FLUDIOXONIL (211)

First draft prepared by Dr. Katerina Mastovska, Agricultural Research Service, United States Department of Agriculture, Wyndmoor PA,USA.

EXPLANATION

Fludioxonil was first evaluated at the 2004 JMPR Meeting. The 2004 Meeting concluded that the residue definition for plant commodities for compliance with MRLs and for estimation of dietary intake was fludioxonil only. No MRL was recommended for pome fruit due to an insufficient number of post-harvest trials at the critical GAP.

Additional supervised trials to support the use pattern were carried out in 2005. The present Meeting received information on the post-harvest use pattern, residue analysis, and post-harvest trials on apples and pears performed in 2000, 2001, and 2005. Results of an apple processing study were also reported.

RESIDUE ANALYSIS

Analytical methods

Two single-residue methods (REM 133.04 and AG-597) and one multiresidue method (DFG S19) for the determination of fludioxonil residues in plant materials were reported to the JMPR meeting in 2004. The 2004 Meeting concluded that these analytical methods were adequate for gathering data in supervised trials, processing studies and for monitoring and enforcing MRLs in samples of plant origin.

The present Meeting received information on the residue analysis of fludioxonil in treated apples and pears and in samples resulting from an apple processing study. Analytical method AG-597B (Campbell, 1996; Williams, 1998) was employed for the determination of fludioxonil residues resulting from post-harvest application to apples and pears in the USA. In brief, the AG-597B method for apples and pears involved the following steps: (i) homogenization of the sample with acetonitrile-water (9:1, v/v), (ii) filtration, (iii) evaporation of an aliquot to remove acetonitrile, (iv) dilution of the concentrated extract with saturated NaCl solution and partitioning with methyl *tert*-butyl ether (MTBE), (v) addition of toluene to the organic phase and evaporation of MTBE, (vi) addition of hexane, (vii) clean-up of the extract using a silica SPE cartridge eluted with dichloromethane-toluene (1:1, v/v), (viii) evaporation of the eluent and reconstitution of the residue in methanol, (ix) addition of water, (x) clean-up of the extract using a phenyl SPE cartridge eluted with acetone, (xi) evaporation of acetone and reconstitution of the residue in HPLC mobile phase consisting of hexane-methanol-isopropanol (90:5:5, v/v), (xii) normal-phase HPLC analysis using an amino column and UV detection at 268 nm.

The LOQ of the method was 0.02 mg/kg. Recoveries of fortified blank (untreated) samples obtained during method validation and concurrently with the analysis of treated samples are shown in Table 1. The overall average recovery was 97% with average relative standard deviation of 9.8%.

Table 1. Recoveries by analytical method AG-597B for determination of fludioxonil in apples and pears in supervised trials.

Sample	Fortification level (mg/kg)	Recovery (%)		RSD (%)	No.	Author(s) Date Study No. Syn. Archive No.
		Mean	Values			
Apples	0.021	107	100, 103, 107, 107, 109, 112	3.4	6	Thompson, Ediger 2003 IR4 07568/1751-02
	0.21	96	95, 96, 97	1.0	3	
	0.525	91	86, 92, 95	5.0	3	

Sample	Fortification level (mg/kg)	Recovery (%)		RSD (%)	No.	Author(s) Date Study No. Syn. Archive No.
		Mean	Values			
	1.05	104	97, 99, 99, 101, 102, 112	6.7	6	CGA173506/6074
	5.25	103	98, 103, 108	4.9	3	
Pears	0.02	108	97, 119		2	Starner
	0.1	127	93, 102, 187	41	3	2003
	1.0	85	76, 83, 84, 95	9.3	4	IR4 07569/556-00
	2.0	92	92		1	CGA173506/5896
	5.0	82	80, 83		2	
Apples	0.02	91	91		1	Ediger
	10	97	97		1	2005
Pears	0.02	72	72		1	T005045-05
	10	102	102		1	CGA173506/6756

Analytical method REM 133.04 (Mair, 1993) was employed for the determination of fludioxonil residues in samples resulting from an apple processing study (Solé, 2004). In brief, slightly modified REM 133.04 method for whole and processed apple samples involved the following steps: (i) homogenization of the sample with methanol, (ii) filtration of an aliquot and dilution with water, (iii) clean-up of the extract using a phenyl SPE cartridge eluted with acetone, (iv) dilution with saturated NaCl solution and partitioning with hexane-diethyl ether (8:2, v/v), (v) evaporation of the organic phase to dryness and reconstitution of the residue in hexane-isopropanol (9:1, v/v), (vi) normal-phase HPLC analysis using an amino column and fluorescence detection (excitation wavelength 265 nm, emission wavelength 312 nm).

