 day egg samples.

Table 7. Metabolite composition in from laying hens eggs on days 8 and 12 after dosing at 3 mg/kg in the diet

	Concentration of metabolites in mg/kg flusilazole equivalents (%TRR)			
	Day 8		Day 12	
	P [b]	T [c]	P [b]	T [c]
Total residues [a]	0.171	0.255	0.193	0.254
Metabolite				
Flusilazole	0.004 (2)	0.004 (1)	0.007 (4)	0.006 (2)
IN-F7321	0.063 (37)	ND	0.062 (32)	ND
IN-37738	0.007 (4)	ND	0.009	ND
IN-H7169	< 0.004 (1)	ND	< 0.004 (< 1)	ND
P5 [d]	0.008 (5)	ND	0.010 (5)	ND
IN-37738-phosphate conjugate	0.006 (4)	ND	0.005 (2)	ND
IN-V5771	0.058 (34)	ND	0.074 (38)	ND
P11 [d]	< 0.004 (2)	ND [e]	0.006 (3)	ND

	Concentration of metabolites in mg/kg flusilazole equivalents (%TRR)			
	Day 8		Day 12	
	P [b]	T [c]	P [b]	T [c]
Lipophilic [d]	0.018 (11)	ND	0.014 (7)	ND
IN-H9933	ND	0.233 (91)	ND	0.197 (77)
Thymine	ND	0.007 (3)	ND	0.023 (9)
Other	< 0.004 (1)	(5)	0.007 (3)	(2)
Total extracted	(101.1)	(101.1)	(100.7)	(106.7)

ND = not detected

a - Expressed as flusilazole equivalents in mg/kg.

b - [Phenyl(U-)14C]flusilazole.

c - [14C-3-triazole]flusilazole.

d - Heterogeneous fractions.

Proposed metabolic pathway in animals

In the rat, goat and hen, flusilazole was rapidly and extensively converted to polar metabolites and primarily excreted in the urine and faeces. Bioaccumulation potential is low. Levels of radioactive residues in milk and eggs plateaued within five and eight days, respectively. Exhaustive extraction techniques ensured that more than 89% of the radiolabelled livestock residues were characterized.

Residues in rats, goats and hens were similar. Generally unchanged flusilazole was present at levels lower than the metabolites. In goat liver and chicken fat of animals dosed with triazole-labelled flusilazole, flusilazole levels were higher than levels of the metabolite 1,2,4-triazole (IN-H9933), perhaps due to the polar nature of the triazole. Except in goat liver and chicken fat, 1,2,4-triazole was the major metabolite arising from triazole-labelled flusilazole. The silanol metabolite (IN-F7321) was also common to both. The main difference between the goat and hen studies was the occurrence of the silanediol (IN-V5771) as a major metabolite in hens. Other phenyl-labelled metabolites, resulting from hydroxylation and conjugation reactions, were present at relatively low levels in chicken tissues and eggs. The major metabolic pathways for flusilazole in rats are consistent with livestock. The major rat metabolites identified in urine and faecal samples were IN-F7321, IN-H7169 and its glucuronide, 1,2,4-triazole, IN-G7072 in addition to unchanged flusilazole. There was no apparent covalent binding to tissue macromolecules or preferential accumulation of flusilazole or its metabolites within any organ. The proposed metabolic pathway for flusilazole in animals is shown in Figure 2.

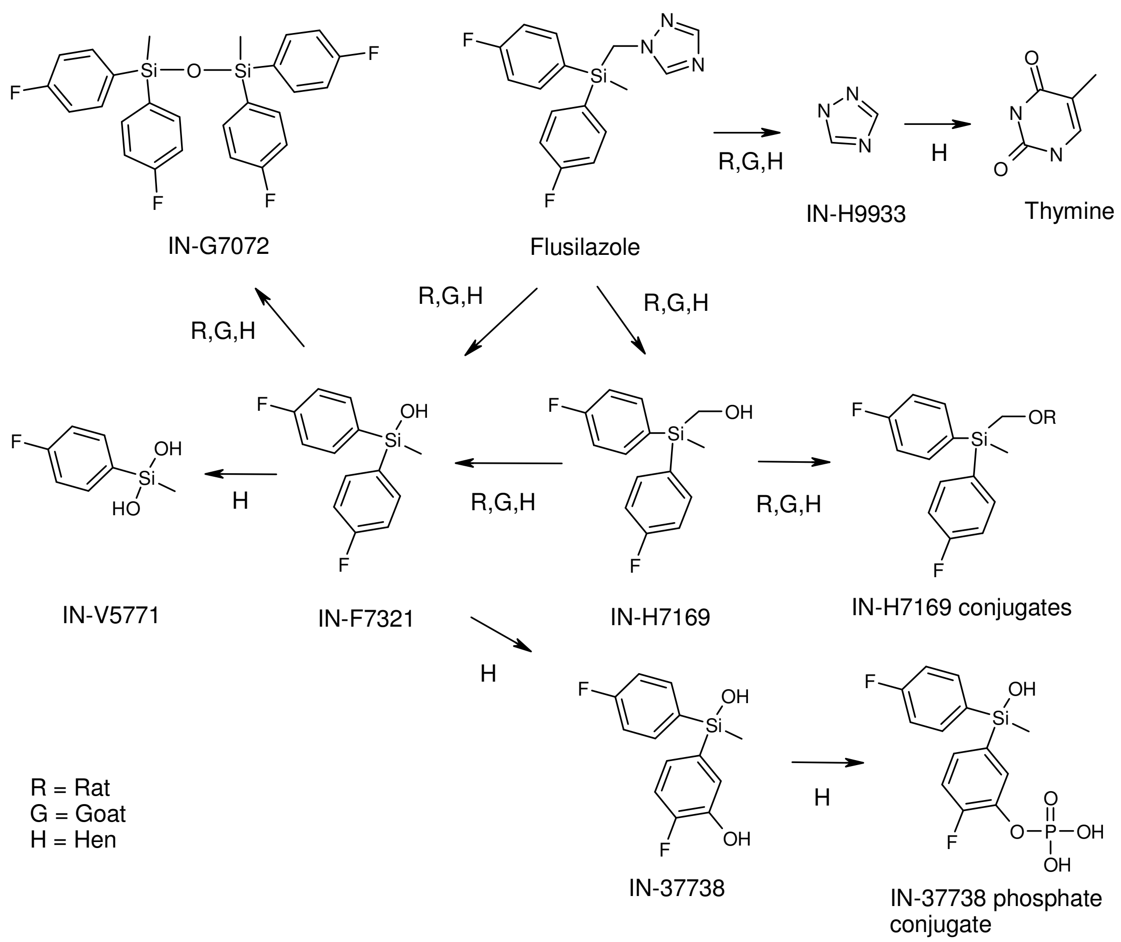


Figure 2. Proposed metabolic pathway of flusilazole in rats, goats, and hens

Plant metabolism

The Meeting received information on flusilazole metabolism studied in wheat (Leach, Carter, and Harvey, 1988), sugar beet (Smyser and Moghaddam, 1997), apples (Harvey *et al*, 1986), grapes (Carter and Monson, 1986a and b), bananas (McFetridge and Rhodes, 1987) and peanuts (Harvey, 1984). Wheat, bananas and sugar beet were greenhouse grown. Grapes, apples and peanuts were grown in the field. Crops were treated in a manner to simulate actual use conditions, mainly *via* direct foliar application. The metabolism of flusilazole in plants was studied using two types of radiolabelled flusilazole: [phenyl(U)-^{14}C]flusilazole and triazole-3-^{14}C]flusilazole.

Greenhouse studies

Wheat

The metabolic fate of [phenyl(U)-^{14}C]flusilazole and [triazole-3-^{14}C]flusilazole was studied in greenhouse-grown Era spring wheat following application (200 g ai/ha) of labelled fungicide to foliage (Leach, Carter and Harvey, 1988). The distribution of radiolabel between forage, straw and grain was evaluated. Plants were harvested 0, 5, 10 – 12, 20, and 52 – 77 (mature crop) days after treatment. Additional plants were treated with higher levels: 320 and 550 g ai/ha for phenyl; 500 g ai/ha for triazole label. Higher application rates were used to generate sufficient metabolites for purification.

In forage, residues (expressed as flusilazole) fell from initial values of 32.3 and 8.6 mg/kg for phenyl and triazole labels, respectively, to approximately 6 mg/kg by Days 5 to 12 (Table 8). Residues in straw were 8.6 and 7.9 mg/kg for phenyl and triazole labels, respectively. There were negligible radioactive residues (0.01 mg/kg) in the grain from phenyl-labelled wheat. In the triazole-labelled wheat, grain residues of 4.4 mg/kg flusilazole equivalents were comprised of triazolyl alanine (IN-V9462) and triazole acetic acid (IN-D8722).

Table 8. Total radioactive residues in wheat treated with phenyl- and triazole-labelled flusilazole

Treatment	Days After Treatment	Sample	mg flusilazole equivalents /kg
Phenyl(U)-^{14}C	0	Forage	32.3
	12	Forage	5.5
	77	Straw	8.6
	77	Chaff	2.2
	77	Grain	0.01
Triazole-3-^{14}C	0	Forage	8.6
	5	Forage	6.0
	10	Forage	6.2
	20	Forage	1.9
	52	Straw	7.9
	52	Chaff	1.5
	52	Grain	4.4 [a]

a - Concentration in report expressed as 2.3-mg triazolyl alanine equivalents per kg of grains.

Extensive metabolism occurred in the wheat plants. Low levels of radioactivity were unextracted (6% maximum in 12-day forage) following exhaustive extraction. Flusilazole accounted for 56 – 59% of the residue in forage at Days 5 – 12. Unchanged flusilazole accounted for only about 15% of the residue in mature straw, and there was extensive metabolism to at least seven phenyl-labelled (Table 9) and six triazole-labelled metabolites (Table 10). No single straw or forage metabolite accounted for more than 13.5% of the total radioactivity present. Unidentified minor metabolites were present in triazole and phenyl ^{14}C-flusilazole treated wheat straw; however, no unidentified metabolites exceeded 4% of the total radioactive residue.

Table 9. Distribution of metabolites (expressed as %TRR) in forage and straw in wheat treated with [phenyl(U)-^{14}C]-flusilazole

Metabolite	0-Day Forage	12-Day Forage	77-Day Straw
Flusilazole	96.2	55.6	14.1
Glucose-6-phosphate of IN-37722	ND	8.6	13.5
IN-37735	ND	6.5	8.7
Conjugate of IN-37738	ND	1.8	6.7
IN-37738	ND	1.2	2.7
IN-37722	ND	0.5	3.9
IN-F7321	ND	2.6	6.7
IN-G7072	ND	1.0	1.5
Other Unknown Metabolites	1.8	15.0 [a]	29.0 [a]
Unextractable	1.9	6.0	5.5

ND = not detected

a - Comprised of at least 12 metabolites, none exceeding 4% of total radioactivity.

Table 10. Distribution of metabolites (expressed as %TRR) in forage, straw and grain in wheat treated with [triazole-3-^{14}C]-flusilazole

Metabolite	0-Day Forage	5-Day Forage	69-Day Straw	69-Day Grain
Flusilazole	92.7	59.1	17.5	ND
Glucose-6-phosphate of IN-37722	ND	8.0	7.1	ND
IN-37735	ND	3.3	4.9	ND
IN-37722	ND	4.1	4.7	ND
IN-V9462	ND	12.2	1.1	68.9
IN-D8722	ND	1.1	7.3	24.3
Metabolite 14[a]	ND	2.2	10.6	ND
Other Unknown Metabolites	5.2	6.7[b]	26.0[b]	2.7
Unextractable	2.1	2.0	2.2	0.2

ND = not detected

a - Metabolite 14 tentatively identified as a conjugate of semicarbazide acetic acid.

b - Comprised of at least 15 metabolites, none exceeding 4% of total radioactivity.

No flusilazole was found in triazole-labelled grain samples harvested 69 days after the treatment. This data indicates that although metabolites containing the triazole ring can be translocated, intact flusilazole is not translocated to grain.

The metabolic pathway of flusilazole in wheat included hydroxylations, conjugations and cleavage of the silicon-methylene bond. The major phenyl-labelled metabolites in straw and forage were the glucose-6-phosphate of metabolite IN-37722; metabolite IN-37735; a conjugate of metabolite IN-37738, and the silanol metabolite IN-F7321. The major triazole-labelled metabolites were triazolyl alanine (IN-V9462), triazole acetic acid (IN-D8722), the glucose-6-phosphate of IN-37722, IN-37735 and IN-37722. Triazolyl alanine and triazole acetic acid accounted for 68.9 and 24.3% of the radioactivity in the grain, respectively.

Bananas

Banana plants are treated commercially by aerial over-spraying while the fruit is bagged. Since banana fruit is generally not directly exposed during commercial application, special application techniques were used in the banana metabolism study to assess translocation to banana pulp (McFetridge and Rhodes, 1987). Phenyl- or triazole-labelled flusilazole, each formulated as an emulsifiable concentrate and diluted to a final concentration six times the label rate, was applied directly to detached green bananas and to leaves of immature banana plants growing under greenhouse conditions. The bananas were analyzed at intervals of 0, 2, 4, 7 and 11 days and the leaves were analysed at intervals of 0, 7, 14 and 18 days.

Autoradiographs showed that flusilazole applied to banana leaves did not translocate from the treated areas. In the case of banana fruit, flusilazole distribution from the peel to the pulp was negligible since 98 – 99% of the radioactivity applied to the peel remained in the washings and peel. The distribution of total ^{14}C-residues in the rinse, peel and banana fruit, are shown in Table 11.

Table 11. Distribution of radioactive residues in banana fruit treated with ^{14}C-labelled flusilazole

DAT[a]	Percent of TRR			Composition of Radioactivity in Rinse % Total Radioactivity in Rinse		
	Ethyl Acetate Rinse	Peel	Pulp	Origin	Flusilazole	Other
[Phenyl(U)- ^{14}C]flusilazole						
0	69	31	0.01	1	95	4
2	27	73	0.24	2	98	1
4	18	82	0.43	1	96	3
7	16	82	1.12	2	96	2
11	14	85	0.81	1	97	2

DAT[a]	Percent of TRR			Composition of Radioactivity in Rinse % Total Radioactivity in Rinse		
	Ethyl Acetate Rinse	Peel	Pulp	Origin	Flusilazole	Other
[Triazole-3-^{14}C]flusilazole						
0	72	28	0.08	1	98	1
2	49	50	0.53	1	96	3
4	38	62	0.46	1	98	1
7	30	69	1.11	1	98	1
11	24	74	1.66	1	97	1

a - Days after treatment

Greater than 95% of the radioactivity in banana pulp and peel was extracted. Intact flusilazole accounted for more than 87% of the radioactivity in the peel rinses, peels and pulp. The composition of residues in the banana fruit is shown in Table 12.

Table 12. Composition of radioactivity recovered from banana fruit (both pulp and peel) 11 days after treatment with ^{14}C-labelled flusilazole (expressed as %TRR)

Fraction	[Phenyl(U)-^{14}C] flusilazole	[Triazole-3-^{14}C] flusilazole
Polar	0.3	4.3
Flusilazole	95.5	87.2
Diffuse	0.6	0.3
Other (aqueous and insoluble)	2.3	4.7
Unextracted	1.3	3.0
Total	100.0	99.5

Sugar beet

Greenhouse sugar beets (variety Hilma) planted in loamy sand soil, were treated post-emergence with either [triazole-3-^{14}C]flusilazole or [phenyl(U)-^{14}C]flusilazole (Smyser and Moghaddam, 1997). The test substance was applied three times at 14 day intervals as an over the top spray at application rates of 124 – 131 g ai/ha. The total application was 372 – 393 g ai/ha.

The concentrations of total radioactivity in sugar beets, harvested at 0, 14, 28 and 59 or 77 days (maturity), were determined as ^{14}C-flusilazole equivalents (Table 13). At each sampling interval, radioactive residues were consistently higher in the foliage than in the roots. Immediately after the third treatment, total radioactive residues in the foliage ranged between 1.54 and 7.16 mg/kg for triazole- and phenyl-labelled flusilazole, respectively. At each sampling interval, total radioactive residues in the roots were lower for the phenyl-treated plants (0.008 mg/kg maximum) than for the triazole-treated plants (0.147 mg/kg maximum). With time, the total radioactive residues in both the foliage and roots decreased.

Flusilazole was the major residue in the foliage, accounting for a maximum of 89% of the total radioactivity present in the foliage (Table 13). Minor metabolites found included IN-G7072 and IN-37722. No flusilazole was detected in root extracts. Other residues in the foliage and roots consisted of polar materials that were not resolved by HPLC.

Table 13. Metabolite distribution in foliage and roots of sugar beet treated with ^{14}C-labelled flusilazole

	Days after third treatment															
	Day 0 foliage		Day 0 roots		Day 14 foliage		Day 14 roots		Day 28 foliage		Day 28 roots		Mature foliage[a]		Mature roots[a]	
	Phenyl	Triazole	Phenyl	Triazole	Phenyl	Triazole	Phenyl	Triazole	Phenyl	Triazole	Phenyl	Triazole	Phenyl	Triazole	Phenyl	Triazole
Total residues[b]	7.16	1.54	0.008	0.014	1.90	0.522	0.003	0.030	1.79	1.26	0.004	0.147	0.637	0.211	0.004	0.046
Metabolite																
Flusilazole	5.98 (83.6)	1.18 (76.1)	NA[e]	NA	1.32 (69.1)	0.47 (89.4)	NA	ND[f]	1.08 (60.0)	0.82 (65.2)	NA	ND	0.17 (26.5)	0.09 (43.0)	NA	ND
IN-G7072			NA	NA			NA		0.04 (2.0)		NA				NA	
IN-37722			NA	NA			NA		0.02 (1.0)	0.014 (1.1)	NA				NA	
Polar	0.79 (11.0)	0.07 (4.72)	NA	NA	0.37 (19.3)	0.07 (13.7)	NA	0.03 (100.8)	0.17 (9.6)	0.15 (11.9)	NA	0.13 (89.1)	0.23 (36.3)	0.09 (40.5)	NA	0.04 (86.7)
Other[e]	NA	NA	NA	NA	NA	NA	NA	NA	0.16 (8.9)	0.05 (4.1)	NA	< 0.01 (0.6)	NA	NA	NA	NA
Bound	0.31 (4.34)	0.02 (1.05)	NA	NA	0.15 (7.92)	0.02 (4.14)	NA	< 0.01 (7.23)	0.31 (17.2)	0.19 (15.4)	NA	0.02 (11.1)	0.14 (21.7)	0.01 (6.34)	NA	< 0.01 (3.97)

a - Phenyl-treated and triazole-treated plants were harvested 77 and 59 days after last application, respectively.

b - Expressed as flusilazole equivalents. Values in parentheses represent % TRR.

c - [Phenyl(U-)^{14}C]flusilazole.

d - [^{14}C-3-triazole]flusilazole.

e - Includes diethyl ether and methylene chloride fractions

NA = not analysed
ND = not detected

Field studies

Grapes

Separate branches of foliage and grapes of Catawba grape vines were treated with phenyl- or triazole-labelled flusilazole under field conditions at Newark, DE, USA (Carter and Monson, 1986a and 1986b). The branches were sprayed just to runoff to simulate actual use conditions. The berries were harvested 41 days after the application.

The distribution of ^{14}C-residues in grape berries is shown in Table 14. Flusilazole was the predominant residue, extracted from grape berries treated with either the phenyl-labelled or triazole-labelled compounds, comprising between 57 and 31% of the recovered radioactivity, respectively. The principal degradation product from phenyl-labelled flusilazole was the silyl methanol metabolite (IN-H7169), accounting for 11% of the residue. Four identified minor metabolites containing the phenyl label (IN-F7321, IN-V5571, IN-A7634, and IN-T7866) together accounted for < 10% of the recovered radioactivity. In addition to flusilazole, triazolyl alanine (IN-V9462) was a major degradation product in triazole-labelled grape berries, accounting 30% of the total radioactivity. Unextractable residues from fruit accounted for between 5 and 14% of the recovered radioactivity.

Table 14. Distribution of ^{14}C residues in grape berries following ^{14}C-flusilazole treatment

Component	Concentration of metabolites in mg/kg flusilazole equivalents (%TRR)	
	[Phenyl(U-)^{14}C]flusilazole	Triazole-3-^{14}C flusilazole
Total residues	0.175	0.089
Flusilazole	0.100 (57.2)	0.042 (30.9)
IN-F7321	0.002 (1.3)	ND
IN-H7169	0.020 (11.3)	ND
IN-V5771	0.001 (0.5)	ND
IN-A7634	0.008 (4.4)	ND
IN-T7866	0.006 (3.2)	ND
Unknowns	0.019 (10.7)	0.004 (5.6) [a]
Polar Unknowns	0.004 (2.5)	ND
Organic solubles	---	0.005 (8.0)
Aqueous soluble	0.007 (4.2)	0.009 (11.9) [a]
IN-V9462	ND	0.020 (30.1) [a]
Unextracted fibre	0.008 (4.6)	0.009 (13.5) [a]

ND = not detected

a - Concentrations expressed as triazolylalanine (IN-V9462) equivalents

Apples

Separate isolated branches of Rome apple trees were treated with either phenyl- or triazole-labelled flusilazole under field conditions at Newark, DE, USA (Harvey *et al*. 1986). Branches were treated four times at 14 day intervals at rates of approximately 8 mg/100 mL. Mature fruit were harvested 14 days after the final application (56 days after the initial application).

Flusilazole was the predominant residue extracted from apple fruit treated with either the phenyl-labelled or triazole-labelled compounds , comprising between 71 and 48% of the recovered radioactivity, respectively (Table 15). Three identified minor metabolites containing the phenyl label (IN-F7321, IN-V5571, and IN-H7169) together accounted for approximately 11% of the recovered radioactivity. Triazolyl alanine (IN-V9462) was a significant triazole-containing metabolite, accounting for 22% of TRR. Unextractable residues from the apple fruit accounted for between 8 and 14% of the recovered radioactivity.

Table 15. Distribution of ^{14}C residues in apple fruit following ^{14}C-flusilazole

Component	Concentration of metabolites in mg/kg flusilazole equivalents (%TRR)	
	Triazole-3-^{14}C flusilazole	[Phenyl(U-)^{14}C]flusilazole
Total residue	0.30	0.21
Flusilazole	0.143 (48)	0.147 (71)
IN-V9462	0.044 (22)	-
Unknown Metabolites 1 and 2	0.015 (11)	-
Unextracted Bound	(14)	0.016 (8)
IN-F7321	-	0.019 (9)
IN-H7169	-	0.001 (1)
IN-V5771	-	0.002 (1)
Unknown Polar Metabolites [a]	-	0.008 (4)

a - Consisted of at least 14 unidentified components.

Peanuts

Field-grown peanuts were treated with [phenyl (U)-^{14}C]flusilazole applied to the foliage at 140 g ai/ha, 52 days prior to harvest (Harvey, 1984). Peanut foliage was sampled at 0, 3, 7, 14, 21 and 52 days. Peanuts (nut and shells) were harvested at 52 days (maturity).

Total radioactive residues in the foliage of peanut plants declined from 3.41 mg/kg at day 0 to 0.38 mg/kg at day 52. There was no significant translocation of phenyl-labelled metabolites to the peanut seed (total residue in the seed was 0.018 mg/kg) or peanut shell (0.03 mg/kg).

Flusilazole was the major residue in the foliage at all sampling intervals, declining from 3.15 mg/kg at Day 0 to 0.19 mg/kg at Day 52. Flusilazole at 0.006 mg/kg and "water soluble metabolites," also at 0.006 mg/kg, were present in the seed with the remaining residue unextractable (Table 16).

Table 16. Distribution of radioactive residues in peanuts treated with [phenyl(U)-^{14}C]flusilazole

Sampling Day	Concentration in mg/kg flusilazole equivalents (%TRR)			
	Total ^{14}C-residue	Flusilazole	Water Soluble	Unextracted
0	3.41	3.15 (92)	0.05 (2)	0.21 (6)
3	3.44	2.55 (74)	0.16 (5)	0.73 (21)
7	2.42	1.88 (78)	0.20 (8)	0.34 (14)
14	1.09	0.69 (63)	0.15 (14)	0.25 (23)
21	1.04	0.68 (66)	0.12 (11)	0.24 (23)
52 (mature)				
Foliage	0.38	0.19 (50)	0.07 (19)	0.12 (31)
Shells	0.03	0.004 (14)	0.018 (56)	0.01 (30)
Nuts	0.018	0.006 (33)	0.006 (33)	0.006 (34)

Proposed metabolic pathway in plants

Plant metabolism studies conducted with wheat, apples, grapes and sugar beets show qualitatively similar metabolism among the crops. Exhaustive extraction techniques ensured that more than 86% of the radiolabelled plant residues were characterized.

The metabolic pathway of flusilazole in plants (shown in Figure 3) involves hydroxylations, conjugations, and cleavage between the silicon and the triazole ring. As the interval between treatment and sampling increases, there are decreasing residues of unchanged flusilazole and increased metabolism and conjugation. Only unchanged flusilazole was identified in bananas, possibly due to the short sampling intervals.

A major metabolic route in plants is cleavage of the Si-CH_2 bond to form the silanol (IN-F7321), which may be further metabolized to the silane diols (IN-V5771 and IN-T7866) or to disiloxane (IN-G7072). Cleavage of the Si-CH_2-N bond occurs in some plants to form the methyl alcohol (IN-H7169). Hydroxylation can occur on the phenyl ring of intact flusilazole or IN-F7321, resulting in phenolic metabolites IN-37722 and IN-37738, respectively. The phenolic groups become the sites for conjugation reactions. The major plant metabolite arising from triazole-labelled flusilazole is triazolyl alanine (IN-V9462), which is subsequently metabolized to triazole acetic acid (IN-D8722). Loss of the silane methyl to form IN-A7634 was found to be only a minor product in one crop (in grapes).

Due to the extensive degradation of flusilazole by multiple mechanisms to many minor metabolites, there are no major flusilazole metabolites in plants, other than triazolyl alanine. With the exception of triazolyl alanine and triazole acetic acid, individual metabolites generally account for less than 14% of the total radioactivity in the plants.

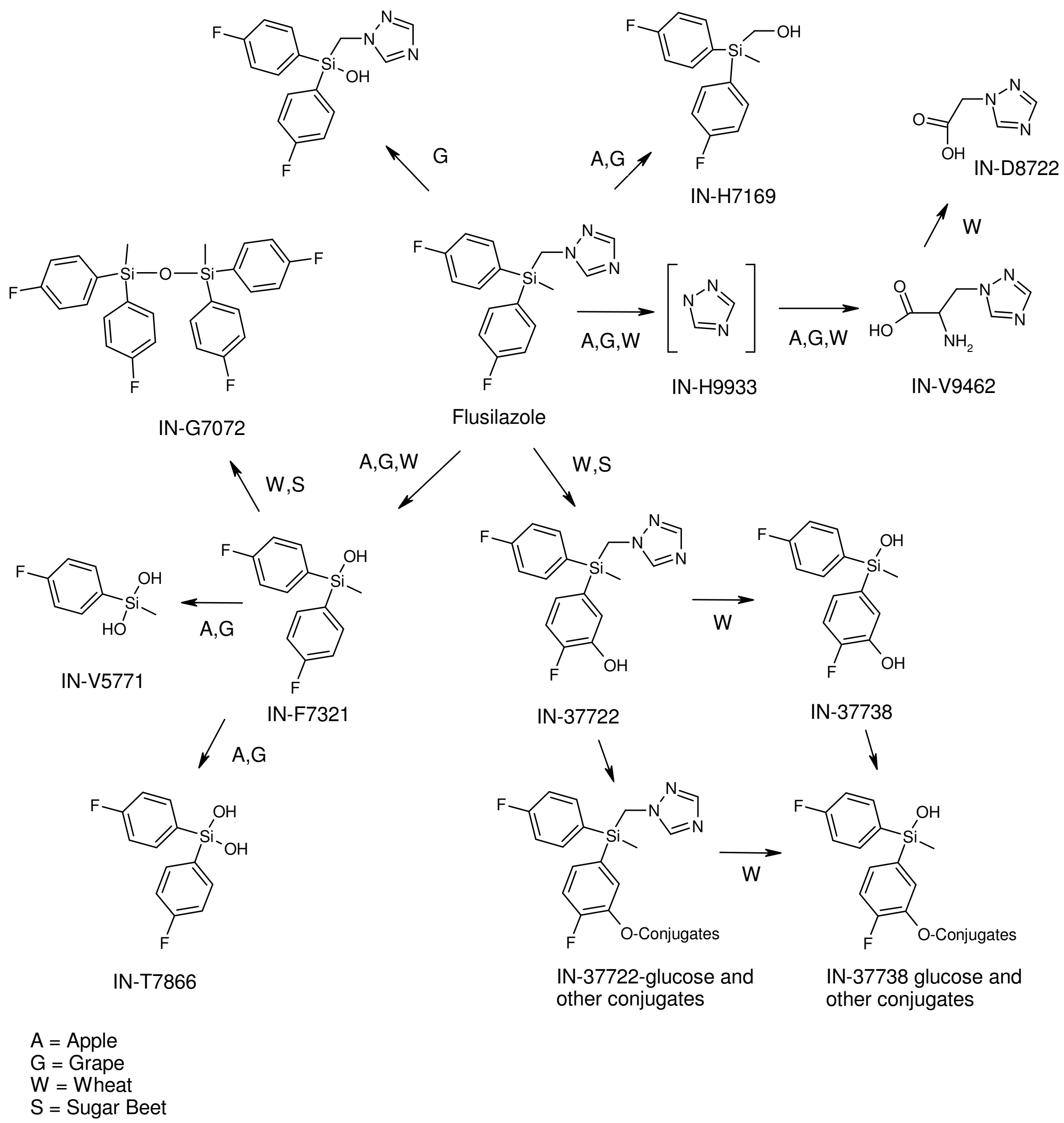


Figure 3. Proposed metabolic pathway of flusilazole in apples, grapes, wheat, and sugar beet

Environmental fate in soil

The Meeting received information on aerobic and anaerobic degradation of flusilazole in soil, soil surface photolysis, mobility in soil and field dissipation studies performed in the United States, Canada and Europe and flusilazole residues in rotational crops.

Aerobic degradation

The aerobic degradation of [phenyl(U)-^{14}C] and [triazole-3-^{14}C] flusilazole was studied in two soils, Woodstown sandy loam (pH 4.6, USA) and Flanagan silt loam (pH 6.7, USA), incubated in the dark at 25 °C for 1 year (Chrzanowski, 1984). Flusilazole was applied to soil at a nominal concentration of 1 mg/kg soil and the soil was adjusted to 70% of the normal water-holding capacity following treatment. Additional samples were treated using sterile soils and sampled up to 20 weeks post-treatment.

The soils were ultrasonically extracted three times with ethyl acetate and three times with acetonitrile/water (50/50, *v/v*). Extracts were concentrated and aliquots analysed by normal-phase

TLC. Extracted soil was combusted to determine the amount of unextractable radioactivity. The bound radioactivity was characterized by a series of extractions with boiling NaOH used to fractionate the soil. The insoluble residues were analysed by combustion and LSC. The soluble fractions were analysed by LSC, TLC, and reversed-phase HPLC. Structures of degradation products were confirmed by TLC, reversed-phase HPLC and GC-MS. Microbial activity was monitored by measuring the evolution of $^{14}CO_2$ from ^{14}C-cellulose.

The primary route of degradation in non-sterile soils was cleavage of the methylene-silicon bond to form IN-F7321 (silanol) and IN-H9933 (triazole). The silanol metabolite (IN-F7321) was found in low concentrations (< 5% applied radiolabel) and the triazole metabolite (IN-H9933) was not detected. This suggests that these two metabolites are further degraded and/or incorporated into the soil organic matter. Approximately 0.2 – 1% of the applied radioactivity was recovered as $^{14}CO_2$ after 52 weeks. Bound (unextractable residues) ranged from 24 – 34% at the end of the incubation period. In sterile soils, flusilazole remained unchanged and bound residues accounted for only 3 – 10% of the applied radioactivity after 20 weeks of incubation, demonstrating that the unextractable residues are products of the microbial metabolism of flusilazole. The bound residues could only be removed from the soil through alkaline hydrolysis (fractionation of the soil), so the ^{14}C can be considered incorporated into the soil. The radioactivity was distributed throughout the humin, α-humus/hymatomelanic acid and fulvic acid fractions. The total recovery of radioactivity ranged from 94 – 107% for unsterilized soils.

In aerobic soils, the degradation of flusilazole is biphasic, with DT_{50} approximately 427 days (14 months) at 25 °C.

Anaerobic degradation

The degradation of [phenyl(U)-14C] and [triazole-3-14C]-flusilazole was studied in two pond water/sediment systems under anaerobic conditions at 25°C at a nominal concentration of 1.0 mg/kg sediment (Chrzanowski, 1986c and 1989). The two sediment systems were a silt loam (pH 5.6, 3.7% OM, Pennsylvania, USA) and a sand (pH 7.3, 6.3% OM, Florida, USA). Fifty-gram aliquots of sediment (wet weight) and 100 mL of the corresponding pond water were added to 250 mL glass bottles with screw caps for each pond water-sediment system. The bottles were incubated in the dark at 25 °C for 30 days with 1 gram of freshly cut alfalfa to activate the soil microorganisms prior to addition of the test substance. After application of test substance, the bottles containing the sediment/water samples were purged with nitrogen, sealed, shaken briefly, and incubated in the dark under anaerobic conditions at 25 °C for 52 weeks. The test vessels for sterile samples also received sodium azide to maintain sterility. Radioactive material rapidly partitioned into the sediment phase, with only 12% of the applied radiolabel present in the water column at Day 0.

Sediment and water were separated by centrifugation, and pH of the water measured. Wet sediments were sonicated and extracted once with 50 mL distilled water and twice with 100 mL methanol/water (67/33, *v/v*). Extracts were combined and counted for total ^{14}C by LSC. Except for Day 0 water samples, pond water and sediment extracts were analysed as composites by combining their corresponding waters with their methanol/water sediment extracts and concentrating on a rotary evaporator to about 5 mL. A 100 µL aliquot of this concentrate and solutions of the reference standards were co-chromatographed using TLC. Radioactive bands were determined by autoradiography on X-ray film and by scraping the individual radioactive areas from the plates and counting by LSC. Extracted soil samples were also air-dried and combusted. Extracted sediments were further analysed by hot alkaline fractionation. The precipitated sediment organic matter fractions (humin, α-humus, α-humus/hymatomelanic, and fulvic acid fractions) were analysed by combustion and LSC. The resultant hydrolysate solution was analysed by TLC/autoradiography.

The major radiolabelled metabolite was identified by GC-MS as bis(4fluoro-phenyl)methyl silanol (IN-F7321). A metabolite that was only found in the fractionated residue was identified as 1H-1,2,4 triazole (IN-H9933) by TLC only. The maximum amount of the silanol metabolite was about 2% of applied radioactivity, with the maximum triazole metabolite about 5%. A polar material was also formed at a maximum of 22% that upon alkaline hydrolysis was found to be predominately the silanol or triazole metabolite. Bound (unextractable) residues reached 17 – 49% of the applied radioactivity after 12 months of incubation. These bound residues were only extractable by hot alkaline hydrolysis. After fractionation, the "bound" radioactivity was distributed in the humin, α-humus/ hymatomelanic acid, β-humus, and fulvic acid fractions. Degradation in the sterilized controls was slower, indicating breakdown by microbial action. No significant loss of total radioactivity was observed over 12 months. Mass balance was maintained over the course of the study with recoveries ranging from 87 – 118%.

Under anaerobic conditions, the DT_{50} ranged between 244 – 945 days in the two sediment systems at 25 °C.

Photolysis on soil surface

The photodegradation of [phenyl(U)-^{14}C] and [triazole-3-^{14}C]-flusilazole was studied using a silt loam soil (pH 7.4, 3.3% OM) under artificial sunlight (Carter, 1984a). Flusilazole was applied to air-dried soil in a glass container at a nominal rate of 1 mg/kg. The treated soils were exposed to simulated sunlight generated by fluorescent sunlamps (300 – 450 nm) for up to 4 weeks. A second set of treated soils were stored in the dark. Each sample was extracted with three portions of ethyl acetate followed by two portions of acetonitrile (the 4 day exposed samples were subjected to an additional ethyl acetate extraction). Following these extractions, all exposed samples, except for 0 day, were extracted once with 70 mL of water. Exposed samples (14, 21 and 30 day) were also extracted once with a mixture of acetonitrile and 10% acetic acid. The triazole-labelled 30 day control was subjected to the second extraction with acetonitrile/acetic acid. Like samples were combined, concentrated, and analyzed for total radioactivity. These soils were air-dried, homogenized, and combusted to determine total radioactivity. Aliquots of the concentrated extracts were analyzed for labelled flusilazole and metabolites using TLC. No significant metabolites were observed in the studies. Polar metabolites accounted for 2% or less of the original radioactivity for both labels. Parent compound contributed the major fraction (< 90%) of radioactivity. The observed half-life was greater than 30 days. This result was expected as flusilazole does not absorb UV light.

A similar experiment was performed in which the photodegradation of [phenyl(U)-^{14}C] and [triazole-3-^{14}C]-flusilazole in natural sunlight was studied using a silt loam soil (Carter, 1986). Flusilazole degraded slowly under these conditions with a DT_{50} of about 97 days for both labels, with no significant degradation in control samples (dark). No photoproduct exceeded 10% of the applied radioactivity. Less than 3.2% of the applied radioactivity remained unextractable after 31 days of exposure. These results further support the conclusion that photolysis on soil is not an important mode of degradation for flusilazole.

Mobility in soil

The adsorption/desorption of flusilazole was studied on 4 soils using batch equilibrium (Priester, 1985). The 4 soils used were a sandy loam soil (pH 6.6, 1.1% organic matter), a sandy loam soil (pH 6.5, 2.1% organic matter), a silt loam soil (pH 5.4, 4.3% organic matter), and a silt loam soil (pH 5.2, 7.5% organic matter). [Phenyl-^{14}C-(U)]flusilazole at nominal concentrations of 0.2, 0.5, 1.0, 2.5, and 6 mg/kg was added to 0.01 N calcium sulfate solution. A co-solvent (acetone) concentration of less than 0.25% was used to assist in dissolving the test substance. A 1:1 soil to solution ratio was used and samples were shaken for 24 h at 25 °C. After shaking, the phases were separated by centrifugation and the concentration of flusilazole in the supernatants was determined by LSC. For the highest test substance concentration in each soil, 2 successive desorption steps were performed. Flusilazole was rapidly and strongly adsorbed to all four soils. .

The mobility of the metabolites, IN-F7321 and triazole (IN-H9933) were studied in four soils (Smyser, 1992). The four soils used were a loamy sand soil (pH 6.9, 0.8% organic matter), a silt soil (pH 6.3, 7.5% organic matter), a sandy loam soil (pH 6.5, 2.1% organic matter), and a silty clay loam soil (pH 7.6, 6.9% organic matter). To determine the degree of adsorption, separate solutions of ^{14}C-labelled IN-F7321 and ^{14}C-IN-H9933 in 0.01 N calcium sulfate were studied at five nominal concentrations ranging from 0.2 to 6 mg/kg. A 1:1 soil to solution ratio was used for both compounds. For IN-F7321, samples were shaken for 2 h at 25 °C. For triazole, samples were shaken for 24 h at 25 °C. After shaking, the phases were separated by centrifugation and the concentration of the test substance in the supernatant was determined. IN-F321 was moderately to strongly bound to the four test soils. The K_f values ranged from 3.78 to 21.5 mL/g. Triazole was weakly bound to the test soils.

Field dissipation studies

The Meeting received results of field studies on the behaviour of flusilazole in soils performed in the United States, Canada and Europe. These studies include studies on bare soil and cropped soils, with both single and multiple applications.

The dissipation of ^{14}C-flusilazole was studied in five soils in a soil cylinder study in the United States: Keyport silt loam (Newark, DE), Norfolk loamy sand (Fayetteville, NC), Bostick silt loam (Stoneville, MS), Myakka sand (Bradenton, FL), and Palouse silt loam (Moscow, ID) [Chrzanowski, 1986a and 1986b]. Two labelled versions of flusilazole were used at the Delaware test site, [phenyl (U)-^{14}C] and [triazole-3-^{14}C] flusilazole. At all other test sites, only the [phenyl (U)-^{14}C] test substance was applied. The application rate at all sites was 2.8 kg ai/ha as a single application in methanol. Samples were taken for up to 19 months after application. During the course of the study, 82 to 98% of the applied radioactivity remained in the top 5 cm of soil. Major metabolites were IN-F7321 (maximum of 14% applied radioactivity) while the triazole metabolites reached a maximum of < 3%. The DT_{50} values ranged from 280 – 552 days (Russell, 2005).

An additional study was performed using multiple applications of labelled flusilazole to bare soil cylinders for 3 years in the Keyport silt loam soil (Smyser, 1993a; Singles and Russell, 1993). The DT_{50} from this study was 293 days (Russell, 2005). These data are within the range of the DT_{50} values generated in laboratory studies and in field dissipation studies performed using formulated flusilazole.

Field soil dissipation trials were performed at 3 bare ground sites with single and multiple applications at each site (1 application/yr for 3 years, Smyser, 1993b). The applications were made using flusilazole at 425 g ai/ha. Highest flusilazole residues were 0.12 – 0.35 mg/kg, with low levels of silanol (0.054 mg/kg) and triazole metabolites (0.013 mg/kg) detected during the study. DT_{50} values ranged from 36 – 606 days in six trials. Residues generally remained in top 15 cm, thus limited mobility was observed.

Field soil dissipation studies were performed at two sites in the USA with an application to a cover crop (wheat, 25EC formulation, Smyser, 1993c). A single application of flusilazole at 460 g ai/ha was made to wheat at tillering. No DT_{50} value could be calculated due to variability in the soil residues, but crop interception values ranged from 37 – 75% of the application.

An additional field study was designed to measure the potential for off-target movement of flusilazole into water-bodies adjacent to orchards (Guinivan, 1992). Formulated product was applied to apple orchards in New York and Washington, with 3 – 6 applications at a rate of 213 – 354 g ai/ha with airblast application. Residues were measured in turf and soil in the orchard and runoff to water and sediment. Low to undetectable levels of flusilazole were detected in water and sediments adjacent to orchards. The study concluded that environmental exposure to non-target areas would be extremely low under normal use conditions.

Field soil dissipation studies were also performed at 4 sites in Canada (Guinivan and Desmond, 1991). Three turf covered sites and 2 bare ground sites were included. Four applications at 40 g ai/ha (160 g ai/ha total) were made at 1 week intervals with soil sampling commencing after the last application. No residues of flusilazole and silanol IN-F7321 were detected below 20 cm in soil. Degradation of flusilazole on the turf-covered sites was rapid with DT_{50} values ranging from 3 - 34 days (Russell, 2005). The DT_{50} values on the bare soil sites ranged from 295-755 days.

Field soil dissipation studies on bare ground were performed at a total of 10 sites in Germany after a single application to bare soil. Five additional trials were performed in Germany that measured flusilazole dissipation in soil after multiple applications to bare soil. The analytes measured were flusilazole and the silanol metabolite IN-F7321.

Six tests of these test sites received a single 300 g ai/ha application of flusilazole (Brodsky and Römbke, 1993a; Brodsky *et al*. 1993b). All residues remained in the top 10 cm. The DT_{50} for flusilazole ranged from 26 to 240 days (Wetherington and Bolton, 1994). Four additional test sites received a single application of 45 g ai/ha of flusilazole formulated as 20% WG (Brodsky and Zietz, 1990). For these test sites, the DT_{50} for flusilazole ranged from 71 to 140 days (Wetherington and Bolton, 1994). The degradation of flusilazole in this study was generally biphasic and not well described by the first-order DT_{50} values. For all of these bare soil field dissipation studies conducted in Germany, there was little downward movement of residues and generally low levels of the silanol metabolite (IN-F7321) were detected.

