CHLOROTHALONIL (081)

EXPLANATION

Chlorothalonil was first evaluated in 1974. Further data were assessed in 1977, 1978, 1979, 1981, 1983, 1985, 1987, 1988 and 1990. The ADI of 0.03 mg/kg was confirmed in 1992.

This evaluation has been prepared as part of the periodic review programme of the CCPR. Information on current GAP and residue trials data have been provided by the manufacturer. A number of countries have also supplied information on GAP.

USE PATTERN

Chlorothalonil is a non-systemic protectant fungicide. Products containing chlorothalonil are used as surface contact fungicides on a range of agricultural and horticultural crops.

Registered uses in various countries are summarized in Table 1, to which the following notes apply (see also the footnotes at the end of Table 1).

1. Crops are listed alphabetically.

2. Only commodities for which data from supervised trials are available are included in the list.

Table 1. Summary of GAP in the use of chlorothalonil in various countries.

Crop	Country	Application			PHI, days
		No.	kg ai/ha	kg ai/hl	
Banana	Australia	-	1.1-2.15	-	1
	USA	-	0.875-1.625	-	0
Barley	Belgium	1	1.0	0.17-0.34	42
	Denmark	1	1.0-1.4	0.33-0.47	(GS 45)[1]
	France	2	1.1	-	-
	Ireland	1-2	0.9-1.35	0.45-0.68	(GS 59)[1]
	Luxembourg	1	1.0	0.17-0.33	42
	UK	1-2	0.9-1.35	0.45-0.68	(GS 59)[1]

Crop	Country	Application			PHI, days
		No.	kg ai/ha	kg ai/hl	
Beans	Australia	-	1-1.5	-	7
	Greece	-	-	0.225	42
	Ireland	2	1.5	-	14
	Italy	-	1.0	-	14
Beans contd.	Spain	-	1.5	0.15	15
	UK	2	1.5	-	14
	USA	4	1.2-2.5	-	7
Broccoli	Australia	-	2.5	-	3
	Canada	-	1.25-2.45	-	7
	UK	2	1.5	-	7
	USA	-	1.7	-	7
Brussels sprouts	Australia	-	2.5	-	3
	Canada	-	1.25-2.15	-	7
	Ireland	-	1.5	-	7
	Netherlands	-	1.5	-	14
	UK	2	1.5	-	7
	USA	-	1.7	-	7
Bulb onion	Australia	-	1.7	-	14
	Denmark	4-5	2.0	0.2-0.7	14
	France	-	1.5	-	-
	Greece	-	-	0.144	10
	Ireland	6	1.0	-	14
	Italy	-	1.5	-	14
	Netherlands	-	1.5	-	14
	Spain	-	1.5	-	15
	UK	6	1.0	-	14
	USA	-	0.8-1.7	-	7
Cabbage	Australia	-	2.5	-	3
	Canada	-	1.25-2.45	-	7
	France	-	1.5	-	-[2]
	Greece	-	1.4	-	10

Crop	Country	Application			PHI, days
		No.	kg ai/ha	kg ai/hl	
	Ireland	2	1.5	-	7
	UK	2	1.5	-	7
	USA	-	1.3	-	7
Carrot	Australia	-	1.3	-	7
	Canada	-	0.8-2.06	-	7
	Spain	-	-	0.12-0.15	15
	USA	-	1.3-1.7	-	0
Cauliflower	Australia	-	2.5	-	3
	Canada	-	1.25-2.45	-	7
	Greece	-	-	0.225	10
	Ireland	-	1.5	-	7
	UK	2	1.5	-	7
	USA	-	1.3	-	7
Celery	Australia	-	1.3	-	2
	Canada	-	0.8-2.06	-	7
	Greece	-	-	0.15	10 outdoors
	Italy	-	1.5	-	14
	Netherlands	-	1.875	-	28
	Spain	-	-	0.125-0.15	15
	UK	-	1.5	0.14-0.15	14
	USA	-	0.8-2.5	-	7
Cherry	Australia	-	2.3	0.12	7
	USA	4	2.6-4.6	-	shuck fall[3]
Cranberry	USA	3	3.4-5.9	-	50
Cucumber	Australia	-	1.8		1
	Canada	-	2.4	-	1
	Denmark	-	1.25 outdoor	0.15 glasshouse	3
	France	-	1.5	-	-
	Ireland	-	1.1	0.11	28
	Italy	-	1.5	-	14
	Netherlands	-	-	0.15	3

Crop	Country	Application			PHI, days
		No.	kg ai/ha	kg ai/hl	
	UK	-	-	0.11	28
	USA	-	1.3-2.5	-	0
Grapes	Australia	-	1.6		7
	France	-	0.4	-	30
	Greece	-	-	0.225	10
Melons	Australia	-	2.5	-	3
	Canada	-	2.4	-	1
	France	-	1-1.6	0.11-0.15	7
	Greece	-		0.15	10
	Italy	-	1.5	-	14
	Netherlands	-	-	0.15	3
	USA	-	1.3-2.5	-	0
Peach	Australia	-	2.3	0.12	7
	Greece	-	1.5	-	14
	Italy	-	1.0	-	21
	Spain	-	1.5	-	15
	USA	4	2.6-4.6	-	shuck fall[3]
Peanut	Australia		1.3		0
	USA		0.8-1.3		14
Potato	Australia	-	1.3	-	-
	Belgium	-	1.1-1.5	0.19-0.36	7
	Canada	-	0.6-1.3	-	1
	Denmark	10	1.25-1.75	0.3-0.4	14
	France	-	1-1.5	0.15-0.44	-
	Greece	-	-	0.15	10
	Ireland	-	1.5	-	7
	Italy	-	1.5	-	14
	Luxembourg	-	1.5	-	7
	Netherlands	-	0.6-2.2	-	3
	Portugal	-	1.5	-	7
	Spain	-	1.5	0.12-0.15	15

Crop	Country	Application			PHI, days
		No.	kg ai/ha	kg ai/hl	
	UK	-	1.5	-	0
Potato cont.	USA	8	0.6-1.3	-	7
Sugar beet	Greece	-	1.5	-	14
Summer & winter squash	Australia	-	1.8	-	1
	Canada	-	2.4	-	1
	Greece	-	-	0.15	10
	USA	-	1.3-2.5	-	0
Sweet corn	USA	-	0.6-1.7	-	14
Tomato	Australia	-	1.7	-	1 outdoors
	Belgium	-	1.4-2	-	3
	Canada	-	2.4	-	1
	France	-	1-1.6	0.11-0.15	7
	Greece	-	-	0.15	10
	Ireland	-	1.1	-	3 glasshouse
	Italy	-	1.5	-	14
	Luxembourg	-	1.5-2	-	3
	Netherlands	2	1.9-3.8	0.15	3
	Portugal	-	-	0.125-0.15	7
	Spain	-	1.5	0.125-0.15	15
	UK	-	1.1	0.11	12 hours
	USA	-	1.2-2.5	-	0

Wheat	Belgium	2	1-1.25	0.17-0.42	42
	Canada (proposed)	1	0.75-1.25	-	30
	Denmark	1	1-1.25	0.33-0.42	30
	France	2-3	1.1-1.2	-	-
	Germany	1	0.7-1.1	0.18-0.28	35-42
	Ireland	1	1.0	-	(GS 59)[1,2]
	Luxembourg	-	1.25	-	42
	Netherlands	2	1.0-1.2	-	42
	Spain	1	1.5	0.15	15
	UK	1	1.0	-	(GS 59)[1]

[1] Zadoks Growth Stage: GS 59 = ear emergence complete
GS 45 = boot swollen
[2] Only used before transplanting
[3] Latest time of treatment

RESIDUES RESULTING FROM SUPERVISED TRIALS

Extensive data were submitted for a range of crops. The trials were carried out in the USA, Australia and Europe.

The residue data are summarized in Tables 2-26.

Table 2 Cherries
Table 3 Peaches
Table 4 Cranberries
Table 5 Grapes
Table 6 Bananas
Table 7 Bulb onions
Table 8 Cabbages
Table 9 Broccoli
Table 10 Brussels sprouts
Table 11 Cauliflower
Table 12 Melons
Table 13 Cucumbers
Table 14 Summer and winter squash, Sweet corn
Table 15 Tomatoes
Table 16 Beans
Table 17 Carrots
Table 18 Potatoes
Table 19 Sugar beet
Table 20 Celery
Table 21 Barley
Table 22 Wheat
Table 23 Oats and Rye
Table 24 Peanuts

In the Tables each location listed in the left hand column represents a different site or site year. Where two or more figures appear in the 'residue' column for a particular location they represent results for separate field samples. Where reports listed replicate analytical results these are represented in the Table by their mean.

Reported residues are not corrected for recovery.

Underlined results in these Tables are those referred to in the text which are from trials where treatment regimes most closely reflected the GAP that was likely to lead to the highest residue.

Several samples were also analysed for 4-hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701, DAC-3701), 3-carboxy-2,5,6-trichlorobenzamide (SDS-46851, DAC-46851), hexachlorobenzene (HCB), and pentachlorobenzonitrile (PCBN). Residues were not found or were very low.

Cherries (Table 2). Residue data were available from a series of trials in the USA, where the maximum permitted application is 4.6 kg ai/ha at shuck fall. Chlorothalonil residues of <0.03-0.52 mg/kg were found where the use was within US GAP.

Table 2. Residues of chlorothalonil in cherries treated with an SC formulation from supervised residue trials in the USA. Last treatments were made at shuck (cot) fall

Crop Location/Year	Application		PHI, days	Residues (mg/kg)	Ref.
	kg ai/ha	No.			
Sweet Cherry Oregon/1981	3.5 4.7	4 4	76 76	0.25,0.27 0.44	1
Tart Cherry Oregon/1981	3.5 4.7	4 4	73 72	0.04, <0.03 0.04	1
Sweet Cherry N York/1981	3.5 4.7	2 2	62 62	0.03, <0.03(2) <0.03 (3)	1
Tart Cherry N York./1981	4.7 5.9	3 3	55 55	0.03 0.03	1
Sweet Cherry Michigan/1982	4.7	4	45	0.52 0.38,0.11	2
Sweet Cherry N York 1982	4.7	5	54	0.06, 0.05, 0.09	2
	9.4	5	54	0.12, 0.22, 0.09	2
Tart Cherry Michigan/1984	3.5	4	50	0.06	3

Underlined results reflect maximum permitted use in the USA.

Peaches (Table 3). In supervised trials from the USA residues in peaches were in the range <0.05-0.12 mg/kg when the treatment regime reflected maximum use within US GAP, which is a last application of 4.6 kg ai/ha at shuck (cot) fall. Residues of 0.57 and 0.98 mg/kg were reported in a trial in Italy under conditions within the official GAP of Spain and Greece (1.5 kg ai/ha and 14-15 days PHI). One of these results (0.98 mg/kg) was reported for a crop treated in accordance with the maximum permitted use in Italy (1.0 kg ai/ha and 21-day PHI).

Table 3. Residues of chlorothalonil in peaches from supervised trials in Italy, Spain and the USA.

Location/ year	Form.	Application		No.	Date of last treatment (day/month)	PHI (days)	Residue (mg/kg)	Ref
		kg ai/ha	kg ai/hl					
Italy, 1990	WP	0.84	0.1	2	-	21	0.18	10
Italy, 1990	WP	1.7 0.82	0.2 0.1	2 3	- -	21 21	0.57 0.14	11 11
Italy, 1990	SC	1.0 2.0	0.04 0.09	4 4	8/7 8/7	21 21	0.98 1.32	12 12
Italy, 1990	WP	1.5	0.1	3	shuck fall (15/4)	64	<0.01(2)	13
Italy, 1990	DG	1.25	0.09	3	shuck fall 15/4	64	<0.01(2)	14

