CLETHODIM (187)

EXPLANATION

Clethodim was first evaluated by the 1994 JMPR which recommended a number of MRLs. At the 1996 CCPR the governments of Germany and The Netherlands provided detailed comments on the 1994 monographs which they considered to be unclear and over-summarized. Reservations were expressed because there were no quantitative data on the metabolites in plants and none on the nature or quantities of individual metabolites in goats. The limit of determination of 0.05*mg/kg was questioned and it was pointed out that the method of analysis could not distinguish between sethoxydim and clethodim. A number of individual recommendations for MRLs were also questioned.

The manufacturer has provided an item-by-item response to the comments of Germany and The Netherlands, together with some comments on other points raised at the 1996 CCPR (Tomen Agro 1996).

A number of new studies submitted to the present Meeting were not reviewed because the data were not identified in the 1994 evaluation as being either required or desirable and they do not help to answer the questions raised by member governments at the 1996 CCPR. However, all the new data on residue trials have been reviewed to allow the estimation of additional maximum residue levels.

Animal metabolism

Goats. In a metabolism study reviewed by the 1994 Meeting, a lactating goat was dosed with [*propyl*-1-^{14}C]clethodim at 14.2 mg/dose 3 times a day for 3 days, and once on the fourth day. A control goat received the same number of empty gelatine capsules. Milk was collected twice daily and excreta daily. The goat was slaughtered about 4 hours after the last dose and samples of muscle, fat, liver, kidneys, heart and blood were collected (Rose and Suzuki, 1988).

Ninety one per cent of the administered radioactivity was found in the urine and faeces with the milk containing 0.02-0.05mg/kg clethodim equivalents (about 0.14% of the administered ^{14}C). The highest tissue concentrations were found in the liver (0.414 mg/kg clethodim equivalents) and kidneys (0.378 mg/kg). The extraction scheme for the milk, blood and tissues resulted in a distribution of radioactivity into hexane, acetonitrile and methanol or methanol/water. In blood and all the tissues except peritoneal fat (in which the radioactive residues were very low), 62-86% of the radioactivity in the samples was found in the acetonitrile extract. In milk 30-66% of the radioactivity was unextractable, although again most of the extractable radioactivity (10-33% of the radioactivity in the milk) was associated with the acetonitrile fraction.

Metabolites were identified only in those extracts which contained a relatively high percentage of the radioactivity. The hexane fraction which, excepting the heart and milk extracts, contained less than 4% of the substrate radioactivity, was not examined. Tables 1 and 2 show the distribution and quantification of the major metabolites in the milk, blood and tissues.

Table 1. Quantification of metabolites in milk of a lactating goat treated with [*propyl*-1-^{14}C] clethodim for 4 days.

Compound	% of radioactivity and (mg/kg clethodim equivalents)							
	Day 1		Day 2		Day 3		Day 4	
	a.m.[1]	p.m.	a.m.	p.m.	a.m.	p.m.	a.m.	Slaughter
Clethodim	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	0.0 (0.00)	3.3 (0.001)	0.0 (0.00)
Clethodim sulfoxide	0.0 (0.00)	29.4 (0.006)	19.2 (0.005)	20.2 (0.007)	18.0 (0.006)	14.7 (0.005)	17.7 (0.006)	27.0 (0.013)
S-methyl sulfoxide	0.0 (0.00)	0.0 (0.00)	6.9 (0.002)	5.5 (0.002)	0.0 (0.00)	4.3 (0.001)	5.7 (0.002)	11.1 (0.005)
Lactose	0.0 (0.00)	0.0 (0.00)	54.1 (0.014)	42.0 (0.014)	44.4 (0.014)	49.4 (0.017)	43.4 (0.016)	29.8 (0.015)

[1]Levels too low for identification

Table 2. Quantification of metabolites in blood and tissues of a lactating goat treated with [*propyl*-1-^{14}C]clethodim for 4 days

Compound	% of radioactivity and (mg/kg clethodim equivalents)						
	Blood	Liver	Kidneys	Heart	Forequarter muscle	Hindquarter muscle	Subcutaneous fat
Clethodim	28.0 (0.047)	27.6 (0.114)	1.3 (0.005)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	2.8 (0.002)
Clethodim sulfoxide	39.9 (0.067)	33.2 (0.137)	36.9 (0.139)	43.2 (0.025)	51.6 (0.017)	40. (0.014)	47.2 (0.037)
Clethodim sulfone	3.8 (0.006)	3.2 (0.013)	1.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
S-methyl sulfoxide	11.6 (0.019)	6.2 (0.025)	30.8 (0.116)	37.2 (0.021)	28.5 (0.009)	32.4 (0.011)	29.0 (0.023)
Imine sulfoxide	3.0 (0.005)	1.5 (0.006)	4.1 (0.016)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	4.7 (0.004)
5-hydroxy sulfone	2.7 (0.004)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
Unidentified	3.2 (0.005)	4.0 (0.016)	4.0 (0.016)	0.0 (0.000)	0.0 (0.000)	7.9 (0.003)	8.1 (0.006)

Plant metabolism

The metabolism of [*cyclohexene*-4,6-^{14}C]clethodim and [*chloroallyl*-2-^{14}C]clethodim was studied on carrots, soya beans and cotton plants which were treated twice at 14-day intervals at an application rate of 0.29 kg ai/ha. The crops were harvested at maturity with PHIs of 20 to 70 days (Chen, 1988). Most of the radiocarbon was found in the leaves and edible parts. The metabolites were characterized and quantified by autoradiography and confirmed by LC-MS. The identified metabolites were clethodim sulfoxide, clethodim sulfone, the imine sulfoxide, imine sulfone, 5-hydroxy sulfoxide and 5-hydroxy sulfone. The results obtained with the two labels are shown in Tables 3 and 4. This study also was reviewed by the 1994 Meeting.

Table 3. Distribution and characterization of ^{14}C in edible parts and leaves of carrots, soya beans and cotton treated with [*cyclohexene*-4,6-^{14}C]clethodim.

Compound	^{14}C , % of TRR and (mg/kg clethodim equivalents)					
	Carrots		Soya beans		Cotton	
	Leaves	Roots	Leaves	Beans	Leaves	Seed
Clethodim		0.8 (0.003)				
Clethodim	15.7 (3.50)	28.6 (0.11)	5.9 (1.65)	32.0 (1.24)	4.1 (0.55)	4.3 (0.0029)

Compound	^{14}C , % of TRR and (mg/kg clethodim equivalents)					
	Carrots		Soya beans		Cotton	
	Leaves	Roots	Leaves	Beans	Leaves	Seed
sulfoxide						
Clethodim sulfone	0.6 (0.13)	3.4 (0.014)	0.9 (0.25)	4.6 (0.178)	0.4 (0.054)	2.8 (0.0019)
Imine sulfoxide	22.1 (4.93)	9.9 (0.04)	13.9 (3.88)	7.8 (0.302)	17.8 (2.40)	6.0 (0.0041)
Imine sulfone	5.9 (1.32)	8.6 (0.034)	8.7 (2.43)	8.1 (0.314)	4.1 (0.55)	2.3 (0.0016)
5-hydroxy-sulfoxide	1.6 (0.36)	6.4 (0.026)	<0.1	7.1 (0.275)	1.4 (0.19)	0.6 (0.0004)
5-hydroxy-sulfone	1.9 (0.42	7.6 (0.030)	3.1 (0.86)	10.7 (0.414)	0.4 (0.054)	1.6 (0.0011)

Table 3. Distribution and characterization of ^{14}C in edible parts and leaves of carrots, soya beans and cotton treated with [*chloroallyl*-4,6-^{14}C]clethodim.

Compound	^{14}C , % of TRR and (mg/kg clethodim equivalents)					
	Carrots		Soya beans		Cotton	
	Leaves	Roots	Leaves	Beans	Leaves	Seed
Clethodim		1.1 (0.007)				
Clethodim sulfoxide	10.5 (0.97)	33.9 (0.210)	4.5 (0.79)	31.5 (1.34)	5.3 (0.35)	3.1 (0.007)
Clethodim sulfone	1.8 (0.17)	4.6 (0.029)	0.9 (0.16)	5.1 (0.217)	1.8 (0.12)	0.4 (0.001)
Imine sulfoxide	------	------	------	------	------	------
Imine sulfone	------	------	------	------	------	------
5-hydroxy-sulfoxide	1.0 (0.09)	7.3 (0.045)	1.4 (0.25)	4.0 (0.17)	1.1 (0.07)	0.4 (0.001)
5-hydroxy-sulfone	1.7 (0.16)	10.1 (0.063)	2.2 (0.39)	10.1 (0.429)	0.6 (0.04)	0.6 (0.001)

METHODS OF RESIDUE ANALYSIS

In a modified confirmatory method for crops, animal tissues, milk and eggs, samples are extracted with methanol or methanol/water and cleaned up by an alkaline precipitation. After partitioning with methylene chloride, the residue is methylated with diazomethane, oxidised with *m*-chloroperbenzoic acid, and cleaned up by silica column chromatography. The methylated sulfones are determined by HPLC on a C-18 column with UV detection. The method is described as suitable for the determination of clethodim sulfoxide, clethodim sulfone, 5-hydroxyclethodim sulfoxide and 5-hydroxyclethodim sulfone, and as "being specific for the metabolites of clethodim and suitable for distinguishing clethodim residues from other similar herbicides (i.e. sethoxydim)". It is a modified version of the method reviewed in the 1994 monograph (Lai and Ho, 1990). Chromatograms were submitted which showed the separation of methylated 5-hydroxyclethodim sulfone and methylated clethodim sulfone from methylated 5-hydroxysethoxydim and methylated sethoxydim sulfone (Lai and Fujie 1993).

A *diazomethane use justification* was submitted for the unmodified version of this confirmatory method. Methylation was stated to be necessary because compounds containing the 3-hydroxy-2-cyclohexene-1-one moiety cannot be chromatographed under the described conditions. Experiments with the alternative methylating agents dimethyl sulfate and methyl iodide were reported not to give high or reproducible yields of the required enol methyl ether, although further experimental details were not submitted (Rose 1990).

Recovery experiments were carried out with the modified confirmatory method on soya beans fortified at 0.05, 1.0 and 5.0 mg/kg with both clethodim sulfoxide and 5-hydroxyclethodim sulfoxide, liver fortified at 0.2 mg/kg with clethodim sulfoxide, and milk fortified at 0.02 and 0.05 mg/kg with clethodim sulfoxide and *S*-methyl-clethodim sulfoxide. Sethoxydim sulfoxide was also included in

some of the experiments. Acceptable recoveries were obtained from soya beans (69-105%) and liver (86-92%) but the mean recoveries from milk were all very low (28-47%). The report stated that the "possible reason for the poor recoveries may be the presence of oil/fat in the sample extracts which may reduce the partition effectiveness of the HPLC mobile phase….". The method was described as being capable of differentiating the clethodim residues from those of the structurally similar sethoxydim, but no chromatograms were provided (Rhoades, 1993).

Another study provided further validation data for the modified confirmatory method at fortification levels of 0.02 and 0.05 mg/kg in milk and 0.2 mg/kg in liver. The report stated that several problems had been encountered with the first attempts to analyse milk and liver, but acceptable recoveries were obtained on making minor changes to the method, with recoveries of 58-85% (mean 70%, SD 12%) and 95-110% (mean 104%, SD 8%) of clethodim sulfoxide from milk and liver respectively. Recoveries of *S*-methyl-clethodim sulfone from milk were 64-120% (mean 93%, SD 28%) after correction for the mean area of interference present in the controls. Experiments with soya beans gave recoveries of clethodim sulfoxide of 300 and 320, 102 and 110 and 62 and 72% at fortification levels of 0.05, 1.0 and 5.0 mg/kg. However recoveries of 60 and 68 % of clethodim sulfoxide and 50 and 82% of 5-hydroxy-clethodim sulfoxide were obtained from soya beans fortified at 0.05 mg/kg when minor modifications were made to the method (Crawford and Dillon, 1994).

Several further studies of the modified confirmatory method with other samples were reported. The data are summarized in Table 5. Recoveries were not always determined at the lowest fortification levels.

Table 5. Recovery data for the modified confirmatory method.

Sample	Fortification levels, mg/kg	Mean recoveries					Reference
		Clethodim sulfoxide	5-Hydroxy-clethodim sulfone	Clethodim	Sethoxydim	5-Hydroxy-sethoxydim sulfone	
Sunflower seed	0.5, 2.0	63	109	95		-	Lai, 1995a
Potato	0.2, 0.5, 1.0, 2.0	-	99	88	96	102	Lai, 1995b
Sugar beet roots	0.1, 0.25, 0.5	80-99	85-122	74	97-98	90-110	Lai, 1994a
Sugar beet tops	0.1, 0.25, 0.5	79-110	118-150	82	95-111	86-103	Lai, 1994a
Dry bean seeds	0.2, 1.0, 2.0, 4.0	92-108	79-88	90-99 at 2& 4 mg/kg	88 at 2 mg/kg	63 at 2 mg/kg	Lai, 1994b
Dry bean vines	0.2, 2.5, 5.0, 10.0	110-122 &, 194[1]	84-112 & 26[2]	97 at 5 mg/kg	55-95 at 5mg/kg	74-86 at 5 mg/kg	Lai, 1994b
Dry bean hay	0.2, 3.5, 7.0, 14	68-100	72-121	-	80 at 7 mg/kg	87 at 7 mg/kg	Lai, 1994b

[1]High recovery of 194% at 5 mg/kg described in report as probably being due to low recovery of the quantitative standard. If referred to 10 mg/kg standard recovery is 112%
[2]Low recovery of 26% described in report as probably due to the subtraction of a 0.2-0.l28 mg/kg interfering peak

USE PATTERN

Clethodim is a post-harvest herbicide, registered for a number of vegetable, fruit, oilseed and fodder crops. It was reported that clethodim is currently registered in some 40 countries and on over 40 food commodities. The manufacturer provided information on the current use patterns which is given in Tables 6-9. This information appears to complement the information already reported in the 1994 monograph and is mainly concerned with those commodities for which trials data were submitted to the present Meeting. Product labels were not submitted in support of all the reported GAP. There is no

GAP in The Netherlands (Olthof, 1997). Registered uses shown shaded were described by the manufacturer as “pending”. The manufacturer informed the Meeting that the applications are all overall sprays except on peaches which are treated by directed application around the base of the peach trees.

Table 6. Registered uses of clethodim on fruit (Tomen Agro, 1997). All field applications of EC.

Commodity	Country	Application			PHI, days	Remarks
		Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		
Fruit	Peru	200-400	0.12-0.18	0.045-0.06	15	
Fruit trees	Chile	200-	0.096-0.480	0.048-0.24	-	
	Ecuador	200-600	0.12-0.18	0.03-0.06	-	
	Saudi Arabia	250-300	0.096-0.24	0.038-0.08	60	
Orchard crops	New Zealand	100-400	0.060-0.720	0.06-0.18		Spray to base of tree to avoid contact with fruit
Peach	Spain	300-400	0.096-0.192[1]	0.032-0.048	[2]	Company stated that there is a current registration which will be included on the label at the next printing.

[1]The manufacturer reported that GAP in Spain was 0.036-0.24kg ai/ha (Byrne, 1997)
[2]The manufacturer reported that although the PHI is not specified in Spain, the "PHI is about 14-40 days (Byrne, 1997)
[1]

Table 7. Registered uses of clethodim on vegetables. All EC applications, field or unspecified.

Commodity	Country	Application			PHI, days	Reference Remarks
		Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		
Beans	Belgium	200-400	0.072-0.36	0.036-0.09	60	Tomen Agro, 1997
	Bolivia	150-200	0.072-0.240	0.048-0.12	65	Tomen Agro, 1997 Ground application
		Min 20-	0.072-0.240	0.3-1.2		Tomen Agro, 1997 Aerial application
	Bulgaria	-	0.096-0.192	-	-	Tomen Agro, 1997
	Paraguay	150-200	0.096-0.240	0.06-0.12	-	Tomen Agro, 1997 Ground application
		Min 10	0.096-0.240	0.96-0.24		Tomen Agro, 1997 Aerial application
	Peru	200-400	0.12-0.18	0.06-0.045	15	Tomen Agro, 1997
	Spain	300-400	0.096-0.192	0.032-0.048	30	Tomen Agro, 1997
	Turkey	200-400	0.072-0.19	0.036-0.048	60	Tomen Agro, 1997 Ground application
	Turkey	30-50	0.072-0.19	0.24-0.38		Tomen Agro, 1997 Aerial application
Beans, Mung	Australia	-	0.06-0.09	-	0	Tomen Agro, 1997 Coleman, 1996 Aerial and ground application
Beans, Fava (i.e. Broad beans)	Australia	-	0.036-0.060 or 0.018	-	0	Coleman, 1996 Aerial and ground application 0.018 kg ai/ha used when applied with another specified product
Beet	France	150-350	0.120-0.300	0.08-0.086	100	Tomen Agro, 1997
	Ukraine	300	0.048-0.192	0.016-0.064	-	Tomen Agro, 1997
Beet, Red (Beetroot)	Australia	-	0.035-0.12-	-	7	Coleman, 1996 Aerial and ground application
	Israel	100-300	0.084-0.120	0.084-0.04	-	Tomen Agro, 1997

