CHLORANTRANILIPROLE (230)

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EXPLANATION

Chlorantraniliprole is a novel insecticide belonging to the class of selective ryanodine receptor agonists and was evaluated for the first time by JMPR in 2008 (T, R). It was also evaluated in 2010 and 2013 for additional MRLs. At the Forty-fifth Session of the CCPR (2013), chlorantraniliprole was listed for residue evaluation for additional maximum residue levels by the 2014 JMPR.

The Meeting received information on registered use patterns, supervised residue trials and fate of residues in processing.

The 2008 JMPR established an ADI and AfRD for chlorantraniliprole of 0–2 mg/kg bw/day and "not required" respectively. A residue definition of *chlorantraniliprole* was established for both compliance and dietary risk assessment in both plant and animal commodities.

USE PATTERN

Information on registered uses made available to this meeting is shown in Table 1.

Table 1 Registered uses of chlorantraniliprole on citrus fruit, green bulb vegetables, pulses (mung beans, chickpeas and soya beans), cereal grains, peanuts and herbs

Crop	Country	Formulation		Application					PHI [days]
		g ai/L or [g ai/kg]	Type	Method	Timing [Interval—days]	Rate [g ai/ ha]	Concentration [g ai/ 100 L]	Season Max. [g ai/ha/year] or (no. per crop)	
Citrus Fruits									
Citrus	Republic of South Africa	200	SC	Foliar	42	297.5	3.5	(2)	7
Bulb Vegetables									
Bulb vegetables [a]	USA	200	SC	Foliar	7	50–73	–	224 g ai/ha/ crop 672 g ai/ha/ year (4)	1
Pulses									
Chickpea, mung beans and soya beans	Australia	[350]	WG [e]	Foliar	7	24.5	–	(2)	14 (harvest, grazing)
Bengal gram	India	200	SC	Foliar	–	25	5	(2)	11
Soya bean, dry	Japan	50	OD	Foliar	–	12.5–37.5	1.25	(2)	7
Soya bean	USA	200	SC	Foliar	3	50–73	–	224 g ai/ha/ year (4)	1
Cereal Grains									
Cereal grains: Crop Group 15 [b] (except corn and wild rice) and cereal for forage Crop Group 16 (except corn and wild rice)	Canada	200	SC	Foliar	7	25–75	–	225 g ai/ha/ season (3)	1
Cereal grains except corn and rice [c]	USA	200	SC	Foliar	7	50–73	–	224 g ai/ha/ year (4)	14

Crop	Country	Formulation		Application					PHI [days]
		g ai/L or [g ai/kg]	Type	Method	Timing [Interval—days]	Rate [g ai/ ha]	Concentration [g ai/ 100 L]	Season Max. [g ai/ha/year] or (no. per crop)	
Oilseeds									
Peanut	USA	200	SC	Foliar	3	50–73	–	224 g ai/ha/ year (4)	1
Herbs									
Herbs subgroup [d]	USA	200	SC	Foliar	3	50–73	–	224 g ai/ha/ crop 897 g ai/ha/ year (4)	1

[a] Chive, fresh leaves; Chive; Chinese fresh leaves; Daylily, bulb; Elegans, hosta; Fritillaria, bulb; Fritillaria, leaves; Garlic, bulb; Garlic, great-headed bulb; Garlic, serpent, bulb; Kurrat, Lady's leek; Leek; Leek, wild; Lily, bulb; Onion, Beltsville bunching; Onion, bulb; Onion, Chinese, bulb; Onion, fresh; Onion, green; Onion macrostem; Onion, pearl; Onion, potato, bulb; Onion, tree tops; Shallot, bulb; Shallot fresh leaves; Cultivars, varieties and/or hybrids of these.

[b] Barley; Buckwheat; Millet, Pearl; Millet, Proso; Oats; Rye; Sorghum; Teosinte; Triticale; Wheat.

[c] Cereal Grains except Corn and Rice Including Barley; Buckwheat; Pearl Millet; Proso Millet; Oats; Rye; Sorghum (milo); Sorghum spp. grain sorghum Sudan grass (seed crop) and hybrids of these grown for its seed; Teosinte; Triticale; Wheat.

[d] Including Angelica; balm basil; borage; burnet; camomile; catnip; chervil (dried); chive, Chinese; clary; coriander (leaf); costmary; culantro (leaf); curry (leaf); dillweed; horehound; hyssop; lavender; lemongrass; lovage (leaf); marigold; marjoram; nasturtium; parsley (dried); pennyroyal; rosemary; rue; sage; savory; summer and winter; sweet bay; tansy; tarragon; thyme; wintergreen; woodruff and wormwood.

[e] Use a non-ionic surfactant/ wetting agent at 125 g active/ 100 L.

RESIDUES RESULTING FROM SUPERVISED TRIALS

The Meeting received information on supervised trials for the uses of chlorantraniliprole on citrus fruits (oranges and mandarins), bulb vegetables (green onions), pulses (chickpeas, mung beans and soya beans), cereals (barley, sorghum and wheat) and oilseeds (peanuts).

Trials were well documented with laboratory and field reports. The former included method validation including recoveries with spiking at residue levels similar to those occurring in samples from the supervised trials. Dates of analyses or duration of sample storage were also provided. Concurrent storage stability data was provided for the green onion trials, confirming sample stability over the trial storage period (24 months). Sufficient storage stability data for a range of crop matrices has also been evaluated by previous Meetings. Applications were generally made using backpack sprayers although occasionally tractor mounted sprayers were used. Samples were collected and stored frozen immediately or soon after sampling. Although trials included control plots, no control data are recorded in the Tables because, unless noted, no residues in control samples exceeded the LOQ. When residues were observed in the control samples they are shown as *c* followed by the residues observed in the control sample. Residues are unadjusted for recoveries. In some trials, samples were taken just before the final application and then again on the same day after the spray had dried. In the data tables the notation for these sampling times is '–0' and '0' respectively.

Residues from the trials conducted according to maximum GAP have been used for the estimation of maximum residue levels and dietary intake assessment. If a higher residue level was observed at a longer PHI than the GAP, the higher value has been used in MRL setting and dietary intake assessment. For replicate samples (from the same plot), the mean value (calculated on unrounded individual values) was used for maximum residue level estimation and dietary intake assessment. For two or more analyses of the same sample, the mean value was used for maximum residue level estimation and dietary intake assessment, with the individual results given in brackets. For multiple trials on a crop from the same location, the result from the trial yielding the highest residue was utilised for maximum residue level estimation and dietary intake assessment. In this case the trials are separated by a dotted line.

Group	Commodity	Country	Table No.
FC Citrus Fruits	Oranges	RSA	2
	Mandarins/ tangelos	RSA	2
VA Bulb Vegetables	Green onion (fresh and dried)	Canada,	3
VD Pulses	Chickpeas	Australia	4
	Bengal gram (chickpea)	India	5
	Mung beans	Australia	6
	Soya beans	Australia	7
GC Cereal Grains	Barley	USA	8
	Sorghum	USA	9
	Wheat	USA	10
SO Oilseeds	Peanuts	USA	11
Animal Feeds	Chickpeas trash and forage	Australia	12
	Bengal gram (chickpea) pods	India	13
	Mung beans trash and forage	Australia	14
	Soya beans trash and forage	Australia	15
	Barley hay and straw	USA	16
	Sorghum forage and stover	USA	17
	Wheat forage, hay and straw	USA	18
Processed commodities	Wheat and processed	USA	19

The results of these supervised trials are shown in the following tables:

Citrus fruits

Supervised trials were carried out on citrus fruit [eight trials (four orange, four mandarins)—Table 2] in the Republic of South Africa (RSA) during the 2010 growing season (van Zyl 2010, 2418/D924). Two foliar applications of a 200 g ai/L SC formulation were made with ground equipment at 3.5 g ai/100 L in 4200–13100 L/ha, resulting in applications of 147–459 g ai/ha. The second application was made 29–31 days after the first and 21 days before harvest. Two field sample replicates were harvested. Residues of chlorantraniliprole in peel and flesh were quantitated by GC-ECD method DuPont 13291. Acceptable concurrent recovery data were obtained.

Note: The RSA citrus data from the 2010 JMPR Meeting have also been tabulated below.

