RECOMMENDATIONS

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

Definition of the residue (for MRL-compliance and estimation of dietary intake, plant and animal commodities): *flumioxazin.*

The residue is not fat soluble.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intake (IEDI) for flumioxazin was calculated for the food commodities for which STMRs or HRs were estimated and for which consumption data were available. The results are shown in Annex 3.

The International Estimated Daily Intakes of flumioxazin for the 17 GEMS/Food cluster diets, based on estimated STMRs were 0–1% of the maximum ADI of 0.02 mg/kg bw (Annex 3). The Meeting concluded that the long-term intake of residues of flumioxazin from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

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

For flumioxazin, the IESTI varied from 0–7% of the ARfD (0.03 mg/kg bw for women of child-bearing age) and the Meeting concluded that the short-term intake of residues of flumioxazin from uses considered by the Meeting is unlikely to present a public health concern.

5.14 FLUOPYRAM (243)

RESIDUE AND ANALYTICAL ASPECTS

Fluopyram, a pyridylethylamide broad spectrum fungicide was evaluated for the first time by the 2010 JMPR, where an ADI of 0–0.01 mg/kg bw and an ARfD of 0.5 mg/kg bw were established, residue definitions were proposed and maximum residue levels were recommended for a number of uses where GAP information was available. New GAP and supporting information were evaluated by JMPR in 2012 and 2014 JMPRs and a number of additional maximum residue levels were recommended.

Residue definitions established by the 2010 JMPR are:

- for plant products (compliance with MRLs and dietary intake assessment): *fluopyram*
- for animal products (compliance with MRLs): sum of fluopyram and 2-(trifluoromethyl) benzamide, expressed as fluopyram
- for animal products (dietary intake assessment): sum of fluopyram, 2-(trifluoromethyl)benzamide and the combined residues N-{(E)-2-[3-chloro-5-(trifluoromethyl)pyridin-2-yl]ethenyl}-2-trifluoromethyl) benzamide and N-{(Z)-2-[3-chloro-5-(trifluoromethyl)pyridin-2-yl]ethenyl}-2-trifluoromethyl) benzamide, all expressed as fluopyram.

New GAP information and supporting residue data were provided by the manufacturer for evaluation by the Meeting.

Resultd of supervised residue trials on crops

The Meeting received new supervised trial data for foliar applications of fluopyram (SC formulations, generally in combinations with other fungicides) on tomatoes, beans, peas, and sunflower and for seed treatments or in-furrow soil treatments on soya bean and cotton. The Meeting also noted that data for some of these crops had been provided to the 2010 JMPR.

The results from these new trials and those previously reported by the 2010 JMPR and either matching critical GAP or where the results can be proportionally adjusted (scaled) to reflect GAP application rates were used to estimate maximum residue levels, STMRs and HRs for a number of commodities for which GAP information was available. Frozen sample storage times in the new trials were within the storage intervals considered acceptable by the 2010 JMPR and the analytical methods used in these trials were the same as those evaluated by JMPR in 2010.

Fruiting vegetables (except Cucurbits)

Tomato

The Meeting was advised that new GAP exists in Greece for fluopyram on protected tomatoes, involving up to three foliar applications of 0.15 kg ai/ha with a 3-day PHI.

In four independent protected tomato trials matching this GAP in Greece, residues were 0.04, 0.07, 0.08 and 0.13 mg/kg.

New GAP was also provided for tomatoes in Ukraine, up to two foliar applications of 0.15 kg ai/ha with a 7 day PHI.

In eight independent trials on field tomatoes conducted in Europe and matching this GAP in Ukraine, fluopyram residues were: < 0.01, 0.02, 0.06, 0.07, 0.1, 0.13, 0.13 and 0.17 mg/kg.

The Meeting noted that the 2010 JMPR had recommended a fluopyram maximum residue level of 0.4 mg/kg based on trials on protected tomatoes where residues had been proportionally adjusted to the GAP in Morocco.

The Meeting agreed that the 2010 JMPR recommendations accommodated the new GAPs for tomatoes in Greece and Ukraine.

Peppers and eggplant

The Meeting noted that the new GAP in Greece for fluopyram on protected tomatoes (3× 0.15 kg ai/ha, 3-day PHI) also applied to protected peppers and eggplants and that the 2012 JMPR had recommended a maximum residue level of 0.5 mg/kg for peppers based on the GAP in Turkey.