Location/ year	Form.	Application		No.	Date of last treatment (day/month)	PHI (days)	Residue (mg/kg)	Ref
		kg ai/ha	kg ai/hl					
Spain, 1990	WP	2.0 +2.6	0.11 0.15	1	 25/4	 61	 0.16	 15
Spain 1990	WP	2.0 +2.6	0.11 0.15	1	25/4	83	0.01	16
Spain 1990	WP	2.0 +2.6	0.11 0.15	1 1	25/4	155	0.02	17
Spain 1990	SC	0.5 0.75 1.25	- - -	4 4 4	shuck fall (1/4) shuck fall (1/4) shuck fall (1/4)	82 82 82	<0.01 <0.01 <0.01	18 18 18
Spain 1991	SC	0.5 0.75 1.25	- - -	4 4 4	shuck fall (23/3) shuck fall (23./3) shuck fall (23/3)	69 69 69	<0.01 <0.01 0.01	19 19 19
USA, California 1979 USA, California 1979 USA, Oregon 1978/9	SC SC SC 	5.0 9.4 5.0 9.4 5.3 10.5 4.7 9.4 3.5 4.7	- - - - - - - - -- -	2 2 2 2 1 1 2 2 3 3	23/3 23/3 23/3 23/3 4/10 4/10 15/1 15/1 18/4 18/4	136 136 158 158 299 299 197 197 131 131	<0.05(3) <0.05(3) <0.05(3) <0.05(3) <0.05 <0.05 <0.05 <0.05 <0.05 <0.05	4 4 4 4 4 4 4 4 4 4
USA, Washington 1989 USA, Louisiana 1979 USA, Louisiana 1978 USA, California 1980 USA, California 1980 USA, Washington 1980	SC SC SC SC SC SC 	5.9 2.2 3.5 2.2 3.5 0.9 1.4 1.8 9.4 9.4 5.9 11.7	- - - - - - - - - - - -	3 1 1 3 3 12 12 12 2 3 3 3	20/4 16/6 16/6 16/6 6/3 10/3 13/5 13/5	117 81 81 58 58 12 12 12 152 133 89 89	0.90,0.08 0.06 <0.05 <0.05 <0.05 <0.05 0.28 0.76 1.00 <0.03(2), 0.03 <0.03(6) 0.23,0.80 0.37 0.19,0.20 0.28	4 4 4 4 4 4 4 4 5 5 5 5
USA, California 1980	SC 	4.7 9.4	- -	2 2	12/3 12/3	106 106	<0.03(3) <0.03(3)	5 5
USA, California 1980	SC 	4.7 9.4	- -	2 2	5/3 5/3	146 146	<0.03 (4) <0.03(4)	5 5
USA, California 1981	SC 	3.5 4.7 4.7	- - -	1 1 1	26/2 26/2 26/2	183 183 177	<0.03(3) <0.03(3) <0.03(3)	6 6 6
USA, Oregon 1981	SC 	2.7 3.5	- -	5 5	14/4 14/4	147 147	<0.03(2) <0.03(2)	6 6
USA, California 1981	SC 	3.5 4.7	-	4 4	9/3 9/3	139 139	<0.03(3) <0.03(3)	6 6
USA, California 1981	SC 	4.7		1 2 1 3	4/2 4/2 20/2 20/2	149 149 133 133	<0.03 <0.03 <0.03 <0.03	6 6 6 6
USA, Washington 1981	SC 	5.9 11.7	- -	3 3	9/5 9/5	86 86	<0.03, 0.06 0.03 0.14, 0.04,0.09	6 6

Location/ year	Form.	Application		No.	Date of last treatment (day/month)	PHI (days)	Residue (mg/kg)	Ref
		kg ai/ha	kg ai/hl					
USA, California 1983	SC	3.5*	-	3	petal fall (28/2)	100	<0.03	7
USA California 1983	SC	3.5 3.5	- -	5 5	- -	122 122	<0.03 <0.03	7 7
USA Louisiana 1985	SC	2.7 + 7.0	-	2 1	shuck fall (9/4)	84	0.03,0.02	8
USA, Florida 1985	SC	3.0 + 9.1	-	4 1	shuck fall (18/3)	84	0.03(2)	8
USA, N Carolina 1986	SC	1.8 + 4.7	-	4 1	shuck fall (8/4)	91	0.01,0.02	8
USA, Ohio 1987	SC	2.4 2.4 + 4.7 2.4 +4.7	- - -	6 4 +1 5 +1	first cover shuck fall first cover	63 73 63	0.09 0.08 0.16	9 9 9
USA, Virginia 1987	SC	2.4 +4.7 2.4 +4.7	- -	4 +1 3 +1	first cover shuck fall	88 96	0.27 0.12	0 9
USA, Louisiana 1988	SC	2.4 +4.7	-	2 +1	shuck fall	70	0.02	9
USA N Carolina 1987	SC	2.4 +4.7	-	1 +2	shuck fall	113	0.02	9
USA, N Carolina 1987	SC	2.4 +4.7	-	1 +1	shuck fall	84	<0.01	9

Results underlined once reflect maximum permitted use in the USA.
Results underlined twice reflect use within GAP in Spain and Greece; two of these results reflect maximum permitted use in Italy.

Cranberries (Table 4). GAP has only been reported for the USA, where a number of residue trials have been carried out. Although only three trials combined the highest allowed application rate with approximately the minimum PHI, the data base included other relevant trials which used 80% of the maximum rate and the minimum PHI. Residues in mature berries sampled from relevant trials were 0.67-4.1 mg/kg.

Table 4. Residues of chlorothalonil in cranberries in supervised residue trials in the USA. All products used were SCs.

Location, year	Application		PHI, days	Residue (mg/kg)	Reference
	kg ai/ha	No.			
Washington, 1982	2.35 2.35 4.7 4.7	2 2 2 2	56 70 56 70	0.38 0.11 2.9 0.69	20 20 20 20
Washington, 1983	5.9	4	54	4.1	20
N Jersey, 1984	5.9 5.9	3 3	49 49	1.3 0.67	20
Wisconsin, 1988	3.5	3	83	0.12	21
Wisconsin, 1988	3.5	3	91	0.04	21

Location, year	Application		PHI, days	Residue (mg/kg)	Reference
	kg ai/ha	No.			
Massachusetts, 1988	4.6	3	50	0.77	21
Washington, 1985	5.9	3	60	3.67	21

Underlined results are from uses similar to the maximum permitted use in the USA.

Grapes (Table 5). Products containing chlorothalonil are registered for use on grapes in Australia and a number of European countries. Maximum application rates range from 0.4 to 2.2 kg ai/ha and minimum PHIs are between 7 and 30 days. Table 5 includes new data and data previously considered by the 1983 JMPR.

In supervised trials carried out in Australia residues were 0.3-5.6 mg/kg for treatments at 0.11-0.15 kg ai//hl after PHIs of 7-28 days. The maximum permitted use in Australia is 1.6 kg ai/ha (equivalent to 0.16 kg ai/hl) with a PHI of 7 days.

Residue levels were 0.01-0.11 mg/kg in trials carried out in France which reflected the maximum permitted use in France (0.4 kg ai/ha and a PHI of 30 days).

Table 5. Residues of chlorothalonil in grapes from supervised trials in Australia, Canada, France, Germany and South Africa.

Location/year	Form.	Application		No.	PHI, days	Residue, mg/kg	Ref
		kg ai/ha	kg ai/hl				
Australia Hunter Valley 1973/4	WP	-	0.11	7	-1 0 10	3.9 6.1, 7.1 5.6 (8.6)[1]	1983 JMPR
	WP	-	0.22	7	-1 0 10	6.8 10.7 8.7 (13.4)[1]	1983 JMPR
S. Australia 1973/4	WP	-	0.13	6	1 7 18 26	1.4 0.6 1.6 (2.9)[1] 0.6, 0.3	1983 JMPR
S. Australia 1973/4	WP	-	0.26	6	1 7 18 26	2.3 3.1 2.7 (4.9)[1] 0.8	1983 JMPR
N. Australia 1991/2	SC	-	0.15 0.15 0.15	7 5 3	28 77 113	0.6 0.04 <0.01	22
Australia Hunter Valley 1990/1	SC		0.15	7 6 4	15 30 66	1.4 0.50 0.20	23
Australia Langhorne Creek 1991	SC	-	0.15 0.15 0.15	6 5 3	19 63 111	2.3 <0.02 <0.02	24
Canada Ontario 1979	WP	1.65	5	5	40	0.28, 0.26 <0.01 (2)	1983 JMPR
	WP	1.65	-	4	30	1.9, 1.6	1983 JMPR
	WP	1.65	-	3 2 1	30 30 30	3.8, 4.1 0.54 0.63, 1.0, 1.2	1983 JMPR

Location/year	Form.	Application		No.	PHI, days	Residue, mg/kg	Ref
		kg ai/ha	kg ai/hl				
France 1983	SC	0.35	-	7	61	0.02	25
	SC	0.175 0.35 0.7	- - -	7 7 7	61 61 61	<0.01 <0.01 <0.01	25
France 1984	SC	0.7	-	6	24	0.08	
France 1984	SC	0.175 0.35 0.46		9 9 9	29 29 29	0.01 0.01 0.03	
France 1986	SC	0.75	-	5	40	0.02 (2) 0.01 (2)	
France, 1987	SC	0.35	-	1	0 7 14 21 29	0.44 0.22 0.10 0.03 0.02	30
France, 1987	SC	0.35	-	1	0 7 14 21 28 42	0.50 0.28 0.09 0.06 0.02 <0.01	31
France, 1987	SC	0.35	-	1	0 7 14 21 30	0.50 0.32 0.18 0.05 0.11	32
France, 1987	SC	0.35	-	8	34	0.02	33
France, 1987	SC	0.35	-	7	27	0.01	34
France, 1987	SC	0.46	-	3	21	0.39	35
France, 1987	SC	0.46	-	4	22	0.43	36
France, 1987	SC	0.46	-	4	15	0.44	37
France, 1987	SC	0.35	-	5	44	0.04	38
France, 1987	SC	0.35	-	10	8	0.11,0.02	39
France, 1987	SC	0.35	-	8	15	0.85	40
France, 1987	SC	0.35	-	8	34	0.02	41
France, 1987	SC	0.35	-	7	27	0.02	
Germany, 1973	-	1.5	-	8	2 51	2.7 0.38	1983 JMPR
Germany, 1974	-	2.2 + 2.9 2.9	- -	6+2 8	0 21 28 35 42 0 21 28 35 42	26 17 8.0 7.0 4.2 28 14 8.0 4.8 6.7	1983 JMPR 1983 JMPR
Germany 1974	- -	1.75 2.33	- -	6 6	0 21 28 35 42 0 21 28 35 42	3.7 1.1 0.55 0.4 0.23 5.2 2.2 1.1 0.72 0.21	1983 JMPR 1983 JMPR
Germany 1975	-	-	0.15 + 0.2	8+2	0 21 28 35	3.8 0.27 0.62 0.63	1983 JMPR

Location/year	Form.	Application		No.	PHI, days	Residue, mg/kg	Ref
		kg ai/ha	kg ai/hl				
					42	0.59	
Germany 1975	-	-	0.15 + 0.18	8+2	0 21 27 35 42	1.9 0.49 0.76 0.52 0.76	1983 JMPR
Germany, 1975	-	-	0.15 + 0.2	6+4	0 21 35 43	2.4 1.1 1.8 2.0	1983 JMPR
S Africa, 1979/80	SC	1.5	-	8	1 2 4 16 32	18,21 12,13 3.6,3.5 2.7,2.5 2.6,2.3	

(Notes on next page)

[1]Figures in parentheses are corrected for recovery (64% Hunter Valley, 55% S Australia)
Results underlined once are from maximum permitted use in Australia.
Results underlined twice are from maximum permitted use in France.

Bananas (Table 6). Supervised trials carried out in Latin America and Australia included application rates similar to the maximum approved in the USA and Australia. Residue levels in treated bananas sampled 0-3 days after treatment were <0.01-2 mg/kg.

Table 6. Residues of chlorothalnil in bananas from supervised trials in Australia, Colombia, Costa Rica, Mexico and Panama.

Location/ year	Form.	Application kg ai/ha	No.	PHI, days	Residue (mg/kg)	Ref
N. Australia, 1978	SC	1.1	10	1 14 28	0.6 0.44 0.03	45
		2.2	10	1 14 28	2.0 0.10 0.09	45
Colombia, 1985	SC	1.5	11	3	<0.01(6)	44
Costa Rica, 1985	SC	1.75	10	6	0.02,0.03(2) 0.11,0.12,0.10	44
Mexico, 1984/5	WP	1.1-1.5	13	2	<0.01(6)	44
Panama, 1978	SC	1.3	8	0	<0.01(4)	43

Underlined results reflect maximum permitted use in Australia.

Bulb onions (Table 7). Products containing chlorothalonil are registered for use in the USA, Australia and several European countries. Maximum application rates range from 1.0 to 2.25 kg ai/ha and minimum pre-harvest intervals are from 7 to 28 days.

In UK trials where treatments were within Danish GAP, up to 2.0 kg ai/ha and a minimum 14-day PHI, residues were <0.01-0.1 mg/kg. In US trials where treatments reflected US GAP at 1.7 kg

ai/ha and a minimum 7-day PHI, residues were 0.02-0.06 mg/kg.

Table 7. Residues in bulb onions following treatment with chlorothalonil.

