DIFENOCONAZOLE (224)

First draft prepared by Prof. Dr. Arpad Ambrus, Hungarian Food Safety Office, Budapest, Hungary

EXPLANATION

Difenoconazole was evaluated by the JMPR at the first time in 2007 when an ADI of 0–0.01 mg/kg bw and ARfD of 0.3 mg/kg bw was established. In addition, the meeting recommended maximum residue levels, supervised trial median and high residue levels for a number of commodities. The compound was listed for additional MRLs by 2010 JMPR at the Forty-first Session of the CCPR.

The manufacturer, the governments of Republic of Korea, Kenya and Thailand provided residue data for additional commodities which were evaluated by the current meeting.

METHODS OF RESIDUE ANALYSIS

Analytical methods

The analytical method reported by the 2007 JMPR were shown to be applicable for other crops and used in supervised trials included in this evaluation.

The method AG-514 (Rodrigues, N.R., Rubbo, P., 1999) was used for the analysis of beans with pods and passion fruit. The validation of the method was carried out with samples of tomatoes and potatoes that were treated with phenyl-^{14}C-difenoconazole. The limit of quantification of the method was 0.05 mg/kg, the typical recovery was 93% ± 18% in the residue range of 0.05–0.5 mg/kg.

The method AG-575 (Darnow, J., Sayers, L., 1990) is the modified version of AG 537A. It was used for the analysis of banana, beans with pods and cereal grains with an LOQ of 0.01 mg/kg, average recovery of 87% ± 15%. The AG-575A (Ross J., 1991) and AG-575B (Ross J., 1993) are corrected and updated versions of AG-575. AG-575A was translated and referenced under AGR/MOA/169374-1.

The AG-575A was further modified for determination of difenoconazole residues with GC-ECD (Ryan, J., 2005). The procedural recovery data from several crop residue studies are summarised in Table 1.

Table 1 Recovery data for various crops using Method AG-575A (ECD)

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Kale	0.02	83, 81	82	N/A	2
	0.20	85, 90	88	N/A	2
	10.0	67	67	N/A	1
		Overall	81	11	5
Head Cabbage	0.01	92	92	N/A	1
	0.02	107, 103, 93, 76, 79	92	15	5
	0.10	91	91	N/A	1
	0.20	108, 102, 97, 84	98	10	4
		Overall	94	12	11
Lettuce	0.04	97, 115, 133, 107, 95, 87	106	16	6
	0.20	83, 90, 91, 84, 81, 92	87	5.4	6
		Overall	96	16	12
Broccoli	0.01	77, 99	88	N/A	2
	0.02	93, 90	92	N/A	2
	0.10	74, 90	82	N/A	2
	0.20	77, 91	84	N/A	2
	4.0	82	82	N/A	1
		Overall	86	10	9

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Celery	0.04	131, 103, 92, 104	108	15	4
	0.20	93, 88, 94, 98	93	4.4	4
	1.0	96, 93	95	N/A	2
		Overall	99	12	10
Sugar Beet Roots	0.02	76, 92, 94, 96, 87, 100	91	9.3	6
	0.04	72, 82, 85, 94	83	11	4
	0.10	91	91	N/A	1
	0.20	93, 88, 94, 93, 96, 88, 110, 85	93	8.2	8
		Overall	90	9.4	19
Sugar Beet Leaves	0.02	109, 65	87	N/A	2
	0.1	89	89	N/A	1
	0.20	106, 99	103	N/A	2
	1.0	87	87	N/A	1
		Overall	93	17	6
Tomatoes	0.01	71, 107, 95, 107	95	18	4
	0.04	99, 82, 98, 94	93	8.4	4
	0.10	87, 70, 82, 84	81	9.2	4
	0.20	100, 89, 93, 96	95	4.9	4
	0.50	84	84	N/A	1
		Overall	91	12	17
Peaches	0.01	93, 97	95	N/A	2
	0.04	110, 100, 97	102	6.7	3
	0.10	80, 88	84	N/A	2
	0.20	100, 95, 69	88	19	3
		Overall	93	12	10
Strawberry	0.04	90, 99, 96	95	5	3
	0.20	90, 97, 94	94	4	3
		Overall	94	4	6
Pome Fruit	0.01	95, 78, 85, 99, 95, 72, 78, 75, 73, 110, 79, 108	87	16	12
	0.02	78	78	N/A	1
	0.04	93, 131, 90	105	22	3
	0.10	72, 73, 83, 91, 72, 89, 75, 87, 84, 74, 96, 81	81	10	12
	0.20	96, 93, 96, 97	96	1.8	4
	0.30	86	86	N/A	1
	0.50	77, 92	85	N/A	2
		Overall	87	15	35
Oilseed Rape	0.02	85, 69, 86	80	12	3
	0.04	89, 95	92	N/A	2
	0.10	89	89	N/A	1
		Overall	86	10	6
Olive Fruit	0.04	75	75	N/A	1
	0.10	100, 104, 96	100	4.0	3
	0.20	102, 95, 101, 103, 87, 77, 96	94	10	7
	1.0	103, 92, 97, 99	98	4.7	4
		Overall	95	9.5	15

N/A = Not Applicable

In the 0.01–1.0 mg/kg concentration range, the overall recovery of difenoconazole residues from crops of high water content was 93 ± 12% (n = 81). The recovery for crops of high oil content (0.02–1.0 mg/kg) was 92 ± 11% (n = 21).

Analytical Method AG-575A was modified for residue quantification with gas chromatography utilizing mass selective detection (Ryan, J., 2005a). Procedural recovery data from a range of high water and high fat content crops are summarised in Table 2.

Table 2 Recovery data for various crops using Method AG-575A (MSD)

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Peaches	0.01	93, 107, 107, 80, 80	93	14	5
	0.10	99, 89, 89, 88	91	6	4
	0.50	94	94	N/A	1
		Overall	93	10	10
Plums	0.01	96, 108, 71, 71, 71	83	21	5
	0.10	86, 109, 71, 78, 78, 70	82	18	6
		Overall	83	18	11
Cherries	0.01	84, 73, 93, 88, 103	88	13	5
	0.10	81, 99, 99, 76, 88	89	12	5
	0.50	72	72	N/A	1
		Overall	87	12	11
Grapes	0.01	102, 99, 100, 95, 98	99	3	5
	0.10	82, 84, 80, 84 , 91	84	5	5
		Overall	92	9	10
Tomatoes	0.01	96, 94, 108, 78, 100	95	12	5
	0.10	104, 109, 89, 93, 102	99	8	5
	0.40	74	74	N/A	1
		Overall	95	12	11
Lettuce	0.01	110, 109, 106, 106, 100	106	4	5
	0.10	89, 93, 89	90	3	3
	5.0	109, 70	90	N/A	2
		Overall	98	13	10
Kale	0.01	95, 103, 106, 94, 90 ,105, 116, 116	103	4	5
	0.10	124, 115, 93, 94	107	3	3
	5.0	106, 105	106	N/A	2
		Overall	104	13	10
Fennel	0.01	84, 80, 88, 96, 97	89	8	5
	0.10	74, 77, 75, 84, 82	78	6	5
		Overall	84	10	10
Olives	0.01	96, 74, 79, 84, 75	82	11	5
	0.10	91, 89, 97, 92	92	4	4
	5.0	75			1
		Overall	85	11	10
Oilseed Rape Seed	0.01	101, 103, 98, 101, 95	100	3	5
	0.10	11, 124, 104, 104, 106	110	8	5
		Overall	105	8	10

N/A = Not Applicable

The REM 147.08 (Crook, S.J., 2004) was used for the analysis of beans with pods and tree nuts with an LOQ of 0.01 mg/kg. The recoveries obtained in various crops (Ely, S., Ryan, J., 2004) are summarised in Table 3.

Table 3 Recovery data for various crops using Method REM 147.08

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Oilseed Rape Seed	0.01	84, 81, 83, 94, 93	87	6.9	5
	0.10	91, 91, 90, 94, 93	92	1.8	5
		Overall	89	5.4	10
Olive Fruit	0.01	115, 108, 103, 110, 93	106	7.9	5
	1.0	109, 104, 98, 97, 100	102	4.9	5
		Overall	104	6.6	10
Olive Oil	0.01	94, 97, 103, 98, 96	98	3.4	5
	1.0	81, 94, 92, 84, 87	88	6.2	5
		Overall	93	7.3	10

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Sugar Beet Leaves	0.01	92, 75, 78, 84, 93	84	10	5
	1.0	96, 102, 95, 90, 95	96	4.5	5
		Overall	90	9.4	10
Sugar Beet Roots	0.01	88, 90 ,93, 83, 84	88	4.7	5
	0.20	84, 86, 91, 92, 93	89	4.4	5
		Overall	88	4.4	10
Wheat Grain	0.01	92, 107, 94, 89, 95	95	7.2	5
	0.10	96, 96, 95, 77, 92	91	8.9	5
		Overall	93	8.0	10
Cherry	0.01	81, 84, 85, 90, 90	86	4.6	5
	0.20	95, 84, 82, 91, 94	89	6.6	5
		Overall	88	5.7	10
Apples	0.01	78, 95, 84, 96, 101	91	10	5
	0.30	90, 84, 84, 83, 89	86	3.8	5
			88	**8.1**	**10**
Tomato Fruit	0.01	85, 85, 81, 87, 89	85	3.5	5
	0.50	76, 79, 87, 89, 85	83	6.6	5
		Overall	84	5.1	10
Tomato Puree	0.01	82, 91, 86, 95, 97	90	6.9	5
	1.0	101, 80, 97, 93, 96	93	8.6	5
		Overall	92	7.6	10
Grapes	0.01	92, 99, 100, 101, 115	101	8.3	5
	0.10	120, 119, 100, 99, 96	107	11	5
		Overall	104	9.6	10
Broccoli (Whole Plant)	0.01	119, 90, 80, 88, 104	96	16	5
	0.10	98, 97, 105, 94 , 103	99	4.5	5
		Overall	98	11	10
Leeks (Whole Plant)	0.01	93, 86, 84, 83, 86	86	4.5	5
	0.20	89, 78, 89, 89, 89	87	5.7	5
		Overall	87	4.8	10

The method used in a banana study (Xueyan Z., 2007) was based on homogenization in acetonitrile with T25 Ultra-Turrax. The extracted mixture was filtered and partitioned. The upper layer was removed and filtered with sodium sulphate, evaporated to dryness and reconstituted with ethyl acetate: petroleum ether (3:2, v/v). The mixture was cleaned up using an anhydrous sodium sulphate and alumina N column conditioned with ethyl acetate: petroleum ether (3:2, v/v). The eluate was evaporated to dryness and diluted with acetone for determination by gas chromatography with nitrogen phosphorus detection (GC-NPD). The validated quantification limit was 0.02 mg/kg. The recoveries are summarised in Table 4.

