DIMETHOATE (27)

OMETHOATE (55)

FORMOTHION (42)

EXPLANATION

Dimethoate was evaluated for residues by the JMPR in 1965–1967, 1970, 1973, 1977, 1978, 1983, 1984, 1986–1988, and 1990. The 1986 JMPR recommended separate MRLs for dimethoate and its metabolite omethoate to replace the previous limits for the combined residue. The 1988 JMPR reviewed substantial quantities of new field trial data, but most of the trials were in two countries in Europe. The 1990 JMPR reviewed additional data on two commodities.

The toxicology of dimethoate was reviewed by the 1996 JMPR within the CCPR periodic review programme. The Meeting allocated an ADI for the sum of dimethoate and omethoate expressed as dimethoate, although it was noted that omethoate was considerably more toxic. The 1996 Meeting noted that a re-evaluation of the toxicity of dimethoate might be required if the periodic review of its residue chemistry showed omethoate to be a major part of the residue.

Dimethoate was scheduled by the 1992 CCPR (ALINORM 93/24) for a periodic review of its residue chemistry by the 1993 JMPR. The schedule was changed in subsequent years, and the 1996 CCPR scheduled dimethoate, omethoate and formothion for periodic review in 1998 (ALINORM 97/24).

Data and information have been submitted by the Dimethoate Task Force (BASF, Cheminova, and Isagro, via Scientific Consulting Co., Woellstein, Germany), Cheminova, and the governments of Australia, Germany, The Netherlands, Thailand, and the UK.

Omethoate is a metabolite of dimethoate and was a marketed pesticide. Australia submitted product labels for omethoate and The Netherlands also submitted information on GAP as well as summaries of supervised field trials on apples and plums and monitoring data on food in commerce. No additional trial data were submitted for the use of omethoate *per se* on any agricultural commodity. The CCPR agreed that the MRLs for omethoate should reflect residues arising from the use of dimethoate.

Formothion has no extant MRLs. No data or information were submitted.

The following evaluation, within the CCPR Periodic Review Programme, is essentially restricted to dimethoate.

IDENTITY

Chemical name:

IUPAC: *O*,*O*-dimethyl *S*-methylcarbamoylmethyl phosphorodithioate

CA: *O*,*O*-dimethyl *S*-[2-(methylamino)-2-oxoethyl] phosphorodithioate

CAS No.: 60-51-5

CIPAC No.:

Synonyms: cygon, cekuthoate, daphene, devigon, dimet, dimethogen, trimetion

Structural formula: $(CH_3O)_2P(=S)SCH_2CONHCH_3$

Molecular formula: $C_5H_{12}NO_3PS_2$

Molecular weight: 229.2 g/mol

Physical and Chemical Properties

Pure active ingredient

Appearance: white crystalline solid

Vapour pressure: 1.85×10^{-6} mm Hg at 25°C
1.18×10^{-6} mm Hg at 35°C (Teeter, 1988)

Melting point: 51–52°C

Octanol/Water Partition coefficient: 5.06 (log K_{ow} = 0.775) (Mangels, 1987)

Solubility:

Water, mg/ml: 39.8 at 25°C (Mangels, 1987)
23.3 at pH 5
23.8 at pH 7
25.0 at pH 9 (20°C) (Robson, *et al.*, 1991)

Other solvents: 140 g/100 ml acetone
140 g/100 ml acetonitrile
120 g/100 ml cyclohexanone
0.043 g/100 ml dodecane
150 g/100 ml ethanol
120 g/100 ml ethyl acetate
0.030 g/100 ml hexane
120 g/100 ml 2-propanol
160 g/100 ml methanol
150 g/100 ml dichloromethane
52 g/100 ml 1-octanol
100 g/100 ml toluene
31 g/100 ml xylenes
120 g/100 ml 1,2-dichloroethane
0.024 g/100 ml n-heptane
(25°C; Madsen, 1994)

Specific gravity: 1.277 g/ml at 65°C

Hydrolysis: Half-lives at 25°C: 68 days at pH 7
: 156 days at pH 5
: 4.4 days at pH 9

The main degradation products are *O*-demethyl-dimethoate and *O,O*-dimethyl hydrogen phosphorothioate acid at pH 9; *O*-demethyl-dimethoate at pH 5 and pH 7 (Hawkins, *et al*, 1986)

Photolysis: Stable under artificial sunlight (15 days continuous exposure) in acetate buffer solution at 25°C (Hawkins, *et al.*, 1986).
Decomposed on sandy loam soil thin-layer plates under artificial sunlight (15 days continuous exposure). Half-lives 7–16 days, control 40 days. Major degradation products were volatiles (9%), dimethyl hydrogen phosphate (15%), and dimethoxon (7%) (Hawkins, *et al.*, 1986)

Thermal stability: Stable up to 35°C. Isomerization to *O*,*S*-dimethyl *O*-methylcarbamoylmethyl phosphorodithioate occurs at higher temperatures. Rapid decomposition when heated.

Technical material

Minimum purity: 96%

Main impurities: Methyl (dimethoxyphosphinothioyl)thioacetate (CAS 757-86-8), 1.5% w/w, *O*,*O*,*S*-trimethyl phosphorodithioate (CAS 2953-29-9) 1.5% w/w

Melting range: 45–47°C

Stability: as pure active ingredient

formulations

The following formulations are available: Cygon, Clean Crop Dimethoate, Perfekthion, BI 58, Danadim 40, Roxion, Rogor. All are emulsifiable concentrates (EC), typically 400 g/l.

METABOLISM AND ENVIRONMENTAL FATE

Animal metabolism

Rats (Dimethoate Task Force, 1995). Dimethoate, labelled with carbon-14 in the two *O*-methyl groups and having a specific activity of 32300 dpm/µg, was administered to Wistar rats, 7–10 weeks of age, at 10 and 100 mg/kg bw in a single dose in three separate experiments (1) orally, in water solution; (2) intravenously, in isotonic saline; and (3) dermally, in 1% aqueous sodium carboxymethylcellulose solution. A separate group of 18 rats was dosed orally at 10 mg/kg bw for seven consecutive days. The radiolabelled material was diluted with natural abundance dimethoate to obtain the desired specific activity.

Urine and faeces samples were collected from each of the single orally dosed animals at intervals for five days after dosing. Expired air was passed through traps of 2-ethoxyethanol/ethanolamine. At slaughter, the stomach and gi tract, adrenal glands, brain, heart, kidneys, liver, lungs, ovaries, testes, pancreas, spleen, thyroid gland, uterus, muscle, fat, bone, bone marrow, and skin were taken for measurement of the ^{14}C balance. Additional groups of six rats each were killed at 0.5, 2, 6, and 25 hours after dosing, and tissues were taken for quantitative determinations. Rats from the dermal treatment were killed after 120 hours.

The excretion of radioactivity from the various forms of administration is shown in Table 1. After oral and intravenous administration about 80% of radioactivity was excreted within 24 hours, almost all in the urine. Although not indicated in Table 1, no differences were observed between males and females.

Table 1. Elimination of radioactivity from rats after a single dose of [^{14}C]dimethoate.

Dose, mg/kg bw	Route	Sample	Elapsed time (h)	Incremental % of dose
10	Oral	Urine	0–6	71 ± 1.2
			6–12	12 ± 4.7
			12–24	3.0 ± 0.60
			24–120	2.4 ± 1.0
		Expired air	0–72	2.2 ± 0.09
		Faeces	0–72	1.3 ± 0.16
		Carcase (incl. gi, kidney, liver, etc)	-	1.5 ± 0.52
		Total		93
100	Oral	Urine	0–6	56
			6–12	22
			12–24	9.9
			24–120	3.4
		Expired air	0 - 72	2.5
		Faeces	0–120	1.4
		Carcase (incl. gi, kidney, liver, etc)	-	1.7
		Total		97
10	Intravenous	Urine	0–6	81
			6–12	4.4
			12–24	2.1
			24 - 120	1.8
		Expired air	0–72	1.7
		Faeces	0–120	1.2
		Carcase (incl. gi, kidney, liver, etc)	-	0.88
		Total		93
10	Dermal	Urine	0–6	5.0
			6–24	2.5
			24–120	0.52
		Faeces	0–120	0.40
		Carcase (incl gi, kidney, liver, etc)	-	0.76
		Skin wash	6	62
		Treated skin		15
		Total		86
100	Dermal	Urine	0 - 6	0.66
			6 - 24	0.32
			24–120	0.15
		Faeces	0–120	0.09
		Carcase (incl gi, kidney, liver, etc)	-	0.16
		Skin wash	6	84
		Treated skin		2.9
		Total		88

The mean concentrations of triplicate determinations of radioactivity in male and female rat plasma after single oral doses at 10 and 100 mg/kg bw reached maxima in about 0.5 hours in both sexes dosed at 10 mg/kg bw and in females at 100 mg/kg bw. In males at 100 mg/kg bw the time was 0.25 hours. The mean maxima were similar in the two sexes dosed at 10 mg/kg bw, 8.62 mg dimethoate equivalents/l in males and 7.68 mg/l in females. After the 100 mg/kg bw dose the mean maxima were 50.7 and 93.2 mg dimethoate equivalents/l in males and females respectively. The decrease in radioactivity after the peak concentration was biphasic. At 24 hours after administration of the 100 mg/kg bw dose, the plasma concentrations of dimethoate were below detectable levels (0.05 mg/l).

Urine samples collected from animals 48 hours after oral, intravenous, and dermal doses (10 and 100 mg/kg bw) were combined and analysed by HPLC and TLC. Additional aliquots were incubated with ∃-glucuronidase/sulfatase enzymes and analysed by TLC. Other extracts, e.g. kidney and liver, were analysed by HPLC and TLC and co-chromatographed with reference standards. Some urine metabolites were isolated by preparative HPLC and identified by MS or GC-MS.

Four metabolites were identified in the urine: U4, dimethyl hydrogen phosphorothioate; U7, dimethyl hydrogen phosphorodithioate; U9, dimethoate carboxylic acid, and omethoate. U4 (8% of the TRR, 0.14% of the dose), U9 (15% of the TRR, 0.26% of the dose) and U7 (40% of the TRR, 0.68% of the dose) were also found in the kidneys (by TLC and co-chromatography). U4 (12% of the TRR, 0.51% of the dose) and U 7 (22% of the TRR, 0.95% of the dose) were found in the liver. The results are shown in Table 2.

Table 2. Radioactive compounds in rat urine after single doses.

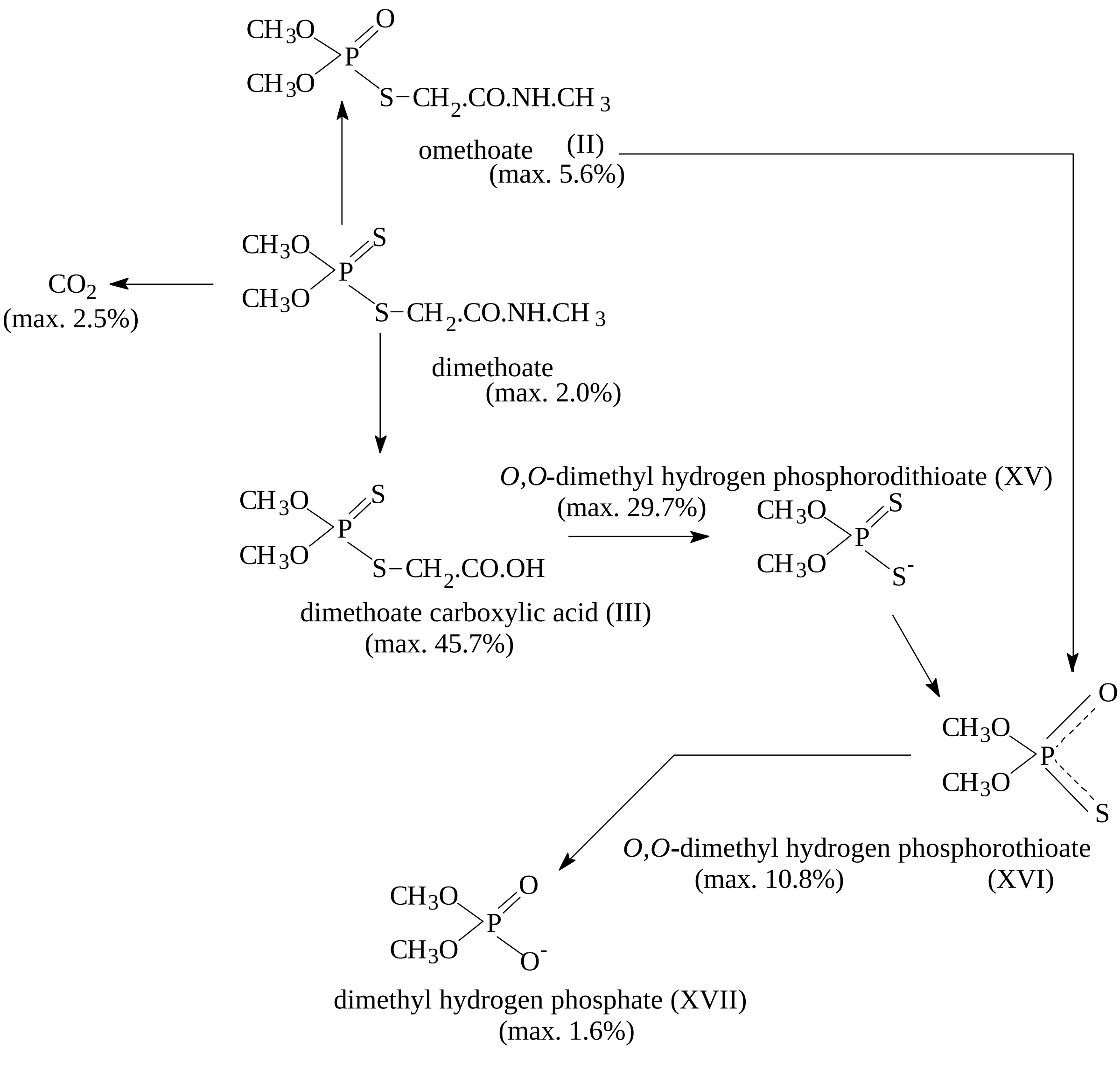
Compound	% of dose							
	Oral: 10 mg/kg bw		Oral: 100 mg/kg bw		Intravenous: 10 mg/kg bw		Dermal: 10 mg/kg bw[1]	
	Male	Female	Male	Female	Male	Female	Male	Female
U1	5.2	5.0	4.8	3.8	4.3	3.9	0.6	0.5
Omethoate	1.5	2.5	3.7	3.7	1.3	1.8	0.2	0.2
U2	0.3	0.2	0.4	0.3	-	-	-	-
U3	4.1	4.0	2.2	2.0	3.7	3.7	0.3	0.3
U4	8.3	5.7	8.7	4.7	6.5	4.0	0.8	0.6
U5	0.9	0.7	1.0	1.3	0.9	0.7	0.2	<0.1
U6	2.5	2.1	2.3	1.9	3.7	1.8		0.1
U7	26.6	25.2	20.3	22.1	22.5	24.1	2.9	3.2
Dimethoate	1.4	0.7	0.7	2.0	0.4	0.5	0.1	0.1
U9	37.8	35.1	43.2	44.4	42.7	45.7	2.5	2.8

[1] Radioactive components from the 100 mg/kg bw treatment were proportionally lower than from 10 mg/kg bw, <0.1–0.3%

The Dimethoate Task Force (DTF) proposed the biotransformation pathway shown in Figure 1.

Figure 1. Metabolism of dimethoate in rats

The values in parentheses are the maximum proportions of the administered dose found in urine. The $^{14}CO_2$ was found in expired air, and XVII was found only in tissues; its identification is tentative.



Poultry (Jalali, *et al.,* 1995). Three groups of 5 White Leghorn laying hens were dosed orally with [*methoxy*-^{14}C]dimethoate by capsule once daily for 7 consecutive days at 0.9 mg/kg bw, equivalent to 10 ppm in the diet. Eggs were collected twice daily, separated into yolks and whites, and pooled within groups. The hens were killed within 24 hours of the last dose, and tissues were composited in each group.

Sub-samples of tissues, eggs, excreta, and blood were homogenized and radio-assayed by combustion and liquid scintillation counting. The results are shown in Table 3.

Table 3. Residues in tissues, eggs, and excreta from the oral administration of [methoxy-^{14}C]dimethoate to laying hens.

Sample	Time	^{14}C, mg/kg as dimethoate			
		Group B[1]	Group C	Group D	Mean
Liver	7 days	0.615	0.621	0.687	0.641
Breast muscle	7 days	0.098	0.087	0.102	0.096
Thigh muscle	7 days	0.079	0.090	0.083	0.084
Fat	7 days	0.028	0.024	0.061	0.038
Skin	7 days	0.042	0.044	0.066	0.051
Blood	7 days	0.234	0.234	0.242	0.237
Egg yolk	0–24 hr	0.018	0.020	0.016	0.018
Egg yolk	24-48 hr	0.040	0.051	0.044	0.045
Egg yolk	4 8-72 hr	0.106	0.099	0.110	0.105
Egg yolk	96–120	0.277	0.246	0.241	0.255
Egg yolk	144 -	0.310	0.351	0.355	0.339
Egg white	0–24	0.080	0.070	0.120	0.090
Egg white	24–48	0.092	0.112	0.141	0.115
Egg white	48–72	0.090	0.120	0.202	0.137
Egg white	96–120	0.183	0.152	0.175	0.170
Egg white	144-	0.144	0.161	0.149	0.151
Excreta	75% dose				

[1] Each group (B,C,D) consisted of 5 hens. Group A was a control group of 5 hens

Homogenized tissue and egg samples were subjected to sequential solvent extraction (hexane and/or acetonitrile/water, methanol/1M ammonium hydroxide, 1:1), protease hydrolysis, 6 N HCl hydrolysis, and 3 N NaOH hydrolysis. These treatments solubilized the following percentages of the TRR: liver 90%, breast 102%, thigh 92%: egg whites 87%, egg yolks 94%, skin 70%, fat 58%, blood 34% and excreta 95%. The acetonitrile/water extracts and the methanol/ammonium hydroxide extracts were analysed by HPLC, as were some protease extracts, e.g. liver. The distribution of the radioactivity is shown in Table 4. Dimethoate was not found in any sample, and omethoate was found at low concentrations only in the liver and egg white.

Table 4. Distribution of the radiolabelled residues from the administration of dimethoate to hens.

Sample	Fraction	% of TRR	mg/kg as dimethoate	Characterization[1] or identification
Liver (0.822 mg/kg)	Hexane	3.0	0.025	
	Methanol/ammonium hydroxide	22	0.18	Phosphorylated natural products 0.16 mg/kg. No formate.
	Protease	36	0.29	0.081 mg/kg omethoate; 0.131 mg/kg dimethoate carboxylic acid. Not confirmed by 2D-TLC (interference). 0.11 mg/kg phosphorylated natural products.
	6 N HCl	27	0.22	No amino acids
	3 N NaOH	2.4	0.020	
	Total	90	0.74	
Breast muscle (0.098 mg/kg)	Acetonitrile/water (8/2)	46	0.045	Phosphorylated natural products
	Protease	34	0.034	
	Methanol/ammonium hydroxide	14	0.014	
	6 N HCl	8,4	0.008	
	Total	102	0.101	
Thigh muscle (0.079 mg/kg)	Acetonitrile/water (8/2)	36	0.028	Phosphorylated natural products
	Protease	36	0.028	
	Methanol/ammonium hydroxide	6.9	0.005	

Sample	Fraction	% of TRR	mg/kg as dimethoate	Characterization[1] or identification
	6 N HCl	6.2	0.005	
	3 N NaOH	6.2	0.005	
	Total	92	0.071	
Egg white (0.127 mg/kg; 96-120 h)	Acetonitrile/water (8/2)	50	0.064	Phosphorylated natural products. No formate.
	Protease	14	0.018	Omethoate 0.004 mg/kg. Dimethoate carboxylic acid, 0.003 mg/kg
	Methanol/ammonium hydroxide	9.5	0.012	
	6 N HCl	4.5	0.006	
	3 N NaOH	8.6	0.011	
	Total	87	0.110	
Egg yolk (0.192 mg/kg; 96-120 h)	Acetonitrile/water (8/2)	29	0.056	Phospholipids. Co-chromatography
	Protease	35	0.067	Phosphorylated natural product and many other peaks
	Methanol/ammonium hydroxide	11	0.021	
	6 N HCl	1.2	0.002	
	3 N NaOH	18	0.035	
	Total	94	0.18	
Fat (0.028 mg/kg)	Hexane	31	0.008	
	Acetonitrile/water (8/2)	9.8	0.003	
	Protease	10	0.003	
	Methanol/ammonium hydroxide	1.2	0.000	
	6 N HCl	5.4	0.001	
	Total	58	0.016	

[1] Phosphorylated natural products = 4 min HPLC peak + ^{14}C not recovered from HPLC +^{14}C solubilized by HCl and/or NaOH

Goats (Jalali *et al*, 1995; Jalali and Hiler, 1995). Dimethoate radiolabelled on the methoxy carbons was orally administered by capsule once daily for 3 consecutive days to two lactating goats at a level of 1.6 mg/kg bw/day. On the basis of the mean feed consumption for three days before the test, this was equivalent to 30 ppm dimethoate in the diet. During the treatment period, milk was collected twice daily. Urine and faeces were also collected, and the goats were slaughtered within 24 hours of the third dose. Total radioactive levels in the milk were determined by direct radio-assay and in the tissues by combustion and liquid scintillation counting. The results are shown in Table 5.

Table 5. Radioactivity in the tissues, milk, and excreta from goats dosed with 1.6 mg [^{14}C]dimethoate/kg bw/day for three consecutive days.

Sample	Collection time	Total radioactive residue, mg/kg, as dimethoate	
		Goat 1	Goat 2
Liver	Slaughter	1.22	1.01
Kidney	Slaughter	0.15	0.15
Muscle	Slaughter	0.070	0.047
Fat	Slaughter	0.045	0.057
Blood	Slaughter	0.076	0.079
Milk	0–12 h	0.15	0.082
	12–24 h	0.035	0.055
	24–36	0.18	0.13
	36–48	0.081	0.052
	48–60	0.23	0.14
	60 -	0.10	0.070
Urine + cage wash		91% of dose	86% of dose
Faeces		3.2% of dose	3.9% of dose

Homogenized tissue sub-samples were extracted sequentially with hexane, acetonitrile/water (8/2), and methanol/1 M ammonium hydroxide (1/1). The final post-extraction residue from the liver only was hydrolysed sequentially with protease, 6 N HCl, and 3 N NaOH. The extracts were analysed by HPLC (C-18 reverse phase) and/or TLC. Some extracts were benzylated with pentafluorobenzyl bromide (PFBB) before analysis. PFBB would benzylate dimethyl phosphate, methyl phosphate, dimethyl phosphorothioate etc.

Milk (48–60 hours) was sequentially extracted with hexane and acetonitrile/water (8/2). The acetonitrile extract was radio-assayed, concentrated, and chromatographed on an anion-exchange SAX solid-phase extraction column. The aqueous fraction from the column was benzylated and analysed by HPLC. In a separate experiment, the water eluate was lyophilized and analysed on a carbohydrate HPLC column. A sample of [^{14}C]lactose was similarly analysed, both before and after hydrolysis with 1.0 N HCl.

Dimethoate was not found in any of the tissue or milk. A low concentration of omethoate, released by protease treatment, was found in liver.

Urine (from 48 hours to slaughter) was fractionated on a QAE Sephadex A-25 column. Three major peaks were found . A separate urine fraction was fractionated on a C-18 solid phase extraction column. Combined aqueous fractions were analysed by TLC. The three fractions from the SPE column that contained the most radioactivity were prepared on a large scale, benzylated, purified, and analysed by HPLC and GC-MS.

The distribution and characterization of the radioactivity is shown in Table 6.

Table 6. Distribution and characterization of radioactivity from the administration of [^{14}C]dimethoate to lactating goats.

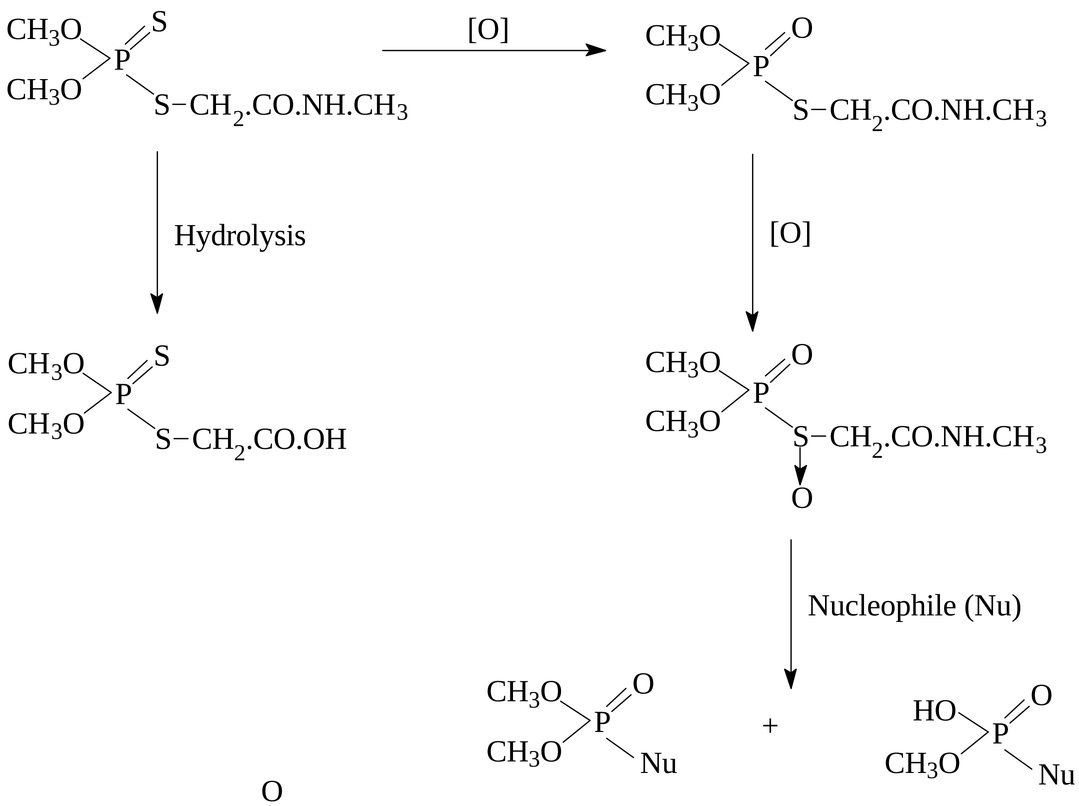
Sample	Fraction	% Total of TRR in sample	mg/kg as dimethoate	Identification or characterization[1, 2]
Liver (1.22 mg/kg)	Hexane	0.3	0.003	
	Acetonitrile/water	41	0.50	Anions 0.076 mg/kg (4 components by HPLC) . Phosphorylated natural products 0.4 mg/kg.
	Methanol/ammonium hydroxide	2.0	0.024	
	Protease	22	0.26	omethoate 0.12 mg/kg, dimethoate carboxylic acid 0.031 mg/kg by HPLC. Confirmation not successful (co-extractives). Phosphorylated natural products 0.03 mg/kg
	6 N HCl	14	0.18	No analysis
	3 N NaOH	1.8	0.022	
	Residue	19	0.23	
Liver (modified extraction)	Hexane	1.0	0.013	
	Acetonitrile/water (8/2)	21	0.26	HPLC peak at 4 min. 84% of injected ^{14}C accounted for. Phosphorylated natural products 0.20 mg/kg, 16% of TRR. No dimethoate carboxylic acid, no dimethyl phosphorothioate, no dimethyl phosphate (A-25 Sephadex). No [^{14}C]formate.
	Protease	22	0.27	Phosphorylated natural products 0.13 mg/kg (HPLC), 11% of TRR. Omethoate and dimethoate carboxylic acid present.
	Residue	11	0.13	

Sample	Fraction	% Total of TRR in sample	mg/kg as dimethoate	Identification or characterization[1, 2]
Kidney (0.149 mg/kg)	Hexane	2.0	0.003	
	Acetonitrile/water (8/2)	66	0.099	HPLC peak at 4 min., 76% of injected ^{14}C accounted for. Phosphorylated natural products 0.048 mg/kg, 32% of TRR. Anions about 0.020 mg/kg, 3 components.
	Methanol/ammonium hydroxide	5.1	0.008	
	Residue	34	0.051	
Muscle (0.070 mg/kg)	Hexane	0.5	<0.001	
	Acetonitrile/water (8/2)	57	0.040	HPLC peak at 4 min., 96% of injected ^{14}C accounted for. Poor benzylation (10%). Phosphorylated natural products 0.037 mg/kg, 53% of TRR. Anions 0.002 mg/kg.
	Residue	17	0.012	
Fat (0.045 mg/kg)	Hexane	11	0.005	
	Acetonitrile/water	12	0.005	
	Acetonitrile	4.2	0.002	
	Acetone	1.8	0.001	
	Residue	82	0.037	
Milk (48 h) (0.228 mg/kg)	Hexane	8.5	0.020	
	Acetonitrile/water (8/2)	82	0.18	HPLC peak at 4 min., 93% of injected ^{14}C accounted for. Poor benzylation, 17%. Phosphorylated natural products 0.12 mg/kg, 53% of TRR. Anions 0.005 mg/kg, 2 components. Lactose not radioactive.
Urine (48 h)	Solid phase extraction (water fractions)			Major metabolites identified by HPLC and TLC: dimethoate carboxylic acid, dimethyl phosphorothioate, dimethyl phosphate (GC-MS). Good benzylation of each metabolite: carboxylic acid 68%; phosphates 95% and 102%.