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref
		kg ai/ha	no.			
Australia, 1982	SC	1.5	3 6	41 27	0.1 <0.1	48 38
Canada, 1987	SC	1.6-1.8	3	0 1 3 7 10 14	0.16 0.07 0.04 0.02 <0.01 <0.01	58
Denmark, 1981	SC	2.0	5	14	0.04	50
Denmark, 1981	SC	1.25	1	14 21	<0.01 <0.01	51
Italy, 1990	SC	1.5 3.0	2 2	14 14	<0.01 <0.01	52 52
Italy, 1990	SC	1.5 3.0	2 2	14 14	<0.01 <0.01	53 53
Netherlands, 1981	WP	1.5	7 6 5 4	7 14 21 28	0.34 0.25 0.19 0.10	54
Netherlands, 1981	WP	1.5	7 6 5 4	7 14 21 28	0.57 0.52 0.52 0.28	55
UK, 1990	SC	1.0 1.5 2.0 3.0	6 6 6 6	2 2 2 2	0.02(2), 0.03(2) 0.05, 0.06, 0.03(2) 0.03, 0.06, 0.07, 0.05 0.11(2), 0.10, 0.08	6 6 6 6
	SC	0.9	6	2	0.01	56
UK, 1990	SC	1.0 1.5 2.0 3.0	6 6 6 6	20 20 20 20	0.01 (4) <0.01 (4) <0.01 (3), 0.02 <0.01 (2), 0.03 (2)	56 56 56 56
UK, 1990	SC	1.0 1.5 2.0	6 6 6	27 27 27	<0.01 (7), 0.02, 0.03 0.05 <0.01, 0.01 (3), 0.02(5), 0.03(2), 0.04, 0.03(2) 0.07, 0.06, 0.02, 0.03,	56 56 56 56 56

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref
		kg ai/ha	no.			
		3.0	6	27	0.04, 0.12	56
	SC	0.9	6	27	0.02(3)	56
UK, 1991	SC	1.0	5	14	<0.01 (2), 0.01 (3), 0.02(2), 0.03	57
		2.0	5	14	<0.01, 0.01, 0.02 (4), 0.03 (2)	57
	DG	1.0	5	14	<0.01 (2), 0.01 (4) 0.02, 0.05	57
		2.0	5	14	0.01 (3), 0.02, 0.03 (4)	57
UK, 1991	SC	1.0 2.0	5 5	14 14	<0.01, 0.01 0.06, 0.02	57 57
UK, 1991	DG	1.0 2.0	5 5	14 14	0.02, 0.01 0.05, 0.04	57 57
UK, 1991	SC	1.0 2.0	5 5	14 14	0.02, 0.05 0.05	57
	DG	1.0 2.0	5 5	14 14	0.02 (2) 0.10, 0.06	57 57
USA, California, 1985	SC	1.75	12	7	0.04	46
USA, Texas, 1985	SC	1.75	7 12	7 7	0.06 0.12	46 46
USA, Michigan, 1984	SC	1.15 + 1.75	3+6	12	<0.01	47
USA, New York 1986	SC	1.75	12	7	0.02	47

Results underlined once reflect Danish GAP.
Results underlined twice reflect US GAP.

Cabbages (Table 8). The USA, Australia, Canada and a number of European countries have reported GAP for chlorothalonil on cabbage, with maximum application rates of 1.25-2.45 kg ai/ha and minimum PHIs of 0-10 days.

Residues in crops treated at 1.3 kg ai/ha and harvested 7 days after the last treatment (within US GAP) at two sites in the USA contained residues at <0.01 or <0.03 mg/kg.

Results from trials at 3 UK sites where treatment regimes were within UK and Irish GAP (1.5 kg ai/ha, 7-day PHI) were

0.04-0.7 mg/kg.

Table 8. Residues of chlorothalonil in cabbages from supervised trials carried out in the UK and the USA.

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
UK 1990	SC	1.5	2	39	0.09,0.10, 0.14,0.15, 0.16 ,0.21, 0.27,0.41,0.46, 0.53	62
		3.0	3	39	0.91,1.37,1.47, 1.46	62
UK, 1991	SC	1.5	2	7	0.18,0.17	63
	DG	1.5	2	7	0.07,0.04	63
UK, 1991	DG	1.5	2	8	0.16,0.13	63
	SC	1.5	2	8	0.28,0.61	63
UK, 1991	SC	1.5	2	8	0.16,0.19, 0.20(2), 0..22,0.24, 0.28,0.53	63
UK, 1991		3.0	2	8	0.14,0.17,0.25, 0.33, 0.49,0.50, 0.69, 0.74	63
	DG	1.5	2	8	0.29,0.30,0.35, 0.38,0.42,0.55, 0.64,0.70	63
		3.0	2	8	0.24(2), 0.26, 0.28,0.34,0.60, 0.64,0.81	63
USA, N York, 1986	SC	1.3	11	0	5.0	59
USA, Georgia, 1984	SC	1.3	9	7	<0.03	60
USA, N York, 1985 USA, Florida, 1986	SC SC SC	1.3 1.3 1.3	8 11 11 11	0 0 1 7 1 7	6.4 5.9 0.23 <0.01 0.03 <0.01	60 60 61 61 61 61

Results underlined once reflect US GAP.
Results underlined twice reflect UK GAP.

Broccoli (Table 9). GAP for applications to broccoli has been reported for Australia, Canada, the UK and the USA. Maximum application rates are 1.0-2.5 kg ai/ha and minimum harvest intervals 3 or 7 days.

In two trials carried out in the USA the treatment regimes were within US and Canadian GAP. Residues in these trials were 2.2 and 2.6 mg/kg.

Table 9. Residues of chlorothalonil in broccoli from supervised trials carried out in the USA using SC formulations.

Location/ year	Form.	Application	PHI, days	Residue (mg/kg)	Ref.

		kg ai/ha	No.			
California, 1986		1.6	9	0	1.7	64
New York, 1985		1.3	6	0	5.8	65
Michigan, 1985		1.3	4	6	2.2	66
New York, 1986		1.3	8	0	11	66
New York, 1987		1.3	8	7	2.6	67

Underlined results reflect GAP in the USA and Canada

Brussels sprouts (Table 10). Products containing chlorothalonil are registered for use on Brussels sprouts in Australia, Canada, the USA and several European countries. Maximum applications rates are 1-2.5 kg ai/ha and minimum pre-harvest intervals are 3, 7 or 14 days.

A residue level of 2.3 mg/kg was reported from an Australian trial where the treatment regime was within Australian GAP (2.5 kg ai/ha, 3-day PHI). Two results (<0.01 and 4.3 mg/kg) were available from US trials reflecting US and Canadian GAP (1.7 and 1.25-2.15 kg ai/ha respectively, 7-day PHI). Residues were 0.09-0.92 mg/kg in six trials carried out in The Netherlands and the UK using treatment regimes within UK and Irish GAP (1.5 kg ai/ha, 7-day PHI).

Table 10. Residues of chlorothalonil in Brussels sprouts from supervised trials carried out in Australia, The Netherlands, the UK and the USA. All products used were SCs.

Location/ year	Application		PHI, days	Residue (mg/kg)	Ref.
	kg ai/ha	No.			
S.Australia 1977	1.3	5	0 1 6	1.3 1.0 2.2	70 70 70
	2.5	5	0 1 6	2.6 2.3 2.3*	70 70 70
Netherlands 1989	1.5	7	7 14 21	0.16,0.09,0.13,0.57 0.49,0.31,0.45,0.66 0.23,0.17,.0.14,0.29	71 71 71
Netherlands 1989	1.5	6	7 14 21	0.35,0.28,0.32,0.32 0.48,0.33,0.36,0.35 0.20,0.19,0.13,0.18	72 72 72
Netherlands 1989	1.5	6	7 14 21	0.14,0.13,0.09,0.36 0.06,0.08,0.06,0.21 0.05,0.04,0.15,0.19	73 73 73
UK, 1989	1.5	2	13	0.14,0.12	74
UK, 1989	1.5	2	12	0.09,0.12	75
UK,1989	1.5	2	12	0.09,0.05	76
UK, 1990	1.5	2	0 3 5 7 12 13	0.19.,0.29,0.18 0.28,0.19,0.19 0.14,0.14,0.21 0.35,0.37,0.18 0.19,0.33,0.28 0.26,0.19,0.23 0.23,0.24,0.17 0.28,0.21,0.27 0.15(2),0.17,0.12, 0.11,0.14 0.24,(2),0.09 0.15,0.18(3)	77 77 77 77 77 77

Location/ year	Application		PHI, days	Residue (mg/kg)	Ref.
	kg ai/ha	No.			
				0.16(2),0.12, 0.20,0.08	
	3.0	2	13	0.15,0.22,0.36,0.61	77
UK,1990	1.5 3.0	2 2	7 7	0.45,0.53,0.92,0.31 1.27,0.68,1.18,1.24	77 77
UK, 1990	1.5 3.0	2 2	7 7	0.15,0.13,0.47,0.29 0.23,0.76,0.49,0.33	77 77
USA, N York 1986	1.3	13	0 7	4.4 4.3	68 68
USA, N York 1987	1.3	9	7	<0.01	69

Results underlined once reflect US GAP.
Results underlined twice reflect UK and Irish GAP.
The asterisked result reflects Australian GAP.

Cauliflower (Table 11). Cauliflower crops may be treated with chlorothalonil in Australia, Canada, the USA and a number of European countries. Maximum treatment rates range from 1.0 to 2.45 kg ai/ha and minimum pre-harvest intervals are 0, 3 or 7 days.

Supervised trials have been carried out in the USA and the UK. The US GAP of 1.3 kg ai/ha and a 7-day PHI was used in two US trials. Residue levels in these trials were 0.12 and 0.04 mg/kg. In UK trials, samples harvested 7 days after treatment at 1.3-1.5 kg ai/ha (within GAP in the UK and Ireland) contained residues in the range 0.04-0.47 mg/kg.

Table 11. Residues of chlorothalonil in cauliflower from supervised trials in the UK and the USA.

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
UK, 1990	SC	1.5 3.0	2 2	32 32	<0.01(3), 0.01(4), 0.02(5) <0.01(2), 0.01(2)	80 80
UK,1991	SC DG	1.5 1.5	2 2	6 6	0.28(2) 0.45,0.42	81 81
UK, 1991	SC DG	1.5 1.5	2 2	6 6	0.19,0.25 0.32,0.47	81 81
UK,1991	SC DG	1.5 3.0	2 2	42 42	0.01,0.02(3) 0.02(4)	81 81
UK,1991	SC DG	1.5 3.0 1.5 3.0	2 2 2 2	42 42 42 42	0.01(3),0.02 0.01(2),0.02(2) 0.01(5),0.02(3) 0.01(2),0.02(2),0.03(4)	81 81 81 81
USA, Oregon 1985	SC	1.3*	8	7	0.12	78
USA, Oregon 1985	SC	1.3	8	7	0.04	78
USA, N York 1985	SC	1.3	8	0	0.41*	78
USA, Florida 1985	SC	1.3	9	0	1.8	78
USA, N York 1985	SC	1.3	6	0	4.5	79

* high apparent residues in controls suggests mislabelling.
Results underlined once reflect GAP in the USA.

Results underlined twice reflect GAP in the UK and Ireland.

Melons (Table 12). Products containing chlorothalonil are registered for use on melons in Australia, Canada, the USA and several European countries. Registered maximum treatment rates are 1.0-2.5 kg ai/ha and minimum pre-harvest intervals are 0-15 days.

Supervised trials have been carried out in the USA, France and Italy. A number of results were available for samples which had been treated at around 2.5 kg ai/ha and harvested on the day of treatment (this is US GAP); residues ranged from 0.18 to 1.45 mg/kg. Residues were <0.01-0.03 mg/kg in samples from French trials which had been treated in accordance with French GAP.

Table 12. Residues of chlorothalonil in melons from supervised trials in France, Italy and the USA.

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref
		kg ai/ha	No.			
France, 1982	SC	1.1	4	6	<0.01	83
	WP	1.5	4	6	0.01	84
France, 1982	SC	1.5`	4	6	<0.01	85
France, 1989	SC	1.5	4	3	0.02	86
				7	0.03	86
Italy, 1990	SC	1.5 3.0	3 3	14 14	0.10 0.56	87 87
USA, Texas, 1980	SC WP	2.5 2.6	5 5	0 0	0.22,0.26,0.21 1.45,0.80(2) 0.30,0.24,0.18, 0.58,0.36,0.84	82 82

(Notes on next page)

Results underlined once reflect US GAP
Results underlined twice reflect French GAP.

Cucumbers (Table 13). GAP for cucumbers has been reported for Australia, Canada, the USA and several European countries. Maximum treatment rates are 1.0-2.5 kg ai/ha (or 0.08-0.19 kg ai/hl) and minimum PHIs are from 0 to 28 days.

Data were available from supervised trials carried out in the USA, France, Italy and Spain. None of these data are from crops grown under protection. Samples treated at 2.5 kg ai/ha and harvested on the day of treatment (this is US GAP) had residue levels in the range 0.43-4.3 mg/kg.

Table 13. Residues of chlorothalonil in cucumbers from supervised trials in France, Italy, Spain and the USA. All trials appear to have been carried out in the field (i.e. without protection).