Commodity	Country	Application			PHI, days	Reference Remarks
		Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		
Beet, Sugar	Germany	200 - 400	0.181	0.045 - 0.09	(F)	Germany, 1996 Spraying Additive: mineral oil 1.38 g ai/l
	Germany	200 - 400	0.242	0.06 - 0.12	(F)	Germany, 1996 Spraying Additive: mineral oil 1.38 g ai/l
Cabbage	Australia (country submission)	50-150	0.036-0.120	-	7	Tomen Agro, 1997 Aerial application: spray volume 20 to 30 l/ha
	Australia (company submission)	-	0.035-0.12-	-	7	Coleman, 1996 Aerial and ground application
	Poland	200-300	0.096-0.240	0.048-0.08	60	Tomen Agro, 1997
Carrot	Brazil		0.108		40	Tomen Agro, 1997 Registration reported to be pending by Ministry of Agriculture.
	Israel	100-300	0.084-0.120	0.084-0.04	-	Tomen Agro, 1997
	Russia	300	0.048-0.240	0.016-0.08	75	Tomen Agro, 1997
Cauliflower	New Zealand	100-400	0.060-0.240	-	35	Tomen Agro, 1997
Celery	Australia	-	0.035-0.12-	-	9 weeks	Coleman, 1996 Aerial and ground application
Chick-peas	Australia	-	0.036-0.060 or 0.018	-	0	Coleman, 1996 Aerial and ground application, 0.018 kg ai/ha used when applied with another specified product
Cucurbits	Paraguay	150-200	0.096-0.240	0.064-0.12	-	Tomen Agro, 1997 Ground application
	Paraguay	Min 10	0.096-0.240	0.96-0.24	-	Tomen Agro, 1997 Aerial application
Cucumber	Poland	200-300	0.096-0.240	0.048-0.08	60	Tomen Agro, 1997
Garlic	Brazil		0.084-0.108		40	Tomen Agro, 1997 Registration reported to be pending by Ministry of Agriculture.
	Saudi Arabia	250-300	0.096-0.24	0.038-0.08	60	Tomen Agro, 1997
	Spain	300-400	0.096-0.192	0.032-0.048	30	Tomen Agro, 1997
	USA ('Select 2EC')	187-373.8	0.066-0.280	-	45	Tomen Agro, 1997 Ground application, no more than 0.56 kg ai/ha (0.28 kg ai/ha on Long Island, New York) per season.
		Min. 187	0.066-0.280	-	45	Tomen Agro, 1997 Aerial application
	USA ('Prism')	46.7-373.8	0.066-0.280	-	45	Tomen Agro, 1997 Ground application
Legumes	Chile	200 ~	0.096-0.480	0.048-0.24	-	Tomen Agro, 1997
Lentils	Canada	55-225	0.03-0.09	0.054-0.04	60	Tomen Agro, 1997 No more than 0.09 kg ai/ha per season. Do not apply by air.
	New Zealand	100-400	0.060	0.060-0.015	35	Tomen Agro, 1997
	Turkey	200-400	0.072-0.19	0.036-0.048	60	Tomen Agro, 1997 Ground application
		30-50	0.072-0.19	0.24-0.38	60	Tomen Agro, 1997 Aerial application
Lettuce	Australia (company submission)	50-150	0.036-0.120	-	28	Tomen Agro, 1997 Aerial application: spray volume 20 to 30 l/ha

Commodity	Country	Application			PHI, days	Reference Remarks
		Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		
	Australia (country submission)	-	0.035-0.12-	-	28	Coleman, 1996 Aerial and ground application
	Israel	100-300	0.084-0.120	0.084-0.04	-	Tomen Agro, 1997
Onion	Australia (company submission)	50-150	0.036-0.120	0.12-0.08	14	Tomen Agro, 1997 Aerial application: spray volume 20 to 30 l/ha
	Australia (country submission)	-	0.035-0.12-	-	14	Coleman, 1996 Aerial and ground application
	Belize	200-350	0.072-0.120	0.036-0.034	-	Tomen Agro, 1997 Ground application
		30-60	0.072-0.120	0.24-0.20	-	Tomen Agro, 1997 Aerial application
	Brazil		0.084-0.108		40 days.	Tomen Agro, 1997 Registration reported to be pending by Ministry of Agriculture.
	Dominican Republic	208	0.06-0.12	0.03-0.06	7-10	Tomen Agro, 1997
	Guatemala	200-350	0.072-0.120	0.036-0.03	No Restrictions	Tomen Agro, 1997 Ground application
		30-60	0.072-0.120	0.24-0.20	No Restrictions	Tomen Agro, 1997 Aerial application
	Honduras	200-350	0.072-0.120	0.036-0.03	No Restrictions	Tomen Agro, 1997 Ground application
		30-60	0.072-0.120	0.24-0.20		Tomen Agro, 1997 Aerial application
	Israel	100-300	0.084-0.120	-0.084-0.04	-	Tomen Agro, 1997
	New Zealand	100-400	0.060-0.240	-	35	Tomen Agro, 1997
	Russia	300	0.048-0.240	0.016-0.08	65	Tomen Agro, 1997
	Saudi Arabia	250-300	0.096-0.24	0.038-0.08	60	Tomen Agro, 1997
	Turkey	200-400	0.072-0.19	0.036-0.048	40	Tomen Agro, 1997 Ground application
		30-50	0.072-0.19	0.24-0.38		Tomen Agro, 1997 Aerial application
	USA ('Select 2EC)	46.7-373.8	0.066-0.280	-	45	Tomen Agro, 1997 Ground application, no more than 0.56 kg ai/ha (0.28 kg ai/ha on Long Island, New York) per season.
		Min. 187	0.066-0.280	-		Tomen Agro, 1997 Aerial application
	USA ('Prism')	Min 187	0.06-0.28	-	45	Tomen Agro, 1997 Aerial application, no more than 0.56 kg ai/ha per season. (Long Island, New York, no more than 0.28 kg ai/ha per season.
	Uzbekistan	300	0.168-0.240	0.056-0.08	-	Tomen Agro, 1997
Peas	Belgium	200-400	0.072-0.36	0.036-0.09	60	Tomen Agro, 1997
	Czech Republic	-	0.096-0.26	-	-	Tomen Agro, 1997
	Israel	100-300	0.084-0.120	-	-	Tomen Agro, 1997
	New Zealand	100-400	0.060	-	-	Tomen Agro, 1997
	Spain	300-400	0.096-0.192	0.032-0.048	30	Tomen Agro, 1997
Peas, Field	Australia (company submission)	50-150	0.036-0.12	-	Not Req'd	Tomen Agro, 1997 Aerial application: spray volume 20 to 30 l/ha

Commodity	Country	Application			PHI, days	Reference Remarks
		Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		
	Australia (country submission)	-	0.036-0.060 or 0.018	-	0	Coleman, 1996 Aerial and ground application, 0.018 kg ai/ha used when applied with another specified product
	Canada	5-	0.03-0.09	0.054-0.04	75	Tomen Agro, 1997 No more than 0.09 kg ai/ha per season. Do not apply by air.
Peas, Proteaginous	France	150-350	0.120-0.300	0.08-0.086	60	Tomen Agro, 1997
Potato[1]	Australia	-	0.035-0.12	-	4 weeks	Coleman, 1996 Aerial and ground application
	Belgium		0.072-0.18		60	
	Bulgaria		0.096-0.192		not needed	
	Canada		0.09		60	
	Czech Republic		0.096-0.26		not specified	
	Dominian Republic		0.06-0.12		7-10	
	Ecuador		0.06-0.12		not specified	
	Germany[2] (country submission)	200 - 400	0.181	0.045 - 0.09	(F)	Germany, 1996 Spraying on grass weeds (2nd - 6th leaf stage) Additive: mineral oil 1.38 g ai/l
	Germany[2] (country submission)	200 - 400	0.242	0.06 - 0.12	(F)	Germany, 1996 Spraying on couch grass (15-20 cm high) Additive: mineral oil 1.38 g ai/l
	Israel		0.084-0.12		not specified	
	Peru		0.12-0.18		15	
	Poland		0.096-0.24		60	
	Russia		0.048-0.24		40	
	Switzerland		0.12-0.36		56	
	Yugoslavia		0.096-0.192		30	
Tomato	Belize	200-350	0.072-0.120	0.036-0.34		Tomen Agro, 1997 Ground application
		30-60	0.072-0.120	0.24-0.20		Tomen Agro, 1997 Aerial application
	Brazil		0.108		20	Tomen Agro, 1997 Registration reported to be pending by Ministry of Agriculture.
	Bulgaria	-	0.096-0.192	-	-	Tomen Agro, 1997
	Dominican Republic	208	0.06-0.12	-0.03-0.06	7-10	Tomen Agro, 1997
	Israel	100-300	0.084-0.120	-	-	Tomen Agro, 1997
	Italy	300-600	0.142	-	30	Tomen Agro, 1997
	Italy	300-600	0.14	0.047-0.023	30	Tomen Agro, 1997
	Nicaragua	200-350	0.072-0.120	0.036-0.03	No Restriction	Tomen Agro, 1997 Ground application
		30-60	0.072-0.120	0.24-0.20	No Restriction	Tomen Agro, 1997 Aerial application
	Spain	300-400	0.096-0.192	0.032-0.048	30	Tomen Agro, 1997
	USA	46.7-373.8	0.066-0.280	-	20	Tomen Agro, 1997 Ground application, no more than 0.56 kg ai/ha (0.28 kg ai/ha on Long Island, New York) per season.

Commodity	Country	Application			PHI, days	Reference Remarks
		Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		
		28.0-93.5	0.066-0.280	-		Tomen Agro, 1997 Aerial application
Vegetables	Chile	200 ~	0.096-0.480	-0.048-0.24	-	Tomen Agro, 1997
	Ecuador	200-600	0.06-0.12	0.06-0.03	-	Tomen Agro, 1997
	New Zealand	100-400	0.060-0.240	0.06	35	Tomen Agro, 1997
	Paraguay	150-200	0.096-0.240	0.064-0.12	-	Tomen Agro, 1997 Ground application
		Min 10	0.096-0.240	0.96-0.24		Tomen Agro, 1997 Aerial application
	Peru	200-400	0.12-0.18	0.06-0.045	15	Tomen Agro, 1997

[1]The PHI will in practice be long since treatment is made at the early stage of the development of the crop
[2]The manufacturer stated that "a label request has been submitted to the German authorities" and did not supply full information on GAP to the current Meeting

Table 8. Registered uses of clethodim on oilseed, fodder crops and miscellaneous commodities.

Commodity	Country	Form	F/G	Application			No	PHI, days	Reference/ Remarks
				Water vol. l/ha	Rate kg ai/ha	Spray conc. kg ai/hl			
Alfalfa	Argentina	EC	F	150-200	0.096-0.336	0.064-0.164	-	15	Tomen Agro, 1997 Ground application
				Min 20 ~	0.096-0.336	0.40-1.68		15	Tomen Agro, 1997 Aerial application
	Canada	EC	F	55-225	0.03-0.09	0.054-0.04	-	30	Tomen Agro, 1997. No more than 0.09 kg ai/ha per season. Do not apply by air.
	Chile	EC	F	200 ~	0.096-0.480	0.048-0.24	-	-	Tomen Agro, 1997
	Ecuador	EC	F	200-600	0.12-0.18	0.06-0.03	-	-	Tomen Agro, 1997
	Israel	EC	F	100-300	0.084-0.120	0.084-0.04	-	-	Tomen Agro, 1997
	Peru	EC	F	200-400	0.12-0.18	0.06-0.045	-	15	Tomen Agro, 1997
	USA	EC	F	46.7-373.8	0.066-0.280	-	-	15	Tomen Agro, 1997. Ground application, no more than 0.56 kg ai/ha (0.28 kg ai/ha on Long Island, New York) per season.
				28.0-93.5	0.066-0.280	-	-	15	Tomen Agro, 1997. Aerial application
Cotton	Australia	EC	-	-	0.06-0.09	-	1	12 weeks	Coleman, 1996 Aerial and ground application
Clover	Israel	EC	F	100-300	0.084-0.120	-	-	-	Tomen Agro, 1997
	New Zealand	EC	F	100-400	0.120	0.12-0.03	-	63	Tomen Agro, 1997
Flax	Canada	EC	F	55 ~ 225	0.03 ~ 0.09	0.054 ~ 0.04	-	60	Tomen Agro, 1997. No more than 0.09 kg ai/ha per season. Do not apply by air.
	Russia	EC	F	300	0.048 ~ 0.240	0.016 ~ 0.08	1	80	Tomen Agro, 1997

Commodity	Country	Form	F/G	Application			No	PHI, days	Reference/ Remarks
				Water vol. l/ha	Rate kg ai/ha	Spray conc. kg ai/hl			
	Ukraine	EC	F	300	0.048 ~ 0.192	0.016 ~ 0.064	1	-	Tomen Agro, 1997
Fodder beet	Belgium	EC	F	200-400	0.072-0.36	0.036-0.09		90	Tomen Agro, 1997
	Czech Republic	EC	F	-	0.096-0.26	-		-	Tomen Agro, 1997
	Germany	EC	F	200 - 400	0.181	0.045 - 0.09	1	(F)	Germany, 1996 Spraying Additive: mineral oil 1.38 g ai/l
	Germany	EC	F	200 - 400	0.242	0.06 - 0.12	1	(F)	Germany, 1996 Spraying Additive: mineral oil 1.38 g ai/l
	Italy	EC	F	300-600	0.1417	-		60	Tomen Agro, 1997
	Italy	EC	F	300-600	0.14	-0.047-0.023		60	Tomen Agro, 1997
	Russia	EC	F	300	0.048-0.240	0.016-0.08	1	65	Tomen Agro, 1997
	Switzerland	EC	F	200-400	0.12-0.36	0.06-0.09		-	Tomen Agro, 1997
Lupin	Australia (country submission)	EC	F	50 ~ 150	0.036 ~ 0.120	0.08 ~ 0.12	1	- Not Req'd	Tomen Agro, 1997 Aerial application: spray volume 20 to 30 l/ha
	Australia (country submission)	EC	-	-	0.042-0.12 or 0.018	-	1	0	Coleman, 1996 Aerial and ground application, 0.018 kg ai/ha used when applied with another specified product
Peanut	Argentina	EC	F	150 ~ 200	0.096 ~ 0.336	0.064 ~ 0.164	-	70	Tomen Agro, 1997 Ground application
				Min 20 ~	0.096 ~ 0.336	0.40 ~ 1.68		70	Tomen Agro, 1997 Aerial application
	Australia (company submission)	EC	F	50 ~ 150	0.060 ~ 0.090	0.12 ~ 0.06	1	49	Tomen Agro, 1997 Aerial application: spray volume 20 to 30 l/ha
	Australia (country submission)	EC	-	-	0.06-0.09	-	1	7 weeks	Coleman, 1996 Aerial and ground application
	Bolivia	EC	F	150 ~ 200	0.072 ~ 0.240	0.048 ~ 0.12	-	65	Tomen Agro, 1997 Ground application
				Min 20 ~	0.072 ~ 0.240	0.36 ~ 1.2		65	Tomen Agro, 1997 Aerial application
	Israel	EC	F	100 ~ 300	0.084 ~ 0.120	0.084 ~ 0.04	-	-	Tomen Agro, 1997
	Taiwan	EC	F	600	0.192	0.032	-	-	Tomen Agro, 1997
	USA	EC	F	46.7 - 373.8	0.066 - 0.280	-	-	40	Tomen Agro, 1997 Ground application
				28.0 ~ 93.5	0.066 ~ 0.280	-	-	40	Tomen Agro, 1997 Aerial application
Rape, oilseed	Australia	EC	-	-	0.036-0.060 or 0.018	-	1	8 weeks	Coleman, 1996 Aerial and ground application, 0.018 kg ai/ha used when applied with another specified product
Soya beans	Australia	EC	-	-	0.06-0.09	-	1	0	Coleman, 1996 Aerial and ground application

Table 9. Registered uses of clethodim on non-edible commodities.

Form	F/	Application			PHI, days days	Reference /
	G	Water vol., l/ha	Rate, kg ai/ha	Spray conc., kg ai/hl		Remarks
EC 'Select'	F	187-373.8	0.066-0.280	-		Tomen Agro, 1997 Ground application. *Plants which will not bear fruit or nuts for at least one year following application.
		Min 187	0.066 - 0.280	-		Tomen Agro, 1997 Aerial application
EC 'Prism'	F	Min 187	0.06-0.28	-	45	Tomen Agro, 1997 Aerial application

RESIDUES RESULTING FROM SUPERVISED TRIALS

The following additional information was provided for the trials on dry beans, dry peas, potatoes, sugar beet and sunflower which were reviewed in 1994.

Table 10. Further information on supervised residue trials on dry beans reviewed in 1994. Brazil, 1989.

Application			Sample	PHI, days	Residue, mg/kg
kg ai/ha	Water, l/ha	No.			
0.084	300	1	Beans in pods	25 45 65 85	0.37 0.06 <0.05, <0.05
0.108	300	1	Beans in pods	25 45 65 85	0.48 0.07 <0.05 <0.05
0.168	300	1	Beans in pods	25 45 65 85	0.82 0.11 <0.05 <0.05
0.216	300	1	Beans in pods	25 45 65 85	0.93 0.14 <0.05 <0.05

Table 11. Further information on supervised residue trials on dry peas reviewed in 1994.

Country, Ref.	Application			Sample	PHI, days	Residue, mg/kg
	kg ai/ha	Water, l/ha	No.			
Australia, 1987	0.06	133	1	Dry seed, Straw	110	<0.1
	0.12	133	1	Dry seed, Straw	110	<0.1
	0.24	133	1	Dry seed, Straw	110	<0.1
Belgium, 1992	0.09	750	1	Seed	41	<0.025
	0.18	750	1	Seed	41	<0.025
UK, 1988 432-88	0.36	300	1	Seed Husk	53	<0.03, <0.03 <0.03, <0.03
UK, 1988 434-88	0.36	300	1	Seed	85	<0.03, <0.03 <0.03, 0.045
UK, 1988 552-88	0..72	300	1	Seed	85	<0.03, <0.03 0.065, 0.085
UK, 1988 556-88	0.72	300	1	Seed Husk	53	0.05, 0.04, 0.038, 0.045 <0.03, 0.03, <0.03, <0.03
France, 1987	0.18	400	1	Seed	67	0.05
T-2301	0.48	400	1	Seed	67	0.11
	0.96	400	1	Seed	67	0.29
	0.18	400	1	Seed	85	0.06
	0.48	400	1	Seed	85	0.28
	0.96	400	1	Seed	85	0.75
France, 1987	0.18	400	1	Seed	72	0.03
T-2302	0.48	400	1	Seed	72	0.08
	0.96	400	1	Seed	72	0.15
France, 1987	0.18	400	1	Seed	82	0.06
T-2303	0.48	400	1	Seed	82	0.28
	0.96	400	1	Seed	82	0.75
France, 1987	0.18	400	1	Seed	72	<0.03
T-2304	0.48	400	1	Seed	72	0.13
	0.96	400	1	Seed	72	0.17
France, 1987	0.48	400	1	Seed	80	0.04
T-2305	0.96	400	1	Seed	80	0.08
France, 1987	0.18	400	1	Seed	80	<0.03
T-2306	0.48	400	1	Seed	80	0.04
	0.96	400	1	Seed	80	0.14

Table 12. Further information on supervised residue trials on potato tubers reviewed in 1994.