[1]Phosphorylated natural products = ^{14}C HPLC peak at 4 min minus benzylated peaks plus ^{14}C not recovered from HPLC column plus ^{14}C content of ammonium hydroxide/methanol extract (liver, kidney) plus ^{14}C residue. This represents an estimate of the maximum possible amount.
[2]Anions were assumed to be the ^{14}C peaks at about 50 min retention (C-18 HPLC) from the acetonitrile extract after benzylation

The metabolic pathways shown in Figure 2 are proposed for both poultry and ruminants. Almost all the dimethoate is eliminated in the urine as dimethyl phosphorothioate and dimethyl phosphate, products of the cleavage of the P–S–CH_2 linkage. The residues found in milk and tissues are consistent with the formation of the sulfoxides of omethoate and dimethoate carboxylic acid. The sulfoxides would combine with available nucleophiles, leading to the phosphorylation of proteins and lipids. Incorporation of -$O^{14}CH_3$ into natural products did not occur, as there was no apparent radioactive formate or lactose in milk.

Figure 2: Metabolism of dimethoate in poultry and ruminants.



Conversion to P=O and P—S(→O) and subsequent reactions with nucleophiles

NU (nucleophile) is a generic term for any electron-rich endogenous component. For example, the sulfoxide might phosphorylate proteins and lipids.

Plant metabolism

The DTF submitted summary information and literature citations on the metabolism of dimethoate in plants (Heidemann, 1995). No detailed reports were submitted.

The metabolism of [^{32}P]dimethoate in sugar beet was studied by Santi *et al* (1964). The radiolabelled dimethoate was applied to sugar beet plants 5 days after emergence, and the distribution of radioactivity was monitored by autoradiography. The metabolites identified were omethoate, de-*O*-methyl-dimethoate, *O,O*-demethyl hydrogen phosphorothiate ethyl hydrogen phosphate and phosphoric acid. Four metabolites remained unidentified. The concentration of omethoate increased to that of dimethoate after 13 to 30 days. Neither dimethoate nor omethoate could be found in the roots or leaves after day 37. The detailed report was submitted in Italian and could not be evaluated.

The metabolism of [^{32}P]dimethoate was investigated after foliar application by plant dipping to maize, cotton, peas and potatoes (Dauterman *et al.*, 1960). The plants were extracted 2 and 12 days after treatment, and metabolites were identified by paper chromatography and HPLC with co-chromatography. The proportion of the applied radioactivity on the leaf surfaces of maize, potato, and cotton decreased to

≤40% within 12 days of application. The most rapid decrease occurred with cotton, where <20% remained in 4 days, and the slowest with maize, where 40% remained at 12 days. These losses are attributed to volatilization and translocation from the surface. The surface residue on potato foliage after two days consisted of 87% dimethoate, 0.8% omethoate, and 13% water-soluble compounds, and after twelve days 17% dimethoate, 1.3% omethoate and 82% water-soluble compounds. The interval residues consisted of 40% dimethoate, 2.5% omethoate and 57% water-soluble compounds after two days, and 3.8% dimethoate, 1.1% omethoate and 95% water-soluble compounds after 12 days. The water-soluble surface and internal compounds were fractionated into four components by ion-exchange chromatography. The results are shown in Table 7.

Table 7. Composition of the water-soluble extracts of plant leaf surfaces and internal tissues after dipping in [^{32}P]dimethoate.

Interval, days	Surface H_3PO_4	Intern al H_3PO	Surface $(MeO)_2P(O)OH$	Internal $(MeO)_2P(O)OH$	Surface Dimetho-ate COOH	Internal Dimetho -ate COOH	Surface De-O-methyl dime-thoate	Internal De-O-methyl dimethoate	Surface $(MeO)_2P(S)OH$	Internal $(MeO)_2P(S)OH$
Maize										
2	0.0	-	3.2	-	77	-	10	-	9.0	
12	0.0	0.0	6.3	14	88	4.1	3.5	64	2.7	18
Potato										
2	0.0	-	0.7	-	94	-	2.6	-	2.7	-
12	0.0	0.0	4.4	26	81	10	8.6	45	4.6	18
Cotton										
2	0.0	-	2.4	-	94	-	1.1	-	2.5	-
12	0.0	0.0	6.2	13	71	65.4	18	13	4.6	69
Pea										
12	52	48	7.6	12	81	5.7	8.6	45	6.0	18

The metabolism of [^{32}P] and [^{14}C]dimethoate (carbonyl label) in beans was studied by Lucier and Menzer (1968). Beans (*Phaseolus vulgaris L*) were planted in a greenhouse and treated after 18 days at the two-leaf stage with a foliar application of 5.15 mg/l [^{14}C]dimethoate to each plant. Plant samples (2 plants each) were taken on days 0, 2, 4, 6, 8 and 10 after treatment. For the [^{32}P] study plants were grown in a Percival plant growth chamber and treated 14 days after planting (1.78 mg/l). Samples taken 2 and 4 days were frozen for thirty minutes and rinsed with acetone to remove surface residues, then macerated in acetone and filtered. The filtrate was concentrated and extracted sequentially with hexane and chloroform. The hexane fraction was analysed by celite column chromatography and the chloroform and water fractions by TLC (2-dimensional, with reference compounds). The results are shown in Table 8.

Table 8. Radiolabelled compounds found from the application of [^{32}P]dimethoate or [^{14}C]dimethoate to the foliage of beans.

Compound	% of applied radioactivity at interval, days						
	2 (^{14}C)	2 (^{32}P)	4 (^{14}C)	4 (^{32}P)	6 (^{14}C)	8 (^{14}C)	10 (^{14}C)
Dimethoate	29	66	23	44	18	13	12
Omethoate	0.69	2.2	0.81	4.4	0.61	0.53	0.48
De-*N*-methyl-dimethoate	0.72		0.05		0.03	0.05	0.05
Dimethoate carboxylic acid	0.12	1.6	0.14	2.4	0.07	0.06	0.20
De-*O*-methyl carboxylic acid	0.21	0.08	0.17	0.09	0.15	0.05	0.21
De-*O*-methyl-dimethoate		0.39		0.49			
Dimethyl phosphorodithioate		2.5		4.2			
Dimethyl phophorothioate		0.43		0.76			
Dimethyl phosphate		0.38		0.74			
Unknown (2)	11		1.3				

Compound	% of applied radioactivity at interval, days						
	2 (^{14}C)	2 (^{32}P)	4 (^{14}C)	4 (^{32}P)	6 (^{14}C)	8 (^{14}C)	10 (^{14}C)
Unknown (6)		4.0		3.1			
Hexane extract (excluding dimethoate)	2.2	1.9	1.9	1.2	1.6	1.2	1.1
Post-extraction solid	8.7	2.4	8.8	7.0	12	16	16
Total recovery (% of applied dose)	53	82	36	68	32	31	30

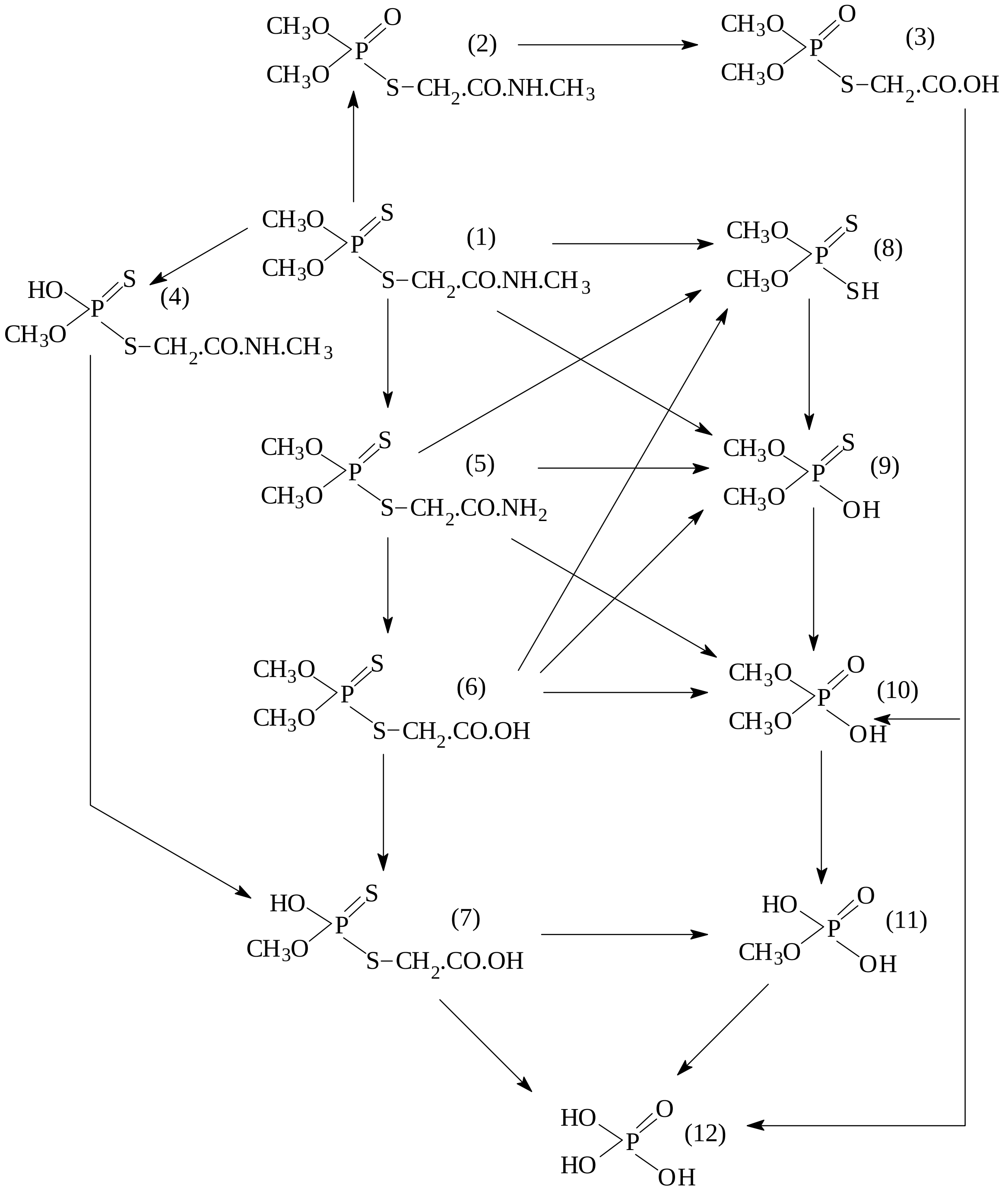
The metabolism of [^{32}P]dimethoate was studied on excised cotton leaves by Hacskaylo and Bull (1963). The third and fourth leaves from the terminal of 8-week old cotton plants removed and the basal ends of the petioles inserted into separate vials containing 100 µg of [^{32}P]dimethoate in 200 ml water. After the solutions were absorbed, the leaves were placed under fluorescent lights for 12 hours. The leaves were macerated with acetone 1, 3, 6 and 14 days after the treatment and the extracts analysed by paper chromatography. The dimethoate fell to 10% of its initial value within 6 days. Omethoate remained at about 6% of the total reactivity in the extract throughout the study. The compounds detected were phosphoric acid, de-*O*-methyl dimethoate carboxylic acid, dimethyl phosphate (2.5–11% of the total radioactivity on the chromatogram), dimethyl phosphorothioate (1.6–12%), dimethyl phosphorodithioate (4–11%), dimethoate carboxylic acid (15–50%) and omethoate. The dimethoate concentration ranged from 70% of the normalized total radioactivity on day 1 to 1.9% on day 14.

The metabolism of [^{32}P]dimethoate on lemons was reported by Santi (1961). The report was in Italian and only an English summary prepared by the Scientific Consulting Co. was available. The radioactive material applied, the method of application and the concentration were not specified. The compounds found were dimethoate, omethoate, dimethyl phosphate, phosphoric acid, *O*,*O*-dimethyl hydrogen phosphorothioate and de-*O*-methyl dimethoate.

Other studies on tomatoes, olives, wheat grain, sorghum grain, onions and cucumbers were reported in detail or as summaries but they provided information deemed inadequate or supplementary. Some residue dissipation studies, e.g. on spinach, with unlabelled dimethoate were also reported.

Although all the studies were deficient in the conduct of the experiments and/or the reporting of the data, taken together they defined the metabolic pathways shown in Figure 3. The metabolism follows two paths, oxidation to omethoate and hydrolysis with the formation of phosphoric acid, dimethyl phosphate, *O*,*O*-dimethyl hydrogen phosphorothioate and de-*O*-methyl dimethoate

Figure 3: Proposed metabolic pathways of dimethoate in plants.



1. dimethoate
2. omethoate
3. omethoate carboxylic acid
4. de-*O*-methyl-dimethoate
5. de-*N*-methyl-dimethoate
6. dimethoate carboxylic acid
7. de-*O*-methyl-dimethoate carboxylic acid
8. *O,O*-dimethyl hydrogen phosphorodithioate
9. *O,O*-dimethyl hydrogen phosphorothioate
10. dimethyl hydrogen phosphate
11. methyl dihydrogen phosphate
12. phosphoric acid

Environmental fate in soil

Residues in rotational crops

In a confined rotational crop study with lettuce, turnips and wheat as the secondary crops (Adair *et al.*, 1995) twelve plots, each consisting of a plastic-lined wooden box 90 x 75 cm x 30 cm deep were filled with Litchfield sandy loam soil in Watsonville, California, USA. Six boxes served as controls. Each of the remaining six was sprayed with an acetone solution of [^{14}C]dimethoate labelled on the methoxy carbons at a rate of 0.56 kg ai/ha which was incorporated into the soil. Before planting the boxes were moved into greenhouses. At 30 days after treatment (DAT), lettuce, wheat and turnips were planted in control and treated boxes. This procedure was repeated at 120 DAT using boxes in which nothing had been planted previously. Some boxes intended for longer planting intervals were not used after measuring the radioactivity levels in the 120 DAT crops.

Samples were collected at normal maturity, weighed and frozen. Wheat hay was dried for three days before freezing. The samples were homogenized with dry ice and returned to frozen storage. The total radioactive residue (of the TRR) in sub-samples was determined by combustion and liquid scintillation counting. Other sub-samples were extracted with solvent, typically acetonitrile or acetonitrile/0.1 N HCl (1:1). Wheat forage extracts (30 DAT) were hydrolysed with hydrochloric acid (6 N, 4 h reflux) to determine conjugates. Other fractions of the wheat forage acetonitrile extracts were acetylated with acetic anhydride in pyridine to determine hydroxy compounds. Wheat forage extracts from the 30 DAT planting were benzylated to determine acidic compounds. The ^{14}C in the post-extraction solids was measured by combustion and LSC.

The final extracts were analysed by HPLC with a C-18 column and UV detector. Fractions were collected at half-minute intervals and analysed by LSC. Extracts were also analysed by TLC on silica gel F254 plates. Compounds were identified by co-chromatography with unlabelled reference standards. All analyses were within 30 days of harvest. The results are shown in Table 9.

Table 9. ^{14}C residues in crops grown in sandy loam soil treated with [^{14}C]dimethoate at 0.56 kg ai/ha.

Crop	Planting DAT	Harvest DAT	TRR, mg/kg as dimethoate	Extracted residue, % of TRR	Unextracted residue, % of TRR	Extract characterization or identification[1]	
						% of TRR, mg/kg	Component
Lettuce	30	78	0.030	74	26	60	Polar
Turnip roots	30	97	0.008	-	-		
Turnip foliage	30	97	0.037	55	45	32	Polar
Wheat forage	30	62	0.036	63	42	50 0 0 25	Polar hydroxy compounds (no acetylation). Conjugates Acidic compounds
Wheat hay	30	97	0.037	35	84	35	Polar
Wheat straw	30	141	0.045	72	29	56	Polar
Wheat grain	30	141	0.021	62	52	57	Polar
Lettuce	120	174	0.003				
Turnip roots	120	208	0.001				
Turnip foliage	120	208	0.005				
Wheat forage	120	168	0.004				
Wheat hay	120	258	0.009				
Wheat straw	120	258	0.020	88	28	55	Polar
Wheat grain	120	258	0.012	27	82		

[1] Co-chromatography with reference standards showed the following compounds to be absent: dimethoate, omethoate, de-*N*-methyl-dimethoate, isodimethoate, de-*O*-methyl-dimethoate, de-*O*-methyl-omethoate, *O*,*O*-dimethyl hydrogen phosphorothioate, MP-1-acetic acid., demethyl-MPEM, methyl dihydrogen phosphate, de-*O*-methyl-dimethoate carboxylic acid.

Degradation

The DTF reported studies on the degradation of radiolabelled dimethoate in soil under both aerobic and anaerobic conditions (Hawkins *et al.*, 1989, 1990). In the aerobic study (in 1988), [*O-methyl*-^{14}C]dimethoate in water was applied to English sandy loam soil at a rate of 2.15 µg/g soil (dry weight). Some soil samples were fortified at the high level of 3.2 mg dimethoate/sample, the dimethoate being a mixture of radiolabelled and unlabelled material. About 80 g of treated soil was placed in each of a series of dishes which were maintained in glass columns flushed with an upward stream of humidified air which was then passed through trapping solutions for $^{14}CO_2$. The systems were maintained in the dark at 22°C. Duplicate dishes were removed at intervals of 0–181 days for analysis and the trapping solutions were sampled at the same times. The soils were extracted with acetonitrile or 1:1 acetonitrile/water at ambient temperature or under reflux. The extracts were radio-assayed and analysed by both reverse- and normal-phase TLC. Identification was based on co-chromatography with authentic standards in two solvent systems.

The [^{14}C]dimethoate was rapidly degraded under aerobic conditions in the sandy loam soil, with a half-life of 2.4 days. Dimethoate as a proportion of the applied radioactivity decreased from 96% on day 0 to 54% on day 2, 28% on day 4, 2% on day 14, 0.8% on day 30 and 0.4% on day 90. Two degradation products were identified: dimethyl phosphorothioate and de-*O*-methyl dimethoate. Neither exceeded 2% of the applied radioactivity at any time. Numerous unknown compounds were found, but none exceeded 2% of the applied radioactivity. As indicated in Table 10, the major route of degradation was volatilization, with $^{14}CO_2$ accounting for about 75% of the applied radioactivity after 181 days.

Table 10. Recovery of radioactivity from sandy loam soil treated with [^{14}C]dimethoate at 2 mg/kg under aerobic conditions.

Elapsed time, days	% of applied ^{14}C			
	Cumulative CO_2	Extractable	Unextractable	Soil total
0		96.9	0.3	97.2
1	5.2	81.0	4.6	85.6
4	15.2	66.3	9.9	76.2
7	52.2	17.3	15.7	33.0
14	61.4	8.7	19.4	28.1
30	65.1	6.6	20.8	27.4
60	67.8	4.6	19.4	24.0
90	70.2	3.7	16.0	19.7
120	72.8	3.4	15.3	18.7
181	74.6	2.2	16.2	18.4

In the anaerobic study [*O-methyl*-^{14}C]dimethoate in water was applied to English sandy loam soil at a rate of 2.06 µg/g soil (dry weight). 100 g portions of treated soil in Buchner flasks equipped with CO_2 traps were maintained at 25°C in darkness and a stream of air was passed through each system for two days at a rate of 30 ml/minute. After two days of aerobic incubation the soil in each flask was flooded to a depth of 2 cm with distilled, degassed water and the gas purge was changed to nitrogen. Flasks were removed at intervals and the soils extracted as in the aerobic study after removal of the supernatant water. Some soil sub-samples were also extracted with 0.5 M aqueous sodium hydroxide, either at ambient temperature or by reflux, for 24 hours. Supernatants and extracts were radio-assayed and analysed by TLC and HPLC. Autoradiographs of the TLC plates were taken and the HPLC was equipped with both UV and radioactivity detectors. The half-life of dimethoate was calculated to be 4 days from the start of anaerobic conditions with biphasic exponential decay. Two degradation products were identified from the anaerobic period as de-*O*-methyl-dimethoate (10% of the applied radioactivity) and *O*,*O*-dimethyl phosphorothioate (5%). About 15% of the applied radioactivity was lost as $^{14}CO_2$ during the 60-day anaerobic phase, in addition to a 27% loss during the initial 2 days of aerobic incubation. The degradation of dimethoate was slower under anaerobic than aerobic conditions. The results are shown in Table 11.

Table 11. Distribution of radioactivity in sandy loam soil after application of [^{14}C]dimethoate at 2 mg/kg under aerobic and anaerobic conditions.

Elapsed time, days	^{14}C, % of applied								
	Cumulative CO_2	Supernatant water	Solvent extract	NaOH Extract	Unextractable	Soil total[1]	Dimethoate	Dimethyl phosphorothionate	De-*O*-methyl-dimethoate
Aerobic phase (days 0–2)									
0		N/A	96		0.3	96	94.7		
2	27		54	9.7	0.8	64	39.8	1.4	3.2
Anaerobic phase (days 2–62)									
9	30	28	18	13	1.0	60	19	3.4	8.6
16	32	28	15	12	0.8	56	13	4.4	9.6
34	35	24	13	14	1.0	52	8.3	4.2	6.2
62	41	16	9.0	21	2.0	48	5.5	3.6	7.1

[1] Supernatant water plus solvent extract plus NaOH extract plus unextractable

Both the DTF and Cheminova reported studies in the UK and USA on the dissipation of dimethoate in or on soil (Burden, 1991; Jacobson and Williams, 1994a,b). In the UK study Riverside clay loam, Middlefield silty clay and Somersham sandy loam were each fortified with dimethoate (60 µg per 50 g dry soil, equivalent to 1.2 kg ai/ha) and incubated aerobically in the dark at 20 ± 3°C . The soils were contained in conical flasks with cotton wool stoppers. The concentration of dimethoate was monitored from day 0 to day 16. The analysis consisted in overnight Soxhlet extraction of a 50 g sample with acetone/hexane (4/1, 200 ml) and hydrochloric acid (1 ml, 4 M). The extract was concentrated, the solvent changed to toluene and the analysis completed by GLC (25 m x 0.53 mm CP Sil-8 column, NPD). The method was validated by fortification of control samples of each of the three soil types. The overall mean recovery was 92% for a fortification range of 0.05 to 1.2 mg/kg, n = 15, range 79–126%. Concurrent recoveries were also determined.

In the New York studies, bare ground characterized as sandy loam at 0–60 cm and as loam at 60-120 cm was treated with dimethoate formulated as a 25% ai wettable powder (WP) at a rate of 4.5 kg ai/ha, in July 1993. The broadcast application was made with a tractor-mounted applicator. Soil core samples were taken immediately before and after treatment and at selected intervals up to 88 days after application. Total irrigation plus rainfall over the 88-day period totalled 28 cm. Samples (25 g frozen up to 177 days before analysis) were extracted with acetone/water (95/5, 250 ml). The filtrates were stripped of acetone and the residual water solutions partitioned with methylene chloride. The extracts were purified on Celite/charcoal columns and the hexane/acetone (1/1) eluate fractions were fortified with carbowax to 0.1%. The final extracts were analysed by GLC (30 m x 0.53 mm RTX-5 column and FPD). The method was validated with overall recoveries of 91% for dimethoate and 86% for omethoate, n = 12, fortification range 0.01–1.0 mg/kg. The recovery ranges were 82–110% for dimethoate and 80–100% for omethoate. Concurrent recoveries were also determined.

In the Texas trial, a sorghum plot was sprayed with dimethoate formulated as a 43.5% ai EC (Dimethoate 400) in July 1993. The application was broadcast, post-emergence, at 1/7 kg ai/ha top two- to four-leaf plants. The soil was characterized as silt loam at 0–120 cm. Soil core samples were taken immediately before and after treatment and at selected intervals for 90 days. The total rainfall plus irrigation over the 90-day period was 22 cm. Soil cores were stored frozen and analysed within 123 days of collection by the method used for the New York work.

The results of the three dissipation studies are shown in Table 12. The half-life of dimethoate in the UK and New York soils was 2–4 days. In Texas, where a crop was sprayed, the half-life was about 11 days. The US trials showed that the dimethoate did not migrate below the top soil layer.

Table 12. Dissipation of dimethoate in soil.

Trial/Year	Application rate, kg ai/ha	Post - treatment interval, days	Soil type/depth, cm, in US trials	Dimethoate, mg/kg	Omethoate, mg/kg	Concurrent analytical recoveries
DTF-UK/1991	1.2	0	Riverside clay loam/NA	1.0		88% at 1.2 mg/kg
		1		0.94		93% at 1.0 mg/kg
		2		0.62		97% at 0.8 mg/kg
		4		0.42		73% at 0.5 mg/kg
		5		0.13		105% at 0.8 mg/kg
		7		0.11		93% at 0.1 mg/kg
		8		0.077		87% at 0.1 mg/kg
		10		0.065		72% at 0.1 mg/kg
		12		0.041		57% at 0.1 mg/kg
	1.2	0	Middlefield silty clay	1.5		115% at 1.2 mg/kg
		1		1.0		93% at 1.0 mg/kg
		2		0.74		95% at 0.8 mg/kg
		4		0.79		57% at 0.5 mg/kg
		5		0.25		57% at 0.8 mg/kg
		7		0.070		100% at 0.1 mg/kg
		8		0.081		90% at o.1 mg/kg
		10		0.063		98% at 0.1 mg/kg
		12		0.037		56% at 0.1 mg/kg
		0	Somersham sandy loam	0.95		82% at 1.2 mg/kg
		1		0.77		82% at 1.0 mg/kg
		2		0.75		84% at 0.8 mg/kg
		4		0.52		72% at 0.5 mg/kg
		5		0.42		74% at 0.8 mg/kg
		7		0.43		87% at 0.1 mg/kg
		8		0.32		
		10		0.065		
		12		0.096		75% at 0.5 mg/kg
		16		0.10		93% at 0.1 mg/kg
Cheminova New York/ 1993	4.5	0	0–5.2	1.38	<0.01	D: 80-110%, n = 15, at 0.01 mg/kg, mean 92% O: 50-100%, n = 15, at 0.01 mg/kg, mean 81% D: 83-95%, n = 10, at 0.02-0.10 mg/kg, mean 87% O: 65-80%, n=10, at 0.02-0.10 mg/kg, mean 69% D: 91-111%, n =5, at 0.25-2.0 mg/kg, mean 92% O: 71-89%, n=5, at 0.25–2.0 mg/kg, mean 78%
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
			45.7-61	<0.01	<0.01	
		1	0-15.2	1.44	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
			45.7-61	<0.01	<0.01	
		2	0-15.2	1.52	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		3	0-15.2	1.39	0.017	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		6	0-15.2	0.59	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		10	0-15.2	0.23	<0.01	
			15.2-30.5	0.011	<0.01	
			30.5-45.7	<0.01	<0.01	
			45.7-61	<0.01	<0.01	
		14	0-15.2	0.090	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
			45.7-61	<0.01	<0.01	

Trial/Year	Application rate, kg ai/ha	Post - treatment interval, days	Soil type/depth, cm, in US trials	Dimethoate, mg/kg	Omethoate, mg/kg	Concurrent analytical recoveries
		28	0-15.2	0.012	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		60	0-15.2	<0.01	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		88	0-15.2	<0.01	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
Cheminova Texas/1993	1.7	0	0-15.2	0.48	<0.01	D: 60–100%, n = 14, at 0.01 mg/kg, mean 89% O: 70–110%, n = 14, at 0.01 mg/kg, mean 86% D: 70-106%, n = 11 at 0.05–0.25, mean 92 O: 26–80%. n = 11, at 0.05–0.25 mg/kg, mean 69 (sd 18) D: 89- 96%, n = 4 at 0.50–1.00 mg/kg, mean 93% O: 67–86%, n = 5 at 0.50–2.0 mg/kg, mean 77%
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		1	0-15.2	0.37	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		2	0-15.2	0.40	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		3	0-15.2	0.37	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		6	0-15.2	0.32	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-35.7	<0.01	<0.01	
		11	0-15.2	0.21	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		14	0-15.2	0.17	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		28	0-15.2	0.088	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		60	<0.01	<0.01	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.01	<0.01	
		90	0-15.2	<0.01	<0.01	
			15.2-30.5	<0.01	<0.01	
			30.5-45.7	<0.1	<0.01	

The DTF reported a soil dissipation study with bean, grape and bare ground plots in California (Becker, 1991). A dimethoate EC formulation was applied three times with a 7-day re-treatment interval at 0.56 kg ai/ha to green beans planted in Atwater Sandy Loam and twice at 2.8 kg ai/ha to bare ground with a 14-day re-treatment interval. The applications were at the early bloom, bloom to 5.1 cm pod and 5.1 to 7.6 cm pod stages. A WP formulation (Dimethogon 25WP, 25% ai; for apples, pears, grapes) was applied twice to the bare ground was with an overhead spray boom at 2.8 kg ai/ha with a 14-day interval The application to grape vines was by airblast spray to the foliage at the 0.75-1.5 and 1.5-2.0 cm diameter berry stages. The crops were maintained according to normal agricultural practice, including furrow irrigation. The half-lives were 9.8 days in bean soil, 6.0 days in grape soil and 7.8 days in bare soil.