Location/ year	Form.	Application			PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	kg ai/hl	No.			
France, 1989	SC	1.5	-	7	3 7	0.05 0.05	92
France, 1989	SC	-	0.15	1	0 3	0.17 0.14	93

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	kg ai/hl / No.			
				5 7 14 21	0.09 0.08 0.10 <0.01	
France, 1989	SC	-	0.15 / 1	0 3 5 7 14 21	0.19 0.21 0.33 0.11 0.07 0.01	94
France, 1989	SC	-	0.15 / 1	0 3 5 7 14 21	0.07 0.12 0.28 0.11 0.03 <0.01	95
France, 1989	SC	2.4	- / 1	0 1 5 10	1.2 1.0 0.26 0.15	96
		4.8	- / 1	0 1 5 10	1.5 1.7 0.61 0.42	96
Italy, 1990	SC DG	0.75 0.66	- / 2	15 15	0.02(2) 0.01	97 97
Italy, 1990	SC DG	1.5 1.3	- / 2 - / 2	15 15	0.01,0.02 0.01	98 98
Italy, 1991	SC	1.5	- / 3	0 14	0.41,0.20,0.34 <0.01(2),0.01	99
Italy, 1991	SC	1.5	- / 3	0 14	1.26,1.42,0.87 <0.01,0.01,0.02	100
Italy, 1991	DG	1.5	- / 3	0 14	0.23,0.83,0.46 0.02,0.01,<0.01	101
Italy, 1991	DG	1.5	- / 3	0 14	1.1(2),1.7 0.01,0.02(2)	102
Italy,1991	DG	1.5	- / 3	0 14	0.10,0.35,0.41 <0.01(2),0.03	103
Italy,1991	DG	1.5	- / 3	0 14	0.70,1.1,1.6 0.02(2),0.05	104
Italy,1991	SC	1.5	- / 3	0 14	0.31,0.36,0.40 0.01(3)	105
Italy,1991	SC	1.0	- / 3	0 14	0.23,0.57,0.74 <0.01(3)	106
Spain, 1990	SC WP DG	1.25 1.5 1.5 1.6	- / 3 3 3 3	7 7 7 7	0.21 0.17 0.22 0.05	107 107 107 105
USA, Michigan, 1979	SC	1.3	- / 6	0 7	0.07,0.06,0.06 0.06,0.04,0.06	88
USA, Texas, 1986	SC SC	2.5 2.5 2.5 +6.8	- / 9 - / 9 - / 8 - / 1	0 0 0 0	4.3 2.6 2.9	89 89 89
USA, S Carolina 1986	SC SC	2.5 2.5 2.5 +6.9	- / 9 - / 9 - / 8 - / 1	0 0 5	2.8 1.4 0.97	89 89 89
USA, Florida, 1986	SC SC	2.5 2.5 2.5 +6.8	- / 9 - / 9 - / 8 - / 1	0 0 0	2.3 0.43 4.0	90 90 90
USA, California 1986	SC	2.5	- / 8	0	1.7	91

Underlined results reflect US GAP.

Summer and winter squash, Sweet corn (Table 14). Products containing chlorothalonil are registered for use on summer and winter squash crops in Canada, the USA, Greece and Italy. Maximum application rates range from 1.1 to 2.5 kg ai/ha and minimum pre-harvest intervals from 0 to 10 days.

Supervised trials have been carried out in the USA. Crops harvested on the day of the last of ten treatments at 2.5 kg ai/ha (US GAP) contained residues in the range 0.59-3.6 mg/kg.

Chlorothalonil residues were not found (<0.01 mg/kg) in sweet corn when chrorothalonil was used according to GAP in supervised trials carried out at one site in the USA.

Table 14. Residues of chlorothalonil in summer squash, winter squash and sweet corn from supervised trials in the USA using SC formulations. All trials accord with US GAP.

Crop	Location/ year	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
Summer squash	Florida, 1985	2.5	10	0	0.97	108
	California, 1985	2.5	10	0	1.8,3.6	108
Winter squash	California, 1985	2.5	10	0	2.6	109
	Florida, 1985	2.5	10	0	0.59	109
	Texas, 1985	2.5	10	0	1.3	109
Sweet corn	Illinois, 1985	1.6	8	14	<0.01(2)	110

Tomatoes (Table 15). Products containing chlorothalonil are approved for use on tomatoes in Australia, Canada, the USA and several European countries. Maximum treatment rates range from 1.1-2.5 kg ai/ha and minimum pre-harvest intervals from 0 to 15 days.

Supervised trials have been carried out in the USA, Italy and Spain. When crops were treated in accordance with the maximum GAP, 2.5 kg ai/ha, and sampled on the day of treatment, residues were in the range 0.15-4.6 mg/kg.

Table 15. Residues of chlorothalonil in tomatoes from supervised trials in
a) the USA and b) Italy and Spain.

a) Trials carried out in the USA.

Location/ year	Application			PHI, days	Residue (mg/kg)	Ref
	Form.	kg ai/ha	No.			
N.Carolina, 1984	SC	1.5	16	1	0.12	111
Florida, 1984	SC	2.4	11	0	0.15	111
Florida, 1984	SC	2.4	16	0	0.18	111

Location/ year	Application			PHI, days	Residue (mg/kg)	Ref
	Form.	kg ai/ha	No.			
Florida, 1984	SC	2.4	11	0	0.49	111
Florida, 1984	SC	2.4	12	1	0.84	111
California, 1984	WP	1.6	8	0	2.4	112
Virginia, 1984	WP	1.6	6	5	0.22,0.17,0.08	112
Ohio, 1984	WP	1.6	5	5	0.64,0.23,0.36	112
California, 1984	WP	1.6	3 6	12 12	0.07,0.06 0.08,0.11	112 112
California, 1984	DG	1.8	6	1	0.36,0.97,1.1, 1.3	112
California, 1984	DG	1.8	7	1	0.37,0.41,1.5, 2.5	112
Ohio, 1985	DG	1.8	7	1	0.18,0.44,0.70	112
California, 1984	DG	1.8	5	1	0.37,0.72,1.6, 1.7	112
Florida, 1985	SC	2.5	9	-	1.4,2.7,2.8,4.6	113

b) Decline trials carried out in Europe

Location	Form.	Application			Residues (mg/kg) after PHI (days)							Ref
		kg ai/ha	kg ai/hl	No.	0	3	5	7	14	21	28	
Italy, 1989	SC	-	0.26 0.52	1 1	0.38 1.0	0.47 1.1	1.2 3.3	1.0 1.8	0.61 1.6	0.40 0.89	0.13 0.63	114
Italy, 1989	SC	-	0.26 0.52	1 1	0.61 0.88	0.73 2.2	1.1 1.9	0.61 1.9	0.50 1.8	0.51 1.4	0.19 0.43	115
Italy, 1989	DG	-	0.26 0.52	1 1	1.1 1.2	1.5 3.5	0.88 1.6	0.68 1.1	0.53 1.0	0.33 0.80	0.26 0.24	116
Italy, 1989	SC	-	0.13	3	1.2 0.13[1]	0.89 0.19[1]	0.64 0.22[1]	0.54 0.13[1]	0.29 0.15[1]	0.24 0.08[1]		117

Location	Form.	Application			Residues (mg/kg) after PHI (days)							
		kg ai/ha	kg ai/hl	No.	0	3	5	7	10	14		
Italy, 1989	SC	-	0.13	3	1.2	1.1	0.89	0.72	0.37	0.39		118
Italy, 1989	DG	-	0.13	3	1.2	1.1	0.87	0.36	0.25	0.27		119
Italy, 1990	SC	1.5	0.15	3	0.32	0.27		0.23	0.23	0.15		120
Italy, 1990	SC	1.5	0.15	3	0.55	0.33		0.24	0.21	0.17		121
Italy, 1990	SC	3.0	0.3	3	0.98	0.42		0.35	0.23	0.29		122
Italy, 1990	SC	1.5	0.15	3	0.25	0.35		0.29	0.28	0.26		123
Italy, 1990	SC	3.0	0.3	3	0.61	0.94		0.40	0.56	0.33		124
Italy, 1990	DG	1.5	0.15	3	0.13	0.27		0.28	0.20	0.11		125
Italy, 1990	DG	3.0	0.3	3	0.66	0.86		0.75	0.47	0.23		126
Italy, 1990	SC	1.1	0.11	3	0.18	0.21		0.15	0.10	0.08		127
Italy, 1990	SC	1.1	0.11	3	0.09	0.04		0.04	0.07	0.07		128
Italy, 1990	SC	3.0	0.3	3	0.32	0.15		0.16	0.17	0.16		129
Italy, 1990	SC	1.5	0.15	3	0.22	0.07		0.14	0.08	0.03		130
Italy, 1990	SC	3.0	0.3	3	0.24	0.21		0.20	0.28	0.17		131
Italy, 1990	DG	1.5	0.15	3	0.21	0.12		0.07	0.10	0.16		132
Italy, 1990	DG	3.0	0.3	3	0.49	0.40		0.31	0.19	0.30		133
Italy, 1990	SC	0.64-0.78	-	5						0.34[2]		134

Location	Form.	Application			Residues (mg/kg) after PHI (days)							Ref
		kg ai/ha	kg ai/hl	No.	0	3	5	7	14	21	28	
		1.4-1.7	-	5						0.62[2]		134
Italy, 1990	SC	0.6-0.75	-	5						0.13[2]		135
		1.1-1.6	-	5						0.32[2]		135
Italy, 1990	SC	1.5	-	3	0.08 0.12 0.23 0.25					0.09 0.15 0.08 0.11		136

					Residues (mg/kg) after PHI, days							
					0	3	5	7	14			
Italy, 1991	DG	1.5	-	3	0.15 0.24 0.30 0.37				0.10 0.13(2) 0.14			137
Italy, 1991	DG	1.5	-	3	0.16 0.24 0.28 0.29				0.06 0.09(2) 0.10			138
Spain, 1990	WP	3.4	-	4	1.3	1.0		0.71	0.49			139
Spain, 1990	SC	1.7	-	4	0.33[2]	0.32[2,3]		0.38[2]				140
Spain, 1990	SC	1.7	-	4	0.38[2]	0.73[2,3]		0.58[2]				141
Spain, 1990	SC	1.8	-	3	1.02[2]	0.69[2,3]		0.46[2,3]	0.20[2,4]			142
Spain, 1990	SC	3.5	-	3	1.02	1.2		0.71	0.33[4]			

[1] After washing
[2] Greenhouse experiment
[3] 4-day PHI
[4] 11-day-PHI

Underlined results reflect US GAP

Beans (Table 16). GAP for beans has been reported for Australia, the USA and several European countries. Maximum treatment rates are 1.5-2.5 kg ai/ha and minimum PHIs are 7-15 days.

In four supervised trials carried out on common beans in the USA and reflecting GAP at 2.5 kg ai/ha and a 7-day PHI residues levels were 0.4-3.1 mg/kg.

Table 16. Residues of chlorothalonil in beans from supervised trials in France, Italy, the UK and the USA.

a) Common beans

Location, year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
France, 1988	SC	0.75 0.75	2 2	12 13	<0.01 0.02	146 146
France, 1988	SC	0.75	2	21	0.01	147
Italy, 1989	SC	1.5	2	0 3 5 7 10 14	1.81 0.50 0.39 0.42 0.22 0.03	148
Italy, 1989	SC	1.5	2	0 3 5 7 10 14	1.71 0.53 0.25 0.22 0.06 0.04	149

Location, year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
Italy, 1989	DG	1.5	2	0 3 5 7 10 14	1.3 0.50 0.38 0.35 0.15 0.04	150
Italy, 1990	SC DG	1.5 1.5	1 1	16 16	0.02(2) 0.04	151
Italy, 1990	SC DG	3.0 3.0	1 1	16 16	0.28,0.02 0.13	152
UK, 1985	SC	0.9	2	76	<0.01*	153
UK, 1986	SC	1.0	2	51	<0.01*(4)	154
UK, 1986	SC	1.0	2	71	<0.01*(2)	155
UK, 1988	SC	1.5 3.0	1 1	19 19	0.78, 0.39 1.5,0.60	156
UK,1988	SC SC	0.75 1.0	1 1	19 19	0.29 0.45	157
UK, 1988	SC	1.5 3.0	1 1	7 10 14 7 10 14	0.37 0.25 0.12 1.2 0.50 0.38	158 158
UK, 1990	SC	1.5 3.0	2 2	84 84	<0.01*(3) <0.01*(3)	159 159
UK, 1991	SC	1.5 3.0	2 2	62 62	<0.01*(3) 0.14*, 0.09*,0.02*	159 159
UK, 1991	SC	1.5 3.0	2 2	49 49	0.02*(2), <0.01* 0.02*(2), 0.03*	160 160
	DG	1.5 3.0	2	49 49	0.02*,0.07* 0.04*,<u>0.02</u>*	160 160
UK, 1991	SC	1.5 3.0	2 2	60 60	<0.01* ,0.01*(3),0.02*(4) 0.02*(3),0.03*(2),0.08* 0.04*,0.05*,<0.01*,0.01*(3)	160 160
	DG	1.5 3.0	2 2	60 60	<0.01*(4),0.01*(3),0.03* 0.02*(4),0.03*(4)	160 160
UK, 1991	SC DG	1.5 3.0 1.5 3.0	2 2 2 2	57 57 57 57	<0.01*(3) <0.01*(3) <0.01*(2) <0.01*(2)	160 160 160 160
USA, Florida, 1986	SC	2.5	3	7	<u>0.40</u>	144
USA, Oregon, 1986	SC	2.4	3	7	<u>3.0</u>	144
USA, N York, 1986	SC	2.5	3	7	<u>3.1</u>	145
USA, Wisconsin, 1986	SC	2.5	4	7	<u>0.78</u>	145

b) Broad beans

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
UK, 1991	SC	1.5 3.0	2 2	10 10	0.98,1.0,0.77,1.4,0.86, 0.96,0.32,0.58,0.61 1.7,4.3,1.4	159 159

Underlined results reflect US GAP.