Country	Application rate per treatment			PHI, days	Residue, mg/kg
	kg ai/ha	Water, l/ha	No.		
Ukraine	0.7 to	300	1	40	<0.2
	0.12	300	1	40	<0.2
Canada, 1990, Ontario, Campbellville #1	0.09	225	1	46	0.11, 0.14
	0.09	225		61	0.14, 0.12
	0.18	225		46	0.25, 0.20
Canada, 1990, Ontario, Campbellville #2	0.09	225	1	46	<0.05, <0.05
	0.09	225		61	<0.05, <0.05
	0.18	225		46	0.20, 0.17
Canada, 1990 Ontario, Guelph	0.09	225	1	46	<0.05, <0.05
	0.09	225		61	<0.05, <0.05
	0.18	225		46	<0.05, <0.05
Canada, 1990 Nova Scotia	0.09	225	1	46	<0.05, <0.05

Country	Application rate per treatment			PHI, days	Residue, mg/kg
	kg ai/ha	Water, l/ha	No.		
	0.09	225		61	<0.05, <0.05
	0.18	225		45	<0.05, 0.13
Italy, 1990 265-90	0.24	600	1	60 70 90	<0.03, <0.03 <0.03, 0.07 <0.03, <0.03
Italy, 1991 267-91	0.24	600	1	30 45 60	0.03, <0.03 <0.03, <0.03 <0.03, <0.03
Morocco 1992 683-92	0.14	400	1	91	<0.03
Belgium, 1992 92CLEPDT1	0.09	750	1	112	<0.025
	0.36	750	1	112	<0.025
France, 1987 T-2283	0.18	500	1	47	<0.03, 0.08
France, 1987 T-2284	0.18	500	1	80	<0.03, <0.03

Full study reports were not available for the trials shown shaded

Table 13. Further information on supervised residue trials on sugar beet reviewed in 1994.

Country	Application			Sample	PHI, days	Residue, mg/kg
	kg ai/ha	Water, l/ha	No			
France, 1986 T-2216	0.18	400	1	roots tops	102	<0.03, <0.03
	0.36	400	1	roots tops	102	<0.03, <0.03
France, 1986 T-2217	0.18	400	1	roots tops	112	<0.03, <0.03
	0.36	400	1	roots tops	112	<0.03, <0.03
France, 1986 T-2218	0.36	400	1	roots tops	119	<0.03, <0.03
	0.48	400	1	roots tops	119	<0.03, <0.03
France, 1986 T-2219	0.18	400	1	roots tops	136	<0.03, <0.03
France, 1986 T-2220	0.18	400	1	roots tops	138	<0.03, <0.03
France, 1986 T-2221	0.36	400	1	roots tops	126	<0.03, <0.03
	0.48	400	1	roots tops	126	<0.03, <0.03
France, 1986 T-2293	0.18	400	1	roots tops	113	<0.03, <0.03
	0.36	400	1	roots tops	113	<0.03, <0.03
	0.48	400	1	roots tops	113	<0.03, <0.03
	0.96	400	1	roots tops	113	<0.03, 0.04
France, 1987 T-2294	0.18	400	1	roots tops	122	<0.03, <0.03
	0.36	400	1	roots tops	122	<0.03, <0.03

Country	Application			Sample	PHI, days	Residue, mg/kg
	kg ai/ha	Water, l/ha	No			
	0.48	400	1	roots tops	122	<0.03, <0.03
	0.96	400	1	roots tops	122	<0.03, <0.03
France, 1987 T-2295	0.18	400	1	roots tops	121	<0.03, <0.03
	0.36	400	1	roots tops	121	<0.03, <0.03
	0.48	400	1	roots tops	121	<0.03, <0.03
	0.96	400	1	roots tops	121	<0.03, 0.03
France, 1987 T-2296	0.18	400	1	roots tops	113	<0.03, <0.03
	0.36	400	1	roots tops	113	<0.03, <0.03
	0.48	400	1	roots tops	113	<0.03, <0.03
	0.96	400	1	roots tops	113	<0.03, 0.03
France, 1987 T-2297	0.18	400	1	roots tops	121	<0.03, <0.03
	0.36	400	1	roots tops	121	<0.03, <0.03
	0.48	400	1	roots tops	121	<0.03, <0.03
	0.96	400	1	roots tops	121	<0.03, 0.03
Germany, 1986 400/86	0.14	350	1	root	92 132	<0.05 <0.05
				top	92 132	<0.05 <0.05
Italy, 1991 263-91	0.24	800	1	root	30 45 60	0.08 0.08 0.17
				top	30 45 60	0.23 0.07 0.07
Italy, 1991 263-91	0.24	800	1	root	30 45 59	0.11 0.04 0.06
				top	30 45 59	0.06 0.07 <0.03
Italy, 1991 263-91	0.24	800		root	30 45 60	0.08,<0.03 0.08,<0.03 0.17,<0.03
				top	30 45 60	0.23,0.05 0.07,<0.03 0.07,<0.03
Italy, 1991 264-91	0.24	800		root	30 45 59	0.11,<0.03 0.04,<0.03 0.06,<0.03
				top	30 45 59	0.06,<0.03 0.07,<0.03 <0.03,<0.03
Morocco 688-92	0.14	400	1	root	153	<0.03, <0.03

Table 14. Further information on supervised residue trials on sunflower seed reviewed in 1994.

Country	Application			Sample	PHI, days	Residue, mg/kg
	kg ai/ha	Water, l/ha	No.			
Argentina, 1987 T 7000	0.1	500	1	Seed	108	0.06
	0.24	500	1		108	<0.05
Argentina, 1987 T 7010	0.12	500	1	Seed	102	<0.05
	0.24	500	1		102	0.085
Argentina, 1987 T 7012	0.12	500	1	Seed	106	<0.05
	0.24	500	1		106	0.065
Italy, 1989 292-89	0.24	600	1	Seed	74	<0.03, <0.03
					92	<0.03, <0.03
					110	<0.03, <0.03
Italy, 1991 266-91	0.24	600	1	Seed	60	0.07, 0.13
					75	0.06, 0.13
					90	0.05, 0.10
Italy, 1991 340-91	0.24	600	1	Seed	60	0.04, 0.12
					75	0.06,<0.03
					90	0.05,<0.03
France, 1987 T-2286	0.18	500	1	Seed and hulls	108	<0.03
France, 1987 T-2287	0.48	500	1	Seed	111	<0.03, <0.03
France, 1987 T-2288	0.48	500	1	Seed	123	<0.03, <0.03

(Tomen Agro, 1996, Bryne, 1997)

Additional residue trials were reported to the present Meeting on alfalfa, artichokes, cabbage, field beans, lupins, carrots, cauliflower, clover, celery, flax, garlic, cucumbers, leeks, lentils, head lettuce, onions, peaches, peanuts, peppers, spinach, summer squash and tomatoes.

The results are given in Table 15-41. The trials were in the field unless stated otherwise. Results used for estimating maximum residue and STMR levels are from maximum GAP (minimum PHI, maximum dose rate and maximum number of treatments). GAP reported as applying to broad groups such as "fruit" or "vegetables", has been ignored in the evaluation. GAP for “fruit” was reported for Peru, and for “vegetables” for Chile, Ecuador, New Zealand, Paraguay and Peru.

The residues in the trials were determined by the oxidation/methylation method described in the 1994 monograph (Fujie, 1990) in which the methylated oxidation products DME[1] and DME-OH[2] are determined by GLC with FP detection. The total residues of DME and DME-OH are expressed as clethodim mg/kg clethodim = [(mg/kg DME x 1.22) + (mg/kg DME-OH x 1.16)]. In a limited number of trials the levels of DME and DME-OH were reported separately. Results which have been corrected for recovery are indicated by a note.

Peaches. GAP was reported for Spain where the manufacturer stated that “there is a current registration, which will be included on the label in the next printing”. GAP was also reported for

[1] dimethyl [2-(ethylsulfonyl)propyl]pentanedioate
[2] dimethyl [2-(ethylsulfonyl)propyl]-3-hydroxypentanedioate

"fruit" in Peru, for "fruit trees" in Chile, Ecuador and Saudi Arabia and for "orchard crops" in New Zealand. The maximum application rates are 0.06-0.24 kg ai/hl or 0.18-0.72 kg ai/ha, with PHIs of 15-60 days or not specified. The manufacturer reported that although the PHI is not specified in Spain, it is about 14-40 days.

Table 15. Supervised residue trials on peaches in Spain.

Location	Application				PHI,	Sample	Residue,	Reference,
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	Notes
Molins de Rei	EC	2	0.18	0.06	0 21 60	Fruit	<0.03 <0.03 <0.03 <0.03 <0.03 <0.03	Report No. 0295-89
Tortosa	EC	2	0.18	0.06	0 7	Fruit	<0.03 <0.03 <0.03 <0.03	Report No. 201464 Last treatment at "green fruit".
Ventallo (Viladamat)	EC	2	0.18	0.06	0 7 14	Fruit	<0.03 <0.03 <0.03 <0.03 <0.03 <0.03	Report No. 201472 Last treatment at "unripe fruit".
Larvern	EC	2	0.18	0.06	0 7 14	Fruit	<0.03 <0.03 <0.03 <0.03 <0.03 <0.03	
La Fortesa	EC	2	0.18	0.06	0 7	Fruit	<0.03 <0.03 <0.03 <0.03	
Castelldans	EC	2	0.18	0.06	0 7	Fruit	<0.03 <0.03 <0.03 <0.03	

Garlic. GAP was reported for Saudi Arabia, Spain and the USA. The maximum application rates are 92-0.28 kg ai/ha with PHIs of 30, 45 or 60 days. No maximum number of applications was reported for any country.

The residues in trials considered to comply with US GAP are underlined in the Table 16. Only two trials were considered to comply with US GAP and in these the manufacturer stated that the DME-OH residues were "not considered to be clethodim related, due to matrix interference peak".

Table 16. Supervised residue trials on garlic.

Location,	Application				PHI,	Sample	Residue,	Reference and Comment
country	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Curitiba/PR,	EC	1	0.108 0.216		20	Bulb	<0.05 <0.05	Report No. 94026049
Brazil			0.108 0.216		40	Bulb	<0.05 <0.05	
			0.108 0.216		60	Bulb	<0.05 <0.05	

Location, country	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl				
Ibia/MG, Brazil	EC	1	0.108 0.216		20	Bulb	<0.05 <0.05	Report No. 94026099
			0.108 0.216		40	Bulb	<0.05 <0.05	
Itapetininga, Sao Paulo, Brazil	EC	2	0.24	0.096	91	Mature	<0.02	Report No. T-7119 Bulbs were dried in shade for 7 days.
			0.48	0.19		dry bulb (tops removed)	<0.02	
La Rhoda, Spain	EC	1	0.24	0.08	0 21	Bulb	0.12 <0.03	Report No. 0293-89
Gilroy, CA USA	EC	2	0.28	0.15	45	Mature bulb	0.13,0.14 (DME) 0.24*, 0.20* (DME-OH)	Report No. T-7429 Last treatment at "mature/drying out". *Residue not considered by manufacturer to be Clethodim related due to matrix interference peak.
	EC	2	0.28	0.15	60	Mature bulb	<0.1,<0.1 (DME) 0.18*, 0.20* (DME-OH)	
Firebaugh, California, USA	EC	2	0.28	0.154 ~ 0.156	44	Mature bulb	<0.10 (DME) 0.10* (DME-OH)	Report No. V-1102A Last treatment at "maturing". *Residue not considered by manufacturer to be Clethodim related, due to matrix interference peak.

Onions. GAP for onions was reported for Australia, Belize, Dominican Republic, Guatemala, Honduras, Israel, New Zealand, Russia, Saudi Arabia, Turkey, the USA and Uzbekistan, and pending GAP for Brazil. The maximum application rate was 0.12-0.28 kg ai/ha with PHIs of 7-65 days.

The residues in trials considered to comply with US GAP are underlined in Table 18. Those according to New Zealand GAP or the pending Brazilian GAP are double underlined, and the single residue from a trial according to Australian GAP is shown in bold italics. Although the Brazilian trials and one of the Ukrainian trials were at elevated dose rates all the residues were <0.05 and <0.01 mg/kg respectively.

Table 17. Supervised residue trials on onions.

Location Country	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl				
Nobby, Queensland Australia	EC	2	0.12	0.094	14 21 28	Bulb	***0.05*** 0.02 0.02	Report No. 5/AU/H6/201/92 Results corrected for mean recoveries
	EC	2	0.24	0.19	14 21 28	Bulb	0.14 0.06 0.08	
	EC	-			-	Bulb	<0.02	
Ibia/MG, Brazil	EC	1	0.108 0.216	- -	20	Bulb	<0.05 <0.05	Report No. 96000097
			0.108 0.216	- -	40		<0.05 <0.05	
			0.108 0.216	- -	60		<0.05 <0.05	

Location Country	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Curitiba/PR, Brazil	EC	1	0.108 0.216	- -	20	Bulb	<0.05 <0.05	Report No. 94026623
			0.108 0.216	- -	40		<0.05 <0.05	
			0.108 0.216	- -	60		<0.05 <0.05	
Itapetininga, Sao Paula, Brazil	EC	1	0.24 0.48	0.08 0.16	68	Whole green onion	<0.03 <0.03	Report No. T-7131 Bulbs were dried in shade for 15 days.
			0.24 0.48	0.08 0.16		Mature dry bulb (tops removed)	<0.03 <0.03	
Borgo Piave, Italy	EC	1	0.24	0.04	20	Bulb	<0.03 <0.03	Report No. 0291-89 Last treatment at “bulb development”.
					30		<0.03 <0.03	
					40		<0.03 <0.03	
Hope, Nelson, New Zealand	EC	1	0.24	0.08	42 84	Bulb	<0.03 <0.03	
			0.48	0.16	42 84		<0.03 <0.03	
Astrakhan, Russia	EC	-	0.096	0.06	65	Bulb	<0.01	
			0.12	0.12	65		<0.01	
			0.096	0.06	90		<0.01	
			0.240	0.12	90		<0.01	
Kiev, Ukraine	EC	-	0.3 to 1.2	-	55	Bulb	<0.01	
Kharkov, Ukraine	EC	-	0.024	0.012	6 58 110	Bulb	<0.02 <0.02 <0.02	
			0.060	0.03	6 58 110		<0.02 <0.02 <0.02	
			-	-	-		<0.02	
Kiev, Ukraine	EC	-	0.168	0.08	61 128	Bulb	<0.02 <0.02	
			0.240	0.12	61 128		<0.02 <0.02	
			-	-	-		<0.02	
Shook, Texas, USA	EC	2	0.30	0.15	45	Mature bulb	0.17 0.12	Report No. T-7300 Duplicate analyses, not duplicate field sample
Fresno, CA, USA	EC	2	0.28	0.15	30	Mature bulb	0.15 <0.05	Report No. T-7301 Growth stage at last treatment: 30 day: 1¼-2” bulb 45 day: 1-1½” bulb 60 day: ¾-1” bulb
					45		<0.05 <0.05	
					60		<0.05 <0.05	
Hillsboro, Oregon, USA	EC	2	0.28	0.15	45	Mature bulb	<0.1 <0.1	Report No. T-7302 Last treatment at “6-8 leaf”.
Greely, Colorado, USA	EC	2	0.28	0.15	44	Mature bulb	<0.1 <0.1	Report No. T-7303 Last treatment at “bulbing”.

Location Country	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Phelps, New York, USA	EC	2	0.28	0.15	30	Mature bulb	<0.1 <0.1	Report No. T-7304
					45		<0.1 <0.1	Growth stage at last treatment:
					60		<0.1 <0.1	30 day: 6-8 leaf 45 day: 4-6 leaf 60 day: 2-3 leaf
Allendale, Michigan, USA	EC	2	0.28	0.145-0.144	30	Mature bulb	<0.1 <0.1	Report No. V-1001-A
					45		<0.1 <0.1	Last treatment at “8 leaves, 2 inch diameter bulbs”.
					60		<0.1 <0.1	
Corcoran, California, USA	EC	2	0.28	0.145	44	Mature bulb	0.11 0.14	Report No. V-1001-B
			0.56	0.295-0.301			0.12 0.12	Last treatment at “maturing/drying out” stage. Duplicate analyses, not duplicate field samples

Leeks. No specific GAP for leeks was reported. The manufacturer claimed that "since leek is classified in Codex under bulb vegetables, the use on onions or garlic can also apply to leeks."

Table 18. Supervised residue trials on leeks.

Location	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Bieujac (Gironde), France	EC	1	0.12	0.036	28 56	Whole plants	0.13 0.07 0.11 0.09	Report No. TE-2316
			0.18	0.096	28 56		0.34 0.31 0.12 0.17	

Cabbages. GAP was reported for Australia and Poland, with maximum application rates of 0.12 and 0.24 kg ai/ha and PHIs of 7 and 60 days respectively.

The residues resulting from trials according to Australian and Polish GAP are underlined and double underlined respectively, in Table 19.

Table 19. Supervised residue trials on cabbages.

Location	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Cranbourne, Victoria Australia	EC	1	0.12	0.096	1 7	Head	0.11 0.07	Report No. 223/AU/94/100/SV01
			0.24	0.192	1 7		0.52 0.20	Last treatment at “mature” stage.
			Control				<0.02	

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Bazas, France	EC	1	0.18	0.036	67	Heart	0.04 0.04	Report No. TE-2324 Duplicate analyses, not duplicate field samples
			0.18	0.036			0.13 0.16	

Cauliflowers. GAP was reported only for New Zealand, with a maximum application rate of 0.24 kg ai/ha and a PHI of 35 days. A single trial complied with the New Zealand GAP. The residues is underlined in Table 20..

Table 20. Supervised residue trials on cauliflowers.

Location Country	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Hope, Nelson New Zealand	EC	1	0.24	0.08	42 84	Head	0.28 <0.03	Report No. 880542 Last treatment at "no florets formed" and "seedlings just planted".
			0.48	0.16	42 84		0.59 <0.03	
	Control						<0.03	

Cucumbers. GAP was reported for cucumbers in Poland with a maximum application rate of 0.24 kg ai/ha and a PHI of 60 days, and for cucurbits in Paraguay with the same application rate and an unstated PHI.

The only residue considered to result from Polish GAP is underlined in Table 21. Although the PHIs were shorter than GAP the residues were all <0.05 mg/kg.