The LOQ of the method was 0.02 mg/kg. Recoveries of fortified blank (untreated) samples obtained during method validation and concurrently with the analysis of treated samples are shown in Table 2. The overall average recovery was 81% (range 70–113%) with relative standard deviation of 14%.

Multiresidue methods, such as previously reported DFG S19 method (Specht *et al.*, 1995; Pelz, 2001) or recently developed QuEChERS method (Anastassiades *et al.*, 2003; Lehotay *et al.*, 2005a), are more suitable for routine monitoring analysis than the single-residue methods AG-597B and REM 133.04. The DFG S19 method (European standard method DIN EN 12393) involves the extraction of the sample with acetone, followed by partition with ethyl acetate-cyclohexane (1:1, v/v) and gel permeation chromatography clean-up. The final extract is analysed by capillary gas chromatography (GC), typically with a mass spectrometric (MS) detection. The QuEChERS method involves the extraction of the sample with acetonitrile and simultaneous liquid-liquid partitioning by adding NaCl and anhydrous $MgSO_4$ (a buffered version of the QuEChERS method uses acetonitrile with 1% acetic acid and sodium acetate instead of NaCl).

After centrifugation, an aliquot is transferred to a mini centrifuge tube for dispersive SPE clean-up using primary secondary amine sorbent and anhydrous $MgSO_4$. After centrifugation, the extract is ready for analysis by either GC-MS or LC-MS/MS. Recoveries in the range of 90–110% were reported for fludioxonil in fruits and vegetables (Lehotay *et al.*, 2005b).

Table 2. Recoveries by analytical method REM 133.04 for determination of fludioxonil in samples resulting from an apple processing study (Solé, 2004).

Sample	Fortification level (mg/kg)	Recovery (%)		No.
		Mean	Values	
Whole and washed apples	0.02	81		1
	0.2	76		1
	0.4	70		1
Washing water	0.02	99		1
	0.2	78		1
Wet pomace	0.02	71		1
	0.2	70		1

Sample	Fortification level (mg/kg)	Recovery (%)		No.
		Mean	Values	
	0.5	79	77, 80	2
Dry pomace	0.02	78		1
	0.2	70		1
	5	71		1
Raw juice	0.02	100		1
	0.2	77		1
Pasteurised juice	0.02	96	79, 113	2
	0.2	83		1
Sieved purée	0.02	85		1
	0.2	77		1
Purée	0.02	86		1
	0.2	76		1

Stability of pesticide residues in stored analytical samples

Fludioxonil residues were previously shown to be stable in apples (Tribolet, 2000) and a number of other commodities for at least 24 months under deep-frozen conditions (< -18°C). In the supervised trial and processing studies reported to the present Meeting, apple and pear samples were stored frozen for a maximum of 177 days (5.8 months).

USE PATTERN

Fludioxonil is registered globally as a fungicide for seed treatment, foliar treatment, and post-harvest application on a variety of crops. The Meeting received a copy of the official label providing information on registered post-harvest use of fludioxonil on pome fruit in the USA relevant to the supervised trial data. This information is summarized in Table 3. For maximum control, it is recommended to treat the fruit once before and once after storage.

Table 3. Registered post-harvest uses of fludioxonil on pome fruit in the USA.

Formulation, ai %	Application		
	Method	Dip or spray concentration (kg ai/hL)	Number
WP, 50	dip (for 30 s)/drench	0.06	2
	spray - low volume (concentrate)[1]	0.86	
	spray - high volume (dilute)	0.24	

[1]Application of 0.5 kg ai/200,000 kg fruit (2.5 mg ai/kg).

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on fludioxonil supervised post-harvest trials on apples and pears, which is summarized in Tables 4 and 5 respectively.

Table 4. Fludioxonil residues resulting from post-harvest application to apples in the USA.