<u>Carrots</u> (Table 17). Products containing chlorothalonil are registered for use on carrots in Australia, Canada, Spain and the USA at treatment rates up to 2 kg ai/ha and with minimum pre-harvest intervals of 0 to 21 days.

Residues were in the range 0.02-0.96 mg/kg in trials in

which crops were treated in accordance with the US GAP of 1.7 kg ai/ha and a 0-day PHI.

Table 17. Residues of chlorothalonil in carrots from supervised trials in Australia and the USA according to US GAP.

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref.
		kg ai/ha	No.			
S Australia, 1976	WP	1.3 2.6	15 15	0 6 0 6	2.0 2.6 1.7 3.6	165 165 165 165
USA, Texas, 1979	SC WP	1.6 1.6	6 6	0 0	0.20,0.26,0.19 0.34,0.33,0.50	161 161
USA, California, 1979	SC WP	1.6 1.6	5 5	0 0	0.30,0.10,0.07 0.46,0.64,0.96	161 161
USA, California, 1979	SC	1.6	5	0	0.88,0.82(2)	162
USA, Texas, 1979	WP SC	1.6 1.6	6 6	0 0	0.21,0.19,0.15 0.12,0.06,0.09	162 162
USA, California, 1986	SC	1.6	10	0	0.09	163
USA, Texas, 1986	SC	1.6* 1.6	10	0	0.08* 0.10	164 164
USA, Washington, 1986	SC	1.6	10	0	0.02	164
USA, Wisconsin, 1986	SC	1.6	8	0	0.03	164

Potatoes(Table 18). Products containing chlorothalonil are authorised for use on potatoes in Australia, Canada, the USA and several European countries. Maximum application rates are between 0.8 and 2.2 kg ai/ha and minimum pre-harvest intervals are 0 to 15 days.

Supervised trials data were available from the USA and several European countries. Results were available from a number of trials carried out in the USA where samples were taken 7 days after treatment, and application rates were around 1.3 kg ai/ha (US GAP is 1.3 kg ai/ha, PHI 7 days). Residues of chlorothalonil were not found (<0.03 mg/kg). Where treatment regimes reflected maximum UK GAP residue levels were 0.01-0.18 mg/kg.

Table 18. Residues in potatoes following treatment with chlorothalonil.

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref
		kg ai/ha	No.			
Belgium, 1980	SC	1.5-2.2	6	7 14 29	0.01 <0.01 <0.01	170
Belgium, 1980	SC	1.5-1.8	5	14 28 41	<0.01 <0.01 <0.01	171
Greece, 1987	WP	0.9	5 6	8 8	<0.01 <0.01	172 172
Italy, 1990	SC	1.5 3.0	2 2	21 21	<0.01 <0.01	173

Location/ year	Form.	Application		PHI, days	Residue (mg/kg)	Ref
		kg ai/ha	No.			
Italy, 1990	SC WP	1.5 3.0	2 2	14 14	<0.01 <0.01	174
UK, 1989	SC WP	3.0 3.0	6 6	49 49	<0.01 <0.01	175 175
UK, 1989	WP DG	1.0-1.5 1.0-1.5	7 7	38 38	<0.01 <0.01	176 176
UK, 1989	SC WP	3.0 3.0	6 6	49 49	<0.01 <0.01	177 177
UK, 1989	WP DG	1.0-1.5 1.0-1.5	7 7	34 34	<0.01 <0.01	178 178
UK, 1990	SC	0.75 1.0 3.0	12 12 12	28 28 28	<0.01(2) <0.01(2) <0.01(2)	179 179 179
UK, 1990	SC	0.75 1.0 3.0	13 13 13	17 17 17	<0.01(2) <0.01(2) <0.01(2)	179 179 179
UK, 1990	SC	0.75 1.0 3.0	11 11 11	35 35 35	<0.01(2) <0.01(2) <0.01(2)	179 179 179
UK, 1991	SC	1.5 3.0	13 13	8 8	<0.01(7), 0.01, 0.01(5),0.02(2),0.04	180 180
	WP DG	1.5 3.0 1.5 3.0	13 13 13 13	8 8 8 8	<0.01(3), 0.01 0.01,0.02,0.03,0.04 <0.01(4),0.01(3),0.02 0.01(4),0.02(4)	180 180 180 180
UK, 1991	SC WP DG	1.5 1.5 1.5	11 11 11	20 20 20	<0.01,0.01 <0.01 <0.01,0.01	180 180 180
UK, 1991	SC WP DG	1.5 1.5 1.5	11 11 11	6 6 6	0.01,0.03 0.01 0.02,0.04	180 180 180
USA, California, 1979 USA, Nebraska, 1979	SC SC	1.5 1.5 1.5	3 6 6	0 0 0	0.01,0.02(2),0.07 0.05 0.04	166 166 166
USA, Florida, 1979	SC WP	1.3 1.3	9 9	0 0	0.08,0.01 0.06,0.09(2) 0.12,0.18,0.06	167 167
USA, Florida, 1979	SC WP	1.3 1.3	11 11	0 0	0.02,0.04(3),0.06(2) 0.02,0.04,0.10	167 167
USA, Idaho, 1979	SC	1.3	2	0	0.1,0.0.2(2)	167
USA, New York, 1980	SC WP	1.3 1.2	9 9	0 0	0.01(3) 0.01(2),.0.02	167 167
USA, Maine, 1984	SC	0.7-1.2	7	7	<0.03	168
USA, Washington, 1984	SC	0.7-1.2	11	7	<0.03	168
USA, Ohio, 1985	SC	0.9-1.2	10	6	<0.03	168
USA, Florida, 1984	SC	0.6-1.2	6	7	<0.03	168
USA, Michigan, 1984	SC	0.6-1.2	11	20	<0.03	168
USA, Idaho, 1986	SC	1.3	6	25	<0.03	169
USA, California, 1986	SC	0.9-1.3	7	12	<0.03	169
USA, Oregon, 1986	SC	1.3	11	7	<0.03	169
USA, Colorado, 1986	SC	0.9	7	27	<0.03	169

Results underlined once reflect UK GAP.
Results underlined twice reflect US GAP.

Sugar beet (Table 19). GAP for sugar beet was reported for Greece. Supervised trials were carried out in 1990 in France and Italy. In four trials the treatment regime reflected the maximum GAP. Residue levels in these trials were <0.01-0.1 mg/kg in roots and 0.33-14 mg/kg in leaves.

Table 19. Residues of chlorothalonil in sugar beet from supervised trials in France and Italy. All treatments were with SC formulations.

Location/ year	Application kg ai/ha	No.	PHI, days	Residue(mg/kg) roots	leaves	Reference
France, 1990	1.5	2	64 65	<0.01,0.02 <0.01,0.09	0.1,8.2 2.2,8.4	181
Italy, 1990	1.0 1.5`	3 3	16 16	<0.01 <u><0.01,0.02</u>	1.4 <u>9,8,4.7</u>	182 182
Italy, 1990	1.5	2	0 7 14 21 28	0.05 0.07 <u>0.02</u> <u>0.05</u> 0.05	39 22 <u>14</u> <u>8.3</u> 6.4	184
Italy, 1990	1.5	2	0 7 14 21 28	0.05 0.03 <u>0.05</u> <u>0.16</u> 0.03	34 23 <u>14</u> <u>5.4</u> 4.6	184
Italy, 1990	1.0 1.5	3 3	18 18	0.02 <u>0.07,0.10</u>	0.33 <u>0.33,5.6</u>	185 185
Italy, 1990	0.6	2	14 21	0.01 <0.01	1.1 0.41	186
Italy, 1990	0.6	2	14 21	<0.01 <0.01	0.30 0.11	187

Underlined results reflect GAP in Greece.

Celery (Table 20). Products containing chlorothalonil are registered for use on celery in Australia, Canada, the USA and several European countries. Maximum treatment rates are in the range 1-2.5 kg ai/ha and minimum PHIs are 1-28 days.

Supervised trials have been carried out in the USA, France and the UK. The US GAP of 2.5 kg ai/ha with a PHI of 7 days was used in a number of trials. Residue levels in samples treated in this way were 0.03-9.8 mg/kg.

Table 20. Residues of chlorothalonil in celery from supervised trials in France, the UK and the USA. Products used were SC formulations.

Location/ year	Application kg ai/ha	No.	PHI, days	Residue (mg/kg)	Ref.
France, 1981	1.5	4	0 7 14 21	8.6 6.5 6.2 2.7	192
France, 1980	1.5	4	0 14 21 28	36 25 10 5.3	193
France, 1981	1.1	4	0 7 14 21	7.0 5.5 4.5 4.5	194
UK, 1980	1.5	1	7 14	0.34 0.41	191
	3.0	1	7 14	<u>0.23</u> <u>1.1</u>	191
USA, Michigan, 1980	2.5	8	0 7	6.9, 4.2, 2.4 <u>3.2,1.4,2.5</u>	188

Location/ year	Application kg ai/ha	No.	PHI, days	Residue (mg/kg)	Ref.
France, 1981	1.5	4	0 7 14 21	8.6 6.5 6.2 2.7	192
USA, California, 1980	2.5	7	7	0.03,0.04(2) 1.3(2), 1.1	188
USA, California, 1986	2.5*	10	7	4.3	189
USA, Michigan, 1986	2.5	15	1	9.8	190
USA, Florida, 1987	2.5	16	7	2.9	190

Underlined results reflect US GAP.

Barley (Table 21). GAP for barley has been reported for several European countries. Maximum application rates are 1.0-1.4 kg ai/ha and minimum PHIs are 42 days or expressed as the latest time of treatment to be complete at ear emergence or earlier.

Supervised trials have been carried out in Germany and the UK. Residue levels in trials where treatment was within 50 days of harvest using rates and numbers of applications which are GAP in at least one country were <0.01-1.4 mg/kg in grain and 0.36-8.1 mg/kg in straw.

Table 21. Residues of chlorothalonil in barley grain and straw from supervised trials in Germany and the UK.

Location, year	Form	Application		PHI, days	Residue (mg/kg)		Ref
		kg ai/ha	No.		grain	straw	
Germany, 1983	SC	1.0	1	42	<0.01	5.2	208
Germany, 1983	SC	1.0	2	42	ND*	1.7	209
Germany, 1983	SC	1.0	2	53	ND*	2.9	210
Germany, 1983	SC	1.0	2	59	ND*	0.83	211
Germany, 1983	SC	1.0	2	30	0.02	1.0	213
UK, 1988	SC	0.75	1	74	<0.01	<0.01	219
UK, 1988	SC	0.75	1	53	<0.01	0.02	220
UK, 1981	SC	1.1	2	93	<0.01	1.0	221
			1	122	<0.01(2)	0.70,0.16	221
UK, 1981	SC	1.1	2 1	67 119	<0.01 <0.01(2)	0.05 <0.01,0.03	222
UK, 1981	SC	1.1	2 1	61 118	<0.01 <0.01(2)	0.13 <0.01(2)	223
UK, 1988	SC	0.75	2 1 1	56 56 93	<0.01 <0.01 <0.01	0.05 0.04 0.02	224
UK, 1988	SC	0.75	2 1 1	75 75 104	<0.01 <0.01 <0.01	0.15 0.09 0.13	225
UK, 1988	SC	0.75	2 1 1	71 71 104	<0.01 <0.01 <0.01	0.02 0.02 <0.01	226

Location, year	Form	Application		PHI, days	Residue (mg/kg) grain	straw	Ref
		kg ai/ha	No.				
UK, 1988	SC	0.75	1	91	<0.01	0.04	227
UK, 1990	SC	0.9 1.8	2 2	50 50	0.05 0.05	4.1 11	228
	SC	0.75 1.5	2 2	50 50	0.02 0.05	2.1 8.1	228
	SC	0.9 1.8	2 2	49 49	0.03 0.08	0.36 0.94	228
	SC	0.75 1.5	2 2	49 49	0.03 0.49	0.97 4.9	228
	SC	0.9 1.8	2 2	49 49	0.04 0.29	2.4 6.2	228
	SC	0.75 1.5	2 2	49 49	0.08 1.4	3.7 16	228

*limit of determination not reported
Results underlined once reflect use at 1.4 kg ai/ha, 49-day PHI.
Results underlined twice reflect use at 1.0 kg ai/ha, 49-day PHI.

Wheat (Table 22). GAP for wheat has been reported for Canada (a proposed use) and several European countries. Maximum application rates are 0.5-1.5 kg ai/ha and minimum PHIs are 15-42 days. In some countries the latest time of treatment is specified as ear emergence complete.

Supervised trials have been carried out in a number of European countries. Residue levels in samples where treatment was within 49 days of harvest using rates and numbers of applications which are GAP in at least one country were <0.01-0.09 mg/kg in grain and 0.09-3.1 mg/kg in straw. Average residues in these data sets (one result, the mean, taken for each location, n = 20) were 0.01 mg/kg in grain and 0.8 mg/kg in straw.

Table 22. Residues of chlorothalonil in wheat grain and straw from supervised trials in Denmark, France, Germany and the UK.

