Developmental neurotoxicity NOAEL	102 mg/kg bw per day (highest dose tested; rat)
Other toxicological studies	
Immunotoxicity NOAEL	230 mg/kg bw per day (highest dose tested; rat)
Toxicological studies on DFA	
Oral LD_{50} (rat)	> 300 – < 2 000 mg/kg bw
Lowest relevant short-term NOAEL	12.7 mg/kg bw per day (90 days; rat)
Genotoxicity	No evidence of genotoxicity
Toxicological studies on difluoroethyl-amino-furanone	
Oral LD_{50} (rat)	> 2 000 mg/kg bw
Lowest relevant short-term NOAEL	243 mg/kg bw per day (28 days; rat)
Genotoxicity	Clastogenic in vitro; not genotoxic in vivo
Toxicological studies on (6-chloro-3-pyridyl)methanol	
Oral LD_{50} (rat)	1 483 mg/kg bw (females), 1 842 mg/kg bw (males)
Lowest relevant short-term NOAEL	48.9 mg/kg bw per day (90 days; rat)
Genotoxicity	No evidence of genotoxicity
Toxicological studies on 6-chloronicotinic acid	
Oral LD_{50} (rat)	> 5 000 mg/kg bw
Genotoxicity	No evidence of genotoxicity
Toxicological studies on amino-furanone	
Genotoxicity	No evidence of genotoxicity
Toxicological studies on flupyradifurone-acetic acid	
Genotoxicity	No evidence of genotoxicity
Medical data	
	No data

[a] Unlikely to pose a carcinogenic risk to humans from the diet.

Summary

	Value	Studies	Safety factor
ADI	0–0.08 mg/kg bw	Two-generation reproductive toxicity study (rat)	100
ARfD	0.2 mg/kg bw	Developmental toxicity study (rabbit)	100

5.16 FLUTRIAFOL (248)

RESIDUE AND ANALYTICAL ASPECTS

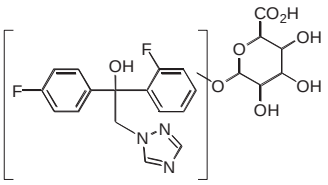
Flutriafol is a triazole fungicide used in many crops for control of a broad spectrum of leaf and ear cereal diseases, particularly embryo borne diseases e.g., bunts and smuts. It was first evaluated for residues and toxicology by the 2011 JMPR. The ADI of flutriafol was 0–0.01 mg/kg bw and the ARfD 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).

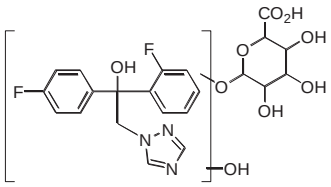
Metabolites referred to in the appraisal were addressed by their common names

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

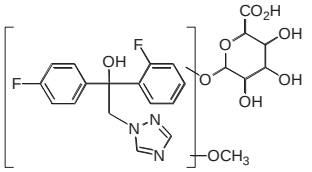
flutriafol glucuronide (M4)



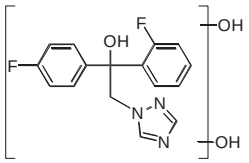
hydroxy flutriafol glucuronide (M3)



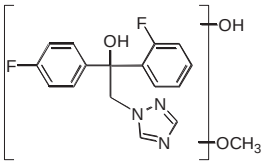
methoxy flutriafol glucuronide (M7)



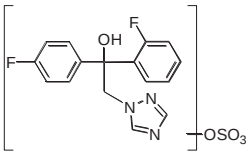
dihydroxy flutriafol (M3e)



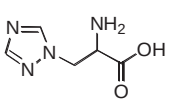
hydroxymethoxy flutriafol (M5)



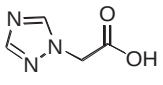
flutriafol sulfate (M10)



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 hydroxyflutriafol 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 metabolised 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), hydroxyflutriafol 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: hydroxyflutriafol 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 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 are 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

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)
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		
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