Country, Year	Application				PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha	kg ai/hl			
		2	0.5		73	<0.1	

BF Bean forage; LB Lima beans
FB French beans; SB Snap beans
FBP Processed French beans; WB White beans
KB Kidney beans; W Water
(G) Glasshouse application
* Not registered for this use; ** Aerial application
[1] Mean of four replicates

Peas. Residues in fresh and dried peas are shown in Table 34. Information on the portion of the commodity analysed (peas or peas plus pods) was available only from The Netherlands.

Table 34. Residues of iprodione in peas.

Country, Year	Application				PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha	kg ai/hl			
Fresh peas							
France	Kidan*	1	0.5	0.1	25	0.1	39
1982		1	0.75	0.15	25	0.13	
		2	0.5	0.1	18	0.16	
		2	0.75	0.15	18	0.48	
		2	0.5	0.1	10	0.28	
		2	0.75	0.15	10	0.39	
		2	0.75		14	0.2	190
1987		2	0.52		30	0.1	198
		2	0.52		32	0.1	
1991	Rovral Aqua Flo	3	1.5		7	<0.05	211
Belgium 1988	Quintal IC	2	0.7		63	2.2	228
Netherlands	Rovral Aqua Flo	3	0.75		3	0.53**	197
1987		3	0.75		3	0.71**	
Dried peas							
France 1986	Calidan	2	0.52		33	0.05	192

Calidan = Quintal IC : Iprodione 175 g/l + carbendazim 87.5 g/l
* Not registered for this use in France
** Peas + pods

Root and tuber vegetables

Carrots, post-harvest treatment. Residues of iprodione were determined in stored carrots treated at three sites in The Netherlands (Table 35).

Table 35. Residues of iprodione in carrots, post-harvest treatment (Netherlands, 1983 and 1985).

Year	Application				Storage period, days	Residue, mg/kg	Ref.
	Form	No	g ai/t	kg ai/hl			
1983	Rovral Flo	1*	8		126	7.4	8
1985	Rovral Flo	1*	15		0	2.8	
					63	3.5	
					130	3.0	
		1*	30		0	4.5	
					63	7.9	
					130	6.7	
		1*	61		0	13	
					63	14	
					130	8.7	
1985	Rovral	1*	15		0	3.4	
	Flo				53	3.3	
					120	3.6	
		1*	30		0	4.5	
					53	4.2	
					120	8.0	
		1*	61		0	9.3	
					53	8.0	
					120	7.6	

* Post-harvest spray treatment

Carrots, pre-harvest treatment. Rovral WP50 was applied to carrot plots in the USA (1985) at two rates, 1.13 and 2.25 kg ai/ha. Eight or thirteen applications were made, starting with the onset of early leaf and continuing weekly until maturity. The last foliar spray was made on the day of harvest. For this study, a total of ten trials were conducted in Arizona (1), California (3), Florida (1), Michigan (1), New Jersey (1), Oregon (1) and Texas (2). The trials covered the various market seasons and agricultural practices. Additional data from one trial (Netherlands, 1993) were reported by The Netherlands (PHI 30-37 days). Spain reported two additional trials from New Zealand. Table 36 shows the results from all the trials.

Table 36. Residues of iprodione in carrots. Pre-harvest treatment.

Country, Year	Application	PHI, days	Residue, mg/kg (No. of samples)	Ref.

	Form	No	kg ai/ha	kg ai/hl			
USA	Rovral WP 50	8	1.3		0	0.49-3.1 (9)	60
1984		8	2.3		0	0.77-7.2 (8)	
		13	1.3		0	1.3	
		13	2.3		0	2.2	
Netherlands	Rovral WP 50	7	0.75	0.075	30	1.4	8
1981					37	1.2	
New Zealand	EC	3	0.5		19	0.16, 0.23	9
1983	250 g/l*	3	0.75		19	0.30, 0.33	

* Not registered for this use in New Zealand

Radishes. Results of two supervised trials at two locations in The Netherlands using Rovral WP 50 as a pre-harvest treatment are summarized in Table 37.

Table 37. Residues of iprodione in radishes (Netherlands, 1978).

Application				PHI, days	Residue, mg/kg	Ref.
Form	No	kg ai/ha	kg ai/hl			
Rovral WP 50	1	2.0	0.33	21	0.2	8
					0.25	
					0.35	
	1	2.0	0.2	12	2.0	
					1.8	
					2.2	

Potatoes. Residues of iprodione applied as either Rovral WP50 or Calidan have been measured in potatoes. After treatment of tubers at planting or spraying of plants, residues in the tubers at harvest were all less than 0.05 mg/kg (Table 38).

Seed potatoes. Residues of iprodione in potato tubers following post-harvest treatment with Rhapsodie at three sites in The Netherlands and of seed potatoes in the UK and France are shown in Table 39.

Table 38. Residues of iprodione in potatoes (USA).

Year	Application			PHI, days	Residue, mg/kg, in tubers	Ref.
	Form	No	kg ai/ha			
1985	Rovral WP 50	4F	1.1	6	<0.05	76
				12	<0.05	
				14	<0.05	
				30	<0.05	
		4F	2.2	6	<0.05	76
				12	<0.05	
				14	<0.05	
				30	<0.05	
1986		4F	5.5	14	0.17	64
1986		4F	11	14	0.32	64
1984		2	0.5	48	<0.05	73
				89	<0.05	

F Foliar spray

Table 39. Residues of iprodione in seed potatoes.

Country, Year	Application				Storage period or PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/t	kg ai/hl			
UK 1978	Rovral WP 50	1P	0.04-0.1		91-123	pulp <0.02 whole<0.02	25
France 1982	Calidan	1D		0.21	136	<0.05	40
1982		1D		0.21	169	0.05	
		1M		0.7	136	<0.05	
		1M		0.7	169	0.1	
1976	Rovral WP 50	1D*		0.2-0.3	162	culls <0.01 pulp <0.01	40
		1M*	0.05-0.1		162	culls <0.01 pulp <0.01	40
		1D**		0.2	34-70	peel 27 pulp 0.4 tuber 3.0	40
		1D**	0.2		34-70	peel 27 pulp 0.27 tuber 5.0	40
		1S**	0.05		34-70	peel 160 pulp 0.5 tuber 25	229
		1S**	0.05		34-70	peel 100 pulp 0.5 tuber 25	229
		1S**	0.1		34-70	peel 340 pulp 1.0 tuber 58	229
		1S**	0.1		34-70	peel 205 pulp 2.2 tuber 67	229
		1S**	0.15		34-70	peel 320 pulp 1.5 tuber 120	229

Country, Year	Application				Storage period or PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/t	kg ai/hl			
		1S**	0.15		34-70	peel 330 pulp 3.2 tuber 140	229
Netherlands	Rhapsodie 350 g/l	1	0.07		5	28	48
1987***		1	0.07		56	27	
		1	0.09		56	35	
		1	0.1		105	3.2	232
1990***		1	0.1		0	0.55, 16	210
					91	2.0	
					92	9.6	
					97	2.9, 8.4	

D* Dipping before planting
D** Dipping during storage
D Dipping at planting
M* Misting before planting
M Misting at planting
P Pre-planting treatment
S** Spraying during storage
SI Sprinkler irrigation system
*** treatment for storage

Sugar beet. Sugar beet was grown from seed treated with Rovral WP50 at a rate of 1.5 g iprodione/kg seed at three sites in the UK. Roots and tops from sugar beet harvested 22 or 26 weeks after drilling contained less than 0.1 mg/kg iprodione.

In France residues 42 days after the last of two foliar treatments with Sumistar were less than 0.05 mg/kg in the roots. The tops contained 0.8 mg/kg (Table 40).

Table 40. Residues of iprodione in sugar beet.

Country, Year	Application			PHI, days	Residue, mg/kg	Ref.
	Form	No	g ai/kg seed			
UK 1986	Rovral WP	1	1.5	154	R <0.1 T <0.1	185
		1	1.5	154	R <0.1 T <0.1	
		1	1.5	182	R <0.1 T <0.1	
France 1988	Sumistar*	2	0.4 kg ai/ha	42	R <0.05 T 0.81	200

R Roots
T Tops
* Not registered for this use in France

Swedes and turnips. The data are from trials in the UK at 3 sites (Table 41).

Table 41. Residues of iprodione in swedes and turnips (UK).

Year	Application			PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha			
1985*	Rovral Flo	3	0.5	28	roots ≤0.1 leaves 2.6	183
				28	roots ≤0.1 leaves 2.9	
1986*		3	0.5	28	roots ≤0.1 leaves 1.2	184
1984**	Rovral Flo	3	0.5	28	≤0.1	187
1985**		3	0.5	21	roots 0.7 leaves 32	183
		3	0.5	26	roots <0.1 leaves 1.8	

* Swedes ** Turnips

Stem vegetables

Celery. Trials in the USA with Rovral WP50 applied as a directed spray at weekly intervals from planting to harvest yielded the residues shown in Table 42.

Table 42. Residues of iprodione in celery (USA, 1984).

Application			PHI, days	Residue, mg/kg (No. of samples)	Ref.
Form	No	kg ai/ha			
Rovral WP 50	11	1.1	0	8.7	65
	11	1.1	0	8.7	
	12	1.1	0	17	
	13	1.1	0	6.2-48 (4)	
	11	2.2	0	20, 25	
	12	2.2	0	31	
	13	2.2	0	7.5-69 (4)	

Cumin seed. Results of one trial reported by The Netherlands are summarized in Table 43.

Table 43. Residues of iprodione in cumin seed (Netherlands, 1985).

Application				PHI, days	Residue, mg/kg	Ref.
Form	No	kg ai/ha	kg ai/hl			
Rovral Flo	2	0.5	0.125	55	1.5	8

Application				PHI, days	Residue, mg/kg	Ref.
Form	No	kg ai/ha	kg ai/hl			
				55	1.9	

Cereal grains

Barley and oats. Results from Germany and the UK are summarized in Table 44. In some trials iprodione was used as a seed dressing (Rovral TS).

Table 44. Residues of iprodione in barley and oats.

Country, Year	Application			PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha			
Barley						
UK 1981	Rovral Flo	2	0.5	65	G 0.19, 0.3	181
1981/82		3	0.5	52	G 0.56, 0.6	180
		3	0.5	64	G <0.1, 0.2 S 0.63, 0.8	
1987		3	0.5	41	G 1.3, 1.5 S 3.0	2
		3	0.5	49	G 0.6, 0.8 S 1.5, 1.8	
		3	0.5	51	G 0.4 S 1.4, 2.3	
1986	Sirocco	3	0.5	51	G <0.1 S 1.5, 2.2	1
		3	0.5	44	G 0.14	
					S 3.8, 5.5	
Germany 1980	Rovral TS *, **	1	53 g/100 kg seed	310	G ≤0.05 S ≤0.05	118
1979		1	53 g/100 kg seed	121	G ≤0.05 S ≤0.05	110
		1	70 g/100 kg seed	121	G ≤0.05 S ≤0.05	110
		1	53 g/100 kg seed	125	E ≤0.1 S ≤0.1	
		1	70 g/100 kg seed	302	G <0.1 S 0.12	110
Oats						
Germany 1979	Rovral TS *, **	1	70 g/100 kg seed	150	G 0.1 S ≤0.05	110

G Grain E Ear * Seed dressing
S Straw ** Not registered in Germany.