The degradation of flusilazole was also studied in the presence of crops in Europe. In these studies, flusilazole was applied to a cover crop according to the recommended application rates for several years. Soil and crop residues were also monitored every year to determine the potential for accumulation of flusilazole residues in these matrices. Studies were performed in cereal crops in France and Denmark, as well as in orchards and vineyards in France. A six-year accumulation study was performed in Dame Marie, France with up to 6 years of continuous application of an SC formulation with 250 g/L flusilazole to cereals, oilseed rape and sugarbeets (Koch, 1995). After up to 3000 g of flusilazole applications to crops, soil residues remained low (< 0.09 mg/kg). Soil residues continued to decline after application of flusilazole was discontinued. The study demonstrated little potential for flusilazole accumulation in soil or crops after multiple years of continuous use. An additional study was conducted for 3 years at Torpe Farm, Denmark, with applications to barley and oilseed rape using formulated flusilazole (20EC or 40EC) containing 200 and 400 g/L of flusilazole, respectively (Cicotti, 1991). No accumulation of flusilazole was seen in either soil or crops and soil residues continued to decline after applications of flusilazole were discontinued. An additional study was performed in southern France with applications of flusilazole to orchards and vineyards for up to 4 years (Enriquez and Singles, 1997). Flusilazole did not accumulate in either soils or crops following application to crops according to GAP.

Residues in rotational crops

The Meeting received results of two confined ^{14}C-flusilazole rotational crop studies (Harvey, 1983; Priester, 1986 and 1992). The first study examined the potential for uptake of phenyl-containing residues into four crops (barley, beets, cabbage, and soybeans) from soil aged for 30 or 120 days under greenhouse conditions. The second field study examined the potential for uptake of phenyl- or triazole-containing residues into three crops (cabbage, wheat and beets) from treated soils aged for 120 or 360 days.

In the first study, sandy loam soil was treated with phenyl-labelled flusilazole at rates of 289 or 543 g ai/ha. After aging for 30 days or 120 days in the greenhouse, a small grain crop (barley), a root crop (beets), a leafy vegetable (cabbage) and soybeans were planted in the soil. Crops were sampled at intervals beginning 30 days after planting until maturity. These short aging intervals would represent the worst case situation.

In the second study two labelled forms of flusilazole were used. A silt loam soil was treated at 1129 g ai/ha. After aging for 120 or 360 days under field conditions, soil was transferred to pots in the greenhouse and planted with a leafy vegetable (cabbage), root crop (red beets), and a small grain crop (wheat). Crops samples were taken at intervals beginning 30 days after planting until maturity.

The total radioactive residues (TRR) in soil are shown in Tables 17 and 18. During both confined rotational crop studies, radioactive residue levels in the soil remained relatively constant during the aging and plant growth periods. Soil residues ranged from 0.04 to 0.12 mg/kg (289 g ai/ha application rate), 0.12 to 0.20 mg/kg (543 g ai/ha application rate) and 0.21 to 0.44 mg/kg (1129 g ai/ha). Flusilazole levels and the percentage of extractable radioactivity decreased with time. Major soil residues included flusilazole and the silanol (IN-F7321).

The distribution of radioactivity in the crop fractions at harvest from the first study with phenyl-labelled flusilazole is shown in Table 19. Residue levels in mature crops ranged from 0.02 mg/kg (soybean seeds and barley grain) to 2.16 mg/kg flusilazole equivalents (barley straw). The high radioactive levels in the straw can be partially attributed to the loss of water during maturation. Mature cabbage, beet roots and beet foliage were extracted and analysed by HPLC. The residues were comprised of flusilazole, IN-F7321 and unidentified polar (water-soluble) metabolites.

Table 17. Total radioactive residues in soils after application of [phenyl(U)-^{14}C]flusilazole at 289 or 543 g ai/ha under greenhouse conditions

Treatment	[^{14}C]-flusilazole equivalent residues (mg/kg)								
	1 Treatment 30 Day Aging			2 Treatments 30 Day Aging			1 Treatment 120 Day Aging		
Sampling Time	Planting	+75 Days	+120 Days	Planting	+60 Days	+90 Days	Planting	+30 Days	+45 Days
Total soil residues	0.04	0.12	0.06	0.12	0.14	0.20	0.06	0.09	0.11

Table 18. Total radioactive residues in soils after application of [phenyl(U)-^{14}C]flusilazole and [triazole-3-^{14}C]flusilazole at 1129 g ai/ha under field conditions

Soil Sample	[^{14}C]-flusilazole equivalent residues (mg/kg)			
	120 Day Aging		360 Day Aging	
	Phenyl	Triazole	Phenyl	Triazole
Days after treatment				
0 [a]	0.18	0.18	0.62	1.0
90 (Aged 90 days)	0.23	0.26	0.23	0.29
120 (120 day planting)	0.35	0.37	0.25	0.21
270 (Harvest)	0.21	0.22	--	
360 (360 day planting)	--	--	0.34	0.44
510 (Harvest)	--	--	0.21	0.31

a - One soil core analysed

The distribution of radioactivity in the crop fractions at harvest from the second study is shown in Table 20. Residue levels in mature crops from the phenyl label ranged from 0.03 (beet tubers) to 3.32 mg/kg flusilazole equivalents (wheat straw). The high levels of residues in the straw can be partially attributed to the decreased fresh weight (decreased water content) of the tissue. Residue levels in plants grown in soil treated with the phenyl label were about a tenth of those treated with the triazole label. RACs containing greater than 0.05 mg/kg TRR were extracted and analysed by HPLC.

Table 19. Total radioactive residues (mg/kg, flusilazole equivalents) in crops from soils aged 30 and 120 days after application of [phenyl(U)-^{14}C]flusilazole at 289 or 543 g ai/ha

Crop Sample	1 Treatment 30-Day Soil Aging					2 Treatments 30-Day Soil Aging					1 Treatment 120-Day Soil Aging	
	Days after Planting					Days after Planting					Days after Planting	
	40	60	75	90	M[a]	45	60	75	90	M[a]	30	45
Barley forage	0.12	0.12	--	--	--	0.30	--	--	--	--	0.05	0.10
Barley straw	--	--	--	--	0.87[b]					2.16[b]	--	--
Barley grain	--	--	--	--	0.02[b]					0.04[b]	--	--

Crop Sample	1 Treatment 30-Day Soil Aging					2 Treatments 30-Day Soil Aging					1 Treatment 120-Day Soil Aging	
	Days after Planting					Days after Planting					Days after Planting	
	40	60	75	90	M[a]	45	60	75	90	M[a]	30	45
Beets	0.05	0.04	0.07	0.10	0.10	0.10	0.11	0.34	0.17	Foliage 0.16 Roots 0.12	0.05	0.04
Cabbage	0.04	0.03	0.03	--	0.05	0.13	0.07	0.10	--	0.12	0.05	< 0.01
Soybean	0.03	0.10	0.04	--	Seed 0.02[b]	0.19	0.24	0.39	--	Seed 0.07[b]	0.06	0.01

a - Mature

b - Dry weight basis

Table 20. Total radioactive residues in mature crops from soils aged 120 and 360 days under field conditions after application of [phenyl(U)-^{14}C]flusilazole and [triazole-3-^{14}C]flusilazole at 1129 g ai/ha

Crop Sample	Total Radioactive Residues (mg/kg, Flusilazole Equivalents)[a]			
	120-Day Soil Aging		360-Day Soil Aging	
	Phenyl	Triazole	Phenyl	Triazole
Beet tops	0.13	0.28	0.064	0.45
Beet roots	0.030	0.55	0.025	0.57
Cabbage	0.055	0.33	0.041	0.51
Wheat chaff	1.1	8.3	0.60	9.5
Wheat straw	3.32	6.0	1.4	7.9
Wheat grain	0.04	13.7	0.081	17.5

a - Calculated on fresh weight basis

The crop residues arising from the phenyl label were comprised of flusilazole, the silanol (IN-F7321), the silanediol (IN-V5571) and high levels of bound residues. The subsequent wheat metabolism study identified major metabolites of phenyl-labelled flusilazole in wheat as IN-F7321 and other hydroxylated metabolites and their conjugates. Thus, the unidentified metabolites in the wheat samples of the crop rotation study were likely to be similar to those in the wheat metabolism study.

Triazolyl alanine (IN-V9462) and an unidentified polar metabolite were the major plant metabolites from the triazole label in addition to high levels of bound residues. In a wheat metabolism study (Leach, Carter, and Harvey, 1988), residues in wheat grain were identified as primarily triazolyl alanine (69%) and triazolyl acetic acid (IN-D8722; 24%). Since triazolyl alanine was identified in wheat grain in the crop rotation study, it is likely that the unidentified polar residues consist primarily of triazolyl acetic acid.

There was no significant accumulation of residues from either label in cabbage, soybeans, or beets in the confined rotation studies. Accumulation did occur in mature small grain fractions of wheat grown in soil treated with [triazole-3-^{14}C]flusilazole. The extent of accumulation was similar in comparable samples from all aging periods. A major wheat metabolite was triazolyl alanine with flusilazole comprising < 20% of the radioactivity in the wheat grain or straw. This suggests that a triazole-containing fragment, rather than intact flusilazole, translocates from soil into wheat.

Environmental fate in water-sediment systems

Hydrolysis

The hydrolysis of ^{14}C-phenyl-labelled and ^{14}C-triazole-labelled flusilazole was studied in sterilized pH 5, 7, and 9 buffers for 34 days at 25 °C in the dark (Cadwgan, 1983). Flusilazole was applied at a nominal concentration of 1 mg/L. No degradation was observed (< 5%) during the course of the study. Therefore, flusilazole is stable to hydrolysis at 25 °C.

Aqueous photolysis

The aqueous photolysis of ^{14}C-phenyl-labelled and ^{14}C-triazole-labelled flusilazole was studied in sterile pH 7 buffer irradiated with simulated sunlight (300 – 450 nm, Carter, 1984b). Flusilazole was applied at a nominal concentration of 1 mg/L. and solutions were irradiated for 30 days. Flusilazole degraded slowly under these conditions with a first half-life of approximately 60 – 80 days. Since flusilazole does not absorb energy in this range, no significant photodegradation products were observed during the studies. Flusilazole was stable for 30 days under control conditions. These results indicated that aqueous photodegradation is not a significant degradative pathway for flusilazole.

The aqueous photolysis of ^{14}C-phenyl-labelled and ^{14}C-triazole-labelled flusilazole was studied in sterile pH 7 buffer irradiated with natural sunlight (300 – 450 nm, Leach, 1988). Flusilazole was applied at a nominal concentration of 1 mg/L. and solutions were irradiated for 30 days. No significant degradation of flusilazole occurred under these conditions. These results further support that aqueous photodegradation is not a significant degradative pathway for flusilazole.

Degradation in water/sediment systems

The degradation of ^{14}C-flusilazole was evaluated in two water/sediment systems (Knoch, 1992) with differing characteristics: a silty loamy sand (pH 7.8, 2.24% OM) and silty loam (pH 7.8, 6.03% OM). ^{14}C-phenyl-labelled and ^{14}C-triazole-labelled flusilazole were applied to the water at a nominal concentration of 0.1 ppm and kept at 20°C in darkness for up to 100 days. Volatiles were trapped (2-methoxy ethanol and KOH). At the time of sampling, oxygen concentration, pH, water temperature, and redox potential of the water and the sediment were measured. Trapping solutions were taken for analysis at the time of removal of the test vessel. Water was analysed by TLC. Sediment samples were extracted with methanol/water (67/33, v/v). If necessary, the extracts were concentrated before TLC analyses. The extracted sediments were air-dried and combusted to determine the amount of unextractable radioactivity. Flusilazole moved rapidly from the water into the sediment in both systems. No transformation products were found in the water column and flusilazole concentrations were below the limit of detection in 2 to 7 days. In the sediment phase, flusilazole degraded slowly to form IN-F7321 (maximum of 3.5% of the applied radioactivity). The amount of $^{14}CO_2$ evolved during the incubation reached a maximum of 2.1% of the applied radioactivity at Day 100. Only a very low amount of organic volatiles were evolved (< 1.0% of the applied radioactivity) in either system. Unextractable residues in the sediment peaked at 60 days (9.4 – 16.5%). The DT_{50} of flusilazole in water was less than 1 day, and greater than 100 days in the total system.

METHODS OF RESIDUE ANALYSIS

Analytical methods

The Meeting received information on analytical methods for flusilazole and its important metabolites in samples of plant and animal origin.

Samples of plant origin

The analytical methods for samples of plant origin are summarized below, including the commodities, for which the methods were validated, analytes and their limit of quantitation (LOQ), determination technique and a brief description of the method. Recoveries are shown in Table 21.

Reference: (Method)	Class, T., 2000 (DuPont-3652; modified DFG S19 method)
Second validation:	Rose, J.E., 2000 (DuPont-3654)
Commodities:	Cereal grain, apples (fruit), sugar beet root, grape (fruit), and oil seed rape
Analytes:	Flusilazole
LOQ:	0.01 mg/kg
Determination:	GC-NPD (GC-MS for confirmation)
Description:	Homogenized samples are extracted by a modified DFG S19 method (German multiresidue enforcement method), using acetone for extraction. Water is added before extraction to obtain water: acetone ratio of 2:1 (*v/v*). After addition of sodium chloride, flusilazole is partitioned into ethyl acetate:cyclohexane (1:1, *v/v*). The extract is cleaned by GPC, followed by a silica gel clean-up. For oilseed rape seed, the method was modified using acetone:acetonitrile (1:9, *v/v*) extraction rather than acetone:water and Florisil instead of silica in the cleanup procedure. Flusilazole is quantified by GC-NPD. GC-MS (*m/z* 233, 315, 300, and 206) is used for confirmation.

Reference: (Method)	Gagnon, M., Stry, J., 2005 (DuPont-15737)
Second validation:	Brookey, F, 2006 (DuPont-16342)
Commodities:	Soybean (bean, meal, and oil), sugar beet, wheat (grain and straw), and corn (grain)
Analytes:	Flusilazole and IN-F7321
LOQ:	0.01 mg/kg 0.02 mg/kg (wheat straw)
Determination:	GC-MS
Description:	Homogenized samples are swelled in water, then extracted twice with acetone:water. After partition (induced by addition of sodium chloride) into ethyl acetate:cyclohexane (1:1, *v/v*) and solvent exchange to acetonitrile:water, the extract is cleaned by SAX-SPE. Diluted SPE effluent is re-extracted with hexane, followed by partition into acetonitrile. The final extract is analysed by GC-MS. Soybean oil was extracted with hexane:acetonitrile, followed by GC-MS analysis of the acetonitrile layer.

Reference: (Method)	Guinivan, R.A., 1983 (AMR 115-83)
Commodities:	Grapes, apples, wheat grain, wheat straw, wheat forage, sugar beet roots, bananas, peanut shells, peanut meat, whole peanuts, peaches, water, soil
Analytes:	Flusilazole
LOQ:	0.01 mg/kg 0.03 mg/kg (wheat forage)
Determination:	GC-NPD
Description:	Homogenized samples are extracted with ethyl acetate or hexane (wheat grain and peanut samples). After a partitioning step employing hexane:water or methanol, the extracts are purified using a Florisil or a silica gel clean-up in addition to using silica medium pressure LC column chromatography prior to GC-NPD determination.

Reference: (Method)	Guinivan, R.A., 1987 (1998) (AMR 604-86, Revision No. 1)
Commodities:	Apples, grapes, dry pomace, and raisins
Analytes:	Flusilazole
LOQ:	0.01 mg/kg 0.03 mg/kg (processed samples)
Determination:	GC-NPD (GC-MS for confirmation)
Description:	After addition of 1N NaOH solution, homogenized samples are extracted twice with ethyl acetate and once with hexane, followed by GPC and silica gel clean-up steps. The sample is then analysed using packed column GC-NPD, followed by a GC-MS confirmation.

Reference: (Method)	Koch, S., 1993 (AMR 2126-91)
Commodities:	Wheat (forage, grain, and straw)
Analytes:	Flusilazole, IN-F7321, IN-G7072, IN-37722, and IN-37738
LOQ:	0.05 mg/kg (grain, straw) 0.25 mg/kg (forage)
Determination:	GC-MS
Description:	Homogenized samples (grain and straw after overnight swelling in water) are extracted using a mixture of 0.1N NaOH and dichloromethane:ethyl acetate (1:9, *v/v*). For grain and straw, the extracts are concentrated and split into two aliquots. One is analysed directly by GC-MS for flusilazole (*m/z* 233, 315, 206) and IN-G7072 (*m/z* 351, 273, 226) and the second derivatised by diazomethane and analysed by GC-MS for major phenyl metabolites of flusilazole: IN-F7321 (*m/z* 264, 249, 219), IN-37722 (*m/z* 345, 263, 236), and IN-37738 (*m/z* 294, 279, 249). For forage, the entire extract is derivatised and analysed.

Reference: (Method)	Koch, S., Desmond, P., Gagnon, M., Guinivan, R., 1993 (AMR 2579-92)
Second validation:	Powley, C.R., DeBernard, P.A., 1993 (AMR 2580-92)
Commodities:	Wheat (forage, grain, and straw)
Analytes:	Flusilazole and IN-F7321
LOQ:	N/A
Determination:	GC-MS
Description:	Homogenized samples are extracted with a mixture of 1N NaOH and ethyl acetate. For wheat forage and straw, the extracts are concentrated and analysed directly by GC-MS. For wheat grain, the extracts are evaporated, redissolved in hexane, and purified using a silica cartridge. One fraction is analysed by GC-MS for IN-F7321 (*m/z* 235, 250, 155); another for flusilazole (*m/z* 233, 315, 206). No derivatisation is used.

Reference: (Method)	Class, T., 1997 (AMR 4212-96)
Second validation:	Rose, J.E., 2000 (DuPont-3654)
Commodities:	Sugar beet (root and tops)
Analytes:	Flusilazole (and famoxadone)
LOQ:	0.01 mg/kg
Determination:	GC-NPD (GC-MS for confirmation)
Description:	This method is very similar to DuPont-3652 method (modified multi-residue enforcement method DFG S19) with a modified elution from the silica gel column to accommodate both flusilazole and famoxadone. Flusilazole is analysed by GC-NPD, followed by a GC-MS confirmation.

Reference:	Class, T., 1997

(Method)	(AMR 4213-96)
Second validation:	Rose, J.E., 2000 (DuPont-3654)
Commodities:	Oilseed Rape (seeds and forage)
Analytes:	Flusilazole (and famoxadone)
LOQ:	0.02 mg/kg
Determination:	GC-NPD (GC-MS for confirmation)
Description:	This method is very similar to DuPont-3652 method (modified multi-residue enforcement method DFG S19) for forage (acetone: water extraction) and rape seeds (acetone:acetonitrile extraction). After a GPC clean-up, a silica column clean-up is used eluting famoxadone and flusilazole in two different fractions. Flusilazole is analysed by GC-NPD, followed by a GC-MS confirmation.

Table 21. Recoveries of flusilazole and its major phenyl metabolites (IN-F7321, IN-G7072, IN-37738 and IN-37722) in samples of plant origin

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
Class, T. 2000 NPD Detector (DuPont 3652)	0.01 (2) 0.1 (2)	91 92	NA NA	91 87	92 96	Wheat Grain/ Flusilazole
	0.01 (2) 0.1 (2)	92 101	NA NA	90 93	94 109	Sugar Beet Root/Flusilazole
	0.01 (5) 0.1 (5)	103 108	6 4	94 100	108 111	Grape/ Flusilazole
	0.01 (5) 0.1 (5)	103 99	4 3	98 96	108 104	Apple/ Flusilazole
	0.01 (5) 0.1 (5)	93 104	15 9	76 91	111 136	Oilseed Rape Seed/Flusilazole
Class, T. 2000 MS Detector (DuPont 3652)	0.01 (1) 0.1 (1)	83 81	NA NA	NA NA	NA NA	Wheat Grain/ Flusilazole
	0.01 (1) 0.1 (1)	88 75	NA NA	NA NA	NA NA	Sugar Beet Root/Flusilazole
	0.01 (1) 0.1 (1)	94 86	NA NA	NA NA	NA NA	Grape/ Flusilazole
	0.01 (1) 0.1 (1)	80 79	NA NA	NA NA	NA NA	Apple/ Flusilazole
	0.01 (1) 0.1 (1)	96 90	NA NA	NA NA	NA NA	Oilseed Rape Seed/Flusilazole
Rose, J.E. 2000 (DuPont 3654)	0.010 (5) 0.10 (5)	88 86	8 3	79 82	97 91	Wheat Grain/ Flusilazole
	0.010 (5) 0.10 (5)	121 103	11 11	109 92	138 117	Sugar Beet Root/Flusilazole
	0.010 (5) 0.10 (5)	94 83	7 2	84 80	100 85	Grape/ Flusilazole
	0.010 (5) 0.10 (5)	99 82	8 5	91 76	109 86	Apple/ Flusilazole
	0.010 (5) 0.10 (5)	76 77	16 9	59 66	93 84	Oilseed Rape Seed/Flusilazole
Gagnon, M.R. Stry, J.J. 2005 (DuPont-15737)	(5) 0.1 (5)	91 89	8 7	79 83	97 97	Soybeans/ Flusilazole
	0.01 (5) 0.1 (5)	86 83	14 12	70 70	99 93	Soybeans/ IN-F7321
	0.01 (5) 0.1 (5)	89 83	9 6	78 75	99 89	Soybean Meal/ Flusilazole
	0.01 (5) 0.1 (5)	85 89	15 7	68 82	96 96	Soybean Meal/ IN-F7321

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%) Low	Range of recoveries (%) High	Matrix/Analyte
	0.01 (5)	89	3	88	92	Soybean Oil/ Flusilazole
	0.1 (5)	102	2	101	102	
	0.01 (5)	92	7	87	104	Soybean Oil/ IN-F7321
	0.1 (5)	104	4	99	109	
Gagnon, M.R. Stry, J.J. 2005 (DuPont-15737)	0.01 (5)	92	7	83	101	Sugar Beets/ Flusilazole
	0.1 (5)	88	12	72	96	
	0.01 (5)	95	12	83	108	Sugar Beets/ IN-F7321
	0.1 (5)	82	12	66	90	
	0.01 (5)	83	6	75	87	Wheat Grain/ Flusilazole
	0.1 (5)	84	5	79	90	
	0.01 (5)	84	4	78	87	Wheat Grain/ IN-F7321
	0.1 (5)	76	11	76	84	
	0.02 (5)	86	10	73	96	Wheat Straw/ Flusilazole
	0.2 (5)	83	8	74	88	
	0.02 (5)	98	9	87	108	Wheat Straw/ IN-F7321
	0.2 (5)	89	10	74	94	
	0.01 (5)	86	2	84	89	Corn Grain / Flusilazole
	0.1 (5)	92	4	90	98	
	0.01 (5)	89	6	85	93	Corn Grain/ IN-F7321
	0.1 (5)	88	4	82	91	
Guinivan, R. 1983 (AMR 115-83)	0.01 (2)	107	--	104	109	Peanuts with shells/ Flusilazole
	0.05 (1)	97	--	97	97	
	0.025 (2)	101	--	91	111	
	0.01 (4)	90	3	87	94	
	0.01 (1)	97	--	97	97	Peanuts without shells/ Flusilazole
	0.025 (2)	93	--	90	96	
	0.01 (3)	91	3	87	93	
	0.100 (2)	93	--	93	93	Peanut Shells/ Flusilazole
	0.025 (1)	88	--	88	88	
	0.010 (6)	97	5	90	100	
	0.10 (2)	90	--	83	97	Bananas/ Flusilazole
	0.050 (2)	76	--	71	80	
	0.025 (2)	81	--	80	81	
	0.01 (2)	83	--	80	86	
	0.1 (2)	97	--	95	98	Sugarbeet Roots/ Flusilazole
	0.05 (2)	94	--	89	98	
	0.025 (2)	101	--	99	103	
	0.01 (2)	86	--	81	90	
	1.0 (2)	100	--	104	112	Wheat Grain/ Flusilazole
	0.5 (2)	102	--	99	105	
	0.05 (2)	103	--	99	106	
	0.01 (3)	94	2	92	95	
Guinivan, R. 1983 (AMR 115-83)	1.0 (1)	96	--	96	96	Wheat Straw/ Flusilazole
	0.5 (2)	98	--	94	102	
	0.2 (1)	87	--	87	87	
	0.1 (2)	103	--	99	107	
	0.08 (1)	95	--	95	95	
	0.05 (1)	94	--	94	94	
	0.04 (1)	85	12	85	85	
	0.03 (3)	93	--	83	104	
	0.01 (1)	98	--	98	98	
	1.0 (1)	94	--	94	94	Wheat Forage/ Flusilazole
	0.5 (1)	99	--	99	99	
	0.1 (3)	97	7	90	103	
	0.08 (2)	91	--	89	92	
	0.04 (2)	94	--	90	97	
	0.03 (2)	93	--	92	93	

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
Guinivan, R. 1983 (AMR 115-83)	0.01 (3) 0.05 (2) 0.5 (2) 1.0 (2)	101 105 104 96	3 -- -- --	91 99 93 93	109 110 94 98	Zinfandel Grapes/ Flusilazole
	0.01 (3) 0.05 (4) 0.5 (2) 1.0 (1)	103 101 100 108	4 8 -- --	100 90 94 108	107 109 105 108	Rome Apples/ Flusilazole
	0.053 (2) 0.11 (2) 0.21 (2)	100	12	85	114	Wheat Straw/ IN-37738
Guinivan, R.A. 1998 (AMR 604-86, Revision No. 3)	0.01 (2) 0.02 (1) 0.03 (2) 0.05 (1) 0.10 (1) 0.20 (2)	110,110 85 83, 100 92 85 95, 105	-- -- -- -- -- ---	110 -- 83 -- -- 95	110 100 105	Apples/ Flusilazole
	0.01 (5) 0.02 (1) 0.03 (1) 0.05 (3) 0.10 (2)	98 100 113 101 110	7 -- -- 13 --	91 90 100	110 116 110	Grapes/ Flusilazole
	0.05 (2) 0.10 (1) 0.80 (1) 1.30 (1)	110 102 80 80	-- -- -- --	110 -- -- --	110 -- -- --	Apple Pomace/ Flusilazole
	0.10 (1) 1.30 (1)	83 100	-- --	-- --	-- --	Grape Pomace/ Flusilazole
	0.03 (2) 0.05 (2) 0.10 (2)	116 110 86	-- -- --	113 108 83	118 112 89	Raisins/ Flusilazole
Koch, S.A.M. 1993 (AMR 2126-91)	0.027 (2) 0.054 (2) 0.54 (2)	97	21	74	130	Wheat Forage/ Flusilazole
	0.026 (2) 0.051 (2) 0.51 (2)	94	11	82	112	Wheat Forage/ IN-F7321
	0.026 (2) 0.053 (2) 0.53 (2)	105	18	91	132	Wheat Forage/ IN-37738
	0.035 (2) 0.070 (2) 0.70 (2)	82	11	70	96	Wheat Forage/ IN-37722
	0.026 (2) 0.051 (2) 0.51 (2)	90	14	69	108	Wheat Forage/ IN-G7072
Koch, S.A.M. 1993 (AMR 2126-91)	0.054 (3) 0.11 (3) 0.22 (3)	92	19	73	123	Wheat Grain/ Flusilazole
	0.051 (3) 0.10 (3) 0.20 (3)	107	19	81	140	Wheat Grain/ IN-F7321
	0.053 (3) 0.11 (3) 0.21 (3)	97	14	70	113	Wheat Grain/ IN-37738
	0.070 (3) 0.14 (3) 0.28 (3)	83	9	71	93	Wheat Grain/ IN-37722
	0.051 (3) 0.10 (3) 0.20 (3)	99	23	78	145	Wheat Grain/ IN-G7072

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
Koch, S.A.M. 1993 (AMR 2126-91)	0.054 (2) 0.11 (2) 0.22 (2)	81	13	63	98	Wheat Straw/ Flusilazole
	0.051 (2) 0.10 (2) 0.20 (2)	100	18	80	130	Wheat Straw/ IN-F7321
	0.053 (2) 0.11 (2) 0.21 (2)	100	12	85	114	Wheat Straw/ IN-37738
	0.070 (2) 0.14 (2) 0.28 (2)	100	21	69	123	Wheat Straw/ IN-37722
	0.051 (2) 0.10 (2) 0.20 (2)	92	13	76	112	Wheat Straw/ IN-G7072
Koch, S.A.M. 1993 (AMR 2579-92)	1.0 (2) 2.0 (2)	112	8	101	121	Wheat Forage/ Flusilazole
	0.05 (2) 1.0 (2)	88	13	74	102	Wheat Forage/ IN-F7321
	0.10 (2) 0.20 (2)	87	11	70	94	Wheat Grain/ Flusilazole
	0.10 (2) 0.20 (2)	75	8	70	85	Wheat Grain/ IN-F7321
	1.0 (2) 2.0 (2)	76	12	64	91	Wheat Straw/ Flusilazole
	0.50 (2) 1.0 (2)	93	4	89	97	Wheat Straw/ IN-F7321
Class, T. 1997 (AMR 4212-96)	0.010 (3) 0.050 (3) 0.25 (3)	105 88 82	7 6 NA	97 83 77	111 94 88	Sugar Beet Root/ Flusilazole
	0.010 (3) 0.10 (3) 0.50 (3)	93 93 94	16 12 4	77 81 92	105 103 98	Sugar Beet Tops/ Flusilazole
Class, T. 1997 (AMR 4213-96)	0.020 (3) 0.10 (3) 0.50 (3)	96 109 103	5 4 5	91 106 100	100 114 109	Oilseed Rape Seed/ Flusilazole
	0.020 (3) 0.10 (3) 0.50 (3)	88 71 78	NA 6 3	86 67 76	90 75 80	Oilseed Rape Forage/ Flusilazole

Samples of animal origin

The analytical methods are summarized below, including the commodities, for which the methods were validated, analytes and their limit of quantitation (LOQ), determination technique and a brief description of the method. Recoveries are shown in Table 22.

Reference: (Method)	Class, T., 2000 (DuPont-2157)
Second validation:	Rose, J.E., 2000 (DuPont-3653)
Commodities:	Chicken eggs, bovine milk, muscle, liver, kidney, and fat
Analytes:	Flusilazole
LOQ:	0.01 mg/kg 0.05 mg/kg (fat)
Determination:	GC-NPD (GC-MS for confirmation)
Description:	Homogenized samples are extracted by a modified DFG S19 method (German multiresidue enforcement method), using acetone for extraction. Water is added before extraction to obtain water:

acetone ratio of 2:1 (*v/v*). After addition of sodium chloride, flusilazole is partitioned into ethyl acetate:cyclohexane (1:1, *v/v*). The extract is cleaned by GPC, followed by a silica gel clean-up. For fat and eggs, the method was modified using acetone:acetonitrile (1:9, *v/v*) extraction (in the presence of filter aids) rather than acetone:water. Flusilazole is quantified by GC-NPD. GC-MS (*m/z* 233, 315, 300, 220 and 206) is used for confirmation

Reference: (Method)	McClory, J. P., 2002 (DuPont-10048)
Commodities:	Rat plasma
Analytes:	Flusilazole
LOQ:	0.001 mg/L
Determination:	LC-MS/MS
Description:	Rat plasma is extracted into ethyl acetate from a borate buffered water-plasma mixture. After freezing of the aqueous layer, the ethyl acetate layer is evaporated to dryness and reconstituted in water:acetonitrile (70:30, *v/v*). The samples are then analysed by LC-MS/MS (*m/z* 316 → 247).

Reference: (Method)	Guinivan, R., 1998 (AMR 462-85, Revision No. 4)
Second validation:	Class, T. 2000 (DuPont-4531)
Commodities:	Bovine milk, cream, muscle, fat, liver, and kidney
Analytes:	Flusilazole and IN-F7321
LOQ:	0.01 mg/kg
Determination:	GC-MS
Description:	Homogenized samples are extracted with ethyl acetate (water and sodium chloride are added in the case of cream and milk samples). Milk, cream, and fat ethyl acetate extracts are partitioned in acetonitrile saturated with hexane. All extracts are purified by a GPC clean-up. After that, two alternative approaches can be used. In the first, a split-assay approach, flusilazole is separated from IN-F7321 on a silica SPE cartridge. The flusilazole fraction is analysed directly by GC-MS, while the IN-F7321 fraction is silanized prior to the GC-MS analysis. In the second procedure, both flusilazole and IN-F7321 are collected in the same silica elution fraction prior to concurrent analysis (IN-F7321 is not derivatised) by capillary GC-MS.

Reference: (Method)	Guinivan, R.A. and Gagnon, M.R., 1991 AMR 1913-90
Commodities:	Chicken tissues (fat, liver, breast, thigh) and eggs
Analytes:	Flusilazole and IN-F7321
LOQ:	0.01 mg/kg (liver and fat) 0.02 mg/kg (eggs and muscle)
Determination:	GC-MS
Description:	Homogenized samples are extracted with ethyl acetate, followed by partition in acetonitrile saturated with hexane, a GPC clean-up and a derivatisation step (silanization). The samples are then passed through a silica SPE cartridge, where the silanized IN-F7321 and underivatised flusilazole are separated into two fractions. The fractions are analysed independently by GC-MS.

Table 22. Recoveries of flusilazole and its major phenyl metabolites (IN-F7321, IN-G7072, IN-37738 and IN-37722) in samples of animal origin

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
Class, T.	0.010 (5) 0.10 (5)	96 89	10 7	80 81	103 97	Whole Milk/ Flusilazole
2000 GC/NPD	0.010 (5) 0.10 (5)	90 87	10 9	77 77	101 97	Muscle/ Flusilazole

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
(DuPont-2157)	0.010 (5) 0.10 (5)	109 107	2 13	106 90	111 127	Bovine Liver/ Flusilazole
	0.010 (5) 0.10 (5)	101 101	10 10	90 87	108 111	Bovine Kidney/ Flusilazole
	0.010 (5) 0.10 (5)	109 85	11 10	90 77	121 96	Bovine Fat/ Flusilazole
	0.010 (5) 0.10 (5)	105 96	4 8	101 86	122 126	Whole Egg/ Flusilazole
Class, T. 2000 GC/MS (DuPont-2157)	0.010 0.10	91 105	--	--	--	Whole Milk/ Flusilazole
	0.010 0.10	90 97	--	--	--	Muscle/ Flusilazole
	0.010 0.10	96 100	--	--	--	Bovine Liver/ Flusilazole
	0.010 0.10	111 125	--	--	--	Bovine Kidney/ Flusilazole
	0.010 0.10	107 100	--	--	--	Bovine Fat/ Flusilazole
	0.010 0.10	104 101	--	--	--	Whole Egg/ Flusilazole
Rose, J. 2000 (DuPont-3653)	0.01 (5) 0.10 (5)	70 74	6 7	66 69	76 83	Whole Milk/ Flusilazole
	0.01 (5) 0.10 (5)	123 105	6 7	116 96	134 111	Muscle/ Flusilazole
	0.01 (5) 0.10 (5)	99 95	8 7	89 87	109 87	Bovine Liver/ Flusilazole
	0.01 (5) 0.10 (5)	75 71	9 3	65 68	82 73	Bovine Kidney/ Flusilazole
	0.01 (5) 0.10 (5)	71 86	7 3	63 82	76 89	Bovine Fat/ Flusilazole
	0.01 (5) 0.10 (5)	73 71	8 7	69 63	84 79	Whole Egg/ Flusilazole
McClory, J.P. 2002 LC/MS/MS (DuPont-10048)	0.01 (7) mg/L 0.1 (7) mg/L 0.3 (7) mg/L	94 95 101	13 4 10	78 90 94	117 101 120	Rat Plasma/ Flusilazole
Guinivan, R.A. 1998 Split Assay NPD (AMR 462-85)	0.02 (1) 0.05 (2) 0.10 (1) 0.20 (1)	115 99 91 90		90	108	Cream/ Flusilazole
	0.03 (1) 0.05 (1) 0.08 (1) 0.10 (1)	110 98 110 110				Milk/ Flusilazole
Guinivan, R.A. 1998 Split Assay MSD (AMR 462-85)	0.02 (1) 0.05 (2) 0.10 (1)	140 107 96		98	116	Cream/ Flusilazole
	0.03 (1) 0.05 (1) 0.08 (1) 0.10 (1)	117 114 95 110				Milk/ Flusilazole
Guinivan, R.A. 1998 Combined Assay MSD (AMR 462-85)	0.05 (1) 0.10 (1) 0.20 (1)	96 110 110				Cream/ Flusilazole
	0.04 (1) 0.05 (15) 0.10 (10) 0.20 (7)	130 108 107 97	 22 19 17	 68 80 72	 150 140 110	Milk/ Flusilazole
Guinivan, R.A. 1998 Split Assay	0.02 (1) 0.05 (2) 0.10 (1)	95 94 110		80	108	Cream/ IN-F7321

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
MSD	0.20 (1)	100				
	0.01 (1)	120				Milk/
(AMR 462-85)	0.03 (1)	80				IN-F7321
	0.05 (1)	80				
	0.08 (1)	86				
	0.10 (1)	93				
Guinivan, R.A.	0.05 (1)	84				Cream/
1998	0.10 (1)	94				IN-F7321
Combined Assay	0.20 (1)	75				
MSD	0.04 (12)	96	17	70	130	Milk/
(AMR 462-85)	0.05 (8)	88	24	64	120	IN-F7321
	0.10 (12)	85	18	66	120	
	0.20 (6)	82	30	65	130	
Guinivan, R.A.	0.05 (1)	108				Bovine Kidney/
1998	0.10 (1)	110				Flusilazole
	0.25 (1)	96				
Split Assay	0.50 (1)	98				
	1.00 (1)	91				
NP	0.02 (1)	125		108	130	Bovine Liver/
	0.05 (2)	119				Flusilazole
(AMR 462-85,	0.10 (1)	100				
Revision No. 4)	0.20 (1)	105				
	0.02 (1)	110				Bovine Fat/
	0.05 (2)	105				Flusilazole
	0.10 (1)	95				
	0.20 (1)	110				
	0.01 (1)	120		103	115	Bovine Muscle/
	0.02 (1)	130				Flusilazole
	0.04 (2)	109				
	0.10 (1)	120				
Guinivan, R.A.	0.05 (1)	84				Bovine Kidney/
1998	0.10 (1)	100				Flusilazole
	0.25 (1)	88				
Split Assay	0.50 (1)	84				
	1.00 (1)	81				
MSD	0.02 (1)	105		84	106	Bovine Liver/
	0.05 (2)	95				Flusilazole
(AMR 462-85,	0.10 (1)	91				
Revision No. 4)	0.20 (1)	90				
	0.02 (1)	95		70	96	Bovine Fat/
	0.05 (2)	83				Flusilazole
	0.10 (1)	87				
	0.20 (1)	95				
	0.01 (1)	120		120	128	Bovine Muscle/
	0.02 (1)	125				Flusilazole
	0.04 (2)	124				
	0.10 (1)	110				
Guinivan, R.A.	0.05 (1)	104				Bovine Kidney/
1998						Flusilazole
	0.02 (1)	115	15	75	100	Bovine Liver/
Combined Assay	0.20 (3)	81				Flusilazole
	0.05 (2)	78		70	86	Bovine Fat/
MSD	0.20 (2)	83		66	100	Flusilazole
	0.02 (1)	115	14	68	95	Bovine Muscle/
(AMR 462-85,	0.20 (3)	79				Flusilazole
Revision No. 4)						
Guinivan, R.A.	0.05 (1)	72				Bovine Kidney/
1998	0.10 (1)	100				IN-F7321
	0.25 (1)	72				
Split Assay	0.50 (1)	80				
	1.00 (1)	94				
MSD						

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
(AMR 462-85, Revision No. 4)						
	0.02 (1) 0.05 (2) 0.10 (1) 0.20 (1)	80 75 81 70		72	78	Bovine Liver/ IN-F7321
	0.02 (1) 0.05 (2) 0.10 (1) 0.20 (1)	95 93 84 105		90	96	Bovine Fat/ IN-F7321
	0.01 (1) 0.02 (1) 0.04 (2) 0.10 (1)	78 70 68 71		63	73	Bovine Muscle - IN-F7321
Guinivan, R.A. 1998 Combined Assay MSD (AMR 462-85, Revision No. 4)	0.04 (1) 0.20 (3)	88 90	22	70	100	Bovine Kidney/ IN-F7321
	0.04 (1) 0.20 (4)	120 83	22	60	100	Bovine Liver/ IN-F7321
	0.10 (2) 0.20 (8)	72 88	21	67	120	Bovine Fat/ IN-F7321
	0.02 (1) 0.04 (1) 0.20 (3) 0.25 (1)	80 75 103 72		85	120	Bovine Muscle - IN-F7321
Class, T. 2000 (DuPont-4531)	0.01 (5) 0.10 (5)	93 85	12 14	78 58	109 94	Whole milk/ IN-F7321
	0.01 (5) 0.10 (5)	100 86	7 16	55 70	106 104	Cream/ IN-F7321
	0.01 (5) 0.10 (5)	89 89	8 18	82 73	96 115	Whole Egg/ IN-F7321
	0.01 (5) 0.10 (5)	103 92	11 12	97 60	104 108	Bovine Muscle - IN-F7321
	0.01 (5) 0.10 (5)	87 81	16 16	69 66	105 98	Bovine Liver/ IN-F7321
	0.01 (5) 0.10 (5)	101 82	6 12	90 69	106 96	Bovine Kidney/ IN-F7321
	0.01 (4) 0.10 (5)	81 97	17 17	70 78	101 117	Bovine Fat/ IN-F7321
Guinivan, R.A. and Gagnon, M. 1991 (AMR 1913-90)	0.01 (1) 0.02 (1) 0.05 (2) 0.10 (2) 0.15 (1) 0.20 (1)	100 100 85 86 68 120	-- -- -- -- -- --	100 100 84 77 68 120	100 100 86 94 68 120	Chicken Fat/ Flusilazole
	0.05 (3) 0.10 (4) 0.15 (4) 0.20 (2)	87 87 90 101	11 16 13 --	78 67 79 92	97 100 100 110	Chicken Fat/ IN-F7321
	0.01 (1) 0.02 (2) 0.05 (3) 0.10 (2) 0.15 (2)	74 81 82 89 83	-- 28 6 -- --	74 65 79 77 83	74 97 88 100 83	Chicken Liver/ Flusilazole
	0.01 (1) 0.02 (2) 0.05 (3) 0.10 (2) 0.15 (2)	94 94 92 78 90	-- -- 25 -- --	94 80 66 71 85	94 108 110 85 94	Chicken Liver/ IN-F7321
	0.02 (2) 0.05 (4) 0.10 (2)	91 102 104	-- 10 --	66 90 104	116 114 104	Chicken Breast/ Flusilazole

Reference (Author, Year)	Fortification levels (mg/kg)	Mean recovery (%)	Relative standard deviation (%)	Range of recoveries (%)		Matrix/Analyte
				Low	High	
	0.15 (2)	90	--	83	96	
Guinivan, R.A. and Gagnon, M. 1991 (AMR 1913-90)	0.02 (2)	107		89	125	Chicken Breast/ IN-F7321
	0.05 (4)	105	--	97	111	
	0.10 (2)	81	7	65	97	
	0.15 (2)	80	--	67	92	
	0.02 (2)	95	--	87	103	Chicken Thigh/ Flusilazole
	0.05 (4)	83	7	76	89	
	0.10 (2)	98	--	95	100	
	0.15 (1)	106	--	106	106	
	0.02 (2)	97	--	88	105	Chicken Thigh/ IN-F7321
	0.05 (3)	108	10	97	118	
	0.10 (2)	84	--	63	105	
	0.15 (1)	86	--	86	86	
Guinivan, R.A. and Gagnon, M. 1991 (AMR 1913-90)	0.02 (2)	83	--	79	86	Chicken Eggs/ Flusilazole
	0.05 (4)	86	21	63	107	
	0.10 (2)	78	--	70	85	
	0.15 (2)	100	--	99	100	
	0.02 (2)	79	--	65	92	Chicken Eggs/ IN-F7321
	0.05 (4)	100	7	91	108	
	0.10 (2)	100	--	89	110	
	0.15 (2)	84	--	68	100	

Stability of pesticide residues in stored analytical samples

The Meeting received information on the stability of flusilazole and its silanol IN-F7321 metabolite in freezer-stored samples of plant and animal origin, including apples, grapes, wheat grain, wheat straw and bovine matrices (milk, muscle, kidney, liver and fat).