Soil cores stored frozen pending analysis were segmented and analysed after acetone extraction by GLC with flame photometric detection. The method was validated with control soil samples fortified at 0.01–0.10 mg/kg with dimethoate and omethoate.

In the bean trial dimethoate and omethoate were not detected below the top core segment (0–15 cm) at any time up to 227 days after the first application. The highest dimethoate concentration was 0.19 mg/kg on the day of the third treatment and the highest omethoate concentration was 0.038 mg/kg 3 days after the third treatment.

In the grape vine plots the maximum dimethoate and omethoate concentrations in the top soil layers (0–15 cm) were 0.27 and 0.093 mg/kg respectively, both 4 days after the second application. Dimethoate only was found in the second core layer (15–30 cm) seven days after the first application at 0.014 mg/kg. Monitoring was continued for 112 days after the first application, with a nominal limit of quantification of 0.01 mg/kg.

After treating bare ground the maximum dimethoate concentration was 1.8 mg/kg in the 0–15 cm layer on the day after the second treatment, and the maximum omethoate concentration 0.56 mg/kg in the same layer three days after the second treatment. Dimethoate was found in lower soil layers up to two weeks after each treatment. The deepest apparent residue was 0.025 mg/kg in the 91–120 cm layer immediately after the second application, but this may have been spurious as no dimethoate was found in the four higher layers (15–91 cm) nor in the 91-120 cm layer in two replicate plots. Generally, dimethoate in the lower layers was highest 2–7 days after an application, with a maximum concentration of 0.022 mg/kg in the 46–61 cm segment. The maximum omethoate migration appeared to occur 3–7 days after the first application with maximum concentrations of 0.015 mg/kg in the 46–61 cm and 0.012 mg/kg in the 61–91 cm layers. No migration was observed after the second application. The bare ground was irrigated one and nine days after the first application and seven days after the second application, 15.2 cm each time.

The DTF reported a study of the mobility of [*O-methyl*-^{14}C]dimethoate in columns of four English soils: sand, sandy loam, silt loam and clay loam (Hawkins *et al.*, 1986). All four were leached after adding unaged dimethoate, and the sandy loam also after ageing. In the experiment with aged residues the sandy loam was treated with a mixture of labelled and unlabelled dimethoate equivalent to 0.15 mg dimethoate per 100 g soil (sifted and brought to 40% of maximum water holding capacity). The samples were placed in conical flasks and stored in the dark at 22^{o}C. After thirty days storage one sample was taken for radio-assay and a duplicate sample was subjected to column leaching. The sample for assay was extracted with 1:1 acetonitrile/water and the radioactivity in both the extract and the extracted soil was determined. For the leaching trial a column of the sandy loam soil (25 cm height) was topped with the remainder of the stored dimethoate-treated soil mixed with ^{36}Cl-sodium chloride. The radiolabelled sodium chloride was used to ascertain the void volume, defined as the volume of eluant needed to leach 50% of the recovered ^{36}Cl through the column. The column was eluted with distilled water (1 l) and fractions of 16–21 ml each were radio-assayed for ^{14}C and ^{36}Cl. The column was divided into six sections of 5 cm each and the soil from each section was air-dried and radio-assayed.

This procedure was repeated with freshly fortified samples of each of the four soils. A weighed 30 cm column of each sifted soil was covered with distilled water and 1 ml of an aqueous solution of [^{14}C]dimethoate and sodium [^{36}Cl]chloride. The application rate was 0.15 mg dimethoate per column, approximately equal to 0.75 kg ai/ha.

The eluates and soil extracts from both aged and unaged soil columns were analysed by TLC and HPLC.

The [^{14}C]dimethoate was extensively leached on columns of all four soils, both unaged and aged. The rate of leaching was inversely proportional to the loam content, being most rapid with sand. The results are shown in Table 13.

Table 13. Elution of [^{14}C]dimethoate from soil columns.

Column section	% of applied radioactivity				
	Somersham sandy loam	Gleadthorpe sand	Goole silt loam	Sandiacre clay loam	30-day aged Somersham sandy loam
1 (top)	2.9	0.3	1.6	2.0	28.4
2	1.7	0.3	2.7	2.7	6.2
3	1.4	0.3	2.7	2.5	0.1
4	1.2	0.2	3.2	2.5	0.1
5	2.1	0.3	3.6	2.5	0.2
6 (bottom)	1.9	0.3	4.0	3.4	0.1
Total retained	11.2	1.6	17.8	15.6	35.1
Total eluted	86.7	100.6	72.8	71.8	5.1
Total recovered	97.9	102.2	90.5	87.4	40.2
% Dimethoate eluted (TLC)	79	93	60	55	-
Distribution coefficient, K_d[1]	0.30	0.06	0.57	0.74	-
% organic carbon in soil	1.5	0.9	3.5	7.4	1.5

[1] K_d (ml/g) = [(vp-1)vv]/[vv/w] where vp is volume of eluant to leach 50% of applied ^{14}C through column, vv is void volume of column, and w is the weight of soil in the column

The DTF also reported a lysimeter trial (Wyss-Benz *et al.*, 1993). [*Carbonyl*-^{14}C]dimethoate was applied as a foliar spray to cabbages planted in two lysimeters embedded in the ground to soil level in 1992 in Itingen, Germany. The depth was 120 cm and the cultivated area was 1 m^2 (115 cm diameter). The amount of dimethoate applied to each lysimeter was 120 mg, corresponding to 1.2 kg ai/ha. Various crops were planted around the lysimeters. The actual applications were 112.02 mg to lysimeter 1 and 113.08 mg to lysimeter 2. Each lysimeter had a steel sieve bottom and was surrounded by a cylindrical sleeve with a vessel to collect water that had percolated through the lysimeter soil. The total precipitation and irrigation over the two-year study was 190 cm. After harvesting the cabbage, winter salad, garden salad, endive salad and winter wheat were planted sequentially. The total study period was 744 days. Some results are shown in Table 14.

The leachates were analysed by TLC after lyophilization. Dimethoate was never detected. Layers 12 and 11 from the lysimeters were extracted and 30–38% of the extractable radioactivity (<4%) was attributable to dimethoate. The unextracted radioactivity was characterized as bound to fulvic acids (20%), bound to humic acids (45%) and bound to humin (30%).

Table 14: Percolation of [^{14}C]dimethoate applied to cabbage at 1.2 kg ai/ha in lysimeters.

Sample	% of applied radioactivity	
	Lysimeter 1	Lysimeter 2
Leachate year 1	0.31	0.28
Leachate year 2	0.12	0.075
Cabbage	1.4	2.5
Winter salad	0.009	0.006
Garden salad	0.019	0.017
Endive salad	0.015	0.015
Winter wheat	0.002	0.002
Layer 12 (0-12 cm)–744 d	18	16
Layer 11 (12-21 cm)	1.3	0.85
Layer 10 (21-30 cm)	0.30	0.30
Layer 9 (30-40 cm)	0.20	0.14
Layer 8 (40-50 cm)	0.12	0.07
Layer 7 (50-60 cm)	0.05	0.04
Layer 6 (60-70 cm)	0.03	0.03
Layer 5 (70-80 cm)	0.02	0.02
Layer 4 (80-90 cm)	0.01	0.03
Layer 3 (90-100 cm)	0.01	0.01
Layer 2 (100-110 cm)	0.01	0.02
Layer 1 (110-120 cm)	0.02	0.01

[1]Unaccounted radioactivity (78–80% of that applied) was assumed to be in volatile substances

The DTF reported a study on the adsorption and desorption of dimethoate on soil (Schanne, 1981). Dimethoate, labelled on the carbonyl carbon, in 0.01 M $CaCl_2$ aqueous solution was equilibrated with various soils (5 g) by shaking at 150-200 oscillations/min for 4.5 hours. The dimethoate concentration range studied was about 0.04 to 5.2 mg/l. The mixtures were centrifuged and decanted. For desorption, the residual soils were equilibrated with $CaCl_2$ solution for 16 hours.

It was found that the amounts adsorbed increased with increasing silt content of the soils. On the basis of the linear relationship between the dimethoate solution concentration and the amount adsorbed, the sorption behaviour was described by a distribution coefficient. The results are shown in Table 15.

Table 15. Freundlich adsorption and desorption constants for dimethoate in various soils.

Soil	% silt	Adsorption k (dm^3/kg)	Desorption k (first step)
Sand/loamy sand	4.8	0.25	0.56
Sandy loam	25	0.33	1.34
Silt loam	52.2	0.42	2.38
Loam/silt loam	50.7	0.42	0.77
Sand	24.5	0.34	0.97
Loam	42.6	0.37	0.34

Environmental fate in water/sediment systems

The DTF reported a study on the degradation of dimethoate in aqueous systems (Volkl, 1993). The systems studied were Rhine river water (550 ml) + sediment (275 g) (system I) and pond water (550 ml) + sediment (190 g) (system II). The apparatus included an all-glass series of traps with an open air-flow system (60-80 ml/min) maintained in the dark at 20°C. Exactly 0.211 mg of [^{14}C]dimethoate, corresponding to a field application rate of 1.194 kg ai/ha, was added in acetone/water solution to each test system. The systems were incubated for 105 days with samples taken 0, 6, 24 and 48 hours and 7, 14, 30, 61 and 105 days. The water and sediment in each sample were separated and radioanalysed. The water phases were analysed by TLC and sediments extracted with acetonitrile or by Soxhlet with methanol. Some extracts were analysed by HPLC.

The half-lives of dimethoate were 17.2 days in system I and 13.2 days in system II estimated by non-linear regression analysis. The half-life values for the transfer of dimethoate to the sediments were 14.8 days for system I and 12.5 days for system II. The major degradation product was demethyl-dimethoate, which reached a maximum value of 22% of the applied radioactivity in the river system on day 30 and 17% in the pond system on day 7. The distribution of the dimethoate residues is shown in Table 16. Most of the ^{14}C was bound to sediment or converted to carbon dioxide.

Table 16. Distribution of ^{14}C from [^{14}C]dimethoate in water/sediment systems after 105 days.

Component	% of applied radioactivity	
	Rhine river system	Pond system
Demethyl-dimethoate	0.9	1.8
Polar metabolites	<5	<2
$^{14}CO_2$	28	24
Humin bound	16	28
Humic acid bound	4.8	11
Fulvic acid bound	21	13
Total accounted for	76	80

Cheminova reported a study of the photodegradation of dimethoate in contact with soil (Skinner and Shepler, 1994). [^{14}C]dimethoate labelled at the *O*-methyl groups was applied to sandy loam soil at a nominal rate of 2.24 kg ai/ha. The treated soil was exposed to natural sunlight for 30 days at a controlled temperature of 25°C. A control soil in an identical apparatus was maintained in the dark. A continuous humidified air flow was maintained and volatile compounds were trapped. The soils were sampled at 0, 2, 5, 10, 20 and 30 days and extracted with acetonitrile/water (1:1, 3 x 10 ml). The extracts were radio-assayed and analysed by TLC, with radioanalytical imaging and HPLC. Residual solids were radio-assayed. Three main degradation products were indicated and two were isolated and identified by GC-MS. The third was lost during isolation and derivatization, apparently as a result of the extreme volatility of the derivative.

The half-life of dimethoate in sunlight was 10.5 days, but its half-life of the control (dark) soils was 7.9 days, showing that dimethoate on soil is not prone to photolytic degradation. On day 30 the extract of the irradiated soil contained 79% of the applied radioactivity, and that of the unexposed soil 84%. The bound soil residues accounted for 12% and 7.9% respectively. Dimethoate represented 11% of the applied radioactivity in the exposed soil and 4.9% in the unexposed (HPLC). The major degradation products identified in the 30-day extracts were dimethyl hydrogen phosphate, 28% and 13% of the applied radioactivity in the exposed and unexposed soils respectively, and dimethyl hydrogen phosphorothioate, 25% and 56% respectively (TLC). A third unidentified product accounted for about 6% of the applied radioactivity, and volatiles for about 5%.

METHODS OF RESIDUE ANALYSIS

Analytical methods

A series of related methods and validation data for them were presented for the determination of dimethoate and omethoate in or on various raw and processed agricultural commodities (ABC Laboratories, 1998). The methods are on the basis of those of Leoni (1992) and Aoki (1975). A homogenized sample, typically 50 g, is blended with acetone (100 ml). If the water content is <47%, 50 ml water is added. The slurry is filtered and the filtrate extracted with methylene chloride (3 x 100 ml). The combined methylene chloride extracts are evaporated to dryness, dissolved in hexane/acetone (1/1), and cleaned up on a column of Celite topped with Celite/charcoal (4:1). The column is eluted with hexane/acetone (200 ml, 1/1) under sufficient vacuum to obtain a 3-5 ml/min flow. Carbowax 200 is added to the eluate to give a 0.1% solution, which is concentrated in a rotary evaporator under nitrogen.

The extraction procedure is modified for oily substrates, such as corn oil and orange oil. A 10 g sample is brought to 50 ml with a methylene chloride/cyclohexane mixture (15/85), mixed thoroughly and chromatographed on a 50 g GPC column. The eluates are adjusted with Carbowax 200 solution to 0.1% and concentrated to 0–2 ml by rotary evaporation. The residue is taken up in acetone for GLC analysis.

This method, with the GPC clean-up, was used in a 1994 market basket survey in Australia (Marro, 1996).

Cotton seed (50 g) is extracted for 24 h with ethyl acetate in a Soxhlet extractor. After extraction the ethyl acetate is stripped and the residual oil is cleaned up by GPC as above. Soapstock (10 g) is mixed with galcial acetic acid (1.5 ml) and cleaned up by GPC. Potato chips (50 g) are mixed with ethyl acetate (3 x 200 ml) and sodium sulfate (~50 g). The mixture is filtered and again cleaned up by GPC.

The concentrated purified extracts are all analysed by GLC on a 30 m x 0.53 mm RTX-5 or 15 m x 0.53 mm DB-17 capillary column with an initial column temperature of 140°C, injection by flash vaporization (splitless) and flame photometric detection in the phosphorus mode. Calibration is with external standards of 0.05–1.0 μg/ml (0.01 to 0.08 mg/kg). The standards are prepared in acetone containing 0.1% Carbowax 200. The Carbowax is needed to maintain constant sensitivity over the course of the GLC run. The limit of quantification is $\leq$ 0.01 mg/kg for each analyte.

The recoveries from a wide range of samples are shown in Table 17.

Table 17. Validation of the ABC/Leoni/Aoki methods for dimethoate and omethoate.

Sample	Fortification range, mg/kg	No. of analyses	Mean Recovery, %		Standard Deviation, %		Recovery Range, %	
			Dimethoate	Omethoate	Dimethoate	Omethoate	Dimethoate	Omethoate
Sorghum grain	0.01–0.50	7	83	85	4	4	80–90	80–90
Sorghum forage	0.01–0.50	7	86	91	3	5	80–90	87–100
Sorghum hay	0.01–0.50	7	85	93	8	7	75–100	83–100
Wheat grain	0.01–0.50	7	92	110	3	7	90–96	104–120
Wheat bran	0.01–0.50	7	93	103	3	5	90–98	96–109
Wheat middlings	0.01–0.50	7	93	97	6	3	80–99	91–100
Wheat shorts	0.01–0.50	7	95	106	5	11	90–102	92–120
Wheat flour	0.01–0.50	7	92	93	23	17	70–140	73 - 124
Maize grain	0.01–0.50	7	87	86	5	10	80–92	71–100
Maize grits	0.01–0.50	7	90	92	2	9	87–92	83–110
Maize meal	0.01–0.50	7	88	88	8	8	76–100	74–100
Maize flour	0.01–0.50	7	96	101	4	15	91–100	82–120
Maize starch	0.01–0.50	7	86	86	4	6	80–90	80–100
Maize oil	0.01–0.50	7	87	78	5	13	78–91	66–100
Cotton seed	0.01–0.50	5	98	65	8	14	90–110	49–80
Cotton seed meal	0.01–0.50	7	83	82	4	8	78–90	66–90
Cotton seed hulls	0.01–0.50	7	87	90	3	8	83–90	81–100
Cotton seed oil (crude)	0.01–0.50	7	105	116	13	17	90–120	99–140
Cotton seed soapstock	0.01–0.05	4	76	31	6	7	70–82	28–40
Oranges (whole)	0.01–0.50	8	101	100	5	12	95–110	82–120
Orange juice	0.01–0.50	7	107	99	4	5	102 –110	90–107
Orange pulp (dry)	0.01–0.50	7	79	72	5	6	69–84	63 - 80
Orange molasses	0.01–0.50	7	87	90	12	12	70–100	66–101
Orange oil	0.01–0.50	7	93	79	7	21	80–100	65–120
Potato	0.01–0.50	7	93	114	3	10	90–98	100–130
Potato granules	0.01–1.0	9	98	112	6	9	90–106	101–130
Potato chips	0.01–0.50	7	100	96	11	21	91–120	77–130
Potato peel (wet)	0.01–1.0	9	89	101	5	13	80–97	80 –120
Potato peel (dry)	0.01–0.50	7	83	87	5	8	80–93	76–100
Tomatoes (whole)	0.01–0.50	7	89	110	7	5	80–96	100–116
Tomato pomace (dry)	0.01–0.50	7	87	97	11	17	70–104	70–114
Tomato paste	0.01–0.50	7	98	88	7	18	90–110	60–107
Beans (succulent)	0.01–0.50	7	92	111	3	6	90–98	105–120
Bean forage	0.01–0.50	7	89	100	5	4	80–95	94–108
Bean straw	0.01–0.50	7	92	96	4	11	86–100	80 - 110
Peas (peas + pods)	0.01–0.50	7	99	104	8	12	90–110	91–120
Pea vines	0.01–0.50	7	88	98	9	16	79–100	83–120
Pea hay	0.01–0.50	7	75	83	5	9	70–82	74–100

The DTF reported a series of validations of Deutsche Forshungsgemeinschaft (DFG) method 236 (Lieferung, 1989). The method involves macerating a homogenized sample (typically 20-25 g) with acetone (2 x 100 ml) and water (2 x 50 ml), filtering, purifying by partition with methylene chloride (100 ml + 3 x 50 ml) followed by activated charcoal (2 g) after drying with sodium sulfate or by gel permeation or Florisil chromatography. The initial extraction solvent mixture may also contain ethyl acetate (e.g. for peas) or may be methanol/water rather than acetone, e.g. for barley. Residues in the concentrated extract are determined by GLC with a flame photometric detector and a 10 m x 530 µm HP-17 or 30 m x 530 µm HP-5 capillary column in the splitless mode, or equivalent. The limit of determination was 0.01 mg/kg, with recoveries of 70–110% and a relative standard deviation of $\leq$20%. Calibration was by external standards with a typical linear calibration range of 0.02 to 1.0 µg/ml. Recoveries are shown in Table 18.

Table 18. Recoveries from various samples fortified with dimethoate and omethoate and analysed by DFG method 236.

Sample	Omethoate		Dimethoate		Reference
	Fortifications, mg/kg/number	Recovery, %, range/mean [! SD]	Fortifications, mg/kg/number	Recovery, %, range/mean [! SD]	
Potato	0.010 n = 6	79–103 92 ± 8.8	0.010 n = 6	87–107 95 ± 8.3	Flatt, 1996
	0.20 n = 6	80–107 94 ± 11	0.20 n = 6	96–112 104 ± 7.0	
Sugar beet, leaf	0.010 n = 6	79–108 94 ± 10	0.010 n = 6	94–116 106 ± 8.2	Flatt, 1995
	0.20 n = 6	81–107 97 ± 11	0.20 n = 6	96–116 107 ± 7.2	
	5.0 n = 6	86–99 94 ± 5.2	5.0 n = 6	98–106 102 ± 2.7	
Sugar beet, root	0.010 n = 6	79–104 91 ± 8.7	0.010 n = 6	69 – 108 94 ± 16	
	0.20 n = 6	77–104 90 ± 11	0.20 n = 6	88–113 102 ± 9.6	
Peas (with pod)	0.01 n = 3	70 – 100 83	0.01 n = 3	71 – 90 80	Heyer and Schreitmuller, 1996
	0.5 n = 3	67–72 69	0.5 n = 3	74–77 75	
	3.0 n = 3	72 – 78 73 76	20. n = 3	55–72 64	
Peas (seeds)	0.01 n = 3	78–90 86	0.01 n = 3	90–100 93	
	0.5 n = 3	96–100 98	0.5 n = 3	65–75 69	
			1.0 n = 3	69–87 78	
Peas (straw)	0.01 n = 3	60–80 73	0.01 n = 3	90–130 113	
	0.20 n = 4	43–56 47	0.20 n = 4	70–73 72	
	5.0 n = 3	42–66 52	0.20 n = 3	75–79 78	
Barley (grain)	0.01 n = 3	60–80 70	0.01 n = 3	89–109 96	Melkebeke, 1996
	0.2 n = 3	77–86 82	0.2 n = 3	91–97 95	
Barley (straw)	0.01 n = 3	61-66 63	0.01 n = 3	93–115 103	
	0.5 n = 3	59–76 66	2. n = 3	79–88 84	
Maize (grain)	0.01 n = 6	90 90	0.01 n = 6	100–110 102 ± 4.0	Heyer, 1995
	0.2 n = 6	69 – 110 88 ± 16	0.2	81–108 95 ± 11	
Maize (cob)	0.01 n = 6	70 – 120 87 ± 18	0.01 n = 6	80–100 88 ± 7.5	
	0.2 n = 6	66–96 83 ± 12	0.2 n = 6	87–95 91 ± 4.0	
Maize (plant, green)	0.01 n = 6	50–70 62 ±7.5	0.01 n = 6	90–130 105 ± 14	
	0.2 n = 6	50–66 59 ± 7.2	0.2 n = 6	91–100 95 ± 3.7	
			5.0 n = 6	66–96 84 ± 10	
Wheat (whole plant)	0.01 n = 6	85–102 94 ± 6.3	0.01 n = 6	96–115 107 ± 7.7	Flatt, 1995
	0.20 n = 6	73-83 78 ± 4.5	0.20 n = 6	84–95 91 ± 4.2	

Sample	Omethoate		Dimethoate		Reference
	Fortifications, mg/kg/number	Recovery, %, range/mean [! SD]	Fortifications, mg/kg/number	Recovery, %, range/mean [! SD]	
			5.2 n = 6	81–89 85 ± 2.9	
Wheat (grain)	0.01 n = 6	70-94 84 ± 9.9	0.01 n = 6	81–95 89 ± 5.4	
	0.20 n = 6	70–81 75 ± 3.9	0.21 n = 6	87–96 93 ± 3.4	
Wheat (straw)	0.01 n = 6	53–72 61 ± 6.4	0.01 n = 6	64–84 76 ± 7.7	
	0.50 n = 6	58–74 66 ± 7.1	0.52 n = 6	88–94 91 ± 2.3	

The Netherlands submitted their official method for the determination of dimethoate (Ministry of Health, Welfare and Sport, 1996). It is a multi-residue method for compounds amenable to determination by GLC. Information was also supplied on methods used for field trials, but it was in Dutch. The official method contains extraction schemes for oily and non-fatty samples, meat, eggs and milk. Extracts are purified by gel permeation chromatography or liquid-liquid partitioning (milk, meat). For organophosphorus pesticides, the recovery is >80% for non-fatty foods, with a limit of determination of 0.01–0.05 mg/kg, and 65–105% for fatty foods, with a limit of determination of 0.01–0.04 mg/kg.

Australia provided information on several methods used with market basket surveys and field trials. method M16.01 (Melksham and Hargreaves, 1981) specifies extraction of the sample (50 g) with acetone (200 ml), evaporation, filtration and washing with water, extraction of the aqueous solution with chloroform, evaporation to dryness and sweep co-distillation (200°C) with ethyl acetate. The distillation step destroys omethoate. The distillate is analysed by GLC with a flame photometric detector. The recommended column is 1800 x 6 mm 3% OV101, operated isothermally at 196°C. The detector response is linear over a range of 20–120 ng dimethoate. The recoveries are shown in Table 19.

Table 19. Recoveries of dimethoate by method M16.01.

Commodity	Dimethoate fortification, mg/kg	Recovery, %	Reference
Avocado peel	2.2	86.5; 78.3; 72.3; 78.3; 78.9	Hargreaves *et al.*, 1982
Avocado pulp	0.48	118.9; 109.1	
	0.39	94.1	
Tomatoes	1	117; 92.4	Hamilton *et al.*, 1980
	0.5	95	
	0.4	95	Hargreaves and Jackson, 1988
Zucchini	0.4	94	

A method was described for the extraction and analysis, without clean-up, of rockmelons and cucumbers (Hargreaves and Heather, 1989). A sample (50 g) is macerated with acetone (3 x 150 ml) and filtered. The final volume is adjusted to 500 ml with acetone. An aliquot (20 ml) is mixed with water (30 ml), stripped of acetone and extracted with chloroform (1 x 100 ml, 2 x 50 ml). The combined organic extracts are concentrated to dryness and dissolved in ethyl acetate (1 ml). This extract is analysed by GLC with a 10 m HP-5 column and a flame photometric detector. The nominal limit of detection is 0.01 mg/kg. The method was validated for rockmelons at 1.5 and 0.5 mg/kg with recoveries of 92% and 97% respectively, and for cucumbers at 0.5 mg/kg, with recoveries of 100% and 101%.

Method PPQ-02 (Simpson, 1993) specifies blending the sample (50 g) with acetone (100 ml), filtration and transfer of a 50 ml aliquot to hexane/methylene chloride (100 ml, 1/1). The residual aqueous layer is saturated with sodium chloride and extracted with methylene chloride (2 x 50 ml). The combined organic fractions are dried with sodium sulfate and concentrated to 1–2 ml. The concentrated extract is analysed by GLC with a 10 m x 0.53 mm HP-5 column and flame photometric detector. The detector displayed linear response from 0.26–52 μg/ml. Confirmation is by GC-MS. The method has been validated for dimethoate only, with strawberries and sweet potatoes. Duplicate samples fortified at 0.52 and 2.1 mg/kg were analysed. The recoveries are shown in Table 20. The method has been used on cabbage, asparagus, pasture grass, strawberries and sweet potatoes, and was used for the determination of residues on litchis in the supervised trials (Table 36).

A variation of method PPQ-02 was developed by Heather, *et al.* (1987). Chopped tomato (200 g) was macerated with acetone (2 x 200 ml) and filtered. The acetone was stripped under vacuum and the residual aqueous fraction extracted with hexane (2 x 100 ml). The aqueous solution was extracted with chloroform (1 x 200 ml, 5 x 100 ml) and the combined chloroform extracts were dried and stirred with decolourising charcoal. The solution was filtered and the solvent changed to acetone. The concentrated acetone extract was analysed by GLC on a 1 m x 2 mm column packed with OV-225.