Wheat. Results of trials in The Netherlands (1986) after one foliar treatment of wheat at one site and in the UK after 3 treatments with Rovral Flo or Sirocco are summarized in Table 45. In Germany

residues in grain and associated straw samples from wheat grown after seed dressing with Rovral TS did not exceed 0.1 mg/kg.

Table 45. Residues of iprodione in wheat.

Country, Year	Application			PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha			
Netherlands 1986	Sumidione*	1	0.4		G 0.09 S4.6	236
UK 1981	Rovral Flo	3	0.5	57	G <0.1, 0.1	180
1981/82		3	0.5	74	G <0.1 S 3.3, 3.9	180
		3	0.5	67	G <0.1 S 1.8, 4.7	180
		3	0.5	68	G 0.1	180
1987		3	0.5	42	G <0.1	2
				59	G <0.1	
				81	G 0.1	
1986	Sirocco*	3	0.5	50	G <0.1	1
				53	G <0.1	
Germany 1980	Rovral TS**	1	70 g/100 kg seed	307	G ≤0.01 S <0.05	118
		1	70 g/100 kg seed	336	G <0.1 S <0.05	
1979		1	53 g/100 kg seed	305	G <0.1 S <0.1	110
		1	70 g/100 kg seed	305	G <0.1 S <0.1	

G Grain * Not registered
S Straw ** Seed dressing

Rice. Residues of iprodione in grain and straw from rice treated with Rovral WP50 are shown in Table 46.

Table 46. Residues of iprodione in rice.

Country, Year	Application				PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha	kg ai/hl			
Japan 1975	Rovral WP 50	1	1.2	0.1	14	G* 0.1 S 16	94, 255
					21	G* 0.1 S 15	
		1	1.2	0.1	28	G* 0.1 S 10	
		3	1.2	0.1	21	G* 2.2 S 45	
		3	1.2	0.1	22	G+ 0.79 S 49	
		3	1.2	0.1	30	G* 1.5 S 32	
		4	1.2	0.1	22	G+ 1.9	

Country, Year	Application				PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha	kg ai/hl			
						S 44	
		1	1.2	0.1	15	G+ 0.31 S 32	
					22	G+ 0.37 S 13	
						G* S	59
USA	Rovral WP 50	2	0.5		32	1.2 3.6	
1985		2	0.5		32	0.74 1.0	
Arkansas		2	0.5		33	7.1 7.5	
Louisiana		2	0.5		34	1.4 2.8	
Mississippi		2	0.5		35	2.0 2.5	
Texas		2	0.5		36	2.5 9.7	
		2	0.5		38	0.55 1.6	
		2	0.5		42	0.2 2.3	
		2	0.5		43	0.2 0.74	
		2	0.5		43	2.5 4.6	
		2	0.5		58	0.66 0.5	
		2	1.1		35	3.6 4.1	
		2	0.5		28	0.51	51
		2	0.5		28	0.59	
		2	0.5		28	0.54	
					47	0.09	
		2	0.5		28	0.92	
					47	0.89	
1985		2	0.5		35	G* 2.0 PR 0.14 H 8.9 B 5.2 S 2.5	59
		2	1.1		35	G* 3.6 PR 0.42 H 18 B 5.8 S 4.1	59
1982		2	1.1		40	H/S 9.9 S 36 H 6.2 M 8.3 B 4.5 BR 0.78 PR 0.26	230
Italy 1986	Rovral WP 50	1	100 g/100 kg		107	<0.05	234

B Bran-polish. Bran with a small amount of kernel
BR Brown rice (kernel with bran). There is 1-4% bran in rice grain
G+ Grain decorticated, not polished rice
G* Grain, unpolished rice
H/S Head/stalks
H Hulls
PR Polished rice
M Millfeed: Hull with a small amount of kernel
S Straw

Maize. In Italy maize grain was treated before sowing by dusting with Rovral WP50, at a rate of 100 g/100 kg seed. At harvest, 236 days after treatment, grain grown from the seeds contained less than 0.05 mg iprodione/kg (limit of detection).

In the USA maize grain was treated with Rovral WP50 at rates of 5, 10 and 20 mg/kg before

being placed in a storage silo. Table 47 shows the residues in grain during 84 days of storage.

Table 47. Residues of iprodione in maize.

Country, Year	Application			PHI, days	Residue, mg/kg	Ref.
	Form	No	g ai/100 kg seed			
Italy 1986	Rovral WP 50	1+	100	236	<0.05	235
USA 1986	Rovral WP 50*	1^	0.5	0	6.2	66
				28	4.8	
				56	4.3	
				84	3.6	
		1^	1.0	0	8.9	66
				28	8.6	
				56	4.6	
				84	4.9	
		1^	2.0	0	17	66
				28	19	
				56	10	
				84	14	

^ Before storage
+ Before sowing
* Not yet registered for this use in the USA.

Tree nuts

Almonds. Almond orchards in California were treated four times with Rovral WP50 at 0.5 kg ai/ha. In one trial the last spray was at 1.1 instead of 0.5 kg ai/ha. The interval between the last application and harvest ranged from 132 to 144 days. The results are summarized in Table 48.

Table 48. Residues of iprodione in almonds (USA, 1984).

Application			PHI, days	Residue, mg/kg	Ref.
Form	No	kg ai/ha			
Rovral WP 50	4	0.5	139	Hulls 1.1	72
	4	0.5	144	Hulls 1.2	
	4	0.5	144	Hulls 0.6	
	4	0.5+1.1	132	Hulls 1.3	
	4	0.5	139	Nut <0.05	
	4	0.5	144	Nut <0.05	
	4	0.5	144	Nut <0.05	
	4	0.5+1.1	132	Nut 0.18	

Oilseed

Rape. Residues of iprodione in oil-seed rape treated with iprodione as either a 255 g/l SC or a 50% WP are shown in Table 49.

Table 49. Residues of iprodione, and carbendazim where applicable, in rape seed and straw.

Country, Year	Application				PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha	kg ai/hl			
Canada 1977	Rovral WP 50	1	1.0		59	seed <0.1	24
1980		1	0.5		40	seed <0.1	
		1	0.5		50	seed <0.1	161
France 1980	Rovral WP 50	2	0.75	0.15	48	seed <0.02	116
1981		1	0.75	0.15	77	seed <0.1	119
		1	0.75	0.16	87	seed <0.1	
		1	0.75	2.5	45	seed 0.15	
		1	0.38	0.075	64	seed <0.1	
1981	Kidan SC	1	0.75	0.15	77	seed <0.1	
		1	0.75	0.16	87	seed <0.1	
		1	0.38	0.075	64	seed <0.1	
1982		1	0.5	0.13	43	seed 0.13	37
		1	0.75	0.18	43	seed 0.13	37
1985	Calidan SC	1	0.61i 0.30c	0.20i 0.1c	61	seed 0.16i <0.05c	62
		1	0.54i 0.27c	0.11i 0.05c	60	seed 0.09i 0.09c	
		1	0.43i 0.21c	0.13i 0.06c	77	seed <0.02i <0.05c	
		1	0.52i 0.26c	0.1i 0.05c	63	seed 0.03i <0.05c	
Germany 1980	Rovral WP 50	3	0.75		43	seed <0.02	116
		3	0.75		55	seed <0.02 straw <0.05	
		2	0.75		77	seed <0.1 straw <0.1	
		2	0.75		95	seed <0.1 straw <0.1	
		1	0.75		298	seed <0.1 straw <0.1	
		2	0.75		67	seed <0.02 straw 0.55	
		2	0.75		70	seed <0.02 straw <0.05	
		3	0.75		72	seed 0.04 straw 0.1	
1981		2	0.5 + 0.75	0.083 + 0.13	73	seed <0.01	122
		1	0.75	0.13	73	seed 0.025	
		1	0.75	0.13	80	seed ≤0.02	
		1	0.75	0.13	66	seed ≤0.02	
		1	0.75	0.13	69	seed ≤0.02	
1981	Rovral Flo	1	0.75	0.13	73	seed 0.025	122
	SC	1	0.75	0.13	80	seed ≤0.02	

Country, Year	Application				PHI, days	Residue, mg/kg	Ref.
	Form	No	kg ai/ha	kg ai/hl			
		1	0.75	0.13	92	seed ≤0.02 straw 0.2	
		1	0.75	0.13	66	seed ≤0.02 straw 0.2	
Germany	SC 255 g/l	1	0.75	0.13	48	pods <0.05	7
1983					55	pods <0.05	
					62	pods <0.05	
					82	seed <0.01	
	SC 255 g/l	1	0.75	0.19	78	seed <0.01	
	SC 255 g/l	1	0.75	0.13	56	pods <0.05	
					74	seed <0.01	
	SC 255 g/l	1	0.75	0.19	75	seed <0.01	
Netherlands 1983	Rovral Flo SC	1	0.5	0.17	17	seed 0.27	8
UK 1981	Rovral Flo	1	0.5		39	seed 0.43	162
	SC	1	0.5		41	seed <0.1, 0.13	
		1	0.5		40	seed 0.19, 0.24	
		2	0.5		20	seed 0.20, 0.41	
1982		2	0.5		22	seed 0.12, 0.16	174
		2	0.5		22	seed 0.12, 0.14	
USA 1989	Rovral 2F SC	2	1.1		57	seed <0.05, 0.32	54
	or 4F SC	2	1.1		50	seed 0.25, 0.32	
		2	1.1		52	seed 0.13, 0.21	
		2	1.1		59	seed <0.05	
		2	1.1		56	seed <0.05, 0.25	
		2	1.1		48	seed 0.34, 0.77	

i iprodione c carbendazim

Sunflower. Table 50 shows the results of trials in France (registered) and Italy (not registered).

Table 50. Residues of iprodione in sunflower.

Country, Year	Application	PHI, days	Residue, mg/kg	Ref.

	Form	No	kg ai/ha	kg ai/hl			
France	Calidan	2	0.7		75	<0.04	151
1986		3	0.7		70	0.06	
		2	0.7		85	<0.04	
1990	Sumistar	2	0.4		61	Seed 0.11 Oil <0.05 Cake <0.05	222
1990		2	0.4		61	S 0.36 O <0.05 C <0.05	222
1991		2	0.4		98	S <0.05	223
		2	0.4		90	S <0.05	
		2	0.4		114	S <0.05	
		2	0.4		101	S <0.05	
Italy 1986	Rovral	2	0.75		41	S 0.07	233
	WP 50*	1	150 g/100 kg seed		133	S <0.05	

Coffee. In two trials during 1981/82 at one site in Brazil plants were treated four times with Rovral WP50 at 0.5 or 1 kg ai/ha. The seed contained 0.8 and 0.9 mg/kg iprodione after 35 days (ref. 191).