Flusilazole and its metabolite IN-F7321 were added to control samples and stored at approximately -20 °C. Samples were removed at specified intervals for extraction and analysis. The results are shown in Tables 23 and 24, together with the references for the employed analytical methods.

No significant degradation of flusilazole and its silanol metabolite IN-F7321 was observed in the tested plant and bovine matrices and storage intervals, with the possible exception of IN-F7321 in liver (percentage of residues survived after adjustment with analytical recoveries 35, 84 and 38% for 1, 3 and 14.25 months of storage, respectively). In the case of 3 month-storage of IN-F7321 in liver, samples were only partially thawed and rapidly refrozen after fortification, whereas the samples were completely thawed and remained in contact with the fortification solution at ambient temperature for at least 30 min in the other two storage experiments (1 and 14.25 months of storage). The partially thawed and rapidly refrozen samples showed limited degradation, probably due to a much lower rate of enzyme activity at lower temperatures. This result indicates good stability, but the need for careful handling of liver samples.

Table 23. Stability of flusilazole and IN-F7321 stored at -20 °C in fortified wheat (grain and straw), apples, grapes, and oilseed rape (seed and shoots) samples

Crop commodity/ Analyte	Storage interval (months)	Conc. (mg/kg)	Mean recovery (%)			Stability study ref.	Method ref.
			Stored[a]	Fresh	Norm.[b]		
Wheat Grain/ Flusilazole	0	0.27	87 ± 8	85	102	AMR 2127-91, SU 1 Desmond, P. 1998	AMR 2126-91 Koch, S.A.M. 1993
	3		87 ± 3	100	87		
	4		91 ± 13	85	106		
	5		83 ± 3	93	89		
	6		70 ± 0	74	95		
	9		78 ± 0	89	88		
	11		95 ± 2	96	98		
	12		70 ± 0	81	86		
	15		113 ± 13	104	109		
	18		78 ± 0	85	92		
	21		85 ± 0	76	112		
	40		69 ± 2	73	94		
Wheat Grain/ Flusilazole	0	0.1	100 ± 8	102	98	FLUS/RES 29 Guinivan, R.A. 1995	AMR 115-83 Guinivan, R.A. AMR 604-86 Guinivan, R.A.
	1		108 ± 11	100	108		
	4		107 ± 0	100	107		
	6		98 ± 10	102	96		
	12		107 ± 5	100	107		
	28.5		99 ± 4	100	99		
	36.5		101 ± 2	100	101		
Wheat Straw/ Flusilazole	0	0.27	81 ± 0	85	95	AMR 2127-91, SU 1 Desmond, P. 1998	AMR 2126-91 Koch, S.A.M. 1993
	3		100 ± 6	100	100		
	4		83 ± 3	85	98		
	5		78 ± 0	93	84		
	6		85 ± 0	85	100		
	9		80 ± 2	85	94		
	11		74 ± 0	78	95		
	12		85 ± 6	89	96		
	15		74 ± 0	85	87		
	18		74 ± 6	80	93		
	21		74 ± 0	80	93		
	40		96 ± 0	88	109		
Wheat Straw/ Flusilazole	0	0.3	104 ± 4	101	103	FLUS/RES 29 Guinivan, R.A. 1995	AMR 115-83 Guinivan, R.A. AMR 604-86 Guinivan, R.A.
	1		106 ± 2	100	106		
	4		110 ± 6	110	100		
	6		95 ± 7	100	95		
	12		97 ± 4	100	97		
	27.5		92 ± 6	100	92		
	36.5		94 ± 3	113	83		
Apples/ Flusilazole	0	0.1	96 ± 1	92	104	FLUS/RES 29 Guinivan, R.A. 1995	AMR 115-83 Guinivan, R.A. AMR 604-86 Guinivan, R.A.
	1		100 ± 1	104	96		
	3		78 ± 0	100	78		
	4		94 ± 6	100	94		
	6		93 ± 8	92	101		
	12		90 ± 6	89	101		
	17		100 ± 0	107	93		
	24		86 ± 3	88	98		
	30.5		91 ± 3	113	81		
	37		109 ± 4	100	109		
	48		92 ± 4	100	92		

Crop commodity/ Analyte	Storage interval (months)	Conc. (mg/kg)	Mean recovery (%)			Stability study ref.	Method ref.
			Stored[a]	Fresh	Norm.[b]		
Grapes/ Flusilazole	0 1.25 3 6.25 17	0.2	108 ± 6 94 ± 8 105 ± 7 104 ± 3 80 ± 4	94 99 110 95 101	114 94 95 109 79	FLUS/RES 29 Guinivan, R.A. 1995	AMR 115-83 Guinivan, R.A. AMR 604-86 Guinivan, R.A.
Oilseed Rape (Seed) /Flusilazole	14	0.05	101 ± 7%	98 ± 6%	97	AMR 5132-98 Jernberg, K.M., 2000	AMR 4213-96 Class, T. 1997
Oilseed Rape (Shoots) /Flusilazole	14	0.05	109 ± 3%	109 ± 10%	100		
Wheat Grain/ IN-F7321	0 3 4 5 6 9 11 12 15 18 21 40	0.26	127 ± 11 94 ± 8 140 ± 3 79 ± 3 106 ± 13 83 ± 25 73 ± 0 69 ± 0 97 ± 22 81 ± 16 121 ± 24 89 ± 11	123 100 123 81 58 92 81 81 96 62 97 92	103 94 114 98 182 90 90 85 101 130 125 96	AMR 2127-91 SU 1 Desmond, P. 1998	AMR 2126-91 Koch, S.A.M. 1993
Wheat Straw/ IN-F7321	0 3 4 5 6 9 11 12 15 18 21 40	0.26	79 ± 3 83 ± 3 95 ± 13 94 ± 3 79 ± 24 125 ± 3 81 ± 22 62 ± 0 71 ± 8 89 ± 22 98 ± 35 121 ± 3	77 85 77 96 119 135 62 81 73 107 79 120	103 98 123 98 66 93 130 77 97 83 124 101	AMR 2127-91 SU 1 Desmond, P. 1998	AMR 2126-91 Koch, S.A.M. 1993
Apples/ IN-F7321	2.5 4 8 18.5 25 26	0.2	111 ± 2 94 ± 5 104 ± 4 98 ± 17 80 ± 1 100 ± 0	100 70 100 100 100 100	111 134 104 98 80 100	FLUS/RES 29 Guinivan, R.A. 1995	AMR 115-83 Guinivan, R.A. AMR 604-86 Guinivan, R.A.
Grapes/ IN-F7321	2.5 4 9 18.5 25	0.2	75 ± 8 85 ± 2 99 ± 11 85 ± 5 98 ± 1	100 100 100 104 100	75 85 99 81 98		

a - Stored: percentage of residues measured in samples after the storage interval indicated

b - Normalised recovery = (average freezer storage value/average fresh fortification value)×100%.

Table 24. Stability of flusilazole and IN-F7321 stored at -20 °C in fortified bovine milk, muscle, kidney, liver and fat samples

Tissue/ Analyte	Storage interval (months)	Conc. (mg/kg)	Mean recovery (%)			Stability study ref.	Method ref.
			Stored[a]	Fresh	Norm.[b]		
Whole milk/ Flusilazole	0.2 2 6	0.2	115 ± 7 73 ± 4 80 ± 14	105 70 80	110 104 100	FLUS/RES 29 Guinivan, R.A. 1995	AMR 115-83 Guinivan, R.A. AMR 604-86 Guinivan, R.A.
Bovine muscle/ Flusilazole	0.2 2 6	0.2	80 ± 14 90 95 ± 21	70 100 75	114 90 127		
Bovine liver/ Flusilazole	0.2 3 6	0.2	75 ± 14 90 ± 0 88 ± 25	75 85 100	100 106 88		
Bovine fat/ Flusilazole	0.2 3 6	0.2	70 ± 0 78 ± 11 103 ± 4	65 100 95	108 78 108		
Whole milk/ IN-F7321	11	0.2	103 ± 45	70	147		
Bovine muscle/ IN-F7321	0.5 3 15	0.1 0.2 0.25	63 95 ± 14 59 ± 17	80 85 72	79 112 82		
Bovine kidney/ IN-F7321	0.5 3.5	0.2	63 ± 4 110 ± 14	70 110	89 100		
Bovine liver/ IN-F7321	1 3 14.25	0.2	27 ± 2[c] 80 ± 3[d] 38 ± 11[c]	75 95 100	35 84 38		
Bovine fat/ IN-F7321	0.15 0.25 3.4 4 16	0.1 0.2 0.1 0.2 0.2	70 ± 4 93 ± 22 91 ± 7 101 ± 17 75 ± 28	67 78 76 105 105	104 119 120 96 71		

a - Stored: percentage of residues measured in samples after the storage interval indicated

b - Normalised recovery = (average freezer storage value/average fresh fortification value)×100%.

c - Liver control samples were completely thawed and remained in contact with the fortification solution at ambient temperature for at least 30 min.

d - Liver control samples were only partially thawed and rapidly refrozen after fortification.

USE PATTERN

Flusilazole is a broad spectrum fungicide that belongs to the triazole subclass of ergosterol biosynthesis inhibitors. Flusilazole is effective against plant diseases caused by many *Ascomycete*, *Basidiomycete* and *Deuteromycete* fungi. The information available to the Meeting on registered flusilazole uses is summarized in Table 25. It is mostly based on the labels or their translation provided by the manufacturer.

Flusilazole is not registered in the United States but it can be applied under a Section 18 Emergency Exemption of Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) for the use on soybeans to control Asian soybean rust.

In the European Union, flusilazole was proposed for the inclusion in Annex I of European Council Directive 91/414/EEC concerning the placing of plant protection products on the market.

Table 25. Registered uses of flusilazole

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Almond	Yemen	EC	400		Foliar	NSOL	3.2	NSOL	NSOL	Y
Apple	Albania	EW	100		Foliar	1-3[l]	2.4	NSOL	14	N
Apple	Albania	EW	100		Foliar	1-3[g]	3	NSOL	14	N
Apple	Albania	EC	400		Foliar	1-3[g]	2	NSOL	28	N
Apple	Albania	EC	400		Foliar	1-3[g]	3	NSOL	28	N
Apple	Algeria	EC	400		Foliar	NSOL[g]	NSOL	NSOL	14	N
Apple	Argentina	EC	400		NSOL	4[c]	4	NSOL	21	Y
Apple	Australia	WG	200		Foliar	1-4 [h]	3	NSOL	14	Y
Apple	Bosnia and Herzegovina	EC	400		Foliar	1-3 [f]	2-3	NSOL	28	N
Apple	Bulgaria	EW	100		Foliar	1-2	3.5	35	30	N
Apple	Bulgaria	EC	400		Foliar	8 [d]	2	NSOL	60	Y
Apple	Canada	WG	200		Ground	4 [c]	NSOL	40	77	Y
Apple	Chile	EC	400		Ground, Aerial	NSOL[h]	3	NSOL	30	Y
Apple	China	EC	106.7	Famoxadone, 100	Foliar	3-4 [m]	5.3	NSOL	NSOL	Y
Apple	Croatia	EW	100		Foliar	1-4 [j]	2.4	NSOL	28	N
Apple	Cyprus	EW	100		Foliar	1-3 [g]	3	90	20	N
Apple	Cyprus	EC	400		Foliar	1-3 [g]	3	90	20	N
Apple	Czech Republic	EW	100		Foliar	NSOL[h]	3	30	35	Y
Apple	Ecuador	EC	400		Ground	NSOL	NSOL	250	NSOL	N
Apple	Egypt	EC	400		Foliar	NSOL	3	NSOL	14	Y
Apple	France	EC	400		Foliar	3[g]	3	NSOL	14	Y
Apple	Germany	WG	200		Foliar	4-8[b]	2.5	37.5	28	N
Apple	Greece	WG	200		Foliar	4 [g]	3	60	20	N
Apple	Greece	EC	400		Foliar	2-4 [g]	2.6	NSOL	20	Y
Apple	Hungary	EC	400		Post-emergence	6	NSOL	100	21	N
Apple	India	EC	400		Foliar	1 (min)	4	NSOL	10	Y
Apple	Israel	EC	400		Foliar	NSOL	NSOL	NSOL	14	N
Apple	Jordan	EC	400		Foliar	NSOL	NSOL	NSOL	NSOL	N
Apple	Kenya	EC	400		Foliar	3-5[c]	3	80	NSOL	Y
Apple	France	EC	400		Foliar	3[g]	3	NSOL	14	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Apple	Korea	WP	25		Foliar	1-6 [g]	1.25	NSOL	21	Y
Apple	Korea	WG	200		Foliar	NSOL[g]	3.3	NSOL	7	Y
Apple	Lebanon	EW	250		Foliar	NSOL[g]	NSOL	NSOL	7	N
Apple	Macedonia	EW	100		Foliar	1-4[l]	3	NSOL	28	N
Apple	Moldavia	EC	400		Foliar	3	NSOL	30	21	N
Apple	Morocco	EW	100		Foliar	NSOL	NSOL	NSOL	30	N
Apple	Poland	EC	400		Foliar	3[g]	NSOL	45	14	Y
Apple	Portugal	EC	400		Foliar	9	4	40	21	N
Apple	Romania	WG	200		Foliar	NSOL	NSOL	NSOL	NSOL	N
Apple	Serbia and Montenegro	EC	400		Foliar	1-3 [g]	3	30	28	N
Apple	Serbia and Montenegro	EC	400		Foliar	1-3 [f]	3	20-30	28	N
Apple	Serbia and Montenegro	EW	100		Foliar	1-3[l]	2.4	NSOL	28	N
Apple	Slovakia	EW	100		Foliar	1-4[g]	3	30	35	N
Apple	Slovakia	EW	100		Foliar	1-4[g]	4.5	45	35	N
Apple	South Africa	EW	100		Foliar	1-5 [b]	2.4	84	14	Y
Apple	Spain	EC	400		Foliar	4 [h]	4.8	72	14	Y
Apple	Switzerland	WG	200		Foliar	1-4	2.5	40	21	N
Apple	Syria	EW	250		Foliar	4 [g]	NSOL	NSOL	14	Y
Apple	Syria	EC	400		Foliar	3-5 [g]	NSOL	NSOL	14	N
Apple	Turkey	EC	400		Foliar	NSOL[h]	2.4	NSOL	30	Y
Apple	Yemen	EW	100		Foliar	NSOL[h]	3	NSOL	NSOL	Y
Apple	Yemen	EC	400		Foliar	3-5 [c]	3.2	NSOL	NSOL	Y
Apricot	Algeria	EC	400		Foliar	NSOL[h]	NSOL	NSOL	14	N
Apricot	Bulgaria	EW	100		Foliar	1-2	3	30	30	N
Apricot	Bulgaria	EC	400		Foliar	3-4 [d]	3	NSOL	60	Y
Apricot	Cyprus	EW	100		Foliar	1-3[b]	4	120	7	N
Apricot	Cyprus	EC	400		Foliar	1-3[b]	4	120	7	N
Apricot	France	EW	100		Foliar	NSOL	4	NSOL	NSOL	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Apricot	Jordan	EC	400		Foliar	NSOL	NSOL	NSOL	NSOL	N
Apricot	Spain	EC	400		Foliar	2 [k]	4.8	72	7	Y
Apricot	Spain	EW	100		NSOL	2 [k]	5	NSOL	7	Y
Banana	China	EC	106.7	Famoxadone, 100	Foliar	2-3[m]	10.7	NSOL	NSOL	Y
Banana	Colombia	EC	400		Foliar	4-6 [e]	NSOL	100	1	Y
Banana	Venezuela	EC	400		Foliar	6[o]	NSOL	100	NSOL	Y
Barley	Algeria	SC	250	Carbendazim, 125	Foliar	NSOL	NSOL	250	NSOL	Y
Barley	Austria	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	NSOL (BBCH 61)	Y
Barley	Austria	EC	250		Foliar	1	NSOL	250	NSOL	Y
Barley	Belgium	EC	106.7	Famoxadone, 100	Foliar	1-2	NSOL	160	NSOL	N
Barley	Belgium	SE	250	Carbendazim, 125	Foliar	2	NSOL	175	28	Y
Barley	Bulgaria	EC	106.7	Famoxadone, 100	Foliar	1-2	NSOL	128	42	N
Barley	Chile	EC	250	Carbendazim, 125	Aerial, ground	2	NSOL	250	21	Y
Barley	Colombia	EC	400		Foliar	1-2	NSOL	120	28	Y
Barley	Czech Republic	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	160	42	N
Barley	Czech Republic	EW	250		Foliar	1	NSOL	200	42	Y
Barley	France	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	49	N
Barley	France	EC	160	Fenpropimorph, 375	Foliar	2	NSOL	160	28	N
Barley	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	NSOL	Y
Barley	France	EC	250	Fenpropimorph, 375	Foliar	2	NSOL	200	NSOL	Y
Barley	France	EW	250		Foliar	2	NSOL	200	NSOL	N
Barley	France	EC	400		Foliar	2	NSOL	200	NSOL	N
Barley	Germany	EC	106.7	Famoxadone, 100	Foliar	1-2 [k]	NSOL	160	42	N
Barley	Germany	EW	250		Foliar	2	50-100	200	NSOL	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Barley	Germany	SE	250	Carbendazim, 125	Foliar	2	50-100	200	42 (BBCH 51)	Y
Barley	Hungary	SC	160	Tridemorph, 350	Foliar	NSOL	NSOL	250	30	N
Barley	Luxembourg	SE	250	Carbendazim, 125	Foliar	2	NSOL	175	28	Y
Barley	Mexico	EC	400		Foliar	1	NSOL	200	42	Y
Barley	Portugal	SE	250	Carbendazim, 125	Foliar	2[q]	NSOL	200	NSOL	Y
Barley	Saudi Arabia	SC	250	Carbendazim, 125	Foliar	2	NSOL	250	NSOL	Y
Barley	Slovakia	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	42	Y
Barley	Slovakia	EC	106.7	Famoxadone, 100	Foliar	1-2	NSOL	128	42	N
Barley	Slovakia	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	160	42	N
Barley	South Africa	SC	125	Carbendazim, 250	Ground	1	29 (max)	87.5	56	Y
Barley	South Africa	SC	250	Carbendazim, 125	Ground	1	33 (max)	100	56	Y
Barley	South Africa	EW	250		Ground	1-2	33 (max)	100	56	Y
Barley	South Africa	SC	125	Carbendazim, 250	Aerial	1	350 (max)	105	56	Y
Barley	South Africa	SC	250	Carbendazim, 125	Aerial	1	375 (max)	112.5	56	Y
Barley	South Africa	EW	250		Aerial	1-2	375 (max)	112.5	56	Y
Barley	Spain	SE	5	Carbendazim, 10	Foliar	1	33	100	NSOL	N
Barley	Spain	SC	250	Carbendazim, 125	Foliar	1	33-67	200	NSOL (BBCH 61)	Y
Barley	Switzerland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	NSOL	N
Barley	Switzerland	EW	250		Foliar	1	NSOL	250	NSOL (BBCH 51)	Y
Barley	Syria	EC	400		Foliar	1-2	NSOL	NSOL	28	N
Barley	Tunisia	SC	250	Carbendazim, 125	Foliar	2	NSOL	200	NSOL	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Barley	Uruguay	SC	125	Carbendazim, 250	Aerial, Ground	1-2	NSOL	112.5	NSOL	N
Barley, Spring	Belgium	EW	250		Foliar	1-2	NSOL	175	28	N
Barley, spring	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125 - 162.5	42	Y
Barley, Spring	Hungary	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	28	Y
Barley, Spring	Hungary	EC	106.7	Famoxadone, 100	Post-emergence	NSOL	NSOL	774	28	N
Barley, Spring	Luxembourg	EW	250		Foliar	1-2	NSOL	175	28	N
Barley, Spring	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	125	35	Y
Barley, Spring	Poland	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	128	35	N
Barley, Spring	Poland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	35	N
Barley, Spring	Poland	EC	400		Foliar	1	NSOL	160	35	Y
Barley, Spring	Poland	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	35	Y
Barley, Spring	Slovakia	EW	250		Foliar	2	NSOL	200	42	Y
Barley, Spring	United Kingdom	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	NSOL	N
Barley, Spring	United Kingdom	EC	160	Fenpropimorph, 375	Foliar	2	NSOL	160	NSOL (BBCH 59)	Y
Barley, spring	United Kingdom	SC	250	Carbendazim, 125	Foliar	1	NSOL	156 / 200	NSOL (BBCH 59 / 33)	Y
Barley, Spring	United Kingdom	EW	250		Foliar	1	NSOL	156 / 200	NSOL (BBCH 71 / 33)	Y
Barley, spring	United Kingdom	EC	400		Foliar	1	NSOL	160 / 200	NSOL (BBCH 73 / 33)	Y
Barley, Winter	Belgium	EW	250		Foliar	NSOL	NSOL	175	28	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Barley, winter	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	42	Y
Barley, Winter	Hungary	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	28	Y
Barley, Winter	Hungary	EC	106.7	Famoxadone, 100	Post-emergence	NSOL	NSOL	774	28	N
Barley, Winter	Luxembourg	EW	250		Foliar	1-2	NSOL	175	28	N
Barley, Winter	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOl	125	35	Y
Barley, Winter	Poland	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	128	35	N
Barley, Winter	Poland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	35	N
Barley, Winter	Poland	EC	400		Foliar	1	NSOL	160	35	Y
Barley, Winter	Poland	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	35	Y
Barley, Winter	United Kingdom	EW	106.7	Famoxadone, 100	Foliar	2	NSOL	160	NSOL	N
Barley, Winter	United Kingdom	EC	160	Fenpropimorph, 375	Foliar	2	NSOL	160	NSOL (BBCH 59)	Y
Barley, winter	United Kingdom	SC	250	Carbendazim, 125	Foliar	1	NSOL	156 / 200	NSOL (BBCH 59 / 33)	Y
Barley, Winter	United Kingdom	EW	250		Foliar	1	NSOL	156 / 200	NSOL (BBCH 71 / 33)	Y
Barley, winter	United Kingdom	EC	400		Foliar	1	NSOL	160 / 200	NSOL (BBCH 73 / 33)	Y
Bean	China	EC	400		Foliar	2-3 [d]	5	NSOL	NSOL	Y
Bean, kidney	Colombia	EC	400		Foliar	1-2	NSOL	120	7	Y
Beans, dry	South Africa	EW	250		Ground	1-4[h]	25	125	30	Y
Beans, dry	South Africa	EW	250	Carbendazim, 125	Ground	1-4[h]	25	125	30	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Beans, dry	South Africa	EW	250		Aerial	1-4[h]	406-542	162.5	30	Y
Beans, dry	South Africa	EW	250	Carbendazim, 125	Aerial	1-4[h]	542	162.5	30	Y
Beans, dry (hay for feeding)	South Africa	EW	250		Ground	1-4[h]	25	125	42	Y
Beans, dry (hay for feeding)	South Africa	EW	250	Carbendazim, 125	Ground	1-4[h]	25	125	42	Y
Beans, dry (hay for feeding)	South Africa	EW	250		Aerial	1-4[h]	406-542	162.5	42	Y
Beans, dry (hay for feeding)	South Africa	EW	250	Carbendazim, 125	Aerial	1-4[h]	542	162.5	42	Y
Beet, Fodder	Bosnia and Herzegovina	EC	400		Foliar	1-2 [g]	NSOL	100	21	N
Beet, fodder	Czech Republic	SE	125	Carbendazim, 250	Foliar	1-2[g]	NSOL	100	NSOL[q]	Y
Beet, Fodder	Germany	EW	250		Foliar	1-2 [e]	37.5-75	150	42	Y
Beet, Fodder	Germany	SE	250	Carbendazim, 125	Foliar	1-2 [e]	37.5-75	150	42	Y
Beet, Fodder	Poland	EC	400		Foliar	2[g]	NSOL	80	35	Y
Beet, Fodder	Romania	SE	125	Carbendazim, 250	Foliar	2[k]	NSOL	75	NSOL	N
Beet, Fodder	Serbia and Montenegro	SE	125	Carbendazim, 250	Foliar	1-2[g]	NSOL	75	35	N
Beet, Fodder	Serbia and Montenegro	EC	400		Foliar	1-2[g]	NSOL	100	21	N
Beet, Fodder	Slovakia	SE	125	Carbendazim, 250	Foliar	1-2[g]	NSOL	125	NSOL[q]	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Beet, Garden, Root	Cyprus	EW	100		Foliar	1-2 [j]	NSOL	80	15	N
Beet, Garden, Root	Cyprus	EC	400		Foliar	1-2 [j]	NSOL	80	15	N
Beet, Sugar	Austria	EC	250		Foliar	2	NSOL	150	21	Y
Beet, Sugar	Belgium	SE	250	Carbendazim, 125	Foliar	2	NSOL	187.5	28	Y
Beet, Sugar	Bosnia and Herzegovina	EC	400		Foliar	1-2[g]	NSOL	100	21	N
Beet, Sugar	Bulgaria	EC	400		Foliar	2	NSOL	80	60	Y
Beet, Sugar	Chile	EC	250	Carbendazim, 125	Aerial, ground	2	NSOL	187.5	21	Y
Beet, Sugar	Czech Republic	SE	125	Carbendazim, 250	Foliar	1-2[g]	NSOL	100	NSOL[q]	Y
Beet, Sugar	France	EW	250		Foliar	2	NSOL	125	28	N
Beet, Sugar	Germany	EW	250		Foliar	1-2 [e]	37.5-75	150	42	Y
Beet, Sugar	Germany	SE	250	Carbendazim, 125	Foliar	1-2 [e]	37.5-75	150	42	Y
Beet, Sugar	Greece	WG	200		Foliar	3	NSOL	80	15	N
Beet, Sugar	Greece	EC	400		Foliar	1-3	NSOL	80	15	Y
Beet, Sugar	Hungary	SE	125	Carbendazim, 250	Foliar	3	NSOL	100	28	Y
Beet, Sugar	Luxembourg	SE	250	Carbendazim, 125	Foliar	2	NSOL	187.5	28	Y
Beet, Sugar	Poland	EC	400		Foliar	2[g]	NSOL	80	35	Y
Beet, Sugar	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	125	35	Y
Beet, Sugar	Romania	SE	125	Carbendazim, 250	Foliar	2[k]	NSOL	75	NSOL	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Beet, Sugar	Serbia and Montenegro	SE	125	Carbendazim, 250	Foliar	1-2[g]	NSOL	75	35	N
Beet, Sugar	Serbia and Montenegro	EC	400		Foliar	1-2[g]	NSOL	100	21	N
Beet, Sugar	Slovakia	SE	125	Carbendazim, 250	Foliar	1-2[g]	NSOL	125	NSOL[q]	Y
Beet, Sugar	Spain	SC	250	Carbendazim, 125	Foliar	1-2	NSOL	125	45	Y
Beet, Sugar	Switzerland	EW	250		Foliar	1	NSOL	200	NSOL	Y
Beet, Sugar	Syria	EW	250		Foliar	3[k]	NSOL	125	28	Y
Beet, Sugar	Syria	EC	400		Foliar	NSOL[k]	NSOL	NSOL	28	N
Beet, Sugar	Turkey	EC	400		Foliar	NSOL[n]	NSOL	80	30	Y
Beet, Sugar	United Kingdom	SC	250	Carbendazim, 125	Foliar	1	NSOL	156	49	Y
Beet, Sugar	United Kingdom	EC	250		Foliar	1	NSOL	156	49	Y
Beet, Sugar	Yemen	EW	100		Foliar	NSOL[h]	NSOL	70	NSOL	Y
Beet, Sugar	Yemen	EC	400		Foliar	NSOL[k]	8	NSOL	NSOL	Y
Beets	France	EC	250	Fenpropimorph, 375	Foliar	2	NSOL	125	28	Y
Beets	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	125	NSOL	Y
Beets	France	EC	400		Foliar	2	NSOL	128	28	N
Beets	Portugal	SE	250	Carbendazim, 125	Foliar	2[p]	NSOL	125	NSOL	Y
Cereal grains	Romania	SE	125	Carbendazim, 250	Foliar	NSOL	NSOL	100	42	Y
Cereals	Kenya	EC	400		Foliar	1	20	200	NSOL	Y
Cherry	Cyprus	EW	100		Foliar	1-3 [b]	4	120	7	N
Cherry	Cyprus	EC	400		Foliar	1-3 [b]	4	120	7	N
Cherry	Czech Republic	EW	100		Foliar	2-3[c]	3	30	28	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Cherry	France	EW	100		Foliar	NSOL	4	NSOL	NSOL	Y
Cherry	Poland	EC	400		Foliar	3[g]	NSOL	45	14	Y
Chicory	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	125	NSOL	Y
Chili	Thailand	EC	400		Foliar	2-3 [b]	600	240	20	N
Citrus fruit	New Zealand	WG	200		Foliar	2[o]	3	NSOL	14	Y
Coffee	Colombia	EC	400		Foliar	3-5	NSOL	240	30	Y
Coffee	Ecuador	EC	400		Ground	NSOL	NSOL	250	NSOL	N
Coffee	Venezuela	EC	400		Foliar	NSOL	NSOL	100	NSOL	Y
Corn / maize	Indonesia	EC	400		Foliar	1-4 [k]	NSOL	100	7	N
Corn, sweet corn / maize	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	NSOL	Y
Corn, sweet corn / maize	France	EW	250		Foliar	2	NSOL	200	NSOL	N
Corn, sweet corn / maize	Israel	EC	400		Foliar	NSOL	NSOL	NSOL	14	N
Corn, sweet corn / maize	South Africa	SC	125	Carbendazim, 250	Aerial, Ground	1-2[k]	31-2500	125	14	Y
Corn, sweet corn / maize	South Africa	SC	250	Carbendazim, 125	Aerial, Ground	2[k]	31-2500	125	14	Y
Corn, sweet corn / maize	South Africa	EW	250		Aerial, Ground	1-2[k]	31-2500	125	14	Y
Corn, sweet corn / maize (grazing)	South Africa	SC	125	Carbendazim, 250	Aerial, Ground	1-2[k]	31-2500	125	60	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Corn, sweet corn / maize (grazing)	South Africa	SC	250	Carbendazim, 125	Aerial, Ground	2[k]	31-2500	125	60	Y
Corn, sweet corn / maize (grazing)	South Africa	EW	250		Aerial, Ground	1-2[k]	31-2500	125	60	Y
Cucumber	China	EC	400		Foliar	2-3 [d]	5	NSOL	7	Y
Cucumber	Korea	WP	25		Foliar	1-3 [g]	2.5	NSOL	3	Y
Cucumber	Korea	WG	200		Foliar	NSOL[g]	2.5	NSOL	3	Y
Currant	Poland	EC	400		Foliar	3[g]	NSOL	45	14	Y
Flax / Linseed	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	70	Y
Garlic	Korea	WP	25		Foliar	1-2[g]	2.5	NSOL	21	Y
Garlic	Thailand	EC	400		Foliar	1-2 [b]	NSOL	100	20	N
Gooseberry	Poland	EC	400		Foliar	3[g]	NSOL	45	14	Y
Grapes	Albania	EW	100		Foliar	1-2[j]	2	NSOL	28	N
Grapes	Albania	EC	400		Foliar	1-2 [j]	2	NSOL	42	N
Grapes	Algeria	EC	400		Foliar	NSOL [g]	NSOL	NSOL	14	N
Grapes	Australia	WG	200		Foliar	3 [e]	2	20	14	Y
Grapes	Bosnia and Herzegovina	EC	400		Foliar	1-4	2	NSOL	42	N
Grapes	Bulgaria	EW	100		Foliar	1-4	2	25	30	N
Grapes	Bulgaria	EC	400		Foliar	1-5 [d]	2	NSOL	NSOL	Y
Grapes	China	EC	400		Foliar	2-3 [d]	5	NSOL	NSOL	Y
Grapes	Croatia	EW	100		Foliar	1-5 [j]	2	NSOL	35	N
Grapes	Cyprus	EW	100		Foliar	1-3 [j]	2.4	72	20	N
Grapes	Cyprus	EC	400		Foliar	1-3 [j]	2.4	72	20	N
Grapes	Czech Republic	EW	100		Foliar	NSOL[p]	3	30	42	Y
Grapes	Ecuador	EC	400		Ground	NSOL	NSOL	250	NSOL	N
Grapes	Egypt	EC	400		Foliar	NSOL	3	NSOL	28	Y
Grapes	France	EW	100		Foliar	NSOL	NSOL	30	NSOL	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Grapes	France	SE	125	Carbendazim, 250	Foliar	NSOL	NSOL	125	NSOL	N
Grapes	France	SE	5	Carbendazim, 10	Brush	NSOL	NSOL	NSOL	NSOL	N
Grapes	Greece	WG	200		Foliar	2[j]	3	30	20	N
Grapes	Greece	EC	400		Foliar	1-2[j]	3	30	20	Y
Grapes	Greece	SE	5	Carbendazim, 10	Brush	1	NSOL	NSOL	NSOL	N
Grapes	Greece	EW	100		Foliar	2	3	NSOL	20	Y
Grapes	Hungary	EC	400		Post-Emergence	6	NSOL	40	21	N
Grapes	India	EC	400		Foliar	1 (min)	4	NSOL	15	Y
Grapes	Israel	EC	400		Foliar	NSOL	NSOL	NSOL	14	N
Grapes	Jordan	EC	400		Foliar	NSOL	NSOL	NSOL	NSOL	N
Grapes	Kenya	EC	400		Foliar	NSOL[h]	2	20	NSOL	Y
Grapes	Korea	WP	25		Foliar	1-5 [g]	2.5	NSOL	7	Y
Grapes	Korea	WG	200		Foliar	NSOL[g]	2.5	NSOL	14	Y
Grapes	Lebanon	EW	250		Foliar	NSOL[g]	NSOL	NSOL	14	N
Grapes	Macedonia	EW	100		Foliar	1-4 [g]	2	NSOL	42	N
Grapes	Morocco	EW	100		Foliar	NSOL	NSOL	NSOL	30	N
Grapes	Portugal	SE	5	Carbendazim, 10	Foliar	1	NSOL	12.5	NSOL	Y
Grapes	Portugal	EW	100		Foliar	3	3	30	7	N
Grapes	Romania	WG	200		Foliar	NSOL	NSOL	NSOL	NSOL	N
Grapes	Serbia and Montenegro	EW	5	Carbendazim, 10	Foliar	1	NSOL	NSOL	NSOL	N
Grapes	Serbia and Montenegro	EW	100		Foliar	1-2 [j]	2	NSOL	42	N
Grapes	Serbia and Montenegro	EC	400		Foliar	1-2 [j]	2	NSOL	42	N
Grapes	Slovakia	EW	100		Foliar	1-4 [k]	3	30	42	N
Grapes	Spain	EC	400		Foliar	5	4.8	20-30 (min)	14	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Grapes	Spain	EW	100		Foliar	5 [k]	5	NSOL	14	Y
Grapes	Switzerland	EW	100		Foliar	1-3	3	48	NSOL	N
Grapes	Switzerland	WP	12	Copper Oxychloride, 200; Cymoxanil, 48	Foliar	1-3	5.2	83	NSOL	N
Grapes	Switzerland	WG	20	Cymoxanil, 80	Foliar	1-3	18	288	NSOL	N
Grapes	Syria	EW	250		Foliar	NSOL[h]	NSOL	30	28	Y
Grapes	Syria	EC	400		Foliar	NSOL[g]	NSOL	NSOL	28	N
Grapes	Taiwan	EC	400		Foliar	NSOL[g]	5	NSOL	21	Y
Grapes	Turkey	EC	400		Foliar	NSOL[h]	1.2	NSOL	30	Y
Grapes	Vietnam	EC	400		Foliar	2[d]	8	NSOL	NSOL	Y
Grapes	Yemen	EW	100		Foliar	NSOL[h]	NSOL	16	NSOL	Y
Grapes	Yemen	EC	400		Foliar	NSOL[h]	1.6	NSOL	NSOL	Y
Grapes, Table	South Africa	EW	100		Foliar	NSOL[e]	5	60-75	21	Y
Grapes, Wine	South Africa	EW	100		Foliar	NSOL[e]	5	60	21	Y
Jujube	Korea	WP	25		Foliar	1-5 [g]	2.5	NSOL	14	Y
Jujube	Korea	WG	200		Foliar	NSOL[g]	2.5	NSOL	14	Y
Loquat	Taiwan	EC	400		Foliar	NSOL	8	NSOL	6	Y
Mango	Egypt	EC	400		Foliar	NSOL	6	NSOL	7	Y
Mango	Philippines	SE	125	Carbendazim, 250	Foliar	NSOL	7.5	NSOL	7	Y
Mango	South Africa	SC	250	Carbendazim, 125	Foliar	1-3[k]	3.75	NSOL	124	Y
Mango	South Africa	EW	250		Ground	1-3[k]	3.75	NSOL	124	Y
Mango	Vietnam	WG	200		Foliar	NSOL	NSOL	160	NSOL	N
Melon	Taiwan	EC	400		Foliar	NSOL	4	NSOL	6	Y
Melon, oriental melon	Korea	WP	25		Foliar	1-7[g]	2.5	NSOL	3	Y
Nectarine	Greece	WG	200		Foliar	4[g]	4 (min)	64	28	N
Nectarine	Greece	EC	400		Foliar	4 [h]	4	40-64	28	Y
Nectarine	Spain	EC	400		Foliar	3 [m]	4.8	72	7	Y
Nectarine	Spain	EW	100		Foliar	3[k]	5	NSOL	7	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Oat	Austria	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	NSOL (BBCH 61)	Y
Oat	Austria	EC	250		Foliar	1	NSOL	250	NSOL	Y
Oat	Chile	EC	250	Carbendazim, 125	Aerial, ground	2	NSOL	250	21	Y
Oat	Hungary	SC	160	Tridemorph, 350	Foliar	NSOL	NSOL	250	30	N
Oat (Fodder)	South Africa	EW	250		Ground	1	25	75	30	Y
Oat (Fodder)	South Africa	EW	250		Aerial	1	300	90	30	Y
Oilseed rape	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	56	Y
Oilseed rape	Czech Republic	EW	250		Foliar	2	NSOL	200	42	Y
Oilseed rape	France	SE	125	Carbendazim, 250	Foliar	1	NSOL	125	NSOL	N
Oilseed rape	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	NSOL	Y
Oilseed rape	France	EW	250		Foliar	1-2	NSOL	200	NSOL	N
Oilseed rape	Germany	SE	250	Carbendazim, 125	Foliar	1	50-100	200	56	Y
Oilseed rape	Hungary	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	60	Y
Oilseed rape	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	150	35	Y
Oilseed rape	Romania	SE	125	Carbendazim, 250	Foliar	2[k]	NSOL	100	56	Y
Oilseed rape	Slovakia	SE	125	Carbendazim, 250	Foliar	2	3	125	56	Y
Oilseed rape	Slovakia	EW	250		Foliar	2	NSOL	200	42	Y
Oilseed rape	Switzerland	EW	250		Foliar	1	NSOL	250	NSOL (BBCH 65)	Y
Oilseed rape	United Kingdom	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	NSOL	Y
Oilseed rape	United Kingdom	EC	250		Foliar	1	NSOL	200	NSOL	Y
Oilseed rape	United Kingdom	EC	400		Foliar	1	NSOL	200	NSOL	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Onion	Thailand	EC	400		Foliar	3-4 [a]	NSOL	100	20	N
Orange	Korea	WG	200		Foliar	NSOL [m]	2.5	NSOL	7	Y
Ornamentals	Kenya	EC	400		Foliar	NSOL[h]	4	40	NSOL	Y
Pea (foliage for feeding)	South Africa	SC	125	Carbendazim, 250	Ground	1-3 [j]	5 (max)	25	28	Y
Pea (foliage for feeding)	South Africa	SC	125	Carbendazim, 250	Aerial	1-3 [j]	104 (max)	31.3	28	Y
Pea (foliage for feeding)	South Africa	SC	250	Carbendazim, 125	Ground	1-3 [j]	6.25 (max)	31.3	28	Y
Pea (foliage for feeding)	South Africa	SC	250	Carbendazim, 125	Aerial	1-3 [j]	125 (max)	37.5	28	Y
Pea, Green	South Africa	SC	125	Carbendazim, 250	Ground	1-3 [j]	5 (max)	25	10	Y
Pea, Green	South Africa	SC	125	Carbendazim, 250	Aerial	1-3[j]	104 (max)	31.3	10	Y
Pea, Green	South Africa	SC	250	Carbendazim, 125	Ground	1-3 [j]	6.25 (max)	31.3	10	Y
Pea, Green	South Africa	SC	250	Carbendazim, 125	Aerial	1-3 [j]	125 (max)	37.5	10	Y
Peach	Algeria	EC	400		Foliar	NSOL[i]	NSOL	NSOL	14	N
Peach	Cyprus	EW	100		Foliar	1-3 [b]	4	120	7	N
Peach	Cyprus	EC	400		Foliar	1-3 [b]	4	120	7	N
Peach	France	EW	100		Foliar	NSOL	4	NSOL	NSOL	Y
Peach	Greece	WG	200		Foliar	4 [g]	4 (min)	64	28	N
Peach	Greece	EC	400		Foliar	4 [h]	4	40-64	28	Y
Peach	Jordan	EC	400		Foliar	NSOL	NSOL	NSOL	NSOL	N
Peach	Korea	WG	200		Foliar	NSOL[b]	2.5	NSOL	7	Y
Peach	Spain	EC	400		Foliar	3 [m]	4.8	72	7	Y
Peach	Spain	EW	100		Foliar	3[k]	5	NSOL	7	Y
Peach	Syria	EW	250		Foliar	2-3[d]	5	NSOL	7	Y
Peach	Syria	EC	400		Foliar	NSOL	NSOL	NSOL	7	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Peanut	Argentina	EC	400		NSOL	4 [i]	NSOL	60	30	Y
Peanut	Argentina	SC	125	Carbendazim, 250	NSOL	4 [i]	NSOL	75	30	Y
Peanut	Israel	EC	400		Foliar	NSOL	NSOL	NSOL	14	N
Peanut	Peru	EC	400		Aerial, ground	NSOL	NSOL	100	NSOL	N
Peanut	South Africa	SC	125	Carbendazim, 250	Aerial	1-5 [h]	281	84	14	Y
Peanut	South Africa	SC	250	Carbendazim, 125	Aerial	1-5 [h]	333	100	14	Y
Peanut	South Africa	SC	125	Carbendazim, 250	Ground	1-5 [h]	25	125	14	Y
Peanut	South Africa	SC	250	Carbendazim, 125	Ground	1-5 [h]	25	125	14	Y
Peanut	Syria	EC	400		Foliar	NSOL [g]	NSOL	NSOL	NSOL	N
Peanut	Vietnam	EC	400		Foliar	2 [d]	8	NSOL	NSOL	Y
Peanut (hay for feeding)	South Africa	SC	125	Carbendazim, 250	Aerial	1-5 [h]	281	84	42	Y
Peanut (hay for feeding)	South Africa	SC	250	Carbendazim, 125	Aerial	1-5 [h]	333	100	42	Y
Peanut (hay for feeding)	South Africa	SC	125	Carbendazim, 250	Ground	1-5 [h]	25	125	42	Y
Peanut (hay for feeding)	South Africa	SC	250	Carbendazim, 125	Ground	1-5 [h]	25	125	42	Y
Pear	Algeria	EC	400		Foliar	NSOL [g]	NSOL	NSOL	14	N
Pear	Algeria	EC	400		Foliar	NSOL [m]	NSOL	NSOL	14	N
Pear	Australia	WG	200		Foliar	1-4 [g]	2	NSOL	14	Y
Pear	Bulgaria	EW	100		Foliar	1-2	3.5	35	30	N
Pear	Bulgaria	EC	400		Foliar	8 [d]	2	NSOL	60	Y
Pear	Chile	EC	400		Aerial, Ground	NSOL [h]	3	NSOL	30	Y
Pear	China	EC	400		Foliar	2-3 [d]	5	NSOL	21	Y
Pear	Cyprus	EW	100		Foliar	1-3 [g]	3	90	20	N
Pear	Cyprus	EC	400		Foliar	1-3 [g]	3	90	20	N
Pear	Czech Republic	EW	100		Foliar	NSOL [h]	3	30	35	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Pear	France	EC	400		Foliar	3[g]	3	NSOL	14	Y
Pear	Germany	WG	200		Foliar	4-8[b]	2.5	37.5	28	N
Pear	Greece	WG	200		Foliar	4[g]	3	60	20	N
Pear	Greece	EC	400		Foliar	2-4[g]	2.6	NSOL	20	Y
Pear	Israel	EC	400		Foliar	NSOL	NSOL	NSOL	14	N
Pear	Jordan	EC	400		Foliar	NSOL	NSOL	NSOL	NSOL	N
Pear	Korea	WP	25		Foliar	1-5[g]	2.5	NSOL	14	Y
Pear	Korea	WG	200		Foliar	NSOL[g]	2.5	NSOL	14	Y
Pear	Lebanon	EW	250		Foliar	NSOL[g]	NSOL	NSOL	7	N
Pear	Poland	EC	400		Foliar	3[g]	NSOL	45	14	Y
Pear	Portugal	EC	400		Foliar	9	4	40	21	N
Pear	Serbia and Montenegro	EW	100		Foliar	1-3[g]	3	NSOL	28	N
Pear	Slovakia	EW	100		Foliar	1-4	3	30	35	N
Pear	South Africa	EW	100		Foliar	1-5 [b]	1.6	56	14	Y
Pear	Spain	EC	400		Foliar	4[h]	4.8	72	14	Y
Pear	Switzerland	WG	200		Foliar	1-4	2.5	40	21	N
Pear	Syria	EW	250		Foliar	4[g]	NSOL	NSOL	14	Y
Pear	Syria	EC	400		Foliar	3-5[g]	NSOL	NSOL	14	N
Pear	Taiwan	EC	400		Foliar	NSOL[b]	4	NSOL	18	Y
Persimmon	Korea	WP	25		Foliar	1-5 [g]	1.25	NSOL	14	Y
Persimmon	Korea	WG	200		Foliar	NSOL[g]	2.5	NSOL	7	Y
Pistachios	Yemen	EW	100		Foliar	NSOL[h]	NSOL	70	NSOL	Y
Pistachios	Yemen	EC	400		Foliar	NSOL[h]	8	NSOL	NSOL	Y
Plum	Cyprus	EW	100		Foliar	1-3[b]	4	120	7	N
Plum	Cyprus	EC	400		Foliar	1-3[b]	4	120	7	N
Plum	France	EW	100		Foliar	NSOL	4	NSOL	NSOL	Y
Plum	Poland	EC	400		Foliar	3[g]	NSOL	45	14	Y
Pome fruit	New Zealand	WG	200		Foliar	4-6 [h]	3	60 (min)	35	Y
Potato	Colombia	EC	400		Foliar	1-2	16	NSOL	28	Y
Potato	South Africa	SC	250	Carbendazim, 125	Ground	1-4 [h]	11.7-17.5	87.5	14	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Potato	South Africa	EW	250		Ground	1-4[h]	11.7-17.5	87.5	14	Y
Potato	South Africa	SC	250	Carbendazim, 125	Aerial	1-4 [h]	333 (max)	100	14	Y
Potato	South Africa	EW	250		Aerial	1-4[h]	333 (max)	100	14	Y
Raspberry	Bulgaria	EC	400		Foliar	2	0.8	NSOL	NSOL	Y
Rice	Colombia	EC	400		Foliar	2-3	NSOL	140	28	Y
Rice	Indonesia	EC	400		Foliar	1-4 [k]	NSOL	100	7	N
Rice	Spain	SC	250	Carbendazim, 125	Foliar	2[k]	NSOL	125	30	Y
Rice	Thailand	EC	400		Foliar	1-2[b]	NSOL	100	20	N
Rice	Venezuela	EC	400		Foliar	NSOL	NSOL	100	NSOL	Y
Rice	Vietnam	WG	200		Foliar	NSOL	NSOL	80	NSOL	N
Rice	Vietnam	EC	400		Foliar	2[g]	NSOL	80	NSOL	Y
Rye	Austria	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	NSOL (BBCH 61)	Y
Rye	Austria	EC	250		Foliar	1	NSOL	250	NSOL	Y
Rye	Germany	EC	106.7	Famoxadone, 100	Foliar	1-2 [k]	NSOL	160	42	N
Rye	Germany	EW	250		Foliar	2	50-100	200	NSOL	Y
Rye	Germany	SE	250	Carbendazim, 125	Foliar	2	50-100	200	42 (BBCH 55)	Y
Rye	Poland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	35	N
Rye	Poland	EC	400		Foliar	1	NSOL	160	35	Y
Rye	Poland	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	35	Y
Rye	Switzerland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	NSOL	N
Rye	Belgium	SE	250	Carbendazim, 125	Foliar	2	NSOL	175	28	Y
Rye	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	42	Y
Rye	Hungary	SC	160	Tridemorph, 350	Foliar	NSOL	NSOL	250	30	N
Rye	Luxembourg	SE	250	Carbendazim, 125	Foliar	2	NSOL	175	28	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Rye	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	125	35	Y
Scallion / Shallot	Indonesia	EC	400		Foliar	1-4 [k]	NSOL	100	7	N
Sorghum	Colombia	EC	400		Foliar	1-2	NSOL	100	30	Y
Sorghum	Venezuela	EC	400		Foliar	NSOL	NSOL	100	NSOL	Y
Soybean	Argentina	SC	125	Carbendazim, 250	Foliar	2 [i]	NSOL	100	35	Y
Soybean	Bolivia	SC	106.7	Famoxadone, 100	Ground	NSOL [m]	NSOL	64	14	N
Soybean	South Africa	SC	125	Carbendazim, 250	Ground	1-2[h]	15	75	30	Y
Soybean	South Africa	SC	125	Carbendazim, 250	Aerial	1-2[h]	234	93.8	30	Y
Soybean	South Africa	SC	250	Carbendazim, 125	Ground	1-2 [h]	20	100	30	Y
Soybean	South Africa	EW	250		Ground	1-2[h]	20	100	30	Y
Soybean	South Africa	SC	250	Carbendazim, 125	Aerial	1-2 [h]	312.5	125	30	Y
Soybean	South Africa	EW	250		Aerial	1-2[h]	312.5	125	30	Y
Soybean	Uruguay	SC	125	Carbendazim, 250	Aerial, ground	1-2	NSOL	125	NSOL	N
Soybean	USA	EC	400		Foliar	2 [i]	NSOL	116	30	Y
Soybean (hay for feeding)	South Africa	SC	125	Carbendazim, 250	Ground	1-2[h]	15	75	42	Y
Soybean (hay for feeding)	South Africa	SC	125	Carbendazim, 250	Aerial	1-2[h]	234	93.8	42	Y
Soybean (hay for feeding)	South Africa	SC	250	Carbendazim, 125	Ground	1-2[h]	20	100	42	Y
Soybean (hay for feeding)	South Africa	EW	250		Ground	1-2[h]	20	100	42	Y
Soybean (hay for feeding)	South Africa	SC	250	Carbendazim, 125	Aerial	1-2[h]	312.5	125	42	Y
Soybean (hay for feeding)	South Africa	EW	250		Aerial	1-2[h]	312.5	125	42	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Stone fruit	New Zealand	WG	200		Foliar	NSOL[d]	4	100 (min)	NSOL	Y
Strawberry	Korea	WG	200		Foliar	NSOL[b]	2.5	120	3	Y
Strawberry	Poland	EC	400		Foliar	3[g]	NSOL	90	14	Y
Sunflower	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	56	Y
Sunflower	Hungary	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	60	Y
Sunflower	Slovakia	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	56	Y
Sunflower (Seed)	Bulgaria	EC	400		Foliar	2	NSOL	120	60	Y
Sunflower (Seed)	France	SE	125	Carbendazim, 250	Foliar	1	NSOL	125	NSOL	N
Sunflower (Seed)	France	EC	250	Fenpropimorph, 375	Foliar	2	NSOL	150	60	Y
Sunflower (Seed)	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	NSOL	Y
Sunflower (Seed)	Romania	SE	125	Carbendazim, 250	Foliar	2[k]	NSOL	75	56	Y
Tea	Indonesia	EC	400		Foliar	NSOL[b]	NSOL	20	14	Y
Triticale	Austria	EC	250		Foliar	1	NSOL	250	NSOL	Y
Triticale	Germany	EC	106.7	Famoxadone, 100	Foliar	1-2 [k]	NSOL	160	42	N
Triticale	Germany	SE	250	Carbendazim, 125	Foliar	2	50-100	200	42 (BBCH 55)	Y
Triticale	Germany	EW	250		Foliar	2	50-100	200	NSOL	Y
Triticale	Luxembourg	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	28	Y
Triticale	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	125	35	Y
Triticale	Poland	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	35	Y
Triticale	Belgium	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	28	Y
Triticale	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	42	Y
Triticale	Hungary	EC	107	Famoxadone,	Post-	NSOL	NSOL	774	28	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
				100	emergence					
Triticale	Poland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	35	N
Triticale	Poland	EC	400		Foliar	1	NSOL	160	35	Y
Triticale	Spain	SC	250	Carbendazim, 125	Foliar	1	33-67	200	NSOL (BBCH 61)	Y
Vetch	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	150-187.5	35	Y
Watermelon	Korea	WP	25		Foliar	1-6[g]	2.5	NSOL	7	Y
Watermelon	Vietnam	WG	200		Foliar	NSOL	NSOL	200	NSOL	N
Wheat	Algeria	SC	250	Carbendazim, 125	Foliar	NSOL	NSOL	250	NSOL	Y
Wheat	Austria	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	NSOL (BBCH 61)	Y
Wheat	Austria	EC	250		Foliar	1	NSOL	250	NSOL	Y
Wheat	Czech Republic	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	42	Y
Wheat	Czech Republic	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	160	42	N
Wheat	Czech Republic	EW	250		Foliar	1	NSOL	200	42	Y
Wheat	France	EC	106.7	Famoxadone, 100	Foliar	2	NSOL	160	36	N
Wheat	Germany	EC	106.7	Famoxadone, 100	Foliar	1-2 [k]	NSOL	160	42	N
Wheat	Germany	EW	250		Foliar	2	50-100	200	NSOL	Y
Wheat	Germany	SE	250	Carbendazim, 125	Foliar	2	50-100	200	42 (BBCH 55)	Y
Wheat	Iran	SE	125	Carbendazim, 250	NSOL	NSOL	NSOL	NSOL	NSOL	N
Wheat	Serbia and Montenegro	EC	106.7	Famoxadone, 100	Foliar	1-2[k]	NSOL	160	42	N
Wheat	Slovakia	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	160	42	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Wheat	Slovakia	SE	250	Carbendazim, 125	Foliar	1-2	NSOL	200	42	N
Wheat	South Africa	SC	125	Carbendazim, 250	Ground	1	29 (max)	87.5	56	Y
Wheat	South Africa	SC	250	Carbendazim, 125	Ground	1	33 (max)	100	56	Y
Wheat	South Africa	SC	125	Carbendazim, 250	Aerial	1	350 (max)	105	56	Y
Wheat	South Africa	SC	250	Carbendazim, 125	Aerial	1	375 (max)	112.5	56	Y
Wheat	Switzerland	EC	80	Chlorothalonil, 200	Foliar	1	NSOL	200	NSOL	N
Wheat	Switzerland	EW	250		Foliar	1	NSOL	300	NSOL (BBCH 61)	Y
Wheat	Switzerland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160-299	NSOL	N
Wheat	Argentina	SC	125	Carbendazim, 250	Foliar	2 [i]	NSOL	125	NSOL	Y
Wheat	Belgium	EC	106.7	Famoxadone, 100	Foliar	1-2	NSOL	160	NSOL	N
Wheat	Bosnia And Herzegovina	EC	400		Foliar	1-2 [k]	NSOL	160	42	N
Wheat	Bulgaria	EC	106.7	Famoxadone, 100	Foliar	1-3	NSOL	128	42	N
Wheat	Bulgaria	EC	400		Foliar	2	NSOL	160	42	Y
Wheat	Chile	EC	250	Carbendazim, 125	Aerial, ground	2	NSOL	250	21	Y
Wheat	Czech Republic	EC	106.7	Famoxadone, 100	Foliar	1-3	NSOL	160	42	N
Wheat	Egypt	EC	400		Foliar	NSOL	18.75	NSOL	28	Y
Wheat	France	EC	160	Fenpropimorph, 375	Foliar	2	NSOL	160	28	N
Wheat	France	EC	250	Fenpropimorph, 375	Foliar	3	NSOL	200	NSOL	Y
Wheat	France	SE	250	Carbendazim, 125	Foliar	2	NSOL	300	NSOL	Y
Wheat	France	EW	250		Foliar	1-2	NSOL	200-300	NSOL	N
Wheat	Hungary	SC	160	Tridemorph, 350	Foliar	NSOL	NSOL	250	30	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Wheat	Morocco	SC	250	Carbendazim, 125	Foliar	2	NSOL	300	NSOL	Y
Wheat	Portugal	SE	250	Carbendazim, 125	Foliar	2[q]	NSOL	200	NSOL	Y
Wheat	Saudi Arabia	SC	250	Carbendazim, 125	Foliar	2	NSOL	250	NSOL	Y
Wheat	Serbia and Montenegro	SE	125	Carbendazim, 250	Foliar	1-2[k]	NSOL	125	42	N
Wheat	Serbia and Montenegro	EC	400		Foliar	1-2[k]	NSOL	160	42	N
Wheat	Slovakia	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	42	Y
Wheat	Slovakia	EC	106.7	Famoxadone, 100	Foliar	1-3	NSOL	160	42	N
Wheat	South Africa	EW	250		Ground	1-2 [e]	33 (max)	100	56	Y
Wheat	South Africa	EW	250		Aerial	1-2 [e]	375 (max)	112.5	56	Y
Wheat	Spain	SC	250	Carbendazim, 125	Foliar	1	33-67	200	NSOL (BBCH 61)	Y
Wheat	Syria	EC	400		Foliar	1-2	NSOL	NSOL	28	N
Wheat	Tunisia	SC	250	Carbendazim, 125	Foliar	2	NSOL	300	NSOL	Y
Wheat	Uruguay	SC	125	Carbendazim, 250	Aerial, Ground	1-2	NSOL	125	NSOL	N
Wheat, Spring	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	125	35	Y
Wheat, Spring	Poland	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	128	35	N
Wheat, Spring	Poland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	35	N
Wheat, Spring	Poland	EC	400		Foliar	1	NSOL	160	35	Y
Wheat, Spring	Poland	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	35	Y
Wheat, Spring	Poland	EW	250		Foliar	1	NSOL	200	35	N