Table 4 Recoveries of difenoconazole from banana

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Banana (whole fruit)	0.02	95.6, 78.7, 87.6, 90.9, 97.0	90.0	8.1	5
	0.5	87.3, 90.0, 99.8, 95.6, 84.9	91.5	6.7	5
	Overall		90.8	7.4	10
Banana (pulp only)	0.02	90.9, 91.6, 91.7, 96.4, 91.8	92.5	2.4	5
	0.5	96.7, 102.5, 102.2, 105.6, 91.5	99.7	5.6	5
	Overall		96.1	4.0	10

Passion fruits were analysed (Ciscato, C.H.P., Gebara, A.B., 1999; Ciscato, C.H.P., Gebara, A.B., 2001) with a method similar to DFG S19 presented in the 2007 Evaluations. The LOQs reported were 0.01–0.02 mg/kg. The recoveries are shown in Table 5.

Table 5 Recovery data from passion fruit (report FHF 017B)

Matrix	Fortification Level (mg/kg)	Recoveries (%)	Mean (%)	Relative Standard Deviation	Number Samples Analysed
Passion fruit	0.01	85	85	NA	1
	0.10	92	92	NA	1
	0.02	96.4	102.8	8.1	3
		100.0			
		111.9			
	1.00	89.1	95.8	5.8	3
		99.1			
		99.3			

Fresh ginseng roots were washed with tap water to remove soil particles and ground. These samples were individually packed in polyethylene bags and stored at -20 °C or -70 °C until analysis. The test portions were blended with acetonitrile, the extract diluted with saturated NaCl solution, partitioned with hexane or dichloromethane, cleaned up on Florisil or alumina columns. The residue concentration was determined after elution on capillary column and detection with GC-ECD or GC-MSD. Five recovery tests were performed as part of the validation of the methods. In addition, concurrent recoveries were tested with untreated test portions at the time of the analysis of field treated samples in three replicates from each field (Chae M.Y., 2010; Hur, J.H., 2009); Kyung, K.S., 2009). There was no statistically significant difference between the pre-trial validation data and the concurrent recoveries. The basic methods and their performance parameters are summarised in Table 6.

Table 6 Summary of analytical methods used for determination of fresh ginseng roots and processed ginseng products

Sample material	Fresh ginseng	Dried ginseng	Red ginseng	Dried red ginseng	Ginseng extract
Test portion [g]	20	10	10	10	10
Extraction solvent	100 mL ACN	100 mL ACN	10 mL H_2O+ 50 ACN	20 mL H_2O+ 50 ACN	50 mL ACN
Solvent/solvent partition	400 mL water + 100 mL saturated NaCl / 2 × 70 mL hexane	500 mL water+50 mL CH_2Cl_2 /2 × 50 mL CH_2Cl_2	400 mL water+100 mL saturated NaCl + 50 mL CH_2Cl_2 /2 × 50 mL CH_2Cl_2	400 mL water+100 mL saturated NaCl + 50 mL CH_2Cl_2 /2 × 50 mL CH_2Cl_2	
Cleanup	10 g Florisil	5 g SiO_2		5 g Florisil	
Elution	60 mL CH_2Cl_2:ACN=1:1	45 mL hexan:acetone/70:30		50 mL CH_2Cl_2:ACN=1:1	
Quantification	GC-ECD	GC/MSD	GC-ECD	GC-ECD	
LOQ Fresh ginseng Dried ginseng EtOH extract	 0.002-0.003	 0.02 0.04 0.04	 0.003 0.007 0.007	 0.007 0.007 0.007	
Recovery: n 0.003 mg/kg 0.007 mg/kg 0.02 mg/kg 0.03 mg/kg 0.07 mg/kg 0.2 mg/kg 1.0 mg/kg	5 91% 101.5% 90.8%	5 95-101% 103-104% 99-105% 5		5 94.6% 99.9 89	
Repeatability	≤ 4%	≤ 7.4%		≤ 3%	

Stability of residues in stored analytical samples

Detailed information provided for the 2007 JMPR indicated that difenoconazole residues were stable in the following crop commodities for the intervals tested, some for 1 year, but most for 2 years: banana, cotton seed, cotton seed meal, cotton seed oil, lettuce, potatoes, soya beans, tomatoes, wheat forage, wheat grain and wheat straw stored for one year at ca. -20 °C. Difenoconazole and metabolite CGA 205375 spiked into animal tissues (0.2 mg/kg) and milk (0.05 mg/kg) were stable when stored at or below -18 °C for approximately 10 months.

Untreated test portions of ginseng and ginseng processed products were spiked with difenoconazole solution and stored at or below -20 °C until the analyses of field treated samples. The spiked test portions for testing the stability of residues under deep-frozen conditions were analysed together with the field treated fresh ginseng and various processed products made from them (Chae M.Y., 2010; Hur, J.H., 2009); Kyung, K.S., 2009). The fortification level and the survived residues after the longest storage period are summarised in Table 7.

Table 7 Storage stability of difenoconazole residues in ginseng roots and processed ginseng products

Matrix	Fortification level [mg kg-']	Residues [a] remained[%]	Relative standard deviation [%]	Days of storage
Fresh ginseng	0.03 0.05	95.32 98.61	0.98 3.53	135 135
Dried ginseng	0.07	98.88	1.44	135
Red ginseng	0.07	109.43	0.69	135
Dried ginseng extract (ethanol)	0.07	103.56	2.54	135
Dried ginseng extract (water)	0.07	94.94	2.58	135
Red ginseng extract (ethanol)	0.07	98.28	3.10	135
Red ginseng extract (water)	0.07	89.71	4.20	135

[a] Average of 5 replicate analyses

USE PATTERNS

The use patterns for protection of crops in which supervised trials had been submitted for evaluation are summarised in Tables 6–8.

Table 8 Registered uses of difenoconazole in banana and passion fruit

Crop	Country	Formulation [a]	Application					PHI (days)
			Method	Rate (kg ai/ha)	Spray conc. (kg ai/hl)	Spray Interval (days)	Number	
Banana	Australia	EC (25% difenoconazole)	Foliar	0.1		14-21	2-3	1
Banana	Bangladesh	EC (25% difenoconazole)	Foliar	0.0625	0.0125		6	
Banana	Belize	EC (25% difenoconazole)	Foliar	0.075-0.1		18-28	4-8	0
Banana	Bolivia	EC (25% difenoconazole)	Foliar (aerial)	0.1	0.02	18-21		1
Banana	Brazil	EC (25% difenoconazole)	Foliar	0.05	0.005-0.01	30	5	7
Banana	Brazil	EC (25% difenoconazole)	Foliar	0.1	0.01-0.02	14-21	5	7
Banana Group	Cameroon	EC (25% difenoconazole)	Foliar	0.1		28	Up to 8	0
Banana	China	EC (25% difenoconazole)	Foliar	-	0.0083 - 0.0125	10	Up to 3	42
Banana	Colombia	EC (25% difenoconazole)	Foliar	0.075-0.1	0.015-0.05			0

Crop	Country	Formulation [a]	Application					PHI (days)
			Method	Rate (kg ai/ha)	Spray conc. (kg ai/hl)	Spray Interval (days)	Number	
Banana	Costa Rica	EC (25% difenoconazole)	Foliar (aerial)	0.1		16-18	Up to 8	0
Banana	Cote d'Ivoire	EC (25% difenoconazole)	Foliar	0.075-0.1		21	6-8	
Banana	Dominican Republic	EC (25% difenoconazole)	Foliar (aerial)	0.1		16-18		0
Banana	Ecuador	EC (25% difenoconazole)	Foliar	0.075-0.1		21-26	2	0
Banana	France	EC (25% difenoconazole)	Foliar	0.1				
Banana	Guatemala	EC (25% difenoconazole)	Foliar	0.1		16-18	Up to 8	0
Banana	Honduras	EC (25% difenoconazole)	Foliar	0.1		16-18	Up to 8	0
Banana	Honduras	EC (25% propiconazole/ 25% difenoconazole)	Foliar (aerial)	0.075		10-21	Up to 8	0
Banana	Nicaragua	EC (25% difenoconazole)	Foliar (aerial)	0.1		12-18	Up to 8	0
Banana	Panama	EC (25% difenoconazole)	Foliar	0.1			Up to 8	0
Banana	Panama	EC (25% propiconazole/25% difenoconazole)	Foliar (aerial)	0.075		10-21	Up to 8	0
Banana	Philippines	EC (25% difenoconazole)	Foliar (aerial)	0.075-0.1			6-8	
Banana	Taiwan	EC (25% difenoconazole)	Foliar	0.05	0.167	14	1-2	6
Banana	Venezuela	EC (25% difenoconazole)	Foliar	0.075-0.1		18-28	4-8	0
Passion fruit	Brazil	EC (25% difenoconazole)	Foliar spray	0.01-0.04	0.005	15	4	14
Passion fruit	Ecuador	EC (25% difenoconazole)	Foliar spray	0.075		7-15	2	0

[a] percentages are w/v or w/w depending on formulation.