Table 21. Supervised residue trials on cucumbers.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Poland	EC	1	0.24	0.15	35	Fruit	<0.05 <0.05 <0.05	Annual Report, 1995
					38		<0.05 <0.05 <0.05	Last treatment at "4-6 leaves" stage.
Michigan, USA	EC	2	0.28		13	Mature fruit	<0.14 <0.14	PR No. 5219.94
South Carolina, USA	EC	2	0.28		13		<0.14 <0.14	
Florida, USA	EC	2	0.28		14	Mature fruit	<0.14 <0.14	PR No. 5219.94
New York, USA	EC	2	0.28		14		<0.14 <0.14	
Texas, USA	EC	2	0.28		14	Mature fruit	<0.14 <0.14	PR No. 5219.94
Wisconsin, USA	EC	2	0.28		14		<0.14 <0.14	

Summer squash. The only relevant GAP was for cucurbits in Paraguay but none of the three US trials complied with it. The results are shown in Table 22.

Table 22. Supervised residue trials on summer squash in the USA.

Location	Application				PHI,	Sample	Residue,	Reference
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
California	EC	2	0.28		15	Whole fruit	<0.10 <0.10	PR No. 5228.96
Michigan	EC	-	0.28		14		0.11 <0.10	
Ohio	EC	2	0.28		14	Whole fruit	<0.10 <0.10	PR No. 5228

Tomatoes. GAP for tomatoes was reported for Belize, Bulgaria, Dominican Republic, Israel, Italy, Nicaragua, Spain and the USA, and pending GAP for Brazil. The maximum application rates are 0.12-0.28 kg ai/ha (0.108 kg/ha for the pending GAP) with PHIs of 7-30 days, "unrestricted" or unstated.

The residues from trials complying with the pending Brazilian, the Spanish and US GAP are underlined, double underlined and in italics respectively in Table 23.

Table 23. Supervised residue trials on tomatoes.

Location	Field/	Application				PHI,	Sample	Residue,	Reference and Comment
	Prot-ected	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Sitio Sao Joao,	-	EC	1	0.108 0.216		20	Fruit	<u><0.05</u> <0.05	Report No. 23687/94
Itupeva Sao Paulo, Brazil				0.108 0.216		40		<0.05 <0.05	
				0.108 0.216		60		<0.05 <0.05	
Curitiba/PR	-	EC	1	0.108 0.216		20	Fruit	<u><0.05</u> <0.05	Report No. 21929/94
Brazil				0.108 0.216		40		<0.05 <0.05	
				0.108 0.216		60		<0.05 <0.05	
Casal Nuovo,	F	EC	1	0.24	0.04	30	Mature fruit	<u>0.08</u> <u>0.13</u>	Report No. 207-88
Italy						51		<0.030 <0.030	
Gava, Spain	F	EC	1	0.24	0.08	0 21 60	Fruit	<0.03 <u><0.03</u> <0.03	Report No. 0294-89 Last treatment at "beginning to mature" stage.
Viladecans, Spain	F	EC	1	0.18	0.06	0 21	Fruit	<0.03 <u><0.03</u>	Report No. 225-90 Last treatment at "mature" stage.
Malgrat de Mar, Spain	F	EC	1	0.18	0.06	0 21	Fruit	0.05 <u>0.03</u>	Report No. 0226-90 Last treatment at "beginning to mature and flower" stage.

Location	Field/ Prot-ected	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
		Form	No.	kg ai/ha	kg ai/hl				
Mataro, Spain	F	EC	1	0.18	0.06	0 21	Fruit	<0.03 <0.03	Report No. 0227-90 Last treatment at "beginning to mature" stage.
Viladecans, Spain	F	EC	1	0.18	0.06	0 22	Fruit	0.03 <0.03	Report No. 206202 Last treatment at "mature" stage.
43204 Reus, Spain	F	EC	1	0.18	0.06	0 21	Fruit	<0.03 <0.03	Report No. 206199 Last treatment at "mature" stage.
California, USA	-	EC	2	0.28-0.29	0.13-0.14	15	Mature fruit	0.85 1.4	Report No. V-10688-A Last treatment at "fruit, some 2 inches" stage.
						20		*0.76,0.71* *0.82,0.76*	
						30		0.54 0.64	
Florida, USA	-	EC	2	0.28	0.11	15	Mature fruit	<0.1 <0.1	Report No. V-10688-B Last treatment at "1st cluster, 2½-3½ inch diameter" stage.
						20		*0.35* *0.15*	
						30		<0.1 <0.1	
Ohio, USA	-	EC	2	0.28	0.10	15	Mature fruit	0.20 0.25	Report No. V-10688-C Last treatment at "ripening" stage.
						20		*0.34* *0.27*	
						30		0.18 0.18	
New Jersey, USA	-	EC	2	0.28	0.10	21	Mature fruit	*0.46* *0.43*	Report No. V-10688-D Last treatment at "fruiting" stage.
Indiana, USA	-	EC	2	0.28	0.22-0.26	20	Mature fruit	*0.12* *0.11*	Report No. 10688-E Last treatment at "bloom/first fruit" stage.
California, USA	-	EC	2	0.27-0.28	0.097-0.10	20	Mature fruit	*0.15* *0.16*	Report No. 10688-F Last treatment at "green-mature fruit" stage.
				1.38-1.40	0.50			1.1 1.2	
California, USA	-	EC	2	1.38-1.40	0.50	20	Mature fruit	0.81,0.87	Report No. V-10688-G Last treatment at "green fruit" stage.
							Wet pomace	0.78,0.79	
							Dry pomace	2.6,2.5	
							Paste	3.0,2.8	
							Juice	0.71,0.81	
South Carolina, USA	-	EC	2	0.28-0.29	0.11-0.14	20	Mature fruit	*0.35* 0.35	Report No. V-10688A-A Last treatment at "fruit 2.0 inches in diameter" stage.
Florida, USA	-	EC	2	0.28	0.12	20	Mature fruit	*<0.1* *<0.1*	Report No. V-10688A-B Last treatment at "mature green" stage.
California, USA	-	EC	2	0.28	0.15	20	Mature fruit	*0.65* *0.54*	Report No. V-10688-A-C Last treatment at "crop height 18-24 inches" stage.
Ohio, USA	-	EC	2	0.28	0.16	20	Mature fruit	*0.17* *0.21*	Report No. V-10688A-D Last treatment at "fruiting" stage.
				1.4	0.79			1.7 1.4	

Location	Field/ Prot-ected	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
		Form	No.	kg ai/ha	kg ai/hl				
Ohio, USA	-	EC	2	1.4	0.79	20	Mature fruit	1.2	Report No. V-10688A-E
							Wet pomace	1.0	
							Dry pomace	4.0	
							Paste	3.6	
							Juice	0.92	
							Purée	2.6	
Pennsylvania, USA	-	EC	2	0.27-0.29	0.12-0.13	20	Mature fruit	*0.52* *0.50*	Report No. V-10688A-F Last treatment at "1% of fruit showing colour" stage.
Michigan, USA	-	EC	2	0.27-0.28	0.12	20	Mature fruit	*<0.10* <0.10	Report No. V-10688A-G Last treatment at "1% mature up to 3 inches diameter" stage.

Spinach. No GAP was reported.

Table 24. Supervised residue trials on spinach.

Location	Application				PHI, days	Sample	Residue, mg/kg	Reference
	Form	No.	kg ai/ha	kg ai/hl				
Puybarban, France	EC	1	0.12	0.024	15	Whole plants	0.14	Report No. TE-2315
			0.18	0.036	30		0.04	
			0.18	0.036	15		0.19	
			0.48	0.096	30		0.08	
					15		0.10	
					30		0.03	
					15		0.15	
					30		0.08	

Lettuce. GAP was reported for Australia and Israel. Both maximum application rates are 0.12 kg ai/ha. The PHIs are 28 days and unstated respectively.

The residues from trials according to the Australian GAP are underlined in Table 25.

Table 25. Supervised residue trials on lettuce.

Location	Field/ Prot-ected	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
		Form	No.	kg ai/ha	kg ai/hl				
Grantham, Queensland, Australia	-	EC	1	0.12	0.087	0 14 28	Head	0.91 0.10 <u>0.04</u>	Report No. S/AU/H6/207/92
				0.24	0.174	0 14 28		2.15 0.08 0.06	Last treatment at "30-50 cm diameter".

Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
		Control				-		<0.02	Results corrected for mean recoveries
Bazas, France	-	EC	1	0.12	0.024	28	Whole heads	0.19 0.09	Report No. TE-2323
				0.18	0.036			0.13 0.11	
				0.18	0.036			0.15 0.27	
				0.48	0.096			0.34 0.29	
Stornara (FG), Italy	F	EC	1	0.24	0.04	0 10 15 20	Head	0.279 0.346 0.141 0.178 0.042 0.065 0.053 0.082	Report No. 0271-90

Beans, except soya beans. GAP was reported for beans for Belgium, Bolivia, Bulgaria, Paraguay, Peru, Spain and Turkey, for mung and fava beans (i.e. broad beans) for Australia and for legumes for Chile. The maximum application rates are 0.06-0.36 kg ai/ha for beans and 0.48 kg ai/ha for legumes, with PHIs of 0-65 days or unstated.

The residues in fresh beans from trials considered to comply with Belgian GAP are underlined in Table 26. Although some of the Belgian results were at shorter PHIs than GAP, the residues were all below the limit of determination. In addition one trial on "green beans" with a residue level of 0.21 mg/kg and one on "French beans" with a residue of <0.03 mg/kg were considered to comply with Spanish GAP; these results are double underlined. Although data on a number of US trials were also submitted, no GAP was reported for the North American continent.

Data from a trial on broad beans in Spain are shown in Table 27. The trial did not comply with relevant GAP.

Table 26. Supervised residue trials on beans.

Crop, Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Fresh beans B2370 Arendonk, Belgium	-	EC	-	0.36	0.12	39	Pod	<0.05 <0.05	Report No. SELPV01 Last treatment at “BBCH 12”.
Fresh beans, B3891 Mielen, Belgium	-	EC	-	0.36	0.12	40	Pod	<0.05	Report No. SELPV03 Last treatment at “BBCH60”.
Fresh beans, B3680 Maaseik, Belgium	-	EC	-	0.36	0.12	40	Pod	<0.05	Report No. SELPV04 Last treatment at “BBCH55”.

Crop, Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Fresh beans, B3891 Mielen, Belgium	-	EC	-	0.36	0.12	39	Pod	<u><0.05</u>	Report No. SELPV05 Last treatment at "BBCH55".
Beans (succulent), B8810 Beitem, Belgium	-	EC	1	0.09	0.012	51	Pod	<0.025 <0.025	Report No. 92clehar1 Last treatment at "Stage 1: vegetative".
Beans (succulent), B8810 Beitem, Belgium	-	EC	1	0.09	0.012	51	Pod	<0.025 <0.025	Report No. 92clehar2 Last treatment at "Stage 1: vegetative".
Beans (succulent), B7561 Esen, Belgium	-	EC	1	0.12 0.36	0.04 0.12	56	Pod	<0.025 <u><0.025</u>	Report No. 93clehar1
Beans (succulent), Tennessee, USA	-	EC	2	0.28		21	Pod	0.60, 0.52 0.59, 0.58	PR No. 5205.94 TN02 Controls but not treated samples were corrected for interference with DME-OH peak
Beans (succulent), Oregon, USA	-	EC	2	0.28		21	Pod	0.22, 0.15, 0.24, 0.18, 0.29	PR No. 5205.93 OR34 Controls but not treated samples were corrected for interference with DME-OH peak
Beans (succulent), Florida, USA	-	EC	2	0.28		21	Pod	0.13, 0.27, 0.13 0.04, <0.05, 0.16 0.04, 0.41, 0.12 0.07, 0.11, 0.09	PR No. 5205.93 FL32 Controls but not treated samples were corrected for interference with DME-OH peak
Beans (succulent), Wisconsin, USA	-	EC	2	0.28		21	Pod	0.20, 0.17 0.18, 0.19 0.15, 0.18 0.21, 0.14, 0.15	PR No. 5205.93 WI07 Controls but not treated samples were corrected for interference with DME-OH peak
Beans (succulent), New York, USA	-	EC	2	0.28		22	Pod	<0.10 <0.10 <0.10	PR No. 5205.92 NY37 Controls but not treated samples were corrected for interference with DME-OH peak
Beans (succulent), Maryland, USA	-	EC	2	0.28		22	Pod	<0.10 0.59 0.65	PR No. 5205.92 MD09

Crop, Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Beans (succulent), Wisconsin, USA	-	EC	2	0.28		23	Pod	<0.10 <0.10 <0.10	PR No. 5205.92 WI19
Beans (succulent), Michigan, USA	-	EC	2	0.28		21	Pod	<0.10 <0.10 0.11	PR No. 5205.92 MI19
Beans (succulent), California, USA	-	EC	2	0.28		19	Pod	<0.10 <0.10 <0.10	PR No. 5205.92 CA124
French beans, Villandraut (Gironde), France	-	EC	1	0.18	0.036	32	Pod	<u><0.03</u> <0.03	Report No. TE-2282
Green beans, Latina, Italy	F	EC	1	0.24	0.04	20	Bean	0.19 0.24	Report No. 0209-88
						24		0.17 <u>0.21</u>	

Table 27. Supervised residue trials on broad beans in Spain.

Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference
Barcelona,	F	EC	1	0.139	0.03	57	Bean	<0.03 <0.03	Report No. 0070-88
Gava							Husk	<0.03 <0.03	

<u>Lupins</u>. GAP for lupins was reported for Australia, with a maximum application rate of 0.12kg ai/ha; no PHI was specified. Only one trial complied with this. The residue is underlined in Table 28.

Table 1. Supervised residue trials on lupins in Australia.

Location	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Cosgrove, Victoria,	EC	1	0.06	0.045	167	Grain (Dried Seed)	<0.1 <0.1 <0.1	Report No. T-7236
		-	-	-	-		<0.1	
		-	0.06 0.12 0.24	0.045 0.090 0.18	167	Straw	<0.1 <u><0.1</u> <0.1	
	Control						<0.1	

<u>Lentils</u>. GAP for lentils was reported to the current Meeting for Canada, New Zealand and Turkey, and to the 1994 Meeting for New Zealand and Spain. GAP for beans and legumes would include lentils. The maximum application rates are 0.06-0.19 kg ai/ha for lentils, 0.06-0.36 kg ai/ha for beans

and 0.48 kg ai/ha for legumes with PHIs of 35 or 60 days for lentils and 15-65 days or unstated for beans and legumes.

Although two Spanish trials were reported, they could not be evaluated against Spanish GAP recorded in 1994 because the GAP did not include a PHI.

Table 29. Supervised residue trials on lentils.

Location	Field/	Application				PHI,	Sample	Residue,	Reference and Comment
	Prot-ected	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Poplar Point, Manitoba, Canada	-	EC	1	0.045	0.04	84	Seed	<0.02 <0.02	Report No. 94-102 DC
				0.09	0.08			<0.02 <0.02	Growth stage at last treatment:
				0.18	0.16			<0.02 <0.02	84 days: 6-8 cm 70 days: 12-15 cm
				0.045	0.04	70		<0.02 <0.02	
				0.09	0.08			<0.02 <0.02	
				0.18	0.16			<0.02 <0.02	
Koral, Sask., Canada	-	EC	1	0.18	0.16	103	Seed	<0.02 <0.02	Report No. 94-102 DC
						118		<0.02 <0.02	Growth stage at last treatment: 103 days: 17 cm 118 days: 7 nodes, 6-7 cm
Haight, Sask., Canada	-	EC	1	0.18	0.16	92	Seed	<0.02 <0.02	Report No. 94-102 DC
						107		<0.02 <0.02	Growth stage at last treatment: 92 days: actively growing, 6 cm height 107 days: 15-18 cm height
Oakbluff, Manitoba, Canada	-	EC	1	0.045	0.04	91	Seed	<0.02 <0.02	Report No. 94-102 DC
				0.09	0.08			<0.02 <0.02	Growth stage at last treatment:
				0.18	0.16			<0.02 <0.02	91 days: 6-8 cm 76 days: 12-15 cm
				0.045	0.04	76		<0.02 <0.02	
				0.09	0.08			<0.02 <0.02	
				0.18	0.16			<0.02 <0.02	
Rowatt, Sask., Canada	-	EC	1	0.045	0.04	89	Seed	<0.02 <0.02	
				0.09	0.08			<0.02 <0.02	Growth stage at last treatment:
				0.18	0.16			<0.02 <0.02	89 days: 6-7 leaf 77 days: flowering
				0.045	0.04	77		<0.02 <0.02	
				0.09	0.08			<0.02 <0.02	
				0.18	0.16			<0.02 <0.02	

Location	Field/	Application				PHI,	Sample	Residue,	Reference and Comment
	Prot-ected	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Okotaks, Atta, Canada	-	EC	1	0.18	0.16	75	Seed	<0.02 <0.02	Growth stage at last treatment: 75 days: flowering stage, 30-35 cm height 90 days: 9 node leaf stage 18-22 cm height
						90		<0.02 <0.02	
Koral, Sask., Canada	-	EC	1	0.04	0.04	58	Seed	<0.02 <0.02	Last treatment at “20 cm” stage.
				0.09	0.08			0.04 0.05	
				0.18	0.16			0.09 0.12	
Bristows, Sask., Canada	-	EC	1	0.04	0.04	62	Seed	0.05 0.05	Last treatment at “30 cm, 13 nodes” stage.
				0.09	0.08			0.15 0.12	
				0.18	0.16			0.22 0.31	
Airdrie, Alberta, Canada	-	EC	1	0.045	0.04	60	Seed	0.13 0.10	Last treatment at “pod filling” stage.
				0.09	0.08			0.27 0.25	
				0.18	0.16			0.22 0.35	
Morden, Manitoba, Canada	-	EC	-	0.18	0.13	67	Seed	<0.02 <0.02	Last treatment at “8 cm, 6 nodes” stage.
Richardson, Sask. Canada	-	EC	1	0.09	0.08	58	Seed	0.04 0.04	Last treatment at “12-26 cm height” stage. Suspect results owing to possible labelling error
				0.18	0.16			0.04 0.04	
Koral, Sask., Canada	-	EC	1	0.045	0.04	72	Seed	<0.02 <0.02	Last treatment at “15 cm” stage.
				0.09	0.08			<0.02 <0.02	
				0.18	0.16			<0.02 <0.02	
Bristows, Sask., Canada	-	EC	1	0.045	0.04	77	Seed	<0.02 <0.02	Last treatment at “25 cm” stage.
				0.09	0.09			<0.02 <0.02	
				0.18	0.16			0.05 0.03	
Airdrie, Alberta, Canada	-	EC	1	0.045	0.04	75	Seed	0.06 0.08	Last treatment at “flowering” stage.
				0.09	0.09			0.02 0.03	
				0.18	0.16			0.07 0.10	
Morden, Manitoba, Canada	-	EC	1	0.18	0.13	77	Seed	<0.02 <0.02	Last treatment at “8 cm, 6 nodes” stage.
Lentils, Richardson, Sask., Canada	-	EC	1	0.09	0.08	74	Seed	0.22 0.23	Last treatment at “3-12 cm height” stage. Suspect results owing to possible labelling error
				0.18	0.16			0.05 0.13	

Location	Field/ Prot-ected	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
		Form	No.	kg ai/ha	kg ai/hl				
Castrobol, Spain	F	EC	1	0.18	0.06	0 21	Husk	2.2 1.4	Report No. 229-90 Last treatment at “before ripening” stage.
Monte Urones-Mayorage Valladolid, Spain	F	EC	1	0.18	0.06	0 21	Husk	2.2 1.1	Report No. 228-90 Last treatment at “before mature” stage.