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Wheat, Winter	Belgium	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	28	Y
Wheat, Winter	Belgium	EW	250		Foliar	NSOL	NSOL	250	28	N
Wheat, Winter	Hungary	SE	125	Carbendazim, 250	Foliar	2	NSOL	125	28	Y
Wheat, Winter	Hungary	EC	107	Famoxadone, 100	Post-emergence	NSOL	NSOL	774	28	N
Wheat, Winter	Luxembourg	SE	250	Carbendazim, 125	Foliar	2	NSOL	200	28	Y
Wheat, Winter	Luxembourg	EW	250		Foliar	NSOL	NSOL	250	28	N
Wheat, Winter	Poland	SC	125	Carbendazim, 250	Foliar	1	NSOL	125	35	Y
Wheat, Winter	Poland	EC	160	Fenpropimorph, 375	Foliar	1	NSOL	128	35	N
Wheat, Winter	Poland	EC	106.7	Famoxadone, 100	Foliar	1	NSOL	160	35	N
Wheat, Winter	Poland	EC	400		Foliar	1	NSOL	160	35	Y
Wheat, Winter	Poland	SC	250	Carbendazim, 125	Foliar	1	NSOL	200	35	Y
Wheat, Winter	Poland	EW	250		Foliar	1	NSOL	200	35	N
Wheat, Winter	Slovakia	EW	250		Foliar	2	NSOL	200	42	Y
Wheat, Winter	United Kingdom	EW	106.7	Famoxadone, 100	Foliar	3	NSOL	160	NSOL	N
Wheat, Winter	United Kingdom	EC	160	Fenpropimorph, 375	Foliar	2	NSOL	160	NSOL (BBCH 61)	Y
Wheat, Winter	United Kingdom	EW	250		Foliar	1-2	NSOL	156 / 200	NSOL (BBCH 71/ 33)	Y
Wheat, Winter	United Kingdom	EC	400		Foliar	1	NSOL	160 / 200	NSOL (BBCH 73 / 33)	Y

Crop	Country	Formulation			Application					L
		Type, g ai/kg or g ai/L		Other substance, g/kg or g/L	Type	No.	g ai/hL	g ai/ha	PHI, days	
Wheat, Winter	United Kingdom	SC	250	Carbendazim, 125	Foliar	1	NSOL	156 / 200	NSOL (BBCH 73 / 33)	Y

L (Y/N): Label or its translation provided by the manufacturer (Yes/No).

NSOL: Not specified on label

Spray intervals:

a - 5 days, b - 7 days, c - 10-12 days, d - 7-10 days, e - 21 days, f - 8-10 days, g - 10 days, h - 10-14 days, I - 15-21 days, j - 12 days, k - 14 days, l - 8 days, m - 15 days, n - 20 days, o - 14-28 days, p - 7-14 days, q - Last treatment before August 31.

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on supervised trials for flusilazole uses that produced residues on the following commodities.

Commodity	Crop	Country	Table no.
Pome fruit	Apple	France, Italy, Spain, Canada, New Zealand, Argentina, South Africa and India	26
	Pear	Italy, South Africa and China	27
Stone fruit	Apricot, nectarine, peach	France, Greece, Italy, New Zealand and Spain	28
Berries and other small fruit	Grapes	Australia, China, France, Germany, Greece, India, Italy, Portugal, South Africa and Spain	29
Assorted tropical and sub-tropical fruits – inedible peel	Banana	Belize, Costa Rica, Guatemala, Honduras, Jamaica and West Indies	30
Fruiting vegetables, cucurbits – edible peel	Cucumber	China	31
Fruiting vegetables, other than cucurbits	Sweet corn	France, South Africa	32
Pulses	Soybeans	Argentina, Canada, France, South Africa, and USA	33
Root and tuber vegetables	Sugar beet (root)	Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain and UK	34
Cereal grains	Barley	Germany, UK and South Africa	35
	Rye	Germany	36
	Wheat	Germany, Spain, UK and South Africa	37
	Maize	France	38
	Rice	Spain	39

Commodity	Crop	Country	Table no.
Oilseed	Rape seed	Belgium, Denmark, France, Germany, Netherlands and UK	40
	Sunflower seed	France	41
Straw, fodder, and forage of cereal grains	Barley, rye, wheat (forage)	Germany	42
	Barley, rye, wheat (straw)	Germany, Spain and UK	43
	Oat (forage and fodder)	South Africa	44
Miscellaneous fodder and forage	Sugar beet leaves	Belgium, Denmark, France, Germany, Greece, Italy, Netherlands, Spain and UK	45

When residues were not detected they are shown as below the LOQ (e.g., < 0.01 mg/kg). Residues, application rates and spray concentrations have generally been rounded to two significant figures. Residue values from the trials conducted according to maximum GAP are double underlined.

Table 26. Flusilazole residues in apples from supervised trials in France, Italy, Spain, Canada, New Zealand, Argentina, South Africa and India

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Italy, 1999 (Golden Delicious)	Foliar	EC	0.072	0.0048	1500	4	14	0.12	DuPont-2188
Italy, 1999 (Golden Delicious)	Foliar	EC	0.075	0.0049	1514	4	14	0.052 0.043 (0.048)	DuPont-2188
Italy, 1999 (Stark Delicious)	Foliar	EC	0.068	0.0046	1465	4	14	0.017 0.019 (0.018)	DuPont-2188
Spain, 1999 (Golden Smoothe)	Foliar	EC	0.072	0.0048	1504	4	14	0.044 0.032 (0.038)	DuPont-2188
France (South), 1999 (Granny Smith)	Foliar	EC	0.066	0.0049	1338	4	14	0.013 < 0.010 (0.012)	DuPont-2188
Italy, 1998 (Golden Delicious)	Foliar	EC	0.069	0.0046	1500	4	14	0.051 0.065 0.062 (0.059)	AMR 4993-98
Italy, 1998 (Mondial Gala)	Foliar	EC	0.070	0.0046	1517	4	14	0.010 0.011 (0.011)	AMR 4993-98
Spain, 1998 (Golden Delicious)	Foliar	EC	0.075	0.0048	1567	4	14	0.040 0.053 (0.047)	AMR 4993-98
France (South), 1998 (Golden Delicious)	Foliar	EC	0.072	0.0048	1492	4	14	0.029 0.051 (0.040)	AMR 4993-98

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Italy, 1988 (Stark Delicious)	Foliar	WG	0.060	0.0030	2000	1	0 7 14 21 35 41	0.06 0.04 0.03 0.02 0.01 0.02	BE-A-11-89-16-BF
Italy, 1988 (Jonathan)	Broadcast with Knapsack Sprayer with Handgun	WG	0.060	0.0030	2000	1	0 7 14 21 35 41 64	0.12 0.08 0.12 0.07 0.04 0.06 0.03	BE-A-11-89-16-BF
Italy, 1986 (Golden Delicious)	Broadcast, Knapsack Sprayer	WG	0.068	0.004	1700	7	7 14 21 38 63 74	0.23 0.13 0.12 0.06, 0.09 0.03 0.02	BF-66.630-03-087-03
France (South), 1986 (Golden Delicious)	Foliar	EC	0.027	0.003	900	10	75	< 0.01, < 0.01	FLUSRES6 RV1
France (South), 1986 (Gregon)	Foliar	EC	0.006	0.003	197	11	59	< 0.01	FLUSRES6 RV1
France (South), 1985 (Golden Delicious)	Foliar	EC	0.0336	0.003	1120	8	76	0.01	BAT 86-04
France (South), 1985 (Royal Gala)	Foliar	EC	0.033	0.003	1100	9	49	< 0.01	BAT 86-04
Canada (ON), 1986 (MacIntosh)	Plot sprayer, spray to wet	WG	0.112	0.0056	2000	8	28	0.068 0.089, 0.054 0.060 0.058	No. 86-1494 Volume 14 Test ARB-86-001
Canada (ON), 1986 (MacIntosh)	Plot sprayer, spray to wet	WG	0.056	0.0028	2000	8	28	0.018, 0.013 < 0.010 0.015 0.014	No. 86-1494 Volume 14 Test ARB-86-001
Canada (NS), 1986 (MacIntosh)	Handgun, dilute to runoff	WG	0.160	0.0047	3400	5	46	0.049	No. 86-1494 Volume 14 Test CAH-86-654
Canada (NS), 1986 (MacIntosh)	Handgun, dilute to runoff	WG	0.070	0.0021	3400	9	53	0.045	No. 86-1494 Volume 14 Test CAH-86-654
Canada (BC), 1986 (MacIntosh)	Handgun	WG	0.160	0.0048	3333	4	104	< 0.01 < 0.01, < 0.01 < 0.01	No. 86-1494 Volume 14 Test CAB-86-680
Canada (BC), 1986 (MacIntosh)	Handgun	WG	0.070	0.0021	3333	4	104	< 0.01 < 0.01, < 0.01 < 0.01	No. 86-1494 Volume 14 Test CAB-86-680

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Canada (BC), 1986 (MacIntosh)	Orchards, back pack	WG	0.052	0.0043	1200	4	77	< 0.01, < 0.01 < 0.01, < 0.01 < 0.01, < 0.01 (< 0.01)	No. 86-1494 Volume 14 Test Ecosoyoos Consulting '86
Canada (BC), 1986 (MacIntosh)	Orchards, back pack	WG	0.035	0.0029	1200	4	77	< 0.01, < 0.01 < 0.01, < 0.01 < 0.01, < 0.01 (< 0.01)	No. 86-1494 Volume 14 Test Ecosoyoos Consulting '86
New Zealand, 1985-86 (Royal Gala)	Foliar	WG	Not given	0.003	Not given	13	1 3 7 14 21 28	0.06 0.04 0.05 0.04 0.03 0.02	FLUSRES7
New Zealand, 1985-86 (Cox's Orange)	Foliar	WG	Not given	0.003	Not given	10	1 7 14 21 28	0.06 0.02 0.02 < 0.01 < 0.01	FLUSRES7
New Zealand, 1985-86 (Gala)	Foliar	WG	Not given	0.003	Not given	7	7 14 21 28	0.05, 0.06 (0.06) 0.03 0.02 0.02	FLUSRES7
Argentina, 2004-05 (Royal Gala)	Foliar	EC	Not given	0.004	Not given	1	0 3 7 14 28 42 66 80 89	0.28, 0.27, 0.29; (0.28) 0.23, 0.16, 0.18; (0.19) 0.15, 0.11, 0.17; (0.14) 0.12, 0.10, 0.07; (0.10) 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)	17-9462

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
South Africa, 1999-2000 (Royal Gala)	Foliar	EW	0.0178	0.0024	740.5	11	BLA[a] 0 3 7 14 21 28	0.06, 0.06; (0.06) 0.07, 0.07; (0.07) 0.06, 0.06; (0.06) 0.03, 0.03; (0.03) 0.02, 0.02; (0.02) 0.02, 0.02; (0.02) 0.01, 0.01; (0.01)	2000-apples-flu-T513
South Africa, 1999-2000 (Golden Delicious)	Foliar	EW	0.0108	0.0024	451.4	10	BLA[a] 0 1 21	0.15, 0.15; (0.15) 0.21, 0.20; (0.21) 0.16, 0.16; (0.16) 0.02, 0.02; (0.02)	2000-apples-flu-T175
South Africa, 1999-2000 (Golden Delicious)	Foliar	EW	0.0216	0.0048	451.4	10	BLA[a] 0 1 21	0.30, 0.30; (0.30) 0.53, 0.52; (0.53) 0.39, 0.39; (0.39) 0.11, 0.11; (0.11)	2000-apples-flu-T175
South Africa, 1994-1995 (Granny Smith)	Foliar	WG	Not given	0.0024	Not given	5	0 1 7 14 21 28 36	0.05, 0.05; (0.05) 0.17, 0.17; (0.17) 0.07, 0.07; (0.07) 0.09, 0.03; (0.06) 0.01, 0.01; (0.01) 0.01, 0.02; (0.02) 0.02, 0.02; (0.02)	1995-apples-flu-M45
South Africa, 1994-1995 (Granny Smith)	Foliar	WG	Not given	0.0048	Not given	5	0 1 7 14 21 28 36	0.17, 0.17; (0.17) 0.13, 0.10; (0.12) 0.10, 0.11; (0.11) 0.11, 0.13; (0.12) 0.04, 0.03; (0.04) 0.07, 0.06; (0.07) 0.03, 0.02; (0.03)	1995-apples-flu-M45

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
South Africa, 1985-1986 (Granny Smith)	Foliar	EC	Not given	0.002	Not given	5	BLA[a] 0 1 2 4 8 16 32	0.02, < 0.02; (0.02) 0.08, 0.08; (0.08) 0.07, 0.06; (0.07) 0.05, 0.05; (0.05) 0.02, 0.04; (0.03) 0.08, 0.10; (0.09) 0.06, 0.05; (0.06) 0.02, 0.02; (0.02)	1986-apples-flu-C24
South Africa, 1985-1986 (Granny Smith)	Foliar	EC	Not given	0.004	Not given	5	BLA[a] 0 1 2 4 8 16 32	0.09, 0.06; (0.08) 0.24, 0.25; (0.25) 0.20, 0.20; (0.20) 0.11, 0.16; (0.14) 0.11, 0.13; (0.12) 0.014, 0.16; (0.15) 0.07, 0.09; (0.08) 0.05, 0.05; (0.05)	1986-apples-flu-C24
South Africa, 1985 (Starking Granny Smith)	Foliar via high volume handspray	EC	Not given	0.002	Not given	5	BLA[a] 0 1 2 4 8 16 32	0.10 0.13 0.11 0.23 0.12 0.06 0.03 0.02	1986-apples-flu-C24
South Africa, 1985 (Starking Granny Smith)	Foliar via high volume handspray	WG	Not given	0.002	Not given	5	BLA[a] 0 1 2 4 8 16 32	0.10 0.27 0.26 0.18 0.15 0.08 0.05 0.03	1986-apples-flu-C24
South Africa, 1984 (Starking)	Foliar	EC	Not given	0.0015	Not given	8	BLA[a] 0 1 2 4 8 17 31	< 0.02 0.24 0.06 0.02 0.01 0.04 0.05 0.02	1986-apples-flu-C24
India, 1993 (Royal Delicious)	Foliar to run-off	40 EC	0.04	0.067	60	4	0 3 15	0.38 0.105 < 0.001	Pestology 19, Jan 1995
India, 1993 (Royal Delicious)	Foliar to run-off	40 EC	0.08	0.133	60	4	0 3 15	0.752 0.202 < 0.001	Pestology 19, Jan 1995

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
India, 1993 (Royal Delicious)	Foliar to run-off	40 EC	0.120	0.2	60	4	0 3 15	1.214 0.285 0.003	Pestology 19, Jan 1995
India, 1992 (Royal Delicious)	Foliar to run-off	40 EC	0.04	0.067	60	4	0 1 3 7 15	0.428 0.313 0.121 0.076 < 0.001	Pestology 19, Jan 1995
India, 1992 (Royal Delicious)	Foliar to run-off	40 EC	0.08	0.133	60	4	0 1 3 7 15	0.801 0.516 0.245 0.108 < 0.001	Pestology 19, Jan 1995
India, 1992 (Royal Delicious)	Foliar to run-off	40 EC	0.120	0.2	60	4	0 1 3 7 15	1.227 0.841 0.467 0.305 < 0.001	Pestology 19, Jan 1995
India, 1991 (Royal Delicious)	Foliar to run-off	40 EC	0.04	0.067	60	4	0 3 15	0.315 0.105 < 0.001	Pestology 19, Jan 1995
India, 1991 (Royal Delicious)	Foliar to run-off	40 EC	0.08	0.133	60	4	0 3 15	0.724 0.198 < 0.001	Pestology 19, Jan 1995
India, 1991 (Royal Delicious)	Foliar to run-off	40 EC	0.120	0.2	60	4	0 3 15	1.050 0.354 0.005	Pestology 19, Jan 1995

a - Residues before last application

Table 27. Flusilazole residues in pears from supervised trials in Italy, South Africa and China

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Italy, 1987 (Kaiser Alexander)	Spraying with a Knapsack Sprayer	WG	0.051	0.0003	1700	1	7 14 21 25 74	0.26 0.14 0.07 0.04 < 0.01	BF-66.630-03-088-16
Italy, 1987 (William)	Spraying with Knapsack Sprayer	EC	0.051	0.0003	1700	1	0 7 14 21 38 49	0.12 0.06 0.02 0.02 < 0.01 < 0.01	BF-66.630-03-088-16
South Africa, 1994-1995 (Packhams Triumph)	Foliar	WG	Not given	0.0024	Not given	5	0 1 7 14 21 28 36	0.08, 0.11; (0.10) 0.11, 0.10; (0.11) 0.05, 0.05; (0.05) 0.01, 0.01; (0.01) 0.01, 0.01; (0.01) < 0.01, < 0.01; (< 0.01) 0.01, < 0.01; (0.01)	1995-pears-flu-M44

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
South Africa, 1994-1995 (Packhams Triumph)	Foliar	WG	Not given	0.0048	Not given	5	0 1 7 14 21 28 36	0.25, 0.25; (0.25) 0.28, 0.29; (0.29) 0.11, 0.10; (0.11) 0.07, 0.05; (0.06) 0.03, 0.02; (0.03) 0.03, 0.02; (0.03) 0.01, < 0.01; (0.01)	1995-pears-flu-M44
South Africa, 1985 (unspecified)	Foliar	EC	0.065	0.002	3250	6	BLA[a] 0 1 2 4 8 16 32	0.05, 0.04; (0.05) 0.23, 0.16; (0.20) 0.12, 0.06; (0.09) 0.06, 0.05; (0.06) 0.03, 0.03; (0.03) 0.03, 0.02; (0.03) 0.02, 0.02; (0.02) < 0.02, < 0.02; (< 0.02)	1986-pears-flu-C15
South Africa, 1985 (unspecified)	Foliar	WG	0.065	0.002	3250	6	BLA[a] 0 1 2 4 8 16 32	0.06, 0.06; (0.06) 0.09, 0.09; (0.09) 0.06, 0.09; (0.09) 0.09, 0.06; (0.08) 0.06, 0.06; (0.06) 0.04, 0.03; (0.04) 0.03, 0.02; (0.03) < 0.02, < 0.02; (< 0.02)	1986-pears-flu-C15
China, Beijing, 1996 (Pyrus bretschneideri Rehd)	Foliar	400 EC	0.15	0.005	3000	4	14 21	0.048, 0.044, 0.012, 0.038; (0.036) 0.054, 0.021, 0.018, < 0.0033; (0.024)	17-9453 Pear

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
China, Shandong, 1996 (Pyrus ussuriensis MAXIM)	Foliar	400 EC	0.15	0.005	3000	4	14 21	0.043, 0.081, 0.093, 0.044; (0.065) 0.057, 0.036, 0.011, 0.013; (0.029)	17-9453 Pear
China, Beijing, 1995 (Pyrus bretschneideri Rehd)	Foliar	400 EC	0.15	0.005	3000	4	14 21	0.011, 0.0033, < 0.0033, 0.0033; (0.005) < 0.0033, < 0.0033, 0.0083, 0.0033; (0.005)	17-9453 Pear
China, Shandong, 1995 (Pyrus ussuriensis MAXIM)	Foliar	400 EC	0.15	0.005	3000	4	14 21	0.18, 0.13, 0.20; (0.17) 0.13, 0.10, 0.16; (0.13)	17-9453 Pear
China, Beijing, 1996 (Pyrus bretschneideri Rehd)	Foliar	400 EC	0.30	0.010	3000	4	14 21	0.19, 0.21, 0.13, 0.15; (0.17) 0.089, 0.029, < 0.0033, 0.10; (0.055)	17-9453 Pear
China, Shandong, 1996 (Pyrus ussuriensis MAXIM)	Foliar	400 EC	0.30	0.010	3000	4	14 21	0.014, 0.036, 0.14, 0.031; (0.054) 0.013, 0.024, 0.11, 0.019; (0.041)	17-9453 Pear
China, Beijing, 1996 (Pyrus bretschneideri Rehd)	Foliar	400 EC	0.30	0.010	3000	4	0 1 3 7 14 21 28	0.79 0.26 0.20 0.13 0.051 0.018 < 0.0033	17-9453 Pear
China, Shandong, 1996 (Pyrus ussuriensis MAXIM)	Foliar	400 EC	0.30	0.010	3000	4	0 1 2 4 7 14 21 28	0.36 0.28 0.24 0.20 0.17 0.050 0.033 0.019	17-9453 Pear
China, Beijing, 1995 (Pyrus bretschneideri Rehd)	Foliar	400 EC	0.30	0.010	3000	4	14 21	0.087, 0.13, 0.11, 0.087; (0.10) 0.16, 0.011, 0.0067; (0.059)	17-9453 Pear

Location, Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
China, Shandong, 1995 (Pyrus ussuriensis MAXIM)	Foliar	400 EC	0.30	0.010	3000	4	14 21	0.17, 0.14, 0.20, 0.20; (0.18) 0.14, 0.12, 0.14, 0.078; (0.12)	17-9453 Pear
China, Beijing, 1995 (Pyrus bretschneideri Rehd)	Foliar	400 EC	0.30	0.010	3000	4	0 1 3 7 14 21 28	1.4 0.81 0.74 0.67 0.42 0.17 0.054	17-9453 Pear
China, Shandong, 1995 (Pyrus ussuriensis MAXIM)	Foliar	400 EC	0.30	0.010	3000	4	0 2 4 8 14 22 28	0.72 0.45 0.53 0.38 0.24 0.13 0.10	17-9453 Pear

a - Residues before last application

Table 28. Flusilazole residues in apricots, peaches, and nectarines from supervised trials in France, Greece, Italy, Spain and New Zealand.

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
France, 1991 Apricot (Colomer)	Foliar	EC	0.024	0.004	600	8	0 (-1 hr) 0 (+ 1hr) 1 3 7 10	0.12 0.34 0.16 0.09 0.08 0.05	K01RE01
France, 1991 Apricot (Thirente)	Foliar	EC	0.040	0.014	280	4	0 (-1 hr) 0 (+ 1hr) 1 3 7 10	0.03 0.03 0.04 0.04 0.05 0.03	K01RE01
France, 1991 Apricot (Rouge de Fournes)	Foliar	EC	0.040	0.014	280	6	0 (-1 hr) 0 (+ 1hr) 1 4 7 10	0.03 0.08 0.10 0.07 0.06 0.06	K01RE01
France, 1988 Apricot (Rouge de Fournes)	Foliar	EC	0.030	0.003	1000	4	106	< 0.01 < 0.01	BE-A-11-89-25 BF
France, 1988 Apricot Rouge de Fournes)	Foliar	EC	0.030 0.040	0.003 0.004	1000	4	109	< 0.01 < 0.01	BE-A-11-89-25 BF
Greece, 1999 Peach (Andros)	Foliar by Standard Airblast	EC	0.083	0.0051	1612	3	7	<u>0.033</u>	DuPont-2189
Italy, 1999 Peach (Sentry)	Foliar to run off	EC	0.082	0.0050	1642	3	7	0.034, 0.039 <u>(0.037)</u>	DuPont-2189

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Italy, 1999 Peach (Rosa del West)	Foliar	EC	0.075	0.0048	1555	3	7	0.041, 0.058 (0.050)	DuPont-2189
Spain, 1999 Peach (Baby Gold 6)	Foliar	EC	0.081	0.0050	1610	3	7	0.043, 0.051 (0.047)	DuPont-2189
France (south), 1999 Peach (Spring Lady)	Foliar to incipient run off	EC	0.071	0.0051	1377	3	7	0.042, 0.057 (0.050)	DuPont-2189
Greece, 1998 Peach (Star)	Foliar by Ground Sprayer	EC	0.070	0.0050	1402	3	7	0.088, 0.11 (0.099)	AMR 4985-98
Italy, 1998 Peach (Glohaven)	Foliar	EC	0.072	0.0048	1507	3	7	0.11, 0.048 (0.079)	AMR 4985-98
Spain, 1998 Peach (Baby Gold 6)	Foliar	EC	0.069	0.0050	1379	3	7	0.062, 0.081 (0.072)	AMR 4985-98
France (south), 1998 Peach (Royal Glory)	Foliar	EC	0.068	0.0050	1356	3	7	0.044, 0.066 (0.055)	AMR 4985-98
Greece, 1992 Peach (Nectared 6)	Hand gun sprayer	EC	0.040	0.004	1000	6	0 7 14 21	0.29, 0.17 0.09 0.02 0.03	BE-A-11-92-22 BG
Greece, 1992 (Peach/ Nectared 6)	Hand gun sprayer	EC	0.080	0.008	1000	6	0 7 14 21	0.18, 0.20 0.07 0.05 0.04	BE-A-11-92-22 BG
Greece, 1992 (Peach/ Andros S 31-99)	Hand gun sprayer	EC	0.040	0.004	1000	5	0 3 7	0.012, 0.13 0.21, 0.24 0.05	BE-A-11-92-22 BG
Greece, 1992 Peach (Andros S 31-99)	Hand gun sprayer	EC	0.080	0.008	1000	5	0 3 7	0.25, 0.19 0.07, 0.05 0.04	BE-A-11-92-22 BG
Italy, 1988 (Peach/ Stark Red)	Spraying	WG	0.06	0.004	1500	3	102	< 0.01	BE-A-11-89-15 BF
New Zealand, 1986 Peach (Red haven)	High volume handgun	WG	0.1 0.2 0.4	0.005 0.010 0.020	2000	5	91	< 0.01 < 0.01 < 0.01	Study No. 45119
New Zealand, 1986 Nectarine (Red gold)	Directed spray	WG	0.1 0.2 0.4	0.005 0.010 0.020	2000	5	113	< 0.01 < 0.01 < 0.01	Study No. 45132/45133
New Zealand, 1986 Nectarine (Sunelo)	Directed spray	WG	0.1 0.2 0.4	0.005 0.010 0.020	2000	4	107	< 0.01 < 0.01 < 0.01 < 0.01	Study No. 45132/45133

Table 29. Flusilazole residues in grapes from supervised trials in France, Greece, Italy, Portugal, Spain, Germany, South Africa, China, Australia and India

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Greece 1998 (Rasaki)	Foliar	EW	0.029	0.003	978	5	14	0.029, 0.026; (0.028)	AMR 4994-98
Spain 1998 (Rarellada)	Foliar	EW	0.031	0.0062	490	5	14	0.036, 0.037; (0.037)	AMR 4994-98
France (south) 1998 (Grenache)	Foliar	EW	0.030	0.0056	538	5	14	0.029, 0.028; (0.029)	AMR 4994-98
France (south) 1991 (Timpanillo)	Ground, Foliar Broadcast	EC	0.030	0.0150	200	6	15	0.10, 0.11; (0.11)	AMR 2060-91
France (south) 1991 (Cabernet Sauvignon)	Ground, Foliar coverage pulveration	EC	0.030	0.0030-0.0036	830-1014	6	14	0.0073, 0.012; (0.0097)	AMR 2060-91
France (south) 1991 (Cabernet Sauvignon)	Ground, foliar coverage	EC	0.030	0.0024-0.0030	990-1230	6	15	0.0091, 0.020; (0.015)	AMR 2059-91
France (south) 1991 (Timpanillo)	Ground, foliar coverage (air mist spray)	EC	0.030	0.0150	200	6	15	0.033, 0.042, 0.035; (0.037)	AMR 2059-91
France (south) 1991 (Timpanillo)	Ground, foliar coverage (air mist spray)	EC	0.060	0.03	200	6	15	0.11, 0.14, 0.11; (0.12)	AMR 2059-91
France (south) 1991 (Mauzac)	Ground, foliar coverage (air mist spray)	EC	0.030	0.0035-0.0074	407-868	6	15	0.0089, 0.0061; (0.0075)	AMR 2059-91
France (south) 1991 (Mauzac)	Ground, foliar coverage (air mist spray)	EC	0.060	0.0069-0.0147	407-868	6	15	0.025, 0.021; (0.023)	AMR 2059-91
France (south) 1991 (Cabernet Sauvignon)	Ground, foliar coverage (air mist spray)	EC	0.030	0.0029-0.0036	829-1022	6	14	0.012, 0.007, 0.0092; (0.009)	AMR 2059-91
France (south) 1991 (Cabernet Sauvignon)	Ground, foliar coverage (air mist spray)	EC	0.060	0.0059-0.0072	829-1022	6	14	0.022, 0.022, 0.031; (0.025)	AMR 2059-91
Italy 1991 (Barbera)	Ground, foliar coverage	EC	0.030	0.0038	800	6	14	0.012, 0.0099, 0.010; (0.011)	AMR 2059-91

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Italy 1991 (Moscato)	Ground, foliar coverage	EC	0.030	0.0038	800	6	14	0.0098, 0.0081, 0.0076; (0.009)	AMR 2059-91
Italy 1991 (Pinto Bianco)	Ground, foliar coverage	EC	0.030	0.003	1000	6	14	0.062, 0.068, 0.086; (0.072)	AMR 2059-91
Italy 1991 (Merlot)	Ground, foliar coverage	EC	0.030	0.0030-0.0036	833-1000	6	15	0.032, 0.026, 0.018; (0.025)	AMR 2059-91
Portugal 1991 (Biol)	Foliar broadcast	EC	0.030	0.0057-0.0060	499-522	6	14	0.021, 0.011, 0.013; (0.015)	AMR 2059-91
Portugal 1991 (Biol)	Foliar broadcast	EC	0.060	0.0115-0.0120	499-522	6	14	0.028, 0.059, 0.049; (0.045)	AMR 2059-91
Portugal 1991 (Talia)	Foliar broadcast	EC	0.030	0.0057-0.0065	462-529	6	14	< 0.0060, 0.023, 0.025; (0.018)	AMR 2059-91
Portugal 1991 (Talia)	Foliar broadcast	EC	0.060	0.0113-0.0130	462-529	6	14	0.030, 0.018, 0.014; (0.021)	AMR 2059-91
Spain 1991 (Tempranillo)	Foliar coverage	EC	0.030	0.0087-0.0094	320-343	6	14	0.017, 0.037, 0.035; (0.030)	AMR 2059-91
Spain 1991 (Tempranillo)	Foliar coverage	EC	0.060	0.0175-0.0188	320-343	6	14	0.083, 0.060, 0.084; (0.076)	AMR 2059-91
Spain 1991 (Macabeo)	Foliar coverage	EC	0.030	0.003	1000	6	15	0.017	AMR 2059-91
Spain 1991 (Macabeo)	Foliar coverage	EC	0.060	0.006	1000	6	15	0.092, 0.15, 0.084; (0.11)	AMR 2059-91
Portugal 1991 (Tinta Roriz)	Ground, foliar broadcast	EC	0.030	0.0037-0.0040	750-817	6	14	0.13, 0.076, 0.085 (0.097)	AMR 2059-91
Portugal 1991 (Tinta Roriz)	Ground, foliar broadcast	EC	0.060	0.0073-0.0080	750-817	6	14	0.26, 0.32, 0.12 (0.23)	AMR 2059-91
Germany 1986 (Kerner)	Foliar	EC	0.040	0.002	2000	7	0 7 14 21 28 35 42 60	0.07 0.13 0.17 0.10 0.08 0.14 0.14 0.07	BF-66.630-03-88-06