Location/ year	Form	Application kg ai/ha	No.	PHI, days	Residue (mg/kg) grain	straw	Ref.
Denmark, 1980	SC SC SC SC	1.4 1.4 0.75 0.75	1 1 1 1	35 54 35 54	<0.01 <0.01 <0.01 <0.01	0.09 0.44 0.11 0.17	195 195 195 195
Denmark, 1980	SC SC SC SC	1.4 1.4 0.75 0.75	1 1 1 1	35 54 35 54	<0.01 <0.01 <0.01 <0.01	0.23 0.53 0.10 0.12	196 196 196 196
Denmark, 1980	SC SC SC SC	1.4 1.4 0.75 0.75	1 1 1 1	35 54 35 54	<0.01 <0.01 <0.01 <0.01	0.11 0.18 0.18 0.16	197 197 197 197
France, 1990	SC	1.1	2	57	<0.01(4)	0.40,0.41, 0.26,0.37	198

Location/ year	Form	Application kg ai/ha	No.	PHI, days	Residue (mg/kg) grain	straw	Ref.
	DG	1.1	2	57	<0.01(2), 0.01(2)	0.21,0.37	198
France, 1990	SC	1.1	2	81	<0.01(4)	0.75,0.57, 0.49,0.63	199
	DG	1.1	2	81	<0.01, 0.01	0.97,0.53	199
France, 1990	SC	1.1	2	43	<0.01(2) 0.01(2)	0.55,1.2, 1.0,1.8	200
	DG	1.1	2	43	<0.01(2)	0.62,1.1	
France, 1990	SC	1.1	2	62	<0.01(4)	0.32,0.40, 0.66,1.2	201
	DG	1.1	2	62	<0.01(2)	0.27,0.44	
France, 1990	SC	1.1	1	57	<0.01(2)	0.18,0.75	202
France, 1990	SC	1.1	1	58	<0.01(2)	0.19,0.07	203
France, 1990	SC	1.1	1	55	<0.01(2)	1.0,1.2	204
	DG	1.1	1	55	<0.01	0.70	
France, 1991	SC DG	1.1 1.1	2 2	45 45	<0.01(2) <0.01(2)	0.54,0.94 0.74,0.70	205
France, 1991	SC DG	1.1 1.1	2 2	46 46	<0.01(2) <0.01(2)	1.4,1.8 1.6,1.9	206
France, 1991	SC	1.1	1	81	<0.01(8)	0.09,0.16, 0.30,0.31, 0.43,0.45, 0.73,1.39	207
	DG	1.1	1	81	<0.01(8)	0.12, 0.13(2), 0.14,0.19, 0.43,0.49, 0.61	207
Germany, 1982	SC	1.1	1	48	<0.01	0.29	216
Germany, 1982	SC	1.1	1	35	<0.01	0.18	217
Netherlands, 1980	SC	1.0	1	68	<0.01	0.38	218
UK, 1988	SC	0.75	1	86	<0.02	0.13	229
UK, 1988	SC	0.75	1	79	<0.01	0.04	230
UK, 1988	SC	0.75	1	68	<0.01	0.02	231
UK, 1989	SC	1.0	4	49	<0.01	1.7	232
UK, 1989	SC	1.0	4	59	<0.01	2.4	233
UK, 1989	SC	1.0	4	43	<0.01	0.27	234
UK, 1989	SC	0.5+1.0	2	49	<0.01	0.33	235
		0.5+1.0	2	63	<0.01	0.11	235
		0.5+1.0	2	82	<0.01	0.19	235
UK, 1989	SC	0.5+1.0 0.5+1.0 0.5+1.0	2 2 2	59 73 89	<0.01 <0.01 <0.01	0.14 0.15 0.05	236 236 236
UK, 1989	SC	0.5+1.0 0.5+1.0 0.5+1.0	2 2 2	43 57 76	<0.01 <0.01 <0.01	0.15 0.09 0.05	237 237 237
UK, 1989	SC	1.0	1	61	<0.01(2)	0.19,0.17	238
UK, 1989	SC	1.0	1	43	<0.01(2)	0.14,0.13	239
UK, 1988	SC	1.0	1	50	<0.01	0.29	240
UK, 1988	SC	0.9	1	73	<0.01	0.02	241
UK, 1988	SC	0.9	1	86	<0.01	0.05	242
UK, 1988	SC	0.9	1	79	<0.01	0.02	243

Location/ year	Form	Application kg ai/ha	No.	PHI, days	Residue (mg/kg) grain	straw	Ref.
UK, 1990	SC	0.5+1.0	2	41	0.02	0.61	244
		0.5+1.0	2	70	0.02	1.2	244
	SC	1.0+2.0	2	41	0.05	3.7	244
		1.0+2.0	2	70	0.03	8.3	244
UK, 1990	SC	0.5+1.0	2	41	<0.01	0.58	244
				60	<0.01	0.92	244
		1.0+2.0	2	41	0.04	7.9	244
				60	0.02	9.2	244
UK, 1990	SC	0.5+1.0	2	45	<0.01	0.74	244
				74	<0.01	1.2	244
		1.0+2.0	2	45	0.04	7.3	244
				74	<0.01	5.5	244
UK, 1990	SC	0.5+1.0	2	41	<0.01	2.3	245
				70	<0.01	1.2	245
		1.0+2.0	2	41	0.04	12	245
				70	0.05	20	245
UK, 1990	SC	0.5+1.0	2	41	<0.01	0.70	245
				60	<0.01	0.13	245
	SC	1.0+2.0	2	41	0.02	5.9	245
				60	0.05	8.9	245
	SC	0.5+1.0	2	45	0.01	1.4	245
				74	<0.01	0.09	245
	SC	1.0+2.0	2	45	0.03	5.1	245
				74	0.03	7.3	245
UK, 1990	DG	1.3	1	84	<0.01(2)	2.1,2.2	246
		3.0	1	84	0.04, 0.08	3.2,7.0	246
UK, 1990	DG	1.3	1	77	<0.01(2)	1.9,1.6	246
		3.0	1	77	<0.01(2)	3.7,2.2	246
UK, 1990	DG	1.3	1	77	<0.01(2)	1.3,0.58	246
		3.0	1	77	0.06,0.07	4.4,9.9	246
UK, 1990	SC	0.6	1	83	<0.01	0.46	247
		1.2	1	83	0.02	4.7	247
		0.75	1	83	<0.01	0.06	247
		1.5	1	83	<0.01	0.15	247
UK, 1990	SC	0.6	1	74	0.02	0.05	247
		1.2	1	74	<0.01	0.98	247
		0.75	1	74	<0.01	0.24	247
		1.5	1	74	<0.01	1.5	247
UK, 1990	SC	0.6	1	88	<0.01	0.62	247
		1.2	1	88	<0.01	1.2	247
		0.75	1	88	<0.01	0.22	247
		1.5	1	88	<0.01	0.41	247
UK, 1991	SC	0.5+1.0	2	37	0.04,0.05	1.5, 1.3	248
		1.0+2.0	2	37	0.16,0.14	7.1,8.5	248
	DG	0.5+1.0	2	37	0.07,0.09	1.5(2)	248
		1.0 +2.0			0.19,0.24	6.8,7.9	248
UK, 1991	SC	0.5+1.0	2	37	<0.01(2)	1.3,3.1	248
		1.0+2.0	2	37	0.02,0.03	10,12	248
	DG	0.5+1.0	2	37	<0.01,0.01	0.9, 1.3	248
		1.0+2.0	2	37	0.02(2)	6.0,5.7	248
UK, 1991	SC	0.5+1.0	2	37	0.01,0.02	2.2,0.8	248
		1.0+2.0	2	37	0.10,0.18	15,10	248
	DG	0.5+1.0	2	37	0.01,0.03	1.1,1.4	248
		1.0+2.0	2	37	0.08,0.15	6.5,5.5	248

Underlined results reflect use up to 1.5 kg ai/ha, PHI 35-49 days.

Oats and rye (Table 23). A single trial on oats and two trials on rye were reported from Germany. Residues in the grain were ≤0.02 mg/kg and in the straw 0.04-0.41 mg/kg.

Table 23. Residues of chlorothalonil in oat and rye grain and

straw from supervised trials carried out in Germany in 1983 with an SC formulation.

Crop	Application kg ai/ha	No.	PHI, days	Residue (mg/kg) grain	straw	Ref.
Oats	1.0	2	51	0.02	0.04	212
Rye	1.0	2	76	ND*	0.12	214
Rye	1.0	2	69	ND*	0.41	215

*Limit of determination not reported

Peanuts (Table 24). In supervised trials carried out in the USA and using treatment regimes within the maximum USA GAP residues were <0.01-0.03 mg/kg in nut-meat and <0.01-0.18 mg/kg in hulls.

Table 24. Residues of chlorothalonil in peanuts from supervised trials carried out in the USA using SC formulations.

Location, year	Application kg ai/ha	No.	PHI, days	Residue (mg/kg) nut-meat	hull	Ref.
Florida, 1986	1.3	7	12	<0.01	0.02	249
Texas, 1986	1.3	6	13	0.01	0.06	249
Alabama, 1986	1.3	8	17	<0.01	0.08	249
Alabama, 1986	1.3	8	17	<0.01	0.10	249
Texas, 1986	1.3	6	13	<0.01	0.04	249
Texas, 1986	1.3	6	13	<0.01	0.07	249
Texas, 1986	1.3	7	17	<0.01	0.08	249
Georgia, 1986	1.3	7	22	0.03	0.18	249
Virgina, 1986	1.3	7	27	<0.01	0.11	249
S Carolina, 1986	1.3	8	32	<0.01	0.03	249
N Carolina, 1986	1.3	5	35	<0.01	0.09	249
Oklahoma, 1986	1.3	6	43	<0.01	<0.01	249

Underlined results reflect use within US GAP.

FATE OF RESIDUES

In plants

The metabolism of chlorothalonil has been investigated in lettuce, tomato, carrot and celery.

Lettuce. Lettuce plants growing in an environmental chamber were treated four times with [^{14}C]chlorothalonil at a rate equivalent to 1.8 kg ai/ha (Nelsen *et al.*, 1985). Concentrations of radioactivity in samples harvested 1-21 days after the last treatment were 100-200 mg chlorothalonil equivalent/kg. Nearly all (>80%) of the radioactivity was

associated with chlorothalonil. The rest was characterized as 4-hydroxy-2,5,6-trichloroisophthalonitrile (SDS-3701, DAC-3701) (up to 2%) or was associated with uncharacterized water-soluble (up to 7%) or unextracted (up to 5%) material.

Tomato. Applications of [^{14}C]chlorothalonil at a rate equivalent to 2.3 kg ai/ha to tomato plants growing in an environmental chamber resulted 1, 7 and 14 days later in total residues in fruit of 2.6, 0.6 and 0.6 mg chlorothalonil equivalent/kg respectively (Nelsen and Duane, 1988). The major component of the residue was chlorothalonil which accounted for 76% of the residue at day 1 and 58% at day 14. The metabolite SDS-3701 was found in fruit, contributing 2-5% of the total residue. The balance of radioactivity was associated with polar water-soluble material (up to 32%) which appeared to contain predominantly conjugated derivatives of chlorothalonil, as well as small amounts (up to 5%) of unextractable material.

Carrot. Carrot plants were treated three times at weekly intervals at 1.6 kg ai/ha (Nelsen *et al.*, 1987). Samples of roots taken 1,7, 14 and 21 days after the last treatment contained total radioactive residues equivalent to 0.07, 0.02, 0.01 and 0.03 mg parent/kg. The residue in the 21-day sample was made up as follows: 40% chlorothalonil, 3% SDS-3701, 15% uncharacterized organosoluble, 20% uncharacterized water-soluble and 30% unextracted material.

Celery. Total radioactive residues in celery stalks harvested 7 and 21 days after the last of 12 applications at rates equivalent to 2.4 kg ai/ha were 1.0-4.6 and 0.7-1.4 mg/kg respectively (Huhtanen, 1992). Chlorothalonil was a significant component (10-56%, average 43%) of the total residue in all stalk samples. SDS-3701 and 3-carboxy-2,5,6-trichlorobenzamide (SDS-46851, DAC-46851) were not found. The balance of radioactivity was associated with a large number of minor components which could not be characterized by comparison with standard materials and did not generate characterizable materials on acid or enzyme hydrolysis.

In storage and processing

A number of studies have been conducted to investigate the fate of chlorothalonil residues during storage and handling or processing of crops prior to consumption.

In several of these studies levels of SDS-3701, SDS-46851, hexachlorobenzene (HCB) and pentachlorobenzonitrile (PCBN) were also measured in processing fractions. Levels of these metabolites and of formulation impurities were low in all samples.

Cherry (Anon, undated). Levels of chlorothalonil in treated cherries (6 x 1.8 kg ai/ha, 7-day PHI) and washed and processed cherries were as follows.

	Residue	
	mg/kg	% of initial
whole unwashed	2.7	100
whole washed	0.52	19
pitted washed	0.38	14
canned (with water)	0.03	1
canned (with syrup)	0.03	1

Chlorothalonil was found in the waste liquid from the pitter (2.6 mg/kg), in cherry stones (0.06 mg/kg) and in wash water (0.03-0.27 mg/kg). No SDS-3701 (<0.01 mg/kg) was found in any sample.