No trials matching the GAP in Greece on peppers and eggplants were available. The Meeting noted that the previous trials on protected peppers provided to the 2010 and 2012 JMPRs all involved only two applications and application rates of either 0.06 kg ai/ha or 0.3 kg ai/ha and agreed that the proportionality approach could not be used to support revised recommendations for peppers and/or extrapolation to eggplants.

Legume vegetables

Beans (except broad bean and soya bean)

The critical GAP for beans in Netherlands and Belgium is for up to two foliar applications of 0.25 kg ai/ha, with a 7-day PHI and results from supervised trials from Europe on protected and outdoor beans were provided to the Meeting to supplement the data provided to the 2010 JMPR.

In nine independent trials on protected beans matching this critical GAP, fluopyram residues were: 0.07, 0.15, 0.16, 0.16, 0.2, 0.22, 0.22, 0.43 and 0.69 mg/kg in beans with pods.

In 32 independent trials on outdoor beans conducted in Europe and matching this critical GAP, fluopyram residues were: **< 0.01, < 0.01, 0.01,** 0.03, **0.04,** 0.04, **0.05**, 0.05, 0.07, **0.08, 0.08**, **0.09, 0.1**, 0.1, 0.11, 0.11, 0.12, **0.14**, **0.15**, **0.17**, **0.17**, 0.17, 0.18, 0.19, 0.2, 0.21, 0.24, 0.24, 0.25, 0.26, **0.32** and 0.43 mg/kg in beans with pods. (Results in bold are from the new trials).

The Meeting noted that the data sets for protected and outdoor bean were statistically different and agreed to use the data from the trials on protected beans to estimate a maximum residue level of 1 mg/kg, an STMR of 0.2 mg/kg and an HR of 0.69 mg/kg for fluopyram on beans (except broad bean and soya bean).

Peas, shelled

The critical GAP for peas (without pods) in Netherlands and Belgium is for up to two foliar applications of 0.25 kg ai/ha, with a 7-day PHI and results from supervised trials from Europe on outdoor peas were provided to the Meeting to supplement the data provided to the 2010 JMPR.

In 30 independent trials conducted in Europe and matching this critical GAP, fluopyram residues were: **< 0.01, < 0.01, < 0.01**, < 0.01, **0.01, 0.01**, 0.01, **0.02, 0.02, 0.02**, 0.02, 0.02, 0.02, 0.02, **0.03, 0.03**, 0.03, 0.03, **0.04**, 0.05, 0.05, 0.05, **0.05**, **0.06, 0.06**, **0.06**, **0.09, 0.09**, 0.1 and **0.12** mg/kg in peas without pods. (Results in bold are from the new trials).

The Meeting estimated a maximum residue level of 0.2 mg/kg, an STMR of 0.03 mg/kg and an HR of 0.12 mg/kg for fluopyram on peas, shelled.

Beans, shelled

The Meeting noted that the GAP for beans in Netherlands and Belgium (up to two foliar applications of 0.25 kg ai/ha, with a 7-day PHI) was for beans with and without pods, and since this GAP for beans was the same as for peas, the Meeting agreed to extrapolate the data from peas, shelled to beans, shelled.

The Meeting estimated a maximum residue level of 0.2 mg/kg, an STMR of 0.03 mg/kg and an HR of 0.12 mg/kg for fluopyram on beans, shelled.

Soya bean (dry)

Results from supervised trials from the USA on soya beans were provided to the Meeting. In 21 independent trials matching the GAP in the USA for use as a seed treatment (0.25 mg ai/seed) fluopyram residues were < 0.01 (12), 0.01, 0.01, 0.01, 0.02, 0.02, 0.03, 0.03 and 0.03 mg/kg in dry soya beans.

The Meeting noted that the metabolism studies did not cover the use of fluopyram as a seed treatment. However the Meeting noted the 2010 JMPR conclusions that fluopyram is slowly degraded in soil and when present, is the major residue in 30-day PBI rotational crops and agreed that the established residue definitions would also cover the use of fluopyram as a seed treatment.

The Meeting estimated a maximum residue level of 0.05 mg/kg and an STMR of 0.01 mg/kg for fluopyram on soya bean (dry).

Oilseeds

Sunflower seed

Results from supervised trials from Europe on sunflowers were provided to the Meeting.

The critical GAP in Ukraine and Moldovia is for up to two foliar sprays of 0.125 kg ai/ha, applied before the start of flowering (BBCH 57) and with a minimum PHI of 50 days.