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1986 (Bacchus)	Foliar	EC	0.044	0.002	2200	7	0 7 14 21 28 35 42	0.01 0.02 0.02 0.02 0.01 0.01 0.06	BF-66.630-03-88-06
Germany 1986 (Muller-Thurgau)	Foliar	EC	0.033	0.006	550	7	0 7 14 21 28 35 42	0.21 0.25 0.28 < 0.01 0.14 0.12 0.10	BF-66.630-03-88-06
Germany 1986 (Kerner)	Foliar	EC	0.036	0.006	600	6	0 7 14 21 28 35 42 65	< 0.01 < 0.01 0.03 0.02 0.07 0.04 0.02 0.02	BF-66.630-03-88-06
Germany 1986 (Bacchus)	Foliar	EC	0.032	0.008	400	6	0 7 14 21 28 35 42	0.07 0.05 0.04 0.04 0.13 0.07 0.03	BF-66.630-03-88-06
Germany 1985 (Kerner)	Foliar	EC	0.040	0.006	666	6	0 7 14 24 28 35 42 60	0.11 0.10 0.08 0.09 0.06 0.05 0.04 0.07	BAT 86-07
Germany 1985 (Reisling)	Foliar	EC	0.0362	0.008	453	5	0 7 14 21 28 35 42 69	0.42 0.17 0.14 0.16 0.14 0.05 0.04 0.04	BAT 86-07
Germany 1985 (Muller-Thurgau)	Foliar	EC	0.036	0.006	600	8	0 7 14 21 28 35 42	1.18 0.14 0.30 0.35 0.23 0.28 0.11	BAT 86-07

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
South Africa 1987-1988 (Chenin Blanc)	Full cover spray	EC	Not given	0.0015	Not given	8	0 1 2 4 8 16	0.14, 0.14 (0.14) 0.08, 0.10 (0.09) 0.08, 0.08 (0.08) 0.07, 0.08 (0.075) 0.09, 0.10 (0.095) 0.05, 0.05 (0.05)	1988 grapes flu E109
South Africa 1987-1988 (Chenin Blanc)	Full cover spray	EC	Not given	0.002	Not given	8	0 1 2 4 8 16	0.09, 0.10 (0.095) 0.09, 0.09 (0.09) 0.14, 0.13 (0.135) 0.11, 0.11 (0.11) 0.10, 0.10 (0.10) 0.06, 0.05 (0.055)	1988 grapes flu E109
South Africa 1987-1988 (Chenin Blanc)	Full cover spray	EC	Not given	0.0016	Not given	8	16	0.06, 0.06 (0.06)	1988 grapes flu E109
South Africa 1987-1988 (Chenin Blanc)	Full cover spray	EC	Not given	0.0032	Not given	8	16	0.08, 0.09 (0.085)	1988 grapes flu E109
South Africa 1985-1986 (Waltham Cross)	CP3 rucksack	EC (a)	Not given	0.002	Not given	7	0 1 2 4 8 16	0.15 0.14 0.12 0.11 0.06 0.04	1986 grapes flu-PF 16-85-86
South Africa 1985-1986 (Waltham Cross)	CP3 rucksack	EC (a)	Not given	0.004	Not given	7	0 1 2 4 8 16	0.31 0.27 0.22 0.19 0.13 0.09	1986 grapes flu-PF 16-85-86
South Africa 1985-1986 (Hanepoot)	Not specified	EC	Not given	0.002	1400	7	BLA[a] 0 1 2 4	< 0.02, < 0.02; (< 0.02) 0.10, 0.11; (0.105) 0.16, 0.16; (0.16) 0.19, 0.13; (0.16) 0.05, 0.05; (0.05)	1986 grapes flu-C25 pdf

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
South Africa 1985-1986 (Hanepoot)	Not specified	EC	Not given	0.002	1400	7	BLA[a] 0 1 2 4	< 0.02, < 0.02; (< 0.02) 0.10, 0.09; (0.095) 0.07, 0.10; (0.085) 0.16, 0.15; (0.155) 0.08, 0.09; (0.085)	1986 grapes flu-C25 pdf
South Africa 1984-1985 (Chenin Blanc)	CP3 rucksack	EC (a)	Not given	0.0015	Not given	7	BLA[a] 0 1 2 4 8 16	0.10 0.06 0.05 0.05 0.03 0.03 0.05	1986 grapes flu-PF 06-84-85
South Africa 1984-1985 (Waltham Cross)	CP3 rucksack	EC (a)	Not given	0.0015	Not given	7	BLA[a] 0 1 2 4 16 32	0.05 0.06 0.06 0.05 0.06 0.05 0.04	1985 grapes flu-Pdf
Beijing, China 2003 (Early Agate)	Spray	EC	not given	0.01	not given	3	0 1 3 7 14 21 28	2.0 1.6 1.3 0.87 0.51 0.39 0.084	17-9457
Beijing, China 2003 (Early Agate)	Spray	EC	not given	0.005	not given	3	28 35	0.11 0.072	17-9457
Beijing, China 2003 (Early Agate)	Spray	EC	not given	0.005	not given	4	28 35	0.12 0.11	17-9457
Beijing, China 2003 (Early Agate)	Spray	EC	not given	0.01	not given	3	28 35	0.15 0.12	17-9457
Beijing, China 2003 (Early Agate)	Spray	EC	not given	0.01	not given	4	28 35	0.22 0.17	17-9457
Changchun, China 2003 (Early Agate)	Spray	EC	not given	0.01	not given	3	0 1 3 5 7 14	0.66 0.69 0.63 0.53 0.17 0.089	17-9457
Changchun, China 2003 (Early Agate)	Spray	EC	not given	0.005	not given	3	28 35	0.11 0.072	17-9457
Changchun, China 2003 (Early Agate)	Spray	EC	not given	0.005	not given	4	28 35	0.19 0.12	17-9457

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Changchun, China 2003 (Early Agate)	Spray	EC	not given	0.01	not given	3	28 35	0.20 0.19	17-9457
Changchun, China 2003 (Early Agate)	Spray	EC	not given	0.01	not given	4	28 35	0.20 0.19	17-9457
Beijing, China 2004 (Early Agate)	Spray	EC	not given	0.01	not given	3	0 1 3 7 14 21	1.4 0.94 0.47 0.34 0.17 0.094	17-9457
Beijing, China 2004 (Early Agate)	Spray	EC	not given	0.005	not given	3	28 35	0.12 0.084	17-9457
Beijing, China 2004 (Early Agate)	Spray	EC	not given	0.005	not given	4	28 35	0.14 0.090	17-9457
Beijing, China 2004 (Early Agate)	Spray	EC	not given	0.01	not given	3	28 35	0.14 0.092	17-9457
Beijing, China 2004 (Early Agate)	Spray	EC	not given	0.01	not given	4	28 35	0.12 0.12	17-9457
Changchun, China 2004 (Early Agate)	Spray	EC	not given	0.01	not given	3	0 1 3 7 14 21	2.9 2.1 1.4 1.1 0.63 0.29	17-9457
Changchun, China 2004 (Early Agate)	Spray	EC	not given	0.005	not given	3	28 35	0.15 0.12	17-9457
Changchun, China 2004 (Early Agate)	Spray	EC	not given	0.005	not given	4	28 35	0.20 0.12	17-9457
Changchun, China 2004 (Early Agate)	Spray	EC	not given	0.01	not given	3	28 35	0.21 0.20	17-9457
Changchun, China 2004 (Early Agate)	Spray	EC	not given	0.01	not given	4	28 35	0.22 0.21	17-9457
Australia 1988 (Rhine Reisling)	Handgun spray	WG	Not given	0.002	Not given	1	7 14 21	0.17 0.11 0.07	FLURES18
Australia 1988 (Rhine Reisling)	Handgun spray	WG	Not given	0.004	Not given	1	7 14 21	0.32 0.22 0.06	FLURES18

Location, Year Crop (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
India 1991 (Panneer Thirazhai, Muscut)	Aspee Gator Rocking high volume foliar sprayer	EC	0.040	Not given	Not given	3	10	< 0.05, < 0.05, < 0.05; (< 0.05)	FIPPAT 1780
			0.080					< 0.05, < 0.05, < 0.05; (< 0.05)	
			0.12					< 0.05, < 0.05, < 0.05; (< 0.05)	
			0.16					< 0.05, < 0.05, < 0.05; (< 0.05)	
India 1992 (Panneer Thirazhai, Muscut)	Aspee Gator Rocking high volume foliar sprayer	EC	0.040	Not given	Not given	3	11	< 0.05, < 0.05, < 0.05; (< 0.05)	FIPPAT 1786
			0.080					< 0.05, < 0.05, < 0.05; (< 0.05)	
			0.12					< 0.05, < 0.05, < 0.05; (< 0.05)	
			0.16					< 0.05, < 0.05, < 0.05; (< 0.05)	
India 1993 (Panneer Thiratchai)	Foliar spray	EC	0.040	Not given	Not given	4	9	< 0.05, < 0.05, < 0.05; (< 0.05)	FIPPAT 1928
			0.080					0.06, < 0.05, < 0.05; (0.053)	
			0.12					< 0.05, < 0.05, < 0.05; (< 0.05)	
			0.16					< 0.05, < 0.05, < 0.05; (< 0.05)	

a - Residues before last application

Table 30. Flusilazole residues in banana (Grand Nain variety) peel and pulp from supervised trials in the Caribbean Basin (Honduras, Costa Rica, Guatemala, Belize, West Indies and Jamaica)

Location, Year	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Honduras 1985-1986	Aerial bagged unwashed	EC	0.100	0.529	18.9	6	1 1 7 7 14 14 28 28	< 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp	AMR 776-87, Revision 1
Honduras 1985-1986	Aerial bagged washed	EC	0.100	0.529	18.9	6	1 1 7 7 14 14 28 28	< 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp	AMR 776-87, Revision 1
Honduras 1985-1986	Aerial bagged unwashed	EC	0.100	0.529	18.9	6	1 1 7 7 14 14 28 28	< 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp 0.011 Peel < 0.01 Pulp 0.011 Peel < 0.01 Pulp	AMR 776-87, Revision 1
Costa Rica 1985	Aerial bagged washed	EC	0.100	0.417	24	7	1 1 7 7 15 15	< 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp	AMR 776-87, Revision 1
Guatemala 1986	Aerial bagged unwashed	EC	0.100	0.427	23.4	4	1 1 7 7 14 14 25 25	0.02 Peel < 0.01 Pulp 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp	AMR 776-87, Revision 1
Guatemala 1986	Aerial bagged washed	EC	0.100	0.427	23.4	4	1 1 7 7 14 14 25 25	0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp	AMR 776-87, Revision 1
Belize 1986	Aerial bagged unwashed	EC	0.100	0.500	20	4	1 1 8 8 14 14 28 28	< 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp < 0.01 Peel < 0.01 Pulp	AMR 776-87, Revision 1

Location, Year	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Martinique (French West Indies) 1984	Aerial bagged unwashed	EC	0.100	0.500	20	5	1	0.017 Peel	AMR 776-87, Revision 1
							1	≤ 0.01 Pulp	
							7	< 0.01 Peel	
							7	< 0.01 Pulp	
							14	< 0.01 Peel	
							14	< 0.01 Pulp	
							28	< 0.01 Peel	
							28	< 0.01 Pulp	
St. Lucia, (British West Indies) 1985	Aerial bagged unwashed	EC	0.100	0.500	20	4	1	≤ 0.01 Peel	AMR 776-87, Revision 1
							1	≤ 0.01 Pulp	
							7	< 0.01 Peel	
							7	< 0.01 Pulp	
							14	< 0.01 Peel	
							14	< 0.01 Pulp	
							28	< 0.01 Peel	
							28	< 0.01 Pulp	
Guadeloupe (French West Indies) 1985-1986	Aerial bagged unwashed	EC	0.100	0.625	16	4	1	< 0.01 Peel	AMR 776-87, Revision 1
							1	≤ 0.01 Pulp	
							7	0.013 Peel	
							7	< 0.01 Pulp	
							14	0.013 Peel	
							14	< 0.01 Pulp	
							28	0.01 Peel	
							28	< 0.01 Pulp	
Jamaica 1986	Aerial bagged unwashed	EC	0.100	0.500	20	7	1	0.012 Peel	AMR 776-87, Revision 1
							1	≤ 0.01 Pulp	
							7	< 0.01 Peel	
							7	< 0.01 Pulp	
							14	< 0.01 Peel	
							14	< 0.01 Pulp	
							21	< 0.01 Peel	
							21	< 0.01 Pulp	
							28	< 0.01 Peel	
							28	< 0.01 Pulp	

Table 31. Flusilazole residues in cucumber from supervised trials in China

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Beijing, China 2000 (Jin Yan No. 4)	Spray	EC	0.150	Not given	Not given	1	0	0.626	17-9454
							1	0.470	
							2	0.261	
							3	0.136	
							5	0.130	
							7	0.079	
							10	0.053	
Nanjing, China 2000 (unspecified)	Spray	EC	0.150	0.018	833	1	0	0.333	17-9455
							1	0.261	
							2	0.176	
							3	0.115	
							5	0.084	
							7	< 0.004	
Beijing, China 2000 (Jin Yan No. 4)	Spray	EC	0.075	Not given	Not given	3	1	0.310	17-9454
							3	0.173	
Beijing, China 2000 (Jin Yan No. 4)	Spray	EC	0.150	Not given	Not given	3	1	0.719	17-9454
							3	0.316	

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Beijing, China 2000 (Jin Yan No. 4)	Spray	EC	0.075	Not given	Not given	4	1 3	0.310 0.262	17-9454
Beijing, China 2000 (Jin Yan No. 4)	Spray	EC	0.150	Not given	Not given	4	1 3	0.503 0.485	17-9454
Nanjing, China 2000 (unspecified)	Spray	EC	0.075	0.009	833	3	1 3	0.091 < 0.004	17-9455
Nanjing, China 2000 (unspecified)	Spray	EC	0.150	0.018	833	3	1 3	0.138 0.023	17-9455
Nanjing, China 2000 (unspecified)	Spray	EC	0.075	0.009	833	4	1 3	0.125 0.047	17-9455
Nanjing, China 2000 (unspecified)	Spray	EC	0.150	0.018	833	4	1 3	0.158 0.099	17-9455
Beijing, China 1999 (Jin Yan No. 4)	Spray	EC	0.150	Not given	Not given	1	0 1 2 3 5 7 10	0.901 0.540 0.437 0.264 0.191 0.042 0.020	17-9454
Nanjing, China 1999 (unspecified)	Spray	EC	0.150	0.018	833	1	0 1 2 3 5 7 10	0.093 0.035 0.029 0.023 0.019 0.012 < 0.004	17-9455
Beijing, China 1999 (Jin Yan No. 4)	Spray	EC	0.075	Not given	Not given	3	1 3	0.144 0.094	17-9454
Beijing, China 1999 (Jin Yan No. 4)	Spray	EC	0.150	Not given	Not given	3	1 3	0.196 0.134	17-9454
Beijing, China 1999 (Jin Yan No. 4)	Spray	EC	0.075	Not given	Not given	4	1 3	0.067 0.040	17-9454
Beijing, China 1999 (Jin Yan No. 4)	Spray	EC	0.150	Not given	Not given	4	1 3	0.163 0.062	17-9454
Nanjing, China 1999 (unspecified)	Spray	EC	0.075	0.009	833	3	1 3	0.063 0.041	17-9455
Nanjing, China 1999 (unspecified)	Spray	EC	0.150	0.018	833	3	1 3	0.153 0.057	17-9455
Nanjing, China 1999 (unspecified)	Spray	EC	0.075	0.009	833	4	1 3	0.059 0.029	17-9455
Nanjing, China 1999 (unspecified)	Spray	EC	0.150	0.018	833	4	1 3	0.131 0.085	17-9455

Table 32. Flusilazole residues in sweet corn from supervised trials in France and South Africa

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
France 1988 (C40)	Foliar	SE	0.200	0.050	400	1	14 28	< 0.01 < 0.01	BE-5122-88-18
France 1988 (C40)	Foliar	SE	0.420	0.105	400	1	14 28	< 0.01 < 0.01	BE-5122-88-18
France 1988 (Napier)	Foliar	SE	0.214	0.054	400	1	10 30	< 0.01 < 0.01	BE-5122-88-18
France 1988 (Napier)	Foliar	SE	0.420	0.105	400	1	10 30	< 0.01 < 0.01	BE-5122-88-18
France 1988 (Jubilée)	Foliar	SE	0.220	0.055	400	1	15 31	< 0.01 < 0.01	BE-5122-88-18
France 1988 (Jubilée)	Foliar	SE	0.420	0.105	400	1	15 31	< 0.01 < 0.01	BE-5122-88-18
South Africa 1992 (unspecified)	Foliar	SE	0.250	0.098	381	2	 0 7 14 21	Foliage 0.32, 0.28; (0.30) 0.14, 0.10; (0.12) 0.15, 0.15; (0.15) 0.12, 0.15; (0.14)	S.A. Bureau of Std 311/88506/K78
South Africa 1992 (unspecified)	Foliar	SE	0.250	0.098	381	2	 21 28	Plant and leaves 0.12, 0.15; (0.14) 0.15, 0.12; (0.14)	S.A. Bureau of Std 311/88506/K78
South Africa 1992 (unspecified)	Foliar	SE	0.250	0.098	381	2	 0 14	Cobs in dough stage < 0.01, < 0.01; (< 0.01) < 0.01, < 0.01; (≤ 0.01)	S.A. Bureau of Std 311/88506/K78

Table 33. Flusilazole residues in soybeans from supervised trials in the United States, Canada, France, Argentina and South Africa

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
USA (GA) 2004 (0212647)	Foliar	EC	0.121	0.081	150	2	32	< 0.01, < 0.01; (≤ 0.01)	DuPont-15704
USA (GA) 2004 (0212647)	Foliar	EC	0.125	0.065	192	2	30	< 0.01, < 0.01; (≤ 0.01)	DuPont-15704
USA (LA) 2004 (DPL 5806)	Foliar	EC	0.123	0.127	97	2	30	0.010, 0.011; (0.011)	DuPont-15704

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
USA (AR) 2004 (Leo 481 RR)	Foliar	EC	0.123	.073	168	2	29	< 0.01, < 0.01; (< 0.01)	DuPont-15704
USA (IL) 2004 (BT-383 CR)	Foliar	EC	0.123	0.056	219	2	29	0.027, 0.023 (0.025)	DuPont-15704
USA (OH) 2004 (SC 388)	Foliar	EC	0.124	0.085	146	2	28	0.016, 0.023; (0.020)	DuPont-15704
USA (OH) 2004 (SC 9373 RR)	Foliar	EC	0.125	0.085	146	2	28	0.021, 0.020; (0.021)	DuPont-15704
USA (IL) 2004 (Pioneer 92M91)	Foliar	EC	0.123	0.085	145	2	30	0.012, 0.015; (0.014)	DuPont-15704
USA (LA) 2004 (DP 5915 RR)	Foliar	EC	0.120	0.055	217	2	-0 0 3 10 14 21 30 42	< 0.01, < 0.01; (< 0.01) 0.016, 0.025; (0.021) < 0.01, 0.011; (0.011) < 0.01, 0.013; (0.012) 0.060, 0.044; (0.052) 0.018, 0.019; (0.018) 0.017, 0.011; (0.014) 0.011, 0.013; (0.012)	DuPont-15704

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
USA (IA) 2004 (Pioneer 93M80)	Foliar	EC	0.123	0.065	188	2	-1 0 3 10 14 21 30 40	< 0.01, 0.010; (0.010) < 0.01, 0.010; (0.010) < 0.01, < 0.01; (< 0.01) < 0.01, < 0.01; (< 0.01) 0.010, 0.011; (0.010) 0.024, 0.019; (0.021) < 0.01, 0.013, (0.012) 0.018, 0.025; (0.022)	DuPont-15704
USA (MO) 2004 (unspecified)	Foliar	EC	0.123	0.095	129	2	30	0.029, 0.025; (0.027)	DuPont-15704
USA (MI) 2004 (Pioneer 91M90)	Foliar	EC	0.120	0.071	168	2	30	0.024, 0.014; (0.019)	DuPont-15704
USA (MI) 2004 (Pioneer 91B.64)	Foliar	EC	0.120	0.071	169	2	30	0.021, 0.018; (0.020)	DuPont-15704
USA (OH) 2004 (Shurgrow 364)	Foliar	EC	0.122	0.073	167	2	30	0.035, 0.032; (0.034)	DuPont-15704
USA (OH) 2004 (GL 3343)	Foliar	EC	0.123	0.074	167	2	30	0.015, 0.017; (0.016)	DuPont-15704
USA (MN) 2004 (Pioneer 91 M 50)	Foliar	EC	0.122	0.080	152	2	29	0.013, 0.015; (0.014)	DuPont-15704
USA (MN) 2004 (Pioneer 91 M 50)	Foliar	EC	0.122	0.080	152	2	29	0.014, 0.014; (0.014)	DuPont-15704
USA (NE) 2004 (Dyna-Gro 32 M 32)	Foliar	EC	0.122	0.065	186	2	30	0.014, 0.013; (0.014)	DuPont-15704
USA (NE) 2004 (NCT 2A98RR)	Foliar	EC	0.123	0.065	187	2	29	0.018, 0.021; (0.020)	DuPont-15704
USA (MO) 2004 (S42-H1)	Foliar	EC	0.123	0.053	231	2	29	0.012, 0.010; (0.011)	DuPont-15704

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
USA (MO) 2004 (S42-H1)	Foliar	EC	0.125	0.054	233	2	29	0.011, < 0.01; (0.010)	DuPont-15704
Canada (QC) 2005 (DeKalb 26-02R)	Foliar	EC	0.120	0.060	200	2	29	0.026, 0.017; (0.022)	DuPont-15704
Canada (QC) 2005 (DeKalb 00-99)	Foliar	EC	0.126	0.063	200	2	30	0.030, 0.031; (0.031)	DuPont-15704
France 1990 (Kador)	Foliar	SE	0.200	0.0769	260	2	72	< 0.01	BE-A-11-91-01-BF
France 1990 (Mapple Arrow)	Foliar	SE	0.200	0.1	200	2	48	0.01, 0.01 (0.01)	BE-A-11-91-01-BF
Argentina 2004 (A3401 RG)	Foliar	SE	0.100 0.200	0.028 0.056	360	1	60	< 0.005 < 0.005	DuPont Agar Cross Study No. 005-2004
Argentina 2004 (A3401 RG)	Foliar	SE	0.100 0.200	0.028 0.056	360	1	54	< 0.005 < 0.005	DuPont Agar Cross Study No. 005-2004
Argentina 2004 (A4404 RG)	Foliar	SE	0.100 0.200	0.028 0.056	360	1	38	< 0.005 < 0.005	DuPont Agar Cross Study No. 005-2004
South Africa 2002 (PAN780)	Foliar	EW	0.075 0.150	0.021 0.042	360	2	34	< 0.005, < 0.005 (< 0.005) < 0.005, < 0.005 (< 0.005)	Report 7214/2126256/W393
South Africa 2002 (PAN780)	Foliar	SC	0.075 0.150	0.021 0.042	360	2	34	< 0.005, < 0.005 (< 0.005) < 0.005, < 0.005 (< 0.005)	Report 7214/2126256/W393
South Africa 2002 (PAN584)	Foliar	EW	0.150	0.042	360	2	48	< 0.005, < 0.005 (< 0.005)	Report 7214/2126256/W393
South Africa 2002 (PAN584)	Foliar	SC	0.075	0.021	360	2	48	< 0.005, < 0.005 (< 0.005)	Report 7214/2126256/W393

Table 34. Flusilazole residues in sugar beet (root) from supervised trials in southern Europe (Greece, Italy, and Spain) and in northern Europe (Belgium, Denmark, northern France, Germany, the Netherlands and the United Kingdom)

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Greece 2000 (Turbo)	Foliar	EC	0.104	0.025	416	3	15	0.015, < 0.01; (0.013)	DuPont-3973
Greece 2000 (Turbo)	Foliar	EC	0.112	0.025	448	3	15	< 0.01, 0.011; (0.011)	DuPont-3973

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Italy 2000 (Sucrosaros)	Foliar	EC	0.098	0.025	383	3	15	0.013, 0.013; (0.013)	DuPont-3973
Italy 2000 (Cremona)	Foliar	EC	0.101	0.025	398	3	15	0.011, < 0.01; (0.011)	DuPont-3973
Spain 2000 (Candela)	Foliar	EC	0.106	0.034	312	3	15	< 0.01, < 0.01; (< 0.01)	DuPont-3973
Spain 2000 (Jerez)	Foliar	EC	0.103	0.034	302	3	15	< 0.01, < 0.01; (< 0.01)	DuPont-3973
Greece 1999 (Turbo)	Foliar	EC	0.107	0.026	418	3	15	0.025, 0.020; (0.023)	DuPont-2190
Greece 1999 (Alexandra)	Foliar	EC	0.104	0.026	405	3	15	< 0.01, < 0.01; (< 0.01)	DuPont-2190
Greece 1998 (Bianca)	Foliar	EC	0.252	0.0625	404	3	15	0.051, 0.051; (0.051)	AMR 5001-98
Greece 1998 (Turbo)	Foliar	EC	0.256	0.0625	409	3	15	0.021, 0.018; (0.020)	AMR 5001-98
Spain 1998 (Hilma)	Foliar	EC	0.265	0.064	412.5	3	15	0.013, 0.012; (0.013)	AMR 5001-98
Spain 1998 (Marina Poly)	Foliar	EC	0.245	0.064	381	3	15	< 0.01, 0.011; (0.011)	AMR 5001-98
Italy 1986 (unspecified)	Foliar	EC	0.080	0.013	600	3	14 21 28	< 0.01 < 0.01 < 0.01	BF-66.630-03-87-04
Stavros, Greece 1985 (Monofort)	Foliar	EC	0.040	0.01	400	6	0 (4 hr) 7 14 21 28	< 0.01 0.01 0.01 < 0.01 < 0.01	BAT 86-06
Stavros, Greece 1985 (Monofort)	Foliar	EC	0.080	0.02	400	6	0 (4 hr) 7 14 21 28	0.01 0.01 ≤ 0.01 0.01 < 0.01	BAT 86-06
Pyrgetos, Greece 1985 (Monofort)	Foliar	EC	0.040	0.01	400	6	0 (4 hr) 7 14 21 28	0.01 < 0.01 < 0.01 < 0.01 < 0.01	BAT 86-06
Pyrgetos, Greece 1985 (Monofort)	Foliar	EC	0.080	0.02	400	6	0 (4 hr) 7 14 21 28	< 0.01 < 0.01 ≤ 0.01 < 0.01 0.01	BAT 86-06
Spain 1992 (Bingo)	Foliar	EC	0.125	Not given	Not given	2	29	0.07	ESP-92-360
Spain 1992 (Aramis)	Foliar	EC	0.125	Not given	Not given	2	29	0.08	ESP-92-360
Spain 1992 (Bingo)	Foliar	EC	0.125	Not given	Not given	2	29	0.12	ESP-92-360

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1997 (Elan)	Foliar	EC	0.115	0.059	250	2	BLA[a] 0 7 14 21 28 42	< 0.01, < 0.01; (< 0.01) < 0.01, < 0.01; (< 0.01) < 0.01, < 0.01; (< 0.01) < 0.01, < 0.01; (< 0.01) < 0.01, < 0.01; (< 0.01) < 0.01, 0.012; (0.011) < 0.01, < 0.01; (< 0.01)	AMR 4218-96
UK 1997 (Celt)	Foliar	EC	0.162	0.054	302	2	BLA[a] 0 7 14 21 28 42	< 0.01, < 0.01; (< 0.01) 0.012, 0.015; (0.014) < 0.01, 0.046 (0.048) 0.017, 0.019; (0.018) 0.017, 0.012; (0.015) 0.011, 0.011; (0.011) 0.012, 0.011; (0.012)	AMR 4218-96
Belgium 1997 (unspecified)	Foliar	EC	0.16	0.077	206	2	42	< 0.01, < 0.01; (< 0.01)	AMR 4217-96
Denmark 1997 (unspecified)	Foliar	EC	0.16	0.080	200	2	42	< 0.01, < 0.01; (< 0.01)	AMR 4217-96
N. France 1997 (unspecified)	Foliar	EC	0.15	0.072	208	2	44	< 0.01, < 0.01; (< 0.01)	AMR 4217-96
Germany 1997 (unspecified)	Foliar	EC	0.15	0.037	404	2	42	< 0.01, < 0.01; (< 0.01)	AMR 4217-96
Netherlands 1997 (unspecified)	Foliar	EC	0.13	0.035	380	2	42	< 0.01, < 0.01; (< 0.01)	AMR 4217-96
UK 1997 (unspecified)	Foliar	EC	0.17	0.054	315	2	42	< 0.01, 0.011; (0.011)	AMR 4217-96

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Christinenthal, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	< 0.01 < 0.01 < 0.01 ≤ 0.01 < 0.01	DuPont-9401
Borsum, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	< 0.01 < 0.01 < 0.01 ≤ 0.01 < 0.01	DuPont-9401
Grunstadt, Germany 1994 (unspecified)	Foliar	SC	0.145	Not given	Not given	2	0 7 20 42 49	0.02 0.02 0.04 0.01 0.02	DuPont-9401
Kotschau, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 50	< 0.01 0.01 < 0.01 ≤ 0.01 < 0.01	DuPont-9401
Gnaschwitz, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 25 42 49	< 0.01 0.01 < 0.01 ≤ 0.01 < 0.01	DuPont-9401
Motterwitz, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	0.01 0.02 < 0.01 ≤ 0.01 < 0.01	DuPont-9401
Germany 1993 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	0.07 0.06 0.04 0.03 < 0.03	AMR 3243-94
Germany 1993 (unspecified)	Foliar	SC	0.150	Not given	Not given	2	0 7 21 42 49	< 0.03 0.04 < 0.03 ≤ 0.03 < 0.03	AMR 3243-94
Nojean en Vexin, France 1987 (unspecified)	Foliar	SC	0.120	0.08	150	2	35	≤ 0.01	BF-66.630-03-88-04
Broussy le Grand, France 1987 (unspecified)	Foliar	SC	0.120	0.03	400	1	63	< 0.01	BF-66.630-03-88-04
Provins, France 1985 (unspecified)	Foliar	EC	0.040 0.060	0.01 0.015	400	1	70	< 0.01 < 0.01	BAT 86-03
Chalons/Marne, France 1985 (unspecified)	Foliar	EC	0.040 0.060	0.01 0.015	400	1	82	< 0.01 < 0.01	BAT 86-03

a - Residues before last application

Table 35. Flusilazole residues in barley grains from supervised trials in Germany, the United Kingdom and South Africa

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 2001 (Winter barley/ Reni)	BBCH 51	SE	0.210	0.070	299	2	64	0.074, 0.060 (0.07)	DuPont-6004
Germany 2001 (Winter barley/ Reni)	BBCH 51	SC	0.205	0.067	306	2	64	0.071, 0.071 (0.07)	DuPont-6004
Germany 2001 (Winter barley/ Carola)	BBCH 51	SE	0.221	0.070	314	2	57	< 0.01, < 0.01 (< 0.01)	DuPont-6004
Germany 2001 (Winter barley/ Carola)	BBCH 51	SC	0.195	0.067	291	2	57	< 0.01, < 0.01 (< 0.01)	DuPont-6004
Germany 2001 (Winter barley/ Theresa)	BBCH 51	SE	0.217	0.070	309	2	61	0.034, 0.041 (0.04)	DuPont-6004
Germany 2001 (Winter barley/ Theresa)	BBCH 51	SC	0.203	0.067	303	2	61	0.052, 0.048 (0.05)	DuPont-6004
Germany 2001 (Winter barley/ Aviron)	BBCH 51	SE	0.216	0.070	307	2	61	0.068, 0.057 (0.06)	DuPont-6004
Germany 2001 (Winter barley/ Aviron)	BBCH 51	SC	0.203	0.067	302	2	61	0.041, 0.042 (0.04)	DuPont-6004
Germany 2001 (Winter barley/ Camera)	BBCH 51	SE	0.221	0.070	314	2	63	0.022, 0.030 (0.03)	DuPont-6004
Germany 2001 (Winter barley/ Camera)	BBCH 51	SC	0.2111	0.067	315	2	63	0.087, 0.081 (0.08)	DuPont-6004
Germany 1995 (Winter barley/ Grete)	BBCH 65	EC	0.250	0.083	300	3	50	0.09	DuPont-9508
Germany 1995 (Winter barley/ Grete)	BBCH 65	EW	0.250	0.083	300	3	50	0.16	DuPont-9508
Germany 1993 (Winter barley/ Angora)	BBCH 65	SE and EC	0.255	0.064	394	3	35 51	0.06 0.05	AMR 3124-94
Germany 1993 (Winter barley/ Angora)	BBCH 69	SE	0.215	0.052	414	3	35 51	0.04 0.04	AMR 3123-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1993 (Winter barley/ unspecified)	BBCH 65	SE	0.2	0.080	250	3	42 49	0.11 0.10	AMR 3123-94
Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE	0.2	0.080	250	3	42 49	0.04 0.05	AMR 3123-94
Germany 1993 (Winter barley/ Angora)	BBCH 69	SE and EC	0.155	0.040	390	3	35 51	0.05 0.04	AMR 3122-94
Borsum, Germany 1993 (Winter barley/ unspecified)	BBCH 65	SE and EC	0.16	0.064	250	3	42 49	0.08 0.09	AMR 3122-94
Havixbeck, Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	42 49	0.07 0.08	AMR 3122-94
Christinenthal, Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	42 49	0.03 0.03	AMR 3122-94
Germany 1990 (Spring barley/ Beate)	EC39	EC	0.250	0.0625	400	2	62	< 0.01	BE-A-11-90-17-BF
Germany 1989 (Winter barley/ Tapir)	EC51-55	EC	0.160	0.040	400	2	58	0.02	BE-A-11-90-14-BF
Germany 1989 (Winter barley/ Gerbel)	EC59	EC	0.250	0.0625	400	2	55	0.02	BE-A-11-90-14-BF
Germany 1987 (Winter barley/ Marylin)	EC59	EC	0.16	0.04	400	2	71	0.02	BF-66.630-03/ 08-88-11
Germany 1987 (Winter barley/ Igri)	EC51	EC	0.16	0.04	400	2	86	< 0.01	BF-66.630-03/ 08-88-11
Steeple Morden-Cambs, UK 1986 (Spring barley/ Triumph)	CER71	EC	0.16	0.08	200	2	69	< 0.01	BG-BF-87-01
Steeple Morden-Cambs, UK 1986 (Spring barley/ Triumph)	CER71	EC	0.16	0.08	200	2	69	< 0.01	BG-BF-87-01

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Ross-Herefordshire, UK 1986 (Spring barley/ Triumph)	CER71	EC	0.16	0.08	200	2	63	0.07	BG-BF-87-01
Ross-Herefordshire, UK 1986 (Spring barley/ Triumph)	CER71	EC	0.16	0.08	200	2	63	0.06	BG-BF-87-01
UK 1986 (Winter barley/ Maris Otter)	GS32	EC	0.16	0.08	200	1	88	0.04, 0.04, 0.03; (0.04)	BG-BF-87-01
UK 1986 (Winter barley/ unspecified)	Not given	EC	0.16	0.08	200	1	77	< 0.01	BG-BF-87-01
UK 1986 (Winter barley/ Panda)	CER39	EC	0.16	0.08	200	1	65	< 0.01	BG-BF-87-01
UK 1986 (Winter barley/ Maris Otter)	GS64	EC	0.16	0.08	200	2	44	< 0.01, < 0.01; (< 0.01)	BG-BF-87-01
UK 1986 (Winter barley/ Maris Otter)	GS64	EC	0.16	0.08	200	2	44	0.02	BG-BF-87-01
UK 1986 (Winter barley/ Maris Otter)	GS64	EC	0.20	0.10	200	2	44	0.04	BG-BF-87-01
UK 1984 (Winter barley/ Tipper)	GS 41	EC	0.1 0.2 0.4	Not given	Not given	1	73	< 0.01 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Winter barley/ Igri)	GS 39-40	EC	0.1 0.2 0.4	Not given	Not given	1	68	< 0.01 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Winter barley/ Tipper)	GS 39	EC	0.1 0.2 0.4	Not given	Not given	1	71	< 0.01 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Spring barley/Triumph)	GS 59	EC	0.1 0.2 0.4	Not given	Not given	1	61	< 0.01 0.02 < 0.01	FLUS/RES 21
UK 1984 (Spring barley/Triumph)	GS 55	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	53	< 0.01 < 0.01 0.02 0.08	FLUS/RES 21
UK 1984 (Spring barley/Tasman)	GS 55	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	67	0.02 < 0.01 < 0.01 0.01	FLUS/RES 21

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
UK 1983 (Spring barley/Triumph)	GS 39	EC	0.08	0.040	200	1	56	< 0.01	FLUS/RES 20
UK 1983 (Spring barley/Triumph)	GS 39	EC	0.16	0.080	200	1	56	< 0.01	FLUS/RES 20
South Africa 1986 (Barley/ Clipper)	Not given	EC	0.125	Not given	Not given	1	56	≤ 0.02	1986-Barley-flu- 14-86-87

Table 36. Flusilazole residues in winter rye grains from supervised trials in Germany

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1995 (Bernburger)	BBCH 69	EC	0.250	0.083	300	3	49	0.03	DuPont-9508
Germany 1995 (Bernburger)	BBCH 69	EW	0.250	0.083	300	3	49	0.03	DuPont-9508
Germany 1993 (Amando)	BBCH 69	SE and EC	0.263	0.065	403	3	35 48	0.06 0.05	AMR 3124-94
Germany 1993 (unspecified)	BBCH 65	SE and EC	0.261	0.104	250	3	42 49 67	0.03 0.04 0.03	AMR 3124-94
Germany 1993 (Amando)	BBCH 69	SE	0.213	0.052	410	3	35 48	0.04 0.05	AMR 3123-94
Germany 1993 (unspecified)	BBCH 65	SE	0.2	0.08	250	3	42 49 67	0.04 0.02 0.03	AMR 3123-94
Germany 1992 (Lucks)	BBCH 72	SE and EC	0.275	0.069	400	3	35 42	0.04 0.04	K02RE01 PT 2
Germany 1990 (Halo)	EC49	EC	0.250	0.0625	400	2	88	< 0.01	BE-A-11-90-17-BF

Table 37. Flusilazole residues in wheat grains from supervised trials in Spain, Germany, the United Kingdom and South Africa

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Spain 1999 (Gazul)	BBCH 73-75	SE	0.200	0.0505	396.7	2	28	0.03, 0.04; (0.04)	DUPONT-2192
Spain 1999 (Cartaya)	BBCH 71-73	SE	0.205	0.0505	406.7	2	28	0.03, 0.01; (0.02)	DUPONT-2192

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Spain 1999 (Vitrón)	BBCH 75	SE	0.209	0.0505	413.3	2	28	< 0.01, < 0.01; (< 0.01)	DUPONT-2192
Spain 1999 (Rinconada)	BBCH 83	SE	0.203	0.0491	414	2	28	< 0.01, < 0.01; (< 0.01)	DUPONT-2192
Spain 1999 (Scissons)	BBCH 77	SE	0.206	0.0491	419	2	28	< 0.01, 0.02; (0.02)	DUPONT-2192
Spain 1998 (Cartaya)	BBCH 83	SE	0.197	0.0505	390	2	28	0.01, 0.02; (0.02)	AMR 4997-98
Spain 1998 (Vitrón)	BBCH 77	SE	0.200	0.0505	397	2	28	0.03, 0.02; (0.03)	AMR 4997-98
Spain 1998 (Cameje)	BBCH 73	SE	0.192	0.0483	397	2	28	0.02, 0.02; (0.02)	AMR 4997-98
Spain 1998 (Cv. Oscar Antón R2)	BBCH 85	SE	0.203	0.0412	492	2	28	0.03, 0.01; (0.02)	AMR 4997-98
Germany 1995 (Winter wheat/ Zentos)	BBCH 65	EC	0.250	0.083	300	3	48	< 0.01	DuPont-9508
Germany 1995 (Winter wheat/ Zentos)	BBCH 65	EW	0.250	0.083	300	3	48	< 0.01	DuPont-9508
Germany 1993 (Winter wheat/ unspecified)	EC 65	SE and EC	0.268	not given	not given	3	35 49	0.01 0.01	AMR 3124-94
Germany 1993 (Winter wheat/ unspecified)	not given	SE	0.207	not given	not given	3	35 49	0.02 0.01	AMR 3123-94
Borsum, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	42 49	< 0.01 < 0.01	AMR 3123-94
Christinenthal, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	42	0.01	AMR 3123-94
Germany 1993 (Winter wheat/ Greif)	EC 65	SE and EC	0.161	0.039	408	3	35 49	0.01 0.01	AMR 3122-94
Borsum, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE and EC	0.161	0.064	250	3	42 49	< 0.01 0.01	AMR 3122-94
Havixbeck, Germany 1993 (Winter wheat/ unspecified)	BBCH 65	SE and EC	0.16	0.064	250	3	42 49	< 0.01 0.01	AMR 3122-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Christinenthal, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	42	0.01	AMR 3122-94
Germany 1992 (Winter wheat/ Apollo)	BBCH 70	SE and EC	0.268	0.067	400	3	35 42	< 0.01 0.01	K02RE01 PT 1
Germany 1992 (Winter wheat/ Greif)	BBCH 72	SE and EC	0.169	.042	400	3	35 42	< 0.01 < 0.01	K02RE02
Germany 1990 (Spring wheat/ Kadett)	EC49	EC	0.250	0.0625	400	2	62	< 0.01	BE-A-11-90-17-BF
Germany 1990 (Spring wheat/ Krake)	EC33	EC	0.250	0.0625	400	2	94	< 0.01	BE-A-11-90-17-BF
Germany 1990 (Winter wheat/ Ares)	EC51-55	EC	0.250	0.0625	400	2	63	≤ 0.01	BE-A-11-90-17-BF
Germany 1987 (Winter wheat/ Kanzler)	EC55	EC	0.160	0.04	400	3	58	≤ 0.01	BF-66.630-03/08-88-11
Germany 1987 (Winter wheat/ Vuka)	EC51/55	EC	0.160	0.04	400	2	58	≤ 0.01	BF-66.630-03/08-88-11
UK 1986 (Winter wheat/ Fenman)	CER71	EC	0.160	0.080	200	3	75	< 0.01, < 0.01 (< 0.01)	BG-BF-87-01
UK 1986 (Winter wheat/ Virtue)	CER71	EC	0.160	0.080	200	3	67	< 0.01, < 0.01 (< 0.01)	BG-BF-87-01
UK 1986 (Winter wheat/ Avalon)	CER71	EC	0.160	0.080	200	3	61	< 0.01, < 0.01 (< 0.01)	BG-BF-87-01
UK 1986 (Winter wheat/ Galahad)	CER71	EC	0.160	0.080	200	3	56	< 0.01, < 0.01 (< 0.01)	BG-BF-87-01
UK 1984 (Winter wheat/ Virtue)	GS 90	EC	0.4	Not given	Not given	1	28	≤ 0.01	FLUS/RES 21
UK 1984 (Winter wheat/ Avalon)	GS 58	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	74	< 0.01 0.04 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Winter wheat/ Avalon)	GS 90	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	12	0.03 0.01 0.05 0.10	FLUS/RES 21