Carrots. GAP for carrots was reported for Israel and Russia, and pending GAP for Brazil. The maximum applications rates are 0.108 (Brazil) to 0.24 kg ai/ha with PHIs of 40-75 days.

The residues from trials according to the pending Brazilian GAP are underlined in Table 30. None of the other trials accorded with reported GAP.

Table 30. Supervised residue trials on carrots.

Location	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl				
Engenheiro, Coelho/SP, Brazil	EC	1	0.108 0.216		20	Root	<0.05 <0.05	Report No. 9402487
			0.108 0.216		40		<0.05 <0.05	
			0.108 0.216		60		<0.05 <0.05	
Engenheiro, Coelho/SP, Brazil	EC	1	0.108 0.216		20	Root	<0.05 <0.05	Report No. 96000098
			0.108 0.216		40		<0.05 <0.05	
			0.108 0.216		60		<0.05 <0.05	
Moscow region, Russia	EC	-	0.096	0.048	0 20 40 60 73	Root-crops	0.11 0.29 0.032 <0.1 <0.1	Last treatment at “4 leaves” stage.
			0.240	0.12	0 20 40 60 70 85		0.21 0.43 0.050 <0.1 <0.1 <0.1	
Leningrad region, Russia	EC	-	0.24	0.12	0 20 45 75		0.02 0.37 0.51 <0.1	
Kiev, Ukraine	EC	-	0.07-0.29	-	-	Root	<0.01	
Florida, USA	EC	2	0.28	-	30	Root	<0.14 <0.14	PR No. 5217.94 FL74
Michigan, USA	EC	2	0.28	-	31	Root	<0.14 <0.14	PR No. 5217.95 MI02
California, USA	EC	2	0.28	-	29	Root	<0.14 <0.14	PR No. 5217.94 CA*91
California, USA	EC	2	0.28	-	31	Root	<0.14 <0.14	PR No. 5217.94 CA*92

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
California, USA	EC	2	0.28	-	29	Root	0.25 0.22	PR No. 5217.95 CA*48 .
California, USA	EC	2	0.28	-	31	Root	<0.14 <0.14	PR No. 5217.95 CA*49
Texas, USA	EC	2	0.28	-	29	Root	0.18 0.28	PR No. 5217.95 WA*32
Washington, USA	EC	2	0.28	-	31	Root	<0.14 <0.14	PR No. 5217.95 WA*32

Artichokes. No specific GAP for artichokes was reported, and the single reported trial in Italy did not comply with any relevant general GAP.

Table 31. Supervised residue trial on artichokes in the field.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Stornara, Italy	EC	1	0.24	0.03	20	Fruit	0.50 0.57	Report No. 0289-89
					25		0.26 0.33	
					30		0.18 0.29	

Celery. GAP for celery was reported for Australia, with a maximum application rate of 0.12 kg ai/ha and a PHI of 9 weeks.

The residue from the single trial under these conditions is underlined in Table 32.

Table 32. Supervised residue trials on celery.

Location	Application				PHI,	Sample	Residue,	Reference
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Cranbourne, Victoria, Australia	EC	1	0.12 0.24 0.48	0.096 0.192 0.384	66	Stalk	0.04 0.13 0.15	Report No. 5/AU/H2/91
			Control-				<0.02	
Texas, USA	EC	2	0.28	-	30	Stalk	0.26 0.31	Report No. 5218.95-TX*44
California, USA	EC	2	0.28	-	39	Stalk	0.33 0.33	Report No. 5218.94-CA*32
California, USA	EC	2	0.28	-	31	Stalk	0.12 0.14	Report No. 5218.94-CA*31
Florida, USA	EC	2	Not stated	-	30	Stalk	0.14 0.14	Report No. 5218.94-FL46
Michigan, USA	EC	2	Not stated	-	31	Stalk	<0.10 <0.10	Report No. 5218.94-MI13

Flax (linseed). GAP was reported for Canada, Russia and the Ukraine. The maximum application rates are 0.09-0.24 kg ai/ha and PHIs 60-80 days or not specified.

None of the Canadian trials were in strict accordance with the Canadian GAP. The residues in several trials at exaggerated dose rates were <0.05 mg/kg at PHIs of 84-119 days, but the Canadian PHI is 60 days. The residues from the single trial in accordance with Russian GAP is double underlined in Table 33.

Table 33. Supervised residue trials on flax.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Birch Hills, Saskatchewan Canada	EC	1	0.12 0.24 -	0.108 0.216 -	116	Mature seed	<0.05 <0.05 <0.05	Report No. T-7095 Last treatment at “16 cm height”.
Elfros, Saskatchewan Canada	EC	1	0.12 0.24 -	0.108 0.216 -	119	Mature seed	<0.05 <0.05 <0.05	Report No. T-7096 Last treatment at “16 cm height”.
Manitoba, Canada	EC	1	0.12	0.096	88	Mature seed	<0.05	
			0.24	0.19			<0.05	Report No. T-7097
	Control						<0.05	Last treatment at “8 to 10 cm height”.
Elie, Manitoba, Canada	EC	1	0.105	0.105	84	Seed	<0.05	Tomen No. 489A
Indus, Alberta, Canada	EC	1	0.105	0.105	108	Seed	<0.05	Tomen No. 489A
Tverj region Russia	EC	-	0.075	0.04	80	Seed	<0.01	
			0.175	0.09	80		<0.01	
			0.250	0.13	80		<u><0.01</u>	
	Control				80		<0.01	
Kiev, Ukraine	EC	-	0.072 0.12 0.17 0.24 0.29	-	-	Seed	<0.01	

<u>Peanuts</u>. GAP was reported for Argentina, Australia, Bolivia, Israel, Taiwan and the USA, with maximum application rates of 0.09-0.336 kg ai/ha and PHIs of 40-70 days or not specified.

The residues from trials according to US GAP are underlined in Table 34.

Table 34. Supervised residue trials on peanuts.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Cordoba Provine, Argentina	EC	1	0.12	-	71	Kernels	<0.01	
			0.24	-			0.6	Tomen No. 527
Queensland, Australia	EC	1	0.24	0.20	49	Kernels	0.81	
			0.48	0.40	-	+	1.3	Report No. 223/AU/94/03/QU01
			Control			hulls	<0.02	
Lowood, Queensland,	EC	1	0.24	0.20	11 18 49	Foliage	17.0 11.0 2.3	Report No. 223/AU/94/03/QU01

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Australia			0.48	0.40	11 18 49		32.0 24.0 5.6	Last treatment at "pegging and just covering between the rows. Height was 30 cm although the top of the plants had been slashed 3 weeks earlier to control the weed growth".
			Control				<0.05	
Alabama, USA	EC	2	0.28	0.15	40	Kernels	1.3, 0.35	Report No. T-7408 Last treatment at "late pegging".
						Hulls	0.18, 0.24	
						Vine[1]	0.27, 0.26	
						Hay	0.36, 0.38	
North Carolina, USA	EC	2	0.28	0.15	40	Kernels	1.3, 0.47	Report No. T-7408 Last treatment at "pod-fill".
						Hulls	0.21, 0.60	
						Vine[1]	1.6, 1.7	
						Hay	2.6,2.5	
Georgia, USA	EC	2	0.28	0.14	25	Kernels	0.03, <0.05	Report No. T-7406 Growth stage at last treatment: 25 days: "early maturing" 40 days: "pegging"
						Hulls	0.40, 0.35	
						Vine[1]	0.58, 0.50	
						Hay	0.97, 1.2	
			0.28	0.14	40	Kernels	2.7, 0.15	
						Hulls	0.20, 0.17	
						Vine[1]	0.56, 0.21	
						Hay	0.43, 0.36	
Georgia, USA	EC	2	0.28	0.13-015	65	Kernels	0.08, 0.06	Report No. T-7406 Last treatment at "early pegging".
						Hulls	0.08, <0.05	
						Vine[1]	0.60, 0.14	
						Hay	0.18, 0.22	
Texas, USA	EC	2	0.28	0.15	60	Kernels	0.39, 0.33	Report No. T-7407 Last treatment at "pegging".
						Hulls	0.74, 0.46	
						Vine[1]	9.2, 13	
						Hay	1.0, <0.05	
Texas, USA	EC	2	0.28	0.15	20	Kernels	0.46, 0.51	Report No. T-7407 Growth stage at last treatment: 20 days: "pod fill" 35 days: "late pegging"
						Hulls	0.45, 0.59	
						Vine[1]	19, 21	
						Hay	1.4, 1.6	

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
			0.28	0.15	35	Kernels	<0.05, <0.05	
						Hulls	0.75, 0.59	
						Vine[1]	10, 12	
						Hay	1.9, 1.7	
Alabama, USA	EC	2	0.28	0.15	0	Plants[2]	3.8 7.4	Report No. T-7408
					12		0.67 0.89	Last treatment at “late pegging”.
					19		0.53 0.73	
					26		0.39 0.45	
					33		0.35 0.40	
					40		0.19 0.22	
Georgia, USA	EC	2	1.4	0.75	40 + 3[3]	Kernels	3.5, 3.4	Report No. T-7409
						Meal (press-cake)	9.6	Last treatment at “pegging”.
						Crude oil	1.7	
						Refined oil	0.32	
						Soap-stock	10	
, USA	EC	2	0.28	0.75	40	Kernels	1.8, 1.7	Report No. T-7409
						Hulls	0.31, 1.3	Last treatment at “pegging”.
						Vine[1]	2.0, 1.8	
						Hay	2.2, 1.9	
			1.4	0.75	40	Kernels	3.9, 4.0	Mean of the duplicate analysis of the GAP results.
						Hulls	0.25, 0.62	was 1.75 mg/kg for Kernels and 0.81 mg/kg for the hull
						Vine[1]	20, 13	
						Hay	5.1, 13	
Georgia, USA	EC	2	0.28	0.15	41	Kernels	0.35, 0.33	Report No. V-1028A
						Hulls	0.17, 0.17	Last treatment at “pegging”.
						Vine[1]	0.11, 0.11	Mean of the duplicate analysis of the GAP results.
						Hay	0.22, 0.23	was 0.34 mg/kg for Kernels and 0.17 mg/kg for the hull.
Texas, USA	EC	2	0.28	0.15	40	Kernels	0.60, 0.52	
						Hulls	0.31, 0.29	
						Vine[1]	2.1, 2.3	Mean of the duplicate analysis of the GAP results.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
						Hay	0.71, 0.58	was 0.56 mg/kg for Kernels and 0.3 mg/kg for the hull.
Florida, USA	EC	2	0.25	0.15	40	Kernels	0.76, 0.82	Report No. V-1028C
						Hulls	0.23, 0.24	Last treatment at "pod development" stage.
						Vine[1]	0.26, 0.19	
						Hay	0.43, 0.42	Mean of the duplicate analysis of the GAP results. was 0.79 mg/kg for Kernels and 0.24 mg/kg for the hull.

[1]Described as immature plant
[2]Twelve individual plants collected
[3]Drying time

Alfalfa. GAP was reported for Argentina, Canada, Chile, Ecuador, Israel, Peru and the USA. The maximum application rates are 0.09-0.48 kg ai/ha with PHIs of 15-30 days or not specified.

The residues from trials according to Canadian and US GAP are underlined and double underlined respectively, in Table 35. US GAP allows 2 x 0.28 kg ai/ha. Where residues from single applications of 0.28 kg/ha exceeded those from the two higher levels have been regarded as being from treatment according to GAP.

Table 35. Supervised residue trials on alfalfa.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
Yerong Creek, Australia	EC	1	0.12	0.15	0 3 14	Forage	6.6 1.2 0.13	Report No. 223/AU/95/08/SN01
			0.24	0.30	0 3 7 14		1.2 3.9 2.0 0.73	
Yerong Creek Australia	EC	1	0.48	0.60	0 14	Forage	27 0.60	Report No. 223/AU/95/08/SN01
Haight,	EC	1	0.045	0.04	30	Forage	<0.02 <0.02	Report No. 95-040.DC
Saskatoon, Saskachawan, Canada			0.09	0.08			<0.02 <0.02	Last treatment at "2-3 foliate".
							<0.02 <0.02	
			0.045	0.04	44		<0.02 <0.02	
			0.09	0.08			<0.02 <0.02	
							<0.02 <0.02	
Koral,	EC	1	0.045	0.04	34	Forage	<0.02 <0.02	Report No. 95-040.DC
Saskatoon, Saskachawan, Canada			0.09	0.08			<0.02 <0.02	Last treatment at "5-6 trifoliate".
			0.18	0.16			<0.02 <0.02	
			0.045	0.04	45		<0.02 <0.02	

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
			0.09	0.08			<0.02 <0.02	
			0.18	0.16			<0.02 <0.02	
Portage,	EC	1	0.045	0.04	31	Forage	<0.02 <0.02	Report No. 95-040.DC
Manitoba, Canada			0.09	0.08			<0.02 <0.02	Last treatment at "3-4 trifoliate".
			0.09	0.08			<0.02 <0.02	
			0.045	0.04	46		<0.02 <0.02	
			0.09	0.08			<0.02 <0.02	
			0.09	0.08			<0.02 <0.02	
Korael,	EC	1	0.045	0.04	47	Forage	<0.02 <0.02	Report No. 95-040.DC
Saskatoon, Saskawan, Canada			0.09	0.08			<0.02 <0.02	Last treatment at "3 trifoliate".
			0.18	0.16			<0.02 <0.02	
			0.045	0.04	29		<0.02 <0.02	
			0.09	0.08			<0.02 <0.02	
			0.18	0.16			<0.02 <0.02	
Oakbluff,	EC	1	0.045	0.04	30	Forage	<0.02 <0.02	Report No. 95-040.DC
Manitoba, Canada			0.09	0.08			<0.02 <0.02	Last treatment at "2-3 trifoliate".
			0.09	0.08			<0.02 <0.02	
			0.045	0.04	45		<0.02 <0.02	
			0.09	0.08			<0.02 <0.02	
			0.09	0.08			<0.02 <0.02	
Guelph,	EC	2	0.09	0.045	30	Forage	<0.02 <0.02	Report No. 95-040.DC
Ontario, Canada					45		<0.02 <0.02	Last treatment at "2-5 trifoliate".
Campbellville,	EC	2	0.09	0.045	30	Forage	<0.02 <0.02	Report No. 95-040.DC
Ontario, Canada					46		<0.02 <0.02	Last treatment at "0-4 trifoliate".
Airdrie,	EC	2	0.09	0.08	30	Forage	0.027 0.022	Report No. 95-040.DC
Alberta, Canada		1			45		<0.02 <0.02	Last treatment at "1-3 trifoliate". Mean of duplicate analyses for the GAP results were 0.0245 mg/kg.
Alfalfa,	EC	1	0.28	0.14	21	Forage	1.4, 1.5	
Minnesota, USA		2	0.28	0.14 to 0.14	20		0.55 0.50	Report No. T-7397 Growth stage at last treatment:

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
		2	0.28	0.14 to 0.15	61		<0.01 <0.01	21 days: "vegetative" 20 days: "50% bloom" 61 days: "50% bloom" Mean residue of duplicate analyses for GAP results was 0.525 mg/kg.
Nebraska, USA	EC	1	0.28	0.15	20 57	Forage	0.87 0.77 <0.01 <0.01	Report No. T-7398 Last treatment at "vegetation".
		2	0.28	0.15	20		0.61 0.63	Mean residue of duplicate analyses for GAP results was 0.62 mg/kg.
		3			20		0.35 0.31	
					61		<0.10 <0.10	
Minnesota, USA	EC	1	0.28	0.14	21+4*	Hay	3.2 2.4	Report No. T-7397 *Drying time. Last treatment at "vegetative, 50% bloom".
		2		0.14 to 0.15	20+7*		1.0 1.1	
					61+6*		<0.10 0.14	
Nebraska, USA	EC	1	0.28	0.15	20+3*	Hay	2.3 1.8	Report No. T-7398 *Drying time. Last treatment at "vegetation".
					57+4*		0.40 <0.1	
Nebraska, USA	EC	2	0.28	0.15	20+2*	Hay	1.2 1.4	Report No. T-7398 *Drying time. Last treatment at "vegetation".
		3			20+2*		0.56 0.47	
					61+6*		<0.10 0.16	
Alfalfa, Nebraska, USA	EC	1	-	0.16	20	Hay	1.1	Report No. T-7399 Last treatment at "vegetative".
		2	0.28	0.15 to 0.16	20		1.6 1.6	
					63		<0.1 <0.1	
South Dakota, USA	EC	1	0.16	0.15	20	Hay	1.1 1.2	Report No. T-7400 Last treatment at "vegetative".
		2			20		0.96 0.98	
					67		<0.1 <0.1	
Alfalfa, Michigan, USA	EC	1	175	0.15	20+3*	Hay	2.6	Report No. T-7399 *Drying time. Last treatment at "vegetative".
		2	175-187	0.15	20+3*		3.0 3.4	
					63+3*		<0.10 <0.10	
South Dakota, USA	EC	1	0.16	0.15	20+2*	Hay	3.1 3.4	Report No. T-7400 *Drying time. Last treatment at "vegetative".
		2			20+1*		1.4 1.6	
					67+3*		<0.1 <0.1	
North Dakota, USA	EC	1	0.28	0.16	15	Forage	1.4 1.2	Report No. T-7401
		2	0.28	0.15-0.16	15		5.7 5.0	
		1	0.28	0.15	19	Forage	0.90 1.3	