The Meeting received results from 12 independent trials conducted in Europe, where two foliar sprays of 0.125–0.13 kg fluopyram/ha were applied up to the seed development or early ripening stages (BBCH 67–85). As these trials did not match the critical GAP, the Meeting did not recommend a maximum residue level for fluopyram on sunflower seed.

Cotton seed

Results from supervised trials from the USA on cotton were provided to the Meeting. These trials included separate plots where fluopyram was applied as a pre-plant seed treatment, or as as a combination of a seed treatment and an in-furrow soil treatment at planting.

In the USA, GAP exists for the use of fluopyram as a pre-plant seed treatment (0.35 mg ai/seed) and also as an in-furrow soil treatment of 0.25 kg ai/ha.

In the plots from 11 independent trials where the seed was treated with 0.5 mg/kg/seed (1.4× GAP), fluopyram residues in cotton seed were all < 0.01 mg/kg (n=11) and in the plots treated with a seed treatment (0.5 mg ai/seed—1.4× GAP) followed by an in-furrow soil treatment matching the US GAP (0.25 kg ai/ha) residues in cotton seed were also < 0.01 mg/kg.

The Meeting noted that the US GAP did not exclude the use of both a seed treatment and an in-furrow treatment at planting, and since residues following the seed treatment + in-furrow soil treatment were all < 0.01 mg/kg (n=11), the Meeting estimated a maximum residue level of 0.01 mg/kg and an STMR of 0.01 mg/kg for fluopyram on cotton seed.

Animal feeds

Bean forage

In 22 of the European trials on outdoor beans evaluated by the Meeting, residues of fluopyram in fresh bean forage from trials matching the GAP in Belgium and Netherlands (two applications of 0.25 kg ai/ha, PHI 7 days) were: 0.24, 0.25, 0.26, 0.31, 0.34, **0.38**, 0.42, **0.55**, 0.57, **0.58**, 0.68, 0.71, 0.72, 0.8, **0.82**, **0.85**, 0.86, 0.88, 1.3, 1.6, 2.8 and 4.3 mg/kg (Results in bold are from the new trials).

The Meeting estimated a median residue of 0.7 mg/kg (fresh weight) and a highest residue of 4.3 mg/kg (fresh weight) for fluopyram on bean forage.

Cotton gin by-products

In the trials from the USA on cotton, residues of fluopyram were measured in gin by-products from six plots that were treated with a combination of a seed treatment (at 1.4× GAP) and an in-furrow soil treatment (at GAP). Residues in these trials were: < 0.01, 0.02, 0.02, 0.03, 0.03 and 0.06 mg/kg.

The Meeting noted that although the in-furrow soil treatment rates in these trials matched the USA GAP, the seed treatment rates were 1.4× higher than GAP and agreed it was not possible to apply the proportionality approach for this combined treatment regime to derive median and highest residues for calculating the livestock dietary burden.

Pea vines and hay

In 30 of the European trials on outdoor peas evaluated by the Meeting, residues of fluopyram in fresh pea vines from trials matching the GAP in Belgium and Netherlands (two applications of 0.25 kg ai/ha, PHI 7 days) were: **0.14**, 0.2, **0.28**, **0.4**, 0.45, **0.46**, 0.46, **0.5**, **0.54**, **0.63**, 0.81, **0.92**, 0.93, 1.1, **1.7**, 1.9, **2.1**, 2.3, **3.2**, 3.3, 3.5, **4.0**, 4.3, **4.9**, 6.6, **7.7**, **8.0**, **8.4**, **9.2** and **9.6** mg/kg (Results in bold are from the new trials).

The Meeting estimated a median residue of 1.8 mg/kg (fresh weight) and a highest residue of 9.6 mg/kg (fresh weight) for fluopyram on pea vines (green).

Residues of fluopyram in pea hay/straw from the new European trials matching the GAP in Belgium and Netherlands and sampled 20–43 days after the last application were: 0.15, 0.33, 0.44, 0.44, 0.64, 0.8, 0.82, 0.93, 3.4, 3.6, 3.6, 4.8, 4.9, 6.3, 7.2, 11, 18 and 19 mg/kg (n=18).

The Meeting estimated a median residue of 3.5 mg/kg (fresh weight), a highest residue of 19 mg/kg (fresh weight) and after correction for an average 88% dry matter content, estimated a maximum residue level of 40 mg/kg for fluopyram on pea hay.

Animal commodity maximum residue levels

Farm animal feeding studies

The 2010 JMPR reviewed feeding studies with fluopyram on lactating dairy cows and laying hens and the conclusions from these residue transfer studies were used to estimate residue levels of fluopyram and its metabolites in milk, eggs and livestock tissues, based on the above dietary burdens.