Location Year (Variety)	Form	Method	Fludioxonil residue, mg/kg[6]	Author(s), Date Study No. Syngenta Archive No.
Idaho[1] 2001 (Red Spur Delicious)	WP 50	Dip treatment[2]	0.75, 0.59 (0.67)	Thompson, Ediger, 2003 IR4 07568/1751-02 CGA173506/6074
Michigan[1] 2001 (Red Delicious)	WP 50	Dip treatment[2]	0.52, 0.35 (0.44)	Thompson, Ediger, 2003 IR4 07568/1751-02 CGA173506/6074
New Jersey[1] 2001 (McIntosh)	WP 50	Dip treatment[2]	0.56, 0.50 (0.53)	Thompson, Ediger, 2003 IR4 07568/1751-02 CGA173506/6074

Location Year (Variety)	Form	Method	Fludioxonil residue, mg/kg[6]	Author(s), Date Study No. Syngenta Archive No.
California[1] 2001 (Fuji)	WP 50	Dip treatment[2]	1.1, 0.76 (0.93)	Thompson, Ediger, 2003 IR4 07568/1751-02 CGA173506/6074
	WP 50	Packing line spray[3]	1.7, 1.3 (1.5)	
	WP 50	Dip treatment followed by packing line spray[4]	2.4, 2.1 (2.2)	
Washington[1] 2001 (Red Delicious)	WP 50	Dip treatment[2]	1.1, 0.72 (0.91)	Thompson, Ediger, 2003 IR4 07568/1751-02 CGA173506/6074
	WP 50	Packing line spray[3]	0.68, 0.57 (0.62)	
	WP 50	Dip treatment followed by packing line spray[4]	2.2, 1.8 (2.0)	
Visalia, California 2005 (Golden Delicious)	WP 50	Dip treatment followed by packing line spray[5]	2.3, 2.6 (2.5)	Ediger, 2005 T005045-05 CGA173506/6756
Parlier, California 2005 (Golden Delicious)	WP 50	Dip treatment followed by packing line spray[5]	2.3, 2.4 (2.4)	Ediger, 2005 T005045-05 CGA173506/6756

[1]Study originally submitted to the 2004 JMPR.

[2]Post-harvest dip: 0.06 kg ai/hL (dip solution included carnuba packing wax), fruit dipped for 2 min (± 10 s)

[3]Packing line spray: 0.5 kg ai in low pressure/low volume post-harvest packing line spray (0.30 - 0.37 kg ai/hL in water with carnuba fruit wax) per 200,000 kg fruit

[4]Post-harvest dip: 0.06 kg ai/hL (without carnuba packing wax), fruit dipped for 2 min (± 10 s); 3 hours drying followed by packing line spray: 0.5 kg ai in low pressure/low volume post-harvest packing line spray (0.30 - 0.37 kg ai/hL in water with carnuba fruit wax) per 200,000 kg fruit

[5]Post-harvest dip: 0.06 kg ai/hL (without fruit wax), fruit dipped for 30 s; approx. 30 min drying followed by packing line spray: 0.5 kg ai in low pressure/low volume post-harvest packing line spray (water with fruit wax) per 200,000 kg fruit

[6]Results from replicate samples are on same line; average values are in parentheses; underlined values were selected for estimation of STMR and MRL

Table 5. Fludioxonil residues resulting from post-harvest application to pears in the USA.

PEARS Location Year, (Variety)	Form	Method	Fludioxonil residue, mg/kg[8]	Author(s), Date Study No. Syngenta Archive No.
Idaho[1] 2000 (D'Anjou)	WP 50	Drench treatment[2]	3.5, 2.2 (2.9)	Starner, 2003 IR4 07569/556-00 CGA173506/5896
	WP 50	Dip treatment[3]	1.4, 0.93 (1.2)	
New Jersey[1] 2000 (Bartlett)	WP 50	Drench treatment[4]	0.76, 0.71 (0.74)	Starner, 2003 IR4 07569/556-00 CGA173506/5896
	WP 50	Dip treatment[3]	1.2, 0.79 (1.0)	
California[1] 2000 (Shinko)	WP 50	Drench treatment[2]	1.6, 1.3 (1.5)	Starner, 2003 IR4 07569/556-00 CGA173506/5896
	WP 50	Dip treatment[3]	2.7, 1.6 (2.2)	
	WP 50	Packing line spray[5]	2.5, 1.4 (2.0)	
	WP 50	Drench treatment[2] followed by packing line spray[5]	2.8, 2.7 (2.8)	
Washington[1] 2000 (Anjou)	WP 50	Drench treatment[2]	1.3, 1.1 (1.2)	Starner, 2003 IR4 07569/556-00 CGA173506/5896
	WP 50	Dip treatment[3]	0.68, 0.67 (0.68)	
	WP 50	Packing line spray[6]	1.6, 1.3 (1.5)	
	WP 50	Drench treatment[2] followed by packing line spray[6]	1.6, 1.5 (1.6)	