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
		2	0.28	0.15	21		1.3 1.1	
North Dakota,	EC	1	0.28	0.16	15+8*	Forage	2.3 2.3	Report No. T-7401
USA		2	0.28	0.15- 0.16	15+ 10*		2.1 3.7	*Drying time.
		1	0.28	0.15	19+8*	Forage	1.7 2.2	
		2	0.28	0.15	21+ 10*		1.2 1.4	
Wisconsin,	EC	1	0.28	0.14	15	Forage	2.8 3.0	Report No. T-7402
USA		2	0.28	0.14- 0.15	15		1.7 2.3	Mean residue of duplicate analyses = 2.0 mg/kg
					44		<0.2 <0.2	
		1	0.28	0.14	20	Forage	0.52 0.72	
		2			20		1.2 1.5	Mean residue of duplicate analyses = 1.35 mg/kg
					49		<0.1 <0.1	
Wisconsin,	EC	1	0.28	0.14	15+4*	Hay	4.0 3.8	Report No. T-7402
USA		2	0.28	0.14- 0.15	15+4*		2.0 1.7	Mean residue of duplicate analyses = 1.85 mg/kg
					44+5*		<0.2 <0.2	
		1	0.28	0.14	20+4*	Forage	1.5 1.3	
		2			20+5*		1.6 1.9	*Drying time.
					49+5*		<0.1 <0.1	
Iowa, USA	EC	1	0.28	0.15	15	Forage	1.4 1.5	Mean residue of duplicate analyses = 1.45 mg/kg
		2			17		1.2 1.1	
					63		<0.2 <0.2	Report No. T-7403
		1	0.28	0.15	20	Forage	0.82 0.73	
		2			22		0.91 0.79	Mean residue of duplicate analyses = 0.85 mg/kg
					68		<0.1 <0.1	
Iowa, USA	EC	1	0.28	0.15	15+2*	Hay	3.1 2.2	Mean residue of duplicate analyses = 2.65 mg/kg
		2			17+2*		1.7 2.2	
					63+3*		<0.2 <0.2	Report No. T-7403
		1	0.28	0.15	20+2*	Hay	1.4 1.5	*Drying time.
		2			22+2*		1.6 1.3	
					68+3*		<0.1 <0.1	
California,	EC	1	0.28	0.15	15	Forage	1.5 1.3	Mean residue of duplicate analyses = 1.4 mg/kg

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
USA		2			15		0.59 0.81	
					43		<0.2 <0.2	Report No. T-7404
					71		<0.02 <0.02	
		1	0.28	0.15	20	Forage	0.44 0.89	Mean residue of duplicate analyses = 0.67 mg/kg
		2			20		0.11 <0.10	
					48		<0.10 <0.10	
					76		<0.10 <0.10	
California, USA	EC	1	0.28	0.15	15+6*	Hay	4.4 4.3	Mean residue of duplicate analyses = 4.35 mg/kg
		2			15+2*		2.4 2.8	
					43+5*		0.13 <0.10	Report No. T-7404
					71+5*		0.64 0.36	
		1	0.28	0.15	20+6*	Hay	1.2 1.6	*Drying time.
		2			20+12*		0.56 0.71	
					48+5*		<0.10 <0.10	
					76+5*		0.12 <0.10	
Wisconsin, USA	EC	1	0.28	0.14	15	Forage	1.4 1.3	Mean residue of duplicate analyses = 1.35 mg/kg
		2	0.28	0.13-0.14			0.86 0.88	Report No. T-7477
New York, USA	EC	1	0.28	0.15	15	Forage	2.6 2.5	Mean residue of duplicate analyses = 2.55 mg/kg
		2					2.1 1.7	Report No. T-7478
Wisconsin, USA	EC	1	0.28	0.14	15+6*	Hay	2.7 2.7	Report No. T-7477
		2	0.28	0.13-0.14	15+5*		1.5 1.8	*Drying time.
New York, USA	EC	1	0.28	0.15	15+3*	Hay	3.5 3.2	Report No. T-7478
		2			15+2*		4.5 4.4	Mean residue of duplicate analyses = 4.45 mg/kg *Drying time.
California, USA	EC	1	0.28	0.61	15	Forage	0.29 0.25	Mean residue of duplicate analyses = 0.27 mg/kg
		2	0.28	0.58-0.61			0.19 0.13	Report No. T-7479 * Aerial application.
Idaho, USA	EC	1	0.28	0.13	15	Forage	2.1 1.8	Report No. T-7480
		2					2.8 3.2	Mean residue of duplicate analyses = 3.0 mg/kg
California, USA	EC	1	0.28	0.61	15+3*	Hay	0.45 0.76	Mean residue of duplicate analyses = 0.61 mg/kg
		2	0.28	0.58-0.61	15+6*		0.58 0.47	Report No. T-7479 *Drying time.
Idaho, USA	EC	1	0.28	0.13	15+5*	Hay	4.6 5.6	Report No. T-7480

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
		2			15+6*		9.2 8.6	Mean residue of duplicate analyses = 8.9 mg/kg *Drying time.
Idaho, USA	EC	1	0.28	0.13	15+11*	Processed	3.8	Report No. T-7480
		2			15+16*	Hay	6.1	*Drying time

White clover. GAP for clover was reported for Israel and New Zealand. Both maximum application rates are 0.12 kg ai/ha with a PHI of 63 days in New Zealand and no specified in Israel.

The two residues in trials complying with New Zealand clover GAP are underlined in Table 36 but the samples analysed were described as "young plants" and "silage".

Table 36. Supervised residue trials on clover.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
White Clover,	EC	1	0.12	0.04	71	Young	0.07	
Methven,			0.36	0.12		Plant	0.24	Report No. 880410
Canterbury, New Zealand	Control						<0.03	Last treatment at “vegetative”.
Clover,	EC	1	0.12	0.04	62	Silage	0.26	
Methven,			0.36	0.12			0.93	Report No. 880410
Canterbury, New Zealand	Control						0.04	Last treatment at “vegetative”.
Clover, Oregon, USA	EC	1	0.28	-	15	Forage	5.8 6.1	Report No. 06218.95-OR29
		1	0.28	-	15+7*	Hay	15 12	*Drying time.
Clover, Oregon, USA	EC	1	0.28	-	15	Forage	5.2 4.6	Report No. 06218.95-OR30
		1	0.28	-	15+7*	Hay	11 12	*Drying time.
Clover, Oregon, USA	EC	1	0.28	-	15	Forage	3.2,3.2 3.2,3.0	Report No. 06218.95-OR31
		1	0.28	-	20	Hay	11,11 12,12	

Field peas (dry). GAP for field peas was reported for Australia and Canada, for chick peas for Australia. The maximum application rate in Canada is 0.09 kg ai/ha with a PHI of 75 days. The maximum rate reported by the Australian government, supported by a product label, was 0.06 kg ai/ha with no PHI and differed from that reported by the manufacturer.

The residues from trials considered to comply with Canadian GAP are underlined, and the single residue which was considered to result from Australian GAP is double underlined. All residues in the Australian trials were <0.1 mg/kg, even those from exaggerated doses.

Table 37. Supervised residue trials on field peas.

Crop, Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Peas (field), Elmore, Victoria, Australia	-	EC	1	0.06 0.12 0.24	0.045 0.09 0.18	110	Grain (dried seed) Straw	<u>≤0.10</u> <0.10 <0.10	Report No. T-7234 Last treatment at 4 to 8 leaves
				0.06 0.12 0.24	0.045 0.18 0.24			<0.10 <0.10 <0.10	
Peas (protein) B9230 Mlelle, Belgium	-	EC	1	0.09	0.012	41	Seed	<0.025 <0.025	Report No. 92CLEPOI 1
				0.18	0.024			<0.025 <0.025	Last treatment at 12-15 cm.
Peas (field), Okotoks, Alta, Canada	-	EC	2	0.09	0.08	75	Seed	0.59 <0.02	Residues from duplicate analyses too different to use.
						90		<0.02 <0.02	Report No. 95.036.DC Growth stage at last treatment: 75 days: flowering, height 50-60 cm 90 days: 6 node leaf, height 20-24 cm
Peas (field), Rowatt, Saskatoon, Canada	-	EC	1	0.045	0.04	77	Seed	0.084 <0.02	Report No. 95.036.DC
				0.09	0.08			<0.02 0.059	Growth stage at last treatment:
			2	0.09	0.08			<u>0.14</u> <u>0.02</u>	Mean residue of duplicate analyses = 0.08 mg/kg
			1	0.045	0.04	62	Seed	0.01 0.21	77 days: 4-8 expanded leaves 62 days: flowering, pod formation
				0.09	0.08			0.64 0.59	
			2	0.09	0.08			<u>0.83</u> <u>0.46</u>	Mean residue of duplicate analyses = 0.65 mg/kg
Peas (field), Korae, Saskatoon, Canada	-	EC	1	0.045	0.04	51	Seed	0.27 0.17	Report No. 95.036.DC
				0.09	0.08			0.50 0.47	Growth stage at last treatment:
				0.18	0.16			0.50 0.33	51 days: 50 cm height 37 days: 70 cm height
			1	0.045	0.04	37	Seed	0.43 0.38	
				0.09	0.08			0.70 0.94	
				0.18	0.16			2.2 1.6	
Peas (field), Airdrie, Alberta, Canada	-	EC	1	0.045	0.04	75	Seed	0.16 0.18	Report No. 95.036.DC
				0.09	0.08			<u>0.24</u> <u>0.38</u>	Mean residue of duplicate analyses = 0.31 mg/kg
			2	0.09	0.16			0.70 1.2	Growth stage at last treatment:
			1	0.045	0.04	60	Seed	0.38 0.54	75 days: flowering 60 days: pod filling
				0.09	0.08			1.5 0.69	
			2	0.09	0.16			<u>2.0</u> <u>1.5</u>	Mean residue of duplicate analyses = 1.75 mg/kg
Peas (field) Richardson,	-	EC	1	0.09	0.08	73	Seed	<u>0.05</u> <u>0.06</u>	Report No. 95.036.DC

Crop, Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
Saskatoon, Canada				0.18	0.16			0.07 0.10	Growth stage at last treatment:
				0.09	0.08	58	Seed	0.71 0.81	73 days: 3-5 expended leaves 58 days: 10-12 expanded
				0.18	0.16			1.9 2.0	leaves and flowering
Peas (field) Polar Point, Manitoba, Canada	-	EC	1	0.18	0.16	82	Seed	0.19 0.15	Report No. 95.036.DC
						67		0.43 0.66	Growth stage at last treatment: 82 days: 3-6 nodes 67 days: 15 nodes
Peas (field), Polar Point, Manitoba, Canada	-	EC	1	0.045	0.04	85	Seed	<0.02 <0.02	Report No. 95.036.DC
				0.09	0.08			<0.02 <0.02	Growth stage at last treatment:
				0.18	0.16			<0.02 <0.02	85 days: 3-6 leaf 71 days: 15-20 cm
				0.045	0.04	71	Seed	<0.02 <0.02	
				0.09	0.08			<0.02 <0.02	
				0.18	0.16			<0.02 <0.02	
Peas (field), Oak bluff, Manitoba, Canada	-	EC	1	0.045	0.04	93	Seed	<0.02 <0.02	Report No. 95.036.DC
				0.09	0.08			<0.02 <0.02	Growth stage at last treatment:
				0.18	0.16			<0.02 <0.02	93 days: 6-12 cm 78 days: 10-20 cm
				0.045	0.04	78	Seed	<0.02 <0.02	
				0.09	0.08			<0.02 <0.02	
				0.18	0.16			<0.02 <0.02	
Peas (field), Edenuold, Saskatoon, Canada	-	EC	1	0.045	0.04	80	Seed	<0.02 <0.02	Report No. 95.036.DC
				0.09	0.08			<0.02 0.18	Residues from duplicate analyses too different to use.
			2	0.09	0.08			0.14 0.02	Growth stage at last treatment: 80 days: 5-6 expanded leaves 68 days: flowering
			1	0.045	0.04	68	Seed	<0.02 <0.02	
				0.09	0.08			0.20 0.15	Mean residue of duplicate analyses =0.175 mg/kg
			2	0.09	0.08			0.34 0.61	
Peas (field), Aubeterre/ Pont Ste. Marie, France	-	EC	1	0.18	0.045	67	Seed	<0.03 0.05	Report No. TE-2301
				0.48	0.12			0.11 0.06	Last treatment at 15-20 cm high.
				0.96	0.24			0.29 0.18	
Peas (field), Voue/ Pont Ste. Marie, France	-	EC	1	0.18	0.045	72	Seed	0.03 <0.03	Report No. TE-2302
				0.48	0.12			0.08 0.04	Last treatment at 20 cm high.

Crop, Location	Field/ Prot-ected	Application Form	No.	kg ai/ha	kg ai/hl	PHI, days	Sample	Residue, mg/kg	Reference and Comment
				0.96	0.24			0.15 0.12	
Peas (field), Warlus/ Airaines, France	-	EC	1	0.18	0.045	82	Seed	0.06 0.04	Report No. TE-2303
				0.48	0.12			0.20 0.28	Last treatment at 20 cm high
				0.96	0.24			0.75 0.43	
Peas (field), Flacey/ Bonneval, France	-	EC	1	0.18	0.045	72	Dry seed	<0.03 <0.03	Report No. TE-2304
				0.48	0.12			0.09 0.13	Last treatment at 20 cm high.
				0.96	0.24			0.10 0.17	
Peas (field), Amiens, France	-	EC	1	0.48 0.96	0.12 0.24	80	Dry seed	<0.03 0.04 0.05 0.08	Report No. TE-2305 Last treatment at 20 cm high.
Peas (field), Marboue Chateaudun, France	-	EC	1	0.18 0.48 0.96	0.45 0.12 0.24	79	Dry seed	<0.03 <0.03 0.04 <0.03 0.14 0.05	Report No. TE-2306 Last treatment at 15 cm high.
Peas (field), Thurston, Suffolk, UK	-	F	1	0.36	0.12	53	Pea green	<0.03 <0.03	Report Nos. 0432-88, 0434-88,
				0.72	0.24			0.08 0.10	0552-88, 0556-88
				0.36	0.12	53	Husk	<0.03 <0.03	Last treatment at 4-5 leaves
				0.72	0.24			<0.03 <0.03	
				0.36	0.12	85		<0.03 0.05	
				0.72	0.24			0.07 0.12	
Peas (dry), Washington, USA	F	EC	2	0.28	-	21	Dried peas	4.6, 3.5 3.7, 3.3 4.8, 4.1 5.8, 4.3	Report No. 5204.93-WA*07
Peas (dry), Washington, USA	F	EC	2	0.28	-	20	Dried peas	6.9, 7.0 6.5, 6.1 6.6	Report No. 5204.94-WA*22
Peas (dry), California, USA	F	EC	2	0.28	-	20	Dried peas	0.48 0.68	Report No. 5204.94 CA93

Peas. GAP for peas was reported for Belgium, the Czech Republic, Israel, New Zealand and Spain, and "proteaginous peas" for France. The maximum application rates are 0.06-0.36kg ai/ha with PHIs of 30 or 60 days, or not specified. None of the trials complied with the reported GAP.

Table 38. Supervised residue trials on peas.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
	EC	1	0.24	0.08	43	Peas +	0.29	
Rawora			0.48	0.16			0.45	Report No. 8804-09
Canterbury,			0.72	0.024		pods	0.34	Last treatment at early
New Zealand	Control						<0.03	flowering.
	EC	1	0.24	0.08	43	Silage	0.47	
Rawora			0.48	0.16			2.24	Report No. 8804-09
Canterbury,			0.72	0.024			0.93	Last treatment at early
New Zealand			-	-	-		0.07	flowering.
Michigan,	EC	2	0.28	-	22		6.19 7.25	PR No. 05202
USA		2	0.28	-	22	+ Pods	3.13 3.88	
Washington, USA	EC	2	0.28	-	21	+ Pods	0.84 0.70 0.88 0.82	PR No. 05202
New York, USA	EC	2	0.28	-	20	+ Pods	0.42 0.71 0.74 0.45	PR No. 05202
Wisconsin, USA	EC	2	0.56	-	20	+ Pods	1.24 1.49 1.39 1.69	PR No. 05202
Illinois, USA	EC	2	0.56	-	20	+ Pods	2.22 2.18 1.96 1.87	PR No. 05202
	EC	-	0.28	-	-		<0.10	
New York, USA		2				+ Pods	0.78 0.84	PR No. 5202.92
	EC	-	0.28	-	-		<0.10	
Wisconsin, USA		2				+ Pods	1.59 2.18	PR No. 5202.92
	EC	-	0.28	-	-		<0.10	
Washington, USA		2				+ Pods	1.32 1.63	PR No. 5202.92

Fodder beet. GAP was reported for Belgium, the Czech Republic, Germany, Italy, Russia and Switzerland. The maximum application rates are 0.14-0.36 kg ai/ha with PHIs of 60-90 days, or not specified.

The residues in the French trials which complied with Belgian GAP are underlined in Table 40.

Table 39. Supervised residue trials on fodder beet.

Location	Application				PHI,	Sample	Residue,	Reference and Comment
	Form	No.	kg ai/ha	kg ai/hl	days		mg/kg	
St. Pardoux du Breuilh, France	EC	1	0.36 0.72	0.072 0.14	129	Top	<0.03 <0.03	Report No. TE-2161
			0.36 0.72	0.072 0.14		Root	<0.03 <0.03	
Veigne, France	EC	1	0.36 0.72	0.06 0.12	109	Top	<0.03 <0.03	Report No. TE-2166
			0.36 0.72	0.06 0.12		Root	<0.03 <0.03	
Bernapre, France	EC	1	0.18 0.36 0.48 0.96	0.045 0.09 0.12 0.24	102	Top	<0.03 <0.03 <0.03 <0.03	Report No. TE-2298
			0.18 0.36 0.48 0.96	0.045 0.09 0.12 0.24		Root	<0.03 <0.03 <0.03 <0.03	

Peppers. No GAP for either sweet or Chilli peppers was reported to the current or the 1994 Meeting. The results of trials on the two types of pepper are shown in Tables 40 and 41.