Animal transfer studies

Cows. Dairy cattle were treated once daily for 29 days with iprodione at levels corresponding to 5, 15, 50 and 200 ppm in the feed; the cows (3 per group) were slaughtered on the morning of the 29th day. Milk samples collected on treatment days 8, 17 and 28 were analyzed for iprodione and its non-hydroxylated and hydroxylated metabolites. Tissue samples (muscle, kidney, liver and fat) collected at slaughter were analyzed for iprodione and its non-hydroxylated metabolites.

The total residue of iprodione and its metabolites in the milk and tissues of the cattle increased in proportion to the level fed, reaching a plateau level by day 7. At 5 ppm there were no detectable levels of iprodione or its metabolites in the milk (<0.01 mg/kg) or tissues (<0.05 mg/kg) except a single value of 0.05 mg/kg in kidney (Craig *et al*., 1982 (ref. 265); see Tables 51 and 52). The kidneys contained the highest residue levels. The residues in the liver, kidney and fat were roughly proportional to the feeding level; the muscle values were too low for reliable comparison.

Table 51. Total residues of iprodione and its metabolites in bovine milk.

Feeding level, ppm	Cow	Total residues (mg/kg expressed as iprodione) at treatment day and time 8 am	8 pm	17 am	17 pm	28 am	28 pm
200	1	0.34	0.31	0.39	0.29	0.3	0.33
	2	0.31	0.38	0.29	0.32	0.25	0.26
	3	0.28	0.32	0.25	0.33	0.27	0.29
50	4	0.096	0.2	0.089	0.17	0.073	0.14
	5	0.041	0.064	0.026	0.043	0.042	0.104
	6	0.52	0.044	0.031	0.104	0.068	0.11
15	7	0.022	0.099	0.017	0.019	0.023	0.02
	8	0.018	0.018	0.016	0.025	0.016	0.019
	9	0.024	0.029	0.018	0.027	0.022	0.035
5	10	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	11	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
	12	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01

Table 52. Total residues of iprodione and its non-hydroxylated metabolites in bovine tissues.

Feeding level, ppm	Cow	Total residues (mg/kg expressed as iprodione) in Muscle	Kidney	Fat	Liver

200	1	0.13, 0.06	2.2, 1.7	0.5, 0.52	1.9, 1,95
	2	0.1, <0.05	2.4, 2.1	0.44, 0.45	1.2, 1.2
	3	0.07, 0.06	2.2, 2.9	0.4, 0.46	1.2, 1,4
50	4	0.07, 0.06	0.8, 0.76	0.21, 0.18	0.66,0.58
	5	<0.05,<0.05	0.58, 0.8	0.13, 0.13	0.42,0.44
	6	<0.05,<0.05	0.36, 0.45	0.09, 0.12	0.43,0.34
15	7	<0.05	0.08	<0.05	0.13
	8	<0.05	0.06	<0.05	0.08
	9	<0.05	0.16	0.05	0.13
5	10	<0.05	<0.05	<0.05	<0.05
	11	<0.05	<0.05	<0.05	<0.05
	12	<0.05	0.05	<0.05	<0.05

Hens. A study by Wargo and Guardigli (1983, ref. 266) was conducted to determine the residue levels of iprodione and its metabolites in the tissues and eggs of laying hens fed with three levels of iprodione.

Three groups of hens were dosed by capsule for 28 days at levels corresponding to 2, 20 and 100 ppm in the diet or 0.15, 1.5 and 7.5 mg/kg bw. Tissues were collected at slaughter and eggs were collected every third day and on the last three days during the treatment period and on every third day during withdrawal.

The mean residues in eggs at the plateau levels reached after day 7 of treatment were 0.1 mg/kg, 0.64 mg/kg and 1.9 mg/kg and had decreased to non-detectable levels (<0.01 mg/kg) by day 9 of withdrawal at the 2 and 20 ppm feeding levels and day 12 in the 100 ppm group. The residues in liver, muscle, kidney and fat at the 2 ppm feeding level on the 28th day of feeding were 0.53, <0.05, 0.29 and 0.15 mg/kg respectively and had decreased to non-detectable levels (<0.05 mg/kg) by day 14 of withdrawal in all three groups. At the highest dosage level of 100 ppm in the diet, the maximum residues in liver, muscle, kidney, fat and eggs were 9.13 mg/kg, 1.3 mg/kg, 6.46 mg/kg, 5.66 mg/kg and 1.9 mg/kg, after 28 days feeding.

FATE OF RESIDUES

Nomenclature of metabolites

Code	Chemical name
RP25040	3-(3,5-dichlorophenyl)hydantoin
RP30228	*N*-(3,5-dichlorophenyl)-3-isopropyl-2,4-dioxoimidazolidine-1-carboxamide
RP32490	3-(3,5-dichlorophenyl)-2,4-dioxoimidazolidine-1-carboxamide
RP32596	3,5-dichloroaniline
RP36112	*N*-(3,5-dichlorophenyl)-2,4-dioxoimidazolidine-1-carboxamide
RP36114	1-(3,5-dichloro-4-hydroxyphenyl)biuret
RP36115	1-(3,5-dichlorophenyl)biuret
RP36221	1-(3,5-dichlorophenyl)-5-isopropylbiuret
RP44160	3-(3,5-dichlorophenylcarbamoyl)ureidoacetic acid
RP44247	3,5-dichlorophenylurea

In animals

The metabolism of iprodione in goats, dairy cows and chickens is extensive and follows a similar qualitative pathway. Excretion into urine and faeces is extensive and rapid.

The major pathway from iprodione leads through RP30228 via hydrolysis and rearrangement to a major metabolite RP36112. Other hydrolysis reactions lead to 3,5-dichlorophenylurea (RP44247) as one of the major metabolites.

Iprodione does not accumulate in the milk or tissues of these animals.

In general, residues of iprodione and its metabolites increase linearly in the tissues and milk of dairy cattle and in the tissues and eggs of chickens and bobwhite quail fed increasing amounts of iprodione in their diets. However, withdrawal of the iprodione from the diet leads to the decrease of the residues in milk, eggs and tissues, indicating that neither iprodione nor its metabolites accumulate in dairy cattle or avian species fed the parent compound.

Dairy cows. Wilkes and Herrera (1981, ref. 267) showed that iprodione is excreted rapidly and extensively in cows. Two cows were dosed orally with [U-^{14}C]phenyl-labelled iprodione at a daily rate of approximately 2 mg/kg bw, which corresponds to approximately 60 ppm in the daily feed. One cow received a single dose; the other received multiple doses over a period of 5 days. Excretion was monitored daily and became insignificant 7 days after the last dose, at which time the cow was slaughtered. Liver, kidney, muscle, fat, heart and blood were collected from each carcase. Urine, faeces and milk were collected throughout the treatment and withdrawal periods.

The fate of iprodione in the lactating cow was characterized by extensive urinary and faecal excretion. From 41.6 to 47% and from 27.4 to 45.9% of the total dose was found in the urine and faeces, respectively, over the entire dosing period.

A maximum of 0.3% of the dose was recovered in milk, where the total residue expressed as iprodione peaked at 0.17 mg/kg (single dose) and at 0.43 mg/kg (multiple doses). The depletion of the milk residue level during withdrawal was rapid; the residue decreased to half of the maximum within 36 hours.

Of the total dose, only an estimated 0.7% (single dose) and 0.3% (multiple doses) were retained in tissues. With the exception of the liver, none of the analyzed tissues contained more than 0.05 mg/kg total residue expressed as iprodione; 0.003 mg/kg was found in muscle. The liver contained higher residue levels (0.13 mg/kg from the single dose; 0.45 mg/kg from multiple doses).

It can be concluded that there is no significant accumulation of residues of iprodione or its metabolites in the tissues or milk. The major metabolites (> 10% of the total ^{14}C residue) in urine and milk were RP36114 and RP32490. In faeces, iprodione and RP36114 were the predominant compounds.

A supplementary study was conducted to demonstrate the stability of residues of iprodione in milk and animal tissue samples stored at <0°C for 13 to 22 months. Iprodione and its

hydroxylated and non-hydroxylated metabolites remained stable in milk, and iprodione and its non-hydroxylated metabolites remained stable in liver, during prolonged freezer storage.

Lactating goats. In this study (Wilkes and Herrera, 1982, ref. 268; Piznik and Wargo, 1983b, ref. 259) a goat was dosed orally for five days with [U-^{14}C]phenyl-labelled iprodione at a daily rate of approximately 2 mg/kg body weight, which corresponded to approximately 200 ppm in the daily feed. Slaughter was 4 hours after the final dose. Liver, kidney, muscle, fat and blood were collected from the carcase. Urine, faeces and milk were collected throughout the treatment period. Total ^{14}C residue levels were determined in urine, faeces, milk and tissues. Samples of tissue and urine were extracted and the extracts analyzed by thin-layer chromatography to identify the metabolites.

Iprodione is excreted rapidly and metabolized extensively in lactating goats, with no significant accumulation of residues of iprodione or its metabolites in tissues or milk. The major compounds (>10% of the total ^{14}C residue) found in the goat were RP36114, RP32490, RP36115, 3,5-dichloro-4-hydroxyphenylurea and iprodione itself. The metabolism is similar to that in other ruminant and avian species.

The fate of iprodione in the lactating goat was primarily characterized by extensive urinary and faecal excretion within 7 hours of dosing. The urine and faeces contained 50.7% and 8.7% of the total dose of [^{14}C]iprodione respectively.

Only 0.3% of the total dose was recovered in the milk, where the total residue expressed as iprodione reached a maximum of 1.5 mg/kg after 4 days of dosing. Of the total dose, an estimated 4% was retained in the tissues. The liver contained the highest level of ^{14}C (7 mg/kg as iprodione).

Laying hens. Fifteen hens were dosed orally with [^{14}C]iprodione for 15 consecutive days at a daily rate equivalent to approximately 10 ppm in the feed which corresponds to approximately 0.7 mg/kg body weight. Five of the hens were slaughtered at each of the following intervals after the last dose: 2 hours, 3 days, and 7 days. Liver, kidney, heart, gizzard, breast muscle, thigh muscle, fat, skin, and blood were collected from each carcase. Eggs and excreta were collected throughout the treatment and withdrawal periods. Total ^{14}C residues were determined in all samples. Samples of liver, kidney, muscle, fat, egg and excreta were extracted and the extracts analyzed by thin-layer chromatography to identify the metabolites (Wilkes *et al*., 1982, ref. 264).