Table 20. Recoveries of dimethoate by method PPQ-02.

Sample	Fortification, mg dimethoate/kg	Recovery, %		
		First analysis	Second analysis	Mean
Strawberries	0.52	111	111	111
	2.1	111	103	107
Sweet Potatoes	0.52	107	104	106
	2.1	103	102	102
Tomato (Heather variation)	0.02	70		
Tomato (Heather variation)	0.1	73		

A method for the extraction and determination of dimethoate and omethoate in or on strawberries has been published (Goodwin, *et al.,* 1985). A chopped sample (25 g) is blended with acetonitrile and filtered. Water is added to the filtrate and the acetonitrile stripped on a rotary evaporator. The aqueous solution is extracted with chloroform (3 x 25 ml) and the chloroform replaced by hexane. The final extract is analysed by GLC on a 2 m x 0.32 mm column of OV-225 on Chromosorb W with a specific thermionic detector. The mean recovery of dimethoate and omethoate was 93 ± 2% from 0.5, 1, 1.5 and 2 mg/kg fortifications.

Stability of pesticide residues in stored analytical samples

Cheminova submitted a detailed report of a study in the USA in 1993-4 on the storage stability of dimethoate and omethoate in potato tubers, orange fruit, sorghum grain, sorghum forage and cotton seed (Williams, 1994). The commodities were stored at –20°C until homogenized, when 50 g sub-samples of each homogenate, fortified separately with either 1.0 mg/kg dimethoate or 0.5 mg/kg omethoate were stored at -20°C. Duplicate samples were analysed at intervals, together with control samples and freshly fortified samples.

Analyses were by the ABC methods detailed above. All essential details and copies of supporting chromatograms were supplied. The results are shown in Table 21.

Table 21. Storage stability of dimethoate and omethoate in frozen samples fortified at 1.0 mg/kg and 0.5 mg/kg respectively.

Commodity	Period, days	Dimethoate			Omethoate		
		Apparent recovery, %	Freshly fortified control recovery, %	Corrected storage recovery, %	Apparent recovery, %	Corrected fortified control recovery, %	Corrected storage recovery, %
Potato	0	92	92	100	93	93	100
	39	77; 81	87	91	78; 76	83	93

Commodity	Period, days	Dimethoate			Omethoate		
		Apparent recovery, %	Freshly fortified control recovery, %	Corrected storage recovery, %	Apparent recovery, %	Corrected fortified control recovery, %	Corrected storage recovery, %
	70	91; 92	96	96	91; 92	95	97
	137	85; 86	95	90	84; 89	95	91
	188	88; 89	94	95	88; 89	93	96
	620	80; 76	88	89	87; 87	93	94
Orange fruit	0	84	84	100	81	81	100
	39	87; 87	93	94	88; 80	89	95
	70	95; 110	97	106	99; 97	94	104
	137	91; 86	99	90	102; 98	101	99
	188	95; 95	97	98	102; 103	102	101
	620	92; 88	89	101	107; 112	100	110
Sorghum Grain	0	91	91	100	91	91	100
	34	88; 86	85	103	84; 33	75	78
	67	74; 72	91	80	86; 90	97	91
	137	89; 90	94	96	84; 88	94	92
	185	92; 98	97	98	92; 93	97	96
	620	71; 68	106	70	77; 79	100	78
Sorghum Forage	0	76	76	100	85	85	100
	36	79; 73	85	90	74; 73	71	104
	69	98; 94	101	95	98; 97	104	94
	139	81; 78	86	93	80; 81	91	89
	187	82; 84	86	97	86; 86	86	100
	622	65; 72	94	73	84; 96	103	90
Cotton seed	82	93; 97	97	96	44; 50	53	87
	126	88; 91	95	95	52; 46	62	79
	189	87; 87	98	89	48; 53	67	76
	623	91; 92	103	92	78; 82	101	80

Cheminova referenced, but did not supply, storage stability data on lettuce and apples.

Definition of the residue

On the basis of the metabolism of dimethoate in plants and animals, the conclusions of the 1996 JMPR on the toxicology, the available analytical methods and the lack of significant data on omethoate *per se*, the Meeting concluded that the residue for compliance with MRLs should be defined as dimethoate. For the estimation of dietary intake the residue is based on the sum of dimethoate and omethoate, each considered separately.

USE PATTERN

The DTF provided numerous labels with translations. Extensive information on GAP was supplied by Australia and some additional information by the governments of the UK, Germany, The Netherlands and Thailand. The information is summarized in Tables 22 and 23.

Table 22. Registered uses of dimethoate.

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Abius	Australia	EC 400 g/l		0.00030		Foliar	7	
Alfalfa	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.24			Ground, aerial (min 20 l water/ha)	7	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Alfalfa	Hungary	Danadim 40 EC. 400 g/l	0.40			Foliar	14	
Alfalfa	Mexico	Perfekthion EC. 400 g/l	0.40	0.0013		Foliar	10	
Alfalfa	USA	Dimethoate 400 EC. 4 lbs/gal	0.56	0.012	1 per cutting	Foliar aerial, ground	10	
Amsoi	Netherlands	Perfekthion EC. 400 g/l	0.20		Repeat as needed	Foliar	21	Outdoor cultivation
Apples	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.075 kg/100 l water		>1	Foliar	7	
Apples	Australia	EC 400 g/l		0.00060		Foliar	7	
Apples	Belgium	Hermootrox EC. 400 g/l	0.04 kg/100 l water			Foliar	21	
Apples	Italy	Danadim EC. 400 g/l	0.048 kg/100 l water			Foliar, no aerial	20	
Apples	Mexico	Perfekthion EC. 400 g/l	0.50 (125 cc/100 l)	0.00050		Foliar	28	Assumed high volume = 1000 l/ha
Apples	Netherlands	400 g/l EC	0.30	0.0002	3	Foliar	21	Perfekthion label: 50 ml/100 l water, NOT for use in glasshouse
Apples	Sweden	Danadim 40 EC. 400 g/l	0.30	0.00075	1 (after blossom)	Foliar	28	Apply at bud formation, before blossoming, or one week after blossoming
Apples	UK	40 EC. 400 g/l	0.68	0.0025 low vol.; 0.00027 high vol.	4	Foliar	35	
Apples	USA	Dimethoate 400 EC. 4 lbs/gal		0.0006 (1 pt/100 gal water)	Not specified	Foliar aerial, ground	28	
Apricots	Australia (Qld)	Saboteur EC 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Artichoke	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Asparagus	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	Wetter recommended
Asparagus	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.30; 0.32	0.00030; 0.00032		Foliar	14 (Perf)	
Asparagus	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Asparagus	Morocco	Rogor L 40 EC. 400 g/l	0.038 kg/ 100 l water			Foliar	20	
Asparagus	Netherlands	400 g/l EC	0.30	0.0006	4	At stem emergence	21	
Asparagus	USA	Dimethoate 400 EC. 4 lbs./gal.	0.56	0.012	5	Foliar aerial, ground, chemigation	180	
Avocado	Columbia	Perfekthion EC. 400 g/l	0.48	0.00048			14	Assumed high volume = 1000 l/ha
Avocado	Australia (Qld)	400 EC. 400 g/l	0.3	0.00030	Not specified	Foliar, high volume @ 1000 l/ha	7	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Avocado	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Babacos	Australia	EC 400 g/l		0.00030		Foliar	7	
Bananas	Australia (Qld, NT, NSW)	EC. 400 g/l	0.30	0.00030	Not specified	Foliar, in at least 1000 l water/ha	7	
Bananas	Australia (NSW)	Rogor Diostop EC. 400 g/l		0.0060		Dip 20–60 sec.	Post-harvest	
Bananas	Australia (Qld, NSW)	Roxion 400 EC. 400 g/l		0.00060	1	Dip 10–60 sec.	Post-harvest	
Bananas	Australia (Qld)	EC. 400 g/l	150 ml/100 l water (600 ppm)		1	Post-harvest dip		
Bananas	New Zealand	EC. 500 g/l	?	?				120 ml/100 l water
Bananas	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	
Barley	Columbia	Perfekthion EC 400 g/l	0.30			Foliar	14; 7 (fodder)	
Barley	Netherlands	400 g/l EC	0.20	0.001	1	Foliar	14	
Beans	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.22; 0.50 high vol.	0.00050 high vol.	>1	Foliar, ground and aerial (min 20 l water/ha)	20	
Beans	Australia	EC. 400 g/l	0.30	0.00030 high vol.; 0.0064 low vol.	Repeat as needed	Foliar	7	
Beans	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	Field beans
Beans	Columbia	Perfekthion EC. 400 g/l	0.30			Foliar	14	
Beans, broad	Denmark	Perfekthion 500 S EC. 500 g/l	0.30	0.00030		Foliar	14	
Beans, horse	Denmark	Danadim 40 EC. 400 g/l	0.32	0.0021		Foliar		
Beans, long	Indonesia	Perfekthion 400 EC. 400 g/l	0.20	0.00020		Foliar		Assumed high volume = 1000 l/ha
Beans	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Beans, French, broad, runner	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	0	
Beans (pulses)	Netherlands	400 g/L EC	0.20	0.001	3	Foliar	21	With and without pods
Beans, broad, French, runner	UK	40 EC. 400 g/ha	0.34	0.0016	2	Foliar	14	
Beans, green, lima, snap, dry	USA	Dimethoate 400 EC. 4 lbs/gal	0.56	0.012	Not specified	Foliar aerial, ground, chemigation	0	
Beetroot	Australia (NSW)	Roxion 400 EC. 400 g/l	0.32	0.0064 (low vol.); 0.00030 high vol. @ 1000 l/ha	Repeat as needed	Foliar	7	
Beetroot	Denmark	Perfekthion 500 S EC. 500 g/l.	0.30; 0.32	0.00030; 0.00032		Foliar	14 (Perf)	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
		Danadim 40 EC. 400 g/l						
Beetroot	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	Also applies to scorzonera root, witloof root, chicory root
Berries	Australia	400 g/l EC	0.32	0.00030 high vol.; 0.0064 low vol.	Repeat as needed	Foliar	7	
Berries	Denmark	Danadim 40 EC. 400 g/l	0.60	0.00030		Foliar		
Blackcurrant	UK	Dimethoate 40 EC. 400 g/l	0.34 low volume; 0.22 high volume	0.00062 low vol.; 0.00022 high vol.	3	Foliar	28	
Blackberries	Netherlands	400 g/l EC	0.24	0.00020	3	Foliar	21	Also raspberries
Brassica vegetables	Australia	Roxion 400 EC. 400 g/l	0.3	0.00030 high vol. @ 1000 l/ha	Not specified	Foliar	7	
Brassica vegetables	Netherlands	400 g/l EC	0.2	0.0005	3	Foliar	21	Specifies broccoli, cauliflower, head, Savoy, pointed and Chinese cabbage, kale, kohlrabi
Brassica vegetables	Thailand	400 g/l EC	0.4	0.00040	4	Foliar	14	
Brassica vegetables	UK	3.6% G (with 3.6% chlorpyrifos)	5.54 g ai/100 meters row; 1.84 kg/ha for 30 cm row spacing; at planting, transplanting; 2nd as a surface band		2	Soil incorporated; banded	28	Specifies broccoli, Brussels sprouts, cabbage, cauliflower, kale, collards, mustard, rape.
Brassica vegetables	UK	40 EC. 400 g/l	0.40	0.00040–0.00067	6	Foliar	7	
Broccoli	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	7	
Broccoli	USA	Dimethoate 400 EC. 4 lbs/gal	0.56	0.012	Not specified	Foliar ground, aerial, chemigation	7	
Brussels sprouts	Germany	400 g/l EC	0.24 0.36	0.0012 (200 l water/ha) 0.00040	2	Foliar	14	Higher rate if >50 cm
Brussels sprouts	USA (CA)	Dimethoate 400 EC. 4 lbs/gal	1.12	0.0012	6	Foliar ground, aerial	10	
Bush fruit	Denmark	Perfekthion 500 S EC. 500 g/l	0.6	0.00030		Foliar	14	
Cabbage	Columbia	Perfekthion EC. 400 g/l	0.20			Foliar	24	
Cabbage	Germany	400 g/l EC	0.24	0.00020–0.00040	2	Foliar	14	Specifies red, white, Savoy. See next entry.
Cabbage	Germany	400 g/l EC	0.4	0.002 (200 l water/ha)	1	Foliar	42	Specifies red, white, Savoy

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Cabbage	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	7	
Cabbage	Sweden	Danadim 40 EC. 400 g/l	0.0001 kg/linear m	0.0002		Directed to soil about root of plant		Use in early July
Cabbage	USA	Dimethoate 400 EC. 4 lbs/gal	0.56	0.012	Not specified	Foliar ground, aerial, chemigation	7	
Cacao	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	
Cacao	New Zealand	EC 500 g/l	?	?				120 ml/100 l
Cactus fruit	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l (400 ppm)		1	Post-harvest dip		
Canola	Australia	400 g/l EC	0.30	0.00030 @ 1000 l/ha	Repeat as needed	Foliar	14	
Canola	Australia	Roxion 400 EC. 400 g/l	165 ml/600 ml water/50 kg seed		1	Seed treatment	N/A	
Caraway seed	Netherlands	400 g/l EC	0.20	0.001	2	Foliar	21	
Carrot	Australia	EC 400 g/l	0.32	0.00030		Foliar	7	
Carrot	Germany	400 g/l EC	0.24	0.00040–0.0012	2	Foliar	14	
Carrot	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	
Carrot	Sweden	Danadim 40 EC. 400 g/l	0.0001 kg/linear m	0.0002		Irrigation preparation, directed to plant roots		
Carrot	UK	40 EC. 400 g/l	0.34 low volume	0.0016	4	Foliar	14	
Casimiroas	Australia	EC 400 g/l		0.00030		Foliar	7	
Cauliflower	Columbia	Perfekthion EC. 400 g/l	0.20			Foliar	14	
Cauliflower	Germany	400 g/l EC	0.4	0.00067; 0.002 (Danadim label; 200 l water/ha)	1	Foliar	42	
Cauliflower	Mexico	Perfekthion EC. 400 g/l	0.4			Foliar	7	
Cauliflower	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		Not specified	Foliar, ground, aerial, chemigation	7	
Celeriac	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	
Celeriac	Netherlands	400 g/l EC	0.40	0.002	2	Foliar	21	
Celery	Australia	Roxion 400 EC. 400 g/l	0.32	0.00030 (high vol. @ 1000 l/ha)	Repeat as needed	Foliar	7	
Celery	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, no aerial	20	
Celery	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	7	
Celery	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	
Celery	USA (FL)	Dimethoate 400 EC. 4 lbs/gal	0.56	0.012	Not specified	Foliar ground, aerial, chemigation	7	
Cereals	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.40			Foliar ground, aerial (min 20 l water/ha)	20	
Cereals	Australia	EC. 400 g/l	0.30 high volume; 0.036 low	0.00030 high vol.; 0.00072	Reapply as needed	Foliar	28	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
			volume	low vol. (ground boom); 0.0018 low vol. (aerial or misting machine)				
Cereals	Australia	400 EC. 400 g/l	0.30; 0.034 low volume	0.00030 high vol. @ 1000 l/ha; 0.0017 low vol. (mister)	Not specified	Foliar, boom, aerial, mister	28	
Cereals	Denmark	Danadim 40 EC. 400 g/l	0.80	0.0053		Foliar		
Cereals	Sweden	Danadim 40 EC. 400 g/l	0.32			Foliar	28	
Cereals	UK	40 EC. 400 g/l	0.34	0.0005; 0.00034	4	Foliar, ground or aerial	14 (ground) Mar. 31 (aerial)	Aerial: at least 20 l water/ha
Cherry	Australia	EC 400 g/l		0.00030		Foliar	7	
Cherry	Australia	400 g/l EC	50 ml/100L (200 ppm)		1	Post-harvest dip		
Cherry	Belgium	Hermootrox EC. 400 g/l	0.030 kg/100 l water			Foliar	14	
Cherry	Germany	400 g/l EC	0.6	0.00040	3	Foliar	21	
Cherry	Italy	Danadim EC. 400 g/l	0.048 kg/100 l water			Foliar, no aerial	20	
Cherry	Netherlands	400 g/l EC	0.3	0.0002	3	Foliar	14	Perfekthion label: 50 ml/100 l water. NOT for use in glasshouses.
Cherry	UK	40 EC. 400 g/l	0.68	0.0023 low vol.; 0.00027 high vol.	4	Foliar	21	
Cherry	USA (ID, OR)	Dimethoate 400 EC. 4 lbs/gal	1.12	0.0024	1	Foliar ground	21	
			0.28	0.0003	1			
Cherry	USA (ID, WA, OR)	Dimethoate 400 EC. 4 lbs/gal		0.0006	1	Foliar ground	≥7 days post-harvest	
Chickpeas	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	21	
Chicory – see Witloof								
Chilli peppers	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Chilli peppers	Indonesia	Perfekthion 400 EC. 400 g/l	0.20	0.00020		Foliar		Assumed high volume = 1000 l/ha
Chilli peppers	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	21	
Chokos	Australia	EC. 400 g/l	0.30	0.00030				
Citrus	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.75	0.00075	>1		20	
Citrus (except Meyer Lemons, Seville Oranges and Kumquats)	Australia	EC. 400 g/l	0.30	0.015 low vol. (misting machine or aerial); 0.00060 high vol.	Repeat as needed	Foliar	7	
Citrus	Columbia	Perfekthion EC. 400 g/l	1.2	0.0012			14	Assumed high volume = 1000 l/ha
Citrus	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Citrus	Morocco	Perfekthion EC. Rogor L 30 EC. 400 g/l	0.048-0.10 kg/100 l water			Foliar	21; 20	
Citrus	Reunion	Perfekthion EC. 400 g/l	100 ml/100 l water			Foliar	15	Do NOT apply to rough lemon or Seville oranges
Citrus	Thailand	400 g/l EC	0.85	0.0004			14	
Citrus	USA	Dimethoate 400 EC. 4 lbs/gal		0.00060	2 (for mature fruit)	Foliar ground		
			2.24	0.048	2 (for mature fruit)	Foliar aerial		
Citrus	USA	Dimethoate 400 EC. 4 lbs./gal		0.00090	2 (for mature fruit)	Foliar ground	45	
Citrus	USA (CA, AZ)	Dimethoate 400 EC. 4 lbs/gal		0.0060	Not specified	Foliar ground, in year trees first bear fruit	Not specified	
Citrus	USA (CA, AZ)	Dimethoate 400 EC. 4 lbs/gal	2.24		Not specified	Soil drench in furrow about trees		Do not apply to trees that bear fruit within one year
Citrus	New Zealand	EC 500 g/l	?	?				80 ml/100 l
Clover	Australia	EC 400 g/l	0.30	0.00030		Foliar	1 (pregraze)	
Clover	Australia	Saboteur EC. 400 g/l	600 ml in 2 L of water/100 kg seed		1	Seed treatment	Not applicable	Do not use for animal feed.
Coffee	Argentina	Perfekthion EC. 400 g/l	1.0	0.0010		Foliar		Assumed high volume = 1000 l/ha
Coffee	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	
Coffee	New Zealand	EC 500 g/l	?	?				120 ml/100 l
Collards	USA	Dimethoate	0.28		Not	Foliar ground,	14	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
		400 EC. 4 lbs/gal			specified	aerial, chemigation		
Cotton	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.16			Ground, aerial (min 20 l water/ha)	14	
Cotton	Australia (NSW, WA, Qld)	400 EC. 400 g/l	0.30	0.004-0.0003 ground boom; 0.01 mister or aerial	Repeat as needed	Foliar	14	
Cotton	Mexico	Perfekthion EC. 400 g/l	0.60			Foliar	14	
Cotton	Morocco	Rogor L 40 EC. 400 g/l	0.038 kg/100 l water			Foliar	20	
Cotton	Reunion	Perfekthion EC. 400 g/l	0.40			Foliar	15	
Cotton	USA (CA, AZ)	Dimethoate 400 EC. 4 lbs/gal	0.56		2	Foliar ground, aerial, chemigation	14	
Cotton	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Multiple at 14 day intervals	Foliar	14	
Courgettes	Netherlands	Perfekthion EC. 400 g/l	0.20		Repeat as needed	Foliar	21	
Cowpea	Australia (NSW)	Roxion 400 EC. 400 g/l	0.32	0.0064 for ground boom; 0.016 for ground mister	2 (pre--bloom to full flowering)	Foliar	7	
Crucifers	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.30; 0.32	0.00030; 0.0021		Foliar	14 (Perf)	Such as cabbage, mustard, cauliflower (Perfekthion)
Cucumbers	Hungary	Danadim 40 EC. 400 g/l	0.48			Foliar	14	
Cucumber	Thailand	400 g/l EC	0.4	0.0008	`	Foliar	14	
Cucurbits	Australia	EC. 400 g/l	0.30	0.00030 high vol. @ 1000 l/ha	Repeat as needed	Foliar	1; 7 (NSW)	
Currants	Australia	EC 400 g/l		0.00030		Foliar	7	
Currants	Hungary	Danadim 40 EC. 400 g/l	0.32			Foliar	14	
Currants	Netherlands	400 g/l EC	0.24	0.0002 0.002 (1/3-1/11)	3	Foliar	21	Specifies black, red, white and gooseberries. Perfekthion label: 50 ml/100 l water. NOT for use in glasshouse.
Currants	Sweden	Danadim 40 EC. 400 g/l	0.2	0.0002		Foliar	28	Apply before blossoming or within one week after blossoming stops
Custard apples	Australia (Qld, NT)	Roxion 400 EC. Saboteur EC. 400 g/l	0.30	0.00030 high vol. @ 1000	Repeat as needed, usually	Foliar, high volume	7	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
				l/ha	late season			
Custard apples	Australia (Qld)	Saboteur EC. 400 g/l	100 ml /. 100 l (400 ppm)		1	Post-harvest dip.	7	Not for food/feed in NSW
Duboisa	Australia (Qld)	Saboteur EC. 400 g/l	0.30	0.003 high vol. @ 1000 l/ha	Repeat as needed, 7–10 day interval	Foliar	None specifi ed	
Egg plant	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l (400 ppm)		1	Post-harvest dip		
Endive	Netherlands	Perfekthion EC. 400 g/l	0.20			Foliar	21	Outdoor cultivation only.
Endive (escarole)	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Feijoas	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l (400 ppm)		1	Post-harvest dip		
Fennel	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	
Figs	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l (400 ppm)		1	Post-harvest dip		
Fruit	Switzerland	400 g/l EC	0.0004 kg/l (0.1%)			Foliar	21	
Fodder beet	Germany	400 g/l EC	0.16	0.00027	1	Foliar	35	
Fodder beet	Netherlands	400 g/l EC	0.40	0.002	3	Foliar		
Fodder beet	Switzerland	400 g/l EC.		0.0004 kg/l (0.1%)		Foliar	42	Last application before flowering
Forage crops	Australia	EC 400 g/l	0.30	0.00030				
Fruit trees	Morocco	Rogor L 40 EC. 400 g/l Perfekthion EC	0.048–0.06kg/100 l water			Foliar	20	Apricots, peaches
Fruits with seeds	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	Pome fruit ?
Garbanzo beans	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		Not specified	Foliar, ground, aerial, chemigation	0	
Gherkins	Australia	EC. 400 g/l	0.30	0.00030		Foliar	1	
Gooseberries	Sweden	Danadim 40 EC. 400 g/l	0.20	0.0002		Foliar	28	Apply before blossoming or within one week after blossoming stops
Grain	Denmark	Perfekthion 500 S EC. 500 g/l	0.75	0.00075		Foliar	14	
Granadillas	Australia	EC. 400 g/l		0.00030		Foliar	7	
Grapefruit	Mexico	Perfekthion EC. 400 g/l	0.80 (200 cc/100 l water)	0.00080		Foliar	15	Assumed high volume = 1000 l/ha
Grapes	Australia (Queens-land)	Roxion 400 EC. Saboteur EC. 400 g /L	0.30	0.00030 high vol. @ 1000 l/ha	Not specified	Foliar, high volume	7	
Grapes	Hungary	Danadim 40 EC. 400 g/l	0.32			Foliar	14	
Grapes	Hungary	Rogor L40 EC. 400 g/l		0.0004		Foliar	14 (7?)	
Grapes	Mexico	Perfekthion EC. 400 g/l	0.60			Foliar	27	
Grapes	Morocco	Rogor L 40 EC. 400 g/l		0.00048		Foliar	21	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Grapes	Netherlands	400 g/l EC	0.30 (1/3–1/11) 0.24	0.0002	3	Foliar	28 (1/3-1/11) 21	
Grapes	USA (CA)	Dimethoate 400 EC. 4 lbs/gal	2.24	0.00067	Repeat as needed	Foliar	28	
Grass	Denmark	Danadim 40 EC. 400 g/l	0.80	0.0053				
Grass	Netherlands	Perfekthion EC. 400 g/l	0.20	0.0013		Foliar		Grass grown for seed.
Grass	USA (ID, OR, WA)	Dimethoate 400 EC. 4 lbs/gal			Not specified	Foliar	Not specifi ed.	Grass grown for seed only
Green-leafed vegetables	Denmark	Perfekthion 500 S EC. 500 g/l	0.30	0.00030		Foliar	21	Such as lettuce, spinach, Chinese cabbage, kale.
Guavas	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water. (400 ppm)		1	Post-harvest dip		
Hops	Hungary	Rogor 40L EC. 400 g/l	0.0002 kg per plant (0.5 L of a 0.1% solution)			Foliar	14	
Hops	UK	Dimethoate 40 EC. 400 g/l	0.34 high volume	0.00034	8	Foliar	14	Fuggles variety only
Kale	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Kiwifruit	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Kohlrabi	Denmark	Danadim 40 EC. 400 g/l	0.32	0.0021				
Leafy vegetables	Australia	400 g/l EC	0.32	0.00030 high vol. @ 1000 l/ha; 0.0064–0.016 low vol.	Repeat as needed	Foliar	7	Specifies cole crops, lettuce, silverbeet, beet, celery.
Leafy vegetables	Denmark	Danadim 40 EC. 400 g/l	0.32	0.00032		Foliar		
Leek	Netherlands	400 g/l EC	0.40 (0.20)	0.001	2 (3)	Foliar	21	
Legumes - pasture and fodder	Australia	EC 400 g/l	0.30	0.00030		Foliar	1 (pregra ze)	
Legumes – seed	Australia	EC 400 g/l	0.32	0.00030		Foliar	1 (pregra ze)	
Legume vegetables	Thailand	400 g/l EC	0.30	0.00040	8		14	
Lemons	Mexico	Perfekthion EC. 400 g/l	0.80 (200 cc/100 l water)	0.0080		Foliar	15	Assumed high volume = 1000 l/ha
Lentils	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.30				20	
Lentils	Australia	EC. 400 g/l	0.04			Foliar	7	
Lentils	USA	Dimethoate 400 EC. 4 lbs. gal	0.56		2	Foliar, ground, aerial, chemigation	14	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Lettuce	Australia	Roxion 400 EC. 400 g/l	0.32 low volume; 0.30 high volume	0.00030 high vol.; 0.0064 low vol.	Repeat as needed.	Foliar	7	
Lettuce	Columbia	Perfekthion EC. 400 g/l	0.20			Foliar	14	
Lettuce, Head	Germany	400 g/l EC	0.24	0.00020–0.00040	2	Foliar	21	
Lettuce	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	21	
Lettuce, Head	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	Also crisphead lettuce
Lettuce	UK	40 EC. 400 g/l	0.34	0.0016 low vol.; 0.00034 high vol. @ 1000 l/ha	1	Foliar	28	
Lettuce, Head	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	7	
Lettuce, Leaf	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Leucaena	Australia	EC. 400 g/l	0.14			Foliar	1 (pre-graze)	
Linseed	Australia	EC. 400 g/l	0.30	0.00030		Foliar	14	
Litchi (lychees)	Australia	EC. 400 g/l	0.1 l/100 l	-		Post-harvest dip	0	
Litchi (lychees)	Australia (Qld, NSW)	EC. 400 g/l	75 ml/100 l water (300 ppm)		1	At-plant dip	N/A	Plants immersed in mixture for one min before planting. Some labels also specify persimmons and Chinese gooseberries
Loquats	Australia (Qld)	Saboteur EC. 400 g./L	100 ml/100 l water. (400 ppm)		1	Post-harvest treatment		
Lucerne	Australia	EC. 400 g/l	600 ml in 1.8 l of water/100 kg seed		1	Seed treatment	Not appli-cable	
Lucerne	Australia	Roxion 400. 400 g/l EC	0.30 high volume; 0.15 low volume	0.003 low vol. (ground boom); 0.008 low vol. (aerial or misting machine) ; 0.00030 high vol.	Repeat as needed	Foliar	1	
Lucerne	Netherlands	400 g/l EC	0.20	0.001	2	Foliar		
Lupins	Australia	400 g/l EC	0.32	0.016 low vol. (ground misting); 0.0064 low vol.		Foliar	14	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
				(ground boom)				
Lupins	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		2	Foliar, ground, aerial, chemigation	0	
Maize	Australia	EC. 400 g/l	0.20			Foliar	28	
Maize	Columbia	Perfekthion EC. 400 g/l	0.24			Foliar	14	
Maize	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.30; 0.32	0.00030; 0.0021		Foliar	14 (Perfek-thion)	
Maize	Hungary	Rogor 40L EC. 400 g/l	0.80			Foliar	14	
Maize	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	14	
Maize	Netherlands	400 g/l EC	0.20	0.001	1	Foliar		
Maize	Reunion	Perfekthion EC. 400 g/l	0.32			Foliar	15	
Maize	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		3	Foliar, ground, aerial, chemigation	14	
Mango	Australia	Roxion 400 EC. Saboteur EC. 400 g/l	0.30	0.00030	Not specified	Foliar	7	
Mango	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip	7	
Marrows	Australia	EC. 400 g/l	0.30	0.00030		Foliar	1	
Mate	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.30			Foliar, ground, aerial (min 20 l water/ha)	7	
Medics	Australia	EC. 400 g/l	0.30	0.00030		Foliar	1 (pre-graze)	
Melons	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	3	
Melons	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		Not specified	Foliar, ground, aerial, chemigation	3	
Mulberries	Australia	EC. 400 g/l		0.00030		Foliar	7	
Mustard	Australia	EC. 400 g/l	0.30	0.00030		Foliar	14	
Mustard greens	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Nectarine	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Oats	Columbia	Perfekthion EC. 400 g/l	0.30			Foliar	14; 7 (fod-der)	
Oats	Netherlands	400 g/l EC	0.2	0.001	1	Foliar	14	
Oil seeds	Australia	EC. 400 g/l.	0.30 high vol.; 0.14 low vol.	0.00030 high vol.; 0.003 low vol. (ground boom): 0.007 low vol. (aerial or misting machine)	Not specified	Foliar	14	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Olives	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.075 kg/100 l water			Foliar ground, aerial (min 20 l water/ha)	20	
Olives	Italy	Danadim EC. 400 g/l	0.060 kg/100 l water			Foliar, no aerial	20	
Olives	Morocco	Rogor L 40 EC. 400 g/l. Perfekthion EC	0.056 kg/100 l water			Foliar	20	
Olives	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	
Onions	Australia	EC. 400 g/l	0.30	0.00030		Foliar	7	
Onions	Denmark	Perfekthion 500 S EC. 500 g/l	0.32	0.00030		Foliar	14	
Onions	Germany	400 g/l EC	0.24	0.00020–0.00040	2	Foliar	14	
Onions	Denmark	Danadim 40 EC. 400 g/l	0.32	0.00032		Foliar		
Onions	Netherlands	Perfekthion EC. 400 g/l	0.40				21	Spring; 1st year sets; 2nd year sets; picklers; silver-skin; shallots; leeks
Onions	Sweden	Danadim 40 EC. 400 g/l	0.0001 kg per linear m	0.0002		Irrigation preparation		
Onions	Sweden	Danadim 40 EC. 400 g/l	0.1% (400 ppm)			Dip		Dip sets for 15 minutes before planting
Oranges	Australia	EC	400 mg /L		1	Dip	0	Queensland only
Oranges	Mexico	Perfekthion EC. 400 g/l	0.80	0.00080		Foliar	15	Assumed high volume = 1000 l/ha
Pak Choi	Netherlands	Perfekthion EC. 400 g/l	0.20		Repeat as needed	Foliar	21	Outdoor cultivation only.
Passion fruit	Australia	Roxion 400 EC. Saboteur EC. 400 g/l	0.30	0.00030	Not specified	Foliar	7	
Oranges	Indonesia	Perfekthion 400 EC. 400 g/l	0.80	0.00080		Foliar		Assumed high volume = 1000 l/ha
Oranges	Mexico	Perfekthion 400 EC. 400 g/l	0.80 (200 cc/100 l water)			Foliar		Assumed high volume = 1000 l/ha
Parsnips	Australia	EC. 400 g/l	0.32	0.00030		Foliar	7	
Passion fruit	Australia	EC. 400 g/l		0.00030		Foliar	7	
Passion fruit	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Pasture	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.40		>1		7	Apply early morning or late evening.