Table 40. Supervised residue trials on sweet peppers.

Location	Field/ Prot-ected	Application				PHI, days	Sample	Residue, mg/kg	Reference and Comment
		Form	No.	kg ai/ha	kg ai/hl				
Borgo Piave, Italy	F	EC	1	0.24	0.04	18	Mature fruit	0.080 0.116	Report No. 0266-90
						28		0.030 0.075	
						38		0.041 0.049	
Bell peppers, New York, USA		EC	2	0.28		19	Mature fruit	0.89 0.68	PR No. 5226.93
Bell peppers, California, USA		EC	2	0.28		-	Mature fruit	0.62 0.58	PR No. 5226.94
Bell peppers, Florida, USA		EC	2	0.28		21	Mature fruit	0.54 0.51	PR No. 5226.93
Bell peppers, North Carolina, USA		EC	2	0.28		19	Mature fruit	0.45 0.38	PR No. 5226.93
Bell peppers, Georgia, USA		EC	2	0.28		20	Mature fruit	0.11 0.14	PR No. 5226.93
Bell peppers, Texas, USA		EC	2	0.28		21	Mature fruit	0.29 0.34	PR No. 5226.93

Table 41. Supervised residue trials on chilli peppers.

Location	Field/ Prot-ected	Application				PHI days	Sample	Residue, mg/kg	Reference and Comment
		Form	No.	kg ai/ha	kg ai/hl				
California, USA	-	EC	2	0.28		NA	Mature fruit	0.91 0.82	
New Jersey, USA	-	EC	2	0.28		22	Mature fruit	0.97 0.87	
Georgia, USA	-	EC	2	0.28		20	Mature fruit	0.12 0.12	
Texas, USA	-	EC	2	0.28		21	Mature fruit	0.40 0.39	
Florida, USA	-	EC	2	0.28		21	Mature fruit	0.43 0.48	
New Jersey, USA	-	EC	2	0.28		22	Mature fruit	0.97 0.87	
Zucchini, Borgo Piave, Italy	F	EC	1	0.24	0.04	28 33 43	Mature fruit	<0.03 <0.03 <0.03	

Livestock feeding trial

In the cow feeding study, reviewed in the 1994 monograph, fourteen dairy cows were used to show the distribution of clethodim residues in bovine tissues. Two were used as controls and the others were split into three groups of four. The treated cows received a daily capsule containing clethodim (5%) and clethodim sulfoxide (95%) for 28 days at 10, 30 and 100 nominal ppm in the feed. Table 42 reproduces the results reported in the 1994 monograph.

Table 42. Residues of ^{14}C expressed as clethodim in bovine tissues

Compound	Feeding level (nominal in diet)	Liver, mg/kg	Kidney, mg/kg	Muscle, mg/kg	Fat, mg/kg
DME	0	<0.05	<0.05	<0.05	<0.05
	10 ppm	0.059	0.051	<0.05	<0.05
	30 ppm	0.119	0.170	<0.05	0.052
	100 ppm	0.445	0.538	0.070	0.153
S-methyl DME	0	<0.05	<0.05	<0.05	<0.05
	10 ppm	<0.05	<0.05	<0.05	<0.05
	30 ppm	<0.05	<0.05	<0.05	<0.05
	100 ppm	0.087	0.078	<0.05	<0.05
DME-OH	0	<0.05	<0.05	<0.05	<0.05
	10 ppm	<0.05	<0.05	<0.05	<0.05
	30 ppm	<0.05	<0.05	<0.05	<0.05
	100 ppm	<0.05	<0.05	<0.05	<0.05

(Tomen Agro, 1997; Weissenburger *et.al.*, 1989)

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

Cotton seed. The 1994 monograph described a study in 1987 in which cotton treated at eight times the normal rate in Mississippi was processed in Texas. Table 42 is adapted from the Table in the 1994 monograph but also includes residues in refined oil.

Table 42. Effect of processing on clethodim residues in cotton seed.

Sample	Residues, mg/kg[1]	Processing factor
Fuzzy cotton seed (unprocessed)	0.80	1.0
Meal	1.35	1.69
Hulls	<0.98	<1.23
Crude oil	<0.18	<0.23
Refined oil	<0.08	<0.10
Soapstock	<0.85	<1.06
Delinted cotton seed	0.88	1.1

[1]Sum of DME and DME-OH expressed as clethodim, means of 3 results

NATIONAL MAXIMUM RESIDUE LIMITS

The following national MRLs were reported to the Meeting.

Country	Crop	MRL, mg/kg	Reference
Argentina	Alfalfa (forage)	10	Tomen Agro, 1997
	Alfalfa (hay)	15	
	Cotton seed	0.5	
	Peanut	0.5	
	Soya bean (grain)	0.5	
	Soya bean (straw)	3.0	
	Sunflower (seed)	0.5	
	Sunflower (straw)	3.0	
Australia[1]	Asparagus	1	Coleman, 1996
	Beans, except broad and soya	0.1*	
	Broad bean	0.1*	
	Brassica vegetables	0.2	
	Cucurbits	0.1*	
	Celery	0.1	
	Cotton seed	0.2	
	Edible offal	0.05*	
	Eggs	0.05*	
	Endive	0.05	
	Fennel, Bulb	0.01*	
	Fruiting veg., cucurbits	0.1*	
	Leek	0.01*	
	Lettuce, Head	0.1	
	Lettuce, Leaf	0.1	
	Lupin, dry	0.2	
	Meat, mammalian	0.05*	
	Milks	0.05*	
	Onion, bulb	0.3	
	Peanut	2	
	Peanut oil, crude	2	
	Peas	0.1*	
	Poppy seed	0.2	
	Poultry, edible offal	0.05*	
	Poultry meat	0.05*	
	Pulses (except lupin dry)[2]	0.1*	
	Rape seed	0.5	
	Root and tuber veg.	1	
	Spinach	0.1*	
	Strawberry	0.1	
	Sunflower seed	0.1*	
	Tomato	0.1	

Country	Crop	MRL, mg/kg	Reference
Belgium	Beans	0.1	Tomen Agro, 1997
	Fodder beet	0.05	
	Onions	0.05	
	Peas	0.1	
	Potatoes	0.1	
	Sugar beet	0.05	
Brazil	Soya bean	1.0	Tomen Agro, 1997
	Garlic	0.05	
	Onion	0.05	
	Tomato	0.05	
	Dry bean	0.05	
	Potato	0.05	
	Carrot	0.05	
	Cotton	0.05	
Canada	Alfalfa seedlings	0.1	Tomen Agro, 1997
	Canola	0.1	
	Field peas	0.5	
	Flax (including low linolenic acid varieties)	0.3 0.5	
	Lentil	0.5	
	Potato	10	
	Soya bean		
France	Proteaginous peas	0.1	Tomen Agro, 1997
	Sugar beet	0.05	
	Sun flower	0.1	
Italy	Sugar beet	0.2	Tomen Agro, 1997
	Fodderbeet	0.2	
	Tomato	0.2	
	Soya bean	1.0	
Mexico	Soya bean	10	Tomen Agro, 1997
Netherlands	All commodities[3]	0.03* - 0.05*	Olthof, 1997
New Zealand	White clover	<0.1	Tomen Agro, 1997
	Pea	<0.1	
	Lentil	<0.1	
	Oilseed rape	<0.1	
	Orchard crops	<0.1	
	Vegetables	<0.1	
Peru	Orange	5	Tomen Agro, 1997
	Apple	5	
	Bean	10	
	Alfalfa	1	
	Cotton	5	
Russia	Carrot	0.1	Tomen Agro, 1997
	Sugar beet	0.1	
	Fodder beet	0.1	
	Red beet	0.1	
	Onion	0.1	
	Soya bean	0.1	
	Flax seed	0.1	
	Potato	0.2	
Spain	Sunflower	0.05	Tomen Agro, 1997
	Beans	0.1	
	Field peas	0.1	
	Tomato	0.1	
	Onion	0.05	
	Garlic	0.05	
	Flax seed	0.1	
	Soya bean	0.3	
	Potato	0.05	
Switzerland	Potato	0.1	Tomen Agro, 1997
	Sugar beet	0.05	
	Fodder beet	0.05	
	Vegetables	0.1	

Country	Crop	MRL, mg/kg	Reference
Ukraine	Sugar beet	0.1	Tomen Agro, 1997
	Fodder beet	0.1	
	Red beet	0.1	
	Potato	0.2	
	Flax seed	0.1	
	Flax seed oil	0.1	
	Onion	0.1	
	Carrot	0.1	
	Soya bean	0.1	
UK		No MRLs established	UK, 1997
USA	Potato[4]	0.5	Tomen Agro, 1997
	Soya bean	10	
	Soya bean soapstock	15	
	Cotton seed	1.0	
	Cotton seed meal	2.0	
	Dry onions	0.2	
	Garlic	0.2	
	Shallots	0.2	
	Sugar beet (tops)	0.5	
	Sugar beet (roots)	0.2	
	Sugar beet (molasses)	2.0	
	Alfalfa (hay)[4]	15	
	Alfalfa (forage)[4]	10	
	Dry bean seed[4]	2.0	
	Dry bean forage[4]	5.0	
	Dry bean straw/hay[4]	7.0	
	Peanut Kernels [4]	3.0	
	Peanut hulls[4]	2.0	
	Peanut hay[4]	5.0	
	Peanut meal[4]	10.0	
	Tomato[4]	1.0	
Uzbekistan	Onion	0.1	Tomen Agro, 1997
	Carrot	0.1	
	Soya bean	0.1	
	Beet	0.1	
	Potato	0.2	

[1]In Australia residues arising from the use of clethodim are covered by MRLs for sethoxydim, defined as "sum of sethoxydim and metabolites containing the 5-(2-ethylthiopropyl) cyclohexene-3-one and 5-(2-ethylthiopropyl)-5-hydroxycyclohexene-3-one moieties and their sulfoxides and sulfones, expressed as sethoxyquin"

[2]Includes field peas, chickpeas, fava beans

[3]No specific MRLs have been established in The Netherlands so the limit of determination (0.03-0.05 mg/kg) applies

[4]Temporary

[5]Tolerance Petition at USA EPA awaiting approval

[5]The MRLs listed under reference Tomen Agro, 1997 were described as either "established or proposed"

APPRAISAL

Clethodim was first evaluated by the 1994 JMPR which recommended a number of MRLs. At the 28th Session of the CCPR opinions were expressed that the 1994 monographs were unclear and over-summarized. Detailed written comments were submitted by some governments, to which the manufacturer has provided an item-by-item response.

In response to the submitted comments, the Meeting evaluated the previously reviewed data in more detail. The comments and the responses of the Meeting are given below.

Metabolism

(i) "*There are no data on the kinds and quantities of metabolites in the goat study. Therefore, it cannot be established whether the definition of residues for cattle kidneys, liver, meat, milk is acceptable*."

The study was re-evaluated. Milk contained 0.02-0.05 mg/kg clethodim equivalents and the highest tissue concentrations were found in the liver (0.414 mg/kg clethodim equivalents) and kidneys (0.378 mg/kg). In milk, the extracted radioactivity was mostly associated with lactose and clethodim sulfoxide. In the blood and tissues the major compounds were clethodim sulfoxide (33-52% of the substrate radioactivity) and *S*-methyl-clethodim sulfoxide (6-37%). Clethodim was only found above 4% of the substrate radioactivity in blood (28%) and liver (28%).

(ii) "*There are no data on quantities concerning the metabolism in plants, i.e. there are no data indicating the determined quantities of the metabolites referred to*."

The metabolism studies on carrots, soya beans and cotton have been re-evaluated and information on the quantities of individual metabolites is provided in the monograph. The identified metabolites were clethodim sulfoxide, clethodim sulfone, the imine sulfoxide and sulfone, and 5-hydroxyclethodim sulfoxide and sulfone. Clethodim was not present or was found at very low levels. Clethodim sulfoxide and the imine sulfoxide were the major metabolites in both leaves and edible parts.

Methods of analysis

(iii) "*According to the method of residue analysis referred to, two compounds have to be determined simultaneously, therefore it is doubtful whether a determination limit of 0.05 mg/kg for both compounds is practicable, also in view of the dissolution of isomers into several peaks which is possible under certain circumstances*."

In the "common moiety" method referred to, clethodim and its metabolites containing the 2-cyclohexen-1-one moiety are determined as dimethyl 3-[2-(ethylsulfonyl)propyl]pentanedioate (DME) and its 3-hydroxy analogue (DME-OH) as described in the 1994 monograph. The manufacturer has supplied several typical chromatograms which showed two resolved peaks with some tailing, for labelled DME and DME-OH standards in clean solvent at concentrations of 0.5 µg/ml and 0.75 µg/ml or 10 or 25 ng. The reports of the trials included data showing acceptable recoveries (generally 70-110%) for a range of crop commodities; these were usually at fortification levels above 0.2 mg/kg each of clethodim, clethodim sulfoxide and 5-hydroxyclethodim sulfone. Some acceptable recoveries of clethodim sulfoxide and sulfone at 0.05 mg/kg were submitted, e.g. for dried peas. Some of the residue trials (e.g. on succulent beans) reported “limits of quantification” of 0.1 mg/kg.

A revised confirmatory method was submitted to the present Meeting. The recovery data for the revised method, which is necessary to differentiate clethodim from related compounds such as sethoxydim, indicated that 0.05 mg/kg could not be achieved routinely. The Meeting noted that the lowest fortification level at which acceptable individual recoveries could be achieved was generally about 0.5 mg/kg. Acceptable recoveries were obtained from sugar beet, potatoes and liver at 0.1, 0.2 and 0.2 mg/kg respectively however. The Meeting agreed that it will be necessary for monitoring and enforcement laboratories to use the amended confirmatory method to differentiate residues of clethodim from those of sethoxydim if measurable residues are found with the "common moiety" method reviewed by the 1994 Meeting. The Meeting also agreed that the limit of determination appropriate for routine monitoring and enforcement should be that of the confirmatory method.

On the basis of the information on the revised confirmatory method, the Meeting concluded that the practical limit of determination appropriate for routine monitoring and enforcement should be 0.5 mg/kg, with lower levels only for sugar beet, fodder beat, potatoes, liver, kidneys and milk. For milk a practical limit of determination of 0.1 mg/kg was considered appropriate. Accordingly the Meeting

recommended that some of the low maximum residue levels estimated by the 1994 Meeting be raised to 0.5* mg/kg and that these should be recommended as MRLs.

(iv) "*The method of analysis referred to does not make it possible to distinguish between residues from sethoxydim and a clethodim treatment. A verification method for the determination of clethodim and its metabolites has not been published and is thus not available for food inspection purposes.*"

The revised confirmatory method mentioned above is evaluated in the monograph. It is specific for the determination of clethodim and its metabolites in crops, animal tissues, milk and eggs, and can distinguish residues of clethodim from those of sethoxydim. The Meeting expressed concern that details of the revised confirmatory method were not currently in the public domain, but was informed that the manufacturer would make full details of the method available to monitoring and enforcement laboratories on request.

Supervised trials

(v) "*The residue trials for beans (dry), field peas (dry), potatoes and Sugar beet are summarized too strongly. Obviously, in some cases only summaries of trials have been available to the JMPR; we hold the view that an evaluation on such a basis should be refused.*"

The trials data for dry beans, dry peas, potatoes and Sugar beet reviewed by the 1994 Meeting are given in more detail in the monograph. The Meeting agreed that summaries of data should not be used when not accompanied by the full study reports, but full study reports were available to the Meeting on all the trials about which concern had been expressed except two potato trials, one each in the Ukraine and Belgium, for which only summaries were available.

(vi) "*It cannot be understood in all cases on which GAPs (use pattern) and which residue data the proposed MRLs are based. We hold the view that the residue data for potatoes are insufficient, irrespective thereof they do not justify an MRL of 0.2 mg/kg since the data from Canada cannot be used as a basis of comparison with the treatment in Belgium, Ecuador, Peru and Switzerland for climatic reasons.*" In addition, it was stated that "*The data is only available in summarized form. The number of trials that are within GAP is rather limited. The proposal is based on Canadian trials.*"

The Meeting agreed that outdoor trials data in Canada would not normally be related to GAP in Europe or South America. Additional information was provided to the current Meeting on GAP for potatoes in Australia, Belgium, Bulgaria, Canada, Czech Republic, Dominican Republic, Ecuador, Germany, Israel, Peru, Poland, Russia, Switzerland and Yugoslavia. This indicated slight changes from the GAP reported in 1994 for Belgium and Switzerland. The maximum application rates are 0.12-0.36 kg ai/ha with PHIs of 7-60 days. Canadian GAP was reported to the current Meeting. Although the Meeting agreed that the data were rather limited, a number of trials were available which indicated that residues resulting from a number of use patterns were low and often below the LOD. The Meeting confirmed that the previously estimated maximum residue level of 0.2 mg/kg was appropriate.

(vii) "*The MRL for sugar beet seems to be based on two Italian trials the results of which deviate from all other trials without any explanation being given.*"

GAP for sugar beet in Belgium, Morocco, Spain and Switzerland was reported to the 1994 Meeting. The maximum application rates were 0.20-0.36 kg ai/ha with PHIs from 50-90 days or not specified.

Nine French trials and one German trial were considered comparable to the German GAP reported to the current Meeting, with residue levels of <0.03 (9) and 0.05 mg/kg. Four Italian trials reported to the 1994 Meeting had originally been considered to comply with Spanish GAP, with reported residue levels of 0.06 (2) and 0.17 (2) mg/kg at 59 or 60 days. However, the Meeting was informed that

treatment of sugar beet was at about the 2-8 leaf stage and that the minimum PHI was "about 90 days in practice."

In view of this new information the Meeting agreed to revise the previous recommendation and estimated a maximum residue level of 0.1* mg/kg, based on the trials according to German GAP. The Meeting concluded that the limit of determination in sugar beet was 0.1 mg/kg because acceptable recovery data for the revised confirmatory method had been submitted at this level.