Table 2 Residues from the foliar application of chlorantraniliprole to citrus fruits in the RSA

Country Year (Variety)	Application						DAT	Chlorantraniliprole (mg/kg)				Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	g ai/100 L	Water (L/ha)	Growth Stage (Last Application)						
GAP, RSA (citrus)	2	42		3.5			7	Peel	Flesh	Flesh Mean	Whole Fruit	
RSA	2	31	355	3.5	10100	21 days before	0 before	0.57	ND	ND	0.11	Van Zyl
LA Visagie,			–	–	–	harvest		0.57	ND			2010,
Nelspruit,							0 after	0.74	0.07	0.07	0.22	2418/D924,
Mpumalanga								0.77	0.07			Trial 1
Province							3	0.96	0.04	0.05	0.23	
2010								1.0	0.05			
Orange—Valencia							7	0.76	0.03	0.04	0.20	
Midnight								0.76	0.04			
RSA	2	29	450	3.5	12900	21 days before	0 before	0.61	0.06	0.05	0.17	Van Zyl
LA Visagie,			459	3.5	13100	harvest		0.49	0.04			2010,

Country Year (Variety)	Application						DAT	Chlorantraniliprole (mg/kg)				Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	g ai/100 L	Water (L/ha)	Growth Stage (Last Application)						
Nelspruit,							0 after	1.2	0.10	0.09	0.38	2418/D924,
Mpumalanga								1.3	0.08			Trial 2
Province							3	1.2	0.09	0.10	0.33	
2010								0.97	0.11			
Orange—Valencia							7	0.82	0.06	<u>0.06</u>	<u>0.24</u>	
Late								0.78	0.06			
RSA	2	29	296	3.5	8400	21 days before	0 before	0.33	0.03	0.03	0.09	Van Zyl
Addo Sundays			296	3.5	8500	harvest		0.29	0.03			2010,
River,							0 after	0.60	0.05	0.05	0.17	2418/D924,
Eastern Cape								0.51	0.05			Trial 5
Province							3	0.51	0.05	0.05	0.15	
2010								0.49	0.05			
Orange—Autumn							7	0.49	0.06	<u>0.05</u>	<u>0.14</u>	
Gold								0.45	0.04			
RSA	2	29	296	3.5	8400	21 days before	0 before	0.19	0.03	0.03	0.06	Van Zyl
Addo Sundays			295	3.5	8400	harvest		0.18	0.02			2010,
River,							0 after	0.40	0.04	0.04	0.13	2418/D924,
Eastern Cape								0.51	0.03			Trial 6
Province							3	0.50	0.04	0.05	0.14	
2010								0.44	0.05			
Navel Orange—							7	0.54	0.05	<u>0.05</u>	<u>0.15</u>	
Lane Late								0.52	0.04			
RSA	2	30	290	3.5	8300	21 days before	0 before	0.39	0.02	0.03	0.12	Van Zyl
Letsitele,			290	3.5	8300	harvest		0.37	0.03			2010,
Mopani, Tzaneen,							0 after	1.4	0.08	0.09	0.42	2418/D924,
Limpopo								1.4	0.10			Trial 3
Province							3	1.6	0.07	0.08	0.40	
2010								1.4	0.09			
Mandarin—							7	1.0	0.08	<u>0.08</u>	<u>0.30</u>	
Clemengold								0.96	0.08			
RSA	2	30	316	3.5	9000	21 days before	0 before	0.40	0.02	0.02	0.11	Van Zyl
Letsitele,			316	3.5	9000	harvest		0.41	0.02			2010,
Mopani, Tzaneen,							0 after	0.80	0.07	0.07	0.26	2418/D924,
Limpopo								0.90	0.07			Trial 4
Province							3	0.92	0.05	0.06	0.24	
2010								0.79	0.07			
Clementine Mandarin							7	0.85	0.07	<u>0.06</u>	<u>0.22</u>	
—Nardocott								0.74	0.05			
RSA	2	30	147	3.5	4200	21 days before	0 before	0.18	ND	ND	0.05	Van Zyl
Drankenstein			216	3.5	6200	harvest		0.17	ND			2010,

Country Year (Variety)	Application						DAT	Chlorantraniliprole (mg/kg)				Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	g ai/100 L	Water (L/ha)	Growth Stage (Last Application)						
Paarl,							0 after	0.42	0.03	0.03	0.13	2418/D924,
Western Cape								0.38	0.03			Trial 7
Province							3	0.55	0.03	0.03	0.15	
2010								0.54	0.02			
Mandarin—							7	0.37	0.02	0.02	0.11	
Satsuma								0.40	0.02			
RSA	2	30	165	3.5	4700	21 days before	0 before	0.19	ND	ND	0.05	Van Zyl
Hermon			197	3.5	5600	harvest		0.25	ND			2010,
Wellington,							0 after	0.42	0.04	0.04	0.15	2418/D924,
Western Cape								0.46	0.04			Trial 8
Province							4	0.37	0.02	0.03	0.11	
2010								0.34	0.03			
Mandarin—							7	0.53	0.04	0.04	0.15	
Nules								0.49	0.03			
RSA	2	30	116	3.5	3300		0 before	0.23	0.03		0.07	2418-D80
Nelspruit,			158	3.5	4500		0 after	0.72	0.07		0.25	
Mpumalanga							3	0.40	0.08		0.17	(2010
Province							7	0.58	0.07		0.22	JMPR)
2009							14	0.46	0.09		0.20	
Orange—Navel							21	0.44	0.07		0.18	
Bahia												
RSA	2	30	95	3.5	2700		0 before	0.14	0.02		0.04	2418-D80
Nelspruit,			123	3.5	3500		0 after	0.30	0.02		0.10	
Mpumalanga							3	0.58	0.07		0.21	(2010
Province							7	0.40	0.05		0.15	JMPR)
2009							14	0.49	0.03		0.15	
Orange—Navel							21	0.19	< 0.01		0.06	
Palmer												
RSA	2	30	214	3.5	6100		0 before	0.27	0.02		0.08	2418-D80
Tzaneen,			214	3.5	6100		0 after	0.57	0.04		0.18	
Limpopo							3	0.86	0.05		0.25	(2010
Province							7	0.74	0.06		0.22	JMPR)
2009							14	0.52	0.11		0.22	
Orange—Valencia							21	0.46	0.04		0.16	
Bennie												
RSA	2	30	296	3.5	8500		0 before	0.38	0.05		0.14	2418-D80
Tzaneen,			296	3.5	8500		0 after	0.71	0.06		0.25	
Limpopo							3	0.68	0.11		0.27	(2010
Province							7	0.78	0.08		0.27	JMPR)
2009							14	0.58	0.08		0.21	
Orange—Valencia							21	0.60	0.07		0.23	
Du Roi												

Country Year (Variety)	Application						DAT	Chlorantraniliprole (mg/kg)				Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	g ai/100 L	Water (L/ha)	Growth Stage (Last Application)						
RSA	2	30	293	3.5	8400		0 before	0.36	0.03		0.10	2418-D80
Addo,			295	3.5	8400		0 after	0.87	0.06		0.26	
Eastern Cape							3	0.91	0.08		0.31	(2010
Province							7	0.72	0.04		0.22	JMPR)
2009							14	0.81	0.05		0.25	
Tangelo—Nova							21	0.68	0.05		0.20	
Tangelo												
RSA	2	30	295	3.5	8400		0 before	0.31	0.06		0.10	2418-D80
Addo,			295	3.5	8400		0 after	0.77	0.07		0.24	
Eastern Cape							3	0.72	0.07		0.23	(2010
Province							7	0.57	0.06		0.18	JMPR)
2009							14	0.60	0.07		0.18	
Mandarin—Nules							21	0.62	0.04		0.16	
Clementine												
RSA	2	30	295	3.5	8400		0 before	0.53	0.02		0.16	2418-D80
Paarl,			295	3.5	8400		0 after	0.75	0.05		0.24	
Western Cape							3	0.79	0.04		0.24	(2010
Province							7	0.91	0.03		0.32	JMPR)
2009							14	0.89	0.05		0.27	
Mandarin—							21	1.1	0.07		0.35	
Satsuma												
RSA	2	30	247	3.5	7100		0 before	0.25	ND		0.07	2418-D80
Wellington,			247	3.5	7100		0 after	0.47	0.04		0.16	
Western Cape							3	0.48	0.03		0.16	(2010
Province							7	0.41	0.03		0.13	JMPR)
2009							14	0.44	0.03		0.13	
Mandarin—							21	0.41	0.06		0.14	
Nules												

LOQ = 0.02 mg/kg for flesh and 0.05 mg/kg for peel
DAT = Days After Treatment

Bulb Vegetables

Supervised trials were carried out on green onions (five trials—Table 3) in Canada and the USA during the 2009–2010 growing seasons (Dorschner 2012b, A10204). Two foliar applications of a 200 g ai/L SC formulation were made at 110–118 g ai/ha. Applications were made to plots using spray volumes of 215–421 L/ha with ground equipment. Two field sample replicates were harvested from each plot for fresh green onions and also for dried green onions (i.e., four samples from each plot). Residues of chlorantraniliprole in fresh and dried whole plant were quantitated using a method similar to LC-MS/MS method DuPont 13294. Acceptable concurrent recovery data were obtained.