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Pasture	Australia	400 EC.	0.30	0.0060 low vol. (ground boom); 0.015 low vol. (aerial or misting machine) 0.00030 high vol.	Repeat as needed	Foliar	1 (pre-gra-zing)	
Pasture	Denmark	Perfekthion 500 S EC. 500 g/l	0.75	0.00075		Foliar	14	
Paw paw	Australia	Roxion 400 EC. Saboteur EC. 400 g/l	0.30	0.00030 high vol.	Not specified	Foliar	7	
Paw paw	Australia (Qld)	Saboteur EC. 400 g/l.	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Peanuts	Australia (Qld, NSW)	Roxion 400 EC. Saboteur EC. 400 g/l	0.14	0.0027 low vol.	Not specified	Foliar	7 or 14	
Peanuts	Australia	EC. 400 g/l	0.30	0.00030		Foliar	14	
Peanuts	Reunion	Perfekthion EC. 400 g/l	0.40			Foliar	15	
Peanuts	New Zealand	EC 500 g/l	0.40	?				
Peach	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.050 kg/100 l water			Foliar ground, aerial (min 20 l water/ha)	20	
Peach	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Peach	Hungary	Rogor 40 L EC. 400 g/l	0.004 kg/10 L water			Foliar	7	
Peach	Italy	Danadim EC. 400 g/l	0.048 kg/100 l water			Foliar, no aerial	20	
Pear	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.075 kg/100 l water		>1	Foliar ground, aerial (min 20 l water/ha)	7	
Pear	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Pears	Italy	Danadim EC. 400 g/l	0.048 kg/100 l water			Foliar, no aerial	20	
Pears	Mexico	Perfekthion EC. 400 g/l	0.50	0.00050		Foliar	28	
Pears	Netherlands	400 g/l EC	0.3	0.0002	3	Foliar	21	Perfekthion label: 50 ml/100 l water. Not for use in glasshouses
Pears	UK	Dimethoate 40 EC. 400 g/l	0.68 low volume; 0.34 high volume	0.0025 low vol.; 0.00034 high vol.	4	Foliar	35	
Pears	USA	Dimethoate 400 EC. 4 lbs/gal		0.00060	Not specified	Foliar, ground, aerial	28	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Peas	Australia	Saboteur EC. 400 g/l	0.32	0.00030 high vol.; 0.0064 low vol.	Repeat as needed	Foliar	7	
Peas	Australia	Roxion 400. Saboteur EC. 400 g/l	300 ml/900-1000 ml water/50 kg seed		1	Seed treatment	N/A	
Peas	Australia	Roxion 400. 400 g/l	0.32	0.00030	Not specified	Foliar	7	
Peas	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	
Peas	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.30; 0.32	0.00030; 0.0021		Foliar	14 (Perf)	
Peas	Hungary	Danadim 40 EC. 400 g/l	0.40			Foliar	14	
Peas	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Peas	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	Dry peas and dry dwarf beans. Field beans for silage.
Peas	UK	40 EC. 400 g/l	0.34	0.00076-0.00034	6	Foliar	14	Aerial application: 25-60 l water/ha
Peas	USA	Dimethoate 400 EC. 4 lbs/gal	0.19		1	Foliar, ground, aerial, chemigation	0 (21 day grazing /hay restric-tion)	
Pecans	USA	Dimethoate 400 EC. 4 lbs/gal	0.37		Not specified	Foliar, ground, aerial	21	
Pepinos	Australia (Qld)	Saboteur EC. 400 g/l	100 ml /100 l water (400 ppm)		1	Post-harvest dip		
Peppers	Australia	Saboteur EC. 400 g/l	0.30	0.00030 high vol.; 0.0060 low vol.	Not specified	Foliar	7	
Peppers	Australia	Roxion 400 EC. 400 g/l	0.30	0.00030 high vol.; 0.0060 low vol.	Repeat as needed	Foliar	7	
Peppers	Australia	. 400 g/l	400 ppm			Dip		Queensland
Peppers	Hungary	Danadim 40 EC. 400 g/l	0.40			Foliar	14	
Peppers	USA	Dimethoate 400 EC. 4 lbs/gal	0.37		Not specified	Foliar, ground, aerial, chemigation	0	
Persimmons	Australia (Qld)	Saboteur EC. 400 g/l	100 ml /100 l water. (400 ppm)		1	Post-harvest dip		
Pigeon peas	Australia	EC. 400 g/l	0.32			Foliar	7 or 14	
Pineapple	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	
Pineapple	Australia	EC. 400 g/l		0.044		Foliar	14	
Pineapple	New Zealand	EC 500 g/l	?	?				120 ml/100 l

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Plum	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Plum	Belgium	Hermootrox EC. 400 g/l	0.020 kg/100 l water			Foliar	21	
Plum	Germany	400 g/l EC	0.6	0.00040	3	Foliar	14	
Plum	Hungary	Rogor 40L EC. 400 g/l	0.004 kg/10 l water			Foliar	7	
Plum	Netherlands	400 g/l EC	0.3	0.0002 (0.002 for 1/3-1/11)	3	Foliar	21 (28 for 1/3–1/11)	Perfekthion label: 50 ml/100 l water. NOT for use in glasshouses
Plum	UK	Dimethoate 40 EC. 400 g/l	0.68 low volume; 0.34 high volume	0.0025 low vol.; 0.00034 high vol.	4	Foliar	21	
Pome fruit	Australia (NSW)	400 EC. 400 g/l	0.60	0.00060 high vol.	Not specified	Foliar	7	
Pome fruit	Australia	400 EC. 400g/l	0.30	0.00030 high vol.	Repeat at 3 week intervals as needed	Foliar	7	
Pome fruit	Denmark	Perfekthion 500 S EC. 500 g/l. Dandim 40 EC. 400 g/l	1.0	0.00050		Foliar	14 (Perf)	
Pome fruit	Germany	400 g/l EC	0.6	0.00040	3 (5 Danadim label; 0.1% per app)	Foliar	21	
Pome fruit	Hungary	Danadim 40 EC. 400 g/l	0.32			Foliar	14	
Pome fruit	Hungary	Rogor L40 EC. 400 g/l	0.004 kg/10 L water			Foliar	14	
Pomegranate	Australia (Qld)	Saboteur EC. 400 g/l	100 ml/100 l water (400 ppm)		1	Post-harvest dip		
Poppy seed	Netherlands	400 g/l EC	0.20	0.001	2	Foliar	21	
Potatoes	Australia	Roxion 400 EC. Saboteur EC. 400 g/l	0.30	0.00030 high vol.; 0.0060 low vol.	Repeat as needed	Foliar	7	
Potatoes	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	
Potatoes	Columbia	Perfekthion EC . 400 g/l	0.30			Foliar	14	
Potatoes	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.30; 0.32	0.00030; 0.0021		Foliar	14 (Perf)	
Potatoes	Germany	EC. 400 g/l	0.24	0.00040	1	Foliar	14	
Potatoes	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar		
Potatoes	Netherlands	400 g/l EC	0.20	0.001	4 (10 day interval)	Foliar	21	
Potatoes	UK	40 EC. 400 g/l	0.34	0.0016 low vol.; 0.00034 high vol.	2 (7 for seed potatoes only)	Foliar	June 30	Aerial application: 25-60 l water/ha
Potatoes	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		Not specified	Foliar, ground, aerial, chemigation	0	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Quince	Australia	400 g/l EC	0.6	0.0006 @ 1000 l/ha	3	Foliar	7	
Rape	Australia	Roxion 400 EC. 400 g/l	165 ml/600 ml water/50 kg seed		1	Seed treatment	N/A	
Rape	Australia	Saboteur EC. 400 g/l	600 ml in 2 L of water/100 kg seed		1	Seed treatment	Not applica ble	See oilseed
Raspberries	Hungary	Danadim 40 EC. 400 g/l	0.32			Foliar	14	
Raspberries	UK	Dimethoate 40 EC. 400 g/l	0.68 low vol.; 0.22 high vol.	0.0013 low vol.; 0.00022 high vol.	4	Foliar	21	
Red beet	Australia	EC. 400 g/l	0.32	0.00030		Foliar	7	
Red beet/	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	Specified as "beet"
Red beet	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.75–0.80	0.0053		Foliar	14 (Perf.)	
Red beet/	Morocco	Rogor L 40 EC. 400 g/l Perfekthion EC	0.028 kg/100 l water 0.20 (Perfekthion)			Foliar	20	
Red beet	Reunion	Perfekthion EC. 400 g/l	0.32			Foliar	15	
Red beet/	UK	Dimethoate 40 EC. 400 g/l	0.40	0.00089 low vol.	2	Foliar	30	Aerial appli-cation: 25-60 l water/ha
Rhubarb	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	
Rice	Reunion	Perfekthion EC. 400 g/l	0.32			Foliar	15	
Rice	New Zealand	EC 500 g/l	0.32	?				
Root vegetables	Australia	EC. 400 g/l	0.30	0.015-0.006 low vol.; 0.00030 high vol.	Repeat as needed	Foliar	7	
Rye	Germany	400 g/l EC	0.24	0.00040	1	Foliar, up to stage 55 (mid-head shooting)	21	
Rye	Netherlands	400 g/l EC	0.20	0.001	1	Foliar	14	
Safflower	Australia	EC. 400 g/l	0.30	0.00030		Foliar	14	
Safflower	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	14	
Safflower	USA (CA, AZ)	Dimethoate 400 EC. 4 lbs/gal	0.73		2	Foliar, ground, aerial, chemigation	14	
Salsify	Netherlands	Perfekthion EC. 400 g/l	0.20		Repeat if needed	Foliar	21	Pen cultivation
Santols	Australia	EC. 400 g/l		0.00030		Foliar	7	
Sapodillas	Australia	EC. 400 g/l		0.00030		Foliar	7	
Scarole	Netherlands	400 g/l EC	0.20	0.001	3	Foliar	21	
Silverbeet	Australia	Roxion 400 EC. 400 g/l	0.30 high volume; 0.32 low volume	0.0064 low vol.; 0.00030 high vol.	Repeat as needed	Foliar	7	
Sorghum	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.40			Foliar, ground, aerial (min 20 l water/ha)	20; 7 (fod-der)	
Sorghum	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	28	

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Sorghum	Reunion	Perfekthion EC. 400 g/l	0.32			Foliar	15	
Sorghum (milo)	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		3	Foliar, ground, aerial, chemigation	28	
Soya beans	Argentina	Perfekthion S EC. 50 g/cm^3	0.60			Foliar, ground and aerial (min 20 l water/ha)	14	Use after flowering
Soya beans	Australia	Roxion 400 EC. 400 g/l	0.30	0.00030 high vol.; 0.0060 low vol.	Repeat as needed	Foliar	7	
Soya beans	Columbia	Perfekthion EC. 400 g/l	1.2	0.0012		Foliar	14	Assumed high volume = 1000 l/ha
Soya beans	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	21	
Soya beans	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		Not specified	Foliar, ground, air, chemigation	21 (5 days for gra-zing)	
Spinach	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Spinach	Morocco	Rogor L 40 EC. 400 g/l	0.028 kg/100 l water			Foliar	20	
Spinach	Netherlands	400 g/L EC	0.20	0.001	3	Foliar	21	
Spinach	UK	Dimethoate 40 EC. 400 g/l	0.40	0.00089 low vol.	2	Foliar	June 30	Aerial application 25-60 L water /ha
Squash, Summer (courgettes)	Netherlands	400 g/l EC	0.20	0.0005	3	Foliar	2	
Stone fruit (except apricots and early peach)	Australia	400 EC. 400 g/l	0.30	0.00030 high vol.	Not specified	Foliar (typically 3)	7	
Stone fruit	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	1.0	0.00050		Foliar	14 (Perf)	
Stone fruit	Hungary	Danadim 40 EC. 400 g/l	0.32			Foliar	14	
Stone fruit	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	
Strawberries	Australia	Roxion 400 EC. Saboteur EC. 400 g/l	0.30	0.00030 high vol.	Repeat as needed (3 week intervals)	Foliar	1	
Strawberries	Denmark	Perfekthion 500 S EC. 500 g/l. Danadim 40 EC. 400 g/l	0.60	0.00030		Foliar	14 (Perf)	
Strawberries	Germany	400 g/l EC	0.4	0.00040	2	Foliar	Pre-flowe-ring; post-harvest	
Strawberries	Hungary	Danadim 40 EC. 400 g/l	0.32			Foliar	14	
Strawberries	Netherlands	400 g/l EC	0.24 (1/3-1/11) 0.20	0.0004	3		28 (1/3-1/11) 21	Perfekthion label: 50 ml/100 l water. NOT

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
								for use in glasshouses
Strawberries	UK	Dimethoate 40 EC. 400 g/l	0.34 low volume	0.00062	6	Foliar	21	
Sugar beet	Belgium	Hermootrox EC. 400 g/l	0.20			Foliar	21	Specified as “beet.”
Sugar beet	Germany	400 g/l EC	0.16	0.00027	1	Foliar	35	
Sugar beet	Hungary	Danadim 40 EC. 400 g/l	0.40			Foliar	14	
Sugar beet	Netherlands	400 g/l EC	0.40	0.002	3	Foliar		
Sugar beet	Reunion	Perfekthion EC. 400 g/l	0.32			Foliar	15	
Sugar beet	Sweden	Danadim 40 EC. 400 g/l	0.32			Foliar	28	
Sugar beet	Switzerland	400 g/l EC		0.0004 kg/l (0.1%)		Foliar	42	Last application before flowering
Sugar beet	UK	40 EC. 400 g/l	0.40	0.00089 low vol.; 0.00040 high vol.	2	Foliar	June 30	Aerial application 25-60 L water/ha
Sugar cane	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.16			Foliar, ground aerial (20 l water min/ha)		
Sugar cane	Indonesia	Perfekthion 400 EC. 400 g/l	0.80	0.00080		Foliar		Assumed high volume = 1000 l/ha
Sunflower	Australia	Roxion 400 EC. 400 g/l	0.30	0.00030 high vol.; 0.0060 low vol.	Repeat as needed	Foliar	14	
Sunflower	Australia	EC. 400 g/l	0.30	0.00030		Foliar	14	
Swede	Denmark	Perfekthion 500 S EC. 500 g/l	0.30	0.00030		Foliar	14	
Swede	UK	3.6% G, with 3.6% chlorpyrifos	5.54 g ai/100 m row; 1.84 kg ai/ha for 30 cm row spacing. 1st at planting or transplanting; 2nd as a surface band.		2	Soil incorporated; banded	2	
Sweet corn	Australia	EC. 400 g/l	0.20			Foliar	7	
Swiss chard	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Tobacco	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.90		>1	Foliar, ground, aerial (min 20 l water/ha)	14	
Tobacco	Columbia	Perfekthion EC. 400 g/l	0.20			Foliar	14	
Tobacco	Morocco	Rogor L 40 EC. 400 g/l	0.038 kg/100 l water			Foliar	20	
Tobacco	Reuniion	Perfekthion EC. 400 g/l	0.48			Foliar	15	Also, 50 ml/20 l water for seedbeds and 100 ml/20 l water for transplants
Tobacco	New Zealand	500 g/l EC	0.50			Foliar		

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
Tomatoes	Australia	EC. 400 g/l	0.30; 0.34 (low volume)	0.00030 high vol.; 0.006 low vol. (misting machine)	2–3	Foliar	7	
Tomatoes	Australia	EC. 400 g/l	400 ppm			Dip	7*	Queensland
Tomatoes	Columbia	Perfekthion EC. 400 g/l	0.30			Foliar	14	
Tomatoes	Germany	400 g/l EC	0.24 0.36 0.48	0.0012 (200 l water/ha) 0.00040 0.00040	3	Foliar, under glass	3	<50 cm 50-125 cm >125 cm
Tomatoes	Italy	Danadim EC. 400 g/l	0.06 kg/100 l water			Foliar, not aerial	20	
Tomatoes	Mexico	Perfekthion EC. 400 g/l	0.60			Foliar	-	
Tomatoes	Morocco	Rogor L 40 EC. 400 g/l	0.038 kg/100 l water			Foliar	20–21	
Tomatoes	Thailand	400 g/l EC	0.25	0.00040	5	Foliar	14	
Tomatoes	UK	Dimethoate 40 EC. 400 g/l	0.34 high volume	0.00034 high vol.	8	7		
Tomatoes	USA	Dimethoate 400 EC. 4 lbs/gal	0.56		Not specified	Foliar, ground, aerial, chemigation	7	
Turnips	UK	3.6% G with 3.6% chlorpyrifos	5.54 g ai/100 meters of row; 1.84 kg ai/ha for 30 cm row spacing. 1st at planting or transplanting; 2nd as a surface band		2	Ground incorporated; banded	28	
Turnip, roots	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Turnip, tops	USA	Dimethoate 400 EC. 4 lbs/gal	0.28		Not specified	Foliar, ground, aerial, chemigation	14	
Vegetables	Argentina	Perfekthion S EC. 50 g/100 cm^3	0.15; 0.50 high volume	0.00050 high vol.		Foliar	20; 7 (potato radish beet chicory yams kohl-rabi); 14 (onions garlic leeks)	Garden vegetables such as artichoke, broad bean, cabbage, potato, onion, tomato
Vegetables	Australia	Saboteur EC. 400 g/l	0.30	0.00030 high vol.; 0.0060 low vol.	Reapply as needed	Foliar	7	
Vegetables	Belgium	Hermotrox EC. 400 g/l	0.20			Foliar	21	Do not use on leafy vegetables. Do not use of

CLICK HERE for continue

*Post-treatment interval

Commodity	Country	formulation	Application				PHI, days	Note
			kg ai/ha	Spray concen-tration, kg ai/l	No.	Method		
								cucurbits ≤3 weeks before flowering.
Vegetables	Hungary	Rogor 40L EC. 400 g/l	0.004 kg/10 L water			Foliar	7	
Vegetables (glasshouse)	Morocco	Rogor L 40 EC. 400 g/l. Perfekthion EC	0.038 kg/100 l water.			Foliar	20	
Vegetables	New Zealand	500 g/l EC	?	?				120 ml/100 l
Vegetables	Reunion	Perfekthion EC. 400 g/l	150 ml/100 l water			Foliar	15	Carrots, cucumbers, beans, peas, onions, celery, tomatoes, cabbage, radish
Vegetables	Switzerland	400 g/l EC		0.0004 kg/l (0.1%)		Foliar	21	Mentions garlic, onion, cabbage
Walnut	Mexico	Perfekthion EC. 400 g/l	0.50	0.00050		Foliar	21	Assumed high volume = 1000 l/ha
Water melon	Indonesia	Perfekthion 400 EC. 400 g/l	0.20	0.00020		Foliar		Assumed high volume = 1000 l/ha
Watermelon	Mexico	Perfekthion EC. 400 g/l	0.40	0.00040		Foliar	3	Assumed high volume = 1000 l/ha
Wax jambus	Australia	EC. 400 g/l	0.30	0.00030		Foliar	7	
Wheat	Columbia	Perfekthion EC. 400 g/l	0.30			Foliar	14; 7 (fod-der)	
Wheat	Germany	400 g/l EC	0.24	0.00040	2	Foliar, up to stage 55 (mid-head shooting)	21	
Wheat	Mexico	Perfekthion EC. 400 g/l	0.40			Foliar	60	
Wheat	Netherlands	400 g/l EC	0.20	0.001	1	Foliar	14	Also, triticale
Wheat	Reunion	Perfekthion EC. 400 g/l	0.32			Foliar	15	
Wheat	UK	40 EC. 400 g/l	0.68 0.34	0.0031 0.00057-0.00034	4 4	Foliar, low volume Foliar, high volume	March 31 (aerial) 14 (gro-und)	Aerial application: 25-60 L water/ha
Wheat	USA	Dimethoate 400 EC. 4 lbs/gal	0.42		2	Foliar, ground, aerial	35 (grain) 14 (gra-zing imma-ture plant)	
Witloof (chicory)	Belgium	Hermootrox EC. 400 g/l	0.30			Foliar	21	
Witloof	Netherlands	400 g/l EC	0.30	0.0015	3	Foliar	21	
Witloof sprouts (chicory)	Netherlands	400 g/l EC	5.0	0.0005	1	Root tops	21	Clamp stage

Table 23. Registered uses of omethoate.

Commodity	Country	Formulation	Application				PHI, days	Note
			kg ai/ha	Spray concentration, kg ai/l	No.	Method		
Apples	Australia	EC 800 g/l	75 ml/100 l		Repeat as needed (14–21 day interval)	Foliar	7	Do not apply during flowering
Apples	Netherlands	EC 565 g/l	1.05 1.27	0.00071 0.00085	2 1	Foliar	21	
Bananas	Australia	EC 800 g/l	0.68		Repeat at needed	Foliar cover spray	4	
Canola	Australia	EC (SC) 290 g/l	2.4 l/2.5 l water/ 100 kg seed			Seed treatment		
Cereals	Australia	EC (SC) 290 g/l	0.035					
Citrus	Australia	EC 800 g/l	75 ml/100 l			Full cover spray	7	
Clover	Australia	EC (SC) 290 g/l	2.4 l/2.5 l water/ 100 kg seed					
Herbs	Australia	EC 50 g/l	60 ml/5 l water		14-21 day repeat	Foliar	7	Do not use in NSW
Legumes	Australia	EC (SC) 290 g/l	0.058					
Lucerne	Australia	EC (SC) 290 g/l	2.4 l/2.5 l water/100 kg seed			Seed treatment		
Lupins	Australia	EC 800 g/l	0.20			Full cover spray	14	
Mandarins	Australia	EC 800 g/l	65 ml/100 l		2	Full cover spray	7	
Oilseed	Australia	EC (SC) 290 g/l	0.035					
Onions	Australia	EC 800 g/l	0.56			Full cover spray	14	
Pasture	Australia	EC (SC) 290 g/l	0.058					
Peach	Netherlands	EC 565 g/l	1.05 1.27	0.00071 0.00085	2 1	Foliar	21	
Pears	Australia	EC 800 g/l	75 ml/100 l			Foliar	7	Do not apply during flowering
Pears	Netherlands	EC 565 g/l	1.05 1.27	0.00071 0.00085	2 1	Foliar	21	
Peas	Australia	EC (SC) 290 g/l	2.4 l/2.5 l water/100 kg seed			Seed treatment		
Plums	Netherlands	EC 565 g/l	1.05 1.27	0.00071 0.00085	2 1	Foliar	21	
Potatoes	Australia	EC 800 g/l	75 ml/100 l		Repeat as needed		7	
Vege-tables	Australia	50 g/l EC	60 ml/5 l water		Every 14-21 days	Foliar	7	

RESIDUES RESULTING FROM SUPERVISED TRIALS

The results of the residue trials are shown in Tables 24–55. The trials were reported in sufficient detail, with acceptable analytical information, unless otherwise noted.

The trials are reviewed in order of the Codex Alimentarius Classification of Foods and Feeds.

Citrus fruits

GAP was reported for Australia, Columbia, Italy, Mexico (lemons, oranges), Morocco, New Zealand, Reunion, Thailand and the USA.

Australia reported post-harvest trials on oranges (Noble, 1993). Oranges were dipped for 1 min in a 400 mg/l solution of dimethoate, air-dried, stored at 21°C and analysed for dimethoate 0 and 3 days after treatment. In a separate experiment, Valencia oranges were flood-sprayed with guazatine (1000 g/l, 10 sec), and 50–60 seconds later waxed with dimethoate at 400 mg/l. The oranges were dried in a drying tunnel at 32°C for 1.5 min. Samples were analysed 2 and 3 days after treatment. In a third experiment, oranges were flood-sprayed for 10 seconds with a mixture of guazatine at 1000 mg/l and dimethoate at 400 mg/l; some were then waxed. Waxed and unwaxed oranges were stored for 2 and 3 days before analysis. The analytical method was not specified. The results are shown in Table 24.

Table 24: Residues of dimethoate in or on oranges after post-harvest dip or wax treatments.

