FLUTRIAFOL (248)

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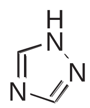
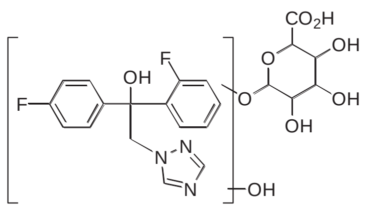
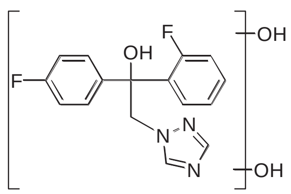
EXPLANATION

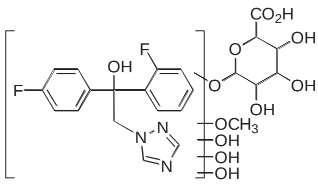
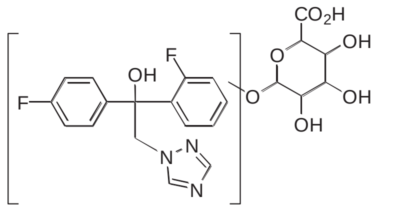
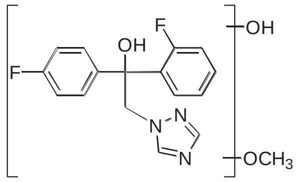
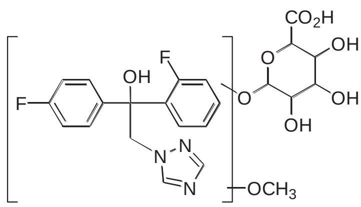
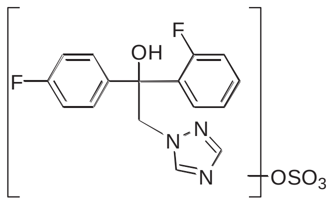
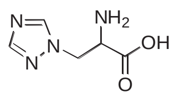
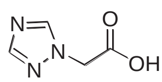
Flutriafol is a triazole fungicide used in many crops for control of a broad spectrum of leaf and ear cereal diseases, particularly embryo borne diseases e.g., bunts and smuts. The Meeting received information on identity, animal and plant metabolism, environmental fate in soil, rotational crops, analytical methods, storage stability, use patterns, supervised trials, farm animal feeding studies and fates of residues in processing. It was first evaluated for residues and toxicology by the 2011 JMPR. The ADI of flutriafol was 0–0.01 mg/kg bw and the ARfD was 0.05 mg/kg bw. The compound was listed by the 46th Session of CCPR for the JMPR to consider additional MRLs. The residue definition for compliance with MRL and for estimation of dietary intake (for animal and plant commodities) is flutriafol.

For the current evaluation the Meeting received new metabolism studies in lactating goats, storage stability data for animal commodities, residue trials on apples, pears, peaches/nectarines, plums, cherries, strawberries, Brassica vegetables (cabbages and broccoli), cucurbits (cucumbers, summer squash and muskmelons), tomatoes, peppers, leafy vegetables (lettuce, spinach, celery and mustard greens), sugar beets, maize, rice, sorghum, almonds, pecans, cotton, and rape, as well as a lactating cow feeding study (residue transfer study).

The chemical structures of the major degradation compounds from the metabolism of flutriafol are provided below.

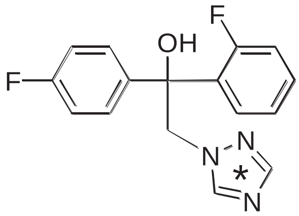
List of metabolites in this evaluation:

Code	Compound	Structure	
M1 T	1,2,4-triazole		
M3	hydroxyl flutriafol glucuronide		
M3e	dihydroxy flutriafol		

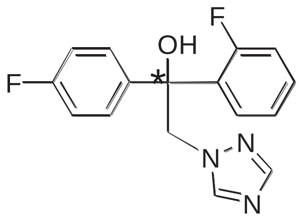
Code	Compound	Structure	
M3e-f1	trihydroxymethoxy flutriafol glucuronide		
M4	flutriafol glucuronide		
M5	hydroxymethoxy flutriafol		
M7	methoxy flutriafol glucuronide		
M10	flutriafol sulfate		
TA	1,2,4-triazole analine		
TAA	1,2,4-triazole acetic acid		

METABOLISM

La Mar (2012 2470) studied the metabolism of flutriafol in lactating goats.



Triazole-label



Carbinol-label

Two lactating goats (crossbreeds, 2–4 years old, 35 and 41 kg bw) were administered either [triazole-3(5)-^{14}C]-flutriafol or [carbinol-^{14}C]-flutriafol by capsule once daily in the morning for five consecutive days at a rate equivalent to 12.0 ppm in the feed (triazole) or 12.2 ppm (carbinol). Animals were fed 1.5 kg goat chow and 1 kg alfalfa hay daily. Milk production during the study averaged 0.54 L/day and 0.65 L/day respectively for the two goats. Excreta were collected once a day (in the morning, before dose administration). Milk was collected twice daily (morning and evening). The goats were sacrificed approximately 20–22 h after the last dose was administered and the following tissues were collected at necropsy—liver, kidney, muscle (loin and flank), fat (subcutaneous, omental and renal), bile, blood and gastrointestinal tract with contents. Analytical work was completed within 30 days after sacrifice.

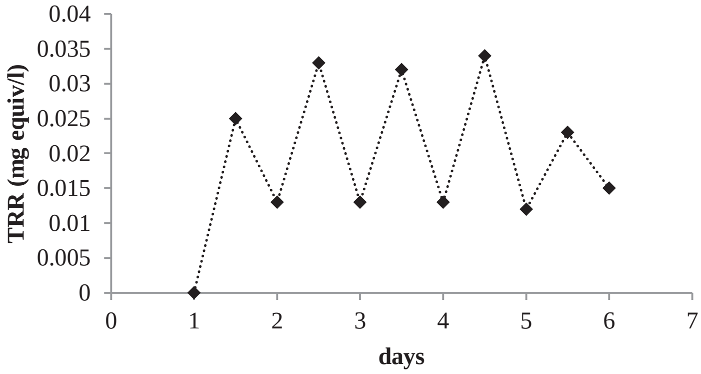
The majority of the administered dose was recovered in the faeces (60–69%) with 31.5–40.6% excreted in urine and 0.05–0.07% in milk (Table 1). The amount of administered radioactivity found in tissues was 0.35–0.45% while the gastrointestinal tract and contents contained 2.5–7.1% giving a total recovery of administered radioactivity of 103–110%. TRR in edible tissues were generally low (0.002–0.01 mg equiv/kg) with the exception of liver (0.264–0.305 mg equiv/kg) and kidney (0.035–0.061 mg equiv/kg).

Table 1 Distribution of TRR following dosing of [^{14}C]flutriafol at 12 ppm for 5 days

	Triazole-label		Carbinol-label	
	%AD	mg equiv/kg	%AD	mg equiv/kg
Tissues				
Liver	0.34	0.305	0.27	0.264
Kidney	0.01	0.061	< 0.01	0.035
Omental fat	< 0.01	0.004	< 0.01	0.002
Subcutaneous fat	< 0.01	0.005	< 0.01	0.003
Renal fat	< 0.01	0.004	< 0.01	0.002
Flank muscle	< 0.01	0.01	< 0.01	0.004
Loin muscle	0.01	0.01	< 0.01	0.004
Blood	–	0.022	–	0.009
Excreta/secretions				
Faeces	60.0		69.0	
GIT and contents	7.12		2.5	
Urine	40.6		31.5	
Whole milk	0.05	–	0.06	–
Bile	0.04	1.33	0.02	0.687
Cage wash	0.01		0.2	
Total	110.2		103.4	

Residues in milk appeared to reach plateau levels by Day 3 of dosing, with significant differences in ^{14}C levels between milk collected in the morning (low levels) compared to evening milk (higher levels), suggesting flutriafol residues are rapidly eliminated following dosing (Figure 1).

A



B

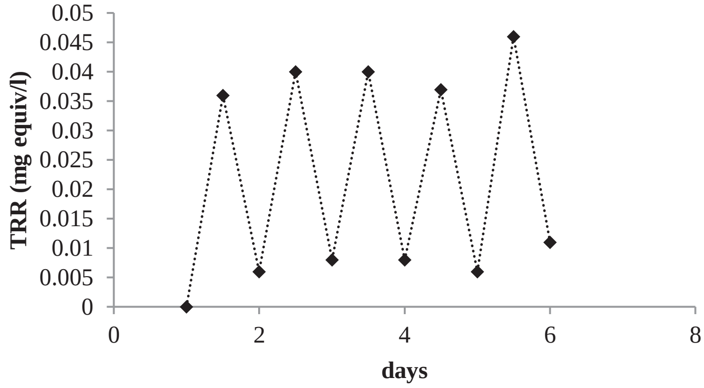


Figure 1 TRR in milk for goats dosed at the equivalent of 12 ppm in the feed with flutriafol (A) triazole label, (B) carbinol label

Acetonitrile and water extraction (2× CH_3CN/H_2O, 1× CH_3CN) of liver, kidney and in the case of the triazole-label also composite muscle, resulted in extraction efficiencies of 25.5–27.5% (liver), 67.7–79.7% (kidney) and 90% (muscle) (Table 2). The CH_3CN/H_2O extracts were concentrated, acidified (0.1% formic acid) and then partitioned with ethyl acetate to give aqueous/acetonitrile (aqueous) and ethyl acetate (organic) phases. Muscle from the carbinol-label and fat (both labels) were not subject to further analysis as the TRR levels were insignificant (< 0.01 mg eq/kg).

Radioactivity in PES of liver and kidney was characterized further. Samples of PES were treated with 1 M HCl in CH_3CN/H_2O (1:1) followed by 1 M KOH in H_2O. Sub-samples of liver PES were also treated with and without pepsin in 0.1 M HCl/glycine buffer pH 2.2 at 37 ºC overnight, followed by treatment with and without pancreatin and bile extract in 0.1 M sodium bicarbonate overnight at 37 ºC. Any remaining radioactivity was solubilised by treatment with 24% KOH.

Milk samples (whole milk) with the highest residue present (typically Day 4, pm) were separated into milk fat and skim milk for extraction. Protein was precipitated from skim milk by adding acetone and chilling in an ice bath. The protein pellet was then extracted with acetone/H_2O (1:1) followed by acetone. Skim milk and protein pellet extracts were combined, concentrated, acidified (0.1% formic acid) and then partitioned with ethyl acetate. Milk fat was extracted with acetone/hexane 1:4 (2×) and acetone (1×). Solids were separated by centrifugation and fat extracts were then concentrated to remove acetone, and partitioned with acetonitrile.

For the TZ label, extraction of liver with CH_3CN/H_2O released M1 (2.9% TRR), M2 (1.5% TRR), M3 (2.6% TRR), M3e (1.8% TRR), M5 (4.7% TRR) and flutriafol (1.5% TRR). The total identified residues in the liver accounted for 13.5% of TRR. A number of unidentified compounds (10% TRR) were observed that were individually present at ≤ 2.9% TRR (≤ 0.008 mg equiv/kg). Hydrolysis of the liver PES under mild acid and alkaline conditions released all of the remaining ^{14}C residues which were able to be resolved into more than six peaks by chromatography. Subsequent treatment of the hydrolysis extracts with enzymes to release conjugates did not result in additional compounds being identified; largest individual component 9.8% TRR.

In kidneys the main ^{14}C residue components were 1,2,4-triazole (M1, 10% TRR), M2 (10% TRR), hydroxyl flutriafol glucuronide (M3, 30% TRR) and dihydroxy flutriafol (M3e, 3.4% TRR). No other single metabolite comprised more than 10% of TRR (0.006 mg equiv/kg).

Residues in skim milk were extracted with acetonitrile and water. Main components identified were 1,2,4-triazole (M1, 26.5% TRR), M2 (2.9% TRR), hydroxyl flutriafol glucuronide (M3, 23.5% TRR) and dihydroxy flutriafol (M3e, 17.6% TRR). No other single metabolite comprised more than 8.8% of TRR (0.003 mg equiv/kg).

Residues in milk fat were extracted with acetone/hexane. Main components identified were 1,2,4-triazole (M1, 13.8% TRR), dihydroxyl flutriafol (M3e, 37.9% TRR) and flutriafol (3.4% TRR). No other single metabolite comprised more than 6.9% of TRR (0.002 mg equiv/kg).

Table 2 Characterisation and identification of ^{14}C residues in tissues and milk of a goat dosed at 12 ppm with triazole-label

Matrix	Liver	Kidney	Skim Milk	Milk Fat	Flank muscle [c]
TRR (ppm)	0.274	0.059	0.034	0.029	0.01
%TRR					
Solvent extracts [a]	25.5	79.7	97.1	86.2	90.0
Aqueous soluble [b]	12.4	66.1	70.6	79.3 (CH_3CN)	70.0
M1	2.9	10.2	26.5	13.8	40.0
M2	1.5	10.2	2.9		10.0
M3 [d]	2.6	30.5	23.5		10.0
M3e				37.9	
Flutriafol				3.4	
Unknowns	4 (2)	15.3 (2)	11.7 (2)	13.8 (2)	10 (1)
Organic soluble [b]	13.1	13.6	26.5	6.9 (hexane)	20.0
M3e	1.8	3.4	17.6		
M5	4.7				
Flutriafol	1.5		< 2.9		
Unknowns	4.4 (2)	10.2 (4)	< 2.9 (1)		
PES	74.4	20.4	2.9	13.8	10.0
Released by 1 N HCl	3.6	1.7			
Released by 1 N KOH	15.7	5.1			
Overall					
Extracted [d]	100[D]	83.5[D]	97.1	86.2	90.0
identified	13.5	44.1	< 70.5	55.1	50.0
characterized	86.0	42.5	< 17.5	20.7	40.0
Unextracted [d]	0.0	13.6	2.9	13.8	10.0

[a] Solvent systems: CH_3CN/H_2O for liver, kidney, skim milk and muscle; acetone/hexane for fat and milk fat

[b] Represents free residues from partition of initial extracts with ethyl acetate. (Aqueous is CH_3CN phase and organic is hexane phase for milk fat)

[c] Extraction and analysis data represent composite of flank and loin muscle

[d] M3 is combination of M3 (major component), M4 and M7. Levels were too low to accurately quantify

M1 = 1,2,4-triazole, M3= hydroxyl flutriafol glucuronide, M4 = flutriafol glucuronide, M7 = methoxy flutriafol glucuronide, M3e = di-hydroxy flutriafol, M5= hydroxy methoxy flutriafol

For the carbinol-label, liver contained M2 (1.7% TRR), hydroxyl flutriafol glucuronide (M3, 4.3% TRR), dihydroxy flutriafol (M3e, 0.9% TRR), hydroxy methoxy flutriafol (M5 11.1% TRR) and flutriafol (0.9% TRR). The total identified residues in the liver accounted for 17.2% of TRR. A number of unidentified compounds (6.9% TRR) were observed that were individually present at $\leq$ 3% TRR ($\leq$ 0.007 mg equiv/kg). Hydrolysis of the liver PES under mild acid and alkaline conditions released all of the remaining ^{14}C residues which was able to be resolved into multiple peaks by chromatography. Subsequent treatment of the hydrolysis extracts with enzymes to release conjugates did not result in additional compounds being identified; largest individual component 9.0% TRR.

In kidneys the main ^{14}C residue components were M2 (9.7% TRR), hydroxyl flutriafol glucuronide (M3, 22.6% TRR) and dihydroxy flutriafol (M3e, 6.5% TRR). No other single metabolite comprised more than 6.5% of TRR (0.002 mg equiv/kg).

Residues in skim milk were extracted with acetonitrile and water. Main components identified were M2 (10.8% TRR, hydroxyl flutriafol glucuronide (M3, 27%TRR) and dihydroxy flutriafol (M3e, 29.7%TRR). No other single metabolite comprised more than 11% of TRR (0.004 mg equiv/kg).

Residues in milk fat were extracted with acetone/hexane. Main components identified were dihydroxy flutriafol (M3e, 42.3%TRR) and flutriafol (3.8% TRR). No other single metabolite comprised more than 11.5% of TRR (0.003 mg equiv/kg).

Table 3 Characterisation and identification of ^{14}C residues in tissues and milk of a goat dosed at 12 ppm with carbinol-label

Matrix	Liver	Kidney	Skim milk	Milk fat	Flank muscle [c]
TRR (mg equiv/kg)	0.234	0.031	0.037	0.026	0.004*
			%TRR		
Solvent extracts [a]	27.8	67.7	54.1	76.9	
Aqueous soluble [b]	9.4	54.8	54.1	76.9 (CH_3CN)	
M2	1.7	9.7	10.8		
M3 [d]	4.3	22.6	27.0		
M3e				42.3	
M10				3.8	
Flutriafol				3.8	
Unknowns	2.2 (2)	12.9 (3)	13.5 (3)	15.3 (2)	
Organic soluble [b]	18.4	12.9	40.5	< 3.8% (hexane)	
M3e	0.9	6.5	29.7		
M5	11.1		2.7		
Flutriafol	0.9		< 2.7		
Unknowns	4.7 (2)	<3.2 (1)	8.1 (2)		
PES	72.2	32.3	5.4	23.1	
Released by 1 N HCl	4.3	3.2			
Released by 1 N KOH	16.2	9.7			
Overall					
Extracted [d]	100.0	80.6	94.6	76.9	
identified	17.2	32.3	62.1	49.9	
characterized	80.8	38.7	32.4	15.3	
Unextracted [d]	0.0	19.4	5.4	23.1	

[a] Solvent systems: CH_3CN/H_2O for liver, kidney, skim milk and muscle; acetone/hexane for fat and milk fat

[b] Represents free residues from partition of initial extracts with ethyl acetate. (Aqueous is CH_3CN phase and organic is hexane phase for milk fat)

[c] Extraction and analysis data represent composite of flank and loin muscle

[d] M3 is combination of M3 (major component), M4 and M7. Levels were too low to accurately quantify

M1 = 1,2,4-triazole, M2 = possible amino acid conjugate, M3 = hydroxyl flutriafol glucuronide, M3e = di-hydroxy flutriafol, M4 = flutriafol glucuronide, M5 = hydroxy methoxy flutriafol, M7 = methoxy flutriafol glucuronide, M10 = flutriafol sulfate

*Residues too low for further characterisation / identification

In an additional study on the metabolism of flutriafol in lactating goats La Mar (2012 2438) used a higher dose rate to allow for better identification of metabolites. Two lactating goats (crossbreeds, 2–4 yrs old, 38 and 58 kg bw) were administered either [triazole-3(5)-^{14}C]-flutriafol or [carbinol-^{14}C]-flutriafol once daily for five consecutive days at a rate equivalent to 30 ppm (triazole) or 30.7 ppm (carbinol) in the feed. Animals consumed 1.8 and 1.3 kg feed/d respectively for the 30 and 31 ppm dose goats. Milk production was 1.6 L/d and 1.5 L/d respectively for the two goats. Excreta were collected once a day (in the morning, before dose administration). Milk was collected twice daily (morning and evening). The goats were sacrificed approximately 20–22 h after the last dose was administered and the following tissues were collected at necropsy—liver, kidney, muscle (loin and flank), fat (subcutaneous, omental and renal), bile, blood and gastrointestinal tract with contents. Analytical work was completed within 30 days after sacrifice.

The majority of the administered dose was recovered in the faeces (35–55%) with 30–54% excreted in urine and 0.09–0.1% in milk. The amount of administered radioactivity found in tissues was 0.27–0.29% while the gastrointestinal tract and contents contained 2.1–6.8% giving a total recovery of administered radioactivity of 88–96%. TRR in edible tissues were generally low

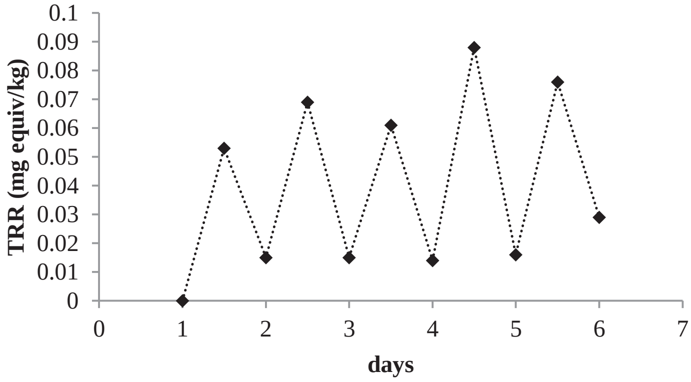
(0.008–0.024 mg equiv/kg) with the exception of liver (0.68–0.70 mg equiv/kg) and kidney (0.11–0.31 mg equiv/kg).

Table 4 Distribution of TRR following dosing of [^{14}C]flutriafol at 30 ppm for 5 days

	Triazole-label		Carbinol-label	
	%AD	mg equiv/kg	%AD	mg equiv/kg
Tissues				
Liver	0.22	0.698	0.22	0.676
Kidney	0.01	0.107	0.02	0.309
Omental fat	< 0.01	0.008	< 0.01	0.018
Subcutaneous fat	< 0.01	0.011	< 0.01	0.018
Renal fat	< 0.01	0.009	< 0.01	0.014
Flank muscle	< 0.01	0.02	< 0.01	0.024
Loin muscle	0.01	0.02	0.01	0.017
Blood	–	0.047	–	0.044
Excreta/secretions				
Faeces	55.32		34.67	
GI tract and contents	2.15		6.84	
Urine	30.03		53.77	
Whole milk	0.1	–	0.09	–
Bile	0.03	4.684	0.05	13.541
Cage wash	0.04		0	
Total	87.91		95.63	

Residues in milk appeared to reach plateau levels by Day 3 of dosing with significant differences in ^{14}C levels between milk collected in the morning (low levels), compared to evening milk (higher levels), suggesting flutriafol residues are rapidly eliminated following dosing (Figure 2).

A



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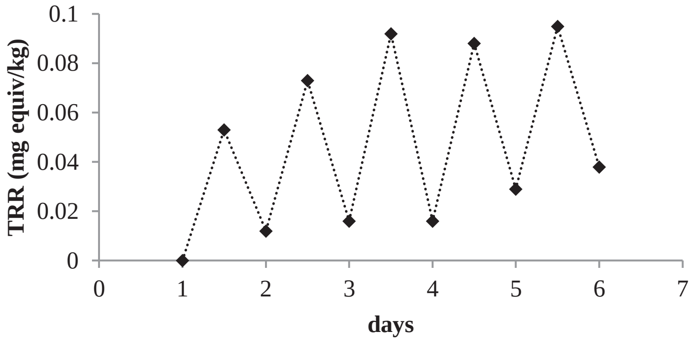

Figure 2 TRR in milk for goats dosed at the equivalent of 30 ppm in the feed with flutriafol (A) triazole label, (B) carbinol label

Acetonitrile and water extraction of liver, kidney, muscle, fat, skim milk and milk fat resulted in extraction efficiencies of 28.7–38.7% (liver), 66.7–86.5% (kidney), > 82% (muscle), > 72% fat, 98% (skim milk) and 82–87% (milk fat) (Tables 5 and 6).

For the TZ label, extraction of liver with CH_3CN/H_2O released 1,2,4-triazole (M1, 2.5% TRR), M2 (1.3% TRR), hydroxy flutriafol glucuronide (M3, 1.8% TRR), dihydroxy flutriafol (M3e, 0.7% TRR), flutriafol glucuronide (M4, 1.6% TRR), hydroxy methoxy flutriafol (M5, 6.9% TRR) and flutriafol (1.0% TRR). The total identified residues in the liver accounted for 16.9% of TRR. A number of unidentified compounds (7.9% TRR) were observed that were individually present at ≤ 2.5% TRR (≤ 0.015 mg equiv/kg). Hydrolysis of the liver PES under mild acid and alkaline conditions released all of the remaining ^{14}C residues which was able to be resolved into more than eight peaks by chromatography. Subsequent treatment of the hydrolysis extracts with enzymes to release conjugates did not result in additional compounds being identified.

In kidneys the main ^{14}C residue components were 1,2,4-triazole (M1, 8.9% TRR), M2 (1.3% TRR), hydroxy flutriafol glucuronide (M3, 9.8% TRR) and dihydroxy flutriafol (M3e, 3.3% TRR), hydroxy methoxy flutriafol (M5, 1.6% TRR), methoxy flutriafol glucuronide (M7, 5.7% TRR) and M8 (4.1% TRR). No other single metabolite comprised more than 4.9% of TRR (0.006 mg equiv/kg).

Muscle and fat contained low levels of ^{14}C. Major metabolites identified were 1,2,4-triazole (M1, 21–42% TRR), M2 (< 5–5.3% TRR), hydroxy flutriafol glucuronide (M3, 5.3–10% TRR). No other single metabolite comprised more than 0.003 mg equiv/kg.

Main components identified in skim milk were 1,2,4-triazole (M1, 14.9% TRR), M2 (3.2% TRR), hydroxy flutriafol glucuronide (M3, 23.4% TRR) and dihydroxy flutriafol (M3e, 35.1% TRR). No other single metabolite comprised more than 0.004 mg equiv/kg.

In milk fat components identified were 1,2,4-triazole (M1, 10.6% TRR), M2 (2.1% TRR), dihydroxy flutriafol (M3e, 43.6% TRR) and M8 (10.6% TRR). No other single metabolite comprised more than 0.005 mg equiv/kg.

Table 5 Characterisation and identification of ^{14}C residues in tissues and milk of a goat dosed with 30 ppm triazole label

Matrix	Liver	Kidney	Skim Milk	Milk Fat	Flank Muscle	Loin Muscle	Omental Fat	Subcut. Fat	Renal Fat
TRR (ppm)	0.607	0.123	0.094	0.094	0.02	0.019	0.014	0.011	0.008
			%TRR						
Solvent extracts [a]	28.7	66.7	97.9	87.2	90.0	89.5	92.9	72.7	75.0
Aqueous soluble [b]	14.3	57.7	54.3	87.2 (CH_3CN)	65.0	63.2	92.9 (CH_3CN)	72.7 (CH_3CN)	75.0 (CH_3CN)
M1	2.5	8.9	14.9	10.6	40.0	42.1	21.4	27.3	25.0
M2	1.3	4.1	3.2	2.1	< 5.0	5.3			
M3	1.8	9.8	23.4	43.6	10.0	5.3		9.1	
M4	1.6	13.0							
M5				1.1					
M7	1.6	5.7	2.1						
M8	0.8	4.1	3.2	10.6					
Flutriafol				3.2			7.1	9.1	
Unknowns	3.6 (4)	7.3 (2)	5.3 (2)	12.8 (3)		< 10.3 (2)	21.4 (2)		< 50 (2)
Organic soluble [b]	14.3	8.9	43.6	< 1.1 [c]	25.0	26.3	< 7.1 [c]	< 9.1 [c]	< 12.5 [c]
M3e	0.7	3.3	35.1						
M5	6.9	1.6	1.1						
Flutriafol	1.0		< 1.1						
Unknowns	4.3 (4)	3.2 (3)	6.5 (3)						
PES	71.3	33.3	2.1	12.8	10.0	10.5	7.1	27.3	25
1 N HCl	2.3	1.6							
1 N KOH	16.0	21.1							
Overall									
extracted	99.9	89.3	97.9	87.2	90	89.3	92.9	81.8	75
identified	16.9	46.4	80.9	69.1	50.0	47.4	28.5	45.5	25
characterized	78.1	37.3	15.0	11.7	35.0	36.9	21.4	18.2	50
unextracted	0.0	10.6	2.1	12.8	10.0	10.5	7.4	27.3	25

[a] Solvent systems: CH_3CN/H_2O for liver, kidney, skim milk and muscle; acetone/hexane for fat and milk fat

[b] Represents free residues from partition of initial extracts with ethyl acetate. (Aqueous is CH_3CN phase and organic is hexane phase for fat matrices)

[c] up to five components each < 0.007 mg equiv/kg and < 14% TRR in tissue with the exception of renal fat = 0.03 mg equiv/kg and 38% TRR

M1 = 1,2,4-triazole, M2 = possible amino acid conjugate, M3 = hydroxyl flutriafol glucuronide, M3e = di-hydroxy flutriafol, M4 = flutriafol glucuronide, M5 = hydroxy methoxy flutriafol, M7 = methoxy flutriafol glucuronide, M10 = flutriafol sulfate

For the carbinol-label the metabolites identified were M2 (2.5% TRR), hydroxyl flutriafol glucuronide (M3, 2.2% TRR), dihydroxy flutriafol (M3e, 1.1% TRR), flutriafol glucuronide (M4, 4.3% TRR), hydroxy methoxy flutriafol (M5, 7.3% TRR), methoxy flutriafol glucuronide (M7, 3.3% TRR), M8 (2.2% TRR) and flutriafol (2.5% TRR). The total identified residues in the liver accounted for 22.9% of TRR. A number of unidentified compounds (7.9% TRR) were observed that were individually present at ≤ 3.6% TRR (≤ 0.023 mg equiv/kg). As with the earlier study and the triazole-label, hydrolysis of the liver PES under mild acid and alkaline conditions released all of the remaining ^{14}C residues. In the case of the carbinol label the released

^{14}C was able to be resolved into more than seven peaks by chromatography. Subsequent treatment of the hydrolysis extracts with enzymes to release conjugates did not result in additional compounds being identified.

In kidneys, the main ^{14}C residue components were M2 (8.6% TRR), hydroxyl flutriafol glucuronide (M3, 12.8% TRR) and dihydroxy flutriafol (M3e, 1.6% TRR), flutriafol glucuronide (M4, 24% TRR), hydroxy methoxy flutriafol (M5, 1.0% TRR), methoxy flutriafol glucuronide (M7, 10.5% TRR), M8 (5.3% TRR) and flutriafol (0.7% TRR). No other single metabolite comprised more than 4.3% of TRR (0.013 mg equiv/kg).

Muscle and fat contained low levels of ^{14}C. Major components identified in muscle were hydroxyl flutriafol glucuronide (M3, 4.3–5.9% TRR) and flutriafol glucuronide (M4, 5.9–17.4% TRR). No other single metabolite comprised more than 0.004 mg equiv/kg. In fat, the major component identified was flutriafol (21–59% TRR).

Main components identified in skim milk were M2 (4.7% TRR), hydroxyl flutriafol glucuronide (M3, 17.6% TRR), dihydroxy flutriafol (M3e, 27.1% TRR), methoxy flutriafol glucuronide (M7, 3.5% TRR), M8 (5.9% TRR) and flutriafol sulfate (M10, 8.2% TRR). Flutriafol was present at 1.2% TRR. No other single metabolite comprised more than 0.005 mg equiv/kg.

In milk fat components identified were M2 (4.3% TRR), hydroxyl flutriafol glucuronide (M3, 30.5% TRR), hydroxy methoxy flutriafol (M5, 2.1% TRR), M8 (7.8% TRR), flutriafol sulfate (M10, 17% TRR) and flutriafol (4.3% TRR). No other single metabolite comprised more than 0.01 mg equiv/kg.

Table 6 Characterisation and identification of ^{14}C residues in tissues and milk of a goat dosed with 30 ppm carbinol label

Matrix	Liver	Kidney	Skim Milk	Milk Fat	Flank Muscle	Loin Muscle	Omental fat	Subcut. fat	Renal Fat
TRR (mg equiv/kg)	0.631	0.304	0.085	0.141	0.023	0.017	0.017	0.017	0.014
				%TRR					
Solvent extracts [a]	38.7	86.5	97.6	82.3	87.0	82.4	82.4	88.2	78.6
Aqueous soluble [b]	21.4	80.3	54.1	82.3 CH_3CN	52.2	47.1	76.5 CH_3CN	88.2 CH_3CN	78.6 CH_3CN
M2	2.5	8.6	4.7	4.3					
M3	2.2	12.8	17.6	30.5	4.3	5.9			
M4	4.3	25.0			17.4	5.9			
M5				2.1					
M7	3.3	10.5	3.5			5.9			
M8	2.2	5.3	5.9	7.8					
M10			8.2	17.0					
Flutriafol				4.3			23.5	58.8	21.4
Unknowns	3.4 (4)	8.6 (3)	7.1 (3)	10.6 (2)	21.7 (2)	29.4 (2)	47 (3)	17.7 (2)	50 (3)
Organic soluble [b]	17.3	6.3	43.5	< 0.7 (h)	34.8	35.3	5.9	< 5.9	< 7.1
M3e	1.1	1.6	27.1						
M5	7.3	1.0	1.2						
Flutriafol	2.5	0.7	1.2						
Unknowns	5.2 (3)	1.0 (1)	11.8 (3)						
PES	47.4	6.3	2.4	17.7	13.0	17.6	17.6	11.8	21.4
1 N HCl	2.4	2.3							
1 N KOH	11.6	4.9							
Overall									
extracted	100.0	93.8	97.6	82.3	87.0	82.4	82.4	88.2	78.6
identified	22.9	56.9	64.7	61.7	21.7	17.7	23.5	58.8	21.4
characterized	71.7	25.4	23.9	25.5	56.5	64.7	52.9	17.7	50.0
unextracted	0.0	6.3	2.4	17.7	13.0	17.6	17.6	11.8	21.4

[a] Solvent systems: CH_3CN/H_2O for liver, kidney, skim milk and muscle; acetone/hexane for fat and milk fat

[b] Represents free residues from partition of initial extracts with ethyl acetate. (Aqueous is CH_3CN phase and organic is hexane phase for fat matrices)

M1 = 1,2,4-triazole, M2 = possible amino acid conjugate, M3 = hydroxyl flutriafol glucuronide, M3e = di-hydroxy flutriafol, M4 = flutriafol glucuronide, M5 = hydroxy methoxy flutriafol, M7 = methoxy flutriafol glucuronide, M10 = flutriafol sulfate

Residues in goat milk and edible tissues resulted from extensive metabolism of flutriafol. In the major metabolic pathway, one of the phenyl rings is oxidised and then conjugated with glucuronic acid to form flutriafol glucuronide (M4), or is further oxidised to form dihydroxy flutriafol (M3e), of which there are a number of possible isomers. M3e is then further transformed via methylation to hydroxyl methyl flutriafol (M5) which can in turn be conjugated with glucuronic acid to form methoxy flutriafol glucuronide (M7). M3e was also conjugated with glucuronic acid to form hydroxyl flutriafol glucuronide (M3). A minor pathway is the cleavage of flutriafol at the 1-nitrogen of the triazole ring to give free triazole. One unique carbinol metabolite designated as M10 was identified as flutriafol sulfate.

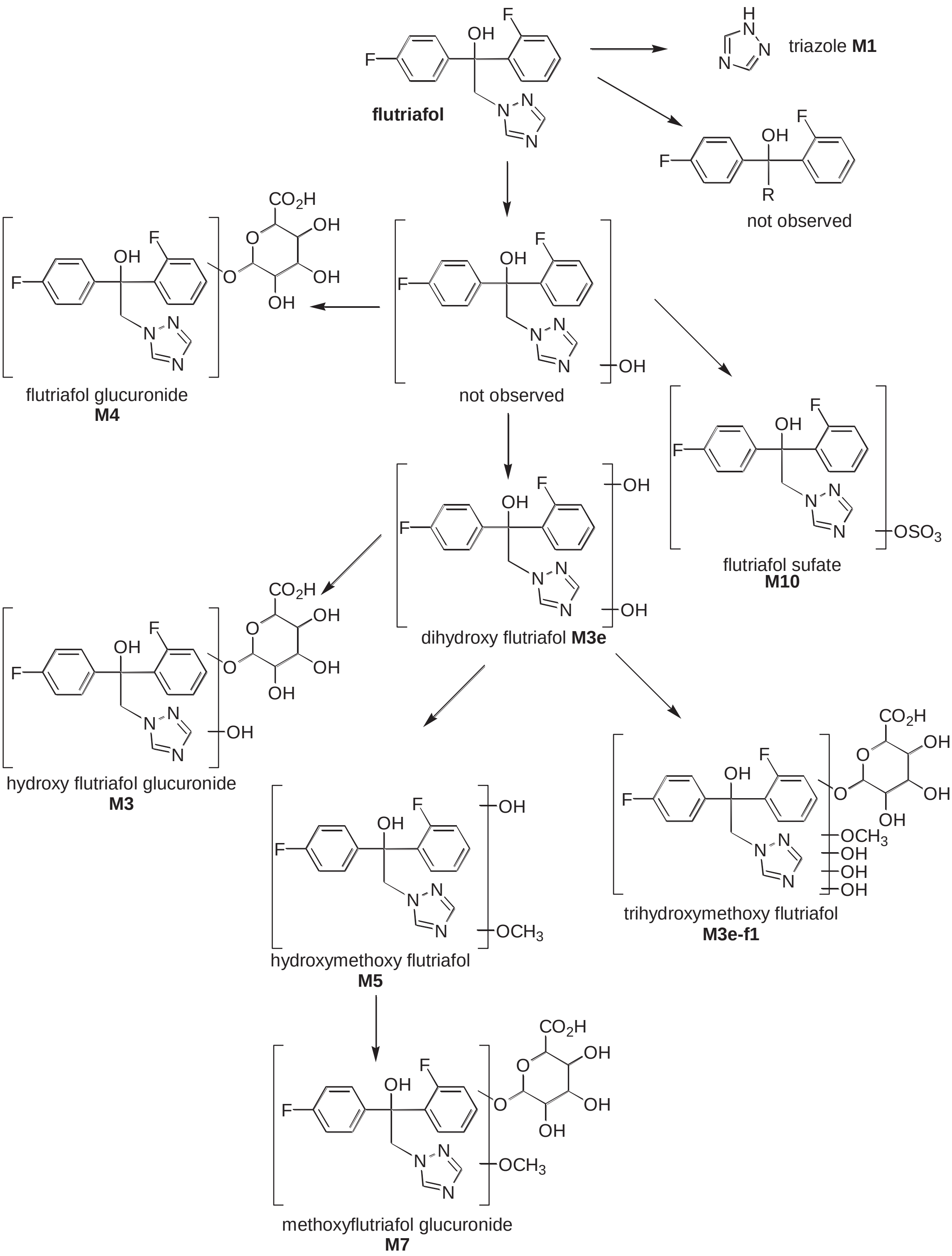

Figure 3 Possible metabolic pathway for flutriafol in goats

RESIDUE ANALYSIS

Analytical method

Stability of pesticide residues in stored analytical samples

The 2011 JMPR evaluated data on the storage stability of flutriafol residues in plant commodities that included apples, grapes, cabbages, sugar beet roots, pea seeds, soybeans, barley grains, wheat and oilseed rape, processed commodities (apple juice, soybean meal and refined oil) and animal commodities (milk, eggs, muscle and fat).