Table 3 Residues from the foliar application of chlorantraniliprole to green onions in the USA and Canada

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, USA (bulb vegetables)	4	7	73 (224/ crop)				1			
USA	2	3	113	412	Mature	Whole plant,	1	0.70	0.65	Dorschner
Salinas, California			113	421	Mature	fresh		0.61		2012b,
2009			226			Whole plant,	1	6.0	6.3	IR-4 A10204,
White spear						dried		6.6		CA 99
USA	2	3	111	215	Bulbing	Whole plant,	1	0.37	0.41	Dorschner
Holtville, California			112	224	Mature	fresh		0.44		2012b,
2010			223			Whole plant,	1	1.1	1.0	IR-4 A10204,
Tri-5503						dried		0.90		CA100
USA	2	3	113	281	Mature	Whole plant,	1	0.84	0.79	Dorschner
Salisbury, Maryland			113	281	Mature	fresh		0.73		2012b,
2009			226			Whole plant,	1	2.7	2.7	IR-4 A10204,
Evergreen hardy white						dried		2.7		MD01
Canada	2	3	118	318	Mature	Whole plant,	1	1.5	1.5	Dorschner
Harrow, Ontario			110	290	Mature	fresh		1.5		2012b,
2009			228			Whole plant,	1	11	11	IR-4 A10204,
Emerald Isle						dried		11		ON09
Canada	2	3	112	393	5 true leaves	Whole plant,	1	0.70	0.72	Dorschner
St Sur Richelieu,			113	402	Mature	fresh		0.74		2012b,
Quebec			225			Whole plant,	1	1.5	1.5	IR-4 A10204,
2009						dried		1.5		QC05
Parade										

LOQ = 0.01 mg/kg
DAT = Days After Treatment

Pulses

Supervised trials were carried out on chickpeas (three trials—Table 4) in Australia during the 2011 growing season (Litzow 2013, DuPont-33763). Two foliar applications of a 350 g ai/kg formulation were made at 24.5–24.9 or 48.7–49.7 g ai/ha. A non-ionic surfactant was added. Applications were made to plots using spray volumes of 77–93 L/ha with ground equipment. Residues of chlorantraniliprole were quantitated by LC-MS/MS using Method DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in chickpea trash and forage are shown in Table 12.

Table 4 Residues from the foliar application of chlorantraniliprole to chickpeas in Australia

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
GAP, Australia (chickpea)	2	7	24.5				14		
Australia	2	7	24.5	78	BBCH 79/81	Seed	14	< 0.01	Litzow 2013,
Condamine Plains,			24.5	80	BBCH 88/93				DuPont-33763,
Queensland,	2	7	48.7	77	BBCH 79/81	Seed	14	< 0.01	Trial 110807
2011			48.7	79	BBCH 88/93				
Hatrick									
Australia	2	7	24.5	91	BBCH 82	Seed	5	0.045	Litzow 2013,
Bellata, New South			24.5	92	BBCH 85		7	< 0.01	DuPont-33763,
Wales							14	0.015	Trial 110808
2011	2	7	49.7	93	BBCH 82	Seed	5	0.37	
Hatrick			49.7	92	BBCH 85		7	0.065	
							14	0.064	
Australia	2	7	24.9	93	BBCH 86/91	Seed	14	0.025	Litzow 2013,
Narrabri,			24.9	90	BBCH 87/94				DuPont-33763,
New South Wales	2	7	49.0	91	BBCH 86/91	Seed	14	0.14	Trial 110809
2011			49.0	90	BBCH 87/94				
(Hatrick)									

LOQ = 0.01 mg/kg
DAT = Days After Treatment

Supervised trials were carried out on Bengal gram (chickpeas) (four trials—Table 5) in India during the 2009–2010 growing seasons (Piriyadarsini 2010, 1004574). Two foliar applications of a 200 g ai/L SC formulation were made at 25 or 50 g ai/ha. Applications were made to plots using spray volumes of 400–500 L/ha with ground equipment. Residues of chlorantraniliprole were quantitated by GC-ECD using a method based on DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in Bengal gram (chickpeas) pods are shown in Table 13.

Table 5 Residues from the foliar application of chlorantraniliprole to Bengal gram (chickpeas) in India

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
GAP, India (chickpea)	2		25				11		
India	2	16	25	400	76 days after planting	Seed	20	< 0.03	Piriyadarsini
Jabalpur			25	400	Pod development				2010,
2010	2	16	50	400	76 days after planting	Seed	20	< 0.03	1004574,
JG-130			50	400	Pod development				Trial 1
India	2	34	25	500	25 days after planting	Seed	18	< 0.03	Piriyadarsini

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
Raichur			25	500	Maturity				2010,
2009–2010	2	34	50	500	25 days after planting	Seed	18	< 0.03	1004574,
JG-11			50	500	Maturity				Trial 2
India	2	17	25	500	53 days after planting	Seed	23	< 0.03	Piriyadarsini
Andhra Pradesh			25	500	Pod formation				2010,
2009–2010	2	17	50	500	53 days after planting	Seed	23	< 0.03	1004574,
JG-11			50	500	Pod formation				Trial 3
India	2	10	25	500	83 days after planting	Seed	11	< 0.03	Piriyadarsini
West Bengal			25	500	Pod formation				2010,
2010	2	10	50	500	83 days after planting	Seed	11	< 0.03	1004574,
Anuradha			50	500	Pod formation				Trial 4

LOQ = 0.03 mg/kg
DAT = Days After Treatment

Supervised trials were carried out on mung beans (three trials—Table 6) in Australia during the 2012 growing season (Litzow 2013, DuPont-33763). Two foliar applications of a 350 g ai/kg formulation were made at 24.5 or 49–49.4 g ai/ha. A non-ionic surfactant was added. Applications were made to plots using spray volumes of 81–110 L/ha with ground equipment. In one trial application was made once at BBCH 65/71 and forage samples were taken. Residues of chlorantraniliprole were quantitated by LC-MS/MS using Method DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in mung bean trash and forage are shown in Table 14.

Table 6 Residues from the foliar application of chlorantraniliprole to mung beans in Australia

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
GAP, Australia (mung bean)	2	7	24.5				14		
Australia	2	7	24.5	110	BBCH 81/84	Seed	–7 (0 DAT1)	0.18	Litzow 2013,
Wellcamp,			24.5	105	BBCH 84/87		–0	0.084	DuPont-33763,
Queensland							0	0.42 *c 0.01*	Trial 110810
Crystal							3	0.30 *c 0.037*	
2012							7	0.49 *c 0.015*	
							14	0.26 *c 0.051*	
	2	7	49.4	110	BBCH 81/84	Seed	–7 (0 DAT1)	0.34	
			49.4	106	BBCH 84/87		–0	0.42	
							0	0.80 *c 0.01*	
							3	0.47 *c 0.037*	
							7	0.49, 0.72 (mean	

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
								0.61) *c 0.015*	
							14	0.33 *c 0.051*	
Australia	2	7	24.5	82	BBCH 83/91	Seed	14	0.12, 0.063 (mean 0.092)	Litzow 2013,
Nandi, Queensland			24.5	81	BBCH 88/93			*c 0.02, < 0.01*	DuPont-33763,
2012	2	7	49	82	BBCH 83/91	Seed	14	0.42, 0.17 (mean 0.30)	Trial 110811
Crystal			49	81	BBCH 88/93			*c 0.02, < 0.01*	
Australia	2	7	24.5	94	BBCH 84/92	Seed	14	0.17	Litzow 2013,
Bellata, New South			24.5	91	BBCH 87/94				DuPont-33763,
Wales	2	7	49	93	BBCH 84/92	Seed	14	0.32	Trial 110812
2012			49	92	BBCH 87/94				
Crystal									

LOQ = 0.01 mg/kg
DAT = Days After Treatment
DAT 1 = Days After Treatment 1

Supervised trials were carried out on soya beans (four trials—Table 7) in Australia during the 2012 growing season (Litzow 2013, DuPont-33763). Two foliar applications of a 350 g ai/kg formulation were made at 24.2–24.5 or 49–49.4 g ai/ha. A non-ionic surfactant was added. Applications were made to plots using spray volumes of 82–106 L/ha with ground equipment. In two trials application was made once at BBCH 51/55 or 71/75 and forage samples were taken. Residues of chlorantraniliprole were quantitated by LC-MS/MS using Method DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in soya bean trash and forage are shown in Table 15.