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
UK 1984 (Winter wheat/ Kador)	GS 60	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	63	< 0.01 < 0.01 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Winter wheat/ Kador)	GS 84	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	23	< 0.01 ≤ 0.01 0.05 0.01	FLUS/RES 21
UK 1984 (Winter wheat/ Kador)	GS 90	EC	0.4	Not given	Not given	1	13	0.05	FLUS/RES 21
UK 1984 (Winter wheat/ Virtue)	GS 43	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	84	< 0.01 < 0.01 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Winter wheat/ Virtue)	GS 61	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	71	< 0.01 < 0.01 < 0.01 < 0.01	FLUS/RES 21
UK 1984 (Winter wheat/ Virtue)	GS 75	EC	0.1 0.2 0.4 0.8	Not given	Not given	1	46	< 0.01 ≤ 0.01 0.01 0.01	FLUS/RES 21
UK 1983 (Winter wheat/ Norman)	GS 53	EC	0.1 0.2	0.05 0.10	200	1	61 61	< 0.01 < 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Norman)	GS 66	EC	0.1 0.2	0.05 0.10	200	1	42 42	< 0.01 < 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Avalon)	GS 39	EC	0.1 0.2	0.05 0.10	200	1	58 58	< 0.01 < 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Avalon)	GS 61	EC	0.1 0.2	0.05 0.10	200	1	44 44	< 0.01 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Rapier)	GS 39	EC	0.1 0.2	0.05 0.10	200	1	65 65	0.01 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Rapier)	GS 65	EC	0.1 0.2	0.05 0.10	200	1	52 52	0.01 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Flanders)	GS 39	EC	0.1 0.2	0.05 0.10	200	1	79 79	< 0.01 < 0.01	FLUS/RES 20
UK 1983 (Winter wheat/ Flanders)	GS 59	EC	0.1 0.2	0.05 0.10	200	1	64 64	< 0.01 0.01	FLUS/RES 20
Harmony, Malmesbury, South Africa 1986 (SST 16)	Not given	EC	0.1	Not given	Not given	2	83	< 0.02	1986-Wheat-flu-A

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Harmony, Malmesbury, South Africa 1986 (SST 16)	Not given	EC	0.25	Not given	Not given	2	83	< 0.02	1986-Wheat-flu-A
Ongegund, Malmesbury, South Africa 1986 (SST 16)	Not given	EC	0.1	Not given	Not given	2	76	< 0.02	1986-Wheat-flu-B
Ongegund, Malmesbury, South Africa 1986 (SST 16)	Not given	EC	0.25	Not given	Not given	2	76	< 0.02	1986-Wheat-flu-B

Table 38. Flusilazole residues in maize grains from supervised trials in France

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
France 1999 (Lucilla)	Foliar	SE	0.199	0.0819	243	2	28	< 0.01, < 0.01; (< 0.01)	DuPont-2193
France 1999 (Cécilia)	Foliar	SE	0.184	0.0844	218	2	28	< 0.01, < 0.01; (< 0.01)	DuPont-2193
France 1998 (Cécilia)	Foliar	SE	0.1925	0.0826	233	2	28	< 0.01, < 0.01; (< 0.01)	AMR 4999-98
France 1998 (Prégia)	Foliar	SE	0.1993	0.0824	242	2	28	< 0.01, < 0.01; (< 0.01)	AMR 4999-98
France 1998 (Cécilia)	Foliar	SE	0.2018	0.0878	230	2	28	< 0.01, < 0.01; (< 0.01)	AMR 4999-98
Abas 40, France 1987 (unspecified)	Foliar	SE	0.250	0.0625	400	1	55	< 0.01	BF-66.630-03-88-02
St, Jean de Morssac France 1987 (unspecified)	Foliar	SE	0.250	0.0625	400	1	55	< 0.01	BF-66.630-03-88-02

Table 39. Flusilazole residues in rice from supervised trials in Spain

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
St Jaume d'Enveja, Tarragona, Spain 1994 (Niva,Senia)	Foliar	EC	0.129	0.125	103	2		Shoot Panicle	E-94-001-RES
							0	2.67, 2.40	
							0	2.70, 1.90	
							0	2.49, 2.26	
							1	1.79, 1.52	
							1	1.75, 1.55	
							1	1.77, 1.57	
							14	0.28, 0.27, 0.30; (0.28)	
							21	0.14, 0.20, 0.22; (0.19)	
								Grain	
							30	0.16, 0.20, 0.17 (0.18)	
								Integral rice	
							30	0.02, 0.02, 0.03; (0.02)	
								Husks	
							30	0.69, 0.67, 0.67; (0.68)	
								White rice	
							30	< 0.01, < 0.01, < 0.01; (< 0.01)	
St Jaume d'Enveja, Tarragona, Spain 1994 (Tebre)	Foliar	EC	0.129	0.125	103	2		Shoot Panicle	E-94-001-RES
							0	1.29, 1.25	
							0	1.18, 1.26	
							0	1.24, 1.29	
							1	0.55, 0.67	
							1	0.57, 0.66	
							1	0.54, 0.60	
							14	0.15, 0.18, 0.16; (0.16)	
							21	0.11, 0.10, 0.09; (0.10)	
								Grain	
							30	0.05, 0.11, 0.16; (0.11)	
								Integral rice	
							30	0.01, < 0.01, < 0.01; (0.01)	
							30	Husks 0.39, 0.37, 0.42; (0.39)	
							30	White rice < 0.01, < 0.01, < 0.01; (< 0.01)	

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
St Jaume d'Enveja, Tarragona, Spain 1994 (Tebre)	Foliar	EC	0.129	0.125	103	2	33	Grain 0.11, 0.08, 0.07; (0.09) Integral rice 0.01, 0.01, < 0.01; (0.01) Husks 0.41, 0.45, 0.46; (0.44) White rice < 0.01, < 0.01, < 0.01; (< 0.01)	E-94-001-RES
St Jaume d'Enveja, Tarragona, Spain 1994 (Tebre)	Foliar	EC	0.129	0.125	103	2	33	Grain 0.07, 0.04, 0.06; (0.06) Integral rice 0.02, 0.01, 0.02; (0.02) Husks 0.32, 0.38, 0.33; (0.34) White rice < 0.01, < 0.01, < 0.01; (< 0.01)	E-94-001-RES

Table 40. Flusilazole residues in oilseed rape from supervised trials in Belgium, Denmark, France, Germany, the Netherlands and the United Kingdom

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 2001 (Zenith)	Foliar	SE	0.22001	0.0703	313	1	63	< 0.01, < 0.01 (< 0.01)	DuPont-6003
Germany 2001 (Contact)	Foliar	SE	0.20876	0.0703	297	1	58	< 0.01, 0.01 (< 0.01)	DuPont-6003
Germany 2001 (Panther)	Foliar	SE	0.21438	0.0703	305	1	67	< 0.01, < 0.01 (< 0.01)	DuPont-6003
Germany (Baden-Württemberg) 2001 (Express)	Foliar	SE	0.21790	0.0703	310	1	62	< 0.01, < 0.01 (< 0.01)	DuPont-6003
Germany (Niedersachsen) 2001 (Express)	Foliar	SE	0.21088	0.1054	200	1	63	< 0.01, < 0.01 (< 0.01)	DuPont-6003
Germany 2001 (Pronto)	Foliar	SE	0.21088	0.1054	200	1	69	< 0.01, < 0.01 (< 0.01)	DuPont-6003
Belgium 1997 (Apex)	Foliar	EC	0.2085	0.1000	206.5	2	84	< 0.02, < 0.02 (< 0.02)	AMR 4220-96

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Denmark 1997 (Express)	Foliar	EC	0.2136	0.1073	199	2	64	< 0.02, < 0.02 (< 0.02)	AMR 4220-96
France 1997 (Colysee)	Foliar	EC	0.2187	0.0716	305.5	2	61	0.051, 0.015 (0.03)	AMR 4220-96
Germany 1997 (Express)	Foliar	EC	0.217	0.07185	302	2	91	< 0.02	AMR 4220-96
The Netherlands 1997 (Joker)	Foliar	EC	0.200	0.0490	406	2	67	< 0.02, < 0.02 (< 0.02)	AMR 4220-96
United Kingdom 1997 (Apex)	Foliar	EC	0.2064	0.102	202.5	2	75	< 0.02, < 0.02 (< 0.02)	AMR 4220-96
Germany 1990 (Arabella)	Foliar	SE	0.250	Not given	Not given	1	0 56 68	1.33, green plant 0.07, pod < 0.01, grain	BE-A-11-90-19-BG
Germany 1990 (Ceres)	Foliar	SE	0.250	Not given	Not given	1	0	2.73, green plant	BE-A-11-90-19-BG
Germany 1990 (Liborius)	Foliar	SE	0.250	n.a.	n.a.	1	0 75 92	0.10, green plant 0.45, pod < 0.01, grain	BE-A-11-90-19-BG
Germany 1990 (Ceres)	Foliar	EW	0.250	0.0625	400	1	0 77	2.5, plant 0.03, 0.05; (0.04), grain	BE-A-11-90-18-BF
Germany 1990 (Liborius)	Foliar	EW	0.250	0.0625	400	1	0 56 109	0.15, 0.17 plant 0.02, pod 0.01, grain	BE-A-11-90-18-BF
Germany 1990 (Arabella)	Foliar	EW	0.250	0.0625	400	1	0 56 68	2.8, plant 0.13, pod < 0.01, grain	BE-A-11-90-18-BF
Germany 1989 (Arabella/ Lirabon)	Foliar	EW	0.125	0.0313	400	1	0 57 76	2.9, plant 0.02, pod < 0.01, grain	BE-A-11-90-15-BF
Germany 1989 (Cobra)	Foliar	EW	0.250	0.0625	400	1	0 56 72	< 0.01, < 0.01, plant 0.04, 0.03, pod 0.01 grain	BE-A-11-90-15-BF

Table 41. Flusilazole residues in sunflower seed from supervised trials in France

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
France 1999 (Istry)	BBCH 67	SE	0.219	0.0826	265	1	50	< 0.01, < 0.01 (<u>≤ 0.01</u>)	DuPont-2191

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
France 1999 (Alliance RM)	BBCH 71	SE	0.201	0.0827	243	1	50	< 0.01, < 0.01 (≤ 0.01)	DuPont-2191
France 1999 (Martisol)	BBCH 69	SE	0.206	0.0772	267	1	50	< 0.01, < 0.01 (≤ 0.01)	DuPont-2191
France 1999 (Farandol)	BBCH 67	SE	0.215	0.0911	236	1	50	< 0.01, < 0.01 (≤ 0.01)	DuPont-2191
France 1998 (Santiago)	BBCH 65	SE	0.1985	0.0696	285	1	50	0.01, 0.01 (0.01)	AMR 4996-98
France 1998 (Bilto)	BBCH 67	SE	0.1980	0.0697	284	1	50	0.03, 0.03 (0.03)	AMR 4996-98
France 1998 (Rigasol)	BBCH 63	SE	0.2000	0.0826	242	1	50	0.04, 0.04 (0.04)	AMR 4996-98
France 1998 (DK 3790)	BBCH 65	SE	0.1993	0.0733	272	1	50	0.03, 0.04 (0.04)	AMR 4996-98

Table 42. Flusilazole residues in barley, rye and wheat forage from supervised trials in Germany.

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1995 (Winter barley/ Grete)	BBCH 65	EC	0.250	0.083	300	3	0 35	3.8 1.1	DuPont-9508
Germany 1995 (Winter barley/ Grete)	BBCH 65	EW	0.250	0.083	300	3	0 35	3.8 2.6	DuPont-9508
Germany 1993 (Winter barley/ Angora)	EC 69	SE and EC	0.255	0.064	394	3	0	3.8	AMR 3124-94
Germany 1993 (Winter barley/ Angora)	BBCH 69	SE	0.215	0.052	414	3	0	4.3	AMR 3123-94
Germany 1993 (Winter barley/ unspecified)	BBCH 65	SE	0.2	0.08	250	3	0	5.6	AMR 3123-94
Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	0	9.3	AMR 3123-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1993 (Winter barley/ Angora)	BBCH 69	SE and EC	0.155	0.040	390	3	0	3.2	AMR 3122-94
Borsum, Germany 1993 (Winter barley/ unspecified)	BBCH 65	SE and EC	0.16	0.064	250	3	0	6.2	AMR 3122-94
Havixbeck, Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	0	5.9	AMR 3122-94
Christinenthal, Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	0	7.6	AMR 3122-94
Germany 1990 (Spring barley/ Beate)	EC39	EC	0.250	0.0625	400	2	0 21 34 42 49	4.2 0.62 0.41 0.44 0.64 (stalks), < 0.01 (ears)	BE-A-11-90-17-BF
Germany 1989 (Winter barley/ Tapir)	EC51-55	EC	0.160	0.04	400	2	0 21 42	1.6 (stalks), 6.9 (ears) 1.5 (stalks), 0.33 (ears) 1.8 (stalks), 0.22 (ears)	BE-A-11-90-14-BF
Germany 1989 (Winter barley/ Gerbel)	EC59	EC	0.250	0.0625	400	2	0 21 42	1.7 0.68 0.31	BE-A-11-90-14-BF
Germany 1987 (Winter barley/ Marylin)	EC59	EC	0.16	0.04	400	2	0 21 42 56	1.2 0.30 0.15 0.19 (stalks), 0.07 (ears)	BF-66.630-03/08-88-11
Germany 1987 (Winter barley/ Igri)	EC51	EC	0.16	0.04	400	2	0 21 42 56	3.1 0.26 0.15 0.36 (stalks), 0.04 (ears)	BF-66.630-03/08-88-11
Germany 1987 (Winter barley/ Gerbel)	EC51	EC	0.160	0.04	400	2	0 21 42 56	1.2 0.21 0.16 0.04	BF-66.630-03/08-88-11
Germany 1995 (Winter rye/ Bernburger)	BBCH 69	EC	0.250	0.083	300	3	0 35	7.5 2.1	DuPont-9508
Germany 1995 (Winter rye/ Bernburger)	BBCH 69	EW	0.250	0.083	300	3	0 35	10 1.8	DuPont-9508

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1993 (Winter rye/ Amando)	BBCH 69	SE and EC	0.263	0.065	403	3	0	6.7	AMR 3124-94
Germany 1993 (Winter rye/ unspecified)	BBCH 65	SE and EC	0.250	0.100	250	3	0	10.8	AMR 3124-94
Germany 1993 (Winter rye/ Amando)	BBCH 69	SE	0.213	0.052	410	3	0	8.3	AMR 3123-94
Germany 1993 (Winter rye/ unspecified)	BBCH 65	SE	0.2	0.08	250	3	0	7.9	AMR 3123-94
Germany 1992 (Winter rye/ Lucks)	BBCH 72	SE and EC	0.275	0.069	400	3	0	7.1	K02RE01 PT 2
Germany 1990 (Winter rye/ Halo)	EC49	EC	0.250	0.0625	400	2	0 21 35 42 49	2.6 0.75 0.92 0.52 0.53 (stalks), 0.02 (ears)	BE-A-11-90-17-BF
Germany 1995 (Winter wheat/ Zentos)	BBCH 65	EC	0.250	0.083	300	3	0 35	3.8 1.4	DuPont-9508
Germany 1995 (Winter wheat/ Zentos)	BBCH 65	EW	0.250	0.083	300	3	0	3.7	DuPont-9508
Germany 1993 (Winter wheat/ unspecified)	EC 65	SE and EC	0.268			3	0	7.4	AMR 3124-94
Germany 1993 (Winter wheat/ unspecified)		SE	0.207			3	0	5.0	AMR 3123-94
Borsum, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	0	3.5	AMR 3123-94
Christinenthal, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	0	4.1	AMR 3123-94
Germany 1993 (Winter wheat/ Greif)	EC 65	SE and EC	0.161	0.039	408	3	0	3.7	AMR 3122-94
Borsum, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE and EC	0.16	0.039	408	3	0	3.4	AMR 3122-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Havixbeck, Germany 1993 (Winter wheat/ unspecified)	BBCH 65	SE and EC	0.16	0.064	250	3	0	2.6	AMR 3122-94
Christinenthal, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	0	3.5	AMR 3122-94
Germany 1992 (Winter wheat/ Apollo)	BBCH 70	SE and EC	0.268	0.067	400	3	0	2.4	K02RE01 PT 1
Germany 1992 (Winter wheat/ Greif)	BBCH 72	SE and EC	0.169	0.042	400	3	0	6.5	K02RE02
Germany 1990 (Spring wheat/ Kadett)	EC49	EC	0.250	0.0625	400	2	0 21 35 42 49	5.8 0.54 0.54 0.38 0.59 (stalks), 0.02 (ears)	BE-A-11-90-17-BF
Germany 1990 (Spring wheat/ Krake)	EC33	EC	0.250	0.0625	400	2	0 21 35 42 49	6.5 0.60 0.20 0.15 0.22 (stalks), < 0.01 (ears)	BE-A-11-90-17-BF
Germany 1990 (Winter wheat/ Ares)	EC51-55	EC	0.250	0.0625	400	2	0 21 35 42 49	4.5 0.90 0.48 0.50 1.1, 1.7, 2.2 (stalks), 0.07 (ears)	BE-A-11-90-17-BF
Germany 1987 (Winter wheat/ Kanzler)	EC55	EC	0.160	0.04	400	2	0 21 28 35 42	1.3 0.14 0.12 0.05 0.08 (stalks), 0.03 (ears)	BF-66.630-03/08-88-11
Germany 1987 (Winter wheat/ Vuka)	EC51/55	EC	0.160	0.04	400	2	0 21 28 35 42	1.6 0.41 0.22 0.08 0.26 (stalks), 0.17 (ears)	BF-66.630-03/08-88-11

Table 43. Flusilazole residues in barley, rye and wheat straw from supervised trials in Germany, Spain and the United Kingdom

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 2001 (Winter barley/ Reni)	BBCH 51	SE	0.21017	0.0703	299	2	64	1.5, 1.5; (1.5)	DuPont-6004
Germany 2001 (Winter barley/ Reni)	BBCH 51	SC	0.20530	0.0671	306	2	64	1.3, 1.4; (1.4)	DuPont-6004
Germany 2001 (Winter barley/ Carola)	BBCH 51	SE	0.22071	0.0703	314	2	57	2.0, 1.9; (2.0)	DuPont-6004
Germany 2001 (Winter barley/ Carola)	BBCH 51	SC	0.19523	0.0671	291	2	57	2.5, 1.7; (2.1)	DuPont-6004
Germany 2001 (Winter barley/ Theresa)	BBCH 51	SE	0.21720	0.0703	309	2	61	1.9, 2.1; (2.0)	DuPont-6004
Germany 2001 (Winter barley/ Theresa)	BBCH 51	SC	0.20328	0.0671	303	2	61	2.4, 2.2; (2.3)	DuPont-6004
Germany 2001 (Winter barley/ Aviron)	BBCH 51	SE	0.21579	0.0703	307	2	61	2.4, 1.9; (2.2)	DuPont-6004
Germany 2001 (Winter barley/ Aviron)	BBCH 51	SC	0.20261	0.0671	302	2	61	2.4, 2.6; (2.5)	DuPont-6004
Germany 2001 (Winter barley/ Camera)	BBCH 51	SE	0.22071	0.0703	314	2	63	1.3, 1.1; (1.2)	DuPont-6004
Germany 2001 (Winter barley/ Camera)	BBCH 51	SC	0.21133	0.0671	315	2	63	2.2, 1.9; (2.1)	DuPont-6004
Germany 1995 (Winter barley/ Grete)	BBCH 65	EC	0.250	0.083	300	3	50	2.9	DuPont-9508
Germany 1995 (Winter barley/ Grete)	BBCH 65	EW	0.250	0.083	300	3	50	2.7	DuPont-9508
Germany 1993 (Winter barley/ Angora)	EC 69	SE and EC	0.255	0.064	394	3	35 51	1.6 0.77	AMR 3124-94
Germany 1993 (Winter barley/ Angora)	BBCH 69	SE	0.215	0.052	414	3	35 51	1.2 1.1	AMR 3123-94
Germany 1993 (Winter barley/ unspecified)	BBCH 65	SE	0.2	0.080	250	3	42 49	3.2 3.0	AMR 3123-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE	0.2	0.080	250	3	42 49	5.7 7.0	AMR 3123-94
Germany 1993 (Winter barley/ Angora)	BBCH 69	SE and EC	0.155	0.040	390	3	35 51	0.75 0.51	AMR 3122-94
Borsum, Germany 1993 (Winter barley/ unspecified)	BBCH 65	SE and EC	0.16	0.064	250	3	42 49	2.5 3.4	AMR 3122-94
Havixbeck, Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	42 49	3.8 4.7	AMR 3122-94
Christinenthal, Germany 1993 (Winter barley/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	42 49	5.0 4.4	AMR 3122-94
Germany 1990 (Spring barley/ Beate)	EC39	EC	0.250	0.0625	400	2	62	0.33	BE-A-11-90-17-BF
Germany 1989 (Winter barley/ Tapir)	EC51-55	EC	0.160	0.040	400	2	58	0.62	BE-A-11-90-14-BF
Germany 1989 (Winter barley/ Gerbel)	EC59	EC	0.250	0.0625	400	2	55	0.48, 0.70; (0.59)	BE-A-11-90-14-BF
Germany 1987 (Winter barley/ Marylin)	EC59	EC	0.16	0.04	400	2	71	0.66	BF-66.630-03/08-88-11
Germany 1987 (Winter barley/ Igri)	EC51	EC	0.16	0.04	400	2	86	0.48	BF-66.630-03/08-88-11
Germany 1987 (Winter barley/ Gerbel)	EC51	EC	0.160	0.04	400	2	72	0.11	BF-66.630-03/08-88-11
Germany 1995 (Winter rye/ Bernburger)	BBCH 69	EC	0.250	0.083	300	3	49	0.89	DuPont-9508
Germany 1995 (Winter rye/ Bernburger)	BBCH 69	EW	0.250	0.083	300	3	49	1.2	DuPont-9508
Germany 1993 (Winter rye/ Amando)	BBCH 69	SE and EC	0.263	0.065	403	3	35 48	3.5 4.9	AMR 3124-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1993 (Winter rye/ unspecified)	BBCH 65	SE and EC	0.261	0.104	250	3	42 49 67	6.0 6.5 4.2	AMR 3124-94
Germany 1993 (Winter rye/ Amando)	BBCH 69	SE	0.213	0.052	410	3	35 48	4.2 0.04, 0.05; (0.045)	AMR 3123-94
Germany 1993 (Winter rye/ unspecified)	BBCH 65	SE	0.2	0.08	250	3	42 49 67	4.3 5.2 3.4	AMR 3123-94
Germany 1992 (Winter rye/ Lucks)	BBCH 72	SE and EC	0.275	0.069	400	3	35 42	7.1 6.8	K02RE01 PT 2
Germany 1990 (Winter rye/ Halo)	EC49	EC	0.250	0.0625	400	2	88	0.25	BE-A-11-90-17-BF
Spain 1999 (Gazul)	BBCH 73-75	SE	0.200	0.0505	396.7	2	28	2.17, 1.97; (2.07)	DuPont-2192
Spain 1999 (Cartaya)	BBCH 71-73	SE	0.205	0.0505	406.7	2	28	1.55, 1.18; (1.37)	DuPont-2192
Spain 1999 (Vitrón)	BBCH 75	SE	0.2086	0.0505	413.3	2	28	10.3, 15.0; (12.7)	DuPont-2192
Spain 1999 (Rinconada)	BBCH 83	SE	0.203	0.0491	414	2	28	3.68, 1.63; (2.66)	DuPont-2192
Spain 1999 (Scissons)	BBCH 77	SE	0.2058	0.0491	419	2	28	2.38, 1.12; (1.75)	DuPont-2192
Spain 1998 (Cartaya)	BBCH 83	SE	0.1969	0.0505	390	2	28	1.83, 1.75; (1.79)	AMR 4997-98
Spain 1998 (Vitrón)	BBCH 77	SE	0.2003	0.0505	397	2	28	1.77, 1.72; (1.75)	AMR 4997-98
Spain 1998 (Cameje)	BBCH 73	SE	0.1919	0.0483	397	2	28	1.71, 1.54; (1.63)	AMR 4997-98
Spain 1998 (Cv. Oscar Antón R2)	BBCH 85	SE	0.2026	0.0412	492	2	28	5.35, 3.49; (4.42)	AMR 4997-98
Germany 1995 (Winter wheat/ Zentos)	BBCH 65	EC	0.250	0.083	300	3	48	2.1	DuPont-9508
Germany 1995 (Winter wheat/ Zentos)	BBCH 65	EW	0.250	0.083	300	3	48	2.5	DuPont-9508
Germany 1993 (Winter wheat/ unspecified)	EC 65	SE and EC	0.268	not given	not given	3	35 49	2.5 3.8	AMR 3124-94

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Germany 1993 (Winter wheat/ unspecified)	not given	SE	0.207	not given	not given	3	35 49	2.5 2.2	AMR 3123-94
Borsum, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	42 49	0.17 0.21	AMR 3123-94
Christinenthal, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE	0.2	0.08	250	3	42	1.7	AMR 3123-94
Germany 1993 (Winter wheat/ Greif)	EC 65	SE and EC	0.161	0.039	408	3	35 49	1.7 2.0	AMR 3122-94
Borsum, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE and EC	0.161	0.064	250	3	42 49	0.75 0.24	AMR 3122-94
Havixbeck, Germany 1993 (Winter wheat/ unspecified)	BBCH 65	SE and EC	0.16	0.064	250	3	42 49	1.2 1.6	AMR 3122-94
Christinenthal, Germany 1993 (Winter wheat/ unspecified)	BBCH 61	SE and EC	0.16	0.064	250	3	42	1.0	AMR 3122-94
Germany 1992 (Winter wheat/ Apollo)	BBCH 70	SE and EC	0.268	0.067	400	3	35 42	0.56 0.31	K02RE01 PT 1
Germany 1992 (Winter wheat/ Greif)	BBCH 72	SE and EC	0.169	0.042	400	3	35 42	4.3 3.4	K02RE02
Germany 1990 (Spring wheat/ Kadett)	EC49	EC	0.250	0.0625	400	2	62	0.24	BE-A-11-90-17-BF
Germany 1990 (Spring wheat/ Krake)	EC33	EC	0.250	0.0625	400	2	94	0.12	BE-A-11-90-17-BF
Germany 1990 (Winter wheat/ Ares)	EC51-55	EC	0.250	0.0625	400	2	63	1.8, 1.4; (1.6)	BE-A-11-90-17-BF
Germany 1987 (Winter wheat/ Kanzler)	EC55	EC	0.160	0.04	400	3	58	0.12	BF-66.630-03/08-88-11
Germany 1987 (Winter wheat/ Vuka)	EC51-55	EC	0.160	0.04	400	2	58	0.23	BF-66.630-03/08-88-11

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
UK 1983 (Winter wheat/ Norman)	GS 53	EC	0.1 0.2	0.05 0.10	200	1	61 61	0.12 0.50	FLUS/RES 20
UK 1983 (Winter wheat/ Norman)	GS 66	EC	0.1 0.2	0.05 0.10	200	1	42 42	0.28 0.66	FLUS/RES 20
UK 1983 (Winter wheat/ Avalon)	GS 39	EC	0.1 0.2	0.05 0.10	200	1	58 58	0.12 0.23	FLUS/RES 20
UK 1983 (Winter wheat/ Avalon)	GS 61	EC	0.1 0.2	0.05 0.10	200	1	44 44	0.32 0.46, 0.50; (0.48)	FLUS/RES 20
UK 1983 (Winter wheat/ Rapier)	GS 39	EC	0.1 0.2	0.05 0.10	200	1	65 65	0.19 1.44, 1.68; (1.56)	FLUS/RES 20
UK 1983 (Winter wheat/ Rapier)	GS 65	EC	0.1 0.2	0.05 0.10	200	1	52 52	0.05 0.37	FLUS/RES 20
UK 1983 (Winter wheat/ Flanders)	GS 39	EC	0.1 0.2	0.05 0.10	200	1	79 79	0.12 0.63, 0.49; (0.56)	FLUS/RES 20
UK 1983 (Winter wheat/ Flanders)	GS 59	EC	0.1 0.2	0.05 0.10	200	1	64 64	0.15 0.65	FLUS/RES 20

Table 44. Flusilazole residues in oat forage and fodder from supervised trials in South Africa

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Growth stage at last appl.	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
South Africa 1991 (Perdeberg)	Not given	250 EC	0.075	0.034	220	1	1 7 14 21 29 (dry foliage)	3.0, 2.6 (2.8) 1.3, 1.3 (1.3) 1.1, 1.2 (1.2) 0.79, 0.81 (0.80) < 0.1	1986oats-flu-J66
South Africa 1991 (Perdeberg)	Not given	250 EC	0.150	0.068	220	1	1 7 14 21 29 (dry foliage)	12, 11 (12) 2.6, 2.6 (2.6) 2.6, 2.6 (2.6) 2.7, 3.0 (2.9) 0.11, 0.10 (0.11)	1986oats-flu-J66

Table 45. Flusilazole residues in sugar beet leaves from supervised trials in southern Europe (Greece, Italy, and Spain) and in northern Europe (Belgium, Denmark, northern France, Germany, the Netherlands and the United Kingdom)

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Greece 2000 (Turbo)	Foliar	EC	0.104	0.025	416	3	15	0.46, 0.86; (0.66)	DuPont-3973
Greece 2000 (Turbo)	Foliar	EC	0.112	0.025	448	3	15	1.2, 1.6; (1.4)	DuPont-3973
Italy 2000 (Sucrosaros)	Foliar	EC	0.098	0.025	383	3	15	1.1, 0.67; (0.89)	DuPont-3973
Italy 2000 (Cremona)	Foliar	EC	0.101	0.025	398	3	15	0.32, 0.30; (0.31)	DuPont-3973
Spain 2000 (Candela)	Foliar	EC	0.106	0.034	312	3	15	0.38, 0.33; (0.36)	DuPont-3973
Spain 2000 (Jerez)	Foliar	EC	0.103	0.034	302	3	15	0.36, 0.53; (0.45)	DuPont-3973
Greece 1999 (Turbo)	Foliar	EC	0.107	0.026	418	3	15	0.30, 0.40; (0.35)	DuPont-2190
Greece 1999 (Alexandra)	Foliar	EC	0.104	0.026	405	3	15	0.082, 0.12; (0.10)	DuPont-2190
Greece 1998 (Bianca)	Foliar	EC	0.252	0.0625	404	3	15	0.83, 1.0; (0.92)	AMR 5001-98
Greece 1998 (Turbo)	Foliar	EC	0.256	0.0625	409	3	15	1.0, 1.2; (1.1)	AMR 5001-98
Spain 1998 (Hilma)	Foliar	EC	0.265	0.064	412.5	3	15	1.7, 1.8; (1.8)	AMR 5001-98
Spain 1998 (Marina Poly)	Foliar	EC	0.245	0.064	381	3	15	0.67, 0.63; (0.65)	AMR 5001-98
Spain 1992 (Aaramis)	Foliar	EC	0.125	Not given	Not given	2	29	0.04	ESP-92-360
Spain 1992 (Bingo)	Foliar	EC	0.125	Not given	Not given	2	29	0.20	ESP-92-360
Spain 1992 (Aramis)	Foliar	EC	0.125	Not given	Not given	2	29	0.46	ESP-92-360
Spain 1992 (Bingo)	Foliar	EC	0.125	Not given	Not given	2	29	0.15	ESP-92-360
Italy 1986 (unspecified)	Foliar	EC	0.080	0.013	600	3	14 21 28	0.48 1.00 0.03	BF-66.630-03-87-04
Stavros, Greece 1985 (Monofort)	Foliar	EC	0.040	0.01	400	6	0 (4 h) 7 14 21 28	1.60 0.65 0.12 0.06 0.03	BAT 86-06

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
Stavros, Greece 1985 (Monofort)	Foliar	EC	0.080	0.02	400	6	0 (4 h) 7 14 21 28	2.25 1.08 0.32 0.04 0.09	BAT 86-06
Pyrgetos, Greece 1985 (Monofort)	Foliar	EC	0.040	0.01	400	6	0 (4 h) 7 14 21 28	1.22 0.64 0.62 0.12 0.02	BAT 86-06
Pyrgetos, Greece 1985 (Monofort)	Foliar	EC	0.080	0.02	400	6	0 (4 h) 7 14 21 28	3.08 0.69 0.50 0.34 0.03	BAT 86-06
Germany 1997 (Elan)	Foliar	EC	0.115	0.059	250	2	BLA[a] 0 7 14 21 28 42	0.33, 0.30; (0.32) 2.9, 3.5; (3.2) 1.8, 1.8: (1.8) 1.6, 1.3; (1.5) 0.90, 0.91; (0.91) 0.42, 0.42; (0.42) 0.21, 0.21; (0.21)	AMR 4218-96
UK 1997 (Celt)	Foliar	EC	0.162	0.054	302	2	BLA[a] 0 7 14 21 28 42	0.092, 0.24; (0.17) 1.4, 1.8; (1.6) 0.22, 0.37; (0.30) 0.28, 0.39; (0.34) 0.29, 0.24 (0.27) 0.23, 0.26; (0.25) 0.14, 0.086; (0.11)	AMR 4218-96
Belgium 1997 (unspecified)	Foliar	EC	0.16	0.077	206	2	42	0.44, 0.24; (0.34)	AMR 4217-96
Denmark 1997 (unspecified)	Foliar	EC	0.16	0.080	200	2	42	0.59, 0.57; (0.58)	AMR 4217-96
France (north) 1997 (unspecified)	Foliar	EC	0.15	0.073	211	2	44	0.88	AMR 4217-96
Germany 1997 (unspecified)	Foliar	EC	0.15	0.037	404	2	42	0.32, 0.19; (0.26)	AMR 4217-96
Netherlands 1997 (unspecified)	Foliar	EC	0.13	0.035	380	2	42	0.30, 0.19; (0.25)	AMR 4217-96

Location Year (Variety)	Application						PHI, days	Flusilazole residues, mg/kg	Ref.
	Method	Form	kg ai/ha	kg ai/hL	Water, L/ha	No.			
UK 1997 (unspecified)	Foliar	EC	0.17	0.054	315	2	42	0.48, 0.26; (0.37)	AMR 4217-96
Christinenthal, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	2.80 0.33 0.26 0.25 0.10	DuPont-9401
Borsum, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	2.05 0.26 0.19 0.05 0.11	DuPont-9401
Grunstadt, Germany 1994 (unspecified)	Foliar	SC	0.145	Not given	Not given	2	0 7 20 42 49	2.52 1.65 0.99 0.29 0.33	DuPont-9401
Kotschau, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 50	2.26 0.70 0.43 0.17 0.19	DuPont-9401
Gnaschwitz, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 25 42 49	5.08 1.16 0.32 0.17 0.09	DuPont-9401
Motterwitz, Germany 1994 (unspecified)	Foliar	SC	0.15	Not given	Not given	2	0 7 21 42 49	4.91 1.82 0.46 0.27 0.09	DuPont-9401
Germany 1993 (unspecified)	Foliar	SC	0.145	Not given	Not given	2	0 7 21 42 49	4.42 3.55 1.57 0.84 0.54	AMR 3243-94
Germany 1993 (unspecified)	Foliar	SC	0.150	Not given	Not given	2	0 7 21 42 49	1.59 1.36 0.52 0.18 0.22	AMR 3243-94
Nojean en Vexin, France 1987 (unspecified)	Foliar	SC	0.120	0.08	150	2	35	0.24	BF-66.630-03-88-04
Broussy le Grand, France 1987 (unspecified)	Foliar	SC	0.120	0.03	400	1	63	0.23	BF-66.630-03-88-04
Provins, France 1985 (unspecified)	Foliar	EC	0.040 0.060	0.01 0.015	400	1	70	0.02 0.05	BAT 86-03
Chalons/Marne, France 1985 (unspecified)	Foliar	EC	0.040 0.060	0.01 0.015	400	1	82	0.01 0.01	BAT 86-03

a - Residues before last application

FATE OF RESIDUES IN STORAGE AND PROCESSING

In storage

No information was received on residues of flusilazole during periods of storage representing a normal commercial practice.

In processing

The Meeting received information on the fate of flusilazole residues during processing of apples, grapes, soybeans and wheat and barley grains and on flusilazole fate under hydrolysis conditions simulating commercial food processing.

In a high-temperature hydrolysis study (DuPont-16357) greater than 99% of flusilazole remained unchanged under conditions simulating industrial processing (temperatures ranging from 90 – 120 °C; pH 5 and 7). Therefore, flusilazole can be considered stable under the usual conditions of pasteurization, baking, brewing, boiling and sterilization.

Processing of apples

The Meeting received information on the fate of flusilazole residues during processing of apples to apple juice and apple pomace (wet and dry). In two studies conducted in the United States in 1985 (AMR 634-86), flusilazole was applied as a foliar spray at 140 g ai/ha (8 – 9 applications) with a PHI of 7 days. Mature apples were squeezed in a hand-cranked commercial apple press to get wet pomace and unclarified juice. A portion of the wet pomace was allowed to dry at room temperature to produce dry pomace. Flusilazole residues and processing factors are summarized in Table 46.

Table 46. Flusilazole residues and processing factors obtained in apple processing studies in the United States (locations in Delaware and Virginia)

Commodity	USA (DE)		USA (VA)		Average processing factor
	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor	
Apple fruit	0.05	1	0.06	1	1
Apple juice	0.01	0.20	< 0.01	< 0.17	0.19
Apple pomace, wet	0.09	1.8	0.18	3.0	2.4
Apple pomace, dry	0.77	15	0.54	9	12

Processing of grapes

The Meeting received information on the fate of flusilazole residues during processing of grapes to grape juice, wine, raisins and pomace (wet and dry) studied in France, the United States and Australia.

In two trials conducted in France at two different locations in 1991 (AMR 2060-91), flusilazole was applied as a foliar broadcast spray at 30 g ai/ha (6 applications) with a PHI of 14 – 15 days. In another study in France conducted in 1992 (K0048AR), flusilazole was applied as a foliar spray at 30 g ai/ha (4 applications) with a PHI of 50 days. The second study did not specify the processing procedures. In the first study, grapes were processed into raisins and wine using a standard procedure to produce red wine. The wine procedure involved pressing, addition of sulphur dioxide to juice, alcoholic fermentation with normal practices (aeration, maceration), removal of pomace, malolactate fermentation, first racking (wine drawn off the lees), second-third racking, and bottling (wine samples taken at this point). The procedure for raisins involved drying in a room where air at 10% relative humidity was passed at 1m/minute over the grapes for 5 h at 80 °C, then air was passed over the grapes for about 5 h at 60 °C. Flusilazole residues and processing factors from the three trials in France are summarized in Table 47.

Table 47. Flusilazole residues and processing factors obtained in grape processing studies in France

Sample	St. Cesaire, Nimes, France (1991)		Parempuyre, Gironde, France (1991)		Le Thor, France (1992)	
	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor
Grape berries	0.10, 0.11 (0.11)	1	0.0073, 0.012 (0.0097)	1	0.06	1
Must (juice)	---	---	0.0040, 0.0038 (0.0039)	0.40	0.03	0.50
Lees	0.067, 0.074 (0.071)	0.65	0.014, 0.014 (0.014)	1.4	< 0.01	< 0.17
Wine	0.0059, 0.0059, 0.0061, 0.0055 (0.0059)	0.05	0.0017, 0.0017, 0.0018, 0.0024 (0.0019)	0.20	< 0.01	< 0.17
Raisins	0.084, 0.088 (0.086)	0.78	0.021, 0.018 (0.020)	2.1	---	---

In three trials conducted in the United States at three different locations in California (CA) in 1984-85 (AMR 637-86), flusilazole was applied as a foliar spray at 70 g ai/ha (4 applications) with a PHI of 14, 17, or 28 days. Grapes were processed into juice, wet pomace, dry pomace and raisins. For juice and pomace (Ripon and Escalon, CA), grapes were squeezed in a hand-cranked commercial apple press. Juice was collected in the bottom of the press. A portion of the wet pomace was allowed to dry for several days at room temperature to produce dry pomace. Grape bunches (Kerman, CA) were processed into raisins at the vineyard using commercial procedures (drying in the sun) and the raisin waste (stems and pieces) was collected from each processed sample. Flusilazole residues and processing factors from the three trials in the United States are summarized in Table 48.

Table 48. Flusilazole residues and processing factors obtained in grape processing studies in the United States

Sample	Ripon, CA, USA		Escalon, CA, USA		Kerman, CA, USA	
	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor
Grape berries	0.09	1	0.07	1	0.04	1
Juice	< 0.01	< 0.11	0.03	0.43	---	---
Raisins	---	---	---	---	0.10	2.5
Raisin waste	---	---	---	---	0.32	8.0
Wet pomace	0.13	1.4	0.4	5.7	---	---
Dry pomace	0.25	2.8	1.3	19	---	---

In two trials conducted in Australia at one location in 1988 (FLUS/RES 18), flusilazole was applied as a foliar spray at 2 or 4 g ai/hL (1 application) with a PHI of 14 days. Grapes were processed into wine. Flusilazole residues and processing factors from these two trials are summarized in Table 49.

Table 49. Flusilazole residues and processing factors obtained in grape processing studies in Australia

Sample	2 g ai/hL		4 g ai/hL	
	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor
Grape berries	0.11	1	0.22	1
Wine	< 0.01	< 0.09	< 0.01	< 0.05

Table 50. Summary of processing factors obtained in grape processing studies conducted in France, the United States, and Australia

Sample	Location	Processing factors	Mean/median processing factor
Grape juice	France United States	0.40, 0.50 < 0.11, 0.43	0.42 [a]
Wine	France Australia	0.05, < 0.17, 0.20 < 0.05, < 0.09	0.09 [a]
Raisins	France United States	0.78, 2.1 2.5	1.8
Grape pomace, wet	United States	1.4, 5.7	3.6
Grape pomace, dry	United States	2.8, 19	11

a – Median values

Processing of soybeans

The Meeting received information on the fate of flusilazole residues during processing of soybeans to soybean meal, hulls, oil, and aspirated grain fraction (AGF) studied in the United States in 2004 (DuPont-15704). In one trial, flusilazole was applied as a foliar spray at 120 g ai/ha (2 applications) with a PHI of 30 days. Whole soybean samples were first dried at 54 – 71 °C until moisture content (determined using a moisture balance) reached 11 – 15%. Light impurities were separated using an aspirator, and the sample was screened to separate foreign particles. Whole soybeans were then fed into a disc mill to crack the hull and liberate the kernel; the soybeans were then passed through the aspirator to separate the hull and kernel material. The hull and kernel fractions were collected.

The kernel material was heated, flaked and expanded into collets, which were dried for 30 – 40 minutes at 54 – 71 °C. Crude oil was then extracted from the collets in a three-step process. The collets were first submerged in 49 – 60 °C solvent (hexane) for 30 minutes; the solvent was drained. Fresh solvent was added and the cycle was repeated two more times. The final two submersions were for 15 minutes each. Warm air was then forced through the spent collets to remove residual hexane. Fractions resulting from the solvent extraction step are miscella (crude oil and hexane) and solvent-extracted collets (the meal fraction). Crude oil in the miscella was then separated from hexane by passing the miscella through a Precision Scientific Recovery unit. The crude oil fraction was collected. The remaining crude oil was then heated to 73 – 90 °C for residual hexane removal, then refined. After refining, the refined oil and soap stock fractions were separated and collected.

For aspirated grain fraction (AGF), the soybean seed was analysed for moisture content, the seed was then dried at 38 – 57 °C until 10 – 13% moisture was achieved. The batch sample was then placed in a dust generation room containing a holding bin, two bucket conveyors, and a screw conveyor. The sample was moved through the system for more than 120 minutes and aspiration was used to remove the light impurities (grain dust). The light impurities were classified by sieving and all material that passed through a 2360 micron sieve were recombined to produce one aspirated grain fraction.