PEARS Location Year, (Variety)	Form	Method	Fludioxonil residue, mg/kg[8]	Author(s), Date Study No. Syngenta Archive No.
Visalia, California 2005 (Bartlett)	WP 50	Dip treatment followed by packing line spray[7]	1.1, 1.1 (1.1)	Ediger, 2005 T005045-05 CGA173506/6756
Parlier, California 2005 (Bartlett)	WP 50	Dip treatment followed by packing line spray[7]	1.2, 1.1 (1.2)	Ediger, 2005 T005045-05 CGA173506/6756

[1]Study originally submitted to the 2004 JMPR.

[2]Post-harvest drench: 0.06 kg ai/hL water

[3]Post-harvest dip: 0.06 kg ai/hL water + carnuba fruit wax, fruit dipped for 30 s

[4]Post-harvest drench: 0.048 kg ai/hL water

[5]Packing line spray: 0.5 kg ai in low pressure/low volume post-harvest packing line spray (0.60 kg ai/hL in undiluted carnuba fruit wax) per 200,000 kg fruit

[6]Packing line spray: 0.57-0.58 kg ai in low pressure/low volume post-harvest packing line spray (0.34-0.35 kg ai/hL in water with carnuba fruit wax) per 200,000 kg fruit

[7]post-harvest dip: 0.06 kg ai/hL (without fruit wax), fruit dipped for 30 s; approx. 30 min drying followed by packing line spray: 0.5 kg ai in low pressure/low volume post-harvest packing line spray (water with fruit wax) per 200,000 kg fruit

[8]Results from replicate samples are on same line; average values are in parentheses; underlined values were selected for estimation of STMR and MRL.

FATE OF RESIDUES IN STORAGE AND PROCESSING

Processing

The Meeting received information on the fate of incurred residues of fludioxonil during the processing of apples into juice and purée. The sponsor noted that this information has been included for completeness because post-harvest treatment of fruit is normally reserved for high value commodities and it is therefore unlikely that treated crops will be processed.

Fludioxonil, formulated as WG 62.5 (containing 25% fludioxonil and 37.5% cyprodinil), was applied to apple trees (variety Golden Delicious) three times as a foliar treatment at an application rate of approximately 250 g ai/ha at a test location in Switzerland. The application interval was 7–8 days and the fruit was harvested seven days after the final application. The fruit was harvested by hand and washed by spraying with water. Sub-samples were taken for processing into juice and purée (see Figure 1 for a processing flow chart).

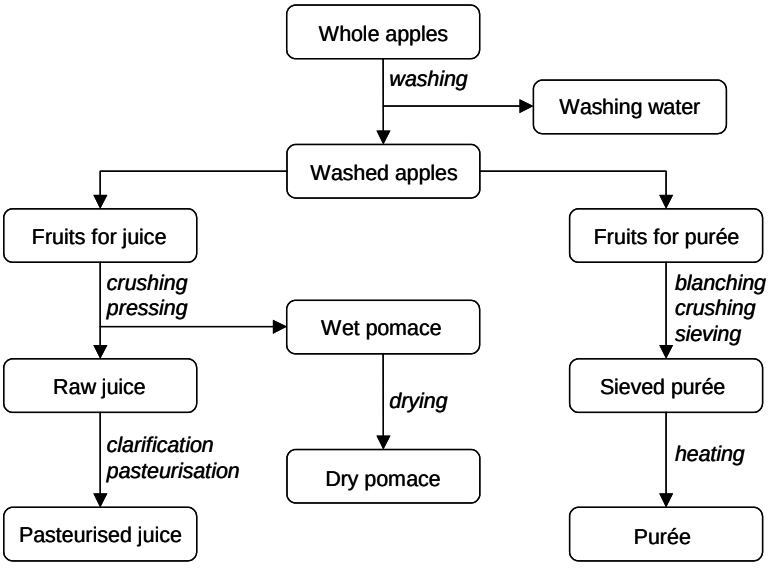

Figure 1. Flow chart for apple processing.