Table 7 Residues from the foliar application of chlorantraniliprole to soya beans in Australia

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
GAP, Australia (soya bean)	2	7	24.5				14		
Australia	2	6	24.5	106	BBCH 85/93	Seed	–6 (0 DAT1)	< 0.01	Litzow 2013,
Condamine Plains,			24.5	100	BBCH 86/93		–0	< 0.01	DuPont-33763,
Queensland							0	< 0.01	Trial 110813
2012							3	0.021	
Fraser							7	< 0.01	
							14	0.029	
	2	6	49	106	BBCH 85/93	Seed	–6 (0 DAT1)	0.050	
			49	100	BBCH 86/93		–0	0.020	

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
							0	0.040	
							3	0.056	
							7	0.022	
							14	0.022	
Australia	2	7	24.5	94	BBCH 83	Seed	14	< 0.01	Litzow 2013,
Forest Hill,			24.5	82	BBCH 87				DuPont-33763,
Queensland	2	7	49	94	BBCH 83	Seed	14	0.013	Trial 110814
2012			49	82	BBCH 87				
Rose									
Australia	2	7	24.5	107	BBCH 83	Seed	14	< 0.01	Litzow 2013,
Murwillumbah,			24.5	106	BBCH 87				DuPont-33763,
New South Wales	2	7	49.4	107	BBCH 83	Seed	14	< 0.01	Trial 110815
2012			49.4	106	BBCH 87				
A6785									
Australia	2	6	24.2	94	BBCH 75/98	Seed	14	< 0.01	Litzow 2013,
Narrabri,			24.2	89	BBCH 80/98				DuPont-33763,
New South Wales	2	6	49.4	94	BBCH 75/98	Seed	14	0.027	Trial 110816
2012			49.4	93	BBCH 80/98				
Bunya									

LOQ = 0.01 mg/kg
DAT = Days After Treatment
DAT 1 = Days After Treatment 1

Cereal grains

Supervised trials were carried out on barley (three trials—Table 8) in the USA during the 2009 growing season (Dorschner 2012a, IR-4 10204, also submitted to JMPR 2013). Two foliar applications of a 200 g ai/L SC formulation were made 7 days apart at 112–117 g ai/ha. Applications were made to plots using spray volumes of 115–210 L/ha with ground equipment. Replicate samples were taken from each plot. Residues of chlorantraniliprole were quantitated by LC-MS/MS using a method based on DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in barley hay and straw are shown in Table 16.

Table 8 Residues from the foliar application of chlorantraniliprole to barley in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, Canada (cereal grains)	3	7	75 (225/season)				1			
USA	2	7	117	116	Kernel hard	Grain	1	1.8	2.0	Dorschner 2012a,
Velva, North Dakota			115	115	Harvest			2.2		IR-4 10204,

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
					ripe					
2009			232							09-ND01
Tradition										
USA	2	7	114	208	Mature grain	Grain	1	1.7	1.9	Dorschner 2012a,
Aurora, South Dakota			<u>114</u>	210	still hard			2.2		IR-4 10204,
2009			228		dough					09-SD07
Lacey					Mature					
USA	2	7	112	187	Drying down	Grain	1	1.9	1.9	Dorschner 2012a
Kimberley, Idaho			<u>112</u>	187	Drying down			1.9		IR-4 10204,
2009			224							09-ID14
Camas Spring										

LOQ = 0.01 mg/kg
DAT = Days After Treatment

Supervised trials were carried out on <u>sorghum</u> (three trials-Table 9) in the USA during the 2009 growing season (Dorschner 2012a, IR-4 10204, also submitted to JMPR 2013). Two foliar applications of a 200 g ai/L SC formulation were made 7 or 30 days apart at 111–114 g ai/ha. Applications were made to plots using spray volumes of 139–255 L/ha with ground equipment. Replicate samples were taken from each plot. Residues of chlorantraniliprole were quantitated by LC-MS/MS using a method based on DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in sorghum forage and stover are shown in Table 17.

Table 9 Residues from the foliar application of chlorantraniliprole to sorghum in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, Canada (cereal grains)	3	7	75 (225/season)				1			
USA	2	30 [a]	112	139	Senesced *via*	Grain	1	1.2	1.2	Dorschner 2012a,
Fargo,			<u>112</u>	139	frost			1.1		IR-4 10204,
North Dakota			224		Ripe					09-ND02
2009										
LM 5001										
USA	2	7	112	172	Seeding	Grain	1	1.5	1.5	Dorschner 2012a,
Las Cruces,			<u>114</u>	194	Mature grain			1.5		IR-4 10204,
New Mexico			226							09-NM13
2009										
DK 28E										
USA	2	7	113	250	Hard dough	Grain	1	0.83	0.79	Dorschner 2012a,
Las Cruces,			<u>111</u>	255	to mature			0.74		IR-4 10204,

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
New Mexico			224		Mature grain					09-NM19
2009										
M3838										

LOQ = 0.01 mg/kg
[a] Second application made 30 days after first application because of prolonged wet and cold weather
DAT = Days After Treatment

Supervised trials were carried out on <u>wheat</u> (five trials—Table 10) in the USA during the 2009–2010 growing seasons (Dorschner 2012a, IR-4 10204, also submitted to JMPR 2013). Two foliar applications of a 200 g ai/L SC formulation were made 7 days apart at 106–120 g ai/ha. Applications were made to plots using spray volumes of 115–252 L/ha with ground equipment. Replicate samples were taken from each plot. Residues of chlorantraniliprole were quantitated by LC-MS/MS using a method based on DuPont 13294. Acceptable concurrent recovery data were obtained.

Residues in wheat forage, hay and straw are shown in Table 18. Processed fraction samples for analysis were generated from trial ND03 (Table 19).

Table 10 Residues from the foliar application of chlorantraniliprole to wheat in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, Canada (cereal grains)	3	7	75 (225/season)				1			
USA	2	7	114	124	Hard dough	Grain	1	0.22	0.23	Dorschner 2012a,
Fargo,			<u>112</u>	122	Ripe wheat			0.23		IR-4 10204,
North Dakota			226							09-ND03
2009										
Alsen										
USA	2	7	113	140	Hard dough	Grain	1	0.20	0.19	Dorschner 2012a,
Fargo,			<u>112</u>	139	Ripe wheat			0.18		IR-4 10204,
North Dakota			225							09-ND04
2009										
Glenn										
USA	2	7	118	117	Kernel hard	Grain	1	0.19	0.18	Dorschner 2012a,
Velva,			<u>115</u>	115	Ripe for			0.18		IR-4 10204,
North Dakota			233		cutting					09-ND05
2009										
Faller										
USA	2	7	120	211	Mature	Grain	1	0.26	0.25	Dorschner 2012a,
Aurora,			<u>106</u>	193	Mature			0.25		IR-4 10204,
South Dakota			226							09-SD08
2009										

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
Briggs Hard Red										
USA	2	7	117	232	Hard	Grain	1	0.43	0.41	Dorschner 2012a,
Las Cruces,			<u>118</u>	252	dough,			0.39		IR-4 10204,
New Mexico			235		mature					09-NM18
2010					Mature					
El Dorado					grain					

LOQ = 0.01 mg/kg
DAT = Days After Treatment

Oilseeds

Supervised trials were carried out on <u>peanuts</u> (six trials—Table 11) in the USA during the 2011 growing season. Two foliar applications of a 200 g ai/L SC formulation were made at 111–115 g ai/ha with an adjuvant added. Applications were made to plots using spray volumes of 117–234 L/ha with ground equipment. Peanut samples (one replicate per untreated plot and two replicates per treated plot) were collected at maturity, 1 day after the second application.

Residues of chlorantraniliprole in peanut nutmeat were quantitated using LC-MS/MS Method DuPont 13294 with modifications. Acceptable concurrent recovery data were obtained.