Table 9 Registered uses of difenoconazole in beans with pods

Crop	Country	Formulation [a]	Application					PHI (days)
			Method	Rate (kg ai/ha)	Spray conc. (kg ai/hl)	Spray Interval (days)	Number	
Bean	Chile	EC (25% difenoconazole)	Foliar spray	0.1-0.125	-	10-15	3	14
Bean	Indonesia	EC (25% difenoconazole)	Foliar spray	0.15	0.0125-0.025	7	6-8	7
Bean	Kenya	EC (25% difenoconazole)	Foliar spray	0.125	0.0125-0.125	7-10	4	14
Bean	Malaysia	EC (25% difenoconazole)	Foliar spray	0.075-0.125	-	7-10	4	7
Bean	Morocco	EC (25% difenoconazole)	Foliar spray	0.125	0.0125	10-15	3	14
Bean	Peru	EC (25% difenoconazole)	Foliar spray	0.15	0.019-0.025	7-10	3	14
Bean	Portugal (EU South)	EC (25% difenoconazole)	Foliar spray	0.125	0.0125	12-14	2	7
Bean	South Africa	EC (25% difenoconazole)	Foliar spray	0.0625	0.013-0.021	10-14		14

Crop	Country	Formulation [a]	Application					PHI (days)
			Method	Rate (kg ai/ha)	Spray conc. (kg ai/hl)	Spray Interval (days)	Number	
Bean	Taiwan	EC (25% difenoconazole)	Foliar spray	0.075-0.1	0.00825	10-14	3	3
French bean	Kenya	EC (25% difenoconazole)	Foliar spray	0.125	0.02	14	4	3
French bean	Senegal	EC (25% difenoconazole)	Foliar spray	0.125	0.02	14		3

[a] percentages are w/v or w/w depending on formulation.

Table 10 Registered uses of difenoconazole in tree nuts and ginseng

Crop	Country	Formulation [a]	Application					PHI (days)
			Method	Rate (kg ai/ha)	Spray conc. (kg ai/hl)	Spray Interval (days)	Number	
Pistachio	Turkey	EC (15% difenoconazole, 15% propiconazole)	Foliar spray	0.135	0.0075	15	2-3	21
Coconut	Brazil	EC (25% difenoconazole)	Foliar spray	0.05	0.005	14	4	14
Cashew nut	Vietnam	EC (25% difenoconazole)	Foliar spray	0.045-0.125	0.015-0.025	7-14	2-3	7
Tree nuts	USA	EC (25% difenoconazole)	Foliar spray	0.091-0.128		14-21	2 [b]	14
Ginseng	Republic of Korea	SC (10.7% difenoconazole	Foliar spray		0.0268	10	max 4	7
Ginseng	Republic of Korea	SC (10.0% difenoconazole)	Foliar spray		0.0535	10	Max 5	14

[a] percentages are w/v or w/w depending on formulation.

[b] Max. 2 sequential applications and max 0.51 kg ai/season

RESIDUES RESULTING FROM SUPERVISED TRIALS

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

Crop group	Commodity	Table No.
Tropical subtropical fruits, inedible peel	Banana	11
	Papaya	12
	Passion fruits	13
Legume vegetables	Bean with pod	14
Root and tuber vegetables	Ginseng	15
Tree nuts	Pecans	16
Animal feed	Beans and peas forage	17
	Almond hulls	18

Trial documentation included field and laboratory reports. Laboratory reports included procedural recoveries from spiking at residue levels similar to those occurring in the samples. Dates

of analyses or duration of residue sample storage were also provided. Residue data are recorded unadjusted for recovery. In trials where replicate test portions were analysed the average of the results are included in the following tables. Some of the trials had not been performed in compliance with GLP principles.

Banana

Difenoconazole formulated as a 250 g/L EC was applied to banana trees (four trials) as a foliar application 3 or 4 times at a rate of 0.125 g/L spray concentration and 3 or 4 times at a spray concentration rate of 0.250 g ai/L. Samples were taken 35 or 42 days after last application (Xueyan Z., 2007). Applications, following the typical Chinese practice, were performed by spraying with manual knapsack equipment, directly upwards to the banana plants.

The average concurrent recovery (n = 10, 0.02–0.5 mg/kg) was 90.8 ± 7.4% in whole banana and 96.1 ± 4% in banana pulp.

A summary of the data from the trials is given in Table 11.

Table 11 Difenoconazole residues in banana from supervised trials performed with 250g/L EC formulation in Yunnan province of China in 2005

Location	Application			PHI days	Crop Part	Difenoconazole Residue (mg/kg)
	g ai/hl	No	Interval, day			
GAP in China: apply 8.33-12.5 g/hl spray solution maximum 3 times at 10-day intervals. PHI: 42 days						
Yunnan, 2005	12.5	3	10–14	35	Whole fruit	0.25
					Pulp	0.081
				42	Whole fruit	0.18
					Pulp	0.051
		4	10–14	35	Whole fruit	0.38
					Pulp	0.048
				42	Whole fruit	0.30
					Pulp	0.037
	25	3	10 - 14	35	Whole fruit	0.48
					Pulp	0.095
				42	Whole fruit	0.52
					Pulp	0.095
		4	10–14	35	Whole fruit	0.68
					Pulp	0.099
				42	Whole fruit	0.47
					Pulp	0.093
Yunnan, 2006	12.5	3	10–14	35	Whole fruit	0.25
					Pulp	0.067
				42	Whole fruit	0.12
					Pulp	0.052
		4	10–14	35	Whole fruit	0.27
					Pulp	0.052
				42	Whole fruit	0.25
					Pulp	0.039
	25	3		35	Whole fruit	0.32
					Pulp	0.11
				42	Whole fruit	0.3
					Pulp	0.064
		4		35	Whole fruit	0.52
					Pulp	0.098
				42	Whole fruit	0.36
					Pulp	0.075
Guangdong, 2005	12.5	3		35	Whole fruit	0.51
					Pulp	0.052
				42	Whole fruit	0.33
					Pulp	0.045

Location	Application			PHI days	Crop Part	Difenoconazole Residue (mg/kg)
	g ai/hl	No	Interval, day			
	12.5	4		35	Whole fruit	0.61
					Pulp	0.036
				42	Whole fruit	0.29
					Pulp	0.039
	25	3		35	Whole fruit	0.80
					Pulp	0.036
				42	Whole fruit	0.45
					Pulp	0.029
		4		35	Whole fruit	0.80
					Pulp	0.03
				42	Whole fruit	0.74
					Pulp	0.26
Guangdong, 2006	12.5	3		35	Whole fruit	0.59
					Pulp	0.12
				42	Whole fruit	0.41
					Pulp	0.11
	12.5	4		35	Whole fruit	0.84
					Pulp	0.13
				42	Whole fruit	0.47
					Pulp	0.11
	25	3		35	Whole fruit	0.87
					Pulp	0.094
				42	Whole fruit	0.66
					Pulp	0.091
		4		35	Whole fruit	1.2
					Pulp	0.12
				42	Whole fruit	1.4
					Pulp	0.11

Papaya

As part of a comprehensive supervised trial programme carried out at two sites in Côte d'Ivoire to detect pesticide residues in papaya in order to provide data for import tolerance in the European Union, difenoconazole was applied 6 times during the growing season at a rate of 60 g ai/ha at about 14 days intervals (PIP, 2004). Papaya is harvested continuously for several months. Pesticides were applied after harvest. Samples consisting of 12-14 fruits and amounting to about 4 kg were packed in cool boxes and sent to the Central Science Laboratory, Sand Hutton, York, UK, for residue analysis.

The summary of the trials is given in Table 12.

Table 12 Difenoconazole residues in papaya fruits treated with 25% EC formulation

Location	Application			PHI days	Residues [a] mg/kg
	kg ai/ha	No. of treatment	Interval day		
Tiassalé SCB	0.06	6	14	3	0.05
				3	0.06
				3	< 0.05
Azaguié	0.06	6	14	3	0.12
				3	0.07
				3	0.13
Tiassalé SCB	0.06	6	14	7	< 0.05
				7	< 0.05
				7	< 0.05
Azaguié	0.06	6	14	7	0.06
				7	< 0.05
				7	0.10

[a] Ready to harvest fruits were picked after the last three applications from the same filed.

Passion fruit

Difenoconazole was applied as EC formulation alone or in combination with azoxystrobin in Brazil at the recommended and higher rate. Average recoveries, were in the range of 85% and 102.8% at 0.01 and 1.0 mg/kg spike levels. In the latter trials the growth stages at applications were between BBCH 75 and 89. The results are shown in Table 13.