Iprodione is excreted rapidly and extensively in laying hens, with no significant build-up of residues of iprodione or its metabolites in chicken tissues or eggs. The major metabolites of iprodione in chickens were RP32490, RP36112, RP36115, RP36114, unknown Y and unknown Z.

Most of the iprodione was excreted: 85% of the administered dose was recovered from the excreta. The ^{14}C residue levels in the eggs and tissues were very low. When a plateau was reached after 10 days of dosing, the eggs contained approximately 0.6 mg/kg expressed as iprodione. Of the tissues, the liver contained the highest ^{14}C residue (3 mg/kg iprodione equivalents 2 hours after the last dose). The residue levels in the eggs and tissues decreased rapidly during the 7-day withdrawal period.

Figure 1: Metabolic pathways of iprodione in plants.

In plants

Several studies carried out on plants with ^{14}C-labelled iprodione showed that the chemical is not systemic by foliar application, which is the normal method of treatment, and that root uptake is a minor route of absorption (Prost, 1992b). The parent compound is generally the main component of the total residue resulting from foliar application. Metabolites (and especially RP30228) account for a significant proportion of the total residue in some plants such as lettuce and rice (straw).

Wheat and strawberries. From a study by Gouot *et al*. (1977, ref. 269), after foliar applications of [U-^{14}C]phenyl-labelled iprodione in a greenhouse the half-life of the parent compound ranged from 30 to 60 days. The principal compounds isolated were iprodione itself, its isomer (RP30228) and a desisopropylated metabolite (RP32490).

Peaches. Peaches were obtained from a field experiment in which [U-^{14}C]phenyl-labelled iprodione was sprayed at a rate equivalent to 1.1 kg ai/ha. Three applications were made: at pink bud, petal fall and pre-harvest stages (i.e. 93, 72 and 8 days before harvest, respectively).

Almost all (95%) of the total radioactive residue found in or on mature peaches was identified as unchanged iprodione. Again, the isomer of iprodione (RP30228) and the desisopropyl compound (RP32490) were found in small but detectable amounts (Gereck *et al.*, 1981, ref. 270).

Lettuce. Iprodione was applied to young lettuce under glasshouse conditions six weeks after sowing by foliar spraying, at a dose of 750 mg ai/l. Thirty-eight days after treatment, the ^{14}C compounds in the aerial portion of the plant consisted mainly of the parent compound (81% of the total radioactivity), with some RP30228 (9%) and a small amount of RP32490 (Gouot *et al*., 1981, ref. 271).

All these metabolism studies demonstrate the same metabolic pathway.

Rice. Outdoor rice plots were treated twice with iprodione in a wettable powder formulation at a rate equivalent to 1.1 kg ai/ha, once at the "booting" stage and once at the "heading" stage (Piznik and Wargo, 1983, ref. 230). The results from this study were similar to those reported above and the residues in all the samples analyzed consisted mainly of the parent compound iprodione and its isomer RP30228. Small amounts of the desisopropyl analogue RP32490 and its isomer RP36112 were also found, as well as minor amounts of a product of further metabolism RP25040 (3-(3,5-dichlorophenyl)hydantoin).

Figure 1 above shows the metabolic pathways of iprodione in plants.

In soil

Iprodione is not persistent in the soil. It is converted rapidly into its isomer RP30228, which is the most abundant degradation compound, and several minor products including RP36221, 3,5-dichloroaniline (RP32596), bound residues, and CO_2 which was found to be the ultimate product of degradation.

3,5-Dichloroaniline has been identified in traces (3% maximum) with a very short half-life (15 days maximum), so no build-up would occur in soil.

The half-life of iprodione depends on several factors including the temperature and pH of the soil. Values at 25°C under aerobic or anaerobic conditions range from 20 to 80 days in most cases (20 to 60% of the applied compound is bound to the soil within 3 to 4 months), and 90% degradation times are in the range 100 to 320 days under the same conditions. In some cases light has been shown to accelerate the degradation process.

Accumulation does not occur after intensive use of iprodione, as demonstrated by many field trials: they showed that there was a progressive increase in the rate of degradation of iprodione with successive treatments (Prost, 1992b).

In storage and processing

Blackcurrant juice. In the UK blackcurrant bushes were treated five times with Rovral WP50 at four sites during 1981 at a rate of 0.75 kg ai/ha. Blackcurrants harvested between 6 and 9 days after the last application contained between 2.6 and 5.4 mg iprodione/kg. Juice obtained from the treated fruit contained between 0.25 and 0.37 mg iprodione/l.

At one site in 1979, blackcurrants treated five times with Rovral Flo at a rate of 1.5 kg ai/ha and harvested 7 days after the last application contained 2 mg/kg iprodione, whilst the associated juice contained 0.74 mg/l.

In 1981, blackcurrants treated 4 times at a rate of 0.75 kg ai/ha at two sites and harvested 7 days after the final application contained between 8.7 and 16 mg/kg iprodione. Juice prepared from the treated fruit contained between 1.1 and 1.4 mg/l (see Table 53).

Table 53. Residues of iprodione in black currants and their juice in the UK.

Year	Form	Application No	kg ai/ha	kg ai/hl	PHI, days	Residue mg/kg: Fruit	Juice	Ref.
1974	Rovral WP 50*	4	1.1	0.05	62	3.9		125
		4	1.1	0.05	62	4.6		
1979	Rovral WP 50*	5	0.75		7	6.1		30
		5	0.75		7	5.9		
		5	0.75		7	1.9		
		5	0.75		7	3.7		
		5	1.5		7	1.5	0.61	155
1981	Rovral WP 50*	5	0.75		6	2.9	0.37	165
		5	0.75		7	4.8	0.27	
		5	0.75		7	2.6	0.25	
		5	0.75		9	3.2	0.36	
1979	Rovral Flo*	5	1.5		7	2.0	0.74	155
1981	Rovral Flo*	4	0.75		7	14	1.4	164
		4	0.75		7	8.7	1.1	

* Not registered for this use in the UK.

Hops and beer. In Germany, hops were treated with Rovral WP50 at the rate of 0.75 to 1.3 kg ai/ha and residues of iprodione were determined in the hops and beer brewed with them. Data summarized in Table 54 show that the highest residue in beer was 0.05 mg/kg (Laurent and Chabassol, 1980, 1981, refs. 260, 261).

Table 54. Residues of iprodione in hops and beer in Germany.

Year	Form	Application No	kg ai/ha	kg ai/hl	PHI, days	Residue, mg/kg	Ref.
1979	Rovral WP 50**	2	0.75	0.037	7	hops 41	248
		+	1.2	0.037	14	23	
					21	26	
					28	25	
					28	beer 0.05	
1980		2	1.3	0.037	21	hops* 11	248
						beer 0.025	
		2	1.1	0.037	22	hops* 12	
						beer 0.025	

* Dried cones
** Not registered for this use in Germany.

Grape fractions: juice, pomace and raisins. (Residues in wine and spirits are discussed in the 1977 monograph). In the USA (Chow *et al*., 1982, ref. 262), Rovral WP50 was applied to grape vines at eleven test sites located in California (6), New York (3), Ohio (1) and Pennsylvania (1) at a rate of 1.1 kg ai/ha. Generally, each site received 4 treatments: two before bunch closing and two more before harvest. All tests were small-scale except two in California where commercial ground equipment was used. Grapes, pomace, juice and raisins were analysed for iprodione and its metabolites RP 30228 and RP 32490. Residues in juice were generally lower than in grapes. Results are summarized in Table 55.

Grapes. There is a striking difference in the residue picture between the large- and small-plot trials: about one week after the last application, the iprodione residues ranged from 16 to 49 mg/kg (mean 32 mg/kg) in the small plots but the corresponding residues from the two large plots were 1.02 and 1.7 mg/kg.

Iprodione decline data from the three New York trials show only a slight decrease in iprodione during the first week after the last application, followed by a more pronounced decline towards the end of the test period.

Pomace. As with grapes, iprodione constituted the greatest proportion of the residue. In the small-scale trials, the iprodione content in or on pomace ranged from 6.8 to 39 mg/kg in those samples taken 7 or 8 days after the last application. The iprodione residues from the large plots were 0.74 and 1.5 mg/kg. Generally, the iprodione residues in pomace were higher than in the corresponding fresh grape samples.

The detection of iprodione residues in the untreated control samples indicates that there was a contamination problem, possibly occurring during processing.

Juice. The iprodione residues in juice made from the grapes taken one week after the last application ranged from 3.9 to 19 mg/kg in the small-scale trials but were lower in juice from the two large-scale sites (*c*. 2 mg/kg). As with the pomace, contamination of the untreated samples was noted.

Raisins. In raisins prepared from the fresh grapes, excluding the large trial plots, iprodione residues ranged from 43 to 130 mg/kg. The residues in or on samples from the large plots were 5.3

and 9.6 mg/kg. The iprodione content in raisins was higher than in the corresponding grapes owing to the drying of the grapes.

Table 55. Residues of iprodione, RP 32490 and RP 30228 in grapes, pomace, juice and raisins (USA, 1981). Rovral WP 50, 4 applications of 1.1 kg ai/ha, 7/8 day PHI (reference 248).

Commodity	Residue, mg/kg		
	iprodione	RP 32490	RP 30228
grapes	16-49(mean 32)* 1.02, 1.7**	<0.05-1.9	0.06-0.47
pomace	6.8-39* 0.74, 1.48**	2.9 (maximum)	0.51 (maximum)
juice	3.9-19* 2**	0.58 (maximum)	0.07 (maximum)
raisins	43-130* 5.3, 3.7**	1.8 (maximum)	3.7 (maximum)

* small plots ** large plots

Tomato fractions. Iprodione residue trials on tomatoes were conducted in the USA on small plots sprayed with Rovral WP50. The rates were 1.1 kg ai/ha, the maximum use rate, and 2.2 kg ai/ha. Five applications were made at weekly or bi-weekly intervals, the last being on the day of harvest. Random representative fruits were picked from each treatment of each plot for residue analysis, and a processing study was conducted to obtain samples of wet pomace, dry pomace, juice and ketchup. Table 56 shows the results.

Residues in the various fractions were in the order dry pomace > wet pomace > ketchup > puree = juice. Residue levels in wet pomace and dry pomace were respectively about 5 times and 21 times those in the whole tomatoes. In the other fractions (juice, puree and ketchup) residue levels were lower than in the whole fruit.

Table 56. Residues of iprodione in tomato processed fractions (USA, 1986).