Flusilazole residues and processing factors from the soybean processing study in the United States are summarized in Table 51.

Table 51. Flusilazole residues and processing factors obtained in a soybean processing study in the United States

Sample	Flusilazole residues (mg/kg)	Processing factor
Soybeans (dry)	0.11	1
Soya bean meal	0.042	0.38
Soya bean hulls	0.12	1.1
Soya bean oil, refined	0.24	2.2
Soybeans (dry)	0.014	1
Soya bean AGF	0.91	65

Processing of wheat grain

The Meeting received information on the fate of flusilazole residues during processing of wheat grains to shorts, germ, middlings, bran, flour, and bread studied in the United States.

In one study conducted in Wyoming (WY) in 1988 (AMR 1154-88), flusilazole was applied to wheat as a foliar spray at 156 – 200 g ai/ha (3 applications) with a PHI of 25 days. Processing of wheat grains included the following sequential steps: 1) cleaning, 2) drying, 3) moisture conditioning, and 4) milling (breaking and sieving) to produce bran and middlings. The middlings were further milled (reduction and sieving) to produce shorts and germ, red dog, low grade flour, and patent flour. The whole grain, shorts and germ, middlings, bran and patent flour were analysed for residues of flusilazole.

In another study conducted in Montana (MN) in 1991 (AMR 2230-91), flusilazole was applied to wheat as an aerial broadcast spray at 140 g ai/ha, 2 applications with a 14 day interval. Processing included two pre-milling steps after drying the grain: 1) aspiration to remove light impurities and 2) screening to give small and large screenings. The cleaned wheat grain was moisture conditioned and then milled in two steps: 1) breaking and sieving to remove the bran and produce middlings and 2) reduction and sieving of the middlings to produce shorts, low grade flour, and patent flour. Flusilazole residues and processing factors from the two wheat processing studies are summarized in Table 52.

Table 52. Flusilazole residues and processing factors obtained in wheat processing studies in the United States

Commodity	USA (WY)		USA (MT)		Average processing factor
	Flusilazole residues (mg/kg)	Processing factor	Flusilazole residues (mg/kg)	Processing factor	
Wheat grain	0.046	1	0.055	1	1
Light impurities	---	---	3.1	56	56
Small screenings	---	---	0.022	0.40	0.40
Large screenings	---	---	0.093	1.7	1.7
Bran	0.017	0.37	0.011	0.20	0.29
Middlings	0.0039	0.085	< 0.05	< 0.91	0.50
Shorts and germ	0.012	0.26	< 0.05	< 0.91	0.59
Low-grade flour	---	---	< 0.05	< 0.91	< 0.91
Patent flour	0.013	0.28	< 0.05	< 0.91	0.60
Bread	---	---	< 0.05	< 0.91	< 0.91

Processing of barley grain

The Meeting received information on the fate of flusilazole residues during processing of barley grains to husks, shorts, bran, and studied in the United States.

In one study conducted in California in 1991 (AMR 1972-91), flusilazole was applied to barley as a foliar spray at 420 g ai/ha, 2 applications with a 14 day interval. Processing included four pre-milling steps: 1) aspiration to remove small impurities; 2) screening; 3) dehusking and 4) aspiration to remove husk. The pearled barley was then milled in two steps: 1) breaking and sieving to remove the bran and 2) reduction and sieving to produce shorts, low grade flour and patent flour. Flusilazole residues and processing factors are summarized in Table 53.

Table 53. Flusilazole residues and processing factors obtained in a barley processing study in the United States

Commodity	USA (CA)	
	Flusilazole residues (mg/kg)	Processing factor
Barley grain	0.13	1
Light impurities	1.0	7.7
Screenings	0.088	0.68
Husks	0.26	2.0
Bran	0.088	0.68

Commodity	USA (CA)	
	Flusilazole residues (mg/kg)	Processing factor
Shorts	0.066	0.51
Low-grade flour	0.043	0.33
Patent flour	0.059	0.45

Residues in the edible portion of food commodities

The Meeting received results from supervised trials with flusilazole used on banana in the Caribbean Basin (Belize, Costa Rica, Guatemala, Honduras, Jamaica and West Indies, including Guadeloupe, Martinique and St. Lucia). The critical GAP for these trials is the GAP of Columbia (100 g ai/ha, 4 – 6 applications, and a PHI of 1 day). Flusilazole residues in banana pulp and peel were reported (see Table 30), but flusilazole was not analysed in the whole fruit.

Based on the literature data (Stover, R.H. and Simmonds, N.W., 1987, Bananas. Tropical Agriculture Series, Longman Scientific & Technical, 468 pp), an average pulp to peel ratio for bananas at harvest is 1.82. Thus, 1 kg of whole fruit would have 0.645 kg of pulp and 0.355 kg of peel. Assuming this ratio, residues of flusilazole in the whole fruit were calculated (residue in whole fruit = 0.645 × pulp residue + 0.355 × peel residue) based on the residues in the pulp and peel obtained with a PHI of 1 day. When residues were below the limit of quantification, the LOQ value was used in the calculation. The results are shown in Table 54.

Table 54. Flusilazole residues in banana peel, pulp and whole fruit (calculated) from supervised trials (1-day PHI) in the Caribbean Basin (Honduras, Costa Rica, Guatemala, Belize, West Indies and Jamaica)

Location, Year	Flusilazole residues (mg/kg)		
	Pulp	Peel	Whole fruit
Honduras, 1985-1986	< 0.01	< 0.01	< 0.01
Honduras, 1985-1986	< 0.01	< 0.01	< 0.01
Honduras, 1985-1986	< 0.01	0.011	0.01
Costa Rica, 1985	< 0.01	< 0.01	< 0.01
Guatemala, 1986	< 0.01	0.02	0.014
Guatemala, 1986	< 0.01	0.01	0.01
Belize, 1986	< 0.01	< 0.01	< 0.01
Martinique, 1984	< 0.01	0.017	0.012
St. Lucia, 1985	< 0.01	< 0.01	< 0.01
Guadeloupe, 1985-1986	< 0.01	0.013	0.011
Jamaica, 1986	< 0.01	0.012	0.011

RESIDUES IN ANIMAL COMMODITIES

Farm animal feeding studies

The Meeting received information on lactating dairy cow (AMR 484-86) and laying hen (AMR-461-85) feeding studies.

Lactating dairy cows

Twelve lactating Guernsey cows, each producing about 13.6 kg or more milk per day, were included in the study (AMR 484-86). Animals were acclimated for 14 days prior to dosing, during which time weights, feed consumption, temperature and milk production were monitored. Cows were randomly assigned among 4 dosing groups of 3 animals each: one control group and 3 groups dosed at one of 3 flusilazole feeding levels each. All groups were fed for 28 days. After 28 days of dosing, 2 animals in each group were sacrificed while the third animal in each group underwent a 7-day period of withdrawal from flusilazole dosing before sacrifice.

The animals were fed a diet formulated from hay and grain to meet or exceed the specifications in "Nutrient Requirements of Dairy Cattle", 5th Revised Edition, 1978, National

Academy of Science. Flusilazole was administered in sealed gelatin capsules twice daily at milking with the grain ration. Groups were scheduled to receive flusilazole at 0 (control), 2, 10, and 50 ppm based on measured feed intake, corresponding to 0, 0.03, 0.14 and 0.81 mg/kg based on body weight, respectively.

Milk samples were collected for analysis twice daily on Days -1, 1, 2, 3, 4, 5, 6, 7, 14, 21 and 28 days and also 1, 3, 5 and 7 days after withdrawal of flusilazole dosing. Morning and evening milk were kept separately and combined for analysis. Selected samples were separated into skim milk and cream (analysed for the 50 mg/kg dosing level only). Triplicate 500 g samples of liver, kidney, skeletal muscle, blood, and renal, omental and subcutaneous fat were collected from each animal. All samples were frozen immediately and kept at about -20 °C until preparation for analysis. The longest freezer storage time for samples in this study was 4 months.

Flusilazole, its phenyl metabolites IN-F7321, IN-H7169 and IN-G7072, and its triazole metabolite (1H-1,2,4-triazole [IN-H9933]) were analysed in all samples. The limit of quantitation (LOQ) for flusilazole, IN-F7321, and IN-G7072 was 0.01 mg/kg. The LOQ was 0.02 mg/kg for IN-H7169. The LOQ for 1H-1,2,4-triazole was 0.10 mg/kg in milk, 0.02 mg/kg in muscle, kidney and liver and 0.05 mg/kg in fat.

Residues in milk reached a plateau at about 7 days. During the withdrawal period, residues decreased significantly in all milk and tissue samples, indicating no bioaccumulation of flusilazole or its metabolites.

Tables 55, 56 and 57 show flusilazole and IN-F7321 residues in milk and tissues obtained at 2, 10 and 50 mg/kg dosing levels in the diet, respectively.

Table 55. Flusilazole and IN-F7321 residues in milk and tissues of dairy cows dosed at 2 mg/kg in the diet.

Matrix	Day	Flusilazole		IN-F7321	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Whole milk	14	< 0.010	< 0.010 – < 0.010	< 0.010	< 0.010 – < 0.010
	21	< 0.010	< 0.010 – < 0.010	< 0.010	< 0.010 – < 0.010
	28	< 0.010	< 0.010 – < 0.010	< 0.010	< 0.010 – < 0.010
Skeletal muscle	28	< 0.010	< 0.010 – < 0.010	< 0.010	< 0.010 – < 0.010
Kidney	28	< 0.010	< 0.010 – < 0.010	0.21	0.21–0.21
Liver	28	0.11	0.09–0.12	0.04 [a]	0.03–0.06 [a]
Omental fat	28	< 0.010	< 0.010 – < 0.010	0.06	0.06–0.06
Renal fat	28	< 0.010	< 0.010 – < 0.010	0.03	0.02-0.04
Subcutaneous fat	28	< 0.010	< 0.010 – < 0.010	0.03 [b]	0.03–0.03 [b]

a - After correction for lower storage stability results (35% recovery of IN-F7321 in stability study).

b - After correction for lower recoveries (68% average recovery for IN-F7321).

Table 56. Flusilazole and IN-F7321 residues in milk and tissues of dairy cows dosed at 10 mg/kg in the diet

Matrix	Day	Flusilazole		IN-F7321	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Whole milk	7	< 0.010	< 0.010 – < 0.010	0.017	< 0.010–0.020
	14	< 0.010	< 0.010 – < 0.010	0.020	0.010–0.030
	21	< 0.010	< 0.010 – < 0.010	0.033	0.020–0.050
	28	< 0.010	< 0.010 – < 0.010	0.027	0.010–0.040
Skeletal muscle	28	< 0.010	< 0.010 – < 0.010	0.045	0.030–0.060
Kidney	28	< 0.010	< 0.010 – < 0.010	0.77	0.69–0.85
Liver	28	0.26	0.20–0.31	0.29 [a]	0.23–0.34 [a]

Matrix	Day	Flusilazole		IN-F7321	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Omental fat	28	< 0.010	< 0.010 – < 0.010	0.22	0.16–0.28
Renal fat	28	< 0.010	< 0.010 – < 0.010	0.36	0.16–0.56
Subcutaneous fat	28	< 0.010	< 0.010 – < 0.010	0.34 [b]	0.18–0.50 [b]

a - After correction for lower storage stability results (35% recovery of IN-F7321 in stability study).

b - After correction for lower recoveries (68% average recovery for IN-F7321).

Table 57. Flusilazole and IN-F7321 residues in milk and tissues of dairy cows dosed at 50 mg/kg in the diet

Matrix	Day	Flusilazole		IN-F7321	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Whole milk	7	0.013	< 0.010–0.020	0.037	0.020–0.050
	14	0.010	< 0.010–0.010	0.047	0.030–0.080
	21	0.013	< 0.010–0.020	0.066	0.050–0.080
	28	0.010	< 0.010–0.010	0.040	0.030–0.050
Skim milk	19/20	< 0.010	< 0.010 – < 0.010	< 0.010	< 0.010 – < 0.010
	26/27	< 0.010	< 0.010 – < 0.010	< 0.010	< 0.010 – < 0.010
Cream	19/20	0.047	0.020–0.080	0.59	0.47-0.70
	26/27	0.057	0.030–0.090	0.51	0.41–0.58
Skeletal Muscle	28	0.015	< 0.010–0.020	0.17	0.16–0.17
Kidney	28	0.015	0.01–0.02	3.9	2.8–5.0
Liver	28	0.74	0.67–0.81	0.63 [a]	0.43–0.80 [a]
Omental Fat	28	0.040	0.03–0.05	0.49	0.40–0.58
Renal Fat	28	0.015	< 0.01–0.02	0.85	0.84–0.86
Subcutaneous Fat	28	0.050 [b]	0.029–0.071[b]	1.3 [b]	1.25–1.35 [b]

a - After correction for lower storage stability results (35% recovery of IN-F7321 in stability study).

b - After correction for lower recoveries (70% and 68% average recoveries for flusilazole and IN-F7321, respectively).

Laying hens

In a hen feeding study (AMR-461-85), eighty healthy White Leghorn laying hens were divided into 4 groups and each group was divided into 4 subgroups of 5 hens each. Each subgroup of a group was dosed for 28 days at 0, 2, 10 or 50 mg/kg of flusilazole in the diet (*i.e.* 0.0, 0.65, 3.24 and 16.18 mg/kg bw/day). Animals were acclimated for 23 days prior to dosing, during which time weights, feed consumption, temperature and egg production were monitored. The animals were fed a diet formulated from Agways layers mash feed supplemented with crushed oyster shells. Flusilazole was administered once daily in sealed gelatin capsules.

Egg samples were collected on Days -1, 1, 2, 4, 7, 14, 20, 21 and 28 for 3 subgroups from each dosing level and also 1, 2, 4 and 7 days after withdrawal of flusilazole dosing for the remaining subgroup from each dosing level. Liver, breast muscle, thigh muscle and fat were collected from each animal and pooled for the 5 animals within a subgroup. Collection was done after 28 days of dosing or 7 days of dose withdrawal. All samples were frozen immediately and kept at about -20 °C until preparation for analysis. The longest freezer storage time for samples in this study was 4 months.

Samples were analysed for flusilazole, its phenyl metabolites IN-F7321, IN-H7169, IN-H7169 and IN-G7072 and its triazole metabolite (1H-1,2,4-triazole [IN-H9933]). The limit of quantitation (LOQ) for flusilazole, IN-F7321 and IN-G7072 was 0.01 mg/kg. The LOQ was 0.02 mg/kg for IN-H7169 and 1H-1,2,4-triazole.

Residues in eggs reached a plateau at about 7 days. During the withdrawal period, residues decreased significantly in all egg and tissue samples, indicating no bioaccumulation of flusilazole or its metabolites.

Tables 58, 59 and 60 show flusilazole and IN-F7321 residues in eggs and tissues obtained at 2, 10, and 50 mg/kg dosing levels in the diet, respectively.

Table 58. Flusilazole and IN-F7321 residues in eggs and tissues of laying hens dosed at 2 mg/kg in the diet

Matrix	Day	Flusilazole		IN-F7321[c]	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Whole egg	7	< 0.01	< 0.01 - < 0.01	0.015	< 0.01 - 0.017
	14	0.01	0.01 - 0.02	0.030	0.017 - 0.034
	21	< 0.01	< 0.01 - < 0.01	0.015	< 0.01 - 0.017
	28	< 0.01	< 0.01 - < 0.01	0.024	< 0.01 - 0.034
	7-28 [d]	0.01	< 0.01 - 0.02	0.021	< 0.01 - 0.034
Egg white	20	< 0.01	< 0.01 - < 0.01	< 0.01	< 0.01 - < 0.01
Egg yolk	20	0.01	< 0.01 - 0.01	0.11	0.09 - 0.13
Breast muscle [a]	28	-----	-----	< 0.02	< 0.02 - < 0.02
Thigh muscle	28	< 0.01	< 0.01 - < 0.01	< 0.01	< 0.01 - < 0.01
Liver [b]	28	-----	-----	0.04	< 0.02 - 0.075
Fat	28	< 0.01	< 0.01 - < 0.01	0.09	0.08 - 0.10

a - Flusilazole residues not analysed in breast muscle, because insignificant flusilazole residues were found in thigh muscle. Residues of flusilazole assumed to be < 0.01 mg/kg in breast muscle.

b - Flusilazole not analysed in liver for 10 and 2 mg/kg dietary dose levels. No determinable residues at the higher 50 mg/kg dietary dose level. Residues of flusilazole assumed to be < 0.01 mg/kg for lower dose levels.

c - Corrected for lower freezer storage stability of IN-F7321 in eggs (59%), breast muscle (42%), and liver (56%).

d - Results for the plateau in eggs (7-28 days).

Table 59. Flusilazole and IN-F7321 residues in eggs and tissues of laying hens dosed at 10 mg/kg in the diet.

Matrix	Day	Flusilazole		IN-F7321[c]	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Whole egg	7	0.06	0.02 - 0.13	0.12	0.10 - 0.15
	14	0.04	0.03 - 0.05	0.10	0.068 - 0.12
	21	0.04	0.03 - 0.06	0.13	0.085 - 0.22
	28	0.02	0.01 - 0.03	0.14	0.051 - 0.27
	7-28 [d]	0.04	0.01 - 0.13	0.12	0.051 - 0.27
Egg white	20	0.03	< 0.01 - 0.04	0.02	< 0.01 - 0.02
Egg yolk	20	0.05	0.02 - 0.08	0.29	0.16 - 0.39
Breast muscle [a]	28	-----	-----	0.05	< 0.02 - 0.095
Thigh muscle	28	< 0.01	< 0.01 - < 0.01	0.03	0.02 - 0.04
Liver [b]	28	-----	-----	0.10	0.061 - 0.13
Fat	28	0.02	< 0.01 - 0.04	0.43	0.37 - 0.50

a - Flusilazole residues not analysed in breast muscle, because insignificant flusilazole residues were found in thigh muscle. Residues of flusilazole assumed to be < 0.01 mg/kg in breast muscle.

b - Flusilazole not analysed in liver for 10 and 2 mg/kg dietary dose levels. No determinable residues at the higher 50 mg/kg dietary dose level. Residues of flusilazole assumed to be < 0.01 mg/kg for lower dose levels.

c - Corrected for lower freezer storage stability of IN-F7321 in eggs (59%), breast muscle (42%), and liver (56%).

d - Results for the plateau in eggs (7-28 days).

Table 60. Flusilazole and IN-F7321 residues in eggs and tissues of laying hens dosed at 50 mg/kg in the diet

Matrix	Day	Flusilazole		IN-F7321[b]	
		Mean residue (mg/kg)	Range of residues (mg/kg)	Mean residue (mg/kg)	Range of residues (mg/kg)
Whole egg	7	0.46	0.32 - 0.57	0.92	0.68 - 1.20
	14	0.09	0.07 - 0.12	0.36	0.20 - 0.47
	21	0.14	0.08 - 0.19	0.47	0.22 - 0.63
	28	0.19	0.13 - 0.21	0.77	0.29 - 1.1
	7-28[c]	0.22	0.07 - 0.57	0.63	0.20 - 1.20
Egg white	20	0.08	0.05 - 0.11	0.06	0.03 - 0.09
Egg yolk	20	0.41	0.20 - 0.64	2.4	1.6 - 3.2
Breast muscle [a]	28	-----	-----	0.18	0.095 - 0.36
Thigh muscle	28	0.01	< 0.01 - 0.01	0.14	0.12 - 0.16
Liver	28	< 0.01	< 0.01 - < 0.01	0.41	0.31 - 0.58
Fat	28	0.24	0.08 - 0.36	3.0	2.5 - 3.3

a - Flusilazole residues not analysed in breast muscle, because insignificant flusilazole residues were found in thigh muscle. Residues of flusilazole assumed to be 0.01 mg/kg or less in breast muscle.

b - Corrected for lower freezer storage stability of IN-F7321 in eggs (59%), breast muscle (42%), and liver (56%).

c - Results for the plateau in eggs (7-28 days).

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

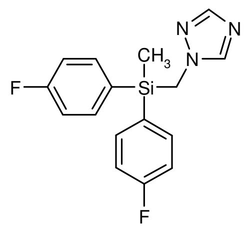
No information was received on residues of flusilazole in food in commerce or at consumption.

APPRAISAL – RESIDUE AND ANALYTICAL ASPECTS

Flusilazole is a fungicide belonging to the ergosterol biosynthesis inhibitor class. It was evaluated by the JMPR for residues in 1989, 1990, 1991 and 1993. Toxicology was reviewed in 1989 and 1995, establishing an ADI of 0 – 0.001 mg/kg bw in 1989 (confirmed in 1995). Flusilazole was listed for the Periodic Re-Evaluation Programme at the 38th Session of the CCPR for periodic review by the 2007 JMPR for toxicology and residues.

Chemical name:

Flusilazole
Bis(4-fluorophenyl)(methyl)(1H-1,2,4-triazol-l-ylmethyl)silane (IUPAC)
1-[[Bis(4-fluorophenyl)methyl)silyl]methyl]-1*H*-1,2,4-triazole (CA)



Animal metabolism

The Meeting received results of animal metabolism studies in rats, lactating goats, and laying hens.

Flusilazole is extensively metabolized in rats. Eight metabolites were identified. In addition to unchanged flusilazole, the major metabolites identified in urine and faecal samples were [bis(4-

fluorophenyl)methyl]silanol (IN-F7321); [bis(4-fluorophenyl)methylsilyl]methanol (IN-H7169) and its glucuronide; 1H-1,2,4-triazole (IN-H9933); and 1,3-dimethyl-1,1,3,3-tetrakis(4-fluorophenyl)disiloxane (IN-G7072). Cleavage and rapid excretion of IN-H9933 (1H-1,2,4 triazole) was the primary step in the metabolism of flusilazole in rats. The silane molecule may then be excreted or further metabolized to fatty acid metabolites, β-D-gluco-pyranuronic acid conjugate and further degrade to more polar molecules.

Two lactating goats received daily doses of [^{14}C] labelled flusilazole orally by gelatine capsule at a level equivalent to 50 ppm in their diet. One lactating goat was dosed daily for 6 consecutive days (phenyl label) and one goat was dosed for 5 consecutive days (triazole label) with 50 mg of [^{14}C]-labelled flusilazole. For the goat dosed with phenyl-labelled flusilazole, muscle contained 0.05 – 0.07% of the total dose (0.41 – 0.70 mg/kg flusilazole equivalents); liver accounted for 5.3% (13.5 mg/kg); kidney had 1.2% of the dose (8.7 mg/kg); and fat contained 0.15 – 0.50% of the total administered dose (4.07 – 5.15 mg/kg). For the goat dosed with triazole-labelled flusilazole, muscle contained 0.10 – 0.15% of the total dose (0.52 – 0.53 mg/kg parent equivalents); liver accounted for 1.5% (3.5 mg/kg); kidney had 0.05% of the dose (0.75 mg/kg); and fat contained 0.01 – 0.07% of the total administered dose (0.15 – 0.94 mg/kg).

The transfer of radioactive residues to milk and tissues was low. Only 0.34 and 1.3% of the dose was present in milk for the phenyl and triazole labels, respectively. After 6 and 5 consecutive days of dosing, concentrations of total residues in milk were only 0.74 and 0.63 mg/kg (flusilazole equivalents) for the phenyl- and triazole-dosed goats, respectively. Residue levels in milk reached a plateau 2 – 5 days after the initial dose.

Percentages of extractable radioactivity varied from 89 to > 99% of the total radioactivity in the tissues for the goat dosed with phenyl-labelled flusilazole, and 90 to 94% for the goat dosed with triazole-labelled flusilazole. Flusilazole was extensively metabolized. Cleavage between the triazole and the silicon moieties was the predominant early metabolic transformation, followed by glucuronidation of one of the products. Except in the liver, unchanged flusilazole accounted for less than 10% of the tissue radioactivity. IN-F7321 (silanol) and IN-H9933 (1H-1,2,4-triazole) were the major metabolites found in tissues of goats dosed with phenyl- and triazole-labelled flusilazole, respectively.

In milk, unchanged flusilazole varied between 13 – 30% of TRR for the goat dosed with phenyl-labelled flusilazole, and < 1 – 13% for the goat dosed with triazole-labelled flusilazole. In the latter, metabolite IN-H9933 (1H-1,2,4-triazole) accounted for 87 to > 99% of the TRR in milk, which represented 0.16 – 0.30% of the administered dose. Metabolites IN-F7321 (silanol) and IN-G7072 (disiloxane) together accounted for 34 to 63% of the TRR in milk from the goat dosed with phenyl-labelled flusilazole. Polar material accounted for 7 to 28% of the radiolabel present in the milk of the goat dosed with phenyl-labelled flusilazole.

Laying hens were administered flusilazole ([^{14}C]-labelled at either the phenyl group or at the triazole group) at 0.36 or 18 mg/day, equivalent to 3 and 150 ppm in the diet. Hens from the low dose group were dosed for 14 days while those from the exaggerated dose group were dosed for 5 days (the higher dose served for metabolite isolation and identification only). Eggs and excreta were collected over the experimental period; edible tissues and blood were taken for analysis at sacrifice (approximately 6 h after the last dose).

Approximately 80% of the total radioactivity (both labels) was eliminated in the excreta. Elimination of radioactivity in the excreta became steady after 48 h. Residues in edible tissues were low, less than 1% of administered dose; thus bioaccumulation potential for flusilazole residues is low.

In hens receiving phenyl-labelled flusilazole at 0.36 mg/day dose level, highest residues were found in the liver (0.60 mg/kg flusilazole equivalents), followed by fat (0.52 mg/kg) and kidney (0.32 mg/kg). Residue levels in the muscle were the lowest. Residue levels in the hens dosed with triazole-labelled flusilazole were highest and essentially equal in whole blood (0.39 mg/kg), liver (0.38 mg/kg), kidney (0.38 mg/kg), and breast muscle (0.35 mg/kg) and much lower in fat (0.07 mg/kg). In eggs from hens dosed at 3 ppm for 14 days, radioactivity reached a steady state after about 8 days with a plateau residue level of approximately 0.2 mg flusilazole equivalents/kg (both labels).

[(4-Fluorophenyl)methyl]silanediol (IN-V5771) was the main metabolite in liver, kidney and muscle of hens dosed with phenyl-labelled flusilazole (33, 29 and 73 – 88% of the TRR, respectively). IN-F7321 (silanol) was the main residue in the fat (82% of the TRR) and a major one in the liver (17% of the TRR). Residues identified in the hens dosed with triazole-labelled flusilazole were IN-H9933 (1H-1,2,4-triazole), thymine and flusilazole, with IN-H9933 being the major metabolite in all tissues (76, 79 and 75 – 83% of the TRR in liver, kidney and muscle, respectively). 1H-1,2,4-triazole residues ranged from 0.057 mg triazole/kg in liver to non-detectable levels in fat. Flusilazole levels ranged from 0.018 mg/kg in kidney to 0.049 mg/kg in fat. No flusilazole was detected in muscle.

In eggs, the two major metabolites from the phenyl label dosed hens were IN-F7321 (silanol) and IN-V5771 (silanediol), at 32 and 38% of the TRR, respectively at 12 days. The major metabolite in eggs from the triazole label dosed hens was 1H-1,2,4-triazole (IN-H9933), with much smaller amounts of thymine and unchanged flusilazole. At 12 days, triazole, thymine and flusilazole residues were 0.197, 0.023 and 0.006 mg flusilazole equivalents/kg, respectively (77, 9 and 2% of the TRR, respectively). When calculated on a molar equivalent basis, the triazole and thymine residues were 0.043 and 0.009 mg/kg in the 12 day egg samples.

The residues found in goats and hens indicated a similar metabolic pathway to the rat. Generally, unchanged flusilazole was present at levels lower than the metabolites. In goat liver and chicken fat of animals dosed with triazole-labelled flusilazole, flusilazole levels were higher than levels of the metabolite 1,2,4-triazole, (IN-H9933) perhaps due to the polar nature of the triazole. Except in goat liver and chicken fat, 1,2,4-triazole was the major metabolite arising from triazole-labelled flusilazole. The silanol metabolite (IN-F7321) was also common to both goats and hens. The main difference between the goat study and the hen studies was the occurrence of the silanediol (IN-V5771) as a major metabolite in hens. Other phenyl-labelled metabolites, resulting from hydroxylation and conjugation reactions, were present at relatively low levels in chicken tissues and eggs.

Based on the results of the submitted studies, the Meeting concluded that, in rats, goats, and hens, flusilazole was rapidly and extensively converted to polar metabolites.

Plant metabolism

The Meeting received plant metabolism studies for flusilazole in wheat, sugar beet, apples, grapes, bananas and peanuts. The wheat, bananas and sugar beet were greenhouse grown. The grapes, apples and peanuts were grown in the field.

<u>Wheat</u> was treated with [phenyl(U)-^{14}C]flusilazole and [triazole-3-^{14}C]flusilazole at 200 g ai/ha. In forage, labelled residues (expressed as flusilazole) fell from initial values of 32 and 8.6 mg/kg for phenyl and triazole labels, respectively, to approximately 6 mg/kg by days 5 to 12. Flusilazole accounted for 56 – 59% of the residue in forage for days 5 – 12. Residues in straw were 8.6 and 7.9 mg/kg for phenyl and triazole labels, respectively. Unchanged flusilazole accounted for only about 14% of the residue in mature straw, and there was extensive metabolism to at least seven phenyl-labelled and six triazole-labelled metabolites. No single straw or forage metabolite accounted for more than 13.5% of the total radioactivity present. Unidentified minor metabolites were present in triazole and phenyl [^{14}C]flusilazole treated wheat straw; however, no unidentified metabolites exceeded 4% of the total radioactive residue.

There were negligible radioactive residues (0.01 mg/kg) in the grain from phenyl-labelled wheat. In the triazole-labelled wheat, grain residues of 4.4 mg/kg flusilazole equivalents (at 52 days after the treatment) were comprised of triazolyl alanine (IN-V9462) and triazole acetic acid (IN-D8722). No flusilazole was found in triazole-labelled grain samples harvested 69 days after the treatment. This data indicates that although metabolites containing the triazole ring can be translocated, intact flusilazole is not translocated to grain.

The metabolic pathway of flusilazole in wheat included hydroxylations, conjugations, and cleavage of the silicon-methylene bond. The major phenyl-labelled metabolites in straw and forage were glucose-6-phosphate of IN-37722 (2-fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazol-1-ylmethyl)silyl]phenol); mono[6-deoxy-2-0-[2-fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazol-1-ylmethyl) silyl] phenyl]-β-D-glucopyranos-6-yl] propanedioate (IN-37735); a conjugate of IN-37738 (2-fluoro-5-[(4-fluorophenyl) (hydroxy) (methyl) silyl] phenol); and [bis(4-fluorophenyl)methyl] silanol (IN-F7321). The major triazole-labelled metabolites were triazolyl alanine (IN-V9462); triazole acetic acid (IN-D8722); the glucose-6-phosphate of IN-37722; IN-37735; and IN-37722. Triazolyl alanine and triazole acetic acid accounted for 69 and 24% of the radioactivity in the grain, respectively.

The leaves and detached unpeeled green fruits of immature banana plants growing under greenhouse conditions were treated directly with phenyl- or triazole- labelled flusilazole, each formulated as an emulsifiable concentrate and diluted to a final concentration six times the label rate. The bananas were analysed at intervals of 0, 2, 4, 7, and 11 days and the leaves were analysed at intervals of 0, 7, 14, and 18 days. Autoradiographs showed that flusilazole applied to banana leaves did not translocate from the treated areas. In the case of banana fruit, flusilazole distribution from the peel to the pulp was negligible since 98 – 99% of the radioactivity applied to the peel remained in the washings and peel. Intact flusilazole accounted for more than 87% of the radioactivity in the peel rinses and peels.

Sugar beets were treated post-emergence with either phenyl- or triazole-labelled flusilazole as an over the top spray at application rates of 124 – 131 g ai/ha (three times at 14 day intervals). The sugar beets were harvested at 0, 14, 28, and 59 or 77 days (maturity). At each sampling interval, radioactive residues were consistently higher in the foliage than in the roots. Immediately after the third treatment, total radioactive residues in the foliage ranged between 1.5 and 7.2 mg/kg for triazole- and phenyl-labelled flusilazole, respectively. At each sampling interval, total radioactive residues in the roots were lower for the phenyl-treated plants (0.008 mg/kg maximum) than for the triazole-treated plants (0.15 mg/kg maximum). With time, the total radioactive residues in both the foliage and roots decreased.

Flusilazole was the major residue in the foliage, accounting for a maximum of 89% of the total radioactivity present in the foliage. Minor metabolites found included 1,3-dimethyl-1,1,3,3-tetrakis(4-fluorophenyl) disiloxane (IN-G7072) and 2-fluoro-5-[(4-fluorophenyl) (methyl) (1H-1,2,4-triazol-1-ylmethyl)silyl]phenol (IN-37722). No flusilazole was detected in root extracts. Other residues in the foliage and roots consisted of polar materials that were not resolved by HPLC.

Grape vines (separate branches of foliage and grapes) were treated with phenyl- or triazole-labelled flusilazole under field conditions. The berries were harvested 41 days after the application. Flusilazole was the predominant residue, extracted from grape berries, treated with either the phenyl-labelled or triazole-labelled compounds, comprising between 57 and 31% of the recovered radioactivity, respectively. The principal degradation product from phenyl-labelled flusilazole was [bis(4-fluorophenyl)methylsilyl] methanol (IN-H7169), accounting for 11% of the residue. Four identified minor metabolites containing the phenyl label together accounted for < 10% of the recovered radioactivity. Those four minor metabolites included [bis(4-fluorophenyl)methyl] silanol (IN-F7321); [(4-fluorophenyl)methyl]silanediol (IN-V5571); bis(4-fluorophenyl) (1H-1,2,4-triazol-1-yl)silanol (IN-A7634); and bis(4-fluorophenyl)silanediol (IN-T7866). In addition to flusilazole, triazolyl alanine (IN-V9462) was a major degradation product in triazole-labelled grape berries, accounting 30% of the total radioactivity. Unextractable residues from fruit accounted for between 5 and 14% of the recovered radioactivity.

Apple trees were treated four times at 14-day interval with either phenyl- or triazole-labelled flusilazole at rates of approximately 8 mg/100 mL. Mature fruit were harvested 14 days after the final application. Flusilazole was the predominant residue extracted from apple fruit treated with either phenyl-labelled or triazole-labelled compounds, comprising between 71 and 48% of the recovered radioactivity, respectively. Three identified minor metabolites containing the phenyl label (IN-F7321, IN-V5571, and IN-H7169) together accounted for approximately 11% of the recovered radioactivity.

Triazolyl alanine (IN-V9462) was a significant triazole-containing metabolite, accounting for 22% of TRR. Unextractable residues from the apple fruit accounted for between 8 and 14% of the recovered radioactivity.

Peanuts were treated with [phenyl (U)-^{14}C]flusilazole applied to the foliage at 140 g ai/ha, 52 days prior to harvest. Peanuts (nut and shells) were harvested at 52 days (maturity). Total radioactive residues in the foliage of peanut plants declined from 3.4 mg/kg at day 0 to 0.38 mg/kg at day 52. There was no significant translocation of phenyl-labelled metabolites to the peanut seed (total residue in the seed was 0.018 mg/kg) or peanut shell (0.03 mg/kg). Flusilazole was the major residue in the foliage at all sampling intervals, declining from 3.2 mg/kg at day 0 to 0.19 mg/kg at day 52. Flusilazole at 0.006 mg/kg and "water soluble metabolites," also at 0.006 mg/kg, were present in the seed with the remaining residue unextractable.

Based on the results of the submitted studies on wheat, apples, grapes and sugar beets, the Meeting concluded that qualitatively similar metabolism occurred among these crops. The metabolic pathway of flusilazole in plants involves hydroxylations, conjugations, and cleavage between the silicon and the triazole ring. As the interval between treatment and sampling increases, the residues of unchanged flusilazole decreased and the metabolism and conjugation increased.

Due to the extensive degradation of flusilazole by multiple mechanisms to many minor metabolites, there are no major flusilazole metabolites in plants, other than triazolyl alanine. With the exception of triazolyl alanine and triazole acetic acid, individual metabolites generally account for less than 14% of the total radioactivity in the plants.

Environmental fate

Soil

The Meeting received information on aerobic and anaerobic degradation of flusilazole in soil; photolysis on soil surface; mobility in soil; field dissipation studies; and flusilazole residues in rotational crops.

The aerobic degradation of [phenyl(U)-^{14}C] and [triazole-3-^{14}C] flusilazole was studied in two soils (sandy and silt loam soils) incubated in the dark at 25 °C for 1 year.

The primary route of degradation in non-sterile soils was cleavage of the methylene-silicon bond to form IN-F7321 (silanol) which was found < 5% of applied radioactivity after one year and IN-H9933 (triazole) which was not detected.

The anaerobic degradation of [phenyl(U)-^{14}C] and [triazole-3-^{14}C]-flusilazole was studied in two pond water/sediment systems (silt loam and a sand) under anaerobic conditions at 25 °C at a nominal concentration of 1.0 mg/kg sediment.

The major radiolabelled metabolite (found at 2% of the applied radioactivity) was identified as bis(4 fluoro-phenyl)methyl silanol (IN-F7321).

The photodegradation of flusilazole was studied using silt loam soils under artificial and natural sunlight. No significant degradation was observed in the studies. Under the artificial sunlight conditions, the observed half-life was greater than 30 days. Under the natural sunlight conditions, flusilazole degraded slowly with a DT_{50} of about 97 days. Based on these results, the Meeting concluded that photolysis on soil is not an important mode of degradation for flusilazole.

Field dissipation studies on bare soil and cropped soils were performed in the United States, Canada and Europe.

The studies showed substantial metabolism of flusilazole with the majority of the applied radioactivity found near the top of the soil (5 – 15 cm). The major metabolite was the silanol (IN-F7321) which was present at no more than 14% of the applied radioactivity while the triazole metabolites reached a maximum of < 3%. In all studies, very limited mobility was observed. The DT_{50} values ranged from 71 – 755 days. However, the residue in soil remained low after multiple applications, and the soil residues continued to decline after application of flusilazole was discontinued.

A field study designed to measure the potential for off-target movement of flusilazole into water-bodies adjacent to orchards showed low to undetectable levels of flusilazole detected in water and sediments adjacent to orchards. The study concluded that environmental exposure to non-target areas would be extremely low under normal use conditions.

A similar pattern was seen in the presence of a wide range of crops (e.g., cereals, oilseed rape and sugar beets). Soil samples of flusilazole remained low (< 0.09 mg/kg) even after a six year accumulation study (up to 3 kg flusilazole applied) and continued to decline after discontinuation of application. No accumulation was seen in soil or crops when used according to recommended use rates. Based on these results, the Meeting concluded that there is a little potential for flusilazole accumulation in soil or crops after multiple years of continuous use.

Residues in rotational crops

The Meeting received results of two confined [^{14}C]flusilazole rotational crop studies. The first study examined the potential for uptake of phenyl-containing residues into four crops (barley, beets, cabbage, and soya beans) from soil (sandy loam) treated with phenyl-labelled flusilazole at rates of 289 or 543 g ai/ha and aged for 30 or 120 days under greenhouse conditions. The second study examined the potential for uptake of phenyl- or triazole-containing residues into three crops (cabbage, wheat and beets) from soils (silt loam) treated with phenyl- or triazole-labelled flusilazole at 1129 g ai/ha and then aged for 120 or 360 days in the field.

During both confined rotational crop studies, radioactive residue levels in the soil remained relatively constant during the aging and plant growth periods. Soil residues ranged from 0.04 to 0.12 mg/kg (289 g ai/ha application rate), 0.12 to 0.20 mg/kg (543 g ai/ha application rate) and 0.21 to 0.44 mg/kg (1129 g ai/ha). Flusilazole levels and the percentage of extractable radioactivity decreased with time. Major soil residues included flusilazole and the silanol (IN-F7321).

There was no significant accumulation of residues from either label in cabbage, soya beans or beets in the confined rotation studies. Accumulation did occur in mature small grain fractions of wheat grown in soil treated with [triazole-3-^{14}C]flusilazole. Parts of matured wheat grown in 360-day aged soilcontained pheny and triazole labelled residues, respectively: chaff 0.60 – 9.5 mg/kg, straw 1.4 – 7.9 mg/kg and grain 0.081 – 17.5 mg/kg.The extent of accumulation was similar in comparable samples from all aging periods. A major wheat metabolite was triazolyl alanine with flusilazole comprising < 20% of the radioactivity in the wheat grain or straw. This suggests that a triazole-containing fragment, rather than intact flusilazole, translocates from soil into wheat.

The Meeting concluded that there is no significant uptake of flusilazole into rotational (succeeding) crops, except ceral grains.

Methods of Analysis

The Meeting received description and validation data for analytical methods for flusilazole and its important metabolites, mainly [bis(4-fluorophenyl)methyl] silanol (IN-F7321), in samples of plant and animal origin.

The described methods are mostly based on extraction with an organic solvent (usually ethyl acetate or acetone); followed by a partition step, gel permeation chromatography (GPC) clean-up, and often also a silica solid-phase extraction (SPE) clean-up. The determination step employs mainly capillary GC with nitrogen-phosphorus detection (NPD), followed by a mass spectrometric (MS) confirmation, or a single-step GC-MS determination.

The typical LOQ is 0.01 mg/kg for most plant and animal matrices, with mean recoveries typically ranging between 70 – 120%.

Multiresidue methods, such as the DFG S19, are available for flusilazole.

The Meeting concluded that adequate multi- and single-residue methods exist for both gathering data in supervised trials and other studies and for monitoring and enforcing flusilazole MRLs in samples of plant and animal origin.

Stability of pesticide residues in stored analytical samples

The Meeting received information on the stability of flusilazole and its silanol IN-F7321 metabolite in freezer-stored samples (at approximately -20 °C) of plant and animal origin, including apples, grapes, wheat grain, wheat straw, oilseed rape (seed and shoots) and bovine matrices (milk, muscle, kidney, liver and fat). Fortified samples were stored up to the following intervals: wheat grain: 40 months; wheat straw: 40 months; apples: 48 months (flusilazole) and 26 months (IN-F7321); grapes: 17 months (flusilazole) and 25 months (IN-F7321); oilseed rape: 14 months (flusilazole only); whole milk: 6 months (flusilazole) and 11 months (IN-F7321); bovine muscle: 6 months (flusilazole) and 15 months (IN-F7321); bovine kidney: 3.5 months (IN-F7321); bovine liver: 6 months (flusilazole) and 14.25 months (IN-F7321); and bovine fat: 6 months (flusilazole) and 16 months (IN-F7321).

No significant degradation of flusilazole and its silanol metabolite IN-F7321 was observed in the tested plant and bovine matrices and storage intervals, with the exception of IN-F7321 in liver (residues remained and corrected for recoveries were 35, 84, and 38% for 1, 3, and 14.25 months of storage, respectively). In the case of 3 month-storage of IN-F7321 in liver, samples were only partially thawed and rapidly refrozen after fortification, whereas the other samples (1 and 14.25 months of storage) were completely thawed and remained in contact with the fortification solution at ambient temperature for at least 30 minutes. The partially thawed and rapidly refrozen samples showed limited degradation, probably due to a much lower rate of enzyme activity at lower temperatures. While this does not directly reflect the stability of incurred residues of IN-F7321 in liver, it emphasises the need, when analysing residues in liver, to ensure that samples are processed expeditiously and are not allowed to remain at elevated temperatures prior to extraction and analysis.

Residue definition

Flusilazole is extensively metabolized in animals and plants. The major metabolic reaction is cleavage of the $Si\text{-}CH_2$ bond to form silanol and triazole related metabolites.

In plants, there are no predominant metabolites with the exception of triazole alanine and triazole acetic acid. These plant metabolites are produced by all fungicides in the triazole class and are therefore excluded from the definition of the residue for flusilazole.