The 2011 JMPR also received information on the freezer storage stability of triazole metabolites in apple (fruit and juice), milk, eggs, muscle and fat.

Storage stability results indicate that flutriafol residues were stable for at least 4 months in animal commodities, for at least 5 months in soybean seeds, for at least 12 months in apples, barley grains and coffee beans, for at least 23 months in grapes, for at least 24 months in cabbages and oilseed rape, and for at least 25 months in wheat (grains and straw), pea seeds, and sugar beet roots. The results also indicate that triazole metabolite residues were stable for at least 4 months in apple fruits and juice, and for at least 5 months in animal commodities.

Mason (2012 2649) studies the freezer storage stability of residues in bovine matrices. The deep freeze storage stability of flutriafol and triazole metabolites 1,2,4-triazole (T), triazole alanine (TA) and triazole acetic acid (TAA) in muscle, fat, liver and kidney was conducted by fortifying separate control samples of homogeneous matrix with flutriafol, T, TA and TAA at levels of 0.1 mg/kg. These samples were placed in freezer storage and analysed after 0, 1, 3, 6, 9 and 12 months frozen storage. All samples were analysed in duplicate. Unfortified control samples were analysed at the same time alongside duplicate freshly fortified samples of control matrix at 0.1 mg/kg.

Residues of flutriafol, and T, TA and TAA in ruminant tissues (muscle, fat, liver and kidney) remain stable for at least 12 months for flutriafol, TA and TAA and at least 6 months for T when samples are stored under deep frozen conditions.

Table 7 Recovery of flutriafol and metabolite residues on frozen storage of animal commodity samples separately fortified with flutriafol, T, TA or TAA

Analyte	Storage time (days)	Amount recovered from stored sample (mg/kg)	Mean procedural recovery (%)
Muscle			
Flutriafol	0	0.077, 0.072	75
	182	0.100, 0.096	79
	275	0.122, 0.104	102
	372	0.118, 0.108	97
T	0	0.093, 0.094	94
	183	0.096, 0.090	90, 97
	322	0.086, 0.091	90
	366	0.078, 0.076	80
TA	0	0.109, 0.106	108
	183	0.108, 0.109	101
	322	0.098, 0.094	88
	366	0.114, 0.101	98
TAA	0	0.104, 0.100	102
	183	0.097, 0.091	103
	322	0.096, 0.092	95
	366	0.108, 0.108	109
Fat			
Flutriafol	0	0.080, 0.078	79
	183	0.069, 0.074	71
	279	0.070, 0.082	86

Analyte	Storage time (days)	Amount recovered from stored sample (mg/kg)	Mean procedural recovery (%)
	370	0.095, 0.106	86
T	0	0.088, 0.087	88
	189	0.066, 0.066	92
	321	0.081, 0.083	94
	367	0.056, 0.065	90
TA	0	0.110, 0.110	110
	189	0.101, 0.104	101
	321	0.106, 0.080	107
	367	0.100, 0.097	105
TAA	0	0.099, 0.099	99
	189	0.094, 0.090	110
	321	0.108, 0.097	105
	367	0.097, 0.089	111
Liver			
Flutriafol	0	0.104, 0.104	104
	32	0.063, 0.067	74
	152	0.093, 0.103	99
	185	0.100, 0.095	76
	276	0.115, 0.114	89
	369	0.126, 0.119	108
T	0	0.089, 0.09	90
	35	0.075, 0.075	77
	117	0.087, 0.089	90
	186	0.087, 0.086	94
	313	0.081, 0.079	92
	370	0.082, 0.071	90
TA	0	0.102, 0.102	102
	35	0.103, 0.097	107
	117	0.103, 0.105	92
	186	0.107, 0.109	99
	313	0.096, 0.093	89
	370	0.108, 0.116	103
TAA	0	0.083, 0.082	83
	35	0.109, 0.109	110
	117	0.110, 0.110	110
	186	0.092, 0.087	101
	313	0.104, 0.107	108
	370	0.113, 0.117	109
Kidney			
Flutriafol	0	0.096, 0.094	95
	37	0.085, 0.080	91
	92	0.092, 0.093	99
	184	0.112, 0.120	110
	365	0.107, 0.109	95
T	0	0.092, 0.095	94
	30	0.095, 0.098	101
	91	0.087, 0.082	90
	198	0.093, 0.093	106
	365	0.061, 0.061	75
TA	0	0.105, 0.107	106
	30	0.099, 0.102	106
	91	0.102, 0.100	102
	198	0.078, 0.080	86
	365	0.092, 0.087	101
TAA	0	0.107, 0.107	107
	30	0.100, 0.100	103
	91	0.110, 0.112	104
	198	0.111, 0.109	110
	365	0.107, 0.099	96

Analytical method flutriafol: muscle, liver, kidney, fat—Method No. ICIA AM00306
Analytical method T, TA, TAA—Meth-160 rev 2.

USE PATTERN

Table 8 Registered uses of flutriafol on crops relevant to this submission

Crop	Country	GS	Rate (g ai/ha)	Water (L/ha)	N	Interval (days)	PHI (days)
Almond walnut	USA		128 Max single 128 Max/year 511	> 93.5 grd/air	4	7	14
Apple	Belarus		25–37.5	1000–1200	4	10–14	40
Apple	Italy		20–30 (or 2–3 g ai/hL)		2	10–14	21
Apple	Kazakhastan		25–37.5		2		20
Brassica (Cole) leafy vegetables	USA		91–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	7
Celery and Chinese celery	USA		91–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	7
Corn (field, pop, seed)	USA	apply no later than R4 (early dough stage	128 Max single 128 Max/year 256	> 93.5 grd > 18.7 air	2	7	7, except forage 0 days
Cotton	USA		Max one 146–290 (soil appl. at planting) + 64–128 (foliar appl.) max total soil + foliar 547	56–93 92–187	1 2	n/a 7	 30
Cucurbit vegetables (except muskmelon)	USA	–	91–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	0
Fruiting vegetables group 8–10	USA	Onset of fruit up to harvest	128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	0
Leafy vegetables (except Brassica vegetables)	USA		91–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	7
Muskmelons	USA	–	91–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	0
Pecan and other tree nuts	USA		64–128 Max single 128 Max/year 511	> 93.5 grd/air	4	7	14
Pome fruit	USA	–	73–119 Max single 119 Max/year 475	> 93.5 grd > 46.8 air	4	7–10	14
Rapeseed	Belarus	End of flowering/ beginning of pod	125		1		30

Crop	Country	GS	Rate (g ai/ha)	Water (L/ha)	N	Interval (days)	PHI (days)
		formation					
Rapeseed	Kazakhastan		125	200	1		30
Rapeseed	Russia	n/a	125	200–300	1–2	10–14	30
Rice	Italy	onset of the 1st symptoms of disease, repeating on appearance panicle	125–187.5		2		28
Rice	Kazakhastan		187.5–250	200 L/ha	1		30
Rice	Russia		250	50–100 L/ha	1		27
Sorghum	USA	–	64–128 Max single 128 Max/year 256	> 93.5 grd > 46.8 air	4	7	30 stover forage grain
Stone fruit (except cherry)	USA	–	128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	7
Stone fruit (inc cherry)	USA	–	128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	7
Strawberry	USA	Onset of fruit up to harvest	91–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	0
Sugar beet	Belarus		62.5–125	300	1		30
Sugar beet	Russia		62.5	300	1–2		30
Sugar beet	USA	–	91–128 Max single 128 Max/year 256	> 93.5 grd > 46.8 air	2	14	21
Tomato	USA	Onset of fruit up to harvest	64–128 Max single 128 Max/year 511	> 93.5 grd > 46.8 air	4	7	0

Stone Fruit: Apricot, Nectarine, Peach, Plum, Cherries (Sweet and Tart), Chickshaw plum, Damson plum, Japanese plum, Plumcot, Prune

Muskmelons: True Cantaloupe, Cantaloupe, Casaba, Crenshaw Melon, Golden Pershaw Melon, Honeydew Melon, Honey Balls, Mango Melon, Persian Melon, Pineapple Melon, Santa Claus Melon, and Snake Melon

Cucurbits: Chayote (Fruit), Chinese Waxgourd, Citron Melon, Cucumber, Gherkin, Gourd Edible (Lagenaria spp.) (Includes Hyotan, Cucuzza, Hechima, Chinese Okra), Momordica spp. (Includes Balsam Apple, Balsam Pear, Bittermelon, Chinese Cucumber), Pumpkin, Squash (Summer), Squash (Winter—Includes Butternut Squash, Calabaza, Hubbard Squash, Acorn Squash, Spaghetti Squash), Watermelon

Brassica (Cole) Leafy Vegetables: Broccoli, Broccoli (Chinese and Raab), Brussels Sprouts, Cabbage, Cabbage (Chinese, Bok Choy, Chinese Mustard/Gai Choy), Cauliflower, Cavalo Broccolo, Collards, Kale, Kohlrabi, Mizuna, Mustard Greens, Mustard Spinach, Rape Greens. Including all cultivars and/or hybrids of these crops.

Leafy Vegetables (except Brassica): Amaranth, Arugula, Cardoon, Celery, Celery (Chinese), Celtuce, Chervil, Chrysanthemum (Edible and Garland), Corn Salad, Cress (Garden and Upland), Dandelion, Dock, Endive, Fennel (Florence), Lettuce (Head and Leaf), Orach, Parsley, Purslane (Garden and Winter), Radicchio, Rhubarb, Spinach, Spinach (New Zealand and Vine), Swiss Chard. Including cultivars and/or hybrids of these crops.

Pecans and other tree nuts: African Tree Nut, Brazil Nut, Burr Oak, Butternut, Cajou, Cashew, Castanha-Do-Maranhao, Coconut, Coquito Nut, Dika nut, Guiana Chestnut, Hazelnut, Heartnut, Hickory Nut, Japanese Horse-Chestnut, Macadamia Nut, Monogongo Nut, Monkey-Pot, Pachira Nut, Pecan, Sapucaia Nut

Fruiting Vegetables (group 8-10): African Eggplant, Bell Pepper, Eggplant, Martynia, Non-Bell Pepper, Okra, Pea Eggplant, Pepino, Roselle, Scarlet Eggplant. Including cultivars, varieties and/or hybrids of these crops.

Crop Rotation: Fields treated with an application rate of greater than 252 g ai/ha/season may be planted to crops that have tolerances established for residues of flutriafol including: field corn, popcorn, cucurbits, fruiting vegetables, grapes, peanuts, pome fruits, soybeans, stone fruits, strawberries, sugar beets, tree nuts, triticale, or wheat immediately after last application.

Fields treated with application rates less than or equal to 252 g ai/ha/season may be planted to the crops listed above, and may also be planted to cotton or sweet corn 180 days after the last application. Rotation to any other crop is prohibited.

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on supervised residue trials of foliar treatments of flutriafol for apples, pears, peaches/nectarines, plums, cherries, strawberries, Brassica vegetables (cabbage and broccoli), cucurbits (cucumbers, summer squash and muskmelons), tomatoes, peppers, leafy vegetables (lettuce, spinach, celery and mustard greens), sugar beets, maize, rice, sorghum, almonds, pecans, cotton, and rape.

Residues, application rates and spray concentrations have been rounded to two figures. Residue data are recorded unadjusted for percentage recoveries or for residue values in control samples. Where multiple analyses were conducted on a single sample, the average value is reported. Residues from the trials conducted according to critical GAP have been used for the estimation of maximum residue levels, STMR and HR values. Those results are underlined.

Table 9 Summary of sprayers, plot sizes and field sample sizes in the supervised trials

Location	Year	Crop	Sprayer	Plot size	Sample size	SAI (days)
Europe	2004	Sugar beet	Boom sprayer, knapsack sprayer	60–120 m^2	Plants ≥ 0.6 kg Leaves ≥ 0.5 kg Roots ≥ 1.0 kg Leaves with tops ≥ 1.0 kg	< 80
Europe	2005	Tomato	CO_2 sprayer	14–33 m^2	≥ 2.0 kg	< 52
Europe	2005	Rape	Boom sprayer	60–90 m^2	Shoots no roots ≥ 1.1 kg Pods ≥ 0.6 kg Shoots no pods ≥ 1.0 kg Seeds ≥ 0.5 kg	< 30
Europe	2005	Sugar beet	Boom sprayer	30–90 m^2	Leaves with tops ≥ 1.0 kg Roots ≥ 1.0 kg	< 80
Europe	2006	Rape	Boom sprayer	30–60 m^2	Seeds ≥ 0.5 kg	< 20
Spain	2006	Sugar beet	Boom sprayer	30 m^2	Leaves with tops ≥ 2.8 kg Roots ≥ 4.8 kg	< 20
France	2007	Rape	Boom sprayer	120 m^2	Seeds ≥ 0.5 kg	< 38
Spain	2005	Rice	Boom sprayer	25–50 m^2	Seeds ≥ 1.0 kg	< 130
USA	2009	Cherry sweet	Tractor-mounted Airblast Sprayer	6–16 trees	Fruit ≥ 1.1 kg	79 F 84 T
USA	2009	Cherry tart	Tractor-mounted Airblast Sprayer	6–16 trees	Fruit ≥ 1.1 kg	64–107 F 58–127 T
USA	2009	Peach	Tractor-mounted Airblast Sprayer	6–8 trees	Fruit ≥ 2.0 kg	45–135 F 40–114 T
USA	2009	Plum	Tractor-mounted Airblast Sprayer	6–8 trees	Fruit ≥ 2.0 kg	9–154 F 13–149 T
USA	2009	Pear	Tractor-mounted Airblast Sprayer	6–7 trees	Fruit ≥ 2.3 kg	24–188 F 23–192 T
USA	2009	Maize	CO_2 backpack sprayer, Tractor mounted side-mount sprayer	56–1110 m^2	Forage ≥ 1.6 kg Grain ≥ 1.0 kg Stover ≥ 0.4 kg	Forage 64–211 F 67–211 T Grain 84–186 F 72–201 T
USA	2009	Sugar beet		46–372 m^2	Leaves with tops ≥ 1.0 kg Roots 12 roots	183 F 194 T
USA	2010	Strawberry	CO_2 backpack sprayer, Hand-held boom sprayer	31–186 m^2	Fruit ≥ 0.6 kg	12–90 F 31–88 T

Location	Year	Crop	Sprayer	Plot size	Sample size	SAI (days)
USA	2010	Apple	Tractor-mounted Airblast Sprayer	6–8 trees	Fruit ≥ 3.0 kg	33–60 F 64–89 T
USA	2010	Tree nuts (Almond, Pecan)	Tractor-mounted Airblast Sprayer	6–8 trees	≥ 1.2 kg	Pecan 162 Almond 230 Hulls 92
Spain	2006	Peach	Boom + knapsack sprayer	3–4 trees	≥ 2.0 kg	< 139
USA	2011	Cucurbits	CO_2 backpack + tractor mounted sprayers	48–180 m^2	≥ 1.5 kg (melon: each fruit quartered opposing 2 quarters selected 24 quarters)	16–104 F 16–176 T
USA	2011	Tomato	CO_2 backpack + boom + tractor mounted sprayers	48–180 m^2	≥ 2.0 kg	18–134
USA	2011	Pepper	CO_2 backpack + boom + tractor mounted sprayers	45–140 m^2	≥ 2.0 kg	18–134
Spain	2004	Strawberry	Backpack + knapsack sprayer	16.5–44 m^2 macrotunnels	≥ 1.0 kg	212
USA	2012	Brassica vegetables	CO_2 backpack + tractor mounted sprayers	45–167 m^2	≥ 1.0 kg (cabbage: Heads were quartered and one quarter of 12 heads collected for each sample OR **Heads were halved and one half of 12 heads collected for each sample	7–195 F 24–178 T
USA	2011	Leafy vegetables	CO_2 backpack + tractor mounted sprayers	43–206 m^2	≥ 1.0 kg	18–184 F 11–212 T
USA	2012	Sorghum	CO_2 backpack + tractor mounted sprayers	93–1490 m^2	≥ 1.0 kg	27–196 F 56–189 T
USA	2012	Cotton	CO_2 backpack + tractor mounted sprayers	93–696 m^2	≥ 1.0 kg	15–110 F 21–141 T

Residues of the triazoles, TA and TAA were frequently observed in both untreated control and samples from treated plots, however, the source of the residues is unknown. That residues were detected in untreated controls suggests a natural origin. Triazole-related compounds are also common metabolites of a number of fungicides which contain the 1,2,4-triazole moiety.

Table 10 Residues of flutriafol in apples following application of an SC formulation in the USA (Carringer 2011 2159) (duplicate samples)

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Cambridge, ON, Canada	6 (14 14 14	120 120	889 898	13	71–73 75	14	0.02 0.02	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01
2010 McIntosh	13 14)	120 120 122 119	879 879 889 926		76–77 77–78 79 81–85	Mean	0.02	< 0.01	< 0.01	< 0.01
St George,	6 (14	119	739	16	74–76	14	0.02 0.01	< 0.01	0.04	< 0.01

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
ON, Canada 2010	14 14 14 13)	117 120	730 730		77 78			< 0.01	0.03 c0.04	< 0.01
Northern spy		119 119 119	702 730 720		79 81 81–85	Mean	0.02	< 0.01	0.04	< 0.01
Conklin, MI, USA 2010 Ida	6 (14 14 14	120 120	804 776	15	75 76	14	0.07 0.05	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Red	14 14)	120 120 121 120	795 776 795 776		77 78 79 85	Mean	0.06	< 0.01	002	< 0.01
Marengo, IL, USA 2010 Gala	6 (14 15 13 14 14)	122 119 122	758 730 730	16	75 76 77	14	0.10 0.12	< 0.01 < 0.01	0.07 0.08 c0.05	0.01 0.01
		121 119 122	748 758 758		80 82 85	Mean	0.11	< 0.01	0.08	0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Table 11 Flutriafol and triazole metabolites residues on apple fruits from supervised trials in USA reported by the 2011 JMPR (Willard, 2007 1471)

Country, year	Application				DALA		Residue (mg/kg)	
(variety) APPLE	Form	kg ai/ha	water, L/ha	no.		Flutriafol	TA	TAA
USA/CA, 2006	SC	0.12	798–936	6	14	0.07, 0.05	0.02, 0.02	< 0.01, < 0.01
(Granny smith)					Mean	0.06		
USA/ ID, 2006	SC	0.12	759–931	6	15	0.07, 0.09	< 0.01, < 0.01	< 0.01, < 0.01
(Macintosh)					Mean	0.08		
USA/IL, 2006	SC	0.12	795–840	6	14	0.06, 0.06	0.02, 0.02	< 0.01, < 0.01
(Golden Supreme)					Mean	0.06		
USA/MI, 2006	SC	0.12	801–843	6	14	0.09, 0.09	0.04, 0.04 c0.06	< 0.01, < 0.01
(Golden Delicious)					Mean	0.09		
USA/MI, 2006	SC	0.12	807–827	6	0	0.07, 0.07	0.06, 0.06	< 0.01, < 0.01
(Ida Red)					Mean	0.07		
					7	0.05 0.04	0.07 0.06	< 0.01, < 0.01
					Mean	0.05		
					13	0.05 0.04	0.05 0.05 c0.03	< 0.01, < 0.01
					Mean	0.05		
					21	0.04 0.04	0.07 0.07	< 0.01, < 0.01
					Mean	0.04		
					27	0.05 0.04	0.06 0.05	< 0.01, < 0.01
					Mean	0.05		
	SC	0.12	804–838	5	0	0.06, 0.06	0.08, 0.05	< 0.01, < 0.01
					Mean	0.06		
					7	0.04 0.04	0.07 0.08	< 0.01, < 0.01
					Mean	0.04		
					13	0.04 0.04	0.07 0.07	< 0.01, < 0.01
					Mean	0.04		
					21	0.04 0.04	0.08 0.09	< 0.01, < 0.01
					Mean	0.04		
					27	0.03 0.03	0.07 0.07	< 0.01, < 0.01
					Mean	0.03		
USA/NY, 2006	SC	0.12	924–981	6	15	0.05, 0.03	0.02, 0.01 c0.03	< 0.01, < 0.01
(Cortland)					Mean	0.04		
USA/NY, 2006	SC	0.12	939–953	6	14	0.05, 0.07	0.03, 0.02 c0.01	< 0.01, < 0.01
(Ida Red)					Mean	0.06		
		0.12-	933–942	6	14	0.10, 0.12	0.03, 0.03	< 0.01, < 0.01
		0.24			Mean	0.11		

Country, year	Application				DALA		Residue (mg/kg)	
(variety) APPLE	Form	kg ai/ha	water, L/ha	no.		Flutriafol	TA	TAA
USA/OR, 2006	SC	0.12	830–849	6	14	0.09, 0.12	0.03, 0.02 c0.03	< 0.01, < 0.01
(Pacific Gala)					Mean	0.10		
USA/OR, 2006	SC	0.12	815–840	6	14	0.05, 0.05	0.03, 0.03	< 0.01, < 0.01
(Jonagold)					Mean	0.05		
USA/PA, 2006	SC	0.12	895–903	6	14	0.11, 0.14	0.02, 0.02 c0.03	< 0.01, < 0.01
(Royal Gala)					Mean	0.12		
USA/PA, 2006	SC	0.12	789–808	6	0	0.14, 0.19	0.05, 0.05	0.01, 0.02
(Loe Rome)					Mean	0.17		
					7	0.09 0.08	0.05 0.05	0.01 0.01
					Mean	0.09		
					14	0.05 0.06	0.05 0.05	0.01 0.01
					Mean	0.05		
					21	0.07 0.09	0.06 0.06 c0.05	0.01 0.01
					Mean	0.08		
					28	0.06 0.05	0.05 0.05	0.01 0.01
					Mean	0.06		
	SC	0.12	800–815	5	0	0.14, 0.17	0.03, 0.04	0.01, 0.01
					Mean	0.16		
					7	0.05 0.05	0.04 0.04	< 0.01, < 0.01
					Mean	0.05		
					14	0.05 0.06	0.04 0.04	< 0.01, < 0.01
					Mean	0.06		
					21	0.07 0.07	0.04 0.04	< 0.01, < 0.01
					Mean	0.07		
					28	0.08 0.05	0.03 0.03	< 0.01, < 0.01
					Mean	0.07		
USA/UT, 2006	SC	0.12	748–804	6	14	0.03, 0.03	< 0.01, < 0.01	< 0.01, < 0.01
(Empire)					Mean	0.03		
USA/VA, 2006	SC	0.12	706–748	6	13	0.06, 0.04	0.03, 0.02 c0.06	< 0.01, < 0.01
(Rome)					Mean	0.05		
USA/VA, 2006	SC	0.12	805–817	6	13	0.12, 0.09	0.03, 0.02 c0.03	< 0.01, < 0.01
(York)					Mean	0.10		
USA/WA, 2006	SC	0.12	861–879	6	0	0.09 0.10	< 0.01, < 0.01	< 0.01, < 0.01
(Braeburn)					Mean	0.10		
					7	0.10 0.12	< 0.01, < 0.01	< 0.01, < 0.01
					Mean	0.11		
					14	0.09 0.12	0.01, 0.01	< 0.01, < 0.01
					Mean	0.11		
					21	0.13 0.13	< 0.01, 0.01	< 0.01, < 0.01
					Mean	0.13		
					27	0.07 0.11	0.01, < 0.01	< 0.01, < 0.01
					Mean	0.09		
	SC	0.12	864–871	5	0	0.16 0.13	0.02 0.02	< 0.01, < 0.01
					Mean	0.14		
					7	0.15 0.13	0.02 0.02	< 0.01, < 0.01
					Mean	0.14		
					14	0.14 0.11	0.02 0.02	< 0.01, < 0.01
					Mean	0.13		
					21	0.15 0.16	0.02 0.02	< 0.01, < 0.01
					Mean	0.16		
					27	0.09 0.16	0.02 0.02	< 0.01, < 0.01
					Mean	0.13		
USA/WA, 2006	SC	0.12	861–872	6	14	0.13, 0.11	0.04 0.03 c0.02	< 0.01 < 0.01
(Red Delicious)					Mean	0.12		
		0.12-	859–877	6	14	0.17, 0.21	0.04 0.04	< 0.01 < 0.01
		0.24			Mean	0.19		

Table 12 Residues of flutriafol in pears following application of an SC formulation in the USA (Carringer 2010 1809) (duplicate samples)

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Alton, NY, 2009 Clapp's	6 (14 14 14	122 118	1141 1094	11	71 72	0	0.02 0.03	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Favorite	14 14)	119	1113		74	Mean	0.02	< 0.01	< 0.01	< 0.01
		120 120 120	1122 1122 1122		75 76 81	14	0.03 0.04	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.04	< 0.01	< 0.01	< 0.01
Poplar, CA, 2009 Olympic	6 (14 14 14	120 121	561 589	21	76 77	0	0.15 0.11	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01
	14 14)	122	571		78	Mean	0.13	< 0.01	< 0.01	< 0.01
		121 121 121	571 561 561		79 79 85	14	0.09 0.26	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01
						Mean	0.18	< 0.01	< 0.01	< 0.01
Lindsay, CA, 2009 Olympic	6 (14 14 14	119 121	2170 2170	5.5	74 75	0	0.07 0.08	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
	14 14)	119	2142		76	Mean	0.08	< 0.01	0.02	< 0.01
		122 120	2170 2151		77 78	0	0.14 0.09	< 0.01 < 0.01	0.02 0.06	< 0.01 < 0.01
		120	2198		87	Mean	0.12	< 0.01	0.04	< 0.01
						7	0.10 0.09	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
						Mean	0.10	< 0.01	0.02	< 0.01
						14	0.13 0.07	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.10	< 0.01	< 0.01	< 0.01
						21	0.18 0.21	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01
						Mean	0.20	< 0.01	< 0.01	< 0.01
						29	0.17 0.25	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
						Mean	0.21	< 0.01	0.01	< 0.01
Ephrata, WA, 2009 Concord	6 (14 14 14	120 119	571 561	21	74 75	0	0.28 0.29	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
	14 14)	120	571		76	Mean	0.28	< 0.01	< 0.01	< 0.01
		120 120	571 571		78 81	14	0.22 0.25	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
		119	561		85	Mean	0.24	< 0.01	< 0.01	< 0.01
Payette, ID, 2009 Bartlett	6 (13 15 13	119 120	1384 1403	8.6	74 75	0	0.12 0.13	< 0.01 < 0.01	0.05 0.05	< 0.01 < 0.01
	16 13)	120	1403		76	Mean	0.12	< 0.01	0.05	< 0.01
		119 122	1384 1431		77 78	0	0.24 0.20	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
		123	1440		79	Mean	0.22	< 0.01	0.04	< 0.01
						7	0.14 0.17	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
						Mean	0.16	< 0.01	0.04	< 0.01
						14	0.14 0.12	< 0.01 < 0.01	0.06 0.05 c0.05	< 0.01 < 0.01
						Mean	0.13	< 0.01	0.06	< 0.01
						21	0.13 0.10	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
						Mean	0.12	< 0.01	0.04	< 0.01
						28	0.08 0.08	< 0.01 < 0.01	0.04 0.03	< 0.01 < 0.01
						Mean	0.08	< 0.01	0.04	< 0.01
Buhl, ID, 2009 Bartlett	6 (16 13 13	120 120	599 543	20	72 73	0	0.08 0.09	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
	14 14)	120	589		74	Mean	0.08	< 0.01	< 0.01	< 0.01
		121 121	580 552		76 78	14	0.08 0.10	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
		119	617		83	Mean	0.09	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Table 13 Residues of flutriafol in sweet cherry following application of an SC formulation in the USA (Carringer 2010 1805) (duplicate samples, fruit without pit)

Location,				g	GS		Residue (mg/kg)			
year, variety	No	g ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Conklin, MI, USA, 2009 Napoleon (sweet)	4 (7 7 7)	128 127 128 129	1777 1777 1805 1833	7	75 78 81 83-85	7	0.31 0.32	< 0.01 < 0.01	0.35 0.32 c0.26	0.03 0.03 c0.02
						Mean	0.32	< 0.01	0.34	0.03
Mears, MI, USA, 2009 Golds (sweet)	4 (7 7 7)	128 128 128 129	580 580 580 599	22	75 78 81 85	7	0.26 0.25	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.26	< 0.01	< 0.01	< 0.01
Plainview, CA, USA, 2009 Tulare (sweet)	4 (7 7 7)	128 128 128 128	1843 1861 1805 1833	7	72 76 78 89	7	0.29 0.21	< 0.01 < 0.01	0.92 0.83 c0.60	0.03 0.03 c0.02
						Mean	0.25	< 0.01	0.88	0.03
Poplar, CA, USA, 2009 Brooks (sweet)	4 (7 7 7)	128 127 128 127	571 617 608 599	22	71 75 79 87	7	0.14 0.19	< 0.01 < 0.01	0.11 0.13 c0.14	< 0.01 < 0.01
						Mean	0.16	< 0.01	0.12	< 0.01
Marsing, ID, USA, 2009 Sweet heart (sweet)	4 (7 7 7)	127 126 126 130	1945 2020 1927 1917	7	78 81 83 86	7	0.66 0.52	< 0.01 < 0.01	< 0.01 < 0.01 c0.12	< 0.01 < 0.01 c0.01
						Mean	0.59	< 0.01	< 0.01	< 0.01
Ephrata, WA, USA, 2009 Bing (sweet)	4 (6 7 7)	129 130 130 130	561 561 561 571	23	75 78 85 87	7	0.40 0.40	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.40	< 0.01	< 0.01	< 0.01
Weiser, ID, USA, 2009	4 (7 7 7)	128	1422	9	75	0	0.41 0.57	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.49	< 0.01	< 0.01	< 0.01
Benton (sweet)		131	1431		77	1	0.51 0.45	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.48	< 0.01	< 0.01	< 0.01
		131	1431		83	3	0.45 0.52	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.48	< 0.01	< 0.01	< 0.01
		131	1431		85	7	0.46 0.45	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.46	< 0.01	< 0.01	< 0.01
						14	0.39 0.49	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.44	< 0.01	< 0.01	< 0.01
						19	0.36 0.38	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.37	< 0.01	< 0.01	< 0.01
Dallas, OR,	4 (7	128	589	22	75	7	0.35 0.31	< 0.01	< 0.01	< 0.01

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
USA, 2009 Lambert (sweet)	7 7)	128 128 129	589 608 608		78 81 85			< 0.01	< 0.01	< 0.01
						Mean	0.33	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2 LOQ 0.01 mg/kg for flutriafol T and TAA and 0.08 mg/kg for TA, however this was based on lowest fortification level and background found in the untreated sample used for spiking. Subsequent work with tart cherries shows an LOQ of 0.01 mg/kg id more appropriate.

Table 14 Residues of flutriafol in tart cherry following application of an SC formulation in the USA (Carringer 2010 1806) (duplicate samples, fruit without pit)

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Alton, NY, USA, 2009 Montmorency	4 (7 7 7)	128 129 128 130	1122 1132 1122 1141	11	75 77 79 85	7	0.45 0.31	< 0.01 < 0.01	0.08 0.07 c0.13	< 0.01 < 0.01
						Mean	0.38	< 0.01	0.08	< 0.01
Conklin, MI, USA, 2009 Montmorency	4 (7 7 7)	128 128 128	580 589 589	22	75 78 81	0	0.35 0.33	< 0.01 < 0.01	0.12 0.11 c0.04	< 0.01 < 0.01
		128	589		85–87	Mean	0.34	< 0.01	0.12	< 0.01
						1	0.35 0.35	< 0.01 < 0.01	0.12 0.12	0.01 < 0.01
						Mean	0.35	< 0.01	0.12	< 0.01
						3	0.36 0.31	< 0.01 < 0.01	0.12 0.12	< 0.01 < 0.01
						Mean	0.34	< 0.01	0.12	< 0.01
						7	0.29 0.30	< 0.01 < 0.01	0.11 0.11	< 0.01 < 0.01
						Mean	0.30	< 0.01	0.11	< 0.01
						14	0.23 0.24	< 0.01 < 0.01	0.11 0.15	< 0.01 0.01
						Mean	0.24	< 0.01	0.13	< 0.01
						21	0.17 0.20	< 0.01 < 0.01	0.22 0.10	0.02 0.01
						Mean	0.18	< 0.01	0.16	0.02
Fremont, MI, USA, 2009 Montmorency	4 (6 7 7)	128 128 128	1665 1646 1665	8	75 78 81	7	0.43 0.35	< 0.01 < 0.01	0.45 0.46 c0.29	0.02 0.03 c0.02
		128	1655		85	Mean	0.39	< 0.01	0.46	0.02
Casnovia, MI, USA, 2009	4 (7 7 7)	129 128 128	645 655 655	20	75 78 81	7	0.33 0.35	< 0.01 < 0.01	0.12 0.15 c0.13	< 0.01 0.01
Montmorency		127	664		85	Mean	0.34	< 0.01	0.14	< 0.01
Sturgeon Bay, WI, USA, 2009	4 (7 7 7)	128 128 128	2750 2965 3049	5	77 81 84	7	0.30 0.29	< 0.01 < 0.01	0.04 0.04 c0.02	< 0.01 < 0.01
Montmorency		128	2750		86	Mean	0.30	< 0.01	0.04	< 0.01
Marengo, IL, USA, 2009 Northstar	4 (7 7 7)	128 128 129	636 673 645	23	80 82 85	7	0.25 0.23	< 0.01 < 0.01	0.12 0.12 c0.48	0.01 0.01 c0.05
		130	599		87	Mean	0.24	< 0.01	0.12	0.01
Perry UT, USA, 2009	4 (8 6 7)	127 128	2011 2048	6	75 79	7	0.42 0.41	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Montmorency		126 128	2002 1917		81–85 85	Mean	0.42	< 0.01	< 0.01	< 0.01
Royal City, WA, USA,	4 (7 7 7)	131 129	571 561	22	78 79	7	0.49 0.45	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
2009		129	561		81	Mean	0.47	< 0.01	0.01	< 0.01

Location,		g			GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Montmorency		130	561		85					

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Table 15 Residues of flutriafol in peach following application of an SC formulation in Spain (López Benet 2005 2186) (whole fruit basis)

Location, year, variety PEACH	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Crop part	Flutriafol (mg/kg)	% flesh
Bugarra, Valencia,	3 (10	31	998	3.125	77	0	Fruit	0.06	90.7
Spain, 2005 San	11)	32	1004	3.125	78	3		0.06	91
Lorenzo		31	998	3.125	80	7		0.04	92.3
						10		0.06	91.3
						14		0.03	91.4
Jumilla, Murcia,	3 (9	32	1002	3.125	78	0	Fruit	0.11	92.1
Spain, 2005	11)	31	1000	3.125	80	3		0.09	94.0
Kandros		31	1002	3.125	87	7		0.08	92.8
						10		0.05	95.0
						14		0.03	93.2
Sun Late	3 (9	31	1005	3.125	78	0	Fruit	0.11	92.4
	11)	32	1008	3.125	80	3		0.06	95.5
		32	1009	3.125	87	7		0.07	94.7
						10		0.04	93.4
						14		0.03	93.5
Jalance, Valencia,	3 (10	31	1006	3.125	74	0	Fruit	0.07	95.4
Spain, 2005	11)	33	1036	3.125	77	3		0.06	90.3
Cofrentes		31	976	3.125	81	7		0.05	92.2
						10		0.03	93.4
						14		0.04	92.6
Jumilla, Murcia,	3 (10	34	1068	3.13	77	0	Fruit	0.06	93.7
Spain, 2006 Amiga	10)	36	1146	3.13	78	7	Fruit	0.03	94.4
		34	1094	3.13	80		Juice	0.05	94.2
							Marmalade	0.02	94.9
Blanca, Murcia,	3 (11	30	958	3.13	77	0	Fruit	0.04	92.5
Spain, 2006 Elegant	10)	32	1021	3.13	78	7	Fruit	0.05	91.5
Lady		31	1000	3.13	80		Juice	0.04	93.2
							Marmalade	0.05	92.6
Summer Lady	3 (10	32	1030	3.13	77	0	Fruit	0.09	91.4
	10)	30	958	3.13	78	7		0.05	91.9
		31	993	3.13	80				
Jalance, Valencia,	3 (11	31	975	3.13	77	0	Fruit	0.12	93.0
Spain, 2006 Andru	10)	30	978	3.13	81	7		0.08	94.3
		30	961	3.13	85				

Analytical method flutriafol: LARP SOP E050/1

Table 16 Residues of flutriafol in peaches following application of an SC formulation in the USA (Carringer 2010 1807) (duplicate samples, fruit without stone)