(viii) "*The MRLs of 0.1 mg/kg cattle kidneys and liver are obviously based on a dosage of 10 mg/kg feed. But there are no reports on residues in potential feeding stuffs which would lead to such residues in everyday feed. Soya beans (MRL 10 mg/kg) usually only reach a percentage of 25-30 % in everyday feed: for cotton seed and rape seed an MRL of only 0.5 mg/kg has been envisaged. The MRL of 0.1 mg/kg cattle kidney, liver thus is unnecessarily high.*"

The Meeting observed that the highest residues (DME, *S*-methyl-DME and DME-OH) found in cows at the lowest dosing level were 0.059, <0.05 and <0.05 mg/kg, and 0.051, <0.05 and <0.05 mg/kg in liver and kidneys respectively. Since clethodim residues are calculated by the summation of the DME and DME-OH peaks in the common moiety method, the Meeting agreed that the maximum residue levels of 0.1 mg/kg estimated for cattle liver and kidneys by the 1994 Meeting had been appropriate. However, in view of the new information provided on the limit of determination of the revised confirmatory method, the Meeting agreed to increase the estimates to 0.2* mg/kg. The Meeting recognised that acceptable data on recoveries from kidneys by the revised confirmatory method were not available but considered that the limit of determination in kidneys was likely to be similar to that in liver, from which recoveries were satisfactory at 0.2 mg/kg.

(ix) The comment was made for beans (dry) "*The data is only available in summarized form. The number of trials is not specified. There are only trials from one country (Brazil) where clethodim is not registered. The trials are in accordance with GAP of other countries in the region. The proposal is based on a PHI of 65 days (pp. 358, 1994 Evaluations). Taking this PHI into account, 0.05 mg/kg is more appropriate.*"

In response, the supervised trials data for dry beans reviewed by the 1994 Meeting are given in more detail in the monograph. The Meeting reassessed the data which were available to the 1994 Meeting, concluded that they were insufficient to estimate a maximum residue level, and withdrew the previous recommendation for an MRL.

(x) "*Although a minor point, the table on pp 346 (1994 Evaluations) does not specify the levels in refined oil, and clarification is sought on the statement in the text (pp 347) that processing reduces levels to 10% in refined oil.*"

Additional information is provided in the monograph. The residue in the refined oil was <0.08 mg/kg and in the unprocessed cotton seed 0.8 mg/kg. A processing factor of <0.1 for cotton seed to refined oil is therefore appropriate.

(xi) Comments on dry field peas were that "*There is only registered use in Australia. The proposal is based on a PHI of 50-110 days (pp 358, 1994 Evaluations). On the basis of the Australian trial data (number of trials not specified, dosage 0.06-0.24 kg ai/ha, PHI 110 days) a limit of 0.05 mg/kg is sufficient. Also UK data (0.36 kg ai/ha [six times Australian registered dose], PHI 53 and 85 days) and Belgium data (up to three times registered dose in Australia, PHI 41 days) support this latter level. Only the French trials (0.18 kg ai/ha, PHI 67-82 days) points to a level of 0.1 mg/kg, but this is not in accordance with GAP.*"

A re-evaluation of the data on dry field peas has been carried out (see below), since new information on GAP and data from residue trials were reported to the present Meeting.

(xii) "*The proposal for sunflower seed is based on data from Argentina taking into account a PHI of 106 days. However, such a long PHI is not in accordance with the PHI reported for Argentina and other countries in table 4 of the Evaluations. The Netherlands therefore reserves its position for these proposals. For oil, crude and oil edible 0.05 mg/kg are reasonable when 0.2 mg/kg is a appropriate level for sunflower seed.*"

GAP for sunflower in Argentina, Bolivia, Ecuador, Israel, Morocco, Paraguay and Spain was reported in the 1994 monograph, where the maximum application rate in Spain was stated to be 0.2 kg ai/ha with an unspecified PHI. The manufacturer informed the Meeting that the use was post-emergence and that the Spanish PHI was "60 days in practice". Residues from applications 60-74 days before harvest were 0.03-0.13 mg/kg in three Italian trials.

The maximum application rate in South America was 0.12-0.34 kg ai/ha with PHIs of 5-56 days or not specified. The PHIs in all of the Argentinean trials were longer at 102-106 days. The manufacturer stated that "although the PHI from the Argentina trials exceeded the GAP of 75 days, we believe that we would not detect any greater than what we have observed at a 75 day PHI." The Meeting concluded that there were insufficient data from trials according to GAP to estimate a maximum residue level and withdrew the previous estimate.

GAP for such broad categories as "fruit" or "vegetables" has been ignored in evaluating the results of the other supervised trials reviewed below.

Peaches. Conflicting information on GAP in Spain had been reported, with application rates of 0.096-0.192 or 0.036-0.24 kg ai/ha. The timing of the application was also unclear. The Meeting was informed that the application was directed around the base of the tree.

GAP for “fruit trees” was reported for Chile, Ecuador and Saudi Arabia and for “orchard crops” for New Zealand. The maximum application rates were 0.06-0.24 kg ai/hl and 0.18-0.72 kg ai/ha with PHIs ranging from 15-60 days or not specified.

The Meeting noted that although all the residues in the trials on peaches were below the limit of determination of 0.03 mg/kg, only one trial included a PHI longer than 21 days. Since longer intervals between treatment and harvest might lead to determinable residues owing to uptake, and in view of the conflicting information on GAP, the Meeting concluded that there were insufficient data to estimate a maximum residue level.

Onions and garlic. Information on GAP for garlic in Saudi Arabia, Spain and the USA was reported. The maximum application rates were 0.192- 0.28 kg ai/ha with PHIs of 30, 45 or 60 days. The maximum number of applications was not stated for any country.

Only two trials on garlic were considered to comply with US GAP. Although the DME-OH residue levels were described by the manufacturer as “not considered to be clethodim-related, due to matrix interference peak” this could not be confirmed by the Meeting and the results were therefore included; the residues (sum of DME and DME-OH) were 0.36 and 0.1 mg/kg.

GAP for onions was reported for Australia, Belize, Dominican Republic, Guatemala, Honduras, Israel, New Zealand, Russia, Saudi Arabia, Turkey, the USA and Uzbekistan, and pending GAP in Brazil. The maximum application rates were 0.12-0.28 kg ai/ha (0.108 kg/ha in the pending Brazilian GAP) with PHIs of 7-65 days.

The residues in trials considered to comply with US GAP were <0.05, ≤0.1(4), 0.13 and 0.15 mg/kg. The residues in trials considered to be in accord with GAP in New Zealand or pending GAP in Brazil were all below the limit of determination, as were other residues from exaggerated application rates in some of these trials. The residues from the trials according to GAP were <0.01, <0.02, <0.03 (4) and <0.05 (6) mg/kg. Only one trial accorded with Australian GAP, with a residue of 0.05 mg/kg.

The Meeting agreed that the results of the garlic and onion trials could be combined, but noted that the US residues formed a different population from those in the Brazilian and New Zealand trials. The combined US residues in rank order were <0.05, <0.1 (4), 0.1, 0.13, 0.15 and 0.36 mg/kg. The Meeting estimated maximum residue levels of 0.5 mg/kg and STMRs of 0.1 mg/kg, based on US GAP, for both onion and garlic.

Cabbage. GAP was reported for Australia and Poland. The maximum application rates are 0.12 and 0.24 kg ai/ha with PHIs of 7 and 60 days respectively.

Only one residue trial was considered to comply with Australian GAP and one with Polish. The residues were 0.07 and 0.15 mg/kg respectively. There were insufficient data to estimate a maximum residue level.

Cauliflower. GAP was reported only for New Zealand, with a maximum application rate of 0.24 kg ai/ha and a PHI of 35 days. Only one trial was considered to comply with this, with a residue of 0.28 mg/kg. There were insufficient data to estimate a maximum residue level.

Cucumber. GAP for cucumbers was reported only for Poland, with a maximum application rate of 0.24 kg ai/ha and a PHI of 60 days, and for cucurbits in Paraguay with the same maximum application rate and an unstated PHI.

A single trial was considered to be comparable to Polish GAP, because although the PHI was shorter the residue level was <0.05 mg/kg. In six US trials all residues were <0.14 mg/kg at the short PHI of 13-14 days, but none of the trials was according to GAP. There were insufficient data to estimate a maximum residue level.

Summer squash. GAP for cucurbits was reported for Paraguay, but none of the three trials in the USA were considered to conform to it. There were insufficient data to estimate a maximum residue level.

Tomatoes. GAP for tomatoes was reported for Belize, Bulgaria, Dominican Republic, Israel, Italy, Nicaragua, Spain and the USA, and pending GAP for Brazil. The maximum application rates are 0.12-0.28 kg ai/ha (0.108 kg/ha for the pending GAP) with PHIs of 7-30 days, “unrestricted” or unstated.

The residues in two trials considered to comply with the pending Brazilian GAP were <0.05 mg/kg.

The residues in trials considered to comply with Spanish GAP were <0.03 (5), 0.03, 0.08 and 0.13 mg/kg, and with US GAP <0.1 (3), 0.11, 0.12, 0.15 (2), 0.16, 0.17, 0.21, 0.27, 0.34, 0.35 (2), 0.43, 0.46, 0.50, 0.52, 0.54, 0.65, 0.71, 0.76 (2) and 0.82 mg/kg. The Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.35 mg/kg, based on the trials according to US GAP.

Lettuce. GAP was reported for Australia and Israel. The maximum application rates are 0.12 kg ai/ha with PHIs of 28 days and unstated respectively.

The residues in trials considered to comply with Australian GAP were 0.04 and 0.21 mg/kg. There were insufficient data to estimate a maximum residue level.

Beans (fresh). GAP was reported for beans for Belgium, Bolivia, Bulgaria, Paraguay, Peru, Spain and Turkey, for mung and fava beans for Australia and for legumes for Chile. The maximum application rates are 0.06-0.48 kg ai/ha with PHIs of 0-65 days or unstated.

The residues in fresh beans from trials considered to comply with Belgian GAP were <0.025 and <0.05 (4) mg/kg. Although some of the Belgian results were at shorter PHIs than GAP, the residues were all below the limit of determination. In addition one trial on "green beans" with a residue of 0.21 mg/kg

and one on "French beans" with a residue of <0.03 mg/kg were considered to comply with Spanish GAP. Although data on a number of US trials were also submitted, no GAP was reported for the North American continent. A trial on broad (fava) beans in Spain did not conform to reported GAP.

The Meeting estimated a maximum residue level of 0.5* mg/kg and an STMR of 0.05 mg/kg for beans, except broad bean and soya bean, based on the trials according to Belgian GAP.

Lentils. GAP for lentils was reported to the current Meeting for Canada, New Zealand and Turkey, and to the 1994 Meeting for New Zealand and Spain. GAP for beans and legumes would presumably cover lentils.

Although two Spanish trials were reported, they could not be evaluated against the Spanish GAP recorded in 1994 because the GAP did not include the PHI. Neither of the trials was considered to comply with relevant GAP. There were insufficient data to estimate a maximum residue level.

Lupins. GAP for lupins was reported for Australia, with a maximum application rate of 0.12 kg ai/ha; no PHI was specified.

Only one trial was considered to comply with Australian GAP with a residue of <0.1 mg/kg. The Meeting could not estimate a maximum residue level.

Carrots. GAP for carrots was reported for Israel and Russia, and pending GAP for Brazil. The maximum application rates were 0.108 (Brazil) - 0.24 kg ai/ha with PHIs of 40-75 days.

The residues in two trials which complied with the pending Brazilian GAP were <0.05 mg/kg. None of the other trials were considered to accord with any other reported GAP. There were insufficient data to estimate a maximum residue level.

Celery. GAP for celery was reported for Australia. The maximum application rate is 0.12 kg ai/ha with a PHI of 9 weeks.

The only trial which complied with Australian GAP showed a residue of 0.04 mg/kg. There were insufficient data to estimate a maximum residue level.

Linseed (flax). GAP was reported for Canada, Russia and the Ukraine. The maximum application rates were 0.09-0.24 kg ai/ha. PHIs were 60-80 days or not specified.

One trial was considered to be in accord with Russian GAP, with a residue of <0.01 mg/kg. Several Canadian trials was reported for which exaggerated rates had been used with all residues below the limit of determination at PHIs of 84-119 days, but since no samples were taken at the Canadian PHI of 60 days the Meeting concluded that there were insufficient data to estimate a maximum residue level.

Peanuts. GAP was reported for Argentina, Australia, Bolivia, Israel, Taiwan and the USA. The maximum application rates were 0.09-0.336 kg ai/ha with PHIs of 40-70 days or not specified. GAP for "vegetables" was also reported for Chile, Ecuador, New Zealand, Paraguay and Peru.

The residues in trials considered to comply with US GAP were <0.05, 0.34, 0.56, 0.79, 1.3 (2), 1.8, 2.7 and 3.5 mg/kg in the kernels and 0.17, 0.20, 0.24, 0.24, 0.3, 0.60, 0.75 and 0.81 mg/kg in the hulls. The Meeting estimated a maximum residue of 5 mg/kg and an STMR of 1.3 mg/kg for peanut.

Alfalfa. GAP was reported for Argentina, Canada, Chile, Ecuador, Israel, Peru and the USA. The maximum application rates were 0.09-0.48 kg ai/ha with PHIs of 15-30 days or not specified.

Trials according to national GAP were carried out in Canada and the USA with residues of <0.02 (7) and 0.02 mg/kg in Canada, and 0.27, 0.53, 0.61, 0.62, 0.67, 0.85, 1.2, 1.4 (3), 1.5, 1.6, 1.9, 2.0, 2.6, 2.7

(2), 3.0, 4.4, 4.5, 5.4 and 8.9 mg/kg in the USA. The Meeting estimated a maximum residue level of 10 mg/kg and an STMR of 1.6 mg/kg, based on US GAP.

White Clover. GAP for clover was reported for Israel and New Zealand. The maximum application rates are both 0.12 kg ai/ha with a PHI of 63 days in New Zealand and not specified in Israel. GAP for "vegetables" was reported for Chile, Ecuador, New Zealand, Paraguay and Peru

The two residues in trials considered to comply with New Zealand GAP were 0.07 and 0.26 mg/kg. The samples analysed were described as "young plants" and "silage". There were insufficient data to estimate a maximum residue level.

Field peas (dry). GAP for field peas was reported for Australia and Canada. The maximum application rate in Canada is 0.09 kg ai/ha with a PHI of 75 days. The maximum rate reported by the Australian government, supported by a product label, was 0.06 kg ai/ha and differed from that reported by the manufacturer.

All the residues in six trials in Australia were <0.1 mg/kg after 110 days even at exaggerated doses. The residues in several further trials which were considered to comply with Canadian GAP were <0.02 (4), 0.06, 0.08, <0.10, 0.18 (2), 0.31, 0.65 and 1.8 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg and an STMR of 0.08 mg/kg, based on Canadian GAP.

Peas. GAP for peas was reported for Belgium, the Czech Republic, Israel, New Zealand and Spain, and for "proteaginous peas" for France. The maximum application rates are 0.06-0.36 kg ai/ha with PHIs of 30 or 60 days, or not specified. No trials were considered to comply with relevant GAP and no maximum residue level could be estimated.

Fodder beet. GAP was reported for Belgium, the Czech Republic, Germany, Italy, Russia and Switzerland. The maximum application rates are 0.14-0.36 kg ai/ha with PHIs of 60-90 days or not specified. The Meeting was informed that application is at about the 2-8 leaf growth stage.

The residues in three trials in France which were considered to comply with Belgian GAP were all below the LOD of 0.03 mg/kg in both roots and tops. In additional trials at the same sites with exaggerated application rates the residues were also all below 0.03 mg/kg. The Meeting estimated a maximum residue level of 0.1* mg/kg and an STMR of 0.03 mg/kg. The Meeting established the limit of determination for fodder beet at 0.1 mg/kg because acceptable recovery data for the revised confirmatory method had been submitted for sugar beet at this level.

Other commodities. Residue trials data were also submitted for leeks, spinach, artichokes, sweet peppers and "non-bell peppers" but no specific GAP was reported to the present or the 1994 Meeting. The Meeting agreed that it would be appropriate to evaluate these trials against a general GAP for vegetables in the case of this compound, since it is a post-emergence herbicide, but there were no trials on any of these commodities according to GAP from which to estimate maximum residue levels.

RECOMMENDATIONS

Definition of the residue for compliance with MRL and for the estimation of the dietary intake: sum of clethodim and its metabolites containing the 5-(2-ethylthiopropyl)cyclohexene-3-one and the 5-(2-ethylthiopropyl)-5-hydroxycyclohexene-3-one moieties and their sulfoxides and sulfones, expressed as clethodim.

The Meeting estimated the following maximum residue levels which are recommended for use as MRLs:

Commodity		Recommended MRL, mg/kg		STMR mg/kg	PHI on which proposal based
CCN	Name	New	Previous		
AL 1020	Alfalfa fodder	10	-	1.6	15
VD 0071	Beans (dry)	W	0.1	0.05	65
VP 0061	Beans, except broad bean and soya bean	0.5*	-	0.05	60
MO 1280	Cattle, kidneys	0.2*	0.1	-	-
MO 1281	Cattle, liver	0.2*	0.1	-	-
MM 0812	Cattle meat	0.5*	0.05*	-	-
ML 0812	Cattle milk	0.1*	0.05*	-	-
PE 0840	Chicken eggs	0.5*	0.05*	-	-
PE 0840	Chicken meat	0.5*	0.05*	-	-
OC 0691	Cotton seed oil, crude	0.5*	0.1	-	-
OR 0691	Cotton seed oil, edible	0.5*	0 05	-	-
VD 0561	Field pea (dry)	2	0.1	0.08	75
AM 1051	Fodder beet	0.1*	-	0.03	90
VA 0381	Garlic	0.5		0.1	45
VA 0385	Onion, bulb	0.5	-	0.1	45
SO 0697	Peanut	5	-	1.3	40
OC 0495	Rape seed oil, crude	0.5*	0.05	-	-
OR 0495	Rape seed oil, edible	0.5*	0.05	-	-
OR 0541	Soya bean oil, edible	0.5*	0.1	-	-
VR 0596	Sugar beet	0.1	0.2	-	-
SO 0702	Sunflower seed	W	0.2	-	-
OC 0702	Sunflower seed oil, crude	W	0.05	-	-
OR 5702	Sunflower seed oil, edible	W	0.05	-	-
VO 0448	Tomato	1	-	0.35	20

FURTHER WORK OR INFORMATION

Desirable

Data on residues occurring in commerce and/or at consumption (from 1994 Meeting).

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