Table 11 Residues from the foliar application of chlorantraniliprole to peanuts in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, USA (peanuts)	4	3	73 224/year				1			
USA	2	5	112	127	BBCH 89	Nutmeat	1	< 0.01	< 0.01	Rice 2012,
Monticello, Florida			<u>113</u>	131	BBCH 89			< 0.01		DuPont-31666,
2011			225							Trial 1
Florida 7										
USA	2	5	111	234	BBCH 87	Nutmeat	1	0.015	0.012	Rice 2012,
Charlotte, Texas			<u>113</u>	234	BBCH 88			0.010		DuPont-31666,
2011			224							Trial 2
Georgia 09										
USA	2	5	113	127	BBCH 89	Nutmeat	1	< 0.01	< 0.01	Rice 2012,
Quitman, Georgia			<u>114</u>	132	BBCH 89			< 0.01		DuPont-31666,
2011			227							Trial 3
Spanish McCloud										
USA	2	5	113	226	BBCH 88	Nutmeat	1	< 0.01	< 0.01	Rice 2012,
Sycamore, Georgia			<u>113</u>	230	BBCH 89			< 0.01		DuPont-31666,
2011			226							Trial 4
GA 06										
USA	2	5	112	121	Mature	Nutmeat	1	< 0.01	< 0.01	Rice 2012,
Quitman, Georgia			<u>112</u>	117	Mature			< 0.01		DuPont-31666,
2011			224							Trial 5
Georgia Green										

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
USA	2	6	115	187	Mature	Nutmeat	1	0.022	0.034	Rice 2012,
Levelland, Texas			113	187	Mature			0.046		DuPont-31666,
2011			228							Trial 6
Tamnut OL06										

LOQ = 0.01 mg/kg
DAT = Days After Treatment

Animal Feeds

Note: Animal feed residues are expressed on a wet weight or 'as received' basis unless stated otherwise.

Table 12 Residues from the foliar application of chlorantraniliprole to chickpeas in Australia

Country Year (Variety)	Application					Matrix	DAT	Moisture Content (%)	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage					
GAP, Australia (chickpea)	2	7	24.5				14			
Australia	2	7	24.5	78	BBCH 79/81	Trash	14	38.5	0.26 *c 0.01*	Litzow 2013,
Condamine Plains,			24.5	80	BBCH 88/93					DuPont-33763,
Queensland,	2	7	48.7	77	BBCH 79/81	Trash	14	25.3	0.82 *c 0.01*	Trial 110807
2011			48.7	79	BBCH 88/93					
Hatrick										
Australia	2	7	24.5	91	BBCH 82	Trash	5	49.1	1.8	Litzow
Bellata,			24.5	92	BBCH 85		7	31.5	1.1	2013,
New South							14	17.4	0.48	DuPont-
Wales						Forage	–7 (0 DAT1)	68.6	3.6	33763,
2011							–0	62.7	0.33	Trial
Hatrick							0	56.9	2.3	110808
	2	7	49.7	93	BBCH 82	Trash	5	52.6	4.6	
			49.7	92	BBCH 85		7	36.7	5.4	
							14	31.7	2.0	
						Forage	–7 (0 DAT1)	66.2	5.3	
							–0	61.3	2.7	
							0	63.1	7.2	
Australia	2	7	24.9	93	BBCH 86/91	Trash	14	13.3	0.27	Litzow 2013,
Narrabri,			24.9	90	BBCH 87/94					DuPont-33763,
New South Wales	2	7	49.0	91	BBCH 86/91	Trash	14	13.4	0.53	Trial 110809
2011			49.0	90	BBCH					

Country Year (Variety)	Application					Matrix	DAT	Moisture Content (%)	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage					
					87/94					
Hatrick										

LOQ = 0.01 mg/kg for forage and 0.05 mg/kg for trash
Results for forage and trash are expressed on a dry weight basis
DAT = Days After Treatment

Table 13 Residues from the foliar application of chlorantraniliprole to Bengal gram (chickpeas) in India

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage				
GAP, India (chickpea)	2		25				11		
India	2	16	25	400	76 days after planting	Pods	20	< 0.03	Piriyadarsini
Jabalpur			25	400	Pod development				2010,
2010	2	16	50	400	76 days after planting	Pods	20	< 0.03	1004574,
JG-130			50	400	Pod development				Trial 1
India	2	34	25	500	25 days after planting	Pods	18	< 0.03	Piriyadarsini
Raichur			25	500	Maturity				2010,
2009–2010	2	34	50	500	25 days after planting	Pods	18	< 0.03	1004574,
JG-11			50	500	Maturity				Trial 2
India	2	17	25	500	53 days after planting	Pods	23	< 0.03	Piriyadarsini
Andhra Pradesh			25	500	Pod formation				2010,
2009–2010	2	17	50	500	53 days after planting	Pods	23	< 0.03	1004574,
JG-11			50	500	Pod formation				Trial 3
India	2	10	25	500	83 days after planting	Pods	11	< 0.03	Piriyadarsini
West Bengal			25	500	Pod formation				2010,
2010	2	10	50	500	83 days after planting	Pods	11	< 0.03	1004574,
Anuradha			50	500	Pod formation				Trial 4

LOQ = 0.03 mg/kg
DAT = Days After Treatment

Table 14 Residues from the foliar application of chlorantraniliprole to mung beans in Australia

Country Year (Variety)	Application					Matrix	DAT	Moisture Content (%)	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage					
GAP, Australia (mung bean)	2	7	24.5				14			
Australia	2	7	24.5	110	BBCH	Trash	–7 (0 DAT1)	69.0	3.1	Litzow

Country Year (Variety)	Application No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage	Matrix	DAT	Moisture Content (%)	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
Wellcamp,					81/84		–0	53.9	4.5	2013,
Queensland			24.5	105	BBCH		0	61.9	7.4	DuPont-
2012					84/87		3	63.0	6.4	33763,
Crystal							7	65.2	10	Trial
							14	61.0	3.8 *c 0.13*	110810
	1	–	24.5	83	BBCH	Forage	14	74.4	3.5	
					65/71					
	2	7	49.4	110	BBCH	Trash	–7 (0 DAT1)	69.2	10	
					81/84		–0	61.2	7.0	
			49.4	106	BBCH		0	65.5	14	
					84/87		3	63.2	12	
							7	64.5	15, 14 (mean 15)	
							14	62.9	8.3 *c 0.13*	
Australia Nandi,	2	7	24.5	82	BBCH 83/91	Trash	14	56.9, 57.2	2.7, 2.0 (mean 2.3) *c 0.081*	Litzow 2013,
Queensland 2012			24.5	81	BBCH 88/93					DuPont-33763,
Crystal	2	7	49	82	BBCH 83/91	Trash	14	68.6, 58.6	3.3, 3.3 (mean 3.3) *c 0.081*	Trial 110811
			49	81	BBCH 88/93					
Australia Bellata,	2	7	24.5	94	BBCH 84/92	Trash	14	62.1	3.3	Litzow 2013,
New South Wales			24.5	91	BBCH 87/94					DuPont-33763,
2012 Crystal	2	7	49	93	BBCH 84/92	Trash	14	57.7	11	Trial 110812
			49	92	BBCH 87/94					

LOQ = 0.01 mg/kg for forage and 0.05 mg/kg for trash
Results for forage and trash are expressed on a dry weight basis
Results in parentheses are for reserve samples
DAT = Days After Treatment

Table 15 Residues from the foliar application of chlorantraniliprole to soya beans in Australia

Country Year (Variety)	Application No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage	Matrix	DAT	Moisture Content (%)	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
GAP, Australia (soya bean)	2	7	24.5				14			
Australia	2	6	24.5	106	BBCH	Trash	–6 (0 DAT1)	28.5	1.1	Litzow
Condamine					85/93		–0	23.8	0.55	2013,
Plains,			24.5	100	BBCH		0	23.4	1.8	DuPont-
Queensland					86/93		3	35.6	1.1	33763,
2012							7	18.7	1.3	Trial