Table 13 Difenoconazole residues in passion fruit from supervised residue trials in Brazil

Location crop variety	Application					Residue (mg/kg)	Reference
	Formulation	Rate (g ai/ha)	Conc (g ai/hl)	Interval (days)	PHI (days)		
GAP in Brazil: 10-40 g ai/ha, spray concentration: 5 g ai/hl, up to 4 times at 15 days, PHI: 14 days							
Morretes – PR not stated	EC 125 g/L	30	-	NA	0 1 3 5 7	< 0.01 0.01 < 0.01 < 0.01 ND	M08078 Trial M08078-DMO F: A13703G-10304
Uberlandia – MG not stated	EC 125 g/L	30	-	NA	0 1 3 5 7	0.01 0.01 < 0.01 < 0.01 < 0.01	M08078 Trial: M08078-JJB F: A13703G-10304
Piedade - SP not stated	EC 125 g/L	30	-	NA	0 1 3 5 7	0.08 0.07 0.04 0.04 0.04	M08078 Trial: M08078-LZF1 F: A13703G-10304
Santa Amelia – PR not stated	EC 125 g/L	30	-	NA	0 1 3 5 7	0.02 0.03 < 0.01 < 0.01 < 0.01	M08078 Trial: M08078-JJB F: A13703G-10304
São Paulo Amarelo	EC 250 g/L	100	10	-	14	< 0.01	FHF 017B Trial: FHF 017B X 14 F:A7402T-10007
São Paulo Amarelo	EC 250 g/L	200	20	-	7	< 0.01	FHF017B Trial: FHF017B2X7 F:A7402T-10007
São Paulo Amarelo	EC 250 g/L	200	20	-	14	< 0.01	FHF017B Trial: FHF017B2X14 F:A7402T-10007
São Paulo Amarelo	EC 250 g/L	100 (x4)	10 (x4)	7–9 days	0 3 7 10 14	< 0.05 < 0.05 < 0.05 < 0.05 < 0.05	FHF 017/98 Trial: FHF 017B 2X14 F:A7402T-10008
São Paulo Amarelo	EC 250 g/L	200 (x4)	20 (x4)	7–8 days	14	< 0.05	FHF 017/98 F:A7402T-10008
São Paulo Azedo	EC 250 g/L	100 (x4)	10 (x4)	7 days	0 3 7 10 14	< 0.02 < 0.02 < 0.02 < 0.02 < 0.02	M00164 Trial:M00164 F:A7402T-10009
São Paulo Azedo	EC 250 g/L	200 (x4)	20 (x4)	7 days	0 3 7 10 14	0.38 < 0.02 < 0.02 < 0.02 < 0.02	M00164 Trial: M00164 F:A7402T-10009

Beans with pod

Difenoconazole formulated as a 25% EC was applied to beans (eight trials) and peas with pods (one trial) as a foliar application in Italy and South France. Samples were taken from 0 to 28 days after last application.

A summary of the residue data from the trials is given in Table 14.

Table 14 Difenoconazole residues in beans and peas following foliar treatments

Country/ Crop/ Variety	Application				Sampling			Report/study reference
	Conc g ai/ha	Volume (L/ha)	Interval (days)	Growth Stage	PHI (days)	Crop Part (Harvest)	Residue (mg/kg)	
GAP in Portugal: 0.125 kg ai/ha (0.0125 kg ai/hl 2 applications at 14–21 days, PHI 7 days								
Italy Bean Goldrush	0.125 0.125 0.125	600 600 600	13 10	Za [a] 19-20 Za 33-35 Za 71-73	0 7 14 21 28	Pods	0.27 0.07 < 0.02 < 0.02 < 0.02	2057-90 Study: RR 2057/90
Italy Bean (Borlotto)	0.140 0.140 0.140	1400 1400 1400	16 15	Pre harvest harvest harvest	0 7 13 21 28	Pods [b]	1.0 0.50 0.05 0.13 0.04	RR-2179-88 Study: 2179/88
Italy Bean (Bob)	0.125 0.125 0.125	700 800 900	11 11		0 7 13 21 28	Pods	1.02 0.31 0.08 0.04 0.02	2058-90
France Bean (Inter)	0.127 0.124	1019 991	12	BBCH 69 BBCH 73	0* 0* 0 0 3 3 7 7 10 10 14 14	Bean + Pod Remaining plant [c] Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant	0.01 0.44 0.28 6.00 0,04 0.53 0.01 0.28 < 0.01 0.23 < 0.01 0.15	05-0510 Trial: AF/8562/SY/1
France Bean (Booster)	127 126	1013 1004	12	BBCH 65 BBCH 77	0* 0* 0 0 3 3 7 7 10 10 14 14	Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant Bean + Pod Remaining plant	0.01 0.19 0.25 3.06 0.16 1.02 0.09 0.76 0.04 0.42 0.04 0.31	05-0510 Trial: AF/8562/SY/2
France Beans with pods (Booster)	130 129	300 300	-- 12	BBCH 59 BBCH 73	7 7	Beans with pods Remaining plant	0.05 0.85	T013977-05 Trial: FR-FR-06-0250
France Beans with pods (Booster)	129 129	300 300	-- 12	BBCH 64 BBCH 76	7 7	Beans with pods Remaining plant	0.04 0.31	T013977-05 Trial: FR-FR-06-0251
France Beans with	128 127	316 316	-- 12	BBCH 62-63	7	Beans with pods Remaining plant	0.03 0.75	T013977-05 Trial: Trial:

Country/ Crop/ Variety	Application				Sampling			Report/study reference
	Conc g ai/ha	Volume (L/ha)	Interval (days)	Growth Stage	PHI (days)	Crop Part (Harvest)	Residue (mg/kg)	
pods (Angers)				BBCH 75	7			FR-FR-06-0252
France [d] Pea (Messire)	100 100	400 400	22	BBCH 51–55 BBCH 65–73	0 7 14 21 28	Pod + Seed Pod + Seed Pod + Seed Pod + Seed Seed	< 0.02,0.24 Mean=0.13 0.17 0.03 0.03 < 0.02	OF95121/LD28 Trial: LD28

[a] Za = Zadoks

[b] The average of two recovery tests was 132%

[c] Remaining plant part

[d] The crops were treated with 62.5 ai/kg WG formulation

Ginseng

Ready to harvest ginseng plantations of 4–6 years old were treated with difenoconazole EC formulation 4 times at 10-day intervals in three typical ginseng growing area of Republic of Korea. Three root samples were collected 14 days after last application from each field. The roots were washed with water to remove soil particles, packed in plastic bags and stored deep-frozen until analyses which were performed latest 135 days after sampling. Part of the crop was processed.

The residues measured in fresh ginseng roots are summarised in Table 15.

Table 15 Difenoconazole residues in fresh ginseng roots treated 4 times with an EC formulation

Location crop variety	Application			Sample material	PHI (days)	Residue [a] (mg/kg)	Study No
	Rate (g ai/hl)	No	Interval (days)				
GAP in Korea: 0.0268 kg ai/hL, maximum 4 times at 10 days intervals, PHI 7 days 0.0535 kg ai/hL, maximum 4 times at 10 days intervals, PHI 14 days							
Gongju, Chungcheongnam-do	0.0535	4	10	Fresh ginseng	14	0.362	09072-945
						0.348	
						0.339	
Wonju, Gangwon	0.0535	4	10	Fresh ginseng	14	< 0.02[b]	08072-051
Icheon, Gyunggi	0.0535	4	10	Fresh ginseng	14	< 0.02[b]	08072-051
Wonju, Gangwon	0.0535			Dried ginseng		0.067	08072-051
						0.067	
						0.063	
Icheon, Gyunggi	0.0535	4	10	Dried ginseng		0.11	08072-051
						0.113	
						0.113	
Wonju, Gangwon	0.0535	4	10	Red ginseng	14	< 0.02[b]	08072-051
Icheon, Gyunggi	0.0535	4	10	Red ginseng	14	0.097	08072-051
						0.10	
						0.097	
Wonju, Gangwon				Ethanol extract of dried ginseng		0.07	08072-051
						0.07	
						0.073	
Icheon, Gyunggi				Ethanol extract of dried ginseng		0.277	08072-051
						0.367	
						0.363	
				Water extract of dried ginseng		< 0.04[c]	

Location crop variety	Application			Sample material	PHI (days)	Residue [a] (mg/kg)	Study No
	Rate (g ai/hl)	No	Interval (days)				
Wonju, Gangwon				Ethanol extract of red ginseng		0.1	
						0.103	
						0.097	
Icheon, Gyunggi				Ethanol extract of red ginseng		0.213	
						0.223	
						0.20	
				Water extract of dried red ginseng		< 0.04[c]	
Chungju, Chuncheongbuk-do	0.0535	4	10	Fresh ginseng	14	0.006	09072-944
						0.006	
						0.0063	
				Dried ginseng		0.012	09072-944
						0.012	
						0.013	
Chungju, Chuncheongbuk-do	0.0535	4	10	Red ginseng		0.011	09072-944
						0.011	
						0.011	
				Ethanol extract of dried ginseng		0.017	09072-944
						0.017	
						0.016	
				Water extract of dried ginseng		0.016	09072-944
						0.015	
						0.014	
				Ethanol extract of red ginseng		0.012	09072-944
						0.011	
						0.012	
				Water extract of red ginseng		0.012[b]	
Goesan, Chuncheongbukdo	0.0535	4	10	Fresh ginseng	14	0.04	
						0.04	
						0.04	
				Dried ginseng		0.072	
						0.067	
						0.068	
				Red ginseng	14	0.037	
						0.035	
						0.038	
				Ethanol extract of dried ginseng		< 0.007[b]	
				Water extract of dried ginseng		< 0.007[b]	
				Ethanol extract of red ginseng		< 0.007[b]	
				Water extract of red ginseng		< 0.007[b]	

[a] Average of three replicate analyses;

[b] All three plots;

[c] All 6 plots

Almonds

Difenoconazole formulated as a 25% EC was applied to almonds in five trials in California, USA, as a foliar application four times at a rate of 0.127 kg ai/ha, with a PHI of 14 days. Treatments were made in varying post foliar spray volumes ranging from low volume (concentrated, 84 L/ha) to high volume (dilute, 3742 L/ha) application. At one trial site two spray volumes were applied for a comparison giving two results for this trial. For all trials the mature almonds were picked 14 days after last application and air dried for 1 week. The nuts were then split to hulls and nutmeat.