Treatment	Post-treatment interval, days	Dimethoate, mg/kg[1]			
		Peel	Pith	Pulp	Whole orange
400 mg/l dip	0	2.0	0.85	0.03	0.43
	3	2.2	0.35	0.03	0.43
Guazatine flood + Castle wax with dimethoate (400 mg/l)	2	1.4	0.24	(0.003)	0.20
	3	0.89	0.18	(0.002)	0.20
Guazatine flood + Peerless wax with dimethoate (400 mg/l)	2	0.57	0.15	(0.004)	0.22
	3	0.49	0.15	(0.003)	0.12
Guazatine (1000 mg/l) + dimethoate (400 mg/l) flood	2	0.29	0.09	(0.004)	0.09
	3	0.38	0.09	(0.004)	0.10
Guazatine (1000 mg/l) + dimethoate (400 mg/l) flood + Castle wax	2	0.92	0.16	(0.005)	0.10
	3	0.62	0.09	(0.006)	0.15
Guazatine (1000 mg/l) + dimethoate (400 mg/l) flood + milestone wax	2	0.78	0.28	(0.005)	0.17
	3	0.68	0.18	(0.01)	0.15

[1] Values in parenthesis are below the limit of determination (not specified)

GAP for Australia (Queensland only) specifies post-harvest treatment with a 400 mg/l dimethoate solution, 0-day PHI. It is a quarantine treatment only, for citrus destined for export to another state or country.

Pome fruits

GAP was reported for Argentina (apples, pears), Belgium (apples), Denmark (pome fruit), Germany (pome fruit), Hungary (pome fruit), Italy (apples, pears), Mexico (apples), The Netherlands (apples, pears), Sweden (apples), the UK (apples, pears), the USA (apples, pears), Australia (pome fruit), New South Wales), pears (Queensland, quince), Morocco (fruit trees) and Reunion (fruits with seeds).

The Netherlands reported two field trials on apples. Trees at Varik and Ophemert were treated with an EC formulation at 0.30 kg ai/ha, 1500 l water/ha. Fruits were collected 0, 7, 14 and 21 days after treatment and analysed by GLC with a flame photometric detector optimized for phosphorus. The stated limits of determination were 0.01 mg/kg for dimethoate and 0.1 mg/kg for omethoate. Germany provided summary data on one trial in which a 400 g/l EC formulation of dimethoate was applied to Boskop variety apple trees at a rate of 0.04 kg ai/ha in 1974. Three treatments were made at approximately 2-week intervals. Apple samples were collected 0, 14, 21 and 63 days after treatment. Residues were reported as the sum of dimethoate and omethoate. The DTF provided a tabular summary only of data on field trials in Germany and France (Pistel and Bleif, 1993). The results are shown in Table 25.

Table 25. Residues of dimethoate after application of EC formulation to apple trees.

Location, Year	Single application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate + Omethoate,[1] mg/kg	
Nordenstadt, Germany 1974	0.04 kg ai/hl	3	0	2.7	
			14	2	
			21	0.63	
			63	0.28	
Varik, Netherlands 1972	0.30 (1500 l water/ha)	1	0	0.16; 0.20; 0.21 (0.19)	
			7	0.10; 0.10; 0.09 (0.10)	
			14	0.06; 0.08; 0.08 (0.07)	
			21	0.03; 0.08; 0.10 (0.07)	
Ophemert, Netherlands 1972	0.30 (1500 l water/ha)	1	0	0.15; 0.20; 0.21 (0.19)	
			7	0.11; 0.10; 0.10 (0.10)	
			14	0.17; 0.19; 0.22 (0.19)	
			21	0.19; 0.15; 0.08 (0.14)	
				Dimethoate, mg/kg	Omethoate, mg/kg
Kappel, Germany 1982	0.42 (1500 l water/ha) 0.50 0.42 0.42 0.50	5	0	0.61	0.10
			7	0.38	0.10
			14	0.21	0.06
			21	0.16	0.05
			28	0.08	<0.05
Firmetsweiler, Germany 1982	0.42 (1500 l water/ha) 0.50 0.42 0.42 0.50	5	0	0.70	<0.05
			7	0.07	<0.05
			14	0.05	<0.05
			21	<0.05	<0.05
			28	<0.05	<0.05
Firmetsweiler, Germany 1982	0.42 (1500 l water/ha) 0.50 0.42 0.42 0.50	5	0	0.46	0.05
			7	0.14	<0.05
			14	0.06	<0.05
			21	<0.05	<0.05
			28	<0.05	<0.05
Rodersheim, Germany 1981	0.42–0-.50 (1500 l water/ha)	5	0	0.35	<0.05
			7	0.31	<0.05
			14	0.23	<0.05

Location, Year	Single application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate + Omethoate,[1] mg/kg	
			21	0.15	≤0.05
			28	0.07	<0.05
Niederkirchen, Germany 1981	0.42–0.50 (1500 l water/ha)	5	0	<0.05	<0.05
			7	0.10	<0.05
			14	0.09	<0.05
			21	<0.05	<0.05
			28	<0.05	<0.05
Friedelsheim, Germany 1981	0.42–0.50 (1500 l water/ha)	5	0	0.13	<0.05
			7	0.05	<0.05
			14	0.06	<0.05
			21	0.08	≤0.05
			28	<0.05	<0.05
Niederkirchen, Germany 1981	0.42–0.50 (1500 l water/ha)	5	0	0.43	<0.05
			7	0.18	0.05
			14	0.18	0.06
			21	0.26	0.06
			28	0.18	<0.05
				0.08	<0.05
Rubmaier, Germany 1981	0.42–0.50 (1500 l water/ha0	5	0	0.47	<0.05
			7	0.19	<0.05
			14	0.15	<0.05
			21	≤0.05	≤0.05
			28	0.05	<0.05
Eutin-Neudorf, Germany 1982	0.42–0.50 (1500 l water/ha)	5	0	0.32	<0.05
			7	0.07	<0.05
			14	<0.05	<0.05
			21	≤0.05	≤0.05
			28	<0.05	<0.05
Rodersheim, Germany 1982	0.6 (1500 l water/ha)	5	0	1.0	0.07
			14	0.36	0.05
			21	0.32	0.06
			28	0.34	0.07
			35	0.22	0.06
Niederkirchen, Germany 1980	0.67 (2000 l water/ha)	7	0	0.28	<0.05
			3	0.16	<0.05
			6	0.21	<0.05
			7	0.12	<0.05
			10	0.12	<0.05
			14	0.20	<0.05
			21	0.10	≤0.05
			28	0.06	<0.05
Rodersheim, Germany 1980	0.67	7	0	0.43	<0.05
			3	0.10	0.07
			6	0.32	0.05
			7	0.28	<0.05
			10	0.84	0.16
			14	0.39	0.08
			21	0.06	0.07
			28	<0.05	<0.05

[1] No omethoate (<0.1 mg/kg) was found in the samples from The Netherlands

GAP for The Netherlands specifies three treatments, each at 0.30 kg ai/ha, with a 21-day PHI. GAP for Germany on pome fruit specifies 3 applications, each 0.6 kg ai/ha or 0.04 kg/hl and a 21-day PHI. The Table entries at a 21-day PHI reflect the GAP conditions.

The DTF provided summary data for supervised field trials on pears in Germany (Pistel and Bleif, 1993). No details were provided. The results are shown in Table 26.

Table 26. Residues of dimethoate and omethoate in or on pears from the foliar application of an EC formulation in Germany.

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Meckenheim, 1982/ Williams Christ	0.42 0.50 (1500 l water/ha)	5	0	0.85	0.17
			7	0.35	0.19
			14	<0.05	0.15
			21	≤0.05	0.13
			28	<0.05	0.08
Meckenheim, 1982/ Williams Christ	0.60 (1500 l water/ha)	5	0	0.46	0.11
			14	0.08	0.10
			21	≤0.05	0.08
			28	<0.05	0.07
			35	<0.05	<0.05
Deisendorf, 1982/ Williams Christ	0.60 (1500 ml water/ha)	5	0	0.46	0.07
			14	0.07	0.08
			21	0.01	0.04
			28	<0.01	<0.01
			35	<0.01	<0.01
Gau-Algesheim, 1982/ Alexander Lukas	0.28 (700 l water/ha)	5	0	0.42	0.23
			14	0.06	0.21
			21	<0.02	0.14
			28	<0.02	0.11
			35	<0.02	0.09
Kleinkarlbach, 1982/ Williams Christ	0.60 (1500 l water/ha)	5	0	0.64	0.05
			14	0.17	0.12
			21	0.03	0.05
			28	<0.01	0.01

The Netherlands reported summary supervised field trial data for the use of *omethoate* on apples. In two trials in 1971 apples were treated at 1.3 kg ai/ha, with 1500 l water/ha.. At PHIs of 0-21 days the omethoate residues were ≤0.1 mg/kg. GAP is 3 x 0.30 kg ai/ha, 21-day PHI.

Stone Fruit

GAP was reported for Australia, Belgium (cherry, plum), Denmark, Reunion, Argentina (peach), Germany (cherry, plum), Hungary, Italy (cherry), Morocco (fruit trees), The Netherlands (cherry, plum), the UK (cherry, plum) and the USA (cherry).

Cherries. Residue trials on sour cherries were reported from the USA (Karren, 1985). An EC concentrate (0.26 kg ai/l) was diluted with water (1.9 ml/l) and applied as a foliar spray at a rate of 15.1 l/tree (7.5 g ai/tree) at four locations in Utah in 1985, when ripening fruit were present. The PHI was 21 days. Samples were stored frozen until analysed, together with stored fortified controls, six months after collection by GLC with a nitrogen-phosphorus detector. The results are shown in Table 27.

Table 27. Residues in or on cherries collected ≥21 days after treatment of trees with dimethoate at 7.5 g ai/tree, Utah, USA.[1]

Location	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Total, mg/kg
1–Perry	21	0.25	0.34	0.59
	28	0.23	0.18	0.41
2–Kaysville	21	0.08	0.20	0.28[2]
	28	0.27	0.37	0.64
3–Payson	21	0.24	0.28	0.52
	28	0.05	0.41	0.46
4–Santaquin	21	0.76	0.28	1.04
	28	0.26	0.23	0.49

[1]Concurrent storage stability recovery for dimethoate: 88.4% ± 7.3 (n = 3; 0.04, 0.14, 0.23 mg/kg); for omethoate: 99.6% ± 7.4 (n = 3; 0.05, 0.16, 0.23 mg/kg)
[2]Reported as 1.28 mg/kg

US GAP specifies a foliar application to cherries at 1.12 kg ai/ha, PHI 21 days. The maximum number of cherry trees per hectare is about 1140. Thus, 7.5 g ai/tree corresponds to a maximum rate of 8.6 kg ai/ha, or 7.7 times the GAP rate. No trials were reported at the maximum GAP rate.

The DTF submitted summary data on supervised field trials with cherries in Germany (Pistel and Bleif, 1993). No details were provided. The results are shown in Table 28. GAP for the use of dimethoate on cherries in Germany is 3 x 0.6 kg ai/ha, 21-day PHI.

Table 28. Residues of dimethoate and omethoate in or on cherries from the foliar application of a dimethoate EC formulation in Germany.

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Meckenheim, 1983	0.72 (1800 l water/ha)	3	0	1.99	0.54
			14	0.14	0.47
			21	<u>≤0.05</u>	<u>0.28</u>
			28	0.05	0.14
			35	<0.05	0.20
Hollern, 1983 Schatten-Morellen	0.8 (2000 l water/ha)	3	0	3.93	0.36
			7	1.61	0.45
			14	0.72	0.48
			21	<u>0.08</u>	<u>0.28</u>
			28	0.04	0.22
Meckenheim, 1968 Hedelfinger Riesen	2 g/tree, 5–6 l water/tree	1	1	5.4	
			3	5.1	
			7	4.3	
			11	2.8	
			17	0.7	
Ingelheim, 1969 Schwarze Fruhe	2 g/tree, 5 l water/tree	3	0	0.77	0.02
			4	0.54	0.08

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
			7	0.35	0.10
			10	0.22	0.10
			14	0.07	0.10
Immenstaad, 1969 Schneiders Knorpel-Kirsche	0.8 (2000 l water/ha)	1	0	4.87	0.14
			4	1.00	0.27
			7	1.00	0.13
			10	0.58	0.19
			14	0.66	0.61
			21	0.19	0.27
Wackernheim, 1972 Hedelfinger	0.8 g/tree, 2 l water/tree	2	0	1.60	0.20
			2	1.30	0.30
			4	0.60	0.30
			10	0.30	0.50
			14	0.14	0.40
			21	0.02	0.20
Immenstaad, 1972 Schneiders Spate	0.80 (2500 l water/ha)	2	0	4.91	<0.01
			4	3.38	<0.01
			10	3.84	<0.01
			14	1.64	<0.01
			21	1.48	≤0.01
Meckenheim, 1982 Schatten-Morelle	0.60 (1500 l water/ha)	3	0	1.32	0.20
			14	0.34	0.34
			21	0.06	0.27
			28	<0.05	0.22
			35	<0.05	0.17
Kirchheim, 1982 Schatten-Morelle	0.60 (1500 l water/ha)	4	0	2.04	0.17
			14	0.37	0.08
			21	0.06	0.03
Allmannsweiler, 1982 Schatten-Morelle	0.60 (1500 l water/ha)	3	0	3.88	0.87
			14	0.27	0.12
			21	0.03	0.05
			28	<0.01	0.01
			35	<0.01	0.02
Meckenheim, 1983	0.72 (1800 l water/ha)	3	0	1.99	0.54
			14	0.14	0.47
			21	≤0.05	0.28
			28	<0.05	0.14
			35	<0.05	0.20
Schwabenheim, 1983	0.48 (1200 l water/ha)	3	0	1.74	0.41
			7	0.21	0.33
			14	0.02	0.21
			21	≤0.02	0.11
			28	<0.02	0.11
Kleinkarlback, 1983	0.48 (1200 l water/ha)	3	0	2.29	0.99
			7	1.44	0.71
			14	0.42	0.54
			21	0.13	0.46
			28	0.075	0.45

Plums. The Netherlands provided information on 4 trials with plums in 1971 (Wit, 1972). The trials were at one location with two varieties of plums and two EC dimethoate formulations (200 g/l, 400 g/l). Dimethoate was applied once at a rate of 0.30 kg ai/ha, 150 water/ha. Samples were taken 0, 7 and 14 days after treatment and analysed by GLC with a flame photometric detector optimized for phosphorus. The limit of determination was shown to be 0.01 mg/kg for dimethoate and 0.1 mg/kg for omethoate. The results are shown in Table 29. GAP for plums in The Netherlands specifies 3 applications at 0.30 kg ai/ha, PHI 21days. The 14-day PHI is more than 30% below the GAP PHI and only one application was made. None of the trials met GAP conditions.

Table 29. Residues in or on plums from the application of dimethoate in The Netherlands, 1971.

Formulation/ variety	Application rate, kg ai/ha	Volume, l water/ha	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Total, mg/kg
Rogor EC 200 g/l Monsieur hatif	0.30	150	0	0.19 (0.06; 0.23; 0.29)	<0.1	<0.29
			7	0.01 (<0.01; <0.01; 0.01)	<0.01	<0.02
			14	0.11 (<0.01; <0.01; 0.30)	<0.01	<0.12
Rogor EC 200 g/l Warwickshire drooper	0.30	150	0	0.03 (0.01; 0.05; 0.03)	<0.01	<0.04
			7	0.02 (0.02; 0.02; <0.01)	<0.01	<0.03
			14	<0.01	<0.01	<0.02
Perfekthion EC. 400 g/l Monsieur hatif	0.30	150	0	0.13 (0.12; 0.06; 0.21)	<0.01	<0.14
			7	<0.01	<0.01	<0.02
			14	<0.01	<0.01	<0.02
Perfekthion EC. 400 g/l Warwickshire drooper	0.30	150	0	0.07 (0.04; 0.14; 0.04)	<0.01	<0.08
			7	<0.01	<0.01	<0.02
			14	0.02 (0.02; 0.02; 0.01)	<0.01	<0.03

The DTF reported supervised field trials with plums in Germany (Pistel and Bleif, 1993). No details were provided. The results are shown in Table 30. GAP for the use of dimethoate on plums in Germany is 3 x 0.6 kg ai/ha, 14-day PHI.

Table 30. Residues of dimethoate and omethoate in or on plums from the foliar application of a dimethoate EC formulation in Germany

Location/Year/ Variety	Application, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Meckensheim, 1981 Orthenauer	0.50 (1500 l water/ha)	4	0	0.10	<0.05
			3	0.07	<0.05
			7	0.05	<0.05
			14	0.05	≤0.05
			21	<0.05	<0.05
Schriesheim, 1981 Haus-Zwetsche	0.50 (1500 l water/ha)	4	0	0.19	<0.05
			3	0.27	<0.05
			7	0.14	<0.05
			14	0.13	≤0.05
			21	0.14	<0.05
			28	0.11	<0.05
Friedelsheim, 1981	0.50 (1500 l	4	0	0.14	<0.05

Location/Year/ Variety	Application, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Stanley	water/ha)				
			3	0.13	<0.05
			7	0.09	<0.05
			14	0.07	<0.05
			21	<0.05	<0.05
Rodersheim, 1981 Haus-Zwetsche	0.50 (1500 l water/ha)	4	0	0.17	<0.05
			3–28	<0.05	<0.05
Ruppertsberg, 1981 Auerbacher	0.50 (1500 l water/ha)	4	0	0.06	<0.05
			3–14	<0.05	<0.05
Gleidingen, 1982 Haus-Zwetsche	0.50 (1500 l water/ha)	4	0	0.16	
			3	0.12	
			7	0.11	
			14	0.10	
			21	0.08	
Roedersheim, 1982 Stanley	0.50 (1500 l water/ha)	4	0–21	<0.05	<0.05
Immenstaad, 1982 Bühler	0.50 (1500 l water/ha)	4	0	1.49	0.11
			3	1.13	0.14
			7	0.60	0.15
			14	0.15	0.12
			21	0.09	0.13
Horgenzell Vogelsang 1982 Italiener	0.50 (1500 l water/ha)	4	0	0.16	<0.05
			3	0.06	<0.05
			7-21	<0.05	<0.05
Immenstaad, 1982 Erfinger	0.50 (1500 l water/ha)	4	0	1.78	0.08
			3	1.56	0.10
			7	1.03	0.08
			14	0.75	0.08
			21	0.75	0.06
Achern-Sasbach, 1982	0.50 (1500 l water/ha)	4	0	1.00	0.19
			3	0.74	0.18
			7	0.28	0.12
			14	0.28	0.17
			21	0.17	0.17
Heidelsheim, 1982 Italiener	0.50 (1500 l water/ha)	4	0	0.19	<0.05
			3	0.09	<0.05
			7–21	<0.05	<0.05
Weisenheim am sand, 1982 President	0.40 (1200 l water/ha)	4	0	1.41	0.16
			3	1.09	0.22
			7	0.52	0.20
			14	0.24	0.22
			21	<0.05	0.10
Rodersheim, 1983 Orthenauer	0.60 (1500 l water/ha)	4	0	0.37	0.06

Location/Year/ Variety	Application, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
			14	0.09	0.05
			21	0.06	<0.05
			28-35	<0.05	<0.05
Immenstaad, 1981 Erginger	0.50 (1500 l water/ha)	4	0	0.72	0.05
			3	0.64	0.06
			7	0.86	0.09
			14	0.46	0.07
			21	0.41	0.08
Meckenheim, 1980 Auerbach	0.67 (2000 l water/ha)	5	0	0.14	<0.05
			3	0.07	<0.05
			5	0.06	<0.05
			7	0.06	<0.05
			10–28	≤0.05	≤0.05
Ruppertsberg, 1980 Orthenhausen	1.33 (2000 l water/ha)	5	0	0.21	<0.05
			3	0.11	0.06
			5	0.10	<0.05
			7	0.12	<0.05
			10	0.06	<0.05
			14	0.06	<0.05
			21–28	<0.05	<0.05
Ludendorf, 1981 Haus-Zwetsche	0.50 (1500 l water/ha)	4	0	0.17	<0.05
			3	0.18	<0.05
			7	0.32	<0.05
			14	0.36	≤0.05
			21	0.21	<0.05
Riedersweiler, 1983 Haus-Zwetsche	0.80 (2000 l water/ha)	3	0	0.23	0.06
			7	0.13	0.05
			14	0.12	0.05
			21	0.05	0.03
			28	0.09	0.06
Meersburg, 1982 Haus-Zwetsche	0.80 (2000 l water/ha)	3	0	0.23	0.06
			7	0.13	0.05
			14	0.12	0.05
			21	0.05	0.03
			28	0.09	0.06
Ingelheim, 1982 Crydiemer	0.60 (1500 l water/ha)	3	0	0.15	0.13
			14	≤0.02	0.15
			21	<0.02	0.12
			28	<0.02	0.09
			35	<0.02	0.08
Ingelheim, 1983 Crydiemer	0.50 (1250 l water/ha)	3	0	0.49	0.10
			14	0.06	0.12
			21	0.02	0.11
			28	<0.02	0.06
			35	<0.02	0.06
Karlsruhe, 1983 Zernowitzer	0.60 (1500 l water/ha)	3	0	0.26	0.04

Location/Year/ Variety	Application, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
			14	0.13	≤0.02
			21	0.02	<0.02
			28–35	<0.02	<0.02
Hove, 1983 Buehler	0.60 (1500 l water/ha)	3	0	0.58	0.07
			14	0.11	0.09
			21	0.11	0.14
			28	<0.02	0.05
			35	<0.02	0.04

The Netherlands provided summary supervised field trial data for the use of *omethoate* on plums in two trials in 1971. Plums were treated at 1.3 kg ai/ha, with 150 l water/ha. At PHIs of 0-21 days the omethoate residues were <0.1–0.1 mg/kg. Details were provided in Dutch. GAP is 3 x 0.3 kg ai/ha, 21-day PHI. The trials were not according to GAP.

Berries and other small fruit

Blueberries. GAP was reported for Australia (berries, grapes, strawberries), Denmark (berries, strawberries), Germany (strawberries), Hungary (currants, grapes, raspberries, strawberries), the UK (blackcurrants, raspberries, strawberries), Mexico (grapes), Morocco (grapes), The Netherlands (blackberries, currants, grapes, strawberries), Sweden (currants, gooseberries) and the USA (grapes). The USA currently has no GAP for blueberries.

Field trials in the USA were reported on the application of dimethoate to blueberry bushes in Maine (1993, 2 trials), Michigan (1994), New Jersey (1994), North Carolina (1994) and Washington (1994) (Samoil, 1996). The Maine trials were with lowbush blueberries and all other trials were with highbush plants. A 480 g ai/l EC formulation was applied with mistblower or airblast sprayers at a rate of 0.37 or 0.74 kg ai/ha and berries harvested 14 or 21 days after the single application. The samples were stored frozen for 333 –689 days before analysis by GLC with a flame photometric detector optimized for phosphorus. External standards were used, with a demonstrated linear calibration range of 1–5 ng for both omethoate and dimethoate. The method was validated at 0.05 mg/kg for dimethoate (83% recovery) and omethoate (57%). The recovery of omethoate was consistently low in concurrent fortified control samples (63 ± 10%, n = 14, at 0.05 mg/kg). The recovery was no better at 0.50 or 5.0 mg/kg. The recovery of dimethoate was 93 ± 16%, n = 14, at 0.05 mg/kg. The results are shown in Table 31.

Storage stability studies were conducted, although they encompassed only 82% of the storage period in the Maine trials. The recovery of omethoate at 0.10 mg/kg was 43 and 63% after 299 days and 38 and 49% after 568 days of frozen storage, and that of dimethoate at 0.10 mg/kg was 56 and 82% after 299 days and 50 and 62% after 568 days. The recoveries were not significantly different at 1.0 mg/kg. The reported residues may therefore be understated by about 50%.

Table 31. Residues from the foliar application of dimethoate EC formulation to blueberry bushes at 0.37 or 0.74 kg ai/ha (1993-1994, USA).

Location	Application rate, kg ai/ha	PHI, days	Vol., l/ha	Storage interval from collection to analysis, days	Dimethoate, mg/kg	Omethoate, mg/kg	Total Residue,[1,2] mg/kg
Maine #1	0.37	21	230	689	0.37 (0.37; 0.26; 0.49)	0.15 (0.12; 0.08; 0.26)	0.52
Maine #1	0.74	21	230	689	0.83 (0.90; 0.60; 1.0)	0.40 (0.36; 0.24; 0.60)	1.2

Location	Application rate, kg ai/ha	PHI, days	Vol., l/ha	Storage interval from collection to analysis, days	Dimethoate, mg/kg	Omethoate, mg/kg	Total Residue,[1,2] mg/kg
Maine #2	0.37	21	230	689	0.42 (0.37; 0.48)	0.10 (0.12; 0.09)	0.52
Maine #2	0.74	21	230	689	0.68 (1.01; 0.67; 0.36)	0.29 (0.40; 0.27; 0.21)	0.97
Michigan	0.37	14	470	333	0.32 (0.25; 0.40)	0.07 (0.06; 0.08)	0.39
New Jersey	0.37	14	2340	360	0.11 (0.14; 0.08)	0.06 (0.05; 0.07)	0.17
North Carolina	0.37	14	1020	405	0.16 (0.13; 0.23)	0.08 (0.06; 0.09)	0.24
Washington	0.37	21	350	336	<0.05 <0.05; <0.05)	<0.05 (<0.05; <0.05)	<0.10

[1]Values are not corrected for probable losses during frozen storage, nor for concurrent method recoveries
[2]No residues (<0.05 mg/kg) were found in control samples

The Government of Australia reported field trials on strawberries (Goodwin, 1984; Goodwin *et al.*, 1985). Three varieties of field strawberries were sprayed four times at weekly intervals with dimethoate solutions of 0.02, 0.03 and 0.05 kg ai/hl, with three replicates of each variety. The PHIs were 0 to 21 days. The dimethoate solutions were applied with knapsack sprayers to run-off, but actual treatment rates (kg ai/ha) were not reported. Analyses were by the multi-residue method PPQ-02 (Simpson, 1993). The recovery of dimethoate at 0.5 mg/kg was 111%. The results are shown in Table 32.

GAP in Australia for strawberries allows multiple applications at 0.30 kg ai/ha at three-week intervals, with a 1-day PHI. This is equivalent to 0.03 kg ai/hl (bold entries in Table 32), assuming a high-volume application of 1000 l per hectare.

Table 32. Combined residues of dimethoate and omethoate in or on strawberries following four applications of an EC formulation in Australia.

Rate, kg ai/hl	PHI, days	Variety	Residue range, mg/kg	Mean residue, mg/kg, n = 3
0.02	0	Naratoga	2.04–2.75	2.40
	1		1.39–2.05	1.78
	2		1.50–2.34	1.83
	3		1.05–1.68	1.28
	4		0.85–1.02	0.95
	7		0.73–0.92	0.82
	14		0.18–0.51	0.33
	21		0.12–0.16	0.14
	0	Tioga	2.91–3.58	3.33
	1		1.43–3.08	2.17
	2		1.00–1.83	1.37
	3		0.61–1.45	1.03
	4		0.42–1.46	0.81
	7		0.40–0.98	0.75
	14		0.07–0.14	0.11
	21		0.03–0.08	0.06
	0	Torrey	2.39–2.98	2.69
	1		1.23–2.83	1.98
	2		1.38–1.72	1.51
	3		0.94–1.04	0.99
	4		0.34–0.68	0.54
	7		0.22–0.49	0.36
	14		0.15–0.91	0.46
	21		0.24–0.49	0.34

Rate, kg ai/hl	PHI, days	Variety	Residue range, mg/kg	Mean residue, mg/kg, n = 3
0.030	0	Naratoga	2.50–5.30	3.80
	1		**2.01–2.38**	**2.25**
	2		2.09–2.30	2.17
	3		1.59–2.00	1.78
	4		0.98–1.69	1.31
	7		0.77–1.10	0.88
	14		0.16–0.50	0.30
	21		0.27-0.36	0.31
	0	Tioga	3.77–4.08	3.91
	1		**2.86–3.50**	**3.25**
	2		1.80–2.46	2.09
	3		1.21–1.63	1.42
	4		1.05–1.78	1.35
	7		0.70–0.96	0.82
	14		0.10–0.41	0.30
	21		0.20–0.63	0.29
	0	Torrey	2.63–3.60	3.23
	1		**1.31–2.64**	**2.18**
	2		0.98–1.74	1.45
	3		0.68–1.10	0.93
	4		0.30–0.72	0.54
	7		0.15–0.58	0.37
	14		0.11–0.18	0.15
	21		0.25-0.31	0.29
0.050	0	Naratoga	4.15–5.78	5.06
	1		4.05–5.49	4.67
	2		2.15–4.72	3.74
	3		1.85–2.74	2.39
	4		1.71–2.35	1.99
	7		0.61–1.32	1.00
	14		0.23–0.60	0.44
	21		0.30–0.36	0.33
	0	Tioga	6.09–7.40	6.59
	1		4.38–5.65	4.91
	2		2.65–5.16	3.75
	3		2.40–3.13	2.73
	4		0.81–1.91	1.45
	7		0.60–0.92	0.78
	14		0.45–0.67	0.57
	21		0.19–0.61	0.33
	0	Torrey	6.38–7.92	7.25
	1		5.55–6.72	5.95
	2		2.33–4.55	3.25
	3		1.71–2.13	1.95
	4		1.38–1.96	1.68
	7		1.02–1.26	1.18
	14		0.31–0.81	0.57
	21		0.27–0.57	0.47

The DTF reported summary data on supervised field trials with grapes in Germany and France (Pistel and Bleif, 1993). No details were provided. The results are shown in Table 33. GAP for the use of dimethoate on grapes in Germany and France was not reported. GAP in The Netherlands is 3 x 0.30, 21 or 28-day PHI.