Country Year (Variety)	Application					Matrix	DAT	Moisture Content (%)	Chlorantraniliprole (mg/kg)	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage					
Fraser							14	20.2 18.6	0.74, 1.7 (mean 1.2)	110813
	1	–	24.5	83	BBCH	Forage	14	74.4	0.68	
					51/55					
	2	6	49	106	BBCH	Trash	–6 (0 DAT1)	36.5	2.5	
					85/93		–0	28.2	1.6	
			49	100	BBCH		0	38.2	3.8	
					86/93		3	37.9	2.8	
							7	26.5	2.6	
							14	24.9, 26.3)	2.6, 2.7 (mean 2.7)	
Australia Forest Hill,	2	7	24.5	94	BBCH 83	Trash	14	17.7	0.68	Litzow 2013,
Queensland 2012			24.5	82	BBCH 87					DuPont-33763,
Rose	1	–	24.5	83	BBCH	Forage	14	76.3	0.69	Trial
					71/75					110814
	2	7	49	94	BBCH 83	Trash	14	17.6	1.7	
			49	82	BBCH 87					
Australia	2	7	24.5	107	BBCH 83	Trash	14	35.5	0.36	Litzow
Murwillumbah,			24.5	106	BBCH 87					2013,
New South Wales	2	7	49.4	107	BBCH 83	Trash	14	44.4	0.90	DuPont-
2012			49.4	106	BBCH 87					33763,
A6785										Trial
										110815
Australia Narrabri,	2	7	24.2	94	BBCH 75/98	Trash	14	9.7	0.96	Litzow 2013,
New South Wales 2012			24.2	89	BBCH 80/98					DuPont-33763,
Bunya	2	7	49.4	94	BBCH 75/98	Trash	14	9.5	1.8	Trial 110816
			49.4	93	BBCH 80/98					

LOQ = 0.01 mg/kg for forage and 0.05 mg/kg for trash
Results for forage and trash are expressed on a dry weight basis
Results in parentheses are for reserve samples
DAT = Days After Treatment
DAT 1 = Days After Treatment 1

Table 16 Residues from the foliar application of chlorantraniliprole to barley in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, Canada (cereal grains)	3	7	75 (225/season)				1			
USA	2	8	115	115	Flag leaf	Hay	1	9.2	9.2	Dorschner 2012a,
Velva, North			113	113	Head			9.3		IR-4 10204,
Dakota			228		emergence					09-ND01
2009					complete					
Tradition	2	7	117	116	Kernel hard	Straw	1	13	14	
			115	115	Harvest			15		
			232		ripe					
USA	2	7	113	205	Milk	Hay	1	5.5	5.5	Dorschner 2012a,
Aurora,			121	217	Soft dough			5.5		IR-4 10204,
South Dakota			234							
2009	2	7	114	208	Mature grain	Straw	1	3.3	3.6	09-SD07
Lacey			114	210	still hard			3.8		
			228		dough					
					Mature					
USA	2	7	110	184	Milk	Hay	1	9.5	11	Dorschner 2012a,
Kimberley, Idaho			111	186	Milk to			12		IR-4 10204,
2009			221		soft dough					09-ID14
Camas Spring	2	7	112	187	Drying down	Straw	1	12	12	
			112	187	Drying down			12		
			224							

LOQ = 0.01 mg/kg
DAT = Days After Treatment

Table 17 Residues from the foliar application of chlorantraniliprole to sorghum in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, Canada (cereal grains)	3	7	75 (225/season)				1			
USA	2	7	112	139	Early dough	Forage	1	3.0	2.7	Dorschner 2012a,
Fargo, North Dakota			112	139	Soft dough			2.4		IR-4 10204,
			224							
2009	2	30 [a]	112	139	Senesced via	Stover	1	3.3	3.4	09-ND02
LM 5001			112	139	frost			3.6		
			224		Ripe					

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
USA	2	7	111	140	Milk,	Forage	1	4.7	4.1	Dorschner 2012a,
Las Cruces,			114	170	soft dough			3.4		IR-4 10204,
New Mexico			225		Soft dough					09-NM13
2009	2	7	112	172	Seeding	Stover	1	6.9	5.9	
DK 28E			114	194	Mature grain			4.9		
			226							
USA	2	7	122	242	Early milk	Forage	1	3.2	3.4	Dorschner 2012a,
Las Cruces,			111	235	Soft to			3.5		IR-4 10204,
New Mexico			235		hard dough					09-NM19
2009	2	7	113	250	Hard dough	Stover	1	4.8	4.1	
M3838			111	255	to mature			3.4		
			224		Mature grain					

LOQ = 0.01 mg/kg
[a] Second application made 30 days after first application because of prolonged wet and cold weather
DAT = Days After Treatment

Table 18 Residues from the foliar application of chlorantraniliprole to wheat in the USA

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
GAP, Canada (cereal grains)	3	7	75 (225/season)				1			
USA	2	7	113	140	Beginning	Forage	1	4.2	4.3	Dorschner 2012a,
Fargo,			113	140	anthesis			4.3		IR-4 10204,
North Dakota			226		Late anthesis	Hay	1	8.6	9.5	09-ND04
2009								10		
Glenn	2	7	113	140	Hard dough	Straw	1	5.4	4.7	
			112	139	Ripe wheat			4.0		
			225							
USA	2	8	115	115	Flag leaf	Forage	1	4.0	4.4	Dorschner 2012a,
Velva,			114	114	Heading			4.8		IR-4 10204,
North Dakota			229			Hay	1	9.2	8.6	09-ND05
2009								8.0		
Faller	2	7	118	117	Kernel hard	Straw	1	15	15	
			115	115	Ripe for			15		
			233		cutting					

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean	
USA	2	7	113	203	Boot to	Forage	1	5.0	4.3	Dorschner 2012a,
Aurora, South			115	204	flowering			3.7		IR-4 10204,
Dakota			228		Flowering	Hay	1	11	11	09-SD08
2009								12		
Briggs Hard Red	2	7	120	211	Mature	Straw	1	6.5	6.4	
			106	193	Mature			6.3		
			226							
USA	2	6	115	191	Early boot	Forage	1	4.6	4.6	Dorschner 2012a,
Las Cruces,			114	209	Late boot			4.6		IR-4 10204,
New Mexico			229			Hay	1	11	11	09-NM18
2010								10		
El Dorado	2	7	117	232	Hard dough,	Straw	1	4.2	4.5	
			118	252	mature			4.8		
			235		Mature grain					

LOQ = 0.01 mg/kg
DAT = Days After Treatment

FATE OF RESIDUES IN STORAGE AND PROCESSING

Residues after processing

Processing studies are necessary according to the uses and the residues of chlorantraniliprole on raw agricultural commodities. The fate of chlorantraniliprole residues during processing of raw agricultural commodities was investigated in wheat.

As a measure for the transfer of residues into processed products, a processing factor (PF) was used, defined as:

$$PF = \frac{\text{Residue in processed products (mg/kg)}}{\text{Residue in raw agricultural commodity (mg/kg)}}$$

Wheat

The effect of processing (laboratory scale) on residues of chlorantraniliprole in wheat was investigated in a trial conducted in the USA in the 2009 growing season (Dorschner 2012a, IR-4 10204). Wheat with incurred residues was obtained where plants were sprayed twice at 114 and 112 g ai/ha. Applications were made in 122 or 124 L/ha using ground equipment. Wheat bulk RAC samples were harvested 1 day after the second application.

Bulk wheat grain samples were processed according to simulated commercial procedures into the following samples: aspirated grain fractions, germ, middlings, flour, shorts and bran.

The moisture content of grain was determined and the grain dried in an oven set at 43–57 °C until the moisture content was 10–13%. The grain was transferred to the dust generation room and moved through the conveyor system for 120 minutes to remove the grain dust with an aspirator. Aspirated grain was cleaned with different sized screens to remove broken grain and foreign material. Cleaning yielded grain dust, screenings and cleaned grain. The aspirated grain fraction (grain dust) sample was collected and placed in frozen storage.

Cleaned grain was further processed into germ, middlings, flour, shorts and bran. For wheat germ, a portion of the cleaned grain was conditioned with water for 1 to 1.5 hours to adjust the moisture content to approximately 16%. The conditioned grain was passed through a mill and sifted with three different sized sieves. Material passing through all three sieves was aspirated to remove bran from the germ. The germ with endosperm was passed through a reduction mill and sifted to separate the germ from the endosperm. The germ was aspirated again to remove remaining bran and milled and sieved again to remove remaining endosperm. The germ fraction sample was collected and placed in frozen storage.

The remaining cleaned grain was mixed with water for at least 15 minutes and moisture conditioned according to the physical property of the wheat. The conditioned grain was passed through a mill, broken with three break rolls and sifted through two different sized screens. Break flour passed through the smaller screen and middlings passed through the larger screen. Coarse bran did not pass through either screen. A middlings fraction sample was collected and placed in frozen storage.