Location,		g			GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Alton, NY, USA, 2009 Red Haven	4 (8 7 6)	128 128 128	1122 1122 1122	11	75 76 77	7	0.17 0.21	< 0.01 < 0.01	0.45 0.36 c0.24	0.02 0.02 c0.01
		128	1122		79	Mean	0.19	< 0.01	0.40	0.02
Montezuma, GA, USA, 2009	4 (7 7 7)	128 127 128	599 608 599	21	77 79 81	7	0.16 0.17	< 0.01 < 0.01	0.33 0.31 c0.26	0.03 0.02 c0.02
Summer Gold		129	589		85	Mean	0.16	< 0.01	0.32	0.02
Chula, GA, USA, 2009 Hawthorne [a]	4 (7 7 7)	128 128 128	982 963 982	13	76 77 81	7	0.26 0.21	< 0.01 < 0.01	0.15 0.18 c0.09	0.01 0.02
		127	982		85	Mean	0.24	< 0.01	0.16	0.02
Chula, GA, USA, 2009	4 (7 8 7)	127 127	664 664	19	74 74	0	0.37 0.37	< 0.01 < 0.01	0.17 0.16	0.01 0.01
June Gold [b]		127	673		75	Mean	0.37	< 0.01	0.16	0.01
		127	673		77	1	0.31 0.26	< 0.01 < 0.01	0.16 0.14	0.01 0.01
						Mean	0.28	< 0.01	0.15	0.01
						3	0.24 0.20	< 0.01 < 0.01	0.14 0.15	0.01 0.01
						Mean	0.22	< 0.01	0.14	0.01
						7	0.13 0.16	< 0.01 < 0.01	0.14 0.13 c0.13	0.01 0.01 c0.01
						Mean	0.14	< 0.01	0.14	0.01
						14	0.08 0.08	< 0.01 < 0.01	0.09 0.12	< 0.01 < 0.01
						Mean	0.08	< 0.01	0.10	< 0.01
						21	0.07 0.06	< 0.01 < 0.01	0.13 0.13	< 0.01 < 0.01
						Mean	0.06	< 0.01	0.13	< 0.01
Pikeville, NC, USA, 2009 New	4 (6 7 6)	128 129 129	1178 1160 1178	11	75 75 78	6	0.40 0.42	< 0.01 < 0.01	0.05 0.06 c0.04	< 0.01 < 0.01
Haven		130	1207		81	Mean	0.41	< 0.01	0.06	< 0.01
Deville, LA, USA,	4 (7 8 8)	131 129	673 673	19	77 81	6	0.24 0.23	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
2009 Regal		127 127	673 655		81 85	Mean	0.24	< 0.01	0.02	< 0.01
Conklin, MI, USA, 2009	4 (7 7 7)	127 128 128	2020 2011 1973	6	76 77 78	7	0.13 0.11	< 0.01 < 0.01	0.16 0.16 c0.15	< 0.01 < 0.01
Bellaire		128	1936		79-81	Mean	0.12	< 0.01	0.16	< 0.01
Blanco, TX, USA,	4 (7 7 7)	128 129	486 580	26	78 81	7	0.13 0.13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Dixieland		130 129	599 514		81 85	Mean	0.13	< 0.01	< 0.01	< 0.01
Fresno, CA, USA, 2009	4 (7 7 7)	130 131	1880 1889	7	81 81	7	0.20 0.16	< 0.01 < 0.01	0.01 0.02	< 0.01 < 0.01
Kaweah		130 130	1880 1889		85 87	Mean	0.18	< 0.01	0.02	< 0.01
Kingsburg, CA, USA, 2009	4 (7 7 7)	124 128 129	627 645 655	20	77 78 79	7	0.12 0.18	< 0.01 < 0.01	0.05 0.04 c0.06	< 0.01 < 0.01
Fayette		131	636		81	Mean	0.15	< 0.01	0.04	< 0.01
Dinuba, CA, USA, 2009	4 (7 7 7)	127 128 128	1814 1833 1852	7	78 79 81	7	0.05 0.05	< 0.01 < 0.01	0.01 0.01 c0.02	< 0.01 < 0.01
Duchess		129	1861		87	Mean	0.05	< 0.01	0.01	< 0.01

Location,		g			GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Portville, CA, USA,	4 (7 6 8)	128 129	673 673	19	81 85	7	0.16 0.20	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Alberta		129 128	683 664		85 87	Mean	0.18	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

[a] Last application 15/09/2009

[b] Last application 12/05/2009

Table 17 Residues of flutriafol in plum following application of an SC formulation in the USA (Carringer 2010 1808) (duplicate samples, fruit without stone)

Location,					GS		Residue (mg/kg)			
year, variety	No	g ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Conklin, MI, USA, 2009 Stanley	4 (7 7 7)	129 128 128	2002 2002 2011	6	77 78 79	7	0.20 0.25	< 0.01 < 0.01	0.34 0.31 c0.67	< 0.01 < 0.01 c0.02
		128	2039		85	Mean	0.22	< 0.01	0.32	< 0.01
Fresno, CA, USA, 2009 Flavor Rich	4 (7 7 7)	129 129 130	561 561 561	23	81 81 85	7	0.02 0.02	< 0.01 < 0.01	0.05 0.05 c0.04	< 0.01 < 0.01
		130	561		87	Mean	0.02	< 0.01	0.05	< 0.01
Dinuba, CA, USA, 2009 Fryer’s	4 (7 7 7)	127 127 128	1777 1861 1861	7	81 81 85	0	0.05 0.05	< 0.01 < 0.01	0.04 0.04 c0.04	< 0.01 < 0.01
		128	1814		87	Mean	0.05	< 0.01	0.04	< 0.01
						1	0.03 0.04	< 0.01 < 0.01	0.04 0.03	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.04	< 0.01
						3	0.04 0.05	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.04	< 0.01
						7	0.03 0.02	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
						Mean	0.02	< 0.01	0.04	< 0.01
						14	0.03 0.04	< 0.01 < 0.01	0.06 0.05	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.06	< 0.01
						21	0.03 0.03	< 0.01 < 0.01	0.08 0.08	< 0.01 < 0.01
						Mean	0.03	< 0.01	0.08	< 0.01
Poplar, CA, USA, 2009	4 (7 7 7)	127 128	683 617	19	81 81	7	0.10 0.11	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
French prunes		128 129	683 692		85 87	Mean	0.10	< 0.01	0.04	< 0.01
Plainview, CA, USA, 2009 prunes	4 (7 7 7)	129 129 129	1637 1655 1655	8	81 85 85	7	0.09 0.09	< 0.01 < 0.01	0.05 0.05 c0.04	< 0.01 < 0.01
(French plum)		128	1637		85	Mean	0.09	< 0.01	0.05	< 0.01
Hughson, CA, USA, 2009 French plum	4 (7 7 7)	127 127 128	608 608 608	21	81 81 81	7	0.12 0.12	< 0.01 < 0.01	0.05 0.05 c0.02	< 0.01 < 0.01
		127	608		85	Mean	0.12	< 0.01	0.05	< 0.01
Ephrata, WA, USA, 2009	4 (7 7 7)	128 128	1871 1880	7	77 79	7	0.03 0.03	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Italian		128 129	1871 1880		81 85	Mean	0.03	< 0.01	< 0.01	< 0.01
Monmouth, OR, USA, 2009 Moyer	4 (7 7 7)	130 130 129	599 599 599	22	79 81 81	7	0.07 0.06	< 0.01 < 0.01	0.13 0.12 c0.02	< 0.01 < 0.01

Location,					GS		Residue (mg/kg)			
year, variety	No	g ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
		128	589		85	Mean	0.06	< 0.01	0.12	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Table 18 Residues of flutriafol in strawberries (macro- and micro-tunnels) following application of an SC formulation in Spain (López Benet 2005 2582 Partington 2006 2583)

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
Villanueva de los	3 (10	210	1136	18.5	85	0	Fruit	0.44
Castillejos, Huelva,	10)	170	909	18.7	87	3		0.27
Spain, 2004 Ventana		170	909	18.7	87	5		0.33
						7		0.22
						10		0.05
Finca La Nina,	3 (11	232	1236	18.8	85	0	Fruit	0.14
Almonte, Huelva,	10)	170	909	18.7	87	3		0.07
Spain, 2004 Camarosa		168	897	18.7	87	5		0.09
						7		0.05
						10		0.04
Finca El Lote,	3 (11	250	1327	18.8	85	0	Fruit	0.23
Almonte, Huelva,	10)	175	939	18.6	87	3		0.15
Spain, 2004 Camarosa		170	909	18.7	87	5		0.17
						7		0.09
						10		0.06
Finca Amanto,	3 (11	238	1255	18.9	85	0	Fruit	0.49
Almonte, Huelva,	10)	172	915	18.9	87	3		0.22
Spain, 2004 Camarosa		165	885	18.6	87	5		0.25
						7		0.14
						10		0.13
Almonte, Spain, 2005	3 (10	191	1018	18.75	61	0	Fruit	0.31
Camarosa	10)	189	1009	18.75	87	1	Fruit	0.37
		199	1059	18.75	88	3	Fruit	0.24 0.32
Bonares, Spain, 2005	3 (10	195	1041	18.75	61	0	Fruit	0.29
Camarosa	10)	191	1018	18.75	87	1	Fruit	0.23
		194	1036	18.75	88	3	Fruit	0.18 0.23
Huelva, Spain, 2005	3 (10	197	1050	18.75	61	0	Fruit	0.18
Ventana [a]	10)	178	950	18.75	87	1	Fruit	0.16
		194	1032	18.75	88	3	Fruit	0.15 0.13
Ventana [a]	3 (10	194	1034	18.75	61	0	Fruit	0.37
	10)	192	1023	18.75	87	1	Fruit	0.33
		195	1041	18.75	88	3	Fruit	0.24 0.31

Analytical method flutriafol: LARP SOP E033/1

[a] Similar location, same date for last application

Table 19 Residues of flutriafol in strawberries following application of an SC formulation in the USA and Canada (Carringer 2011 2158) (duplicate samples, applications include non-ionic surfactant)

Location, year,					GS		Residue (mg/kg)			
variety	No	g ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
East Williamson,	4 (4 7 7)	129 128	281 281	46	73 74	0	0.19 0.09	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
NY, USA, 2010 Idea		129 126	281 281		75 87	Mean	0.14	< 0.01	< 0.01	< 0.01
Seven Springs, NC, USA, 2010	4 (7 8 6)	129 123	430 412	30	86 86	0	0.19 0.30	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Camino Real		131 126	421 402		87 88	Mean	0.24	< 0.01	0.01	< 0.01
Lawtly, FL,	4 (7	128	262	49	71–73	0	0.42 0.31	< 0.01	0.07	< 0.01

Location, year,					GS		Residue (mg/kg)			
variety	No	g ai/ha	L/ha	g ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
USA, 2010	7 8)	128	253		81			< 0.01	0.07	< 0.01
Camarosa		127 130	262 262		85 87	Mean	0.36	< 0.01	0.07	< 0.01
Richland, IA, USA, 2010	4 (8 6 7)	130 123	262 243	50	65 81	0	0.41 0.42	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Extra sweet		126 127	253 243		81 87	Mean	0.42	< 0.01	0.02	< 0.01
Brantford ON, CAN, 2010	4 (7 8 7)	131 131	355 355	37	59–65 61–71	0	0.58 0.52	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Sapphire		136 127	365 337		67–73 81–87	Mean	0.55	< 0.01	0.01	< 0.01
Brampton, ON, CAN, 2010	5 (7 7	137 130	365 346	38	59–65 65–67	0 (after 4th)	0.58 0.73	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Mira	8 8)	128 136	346 365		65–73 67–73	Mean	0.66	< 0.01	0.01	< 0.01
		135	355	38	85–87	0 (after 5th)	0.43 0.47	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
						Mean	0.45	< 0.01	0.01	< 0.01
Salinas, CA, USA, 2010	4 (6 8	126 121	449 430	28	71–81 83	0	0.73 0.53	< 0.01 < 0.01	0.08 0.07	< 0.01 < 0.01
Albion	7)	129 132	468 486		73–85 89	Mean	0.63	< 0.01	0.08	< 0.01
Porterville, CA, USA, 2010	4 (6 8 7)	129 127	327 327	39	71–83 73–83	0	0.31 0.29	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Diamante [a]		129 128	327 327		71–83 85–87	Mean	0.30	< 0.01	0.02	< 0.01
Porterville, CA, USA, 2010	4 (7 7 6)	127 127	290 290	44	73–81 73–81	0	0.67 0.78	< 0.01 < 0.01	0.07 0.06	< 0.01 < 0.01
Diamante [b]		128	327		73–85	Mean	0.72	< 0.01	0.06	< 0.01
		128	327		85–87	1	0.63 0.47	< 0.01 < 0.01	0.09 0.06	< 0.01 < 0.01
						Mean	0.55	< 0.01	0.08	< 0.01
						3	0.69 0.52	NA	NA	NA
						Mean	0.60			
						5	0.42 0.54	< 0.01 < 0.01	0.09 0.08	< 0.01 < 0.01
						Mean	0.48	< 0.01	0.08	< 0.01
						7	0.13 0.15	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
						Mean	0.14	< 0.01	0.02	< 0.01
						10	0.08 0.08	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
						Mean	0.08	< 0.01	0.02	< 0.01
Elmira, OR, USA, 2010	4 (7 7 6)	129 127	290 281	20	73–85 73–85	0	0.44 0.45	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Benton		131 127	299 281		73–85 87	Mean	0.44	< 0.01	0.01	< 0.01

Induce 0.25% v/v, Induce 0.14–0.28% v/v, Induce 0.25% v/v, Activator 90 0.25% v/v, Agral 90 0.5% v/v, Agral 90 0.5% /v, Pro 90 0.25% v/v, Pro 90 0.5% v/v, Pro 90 0.25% v/v, Dyne-Amic 0.25% v/v.

NA=not analysed

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

[a] Last application 16/06/2010

[b] Last application 02/06/2010, different location to other Porterville trial [a]

Table 20 Residues of flutriafol in cabbage and broccoli following application of an SC formulation in the USA (Carringer 2013 2697) (duplicate samples, applications include non-ionic surfactant)

Location, year,				GS			Residue (mg/kg)			
variety	No	g ai/ha	L/ha	(BBCH)	DALA	Sample	Flutriafol	T	TA	TAA

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Sample	Residue (mg/kg) Flutriafol	T	TA	TAA
CABBAGE										
Alton, NY, USA, 2012 Blue lagoon	4 (7 7	128 127 127	281 281 281	18 41 42	0	Heads	2.64 2.68	< 0.01 < 0.01	0.12 0.13 c0.08	< 0.01 0.01
	7)	128	281	46	Mean		2.66	< 0.01	0.12	< 0.01
					3	Heads	0.62 0.79	< 0.01 < 0.01	0.14 0.12	< 0.01 < 0.01
					Mean		0.70	< 0.01	0.13	< 0.01
					7	Heads	0.46 0.43	< 0.01 < 0.01	0.12 0.13	< 0.01 < 0.01
					Mean		0.44	< 0.01	0.12	< 0.01
					10	Heads	0.33 0.33	< 0.01 < 0.01	0.08 0.11	< 0.01 < 0.01
					Mean		0.33	< 0.01	0.10	< 0.01
					14	Heads	0.30 0.27	< 0.01 < 0.01	0.10 0.12	< 0.01 < 0.01
					Mean		0.28	< 0.01	0.11	< 0.01
Seven Springs, NC, USA, 2011 Bravo	4 (7 7	129 129 131	290 299 299	41 41 42	7	Heads	0.80 0.68	< 0.01 < 0.01	0.04 0.04 c0.02	< 0.01 < 0.01
	7)	127	290	44	Mean		0.74	< 0.01	0.04	< 0.01
Oviedo, FL USA, 2011 Cheers	4 (6 6	128 127 128	281 281 281	42 44 46	8	Heads	0.22 0.18	< 0.01 < 0.01	0.05 0.05 c0.02	< 0.01 < 0.01
	7)	128	281	48	Mean		0.20	< 0.01	0.05	< 0.01
Conklin, MI, USA, 2012 Megaton	4 (7 7	129 129 128	48 49 47	41–42 42–43 43–44	7	Heads	0.13 0.08	< 0.01 < 0.01	0.07 0.07 c0.02	< 0.01 < 0.01
	7)	128	47	46–47	Mean		0.10	< 0.01	0.07	< 0.01
Uvalde, TX, USA, 2011	4 (7	128 127	187 178	46 47	7	Heads	0.07 0.08	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Pennant	7	131	168	48	Mean		0.08	< 0.01	0.01	< 0.01
	7)	128	206	49						
Porterville, CA, USA, 2011	4 (7	127 130	45 50	45 47	7	Heads	0.13 0.05	< 0.01 < 0.01	0.03 0.04	< 0.01 < 0.01
Supreme	7	128	48	48	Mean		0.09	< 0.01	0.04	< 0.01
Vantage	7)	129	49	49						
BROCCOLI										
Uvalde, TX, USA, 2011	4 (7	128 128	47 47	41 43	6	Heads	0.18 0.10	< 0.01 < 0.01	0.04 0.03	< 0.01 < 0.01
Green Magic	7 7)	128 128	47 47	43 48	Mean		0.14	< 0.01	0.04	< 0.01
Porterville, CA, USA, 2012	4 (7	128 128	365 365	42 45	0	Heads	0.24 0.24	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
Heritage [a]	7	128	365	45	Mean		0.24	< 0.01	0.04	< 0.01
	7)	129	365	49	3	Heads	0.11 0.07	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
					Mean		0.09	< 0.01	0.04	< 0.01
					7	Heads	0.07 0.08	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
					Mean		0.08	< 0.01	0.04	< 0.01
					10	Heads	0.12 0.08	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
					Mean		0.10	< 0.01	0.04	< 0.01
					14	Heads	0.07 0.07	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
					Mean		0.07	< 0.01	0.04	< 0.01
King City, CA, USA, 2011 Legacy	4 (7 7	128 131 130	299 309 309	46 47 47	7	Heads	0.20 0.17	< 0.01 < 0.01	0.02 0.02 c0.01	< 0.01 < 0.01
	6)	128	299	49	Mean		0.18	< 0.01	0.02	< 0.01
Porterville, CA,	4	129	48	47	7	Heads	0.21 0.27	< 0.01	0.10	< 0.01

Location, year,				GS			Residue (mg/kg)			
variety	No	g ai/ha	L/ha	(BBCH)	DALA	Sample	Flutriafol	T	TA	TAA
USA, 2011 Heritage [b]	(6 7	129 129	47 49	47 47				< 0.01	0.09 c0.02	< 0.01
	7)	129	48	49	Mean		0.24	< 0.01	0.10	< 0.01
Santa Maria, CA, USA, 2011	4 (8	128 128	281 281	41 43	7	Heads	0.36 0.34	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Heritage	7 6)	130 128	281 281	43 46	Mean		0.35	< 0.01	0.02	< 0.01
Hilsboro, OR, USA, 2011 Bay Meadows	4 (8 7	162 123 127	187 187 187	18–19 21 42–43	7	Heads	0.05 0.08	< 0.01 < 0.01	0.51 0.52 c0.20	< 0.01 < 0.01
	7)	127	187	42	Mean		0.06	< 0.01	0.52	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.5% v/v, Induce 0.29-0.41% v/v, Triangle D-W Surfactant 0.25% v/v, R11 0.06% v/v, Induce 0.25% v/v, Pro 90 0.25% v/v, Induce 0.25% v/v, Pro 90 0.5% v/v, Pro 90 0.5% v/v, Pro 90 0.5% v/v, DyneAmic 0.38% v/v, Induce 0.13% v/v

[a] Last application 29/05/2012

[b] Last application 29/11/2011, different location to other Porterville trial [a]

Table 21 Residues of flutriafol in cucumber application of an SC formulation in the USA (Carringer 2012 2439) (duplicate samples, applications include non-ionic surfactant)

Location, year,		g		g	GS		Residue (mg/kg)			
variety	N	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Seven Springs, NC, USA, 2011 Lancer 152	4 (7 7 7)	129 131 129	150 159 159	82	14 51 61	0	0.05 0.07	< 0.01 < 0.01	0.10 0.12 c0.03	< 0.01 < 0.01
		128	159		71	Mean	0.06	< 0.01	0.11	< 0.01
						3	0.05 0.07	< 0.01 < 0.01	0.15 0.15	< 0.01 < 0.01
						Mean	0.06	< 0.01	0.15	< 0.01
						7	0.02 0.04	< 0.01 < 0.01	0.14 0.14	< 0.01 < 0.01
						Mean	0.03	< 0.01	0.14	< 0.01
						10	0.03 0.02	< 0.01 < 0.01	0.15 0.18	< 0.01 < 0.01
						Mean	0.02	< 0.01	0.16	< 0.01
						14	0.02 0.02	< 0.01 < 0.01	0.32 0.24	< 0.01 < 0.01
						Mean	0.02	< 0.01	0.28	< 0.01
Chula, GA, USA, 2011 Thunder	4 (7 7 7)	128 127 129	46 47 46	278	54 68 75	0	0.02 0.03	< 0.01 < 0.01	0.06 0.06 c0.02	< 0.01 < 0.01
		127	46		78	Mean	0.02	< 0.01	0.06	< 0.01
Newberry, FL, USA, 2011 Thunder	4 (7 7 7)	128 124 131	225 253 234	57	54 67 72	0	0.04 0.04	< 0.01 < 0.01	0.05 0.05 c0.01	< 0.01 < 0.01
		126	234		77	Mean	0.04	< 0.01	0.05	< 0.01
Conklin, MI, USA, 2011	4 (7 7 7)	129 127	215 215	60	63 69	0	0.03 0.04	< 0.01 < 0.01	0.09 0.09	< 0.01 < 0.01
Impact		128 128	206 206		70 73	Mean	0.04	< 0.01	0.09	< 0.01
Delavan, WI, USA, 2011	4 (7 7 7)	129 128	196 206	66	82 83	0	0.02 0.01	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Marketmore 76		129 130	196 206		84 89	Mean	0.02	< 0.01	0.02	< 0.01
Richland, IA, USA, 2011 Straight Eight	4 (7 6 7)	129 129 128	150 150 150	86	65 67 75	0	0.04 0.03	< 0.01 < 0.01	0.05 0.04 c0.03	< 0.01 < 0.01
		129	140		88	Mean	0.04	< 0.01	0.04	< 0.01
Branchton, ON,	4 (7	114	43	265	71	0	0.06 0.05	< 0.01	0.06	< 0.01

Location, year,		g		g	GS		Residue (mg/kg)			
variety	N	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
CAN, 2011 Talladega	7 7)	117 129	41 49		85 87-89			< 0.01	0.06 c0.03	< 0.01
		126	47		89	Mean	0.06	< 0.01	0.06	< 0.01
Uvalde, TX, USA, 2011	4 (7 7 7)	130 129	187 253	51	71 75	0	0.05 0.04	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
Stonewall		127 132	243 234		77 79	Mean	0.04	< 0.01	0.03	< 0.01
Hillsboro, OR, USA, 2011 Raider F1	4 (7 7 7)	127 131 129	234 243 234	54	51-71 61-83 61-83	0	0.03 0.03	< 0.01 < 0.01	0.05 0.05 c0.07	< 0.01 < 0.01
		129	234		61-85	Mean	0.03	< 0.01	0.05	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.4–0.5% v/v, Induce 0.25% v/v, Induce 0.25% v/v, R-11 0.06% v/v, Preference 0.5% v/v, Preference 0.25% v/v, Agral 90 0.25% v/v, Induce 0.25–0.26% v/v, Induce 0.5% v/v

Table 22 Residues of flutriafol in summer squash application of an SC formulation in the USA (Carringer 2012 2439) (duplicate samples, applications include non-ionic surfactant)

Location, year,		g		g	GS		Residue (mg/kg)			
variety	N	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Alton, NY, USA, 2011Superpik F1	4 (7 7 7)	127 129 128 129	281 290 281 290	45 44 46 44	63 65 71 75	0	0.05 0.05	< 0.01 < 0.01	0.04 0.06	< 0.01 < 0.01
						Mean	0.05	< 0.01	0.05	< 0.01
Chula, GA, USA, 2011 Dixie	4 (7 7 7)	127 129 130 131	234 234 243 243	54 55 53 53	15 62 81 89	0	0.04 0.05	< 0.01 < 0.01	0.08 0.07 c0.04	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.08	< 001
Newberry, FL, USA, 2011 Dixie	4 (7 7 7)	128 128 124 127	234 234 225 234	55 55 55 54	16 61 71 89	0	0.05 0.05	< 0.01 < 0.01	0.07 0.11	< 0.01 < 0.01
						Mean	0.05	< 0.01	0.09	< 0.01
Conklin, MI, CAN, 2011 Black Beauty	4 (7 7 7)	129 128 128 128	225 215 215 206	57 60 60 62	12 63 70 71	0	0.04 0.03	< 0.01 < 0.01	0.06 0.06	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.06	< 0.01
Richland, IA, USA, 2011 Black Beauty	4 (8 7 7)	128 131 129 129	159 168 206 206	81 78 63 63	51 54 73 86	0	0.06 0.06	< 0.01 < 0.01	< 0.03 0.03	< 0.01 < 0.01
						Mean	0.06	< 001	< 0.03	< 0.01
Branchton, ON, CAN, 2011 Senator	4 (7 7 7)	126 130 130 123	49 49 48 45	257 265 265 273	69–72 84–89 85–89 70–89	0	0.06 0.07	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
						Mean	0.06	< 0.01	0.04	< 0.01
Porterville, CA, USA, 2011	4 (6 8 7)	127	49	259	62	0	0.05 0.05	< 0.01 < 0.01	0.03 < 0.03	< 0.01 < 0.01
						Mean	0.05	< 0.01	< 0.03	< 0.01
Black Beauty		129	49	263	65	3	0.05 0.06	< 0.01 < 0.01	0.05 0.04	< 0.01 < 0.01
						Mean	0.06	< 0.01	0.04	< 0.01
		126	48	263	72	7	0.03 0.03	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
						Mean	0.03	< 0.01	0.04	< 001
		128	49	261	74	10	0.03 0.03	< 0.01	0.04	< 0.01

Location, year,		g		g	GS		Residue (mg/kg)			
variety	N	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
								< 0.01	0.04	< 0.01
						Mean	0.03	< 001	0.04	< 0.01
						14	0.03 0.03	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
						Mean	003	< 001	0.04	< 0.01
Hillsboro, OR, USA, 2011 Zucchini RSQ5119	4 (7 7 7)	128 131 128 128	234 243 234 234	55 54 55 55	51–71 61–83 61–83 61–85	0	0.04 0.04	< 0.01 < 0.01	0.03 < 0.03	< 0.01 < 0.01
						Mean	0.04	< 0.01	< 0.03	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.5% v/v, Induce 0.25% v/v, Induce 0.25% v/v, R-11 0.06% v/v, Preference 0.25–0.26% v/v, Agral 90 0.24–0.25% v/v, Pro 90 0.25% v/v, Induce 0.5% v/v

Table 23 Residues of flutriafol in muskmelon application of an SC formulation in the USA (Carringer 2012 2439) (duplicate samples, applications include non-ionic surfactant)

Location, year,		g		g	GS			Residue (mg/kg)			
variety	N	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Sample	Flutriafol	T	TA	TAA
Chula, GA, USA, 2011	4 (7 6 6)	127 131	234 159	54 82	73 76	0	Fruit	0.06 0.08	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Athena		129	150	86	83	Mean		0.07	< 0.01	0.02	< 0.01
		128	150	86	89	0	Pulp	0.01 < 0.01	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
						Mean		< 0.01	< 0.01	0.03	< 0.01
						0	Peel	0.17 0.13	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
						Mean		0.15	< 0.01	0.02	< 0.01
Conklin, MI, USA, 2011	4 (7 7 7)	128 128	206 206	62 62	70 70	0	Fruit	0.04 0.05	< 0.01 < 0.01	0.07 0.07	< 0.01 < 0.01
Minerva		127	215	59	70	Mean		0.04	< 0.01	0.07	< 0.01
		127	206	62	87–89	0	Pulp	0.01 0.02	< 0.01 < 0.01	0.06 0.06	< 0.01 < 0.01
						Mean		0.02	< 0.01	0.06	< 0.01
						0	Peel	0.12 0.13	< 0.01 < 0.01	0.06 0.07	< 0.01 < 0.01
						Mean		0.12	< 0.01	0.06	< 0.01
Richland, IA, USA, 2011	4 (7 7 7)	129 129	159 196	81 66	71 74	0	Fruit	0.10 0.10	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
Delicious 51		129 131	196 196	66 67	82 89	Mean		0.10	< 0.01	0.03	< 0.01
Branchton, ON, CAN, 2011	4 (7 7 7)	129 118	46 43	280 274	79–82 71–81	0	Fruit	0.13 0.11	< 0.01 < 0.01	0.06 0.05	< 0.01 < 0.01
Primo		141 124	52 44	271 282	86–88 89	Mean		0.12	< 0.01	0.06	< 0.01
Uvalde, TX, USA, 2011	4 (7 7 7)	129 130	253 253	51 51	69 71	0	Fruit	0.09 0.12	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Rocket F1		127	225	56	72	Mean		0.10	< 0.01	< 0.01	< 0.01
		129	225	56	82	0	Pulp	< 0.01 < 0.01	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
						Mean		< 0.01	< 0.01	0.01	< 0.01
						0	Peel	0.15 0.22	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean		0.18	< 0.01	< 0.01	< 0.01
Porterville, CA, USA, 2011	4 (7 7 7)	129 128	262 262	49 49	71 79	0	Fruit	0.01 0.01	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Green Flesh		129	262	49	82	Mean		0.01	< 0.01	0.01	< 0.01
		128	262	49	88	3	Fruit	0.01 0.02	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01

Location, year, variety	N	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Sample	Residue (mg/kg) Flutriafol	T	TA	TAA
						Mean		0.02	< 0.01	0.01	< 0.01
						7	Fruit	< 0.01 < 0.01	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
						Mean		< 0.01	< 0.01	0.02	< 0.01
						10	Fruit	< 0.01 < 0.01	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
						Mean		< 0.01	< 0.01	0.02	< 0.01
						14	Fruit	< 0.01 0.03[AB] [0.03 0.03 0.02]	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
						Mean		0.02	< 0.01	0.02	< 0.01
Visalia, CA, USA, 2011	4 (7 7 7)	128 129	51 51	251 253	86 87	0	Fruit	0.08 0.09	< 0.01 < 0.01	0.05 0.05	< 0.01 < 0.01
Hale's Best Jumbo		128 131	51 53	251 247	88 89	Mean		0.08	< 0.01	0.05	< 0.01
Porterville; CA, USA, 2011	4 (7 7 7)	127 128	262 262	48 49	86 87	0	Fruit	0.10 0.15	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Hale's Best		128	262	49	88	Mean		0.12	< 0.01	0.02	< 0.01
Jumbo		128	262	49	89	0	Pulp	0.02 0.02	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
						Mean		0.02	< 0.01	0.02	< 0.01
						0	Peel	0.23 0.20	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
						Mean		0.22	< 0.01	0.02	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.25% v/v, R-11 0.06% v/v, Preference 0.25% v/v, Agral 90 0.25% v/v, Induce 0.25-0.26% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Induce 0.5% v/v, Induce 0.25% v/v

[a] Mean of triplicate analysis, individual results in brackets

[b] Last application 19/08/2011

[c] Last application 21/09/2011, same location as other Porterville trial [b] but considered independent as one month between crops and different varieties involved

Table 24 Residues of flutriafol in greenhouse tomato from trials in Spain using an SC formulation (Gimeno 2004a 1263; Gimeno 2004b 1267;Lópaz Benet 2004 1262, Lópaz Benet 2004 1266)

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
Picasent, Valencia,	3	179	1017	18.75	83	0	Fruit	0.07
Spain, 2003 Bou	(10	179	1017	18.75	85	3		0.11
	10)	174	989	18.75	87	7		0.15
						14		0.16
						21		0.09
Meliana, Valencia,	3	176	1000	18.75	83	0	Fruit	0.16
Spain, 2003 Gardel	(10	176	1000	18.75	85	3		0.23
	10)	175	1000	18.75	87	7		0.24
						14		0.18
						21		0.18
El Ejido, Almeria,	3	178	1014	18.75	82	0	Fruit	0.16
Spain, 2003 Brillante	(10	178	1014	18.75	84	3		0.14
	10)	175	993	18.75	87	7		0.06
						14		0.1
						21		0.1
El Ejido, Almeria,	3	180	1029	18.75	82	0	Fruit	0.24
Spain, 2003 Zinal	(10	176	1000	18.75	84	3		0.15
	10)	180	1029	18.75	87	7		0.15

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
						14		0.14
						21		0.09
Picasent, Valencia,	3	188	1004	18.75	87	0	Fruit	0.15
Spain, 2004	(10	187	996	18.75	88	3	Fruit	0.19
Marmande Raf	10)	190	1019	18.75	89	3	Preserved	0.05
						3	Juice	0.07
						7	Fruit	0.17
						7	Preserved	0.06
						7	Juice	0.06
Meliana, Valencia,	3	185	989	18.75	87	0	Fruit	0.12
Spain, 2004 Gardel	(10	183	976	18.75	88	3	Fruit	0.09
	10)	184	979	18.75	89	3	Preserved	0.05
						3	Juice	0.05
						7	Fruit	0.13
						7	Preserved	0.05
						7	Juice	0.04
Almeria, Spain, 2004	3	183	975	18.75	81	0	Fruit	0.18
Durintia	(10	188	1000	18.75	83	3	Fruit	0.14
	11)	184	980	18.75	85	3	Preserved	0.08
						3	Juice	0.08
						7	Fruit	0.15
						7	Preserved	0.06
						7	Juice	0.07
Almeria, Spain, 2004	3[a]	225	1200	18.75	81	0	Fruit	0.15
Tirade		228	1220	18.75	82	3	Fruit	0.16
		224	1200	18.75	82	3	Preserved	0.11
						3	Juice	0.12
						7	Fruit	0.15
						7	Preserved	0.13
						7	Juice	0.1

Table 25 Residues of flutriafol in tomato following application of an SC formulation in the USA (Carringer 2012 2440) (duplicate samples, applications include non-ionic surfactant)

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Germansville, PA, USA, 2011	4 (7	131 132	48 48	273	81 83	0	0.08 0.06	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Mountain Spring	7 7)	135 132	49 49		85 87	Mean	0.07	< 0.01	< 0.01	< 0.01
Seven Springs, NC, USA, 2011 Homestead	4 (7 7	131 129 127	159 159 159	82	61 71 72	0	0.10 0.13	< 0.01 < 0.01	0.06 0.06 c0.02	< 0.01 < 0.01
	7)	129	159		82	Mean	0.12	< 0.01	0.06	< 0.01
Greenville, FL, USA, 2011 Amelia	4 (7 7	128 127 128	234 225 225	55	71 74 79	0	0.17 0.13	< 0.01 < 0.01	0.01 0.02 c0.03	< 0.01 < 0.01
	7)	127	225		79	Mean	0.15	< 0.01	0.02	< 0.01
Greenville, FL, USA, 2011 6-02	4 (7 7	128 128 128	243 253 253	53	73 75 77	0	0.12 0.12	< 0.01 < 0.01	0.02 0.02 c0.01	< 0.01 < 0.01
	7)	128	262		81	Mean	0.12	< 0.01	0.02	< 0.01
Richland, IA, USA, 2011 Rutgers	4 (7 7	129 128 130	140 206 140	92	72 75 81	0	0.07 0.04	< 0.01 < 0.01	< 0.01 0.01 c0.01	< 0.01 < 0.01
	7)	131	140		87	Mean	0.06	< 0.01	< 0.01	< 0.01
Carlyle, IL, USA, 2011 La Roma	4 (7 7	127 128 129	243 253 253	52	71 76 79	0	0.06 0.06	< 0.01 < 0.01	0.04 0.05 c0.03	< 0.01 < 0.01
	7)	129	262		81	Mean	0.06	< 0.01	0.04	< 0.01

Location, year,		g		g	GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Wyoming, IL, USA, 2011 Better Boy	4 (7 7	127 129 127	178 187 187	71	78–79 81 82–83	0	0.07 0.05	< 0.01 < 0.01	0.02 0.02 c0.01	< 0.01 < 0.01
	7)	130	187		85	Mean	0.06	< 0.01	0.02	< 0.01
Delavan, WI, USA, 2011 Sweet	4 (7	129 129	225 206	57	74 79	0	0.12 0.08	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Treat (cherry)	7 7)	128 129	196 196		83 89	Mean	0.10	< 0.01	< 0.01	< 0.01
Sparta, MI, USA, 2011 Sunoma	4 (7	128 128	206 206	62	71 80	0	0.05 0.05	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
(Red Roma)	7 7)	128 127	206 206		81–82 83	Mean	0.05	< 0.01	< 0.01	< 0.01
Conklin, MI, USA, 2011 Big	4 (7	128 127	215 206	60	71 80	0	0.04 0.05	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Beef	7 7)	128 127	215 215		81–82 82–83	Mean	0.04	< 0.01	< 0.01	< 0.01
Branchton, ON, CAN, 2011 Biltmore	4 (7 7	122 132 131	46 47 47	265	69 69 79–81	0	0.06 0.07	< 0.01 < 0.01	0.03 0.05 c0.05	< 0.01 < 0.01
	7)	123	46		73–79	Mean	0.06	< 0.01	0.04	< 0.01
Burford, ON, CAN, 2011 Sweet Million	4 (7 7	128 122 121	290 281 290	44	79–80 81–82 85–86	0	0.32 0.34	< 0.01 < 0.01	0.02 0.02 c0.01	< 0.01 < 0.01
(cherry)	7)	119	290		87	Mean	0.33	< 0.01	0.02	< 0.01
Porterville, CA, USA, 2011 Roma	4 (7	130 130	299 299	43	87 88	0	0.14 0.15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
VF [a]	8 6)	131 129	290 299		89 89	Mean	0.14	< 0.01	< 0.01	< 0.01
	4 (7	637 642	299 290	213	87 88	0	0.63 0.47	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
	8 6)	641 644	290 299		89 89	Mean	0.55	< 0.01	< 0.01	< 0.01
Champion [a]	4 (7	129 128	262 262	49	83 85	0	0.09 0.12	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
(Fresh Market)	7	128	262		87	Mean	0.10	< 0.01	< 0.01	< 0.01
	7)	128	262		88	3	0.08 0.13	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.10	< 0.01	< 0.01	< 0.01
						7	0.08 0.09	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
						Mean	0.08	< 0.01	< 0.01	< 0.01
						14	0.05 0.05	< 0.01 < 0.01	< 0.01 0.02	< 0.01 < 0.01
						Mean	0.05	< 0.01	< 0.02	< 0.01
						21	0.08 0.09	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
						Mean	0.08	< 0.01	0.01	< 0.01
Visalia, CA, USA, 2011 AB2	4 (7	127 128	51 51	249	86 87	0	0.09 0.16	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
(Roma Processing)	7 7)	127 129	51 51		88 89	Mean	0.12	< 0.01	0.01	< 0.01
King City, CA, USA, 2011	4 (7	128 129	281 290	46	85 86	0	0.07 0.10	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Champion (Fresh Market)	7 7)	129 129	290 281		88 89	Mean	0.08	< 0.01	< 0.01	< 0.01
Porterville, CA, USA, 2011 AB2	4 (7	128 128	309 309	41	79 86	0	0.17 0.18	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
(Roma Processing) [b]	7 7)	128 129	309 309		87 89	Mean	0.18	< 0.01	< 0.01	< 0.01
Corning, CA, USA, 2011 Sun	4 (7	132 132	187 187	71	81 83	0	0.38 0.43	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
6366	7	132	187		87	Mean	0.40	< 0.01	0.02	< 0.01

Location, year,		g		g	GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
	7)	131	187		89					
Paso Robles, CA, USA, 2011	4 (6	130 128	384 374	34	84 85	0	0.42 0.42	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Washington cherry	7 7)	129 128	374 374		87 88	Mean	0.42	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.125% v/v, Induce 0.3–0.48% v/v, Induce 0.25% v/v, Induce 0.25% v/v, Preference 0.25% v/v, NIS 0.25% v/v, Aquagene 90 0.05% v/v, preference 0.5% v/v, R-11 0.065% v/v, R-11 0.064% v/v, Agral 90 0.25% v/v, Agral 90 0.25% v/v, Pro 90 0.5% v/v, Pro 90 0.5% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, R-11 0.096% v/v, Dyne-Amic 0.5% v/v.