In ruminants (goats), the most abundant metabolites in tissues and milk were flusilazole, [bis(4-fluorophenyl)methyl] silanol(IN-F7321), and 1H-1,2,4-triazole(IN-H9933). In poultry, metabolites in tissues and eggs were flusilazole, [bis(4-fluorophenyl)methyl]silanol, 1H-1,2,4-triazole, and [(4-fluorophenyl)methyl]silanediol(IN-V771). As 1H-1,2,4-triazole is a common metabolite to all triazole fungicides, it is not deemed suitable as an indicator of flusilazole exposure to ruminants or hens. The silanediol metabolite is only found in poultry tissues, and is not expected to be detectable at anticipated dietary exposure levels to laying hens.

Based on the above, the Meeting agreed in the following residue definitions:

Definition of the residue in plant commodities for estimation of dietary intake and for compliance with MRLs: flusilazole

Definition of the residue in animal commodities for estimation of dietary intake and for compliance with MRLs: flusilazole plus [bis(4-fluorophenyl)methyl]silanol (IN-F7321)

The log K_{ow} is 3.87 (at 20 °C, pH 7), suggesting that flusilazole is fat-soluble. Both in the goat and hen metabolism studies the residues of flusilazole and its silanol, IN-F7321, in muscle was generally less than one-tenth that in the various fat depots. The Meeting concluded that the flusilazole residue is fat soluble.

Results of supervised trials on crops

The Meeting received supervised trials data for flusilazole on apple, pear, apricot, nectarine, peach, grapes, banana, cucumber, sweet corn, soya bean, sugar beet (root and leaves), barley (grain, forage, and straw), rye (grain, forage, and straw), wheat (grain, forage, and straw), maize, rice, rape seed, sunflower seed and oat (forage and fodder).

Pome fruit

Apple

The Meeting received results from supervised trials with flusilazole used on apples in southern Europe (Italy, Spain and southern France), Argentina, Canada, India, New Zealand and South Africa.

None of the trials in Argentina, India, or New Zealand were conducted according to the respective GAPs of Argentina (4 applications at 4 g ai/hL with a PHI of 21 days), India (4 g ai/hL with a PHI of 10 days), and New Zealand (3 g ai/hL, up to 6 applications, with a PHI of 35 days).

The critical GAP for the southern European trials conducted in Spain, Italy and southern France is the GAP of Spain that specifies a spray concentration of 4.8 g ai/hL in high-volume applications (more than 1500 L water/ha, i.e., a maximum of ≥ 72 g ai/ha), maximum of 4 applications per year, and a PHI of 14 days. Flusilazole residues from ten trials according to the GAP of Spain, in ranked order, were: 0.01, 0.01, 0.02, 0.04(2), 0.05(2), 0.06, 0.12 and 0.13 mg/kg.

Two trials in Canada were conducted according to the GAP of Canada: 40 g ai/ha, maximum of 4 applications, and a PHI of 77 days. Flusilazole residues (at 88 and 130% GAP) were < 0.01 mg/kg (below LOQ of the analytical method used).

The GAP of South Africa specifies a spray concentration of 2.4 g ai/hL in high-volume applications (1500–3500 L water/ha, i.e., 36–84 g ai/ha), 5 applications, and a PHI of 14 days. One trial was conducted according to this GAP. The residue of flusilazole from this trial was 0.06 mg/kg.

Pear

The Meeting received results from supervised trials with flusilazole used on pears in Italy, South Africa and China.

Trials in Italy were not conducted according to the critical GAP of the southern European region, i.e., that of Spain (the same treatment regime as for apples).

The GAP of South Africa specifies a spray concentration of 1.6 g ai/hL in high-volume applications (1500 – 3500 L water/ha, i.e., 24 – 56 g ai/ha), 5 applications, and a PHI of 14 days. Two trials were conducted at a higher application rate of 2 g ai/hL (125% GAP), 6 applications and 2-day longer PHI of 16 days. Flusilazole residues from these trials were 0.02 and 0.03 mg/kg.

Four trials in China were conducted according to the GAP of China (5 g ai/hL, 3 applications, with a PHI of 21 days), with the exception four applications were made instead of three. Flusilazole residues from these trials were: 0.01, 0.02, 0.03, and 0.13 mg/kg.

The Meeting agreed that the data on apples from southern Europe and South Africa and on pears from China appear to be from similar populations and could be used to support a “pome fruit” commodity group maximum residue level. Pome fruit is registered for use in New Zealand. Flusilazole residues in pome fruit, in ranked order, were: 0.01(3), 0.02(2), 0.03, 0.03, 0.04(2), 0.05(2), 0.06(2), 0.12 and 0.13(2) mg/kg. The Meeting estimated a maximum residue level for pome fruit of 0.3 mg/kg to replace the previous recommendation of 0.2 mg/kg, an STMR value of 0.04 mg/kg, and an HR value of 0.13 mg/kg.

Apricot, nectarine and peach

The Meeting received results from supervised trials with flusilazole used on apricots in France, on peaches in southern Europe (Greece, Italy, Spain, and southern France) and on peaches and nectarines in New Zealand.

The GAP of New Zealand for stone fruit (4 g ai/hL) does not specify a PHI. The label states that the product should not be applied after the start of shuck fall, which should be 86–113 days before harvest for most peach and nectarine cultivars. Nine trials were reported (three on peach and six on nectarine). The spray concentrations in these trials were 5, 10 and 20 g ai/hL, with very long PHIs of 91 – 113 days. All flusilazole residues from these trials were < 0.01 mg/kg (below LOQ of the analytical method used).

The critical GAP for the southern European trials conducted on peach in Spain, Greece, Italy and southern France is the GAP of Spain that specifies a spray concentration of 5 g ai/hL, maximum of 3 applications per year, and a PHI of 7 days. Flusilazole residues from twelve trials according to the GAP of Spain, in ranked order, were: 0.03, 0.04, 0.05(4), 0.06, 0.07, 0.08, 0.09 and 0.10 mg/kg.

The GAP of France for apricot (4 g ai/hL) does not specify a PHI. The critical GAP in the region is the GAP of Spain (5 g ai/hL, maximum of 2 applications per year, and a PHI of 7 days). Three apricot trials were conducted with a PHI of 7, one with 4 g ai/hL (8 applications) and two with 14 g ai/hL (4 and 6 applications). Flusilazole residues from these trials were 0.08, 0.05 and 0.06, respectively.

The critical GAP for the southern European trials (the GAP of Spain) is the same for peach and nectarine. The critical GAP for apricot (the GAP of Spain) specifies the same spray concentration and PHI as for peach and nectarine, with maximum of two applications instead of three. Flusilazole residues for apricot (a smaller fruit than peach) fell within the range of residues obtained for peach, even though exaggerated spray concentration (280% GAP) and/or significantly higher number of applications were used.

The Meeting decided to use the residue data from the eleven trials on peach in southern Europe to estimate a maximum residue level of 0.2 mg/kg for apricot, nectarine and peach to replace the previous recommendation of 0.5 mg/kg. The Meeting also estimated an STMR value of 0.05 mg/kg, and an HR value of 0.10 mg/kg for apricot, nectarine and peach.

Grapes

The Meeting received results from supervised trials with flusilazole on grapes in southern Europe (Greece, Italy, Portugal, Spain and southern France), Germany, Australia, China, India and South Africa.

None of the trials in India and South Africa were conducted according to the respective GAPs of India (4 g ai/hL with a PHI of 15 days) or South Africa (5 g ai/hL with a PHI of 21 days).

Flusilazole is not registered for use on grapes in Germany but it is registered in France, Switzerland and the Czech Republic. The GAPs of France and Switzerland do not specify a PHI. The GAP of the Czech Republic for grapes specifies 30 g ai/ha (spray volume 1000 L water/ha, i.e., 3 g ai/hL), spraying interval 7 – 14 days (number of applications not specified), and a PHI of 42 days.

Five trials in Germany were conducted with a 42 day PHI and 32 – 36 g ai/ha (106 – 120% of GAP). Flusilazole residues in these trials were: 0.02, 0.03, 0.04, 0.10 and 0.11 mg/kg.

The GAP of Australia specifies maximum of 3 applications at 2 g ai/hL or 20 g ai/ha with a PHI of 14 days. In one trial in Australia, flusilazole was applied as a single application with 2 g ai/hL and a PHI of 14 days. Flusilazole residue from that trial was 0.11 mg/kg.

The critical GAP for the southern European trials conducted on grapes in Spain, Portugal, Greece, Italy and southern France is the GAP of Spain, specifying a spray concentration of 5 g ai/hL, a maximum of 5 applications and a PHI of 14 days. Flusilazole residues from eight trials according to the GAP of Spain (with 5 – 6 applications), in ranked order (median underlined), were: 0.01(2), 0.02(2), 0.03, 0.04, 0.10, and 0.11 mg/kg. One trial with a PHI of 15 days was also included as a higher residue of 0.11 mg/kg was recorded than from trials with a 14 day PHI.

The GAP of China specifies a spray concentration of 5 g ai/hL and 3 applications but does not specify a PHI or growth stage and could not be evaluated.

The Meeting decided to use the residue data from southern Europe and Germany to estimate a maximum residue level for grapes. Residues from these trials in ranked order were: 0.01(2), 0.02(3), 0.03(2), 0.04(2), 0.10(2) and 0.11(2) mg/kg. The Meeting estimated a maximum residue level of 0.2 mg/kg to replace the previous recommendation of 0.5 mg/kg, an STMR value of 0.03 mg/kg, and an HR value of 0.11 mg/kg.

Banana

The Meeting received results from supervised trials with flusilazole used on bananas in the Caribbean Basin (Belize, Costa Rica, Guatemala, Honduras, Jamaica and West Indies, including Guadeloupe, Martinique and St. Lucia). The Meeting considered the GAP of Columbia (100 g ai/ha, 4 – 6 applications, and a PHI of 1 day) as the critical GAP for the evaluation of the submitted trials.

In the eleven submitted trials, bananas were treated with flusilazole at 100 g ai/ha (4 – 7 applications) using aerial application to bagged bunches with washing (normal practice) or without washing at the harvest. With a PHI of 1 day, flusilazole residues in the pulp were < 0.01 mg/kg for all the trials. With the same PHI, flusilazole residues in the peel of washed bananas (three trials) were: < 0.01 (2) and 0.01 mg/kg. Residues in the peel of unwashed bananas (eight trials) were: < 0.01 (3), 0.011, 0.012, 0.013, 0.017 and 0.02 mg/kg. Flusilazole was not analysed in the whole fruit.

Based on data in the published literature[17] an average pulp to peel ratio for bananas at harvest is 1.82. Assuming this ratio and combining the results from washed and unwashed bananas, flusilazole residues in whole fruit, in ranked order, were: < 0.01 (5) and 0.01 (6) mg/kg.

The Meeting estimated a maximum residue level for flusilazole in banana (whole fruit) of 0.03 mg/kg to replace the previous recommendation of 0.1 mg/kg. Based on the pulp data, the Meeting estimated an STMR value of 0.01 mg/kg and an HR value (for pulp) of 0.01 mg/kg for banana pulp.

Cucumber

Flusilazole is registered for foliar application on cucumber in China (5 g ai/hL, 3 applications, a PHI of 7 days) and Korea (2.5 g ai/hL, 3 applications, and a PHI of 3 days). The Meeting received results from supervised trials with flusilazole on cucumber in China. None of the trials were conducted according to the GAPs of China or Korea. Therefore, the Meeting could not estimate a maximum residue level for flusilazole in cucumber.

Sweet corn

The Meeting received results from supervised trials with flusilazole on sweet corn in France and South Africa.

The GAP of France (200 g ai/ha, 2 applications) does not specify a PHI. The six reported trials on sweet corn in France were conducted as a single application at 200 – 420 g ai/ha (100 – 210% GAP) with PHIs of 10 – 31 days. Flusilazole residues in sweet corn kernels were < 0.01 mg/kg in all these trials.

The GAP of South Africa specifies a maximum of 2 applications at 125 g ai/ha with a PHI of 14 days. One trial conducted in South Africa at 250 g ai/ha (200% GAP) with 2 applications, resulted in flusilazole residues in cobs < 0.01 mg/kg for both tested PHIs of 0 and 14 days.

The Meeting estimated a maximum residue level for flusilazole in sweet corn (corn-on-the-cob) of 0.01* mg/kg an STMR value of 0.01 mg/kg and an HR value of 0.01 mg/kg.

[17] Stover, R.H. and Simmonds, N.W., 1987, Bananas. Tropical Agriculture Series, Longman Scientific & Technical, 468 pp

Soya beans (dry)

The Meeting received results from supervised trials with flusilazole used on soya beans in Argentina, Canada, France, South Africa and the United States. The trials in France could not be evaluated because there is no GAP for soya beans in Europe.

None of the six trials reported from Argentina were conducted according to the GAP of Argentina (100 g ai/ha, 2 applications, and a PHI of 35 days). In three of these trials, a single application rate of 200 g ai/ha (200% GAP) resulted in flusilazole residues < 0.005 mg/kg (below LOQ of the used analytical method) 38 – 60 days after the application.

The critical GAP of South Africa specifies 125 g ai/ha for aerial application or 100 g ai/ha for ground application, maximum of 2 applications, and a PHI of 30 days. Four trials in South Africa were conducted with a PHI of 34 days and using either 75 or 150 g ai/ha in two applications (75 or 150% GAP assuming ground application). Flusilazole residues were < 0.005 mg/kg (below LOD of the used analytical method) in all these trials at 34 days.

The GAP of the United States specifies 116 g ai/ha, 2 applications, and a PHI of 30 days. Twenty-one trials in the United States and two trial in Canada were conducted at 103–109% of the GAP rate, resulting in flusilazole residues of < 0.01(3), 0.01(8), 0.02(9) and 0.03(3) mg/kg.

Based on the residues obtained in the trials in the United States and Canada, the Meeting estimated a maximum residue level for flusilazole in soya beans (dry) of 0.05 mg/kg, an STMR value of 0.02 mg/kg and an HR value of 0.03 mg/kg.

Sugar beet (root)

The Meeting received results from supervised trials with flusilazole used on sugar beet in southern Europe (Greece, Italy, and Spain) and in northern Europe (Belgium, Denmark, northern France, Germany, the Netherlands and the United Kingdom).

Five trials in southern Europe (two in Greece, two in Italy, and one in Spain) were conducted according to the GAP of Greece (80 g ai/ha, 3 applications, and a PHI of 15 days). The Meeting noted that there were four other trials conducted in southern Europe with a shorter PHI of 14 days (3 or 6 applications) or a higher application rate (132.5% GAP) that resulted in flusilazole residues of < 0.01 mg/kg. Thus, results of these trials were also included. Flusilazole residues in sugar beet root, in ranked order, were: < 0.01 (6), and 0.01 (3) mg/kg.

Sixteen trials in northern Europe (ten in Germany, two in the UK, and one in Belgium, Denmark, the Netherlands and northern France) were conducted according to the GAP of Germany (150 g ai/ha, 2 applications, a PHI of 42 days). Among these trials, one trial in northern France had only a 35-day PHI but the flusilazole residue was < 0.01 mg/kg. Flusilazole residues in sugar beet root, in ranked order, were: < 0.01 (11), 0.01(2), 0.02, < 0.03, and 0.03 mg/kg.

The Meeting noted that the residues obtained in southern and northern Europe were from similar populations and agreed to combine the results. Flusilazole residues in sugar beet root, in ranked order, were: < 0.01 (17), 0.01 (5), 0.02, < 0.03, and 0.03 mg/kg.

The Meeting estimated a maximum residue level for flusilazole in sugar beet root of 0.05 mg/kg to replace the previous recommendation of 0.01* mg/kg, an STMR value of 0.01 mg/kg, and a highest residue value of 0.03 mg/kg.

Cereal grains

Barley

The Meeting received information on flusilazole residues in barley grains from supervised trials in Germany, the United Kingdom and South Africa.

The GAP of Germany specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 51 and a PHI of 42 days. Twelve trials in Germany on winter barley were conducted at 160-221 g ai/ha (80–111% GAP), 2 applications, with the growth stage at the last application of BBCH 51 (PHI of 57 – 86 days). Flusilazole residues, in ranked order, were: < 0.01 (3), 0.02, 0.03, 0.04 (2), 0.05, 0.06, 0.07 (2), and 0.08 mg/kg.

The critical GAPs of the United Kingdom specify 156–160 g ai/ha, 1 application, and the BBCH 71 or 73 (watery ripe stage or early milk stage, respectively) growth stage at the last application. Four trials in the United Kingdom on spring barley were conducted at 160 g ai/ha, 2 applications, and the BBCH 71 growth stage at the last application. Flusilazole residues, in ranked order, were: < 0.01 (2), 0.06, and 0.07 mg/kg.

The critical GAP of South Africa specifies 112.5 g ai/ha (aerial application) or 100 g ai/ha (ground application), 1 – 2 applications and a PHI of 56 days. One trial in South Africa was conducted as a single application at 125 g ai/ha with a PHI of 56 days (application method and spray volume were not specified). Flusilazole residue from this trial was < 0.02 mg/kg.

The Meeting noted that the residues obtained in Germany, the United Kingdom and South Africa were from similar populations and agreed to combine the results. Flusilazole residues in barley grain, in ranked order, were: < 0.01 (5), < 0.02, 0.02, 0.03, 0.04 (2), 0.05, 0.06 (2), 0.07 (3), and 0.08 mg/kg.

Rye

The Meeting received information on flusilazole residues in rye grains from supervised trials in winter rye Germany. The GAP of Germany specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 55. The Meeting noted that the growth stages (BBCH of 49, 65, 69, or 72) at the last application in the trials did not match the GAP specification. Two trials were conducted at 100 – 130% of the GAP rate, with 3 applications and a PHI of 42 days (BBCH 65). One additional trial resulted in a higher flusilazole residue at a PHI of 48 days *vs.* 35 days (BBCH 69). Flusilazole residues obtained in these trials were: 0.04 (2), and 0.05 mg/kg.

Wheat

The Meeting received information on flusilazole residues in wheat grains from supervised trials in Germany, Spain, the United Kingdom and South Africa.

None of the trials in South Africa were conducted according to the critical GAP of South Africa: 112.5 g ai/ha (aerial application) or 100 g ai/ha (ground application), 1 – 2 applications and a PHI of 56 days.

The GAP of Germany specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 55, and a PHI of 42 days. The Meeting agreed that the growth stage at the last application is a better indication of the GAP than the PHI. Three trials in Germany were conducted at 160 – 250 g ai/ha (80–125% GAP), with 2-3 applications, and the last application at the growth stage of BBCH 55 (PHI of 58–63 days). Flusilazole residues were < 0.01 mg/kg. The Meeting noted that several other trials at approx. the GAP rate (2 – 3 applications) but with later growth stages at the last application also resulted in flusilazole residues < 0.01 mg/kg.

The GAP of Spain specifies 200 g ai/ha, 1 application, and the BBCH 61 (beginning of flowering) growth stage at the last application. The trials in Spain were conducted at approximately 200 g ai/ha, with 2 applications, but the growth stage at the last application was in the range of 73 - 85 (a PHI of 28 days). Flusilazole residues from two of these trials (at BBCH 75 and 83) were < 0.01 mg/kg.

The critical GAPs of the United Kingdom specify 156 – 160 g ai/ha, 1 – 2 applications, and the BBCH 71 or 73 (watery ripe stage or early milk stage, respectively) growth stage at the last application. Four trials in the United Kingdom on winter wheat were conducted at 160 g ai/ha, 3 applications, and the BBCH 71 growth stage at the last application. Flusilazole residues were: < 0.01(4) mg/kg. Three other trials that were conducted as a single at 200 or 400 g ai/ha and later growth stages at the last application (75, 84, or 90) resulted in flusilazole residues < 0.01 (3) mg/kg.

The Meeting noted that flusilazole residues in wheat grain obtained in the sixteen trials in Germany, Spain and the United Kingdom were all < 0.01(16) mg/kg.

Maize

The Meeting received information on flusilazole residues in maize grains from supervised trials in France.

The GAP of France (200 g ai/ha, 2 applications) does not specify a PHI (the other available GAP in Europe, the GAP of Romania for cereal grains, specifies 100 g ai/ha and a PHI of 42 days). Five trials on maize were conducted at approx. 200 g ai/ha (2 applications) with a PHI of 28 days. Flusilazole residues in maize grain were < 0.01 mg/kg in all these trials.

The Meeting agreed that the data on barley, rye, wheat and maize could be used to support a "cereal grains" commodity group maximum residue level. The Meeting decided to recommend a maximum residue level of 0.2 mg/kg for cereals except rice, an STMR value of 0.04 mg/kg based on the barley data and a highest residue of 0.08 mg/kg based on the barley data.

The Meeting also agreed to withdraw its previous recommendations of maximum residue levels of 0.1 mg/kg for barley, rye and wheat grains.

Rice

The Meeting received information on flusilazole residues in rice grains from supervised trials in Spain. The GAP of Spain specifies 125 g ai/ha, 2 applications and a PHI of 30 days. Four trials were conducted at 129 g ai/ha (2 applications) with PHIs of 30 or 33 days. Flusilazole residues in rice grain, in ranked order, were: 0.06, 0.09, 0.11, and 0.18 mg/kg.

The meeting considered four trials insufficient to estimate a maximum residue level for flusilazole in rice.

Rape seed

The Meeting received results from supervised trials with flusilazole used on oilseed rape in Belgium, Denmark, France, Germany, the Netherlands and the United Kingdom. The critical GAPs in France, Germany, and the United Kingdom specify 200 g ai/ha, 1 – 2 applications and a PHI of 56 days (Germany) or a PHI that is not specified. The submitted trials were conducted at about the GAP rate with a PHI longer than 56 days. Flusilazole residues in these trials were generally below the LOQ of the used analytical methods: < 0.01 (9) or < 0.02 (5) mg/kg (PHIs in the range of 58 – 92 days). Results above LOQ: 0.01, 0.01, 0.03, and 0.04 mg/kg; were obtained with a PHI of 72, 109, 61, and 77, respectively.

Flusilazole residues in ranked order, median underlined, were: < 0.01(9), <u>0.01</u>(2), < 0.02(5), 0.03 and 0.04 mg/kg.

The Meeting estimated a maximum residue level of 0.1 mg/kg for flusilazole in rape seed, an STMR value of 0.01 mg/kg and a highest residue of 0.04 mg/kg.

The meeting recommended withdrawal of the previous recommendation for rape seed of 0.05 mg/kg.

Sunflower seed

Flusilazole is registered for foliar application on sunflower in Czech Republic, Bulgaria, France, Hungary, Romania and Slovakia. The GAPs for sunflower in these countries specify 75 – 200 g ai/ha, 1 – 2 applications, and a PHI of 56 or 60 days (or a PHI is not specified, which is the case of the highest rate of 200 g ai/ha).

The Meeting received results from supervised trials with flusilazole used on sunflower in France. The critical GAP of France specifies 200 g ai/ha and 2 applications (1 application for late infections) but does not specify a PHI. Eight trials in France were conducted at approx. 200 g ai/ha, one application, and a PHI of 50 days (BBCH 63 – 71). Flusilazole residues, in ranked order, were: < 0.01 (4), 0.01, 0.03, and 0.04 (2) mg/kg.

The Meeting estimated a maximum residue level of 0.1 mg/kg for flusilazole in sunflower seed, an STMR value of 0.01 mg/kg and a highest residue value of 0.04 mg/kg.

Barley, rye and wheat forage

The Meeting received information on flusilazole residues in barley, rye and wheat forage from supervised trials in Germany. The GAP of Germany for barley, rye and wheat specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 51 (barley) or BBCH 55 (rye and wheat). In the case of livestock grazing, it is assumed that animals are unlikely to be foraging within 7 days of the application of the fungicide. Data was available for residues in forage at 0, 21, 34 and 42 days according to the above gap. For the purposes of animal exposure through grazing, a value at 7 days, interpolated from the 0 and 21 day values is a satisfactory measure of the average residue that livestock would be exposed to for a 14 day period.

The results were considered from all trials conducted at the GAP rate (± 30%) with 2 applications (independent of the growth stage at the last application). Five trials on barley matching the criteria resulted in flusilazole residues of 0.9 (2), 1.35, 2.2, and 3.0 mg/kg. One trial on rye matched the criteria with flusilazole residues being 2.0 mg/kg. Five trials on wheat matching the criteria resulted in flusilazole residues of 0.9, 1.2, 3.3, 4.2 and 4.5 mg/kg. Combined flusilazole residues, in ranked order, were: 0.9 (3), 1.2, 1.35, 2.0, 2.2, 3.0, 3.3, 4.2 and 4.5 mg/kg; resulting in an STMR value of 2.0 mg/kg and a highest residue value of 4.5 mg/kg for flusilazole in barley, rye and wheat forage.

Barley, rye, and wheat straw and fodder, dry

The Meeting received information on flusilazole residues in barley straw from supervised trials in Germany. The GAP of Germany specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 51 and a PHI of 42 days. Thirteen trials in Germany on winter barley were conducted at 160 – 221 g ai/ha (80 – 111% GAP), 2 applications, with the growth stage at the last application of BBCH 51 (PHI of 57 – 86 days). Flusilazole residues, in ranked order, were: 0.11, 0.48, 0.62, 1.2, 1.4, 1.5, 2.0 (2), 2.1 (2), 2.2, 2.3, and 2.5 mg/kg.

The Meeting received information on flusilazole residues in rye straw from supervised trials on winter rye in Germany. The GAP of Germany specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 55 and a PHI of 42 days. The Meeting noted that the growth stages (BBCH of 49, 65, 69, or 72) at the last application in the trials did not match the GAP specification.

The Meeting received information on flusilazole residues in wheat straw from supervised trials in Germany, Spain and the United Kingdom.

The GAP of Germany specifies 200 g ai/ha, 2 applications, the second application up to the growth stage of BBCH 55, and a PHI of 42 days. Three trials in Germany were conducted at 160 – 250 g ai/ha (80 – 125% GAP), with 2 – 3 applications and the last application at the growth stage of BBCH 55 (PHI of 58–63 days). Flusilazole residues, in ranked order, were: 0.12, 0.23 and 1.6 mg/kg.

The GAP of Spain specifies 200 g ai/ha, 1 application and the BBCH 61 (beginning of flowering) growth stage at the last application. The trials in Spain were conducted at approx. 200 g ai/ha, with 2 applications, but the growth stage at the last application was in the range of 73 – 85.

The critical GAPs of the United Kingdom specify 156–160 g ai/ha, 1 – 2 applications, and the BBCH 71 or 73 (watery ripe stage or early milk stage, respectively) growth stage at the last application. None of the submitted trials on wheat (straw) in the United Kingdom matched were conducted according to the GAP (growth stage at the last application was in the range of 39 – 65).

The Meeting noted that flusilazole residues obtained in barley and wheat straw in Germany appeared to be from similar populations and agreed to combine the results. Flusilazole residues, in ranked order, median underlined, were: 0.11, 0.12, 0.23, 0.48, 0.62, 1.2, 1.4, 1.5, 1.6, 2.0 (2), 2.1 (2), 2.2, 2.3 and 2.5 mg/kg. The Meeting also agreed to extrapolate the results for barley and wheat straw to rye straw and estimated a maximum residue level of 5 mg/kg for flusilazole in barley, rye and wheat straw and fodder, dry (to replace the previous recommendation of 2 mg/kg), an STMR value of 1.6 mg/kg and a highest residue value of 2.5 mg/kg.

Oat forage and fodder

The Meeting received information on flusilazole residues in oat forage and dry foliage (dry fodder) from two supervised trials in South Africa. The GAP of South Africa for oat fodder specifies 75 g ai/ha, one application, and a PHI of 30 days. One trial was conducted at the GAP rate with a PHI of 29 days. Flusilazole residue in dry foliage (fodder) was < 0.1 mg/kg.

The Meeting considered one trial insufficient to estimate a maximum residue level for oat fodder.

Sugar beet leaves or tops

The Meeting received information on flusilazole residues in sugar beet leaves from supervised trials on sugar beet in southern Europe (Greece, Italy, and Spain) and in northern Europe (Belgium, Denmark, northern France, Germany, the Netherlands and the United Kingdom).

Six trials in southern Europe (two in Greece, three in Italy and one in Spain) were conducted according to the GAP of Greece (80 g ai/ha, 3 applications, and a PHI of 15 days). Flusilazole residues in sugar beet leaves, in ranked order, were: 0.10, 0.31, 0.45, 0.66, 0.89 and 1.0 mg/kg.

Sixteen trials in northern Europe (ten in Germany, two in the UK, and one in Belgium, Denmark, the Netherlands, and northern France) were conducted according to the GAP of Germany (150 g ai/ha, 2 applications, a PHI of 42 days). Flusilazole residues in sugar beet leaves, in ranked order, were: 0.11(2), 0.17, 0.19, 0.21, 0.22, 0.25(2), 0.26, 0.27, 0.33, 0.34, 0.37, 0.58, 0.84 and 0.88 mg/kg.

The Meeting noted that the residues obtained in southern and northern Europe were from similar populations and agreed to combine the results. Flusilazole residues in sugar beet leaves, in ranked order (median underlined), were: 0.10, 0.11 (2), 0.17, 0.19, 0.21, 0.22, 0.25 (2), 0.26, 0.27, 0.31, 0.33, 0.34, 0.37, 0.45, 0.58, 0.66, 0.84, 0.88, 0.89 and 1.0 mg/kg.

The Meeting estimated an STMR value of 0.29 mg/kg and a highest residue value of 1.0 mg/kg for flusilazole in sugar beet leaves.

Rice hulls

The Meeting received information on flusilazole residues in rice hulls (husks) from supervised trials in Spain. The GAP of Spain specifies 125 g ai/ha, 2 applications and a PHI of 30 days. Four trials were conducted at 129 g ai/ha (2 applications) with PHIs of 30 or 33 days. Flusilazole residues in rice hulls, in ranked order, were: 0.34, 0.39, 0.44, and 0.68 mg/kg.

The Meeting made no recommendation for rice hulls as none could be made for the primary commodity rice.

Fate of residues during processing

The Meeting received information on the fate of flusilazole residues during processing of apples, grapes, soya beans, wheat and barley grain and on flusilazole fate under hydrolysis conditions simulating commercial food processing.

In a high-temperature hydrolysis study greater than 99% of flusilazole remained unchanged under conditions simulating industrial processing (temperatures ranging from 90–120°C; pH 5 and 7). Therefore, flusilazole can be considered stable to simulated pasteurization, baking, brewing, boiling and sterilization.

The STMR-P values calculated from the processing factors are summarized in the table below.

Raw agricultural commodity		Processed commodity		
Commodity	STMR (mg/kg)	Commodity	Processing factor [a]	STMR-P (mg/kg)
Apple	0.04	Apple juice	0.19(2)	0.008
		Apple pomace, wet	2.4(2)	0.094
		Apple pomace, dry	12(2)	0.48
Grapes	0.03	Grape juice	0.42(4)	0.012
		Wine	0.09(5)	0.003
		Dried Grapes (raisins)	1.8(3)	0.054
		Grape pomace, wet	3.6(2)	0.108
		Grape pomace, dry	11(2)	0.33
Soya beans	0.02	Soya bean meal	0.38	0.008
		Soya bean hulls	1.1	0.022
		Soya bean oil, refined	2.2	0.044
Wheat	0.04	Wheat bran	0.29	0.012
		Wheat flour, low-grade	< 0.91	< 0.036
		Wheat milled by products	0.59	0.024

a - mean value of (no. trials) except for soya beans where only one trial was performed

The Meeting estimated a maximum residue level of 2 mg/kg for *apple pomace, dry*, based on the highest residue of 0.13 mg/kg in pome fruits and the processing factor of 12.

Based on the HR value of 0.11 mg/kg in grapes and the processing factor of 1.8, the Meeting estimated a maximum residue level of 0.3 mg/kg for *dried grapes (including currants, raisins, and sultanas)* to replace its previous recommendation of 1 mg/kg.

Based on the highest residue of 0.03 mg/kg in soya beans and the processing factors of 1.1 and 2.2, the Meeting estimated a maximum residue level of 0.05 mg/kg for *soya bean hulls* and 0.1 mg/kg for *soya bean oil, refined*.

Livestock dietary burden

The Meeting estimated the dietary burden of flusilazole in farm animals on the basis of the diets listed in Annex 6 of the 2006 JMPR Report (OECD Feedstuffs Derived from Field Crops). Calculation from the highest residue, STMR (some bulk commodities) and STMR-P values provides the levels in feed suitable for estimating maximum residue levels, while calculation from STMR and STMR-P values for feed is suitable for estimating STMR values for animal commodities.

The table below shows estimated maximum and mean dietary burdens for beef cattle, dairy cattle, broilers and laying poultry based on the animal diets from the United States/Canada, the European Union, and Australia. The calculations are provided in Annex 6.

	Flusilazole, Animal dietary burden (mg/kg)					
	US-Canada		EU		Australia	
	Maximum	Mean	Maximum	Mean	Maximum	Mean
Beef cattle	7.5	2.25	6.3	2.9	18[a]	8.0[b]
Dairy cattle	7.5	3.4	6.7	2.9	11.5[c]	5.3[d]
Poultry - broiler	0.04	0.04	0.04	0.04	0.04	0.03
Poultry - layer	0.04	0.04	2.3[e]	1.1[f]	0.02	0.02

a - Highest maximum beef cattle dietary burden suitable for MRL estimates for mammalian meat

b - Highest mean beef cattle dietary burden suitable for STMR estimates for mammalian meat.

c - Highest maximum dairy cattle dietary burden suitable for MRL estimates for milk

d - Highest mean dairy cattle dietary burden suitable for STMR estimates for milk.

e - Highest maximum poultry dietary burden suitable for MRL estimates for poultry meat and eggs

f - Highest mean poultry dietary burden suitable for STMR estimates for poultry meat and eggs

Farm animal feeding studies

The Meeting received information on lactating dairy cow and laying hen feeding studies.

Twelve lactating cows were randomly assigned among 4 dosing groups of 3 animals each: one control group and 3 groups dosed at one of 3 flusilazole feeding levels each (2, 10, and 50 mg/kg based on measured feed intake, corresponding. All groups were fed for 28 days. Residues in milk reached a plateau at about 7 days. During the withdrawal period, residues decreased significantly in all milk and tissue samples, indicating no bioaccumulation of flusilazole or its metabolites.

Total residues of flusilazole and [bis(4-fluorophenyl)methyl]silanol (IN-F7321) in whole milk (on days 7 – 28, i.e., at the plateau) and tissues obtained at the 2, 10, and 50 mg/kg dosing levels in the diet are summarized in the table below.

Matrix	Dose (mg/kg)	Highest residue	Mean residue
Whole milk	2	< 0.01	< 0.01
	10	0.05	0.02
	50	0.10	0.06
Muscle	2	< 0.01	< 0.01
	10	0.06	0.05
	50	0.19	0.19
Kidney	2	0.21	0.21
	10	0.85	0.77
	50	5.0	3.9
Liver	2	0.18	0.15
	10	0.65	0.55
	50	1.6	1.4
Fat [a]	2	0.06	0.06
	10	0.56	0.36
	50	1.4	1.35

a - Residues for omental, renal, and subcutaneous fat for the 2, 10 and 50 mg/kg dose, respectively. These were the highest residues at the respective dose levels for the three kinds of analysed fat samples.

In a hen feeding study, eighty laying hens were divided into 4 groups and each group was divided into 4 subgroups of 5 hens each. Each subgroup of a group was dosed for 28 days at 0, 2, 10, or 50 mg/kg of flusilazole in the diet. Residues in eggs reached a plateau at about 7 days. During the withdrawal period, residues decreased significantly in all egg and tissue samples, indicating no bioaccumulation of flusilazole or its metabolites.

Total residues of flusilazole and [bis(4-fluorophenyl)methyl]silanol (IN-F7321) in eggs (on days 7–28, i.e., at the plateau) and tissues (on day 28) obtained at the 2, 10, and 50 mg/kg dosing levels in the diet are summarized in the table below.

Matrix	Dose (mg/kg)	Highest residue, mg/kg	Mean residue, mg/kg
Whole egg	2	0.05	0.03
	10	0.40	0.16
	50	1.8	0.85
Muscle	2	< 0.02	< 0.02
	10	0.10	0.05
	50	0.37	0.19
Liver [a]	2	0.08	0.04
	10	0.13	0.10
	50	0.58	0.41

Matrix	Dose (mg/kg)	Highest residue, mg/kg	Mean residue, mg/kg
Fat	2	0.10	0.09
	10	0.54	0.45
	50	3.7	3.2

a - Flusilazole was not analysed in liver for the 2 and 10 mg/kg dosing levels, but the residues can be assumed to be < 0.01 mg/kg because < 0.01 mg/kg was obtained for the 50 mg/kg dosing levelIn both the cattle and poultry feeding studies, the flusilazole residues in muscle were significantly lower than in fat and confirms that the residue (sum of flusilazole and [bis(4-fluorophenyl)methyl]silanol) is fat-soluble and that fat is the target tissue.

Animal commodity maximum residue levels

The dietary burdens for the estimation of maximum residue levels for animal commodities are 18 mg/kg for beef cattle, 11.5 mg/kg for dairy cattle and 2.3 mg/kg for poultry. The dietary burdens for the estimation of STMR values for animal commodities are 8.0 mg/kg for beef cattle, 5.3 mg/kg for dairy cattle and 1.1 mg/kg for poultry. The sum of flusilazole and [bis(4-fluorophenyl)methyl]silanol (IN-F7321) residues was used for the estimation of "flusilazole residue" levels in animal commodities.

The maximum dietary burden of 18 mg/kg for beef cattle fell between the 10 and 50 mg/kg dosing levels in the cattle feeding study. The residues in muscle were significantly lower than in fat. The target tissue for flusilazole residues is fat. Using the highest residues of 0.56 and 1.4 mg/kg in fat for 10 and 50 mg/kg dosing levels, respectively, the interpolated highest residue in fat for the dietary burden of 18 mg/kg was 0.73 mg/kg. Similarly, for beef liver and kidney the highest residues were 0.84 and 1.68 mg/kg, respectively.

The mean dietary burden was 8.0 mg/kg for beef cattle. By interpolation, the mean residues obtained in fat, liver and kidney were 0.285, 0.45 and 0.65 mg/kg, respectively.

On the fat basis, the Meeting estimated a maximum residue level of 1.0 mg/kg for meat (fat) from mammals (other than marine mammals), an STMR value of 0.285 mg/kg and an HR value of 0.73 mg/kg. Based on the liver and kidney results, the Meeting estimated a maximum residue level of 2 mg/kg for mammalian edible offal and, based on the kidney data, an STMR value of 0.65 mg/kg and an HR value of 1.68 mg/kg.

The mean dietary burden of 5.3 mg/kg for dairy cattle fell between the 2 and 10 mg/kg dosing levels in the feeding study. The interpolated highest residue in whole milk, using the mean residues in the feeding study, was 0.03 mg/kg. Similarly, the mean residue based upon a dietary burden of 5.3 mg/kg, in whole milk was 0.01 mg/kg. The Meeting estimated a maximum residue level of 0.05 mg/kg for whole milk, an STMR value of 0.01 mg/kg and an HR value of 0.03 mg/kg.

Maximum and mean dietary burdens for poultry (2.3 and 1.1 mg/kg, respectively) were near the lowest dosing level of 2 mg/kg. By interpolation, the highest residues obtained in fat, liver and eggs between the 2 and 10 mg/kg feeding level were 0.13, 0.09 and 0.07 mg/kg, respectively. Extrapolating the mean residues gave 0.05 mg/kg for fat, 0.02 mg/kg for liver and 0.02 mg/kg for eggs.

On the fat basis, the Meeting estimated a maximum residue level of 0.2 mg/kg for poultry meat (fat), an STMR value of 0.05 mg/kg and an HR value of 0.13 mg/kg. Based on the liver results, the Meeting estimated a maximum residue level of 0.2 mg/kg for poultry edible offal, an STMR value of 0.02 mg/kg and an HR value of 0.09 mg/kg. The Meeting estimated a maximum residue level of 0.1 mg/kg for eggs, an STMR value of 0.02 and HR value of 0.07 mg/kg.

The Meeting agreed to withdraw its previous recommendations of maximum residue levels of 0.01* mg/kg for cattle fat, cattle meat, cattle milk, chicken meat, chicken eggs, and chicken edible offal; and 0.02* mg/kg for cattle edible offal.

RECOMMENDATIONS

On the basis of the data from supervised trials, processing studies and livestock feeding studies, 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 MRLs and estimation of dietary intake in plant commodities:* flusilazole.
>
> *Definition of the residue for compliance with MRLs and estimation of dietary intake in livestock commodities*: flusilazole plus [bis(4-fluorophenyl)methyl]silanol. Flusilazole is fat-soluble.

Commodity		MRL (mg/kg)		STMR or STMR-P (mg/kg)	HR or HR-P (mg/kg)
CCN	Name	New	Previous		
JF 0226	Apple juice			0.008	
AB 0226	Apple pomace, dry	2		0.48	
FS 0240	Apricot	0.2	0.5	0.05	0.10
FI 0327	Banana	0.03	0.1	0.01	0.01
GC 0640	Barley	W	0.1		
AS 0640	Barley straw and fodder, dry	W	2		
MF 0812	Cattle fat	W	0.01*		
MM 0812	Cattle meat	W	0.01*		
ML 0812	Cattle milk	W	0.01*		
MO 0812	Cattle, Edible offal of	W	0.02*		
GC 0080	Cereal grains (except rice)	0.2		0.04	0.08
	Cereal forage (except rice)			2.0	4.5
PE 0840	Chicken eggs	W	0.01*		
PM 0840	Chicken meat	W	0.01*		
PO 0840	Chicken, Edible offal of	W	0.01*		
DF 0269	Dried grapes (= currants, raisins, sultanas)	0.3	1	0.054	
MO 0105	Edible offal (Mammalian)	2		0.65	1.68
PE 0112	Eggs	0.1		0.02	0.07
JF 0269	Grape juice			0.012	
AB 0269	Grape pomace, dry	2		0.33	
FB 0269	Grapes	0.2	0.5	0.03	0.11
MM 0095	Meat (from mammals other than marine mammals)	1(fat)		0.285	0.73
ML 0106	Milks	0.05		0.01	0.03
FS 0245	Nectarine	0.2	0.5	0.06	0.10
FS 0247	Peach	0.2	0.5	0.06	0.10
FP 0009	Pome fruits	0.3	0.2	0.04	0.13
PM 0110	Poultry meat	0.2		0.05	0.13
PO 0111	Poultry, Edible offal of	0.2		0.02	0.09
SO 0495	Rape seed	0.1	0.05	0.01	0.04
GC 0650	Rye	W	0.1		
AS 0650	Rye straw and fodder, dry	W	2		
VD 0541	Soya bean (dry)	0.05		0.02	0.03
AB 0541	Soya bean hulls	0.05		0.022	
AB 1265	Soya bean meal			0.008	
AS0081	Straw and fodder (dry) of cereal grains [a]	5		1.6	2.5
OR 0541	Soya bean oil, refined	0.1		0.044	
VR 0596	Sugar beet	0.05	0.01*	0.01	0.03
AV 0596	Sugar beet leaves or tops			0.29	1.0
SO 0702	Sunflower seeds	0.1		0.01	0.04

Commodity		MRL (mg/kg)		STMR or STMR-P (mg/kg)	HR or HR-P (mg/kg)
CCN	Name	New	Previous		
VO 0447	Sweet corn (corn on the cob)	0.01*		0.01	0.01
GC 0654	Wheat	W	0.1		
AS0654	Wheat straw and fodder dry	W	2		
CM 0654	Wheat bran			0.012	
CF 1211	Wheat flour, low-grade			0.036	
	Wine			0.003	

* at or about the LOQ.

a - except rice

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDIs) of flusilazole based on STMR and STMR-P values estimated for 22 commodities for the thirteen GEMS/Food regional diets were 2 – 10% of the maximum ADI (0.007 mg/kg bw). The results of which are shown in Annex 3 of the 2007 Report of the JMPR. The Meeting concluded that the long-term dietary intake of flusilazole residues is unlikely to present a public health concern.

Short-term intake

The International Estimated Short Term Intake (IESTI) of flusilazole calculated on the basis of the recommendations made by the JMPR represented for the general population 0 – 40% and for children 0 – 100% of the ARfD (0.02 mg/kg bw). The results are shown in Annex 4 of the 2007 Report of the JMPR. The Meeting concluded that the short-term intake of residues of flusilazole resulting from uses that have been considered by the JMPR is unlikely to present a public health concern.

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