Peach (Anon, undated). Levels of chlorothalonil in treated peaches (6 x 0.9 kg ai/ha, 7-day PHI) and their processed products were as follows:

	Residue	
	mg/kg	% of initial
whole unwashed	13	100
whole washed (water)	5.9	45
whole peeled (caustic)	0.21	2
canned peach puree	<0.01	-

Chlorothalonil was not found (<0.01 mg/kg) in waste pulp. SDS-3701 was not found (<0.01 mg/kg) in waste pulp or peach puree but was found (0.13 mg/kg) in whole peeled peaches.

Grapes (Table 5). In trials carried out in 1987 in France residues were not found (<0.0025 mg/kg) in wine prepared from grapes containing low residues (0.02 mg/kg) of chlorothalonil.

Cabbage (King *et al.*, 1986) Residue levels in treated cabbages were determined at 3 points in the distribution chain: at the farm gate, on leaving the packing house and at retail outlets. Samples were taken and traced from four locations through 3 packing houses to a total of 37 grocery stores.

Residue levels at retail outlets were 8.5% of those present at harvest.

Cucumber. The effect of commercial processing on residue levels in treated cucumbers (2 x 6.54 l/ha Bravo 500, 12-hour PHI) has been investigated (King and Ballee, 1987). Chlorothalonil concentrations were 1.3 mg/kg in unwashed cucumbers, 0.71 mg/kg after washing and 0.52 mg/kg following additional rinsing. After slicing and soaking in brine for 1 hour the residue level was 0.38 mg/kg. After a boiling vinegar/water/sugar solution was added and pickle slices were allowed to cool the residue level was 0.11 mg/kg. After canning, including heating at 210^{o}F for 10 minutes, residue levels in hot canned pickle slices were 0.01 mg/kg. Thus 98% of the residue was lost during commercial processing.

In a separate study (Marks, 1987), treated cucumbers (3 or

4 x 1.8 kg ai/ha, 0- or 1-day PHI) were sampled at 3 points in the distribution chain: at the farm gate (4 sites), at the exits from packing houses (4 houses) and at retail outlets (a total of 40 stores or restaurants/delicatessens). The ranges of residue levels found were 0.02-0.79, <0.01-0.05 and <0.01-0.04 mg/kg at the respective locations. Residue levels decreased to 8-14% of initial levels at the packing houses, where samples were washed, brushed and waxed.

Squash (King and Prince, 1990a). Levels of chlorothalonil in treated squash (11 x 2.6 kg ai/ha, 0-day PHI) and sequential fractions of processed squash were as follows.

	Residue	
	mg/kg	% of initial
whole unwashed	3.2	100
peeled, deseeded	<0.01	-
milled	<0.01	-
partially cooked	<0.01	-
baby food	<0.01	-

Chlorothalonil was not found (<0.01 mg/kg) in finisher waste and 0.15 mg/kg was found in squash waste. SDS-3701 was not found except at very low levels in whole unwashed squash (0.02 mg/kg) and finisher waste (0.01 mg/kg). SDS 46851 was not found except for low levels in whole unwashed fruit (0.06 mg/kg), peeled squash (0.04 mg/kg) and squash waste (0.03 mg/kg). HCB and PCBN were only found in waste (0.003 or 0.005 mg/kg and 0.008 mg/kg, respectively).

Tomato. Levels of chlorothalonil have been measured in treated tomatoes (5, 7 or 9 x 1.8 or 1.6 kg ai/ha 4,7 or 12-day PHI) and processed tomatoes (Anon, undated). Two processing procedures were used; both simulated commercial practice. In one the peel was removed and in the other it was retained. Results were as follows.

	Residue, mg/kg	
Peel removed		
whole unwashed	i) 3.2	ii) 1.8
whole washed	0.2	0.02
whole washed and rinsed	0.2	-
pomace	0.02	0.03
juice	<0.01	<0.01
Peel retained		
whole unwashed	4.0	
pomace	0.62	
canned tomatoes	<0.01	
canned tomato paste	<0.01	
canned tomato juice	<0.01	

In a second study tomatoes were treated 7 times at 2.5 kg ai/ha or double that rate (Szalkowski *et al.*, 1980). Samples (400 lb from each plot) were harvested one day after the last treatment. Tomatoes were processed using a commercial method

which does not remove skins during the early stages of processing. Fruits were power-washed with cold water, passed through a disintegrator and heated to 140-150◦F before passing through a cyclone separator with 0.093 and 0.060 inch finisher screens in place. Juice was hot-filled at 150◦F and air-cooled. Paste (36-40% solids) was prepared by vacuum distillation at 140-150◦F and hot-filled at 150◦F. Chlorothalonil concentrations in processing fractions (mg/kg) were as follows:

	2.5 kg/ha		5 kg/ha
whole unwashed	2.5		4.7
whole washed	0.65		1.2
pomace	2.2	3.8	
juice	0.02		0.78
paste	<0.01		0.02

Chlorothalonil was found in wash water (0.4 or 0.2 mg/kg) but not in condensate (<0.0003 mg/kg). Levels of SDS-3701 were low in all fractions.

In another study (Dillon, 1986a) treated tomatoes were sampled at 3 points in the distribution chain: in the field, at the packing house and at the point of retail sale. Crops had been treated 2-15 times at 0.2-2.3 kg ai/ha and were harvested one day after the last treatment. Four crop locations, four packing houses and 40 retail outlets were investigated. Fruit were washed, dried and waxed in the packing house. Residue levels were 0.12-2.9 mg/kg in field samples, <0.01-0.07mg/kg in packing house samples and <0.01-0.03 mg/kg in retail samples. The residue loss at the packing house was 98%.

Snap beans (Ballee *et al.*, 1980). Treated samples (no treatment details given) were mechanically harvested, air-cleaned, then washed with water, blanched and canned or washed twice, sliced and blanched for freezing. Chlorothalonil concentrations (mg/kg) in the processed beans were as follows.

Canning		Freezing	
at harvest	0.84	at harvest	0.78
after air cleaning	0.54	after first wash	0.16
washed	<0.01	after second wash	0.09
blanched	<0.01	after slicing	0.10
canned	<0.01	after blanching	<0.01

Concentrations of chlorothalonil in canning waste were 29 mg/kg in field trash, 5.2 mg/kg in air cleaner trash, 0.02 mg/kg in solid waste, 0.05 mg/l in wash water and 0.05 mg/l in water discharged from the plant. In freezing waste they were 0.11 mg/kg in bean waste, 0.005 mg/l in first wash water, 1 mg/l in second wash water and 0.004 mg/l in water discharged from the plant.

Carrots (King and Prince, 1990b). Carrot crops were treated 11 times at 2.3 or 23 kg ai/ha and harvested on the day of the last treatment. Root samples (400 lbs) were peeled, cooked, and pureed, then canned. Concentrations of chlorothalonil (mg/kg) were as follows.

	Lower rate	Higher rate
whole, unwashed	0.04	2.2
whole, peeled	<0.01	<0.01
pureed	<0.01	<0.01
cooked	<0.01	<0.01
canned baby food	<0.01	<0.01

Potatoes (Dillon *et al.*, 1986). Potato crops were treated 8 times at 0.6 or 1.2 kg ai/ha. Vines were killed 14 days after the last treatment. Eight days later crops were treated at 0, 2, 8 or 16 pints/acre. Residues of chlorothalonil were not found (<0.01 mg/kg) except in samples treated at the highest rate. Potato samples were washed and peeled, then either sliced and crisped or diced, cooked, dehydrated to granular potato and/or powdered. Residue levels (mg chlorothalonil/kg) were as follows.

whole, unwashed	0.01		
peeled, washed	<0.01		
crisps, sliced	<0.01	dried diced	<0.01
crisps	<0.01	cooked	<0.01
		dried, granular	<0.01
		dried, powdered	<0.01

Chlorothalonil levels were 2.8 mg/kg in the wash water and 0.04 mg/kg in the peel.

Celery (Dillon, 1986b). Samples of treated celery were taken for analysis at 3 points in the distribution chain: in the field, at the packing house and at the point of retail sale (grocery or restaurant). Crops had been treated 2-11 times at 1.1-2.4 kg ai/ha and were harvested 7 or 8 days after the last treatment. Four treatment locations, 4 packing houses and 40 retail outlets were included. Concentrations of chlorothalonil were 0.12-7.3 mg/kg in the field, 0.06-6.5 mg/kg at the packing house, 0.06-1.6 mg/kg at grocery stores and <0.01-0.82 mg/kg at restaurants. Samples taken at restaurants were sliced or diced using normal procedures. The loss of residues was 49% in the packing house and end users received 25% of field residues in grocery stores and 3% in restaurants.

Peanuts (Kenyon and Ballee, 1987). Plants were either treated 11 times at 1.2 kg ai/ha and combined 16 days after the last application or 13 times at 1.2 kg ai/ha and combined 6 days after the last treatment. Residues were found only when the latter regime was used. Samples (40 lbs) were shelled and pressed; crude oil was refined. Residue levels (mg/kg) were as

follows:

field sample, nut-meat	0.01
nut-meat before processing	0.02
crude oil (after pressing)	<0.01
crude oil (solvent extracted from presscake)	0.01
refined oil	<0.01

Chlorothalonil was not found (<0.01 mg/kg) in the presscake following solvent extraction or in soapstock but was present in hulls (0.19-0.40 mg/kg) and trash (0.42 mg/kg).

Stability of pesticide residues in stored analytical samples

Cherries (King *et al.*, 1990a). Residues of chlorothalonil in sour cherries were stable during freezer storage for one year; two samples were taken for analysis after 0, 1, 7, 29, 85, 194, 271 and 362 days storage. Samples for storage were harvested two hours after the last of 10 treatments at 3.4 kg ai/ha and had field-incurred residues of 10 mg/kg.

Cucumbers (Wiedmann and Ballee, 1990). Samples were taken one hour after the last of four treatments at 5 or 7.5 kg ai/ha and had field-incurred residues of 1 mg chlorothalonil/kg. Residues of chlorothalonil were stable during freezer storage for one year; four samples were taken for analysis after 0, 1, 7, 28, 91, 182, 276 and 360 days storage.

Tomatoes (Kenyon *et al.*, 1990a). Residues of chlorothalonil in tomatoes were stable during freezer storage for one year; four samples were taken for analysis after 0, 1, 7, 30, 92, 174, 274 and 363 days storage. Samples for storage were harvested 1½ hours after the last of nine treatments at 2.5 or 7.5 kg ai/ha and had field-incurred residues of 10 mg chlorothalonil/kg.

Carrots (Rose *et al.*, 1990a). Samples were taken five hours after the last of 11 treatments at 17 kg ai/ha and had field-incurred residues of 1.5 mg chlorothalonil/kg. Residues of chlorothalonil were stable during freezer storage for one year; four samples were taken for analysis after 0, 1, 6, 33, 90, 180, 270 and 363 days storage.

Potatoes (Rose *et al.*, 1990b). Residues of chlorothalonil in potatoes were stable during freezer storage for one year; four samples were taken for analysis after 0, 1, 7, 30, 90, 180, 270 and 363 days storage. Samples for storage were harvested on the day of the last of 15 applications at 12 kg ai/ha and had field-incurred residues of 2 mg chlorothalonil/kg.

Celery (King *et al.*, 1990b). Samples were taken one hour after the last of 16 treatments at 2.5 kg ai/ha and had field-incurred residues of 5 mg chlorothalonil/kg. Residues of chlorothalonil were stable during freezer storage for one year; four samples were taken for analysis after 0, 1, 7, 28,

91, 181, 280 and 364 days storage.

Wheat grain (Kenyon *et al.*, 1990b). Residues of chlorothalonil in wheat grain were stable during freezer storage for one year; four samples were taken for analysis after 0, 1, 7, 30, 91, 179, 273 and 362 days storage. Samples for storage were harvested on the day of the last of seven treatments at 12 kg ai/ha and had field-incurred residues of 40 mg chlorothalonil/kg.

Peanuts (King *et al.*, 1991). Samples of nut-meat were taken on the day of the last of 11 treatments at 10-12 kg ai/ha and had field-incurred residues of 13 mg/kg. Four samples were taken for analysis after 0, 1, 7, 28, 80, 171, 266, 300, 328, 363, 425, 485, 544, 601, 663 and 726 days storage. There was a 22% per year decline in chlorothalonil residues. This was not, however, a clear linear decline, rather a 'shift' at 266 days preceded and followed by apparent stability.

APPRAISAL

Chlorothalonil was first evaluated in 1974. This evaluation has been prepared as part of the programme of periodic reviews agreed by the CCPR.

Information on current GAP and residue trials data were made available to the Meeting by one of the manufacturers; GAP information was also provided by Australia, Canada and the EC.

At the initiation of this review there were 35 MRLs for chlorothalonil; all were CXLs except the MRL for grapes which was at step 7B.

The fate of chlorothalonil has been studied in lettuce, tomato, carrot and celery. Chlorothalonil was the major characterised component of the residue in all cases; small amounts of 4-hydroxy-2, 5, 6-trichloroisophthalonitrile (SDS-3701) were also found.