Farm animal dietary burden

The Meeting estimated the dietary burden of fluopyram in farm animals on the basis of the diets listed in Annex 6 of the 2009 JMPR Report (OECD Feedstuffs Derived from Field Crops) and using the estimated residues in livestock feed commodities evaluated by the Meeting and by previous JMPRs.

	Animal dietary burden, fluopyram, ppm of dry matter diet							
	US-Canada		EU		Australia		Japan	
	Max	Mean	Max	Mean	Max	Mean	Max	Mean
Beef cattle	0.14	0.13	16	2.4	32 a	7.6 c	0.04	0.04
Dairy cattle	4.5	1.3	21	2.7	25 b	7 d	0.07	0.07
Poultry—broiler	0.041	0.041	0.21	0.12	0.021	0.021	–	–
Poultry—layer	0.041	0.041	5.8 e, g	0.92 f, h	0.021	0.021	–	–

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

[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 tissues

[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 tissues

[f] Highest mean poultry dietary burden suitable for STMR estimates for poultry tissues

[g] Highest maximum poultry dietary burden suitable for MRL estimates for poultry eggs
[h] Highest mean poultry dietary burden suitable for STMR estimates for poultry eggs

Animal commodity maximum residue levels

The calculations used to estimate total residues for use in estimating maximum residue levels, STMRs and HRs are shown below. For maximum residue level estimation, the total residues are the sum of fluopyram plus BZM (expressed as fluopyram equivalents) and for dietary intake estimation (STMRs and HRs) the total residues are the sum of fluopyram, BZM and total olefins (expressed as fluopyram equivalents).

Cattle

For beef and dairy cattle, the highest maximum dietary burdens were 32 ppm and 25 ppm (dairy) and the mean dietary burdens were 7.6 ppm and 7 ppm (dairy).

	Feed level for milk (ppm)	Total residues in milk (mg/kg)	Feed level for tissues (ppm)	Total residues (mg/kg)			
				Muscle	Liver	Kidney	Fat
MRL beef or dairy cattle (fluopyram + BZM)							
Feeding study [a]	14.4 44	0.25 0.64	14.4 44	0.045 0.83	2.88 6.	0.39 0.93	0.4 0.78
Dietary burden/residue estimate	25	0.38	32	0.52	4.7	0.71	0.63
High residue beef or dairy cattle (fluopyram + BZM + Total olefins)							
Feeding study [a]			14.4 44	0.47 0.86	2.9 6.1	0.41 0.97	0.52 1.2
Dietary burden/residue estimate			32	0.7	4.8	0.74	0.86
STMR beef or dairy cattle ((fluopyram + BZM + Total olefins)							
Feeding study [b]	1.5 14.4	0.02 0.27	1.5 14.4	0.02 0.32	0.35 2	0.03 0.31	0.04 0.31
Dietary burden/residue estimate	7	0.12	7.6	0.16	1.1	0.16	0.17

[a] For estimating highest residues for tissues and mean residues for milk
[b] For estimating mean residues for tissues and for milk

Total residues of fluopyram and BZM (expressed as fluopyram equivalents) calculated in cattle milk and tissues for use in estimating maximum residue levels are: 0.63 mg/kg (fat), 0.52 mg/kg (muscle), 4.7 mg/kg (liver) and 0.71 mg/kg (kidney) and the mean residue for milk is 0.38 mg/kg.

The Meeting estimated maximum residue levels of 0.7 mg/kg for fluopyram in meat (from mammals other than marine mammals), 0.7 mg/kg for mammalian fats (except milk fats), 0.8 mg/kg for edible offal (mammalian) except liver, 5 mg/kg for liver of cattle, goats, pigs and sheep and 0.5 mg/kg for milks and agreed to withdraw the previous recommendations.

Estimated HRs for dietary intake estimation for fluopyram (and including residues of BZM and total olefins) are 0.86 mg/kg for mammalian fat, 0.7 mg/kg for mammalian muscle, 4.8 mg/kg for liver and 0.74 mg/kg for kidney and other edible offal.