The resides of parent compound and its main metabolites (1,2,4-triazole, triazole alanine and triazole acetic acid) were determined and detected separately. The average concurrent recoveries of difenoconazole in nutmeat and almond hulls were 79% and 84%, respectively.

The difenoconazole residues were below LOQ (0.01 mg/kg) in all nutmeat samples. The trial conditions are reported in Table 18.

Pecans

Difenoconazole formulated as a 25% EC was applied to pecans in different states of USA as a foliar application four times at a rate of 0.129 kg ai/ha, with a PHI of 14 days. Treatments were made with varying spray volumes ranging from low volume (concentrated, 94 L/ha) to high volume (dilute, 1439 L/ha) application. At one trial a comparison of spray volumes was made giving two results for this trial. For all trials the mature pecans were picked 14 days after last treatment, then split to obtain the nutmeat. The average recovery in nutmeat was 94% at spike levels of 0.01-0.5 mg/kg

A summary of the residue data from the trials is given in Table 16.

Table 16 Difenoconazole residues in pecan nutmeat 14 days after the treatments with 25%EC formulation in USA

GLP and Trial Details	Foliar Application				Sampling	Difenoconazole Residue [a] (mg/kg)	Study reference
	Conc (kg ai/ha)	Volume (L/ha)	Spray Interval (days)	Growth Stage	PHI (days)		
US GAP: max 0.091-0.128 kg/ha (0.085 kg ai/hl) with max 2 sequential applications at 14-21 days, max. seasonal rate is 0.51 kg ai/ha, PHI 14 days							
Pecans/ Sumner Georgia	0.129[b] 0.129[c] 0.129[d] 0.129[e]	1139 1242 1220 1206	14		14	< 0.01 <u>< 0.01</u>	T004710-06 E14GA078001/GA
Pecans/ Sumner North Carolina	0.129 0.129 0.129 0.129	95 94 94 94	14	75 83 85 89	14	< 0.01 <u>< 0.01</u>	T004710-06 E13NC078002/NC
Pecans/ Sumner Louisiana	0.129 0.129 0.129 0.129	723 720 711 755	14	79 81 88 93	14	< 0.01 <u>< 0.01</u>	T004710-06 E17LA078003/LA
Pecans/ Shawnee Texas	0.129 0.129 0.129 0.129	413 434 379 442	14	71 85 89 89	0 7 14 <u>14</u> 21	0.02 < 0.01 < 0.01 <u>< 0.01</u> < 0.01	T004710-06 W07TX078004/TX
	0.129 0.129 0.129 0.129	1272 1439 1224 1372	14	71 85 89 89	0 7 14 <u>14</u> 21	< 0.01 < 0.01 < 0.01 <u>< 0.01</u> < 0.01	
Pecans/ Berkett New Mexico	0.129	1037 1041 1042 1062	14	79 80 81 89	14	0.02 <u>0.02</u>	T004710-06 W01NM078005/NM

[a]: Untreated control samples did not contain detectable residues.

[b] Dough stage;
[c] Late dough stage early split;
[d] 40% shuck split;
[e] 70% shuck split

Animal feed commodities

Beans and peas forage

Table 17 Difenoconazole residues in beans and peas forage treated with 25EC formulation

Country/ Crop/ Variety	Application				Sampling			Report/study reference
	Conc kg ai/ha	Volume (L/ha)	Interval (days)	Growth Stage	PHI (days)	Crop Part (Harvest)	Residue (mg/kg)	
GAP in Portugal: 0.125 kg ai/ha (0.0125 kg ai/hl 2 applications at 14-21 days, PHI 7 days								
France Bean (Inter)	0.127 0.126	1019 1004	12	BBCH 69	0* 0 3 7 10 14	Remaining plant [a] Remaining plant Remaining plant Remaining plant Remaining plant Remaining plant	0.44 6.00 0.53 <u>0.28</u> 0.23 0.15	05-0510 Trial: AF/8562/SY/1
France Bean (Booster)	0.127 0.126	1013 1004	12	BBCH 65 BBCH 77	0* 0 3 7 10 14	Remaining plant Remaining plant Remaining plant Remaining plant Remaining plant Remaining plant	0.19 3.06 1.02 <u>0.76</u> 0.42 0.31	05-0510 Trial: AF/8562/SY/2
France Bean (Booster)	0.130 0.129	300 300	-- 12	BBCH 59 BBCH 73	7	Remaining plant	<u>0.85</u>	T013977-05 Trial: FR-FR-06-0250
France Beans (Booster)	0.129 0.129	300 300	-- 12	BBCH 64 BBCH 76	7	Remaining plant	<u>0.31</u>	T013977-05 Trial: FR-FR-06-0251
France Beans (Angers)	0.128 0.127	316 316	-- 12	BBCH 62-63 BBCH 75	7	Remaining plant	<u>0.75</u>	T013977-05 Trial: FR-FR-06-0252

[a] Remaining plant part without beans in pod

Almond hulls

Table 18 Difenoconazole residues in almond hulls following treatments with 25%EC formulation in USA in 2006

Location/ variety	Foliar Application			PHI (days)	Crop Part (Harvest) [3]	Residue [a] (mg/kg)	Report/trial number
	Conc (kg ai/ha)	Volume (L/ha)	Spray Interval (days)				
US GAP: application rate 0.091-0.128 kg ai/ha with max 2 sequential applications at 14-21 days, max. seasonal rate is 0.51 kg ai/ha, PHI 14 days							
Hanford, CA Fritz (Soft Shell)	0.127 0.127 0.127 0.127	84-103	14	 14 14	 Hulls Hulls	Treated: 1.41 <u>1.44</u>	T014337-05 Trial: 09620.06-CA47/CA
Parlier, CA Mission (Hard Shell)	0.127 0.127 0.127 0.127	468-935	14	 14 14	 Hulls Hulls	Treated: 2.94 <u>3.22</u>	T014337-05 Trial:09620.06-CA48/CA

Location/ variety	Foliar Application			PHI (days)	Crop Part (Harvest) [3]	Residue [a] (mg/kg)	Report/trial number
	Conc (kg ai/ha)	Volume (L/ha)	Spray Interval (days)				
Hanford, CA Nonpariel (Soft Shell)	0.127 0.127 0.127 0.127	468- 935	14	 14 14	 Hulls Hulls	Treated: 0.49 <u>0.83</u>	T014337-05 Trial:09620.06- CA49/CA
	0.127 0.127 0.127 0.127	945- 3742	14	14 14	Hulls Hulls	<u>0.53</u> 0.24	
Arbuckle, CA Butte (Hard Shell)	0.127 0.127 0.127 0.127	945- 3742	14	 14 14	 Hulls Hulls	Treated: <u>1.93</u> 1.74	T014337-05 Trial:09620.06- CA50/CA
Arbuckle, CA Nonpariel (Soft Shell)	0.127 0.127 0.127 0.127	945- 3742	14	 14 14	 Hulls Hulls	Treated: <u>1.04</u> 0.65	T014337-05 Trial:09620.06- CA51/CA

[a] Untreated control samples did not contain detectable residues. The residues of difenoconazole alone are given.

FATE OF RESIDUES IN STORAGE AND PROCESSING

Fresh ginseng

Fresh ginseng was harvested 14 days after the application of pesticide at each test site and washed with tap water to remove soil particles.

Fresh ginseng roots were blended. These samples were individually packed in a 20 g pack and stored at -20 °C or -70 °C until processing.

Dried ginseng

The washed fresh ginseng was dried in hot air drying machine set to 60 °C to reduce the water content below 14%. Dried ginseng was blended. Analytical samples were individually packed in polyethylene bags and stored at -20 °C until analysis.

Fresh red ginseng

The washed fresh red ginseng was steamed for 3 hours at 98 °C. The steamed samples were dried in hot air drying machine set to 65 °C to reduce the water content to 50~55%. The smaller roots were removed from the dried samples and further drying processes were carried out under the sunlight to reduce the water content below 14%. The dried samples were blended. Analytical samples were individually packed in 10 g polyethylene bags and stored at -20 °C or -70 °C until analysis.

Dried ginseng ethanol extract

Dried or red ginsengs were cut to about 1 cm in size and extracted three times in refluxing extractor with 70% EtOH at 70 °C about 18 hours. The solvents were then evaporated in vacuum rotary evaporator to reach the 65° Brix. Analytical samples were packed in plastic bottle and stored at -20 °C until analysis.

Dried red ginseng water extract

Dried or red ginsengs were cut to about 1 cm in size and extracted three times in refluxing extractor with water at 85 °C about 18 hours. The solvents were then evaporated in vacuum rotary evaporator to reach the 65° Brix. Analytical samples were packed in plastic bottom and stored at -20 °C until analysis.

Water content of fresh ginseng and its products were determined according to the method in the Korean Food Code (KFDA, Republic of Korea). 10 g or 5 g of analytical samples were dried in drying oven set at 105 ± 1 °C for 5 hours and cooled in desiccators for 30 minutes and weighed.