In apple juice processing, washed apples were crushed and pressed, generating raw juice and wet pomace. Wet pomace was dried in an oven at 60°C to yield dry pomace. Pectolytic enzymes were added to apple juice and the mixture was allowed to settle. The clear juice was racked and pasteurised by heating to 85°C for one minute.

In apple purée processing, washed apples were blanched in boiling water (2 L/kg apple) for two minutes to avoid enzymatic browning. The blanched fruits were crushed and sieved to obtain purée. After addition of sugar, the purée was reduced by heating in a double jacket saucepan to obtain a Brix degree of 24%.

Residues of fludioxonil were determined in the harvested and washed apples, wet and dry pomace, raw juice, pasteurised juice, sieved purée and purée. Results are shown in Table 6.

Table 6. Fludioxonil residues in apples and processed commodities.

APPLES Location Year (Variety)	Application[1]			PHI days	Commodity	Fludioxonil mg/kg or mg/L[2]	Processing factor	Author(s) Date Study No. Syn. Arch. No.
	Form	No.	kg ai/ha					
Switzerland 2003 (Golden Delicious)	WG 62.5	3	0.26 0.25 0.25	7	Whole apple	0.25		Solé 2004 03-0801 CGA173506/ 6057
					Washed apple	0.21	0.84	
					Washing water	0.12		
					Wet pomace	0.34	1.4	
					Dry pomace	1.25, 1.39, 1.33, 1.33 (1.33)	5.3	
					Raw juice	0.05	0.20	
					Pasteurised juice	<0.02, <0.02, <0.02, 0.02 (0.02)	0.08	
					Sieved purée	0.02, 0.02, 0.02, 0.02 (0.02)	0.08	
					Purée	0.03, 0.03, 0.03, 0.03 (0.03)	0.12	

1 Three foliar treatments: the first application at the BBCH growth stage 85, followed by the second treatment after 7 days (at BBCH 86), and then the third treatment after further 8 days (at BBCH 86-87). The fruit was harvested 7 days after the third treatment (at BBCH 87).

2 Average values are in parentheses.

APPRAISAL

Fludioxonil was first evaluated by the 2004 JMPR Meeting. The 2004 Meeting estimated an MRL of 0.7 mg/kg for foliar uses on pears, but did not recommend an MRL for pome fruit based on post-harvest use due to an insufficient number of trials performed at the maximum GAP. The present Meeting received information on the post-harvest use pattern, residue analysis, and post-harvest trials on apples and pears. Results of an apple processing study were also reported.

Methods of residue analysis

The Meeting concluded that adequate multi- and single-residue methods exist for both gathering data in supervised trials and processing studies and for the monitoring and enforcement of fludioxonil MRLs in commodities of plant origin.

Two single-residue methods (AG-597 and REM 133.04) were used for the analysis of fludioxonil in treated apples and pears and in samples resulting from an apple processing study. The LOQ of both methods was 0.02 mg/kg. In the case of method AG-597B, the overall average recovery was 97% with an average relative standard deviation of 9.8%. The analytical method REM 133.04 gave an overall average recovery of 81% with an average relative standard deviation of 14%.

Multiresidue methods, such as the previously reported method DFG S19 or recently developed QuEChERS method, are more suitable for routine monitoring of residues than the two single-residue methods AG-597B and REM 133.04.

Stability of pesticide residues in stored analytical samples

The JMPR 2004 Meeting concluded that fludioxonil residues are stable in apples and many other commodities for at least 24 months under deep freeze conditions (<-18°C). In the supervised trial and processing studies reported to the present Meeting, apple and pear samples were stored frozen for a maximum of 177 days (5.8 months).

Results of supervised trials on crops

The Meeting received supervised trial data for post-harvest treatments of pome fruit (apples and pears) conducted in the USA. Apples and pears were treated by post-harvest dip, drench, or spray using a 50% wettable powder formulation of fludioxonil. GAP for pome fruit specifies a maximum of two treatments, one on entering storage and a second on exit from storage for market distribution, at a single application rate of 0.5 kg ai/200,000 kg fruit (2.5 mg ai/kg fruit) for spray treatment (0.86 kg ai/hL for droplet-type applications using a low-volume concentrate; 0.24 kg ai/hL for high-volume jet-type sprays) and 0.06 kg ai/hL for dip/drench treatments.