Table 33. Residues of dimethoate and omethoate in or on grapes from the application of an EC formulation.

Location Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Schwabenheim, Germany, 1972 Silvaner	0.04 kg ai/hl	2	0	1.06	0.08
			7	0.59	0.12
			14	0.35	0.12
			21	0.24	0.12
			28	0.14	0.10
Schwabenheim, Germany, 1974 Silvaner	0.04 kg ai/hl	2	0	1.09	<0.02
			14	0.34	0.06
			21	0.31	0.09
			28	0.20	0.08
Schwabenheim, Germany, 1974 Müller-Thurgau	0.04 kg ai/hl	2	0	0.82	<0.02
			14	0.356	0.06
			21	0.39	0.10
			28	0.27	0.11
Vauvert, France, 1980 Carignan	0.34 (100 l water/ha)	1	27	0.89	0.19
Ste Hilaire, France, 1980 Groslot	0.33 (100 l water/ha)	1	45	0.34	0.18
Fronton, France, 1984 Negrette	0.23 (200 l water/ha)	1	0	2.07	<0.05
			7	0.83	0.07
			14	0.53	0.08
			28	0.27	0.11
			49	0.06	0.07
Rochecarbon, France, 1984 Chenin	0.23 (400 l water/ha)	1	0	1.13	<0.05
			7	0.25	0.05
			14	0.48	<0.05
			28	0.11	0.06
			86	<0.05	0.05
Gajan, France, 1984 Carignan	0.09 (400 l water/ha)	1	0	0.37	<0.05
			7	0.13	
			14	0.10	
			28, 51	<0.05	
Carignan, France, 1984 Carignan	0.09 (400 l water/ha)	1	0	1.73	<0.05
			7	0.17	<0.05
			14	0.09	<0.05
			28	<0.05	<0.05
			49	0.06	<0.05
Salles d'Armagnac, France, 1981 Colombard	0.23 (150 l water/ha)	1	57	0.11	0.11
Milhaud, France, 1981 grenache	0.23 (150 l water/ha)	1	26	0.11	0.11
Ailleville, France, 1982 Pinot Meunier	0.3 (180 l water/ ha)	1	53	0.13	0.07
St. Lambert du Lattay, France, 1982 Gros Lot	0.23 (100 l water/ha)	1	62	<0.5	<0.05
Montreal, France, 1982 Listan	0.23 (1000 l water/ha)	1	48	<0.05	<0.05
Montreal, France, 1982 Listan	0.23 (150 l water/ha)	4	24	0.21	0.14
Vauvert, France Carignan	0.23 (1000 l water/ha)	1	17	0.18	<0.05

Location Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Vauvert, France Carignan	0.23 (100 l water/ha)	2	17	1.18	0.11
Gallargues, France, 1982 Aramon	0.83 1.0 (500 l water/ha)	2	29	<0.05	<0.05
Gallician, France, 1982 Grenache	0.83 1.0 (500 l water/ha)	2	35	0.6	0.14
Fronton, France, 1982 Gamay	0.83 1.0 (500 l water/ha)	2	33	1.21	0.41
Tours, France, 1982 Cot Sur	0.5 (300 l water/ha) 0.62 (235 l water/ha)	2	40	0.78	0.43
Tours, France, 1982 Pineau de la Loire	0.5 (300 l water/ha) 0.62 (235 l water/ha)	2	54	0.66	0.31

The DTF reported supervised field trials with currants in Germany (Pistel and Bleif, 1993). No details were provided. The results are shown in Table 34. GAP for the use of dimethoate on currants in Germany was not reported. GAP for The Netherlands is 3 x 0.24 kg ai/ha, or 0.02 kg ai/hl, 21-day PHI.

Table 34. Residues of dimethoate and omethoate in or on currants from the application of a dimethoate EC formulation in Germany.

Location, Year, Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Winterborn, 1974 Silvergieters	0.60 (1500 l water/ha)	1	0	11.2	<0.02
			7	4.5	0.60
			15	0.40	0.40
			21	0.15	0.20
Deisendorf, 1974 Silvergieters	0.86 (2000 l water/ha)	3	0	8.0	0.06
			7	4.5	0.04
			14	0.32	<0.02
			21	0.12	<0.02
			28	0.45	<0.02
Schriesheim, Germany, 1983 Rondom	0.60 (1500 l water/ha)	2	0	5.2	0.22
			14	2.4	0.38
			28	1.4	0.56
			35	0.35	0.36
			42	0.27	0.31
Schriesheim, 1982 Rondom	0.60 (1500 l water/ha)	2	0	3.7	0.29
			7	2.0	0.29
			14	1.3	0.26
			21	0.67	0.29
			28	0.17	0.11
			35	0.11	0.08
Schwabenheim, 1973 Heros	0.04 kg ai/hl	1	0	0.58	<0.02
			14	0.15	0.08
			21	0.03	0.09
Schwabenheim, 1973 Heros	0.04 kg ai/hl	1	0	0.42	0.02
			7	0.20	0.12
			14	0.08	0.14
			21	0.05	0.11
Schwabenheim, 1973 Heros	0.04 kg ai/ha	2	0	0.58	0.02
			7	0.28	0.05
			14	0.15	0.08
			21	0.03	0.10

Location, Year, Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Deisendorf, 1973 Heros	0.809 (2000 l water/ha)	1	0	2.2	0.01
			4	2.1	0.02
			7	1.1	0.02
			10	0.40	0.02
Schwabenheim, 1982 Heros	0.40 (1000 l water/ha)	2	0	0.36	0.19
			7	0.11	0.26
			14	0.05	0.21
			21	0.02	0.19
			29	0.02	0.19
Schriesheim, 1982	0.60 (1500 l water/ha)	2	0	3.7	0.29
			7	2.0	0.29
			14	1.3	0.26
			21	0.67	0.29
			28	0.17	0.121
			35	0.11	0.08
Immenstaad, 1982 Jonkher Van Tets	0.60 (1500 l water/ha)	2	0	1.4	0.02
			7	0.27	0.01
			14	0.10	0.02
			21	<0.01	0.02
			28	<0.01	<0.01
Ebersweier, 1982 Macheraus Rote Riesentraube	0.60 (1500 l water/ha)	2	0	3.1	0.07
			7	1.2	0.03
			14	0.63	0.03
			21	0.47	<0.01
			28	0.35	<0.01
Schwabenheim, 1983 Red Lake	0.52 (1300 l water/ha)	2	0	1.9	0.30
			14	0.81	0.31
			21	0.68	0.26
			28	0.32	0.18
			35	0.18	0.17
			42	0.05	0.10
Schriesheim, 1983 Rondom	0.60 (1500 l water/ha)	2	0	5.2	0.22
			14	2.4	0.38
			28	1.4	0.46
			35	0.35	0.36
			42	0.27	0.31
Immenstaad, 1983 Jonkheer Van Tets	0.60 (1500 l water/ha)	2	21	0.12	0.05
			28	0.04	0.06
			35	<0.02	0.08
			42	<0.02	0.04
Hove, 1983 Red Lake	0.60 (1500 l water/ha)	2	0	15.	0.23
			14	4.9	0.30
			28	3.7	0.21
			35	2.3	0.24
			42	1.4	0.28

Assorted tropical and sub-tropical fruits–inedible peel.

Information on GAP was supplied for Columbia (avocado), Australia (avocado, banana, custard apple, feijoa, guava, kiwifruit, mango, passion fruit, persimmon, pineapple, pomegranate), New Zealand (banana, pineapple) and Reunion (banana, pineapple).

Australia (Queensland) reported field trials on avocados (Hargreaves *et al.,* 1982f), mangoes (Hargreaves *et al.,* 1984; Swaine *et al.,* 1984a,b) and litchis (Hamilton and Priestly, 1996). All trials were with post-harvest dips or sprays. The results for avocados and mangoes are shown in Table 35 and for litchis in Table 36.

Table 35. Dimethoate residues in or on avocados and mangoes from post-harvest treatment with dimethoate.

Fruit	Treatment	Withholding period, days	Dimethoate, mg/kg			Method of analysis
			Peel	Pulp	Whole fruit[1]	
Avocado	Dip 400 mg/l	0	1.3	0.02	0.20	Separate into peel, pulp, and seeds. Macerate, extract, sweep co-distil, GLC with FPD. Omethoate destroyed by co-distillation.
		3	0.6	0.02	0.10	
		6	0.7	0.02	0.11	
	Dip 800 mg/l	0	1.5	0.04	0.24	
		3	0.9	0.03	0.21	
		6	1.1	0.01	0.16	
Mango	High volume spray, 400 mg/l	0	2.2	0.024	0.27	
		3	0.52	0.04	0.11	
		7	0.14	0.05	0.05	
	Dip 500 mg/l	0	2.4	0.10	0.49	
		7	0.40	0.025	0.088	

[1] Calculated from weights of peel, pulp and seeds

Litchis (Wai Chee variety) were treated with either a dip solution of dimethoate (315 mg/l water, total volume 100 l, made from Perfekthion EC400) or a flood spray solution (290 mg/l, total volume 230 l). Each trial was with 10 kg fruit. After treatment the litchis were drained for 5 minutes, stored in plastic bags at 22°C and sampled for analysis at intervals of 0–5 days. The samples were separated into peel, stone and pulp and each component was weighed. Pulp and peel fractions were immediately analysed by method PPQ-02, validated by the determination of omethoate and dimethoate recoveries from fortified litchi peel and pulp; the recovery range 92–102%. The limits of determination for dimethoate and omethoate were shown to be 0.02 mg/kg in the pulp and 0.10 mg/kg in the peel. The results are shown in Table 36.

Table 36. Residues of dimethoate and omethoate in or on litchis from the post-harvest treatment (dip or flood spray) with a dimethoate EC formulation (Queensland, Australia, 1996).

Treatment	Days, post-treatment	Peel, mg/kg		Pulp, mg/kg		Whole fruit[1], mg/kg
		Omethoate	Dimethoate	Omethoate	Dimethoate	Dimethoate + omethoate
Dip 315 mg/l, 1 min	0	<0.1 <0.1	7.41 7.59	<0.02 <0.02	0.07 0.05	1.9 2.1
	1	0.13 0.22 0.18 0.21	5.87 5.14 4.60 5.17	<0.02 <0.02 <0.02 <0.02	0.57 0.59 0.66 0.66	1.8 1.6 1.5 1.7
	2	0.28 0.30	4.38 3.85	0.02 0.02	0.92 0.68	1.7 1.4
	5	0.47 0.45	1.90 2.58	0.02 0.02	0.98 0.99	1.2 1.4
Flood Spray, 290 mg/l, 10 sec	0	<0.1 <0.1	5.53 4.49	<0.02 <0.02	0.08 0.08	1.3 1.2
	1	0.11 <0.1 0.17 0.14	4.05 3.76 4.22 3.94	<0.02 <0.02 <0.02 <0.02	0.40 0.43 0.45 0.46	1.2 1.2 1.3 1.3
	2	0.14 0.12	3.11 2.97	0.02 <0.02	0.62 0.52	1.2 1.0
	5	0.40 0.40	1.53 1.59	<0.02 0.02	0.66 0.67	0.91 0.92

[1] Calculated from the peel and pulp weights and their residues

GAP for Australia specifies 0.1 l of a 400 g/l EC formulation (Perfekthion EC 400) per 100 l dip, or 400 ppm. The use is limited to Queensland and the post-treatment interval is 0 days for avocado and litchi and 7 days for mango.

Bulb vegetables

Information on GAP was received for The Netherlands (leeks, onions), Denmark (onions), Germany (onions) and Sweden (onions).

Germany provided summary reports of field trials on chives and leeks. No details were given and the analytical methods were not specified. Chives at 4 locations in Germany were treated with dimethoate (1975–1976), harvested 12–32 days after treatment and analysed for residues, presumably dimethoate. Leeks treated with a 0.1% dimethoate solution at two locations (1974) were harvested 0–48 days after treatment.. The DTF provided summary data on supervised field trials with onions in Germany (Pistel and Bleif, 1993). All the results are shown in Table 37. GAP in Germany for onions specifies 2 foliar treatments with an EC formulation, each 0.24 kg ai/ha, with a 14-day PHI. GAP in The Netherlands for leeks specifies 2 foliar applications with an EC formulation, each 0.40 kg ai/ha, or 3 treatments at 0.20 kg ai/ha, PHI 21 days.

Table 37. Residues of dimethoate in or on bulb vegetables from the application of an EC dimethoate formulation in Germany.

Crop	Location/Year/ Variety	Treatment rate, kg ai/ha or as specified	Growth stage/interval	PHI, days	Dimethoate, mg/kg	
Leek	Buttelborn, 1974	0.04 kg ai/hl	Two fingers strong	0	1.17	
				7	0.05	
				14, 21, 48	<0.02	
		0.04 kg ai/hl	35 cm high	0	0.12	
				7, 14, 21, 27	<0.05	
Chive	Mainz-Bretzenheim, 1976	0.32 2 l water/m^2	Sprouting plants	12	3.5 4.1	
	Frankfurt, 1976	0.32 2 l water/m^2		32	1.7	
	Frankfurt, 1976	0.32 2 l water/m^2		25	1.1	
	Gundelfingen, 1975	0.32 2 l water/m^2		?	0.23 0.27	
	Poppenreuth, 1975	0.32 or 0.8? 2 l water/m^2		13	0.17	
					Dimethoate, mg/kg	Omethoate, mg/kg
Onion	Hamburg-Kirchwerder, 1975 Allround	0.04 2 treatments	Not specified. 82-day interval	0	0.02	<0.01
				7	0.31	0.02
				14	0.14	<0.01
				21	0.04	<0.01
	Limburgerhof, 1975 Rocket	6.4 (drenching, 16,700 l water/ha) 0.24 (spraying, 600 l water/ha)	54-day interval	0	0.20	<0.05
				7-28	≤0.05	≤0.05

Crop	Location/Year/ Variety	Treatment rate, kg ai/ha or as specified	Growth stage/interval	PHI, days	Dimethoate, mg/kg	
					Dimethoate, mg/kg	Omethoate, mg/kg
	Schwabenheim, 1982 Zittauer Gelbe	0.2 g/m (drenching; 500 ml water/m) 0.2 g/m (drenching, 500 ml water/m) 0.24 (spraying, 600 l water/ha)	 11-day interval 66-day interval	0	0.02	<0.02
				7–28	<u>≤0.02</u>	<u>≤0.02</u>
	Schwabenheim, 1975 Zittauer Gelbe Riesen	0.24 600 l water/ha	1	0	0.12	<0.02
				7	0.10	<0.02
				14–21	<u>≤0.02</u>	<u>≤0.02</u>
	Schwabenheim, 1974 Zittauer Gelbe Riesen	0.2 g/m (drenching, 500 ml water/m)	2 (105-day interval)	0	0.04	<0.02
				7	0.08	<0.02
				14	<u>0.04</u>	<u>≤0.02</u>
				21	<0.02	<0.02
	Limburgerhof, 1982 Ontario	8 (drenching, 500 ml water/m) 0.24 (spraying, 600 l/ha)	2 (80-day interval)	0	0.20	<0.05
				7-28	<u>≤0.05</u>	<u>≤0.05</u>
	Gundlingen, 1982 Hyper	8 (drenching, 500 ml/m) 8 (drenching, 500 ml/m) 0.24 (spraying, 600 l/ha)	3 11-day interval 63-day interval	0	0.01	<0.01
				7–28	<u>≤0.01</u>	<u>≤0.01</u>
	Reichenau, 1982 Hyper	8 (drenching, 500 ml/m) 8 (drenching, 500 ml/m) 0.24 (spraying, 600 l/ha)	3 11-day interval 63-day interval	0	<u>≤0.01</u>	<u>≤0.01</u>

<u>Brassica vegetables</u>

Information on GAP was provided for Australia, Thailand, the UK, Mexico (broccoli, cabbage, cauliflower), The Netherlands (broccoli, Brussels sprouts, cabbage, cauliflower, kohlrabi), the USA (broccoli, Brussels sprouts–California, cabbage, cauliflower), Germany (Brussels sprouts, cabbage), Columbia (cabbage, cauliflower), Sweden (cabbage) and Denmark (crucifers, kohlrabi).

The Netherlands reported field trials on Brussels sprouts (Ministry of Health, Welfare and Sport, 1979), Germany provided data on Brussels sprouts, cauliflower and broccoli (Federal Biological Research Centre for Agriculture and Forestry), Cheminova provided data on Brussels sprouts (USA) and the DTF supplied data on cabbage (Germany, The Netherlands) and summary information on trials on cauliflower, Brussels sprouts, white cabbage, Savoy cabbage and kohlrabi, all from Germany (Pistel and Bleif, 1993), but with no details. The DTF also reported supervised field trials in the UK on cauliflower, Brussels sprouts and cabbage (Partington, 1998). The results of all the trials are shown in Table 38.

Table 38. Residues of omethoate and dimethoate in or on brassica vegetables from the foliar application of a dimethoate EC formulations.

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
Cauliflower	Braunschweig, Germany 1983	0.24 600 l water/ha	2	0	0.79		
				7	0.08		
				14	<0.03		
				21	<0.03		
	Limburgerhof, Germany 1975 Candor	1.4 (drenching, 80 ml water/plant) 0.4 (spraying, 1000 l/ha)	2 (42 day interval)	0	0.70		Summary only
				7	0.09		
				14	0.04		
				21	<0.02		
	Limburgerhof, Germany 1974 Malinus	0.32 (drenching, 800 l water/ha) 0.32 (spraying, 800 l water/ha)	2 (49 day interval)	0	0.22		Summary only
				7	0.10		
				14	0.13		
				21	0.05		
	Schwabenheim, Germany 1973 Candor	80 mg/plant (drenching, 80 ml/plant) 0.4 kg/ha (spraying, 3100 l/ha) 0.4 kg/ha (spraying, 3100 l/ha)	3 (21 day interval) (22 day interval)	0	0.80	<0.02	Summary only
				7	0.04	0.03	
				14	<0.02	0.03	
				21	<0.02	0.05	
	Schwabenheim, Germany 1973 Candor	80 mg/plant (drenching, 80 ml water/plant) 0.4 kg/ha (spraying, 2100 l water/ha)	2 (21 day interval)	0	2.97	0.22	Summary only
				7	1.37	0.23	
				14	0.10	0.05	
				21	<0.02	0.02	
	Schwabenheim, Germany 1975 Lukra	32 mg/plant (drenching, 80 ml water/plant)	2 (47 day interval)	0	0.78		Summary only
				7	0.14		
				14	0.05		
				21	0.05		
	Limburgerhof, Germany 1974 Malinus	0.31 (800 l water/ha)	1	0	0.78		Summary only
				7	0.30		

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
				14	0.18		
				21	0.10		
	Schwabenheim, Germany 1969 Markstolz	32 mg/plant (drenching, 80 ml water/plant)	2	25	0.03	<0.02	Summary only
				30	0.02		
				35	0.02		
				42	0.02		
	Kiel, Germany 1973 Delfter Markt	80 ml/plant (drenching, 600 l/ha)	2	0	1.20	0.15	Summary only
				7	0.31	<0.01	
				14	0.17	<0.01	
				21	0.01	<0.01	
Cauliflower	Birchington, Kent, UK 1996	0.4 597-611 l water/ha	6 (7-8 day interval)	0 3 7 14 21	0.51 0.44 0.34 0.21 0.11	<0.01 <0.01 0.01 <0.01 0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 105%, O 101%. Max frozen storage 83 days.
	Kings Newton, Derbyshire, UK 1996	0.4 585-623	6 (7-8 day interval)	0 3 7 14 21	0.06 0.02 0.03 0.03 0.02	<0.01 <0.01 ≤0.01 <0.01 <0.01	DFG 236 (ethyl acetate; gel permeation). Max frozen storage 68 days.
	Gosberton Clough, Lincolnshire, UK 1996	0.4 587-620 l water/ha	6 (7 day interval)	0 3 7 14 21	0.37 0.42 0.11 0.02 <0.01	<0.01 <0.01 ≤0.01 <0.01 <0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 112, 105, 109%, O 85, 87, 100%. Max frozen storage 153 days.
	Gullane, East Lothian, UK 1996	0.4 583-603 l water/ha	6 (6-7day interval)	0 3 7 14 21	0.30 0.19 0.09 0.05 destruct	<0.01 <0.01 ≤0.01 <0.01 destruct	DFG 236 (ethyl acetate; gel permeation). Max frozen storage 130 days.
	Birchington, Kent, UK 1997	0.4 595-604 l water/ha	6 (7 day interval)	0 3 7 14 21	0.12 0.02 0.02 <0.01 <0.01	<0.01 <0.01 ≤0.01 <0.01 <0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg D 96, 84%, O 83, 70%. Max frozen storage 83 days.
	Elford, Stafford-shire, UK 1997	0.4 596-608 l water/ha	6 (7 day interval)	0 3 7 14 21	0.70 0.27 0.09 0.02 no sample	0.03 0.01 ≤0.01 <0.01 no sample	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 99%, O 107%. Max frozen storage 144 days.

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
	Friskney, Lincolnshire, UK 1997	0.4 594-601 l water/ha	6 (7 day interval)	0 3 7 14 21	0.05 0.04 0.04 0.03 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	DFG 236 (ethyl acetate; gel permeation). Max frozen storage 82 days.
	Longniddry, East Lothian, UK 1997	0.4 593-601 l water/ha	6 (7 day interval)	0 3 7 14 21	0.04 0.02 0.02 <0.01 <0.01	<0.01 <0.01 <0.01 <0.01 <0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg fortification, D recovery 108%, O recovery 109%. Max frozen storage 100 days.
Broccoli	Braunschweig, Germany 1983	0.24 600 l water/ha	2	0	0.66		
				7	0.09		
				14	<0.05		
				21	≤0.05		
Brussels sprouts	Limburgerhof, Germany 1974 Lancelot	0.32 (800 l water/ha)	2 (92 day interval)	0	0.21		Summary only
				7	0.12		
				14	0.06		
				21	0.02		
				28	<0.02		
	Swisttal, Germany 1982 Cor Valiant	0.24 (600 l water/ha)	3 (13 and 43 day inter-vals)	0	0.23	0.19	Summary only
				3	0.11	0.16	
				7	0.08	0.18	
				14	≤0.05	0.16	
				21	<0.05	0.15	
	Limburgerhof, Germany 1982 Sprout Harald	0.24 (600–900 l water/ha)	3 (14 and 67 day inter-vals)	0	1.30	0.15	Summary only
				3	0.32	0.15	
				4	0.26	0.15	
				7	0.11	0.13	
				14	0.05	0.09	
				21	0.09	0.18	
	Landshut, Germany 1982 Prinz Ascold	0.24 (600 l water/ha) 0.36 (900 l water/ha)	2 (14 day interval) 1 (41 day interval)	0	0.20	0.37	Summary only
				3	0.14	0.28	
				7	<0.05	0.61	
				14	≤0.05	0.30	
				21	<0.05	0.41	

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
	Oldenburg, Germany 1982	1.2 (0.0008 kg/l)	1	0	3.6		
				7	0.33		
				14	<0.1		
				21	<0.1		
	Hurth-Fischenich, Germany 1982	2.4 (0.0008 kg/l)	2	0	6.41		
				7	1.32		
				14	0.42		
				21	0.15		
	Berlin-Britz, Germany 1982	1.2 (0.0008 kg/l)	1	0	1.55		
				7	0.64		
				14	<0.1		
				21	<0.1		
	Hannover, Germany 1982	1.2 (0.0008 kg/la)	1	0	11.8		
			1	7	1.98		
				14	0.19		
				21	<0.1		
	Frankfurt, Germany 1982	1.2 (0.0008 kg/l)	1	0	0.27		
				7–21	<0.1		
	Mainz-Bretzenheim, Germany 1982	1.2 (0.0008 kg/l)	1	0	0.34		
				7–21	<0.1		
	Münster, Germany 1982	1.2 (0.0008 kg/l)	1	0	0.49		
				7	0.15		
				14–21	<0.1		
	Braunschweig, Germany 1982	1.2 (0.0008 kg/l)	1	0	2.09		
				7	0.41		
				14	0.15		
				21	<0.1		
	Tinte, Netherlands 1979	0.20 (1000 l water/ha)	3	7	0.07 (0.06-0.09)	0.01 (<0.01-0.02)	Method: extract with ethyl acetate; silica gel clean-up. GLC with FPD. Limits of determination: 0.005 dimethoate; 0.01 mg/kg omethoate. Dimethoate (0.11 mg/kg) 83%. Omethoate (0.13 mg/kg) 71%.
				14	0.02 (0.01-0.02)	<0.01	
				21	0.005 (<0.005-0.005)	≤0.01	
	Breda, Netherlands 1979	0.20 (1000 l water/ha)	3	7	0.05 (0.02-0.06)	<0.01	
				14	0.06 (0.03-0.10)	<0.01	
				21	0.03 (0.01-0.04)	0.01 (<0.01-0.02)	
	Kerkwijk, Netherlands 1979	0.20 (1000 l water/.ha)	3	7	0.009 (0.005-0.01)	<0.01	
				14	0.008 (0.005-0.01)	0.02 (<0.01-0.04)	
				21	0.009 (<0.005-0.02)	≤0.01	

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
	USA (Watsonville, California)	0.56 (940 l water/ha)	6	7	2.33	0.47	Method: Pesticide Analytical Manual, Vol. II. Results corrected for recoveries. Dimethoate 77–90% (0.1-4.0 mg/kg). Omethoate 80–98% (0.4–2.0 mg/kg)
				10	1.02	0.40	
				14	0.66	0.32	
		1.12 (940 l water/ha)	6	7	5.02	0.62	
				10	3.12	0.58	
				14	1.67	0.56	
Brussels sprouts	Bicker, Lincolnshire, UK 1996	0.4 591-624 l water/ha	6 (7-8 day interval)	0 3 7 14 21	0.45 0.21 0.11 0.03 0.02	0.02 0.02 0.02 <0.01 0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 108%, O 106%. Max frozen storage 86 days.
	Bicker, Lincolnshire, UK 1996	0.4 586-628 l water/ha	6 (7 day interval)	0 3 7 14 21	0.62 0.38 0.17 0.06 0.04	0.04 0.04 0.06 0.03 0.01	DFG 236 (ethyl acetate; gel permeation). Control samples showed significant dimethoate, e.g. 0.14 mg/kg at 0 days PHI. Max frozen storage 145 days.
	Gosberton clough, Lincolnshire, UK 1996	0.4 599-608 l water/ha	6 (7-8 day interval)	0 3 7 14 21	0.30 0.10 0.10 0.11 0.03	0.04 0.02 ≤0.01 <0.01 <0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 79%, O 94%. Max frozen storage 76 days.
	Longniddry, East Lothian, UK 1996	0.4 589-610 l water/ha	6 (6-7 day interval)	0 3 7 14 21	0.31 0.33 0.17 0.10 0.06	0.05 0.05 0.04 0.04 0.03	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 104, 96%, O 94, 96%. Max frozen storage 103 days.
	Ickham, Kent, UK 1997	0.4 597-612 l water/ha	6 (7 day interval)	0 3 7 14 21	0.18 0.08 0.07 0.03 0.02	0.03 0.02 0.03 0.02 0.02	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 111, 97%, O 114, 71%. Max frozen storage 69 days.