The residues measured in fresh ginseng and in the processed products made from them are summarised in Table 15. The processing factors, calculated as residues in processed product/residues in fresh ginseng, are summarised in Table 19. The water contents of fresh and processed ginseng products are given in Table 20.

Water contents of fresh ginseng and its products were 5.56 ± 0.25% ~ 66.97 ± 1.04%.

Table 19 Processing factors estimated for ginseng products

Matrix	Site	Processing factor	Best estimate
Dried ginseng	Field 1	3.28	3.28
	Field 2	5.67	
	Field 3	2.04	
	Field 4	1.15[a]	
	Overall		
Dried ginseng extract(EtOH)	Field 1	3.56	
	Field 2	18.44	
	Field 3	2.70	
Dried ginseng extract(water)	Field 1	2[b]	2
	Field 2	2[b]	
	Field 3	2[b]	
Red ginseng extract (EtOH)	Field 1	5.0	
	Field 2	10.6	
	Field 3	1.1	
Red ginseng extract (water)	Field 1	2	
	Field 2	2	
	Field 3	1.09	1.1

[a] The application rate was 170 g/ha compared to the recommended maximum rate of 280 g/ha

[b] LOQ values (0.02, 0.04) used when residues were lower than LOQ

Table 20 Water content of fresh and processed ginseng

Matrix	Location	Water content (%)	Field 3	Field 4
Fresh ginseng	Field 1	66.97±1.04	72.8±3.05	72.19 ±0.03
	Field 2	65.59±0.65		
Dried ginseng	Field 1	5.56±0.25	8.24±1.38	7.79 ± 2.12
	Field 2	8.44±0.31		
Red ginseng	Field 1	12.57±0.42	9.04±1.02	8.88 ± 0.11
	Field 2	10.60±0.30		
Dried ginseng extract (EtOH)	Field 1	21.73±0.10	38.1±2.53	48.94 ± 2.64
	Field 2	21.87±0.09		
Dried ginseng extract (water)	Field 1	16.69±0.16	47.5±3.94	48.41±0.31
	Field 2	18.89±0.39		
Red ginseng extract (EtOH)	Field 1	24.35±0.11	37.8±3.05	59.26 ± 0.77
	Field 2	24.19±0.10		
Red ginseng extract (water)	Field 1	16.58±0.37	53.1±4.83	39.5 ± 1.6
	Field 2	11.77±0.23		

RESIDUES IN ANIMAL COMMODITIES

The 2007 JMPR evaluated two animal transfer studies carried out with Holstein dairy cows administering difenoconazole at 1 ppm (1×), 3 ppm (3×) 5 ppm (5×) 10 ppm (10×) and 15 ppm (15×) in the dry-weight diet for 29-30 consecutive days. The Meeting concluded that the transfer factors were generally in good agreement in the two feeding studies, and decided to use the study with the 1 and 3 ppm feeding levels as most closely bracketing the dietary burdens.

APPRAISAL

Difenoconazole was evaluated by the JMPR for the first time in 2007 when an ADI of 0–0.01 mg/kg bw and an ARfD of 0.3 mg/kg bw were established, and maximum, supervised trial median and high residue levels were recommended for a range of commodities. Additional studies on residues in banana, passion fruits, beans with pods, papaya, ginseng and almonds were evaluated by the present Meeting.

Methods of analysis

The analytical methods used for the determination of difenoconazole residues in samples derived from supervised trials, submitted for evaluation to the present Meeting, had already been considered by the 2007 JMPR. These methods are based on GC separation and pulse flame photometric detection (PFPD), ECD or MS detection. The validity of the results was supported by validation data on representative crops and results of concurrent recovery studies.

Fresh ginseng root and ginseng processed products were extracted with acetonitrile, partitioned either with dichloromethane or n-hexane, cleaned up on Florisil or silica gel column, and determined applying capillary column GC and ECD. The methods were validated before the analysis of the samples. Additional recovery studies were performed at the same time when the treated or processed samples were analysed. The average recoveries based on minimum 5 replicates ranged between 89 and 105% with repeatability of ≤ 7.4%. The limits of quantification were between 0.002–0.007 mg/kg for fresh ginseng root, and 0.007–0.04 for various ginseng products.

The freezer storage stability studies carried out with fresh ginseng and ginseng processed products showed that the residue was stable for the longest period (135 days) for which the samples were stored at or below -20 ºC. The studies reported by the 2007 JMPR cover the other sample materials evaluated by the present Meeting.

Results of supervised trials on crops

The original labels with translation were provided only for the countries where the trials had been carried out.

The reports on supervised trials were made available for the Meeting. Some of the trials had not been conducted according to GLP. However, the documentation of the trials was sufficient for evaluation of the results.

Banana

A national use pattern in China permits a foliar application of difenoconazole EC 25 (250 g/L) on bananas at a dilution rate of 2000 to 3000 which equates to spray solution concentrations of 8.33 to 12.5 g ai/hL with a PHI of 42 days. Multiple applications are permitted with a maximum of three treatments at 10-day intervals.

Difenoconazole formulated as a 250 g/L EC was applied to banana plants (four trials) as a foliar application 3 or 4 times at the maximum GAP rate of 12.5 g ai/hL (2000× dilution) and 3 or 4 times at a spray rate of 25 g ai/hL (double rate) in China. Samples were taken at 35 and 42 days. According to the typical practice in China, the applications were performed by spraying, from the ground using manual knapsack or mechanised equipment, directly upwards to the banana plants.

The difenoconazole residues in whole fruit samples treated according to the maximum GAP rate, in ranked order, were: 0.12, 0.18, 0.33 and 0.41 mg/kg.

Residues from 4 treatments at 12.5 g ai/hL rate were: 0.25, 0.29, 0.3, and 0.47 mg/kg. The residues from 3 or 4 treatments were not significantly different indicating that the first treatment made at least 82 days before sampling did not influence the final residue level. The trials performed with 3

and 4 applications were conducted side-by–side, therefore they are not independent and the results cannot be combined.

The residues in banana pulp derived from the same trials were substantially lower. For the 3 application trials the residues were: 0.045, 0.051, 0.052, and 0.11 mg/kg.

No correlation between the residue in pulp and whole banana could be established based on the results.

The 2007 JMPR evaluated residue data derived from ground and aerial treatments carried out with much lower dosage rate (GAP 8 × 0.1 kg/ha, PHI 0 day) than the Chinese trials, and resulted in lower residue values: < 0.02 (6), 0.02, 0.03, 0.04, 0.06, 0.07 and 0.13 mg/kg.

The two residue populations are significantly different and could not be combined.

The Meeting concluded that four residue trials, reflecting the Chinese GAP and growing conditions, was not sufficient for the estimation of residue levels.

Papaya

To protect fruits from pests and diseases a 3-day PHI is required during harvesting period for continuously fruiting crops like papaya in the Equatorial countries of Africa.

As part of the field trials conducted within the Pesticide Initiative Programme, aiming to provide data for the establishment of import tolerance in the European Union, difenoconazole was applied 6 times during the growing season at 60 g ai/ha at about 14-day intervals at two sites in Côte d'Ivoire. The application conditions (dosage, interval between applications and PHI) were based on the requirement to achieve adequate control of papaya diseases, but were not supported by a label or official declaration of approved use. Samples were collected at 3 and 7 days after the last three applications. The residues measured in samples taken at day 3 were: < 0.05, 0.05, 0.06, 0.07, 0.12 and 0.13 mg/kg.

Residues in samples taken 7 days after the last treatment were: < 0.05, < 0.05, < 0.05; 0.06, < 0.05 and 0.10 mg/kg.

Taking into account the rapid decrease of residues it is most likely that only the last application affects the residue levels in fruits. The residues taken from the same site after repeated treatments can be considered independent.

Based on the 3-day PHI and 0.06 kg ai/ha application rate which provided efficient control of diseases to protect the crop, the Meeting estimated a maximum residue level, STMR and HR values of 0.3, 0.065 and 0.13 mg/kg, respectively.

Passion fruit

A national use pattern in Brazil permits up to four foliar applications of difenoconazole EC 25 (250 g/L) on passion fruit at a rate of 5 g ai/hL or between 0.01 and 0.04 kg ai/ha with a PHI of 14 days.

In four Brazilian trials the applications were performed within GAP (1 treatment with −25% dosage rate) and the samples taken at 7 days after the treatment contained residues below the LOQ of 0.01 mg/kg with one exception (0.04 mg/kg).

Where the trials were conducted at 2.5–5 times maximum GAP rate the residues in all samples taken at 7 or 14 days were below the limit of quantification (0.01–0.05 mg/kg).

The difenoconazole residues in whole fruit collected at 7 or 14 days PHI were, in ranked order: < 0.01 (6), < 0.02 (2), 0.04, < 0.05 (2) mg/kg.

Taking into account that up to 5 times GAP dose rate did not lead to residues at or above 0.05 mg/kg at shorter intervals than the recommended PHI, the Meeting estimated a maximum residue level, an STMR value and HR value of 0.05, 0.01 and 0.04 mg/kg, respectively.

Legume vegetables

National use pattern in Portugal permits 2 foliar applications of difenoconazole EC 25 (250 g/L) at 12 to 14 days intervals on beans at a rate of 0.125 kg ai/ha with a PHI of 7 days. Eight trials in beans and one in peas were conducted in Italy and South France.

The results were evaluated against the Portugal GAP. The difenoconazole residues in beans or peas with pods were, in ranked order: 0.01, 0.03, 0.04, 0.05, 0.07, 0.09, 0.17, 0.31 and 0.50 mg/kg.