The remaining middlings were poured into the reductions system, passed through two reduction rolls and sifted. Reduction flour passed through the sifter, while shorts did not. The break flour and reduction flour were poured into an agitator and mixed for 15 minutes. The recombined flour fraction sample was collected and placed in frozen storage. The coarse bran was placed in a bran finisher and conveyed over a screen. Shorts passed through the screen and bran passed over the screen. The shorts from the bran finisher were added to the shorts from the reduction system to produce the shorts fraction sample, which was placed in frozen storage. The bran fraction sample was collected and placed in frozen storage.

Residues of chlorantraniliprole in wheat RAC and processed commodities were determined by LC/MS/MS using Method 13294. Acceptable concurrent recovery data were obtained for all wheat commodities.

Table 19 Residues of chlorantraniliprole in wheat and processed commodities

Country Year (Variety)	Application					Matrix	DAT	Chlorantraniliprole (mg/kg)		Processing Factor	Author, Study No., Trial No.
	No	Interval (Days)	g ai/ha	Water (L/ha)	Growth Stage			Individual	Mean		
GAP, USA (wheat)	3		75 (225/season)				1				
USA	2	7	114	124	Hard dough	Grain	1	0.22, 0.23	0.23		Dorschner
Fargo,			112	122	Ripe wheat	AGF		7.3, 7.9	7.6	33	2012a,
North Dakota			226			Germ		0.26, 0.26	0.26	1.13	IR-4
2009						Middlings		0.064, 0.066	0.065	0.28	10204,
Alsen						Flour		0.088, 0.088	0.088	0.38	09-ND03
						Shorts		0.18, 0.14	0.16	0.7	
						Bran		0.24, 0.24	0.24	1.04	

AGF = Aspirated Grain Fractions
DAT = Days After Treatment

APPRAISAL

Chlorantraniliprole was first evaluated for residues and toxicological aspects by the 2008 JMPR. The 2008 JMPR established an ADI for chlorantraniliprole of 0-2 mg/kg bw and concluded that an ARfD was unnecessary. It was also evaluated in 2010 and 2013 for additional maximum residue levels. At the Forty-fifth Session of the CCPR (2013), chlorantraniliprole was listed for consideration of further additional maximum residue levels by the 2014 JMPR.

The Meeting received information on registered use patterns, supervised residue trials and fate of residues in processing. Product labels were available from Australia, Canada, India, the Republic of South Africa and the United States of America.

The residue definition for compliance with MRL and for dietary intake for plant and animal commodities is chlorantraniliprole. The residue is considered fat soluble.

Methods of analysis

Residue trial samples were analysed using LC-MS/MS methods based on those previously evaluated by the JMPR in 2008.

Stability of pesticide residues in stored analytical samples

Samples from the submitted studies were stored for periods less than the period of stability demonstrated in studies provided to the 2008 Meeting. Since the storage stability data from the 2008 JMPR cover a diverse range of crops and demonstrated stability of chlorantraniliprole for up to 2 years, it is considered that these data should be sufficient to cover the storage stability of all commodities in this submission.

The Meeting noted that concurrent storage stability data provided with the green onion residue trials also demonstrated stability of chlorantraniliprole residues over 24 months (the period for which the samples were stored) in fresh and dried green onions.

Results of supervised residue trials on crops

The Meeting received supervised trial data for application of chlorantraniliprole on oranges, mandarins, green onions (fresh and dried), chickpeas, mung beans and soya beans, barley, grain sorghum, wheat and peanuts.

Citrus Fruits

Residue trials were conducted in citrus fruits in the Republic of South Africa (RSA) in 2010 according to the critical GAP in the RSA (up to 2 applications at 3.5 g ai/ 100L, and a 7 day PHI).

Four trials were conducted in oranges and four trials in mandarins. In one orange trial the rate of the second application was not known, so data from this trial were not considered for estimation of a maximum residue level and STMR.

The Meeting noted that the RSA GAP is for the citrus fruit group and that a group maximum residue level of 0.5 mg/kg for chlorantraniliprole in citrus fruits was estimated at the 2010 JMPR Meeting based on 2009 South African trials in oranges (4) and mandarins/ tangelos (4). An STMR of 0.07 mg/kg was estimated.

The new citrus data were combined with the 2009 data to give a larger data set on which to base an estimation of the maximum residue level and STMR.

The ranked order of residues in oranges (whole fruit) from supervised trials in the RSA in 2009 and 2010 according to GAP was: ***0.14***, 0.15, ***0.15***, 0.22, 0.22, ***0.24*** and 0.27 mg/kg (*new data in **bold italics***).

The ranked order of residues in mandarins and tangelos (whole fruit) from supervised trials in the RSA in 2009 and 2010 according to GAP was: ***0.11***, 0.14, ***0.15***, 0.18, ***0.22***, 0.25, ***0.30*** and 0.35 mg/kg (*new data in* ***bold italics***).

The Meeting noted that the RSA GAP is for the citrus group and considered a group maximum residue level. To consider a group maximum residue level, residues across individual crops should not differ by more than 5×median. The Meeting noted that the median of the oranges and mandarins/ tangelos differed by less than 5-fold (only a 1.1-fold difference).

In deciding whether to combine the datasets for oranges and mandarins/ tangelos for use in the statistical calculator or to only utilise the data from the commodity with the highest residues, the Meeting recognised the similarity of the datasets (Mann-Whitney U-Test). Therefore the Meeting decided to combine the data from oranges and mandarins/ tangelos in order to estimate a maximum residue level for citrus fruit.

The ranked order of residues in oranges and mandarins/ tangelos (whole fruit) from supervised trials in the RSA in 2009 and 2010 according to GAP was: 0.11, 0.14 (2), 0.15 (3), 0.18, 0.22 (3), 0.24, 0.25, 0.27, 0.30 and 0.35 mg/kg.

The ranked order of residues in oranges and mandarins/ tangelos (edible portion - flesh) from supervised trials in the RSA in 2009 and 2010 according to GAP was: 0.02, 0.04, 0.05 (4), 0.06 (3), 0.07 (2), 0.08 (2), 0.09 and 0.11 mg/kg.

The Meeting estimated a maximum residue level of 0.7 mg/kg for residues of chlorantraniliprole in citrus fruits, together with an STMR of 0.06 mg/kg (based on the edible portion data). The Meeting estimated a median residue for whole citrus fruit of 0.22 mg/kg for use in processing calculations.

The Meeting withdrew its previous recommendation of 0.5 mg/kg for chlorantraniliprole in citrus fruits.

Bulb Vegetables – green onion

The GAP for bulb vegetables in the USA is for up to 4 applications at a maximum rate of 73 g ai/ha, or a maximum of 224 g ai/ ha, with a 7 day retreatment interval and a PHI of 1 day.

Residue trials were conducted in green onions in the USA (3 trials) and Canada (2 trials) in which two applications of chlorantraniliprole were made at 110 – 118 g ai/ ha (223-228 g ai/ ha per crop) with a 3 day retreatment interval and a PHI of 1 day.

The Meeting did not estimate a maximum residue level as the trials were not in accordance with the GAP.

Pulses – chickpeas

The critical GAP in India is 2 applications at 25 g ai/ ha and an 11-day PHI.

Four residue trials were conducted in chickpea (Bengal gram) in India in which two foliar applications of chlorantraniliprole were made at 25 or 50 g ai/ha. The PHI was 11 - 23 days.

Only one trial matches the Indian GAP. The observed residues were < 0.03 mg/kg.

The Meeting determined that a single trial was insufficient for estimation of a maximum residue level.

Three residue trials were conducted in chickpeas in Australia according to the GAP in Australia (2 applications at 24.5 g ai/ ha, 7 day retreatment interval and a 14 day PHI).

The ranked order of residues from supervised trials in Australia according to GAP was:

< 0.01, 0.015 and 0.025 mg/kg.

The Meeting decided that the number of trials available was not adequate to estimate a maximum residue level for chickpeas (dry).

Pulses – mung beans

Residue trials were conducted in mung beans in Australia according to the critical GAP in Australia (2 applications at 24.5 g ai/ ha, 7 day retreatment interval and a 14 day PHI).

The ranked order of residues from supervised trials in Australia according to GAP was: 0.092, 0.17 and 0.26 mg/kg.

The Meeting concluded that the number of trials available was not adequate to estimate a maximum residue level for mung beans (dry).