[a] Last application 12/09/2011 for Roma VF and 14/09/2011 for Champion

[b] Last application 08/08/2011, also different location to other Porterville trial [a]

Table 26 Residues of flutriafol in pepper following application of an SC formulation in the USA (Carringer 2012 2440) (duplicate samples, applications include non-ionic surfactant)

Location, year,		g		g	GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Seven Springs, NC, USA, 2011 California	4 (7 7	130 129 131	159 159 168		53 71 81	0	0.16 0.14	< 0.01 < 0.01	0.07 0.07 c0.02	< 0.01 < 0.01
Wonder (Bell)	7)	129	159		89	Mean	0.15	< 0.01	0.07	< 0.01
Greenville, FL, USA, 2011	4 (7	128 127	196 187		71 73	0	0.09 0.10	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
Aristotle (Bell)	7 7)	128 126	196 196		75 77	Mean	0.10	< 0.01	0.03	< 0.01
Delavan, WI, USA, 2011 California	4 (7 7	129 129 128	225 206 196		74 79 83	0	0.03 0.03	< 0.01 < 0.01	0.02 0.02 c0.01	< 0.01 < 0.01
Wonder (Bell)	7)	128	196		89	Mean	0.03	< 0.01	0.02	< 0.01
Conklin, MI, USA, 2011 Aristotle (Bell)	4 (7 7	127 127 127	206 206 206		71 72 73	0	0.07 0.06	< 0.01 < 0.01	0.03 0.03 c0.01	< 0.01 < 0.01
	7)	128	206		74	Mean	0.06	< 0.01	0.03	< 0.01
Sparta, MI, USA, 2011 Sopron	4 (7	128 128	206 206		71 72	0	0.08 0.08	< 0.01 < 0.01	< 0.01, < 0.01	< 0.01 < 0.01
(non-bell, large banana)	7 7)	128 128	206 206		73 74–75	Mean	0.08	< 0.01	< 0.01	< 0.01
Burford OR Canada, 2011 Aristotle (Bell) [a]	4 (7 7	127 123 124	47 45 47		69–73 79–85 82–84	0	0.05 0.07	< 0.01 < 0.01	0.03 0.03 c0.01	< 0.01 < 0.01
	7)	123	46		83–84	Mean	0.06	< 0.01	0.03	< 0.01
Burford OR Canada, 2011 Crimson hot	4 (7 7	133 135 129	299 318 299		65–71 73–82 81–87	0	0.08 0.15	< 0.01 < 0.01	0.07 0.06 c0.02	< 0.01 < 0.01
(chilli) [b]	7)	132	309		85–87	Mean	0.12	< 0.01	0.06	< 0.01
Uvalde TX, USA, 2011 Tauras	4 (7	128 131	159 150		Mature 82	0	0.14 0.14	< 0.01 < 0.01	< 0.01, < 0.01	< 0.01 < 0.01
(Bell)	7	129	150		83	Mean	0.14	< 0.01	< 0.01	< 0.01
	7)	131	140		85	2	0.14 0.10	< 0.01 < 0.01	< 0.01, < 0.01	< 0.01 < 0.01
						Mean	0.12	< 0.01	< 0.01	< 0.01
						7	0.08 0.09	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01
						Mean	0.08	< 0.01	< 0.01	< 0.01
						14	0.04 0.05	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.02	< 0.01

Location, year,		g		g	GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
						21	0.04 0.05	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
						Mean	0.04	< 0.01	0.02	< 0.01
Levelland TX, USA, 2011	4 (7	129 129	187 187		Start frt Fruiting	0	0.31 0.31	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
Jalapeno M (chilli)	7 7)	128 130	187 187		Most mat	Mean	0.31	< 0.01	0.03	< 0.01
Porterville, CA, USA, 2011 P33R	4 (7	129 133	49 50		48 48	0	0.18 0.14	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
(Bell) [c]	7 7)	129 129	48 49		49 49	Mean	0.16	< 0.01	0.01	< 0.01
King City, USA, 2011 P33R	4 (7	128 128	299 290		48 48	0	0.11 0.11	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
(Bell) [e]	7 7)	128 129	290 299		48 49	Mean	0.11	< 0.01	0.01	< 0.01
Porterville, CA, USA, 2011	4 (7	131 128	290 290		47 48	0	0.22 0.19	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
Fresno (chilli) [d]	7 7)	130 133	299 318		48 49	Mean	0.20	< 0.01	0.02	< 0.01
King City, USA, 2011 Serrano	4 (7	131 128	299 299		47 49	0	0.26 0.26	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
(chilli) [f]	7 7)	127 128	290 299		49 49	Mean	0.26	< 0.01	0.02	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.3–0.48% v/v, Induce 0.25% v/v, Preference 0.5% v/v, R-11 0.063% v/v, R-11 0.063% v/v, Agral 90 0.25% v/v, Agral 90 0.25% v/v, Induce 0.25% v/v, R-11 0.23% v/v, Pro 90 0.25% v/v, Pro 90 0.5% v/v, Pro 90 0.25% v/v, Pro 90 0.5% v/v.

[a] Last application 02/09/2011

[b] Last application 26/08/2011, same location but different varieties with significantly different residues potential

[c] Last application 11/08/2011

[d] Last application 10/08/2011, different location and different varieties with significantly different residues potential

[e] Last application 09/09/2011

[f] Last application 30/09/2011, location close but different varieties with significantly different residues potential and different application times

Table 27 Residues of flutriafol in lettuce (head and leaf) following application of an SC formulation in the USA (Carringer 2013 2698) (duplicate samples, applications include non-ionic surfactant)

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Crop part	Flutriafol	T	TA	TAA
HEAD LETTUCE										
Germansville, PA, USA, 2012	4 (6	131 132	48 49	Vegetative Early	7	Heads	0.05 0.05	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Ithaca (head)	6	130	48	head	Mean		0.05	< 0.01	0.01	< 0.01
	7)	136	50	formation Heads 5–						
				10 cm dia Heads 15– 20 cm dia						
Oviedo, FL, USA, 2011 Great	4 (7	127 127	281 281	41 42	7	Heads	0.15 0.14	0.04, 0.03	< 0.01 < 0.01	< 0.01 < 0.01
Lakes (head)	7 7)	128 127	281 281	45 48	Mean		0.14	0.04	< 0.01	< 0.01
Porterville, CA, USA, 2011	4 (7	128 129	309 318	41 43	0	Heads	0 82 1.17	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Vandenberg	7	128	309	46	Mean		1.00	< 0.01	< 0.01	< 0.01
(head) [a]	7)	128	309	47	2	Heads	0.12 0.20	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.16	< 0.01	< 0.01	< 0.01
					7	Heads	0.28 0.17	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Crop part	Flutriafol	T	TA	TAA
					Mean		0.22	< 0.01	< 0.01	< 0.01
					10	Heads	0.19 0.30	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.20	< 0.01	< 0.01	< 0.01
					14	Heads	0.07 0.06	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.06	< 0.01	< 0.01	< 0.01
King City, CA, USA, 2011	4 (8	128 128	281 281	44 45	7	Heads	0.46 0.46	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Venus (head)	7	128	281	47	Mean		0.46	< 0.01	< 0.01	< 0.01
	7)	127	281	48						
Porterville, CA, USA, 2011	4 (7	126 126	49 50	44 45	7	Heads	0.08 0.08	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Vandenberg (head) [b]	7 7)	130 128	50 48	47 48	Mean		0.08	< 0.01	< 0.01	< 0.01
Arroyo Grande, CA, USA, 2012	4 (7	130 129	384 371	19 24	7	Heads	0.66 0.67	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
Vandenberg	6	128	374	47	Mean		0.66	< 0.01	< 0.02	< 0.01
(head)	7)	129	374	48						
Visalia, CA, USA, 2012	4 (7	129 129	318 309	45 46	7	Heads	0.47 0.57	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01
Regency (head)	7 7)	128 128	309 309	47 48	Mean		0.52	< 0.01	< 0.01	< 0.01
Greenfield, CA, USA, 2012 Delta	4 (6	129 128	299 309	46 46	7	Heads	0.03 0.05	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
John (head)	7 7)	129 129	309 309	46 49	Mean		0.04	< 0.01	< 0.01	< 0.01
LEAF LETTUCE										
Germansville, PA, USA, 2011 Red Sails (leaf)	4 (6 7	135 127 129	50 46 47	15 7.6–10 cm diameter	7	Leaves	0.39 0.33	< 0.01 < 0.01	< 0.01 < 0.01 c0.04	< 0.01 < 0.01
	7)	129	47	10–15 cm diameter 15–20 cm diameter	Mean		0.36	< 0.01	< 0.01	< 0.01
Oviedo, FL, USA, 2011 Butter	4 (7	128 126	281 281	43 43	7	Leaves	0.34 0.27	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Crunch (leaf)	7 7)	124 128	271 281	47 49	Mean		0.30	< 0.01	0.02	< 0.01
Porterville, CA, USA, 2011 Butter	4 (7	128 130	281 281	16 42	0	Leaves	3.71 4.06	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Crunch (leaf) [c]	6	130	281	44	Mean		3.88	< 0.01	< 0.01	< 0.01
	7)	129	281	49	3	Leaves	1.58 1.53	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		1.56	< 0.01	< 0.01	< 0.01
					7	Leaves	1.47 1.43	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		1.45	< 0.01	< 0.01	< 0.01
					9	Leaves	1.22 1.41	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		1.32	< 0.01	< 0.01	< 0.01
					14	Leaves	0.55 0.59	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.57	< 0.01	< 0.01	< 0.01
Butter	4 (7	124 128	271 281	16 42	7	Leaves	0.63 0.68	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Crunch (leaf) [d]	7 7)	128 132	281 290	44 45	Mean		0.66	< 0.01	< 0.01	< 0.01
Visalia, CA, USA, 2012	4 (7	128 128	318 318	44 45	7	Leaves	2.95 2.33	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
Greenstar (leaf)	7 7)	128 129	318 318	47 48	Mean		2.64	< 0.01	0.01	< 0.01

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Crop part	Flutriafol	T	TA	TAA
San Ardo, CA, USA, 2012	4 (7	129 130	309 309	45 45	7	Leaves	0.24 0.39	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Salvius (leaf)	7 7)	132 129	327 318	45 49	Mean		0.32	< 0.01	< 0.01	< 0.01
COS LETTUCE										
King City, CA, USA, 2011	4 (6	123 129	47 48	45 46	7	Leaves	0.26 0.30	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Romaine (leaf) [e]	7 6)	126 131	47 49	49 49	Mean		0.28	< 0.01	< 0.01	< 0.01
King City, CA, USA, 2012	4 (7	129 128	281 281	19 19	8	Leaves	0.21 0.19	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Paragon (Romaine) (leaf) [f]	7 7)	130 128	290 281	41 47	Mean		0.20	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.25–0.33% v/v, D-W 0.25% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Kinetic 0.064% v/v, Pro 90 0.25% v/v, Pro 90 0.25% v/v, Induce 0.125% v/v, Triangle D-W 0.25% v/v, Pro 90 0.5% v/v, Pro 90 0.5% v/v, Pro 90 0.25% v/v, FC Spreader Sticker 0.045% v/v, Pro 90 0.25% v/v, Pro 90 0.5 % v/v.

[a] Last application 01/11/2011

[b] Last application 10/11/2011, related location, same varieties as other Porterville trial[A]

[c] Last application 01/11/2011

[d] Last application 03/11/2011, related location, same varieties as other Porterville trial[C]

[e] Last application 16/11/2011

[f] Last application 06/04/2011, same location but application dates significantly different

Table 28 Residues of flutriafol in celery following application of an SC formulation in the USA (Carringer 2013 2698) (duplicate samples, applications include non-ionic surfactant)

Location, year,		g		GS			Residue (mg/kg)			
Variety	No	ai/ha	L/ha	(BBCH)	DALA	Sample	Flutriafol	T	TA	TAA
Oviedo, FL, USA, 2011	4 (7 7 7)	128 129	281 281	37 38	7	Plant	0.87 0.97	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Tango		126 128	281 281	40 48	Mean		0.92	< 0.01	0.02	< 0.01
Sparta, MI, USA, 2012	4 (7 6 8)	129 128	46 47	45 46	7	Plant	0.74 0.72	0.06 0.06	< 0.01 < 0.01	< 0.01 < 0.01
Greenbay	6 8)	128	46	47	Mean		0.73	0.06	< 0.01	< 0.01
		128	46	48		SPCF	0.56 0.51	0.04 0.05	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.54	0.04	< 0.01	< 0.01
King City, CA, USA, 2011	4 (7 7 6)	128 133	299 318	4747	0	Plant	0.99 0.81	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
SSCI		129	309	48	Mean		0.90	< 0.01	< 0.01	< 0.01
		127	299	49	2	Plant	0.54 0.46	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.50	< 0.01	< 0.01	< 0.01
					7	Plant	0.41 0.47	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.44	< 0.01	< 0.01	< 0.01
					10	Plant	0.32 0.42	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.37	< 0.01	< 0.01	< 0.01
					14	Plant	0.43 0.38	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean		0.40	< 0.01	< 0.01	< 0.01
Porterville, CA, USA, 2011	4 (8 7 7)	130 128	47 47	45 46	7	Plant	1.40 1.41	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Command		133 131	133 131	48 49	Mean		1.40	< 0.01	< 0.01	< 0.01

Location, year,		g		GS			Residue (mg/kg)			
Variety	No	ai/ha	L/ha	(BBCH)	DALA	Sample	Flutriafol	T	TA	TAA
Porterville, CA, USA, 2012	4 (7 7 6)	129 128	365 365	44 46	7	Plant	0.96 1.20	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
Mission		129	365	46	Mean		1.08	< 0.01	0.02	< 0.01
		127	365	48		SPCF	1.4 1.3	< 0.01 < 0.01	0.02 0.01	< 0.01 < 001
					Mean		1.35	< 0.01	0.02	< 0.01
Guadalupe, CA, USA, 2011 Conquistador	4 (6 7 6)	128 129 129	271 262 271	45 46 47	8	Plant	0.79 0.76	0.04, 0.04	0.06 0.05 c0.03	< 0.01 < 0.01
		128	271	48	Mean		0.78	0.04	0.06	< 0.01
						SPCF	0.64 0.50	0.04 0.02	0.05 0.05	< 0.01 < 0.01
					Mean		0.57	0.03	0.05	< 0.01
Oviedo, FL, USA, 2012	4 (7 7 7)	127 130	281 290	45 45-49	7	Plant	0.48 0.49	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
Tango		127 129	281 281	47 49	Mean		0.48	< 0.01	0.03	< 0.01
King City, CA, USA, 2012	4 (8 7 7)	130 130	309 309	46 46	7	Plant	0.32 0.36	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Conquistador		129 130	309 309	46 48	Mean		0.34	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Triangle D-W 0.25% v/v, R-11 0.07% v/v, Pro 90 0.5% v/v, Pro 90 0.25% v/v, FC Spreader Sticker 0.065% v/v, Triangle D-W 0.25% v/v, Pro 90 0.5% v/v

Table 29 Residues of flutriafol in spinach following application of an SC formulation in the USA (Carringer 2013 2698) (duplicate samples, applications include non-ionic surfactant)

Location, year,		g		GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Alton NY, USA, 2011 Space	4 (7 7 7)	127 127 127	281 281 281	15 17 17	7	2.3 1.9	< 0.01 < 0.01	0.03 0.03 c0.07	< 0.01 < 0.01
		127	281	18	Mean	2.1	< 0.01	0.03	< 0.01
Chula GA USA 2011 Vancouver	4 (7 6 8)	128 128	47 47	12 14	7	1.25 1.4	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
		128 128	47 47	17 37	Mean	1.32	< 0.01	0.03	< 0.01
Uvalde TX USA, 2011 DMC 66-07	4 (7 7 6)	126 128	168 168	45 45	7	0.96 0.93	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
		129 128	206 196	46 46	Mean	0.94	< 0.01	< 0.01	< 0.01
Jerome ID, USA, 2011 Unipack 151	4 (8 7 7)	129 131	215 206	15 19	6	1.6 1.5	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
		128 129	206 206	35 45	Mean	1.55	< 0.01	< 0.01	< 0.01
Porterville, CA, USA, 2011 Shasta	4 (7 7 6)	128 132	365 365	10 11	7	0.59 0.51	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
		132 130	365 365	14 17	Mean	0.55	< 0.01	0.04	< 0.01
Arroyo Grande CA, USA, 2011 Falcon	4 (6 7 6)	128 127	196 196	45 45	7	5.2 4.9	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
		128 128	196 196	46 47	Mean	5.05	< 0.01	0.02	< 0.01
Blackville SC USA 2012	4 (8 6 7)	129 128	140 140	12 13	7	1.7 1.85	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
		129 128	140 140	15 17	Mean	1.78	< 0.01	0.02	< 0.01
Raymondville TX USA 2012	4 (6 7 7)	132 132	196 196	17–18 19	0	8.0 7.8	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
		132	196	38	Mean	7.9	< 0.01	0.01	< 0.01
		131	196	47–49	3	6.1 6.3	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
					Mean	6.2	< 0.01	0.02	< 0.01
					6	5.4 5.5	< 0.01 < 0.01	0.01 0.02	< 0.01 < 0.01
					Mean	5.45	< 0.01	0.02	< 0.01
					10	3.4 3.1	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	3.25	< 0.01	0.02	< 0.01
					13	2.3 3.0	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	2.65	< 0.01	0.02	< 0.01

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Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.25% v/v, Induce 0.25% v/v, Induce 0.25% v/v, Induce 0.5% v/v, Induce 0.5% v/v, Pro 90 0.5% v/v, First Choice 0.03% v/v, Scanner 0.25–0.26% v/v, R11 0.25% v/v

Table 30 Residues of flutriafol in mustard greens following application of an SC formulation in the USA (Carringer 2013 2697) (duplicate samples, applications include non-ionic surfactant)

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Seven Springs, NC, USA, 2011 Southern	4 (7 7	128 127 131	290 290 299	35 39 42	7	2.37 1.88	< 0.01 < 0.01	0.05 0.05 c0.02	< 0.01 < 0.01
Curly Giant	7)	131	299	45	Mean	2.12	< 0.01	0.05	< 0.01
Proctor AR USA, 2011	4 (7	128 128	150 150	2–4 lf 3–4 lf	7	2.53 3.03	< 0.01 < 0.01	0.01 0.02	< 0.01 < 0.01
Florida Broadleaf	7 7)	128 128	150 150	4–6 lf 4–6 lf	Mean	2.78	< 0.01	0.02	< 0.01
Conklin, MI, USA, 2012 Green Wave	4 (7 7	130 129 129	50 49 49	12–16 13–17 16–20	7	2.0 2.24	< 0.01 < 0.01	0.06 0.06 c0.02	< 0.01 < 0.01
	7)	128	48	46–48	Mean	2.12	< 0.01	0.06	< 0.01
Uvalde, TX, USA, 2011	4 (7	126 129	150 140	45 46	7	2.24 2.06	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
India Mustard	7 7)	128 128	159 159	47 48	Mean	2.15	< 0.01	0.03	< 0.01
Porterville, CA, USA, 2011	4 (6	124 132	46 49	13 14	0	3.4 3.41	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Florida	8	122	45	17	Mean	3.40	< 0.01	< 0.01	< 0.01
Broadleaf	7)	124	46	49	3	1.97 1.84	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
					Mean	1.90	< 0.01	0.01	< 0.01
					7	1.59 0.80	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
					Mean	1.20	< 0.01	0.01	< 0.01
					10	0.66 0.84	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.75	< 0.01	0.02	< 0.01
					14	0.55 0.45	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.50	< 0.01	0.02	< 0.01
Elko SC, USA 2011 Florida	4 (7	128 128	140 140	13 17	7	3.53 3.32	< 0.01 < 0.01	0.04 0.05	< 0.01 < 0.01
	7 7)	129 127	140 140	18 19	Mean	3.42	< 0.01	0.04	< 0.01
Oveido FL USA 2011 Florida	4 (7 7	128 130	281 290	19 43	7	1.45 1.53	< 0.01 < 0.01	0.18 0.13	< 0.01 < 0.01

Location, year,				GS		Residue (mg/kg)			
variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
		126	281	46				c0.01	
Broadleaf	7)	128	281	48	Mean	1.49	< 0.01	0.16	< 0.01
Visalia CA USA 2011 Florida	4 (7 7	128 129 128	309 318 309	19 33 35	7	1.92 2.12	< 0.01 < 0.01	0.04 0.04 c0.02	< 0.01 < 0.01
Broadleaf	7)	128	318	47	Mean	2.02	< 0.01	0.04	< 0.01

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Induce 0.3–0.4% v/v, DyneAmic 0.5% v/v, R11 0.06% v/v, Induce 0.25% v/v, Pro 90 0.5–1% v/v, Scanner 0.24–0.25% v/v, Triangle D-W 0.25% v/v, Pro 90 0.25% v/

Table 31 Residues of flutriafol in sugar beet (roots) in Europe following application of an SC formulation (Pollmann 2005a 1235; 2005b 1236; 2006a 1368; 2006b 1335; 2007b 1381)

Location, year, variety SUGAR BEET	No	g ai/ha	L/ha	GS (BBCH)	DALA	Flutriafol (mg/kg)
Northern Europe (1235)						
Scherwiller, Alsace, Northern	2	120	290	39	15	0.01
France 2004 Guepard	(21)	135	327	39	22	< 0.01
					29	< 0.01
					41	< 0.01
Dollern, Niedersachsen,	2	131	263	45	14	< 0.01
Germany 2004 Famosa	(22) [a]	126	253	43–44	22	< 0.01
					27	0.01
					41	< 0.01
Haderslev, Jutland, Denmark	2	125	303	39	15	< 0.01
2004 Verity	(21) [b]	111	269	46	21	< 0.01
					28	< 0.01
					42	< 0.01
Holme, Peterborough, UK 2004	2	121	293	45	15	0.02
Cinderella	(21) [c]	120	292	47	20	0.01
					29	< 0.01
					41	< 0.01
Dudenbuttel, Lower Saxony,	2	126	300	43	22	< 0.01
Germany 2005 Ricardo	(21) [d]	131	311	44–46	28	< 0.01
Haderslav, Sonderjylland,	2	133	316	43–44	20	< 0.01
Denmark 2005 Verity	(21) [e]	138	329	46	28	< 0.01
Scherwiller, Alsace, Northern	2	123	292	39	21	0.02
France 2005 Canyon	(20) [f]	138	328	39	27	0.03
Bishop’s Tachbrook,	2	127	302	47	21	0.03
Warwickshire, UK 2005	(21) [g]	130	310	48	29	0.02
Cinderella						
Southern Europe (1236, 1335)						
Castelnuovo della Daunia,	3	132	320	35–37	7	< 0.01
Puglia, Italy, 2004 Monatonno	(21	131	317	36–38	15	< 0.01
	22) [h]	127	308	45–47	22	< 0.01
					29	< 0.01
Poggio Renatico, Emilia	3	127	410	37	6	< 0.01
Romagna, Italy, 2004 Gea	(21	125	402	39–41	13	< 0.01
	21)	124	400	44	20	< 0.01
					29	< 0.01
Pozoarmargo, Cuenca, Spain,	3	127	408	39	7	< 0.01
2004 Vincent	(21	127	410	39	15	0.02
	20)	124	401	39	22	0.01
					30	< 0.01
Tobarra, Albacete, Spain, 2004	3	128	412	39	7	0.01
Brigitta	(21	132	427	39	14	< 0.01
	21)	126	405	39	21	< 0.01
					29	< 0.01

Location, year, variety SUGAR BEET	No	g ai/ha	L/ha	GS (BBCH)	DALA	Flutriafol (mg/kg)
Tobarra, Albacete, Spain, 2005	3	122	390	39	20	0.02
Heracles	(22	125	401	39	27	0.02
	20)	117	373	42		
Poggio Renatico, Emilia	3	125	397	45	22	0.01, < 0.01 (< 0.01)
Romagna, Italy, 2005 Opera	(21	124	393	47	28	0.02, 0.01 (0.02)
	21) [i]	127	403	47		
Ponte Pietra, Cesena, Emilia	3	128	407	42	22	0.02
Romagna, Italy, 2005 Gea	(20	123	390	44	28	< 0.01
	20) [j]	124	393	46		
Arevalo, Avila, Spain, 2006	3	131	312	39	22	0.04
Brigitta	(20	138	328	39	29	0.03
	21)	126	299	39		

[a] 6 mm rainfall within 24 h of 1st application
[b] 2 mm and 3 mm rain within 24 h 1st and 2nd spray
[c] 10.2 mm after 2nd spray
[d] 7 mm after 2nd spray
[e] 3 and 9 mm rain within 24 h 1st and 2nd spray
[f] 3 and 3 mm rain within 24 h 1st and 2nd spray
[g] 5 mm rainfall within 24 h of 1st application
[h] 0.4 mm rain within 24 h 1st spray
[i] 3.6 mm rain within 24 h 2nd spray
[j] 0.6 mm rain within 24 h 3rd spray

Table 32 Residues of flutriafol in sugar beet (roots) in the USA following application of an SC formulation (Jones 2009 1812) (duplicate samples)

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Porterville, CA,	3	129	306	81	14	0.05 0.05	< 0.01 < 0.01	0.02 0.01	
USA, 2009 Pheonix	(14 14)	127 124	307 292	81–83 87	Mean	0.05	< 0.01	0.02	< 0.01
Fresno, CA,	3	125	325	48	14	0.02 0.02	< 0.01 < 0.01	0.04 0.03 c0.02	
USA, 2009 HH142	(14 14)	128 128	329 329	48 49	Mean	0.02	< 0.01	0.04	< 0.01
American Falls,	3	123	279	49	14	0.01 0.02	< 0.01 < 0.01	< 0.01 < 0.01	
ID, USA, 2009 Hillshog 9026	(14 15)	129 123	295 318	49 49	Mean	0.02	< 0.01	< 0.01	< 0.01
Jerome, ID,	3	128	345	49	14	0.01 0.02	< 0.01 < 0.01	0.01 0.01	
USA, 2009 BTSCT01RR07	(14 14)	128 124	332 339	49 49	Mean	0.02	< 0.01	0.01	< 0.01
Geneva, MN,	3	129	288	Vegetative	14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
USA, 2009 Beta 130R	(15 13)	128 129	280 289	Vegetative Vegetative	Mean	< 0.01	< 0.01	< 0.01	< 0.01
Campbell, MN, USA, 2009 4012RR	3 (13 14)	128 128 129	328 328 330	33 35 49	0	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
					7	0.01 0.02	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	0.02	< 0.01	< 0.01	< 0.01
					14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
					21	0.01	< 0.01	< 0.01	

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
						< 0.01	< 0.01	< 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
					28	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
Paynesville, MN, USA, 2009 Crystal RR202	3 (13 14)	130 131 130	283 285 281	45 45 47	14	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
Pavillion, WY, USA, 2009 Beta 36RR11	3 (14 14)	128 130 130	304 302 318	49 49 49	14	0.04 0.06	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	0.05	< 0.01	< 0.01	< 0.01
Northwood, ND, USA, 2009 Beta 1305R	3 (15 13)	127 129 127	325 329 324	39 39 39	14	< 0.01 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
Velva, ND, USA, 2009 R308	3 (14 14)	130 131 127	284 286 284	37 39 39	14	0.02 0.02	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	0.02	< 0.01	< 0.01	< 0.01
York, NE, USA, 2009 Beta 734IR	3 (14 14)	129 130 129	329 329 325	42d before harvest 39 49	14	0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01
Levelland, TX, USA, 2009 Phoenix	3 (14 15)	130 124 127	324 322 325	Roots starting to enlarge roots enlarging maturing roots	14	0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	
					Mean	< 0.01	< 0.01	< 0.01	< 0.01

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Table 33 Residues of flutriafol in maize (grain) following application of an SC formulation in the USA (Carringer 2010 1810) (duplicate samples) A non-ionic surfactant was added to the tank mix at all sites except for decline trials where plots were sprayed with and without surfactant.

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Germansville, PA, USA,	2 (6)	129 132	140 140	77 79	87 89	6	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Hybrid 2D324 Mycogen Seed						Mean	< 0.01	< 001	< 0.01	< 0.01
Seven Springs, NC,	2 (7)	129 131	131 131	82 84	86 89	6	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.06	< 0.01 < 0.01
USA, 2009 N77-P5						Mean	< 0.01	< 0.01	0.06	< 0.01
Wyoming, IL, USA, 2009	2 (7)	129	112	96	89	0	< 0.01 < 0.01	< 0.01 < 0.01	0.06 0.07	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
DKC 61–69		128	112	95	89	1	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.06	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.07	< 0.01
						7	< 0.01 < 0.01	< 0.01 < 0.01	0.07 0.07	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.07	< 0.01
						15	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.07	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.08	< 0.01
						21	< 0.01	< 0.01	0.06	< 0.01

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
							< 0.01	< 0.01	0.06	< 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
No surfactant	2 (7)	128	112	96	89	0	< 0.01 < 0.01	< 0.01 < 0.01	0.07 0.07	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.07	< 0.01
		128	112	95	89	1	< 0.01 < 0.01	< 0.01 < 0.01	0.06 0.06	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
						7	< 0.01 < 0.01	< 0.01 < 0.01	0.06 0.07	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
						15	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.10	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.09	< 0.01
						21	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.09	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.08	< 0.01
Carlyle, IL, USA, 2009	2 (8)	127 128	122 140	87 76	87 89	7	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.08	< 0.01 < 0.01
8G23						Mean	< 0.01	< 0.01	0.08	< 0.01
Grantfork, IL, USA, 2009	2 (7)	130 130	122 112	89 97	89 89	7	< 0.01 < 0.01	< 0.01 < 0.01	0.03 < 0.01	< 0.01 < 0.01
AgriGolg AG457						Mean	< 0.01	< 0.01	< 0.02	< 0.01
Conklin, MI, USA, 2009	2 (8)	128 128	122 122	88 88	87 88	6	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
A1005113						Mean	< 0.01	< 0.01	< 0.01	< 0.01
Richland, IA, USA, 2009	2 (7)	129	140	77	89	0	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.04	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.04	< 0.01
Pioneer 34R67		129	140	77	89	1	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.04	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.04	< 0.01
						7	< 0.01 < 0.01	< 0.01 < 0.01	0.06 0.06	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
						13	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.05	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.05	< 0.01
						20	< 0.01 < 0.01	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.04	< 0.01
No surfactant	2 (7)	128	140	77	89	0	< 0.01 < 0.01	< 0.01 < 0.01	0.06 0.05	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
		129	140	77	89	1	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.05	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.05	< 0.01
						7	< 0.01 < 0.01	< 0.01 < 0.01	0.06 0.06	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
						13	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.06	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
						20	< 0.01 < 0.01	< 0.01 < 0.01	0.07 0.06	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.06	< 0.01
Douds, IA, USA, 2009	2 (7)	126 127	140 131	75 81	87 87–89	7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Garst 84N57						Mean	< 0.01	< 0.01	< 0.01	< 0.01
Batavia, IA, USA, 2009	2 (7)	129 126	140 131	77 80	87 87–89	7	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.08	< 0.01 < 0.01

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Garst 82K79						Mean	< 0.01	< 0.01	0.08	< 0.01
LaPlata, MO, USA, 2009	2 (7)	130 128	140 140	77 76	87 89	6	< 0.01 < 0.01	< 0.01 < 0.01	0.03 0.04	< 0.01 < 0.01
LG 2614 VT						Mean	< 0.01	< 0.01	0.04	< 0.01
Jefferson, IA, USA, 2009	2 (7)	129 127	112 103	96 103	87 87	7	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.04	< 0.01 < 0.01
33H27						Mean	< 0.01	< 0.01	0.06	< 0.01
Bagley, IA, USA, 2009	2 (7)	126 127	103 103	102 103	87 87	7	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
33M16						Mean	< 0.01	< 0.01	< 0.01	< 0.01
Bristol, IN, USA, 2009	2 (7)	128 128	122 122	88 88	87 88	8	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
34F97						Mean	< 0.01	< 0.01	< 0.01	< 0.01
York, NE, USA, 2009	2 (8)	129 124	140 140	77 74	87 87	6	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.11	< 0.01 < 0.01
7B15RRY GCBP						Mean	< 0.01	< 0.01	0.10	< 0.01
Osceola, NE, USA, 2009	2 (7)	129 129	140 140	77 77	87 87	7	< 0.01 < 0.01	< 0.01 < 0.01	0.05 0.05	< 0.01 < 0.01
7B15RRY GCBP						Mean	< 0.01	< 0.01	0.05	< 0.01
Geneva, NE, USA, 2009	2 (7)	128 128	140 140	76 76	87 87	6	< 0.01 < 0.01	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
7B15RRY GCBP						Mean	< 0.01	< 0.01	0.04	< 0.01
Geneva, MN, USA, 2009	2 (6)	129 129	140 140	77 77	87 87	8	< 0.01 < 0.01	< 0.01 < 0.01	0.04 0.04	< 0.01 < 0.01
Pioneer 38P43						Mean	< 0.01	< 0.01	0.04	< 0.01
Paynesville, MN, USA,	2 (7)	129 130	131 131	82 83	87 89	7	< 0.01 < 0.01	< 0.01 < 0.01	0.08 0.06	< 0.01 < 0.01
2009 Dekalb DKC35						Mean	< 0.01	< 0.01	0.07	< 0.01
Fitchburg, WI, USA,	2 (6)	128 128	131 131	81 81	87 89	9	< 0.01 < 0.01	< 0.01 < 0.01	0.03 0.05	< 0.01 < 0.01
2009 Pioneer 37Y14						Mean	< 0.01	< 0.01	0.04	< 0.01
Hinton, OK, USA, 2009	2 (7)	129 129	131 131	82 82	87 87	7	< 0.01 < 0.01	< 0.01 < 0.01	0.11 0.09	< 0.01 < 0.01
DKC 52-59						Mean	< 0.01	< 0.01	0.10	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

1 X-77 @ 0.25% v/v; 2 Induce @ 0.34% v/v; 3 Aquagene 90 @ 0.05% v/v; 4 Surfac 820 @ 0.25% v/v; 5 NIS @ 0.25% v/v; 6 R-11 @ 0.064% v/v; 7 Silwet L-77 @ 0.25% v/v; 8 X-77 @ 0.25% v/v; 9 X-77 @ 0.25% v/v; 10 X-77 @ 0.25% v/v; 11 Hel-Fire 90 @ 0.25% v/v; 12 Hel-Fire 90 @ 0.25% v/v; 13 R11 @ 0.064% v/v; 14 Cornbelt Premier 90 @ 0.25% v/v; 15 Cornbelt Premier 90 @ 0.063% v/v; 16 Cornbelt Premier 90 @ 0.25% v/v; 17 Dyne Amic NIS @ 0.375% v/v; 18 Preference @ 0.25% v/v; 19 Preference @ 0.25% v/v; 20 Baron @ 0.076% v/v

Moisture content %: 27.7, 20.8, 34.2 (0 d), 33.7 (1 d), 30.9 (7 d), 25.7 (15 d), 22.8 (21 d), 29.5, 19.4, 33.3, 28.6 (0 d), 29.6 (1 d), 26.7 (7 d), 23.0 (13 d), 21.4 (20 d), 32.6, 37.0, 24.4, 22.8, 26.0, 35.8, 28.1, 31.8, 28.5, 33.8, 14.4, 27.0, 15.2

Table 34 Residues of flutriafol in paddy rice following application of an SC formulation in southern Europe (Gimeno 2006 1629-2, López Benet 2006 1629-1, Gimeno Martos 2007 1630)

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
Amposta, Tarragona,	2	189	404	47	BBCH 83	0	Paddy rice	3.4
Spain, 2005 Fonsa	(14)	188	400	47	BBCH 89		Husked rice	0.25
	2	183	392	47	BBCH 77	7	Paddy rice	2.47
	(14)	182	388	47	BBCH 87			
	2	186	396	47	BBCH 65	14	Paddy rice	1.25
	(14)	188	400	47	BBCH 83		Husked rice	0.35
	2	182	388	47	BBCH 58	21	Paddy rice	1.68
	(14)	186	396	47	BBCH 77		Husked rice	0.47
	2	195	416	47	BBCH 51	28	Paddy rice	0.74
	(14)	182	388	47	BBCH 65			
Sueca, Valencia,	2	191	408	47	BBCH 83	0	Paddy rice	2.89
Spain, 2005, Masso	(14)	193	412	47	BBCH 87–89		Husked rice	0.23
	2	191	400	48	BBCH 79	7	Paddy rice	1.4
	(14)	193	400	48	BBCH 85			
	2	193	412	47	BBCH 77	14	Paddy rice	1.79
	(14)	187	400	47	BBCH 83		Husked rice	0.42
	2	186	396	47	BBCH 57	21	Paddy rice	1.28
	(14)	187	400	47	BBCH 79		Husked rice	0.36
	2	191	428	45	BBCH 49	28	Paddy rice	1.06
	(14)	193	388	50	BBCH 77			
Perello, Valencia,	2	187	400	47	BBCH 85	0	Paddy rice	3.23
Spain, 2005 Fonsa	(14)	189	404	47	BBCH 89		Husked rice	0.36
	2	187	400	47	BBCH 85	7	Paddy rice	1.93
	(14)	189	400	47	BBCH 87			
	2	204	436	47	BBCH 83	14	Paddy rice	1.85
	(14)	187	400	47	BBCH 85		Husked rice	0.46
	2	182	388	47	BBCH 71	21	Paddy rice	1.92
	(14)	186	396	47	BBCH 85		Husked rice	0.42
	2	187	372	50	BBCH 57	28	Paddy rice	1.51
	(14)	189	396	48	BBCH 83			
Valencia, Valencia,	2	189	404	47	BBCH 83	0	Paddy rice	4.07
Spain, 2005	(14)	188	400	47	BBCH 89		Husked rice	0.15
Montsianell	2	187	380	49	BBCH 77	7	Paddy rice	3.07
	(14)	189	406	47	BBCH 85			
	2	182	388	47	BBCH 77	14	Paddy rice	2.02
	(14)	187	400	47	BBCH 83		Husked rice	0.28
	2	186	396	47	BBCH 59	21	Paddy rice	1.75
	(14)	182	388	47	BBCH 77		Husked rice	0.29
	2	187	386	47	BBCH 55	28	Paddy rice	1.32
	(14)	189	400	47	BBCH 77			
Mareny de	2	187	400	47	BBCH 80	0	Paddy rice	3.19
Barraquetes,	(14)	186	396	47	BBCH 89		Husked rice	0.16
Valencia, Spain, 2006						0	Polished rice	0.08
Montsianell	2	187	400	47	BBCH 69	14	Paddy rice	1.57
	(14)	183	390	47	BBCH 89	14	Husked rice	0.37
						14	Polished rice	0.26
Sueca, Valencia,	2	187.5	400	47	BBCH 81	0	Paddy rice	1.73
Spain, 2006 J. Sendra	(14)	183	390	47	BBCH 89	0	Husked rice	0.07
						0	Polished rice	0.03
	2	187	398	47	BBCH 75	14	Paddy rice	0.9
	(14)	186	396	47	BBCH 81	14	Husked rice	0.19
						14	Polished rice	0.17
Amposta, Tarragona,	2	189	404	47	BBCH 80	0	Paddy rice	2.62
Spain, 2006 Fonsa	(14)	187.5	400	47	BBCH 89	0	Husked rice	0.33
						0	Polished rice	0.21
	2	185	394	47	BBCH 69	14	Paddy rice	1.74
	(14)	190	406	47	BBCH 80	14	Husked rice	0.37