Seventeen trials (seven on apples and ten on pears) were conducted as a single application at approximately the GAP rate. Eight trials (four on apples and four on pears) were conducted at the GAP rate with two sequential applications, involving 0.06 kg ai/hL dip/drench treatment followed by packing-line spray at 2.5 mg ai/kg fruit (2.85 mg ai/kg fruit, *i.e.* 114% GAP, was used in one trial on pears).

As GAP specifies two treatments, the Meeting regarded the eight trials with two sequential applications as an approximation of the maximum GAP. The residue levels on apples, in ranked order were: 2.0, 2.2, 2.4, and 2.5 mg/kg. The residue levels on pears, in ranked order were: 1.1, 1.2, 1.6, and 2.8 mg/kg (note: 1.6 mg/kg resulted from a dip treatment at 100% GAP followed by the spray treatment at 114% GAP). The Meeting decided to combine the data, thus the residue levels on pome fruit, in ranked order, were: 1.1, 1.2, 1.6, 2.0, 2.2, 2.4, 2.5, and 2.8 mg/kg. The Meeting estimated a maximum residue level for pome fruit of 5 mg/kg and an STMR of 2.1 mg/kg, and withdrew its previous recommendation for a maximum residue level of 0.7 mg/kg for pears

Fate of residues during processing

The Meeting received information on the fate of incurred residues of fludioxonil during commercial-type processing of apples into juice and purée. The processing factors and STMR-P values, based on an STMR of 2.1 mg/kg for pome fruits, are summarized in the table below.

Raw agricultural commodity	Processed commodity		
	Commodity	Processing factor	STMR-P (mg/kg)
Apple	Washed fruit	0.84	
	Juice, pasteurised	0.08	0.17
	Pomace, wet	1.4	2.9
	Pomace, dry	5.3	11
	Purée	0.12	0.25

The Meeting estimated a maximum residue level of 20 mg/kg for apple pomace, dry, based on the highest residue of 2.8 mg/kg in the pome fruit post harvest trials and the processing factor of 5.3.

Farm animal dietary burden

The Meeting estimated the maximum dietary burden of fludioxonil residues for farm animals (beef cattle, dairy cows, and poultry) using previously recommended MRLs and STMR-Ps for possible feed commodities and STMR-P for wet apple pomace estimated by the present Meeting. The table below shows the basis for the dietary intake calculation.

Commodity	Group	Maximum or highest residue level (mg/kg)	STMR or STMR-P	Dry matter (%)	Residue on dry wt (mg/kg)	*Dietary content (%)*			Residue contribution (mg/kg)		
						Beef cattle	*Dairy cows*	*Poultry*	Beef cattle	Dairy cows	Poultry
Apple pomace (wet)	AB		2.9	40	7.3	*40*	*20*		2.9	1.5	
Wheat forage	AF	0.05		25	0.20	*25*	*60*		0.05	0.12	
Rape forage	AM	0.05		30	0.17	*30*	*20*		0.05	0.03	
Maize grain	GC	0.05		88	0.06			*80*			0.05
Pea seed	VD	0.07		90	0.08	*5*		*20*	0.004		0.02
Total						***100***	***100***	***100***	**3.0**	**1.7**	**0.07**

The maximum dietary burdens of fludioxonil in beef cattle, dairy cows, and poultry (on the basis of diets listed in Appendix IX of the *FAO Manual*) are 3.0, 1.7, and 0.07 mg/kg, respectively. For comparison, the previously calculated dietary burdens were 0.07, 0.06, and 0.07 mg/kg, respectively (JMPR Report 2004).

Farm animal feeding studies

The 2004 Meeting received information on a ruminant feeding study, the results of which are summarized in the tables below. No study was available on poultry feeding.

Residues of fludioxonil and its metabolites (converted via oxidation to 2,2-difluoro-1,3-benzodioxole-4-carboxylic acid), found in milk were:

Animal number	Dose level in diet	Residues (mg/kg) at dosing (day)						
		0 (pre-dosing)	1	3	7	14	21	26
2A	1x	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2B	0.55 mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
2C		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3A	3x	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3B	1.6 mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
3C		< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4A	10x	< 0.01	< 0.01	< 0.01	< 0.01	**0.019**	**0.012**	< 0.01
4B	5.5 mg/kg	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01	< 0.01
4C		< 0.01	< 0.01	**0.016**	**0.011**	**0.010**	**0.014**	< 0.01