Pulses – soya beans

The GAP for soya beans in Australia is 2 applications at 24.5 g ai/ ha, 7-day retreatment interval, and a 14 day PHI.

Residue trials were conducted in soya beans in Australia.

The ranked order of residues from supervised trials in Australia according to GAP was:

< 0.01 (3) and 0.029 mg/kg.

Residue trials conducted in soya beans in Japan which were considered at the time of the 2010 JMPR showed that residues in dry soya beans were < 0.01 (2) mg/kg after 3 applications at 25 g ai/ ha at 7 day intervals and with a 14 day PHI. These trials match the Australian GAP, with the exception of three rather than two applications being made. However, the Meeting noted that the additional application had no effect on the residues in the Japanese trials, which were below the LOQ.

The Australian and Japanese soya bean data were combined and the ranked order of residues from supervised trials in Australia and Japan according to Australian GAP was:

< 0.01 (5) and 0.029 mg/kg.

The Meeting estimated a maximum residue level and an STMR value of 0.05 and 0.01 mg/kg respectively for chlorantraniliprole in soya beans.

Cereals

The Codex MRL for chlorantraniliprole in cereal grains is 0.02 mg/kg following the recommendation of the 2008 JMPR based on rotational crop data. An STMR of 0.01 mg/kg was estimated.

A study conducted on cereals in the USA in 2009 - 2010 (three trials in barley and sorghum and five in wheat) was submitted to the 2013 JMPR. As the compound was not registered in the USA for these crops, no estimations of maximum residue levels or STMRs were made. The study has been resubmitted, with relevant registered label use patterns in the USA and Canada for cereal grains except corn and wild rice, and is evaluated here against the critical Canadian GAP.

The GAP for cereals in Canada is 3 × 75 g ai/ha applications, with a 7-day retreatment interval and a 1-day PHI.

However, the submitted cereal trials were conducted with 2 × 111-117 g ai/ha applications (RTI 7 days, PHI 1 day). The Meeting therefore did not estimate maximum residue levels for cereal grains as the trials were not conducted in accordance with the GAP.

Oilseeds – peanuts

The GAP in the USA is up to 4 applications at a rate of 73g ai/ha (or a maximum of 224 g ai/ha/ year) with a 3 day retreatment interval and a PHI of 1 day.

Six residues trials were conducted in peanuts in the USA in which two applications of chlorantraniliprole were made at 111–115 g ai/ ha (total application rate of 224–228 g ai/ha) with a 5-6 day retreatment interval and a PHI of 1 day.

A maximum residue level and STMR were not estimated as the trials were not conducted in accordance with the GAP.

Animal feeds

The Meeting received supervised trials data for chickpea, mung bean and soya bean forage, barley hay and straw, grain sorghum forage and stover and wheat forage, hay and straw.

Pulse forage

The GAP in Australia for chickpea, mung bean and soya bean is 2 × 24.5 g ai/ha applications with a 14-day grazing PHI.

Data for mung bean, chickpea and soya bean forage is available from the Australian trials, but does not match GAP as only one application was made, while in the chickpea trials, forage was not sampled at the correct PHI. The Meeting therefore did not estimate median and highest residues for pulse forages.

Cereals forages and fodders

Residue data for sorghum and wheat forage, barley and wheat hay, wheat straw and sorghum stover were received. The Meeting determined that the trials did not match the Canadian GAP, and maximum residue levels and median and highest residues were not estimated.

Fate of residues during processing

The Meeting received a processing study for wheat. STMR-P values were estimated for wheat grain processed commodities using the cereal grains STMR value of 0.01 mg/kg estimated by the 2008 Meeting based on rotational crop data (see table below).

A processing study for orange processing into juice was considering by the 2010 Meeting (see table below).

Processing Factors for Chlorantraniliprole from the Processing of Raw Agricultural Commodities (RACs)

RAC	Processed Commodity	Best Estimate Processing Factor	RAC MRL	RAC STMR	Processed Commodity STMR-P/median residue
Wheat	Aspirated Grain Fractions	33	0.02	0.01	0.34
	Bran	1.04			0.011
	Flour	0.38			0.004
	Middlings	0.28			0.003
	Shorts	0.7			0.007
	Germ	1.13			0.011
Oranges	Juice	0.17	0.7	0.22	0.037

Animal commodities

The Meeting recalculated the livestock dietary based on the uses considered by the current Meeting and by the 2008, 2010 and 2013 Meetings on the basis of diets listed in the FAO Manual Appendix IX (OECD Feedstuff Table).

The maximum dietary burdens are 36.1 ppm for beef cattle and 29.0 ppm for dairy cattle, while the mean dietary burdens are 17.4 ppm for beef cattle and 13.6 ppm for dairy cattle. These values have changed only marginally from those calculated by the 2013 Meeting (beef cattle maximum/mean of 31.7/15.7 ppm, and dairy cattle maximum/mean of 26.8/13.1 ppm). The maximum and mean dietary burdens for poultry were unchanged from those previously calculated.

The Meeting confirmed its previous recommendations for maximum residue levels and STMR values for meat from mammals other than marine mammals, milks, edible offal (mammalian), poultry meat, poultry, edible offal of, and eggs.

The Meeting noted that maximum residue levels have not previously been estimated for mammalian fats and poultry fats.

The Meeting noted that the 2010 Meeting estimated a maximum residue level of 0.2 mg/kg for meat (from mammals other than marine mammals) of 0.2 mg/kg (fat), together with STMR values of 0.049 mg/kg in fat and 0.009 mg/kg in muscle. The dietary burden has not changed significantly since. The Meeting estimated a maximum residue level of 0.2 mg/kg for mammalian fats (except milk fats), together with an STMR of 0.049 mg/kg.

The Meeting noted that the 2013 Meeting estimated a maximum residue level of 0.01* mg/kg (fat) and an STMR of 0 for poultry meat. The dietary burden has not changed significantly. The Meeting estimated a maximum residue level of 0.01* mg/kg for poultry fats, together with an STMR of 0.

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 assessment.

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

The residue is fat soluble

The Meeting estimated the maximum residue levels and STMR values shown below.

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg
CCN	Name	New	Previous	
FC 0001	Citrus Fruits	0.7	0.5	0.06
	Citrus fruit juice	-	-	0.037
MF 0100	Mammalian fats (except milk fats)	0.2	-	0.049
PF 0111	Poultry fats	0.01*	-	0
VD0541	Soya bean (dry)	0.05	-	0.01
CF 0654	Wheat bran, processed	-	-	0.011
CF 1211	Wheat flour	-	-	0.004
CF 1210	Wheat germ	-	-	0.012

Commodity		MRL, mg/kg	Highest residue, mg/kg	Median residue, mg/kg	Comments
CCN	Name				
-	Wheat aspirated grain fractions	-	-	0.34	Feedstuff
-	Wheat middlings	-	-	0.003	Feedstuff
-	Wheat shorts	-	-	0.007	Feedstuff

DIETARY RISK ASSESSMENT

Long-term intake

The evaluation of chlorantraniliprole has resulted in recommendations for MRLs and STMRs for raw and processed commodities. The International Estimated Daily Intakes for the 17 GEMS/Food cluster diets, based on STMRs estimated by this Meeting and the 2008, 2010 and 2013 Meetings were in the range 0-1 % of the maximum ADI of 2 mg/kg bw (Annex 3).

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

Short-term intake

The 2008 JMPR decided that an ARfD was unnecessary and concluded that the short-term intake of residues of chlorantraniliprole is unlikely to present a public health concern.

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Code	Authors	Year	Title, Institute, Report reference
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IR-4 A10204	Dorschner, K	2012b	Chlorantraniliprole: Magnitude of the residue on green onion (fresh and dried) and dill seed. IR-4 Project, Princeton, New Jersey, USA. DuPont Report No IR-4 A10204. Unpublished.
DuPont-33763	Litzow, D	2013	Determination of chlorantraniliprole residues in pulse crops following foliar application of Altacor, Australia, 2011/2012. Agrisearch Services Pty Ltd, Orange, New South Wales, Australia. DuPont Report No DuPont-33763. Unpublished.
1004574	Piriyadarsini, JR	2010	Studies on the residues of chlorantraniliprole 20% SC w/v in Bengal gram (*Cicer arietinum* L) and Soil (Multi-Location Study). International Institute of Biotechnology and Toxicology (IIBAT). Dupont Report No. II BAT 1004574. Unpublished.
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