Location, year, variety	No	g ai/ha	L/ha	g ai/hL	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
						14	Polished rice	0.32
Sueca, Valencia,	2	190	406	47	BBCH 85	0	Paddy rice	2.76
Spain, 2006 Fonsa	(14)	183	390	47	BBCH 89	0	Husked rice	0.28
						0	Polished rice	0.14
	2	187.5	400	47	BBCH 76	14	Paddy rice	1.23
	(14)	187.5	400	47	BBCH 85	14	Husked rice	0.38
						14	Polished rice	0.33

Table 35 Residues of flutriafol in sorghum grain following application of an SC formulation in the USA (Carringer 2013 2699) (duplicate samples, applications include non-ionic surfactant)

				GS		Residue (mg/kg)			
Location, year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Seven Springs, NC, USA, 2012 DKS54-00	2 (7)	131 127	168 131	60 69	30	0.03 0.03	< 0.01 < 0.01	0.38 0.37 c0.04	0.03 0.03
					Mean	0.03	< 0.01	0.38	0.03
Proctor, AR, USA, 2012 GX12564	2 (7)	128 129	140 140	Mature grain	30	0.40 0.35	< 0.01 < 0.01	0.02 0.03 c0.01	0.02 0.02 c0.01
				Mature grain	Mean	0.38	< 0.01	0.02	0.02
Richland, IA, USA, 2012 Pioneer 84G62	2 (7)	127 129	178 178	85 87	30	0.24 0.27	< 0.01 < 0.01	0.06 0.05 c0.05	< 0.01 < 0.01
					Mean	0.26	< 0.01	0.06	< 0.01
Kirksville, MO, USA, 2012 Pioneer 84G62	2 (7)	128 129	159 159	81–85 85	30	0.20 0.19	< 0.01 < 0.01	0.08 0.09 c0.07	< 0.01 < 0.01
					Mean	0.20	< 0.01	0.08	< 0.01
Stafford, KS, USA, 2012 84G62	2 (7)	128 127	168 168	85 85	29	0.26 0.31	< 0.01 < 0.01	0.04 0.03 c0.03	0.01 0.01 c0.01
					Mean	0.28	< 0.01	0.04	0.01
York, NE, USA, 2012 85G01	2 (7)	127 128	178 178	85 85	31	0.33 0.35	< 0.01 < 0.01	0.07 0.06 c0.07	0.04 0.03 c0.03
					Mean	0.34	< 0.01	0.06	0.04
Uvalde, TX USA, 2012 Pioneer 83G19	2 (7)	126 128	150 159	73 87	30	0.77 0.72	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.74	< 0.01	< 0.01	< 0.01
Hinton, OK, USA, 2012 DKS29-28	2 (7)	127 126	159 168	85 85	30	0.15 0.16	< 0.01 < 0.01	0.07 0.07 c0.05	0.04 0.03 c0.02
					Mean	0.16	< 0.01	0.07	0.04
Grand Island, NE, USA, 2012 85G01	2 (7)	128 128	187 178	85 85	30	0.41 0.38	< 0.01 < 0.01	0.08 0.08 c0.13	0.03 0.03 c0.06
					Mean	0.40	< 0.01	0.08	0.03
Larned, KS, USA, 2012 84G62	2 (7)	129 128	168 168	85 87	23	0.24 0.24	< 0.01 < 0.01	0.06 0.07	0.01 0.01
					Mean	0.24	< 0.01	0.06	0.01
					29	0.25 0.22	< 0.01 < 0.01	0.05 0.05 c0.03	0.01 0.01
					Mean	0.24	< 0.01	0.05	0.01
					36	0.24 0.22	< 0.01 < 0.01	0.05 0.06	< 0.01 < 0.01
					Mean	0.23	< 0.01	0.06	< 0.01
					43	0.23 0.17	< 0.01 < 0.01	0.05 0.06	< 0.01 0.01

				GS		Residue (mg/kg)			
Location, year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
					Mean	0.20	< 0.01	0.06	< 0.01
					50	0.22 0.22	< 0.01 < 0.01	0.06 0.06	< 0.01 < 0.01
					Mean	0.22	< 0.01	0.06	< 0.01
Wall, TX, USA, 2012 DKS44-20	2 (7)	127 129	140 140	85 87	29	0.17 0.16	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01
					Mean	0.16	< 0.01	< 0.01	< 0.01
Levelland, TX, USA, 2012 165310	2 (7)	128 127	178 178	85 85–87	30	0.81 0.66	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.74	< 0.01	< 0.01	< 0.01

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Induce 0.28–0.3% v/v, Dyne-Amic 0.5% v/v, Preference 0.5% v/v, Preference 0.5% v/v, Spreader 90 0.25% v/v, Cornbelt Premier 90 0.03% v/v, Induce 0.2% v/v, Baron 0.25% vv, Cornbelt Premier 0.03% v/v, Spreader 90 0.25% v/v, Induce 0.5% v/v, R-11 0.22% v/v

Table 36 Residues of flutriafol in tree nuts (nutmeat) following application of an SC formulation in the USA (Rice 2011 2161) (duplicate samples)

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Pecan										
Chula, GA, USA, 2010 Pecan Sumner	6 (7 7 7 7 7)	128 128 128 128 128 128	1370 1505 1524 1440 1425 1340	9.3 8.5 8.4 8.9 9.0 9.6	Nut fill Nut fill Nut fill Nut fill Shuck split Shuck split (falling)	14	< 0.01 < 0.01	< 0.01 < 0.01	0.52 0.42 c0.24	0.04 0.04 c0.01
						Mean	< 0.01	< 0.01	0.47	0.04
Pecan Sumner Steward	6 (7 7 7 7 7	129 130 128 130 129 129	571 632 632 612 603 565	23 21 20 21 21 23	Nut fill Nut fill Nut fill Nut fill Shuck split Shuck split (falling)	14	< 0.01 < 0.01	< 0.01 < 0.01	0.41 0.40 c0.31	0.05 0.05 c0.01
						Mean	< 0.01	< 0.01	0.40	0.05
Bertrand, MO, USA, 2010 Pecan Pawnee	6 (8 7 6 7 7)	125 127 128 127 127 127	1590 1590 1590 1590 1590 1590	7.9 8 8 8 8 8	89 89 89 89 89 89	14	< 0.01 < 0.01	< 0.01 < 0.01	0.02 0.02 c0.02	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.02	< 0.01
D'Haris, TX, USA, 2010 Pecan Cheyenne	6 (6 8 7 7 7)	129 125 128 128 127 127	1549 1545 1521 1545 1524 1559	8.3 8.1 8.4 8.3 8.3 8.1	85 85 85 85 87 87	14	0.01 0.01	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
						Mean	0.01	< 0.01	0.02	< 0.01
Anton, TX, USA, 2010 Pecan Western Schley	6 (7 7 6 8 8)	132 127 125 125 131 128	560 560 560 560 560 560	24 23 22 22 23 23	green shuck green shuck green shuck shuck split shuck split shuck split	11	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
						Mean	< 0.01	< 0.01	< 0.01	< 0.01
Almond										
Dinuba, CA, USA, 2010 Almond Sonora	6 (8 8 8 8 8)	128 129 128 129 128 128	731 750 781 788 791 883	17 17 16 16 16 14	75 75 78 78 81 81	14	0.08 0.05	< 0.01 < 0.01	< 0.2 < 0.2 c0.2	< 0.01 < 0.01
						Mean	0.06	< 0.01	< 0.2	< 0.01
Strathmore, CA, USA, 2010 Almond Fritz	6 (6 7 7 7 7)	128 128 129 128 128 128	2759 2751 2768 2761 2753 2773	4.6 4.6 4.7 4.6 4.6 4.6	79 79 79 80 80 88	14	0.01 0.01	0.02 0.02 c0.11	0.91 0.92 c2.68	0.01 < 0.01 c0.03
						Mean	0.01	0.02	0.92	< 0.01
Wasco, CA, USA, 2010	6 (8 6 7 7 7)	128 128 128 128 128 128	809 788 791 786 785 827	16 16 16 16 16 15	79 79 79 79 79 85	14	0.07 0.06	< 0.01 < 0.01	0.56 0.55 c0.29	< 0.01 < 0.01
						Mean	0.06	< 0.01	0.56	< 0.01
Buttonwillow, CA, USA, 2010 Almond Monterey's	6 (7 7 7 7 7)	128 127 133 128 128 128	3301 3321 3313 3304 3327 3223	3.9 3.8 4 3.9 3.8 4	78 79 79 83 85 87	14	< 0.01 < 0.01	< 0.01 < 0.01	0.61 0.63 c0.49	< 0.01 < 0.01
						Mean	< 0.01	< 0.01	0.62	< 0.01
Terra Bella, CA, USA, 2010 Almond Non Pareil	6 (9 7 9 8 8)	127 128 127 129 129 128	661 605 627 661 661 661	19 21 20 19 19 19	75 72 78 79 79 81	1	0.40 0.42	< 0.01 < 0.01	0.67 0.61	< 0.01, < 0.01
						Mean	0.41	< 0.01	0.64	< 0.01
						7	0.27 0.26	< 0.01 < 0.01	0.57 0.59	< 0.01 < 0.01
						Mean	0.27	< 0.01	058	< 0.01
						14	0.32 0.27	< 0.01 < 0.01	0.63 0.78 c2.08	< 0.01 < 0.01
						Mean	0.30	< 0.01	0.71	< 0.01
						21	0.38 0.45	0.01 < 0.01	1.02 0.78	< 0.01 < 0.01
						Mean	0.42	< 0.01	0.90	< 0.01
						28	0.26 0.23	< 0.01 < 0.01	0.61 0.75	< 0.01 < 0.01
						Mean	0.24	< 0.01	0.68	< 0.01

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Table 37 Residues of flutriafol in cotton (undelinted seed) following application of an SC formulation in the USA (Carringer 2013 2700) (duplicate samples, applications include non-ionic surfactant) one soil pre-emergence application and two post-emergence foliar applications

Location,				GS		Residue (mg/kg)			
year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Elko, SC, USA, 2012	3 (131 6)	294 PP 129 PO	42 187	0 80	30	0.05 0.06	< 0.01 < 0.01	0.94 0.42	0.02 0.01

Location,				GS		Residue (mg/kg)			
year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
DP 0912		128PO	178	81				c0.04	
B2RF					Mean	0.06	< 0.01	0.68	0.02
Proctor, AR, USA, 2012 DP	3 (120 7)	290 PP 128 PO 128 PO	44 92 187	0 82 84	30	0.13 0.15	< 0.01 < 0.01	0.17 0.14 c0.03	< 0.01 < 0.01
0912 B2RF					Mean	0.14	< 0.01	0.16	< 0.01
Fisk, MO, USA, 2012 PHY 375	3 (120 7)	294 PP 128 PO 128 PO	47 187 187	0 80 81	29	< 0.01 < 0.01	< 0.01 < 0.01	0.44 0.41 c0.19	0.01 0.01
					Mean	< 0.01	< 0.01	0.42	0.01
Cheneyville, LA, USA, 2012 DP	3 (119 7)	304 PP 135 PO 129 PO	47 168 178	0 82–83 84–85	30	0.08 0.10	< 0.01 < 0.01	0.14 0.16 c0.04	< 0.01 < 0.01
0912 B2RF					Mean	0.09	< 0.01	0.15	< 0.01
Uvalde, TX, USA,	3 (112 7)	288 PP 127 PO	30 178	0 82	30	0.02 0.03	< 0.01 < 0.01	0.11 0.11	< 0.01 < 0.01
2012 DP 0912 B2RF		126 PO	159	86	Mean	0.02	< 0.01	0.11	< 0.01
Wall, TX, USA, 2012	3 (105 7)	295 PP 124 PO	41 168	0 82	30	0.32 0.19	< 0.01 < 0.01	0.07 0.09	< 0.01 < 0.01
DP 0912 B2RF		127 PO	168	83	Mean	0.26	< 0.01	0.08	< 0.01
Edmonson, TX, USA, 2012 DP	3 (131 7)	294 PP 128 PO 128 PO	41 140 150	0 81–82 82–83	30	0.08 0.08	< 0.01 < 0.01	0.05 0.05 c0.04	< 0.01 < 0.01
0912 B2RF					Mean	0.08	< 0.01	0.05	< 0.01
Hinton, OK, USA,	3 (112 8)	291 PP 128 PO	41 112	0 80	22	0.06 0.05	< 0.01 < 0.01	0.75 0.97	0.03 0.03
2012		128 PO	140	87	Mean	0.06	< 0.01	0.86	0.03
DP 0912 B2RF					29	0.06 0.06	< 0.01 < 0.01	0.83 0.73 c0.05	0.03 0.02
					Mean	0.06	< 0.01	0.78	0.02
					36	0.07 0.07	< 0.01 < 0.01	0.93 0.91	0.03 0.04
					Mean	0.07	< 0.01	0.92	0.04
					44	0.08 0.06	< 0.01 < 0.01	0.71 0.81	0.02 0.03
					Mean	0.07	< 0.01	0.76	0.02
					51	0.06 0.03	< 0.01 < 0.01	0.85 0.51	0.03 0.02
					Mean	0.04	< 0.01	0.68	0.02
Levelland, TX, USA,	3 (123 7)	299 PP 130 PO	38 178	0 80	30	0.04 0.04	< 0.01 < 0.01	0.09 0.09	< 0.01 < 0.01
2012 DP 0912 B2RF		129 PO	178	81	Mean	0.04	< 0.01	0.09	< 0.01
Porterville, CA, USA,	3 (146 6)	291 PP 128 PO	45 140	0 84	30	0.13 0.08	< 0.01 < 0.01	0.23 0.24	< 0.01 < 0.01
2012 Untreated Upland [a]		128 PO	140	84	Mean	0.10	< 0.01	0.24	< 0.01
Porterville, CA, USA,	3 (142 6)	299 PP 128 PO	46 140	0 84	30	0.32 0.21	< 0.01 < 0.01	0.21 0.18	< 0.01 < 0.01
2012 Untreated Upland [b]		128 PO	140	84	Mean	0.26	< 0.01	0.20	< 0.01
Visalia, CA, USA, 2012 Untreated	3 (136 6)	295 PP 128 PO 128 PO	46 140 140	0 84 84	30	0.17 0.15	< 0.01 < 0.01	0.21 0.21 c0.08	0.01 0.01
Upland					Mean	0.16	< 0.01	0.21	0.01

1st spray at planting as a band spray (T-band) followed by two foliar sprays closer to harvest

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Scanner 0.25% v/v, Dyne-Amic 0.5% v/v, Induce 0.25% v/v, 80-20 Surfactant 0.25% v/v, Activator 90 0.25% v/v, Activator 90 0.25% v/v, Induce 0.5% v/v, Preference 1% v/v, Baron 0.06% v/v, R-11 0.22% v/v, Pro 90 0.5% v/v, Pro 90 0.5% v/v, Pro 90 0.5% v/v

Undelinted seed % moisture: 9.2, 14.6, 12.0, 11.6, 8.4, 9.8, 8.2, 9.6 (23 d), 7.8 (37 d), 8.9 (44 d), 9.4 (51 d), 7.9, 8.8, 8.8, 10.6

[a] Last application 10/10/2012

[b] Last application 10/10/2012, related location, same variety as other Porterville trial [a]

Table 38 Residues of flutriafol in rape seed in Europe following application of an SC formulation (Pollmann 2006a 1298; 2006b 1334; 2007a 1542)

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
Northern Europe							
Bietigheim, Baden-	2	124	293	62	13	pods	0.62
Wurttemberg,	(26) [a]	131	311	80	20	pods	0.61
Germany, 2005					26	seed	0.13
Lisanne							
Padborg,	2	138	329	62	13	pods	0.08
Sonderjylland,	(49)	127	302	80	20	pods	0.11
Denmark, 2005					54	seed	0.03
Trabant							
Meistratzheim,	2	129	255	62	13	pods	0.2
Alsace, Northern	(28) [b]	125	247	80	21	pods	0.26
France, 2005					35	seed	0.07
Hability							
Charndon, Bicester,	2	131	313	62	13	pods	1.61
Oxfordshire, UK,	(55) [c]	129	307	80	20	pods	1.04
2005 Labrador					34	seed	<u>0.31</u> (0.31 0.30)
Padborg, Sonderjylland, Denmark, 2006 Excalibur	2 (43) [d]	135 126	320 300	62 80	28	seed	0.04
Burweg, Niedersachsen, Germany, 2006 Titan	2 (39) [e]	137 137	327 327	62 80	32	seed	0.08
Wiesloch-Baiertal, Baden Wurrtemberg, Germany, 2006 Titan	2 (38)	136 121	323 287	62 80	28	seed	0.15
Drusenheim, Alsace, Northern France, 2007	2 (30) [f]	127 126	201 200	62 80	17	seed	0.08
Southern Europe							
Lavaur, Midi-	2	133	420	62	13	pods	0.42
Pyrénées, Southern	(42) [g]	134	424	80	21	pods	0.48
France, 2005 Corail					34	seed	0.15
+ Cocktail							
St. Paul Trois	2	132	345	62	15	pods	0.23 (0.24 0.22)
Chateaux, Rhone-	(41) [h]	117	305	80	22	pods	0.45 (0.45 0.44)
Alpes, Southern					29	seed	0.03
France, 2005 Navajo							
11420 Plaigne, Languedoc-Roussillon, Southern France, 2006	2 (50)	130 131	412 415	62 80	27	seed	0.05
Lavaur, Midi-Pyrenees, Southern France, 2006 Exagone	2 (50) [i]	134 126	425 400	62 80	24	seed	0.13

[a] 8 and 0.3 mm rain within 24 h 1st and 2nd sprays

[b] 6–7 mm rain within 24 h of the 2nd spray

[c] 2.6 mm rain within 24 h of the 2nd spray

[d] 1 mm rain within 24 h of the 2nd spray

[e] 1 mm rain within 24 h of the 2nd spray

[f] 10 mm rain within 24 h of the 2nd spray

[g] 14.4 and 0.2 mm rain within 24 h 1st and 2nd sprays

[h] 8.6 mm rain within 24 h of the 2nd spray

[i] 0.2 mm rain within 24 h of the 2nd spray

Animal feeds

Table 39 Residues of flutriafol in sugar beet (tops) following application of an SC formulation in the European Union (Pollmann 2006 1298)

Location, year, variety SUGAR BEET	No	g ai/ha	L/ha	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
Scherwiller, Alsace, Northern	2	120	290	39	0	plant	0.45
France 2004 Guepard	(21) [a]	135	327	39	15	leaves	0.24
					22	leaves	0.28
					29	leaves	0.22
					41	leaves	0.13
Dollern, Niedersachsen,	2	131	263	45	0	plant	0.72
Germany 2004 Famosa	(22) [b]	126	253	43–44	14	leaves	0.45
					22	leaves	0.38
					27	leaves	0.14
					41	leaves	0.11
Haderslev, Jutland, Denmark	2	125	303	39	0	plant	1.08
2004 Verity	(21) [c]	111	269	46	15	leaves	0.5
					21	leaves	0.27
					28	leaves	0.18
					42	leaves	0.11
Holme, Peterborough, UK 2004	2	121	293	45	0	plant	1.02
Cinderella	(21) [d]	120	292	47	15	leaves	0.49
					20	leaves	0.32
					29	leaves	0.18
					41	leaves	0.14
Dudenbuttel, Lower Saxony,	2	126	300	43	22	leaves	0.14
Germany 2005 Ricardo	(21) [e]	131	311	44–46	28	leaves	0.1
Haderslav, Sonderjylland,	2	133	316	43–44	20	leaves	0.15
Denmark 2005 Verity	(21) [f]	138	329	46	28	leaves	0.14
Scherwiller, Alsace, Northern	2	123	292	39	21	leaves	0.64
France 2005 Canyon	(20) [g]	138	328	39	27	leaves	0.75
Bishop's Tachbrook,	2	127	302	47	21	leaves	0.33
Warwickshire, UK 2005	(21)	130	310	48	29	leaves	0.22
Cinderella							

[a] 6 mm rainfall within 24 h of 1st application

[b] 2 mm and 3 mm rain within 24 h 1st and 2nd spray

[c] 10.2 mm after 2nd spray

[d] 7 mm after 2nd spray

[e] 3 and 9 mm rain within 24 h 1st and 2nd spray

[f] 3 and 3 mm rain within 24 h 1st and 2nd spray

[g] 5 mm rainfall within 24 h of 1st application

Table 40 Residues of flutriafol in sugar beet (tops) following application of an SC formulation in Spain (Pollmann 2007 1381)

Location, year, variety SUGAR BEET	No	g ai/ha	L/ha	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
Castelnuovo della Daunia,	3	132	320	35–37	0	plant	0.13
Puglia, Italy, 2004 Monatonno	(21	131	317	36–38	7	leaves	0.21
	22) [a]	127	308	45–47	15	leaves	0.22
					22	leaves	0.05
					29	leaves	0.01
Poggio Renatico, Emilia	3	127	410	37	0	plant	2.35
Romagna, Italy, 2004 Gea	(21	125	402	39–41	6	leaves	1.47
	21)	124	400	44	13	leaves	1.23
					20	leaves	0.36
					29	leaves	0.3
Pozoarmargo, Cuenca, Spain,	3	127	408	39	0	plant	0.51
2004 Vincent	(21	127	410	39	7	leaves	0.3

Location, year, variety SUGAR BEET	No	g ai/ha	L/ha	GS (BBCH)	DALA	Sample	Flutriafol (mg/kg)
	20)	124	401	39	15	leaves	0.28
					22	leaves	0.22
					30	leaves	0.29
Tobarra, Albacete, Spain, 2004	3	128	412	39	0	plant	0.54
Brigitta	(21	132	427	39	7	leaves	0.5
	21)	126	405	39	14	leaves	0.19
					21	leaves	0.14
					29	leaves	0.46
Tobarra, Albacete, Spain, 2005	3	122	390	39	20	leaves	0.26, 0.31
Heracles	(22	125	401	39	27	leaves	0.33, 0.34
	20)	117	373	42			
Poggio Renatico, Emilia	3	125	397	45	22	leaves	0.15, 0.14
Romagna, Italy, 2005 Opera	(21	124	393	47	28	leaves	0.05, 0.04
	21) [b]	127	403	47			
Ponte Pietra, Cesena, Emilia	3	128	407	42	22	leaves	0.84
Romagna, Italy, 2005 Gea	(20	123	390	44	28	leaves	0.74
	20) [c]	124	393	46			
Arevalo, Avila, Spain, 2006	3	131	312	39	22	leaves	0.33
Brigitta	(20	138	328	39	29	leaves	0.18
	21)	126	299	39			

[a] 0.4 mm rain with 24 h 1st spray

[b] 3.6 mm rain with 24 h 2nd spray

[c] 0.6 mm rain with 24 h 3rd spray

Table 41 Residues of flutriafol in sugar beet (tops) in the USA following application of an SC formulation (Jones 2009 1812) (duplicate samples)

Location, year,		g		GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Porterville, CA, USA, 2009	3	129	306	81	14	1.44 1.20	< 0.01 < 0.01	0.03 0.04	< 0.01 < 0.01
Pheonix	(14 14)	127 124	307 292	81–83 87	Mean	1.32	< 0.01	0.04	< 0.01
Fresno, CA, USA, 2009 HH142	3 (14 14)	125 128 128	325 329 329	48 48 49	14	0.83 0.96	< 0.01 < 0.01	0.03 0.04 c0.01	< 0.01 < 0.01
					Mean	0.9	< 0.01	0.04	< 0.01
American Falls, ID, USA, 2009	3	123	279	49	14	0.08 0.06	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01
Hillshog 9026	(14 15)	129 123	295 318	49 49	Mean	0.07	< 0.01	< 0.01	< 0.01
Jerome, ID, USA, 2009	3	128	345	49	14	0.27 0.25	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
BTSCT01RR07	(14 14)	128 124	332 339	49 49	Mean	0.26	< 0.01	< 0.01	< 0.01
Geneva, MN, USA, 2009 Beta	3	129	288	Vegetative	14	0.65 0.61	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
130R	(15 13)	128 129	280 289	Vegetative Vegetative	Mean	0.63	< 0.01	0.01	< 0.01
Campbell, MN, USA, 2009	3 (13 14)	128 128	328 328	33 35	0	3.75 3.11	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
4012RR		129	330	49	Mean	3.43	< 0.01	< 0.01	< 0.01
					7	0.67 0.63	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.65	< 0.01	< 0.01	< 0.01
					14	0.40 0.45	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.43	< 0.01	< 0.01	< 0.01
					21	0.21 0.28	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01

Location, year,		g		GS		Residue (mg/kg)			
variety	No	ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
					Mean	0.25	< 0.01	< 0.01	< 0.01
					28	0.23 0.23	< 0.01 < 0.01	0.01 0.01	< 0.01 < 0.01
					Mean	0.23	< 0.01	0.01	< 0.01
Paynesville, MN, USA,	3 (13 14)	130 131	283 285	45 45	14	0.02 0.04	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Crystal RR202		130	281	47	Mean	0.03	< 0.01	< 0.01	< 0.01
Pavillion, WY, USA, 2009	3 (14 14)	128 130	304 302	49 49	14	1.72 1.83	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Beta 36RR11		130	318	49	Mean	1.78	< 0.01	< 0.01	< 0.01
Northwood, ND, USA, 2009	3	127	325	39	14	0.16 0.11	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Beta 1305R	(15 13)	129 127	329 324	39 39	Mean	0.14	< 0.01	< 0.01	< 0.01
Velva, ND,	3	130	284	37	14	1.22 1.11	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
USA, 2009 R308	(14 14)	131 127	286 284	39 39	Mean	1.17	< 0.01	< 0.01	< 0.01
York, NE, USA, 2009 Beta	3 (14 14)	129	329	42 d before harvest	14	0.84 0.72	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
734IR		130 129	329 325	39 49	Mean	0.78	< 0.01	< 0.01	< 0.01
Levelland, TX, USA, 2009 Phoenix	3 (14 15)	130	324	Roots starting to enlarge	14	0.50 0.64	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
		124 127	322 325	roots enlarging maturing roots	Mean	0.57	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Table 42 Residues of flutriafol in almond hulls following application of an SC formulation in the USA (Rice 2011 2161) (duplicate samples)

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
Dinuba, CA, USA, 2010 Almond	6 (8 8 8 8 8)	128 129 128	731 750 781	17 17 16	75 75 78	14	2.17, 1.78	< 0.01 < 0.01	0.02 0.02 c0.02	< 0.01 < 0.01
Sonora		129 128 128	788 791 883	16 16 14	78 81 81	Mean	1.98	< 0.01	0.02	< 0.01
Strathmore, CA, USA, 2010	6 (6 7 7 7 7)	128 128 129	2759 2751 2768	4.6 4.6 4.7	79 79 79	14	6.90, 6.47	< 0.01, < 0.01	0.11 0.10 c0.16	0.02, 0.02 c0.04
Almond Fritz		128 128 128	2761 2753 2773	4.6 4.6 4.6	80 80 88	Mean	6.54	< 0.01	0.10	0.02
Wasco, CA, USA, 2010	6 (8 6 7 7 7)	128 128 128	809 788 791	16 16 16	79 79 79	14	1.77, 1.84	ND, ND	0.02 0.02 c0.02	< 0.01, < 0.01
		128 128 128	786 785 827	16 16 15	79 79 85	Mean	1.80	< 0.01	0.02	< 0.01
Buttonwillow, CA, USA, 2010	6 (7 7 7 7 7)	128 127 133	3301 3321 3313	3.9 3.8 4	78 79 79	14	4.28, 3.67	< 0.01, < 0.01	0.06 0.05 c0.03	0.02 0.02 c0.02
Almond Monterey's		128 128	3304 3327	3.9 3.8	83 85	Mean	3.98	< 0.01	0.06	0.02

Location,		g		g	GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	ai/hL	(BBCH)	DALA	Flutriafol	T	TA	TAA
		128	3223	4	87					
Terra Bella, CA, USA,	6 (9 7 9 8 8)	127 128	661 605	19 21	75 72	1	2.68, 2.52	ND, < 0.01	0.04 0.06	< 0.01, < 0.01
2010		127	627	20	78	Mean	2.60	< 0.01	0.05	< 0.01
Almond Non Pareil		129 129	661 661	19 19	79 79	7	0.99, 1.19	< 0.01 < 0.01	0.03 0.06	< 0.01 < 0.01
		128	661	20	81	Mean	1.09	< 0.01	0.04	< 0.01
						14	0.93, 1.21	< 0.01 < 0.01	0.04 0.05 c0.11	< 0.01 < 0.01 c0.02
						Mean	1.07	< 0.01	0.04	< 0.01
						21	1.12, 1.39	< 0.01 < 0.01	0.05 0.05	< 0.01 < 0.01
						Mean	1.26	< 0.01	0.05	< 0.01
						28	0.81, 0.70	< 0.01 < 0.01	0.03 0.04	< 0.01 < 0.01
						Mean	0.76	< 0.01	0.04	< 0.01

Table 43 Residues of flutriafol in maize forage following application of an SC formulation in the USA (Carringer 2010 1810) (duplicate samples). A non-ionic surfactant was added to the tank mix at all sites except for decline trials where plots were sprayed with and without surfactant.

Location,		g		GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Germansville, PA, USA, 2009 Hybrid	2 (6)	131 130	140 140	79 85	0	2.30 2.57	< 0.01 < 0.01	0.01 0.01 c0.01	< 0.01 < 0.01
2D324 Mycogen Seed					Mean	2.44	< 0.01	0.01	< 0.01
Seven Springs, NC, USA, 2009	2 (7)	128 126	131 131	83 85	0	2.08 2.30	< 0.01 < 0.01	0.02 0.02 c0.03	< 0.01 < 0.01
N77-P5					Mean	2.19	< 0.01	0.02	< 0.01
Wyoming, IL, USA, 2009	2 (7)	129 129	112 112	75–83 83–85	0	1.37 1.22	< 0.01 < 0.01	0.01 < 0.01 c0.01	< 0.01 < 0.01
DKC 61–69					Mean	1.30	< 0.01	< 0.01	< 0.01
					1	0.987 0.160	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01
					Mean	0.57	< 0.01	< 0.01	< 0.01
					7	1.26 1.11	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
					Mean	1.18	< 0.01	0.02	< 0.01
					14	0.87 1.11	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.99	< 0.01	0.02	< 0.01
					21	0.74 0.87	< 0.01 < 0.01	0.01 0.02	< 0.01 < 0.01
					Mean	0.80	< 0.01	0.02	< 0.01
No surfactant		128 129	112 112	75–83 83–85	0	2.00 0.94	< 0.01 < 0.01	0.01 0.02	< 0.01 < 0.01
					Mean	1.47	< 0.01	0.02	< 0.01
					1	1.58 0.98	< 0.01 < 0.01	0.01 0.02	< 0.01 < 0.01
					Mean	1.28	< 0.01	0.02	< 0.01
					7	1.35 1.17	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	1.26	< 0.01	0.02	< 0.01
					14	0.76 1.01	< 0.01 < 0.01	0.02 0.06	< 0.01 < 0.01
					Mean	0.88	< 0.01	0.04	< 0.01

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
					21	0.64 0.50	< 0.01 < 0.01	0.03 0.03	< 0.01 < 0.01
					Mean	0.57	< 0.01	0.03	< 0.01
Carlyle, IL, USA, 2009 8G23	2 (7)	130 133	112 131	85 85	0	0.53 0.53	< 0.01 < 0.01	0.02 0.02 c0.02	< 0.01 < 0.01
					Mean	0.53	< 0.01	0.02	< 0.01
Grantfork, IL, USA, 2009	2 (7)	130 128	122 103	85 85	0	1.85 1.93	< 0.01 < 0.01	< 0.01 0.01 c0.02	< 0.01 < 0.01
AgriGolg AG457					Mean	1.89	< 0.01	< 0.01	< 0.01
Conklin, MI, USA, 2009 A1005113	2 (7)	128 128	122 122	85 85–86	0	1.01 1.27	< 0.01 < 0.01	0.02 0.02 c0.02	< 0.01 < 0.01
					Mean	1.14	< 0.01	0.02	< 0.01
Richland, IA, USA, 2009	2 (8)	129 129	140 140	79 87	0	1.83 1.47	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
Pioneer					Mean	1.65	< 0.01	0.02	< 0.01
34R67					1	1.26 1.20	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
					Mean	1.23	< 0.01	0.02	< 0.01
					7	0.31 0.30	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
					Mean	0.30	< 0.01	0.02	< 0.01
					13	0.32 0.34	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
					Mean	0.33	< 0.01	0.02	< 0.01
					20	0.32 0.34	< 0.01 < 0.01	0.03 0.02	< 0.01 < 0.01
					Mean	0.33	< 0.01	0.02	< 0.01
No surfactant	2 (8)	129 129	140 140	79 87	0	1.05 0.99	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	1.02	< 0.01	0.02	< 0.01
					1	0.68 0.74	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
					Mean	0.71	< 0.01	0.02	< 0.01
					7	0.13 0.13	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.13	< 0.01	0.02	< 0.01
					13	0.19 0.21	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
					Mean	0.20	< 0.01	0.02	< 0.01
					20	0.19 0.18	< 0.01 < 0.01	0.04 0.03	< 0.01 < 0.01
					Mean	0.19	< 0.01	0.04	< 0.01
Douds, IA, USA, 2009	2 (6)	131 128	150 140	75–78 85	0	1.48 1.42	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Garst 84N57					Mean	1.45	< 0.01	< 0.01	< 0.01
Batavia, IA, USA, 2009 Garst 82K79	2 (6)	132 130	150 140	75–78 85	0	1.56 1.17	< 0.01 < 0.01	0.03 0.03 c0.05	< 0.01 < 0.01
					Mean	1.36	< 0.01	0.03	< 0.01
LaPlata, MO, USA, 2009 LG 2614 VT	2 (6)	127 129	140 140	75–80 83–85	0	0.74 1.08	< 0.01 < 0.01	< 0.01 0.01 c0.01	< 0.01 < 0.01
					Mean	0.91	< 0.01	< 0.01	< 0.01
Jefferson, IA, USA, 2009 33H27	2 (7)	131 130	131 122	85 85	0	3.47 1.84	< 0.01 < 0.01	0.02 0.01 c0.02	< 0.01 < 0.01
					Mean	2.66	< 0.01	0.02	< 0.01
Bagley, IA,	2 (7)	131	140	85	0	1.50 1.76	< 0.01	0.01	< 0.01

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
USA, 2009 33M16		130	103	85			< 0.01	0.01 c0.02	< 0.01
					Mean	1.63	< 0.01	0.01	< 0.01
Bristol, IN, USA, 2009	2 (7)	128 128	122 122	83–85 86	0	1.50 1.56	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
34F97					Mean	1.53	< 0.01	0.02	< 0.01
York, NE, USA, 2009 7B15RRY	2 (8)	129 129	140 140	83 85	0	2.20 1.50	< 0.01 < 0.01	0.02 0.02 c0.02	< 0.01 < 0.01
GCBP					Mean	1.85	< 0.01	0.02	< 0.01
Osceola, NE, USA, 2009 7B15RRY	2 (7)	128 129	140 140	83 85	0	1.8 1.74	< 0.01 < 0.01	0.05 0.04 c0.02	< 0.01 < 0.01
GCBP					Mean	1.77	< 0.01	0.04	< 0.01
Geneva, NE, USA, 2009 7B15RRY	2 (8)	129 129	140 140	83 85	0	1.07 1.10	< 0.01 < 0.01	0.02 0.02 c0.02	< 0.01 < 0.01
GCBP					Mean	1.08	< 0.01	0.02	< 0.01
Geneva, MN, USA, 2009 Pioneer	2 (7)	127 128	140 140	R4 86	0	1.41 1.90	< 0.01 < 0.01	0.01 0.01 c0.01	< 0.01 < 0.01
38P43					Mean	1.66	< 0.01	0.01	< 0.01
Paynesville, MN, USA, 2009 Dekalb	2 (7)	129 129	131 131	85 85	0	1.99 1.51	< 0.01 < 0.01	< 0.01 < 0.01 c0.02	< 0.01 < 0.01
DKC35					Mean	1.75	< 0.01	< 0.01	< 0.01
Fitchburg, WI, USA, 2009 Pioneer	2 (7)	127 127	131 131	83 85–86	0	2.71 2.77	< 0.01 < 0.01	0.01 0.01 c0.01	< 0.01 < 0.01
37Y14					Mean	2.74	< 0.01	0.01	< 0.01
Hinton, OK, USA, 2009 DKC 52–59	2 (7)	128 128	131 131	85 85	0	0.77 0.71	< 0.01 < 0.01	0.04 0.04 c0.05	< 0.01 < 0.01
					Mean	0.74	< 0.01	0.04	< 0.01

1 X-77 @ 0.25% v/v; 2 Induce @ 0.34% v/v; 3 Aquagene 90 @ 0.05% v/v; 4 Surfac 820 @ 0.25% v/v; 5 NIS @ 0.25% v/v; 6 R-11 @ 0.064% v/v; 7 Silwet L-77 @ 0.25% v/v; 8 X-77 @ 0.25% v/v; 9 X-77 @ 0.25% v/v; 10 X-77 @ 0.25% v/v; 11 Hel-Fire 90 @ 0.25% v/v; 12 Hel-Fire 90 @ 0.25% v/v; 13 R11 @ 0.064% v/v; 14 Cornbelt Premier 90 @ 0.25% v/v; 15 Cornbelt Premier 90 @ 0.063% v/v; 16 Cornbelt Premier 90 @ 0.25% v/v; 17 Dyne Amic NIS @ 0.375% v/v; 18 Preference @ 0.25% v/v; 19 Preference @ 0.25% v/v; 20 Baron @ 0.076% v/v

Moisture content %: 70.6, 68.2, 69.9 (0 d), 69.8 (1 d), 67.2 (7 d), 57.7 (14 d), 56.3 (21 d), 71.5, 70.4, 72.7, 70.6 (0 d), 66.5 (1 d), 69.0 (7 d), 68.0 (13 d), 67.1 (20 d), 69.8, 70.0, 71.3, 68.6, 71.2, 72.3, 67.7, 65.3, 65.9, 71.3, 54.2, 62.4, 61.4

Table 44 Residues of flutriafol in maize stover following application of an SC formulation in the USA (Carringer 2010 1810) (duplicate samples). A non-ionic surfactant was added to the tank mix at all sites except for decline trials where plots were sprayed with and without surfactant.