Data from supervised residue trials carried out in a number of countries and on a range of crops were available.

No GAP was reported for citrus fruit, so the Meeting recommended that the CXL of 5mg/kg should be withdrawn.

The CXL of 10 mg/kg for cherries was proposed in 1974; it was based on US GAP with a 7-day pre-harvest interval and residue data from trials carried out in the USA. Since use so close to harvest is no longer GAP in the USA the CXL is obsolete and the Meeting considered that it should be withdrawn. Results from a series of trials carried out in accordance with current GAP in the USA were available at the Meeting. Residues up to 0.5 mg/kg were found. The Meeting recommended that an MRL of 0.5 mg/kg was appropriate for this use.

For peaches, the CXL of 25 mg/kg was again based on US GAP permitting use up to 7 days before harvest and residue trials data from the USA. This US GAP is now obsolete and therefore the CXL was not acceptable. Supervised trial data on peaches from Italy, Spain and the USA were made available to the Meeting. Residues up to 0.12 mg/kg were found when chlorothalonil was used according to current US GAP, and up to 0.98 mg/kg in Italian trials within Spanish and Greek (1.5kg ai/ha and 14-15 days PHI) and Italian (1.0 kg ai/ha and 21-day PHI) GAP. The Meeting recommended an MRL of 1 mg/kg for peaches.

Chlorothalonil residues up to 4.1 mg/kg were found in cranberries harvested 50-70 days after treatment at 5.9 kg ai/ha (within US GAP) in a series of trials in the USA in the 1980s. The Meeting confirmed the MRL of 5 mg/kg for cranberry.

The CXLs of 25 mg/kg for raspberries (red and black) and currants (black, red and white) and 10 mg/kg for blackberries were based on GAP and trials in the USA. Since this GAP is no longer current the Meeting recommended that these CXLs should be withdrawn.

For grapes, the draft MRL, at step 7B, is 10 mg/kg. This proposal was based on Austrian GAP of 0.11 kg ai/ha with a PHI of 7 days and on data from supervised trials carried out in Germany; this GAP is no longer current. A 1.6 kg ai/ha, 7-day PHI GAP has been reported for Australia and in one trial in 1973/4 chlorothalonil residues up to 5.6 mg/kg were found in supervised trials after treatment within this GAP. However, GAP in France (0.4 kg ai/ha, 30 days PHI) yielded much more recent data that were consistent and were deemed more suitable as the basis for a recommendation. The Meeting therefore recommended an MRL of 0.5 mg/kg, based on the data from France.

For banana the GAP on which the CXL of 0.2 mg/kg was based is not clearly described in the 1973 evaluations. The data base considered by the present Meeting was not sufficient to support a soundly based MRL and the Meeting recommended that the CXL should be withdrawn.

The CXL of 5 mg/kg for bulb onions was based on trials data for green onions; the Meeting therefore concluded that it needed revision. Chlorothalonil residues up to 0.57 mg/kg were found in bulb onions harvested 7 days after treatment at 1.5 - 1.75 kg ai/ha (within US GAP) and up to 0.52 mg/kg 14 days after treatment at 1.5 kg ai/ha (within other countries' GAP), although most results were lower than these. The Meeting recommended an MRL of 0.5 mg/kg.

The CXL of 5 mg/kg for cabbages was based on residue data from US trials where crops were harvested on the day of the last treatment. Since current US GAP specifies a minimum PHI of 7 days the CXL should be revised. Chlorothalonil residues

up to 0.7 mg/kg were reported from trials using treatment regimes within US, UK and Irish GAP. The Meeting recommended an MRL of 1 mg/kg.

For broccoli, the CXL of 5 mg/kg is based on a 7-day PHI and results from US trials. This GAP is still current in the USA and Canada but although results were reported from two further US trials where treatments were within GAP, the Meeting considered the data were inadequate and recommended that the CXL of 5 mg/kg should be withdrawn.

The CXL of 5 mg/kg for Brussels sprouts was based on a PHI of 7 days and data from the USA. Chlorothalonil residues up to 4.3 mg/kg were reported for samples harvested 6-7 days after treatment at 1.3-2.5 kg ai/ha. The Meeting recommended that the CXL should be maintained.

For cauliflower, the CXL of 5 mg/kg was based on a PHI of 7 days and residue data from the USA. Chlorothalonil residues up to 0.47 mg/kg were reported from trials where treatments were within current GAP in the USA, UK and Ireland. The Meeting recommended an MRL of 1 mg/kg.

For kale, the CXL of 10 mg/kg was based on US GAP and residue data. Since this GAP is no longer current the Meeting recommended withdrawal of the CXL.

The CXL of 5 mg/kg for melons except watermelon was based on US trials data and a 1-day PHI. Chlorothalonil residues up to 1.45 mg/kg were found in samples treated in accordance with US GAP. The Meeting recommended an MRL of 2 mg/kg but recognised that additional data on residues on different types of melons would be desirable.

For cucumbers, the CXL of 5 mg/kg is based on a 1-day PHI. Chlorothalonil residues up to 4.3 mg/kg were reported from trials where treatments were in accordance with US GAP and the Meeting recommended that the CXL should be maintained.

The CXLs of 5 mg/kg for summer and winter squash and pumpkins were based on a 1-day PHI. Chlorothalonil residues up to 3.6 mg/kg were found in samples of summer and winter squash treated in accordance with current US GAP. The Meeting recommended that MRLs of 5 mg/kg were appropriate for summer and winter squash. No residue data were presented for pumpkins and therefore that CXL should be withdrawn, although pumpkins appear to be covered in the Codex Classification by the MRL for winter squash.

For sweet corn, the CXL of 1 mg/kg was based on a 1-day PHI which is no longer GAP. Residue data reflecting current US GAP were available from only one trial; these were not sufficient to estimate a maximum residue level. The Meeting recommended withdrawal of the CXL.

The CXL for tomato is 5 mg/kg, based on US data and GAP.

Chlorothalonil residues up to 4.6 mg/kg were found in trials where treatments were within GAP. The Meeting recommended that the CXL should be maintained.

The CXL of 10 mg/kg for peppers was based on US GAP and residue data. Since use on peppers is no longer GAP in the USA the Meeting recommended withdrawal of this recommendation.

The CXLs for endive, lettuce and witloof chicory (sprouts) were based on US GAP and residue data. Since use on these crops is no longer GAP in the USA the Meeting recommended withdrawal of these CXLs.

The CXL of 5 mg/kg for common bean (pods and/or immature seeds) was based on US GAP and residue data. In supervised trials residue levels in crops treated in accordance with GAP were up to 3.1 mg/kg. The Meeting recommended that the CXL should be maintained.

The CXL for lima beans (dry) was based on US GAP and residue data. Since this use is no longer GAP in the USA the Meeting recommended withdrawal of the CXL.

The CXL of 1 mg/kg for carrots was based on GAP and residue data from the USA. Residues up to 0.96 mg/kg were reported from trials where treatments were within GAP. The Meeting recommended that the CXL should be maintained.

The CXL of 0.1 mg/kg for potato was based on a 0-day PHI. Residues up to 0.18 mg/kg were reported from trials where treatments were within GAP although only one result exceeded 0.1 mg/kg. The Meeting recommended an MRL of 0.2 mg/kg.

The CXL of 1 mg/kg for sugar beet was based on a 1-day PHI; this is no longer GAP. Residues reflecting current GAP were up to 0.1 mg/kg in the root. The Meeting recommended an MRL of 0.2 mg/kg for sugar beet root. Corresponding residues in the leaves reached 14 mg/kg. The Meeting recommended an MRL of 20 mg/kg for sugar beet leaves or tops but realised that appropriate animal transfer studies were lacking.

The CXL of 15 mg/kg for celery was based on a 7-day PHI. Chlorothalonil residues up to 9.8 mg/kg were found in trials where treatments reflected current GAP. The Meeting recommended an MRL of 10 mg/kg.

Barley grain from crops treated in accordance with GAP contained up to 1.4 mg chlorothalonil/kg. Most results however were much lower than this. The Meeting decided that the data reflecting use up to 1.4 kg ai/ha were not sufficient to support a soundly based MRL and recommended an MRL of 0.1 mg/kg for grain, based on application rates up to 1.0 kg ai/ha. The Meeting also recommended an MRL of 20 mg/kg for barley straw; animal transfer studies are desirable.

Wheat grain from crops treated in accordance with GAP

contained up to 0.09 mg chlorothalonil/kg. The Meeting recommended that the MRL should be established at 0.1 mg/kg for grain and 20 mg/kg for wheat straw, recognising that animal transfer studies were desirable.

GAP was not reported for any other cereal grain. The Meeting recommended that the CXL for cereal grains should be withdrawn.

The CXLs for whole peanut and peanut kernels were based on a 1-day PHI; this is no longer GAP. Chlorothalonil residues up to 0.03 mg/kg were found in crops treated in accordance with current GAP. The Meeting recommended an MRL of 0.05 mg/kg for peanut and withdrawal of the CXL for whole peanuts.

Information on residue distribution between the inedible and edible portions of the commodity was available for banana; chlorothalonil is essentially a surface residue and transfer to pulp was insignificant.

Processing studies are available for cherry, peach, grape, cabbage, cucumber, squash, tomato, snap bean, carrot, potato, celery and peanut.

Washing cherries, peaches, cucumbers, tomatoes and snap beans removed 45-95% of the residue. Residue reductions of 75-98% occurred in cabbages, cucumbers, tomatoes and celery during distribution from the farm gate to retail outlets. Residue levels in canned cherries, canned pickled cucumber and tomato juice made from treated crops were very low (1-2% of initial residues). Residues were not found in canned peach puree, wine, squash-based baby food, tomato paste, canned or frozen snap beans, carrot-based baby food, potato crisps, dried potato or refined peanut oil prepared from crops with incurred residues.

Chlorothalonil residues were stable during freezer storage for one year in cherries, cucumbers, tomatoes, carrots, potatoes, celery and wheat grain.

RECOMMENDATIONS

On the basis of the data on residues from supervised trials the Meeting concluded that the residue levels listed below are suitable for establishing maximum residue limits.

Definition of the residue: chlorothalonil

Commodity		Recommended MRL (mg/kg)		PHI on which based, days
CCN	Name	New	Previous	
FI 0327	Banana	W	0.2	-
GC 0640	Barley	0.1	0.2 (cereals)	49

Commodity		Recommended MRL (mg/kg)		PHI on which based, days
CCN	Name	New	Previous	
AS 0640	Barley straw and fodder, dry	20	-	49
FB 0264	Blackberries	W	10	-
VB 0400	Broccoli	W	5	7
VB 0402	Brussels sprouts	5	5	7
VB 0041	Cabbages, Head	1	5	7
VR 0577	Carrot	1	1	0
VB 0404	Cauliflower	1	5	7
VS 0404	Celery	10	15	7
GC 0080	Cereal grains	W	0.2	-
FS 0013	Cherries	0.5	10	*
FC 0001	Citrus fruits	W	5	-
VP 0526	Common bean (pods and/or immature seeds)	5	5	7
FB 9265	Cranberry	5	5	50
VC 0424	Cucumber	5	5	0
FB 0021	Currants (Black, Red, White)	W	25	-
VL 0476	Endive	W	10	-
FB 0269	Grapes	0.5	10	30
VL 0480	Kale	W	10	-
VL 0482	Lettuce, Head	W	10	-
VD 0534	Lima bean (dry)	W	0.5	-
VC 0046	Melons, except watermelon	2	5	0
VA 0385	Onion, Bulb	0.5	5	14
FS 0247	Peach	1	25	14-21
SO 0703	Peanut, whole	W	0.5	-
SD 0697	Peanut	0.05	0.1	14
VO 00051	Peppers	W	10	-
VR 0589	Potato	0.2	0.1	0
VC 0429	Pumpkins	W	5	-
FB 0272	Raspberries (Red, Black)	W	10	-
VC 0431	Squash, summer	5	5	0
VR 0596	Sugar beet	0.2	1	14
AV 0596	Sugar beet leaves or tops	20	-	14
VO 0447	Sweet corn	W	1	
VO 0448	Tomato	5	5	0
GC 0654	Wheat	0.1	0.2 (cereals)	41-45
AS 0654	Wheat straw and fodder, dry	20	-	41-45
VC 0433	Winter squash	5	5	0
VS 0469	Witloof chicory (sprouts)	W	10	-

* last use at shuck (cot) fall.

FURTHER WORK OR INFORMATION

Desirable

1. Additional residue data from supervised trials on different types of melons.

2. Animal transfer studies assuming a residue equivalent to the recommended MRL of 20 mg/kg in sugar beet leaves or tops, barley straw and wheat straw.

3. Additional residue data on grapes treated according to GAP in Australia.

REFERENCES

References to supervised trials are cited by number in the Tables. References to the fate of residues are cited by authors' names in the text.

Reference List 1 (numerical) gives complete references to all the citations in the monograph. List 2 (alphabetical) comprises the references to the fate of residues. Each reference gives only the author(s), the year, and the number in List 1 under which the complete reference will be found.

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