The Meeting estimated a maximum residue level, STMR value and an HR value for difenoconazole in beans and peas of 0.7, 0.07 and 0.5 mg/kg, respectively.

Ginseng

The GAP in Korea permits 4 or 5 foliar applications at 10 day intervals with 0.027 kg ai/hL or 0.053 kg ai/hL spray concentration and 7 or 14 days PHI, respectively.

Ready to harvest ginseng plantations of 4–6 years old were treated with difenoconazole EC formulation (0.053 kg ai/hL) 4 times at 10-day intervals in three typical ginseng growing areas in the Republic of Korea.

Three root samples were collected 14 days after the last application from each field. The residues in fresh ginseng root were: 0.0063, 0.011, < 0.02 (3), 0.038, 0.04, 0.10, and 0.36 mg/kg.

The Meeting estimated a maximum residue level, HR and STMR of 0.5 mg/kg, 0.36 mg/kg and 0.02 mg/kg, respectively.

Tree nuts

The US GAP permits up to two foliar applications of difenoconazole EC 250 (232 g/L) on almonds at a rate of 91 to 128 g ai/ha with a PHI of 14 days.

Six trials were conducted with four foliar applications at a rate of 127 g ai/ha. Samples of mature almond were collected at 14 days after the last application. Residues in all almond nutmeat samples were below the limit of quantification (0.01 mg/kg).

The US GAP permits up to two foliar applications of difenoconazole EC 250 (232 g/L) on pecans s at a rate of 91 to 128 g ai/ha with a PHI of 14 days.

Trials were conducted with four applications at a rate of 0.129 kg ai/ha. Residues in 6 pecan nutmeat samples were < 0.01 (5) and 0.02 mg/kg.

Based on the mutually supporting residue data, the Meeting estimated a maximum residue level, STMR value and an HR value for difenoconazole in tree nuts of 0.03, 0.01 and 0.02 mg/kg, respectively.

Animal feed commodities

Beans and peas forage

Residues in bean forage following the treatments according to GAP (2 × 0.125 kg/ha, PHI 7 days) were: 0.28, 0.31, 0.75, 0.76, and 0.85 mg/kg.

The Meeting estimated an STMR value and high residue for difenoconazole in bean forage 0.75 and 0.85 mg/kg, respectively.

Almond hulls

The residues in almond hulls derived from trials complying with the total seasonal rate as specified by US GAP (0.51 kg/ha) in ranked order, were: 0.53, 0.83, 1.04, 1.44, 1.93 and 3.22 mg/kg.

The Meeting estimated a maximum reside level, an STMR value and high residue for difenoconazole in almond hulls of 6, 1.24 and 3.22 mg/kg, respectively. Estimated derived from use of the NAFTA and OECD calculators was 6 mg/kg.

Fate of residues during processing

Fresh ginseng roots were dried or extracted with ethanol to produce powdery material. The processing was carried out independently from samples obtained from three plots treated at each of the three different sites. The average processing factors were calculated from the results obtained from the three replicate plots. The best estimate for the processing factor for dried ginseng is 3.28. The ethanol extract of dried ginseng resulted in a wide range of processing factors (2.7–18.44) which made the obtaining of a single best estimate impossible. The apparent numerical processing factor for the water extract is 2. However, this estimate is very uncertain as it is based on the LOQ values of processed and fresh ginseng. In one study where the LOQ value was sufficiently low the results indicated a processing factor of 1.1

Consequently the Meeting could only estimate a processing factor of 3.3 for dried ginseng.

Residues in animal commodities

The 2007 JMPR evaluated two animal transfer studies carried out with Holstein dairy cows administering difenoconazole at 1 ppm (1×), 3 ppm (3×), 5 ppm (5×), 10 ppm (10×) and 15 ppm (15×) in the dry-weight diet for 29–30 consecutive days. The Meeting concluded that the two feeding studies were generally in good agreement of transfer factors, and decided to use the study with the 1 and 3 ppm feeding levels as most closely bracketing the dietary burdens.

Livestock dietary burden

The residues in almond hull and bean forage evaluated by the present Meeting contributed substantially to the beef and dairy cattle dietary burden calculation based on the maximum portion of agricultural commodities in animal feed (FAO, 2009). Dietary burden calculations for beef cattle, and dairy cattle are provided in Annex 6. The Japanese animal diet contained only soya bean seed of those commodities for which the JMPR estimated highest and median residues. The residues in soya been seed resulted in an animal dietary burden of 0.00 ppm on dry matter bases, therefore those values are not included in the summary below.

	Livestock dietary burden, difenoconazole, ppm of dry matter diet					
	US/CAN		EU		Australia	
	max	mean	max	mean	max	mean
Beef cattle	0.62	0.48	1.85	0.81	2.0	1.77 [b]
Dairy cattle	0.80	0.31	2.42 [a]	1.15	2.14	1.82 [c]

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

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

[c] Highest mean dairy cattle dietary burden suitable for STMR estimates for milk.

Animal commodities, MRL estimation

For MRL estimation, the residues in the animal commodities are the sum of difenoconazole and CGA 205375 (1-[2-chloro-4-(4-chloro-phenoxy)-phenyl]-2-(1,2,4-triazol)-1-yl-ethanol)) expressed as difenoconazole.

Cattle

For maximum residue level estimation, the high residues in the tissues were calculated by interpolating the maximum dietary burden of 2.42 ppm (in 2007 it was 2.10 ppm) between the

relevant feeding levels (1 and 3 ppm) from the dairy cow feeding study and using the highest tissue concentrations from individual animals within those feeding groups.

The STMR values for the tissues were calculated by taking the STMR dietary burden (1.82 ppm) between the relevant feeding levels (1 and 3 ppm) from the dairy cow feeding study and using mean residue of the 3 animals.

In the following table, dietary burdens are shown in round brackets (), feeding levels and residue concentrations from the feeding study are shown in square brackets [] and estimated concentrations related to the dietary burdens are shown without brackets.

Dietary burden (ppm)					
Feeding level [ppm]	Milk	Muscle	Liver	Kidney	Fat
MRL					
	Mean	highest	highest	highest	highest
MRL dairy cattle (2.42) [1, 3]	< 0.005 [< 0.005, < 0.005]	0.021 [< 0.01, 0.026]	0.121 [0.051, 0.15]	0.0178 [< 0.01, 0.021]	0.031 [0.015, 0.038]
STMR					
	Mean	mean	mean	mean	mean
STMR dairy cattle (1.82) [0, 1, 3]	< 0.005 [0, < 0.005, < 0.005)]	< 0.01 [0, < 0.01]	0.041 [0, 0.045]	< 0.01 [0, < 0.01]	0.012 [0, 0.013]

The data from the cattle feeding studies were used to support mammalian meat and milk maximum residue levels.

Residues in the milk were below LOQ (0.005 mg/kg) for all samples from the 1 ppm and 3 ppm feeding groups, so the dietary burdens (2.42 and 1.82 ppm) were taken as a proportion of the 3 ppm to calculate the residues resulting from the dietary burdens.

For muscle, the residue arising from a dietary burden of 2.42 ppm was 0.021 mg/kg, while the residue resulting from a dietary burden of 1.82 ppm was < 0.01 mg/kg. For fat, the residue arising from a dietary burden of 2.42 ppm was 0.031 mg/kg, while the residue resulting from a dietary burden of 1.82 ppm was 0.012 mg/kg.

The Meeting confirmed its previous recommendation for a maximum residue level for difenoconazole in mammalian meat (fat) of 0.05 mg/kg. The Meeting estimated STMR and HR values for meat (fat) of 0.012 and 0.031 mg/kg respectively. The Meeting estimated STMR and HR values for meat (muscle) of 0.01 and 0.021 mg/kg respectively.

The residues in milk were below the limit of quantification at 1 and 3 ppm feeding level. The Meeting estimated a maximum residue level of 0.005* mg/kg and STMR value of 0.005 mg/kg for milk.

For liver, the residue arising from a dietary burden of 2.42 ppm was 0.121 mg/kg, while the residue resulting from a dietary burden of 1.82 ppm was 0.041 mg/kg. The Meeting confirmed its recommendation for a maximum residue level of 0.2 mg/kg, and estimated an STMR value and an HR value for difenoconazole in liver of 0.041 and 0.12 mg/kg, respectively.

For kidney, the residue arising from a dietary burden of 2.42 ppm was 0.018 mg/kg, while the residue resulting from a dietary burden of 1.82 ppm was < 0.01 mg/kg. Although the residue levels in kidney were somewhat below those in liver, the Meeting decided that it was preferable to have an animal offal MRL which would be supported by the liver data.

The Meeting estimated a maximum residue level, an STMR value and an HR value for difenoconazole in mammalian edible offal of 0.2, 0.041 and 0.12 mg/kg, respectively.

The Meeting withdrew its previous recommendations for STMR values of 0.043 mg/kg and HR values of 0.11 mg/kg for edible offal (mammalian), and HR values of 0.019 for meat (muscle) and 0.028 mg/kg meat (fat).

RECOMMENDATIONS

On the basis of the data from supervised trials, the Meeting concluded that the residue concentrations listed below are suitable for establishing MRLs and for assessing IEDIs and IESTIs.

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

Definition of the residue (for compliance with the MRL and for estimation of dietary intake) for animal commodities: *sum of difenoconazole and 1-[2-chloro-4-(4-chloro-phenoxy)-phenyl]-2-(1,2,4-triazol)-1-yl-ethanol), expressed as difenoconazole*.

The residue is fat soluble.