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
Germansville, PA, USA,	2 (6)	129 132	140 140	87 89	6	2.67 3.31	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Hybrid 2D324 Mycogen Seed					Mean	2.99	< 0.01	< 0.01	< 0.01
Seven Springs, NC, USA, 2009	2 (7)	129 131	131 131	86 89	6	2.25 1.89	< 0.01 < 0.01	< 0.01 0.02 c0.03	< 0.01 < 0.01
N77-P5					Mean	2.07	< 0.01	< 0.02	< 0.01
Wyoming, IL, USA,	2 (7)	129 128	112 112	89 89	0	1.23 0.92	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009					Mean	1.08	< 0.01	< 0.01	< 0.01
DKC 61-69					1	1.04 1.76	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	1.40	< 0.01	< 0.01	< 0.01
					7	0.62 0.93	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.78	< 0.01	< 0.01	< 0.01
					15	0.84 0.71	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.78	< 0.01	< 0.01	< 0.01
					21	0.90 0.84	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.87	< 0.01	< 0.01	< 0.01
No surfactant	2 (7)	128 128	112 112	89 89	0	1.09 1.07	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	1.08	< 0.01	< 0.01	< 0.01
					1	1.48 1.40	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	1.44	< 0.01	< 0.01	< 0.01
					7	0.96 0.74	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.85	< 0.01	< 0.01	< 0.01
					15	0.74 0.72	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.73	< 0.01	< 0.01	< 0.01
					21	0.77 0.58	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.68	< 0.01	< 0.01	< 0.01
Carlyle, IL, USA, 2009	2 (8)	127 128	122 140	87 89	7	1.63 2.24	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
8G23					Mean	1.94	< 0.01	< 0.01	< 0.01
Grantfork, IL, USA,	2 (7)	130 130	122 112	89 89	7	0.87 0.90	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 AgriGolg AG457					Mean	0.88	< 0.01	< 0.01	< 0.01
Conklin, MI, USA, 2009	2 (8)	128 128	122 122	87 88	6	1.06 1.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
A1005113					Mean	1.04	< 0.01	< 0.01	< 0.01
Richland, IA, USA, 2009	2 (7)	129 129	140	89 89	0	3.30 2.77	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Pioneer					Mean	3.04	< 0.01	< 0.01	< 0.01
34R67					1	0.77 0.89	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.83	< 0.01	< 0.01	< 0.01
					7	0.95 1.06	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	1.00	< 0.01	< 0.01	< 0.01

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Residue (mg/kg) Flutriafol	T	TA	TAA
					13	0.69 0.71	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.70	< 0.01	< 0.01	< 0.01
					20	0.78 1.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.90	< 0.01	< 0.01	< 0.01
No surfactant	2 (7)	128 129	140 140	89 89	0	2.46 2.36	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	2.41	< 0.01	< 0.01	< 0.01
					1	0.81 0.78	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.80	< 0.01	< 0.01	< 0.01
					7	0.56 0.64	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.59	< 0.01	< 0.01	< 0.01
					13	0.49 0.72	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.60	< 0.01	< 0.01	< 0.01
					20	0.62 0.60	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.61	< 0.01	< 0.01	< 0.01
Douds, IA, USA, 2009	2 (7)	126 127	140 131	87 87–89	7	1.34 1.54	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Garst 84N57					Mean	1.44	< 0.01	< 0.01	< 0.01
Batavia, IA, USA, 2009	2 (7)	129 126	140 131	87 87–89	7	2.73 2.54	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Garst 82K79					Mean	2.64	< 0.01	< 0.01	< 0.01
LaPlata, MO, USA, 2009	2 (7)	130 128	140 140	87 89	6	1.48 1.45	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01
LG 2614 VT					Mean	1.46	< 0.01	< 0.01	< 0.01
Jefferson, IA, USA,	2 (7)	129 127	112 103	87 87	7	6.12 4.77	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 33H27					Mean	5.44	< 0.01	< 0.01	< 0.01
Bagley, IA, USA, 2009	2 (7)	126 127	103 103	87 87	7	2.82 2.15	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
33M16					Mean	2.48	< 0.01	< 0.01	< 0.01
Bristol, IN, USA, 2009	2 (7)	128 128	122 122	87 88	8	0.87 0.56	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
34F97					Mean	0.72	< 0.01	< 0.01	< 0.01
York, NE, USA, 2009	2 (8)	129 124	140 140	87 87	6	2.82 3.27	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
7B15RRY GCBP					Mean	3.04	< 0.01	< 0.01	< 0.01
Osceola, NE, USA, 2009	2 (7)	129 129	140 140	87 87	7	3.71 4.25	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
7B15RRY GCBP					Mean	3.98	< 0.01	< 0.01	< 0.01
Geneva, NE, USA, 2009	2 (7)	128 128	140 140	87 87	6	3.25 2.73	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
7B15RRY GCBP					Mean	2.99	< 0.01	< 0.01	< 0.01
Geneva, MN, USA, 2009	2 (6)	129 129	140 140	87 87	8	2.33 2.43	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
Pioneer 38P43					Mean	2.38	< 0.01	< 0.01	< 0.01
Paynesville, MN, USA,	2 (7)	129 130	131 131	87 89	7	0.02 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Dekalb DKC35					Mean	< 0.02	< 0.01	< 0.01	< 0.01
Fitchburg, WI, USA,	2 (6)	128 128	131 131	87 89	9	1.23 1.40	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
2009 Pioneer 37Y14					Mean	1.32	< 0.01	< 0.01	< 0.01

Location,		g		GS		Residue (mg/kg)			
year, variety	No	ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Hinton, OK, USA, 2009	2 (7)	129 129	131 131	87 87	7	2.65 1.89	< 0.01 < 0.01	0.03, 0.03 c0.02	< 0.01 < 0.01
DKC 52–59					Mean	2.27	< 0.01	0.03	< 0.01

1 X-77 @ 0.25% v/v; 2 Induce @ 0.34% v/v; 3 Aquagene 90 @ 0.05% v/v; 4 Surfac 820 @ 0.25% v/v; 5 NIS @ 0.25% v/v; 6 R-11 @ 0.064% v/v; 7 Silwet L-77 @ 0.25% v/v; 8 X-77 @ 0.25% v/v; 9 X-77 @ 0.25% v/v; 10 X-77 @ 0.25% v/v; 11 Hel-Fire 90 @ 0.25% v/v; 12 Hel-Fire 90 @ 0.25% v/v; 13 R11 @ 0.064% v/v; 14 Cornbelt Premier 90 @ 0.25% v/v; 15 Cornbelt Premier 90 @ 0.063% v/v; 16 Cornbelt Premier 90 @ 0.25% v/v; 17 Dyne Amic NIS @ 0.375% v/v; 18 Preference @ 0.25% v/v; 19 Preference @ 0.25% v/v; 20 Baron @ 0.076% v/v

Moisture contents %: 57.2, 57.2, 63.2 (0 d), 67.8 (1 d), 57.8 (7 d), 61.2 (15 d), 55.1 (21 d), 61.4, 45.8, 69.6, 63.4 (0 d), 72.3 (1 d), 66.7 (7 d), 61.6 (13 d), 52.1 (20 d), 63.9, 67.7, 60.8, 33.0, 65.6, 62.2, 56.1, 61.9, 61.7, 64.6, 39.2, 65.2, 55.0.

Plots were established for the collection of the forage samples and the applications timed such that the forage samples were collected nominally at soft dough to hard dough stage (BBCH 85–87) 30 days (± 1) after the last application (30-day PHI).

Table 45 Residues of flutriafol in sorghum forage following application of an SC formulation in the USA (Carringer 2013 2699) (duplicate samples, applications include non-ionic surfactant, separate plots to those used for grain and stover)

				GS		Residue (mg/kg)			
Location, year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Seven Springs, NC, USA, 2012 DKS54-00	2 (7)	129 129	178 168	37 39	30	0.21 0.17	< 0.01 < 0.01	0.10 0.08	0.04 0.03
					Mean	0.19	< 0.01	0.09	0.04
Proctor, AR, USA, 2012 GX12564	2 (7)	128 129	150 150	Pre-heading Pre-	30	0.36 0.21	< 0.01 < 0.01	0.03 0.03 c0.01	0.01 0.01
				heading	Mean	0.28	< 0.01	0.03	0.01
Richland, IA, USA, 2012 Pioneer 84G62	2 (7)	128 131	178 178	39 51	30	0.07 0.10	< 0.01 < 0.01	0.04 0.04 c0.03	< 0.01 < 0.01
					Mean	0.08	< 0.01	0.04	< 0.01
Kirksville, MO, USA, 2012 Pioneer 84G62	2 (7)	123 126	159 159	39 51	30	0.26 0.22	< 0.01 < 0.01	0.03 0.03 c0.02	< 0.01 < 0.01
					Mean	0.24	< 0.01	0.03	< 0.01
Stafford, KS, USA, 2012 84G62	2 (7)	124 130	159 168	47 53	29	0.23 0.28	< 0.01 < 0.01	0.05 0.04	< 0.01 < 0.01
					Mean	0.26	< 0.01	0.04	< 0.01
York, NE, USA, 2012 85G01	2 (7)	127 128	178 187	65 71	31	0.20 0.21	< 0.01 < 0.01	0.05 0.06 c0.03	0.02 0.03 c0.01
					Mean	0.20	< 001	0.06	0.02
Uvalde, TX USA, 2012 Pioneer 83G19	2 (7)	128 128	140 150	16 18	30	0.47 0.61	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.54	< 0.01	< 001	< 0.01
Hinton, OK, USA, 2012 DKS29-28	2 (7)	128 128	168 178	68 69	30	0.82 1.18	< 0.01 < 0.01	0.06 0.06 c0.02	0.02 0.03
					Mean	1.0	< 0.01	0.06	0.02
Grand Island, NE, USA, 2012 85G01	2 (7)	128 128	178 178	75 85	30	0.61 0.67	< 0.01 < 0.01	0.02 0.02 c0.03	0.02 0.02 c0.02
					Mean	0.64	< 0.01	0.02	0.02
Larned, KS, USA, 2012 84G62	2 (7)	131 132	178 178	59 69	22	0.61 0.65	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.63	< 0.01	0.02	< 0.01
					29	0.57 0.48	< 0.01 < 0.01	0.03 0.02 c0.01	< 0.01 < 0.01

				GS		Residue (mg/kg)			
Location, year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
					Mean	0.52	< 0.01	0.02	< 0.01
					37	0.27 0.28	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.28	< 0.01	0.02	< 0.01
					44	0.21 0.24	< 0.01 < 0.01	0.02 0.03	< 0.01 < 0.01
					Mean	0.22	< 0.01	0.02	< 0.01
					50	0.23 0.23	< 0.01 < 0.01	0.04 0.03	< 0.01 < 0.01
					Mean	0.23	< 0.01	0.04	< 0.01
Wall, TX, USA, 2012 DKS44-20	2 (7)	128 129	131 140	38 43	29	0.77 0.66	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.72	< 0.01	0.02	< 0.01
Levelland, TX, USA, 2012 165310	2 (7)	129 130	178 178	55 51–59	30	0.79 0.78	< 0.01 < 0.01	0.02 0.02	< 0.01 < 0.01
					Mean	0.78	< 0.01	0.02	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.28-0.3% v/v, Dyne-Amic 0.5% v/v, Preference 0.5% v/v, Preference 0.5% v/v, Spreader 90 0.25% v/v, Cornbelt Premier 90 0.03% v/v, Induce 0.2% v/v, Baron 0.25% vv, Cornbelt Premier 0.03% v/v, Spreader 90 0.25% v/v, Induce 0.5% v/v, R-11 0.22% v/v

Table 46 Residues of flutriafol in sorghum stover following application of an SC formulation in the USA (Carringer 2013 2699) (duplicate samples, applications include non-ionic surfactant)

				GS		Residue (mg/kg)			
Location, year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Seven Springs, NC, USA, 2012 DKS54-00	2 (7)	129 129	178 168	37 39	30	0.44 0.41	< 0.01 < 0.01	0.01 < 0.01	0.02 0.02
					Mean	0.42	< 0.01	< 0.01	0.02
Proctor, AR, USA, 2012 GX12564	2 (7)	128 129	150 150	Pre- heading Pre-	30	0.44 0.46	< 0.01 < 0.01	0.02 0.01 c0.02	< 0.01 < 0.01
				heading	Mean	0.45	< 0.01	0.02	< 0.01
Richland, IA, USA, 2012 Pioneer 84G62	2 (7)	128 131	178 178	39 51	30	1.35 0.93	< 0.01 < 0.01	0.01 0.01 c0.02	< 0.01 < 0.01
					Mean	1.14	< 0.01	0.01	< 0.01
Kirksville, MO, USA, 2012 Pioneer 84G62	2 (7)	123 126	159 159	39 51	30	0.86 0.89	< 0.01 < 0.01	< 0.01 0.01 c0.02	< 0.01 < 0.01
					Mean	0.88	< 0.01	< 0.01	< 0.01
Stafford, KS, USA, 2012 84G62	2 (7)	124 130	159 168	47 53	29	0.80 0.80	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.80	< 0.01	< 0.01	< 0.01
York, NE, USA, 2012 85G01	2 (7)	127 128	178 187	65 71	31	0.67 0.70	< 0.01 < 0.01	0.02 0.04 c0.01	< 0.01 0.01
					Mean	0.68	< 0.01	0.03	< 0.01
Uvalde, TX USA, 2012 Pioneer 83G19	2 (7)	128 128	140 150	16 18	30	1.70 1.21	< 0.01 < 0.01	0.02 0.01	< 0.01 < 0.01
					Mean	1.46	< 0.01	0.02	< 0.01
Hinton, OK, USA, 2012 DKS29-28	2 (7)	128 128	168 178	68 69	30	0.92 0.92	< 0.01 < 0.01	0.06 0.06 c0.01	0.02 0.02
					Mean	0.92	< 0.01	0.06	0.02
Grand Island, NE, USA, 2012 85G01	2 (7)	128 128	178 178	75 85	30	0.55 0.50	< 0.01 < 0.01	0.01 0.01 c0.01	< 0.01 < 0.01
					Mean	0.52	< 0.01	0.01	< 0.01

				GS		Residue (mg/kg)			
Location, year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Larned, KS, USA, 2012 84G62	2 (7)	131 132	178 178	59 69	23	0.29 0.28	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.28	< 0.01	< 0.01	< 0.01
					29	0.33 0.26	< 0.01 < 0.01	0.01 < 0.01	< 0.01 < 0.01
					Mean	0.30	< 0.01	< 0.01	< 0.01
					36	0.27 0.23	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.25	< 0.01	< 0.01	< 0.01
					43	0.22 0.25	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	0.24	< 0.01	< 0.01	< 0.01
					50	0.25 0.27	< 0.01 < 0.01	< 0.01 0.01	< 0.01 < 0.01
					Mean	0.26	< 0.01	< 0.01	< 0.01
Wall, TX, USA, 2012 DKS44-20	2 (7)	128 129	131 140	38 43	29	5.05 [5.78 4.86 4.52] 3.74 [4.30 3.28 3.65]	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 < 0.01
					Mean	4.40	< 0.01	< 0.01	< 0.01
Levelland, TX, USA, 2012 165310	2 (7)	129 130	178 178	55 51–59	30	1.72 1.33	< 0.01 < 0.01	< 0.01 < 0.01	< 0.01 0.01
					Mean	1.52	< 0.01	< 0.01	< 0.01

Analytical method flutriafol: RAM 219/04

Analytical method T, TA, TAA: Meth-160, revision 2

Induce 0.28-0.3% v/v, Dyne-Amic 0.5% v/v, Preference 0.5% v/v, Preference 0.5% v/v, Spreader 90 0.25% v/v, Cornbelt Premier 90 0.03% v/v, Induce 0.2% v/v, Baron 0.25% vv, Cornbelt Premier 0.03% v/v, Spreader 90 0.25% v/v, Induce 0.5% v/v, R-11 0.22% v/v

Table 47 Residues of flutriafol in rape plants in Europe following application of an SC formulation (Pollmann 2006a 1298; 2006b 1334; 2007a 1542)

Location, year, variety	No	g ai/ha	L/ha	GS (BBCH)	DALA	Sample	Flutriafol residues (mg/kg)
Northern Europe							
Bietigheim, Baden-	2	124	293	62	0	shoots	2.2
Wurttemberg,	(26)	131	311	80	7	shoots	0.39
Germany, 2005	[a]				13	plant	0.22
Lisanne					20	plant	0.12
Padborg,	2	138	329	62	0	shoots	2.4
Sonderjylland,	(49)	127	302	80	6	shoots	0.28
Denmark, 2005					13	plant	0.26
Trabant					20	plant	0.17
Meistratzheim,	2	129	255	62	0	shoots	1.88
Alsace, Northern	(28)	125	247	80	7	shoots	0.24
France, 2005	[b]				13	plant	0.19
Hability					21	plant	0.07
Charndon, Bicester,	2	131	313	62	0	shoots	3.18
Oxfordshire, UK,	(55)	129	307	80	7	shoots	1.75
2005 Labrador	[c]				13	plant	0.62
					20	plant	0.41
Southern Europe							
Lavaur, Midi-	2	133	420	62	0	shoots	2.22
Pyrénées, Southern	(42)	134	424	80	6	shoots	0.59
France, 2005 Corail	[d]				13	plant	0.42
+ Cocktail					21	plant	0.23
St. Paul Trois	2	132	345	62	0	shoots	2.19
Chateaux, Rhone-	(41)	117	305	80	6	shoots	0.22
Alpes, Southern	[e]				15	plant	0.1
France, 2005 Navajo					22	plant	0.06

[a] 8 and 0.3 mm rain within 24 h 1st and 2nd sprays
[b] 6-7 mm rain within 24 h of the 2nd spray
[c] 2.6 mm rain within 24 h of the 2nd spray
[d] 14.4 and 0.2 mm rain within 24 h 1st and 2nd sprays
[e] 8.6 mm rain within 24 h of the 2nd spray

Table 48 Residues of flutriafol in cotton gin by-products (trash) following application of an SC formulation in the USA (Carringer 2013 2700) (duplicate samples, applications include non-ionic surfactant)

Location,				GS		Residue (mg/kg)			
year, variety	No	g ai/ha	L/ha	(BBCH)	DALA	Flutriafol	T	TA	TAA
Wall, TX, USA, 2012	3 (105	295 124	41 168	0 82	30	2.25 2.28	< 0.01 < 0.01	< 0.01 < 0.01	0.02 0.02
DP 0912 B2RF	7)	127	168	83	Mean	2.26	< 0.01	< 0.01	0.02
Hinton, OK, USA,	3 (112	291 128	41 112	0 80	23	0.88 0.94	< 0.01 < 0.01	0.02 0.03	0.16 0.15
2012	8)	128	140	87	Mean	0.91	< 0.01	0.02	0.16
DP 0912 B2RF					30	0.93 0.82	< 0.01 < 0.01	0.03 0.02	0.22 0.18 c0.01
					Mean	0.88	< 0.01	0.02	0.20
					37	1.19 1.05	< 0.01 < 0.01	0.01 0.02	0.18 0.22
					Mean	1.12	< 0.01	0.02	0.20
					44	1.02 0.85	< 0.01 < 0.01	0.03 0.03	0.16 0.16
					Mean	0.94	< 0.01	0.03	0.16
					51	0.82 0.97	< 0.01 < 0.01	0.02 0.03	0.12 0.14
					Mean	0.90	< 0.01	0.02	0.13
Levelland, TX, USA,	3 (123	299 130	38 178	0 80	30	1.74 1.80	< 0.01 < 0.01	0.01 0.01	0.02 0.03
2012 DP 0912 B2RF	7)	129	178	81	Mean	1.77	< 0.01	0.01	0.02

1st spray at planting as a band spray (T-band) followed by two foliar sprays closer to harvest

Gin by-products %moisture: 10.4, 18.0 (23 d), 18.0 (30 d), 9.6 (37 d), 13.6 (44 d), 13.4 (51 d), 10.4

FATE OF RESIDUES IN STORAGE AND POCESSING

In processing

The hydrolytic behaviour of [^{14}C]flutriafol was studied under conditions at high temperatures in sterile aqueous buffers at pH 4, 5 and 6 for periods of up to 60 minutes in order to simulate common processing practices (pasteurisation, baking/brewing/boiling, and sterilisation) (Hiler 2012 2441). The concentration of flutriafol was approximately 1 mg/L.

Table 49 Conditions for simulated processing trials (Hiler 2012 2441)

Simulated process	pH	Nominal temperature	Test period
Pasteurisation	4 ± 0.1	90 ± 5 ºC	20 minutes
Baking/Brewing/Boiling	5 ± 0.1	100 ± 5 ºC	60 minutes
Sterilisation	6 ± 0.1	120 ± 5 ºC	20 minutes

Recoveries of ^{14}C ranged from 98.6 to 108.1% of that applied. Flutriafol was not degraded under any of the sets of conditions tested. Therefore it is concluded that flutriafol should remain stable in /on processed commodities during common processing practices.

Table 50 Stability of flutriafol during simulations of typical processing conditions (Hiler 2012 2441)

	Flutriafol % of Applied Dose		
	pH 4 Buffer Test System (90 °C ± 5 °C)	pH 5 Buffer Test	pH 6 Buffer Test System

Sample		System (100 °C ± 5 °C)	(120 °C)
Time 0 Rep A	99.1	98.6	99.1
Time 0 Rep B	99.9	98.7	99.2
Time 20 min Rep A	100.7	101	108.1
Time 20 min Rep B	100.4	100.4	105.9

Peach

Two processing trials were conducted on peaches and nectarines in Spain (Martos 2011 2187.2 FLU amdt-1). Three foliar air blast applications were made using an SC formulation of flutriafol at a rate of 30 g ai/ha with a 7 day interval. Mature peaches and nectarines were sampled at a PHI of 7 days and were transported at ambient temperature to the processing facility where they were processed into juice and jam within 24 hours.

The fresh fruit was washed with water sprayed from a constant gas pressure sprayer (approx. 0.75 L water per kg fruit). Thereafter the fruit sample was divided into two portions and a minimum of 10 kg was used for processing into juice and 2 kg was used for processing into jam. Stones were removed and the separated pulp and stones weighed before discarding the stones.

Processing to Juice

Fruit pulp was then passed through a liquidiser to obtain the juice. Extracted fruit pulp (flesh) and raw juice were both weighed before discarding the extracted fruit pulp (waste). The pH of the juice was checked to be in the region of pH 3.5 before filtration and bottling.

Processing to jam

The fruit flesh was then cut into small pieces and heated until boiling. The heat was then reduced and the fruit allowed to simmer for approximately 15 minutes to provide raw fruit purée. Sugar was added at a ratio of 1:1 to the purée and the jam heated for 45 minutes until the Brix reached 65–68 °. The pH of the jam was checked to be in the region of pH 3.5 before being filled into glass bottles. The bottles were then tightly sealed and sterilized for 10 minutes (boiling water method).

Samples were stored frozen until analysed using a validated analytical method for residues of flutriafol. The LOQ of the method is 0.01 mg/kg for flutriafol.

Results show no significant difference of residues in processed products compared to the raw agricultural commodity with residues ranging from 0.03 to 0.05 mg/kg in fruit, 0.05 to 0.04 mg/kg in juice and 0.05 to 0.02 mg/kg in jam. The worst case PF was approximately 1.7 for juice and 1.0 for jam.

Table 51 Residues of flutriafol in peach juice and jam following processing of fruit (Martos 2011 2187.2 FLU amdt-1)

Location	N	g ai/ha	g ai/hL	BBCH	Matrix	Residue (mg/kg)	PF
Jumilla, Murcia,	3 (10 10)	34	3.13	77	Fruit	0.03	–
Spain, 2006 Amiga		36	3.13	78	Juice	0.05	1.7
		34	3.13	80	Jam	0.02	0.7
Blanca, Murcia,	3 (11 10)	30	3.13	77	Fruit	0.05	–
Spain, 2006 Elegant		32	3.13	78	Juice	0.04	0.8
Lady		31	3.13	80	Jam	0.05	1.0

Plums

One processing trial has been conducted on plums in the USA in 2009 (Carringer 2010 1808). Four foliar air blast applications were made using flutriafol formulated as a 125 g/L SC. All applications were made at a rate of 640 g ai/ha. Applications were made with a 7 day interval with the final application being made 7 days before harvest. Mature plums were transported overnight at ambient temperature to the processing facility where they were processed into prunes.

Fruit (18 kg) were inspected, sorted and culls removed. The fresh plums were washed for 5 minutes using a ratio of 2 kg of cold water to each 1 kg of fruit. The washed fruit were placed on drying trays and air-dried at 68–79 °C. The fruit was removed when average moisture contents of 19.3 to 20.0% were achieved which is lower than the target of approximately 21 to 32%. The prunes were allowed to cool for approximately 20 minutes. The cooled prunes were packaged, labelled, and placed in frozen storage for the required prune sample fraction. The LOQ of the method is 0.01 mg/kg for flutriafol, T, TA and TAA in plums but the LOQ was raised to 0.05 mg/kg for TA in prunes due to the presence of endogenous material.

Fresh plums and prunes were analysed for residues of flutriafol and the three triazole metabolites using a validated analytical method. Results show an increase in residues of flutriafol in prunes from 0.64 mg/kg to 1.4 mg/kg. No residues of T or TAA were observed in fresh plums or prunes. Residues of TA were 0.07 mg/kg in plums and 0.10 mg/kg in prunes. It is therefore concluded that flutriafol and TA do concentrate in processed commodities. The PF was approximately 2.2 for flutriafol.

Table 52 Residues of flutriafol in dried prunes following processing of plums (Carringer 2010 1808) (means of duplicate samples)

						Residue (mg/kg)		
Location	N	g ai/ha	g ai/hL	BBCH	Sample	Flutriafol	TA	PF
Poplar, CA, USA, 2009 French	4 (7 7 7)	633 638 643 644	93	81 81 85 87	Fruit	0.64	0.07	-
prunes					Prune	1.4	0.10	2.2

PF = for flutriafol residues only

Grapes

Two trials have been conducted in Germany and Southern France, one trial in white grapes and one in red grapes in each country (Block 2013 2650). Each trial consists of three plots—one untreated and two treated plots. Four applications of an SC formulation of flutriafol were made to grape vines at an exaggerated rate of 450 g ai/ha. The interval between applications and the interval between last application and harvest was 14 days.

At the processing facility a total of eight processing trials were conducted, one for each treated plot. Two of these trials were balance trials, one balance trial in red wine and one in white wine. In the balance trials red grapes were processed into stems, must, alcohol fermented wine (AF wine), wet and dry pomace, malolactic fermented wine (MF wine), lees, sediments and red wine. The white grapes were processed into must, wet and dry pomace, must deposit, AF wine, sediments and white wine. In trials for magnitude of residues, samples were only taken in fresh grapes, must, dry pomace and wine.

For red wine, fresh grapes were crushed and stemmed. Potassium metabisulphite and dry yeast was added to must to initiate the fermentation. During this process sugar was added to enhance the alcohol content. The fermented must was then separated in a liquid (free-run wine) and solid part. The solid part was pressed to produce pressed wine and wet pomace. Pomace was dried at 60 °C to produce dry pomace. Free-run and pressed wine was combined (AF wine) before further processing. Lactic bacteria (*Leuconostoc oenos*) was added to AF wine in air-free conditions. Potassium metabisulphite was added and the clarification process started. The intermediate wine was racked to produce MF wine and lees. Further potassium metabisulphite plus gelatine was added to the MF wine. Clarification proceeds while the wine was stored at

10 °C. Solid matter was removed before filtration of the red wine. Finally potassium metabisulphite was added to the wine before bottling.

For white wine, fresh grapes were pressed directly into must and wet pomace. Dry pomace was produced as for red wine production. Pectolic enzymes and potassium metabisulphite were added to the must before racking. Then dry yeast was added to initiate the fermentation. During this process sugar was added to enhance the alcohol content. Potassium metabisulphite was added and the clarification process started. Then the fermented must was racked to produce AF wine and lees. Further clarification, removal of solid matter, filtration and bottling was performed as for red wine.

Both samples of fresh grapes and processed samples were stored and shipped at frozen conditions before analysis. All samples were analysed for the content of flutriafol and the three metabolites 1,2,4-triazole, triazole alanine and triazole acetic acid using two separate validated analytical methods. The LOQ and LOD are 0.01 mg/kg and 0.003 mg/kg respectively for both flutriafol and the metabolites.

For flutriafol in the mass balance processing results for red wine gave an increase in flutriafol mass to 300% of that originally present in the starting grapes. The results were recalculated assuming the original mass present is the sum of the mass of must and stems. Following the adjustment the mass balance for red and white wine are in general agreement. Most flutriafol is retained in the must (48–97%) and wet pomace (25–95%). The AF wine contained 32–35% of the flutriafol mass. Lees taken after fermentation contained 5–8% of the initial flutriafol amount. Wine at bottling contained 31–37% of the initial mass of flutriafol.

Table 53 Red wine balance—mass balance

Sample	Weight	Corrected weight	Residue flutriafol (mg/kg)	Mass flutriafol (mg)	%mass (grapes 38.56)	%mass (stems + must 118.51)
Grapes prior to processing	56.7	56.7	0.68	38.6	100	
Stems, after crushing and stemming	2.1	2.2	1.8	4.0	10	3
Must, after crushing and stemming	53.5	54.5	2.1	114.6	97	97
AF wine, after pressing	38.7	40.1	0.94	37.7	98	32
Wet pomace, after pressing	9.4	9.8	3	29.4	76	25
Dry pomace, after drying	1.7	3.3	10.2	33.2	86	28
MLF wine, after malolactic fermentation	29.5	37.6	0.92	34.6	90	29
Lees, after malolactic fermentation	1.7	2.2	2.8	6.0	16	5
Sediments, after clarification	0.53	1.3	1.0	1.3	3	1
Red wine, at bottling	14.9	35.9	1.0	37.0	96	31

Table 54 White wine balance—mass balance

Sample	Weight	Corrected weight	Residue flutriafol (mg/kg)	Mass flutriafol (mg)	%mass (grapes)
grape, prior processing	55.0	55.0	1.2	68.2	100
Must, after pressing	32.9	33.9	0.97	32.9	48
Wet pomace, after pressing	20.5	21.1	3.1	65.0	95
Dry pomace, after drying	1.2	4.98	6.7	33.6	49
Must deposit, after racking	3.0	3.2	1.2	3.9	6
AF wine, after alcoholic fermentation	24.4	26.8	0.90	24.1	35
Lees, after alcoholic fermentation	2.6	2.9	1.8	5.3	8
Sediment, after clarification	0.96	1.7	1.0	1.7	3
White wine, at bottling	14.2	24.6	1.0	25.5	37

No residues or very low levels of residues were seen for the metabolites in both fresh grapes and processed fractions. Therefore no PF is calculated for the metabolites. Flutriafol residues levels were higher and increased slightly in must and white wine. The PF is 1.8 for red must, 1.6 for white must and 1.7 for white wine. No significant change in residue levels in red wine (PF of 1.1). A significant increase in flutriafol residues in dry pomace was observed with PFs of 10.7 and 6.5 for dry pomace from red and white wine production respectively.

Table 55 Transfer of residues of flutriafol in grape processed commodities (Block 2013 2650)

	kg ai/hL	kg ai/ha	PHI	GS BBCH	Portion analysed	Residue (mg/kg)	PF
Nieder-kirchen,	0.075	0.403	14	85	whole grape, prior processing	0.68	
Rheinland-Pfalz,	0.075	0.47			stems, after crushing and stemming	1.84	
Germany 2012	0.0749	0.436			must, after crushing and stemming	2.10	3.09
Spätbur-gunder	0.075	0.425			AF wine, after pressing	0.94	
(red grapes)					wet pomace, after pressing	3	4.4
					dry pomace, after drying	10.22	15.0
					MLF wine, after malolactic fermentation	0.92	
					lees, after malolactic fermentation	2.76	
					sediments, after clarification	1.01	
					red wine, at bottling	1.03	1.51
	0.0751	0.408	14	85	whole grape, prior processing	0.6	
	0.075	0.456			must, after crushing & stemming	1.67	2.42
	0.0751	0.453			dry pomace, after drying	12.25	17.75
	0.075	0.415			red wine, at bottling	1.09	1.58
Saint-Jean-d'Ardières,	0.0901	0.464	14	85	whole grape, prior processing	0.46	
Rhône, France 2012	0.09	0.487			must, after crushing and stemming	0.39	0.85
Gamay	0.0901	0.464			dry pomace, after drying	1.82	3.96
(red grapes)	0.0898	0.406			red wine, at bottling	0.26	0.57
	0.09	0.442	14	85	whole grape, prior processing	0.56	
	0.09	0.488			must, after crushing and stemming	0.54	0.98
	0.09	0.458			dry pomace, after drying	3.31	6.02
	0.09	0.45			red wine, at bottling	0.3	0.55
Nieder-kirchen,	0.075	0.44	14	85	whole grape, prior processing	1.24	
Rheinland-Pfalz,	0.075	0.426			must, after pressing	0.97	0.78
Germany 2012	0.075	0.422			wet pomace, after pressing	3.08	
Riesling (white	0.075	0.409			dry pomace, after drying	6.74	5.44
grapes)					must deposit, after racking	1.2	
					AF wine, after alcoholic fermentation	0.9	
					lees, after alcoholic fermentation	1.85	
					sediments, after clarification	1.02	
					white wine, at bottling	1.04	0.84
	0.0751	0.437	14	85	whole grape, prior processing	0.0751	
	0.075	0.441			must, after pressing	0.075	0.73
	0.0749	0.463			dry pomace, after drying	0.0749	6.71
	0.0749	0.433			white wine, at bottling	0.0749	0.79
Redessan, Gard,	0.0691	0.439	14	85	whole grape, prior processing	0.7	
France 2012	0.0692	0.505			must, after pressing	1.15	1.64
Roussanne Blanc	0.0692	0.462			dry pomace, after drying	3.04	4.34
(white grapes)	0.0693	0.488			white wine, at bottling	1.22	1.74
	0.0693	0.419	14	85	whole grape, prior processing	0.34	
	0.0692	0.465			must, after pressing	1.13	3.32
	0.0692	0.463			dry pomace, after drying	3.27	9.62
	0.0692	0.476			white wine, at bottling	1.14	3.35

Analytical method flutriafol: AGR/MOA/FLUTRI-1

Analytical method T, TA, TAA: AGR/MOA/TRZ-1

Strawberry

Four processing trials were conducted on protected strawberries in Spain in 2004 (Clark 2005 2583). Three applications of flutriafol were made, formulated as a 125 g/L SC using a hydraulic knapsack sprayer. All applications were made at a nominal rate of 18.75 g ai/hL using a nominal water volume of 1000 L/ha. Applications were made with a 10 day interval with the final application being made 3 days before commercial harvest.

Mature fresh strawberries were harvested from the field and transported at cool temperature to the processing facility where they were processed into strawberry jam using processes considered typical of commercial practice.

Whole strawberries were washed with an automatic fruit washer (500–750 mL water per kg fruit) and strained. Strawberries (1.4–1.7 kg) were sorted and crushed and the Brix degree measured. White sugar was added to the crushed strawberries and then the sample was reduced in a double jacketed saucepan in order to reach 62 °Brix. The pH was adjusted with citric acid to approximately pH 3.5 and bottled. Packaged samples were then sterilised at 115 °C for 10 minutes.

Untreated and treated samples of fresh fruit prior to processing and processed jam were stored frozen and shipped under frozen conditions to the analytical laboratory for analysis. Samples were analysed using a validated analytical method. The LOQ of the method is 0.01 mg/kg.

Fresh strawberries and jam were both analysed for residues of flutriafol using a validated analytical method. Results show a decrease in residues in jam. The mean PF was 0.875 (range 0.75 to 0.96).

Table 56 Residues of flutriafol in strawberry jam following household processing of berries (Clark 2005 2583)

Location	n	g ai/ha	g ai/hL	BBCH	DALA	Sample	Residue (mg/kg)	PF
Almonte, Spain, 2005	3	191	18.75	61	3	Fruit	0.32	
Camarosa		189	18.75	87		Jam	0.24	0.75
		199	18.75	88				
Huelva, Spain, 2005	3	197	18.75	61	3	Fruit	0.13	
Ventana		178	18.75	87		Jam	0.12	0.92
		194	18.75	88				
Bonares, Spain, 2005	3	195	18.75	61	3	Fruit	0.23	
Camarosa		191	18.75	87		Jam	0.22	0.96
		194	18.75	88				
Huelva, Spain, 2005	3	194	18.75	61	3	Fruit	0.31[b]	
Ventana		192	18.75	87		Jam	0.27	0.87
		195	18.75	88				

Cabbage

Three processing trials were conducted on cabbage in the USA in 2011 (Carringer 2013 2697). Four applications of an SC flutriafol formulation were made at a nominal rate of 128 g ai/ha. Applications were made with a 7 day interval with the final application being made 7 days before harvest.

The cabbage heads for the Sample Prepared for Consumption (SPFC) samples were visually examined and any damaged or wilted leaves, as well as the wrapper leaves, removed. Each cabbage head was then rinsed under cold running tap water for approximately 15–20 seconds. The heads were turned top side down and allowed to drain for at least two minutes.

The control, RAC and SPFC samples were placed in frozen storage within 2.5 hours after collection from the field and maintained frozen during transportation to the analytical laboratory. Samples were analysed using validated analytical methods. The LOQ of the methods is 0.01 mg/kg for all analytes.