Residues of fludioxonil and its metabolites (converted via oxidation to 2,2-difluoro-1,3-benzodioxole-4-carboxylic acid) found in ruminant tissues were:

Animal number	Dose level in diet	Residues (mg/kg) at dosing (day)					
		Round muscle	Tenderloin muscle	Liver	Kidney	Perirenal fat	Omental fat
2A	1x	na	na	na	na	na	na
2B	0.55 mg/kg	na	na	na	na	na	na
2C		na	na	na	na	na	na

Animal number	Dose level in diet	Residues (mg/kg) at dosing (day)					
		Round muscle	Tenderloin muscle	Liver	Kidney	Perirenal fat	Omental fat
3A	3x	na	na	na	na	na	na
3B	1.6 mg/kg	na	na	na	na	na	na
3C		na	na	na	na	na	na
4A	10x	< 0.01	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05
4B	5.5 mg/kg	< 0.01	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05
4C		< 0.01	< 0.01	< 0.05	< 0.05	< 0.05	< 0.05

Animal commodity maximum residue levels

The addition of wet apple pomace to the list of possible feed items resulted in the estimated maximum dietary burden of 3.0, 1.7, and 0.07 mg/kg for beef cattle, dairy cows, and poultry, respectively.

Based on the information in Appendix IX of the *FAO Manual*, apple pomace is not a significant part of a poultry diet, thus the addition of this feed item did not change the previous estimation of maximum dietary burden and MRLs. The 2004 Meeting recommended MRLs of 0.01 (*) mg/kg for poultry meat and 0.05 (*) mg/kg for eggs and poultry offal. STMR values of 0 mg/kg were estimated for eggs, poultry meat, and poultry offal.

In the feeding study reported to the 2004 Meeting, no quantifiable residue of fludioxonil was found in the tissues of ruminants at the 5.5 mg/kg feeding level, which corresponds to 3.2-fold and 1.7-fold higher levels than the estimated maximum dietary burdens for dairy cows and beef cattle, respectively. Thus, the addition of wet apple pomace to the list of possible feed items did not change the recommendation of the 2004 Meeting.

The present Meeting confirmed the previous recommendations for a maximum residue level of 0.05* for edible offal and 0.01 (*) mg/kg for muscle and the STMR values of 0 mg/kg for both edible offal and muscle.

In milk, the highest residue level found was 0.019 mg/kg at the 5.5 mg/kg feeding level. Using this information and extrapolating to a 1.7 mg/kg feeding level (corresponding to the maximum dietary burden for dairy cows), the highest residues expected in milk would be below the reported LOQ of 0.01 mg/kg. This estimation is also supported by the results of the 1.6 mg/kg feeding study (a close approximation of the maximum dietary burden for dairy cows), which led to no quantifiable fludioxonil residues (< 0.01 mg/kg) in milk. This reaffirms the 2004 JMPR recommendation of the MRL of fludioxonil residue at the LOQ, 0.01 (*) mg/kg, and the STMR value for milk of 0 mg/kg.

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

Definition of the residue for compliance with MRLs and estimation of dietary intake in livestock commodities: fludioxonil and metabolites determined as 2,2-difluoro-1,3-benzodioxole-4-carboxylic acid and calculated as fludioxonil. Fludioxonil is fat-soluble.

RECOMMENDATIONS

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

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

Definition of the residue for compliance with MRLs and estimation of dietary intake in livestock commodities: fludioxonil and metabolites determined as 2,2-difluoro-1,3-benzodioxole-4-carboxylic acid and calculated as fludioxonil. Fludioxonil is fat-soluble.

Commodity		MRL (mg/kg)		STMR or STMR-P (mg/kg)
CCN	Name	New	Previous	
JF 226	Apple juice			0.17
AB 226	Apple pomace, dry	20		11
	Apple purée			0.25
FP 0230	Pear	W	0.7	
FP 0009	Pome fruits	5 Po		2.1

DIETARY RISK ASSESSMENT

Long-term intake

The IEDIs of fludioxonil based on STMR and STMR-P values estimated for 47 commodities for the thirteen GEMS/Food regional diets were 0–2% of the ADI (Annex 3 of the 2006 Report). A similar result was obtained in 2004, when the Meeting concluded that the long-term dietary intake of fludioxonil residues is unlikely to present a public health concern.