Commodity		Recommended MRL, mg/kg		STMR/STMR-P mg/kg	HR/HR-P mg/kg
CCN	Name	New	Previous		
AM 0660	Almond hulls		-	1.24	3.22
VD 0061	Bean and peas in pod	0.7		0.07	0.5
AL 1030	Bean forage (green)			0.75	0.85
MO 0105	Edible offal (Mammalian)	0.2		0.041	0.12
	Ginseng root, fresh	0.5		0.02	0.36
MM 0095	Meat (from mammals other than marine mammals	0.05(fat)[a]		0.01 muscle 0.012 fat	0.021 Muscle 0.031 fat
ML 0106	Milks	0.005* [a]		0.001	
FI 0350	Papaya	0.3 [b]		0.065	0.13
TN 0095	Tree nuts	0.03		0.01	0.02
FI 4132	Passion fruits	0.05		0.01	0.04

[a] The maximum residue limits recommended by the 2007 JMPR remained the same.

[b] The recommendation is based on reported use conditions provided appropriate protection of the crop, but it is not supported by official information on use.

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of difenoconazole 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 13 GEMS/Food Consumption Cluster Diets. The results are shown in Annex 3 of the 2010 JMPR Report.

The IEDIs in the thirteen Cluster Diets, based on estimated STMRs were 1–10% of the maximum ADI (0.01 mg/kg bw). The Meeting concluded that the long-term intake of residues of difenoconazole from uses that have been considered by the JMPR is unlikely to present a public health concern.

Short-term intake

The IESTI of difenoconazole calculated on the basis of the recommendations made by the JMPR represented 0–3 % of the maximum ARfD (0.3 mg/kg bw) for children and 0–2 % for the general population.

The Meeting concluded that the short-term intake of residues of difenoconazole resulting from uses that have been considered by the JMPR is unlikely to present a public health concern.

REFERENCES

Author(s)	Year	Title, Report No, Syngenta File No.
Williams R.K, Shoffner K.P	1987	CGA 169374, Analytical method for the determination of CGA 169374 in tomatoes and potatoes by gas chromatography, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Corp., Greensboro, USA, AG-514 GLP, not published, Syngenta File No CGA169374/0052
Rodrigues N, Rubbo P	1999	Determination of Residues of Difenoconazole (SCORE) in Passion Fruit Syngenta Proteção de Cultivos Ltd.a, São Paulo, Brazil, FHF 017/98 Not GLP, not published, Syngenta File No A7402T_10008
Darnow J., Sayers L.	1990	CGA 169374, Analytical method for the determination of CGA 169374 in wheat raw agricultural commodities by gas chromatography with nitrogen/phosphorus detection, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Corp., Greensboro, USA, AG-575 Not GLP, not published, Syngenta File No CGA169374/0048
Ross J.	1991	Anal. method for the determination of CGA 169374 in wheat raw agricultural commodities by gas chromatography with nitrogen/phosphorus detection Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Corp., Greensboro, USA, AG-575A, GLP, not published, Syngenta File No CGA169374/0450
Ross J.	1993	Analytical method for the determination of CGA 169374 in wheat raw agricultural commodities by gas chromatography with nitrogen/phosphorus detection, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Corp., Greensboro, USA, AG-575B, GLP, not published Syngenta File No CGA169374/0793
Yokley R.A.	1993	Specificity of analytical method AG-575A for the determination of CGA 169374 in small grains, Novartis Crop Protection AG, Basel, Switzerland Ciba-Geigy Corp., Greensboro, USA, ABR-92084, GLP, not published Syngenta File No CGA169374/0792
Yarko J.	1990	Independent laboratory confirmation of a proposed tolerance enforcement method for CGA 169374 / AG-575, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Corp., Greensboro, USA, 900201, GLP, not published, Syngenta File No CGA169374/0618
Ryan J.	2005	Difenoconazole (CGA169374) : Summary of Validation Data for Analytical Method AG-575 A on Various Crops, Syngenta Crop Protection AG, Basel, Switzerland, Syngenta - Jealott's Hill, Bracknell, United Kingdom, TMJ5014B Not GLP, not published, Syngenta File No CGA169374/2688
Ryan J.	2005 a	Difenoconazole (CGA169374) : Summary of Validation Data for Analytical Method AG-575A on Various Crops with Final Determination by GC-MSD Syngenta Crop Protection AG, Basel, Switzerland, Syngenta, Jealott's Hill, United Kingdom, TMJ5031B, Not GLP, not published, Syngenta File No CGA169374/2742
Crook S. J.	2004	Residue Method for the Determination of Difenoconazole (CGA169374) in Various Crops and Processed Crop Fractions. Final Determination by LC-MS/MS, Syngenta Crop Protection AG, Basel, Switzerland, Syngenta, Jealott's Hill, United Kingdom, REM147.08, Not GLP, not published Syngenta File No CGA169374/2642
Ely S., Ryan J.	2004	DIFENOCONAZOLE (CGA169374) : Validation of Residue Analytical Method REM147.08 for the Determination of Residues in Various Crops and Processed Crop Fractions., Syngenta Crop Protection AG, Basel, Switzerland Syngenta - Jealott's Hill, Bracknell, United Kingdom, RJ3560B, GLP, not published, Syngenta File No CGA169374/2629
Ciscato C, Gebara A	1999	Study report on Residues of SCORE(Difenoconazole) in Passion Fruit Syngenta Proteção de Cultivos Ltd.a, São Paulo, Brazil, FHF 017B Not GLP, not published, Syngenta File No A7402T_10007
Ciscato C, Gebara A	2001	Study report on Residues of SCORE(Difenoconazole) in Passion Fruit Syngenta Proteção de Cultivos Ltd.a, São Paulo, Brazil, M00164, 144/01 Not GLP, not published, Syngenta File No A7402T_10009
Xueyan Z.	2007	A7402P - Report of Residue Study of Sico 250g/L EC in Banana, China Syngenta, Not GLP, not published, Syngenta File No A7402P_10000

Author(s)	Year	Title, Report No, Syngenta File No.
Casallanovo F., Maslowski K.	2008	Amistar Top - Residues of Azoxystrobin, R230310 and Difenoconazole in passionfruit - Brazil, 2007-08, Syngenta, Syngenta Proteção de Cultivos Ltd.a, São Paulo, Brazil, M08078, GLP, not published Syngenta File No A13703G_10304
Kuhne-Thu H.	1992	CGA 169374, common beans, Italy, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Ltd., Basel, Switzerland, 2057-90 GLP, not published, Syngenta File No CGA169374/0596
Kuhne-Thu H.	1990	CGA 169374, common beans, Italy, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Ltd., Basel, Switzerland, RR-2179-88 Not GLP, not published, Syngenta File No CGA169374/0321
Kuhne-Thu H.	1992 a	CGA 169374, common beans, Italy, Novartis Crop Protection AG, Basel, Switzerland, Ciba-Geigy Ltd., Basel, Switzerland, 2058-90 GLP, not published, Syngenta File No CGA169374/0597
Bour D.	2006	Difenoconazole (CGA169374) - Residue study on beans with pods in Southern France, Syngenta Crop Protection AG, Basel, Switzerland ADME - Bioanalyses, Vergeze, France, 05-0510, GLP, not published Syngenta File No CGA169374/3077
Royer A.	2007	Difenoconazole (CGA169374) - Residue study on beans with pods in France (South) in 2006, Syngenta Crop Protection AG, Basel, Switzerland ADME - Bioanalyses, Vergeze, France, T013977-05-REG, GLP, not published, Syngenta File No CGA169374/3282
Maffezzoni M.	1997	Magnitude of Residues after Application of CGA 219417 and CGA 169374 as Formulation WG 31.25% - A9281D - in Peas, Novartis Crop Protection AG, Basel, Switzerland, Novartis Agro S.A., Aigues-Vives, France, OF 95121/LD28,. GLP, not published, Syngenta File No CGA169374/1382
Hamilton L.	2008	Difenoconazole - Magnitude of the Residues in or on Almonds Syngenta, Syngenta Crop Protection, Inc., Greensboro, USA, T014337-05 GLP, not published, Syngenta File No CGA169374_10444
Hamilton L.	2008 a	Difenoconazole - Magnitude of the Residues in or on Pecans Syngenta, Syngenta Crop Protection, Inc., Greensboro, USA, T004710-06 GLP, not published, Syngenta File No CGA169374_10445
PIP	2005	Report on residues trials in Côte d'Ivoire on papaya, Trial identification number CIV/CNRA/PA/2004
Chae M. Y	2010	Residue Study of Difenoconazole in Fresh Ginseng, AgroLife Research Institute/Dongbu HiTek Co., Ltd. Daejeon, Republic of Korea Study number 09072-945.
Hur J.H.	2009	Residue study of difenoconazole during cultivation and processing of ginseng Chuncheon 200-701, Kangwon National University Republic of Korea, Study number: KFDA 08072-051.
Kyung K.S.	2009	Residue Study of Difenoconazole During Cultivation and Processing of Ginseng, Chungbuk National University, Cheongju 441-707, Republic of Korea, Study number KFDA 08082-016.
FAO	2009	FAO Manual on the submission and evaluation of pesticide residues data for the estimation of maximum residue levels in food and feed, Appendix IX . http://www.fao.org/fileadmin/templates/agphome/documents/Pests_Pesticides/JMPR/FAO_manual2nded_Oct07.pdf
FAO	2008	Pesticide Residues in Food - Evaluations 2007 http://www.fao.org/agriculture/crops/core-themes/theme/pests/pm/jmpr/jmpr-rep/en/
FAO	2007	Pesticide residues in food 2007 – Report 2007, FAO Plant Protection and Production Paper 191