RAC samples and SPFC samples were all analysed for residues of flutriafol and triazole metabolites using a validated analytical method. Results show a decrease in residues of flutriafol in the samples prepared for consumption with PFs ranging from 0.05 to 0.14.

Table 57 Residues of flutriafol in cabbage following household processing of plants(Carringer 2013 2697) (means of duplicate samples)

Location	N	g ai/ha	g ai/hL	DALA	Sample	Residue (mg/kg)		PF
						flutriafol	TA	
Seven Springs, NC, USA, 2011 Bravo	4	129 129 131 127	41 41 42 44	7	RAC	0.74	0.04	
				7	SPFC	0.04	0.06	0.05
Uvalde, TX, USA, 2011 Pennant	4	128 127 131 128	46 47 48 49	7	RAC	0.07	0.01	
				7	SPFC	0.01	0.01	0.14
Porterville, CA, USA, 2011 Supreme Vantage	4	127 130 128 129	45 47 48 49	7	RAC	0.09	0.04	
				7	SPFC	< 0.01	0.05	< 0.11

PF = for flutriafol residues only

SPFC = samples prepared for consumption

Tomato

One processing study has been conducted on tomatoes in the USA in 2011 (Carringer 2012 2440). Four applications of flutriafol (SC formulation) were made at five times the nominal rate of 128 g ai/ha with a 7 day interval and the final application being made 0 days before commercial harvest. Mature tomato fruit were transported cool (approximately 4 °C) to the processing facility where they were processed into tomato purée and tomato paste.

For juice, tomatoes were soaked in aqueous NaOH (ca. 0.1 N) at 52–60 °C for 3 minutes and rinsed with warm (68–74 °C) water before being crushed, rapidly heated to 79–85 °C, held for 30 seconds and separated into pomace and juice. The wet pomace was pressed to recover additional juice which was combined.

For purée, an aliquot of 9 kg juice was evaporated under vacuum and when the required Brix was achieved, 1% salt and distilled water were added to adjust the Brix range to 12–13 °. The puree was then heated to 82–88 °C and sealed into cans before being placed into a boiling bath for 15 minutes at 96–100 °C. Cans were then cooled and stored frozen prior to analysis.

For paste, a 9 kg aliquot of juice was evaporated under vacuum until the desired Brix range was achieved, 0.5% salt and distilled water were added to adjust the Brix range to 24–33 °. The paste was then heated 82–88 °C and sealed into cans before being placed into a boiling bath for 15 minutes at 96–100 °C. Cans were then cooled and stored frozen prior to analysis.

The LOQ of the method is 0.01 mg/kg except for TA in purée (0.02 mg/kg) and paste (0.03 mg/kg).

Fresh tomatoes, purée and paste were analysed for residues of flutriafol and triazole metabolites T, TA and TAA using a validated analytical method. Results showed an increase in flutriafol residues in puree with a PF of 1.2 and an increase in residues in paste with a PF of 3.6. No residues of T, TA or TAA were present above LOQ in any control or treated samples analysed.

Table 58 Residues of flutriafol in tomato processed fractions following processing of fruit (Carringer 2012 2440)

Location	n	g ai/ha	g ai/hL	DALA	Sample	Residue (mg/kg)	PF
Porterville, CA, USA, 2011 Roma VF	5			0	RAC	0.55	

Location	n	g ai/ha	g ai/hL	DALA	Sample	Residue (mg/kg)	PF
99 kg batch					Purée	0.64	1.2
					Paste	1.98	3.6

Head lettuce

Three processing trial have been conducted on head lettuce in the USA in 2011 (Carringer 2013 2698). Four applications of flutriafol were made, formulated as a 125 g/L SC using a backpack or tractor-mounted boom sprayer. All applications were made at a nominal rate of 128 g ai/ha. Applications were made with a 7 day interval with the final application being made 7 days before harvest. Mature head lettuce (RAC) and samples prepared for consumption (SPFC) were transported frozen to the analytical facility for analysis.

The head lettuce for the SPFC samples were visually examined and any damaged or wilted leaves, as well as wrapper leaves, removed. Each head was rinsed under cold running tap water for 15 to 20 seconds and allowed to drain top side down for at least two minutes.

The control, RAC and SPFC samples were placed in frozen storage within 3.17 hours after collection from the field and maintained frozen during transportation to the analytical laboratory. Samples were analysed using validated analytical methods. The LOQ of the methods is 0.01 mg/kg for all analytes.

RAC samples and SPFC samples were all analysed for residues of flutriafol and triazole metabolites using a validated analytical method. PFs for flutriafol range from 0.03 to 0.4 (mean of 0.21). Flutriafol does not concentrate in processed commodities.

Table 59 Residues of flutriafol in head lettuce following household processing of plants(Carringer 2013 2698) (means of duplicate samples)

Location	DALA	Sample	Residue (mg/kg)		PF
			Flutriafol	TA	
Germansville, PA, USA, 2011 Ithaca	7	RAC/ Heads	0.05	0.01	-
		SPFC/ Heads	0.02	0.01	0.4
King City, CA, USA, 2011 Venus	7	RAC/ Heads	0.05	< 0.01	-
		SPFC/ Heads	< 0.01	< 0.01	0.2
Arroyo Grande, CA, USA, 2011 Vandenberg	7	RAC/ Heads	0.67	0.03	-
		SPFC/ Heads	0.02	0.01	0.03

PF = for flutriafol residues only

SPFC = samples prepared for consumption

Sugar beet

In a processing study conducted on sugar beet in the USA (Jones 2009 1812) three applications of flutriafol (SC formulation) were made at a nominal rate of 640 g ai/ha with a 14 day interval and the final application 14 days before harvest. Mature sugar beet roots were transported at ambient temperature to the processing facility where they were processed into refined sugar, molasses and dry pulp samples.

Sugar beets (45.4 kg batch) were cleaned prior to processing by washing with a brush and water thereby removing excess soil, loose leaves and other debris. Cleaned beets were then sliced in a Hobart food cutter and the slices (cossettes) were first exposed to 88.5–93 °C water for 30–45 seconds (only) and then diffused in five kettles in a 69–74.5 °C water bath for a minimum of 9 minutes. After diffusion the raw juice was screened with a US#100 standard sieve to remove small pieces of beet from the juice.

Diffused cossettes were then dewatered with a FMC pulper/finisher. Beet pulp was produced by drying the dewatered material in a Steelman Industries oven at 55–72 °C for final moisture of 15% or less. Juice from dewatering was screened with the 100 mesh sieve and combined with juice from diffusion. The resulting fraction from this step is dried beet pulp.

During the first phosphatisation step, raw juice was mixed and the temperature increased to 81–86 °C. 20% calcium oxide solution and if required 3 M phosphoric acid was added until a pH of around 10.5 was achieved resulting in a precipitate. The sample was centrifuged to separate the precipitate from the juice.

During the second phosphatisation step, the juice was mixed and the temperature increased to 81–86 °C and pH reduced using 3 M phosphoric acid to around 9.1–9.3. The juice was then centrifuged and vacuum filtered to separate precipitate from the clear juice (thin juice). The juice was light yellow to light brown in colour. The thin juice was mixed and heated to 81–86 °C and pH reduced to 8.8–9.0 with sodium bisulphite.

The juice was evaporated under vacuum until the juice was 50–60% solids (thick juice) during which time the temperature was maintained below 86 °C). After evaporation the thick juice was filtered through cotton.

Evaporation continued under vacuum until the juice was 70–80% solids (syrup). Commercially available white cane sugar was added to the juice (seeding) after which crystallisation began.

The solution was allowed to cool after which the sugar and molasses were separated by centrifuging in a Western States basket centrifuge with filter basket. Steam was added to remove residual molasses from crystallised sugar. After removing the molasses the refined white sugar could be dried if necessary in a Steelman Industry oven at 55–72 °C to achieve a final moisture content of 10%. Samples did not require drying. The resulting fraction from this step is refined sugar and molasses.

Untreated and treated samples of sugar beet, refined sugar, molasses and beet pulp were stored frozen and shipped under frozen conditions to the analytical laboratory for analysis. Samples were analysed using a validated analytical method. The LOQ of the method is 0.01 mg/kg.

Sugar beet roots, refined sugar, molasses and dry pulp samples were all analysed for residues of flutriafol and triazole metabolites using a validated analytical method. Residues were < 0.01 mg/kg in the RAC and the processed commodities with the exception of TA being observed in both untreated and treated molasses samples at 0.02 mg/kg. It is therefore concluded that flutriafol does not concentrate in refined sugar, molasses or dry pulp.

Celery

Three processing trial have been conducted on celery in the USA in 2011 (Carringer 2013 2698). Four applications of flutriafol SC formulation were made at a nominal rate of 128 g ai/ha.

The celery heads for the SPFC samples were prepared by removing the inedible portion of the stalk (i.e. the woody part at the base of the stalk) to separate the stems. The leaves were not removed unless discoloured or damaged. The stems were then rinsed under cold running tap water for approximately 15–20 seconds and allowed to drain for at least 2 minutes.

The control, RAC and SPFC samples were placed in frozen storage within 3.17 hours after collection from the field and maintained frozen during transportation to the analytical laboratory. Samples were analysed using validated analytical methods. The LOQ of the methods is 0.01 mg/kg for all analytes.

Mature celery (RAC) and samples prepared for consumption (SPFC) were transported frozen to the analytical facility for analysis.

RAC samples and SPFC samples were all analysed for residues of flutriafol and triazole metabolites using a validated analytical method. PFs for flutriafol ranging from 0.73 to 1.24 (mean of 0.9) indicates that flutriafol does not concentrate significantly in celery processed commodities.

Table 60 Residues of flutriafol in celery following household processing of plants(Carringer 2013 2698) (means of duplicate samples)

		g		GS	DALA	Crop	Residue (mg/kg)			
Location, year, variety	No	ai/ha	L/ha	(BBCH)		part	Flutriafol	T	TA	PF
Sparta, MI, USA, 2012 Greenbay	4 (7 6 8)	129 128 128 128	46 47 46 46	45 46 47 48	7	Plant	0.73	0.06	< 0.01	
						SPCF	0.53	0.04	< 0.01	0.73
Porterville, CA, USA, 2012 Mission	4 (7 7 6)	129 128 129 127	365 365 365 365	44 46 46 48	7	Plant	1.08	< 0.01	0.02	
						SPCF	1.34	< 0.01	0.02	1.2
Guadalupe, CA, USA, 2011 Conquistador	4 (6 7 6)	128 129 129 128	271 262 271 271	45 46 47 48	8	Plant	0.77	0.04	0.06 c0.03	
						SPCF	0.57	0.03	0.05	0.74

PF = for flutriafol residues only

SPFC = samples prepared for consumption

Maize

Processing trials were conducted on field corn in the USA (Carringer 2010 1810). Two applications of flutriafol, formulated as a SC, were made at 128 g ai/ha and samples of mature field corn grains were used for generation of aspirated grains fractions (AGF). Additionally at one trial, applications were made at an exaggerated rate of 640 g ai/ha/application and samples from this site were processed into grits, meal, flour, starch and refined oil (wet and dry milled). At all sites applications were made with a 7 day interval with the final application being made 7 days before harvest. Mature corn grain were transported frozen to the processing facility and stored frozen until processing. Field corn grains samples were dried at 43–57 °C until the moisture content was 9–15%.

Generation of aspirated grain fractions (AGF)

To generate AGF, dried field corn grain samples were placed in a dust generation room containing a holding bin, two bucket conveyors and a screw conveyor. As the samples were moved in the system, aspiration was used to remove light impurities (grain dust). The grain dust was sieved for classification before being recombined for analysis.

Refined oil, dry milling process.

In preparation for processing field corn grain into refined oil utilising the dry milling process, samples of dried field corn grains were cleaned by aspiration and screening. Light impurities were removed by aspiration after which samples were screened to separate large and small foreign particles (screenings) from the field corn. The dried and cleaned samples were then moisture conditioned to 21% and fed into a mill to crack the kernels. Cornstock from the mill was dried in an oven for 30 minutes at 54–71 °C and screened with a 3.2 mm screen to separate bran, germ and large grits from grits, meal and flour.

Material below 3.2 mm was separated into grits, meal and flour using a sieve fitted with two screens of different sizes. Material greater than 3.2 mm was by means of screening, aspiration and milling (if necessary) separated into grits, meal, flour and germ.

Germ material was heated to 72–80 °C and flaked in a flaking roll. The flakes were then placed in batch extractors and submerged in 49–60 °C hexane. The crude oil/hexane mixture was drained and the extraction process repeated twice more with fresh hexane. After extraction the spent flakes were air dried to produce solvent extracted germ meal. The crude oil/hexane was passed through an evaporator to separate the crude oil from the hexane and then crude oil was heated to remove residual hexane before being filtered and refined. Crude oil and sodium hydroxide were mixed for 15 minutes at high RPM at approximately 20 °C and then for 12 minutes at low RPM at approximately 63–68 °C. The neutralised oil was centrifuged and the refined oil decanted and filtered.

Refined oil, wet milling process

A sample of dried and cleaned corn was steeped in 49–54 °C water containing 0.1–0.2% sulphur dioxide for 22–48 hours. The whole corn was then passed through a disc mill and the majority of the germ and hull was removed using a water centrifuge. Germ and hull were dried and separated using aspiration and screening.

Cornstock (without germ and hull) ground in the disc mill was passed over a 50µm screen where only bran was retained. The process water passing through the screen was separated into starch and gluten by centrifugation. Starch was dried in a dehydrator oven at 54–71 °C until moisture content was less than 15.0%.

The dried germ samples were moisture conditioned to 12%, heated to 88–104 °C in a mixer, flaked in a flaking roll and pressed in an expeller to liberate part of the crude oil (expelled crude oil). Residual crude oil was extracted from the presscake utilising the batch extractors submerged in hexane at 49–54 °C. The extraction procedure was repeated twice more with fresh hexane. The crude oil/hexane was passed through an evaporator to separate the crude oil from the hexane and then crude oil was heated to remove residual hexane before being filtered and refined. Crude oil and sodium hydroxide were mixed for 15 minutes at high RPM at approximately 20 °C and then for 12 minutes at low RPM at approximately 63–68 °C. The neutralised oil was centrifuged and the refined oil decanted and filtered.

Untreated and treated samples of from the processes were stored frozen and shipped under frozen conditions to the analytical laboratory for analysis. Samples were analysed using validated analytical methods. The LOQ of the methods is 0.01 mg/kg for flutriafol and its metabolites T and TAA. For TA the LOQ was 0.01 mg/kg in all matrices except grits (0.15 mg/kg), field corn grains (0.03 mg/kg), meal 0.034 mg/kg, flour (0.034 mg/kg) and AGF (0.1 mg/kg), where endogenous residues of TA resulted in LOQs higher than the target LOQ of 0.01 mg/kg.

Corn grains, AGF, grits, meal, flour, starch and refined oils were all analysed for residues of flutriafol and the triazole metabolites T, TA and TAA. Results show an increase in residues in meal, flour and oil (wet and dry milled), AGF. PFs range from > 4 for AGF, 3 for meal flour and oil and < 1 for grits and starch.

Table 61 Residues of flutriafol in maize processed fractions following processing of grain (Carringer 2010 1810)

Location, year,		kg		Crop	Residue (mg/kg)			
variety	No	ai/ha	DALA	part	Flutriafol	TA	TAA	PF
Carlyle Illinois USA		1.28	7	Grain	< 0.01	< 0.01	0.07	
2009 8G23				Grits	< 0.01	< 0.01	< 0.01	
				Meal	< 0.01	< 0.01	0.05	
232 kg batch				Flour	< 0.01	< 0.01	0.07	
milling				Refined oil (dry milling)	0.01	< 0.01	< 0.01	
				Starch	< 0.01	< 0.01	< 0.01	
				Refined oil (wet milling)	0.01	< 0.01	< 0.01	
299 kg batch				Grain	< 0.01	0.07	< 0.01	
306 kg batch				AGF	0.04	< 0.1	< 0.01	

%moisture: pre-processing 30%, AGF 9.8%, grits 16.6%, meal 18.0%, flour 17.6%, starch 7.0%

PF = flutriafol only

Rice

Four processing trial have been conducted on rice in Spain in 2006 (Gimeno 2007 1630). Two applications of flutriafol were made, formulated as a 125 g/L SC formulation using sprayer equipment typical of broadcast application. Applications were made at nominally 187.5 g ai/ha/application with a 14 day interval with the final application being made 14 days before harvest. Mature paddy rice were used for generation of husked (brown) rice and polished (white) rice.

At harvest plants were cut down and left to dry in a threshing floor, grains were then separated from straw and paddy rice samples obtained. The paddy rice was further dried and was then passed through a machine which removed the husks to obtain husked rice. The husked rice was fed into a mill where a set of huller reels removed the germ, outer bran and the waxy cuticle producing polished rice.

All samples were frozen immediately after processing and transported to the analytical facility. Samples were analysed for residues of flutriafol using a validated analytical method. See earlier table.

Sorghum

One processing trial has been conducted on grain sorghum in the USA in 2012 (Carringer 2013 2699). Two applications of flutriafol were made, formulated as a 125 g/L SC using sprayer equipment typical of broadcast application. Applications were made at the maximum use rate of nominally 128 g ai/ha/application with a 7 day interval with the final application being made 30 days before harvest. Mature grain sorghum grains were used for generation of aspirated grains fractions (AGF). Mature grain sorghum grain were transported frozen to the processing facility.

To generate AGF, dried field corn grain samples were placed in a dust generation room containing a holding bin, two bucket conveyors and a screw conveyor. As the samples were moved in the system, aspiration was used to remove light impurities (grain dust). The grain dust was sieved for classification before being recombined for analysis.

Untreated and treated samples from the processes were stored frozen and shipped under frozen conditions to the analytical laboratory for analysis. Samples were analysed using validated analytical methods. The LOQ of the methods is 0.01 mg/kg for flutriafol and its metabolites T, TA and TAA.

Residues are higher in AGF compared to grain with a processing factor of 8. The triazole metabolites T, TA and TAA are not concentrated in during processing into AGF.

Table 62 Residues of flutriafol in sorghum processed commodities following cleaning of grain harvested from a treated crop (Carringer 2013 2699) (duplicate samples)

Location, year, variety	No	g ai/ha	Run	DALA	Crop part	Flutriafol	TA	TAA	PF
York, NE, USA, 2012 85G01	2 (7)		1	31	Grain	0.39	0.06	0.04	
308 kg batch 1					AGF	2.78	0.03	0.04	7.1
310 kg batch 2			2		Grain	0.38	0.06	0.04	
					AGF	3.38	0.03	0.04	8.9

PF = flutriafol only

Cotton

One processing trial has been conducted on cotton in the USA in 2012 (Carringer 2013 2700).

The plot received one T-band application of flutriafol 125 g/L SC formulation at 290 g ai/ha/application at planting applied using a commercial tractor mounted T-band sprayer.

The T-band application was followed by two foliar applications at 5× rate (640 g ai/ha/application) 37 and 30 days before harvest applied using a CO_2 backpack sprayer. Seed cotton was ginned on the same day as harvest resulting in undelinted seeds with approximately 11–15% remaining lint. Undelinted cotton seeds were transported frozen to the processing facility and processed into meal, hulls and refined oil.

Delinting (Mechanical)

The undelinted cottonseed samples (41 kg) were saw delinted in a delinter to remove most remaining lint producing delinted cottonseed with approximately 3% lint remaining on the seed.

Hulling and separation

Delinted cottonseed was mechanically cracked in a roller mill. Kernel and hull material was separated with a careen cleaner.

Kernel material moisture was determined and then adjusted to 13.5% by placing the kernel material in a rotating mixer and adding water.

Oil and meal production

Kernel material was heated in a steam heated mixer to 79.4–90.6 °C and held for 30 minutes. After heating, kernel material was flaked in a flaking roll. Flaked kernel material was then fed into an expander. As the material moved through the expander, steam was injected directly on the product. Maximum exiting temperature range of the material was 93.3–121.1 °C. Collets were ground, dried in an oven at 65.6–82.2 °C for 30–40 minutes.

Ground collets were placed in batch extractors and submerged in 49–60 °C hexane. After 30 minutes the hexane/crude oil mixture was drained and extraction repeated three more times with fresh hexane.

After extraction the solvent extracted meal was toasted in a steam jacketed paddle mixer with steam injected directly on the material until the temperature of the meal reached 101.7–104.4 °C. Steam injection was stopped and the meal heated to 104.4–115.6 °C and held for 45–60 minutes. After toasting, the meal was cooled to room temperature.

The crude oil/hexane was passed through an evaporator to separate the crude oil from the hexane and then crude oil was heated to remove residual hexane before being filtered and refined.

Alkali refining, bleaching and deodorisation

Crude oil and sodium hydroxide was mixed for 15 minutes at high RPM at approximately 20 °C and then for 13 minutes at low RPM at approximately 63–68 °C. The neutralised oil was centrifuged and the refined oil decanted and filtered.

The refined oil was bleached by heating it to 40–50 °C and adding an activated bleaching earth. The mixture was placed under vacuum, heated to 85–100 °C and held there for 10–15 minutes. Heating was stopped and the oil was allowed to cool. During the cooling phase vacuum was broken, filter aid added and vacuum resumed. When the mixture reached approximately 60 °C vacuum was broken and the bleached oil filtered.

The blanched oil was then deodorised by steam bathing for approximately 30 minutes under vacuum at 220–230 °C. During the following cooling period 0.5% citric acid solution was added.

Untreated and treated samples from the processes were stored frozen and shipped under frozen conditions to the analytical laboratory for analysis. Samples were analysed using validated analytical methods. The LOQ of the methods is 0.01 mg/kg for flutriafol and its metabolites T and TAA. For TA the LOQ was 0.01 mg/kg in all matrices except for TA in undelinted cottonseed and cottonseed meal, where the LOQs were 0.03 and 0.04 mg/kg respectively due to endogenous residues in available control samples.

Undelinted cotton seeds, meal, hulls and refined oil were all analysed for residues of flutriafol using a validated analytical method. Residues of flutriafol in undelinted cotton seeds were present at 0.12 mg/kg. Residues were all lower in the processed commodities ranging from < 0.01 mg/kg in refined oil to 0.04 mg/kg in hulls. Results indicates, that flutriafol does not concentrate during processing into refined cottonseed oil.

Table 63 Residues of flutriafol in cotton processed products (meal, hulls, oil) on processing seed from a treated crop (Carringer 2013 2700) (duplicate samples)

Location	N	g ai/ha	DALA	Sample	Residue (mg/kg) Flutriafol	TA	PF
Uvalde TX, USA, 2012	3		30	Undelinted Seed	0.12 0.12	0.13 0.10	
DP 0912 B2RF 40.9 kg batch				Meal	0.01 0.01	0.14 0.19	0.08
				Hulls	0.04 0.03	0.04 0.07	0.33
				Refined oil	< 0.01 < 0.01	< 0.01 < 0.01	0.08

Meal 9.4% moisture

Hulls 9.4% moisture.

PF = flutriafol only

Livestock feeding

A livestock feeding study has been conducted in Holstein dairy cows to determine the magnitude of residues of flutriafol and three triazole metabolites 1,2,4-triazole (T), triazole alanine (TA) and triazole acetic acid (TAA) in milk, muscle, liver, kidney and fat (Rice 2012 2479). Three groups of three Holstein cows (3–7 years old, 450–690 kg bw) cows (three additional cows used for depuration phase) plus two concurrent control cows were dosed at 0, 5, 16 and 50 ppm (equivalent to 0, 0.15, 0.45 and 1.59 mg/kg bw of flutriafol) once daily for 28 consecutive days. Average feed consumption for the 5, 16 and 50 ppm groups were 18.5, 17.7 and 17.9 kg/day. Average milk production was 25.6, 22.0 and 21.3 L/d respectively for the 5, 16 and 50 ppm dose groups. Milk was collected twice daily and samples at 0, 3, 7, 10, 14, 17, 21, 24, 26 and 28 days were pooled and mixed before analysis. All cows were sacrificed within 24 hours after final dosing and samples of muscle (composite of round and loin), liver, kidneys, fat (renal, omental and subcutaneous fat deposits) were collected for analysis. Residues of flutriafol and triazole metabolites were analysed using validated analytical methods with an LOQ of 0.01 mg/kg for each analyte/matrix combination.

Highest average residues of flutriafol were found in liver and ranged from 0.33 mg/kg for the 5 ppm group, 0.59 mg/kg for the 16 ppm group and 1.83 mg/kg for the 50 ppm group. No residues were observed in liver samples taken from the depuration phase at 31, 35 and 42 days. For remaining matrices, highest average flutriafol residues ranged from < 0.01 mg/kg in milk, 0.01 mg/kg (50 ppm group) in cream at day 21, < 0.01 mg/kg in skimmed milk, 0.096 mg/kg (50 ppm group), 0.01 mg/kg (16 ppm group) in kidney, 0.04 mg/kg (50 ppm group) in muscle and 0.07–0.195 mg/kg (50 ppm group), 0.01 mg/kg (16 ppm group) in fat. All other residues of flutriafol from all dose groups were < 0.01 mg/kg. No residues were observed above LOQ in tissue or milk samples taken from the depuration phase at 31, 35 and 42 days.

Highest average residues of triazole metabolite residues were found in liver and ranged from < 0.01–0.02 mg/kg for 1,2,4-triazole, 0.03 to 0.157 mg/kg for triazole alanine and < 0.01 mg/kg for triazole acetic acid. Only triazole alanine residues were found during the depuration phase and ranged from 0.093 to 0.135 mg/kg. For remaining matrices, highest average residues ranged from 0.020 mg/kg 1,2,4-triazole in milk (50 ppm group), 0.015 mg/kg 1,2,4-triazole (50 ppm group) in cream at day 14/21, 0.021 mg/kg 1,2,4-triazole in skimmed milk (50 ppm group), 0.029 mg/kg 1,2,4-triazole and 0.058 mg/kg triazole alanine (50 ppm group) in kidney, 0.020 mg/kg 1,2,4-triazole and 0.086 mg/kg triazole alanine (50 ppm group) in muscle and 0.02 mg/kg triazole alanine (50 ppm group) in fat. No average residues of triazole acetic acid were observed in tissue or milk samples. Only triazole alanine was observed above LOQ in tissues during the depuration phase

Table 64 Recovery data

Tissue matrix	Analyte	Fortification range	Recovery (%)		n
		(mg/kg)	Range	Mean	
Milk	Flutriafol	0.01–0.1	68–115	92	26
	T	0.01–0.1	70–103	90	32
	TA	0.01–0.1	86–119	101	30
	TAA	0.01–0.1	70–119	106	30
Cream	Flutriafol	0.01–0.1	72–95	81	8
	T	0.01–0.1	89–104	96	10
	TA	0.01–0.1	89–105	98	8
	TAA	0.01–0.1	73–124	105	8
Skim milk	Flutriafol	0.01–0.1	74–93	84	6
	T	0.01–0.1	86–101	93	12
	TA	0.01–0.1	91–109	100	8
	TAA	0.01–0.1	78–120	100	8
Liver	Flutriafol	0.01–2.0	99–120	110	6
	T	0.01–0.1	70–98	85	6
	TA	0.01–0.3	95–105	99	6
	TAA	0.01–0.1	96–114	106	6
Kidney	Flutriafol	0.01–0.3	91–120	98	8
	T	0.01–0.1	91–109	97	8
	TA	0.01–0.1	87–113	99	8
	TAA	0.01–0.1	95–118	108	8
Muscle	Flutriafol	0.01–0.1	83–120	99	6
(Round)	T	0.01–0.1	76–119	92	8
	TA	0.01–0.3	94–104	97	6
	TAA	0.01–0.1	97–118	106	6
Muscle	Flutriafol	0.01–0.3	75–116	98	6
(Loin)	T	0.01–0.1	75–102	90	8
	TA	0.01–0.3	84–98	92	8
	TAA	0.01–0.1	75–108	95	8
Fat	Flutriafol	0.01–3.0	66–120	95	6
(Omental)	T	0.01–0.1	71–107	91	8
	TA	0.01–0.1	93–99	96	6
	TAA	0.01–0.1	98–108	103	6
Fat	Flutriafol	0.01–3.0	72–89	80	6
(Renal)	T	0.01–0.1	86–100	94	6
	TA	0.01–0.1	93–107	99	6
	TAA	0.01–0.1	87–117	104	6
Fat	Flutriafol	0.01–3.0	76–103	87	6
(Subcutaneous)	T	0.01–0.1	83–108	96	6
	TA	0.01–0.1	96–116	108	6
	TAA	0.01–0.1	89–111	103	6

Table 65 Residues of flutriafol and triazine metabolites in milk

	Flutriafol		1,2,4 Triazole		Triazole Alanine	
	Range	Average	Range	Average	Range	Average
5 ppm						
–1	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
3	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
7	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
10	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
14	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
17	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
21	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
24	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01

	Flutriafol		1,2,4 Triazole		Triazole Alanine	
	Range	Average	Range	Average	Range	Average
26	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
28	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
16 ppm						
–1	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
3	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
7	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
10	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
14	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
17	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
21	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
24	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
26	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
28	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01	< 0.01–< 0.01	< 0.01
50 ppm						
–1	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
3	< 0.01–< 0.01	< 0.01	0.02–0.02	0.02	< 0.01–< 0.01	< 0.01
7	< 0.01–< 0.01	< 0.01	0.01–0.03	0.02	< 0.01–< 0.01	< 0.01
10	< 0.01–< 0.01	< 0.01	0.01–0.03	0.02	< 0.01–< 0.01	< 0.01
14	< 0.01–< 0.01	< 0.01	0.01–0.02	0.02	< 0.01–< 0.01	< 0.01
17	< 0.01–< 0.01	< 0.01	0.01–0.02	0.01	< 0.01–< 0.01	< 0.01
21	< 0.01–< 0.01	< 0.01	0.01–0.02	0.02	< 0.01–< 0.01	< 0.01
24	< 0.01–< 0.01	< 0.01	0.01–0.02	0.02	< 0.01–< 0.01	< 0.01
26	< 0.01–< 0.01	< 0.01	< 0.01–0.02	0.02	< 0.01–< 0.01	< 0.01
28	< 0.01–< 0.01	< 0.01	0.01–0.03	0.02	< 0.01–< 0.01	< 0.01
28dep	< 0.01–< 0.01	< 0.01	< 0.01–0.02	0.01	< 0.01–< 0.01	< 0.01
31dep	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
35dep	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
42dep	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01

n/a = Sample not analysed

Table 66 Partitioning of residues of flutriafol and triazine metabolites between cream and skim milk

	Flutriafol		1,2,4 Triazole		Triazole Alanine	
	Range	Average	Range	Average	Range	Average
5 ppm						
14 (Cream)	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
21 (Cream)	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
14 (Skim)	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
21 (Skim)	n/a	n/a	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
16 ppm						
14 (Cream)	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
21 (Cream)	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
14 (Skim)	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
21 (Skim)	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
50 ppm						
14 (Cream)	< 0.01–0.0155	< 0.01	0.0110–0.0206	0.0146	< 0.01–< 0.01	< 0.01
21 (Cream)	< 0.01–0.0144	0.0106	0.0107–0.0198	0.0146	< 0.01–< 0.01	< 0.01
14 (Skim)	< 0.01–< 0.01	< 0.01	0.0154–0.0245	0.0211	< 0.01–< 0.01	< 0.01
21 (Skim)	< 0.01–< 0.01	< 0.01	0.0156–0.0267	0.0216	< 0.01–< 0.01	< 0.01

Table 67 Residues of flutriafol and triazine metabolites in tissues

	Flutriafol		1,2,4 Triazole		Triazole Alanine	
	Range	Average	Range	Average	Range	Average
5 ppm						
Liver	0.27–0.44	0.33	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
Kidney	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	0.01–0.02	0.01
Round	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	0.01–0.02	0.02
Loin	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01

	Flutriafol		1,2,4 Triazole		Triazole Alanine	
	Range	Average	Range	Average	Range	Average
Omental	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
Renal	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
Subcutaneous	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
16 ppm						
Liver	0.23–0.77	0.59	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
Kidney	< 0.01–0.02	0.01	< 0.01–0.02	< 0.01	0.01–0.03	0.02
Round	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01	0.01–0.03	0.02
Loin	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01	< 0.01–0.02	0.01
Omental	< 0.01–0.02	0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
Renal	< 0.01–0.02	0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
Subcutaneous	< 0.01–0.02	0.01	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01
50 ppm						
Liver	1.64–1.95	1.83	0.01–0.02	0.02	0.13–0.19	0.16
Kidney	0.04–0.15	0.10	0.02–0.03	0.03	0.05–0.07	0.06
Round	0.02–0.06	0.04	0.01–0.03	0.02	0.08–0.10	0.09
Loin	0.02–0.07	0.04	0.01–0.03	0.02	0.04–0.06	0.05
Omental	0.08–0.34	0.19	< 0.01–0.01	< 0.01	< 0.01–0.01	< 0.01
Renal	0.07–0.32	0.18	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01
Subcutaneous	0.04–0.11	0.07	< 0.01–0.02	< 0.01	0.01–0.03	0.02
Depuration						
31–42 Liver	< 0.01–< 0.01	< 0.01	0.02–0.02	0.02	0.09–0.14	0.11
31–42 Kidney	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	0.04–0.05	0.04
31–42 Round	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	0.04–0.05	0.05
31–42 Loin	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	0.03–0.04	0.03
31–42 Omental	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01
31–42 Renal	< 0.01–< 0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–0.01	< 0.01
31–42 Subcutaneous	< 0.01–0.01	< 0.01	< 0.01–< 0.01	< 0.01	< 0.01–0.02	0.01

Note: residues of triazole analine were detected in muscle (loin and round) samples from control animals: The levels detected were < 0.01–0.01, mean < 0.01 mg/kg in round and 0.08–0.09 mg/kg, mean 0.09 mg/kg in loin muscle. The large difference between loin and round residues as well as the fact that no residues of TAA were detected in corresponding control liver, kidney or fat samples suggesting this detection is due to a mislabelling of the sample or cross-contamination during processing for analysis.

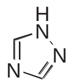
APPRAISAL

Flutriafol is a triazole fungicide used in many crops for control of a broad spectrum of leaf and ear cereal diseases, particularly embryo borne diseases e.g., bunts and smuts. It was first evaluated for residues and toxicology by the 2011 JMPR. The ADI of flutriafol was 0–0.01 mg/kg bw and the ARfD was 0.05 mg/kg bw. The compound was listed by the Forty-sixth Session of CCPR for the JMPR to consider additional MRLs. The residue definition for compliance with MRL and for estimation of dietary intake (for animal and plant commodities) is flutriafol.

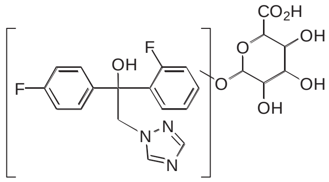
For the current evaluation the Meeting received new metabolism studies in lactating goats, storage stability data for animal commodities, residue trials on apples, pears, peaches/nectarines, plums, cherries, strawberries, Brassica vegetables (cabbage and broccoli), cucurbits (cucumbers, summer squash and muskmelons), tomatoes, peppers, leafy vegetables (lettuce, spinach, celery and mustard greens), sugar beet, maize, rice, sorghum, almonds, pecans, cotton, and rape, as well as a lactating cow feeding study (residue transfer study).

Metabolites referred to in the appraisal were addressed by their common names

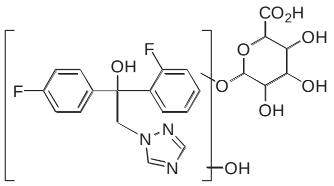
1,2,4-triazole (M1, T)



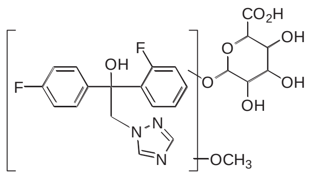
flutriafol glucuronide (M4)



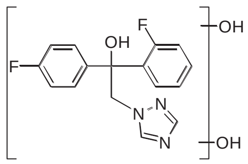
hydroxy flutriafol glucuronide (M3)



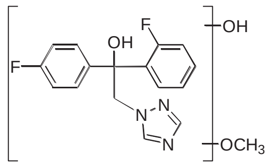
methoxy flutriafol glucuronide (M7)



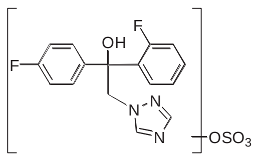
dihydroxy flutriafol (M3e)



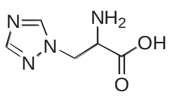
hydroxymethoxy flutriafol (M5)



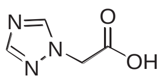
flutriafol sulfate (M10)



1,2,4-triazole analine (TA)



1,2,4-triazole acetic acid (TAA)



Animal metabolism

Metabolism of flutriafol in cattle involves hydroxylation of flutriafol to hydroxy flutriafol and a range of polar water soluble metabolites that are present at low levels, presumably additionally hydroxylated flutriafol compounds and their conjugates. The current Meeting received two additional studies on the metabolism of flutriafol in ruminants involving dosing lactating goats with triazole- or carbinol-labelled flutriafol at the equivalent of 12 or 30 ppm in the feed.

The majority of the ^{14}C residues were recovered in the excreta (urine 30–54% AD, faeces 35–55% AD). For tissues of goats dosed at 30 ppm, ^{14}C residues were highest in liver, (0.68–0.70 mg equiv/kg), followed by the kidney (0.11–0.31 mg equiv/kg) with only low levels detected in fat (0.011–0.018 mg equiv/kg) and muscle (0.02 mg equiv/kg). Residues in milk appeared to reach plateau levels by day three of dosing with significant differences in ^{14}C levels between milk collected in the morning (low levels) compared to evening milk (higher levels) suggesting flutriafol residues are rapidly eliminated following dosing. TRR in milk reached a maximum of 0.095 mg equiv/kg.

Acetonitrile and water extraction of liver, kidney, muscle, fat, skim milk and milk fat resulted in extraction efficiencies of 28.7–38.7% (liver), 66.7–86.5% (kidney) and > 82% (muscle), > 72% fat, 98% (skim milk) and 82–87% (milk fat).

Flutriafol was extensively metabolized and accounted for ≤ 2.5% TRR in liver, ≤ 0.7% TRR in kidney, ≤ 4.3% TRR in milk fat, not detected in muscle and ≤ 0.01 mg/kg in fat. Significant metabolites and the highest % TRR in tissues are 1,2,4-triazole (M1: 15% skim milk, 11% milk fat, 42% muscle, 27% fat), hydroxy flutriafol glucuronide (M3: 13% kidney, 23%

skim milk, 44% milk fat, 10% muscle), di-hydroxy flutriafol (M3e: 35% skim milk), flutriafol glucuronide (M4: 25% kidney, 17% muscle) and methoxy flutriafol glucuronide (M7: 10% kidney).