Form	Application No	kg ai/ha	kg ai/hl	Residue, PHI, days	mg/kg	Reference
Rovral WP 50	5	1.1		0	WP 1.5 DP 5.1 J 0.12 P 0.08 K 0.16 F 0.22,1.6	68
Rovral WP 50	5	2.2		0	WP 1.4 DP 8.7 J 0.17 P 0.29 K 0.59 F 0.46,2.8	

WP Wet pomace J Juice F Fruit
DP Dry pomace P Puree K Ketchup

Processed potatoes: chips, flakes, granules. In the USA, plants were sprayed initially with Rovral WP50 at approximately row closing at the rates of 1.1 and 2.2 kg ai/ha. Three additional sprays were made at approximately two-week intervals with the last spray 14 days before harvest. In some cases the pre-harvest interval was shorter or longer than the targeted 14 days. The trials were on autumn, spring and summer crops. At harvest representative, random samples of commercial tubers

and culls were collected from each treatment for residue analysis. In addition to the tubers and culls, potatoes from two trials were used to prepare potato flakes and chips (residues were <0.05 mg/kg).

No finite residues were found in potato chips or granules (<0.05 mg/kg; USA, 1986, reference 64) after treating potatoes with 4 x 11.0 kg ai/ha. In potato flakes 0.16 mg/kg was found in the sample treated at the high rate while no residues were detected in the low-rate sample. No residues (<0.05 mg/kg) were found in the stock feed (potato peels) from the granule processing after treatment at either rate. The stock feed from the flake and the chip processing contained respectively 0.32 and 0.27 mg/kg iprodione after treatments at 5.5 kg ai/ha and 0.1 and 0.69 mg/kg from those at 11 kg ai/ha. The concentration factor for the residues from the whole potato to the peel varied from about 0.3 to 2.

Analyses have also been carried out in the UK to show the effects of cooking on residues of iprodione in potatoes treated post-harvest with an aqueous flowable formulation containing 500 g/l iprodione, at a rate of 100 g ai/tonne. Samples were removed from the farm store approximately one month after treatment.

Raw, washed potatoes contained 13 mg/kg iprodione. It was found that in boiled and chipped potatoes iprodione levels were reduced to 0.57 and 1.7 mg/kg respectively, while in oven-baked and microwaved potatoes the residues were 12 and 15 mg/kg respectively. Results are summarized in Table 57.

Table 57. Residues of iprodione in processed potatoes.

Country year	Form	Application No	kg ai/ha	PHI, days		Residue mg/kg	Ref.
USA 1985	Rovral WP 50	4	1.1	6	T	<0.05	76
				12		<0.05	
				14		<0.05 (11)	
				14		<0.05 (2)	
				30		<0.05 (2)	
				6	C	<0.05	
				12		0.08	
				14		<0.05 (11)	
				14		0.09, 0.11	
				30		<0.05 (2)	
1985		4	2.2	6	T	<0.05	76
				12		<0.05	
				14		<0.05 (9)	
				14		<0.05 (4)	
				30		<0.05 (2)	
				6	C	<0.05	
				12		<0.05	
				14		<0.05 (9)	
				14		0.05-0.1 (4)	
				30		<0.05 (2)	
1985		4	1.1	14	T	<0.05	76
					FL	<0.05	
					CH	<0.05	
		4	2.2	15	T	<0.05	
					FL	<0.05	
					CH	<0.05	
1986		4	5.5	14	T	0.17	64
					FL	<0.05	
					CH	<0.05	
					SC	0.27	
					SF	0.32	
					SG	<0.05	
					GR	<0.05	
		4	11.0	14	T	0.32	64
					FL	0.16	
					CH	<0.05	

						SC 0.69 SF 0.10 SG <0.05 GR <0.05	
UK 1990/91	Rovral Aqua Flo	1	0.1 kgai/t	30	tuber,raw 13.0 tuber, boiled 0.5 tuber, baked 12.0 tuber, fried 1.7 tuber,microwaved 15.0		257

T	Tubers	SC	Stock feed from chip processing
C	Culls	SF	Stock feed from flake processing
FL	Flakes	SG	Stock feed from granule processing
CH	Chips	GR	Granules

Cereal fractions, flour and bread. In the USA, maize grain was treated with Rovral WP50 at rates of 2 and 4 kg ai/t before being placed in a storage silo.

Table 58 shows the residues in the grain after storage up to 84 days and in the grits, meal, flour, crude oil and refined oil from dry and wet milling operations. The residues in grits, flour, meal and oil (crude and refined) were lower than in the grain, demonstrating that the residues were not concentrated by processing. A reduction in the residue of over 100-fold was observed from crude to refined oil.

Table 58. Residues of iprodione in processed fractions of maize (USA, 1986).

Application				Ref.
Form	No	g ai/ 100 kg	Residue, mg/kg	
Rovral WP 50	1	2	grain 18 grits 1.9 flour 14 meal 9.9 crude oil 10.4 refined oil 0.06 starch 10.4	66
	1	4	grain 44 grits 4.0 flour 35 meal 24 crude oil 11 refined oil 0.06 starch 24	66

In the UK, flour from wheat treated three times with iprodione at a rate of 0.5 kg ai/ha and harvested between 5 and 47 days after the last application contained 0.14-0.73 mg/kg iprodione, whilst the corresponding bread samples contained <0.1-0.45 mg/kg. Flour from wheat treated four times with iprodione at a rate of 0.5 kg ai/ha and harvested on the day of the last application contained 0.63-1.1 mg/kg iprodione and the corresponding bread 0.30-0.48 mg/kg (Brockelsby *et al*., 1987, ref. 263; see Table 59).

Table 59. Residues of iprodione in wheat flour and bread (UK, 1986).

Form	Application No	kg ai/ha	PHI, days	Residue, mg/kg	Ref.
Sirocco	3	0.5	47	flour 0.21,0.22 bread 0.13,0.14	248
	3	0.5	9	flour 0.14,0.20 bread <0.1,0.12	
	3	0.5	5	flour 0.39,0.73 bread 0.29,0.45	
Sirocco Rovral Flo	4	0.5	0	flour 0.66,0.85 bread 0.33,0.37	248
	4	0.5	0	flour 0.63,1 bread 0.30,0.38	
	4	0.5	0	flour 0.88,1.1 bread 0.47,0.48	

Peanut processed fractions. Rovral WP50 was applied to peanut trial plots in the major peanut-producing areas of the USA in 1983 and 1984. Three foliar applications were made to the plants at 1.1 or 2.2 kg ai/ha per application. Residues in hay, hulls, nut-meat and processed fractions are shown in Table 60.

Hay. Iprodione accounted for the greatest part of the residues. The highest residue of iprodione after 11 days was 65 mg/kg.

Hulls contained residues up to 5.2 mg/kg of iprodione.

Nut-meat. No residues (<0.05 mg/kg) were present in any of the 1983 samples, but residues of 0.21 and 0.27 mg/kg iprodione from the low and high application rates respectively were found in the 1984 samples owing to contamination from the hulls during commercial shelling of the peanuts.

Processed fractions. In the 1984 trials 0.54 and 0.67 mg/kg of iprodione were found in the screw-press crude oil but none in the solvent-extracted crude oil, refined oil or peanut meal. The residues in the screw-press oil were caused by surface contamination from the hulls during their commercial separation from the nut-meat. Soapstock contained residues of 1.3 and 2.6 mg/kg iprodione.

Table 60. Residues of iprodione in processed fractions of peanuts (USA, ref. 248).

Year	Application				Residue,
	Form	No	kg ai/ha	kg ai/hl	PHI, days	mg/kg (No. of samples)
1983	Rovral WP 50	3	1.1			hay
					0	28-147 (3)
					3	57
					4	16- 77 (3)
					5	56
					9	90
					11	25 -65 (3)
						hulls
					0	0.57-5.2 (3)
					3	0.39
					4	1.2-5.2 (3)
					5	0.67
					9	0.61
					11	0.26-1.1 (3)
						nut-meat
					0-11	<0.05 (12)
1984		3	1.1		4	hulls 2.3
					4	nut-meat 0.21
					4	SPCO 0.54
					4	SECE <0.05
					4	refined oil<0.05
					4	soapstock 1.3
		3	2.2		4	hulls 4.3
					4	nut-meat 0.27
					4	SPCO 0.67
					4	SECE <0.05
					4	R. oil <0.05
					4	soapstock 2.6
					4	peanut meal<0.05

SPCO screw-press crude oil SECE solvent-extracted crude oil
R.oil refined oil

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

The results of enforcement analyses by the Governmental Food Inspection Services in The Netherlands in 1987-1991 were brought to the attention of the Meeting.

In 1991 65 commodities were analysed (1058 samples). Residues above the MRLs were found in only a few samples in eight commodities (see Table 61).

Table 61. Enforcement analyses for iprodione of the Governmental Food Inspection Services in The Netherlands (1991).

Commodity	No. of samples		
	Analysed	<MRL	>MRL
scarole	144	142	2
kiwifruit	29	28	1
lettuce, head incl. cos lettuce	246	244	2
nectarine	8	6	2
sugar pea (young pods)	2	1	1
leek	8	7	1
turnip tops, incl. rucola	19	15	4
corn salad	27	26	1

The results of enforcement analyses in 1987-1990 are summarized in Table 62.

Table 62. Results of enforcement analyses for iprodione in The Netherlands, 1987-1990.

Commodity	No.*	Mean	Std. dev.	Median	Min.	Max.	95% max.
Currants, Black, Red, White	32	1.171	1.793	0.5	0.05	8.1	5.6
Strawberry	398	1.163	1.984	0.5	0.01	22	4
Scarole	493	0.841	2.875	0.22	0.01	41.5	3
Apple	33	0.602	0.671	0.5	0.02	3.1	1.6
Egg plant	35	0.419	0.653	0.07	0.02	2.95	2.2
Celery, blanched	57	0.368	0.772	0.1	0.01	3.54	2.56
Kale	5	0.338	0.472	0.14	0.08	1.18	1.18
Beans (runner/snap/slicing)	79	0.159	0.422	0.07	0.01	3.7	0.56
Blackberries	22	1.073	0.982	0.905	0.05	4.4	2.5
Broccoli	23	0.24	0.264	0.1	0.03	1	0.75
Chinese cabbage, amsoi, choisum and paksoi	33	0.328	0.424	0.14	0.02	1.7	1.32
Grapes	41	0.463	0.564	0.28	0.02	2.5	1.7
Raspberries	12	1.086	1.315	0.55	0.05	4.6	4.6
Crisphead lettuce	48	0.185	0.235	0.1	0.02	1.3	0.5
Cherries	7	0.911	0.928	0.683	0.11	2.72	2.72
Kiwifruit	27	0.805	1.056	0.43	0.01	5	2.4
Celeriac	5	0.614	0.512	0.62	0.1	1.35	1.35
Fennel, bulb	27	1.979	3.592	0.5	0.03	15.5	11.8
Cucumber	23	0.095	0.201	0.04	0.01	1	0.14
Lettuce, Head incl. cos lettuce	1351	0.72	1.982	0.27	0.01	42	2.9
Lettuce, Leaf	43	0.663	1.363	0.21	0.03	8.1	2.1
Melons, except watermelon	10	0.063	0.076	0.04	0.003	0.27	0.27
Other agricultural crops	6	0.772	1.258	0.21	0.09	3.3	3.3
Other vegetables	40	1.179	1.887	0.33	0.02	9	4.5
Other agricultural and horticultural crops	33	0.241	0.516	0.07	0.01	2.6	1.54
Sweet and chilli peppers	148	0.346	0.762	0.08	0.01	4.99	2.1
Peach	14	0.241	0.222	0.22	0.01	0.64	0.64
Parsley, root parsley	23	0.832	1.155	0.3	0.1	4.23	3.35
Winter squash, courgette and patisson	9	0.201	0.113	0.23	0.04	0.4	0.4
Purslane	6	1.303	1.512	0.785	0.21	4.18	4.18
Leek	24	0.521	0.496	0.38	0.02	1.8	1.8
Plums, inc. prunes	10	0.197	0.153	0.195	0.03	0.57	0.57
Turnip, tops inc. rucola	60	5.308	7.594	2.24	0.05	30.6	29
Rhubarb	8	0.34	0.28	0.33	0.04	0.75	0.75
Radish	226	0.289	0.629	0.1	0.01	5	1.3
Radish, Black	10	0.274	0.608	0.075	0.04	2	2
Celery leaves	59	1.544	4.613	0.2	0.03	27.8	7
Leaf lettuce	17	0.355	0.652	0.11	0.05	2.6	2.6
Spinach	65	0.74	1.433	0.2	0.02	9.5	2.6
Cabbage, pointed	5	0.258	0.183	0.19	0.1	0.5	0.5
Brussels sprouts	49	0.788	1.467	0.1	0.02	6	4
Tomato	21	0.172	0.16	0.14	0.01	0.55	0.52
Corn salad	208	2.77	3.916	1.425	0.02	28	8.54
Fennel	7	0.624	1.144	0.16	0.1	3.2	3.2