Short-term intake

The 2004 Meeting decided that an ARfD for fludioxonil is unnecessary and concluded that the short-term dietary intake of fludioxonil residues is unlikely to present a public health concern.

REFERENCES

Author, Date, Title, Institute, Report Reference, Document No.

Anastassiades, M., et al. 2003. Fast and easy multiresidue method employing acetonitrile extraction/partitioning and "dispersive solid-phase extraction" for the determination of pesticide residues in produce. J. AOAC Int., 86, 412-31.

Campbell, D.D. 1996. Analytical method for the determination of CGA-173506 in crops by high performance liquid chromatography including validation data (AG-597B). Ciba-Geigy Corporation, Greensboro, USA. Report issued 04.03.1996, CGA173506/0773

Ediger, K.D. 2005. Fludioxonil: magnitude of the residues on pome fruit following post-harvest applications. Syngenta (study No. T005045-05), Greensboro, USA. Report issued 29.11.2005 CGA173506/6756.

Lehotay, S.J., Mastovska, K. and Lightfield, A.R. 2005a. Use of buffering and other means to improve results of problematic pesticides in a fast and easy method for residue analysis of fruits and vegetables, J. AOAC Int., 88, 615-29.

Lehotay, S.J., et al. 2005b. Validation of a fast and easy method for the determination of 229 pesticide residues in fruits and vegetables using gas and liquid chromatography and mass spectrometric detection, J. AOAC Int., 88,595-614.

Mair, P. 1993. Determination of CGA 173506 in plant material, wine and soil by HPLC including validation data. Ciba-Geigy LtD., Basel, Switzerland. Report REM 133.04 issued 01.04.1993 CGA173506/0313.

Pelz, S. 2001. Validation of the DFG Method S19 (extended version) for the determination of residues of fludioxonil (CGA 173506) in/or plant material. Dr. Specht und Partner Chem. Laboratorien GmbH, Hamburg, Germany. Report SYN-0103V issued 27.07.2001, CGA173506/5404

Solé, C. 2004. Residue study with cyprodinil (CGA 219417) and fludioxonil (CGA 173506) in or on apples in Switzerland. ADME Bioanalyses, Vergèze, France. Report 03-0801 issued 25.10.2004 CGA173506/6057

Specht, W., Pelz, S., and Gilsbach, W. 1995. Gas-chromatographic determination of pesticide residues after clean-up by gel-permeation chromatography and mini-silica gel-column chromatography. Fresenius J. Anal. Chem., 353, 183-90.

Starner, V.R. 2003. Fludioxonil: magnitude of the residue on pear following post-harvest treatment. IR-4 Project 07569 (Syngenta study No. 556-00), Centre for Minor Crop Pest Management, Technology Centre of New Jersey, North Brunswick, USA. Report issued 14.07.2003, CGA173506/5896

Thompson, D.C. and Ediger, K.D. 2003. Fludioxonil: magnitude of the residue on apple following post-harvest treatment. IR-4 Project 07568 (Syngenta study No. 1751-02), IR-4 Headquarters, Technology Centre of New Jersey, North Brunswick, USA. Report issued 02.06.2003, CGA173506/6074

Tribolet, R. 2000. Stability of residues of CGA 173506 (fludioxonil) in apples under freezer storage conditions. Syngenta AG, Basel, Switzerland. Report 221/98 issued 15.12.2000 CGA173506/5349

Williams, R.K. 1998. Validation of method AG-597B for CGA 173506 “Analytical method for the determination of CGA 173506 by high performance liquid chromatography”. Novartis Crop Protection Inc., Greensboro, USA. Report issued 29.04.1998, CGA173506/1123

CROSS REFERENCES

Author	Document Code	Year
Anastassiades, M., *et al.*		2003
Campbell, D.D.	CGA173506/0773	1996
Ediger, K.D	CGA173506/6756	2005
Lehotay, S.J., Mastovska, K. and Lightfield, A.R		2005a.
Lehotay, S.J.,*et al*.		2005b.
Mair, P.	CGA173506/0313	1993
Pelz, S.	CGA173506/5404	2001
Solé, C.	CGA173506/6057	2004
Specht, W., Pelz, S., and Gilsbach, W.		1995
Starner, V.R.	CGA173506/5896	2003
Thompson, D.C. and Ediger, K.D.	CGA173506/6074	2003
Tribolet, R.	CGA173506/5349	2000
Williams, R.K.	CGA173506/1123	1998