The Meeting noted that in the lactating cow evaluated by the 2011 JMPR, animals were dosed orally twice daily at the equivalent of 2 ppm in the diet for seven days and sacrificed at 4 hours after the last dose. In the current studies, goats were dosed once daily at 12 or 30 ppm with sacrifice occurring 20–22 hours after the last dose. The difference in sacrifice times and the higher dose rates have allowed for increased identification of residue components. The major residues in kidney, in both the lactating cow and goat studies, is flutriafol glucuronide (M4) (reported as M1B in the lactating cow study) at 22% TRR in cows and 13–15% TRR in goats at the highest dose. With the longer interval between the last dose and sacrifice, flutriafol is no longer found as the major component of the residue in liver (cow 27% TRR; goat 1.0–2.5% TRR) and no metabolite was individually present at > 10% TRR in liver in the goat studies. The levels of radioactivity in milk from the cow study were too low to allow for adequate characterisation and identification of components. In the goat study, considering the levels found in skim milk and in milk fat, three components are likely to be present at more than 10% TRR in whole milk: hydroxy flutriafol glucuronide (M3), di-hydroxy flutriafol (M3e) and flutriafol sulphate (M10).

The major metabolic pathway involves oxidation of one of the phenyl rings followed by conjugation with glucuronic acid to form flutriafol glucuronide (M4). Further oxidation results in formation of dihydroxy flutriafol (M3e), of which there are a number of possible isomers. M3e is then further transformed via methylation to hydroxyl methyl flutriafol (M5) which can, in turn, be conjugated with glucuronic acid to form methoxy flutriafol glucuronide (M7). M3e was also conjugated with glucuronic acid to form hydroxy flutriafol glucuronide (M3). The lactating goat study extends the knowledge of flutriafol metabolism and is consistent with earlier studies in lactating cow as well as laboratory animals.

The new goat metabolism studies have identified potential marker residues that could be included in the residue definitions for compliance and dietary intake risk assessment. However, the Meeting noted at the current livestock dietary burdens, residues in animal commodities of these components are expected to be at the limit of quantification or below. The Meeting agreed that the residue definitions for animal commodities did not need to be revised although this may change in the future if there are significant increases in the estimated livestock dietary burdens.

Stability of pesticide residues in stored analytical samples

The 2011 JMPR concluded that when stored, frozen flutriafol residues were stable for at least 5 months in soya bean seed, for at least 12 months in apple, barley grains and coffee beans, for at least 23 months in grapes, for at least 24 months in cabbage and oilseed rape, and for at least 25 months in wheat (grains and straw), pea seed, sugar beet root. Triazole metabolite residues were stable for at least 4 months in apple fruits and juice, and for at least 5 months in animal commodities.

The 2015 Meeting received information on the stability of flutriafol and triazole metabolites T, TA and TAA in samples of animal commodities stored frozen. Residues of flutriafol, TA and TAA in ruminant tissues (muscle, fat, liver and kidney) remain stable for at least 12 months, residues of T remains stable for at least 12 months in muscle and liver, and for a maximum 6.6 months in kidney and 10.7 months in fat when samples are stored under deep frozen conditions.

The periods of demonstrated stability cover the frozen storage intervals used in the residue studies.

Results of supervised residue trials on crops

Pome fruit

Field trials involving apples and pears conducted in the USA were made available to the Meeting. The cGAP for pome fruit in the USA is four applications at 119 g ai/ha (7–10 day interval between sprays, PHI 14 days). None of the trials on apples and pears submitted matched cGAP. However, the number of sprays in the trials was six and available decline data suggest the additional two sprays do not significantly contribute to the final residues and trials conducted at the maximum application rate but with six sprays were considered to approximate cGAP.

Apples

Residues in trials evaluated by the 2015 JMPR approximating *c*GAP were (n=4): 0.02, 0.02, 0.06 and 0.11 mg/kg.

The 2011 JMPR reported residues from sixteen trials on apples that also approximated *c*GAP (n=16): 0.03, 0.04, 0.05 (3), 0.06 (3), 0.08 (2), 0.09, 0.10 (2), 0.12 (2) and 0.16 mg/kg.

Pears

Residues in trials on pears approximating *c*GAP were: 0.04, 0.09, 0.13, 0.18, 0.21 and 0.24 mg/kg.

The GAP in the USA is for the group Pome fruit. The median residues in apples and pears differed by less than a factor of five and the Meeting decided to recommend a group maximum residue level. In deciding which data set to use for the recommendation, as a Mann Whitney U-test indicated that the residue populations were not different it was decided to combine the data sets.

The combined apple and pear dataset is: 0.02 (2), 0.03, 0.04 (2), 0.05 (3), 0.06 (4), 0.08 (2), 0.09 (2), 0.10 (2), 0.11, 0.12 (2), 0.13, 0.16, 0.18, 0.21 and 0.24 mg/kg

The Meeting estimated a maximum residue level of 0.4 mg/kg for pome fruit together with an STMR of 0.08 mg/kg and an HR 0.26 mg/kg (highest individual analytical result from duplicate samples) and agreed to replace the previous recommendation of 0.3 mg/kg.

Stone fruit

Field trials involving applications to cherries, peaches and plums were made available from the USA.

The cGAP for stone fruit in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7day interval between sprays, PHI 7 days).

Residues in cherries (sweet and tart) from trials matching GAP were: 0.16, 0.24, 0.25, 0.26, 0.30, 0.30, 0.32, 0.33, 0.34, 0.38, 0.39, 0.40, 0.42, 0.46, 0.47 and 0.59 mg/kg.

Residues in peaches from trials matching cGAP were: 0.05, 0.12, 0.13, 0.14, 0.15, 0.16, 0.18, 0.18, 0.19, 0.24, 0.24 and 0.41 mg/kg

Residues in plums from trials matching cGAP were: 0.02, 0.03, 0.04, 0.06, 0.09, 0.10, 0.12 and 0.22 mg/kg.

The Meeting noted the use in the USA is for the group stone fruit and that a group MRL recommendation might be possible. Although the median residues differed by less than a factor of five, the Meeting decided to recommend maximum residue levels for all the sub-groups of stone fruit as there were sufficient trials available for each sub-group.

The Meeting estimated a maximum residue level of 0.8 mg/kg for the sub-group cherries together with an STMR of 0.335 mg/kg and an HR 0.66 (highest individual analytical result from duplicate samples) mg/kg.

The Meeting estimated a maximum residue level of 0.6 mg/kg for sub-group peaches together with an STMR of 0.17 mg/kg and an HR 0.42 (highest individual analytical result from duplicate samples) mg/kg.

The Meeting estimated a maximum residue level of 0.4 mg/kg for sub-group plums together with an STMR of 0.075 mg/kg and an HR 0.25 (highest individual analytical result from duplicate samples) mg/kg.

Strawberries

Trials were available from Spain and the USA. The cGAP for strawberries in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 0 days).

Residues in strawberries from trials matching cGAP were (n=10): 0.14, 0.24, 0.30, 0.36, 0.42, 0.44, 0.45, 0.55, 0.63 and 0.72 mg/kg.

The Meeting estimated a maximum residue level of 1.5 mg/kg for strawberries together with an STMR of 0.43 mg/kg and an HR 0.78 (highest individual analytical result from duplicate samples) mg/kg.

Brassica vegetables

Residue trials were available from the USA. The cGAP for Brassica (Cole) leafy vegetables in the USA is four applications 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 7 days). Residues in trials matching cGAP were cabbage (n=6) 0.08, 0.09, 0.10, 0.20, 0.44, 0.74 mg/kg and broccoli (n=5) 0.06, 0.08, 0.14, 0.18, 0.35 mg/kg.

The GAP in the USA is for the group Brassica vegetables. The median residues in cabbage and broccoli differed by less than a factor of five and the Meeting decided to recommend a group maximum residue level. In deciding which data set to use for the recommendation, as a Mann Whitney U-test indicated that the residue populations were not different it was decided to combine the data sets.

The combined data set is (n=11): 0.06, 0.08, 0.08, 0.09, 0.10, 0.14, 0.18, 0.20, 0.35, 0.44 and 0.74 mg/kg.

The Meeting estimated a maximum residue level of 1.5 mg/kg for Brassica (Cole or cabbage) vegetables together with an STMR of 0.14 mg/kg and an HR 0.80 mg/kg (highest individual analytical result from duplicate samples).

Fruiting vegetables, cucurbits

Residue trials were available from the USA. The Meeting noted that there are GAPs in the USA that cover the whole group fruiting vegetables, cucurbits and that the cGAP is the same for all crops that are members of the group. It was agreed to consider the trials on melons and other cucurbits together. The cGAP for the muskmelons and cucurbit vegetables (except muskmelons) in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 0 days).

Residues matching cGAP were muskmelons, whole fruit (n=8), 0.02, 0.04, 0.07, 0.08, 0.10, 0.10, 0.12 and 0.12 mg/kg (whole fruit); muskmelons, flesh (n=4), < 0.01, < 0.01, 0.02 and 0.02 mg/kg; cucumbers, (n=8), 0.02, 0.02, 0.03, 0.04, 0.04, 0.04, 0.06 and 0.06 mg/kg; summer squash, (n=7), 0.04, 0.04, 0.04, 0.05, 0.05, 0.06 and 0.06 mg/kg.

The GAP in the USA covers the whole group cucurbit vegetables. The median residues in cucumbers, muskmelons and summer squash datasets differed by less than a factor of five and the Meeting decided to recommend a group maximum residue level. In deciding which data set to use for the recommendation, as a Kruskal-Wallis H-test indicated that the residue populations were different it was decided to use the muskmelon dataset which has the highest residues.

The Meeting estimated a maximum residue level of 0.3 mg/kg for fruiting vegetables, cucurbits, together with an HR 0.13 mg/kg (highest individual analytical result from duplicate samples from muskmelons) and an STMR of 0.09 mg/kg.

Tomatoes

Flutriafol is approved in the USA for use on tomatoes. The cGAP for tomatoes in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 0 days). Residues from trials matching cGAP were (n=18): 0.04, 0.05, 0.06, 0.06, 0.06, 0.06, 0.07, 0.08, 0.10, 0.12, 0.12, 0.12, 0.15, 0.18, 0.33, 0.40, 0.42 and 0.55 mg/kg.

The Meeting estimated a maximum residue level of 0.8 mg/kg for tomatoes together with an STMR of 0.11 mg/kg and an HR 0.63 (highest individual analytical result from duplicate samples) mg/kg.

Peppers

Residue trials were available from the USA. The cGAP for fruiting vegetables (USA group 8–10) which includes peppers in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 0 days).

Residues in trials matching USA GAP were peppers, sweet (n=9), 0.03, 0.06, 0.06, 0.08, 0.10, 0.11, 0.14, 0.15 and 0.16 mg/kg, and chilli, (n=4), 0.12, 0.20, 0.26 and 0.31 mg/kg.

Residues in peppers and chilli, from trials submitted to the 2015 JMPR are covered by maximum residue levels recommended by the 2011 JMPR of 1 mg/kg for peppers, sweet however, the Meeting noted the commodity description from the 2011 JMPR should have been VO 0051 Peppers (subgroup including Peppers, Chilli and Peppers, Sweet) and not VO 0445 Peppers, Sweet (including pimento or pimiento). To resolve this Meeting recommends a maximum residue level of 1 mg/kg, STMR of 0.28 mg/kg and an HR of 0.41 mg/kg for peppers (VO 0051) to replace the previous recommendation of 1 mg/kg for peppers, sweet (VO 0445).

Leafy vegetables

Residue trials were available from the USA. The *c*GAP for leafy vegetables (except Brassica leafy vegetables) in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 7 days). Brassica (Cole) leafy vegetables in the USA have the same *c*GAP as for other leafy vegetables and as mustard greens are considered leafy vegetables under Codex, the Meeting agreed to evaluate all leafy vegetables together.

Residues in trials matching *c*GAP were, head lettuce, (n=7), 0.04, 0.05, 0.14, 0.22, 0.46, 0.52 and 0.66 mg/kg; leaf lettuce, (n=5), 0.30, 0.32, 0.36, 1.45 and 2.64 mg/kg; Cos lettuce (Romaine), (n=2), 0.20 and 0.28 mg/kg; spinach, (n=8), 0.55, 0.94, 1.32, 1.55, 1.78, 2.1, 5.05 and 5.45 mg/kg; and mustard greens, (n=8), 1.20, 1.49, 2.02, 2.12, 2.12, 2.15, 2.78 and 3.42 mg/kg.

GAP in the USA is for leafy vegetables and a group maximum residue level recommendation may be possible. However, as the median residue levels in the datasets differed by more than 5×, residues in the individual commodities cannot be considered similar and the Meeting decided to recommend levels for the individual leafy vegetables for which data are available.

The Meeting estimated a maximum residue level of 1.5 mg/kg for head lettuce together with an STMR of 0.22 mg/kg and an HR 0.67 mg/kg (highest individual analytical result from duplicate samples).

The Meeting estimated a maximum residue level of 5 mg/kg for leaf lettuce together with an STMR of 0.36 mg/kg and an HR 2.95 mg/kg (highest individual analytical result from duplicate samples).

The Meeting agreed there were insufficient residue trials to estimate a maximum residue level for Cos lettuce.

The Meeting estimated a maximum residue level of 10 mg/kg for spinach together with an STMR of 1.665 mg/kg and an HR 5.5 mg/kg (highest individual analytical result from duplicate samples).

The Meeting estimated a maximum residue level of 7 mg/kg for mustard greens together with an STMR of 2.12 mg/kg and an HR 3.53 mg/kg (highest individual analytical result from duplicate samples).

The IESTI represented greater than 100% of the ARfD of 0.05 mg/kg bw in the case of leaf lettuce (110% children), mustard greens (350% children; 140% general population) and spinach (460% total or 160% raw spinach only, children; 130% general population). No alternative GAP was available.

Sugar beet

Residue trials were available from the countries of the EU and also the USA.

The *c*GAP for sugar beet in the USA is two applications at 128 g ai/ha (maximum application per year 256 g ai/ha, 14 day interval between sprays, PHI 21 days).

No trials matched cGAP as the number of sprays differed and there is insufficient data to conclude the additional spray does not significantly contribute to the terminal residue (three sprays in trials versus two sprays cGAP, PHI 14 day trials versus 21 days cGAP).

GAP in Russia is for two applications at 62.5 g ai/ha with a 30 day PHI. Residues in trials from northern Europe at approximately double the application rate were (n=8), < 0.01, < 0.01, < 0.01, < 0.01, < 0.01, 0.01, 0.02 and 0.03 mg/kg. The Meeting decided to apply proportionality to the residue data.

Trial application rate (2nd spray) g ai/ha	Scaling factor = 62.5/trial application rate	Trial residue (mg/kg)	Scaled residue =scaling factor × trial residue (mg/kg)
135	0.463	< 0.01	< 0.01
111	0.563	< 0.01	< 0.01
120	0.521	< 0.01	< 0.01
131	0.477	< 0.01	< 0.01
138	0.453	< 0.01	< 0.01
126	0.496	0.01	0.0050
130	0.481	0.02	0.0096
138	0.453	0.03	0.0136

Based on the residues from Europe scaled to cGAP for Russia, the Meeting estimated an STMR of 0.01 mg/kg, an HR of 0.0136 mg/kg and a maximum residue level of 0.02 mg/kg for sugar beet.

Celery

Celery is classified as a leafy vegetable in the USA but as a stalk and stem vegetable in Codex. Residues in celery (whole plant) conducted according to cGAP in the USA (4× 128 g ai/ha, PHI 7 days) were (n=7), 0.44, 0.48, 0.73, 0.78, 0.92, 1.08 and 1.40 mg/kg.

The Meeting estimated a maximum residue level of 3 mg/kg for celery together with an STMR of 0.78 mg/kg and an HR 1.41 mg/kg (highest individual analytical result from duplicate samples).

Cereal grains

Maize

Residue trials were available from the USA. The cGAP for maize (field corn, popcorn and seed corn) in the USA is two applications at 128 g ai/ha (maximum application per year 256 g ai/ha, 7 day interval between sprays, PHI 7 days). Residues in trials matching cGAP were: < 0.01 (20) mg/kg. At one site two applications were also made at an exaggerated rate of 640 g ai/ha with harvest of grain 7 days later. Residues in grain were < 0.01 mg/kg.

The Meeting estimated an STMR of 0 mg/kg and a maximum residue level of 0.01 (*) mg/kg for maize.

Rice

The Meeting received field trials performed in Italy on rice. The cGAP for Italy is for 2× 187.5 g ai/ha with a PHI of 28 days. In trials approximating critical GAP in the Italy total residues in rice grain (with husk) were (n=4), Paddy rice, 0.74, 1.06, 1.32 and 1.51 mg/kg.

The number of trials is insufficient to make a maximum residue level recommendation for rice.

Sorghum

Residue trials were available from the USA. The cGAP for sorghum in the USA is two applications at 128 g ai/ha (maximum application per year 256 g ai/ha, 7 day interval between sprays, PHI 30 days). Residues in trials matching *c*GAP were (n=12), 0.03, 0.16, 0.16, 0.20, 0.24, 0.26, 0.28, 0.34, 0.38, 0.40, 0.74 and 0.74 mg/kg.

The Meeting estimated an STMR of 0.27 mg/kg and a maximum residue level of 1.5 mg/kg for sorghum.

Tree nuts

Residue trials were available from the USA. The cGAP for almonds and walnuts as well as for pecans and other tree nuts in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 14 days). No trials matched *c*GAP as the number of sprays differed and there is insufficient data to conclude the additional spray does not significantly contribute to the terminal residue.

Cotton seed

Residue trials were available from the USA. The cGAP for cotton in the USA is a pre-plant soil application at up to 290 g ai/ha followed by foliar applications at 128 g ai/ha (maximum application per year 547 g ai/ha, 7 day interval between sprays, PHI 30 days). Residues in trials matching cGAP were (n=11), < 0.01, 0.02, 0.04, 0.06, 0.07, 0.08, 0.09, 0.14, 0.16, 0.26 and 0.26 mg/kg.

The Meeting estimated an STMR of 0.08 mg/kg and a maximum residue level of 0.5 mg/kg for cotton seed.

Rape seed

Residue trials were available from the USA and member states of the European Union. The cGAP for rape in Russia is application at 125 g ai/ha (maximum two applications/year, interval 10–14 days, PHI 30 days). In trials conducted in member countries of the European Union approximating critical GAP in Russia, residues in rape seed were (n=8), mg/kg, Northern Europe, 0.04, 0.07, 0.13, 0.15 and 0.31 mg/kg, and Southern Europe, 0.03, 0.05 and 0.15 mg/kg.

The Meeting estimated an STMR of 0.1 mg/kg and a maximum residue level of 0.5 mg/kg for rape seed.

Animal feeds

Straw, forage and fodder of cereal grains and grasses

Maize forage and fodder

Residue trials were available from the USA. The cGAP for maize (field corn, popcorn and seed corn) in the USA is two applications at 128 g ai/ha (maximum application per year 256 g ai/ha, 7 day interval between sprays, PHI 7 days, 0 days for forage). Residues in forage from trials matching cGAP were (n=20), 0.53, 0.74, 0.91, 1.08, 1.14, 1.36, 1.45, 1.47, 1.53, 1.63, 1.65, 1.66, 1.75, 1.77, 1.85, 1.89, 2.19, 2.44, 2.66 and 2.74 mg/kg (as received basis). When corrected for measured moisture contents (33–70%) residues were , 1.86, 1.92, 3.17, 3.17, 3.82, 4.18, 4.53, 4.80, 4.88, 5.10, 5.52, 5.61, 5.66, 5.73, 5.78, 6.39, 6.89, 7.29, 8.30 and 8.47 mg/kg.

The Meeting estimated median residue of 5.31 mg/kg and a highest residue of 8.47 mg/kg for maize forage (dry weight basis).

Residues in maize fodder (stover) from trials matching cGAP were (n=20), < 0.02, 0.72, 0.88, 1.00, 1.04, 1.32, 1.40, 1.44, 1.46, 1.94, 2.07, 2.27, 2.38, 2.48, 2.64, 2.99, 2.99, 3.04, 3.98 and 5.44 mg/kg (as received basis). When corrected for measured moisture contents (54–73%) residues were 0.03, 1.62, 1.90, 3.00, 3.42, 3.72, 3.79, 3.99, 4.35, 4.84, 5.03, 5.04, 6.72, 6.92, 6.99, 7.21, 7.81, 8.12, 8.17 and 10.45 mg/kg.

The Meeting estimated median residue of 4.93 mg/kg, a highest residue of 10.45 mg/kg and a maximum residue level of 20 mg/kg for maize fodder (dry weight basis).

Sorghum

Residue trials were available from the USA. The *c*GAP for sorghum in the USA is two applications at 128 g ai/ha (maximum application per year 256 g ai/ha, 7 day interval between sprays, PHI 30 days for grain, forage and stover).

Sorghum forage (n=12), 0.08, 0.19, 0.20, 0.24, 0.26, 0.28, 0.52, 0.54, 0.64, 0.72, 0.78 and 1.0 mg/kg (fresh weight). Median and highest residues in sorghum forage are 0.40 and 1.0 mg/kg (fresh weight basis) or 1.1 and 2.85 mg/kg (dry weight basis) as forage contains 35% dry matter.

Sorghum fodder (n=12), 0.30, 0.42, 0.45, 0.52, 0.68, 0.80, 0.88, 0.92, 1.14, 1.46, 1.52 and 4.40 mg/kg (fresh weight). The Meeting estimated median and highest residues of 0.84 mg/kg and 4.4 mg/kg (fresh weight basis) or 0.95 and 5 mg/kg when expressed on a dry weight basis and assuming fodder contains 88% dry matter. The Meeting estimated a maximum residue level of 7 mg/kg for sorghum fodder (dry weight basis).

Miscellaneous fodder and forage crops

Sugar beet tops

The Meeting received trials performed in countries of the EU and also the USA.

The *c*GAP for sugar beet in the USA is two applications at 128 g ai/ha (maximum application per year 256 g ai/ha, 14 day interval between sprays, PHI 21 days). No trials matched GAP as the number of sprays differed and there is insufficient data to conclude the additional spray does not significantly contribute to the terminal residue (three sprays in trials vs two sprays cGAP).

GAP in Russia is for two applications at 62.5 g ai/ha with a 30 day PHI. Residues in trials from northern Europe at approximately double the application rate were (n=8), 0.1, 0.14, 0.14, 0.18, 0.18, 0.22, 0.22 and 0.75 mg/kg (on an as received basis). The Meeting decided to apply proportionality to the residue data.

Trial application rate (2nd spray) g ai/ha	Scaling factor = 62.5/trial application rate	Trial residue (mg/kg)	Scaled residue =scaling factor × trial residue (mg/kg)

131	0.477	0.10	0.048
128	0.488	0.14	0.068
126	0.496	0.14	0.069
120	0.520	0.18	0.094
111	0.563	0.18	0.101
135	0.463	0.22	0.102
130	0.481	0.22	0.106
138	0.453	0.75	0.340

Based on the residues from Europe scaled to cGAP for Russia, the Meeting estimated a median residue of 0.098 mg/kg and a highest residue of 0.340 mg/kg (on an as received basis). Sugar beet tops contain approximately 23% DM. The Meeting estimated a median residue of 0.424 mg/kg, a highest residue of 1.477 mg/kg and a maximum residue level of 3 mg/kg for sugar beet tops (on a dry weight basis).

Rape seed forage

Residue trials were available from the USA and member states of the European Union. The GAP for rape in Russia is application at 125 g ai/ha (maximum two applications/year, interval 10–14 days, PHI 30 days). The late application precludes the use of plant material as forage.

Cotton gin by-products

Residue trials were available from the USA. The cGAP for cotton in the USA is a pre-plant soil application at up to 290 g ai/ha followed by foliar applications at 128 g ai/ha (maximum application per year 547 g ai/ha, 7 day interval between sprays, PHI 30 days). Three trial matched cGAP with residues 1.12, 1.77 and 2.26 mg/kg (fresh weight basis). Three residue trials is insufficient to estimate a maximum residue level for cotton gin by-products.

Almond hulls

Residue trials were available from the USA. The cGAP for almonds, walnuts, pecans and other tree nuts in the USA is four applications at 128 g ai/ha (maximum application per year 511 g ai/ha, 7 day interval between sprays, PHI 14 days). No trials matched cGAP as the number of sprays differed and there is insufficient data to conclude the additional spray does not significantly contribute to the terminal residue (six sprays in trials versus four sprays for cGAP).

Fate of residues during processing

The Meeting received information on the nature of residues under simulated processing conditions on the fate of incurred residues of flutriafol during the processing of peaches, plums, grapes, strawberries, cabbages, tomatoes, lettuce, celery, sorghum, rice, and cotton seed. Flutriafol residues are stable under simulated processing conditions (pasteurization, baking/brewing/boiling and sterilisation).

Summary of selected processing factors for flutriafol

Raw commodity	Processed commodity	Individual PF	Best estimate PF	$STMR_{RAC}$ (mg/kg)	$STMR_{RAC}$ × PF (mg/kg)	HR_{RAC} (mg/kg)	HR_{RAC} × PF (mg/kg)
Apple	Juice [a]	0.50 0.45	0.48	0.08	0.038		
	Wet pomace [a]	1.9 1.9	1.9		0.152		
	Dry pomace [a]	10 8.5	9.3		0.744		
Peach	Juice	1.7 0.8	1.25	0.17	0.2125		
	Jam	0.7 1.0	0.85		0.1445		
Plum	Dried fruit	2.2	2.2	0.075	0.165	0.22	0.484
Grapes	Wet pomace	2.5 4.4	3.45	0.21	0.7245		
	Dry pomace	4.0 4.3 5.4 6.0 6.7 9.6 15, 17.8	8.6		1.806		
	Red wine	0.55 0.57 1.5 1.6	1.055		0.22155		
	White wine	0.79 0.84 1.7 3.4	1.68		0.3528		

Raw commodity	Processed commodity	Individual PF	Best estimate PF	STMR$_{RAC}$ (mg/kg)	STMR$_{RAC}$ × PF (mg/kg)	HR$_{RAC}$ (mg/kg)	HR$_{RAC}$ × PF (mg/kg)
Strawberry	Jam	0.75 0.87 0.92 0.96	0.875	0.43	0.3685		
Tomato	Purée	1.2	1.2	0.11	0.132		
	Paste	2.6	2.6		0.286		
Sorghum	Aspirated grain fraction	7.1 8.9	8.0	0.27	2.16		
Cottonseed	Hulls	0.33	0.33	0.08	0.0264		
	Meal	0.08	0.08		0.0064		
	Oil	0.08	0.08		0.0064		

[a] Values from 2011 JMPR

Residues concentrated in prunes (dried plums). Based on the estimated maximum residue level for plums of 0.4 mg/kg, the Meeting recommended a maximum residue level for prunes of 0.9 mg/kg (MRL × PF = 0.4 × 2.2 = 0.88 mg/kg rounded to 0.9 mg/kg).

Residues in animal commodities

Farm animal feeding studies

The Meeting received information on the residue levels arising in tissues and milk when dairy cows were fed a diet containing flutriafol at dietary levels of 5, 16 and 50 ppm for 28 consecutive days. Residues in whole milk were < 0.01 mg/kg. In cream, residues were < 0.01 mg/kg except for Day 21 where a residue of 0.01 mg/kg was detected. The highest residues (mean in brackets) in liver, kidney, fat and muscle from the 50 ppm dose group were 1.95 (1.83), 0.15 (0.10), 0.34 (0.19) and 0.07 (0.04) mg/kg respectively.

Animal commodity maximum residue levels

Dietary burden calculations for beef cattle and dairy cattle and poultry are provided below. The dietary burdens were estimated using the OECD diets listed in Appendix IX of the 2009 edition of the FAO Manual.

Potential cattle and poultry feed items include maize, peanut, soya bean and wheat commodities.

Summary of livestock dietary burden (ppm of dry matter diet)

	US-Canada		EU		Australia		Japan	
	max	mean	Max	mean	max	Mean	max	Mean
Beef cattle	1.8	1.07	20.7 [a]	9.76 [c]	76	32	0.161	0.161
Dairy cattle	19.0	8.3	19.1 [b]	8.7 [d]	49.8	21.2	4.3	2.8
Poultry Broiler	0.26	0.26	0.24	0.24	0.24	0.24	0.23	0.23
Poultry Layer	0.26	0.26	7.9 [e]	3.45 [f]	0.24	0.24	0.20	0.20

[a] Highest maximum beef or dairy cattle dietary burden suitable for MRL estimates for mammalian meat

[b] Highest maximum dairy cattle dietary burden suitable for MRL estimates for mammalian milk

[c] Highest mean beef or dairy cattle dietary burden suitable for STMR estimates for mammalian meat

[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.

The maximum dietary burden for cattle exceeds the maximum dosing level used in the feeding studies. It was noted that the dietary burdens are driven by the residues in wheat forage from trials that matched GAP in the USA (selected with a 0 day PHI) and that it may be possible to further refine the dietary burdens. In Australia, flutriafol is approved for use on wheat but the anticipated residues in forage are much lower as GAP requires a 49 day interval between last application and grazing and on other cereals with a 70 day interval for grazing. At these intervals residues in forage and fodder are less than 3 mg/kg and the cattle dietary burdens for Australia listed in the table are overestimates. The Meeting decided to recalculate the cattle dietary burdens for Australia discounting cereal forages.

Additional refinement is also possible for the EU livestock burdens as in the EU uses on cereals are understood as "on cereal for grain production" and therefore, only residues in grains and straw are considered for the animal burden calculation and to utilise the cattle dietary burdens for the EU in estimating residues in cattle commodities (http://www.efsa.europa.eu/sites/default/files/event/140619-m.pdf). The maximum dietary burdens on refinement are 10.5 and 4.2 ppm for the maximum and mean burdens for beef and dairy cows in the Australian region. The refined poultry dietary burdens are 1.35 and 0.75 ppm for the maximum and mean burdens for laying hens in the EU region.

Animal commodity maximum residue levels

The calculations used to estimate highest total residues for use in estimating maximum residue levels, STMR and HR values are shown below.

Flutriafol feeding study	Feed level	Residues	Feed level	Residues (mg/kg) in			
	(ppm) for milk residues	(mg/kg) in milk	(ppm) for tissue residues	Muscle	Liver	Kidney	Fat
MRL and HR beef or dairy cattle							
Feeding study [a]	16	< 0.01	16	< 0.01	0.77	0.02	0.02
Dietary burden and high residue	10.5	< 0.0066	10.5	0.0066	0.505	0.013	0.013
STMR beef or dairy cattle							
Feeding study [b]	16	< 0.01	5	< 0.01	0.33	< 0.01	< 0.01
Dietary burden and median residue	4.2	< 0.0026	4.2	< 0.008	0.277	< 0.008	< 0.008

[a] Highest residues for tissues and mean residues for milk

[b] Mean residues for tissues and mean residues for milk

The Meeting estimated a maximum residue levels of 0.01 (*) mg/kg for milk, 0.02 mg/kg for mammalian meat [in the fat], 0.02 for mammalian fats (except milk fats) and 1 mg/kg for mammalian edible offal.

The refined maximum dietary burden for broiler and layer poultry is lower than that estimated by the 2011 JMPR at 1.35 ppm and is now lower than the highest dose level in the feeding study of 5.0 ppm. The Meeting utilised the refined estimates of poultry dietary burdens and estimated maximum residue levels of 0.01 (*) mg/kg for poultry meat, 0.02 mg/kg for poultry fats, 0.03 mg/kg for poultry edible offal and 0.01 (*) mg/kg for eggs.

Flutriafol feeding study	Feed level	Residues	Feed level	Residues (mg/kg) in			
	(ppm) for egg residues	(mg/kg) in eggs	(ppm) for tissue residues	Muscle	Liver		Fat
MRL and HR chickens							
Feeding study [a]	5	0.03	5	< 0.01	0.10		0.07
Dietary burden and high residue	1.35	0.0081	1.35	< 0.0027	0.027		0.0189
STMR chickens							
Feeding study [b]	5	0.03	5	< 0.01	0.07		0.06
Dietary burden and residue estimate	0.75	0.0045	0.75	0.0015	0.0105		0.009

[a] Highest residues for tissues and mean residues for eggs

[b] Mean residues for tissues and mean residues for eggs

RECOMMENDATIONS FURTHER WORK OR INFORMATION

On the basis of the data obtained from supervised residue trials the Meeting concluded that the residue levels listed in Annex 1 are suitable for establishing maximum residue limits and for IEDI and IESTI assessment.

Definition of the residue for compliance with MRL and for estimation of dietary intake (for animal and plant commodities): *flutriafol.*

Definition of the residue for compliance with MRL and estimation of dietary intake (for animal and plant commodities): flutriafol.

The residue is fat soluble.

Table of recommendations

Commodity		Recommended MRL (mg/kg)		STMR or STMR-P (mg/kg)	HR, HR-P, highest residue (mg/kg)
CCN	Name	New	Previous		
VB 0040	Brassica (cole or cabbage) vegetables, Head cabbages, Flowerhead brassicas	1.5		0.14	0.80
VS 0624	Celery	3		0.78	1.41
FS 0013	Cherries	0.8		0.335	0.66
SO 0691	Cotton seed	0.5		0.08	
MO 0105	Edible offal (mammalian)	1		0.277 liver 0.008 kidney	0.505 liver 0.013 kidney
PE 0112	Eggs	0.01 (*)		0.0045	0.0081
VC 0045	Fruiting vegetables, Cucurbits	0.3		0.09	0.13
VL 0482	Lettuce, Head	1.5		0.22	0.67
VL 0483	Lettuce, Leaf	5[a]		0.36	2.95
GC 0645	Maize	0.01 (*)		0	
AS 0645	Maize fodder (dry)	20		4.93 dw	10.45 dw
MF 0100	Mammalian fats (except milk fats)	0.02		0.008	0.013
MM 0095	Meat (from mammals other than marine mammals)	0.02 (fat)		0.008 fat 0.008 muscle	0.013 fat 0.007 muscle
ML 0106	Milks	0.01 (*)		0.0026	0.0066
VL 0485	Mustard greens	7[a]		2.12	3.53
FS 2001	Peaches (including nectarine and apricots)	0.6		0.17	0.42
VO 0051	Peppers (Subgroup including Peppers, Chili and Peppers, Sweet)	1		0.28	0.41
VO 0445	Peppers, Sweet (including pimento or pimiento)	W	1		
FS 0014	Plums (including prunes)	0.4		0.075	0.25
FP 0009	Pome fruit	0.4	0.3	0.08	0.26
PF 0111	Poultry fats	0.02		0.009	0.0189
PM 0110	Poultry meat	0.01 (*)		0.0015	0.0027
PO 0111	Poultry, Edible offal of	0.03		0.0105	0.027
DF 0014	Prunes	0.9		0.165	0.484
SO 0495	Rape seed	0.5		0.1	
GC 0651	Sorghum	1.5		0.27	
AS 0651	Sorghum straw and fodder, dry	7		0.95 dw	5 dw
VL 0502	Spinach	10[a]		1.665	5.5
FB 0275	Strawberry	1.5		0.43	0.78
VR 0596	Sugar beet	0.02		0.01	0.0136
AV 0596	Sugar beet leaves or tops	3 dw		0.424 dw	1.477 dw
VO 0448	Tomatoes	0.8		0.11	0.63

dw = dry weight basis

[a] On the basis of information provided to the JMPR, the Meeting concluded that the short-term intake of residues of flutriafol from consumption of leaf lettuce, mustard greens and spinach may present a public health concern.

Table of additional STMR/median and HR/highest residue values for use in dietary intake and livestock dietary burden estimation.

Commodity		Recommended MRL (mg/kg)		STMR or STMR-P (mg/kg)	HR, HR-P, highest residue (mg/kg)
CCN	Name	New	Previous		
OR 0691	Cotton seed oil, edible			0.0064	
	Cotton seed hulls			0.0264	
	Cotton seed meal			0.0064	
AB 0269	Grape pomace, dry			1.806	

Commodity		Recommended MRL (mg/kg)		STMR or STMR-P (mg/kg)	HR, HR-P, highest residue (mg/kg)
CCN	Name	New	Previous		
	Red wine			0.22155	
	White wine			0.3528	
AF 0645	Maize forage			5.31 dw	8.47 dw
	Peach juice			0.2125	
	Peach jam			0.1445	
AB 0226	Apple pomace, dry			0.744	
AF 0651	Sorghum forage (green)			1.1 dw	2.85 dw
	Sorghum aspirated grain fractions			2.16	
	Strawberry jam			0.3685	
	Tomato purée			0.132	
	Tomato paste			0.286	

dw = dry weight basis

DIETARY RISK ASSESSMENT

Long-term intake

The 2011 JMPR established an Acceptable Daily Intake (ADI) of 0–0.01 mg/kg bw for flutriafol.

The evaluation of flutriafol resulted in recommendations for MRLs and STMR values for raw and processed commodities. Where data on consumption were available for the listed food commodities, dietary intakes were calculated for the 17 GEMS/Food Consumption Cluster Diets. The results are shown in Annex 3.

The IEDIs in the seventeen Cluster Diets, based on the estimated STMRs were 3–10% of the maximum ADI (0.01 mg/kg bw). The Meeting concluded that the long-term intake of residues of flutriafol from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The 2011 JMPR established an Acute Reference Dose (ARfD) of 0.05 mg/kg bw for flutriafol. The International Estimated Short-term Intake (IESTI) for flutriafol was calculated for raw and processed commodities for which maximum residue levels, HR and STMR values were estimated. The results are shown in Annex 4 to the 2015 Report.

The IESTI represented greater than 100% of the ARfD of 0.05 mg/kg bw in the case of leaf lettuce (360% children; 120% general population), mustard greens (350% children; 140% general population) and spinach (490% children; 150% general population). No alternative GAP was available. On the basis of information provided to the JMPR, the Meeting concluded that the short-term intake of residues of flutriafol from consumption of leaf lettuce, mustard greens and spinach may present a public health concern.

Estimates of intake for the other commodities considered by the 2015 JMPR were within 0–90% of the ARfD. The Meeting concluded that the short-term intake of flutriafol for these other commodities considered is unlikely to present a public health concern when flutriafol is used in ways that considered by the Meeting.

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