Commodity	No.*	Mean	Std. dev.	Median	Min.	Max.	95% max.
Winter carrot	16	0.368	0.325	0.215	0.03	1.2	1.2
Witloof chicory (sprouts)	73	0.394	0.861	0.09	0.02	4.8	2.6
Carrot	65	0.915	1.34	0.3	0.01	5.28	3.63

* Only the numbers of samples with residues were reported

METHODS OF RESIDUE ANALYSIS

General method for plant substrates. Analytical methods for determining residues in plant substrates are specific for the parent compound iprodione and when needed (as in the USA) for its metabolites RP30288 (isomer of iprodione) and RP32490 (desisopropylated metabolite). Determination is by GLC with an EC detector after solvent extraction of the substrate and clean-up by Florisil column chromatography. The limit of determination in most crop and animal samples is between 0.01 and 0.1 mg/kg (Prost, 1992d).

NATIONAL MAXIMUM RESIDUE LIMITS

The following national MRLs were reported to the Meeting.

Country	Commodity	MRL,mg/kg
Argentina	Grapes	1
	Lettuce	0.5
	Strawberries	0.5
Australia	Beans	0.2
	Berry fruit	12
	Celery	2
	Grapes	20
	Kiwifruit	10
	Lettuce	5
	Lupin seed	0.1
	Meat	0.1
	Milk and milk products	0.1
	Passion fruit	10
	Peanut	0.05
	Peanut forage (green)	20
	Pome fruits	3
	Potato	0.05
	Soya bean (dry)	0.05
	Soya bean forage (green)	5
	Stone fruits	10
	Tomato	2
Belgium	Banana	5
	Carrot	2
	Citrus	5
	Corn salad	10
	Grapes	10
	Oilseed rape	0.2
	Other commodities of plant origin	0.05
	Potatoes	0.5
	Shallot	5
	Stone fruit	5
	Strawberries	10
	Vegetables	5
	Witloof (leaves)	1
Brazil	Carrots	0.02
	Coffee	0.8
	Cotton	0.1
	Garlic	0.1
	Grapes	1
	Lettuce	1
	Onion	0.01
	Peaches	5
	Potatoes	0.02
	Strawberries	1
	Sugar cane	2.5
	Sweet pepper	4

Country	Commodity	MRL,mg/kg
	Tomatoes	4
	Wheat	0.3
Canada	Beans	0.3
	Cherries	5
	Cucumber	0.5
	Ginseng	0.1*
	Grapes	10
	Kiwifruit	0.5
	Onion	0.1*
	Peach	5
	Strawberry	5
	Tomato	0.5
Denmark	Berries and small fruits	10
	Cabbage	10
	Leafy vegetables	10
	Other vegetables	5
	Pome fruits	10
	Potato	5
	Stone fruits	10
Finland	Boysenberry	10
	Kiwifruit	10
	Other small fruits and berries	5
	Vegetables	5
France	Beans, French	5
	Berries, other	7
	Carrots	2
	Cereals, grain	0.05
	Cucumbers	5
	Grapes	10
	Kiwifruit	7
	Lettuce	10
	Onions	2
	Pome fruit	10
	Potato	0.02
	Stone fruit	10
	Strawberry	10
	Tomato	5
	Rape seed	0.5
	Witloof	1
Germany	Cereal grains	0.5
	Cucumber	5
	Grapes	5
	Kiwifruit	5
	Kiwifruit, peeled	0.5
	Lettuce	10
	Oilseed	0.2
	Other commodities of plant origin	0.02
	Peas, field	0.1
	Peppers, Sweet	5
	Plums	3
	Strawberry	10
	Tomato	5

Country	Commodity	MRL,mg/kg
	Witloof chicory (sprouts)	1
Hungary	Apples	3
	Cabbage	0.2
	Grapes	5
	Nuts	0.2
	Pears	3
	Soft fruit	3
	Stone fruit	5
	Strawberries	3
	Sugar beet	0.2
	Sunflower	3
Italy	Apples	3
	Cabbage	0.5
	Egg plant	0.5
	Endive	0.5
	Grapes	5
	Kiwifruit	3
	Lemon	1
	Lettuce	0.5
	Oilseed rape	0.05
	Pears	5
	Pineapple (whole fruit)	5
	Rice	0.5
	Stone fruits	5
	Strawberry	0.5
	Tomato	0.5
Japan	Banana	10
	Beans	1
	Beans (Soya, Broad)	0.2
	Cereals (wheat and barley)	10
	Cherries	10
	Chicory	1
	Citrus	10
	Mango	10
	Melon	10
	Papaya	10
	Pineapple	10
	Potatoes	0.1
	Rice	3
	Sugar beet	1
	Vegetables (incl. Cucumber)	5
	Watermelon	10
Netherlands	Beans (fresh)	1
	Beans (dry)	0.2
	Berries, other	5
	Blackberries	5
	Caraway, seed	2
	Cherries	5
	Corn salad	10
	Carrots (post-harvest)	10
	Currant, black	5
	Currant, red	15

Country	Commodity	MRL,mg/kg
	Garlic	0.1
	Grapes	10
	Kiwifruit	5
	Kohlrabi	5
	Lettuce, leaf	5
	Meat	0.05*
	Milk	0.05*
	Onions	0.1
	Other food commodities	0.05*
	Peaches	10
	Pome fruits	10
	Plums	10
	Prunes	10
	Pulses (dry)	0.2
	Raspberries	5
	Rice	3
	Squash	1
	Strawberries	10
	Vegetables, other	5
New Zealand	Berries	10
	Grapes	10
	Kiwifruit	7
	Stone fruits	10
	Tangelo	2
	Tomato	5
South Africa	Grapes (table, wine)	5
	Onions	0.5
	Peaches	5
	Peaches (canned)	0.05
	Pears	0.05
	Tomato	2
Spain	Banana	5
	Bulb vegetables	1
	Citrus fruits	5
	Grapes	10
	Kiwifruit	5
	Leafy vegetables	10
	Fruiting vegetables	5
	Pineapple	5
	Pome fruits	10
	Root and bulb vegetables	1
	Stone fruits	10
	Strawberry	10
Sweden	Strawberry	10
	Vegetables	5
Switzerland	Asparagus	0.05
	Beans	0.5
	Blackberries	2
	Carrot	2
	Chinese cabbage	1
	Grapes	7
	Kiwifruit	5

Country	Commodity	MRL,mg/kg
	Kiwifruit (peeled)	0.5
	Lettuce	6
	Onions	0.1
	Pome fruits	0.05
	Raspberries	2
	Stone fruits	0.05
	Tomato	6
	Wine	2
United Kingdom	Apples	10
	Bulb vegetables	0.1
	Cabbage	3
	Cucumbers	5
	Common bean	3
	Currants (red, black, white)	5
	Grapes	10
	Lettuce	10
	Nectarines	10
	Onions	0.1
	Peas	3
	Peaches	10
	Pears	10
	Plums	10
	Raspberries	5
	Strawberry	10
	Tomato	5
USA	Almond hulls	2
	Almond nut-meat	0.3
	Apricots	20
	Bean hay, forage	90
	Beans (dry, succulent)	2
	Blackberries	25
	Blueberries	15
	Boysenberries	15
	Broccoli	25
	Carrots	5
	Cherries, sour	20
	Cherries, sweet (pre- and post-harvest)	20
	Currants (import MRL)	15
	Field corn grain (stored)	20
	Garlic	0.1
	Ginseng (dry)	4
	Ginseng (fresh)	2
	Grape pomace	225
	Grapes	60
	Lettuce (head)	25
	Loganberries	25
	Nectarines, peaches	20
	Onions, Bulb	0.5
	Peanut	0.5
	Peanut forage, dry and hay	150
	Peanut hulls	7
	Plums	20

Country	Commodity	MRL,mg/kg
	Potatoes	0.5
	Prunes (fresh)	20
	Raisin waste	300
	Raisins	300
	Raspberries	15
	Rice bran	30
	Rice grain	10
	Rice hulls	50
	Rice straw	20
	Strawberries	15
	Tomatoes	3
	Youngberries	25
Yugoslavia	Apples	3
	Grapes	2
	Strawberries	2

APPRAISAL

Iprodione, used as a fungicide for a variety of crops, was reviewed in the CCPR periodic review programme. It is applied by pre- or post-harvest foliar spray, dipping of plants or roots, and as a seed treatment. It is formulated as WP or SC, and for foliar spraying it is applied between one and five times at a rate of 0.25-1.5 kg ai/ha. In the post-harvest treatment of fruits and vegetables it is used at spray concentrations of 0.075-0.5 kg ai/hl and for seed treatment at rates up to 2.5 g/kg seed. Residue data have been received from supervised trials on citrus, pome and stone fruits, berries, grapes, bananas, kiwifruit, vegetables (brassica, bulb, leafy, legume, root and tuber, stalk and stem vegetables, cucumbers, tomatoes and peppers), cereals, nuts and seeds.

Metabolism studies in plants have shown that iprodione is degraded to *N*-(3,5-dichlorophenyl)-3-isopropyl-2,4-dioxoimidazolidine-1-carboxamide (RP30228), which is the only significant metabolite in certain crops, and also to the desisopropyl derivative (RP32490), a relatively minor metabolite.