Estimated STMRs for dietary intake estimation for fluopyram (and including residues of BZM and total olefins) are 0.17 mg/kg for mammalian fat, 0.16 mg/kg for mammalian muscle, 1.1 mg/kg for liver of cattle, goats, pigs and sheep, 0.16 mg/kg for kidney and other edible offal of cattle, goats, pigs and sheep and 0.12 mg/kg for milks

Poultry

The dietary burdens for poultry broilers are 0.21 ppm (maximum) and 0.12 ppm (mean) but the Meeting decided to estimate residue levels in poultry tissues using the higher maximum and mean dietary burdens in poultry layers (5.8 ppm and 0.92 ppm respectively) as they may also be consumed. Since the dose-response curves in the poultry feeding study showed a linear relationship (R^2 values of 0.97–0.99) and as the maximum dietary burden estimates were not more than 120% of the highest dose, the Meeting agreed to estimate maximum total residues by extrapolation from the results of the poultry feeding study.

	Feed level for eggs (ppm)	Total residues in eggs (mg/kg)	Feed level for tissues (ppm)	Total residues (mg/kg)		
				Muscle	Liver	Skin with Fat
MRL broiler or laying hen (fluopyram + BZM)						
Feeding study [a]	4.8	0.72	4.8	0.33	1.6	0.64
Dietary burden/residue estimate	5.8	0.87	5.8	0.39	1.9	0.75
High residue broiler or laying hen (fluopyram + BZM + Total olefins)						
Feeding study [a]	4.8	0.74	4.8	0.39	1.64	0.72
Dietary burden/residue estimate	5.8	0.8	5.8	0.46	1.9	0.85
STMR broiler or laying hen (fluopyram + BZM + Total olefins)						
Feeding study [b]	0.49 1.6	0.08 0.22	0.49 1.6	0.03 0.09	0.16 0.43	0.06 0.12
Dietary burden/residue estimate	0.92	0.13	0.92	0.058	0.26	0.086

[a] For estimating highest residues for tissues and mean residues for eggs

[b] For estimating mean residues for tissues and for eggs

Combined residues of fluopyram and BZM (expressed as fluopyram equivalents) expected in poultry eggs and tissues for use in estimating maximum residue levels are: 0.75 mg/kg (fat), 0.39 mg/kg (muscle), 1.9 mg/kg (liver) and 0.87 mg/kg (eggs).

The Meeting estimated maximum residue levels of 0.5 mg/kg for fluopyram in poultry meat, 1 mg/kg for poultry fat, 2.0 mg/kg for poultry edible offal and 1.0 mg/kg for eggs.

Estimated HRs for dietary intake estimation for fluopyram (and including residues of BZM and total olefins) are 0.85 mg/kg for poultry fat, 0.46 mg/kg for poultry muscle, 1.9 mg/kg for poultry edible offal and 0.8 mg/kg for eggs.

Estimated STMRs for dietary intake estimation for fluopyram (and including residues of BZM and total olefins) are 0.086 mg/kg for poultry fat, 0.058 mg/kg for poultry muscle, 0.26 mg/kg for poultry edible offal and 0.13 mg/kg for eggs.

RECOMMENDATIONS

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

Definition of the residue for compliance with the MRL and for the estimation of dietary intake for plant commodities: *fluopyram*

Definition of the residue for compliance with the MRL for animal commodities: *Sum of fluopyram and 2-(trifluoromethyl) benzamide, expressed as fluopyram*

Definition of the residue for the estimation of dietary intake for animal commodities: Sum of fluopyram, 2-(trifluoromethyl)benzamide and the combined residues N-{(E)-2-[3-chloro-5-(trifluoromethyl)pyridin-2-yl]ethenyl}-2-trifluoromethyl) benzamide and N-{(Z)-2-[3-chloro-5-(trifluoromethyl)pyridin-2-yl]ethenyl}-2-trifluoromethyl) benzamide, all expressed as fluopyram.

DIETARY RISK ASSESSMENT

Long-term intake

The International Estimated Daily Intakes (IEDIs) for fluopyram were calculated for the food commodities for which STMRs or HRs were estimated and for which consumption data were available. The results are shown in Annex 3 to the 2015 Report.

The International Estimated Daily Intakes of fluopyram for the 17 GEMS/Food regional diets, based on estimated STMRs were 4–30% of the maximum ADI of 0.01 mg/kg bw (Annex 3). The Meeting concluded that the long-term intake of residues of fluopyram from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The International Estimated Short-term Intakes (IESTIs) for fluopyram were calculated for the food commodities for which STMRs or HRs were estimated and for which consumption data were available (Annex 4 to the 2015 Report).

For fluopyram the IESTI varied from 0–10% of the ARfD (0.5 mg/kg bw) and the Meeting concluded that the short-term intake of residues of fluopyram from uses considered by the Meeting is unlikely to present a public health concern.