The parent compound is generally the main component of the total residue resulting from foliar application. Except in potatoes, certain rice fractions (especially straw) and peanut hay, residues of metabolites are undetectable.

Iprodione is metabolized extensively in goats, chickens and dairy cows. Excretion in urine and faeces is extensive and rapid. Iprodione does not accumulate in the milk, eggs or tissues. Residues of iprodione and its metabolites decrease rapidly when the dose is withdrawn. Metabolism is similar in goats, chickens and dairy cattle.

Iprodione has low water solubility, is not volatile and is expected to dissipate rapidly in water under natural field conditions. Under laboratory conditions it shows no significant degradation at pH 3, a half-life of 20 days at pH 6 and complete degradation in less than 24 hours at pH 9.

Iprodione has low mobility in various soil types and does not accumulate in soil: its half-life generally varies, in the laboratory, between 20 and 80 days. Light has been shown to accelerate degradation under aerobic conditions. Field trials showed that there was a progressive increase in the

rate of degradation with successive treatments.

Processing studies on black currants, grapes, tomatoes, potatoes, maize, wheat, peanuts and hops showed a reduction of the residues in juice, beer, flour and potato flakes and chips, but a concentration in dry pomace and raisins.

Methods of analysis are based on GLC with an EC detector after solvent extraction of the substrate and clean-up by Florisil column chromatography. The limit of determination in most crop and animal samples is between 0.01 and 0.1 mg/kg. The methods determine the parent compound, and the two metabolites if required.

The residue data from supervised trials are on the parent compound only and were evaluated as follows.

Citrus fruits. Data were available from New Zealand, Japan and Israel, but there was no information on GAP. As there were only two trials with dip treatments (0.05-0.075 kg ai/hl, in Italy), the data were also rather limited. No MRL could be recommended.

Pome fruits. Trials on apples with spray treatments in Japan were not in line with GAP. Only three results could be evaluated for pears from spray treatments (Italy, 4-7 treatments, application rate 1.35 kg ai/ha, PHI 20 to 21 days). The residues were 0.51-3.6 mg/kg. These results are not sufficient to recommend an MRL, particularly as according to GAP there should be only 2-3 treatments.

Post-harvest dipping trials (one treatment, 0.05-0.075 kg ai/hl) carried out in France and Italy on apples could be used to estimate a maximum residue level. As there was no decrease in residues during storage, ten results from storage periods between 0 and 222 days could be evaluated (minimum residue 0.61 mg/kg, maximum 2.4 mg/kg). The Meeting agreed to replace the recommendation for apples and pears (10 mg/kg Po), by a recommendation for pome fruits of 5 mg/kg Po.

Apricots. There were only two trials from France, and samples were not taken within the recommended PHI. An MRL could not be recommended.

Cherries. There were five values from Canadian spray trials. There were 6-8 treatments at rates of 0.7-0.875 kg ai/ha with a one-day PHI (residues 1.1-6.5 mg/kg). The Meeting considered the data from cherries and from other stone fruits to be mutually supportive and estimated a maximum residue level of 10 mg/kg for cherries.

Peaches. There were nine values from Canadian trials, based on 2-5 pre-harvest spray treatments at rates of 0.75-1.0 kg ai/ha with a PHI of 0-1 day, similar to Canadian GAP. Residues were 2.2-7.6 mg/kg. In one trial the residues on days 4, 7 and 14 after treatment (9, 10 and 8.5 mg/kg respectively) were higher than on day 0 (7.6 mg/kg). There were no new data on post-harvest treatments. The Meeting estimated a maximum residue level of 10 mg/kg for peaches to replace the previous recommendation (10 mg/kg Po).

Data from France and Australia on nectarines were made available to the Meeting, but there is no GAP in France. A single value from Australia was not sufficient to recommend an MRL.

Plums. Iprodione is registered in France, New Zealand and the USA. For pre-harvest spraying there are 2-3 treatments, a rate of 0.037-0.075 kg ai/hl and a PHI of 0-3 days. There were no residue data from these countries that could be evaluated. Data from South Africa were made available, but there was no GAP. The Meeting agreed to withdraw the recommendation for an MRL for plums (including prunes) of 10 mg/kg.

Gooseberry; Currants, Black, Red, White. The trials on currants and gooseberries carried out in the UK and The Netherlands were not in conformity with GAP, with one exception. The residues considerably exceeded the MRL recommended in 1977, the maximum being 20 mg/kg. The Meeting agreed to recommend withdrawal of the MRL for currants (5 mg/kg).

Blackberries and raspberries. Residue data from four trials on blackberries in the USA in 1986 were provided. The US GAP is included in the GAP for caneberries, which specifies a maximum of 4 applications. Five applications were used in the trials, but this was not regarded as significantly different from 4 in its effect on residues. The residues covered a wide range, from 5.8 to 22 mg/kg, reflecting the typical variation of residues in berry fruits. The Meeting noted that trials in Canada on raspberries with a similar use pattern gave similar residues. The Meeting estimated a maximum residue level of 30 mg/kg for iprodione in blackberries.

In raspberry trials there were four results from the UK which corresponded to GAP: 4-5 treatments, 0.75 kg ai/ha and a PHI of 7 to 8 days. The residues were 0.92-5.4 mg/kg. The Meeting also evaluated Canadian raspberry data (residues 4.6 to 31 mg/kg) according to US GAP and used US blackberry data in support. The Meeting estimated a maximum residue level of 30 mg/kg for raspberries to replace the previous recommendation (5 mg/kg).

Strawberries. There were many results from world-wide strawberry trials. The five US trials with 22 results (minimum residue 0.5 mg/kg, maximum 9.1 mg/kg) were based on 1-5 treatments at 1.1 kg ai/ha with a 0-day PHI. From Belgium there were 4 residues from trials according to GAP (1.9-6.0 mg/kg). In Germany (6 results), residues 10-12 days after the last of 3 treatments at 0.94-1,25 kg ai/ha were lower at 0.13-4.5 mg/kg. The UK provided 7 results from trials according to GAP (0.75 kg ai/ha, 1-day PHI) with residues of 1.9-4.8 mg/kg. There were 6 results from the similar Canadian GAP (1.1 kg ai/ha, 1-day PHI) (minimum residue 0.97 mg/kg, maximum 6 mg/kg) and two results each from New Zealand (3 treatments, 0.7 kg ai/ha, 1-day PHI) and Spain (2-3 treatments, 0.75 kg ai/ha, 3-day PHI) with values from 1.6 to 3.9 mg/kg. The Meeting agreed to maintain the current recommendation of 10 mg/kg for strawberries.

Grapes. Extensive data on grapes were available from France, Chile, Portugal, Spain, Italy, Germany, Morocco, Canada and the USA. The official application rates (mostly 0.75-1.0 kg ai/ha) and number of applications (mostly 3 or 4) were similar from country to country, but the official PHI varied from 0 days (USA) to 28 days (Germany and Italy). Iprodione residues were quite persistent, and sometimes higher at longer intervals than at the official PHI. Numerous residues were in the 1-5 mg/kg range, with three in the 6-10 mg/kg range and three at 10-11 mg/kg. The Meeting agreed to maintain the current recommendation of 10 mg/kg for grapes.

Bananas. In Spain, iprodione is registered as a post-harvest treatment (1 application, 0.03 kg ai/hl, no PHI). Three residue values from trials according to GAP were available (pulp <0.1 mg/kg, peel 4-7 mg/kg, whole fruit 1.7-3.4 mg/kg). Only three values from one country were not sufficient to

recommend an MRL.

Kiwifruit. The suggested MRL is based on 13 values from New Zealand 3-5 applications at 0.75 kg ai/ha and a 1-day PHI (minimum residue 0.28 mg/kg, maximum 4.5 mg/kg). The residues determined in six samples of peeled fruit were between 0.14 and 0.91 mg/kg. The Meeting agreed to maintain the current recommendation of 5 mg/kg for kiwifruit. No GAP was available for post-harvest treatment.

Fennel. The data from one supervised trial were insufficient to recommend an MRL.

Garlic. Data from two trials were available, but their validity could not be confirmed. The Meeting agreed to withdraw the recommendation for garlic (0.1 mg/kg).

Bulb onions. There were six results from Canada (2-5 spray treatments, 0.75-1 kg ai/ha, a 13 to 19-day PHI) which approximated GAP, giving residues of 0.05-0.18 mg/kg. The 5 values from two US trials according to GAP ranged from <0.05 mg/kg to 0.11 mg/kg. The Meeting estimated a maximum residue level of 0.2 mg/kg for onions to replace the previous recommendation (0.1 mg/kg).

Broccoli. Eight values from 4 trials in the USA (1.1 kg ai/ha, 2 treatments) showed iprodione residues between 4.1 and 22 mg/kg. The Meeting estimated a maximum residue level of 25 mg/kg for iprodione in broccoli.

Cauliflower. Trials from Canada could not be evaluated because no Canadian GAP was available. Some French trials were within the application conditions of GAP, but the intervals after treatment were much longer than the official PHI of 15 days. The data could not be used to estimate a maximum residue level.

Head cabbages. Trials from Canada, Germany and the UK were not in conformity with GAP. An MRL could not be recommended.

Chinese cabbage. Trials from Canada, Germany, Denmark and the USA were generally not in accord with GAP. An MRL could not be recommended.

Kohlrabi. There was only one residue value from a treatment according to GAP, from The Netherlands. An MRL could not be recommended.

Cantaloupe. Although there were two trials from France, there was no information on French GAP. An MRL could not be recommended.

Cucumbers. Residue data were available from 7 trials which did not closely reflect GAP. An evaluation of a total of 10 results from France (4 treatments, 0.075 kg ai/hl, a 5-day PHI), the UK (4 treatments, 1.1 kg ai/hl, a 2-day PHI), Denmark (2 to 4 treatments, 0.05 to 0.075 kg ai/hl, PHI 2 to 4 days) and Canada (3 to 9 treatments, 0.05 kg ai/hl, 1-day PHI) showed residues of <0.1-1.8 mg/kg). The Meeting therefore estimated a maximum residue level of 2 mg/kg to replace the previous recommendation (5 mg/kg).

Sweet peppers. Seven US trials based on 8 applications and a 0-day PHI were not in line with GAP (up to 4 treatments, PHI of 3-14 days). The Meeting agreed to withdraw the recommendation for

sweet peppers (5 mg/kg).

Tomatoes. Outdoor trials from the USA could not be evaluated because no US GAP was available. The conditions of application in indoor trials in Denmark, Canada and the UK (1 to 7 treatments, 0.05 kg ai/hl, a 0- or 1-day PHI) approximated GAP, but a total of 6 results was not sufficient to support an MRL for a major crop. The Meeting agreed to withdraw the previous recommendation for tomato (5 mg/kg).

Witloof chicory (sprouts). The MRL of 1 mg/kg for witloof chicory recommended in 1977 has been supported by trials in France (1987-1992). There was a total of 20 results which could be evaluated, with residues of 0.03-1 mg/kg. The Meeting agreed to maintain the current recommendation of 1 mg/kg.

Lettuce, Head and Leaf. Numerous trial results were available from many countries. Data on head lettuce were from six German greenhouse trials based on 3 treatments, 0.5 kg ai/ha and a 21-day PHI, two outdoor UK trials (2-6 treatments, 0.25 kg ai/ha, a 7-day PHI), two trials from The Netherlands (2 applications, 0.75 kg ai/ha, 10-42-day PHI, indoor) and one French trial (3 treatments, 0.75 kg ai/ha, 23-day PHI, indoor). The total of 24 residues from <0.02 to 9.2 mg/kg were within the range of the previous MRL. The Meeting agreed to maintain the current recommendation of 10 mg/kg for head lettuce.

Data from US trials on leaf lettuce (3 treatments, 1.1 kg ai/ha, 14-day PHI) were made available to the Meeting. The 18 residue values ranged from 0.16 to 22 mg/kg. The Meeting estimated a maximum residue level for leaf lettuce of 25 mg/kg.

Dandelions. Iprodione is authorized for use in France, but there was only one residue trial which was not in line with GAP. An MRL could not be recommended.

Common beans (pods and/or immature seeds). Trials on succulent beans (snap and lima beans) from Canada and the USA approximated GAP. Residue data from 4 Canadian trials (1-2 treatments, 0.75 kg ai/ha) and 15 US trials (2 treatments, 1.1 kg ai/ha) were provided. In a total of 19 values residues were from <0.05 to 1.3 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg for common bean (pods and/or immature seeds).

Beans (dry). An evaluation of 14 results from trials in Canada and Japan on white and kidney beans showed that after 14-76 days the residues were lower than 0.1 mg/kg. The Meeting estimated a maximum residue level for dry beans of 0.1 mg/kg to replace the previous recommendation (0.2 mg/kg).

Peas. The description of the analyzed commodity in the submitted trials could not be verified and the data were considered inadequate for the estimation of a maximum residue level.

Carrots. There were two residue trials according to GAP from The Netherlands covering pre-storage treatment (1 post-harvest spray, 30.4 g ai/t). As the residues do not decrease during storage but even increase because of the water loss, residues at days 0, 63 and 130 were considered for evaluation. Residues were 4.1-7.9 mg/kg.

Results from pre-harvest trials using foliar sprays were available from the USA with rates

of application (1.3 to 2.25 kg ai/ha) and numbers of treatments (8 to 13) which were somewhat higher than GAP (4 treatments, 0.56 to 1.12 kg ai/ha). The residues, 0.49-3.1 mg/kg, were substantially below those from the post-harvest treatments. The data were consistent among the various post-harvest trials and the Meeting recommended an MRL of 10 mg/kg. The residues from pre-harvest treatments were lower and would be covered by the proposal for post-harvest treatment.

Radishes. Only three residues from GAP treatments were available, from The Netherlands (1 treatment, 2 kg ai/ha, a 12-day PHI). The residues were 1.8-2.2 mg/kg from a single trial. An MRL could not be recommended.

Potatoes. Four results from US trials after foliar spraying (4 treatments, 1.1 to 2.2 kg ai/ha, 14-day PHI) were in conformity with GAP. The residues in the tubers were below the limit of detection (<0.05 mg/kg). As there were only two trials and potatoes are a major crop no MRL is recommended. Post-harvest uses are registered only for seed potatoes; there is no GAP for the post-harvest treatment of potatoes for consumption.

Sugar beet. Iprodione is an authorized product for seed treatment in France and Greece. After seed treatment in UK trials (1.5 kg ai/tonne of seed), there were no residues above the limit of detection (<0.1 mg/kg). An MRL of 0.1* mg/kg is recommended.

Swedes and turnips. Only one trial from the UK corresponded to GAP. The data are not sufficient to estimate a maximum residue level.

Celery. Iprodione is authorized in Australia, but there were only residue values up to 69 mg/kg from US trials which did not correspond to GAP. An MRL could not be recommended.

Cumin Seed. A single trial was inadequate to recommend an MRL.

Barley. Thirteen residue values from UK trials in accordance with GAP (2-3 treatments, 0.5 kg ai/ha, PHI 41-65 days) were <0.1-1.5 mg/kg. After seed treatment according to German GAP, the residues in the grain were less than 0.05 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg for barley.

Oats. A single trial of a seed treatment was inadequate to recommend an MRL.

Wheat. As with barley, the trials were in the UK (3 treatments, 0.5 kg ai/ha, a PHI of 42 to 74 days). The residues in grain (5 trials, 8 results) were all ≤0.1 mg/kg. The data were considered inadequate to estimate a maximum residue level for a major crop.

Maize. There were trials in Italy and the USA, but as there was no information on GAP an MRL could not be recommended.

Rice. USA GAP for the use of iprodione on rice permits 2 treatments and a rate of 0.56 kg ai/ha, with the last application not later than when the heading is 75% complete. There were 18 results on husked rice after PHIs of 28 to 58 days. Residues were 0.09-7.1 mg/kg. The Meeting estimated a maximum residue level of 10 mg/kg for rice, husked, to replace the previous recommendation (3 mg/kg).

Almonds. USA GAP for the use of iprodione on almonds permits 4 treatments and a rate of 0.56 mg/kg ai/ha, with the last application within 5 weeks from petal fall. Four trials could be evaluated, which showed that the residues were mainly on the hulls. Those in the nuts were <0.1-0.18 mg/kg. The Meeting estimated a maximum residue level of 0.2 mg/kg for almonds. This would be compatible with residues of 2 mg/kg in almond hulls.

Rape, oilseed. Data from UK trials (residues 0.12-0.43 mg/kg from 1 to 2 treatments at 0.5 kg ai/ha with a 21-day PHI) could be used to recommend an MRL. The Meeting estimated a maximum residue level of 0.5 mg/kg for rape seed.

Sunflower seed. The use of iprodione on sunflower is registered in France. There were five values from France (2 to 3 treatments, 0.4 to 0.7 kg ai/ha, PHI 61-85 days) and 1 value from Italy (2 treatments, 0.75 kg ai/ha, 41-day PHI) that could be used. Residues were <0.04-0.36 mg/kg. The Meeting estimated a maximum residue level of 0.5 mg/kg for sunflower seed.

Coffee. Although iprodione was applied to coffee in two trials, there was no information on GAP. The data were insufficient to recommend an MRL.

Milk, cow tissues. Dairy cattle were treated once daily for 29 days with iprodione at levels corresponding to 5, 15, 50 and 200 ppm in the feed. Milk samples were collected on treatment days 8, 17 and 28 and tissue samples at slaughter. At the 5 ppm feeding level there were no detectable residues of iprodione or its metabolites in milk (<0.01 mg/kg) or tissues (<0.05 mg/kg). At the 15 and 50 ppm feeding levels the total residues in milk were 0.026-0.052 mg/l) and in tissues <0.05-0.76 mg/kg. In the absence of detailed information on metabolism the Meeting was unable to recommend MRLs for milk or tissues.

Poultry. Three groups of hens were treated for 28 days by capsule with iprodione at nominal levels of 2, 20 and 100 ppm in the diet or 0.15, 1.5 and 7.5 mg/kg body weight. The total residues in eggs reached a plateau after day 7 of the treatment at 0.1 mg/kg, 0.64 mg/kg and 1.9 mg/kg at the three feeding levels. They had decreased to undetectable levels (<0.01 mg/kg) by day 9 for the 2 and 20 ppm feeding levels and day 12 in the 100 ppm group.

The total residues in liver, muscle, kidney and fat from the 2 ppm feeding level at day 28 were 0.53, <0.05, 0.23 and 0.15 mg/kg respectively, and had decreased to undetectable levels (<0.05 mg/kg) by day 14 of withdrawal at all three feeding levels. In the absence of detailed information on metabolism the Meeting was unable to recommend MRLs for poultry meat or eggs.

Animal feeds. Results of trials on bean fodder and the straw and fodder of cereal grains were available.

Bean forage. Residue data from 13 supervised US trials on snap and Lima bean forage covered a wide range. On the basis of the highest value of 75 mg/kg the Meeting could support a maximum residue level of 100 mg/kg for bean forage (green).

Straw and fodder (dry) of cereal grains. Residue data from supervised trials in the UK on the straw of barley (11 values) and wheat (4 values) were provided. Residues ranged from 0.63 to 5.5 mg/kg. Residues in the grains were of the order of 0.1 mg/kg (wheat) to 1.5 mg/kg (barley). The Meeting agreed the data could support a maximum residue level of 5 mg/kg for the straw and fodder (dry) of

cereal grains.

RECOMMENDATIONS

On the basis of the residue data from supervised trials the Meeting concluded that the residue levels listed in Annex I are suitable for establishing MRLs.

Definition of the residue: iprodione

Commodity		Recommended MRL (mg/kg)		PHI on which based, days
CCN	Name	New	Previous	
TN 0660	Almonds	0.2	-	132-144
FP 0226	Apple	W	10 Po	
GC 0640	Barley	2	-	41-65
VD 0071	Beans (dry)	0.1	0.2	41-76
FB 0264	Blackberries	30	-	0
VB 0400	Broccoli	25	-	0
VR 0577	Carrot	10Po	-	0-130
VP 0562	Common bean (pods &/or immature seeds)	2	-	3-27
FS 0013	Cherries	10	-	1
VC 0424	Cucumber	2	5	1-5
FB 0021	Currants, black, red, white	W	5	
VA 0381	Garlic	W	0.1	
FB 0269	Grapes	10	10	0-30
FI 0341	Kiwifruit	5	5	1
VL 0482	Lettuce, head	10	10	7-42
VL 0483	Lettuce, leaf	25	-	10-14
VA 0385	Onion, bulb	0.2	0.1	7-19
FS 0247	Peach	10	10 Po	0-1
FP 0230	Pear	W	10	
VO 0445	Peppers, sweet	W	5	
FS 0014	Plums (including Prunes)	W	10	

Commodity		Recommended MRL (mg/kg)		PHI on which based, days
CCN	Name	New	Previous	
FP 0009	Pome fruits	5 Po		0-222
SO 0495	Rape seed	0.5	-	21
FB 0272	Raspberries,	30	5	7-8
VR 0596	Sugar beet	0.1*	-	154-182
SO 0702	Sunflower seed	0.5	-	41-85
FB 0275	Strawberry	10	10	0-1
CM 0649	Rice, husked	10	3	28-58
VO 0448	Tomato	W	5	
VS 0469	Witloof chicory (sprouts)	1	1	21-104

Po Post-harvest treatment
* Limit of determination
W Withdrawal

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