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
	Gosberton Clough, Lincolnshire, UK 1997	0.4 585-614 l water/ha	6 (7-8 day interval)	0 3 7 14 21	0.23 0.17 0.08 0.04 0.02	0.03 0.03 0.03 0.03 0.02	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 99%, O 101%. Max frozen storage 68 days.
	Friskney, Lincolnshire, UK 1997	0.4 572-601 l water/ha	6 (6-8 day interval)	0 3 7 14 21	0.40 0.23 0.21 0.11 0.04	0.06 0.04 0.08 0.07 0.04	DFG 236 (ethyl acetate; gel permeation. Max frozen storage 29 days.
	Longniddry, East Lothian, UK 1997	0.4 600-601 l water/ha	6 (7 day interval)	0 3 7 14 21	1.1 0.88 0.46 0.10 0.03	0.13 0.13 0.17 0.11 0.07	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 110, 89%, O 108, 82%. Max frozen storage 87 days.
Cabbage	Rheinland-Pfalz, Germany 1995	0.46 (333 l water/ha) 0.26 (423 l water/ha) 0.26 (417 l water/ha)	3 (1 x band; 2 x surface)	0	0.17	<0.01	Method: DFG 236. Calibration 0.02--0.75 µg/ml. Dimethoate recovery 77–105%, n = 8, at 0.01 and 1.0 mg/kg; omethoate: 70–81%, n = 8, 0.01 and 1.0 mg/kg. Variety: Wirosa, Growth stage 45 at last application.
				15	<0.01	<0.01	
				21	<0.01	<0.01	
	Rheinland-Pfalz, Germany 1995	0.46 (333 l water/ha) 0.25 (406 l water/ha) 0.60 (402 l water/ha)	3 (1 x band; 2X surface)	0	0.69	<0.01	Method DFG 236. Variety: Julius. Growth stage 43 at last application.
				14	<0.01	<0.01	
				21	<0.01	<0.01	
	Limburg, Netherlands 1995	0.42 (306 l water/ha) 0.25 (408 l water/ ha) 0.26 (420 l water/ha)	3 (1 x band; 2 x surface)	0	0.60	<0.01	Method DFG 236. Variety: Verosa. Growth stage 43 at last application
				13	<0.01	<0.01	
				19	<0.01	<0.01	
	Nord Brabant, Netherlands 1995	0.40 (296 l water/ha) 0.24 (389 l water/ha) 0.25 (409 l water/ha)	3 (1 x band; 2 x surface)	0	0.89	<0.01	Method 236. Variety: Winterkoning. Growth stage 43 at last application
				15	<0.01	<0.01	

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
				22	<0.01	<0.01	
White cabbage	Limburgerhof, Germany 1974 Dithmarscher Allerfrühester	0.32 (800 l water/ha)	2 (23 day interval)	0	1.93		Summary only
				7	0.16		
				14	0.07		
				21	<0.02		
White cabbage	Limburgerhof, Germany 1974	0.32 (800 l water/ha)	2 (23 day interval)	0	0.19		Summary only
				7	0.14		
				14	<0.02		
				21	<0.02		
White cabbage	Kiel, Germany. 1973 Weisskohl	32 mg/plant (80 ml water/plant)	2 (20 day interval)	0	1.75	0.39	Summary only
				7	0.02	0.01	
				14	0.02	0.02	
				21	<0.01	<0.01	
Savoy cabbage	Limburgerhof, Germany 1982	32 mg/plant (watering, 80 ml water/plant) 0.24 (600 l water/ha)	2 (15 day interval) (7 day interval) 2 (14 day interval)	0	1.32	0.54	Summary only.
				7	0.08	0.67	
				14	<0.05	0.53	
				21	<0.05	0.68	
				28	<0.05	<0.05	
Savoy cabbage.	Limburgerhof, Germany 1983 Grünkopf	32 mg/plant (80 ml water/plant) 0.24 (600 l water/ha)	2 (13 day interval) (4 day interval) (14 day interval)	0	2.14	0.19	Summary only
				7	0.43	0.38	
				14	<0.05	0.11	
				21	<0.05	0.09	
				28	<0.05	<0.05	
Savoy cabbage.	Limburgerhof, Germany 1983 Grünkopf	20 mg/m (watering, 30 ml water/m) 0.24 (600 l water/ha)	2 (7 day interval) (7 day interval) (14 day interval)	0	1.47	0.17	Summary only. .
				7	0.09	0.19	
				14	≤0.05	0.13	
				21	<0.05	0.12	
				28	<0.05	0.14	

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
Savoy cabbage.	Limburgerhof, Germany 1969 Frühkofp	0.04 kg ai/hl		0	2.7		Summary only. .
				12	0.05		
Savoy cabbage.	Limburgerhof, Germany 1982	32 mg/plant (80 ml water/plant) 0.24 (600 l /ha)	2 (15 day interval) (7 day interval) 2 (15 day interval)	0	1.32	0.54	Summary only. .
				7	0.08	0.67	
				14	<0.05	0.53	
				21	<0.05	0.68	
				28	<0.05	<0.05	
Savoy cabbage.	Limburgerhof, Germany 1982 Früh-Wirsing	20 mg/m (watering, 30 ml/m) 0.24 (600 l water/ha)	2 (11 day interval) (11 day interval) 2 (14 day interval)	0	0.68	0.25	Summary only. .
				7	0.05	0.30	
				14	<0.05	0.66	
				21	<0.05	0.51	
				28	<0.05	0.34	
Savoy cabbage.	Reichenau, Germany 1982 Marner Frühkopf	20 mg/m (watering, 30 ml/m) 0.24 (600 l water/ha)	2 (11 day interval) (11 day interval) (13 day interval)	0	0.14	0.03	Summary only. .
				7	0.02	<0.01	
				14–28	<0.01	<0.01	
Savoy cabbage.	Mengen, Germany 1982 Marner Grünkopf	20 mg/m (watering, 30 ml water/m) 0.24 (600 l water/ha)	2 (11 day interval) (14 day interval) 2 (13 day interval –	0	0.28	0.05	Summary only. .
				7	0.02	0.03	
				14	<0.01	<0.01	
				21	<0.01	<0.01	
				28	<0.02	<0.01	

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
Savoy cabbage.	Mengen, Germany 1982 Marner Grünkopf	32 mg/plant (80 ml water/plant) 0.24	2 (11 day interval) (14 day interval) 2 (13 day interval)	0	0.37	0.05	Summary only. .
				7	0.02	0.02	
				14	0.01	0.01	
				21	<0.01	<0.01	
				28	<0.01	<0.01	
Savoy cabbage.	Reichenau, Germany 1982 Marner Frühkopf	32 mg/plant (80 ml water/plant) 0.24 (600 l water/ha)	2 (11 day interval) (10 day interval) 2 (13 day interval)	0	0.21	0.04	Summary only. .
				7	0.01	0.02	
				14	<0.01	<0.01	
				21	<0.01	0.01	
				28	<0.01	<0.01	
Savoy cabbage.	Schwabenheim, Germany 1982 Zieglers Vorbote	209 mg/m (watering, 20 ml water/m) 0.24 (600 l water/ha)	2 (9 day interval) (10 day interval) 2 (14 day interval)	0	0.96	0.40	Summary only. .
				7	<0.02	0.378	
				14	<u>≤0.02</u>	<u>0.31</u>	
				21	<0.02	<0.02	
				28	<0.02	<0.02	
Savoy cabbage.	Schwabenheim, Germany 1983 Zieglers Vorbote	20 mg/m (watering, 30 ml water/m) 0.24 (500 l water/ha)	2 (10 day interval) (7 day interval) 2 (14 day interval)	0	1.34	0.16	Summary only. .
				7	<0.02	0.11	
				14	<u>≤0.02</u>	<u>0.17</u>	
				21	0.15	0.03	
				28	0.07	0.11	
Savoy cabbage.	Schwabenheim, Germany 1983 Zieglers Vorbote	32 mg/plant (80 ml water/plant) 0.24 (50 0 l water/ha)	2 (10 day interval) (7 day interval) 2(14 day interval)	0	0.98	0.04	Summary only. .
				7	0.04	0.03	

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
				14	0.04	0.05	
				21	<0.02	0.03	
				28	<0.02	0.03	
Savoy cabbage.	Mengen, Germany 1983 Marner Frühkopf	2 g/m (3 l water/m) 0.24 (600 l water/ha)	2 (10 day interval) (7 day interval) 2 (14 day interval)	0	0.87	0.16	Summary only. .
				7	0.07	<0.02	
				14-28	<0.02	<0.02	
Savoy cabbage.	Mengen, Germany 1983 Marner Frühkopf	2 g/m (3 l water/m) 0.24 (600 l water/ha)	2 (11 day interval) (7 day interval) 2 (14 day interval)	0	0.96	0.07	Summary only. .
				7	0.22	0.05	
				14-28	≤0.02	≤0.02	
Savoy cabbage.	Kremper, Germany 1983 Marner Frühkopf	2 mg/m (3 L water/m) 0.24 (600 l water/ha)	2 (10 day interval) (14 day interval) 2 (14 day interval)	0	0.40	0.04	Summary only. .
				7	<0.02	0.03	
				14-28	<0.02	<0.02	
Savoy cabbage.	Kremper, Germany 1983 Marner Frühkopf	32 mg/plant 0.24 (600 l water/ha)	2 (10 day interval) (14 day interval) 2 (14 day interval)	0	0.68	0.07	Summary only. .
				7	0.08/	0.07	
				14–28	≤0.02	≤0.02	
Cabbage	Birlingham, Worcestershire, UK 1996	0.4 583-603 l water/ha	6 (7 day interval)	0 3 7 14 21	5.0 2.8 0.29 0.67 0.20	0.65 0.89 0.29 0.64 0.36	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D 100 %, O 113, 111%. Max frozen storage 107 days.

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
	Shepshed, Leicestershire, UK 1996	0.4 589-615 l water/ha	6 (7 day interval)	0 3 7 14 21	4.6 3.9 1.2 0.34 0.25	0.81 1.5 0.63 0.30 0.46	DFG 236 (ethyl acetate; gel permeation). Max frozen storage 127 days.
	Kings Newton, Derbyshire. UK 1996	0.4 584-638 l water/ha	6 (7 day interval)	0 3 7 14 21	5.3 2.7 1.0 0.82 0.99	0.29 0.29 0.15 0.22 0.35	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg D 111%, O 111%. Max frozen storage 80 days.
	Gullane, East Lothian, UK 1996	0.4 593-619 l water/ha	6 (7-8 day interval)	0 3 7 14 21	1.9 2.5 0.25 0.11 0.04	0.30 0.687 0.05 0.07 0.03	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg, D recovery 101%, O 111%. Max frozen storage 153 days.
	Manston, Ketn, UK 1997	0.4 594-610 l water/ha	6 (7 day interval)	0 3 7 14 21	2.9 0.52 0.07 0.05 0.06	0.58 0.30 ≤0.01 <0.01 0.02	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg D 111%, O 108%. Max frozen storage 81 days.
	Friskney, Lincolnshire, UK 1997	0.4 584-609 l water/ha	6 (7-8 day interval)	0 3 7 14 21	0.68 0.55 0.14 0.04 0.02	0.13 0.19 0.04 0.02 0.02	DFG 236 (ethyl acetate; gel permeation). Max frozen storage 107 days.
	Kings Newton, Derbyshire, UK 1997	0.4 593-601 l water/ha	6 (7-10 day interval)	0 3 7 14 21	2.8 1.5 0.82 0.71 0.23	0.11 0.25 0.28 0.25 0.17	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg D 77%, O 71%. Max frozen storage 80 days.
	Aberlady, East Lothian, UK 1997	0.4 597-604 l water/ha	6 (7 day interval)	0 3 7 14 21	0.85 0.70 0.04 0.01 0.01	0.27 0.38 0.02 <0.01 0.01	DFG 236 (ethyl acetate; gel permeation). Recoveries at 0.01 mg/kg D 92%, O 83%. Max frozen storage 94 days.
Kohlrabi	Limburgerhof, Germany 1976 Neuzucht Haubner	6.4 (watering, 16000 l water/ha) 0.24 (600 l water/ha)	2 (38 day interval)	0	9,5		Summary only.
				7	1.85		
				14	0.82; 0.40		
				21	0.72; 0.32		

Crop	Location, Year, Variety	Treatment rate, kg ai/ha	No. of applicns	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
	Schwabenheim, Germany 1969 Delikatess Weiss	32 mg/plant (80 ml water/plant)	2 (interval 10 days)	25	0.03		
				30-42	<0.02		

GAP in Germany specifies 1 application at 0.4 kg ai/ha, 42-day PHI for cauliflower, 2 x 0.24 kg ai/ha with a 14-day PHI or 1 x 0.4 kg ai/ha with a 42-day PHI for cabbage and 2 applications, 0.24 and 0.36 kg ai/ha, with a 14-day PHI for Brussels sprouts. No GAP was reported for broccoli in Germany, but GAP in The Netherlands specifies multiple applications at 0.2 kg ai/ha with a 21-day PHI. GAP for cabbage and Brussels sprouts in The Netherlands calls for repeat applications at 0.2 kg ai/ha with a 21-day PHI. GAP for Brussels sprouts in the USA (California only) allows up to six applications of 1.12 kg ai/ha, with a 10-day PHI. GAP for kohlrabi in Germany was not reported, but in Denmark the rate is 0.32 kg ai/ha, PHI not specified. GAP for foliar application to Brassica vegetables in the UK specifies 6 x 0.40 kg ai/ha, 7-day PHI.

Cucurbits

Australia reported trials on cucumbers, zucchini, rockmelons and watermelons. Rockmelons and cucumbers were treated with a post-harvest dip (Hargreaves and Heather, 1989). A 400 g/l EC formulation of dimethoate was diluted with water to a 400 mg/l solution. Twenty-four rockmelons were dipped, followed by 24 cucumbers. The dimethoate dip solution was analysed before and after the dippings and contained 409 mg/l and 404 mg/l respectively. Four samples each of rockmelon and cucumber were taken 0, 3 and 7 days after treatment and homogenized. The homogenates were stored at –12°C until analysis of duplicate samples by the method of Hargreaves and Heather (1989) described above.

Trials on the post-harvest dip treatment of zucchini (Hargreaves and Jackson, 1988) were similar except that chopped samples were stored frozen up to 3 weeks at –18°C and the homogenates were analysed by method M16.01.

Watermelons were dipped in a nominal 400 mg/l solution of dimethoate, shown by analysis to contain 375 mg/l before and 379 mg/l after dipping (Jackson and Cheyne, 1994). Duplicate samples of 4 melons were taken from storage at 13°C and 20°C at 0. 1, 2, 4 and 7 days after treatment. One quarter of each of the 4 melons was chopped and stored at -10°C until analysis by an unspecified method.

The results of all the trials are shown in Table 39.

Table 39. Residues of dimethoate in or on various cucurbits following a post-harvest dip in a 400 mg/l solution.

Commodity	Storage period, days	Dimethoate, mg/l
Rockmelon	0	1.2; 1.4 average 1.3
	3	1.3; 1.5 average 1.4
	7	1.3; 1.4 average 1.4
Cucumber	0	0.5, 0.5
	3	0.6; 0.6
	7	0.5; 0.6 average 0.6

Commodity	Storage period, days	Dimethoate, mg/l
Zucchini	0	1.8; 1.5 average 1.6
	3	1.7; 1.4 average 1.6
	7	1.6; 1.0 average 1.3
Watermelon	0 at 13°	0.19; 0.17 average 0.18
	1 at 13°	0.18; 0.17 average 0.18
	2 at 13°	0.14; 0.14
	4 at 13°	0.14; 0.12 average 0.13
	7 at 13°	0.15; 0.14 average 014
	0 at 20°	0.19; 0.17 average 0.18
	1 at 20°	0.18; 0.20 average 0.19
	2 at 20°	0.14; 0.20 average 0.16
	4 at 20°	0.14; 0.10 average 0.12
	7 at 20°	0.12; 0.16 average 0.14

GAP for cucurbits in Australia specifies a post-harvest dip or spray treatment with a 400 mg/l solution of an EC formulation and a 0-day withholding period. There are additional pre-harvest uses on various cucurbits in Australia.

Other fruiting vegetables

In trials in Australia (Bruce, 1988; Hamilton *et al.*, 1980; Hargreaves and Jackson, 1988; Hargreaves *et al.*, 1985; Heather *et al.*, 1987; Swaine *et al.*, 1984a) tomatoes were treated post-harvest by dipping or high volume (flood) spraying with a 400–500 mg/kg solution of dimethoate in water. The tomatoes were stored in ambient conditions and samples taken at intervals were homogenized and analysed for dimethoate residues by method M16.01. In the trials by Heather *et al.* omethoate was also determined by acetone extraction, exchange to chloroform, charcoal treatment and GLC with FPD. The results are shown in Table 40.

Table 40. Residues of dimethoate in or on tomatoes following post-harvest treatment with dimethoate in Australia.

Variety, Year	Treatment	Concentration of treatment solution, mg/l	Ambient storage period, days	Dimethoate, mg/kg
Green, 7 cm 1980	Dip (3 minutes)	425	0	0.59
			3	0.71
			7	0.26
1988	Dip	403	0	1.8, 1.5 average 1.6
			3	1.7, 1.4 average 1.6

Variety, Year	Treatment	Concentration of treatment solution, mg/l	Ambient storage period, days	Dimethoate, mg/kg
			7	1.6, 1.0 average 1.3
Floaradade (F), Redlander (R) 1988	Dip (1 minute)	428	0	F: 0.54, 0.64 average 0.59 R: 0.79, 0.73 average 0.76
			1	F: 0.41, 0.32 average 0.37 R: 0.39, 0.41 average 0.40
			3	F: 0.35, 0.39 average 0.37 R: 0.22, 0.32 average 0.27
			7	F: 0.19, 0.24 average 0.22 R: 0.24, 0.21 average 0.22
1983	Flood (high volume spray)	520	0	0.89, 0.78 (duplicate treatment) average 0.84 omethoate: <0.005
			3	0.69, 0.71 (duplicate treatment) average 0.70 omethoate: 0.03
			7	0.42, 0.25 (duplicate treatment) average 0.34 omethoate: 0.02
1986	Dip	420	0	0.54, 0.70 average 0.66
			3	0.43, 0.52 average 0.48
			7	0.27, 0.21 average 0.24
1984	Dip	425 (3 minutes)	0	0.58
			3	0.66
			7	0.26

Post-harvest GAP for tomatoes in Australia requires a dip in a 400 mg/l solution with a 7-day post-treatment holding period. There are additional pre-harvest foliar uses.

The DTF provided summary information only on supervised trials on tomatoes in Germany (Pistel and Bleif, 1993). No details of the trials or analyses were provided. The results are shown in Table 41.

Table 41. Residues of dimethoate and omethoate from the application of an EC formulation to tomatoes in Germany.

Location, Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Christinenthal 1975 Frembgens Rheinlands Ruhm	0.04 kg ai/hl	2 (35 day interval)	0	0.91	0.08

Location, Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
			1	0.51	0.04
			3	0.42	0.04
			8	0.22	0.07
Limburgerhof 1983 Surprise	0.48 (1200 l water/ha)	3 (13 day interval)	0	0.72	<0.05
			1	0.33	<0.05
			3	0.20	≤0.05
			5	<0.05	<0.05
			7	0.11	<0.05
Limburgerhof 1975 Panase	0.4 (1000 l water/ha)	3 (21 day interval)	0	0.16	0.04
			4	0.05	0.05
			7	0.03	0.07
			14	<0.01	0.03
Schabenheim 1974 Tip Top	0.04 kg ai/hl	2 (10 day interval)	0	0.73	0.07
			1	0.23	0.06
			3	0.15	0.05
			7	0.06	0.07
Limburgerhof 1974	0.4 (1000 l water/ha)	3 (42 d, 20 day interval)	0	0.19	0.03
			3	0.12	0.06
			7	0.10	0.12
			14	0.05	0.16
			21	<0.02	0.02
Hamburg-Curslack 1975	0.04 kg ai/hl	2 (32 day interval)	0	0.12	0.02
			1	0.13	0.06
			2	0.31	0.03
			6	0.14	0.07
Schwabenheim 1975 Tip Top	0.4 (1000 l water/ha)	2 (31 day interval)	0	0.50	0.03
			1	0.25	0.03
			4	0.08	0.03
Schwabenheim 1975 Tip Top	0.4 (1000 l water/ha)	3 (22 day, 21 day interval)	0	0.36	0.07
			4	0.05	0.05
			7	0.03	0.06
			14	<0.02	0.05
Limburgerhof 1982 Muosa	0.72 (1800 l water/ha)	3 (14 day interval)	0	0.26	0.09
			1	0.53	0.14
			3	0.41	0.13
			5	0.24	0.12
			7	0.14	0.12
Opfingen 1982 Estrella	0.84 (2100 l water/ha)	3 (7 day, 8 day interval)	0	0.09	<0.01
			1	0.06	0.03
			3	0.01	0.01
			5	<0.01	0.02
			7	<0.01	<0.01
Bonn 1982 Luca	0.72 0.72 (1800 l water/ha)	3 (16 day interval) (13 day interval)	0	1.57	0.29

Location, Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
	0.84 (2100 l water/ha)				
			1	1.31	0.43
			3	0.80	0.32
			5	0.91	0.39
			7	0.59	0.36
Bonn 1983 Hellfrucht	0.36 (900 l water/ha) 0.48 0.48 (1200 l water/ha)	3 (14 day interval) (14 day interval)	0	0.06	<0.02
			1		0.03
			3	0.06	0.03
			5	0.04	0.03
			7	<0.02	<0.02
Frankfurt 1983 Angela	0.48 (1200 l water/ha)	3 (14 day interval)	0	0.08	0.21
			1	0.08	0.1`6
			3	0.06	0.09
			5	0.06	0.04
			7	0.07	0.04
Opfingen 1983 Luca	0.44 (1200 l water/ha)	3 (4 day, 14 day interval)	0	0.36	0.16
			1	0.19	0.16
			3	0.19	0.14
			5	0.12	0.14
			7	0.02	0.08

GAP for the use of dimethoate EC formulation on tomatoes specifies 3 applications, 0.24, 0.36 and 0.48 kg ai/ha, or 0.04 kg ai/hl, with a 3-day PHI. The use is for glasshouses.

Australia provided data on the post-harvest high-volume spray treatment of sweet peppers (capsicums) with 400 mg/l or 800 mg/l dimethoate in 1986 and 1994 (Hargraves, 1986; Hargreaves *et al.,* 1994). The 1986 samples were analysed by method M16.01. Three of them were also analysed for omethoate, using method PPQ-02 (Table 42). The method of analysis for the 1994 samples was not specified. GAP is 0.04 kg/100 l dip (400 mg/l) with no specified withholding period in Queensland only.

Table 42. Residues in or on sweet peppers from post-harvest spraying with dimethoate in Australia.

Year	Spray concentration, mg/l	Storage: days/temperature, °C	Dimethote, mg/kg	Omethoate, mg/kg
1986	390	0/?	0.97, 1.1 1.0 average	0.03
	390	3/?	0.68, 0.71 0.70 average	0.08
	390	7/?	0.29, 0.38 0.34 average	0.08
	800 nominal	0/?	2.0, 2.0	
		3/?	1.0, 1.5 1.2 average	
		7/?	0.95, 1.0 0.98 average	
		1/13	0.78, 1.05 0.91 average	

Year	Spray concentration, mg/l	Storage: days/temperature, °C	Dimethote, mg/kg	Omethoate, mg/kg
		2/13	0.63, 1.04 0.83 average	
		3/13	0.73, 0.85 0.79 average	
		7/13	0.63, 0.81 average 0.72	
		0/20	0.66, 0.72 0.69 average	
		1/20	0.75, 0.82 0.79 average	
		2/20	1.00, 0.82 0.91 average	
		3/20	0.62, 0.70 0.66 average	
		7/20	0.65, 0.54 0.60 average	

Leafy vegetables

Germany provided summary information on trials with dimethoate (400 g/l EC) on kale, spinach, chard and leaf lettuce in 1982-83. No analytical method was specified nor were any analytical recovery data provided. The DTF also provided summary information only without details on supervised trials on head lettuce and spinach in Germany (Pistel and Bleif, 1993). The results are shown in Table 43. No GAP was reported for leaf lettuce, kale, spinach or chard in Germany; GAP for head lettuce is 2 x 0.24 kg ai/ha, maximum 21-day PHI. GAP in The Netherlands for kale is 0.20 kg ai/ha, multiple applications, 21-day PHI; for spinach 0.20 kg ai/ha, 3 treatments maximum, 21-day PHI.

Table 43. Residues from the foliar application of dimethoate EC formulation to leafy vegetables in Germany.

Crop/Variety	Location/Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Chard (beet leaf)/Grüner Schnitt	Braunschweig, 1983	0.24 (600 l water/ha)	1	0	10.5	0.06
				7	0.43	0.08
				14-28	<0.03	<0.02
Kale/lerchen-zungen	Oldenburg, 1982	1.2 (1500 l water/ha)	1	0	14.0	
				7	1.96	
				14	0.27	0.36
				21	<0.05	
Kale/Niedriger Grüner Krauser	Hurth-Fischenich, 1982	1.2 (1500 l water/ha)	2 (7 day interval)	0	14.7	
				7	3	
				14	1.32	
				21	0.7	
Kale/Frosty	Braunschweig, 1982	1.2 (1500 l water/ha)	1	0	14.8	
				7	1.57	
				14	0.47	0.27
				21	0.1	
Kale/Benjo	Berlin-Britz, 1982	1.2 (1500 l water/ha)	1	0	13.7	
				7	1.23	
				14	0.1	0.3
				21	<0.05	

Crop/Variety	Location/Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Kale/Hammer	Griesheim, 1982	1.2 (1500 l water/ha)	1	0	9.46	
				7	0.44	
				14	0.05	0.13
				21	<0.05	
Kale/Westerlander Halbhoher Wundergrün	Mainz-Bretzenheim, 1982	1.2 (1500 l water/ha)	1	0	17.3	
				7	1.32	
				14	0.1	0.12
				21	<0.05	
Kale/Halbhoher Krauser	Münster, 1982	1.2 (1500 l water/ha)	1	0	11.6	
				7	5.31	
				14	0.24	0.51
				21	0.13	
Kale/Frosty	Hannover, 1982	1.2 (1500 l water/ha)	1	0	11.5	
				7	5.3	
				14	0.41	0.22
				21	0.18	
Leaf lettuce/Gelber Runder	Braunschweig, 1983	0.24 (600 l water/ha)	1	0	11.2	<0.2
				7	0.31	<0.2
				14	<0.03	<0.2
				21	<0.03	<0.2
Spinach/Atlanta	Braunschweig, 1983	0.24 (600 l water/ha)	1	0	20.7	<0.2
				7	0.72	<0.2
				14	<0.05	<0.2
				21	<0.03	<0.2
				27	<0.03	<0.2
Spinach/Medania	Limburgerhof, 1974	0.32 (800 l water/ha)	1	0	16.0	<0.01
				2	8.30	0.36
				4	3.80	0.32
				7	2.60	0.29
				14	1.10	0.45
Spinach/Universal	Schwabenheim, 1973	0.32 (800 l water/ha)	1	0	13.4	0.36
				2	3.12	1.09
				7	0.23	1.15
				14	0.03	0.35
Spinach/Matador	Schwabenheim, 1975	0.24 (600 l water/ha)	1	0	21.5	0.40
				4	5.40	1.46
				7	3.28	1.49
				14	0.90	1.35
				21	0.18	0.65
Head lettuce/Mona	Limburgerhof, 1974	0.32 (800 l water/ha)	3 (21 day, 1 day interval)	0	4.86	0.12
				7	2.40	0.33
				14	0.64	0.16
				21	0.09	0.10
				28	0.02	0.01
Head lettuce/Verpia	Limburgerhof, 1982	0.24 (600 l water/ha)	2 (14 day interval)	0	8.17	0.24
				7	0.12	<0.05
				14–28	<0.05	<0.05

Crop/Variety	Location/Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Head lettuce/Hilds Neckarriesen	Schwabenheim, 1982	0.24 (500 l water/ha)	2 (14 day interval)	0	4.97	0.29
				7	1.52	0.96
				14	<0.02	0.60
				21	≤0.02	0.03
				28	<0.02	<0.02
Head lettuce/Victoria King	Ingelheim, 1983	0.24 (400 l water/ha)	2 (14 day interval)	0	4.54	0.04
				7	0.12	0.05
				14–28	≤0.02	≤0.02
Head lettuce/Frühlings-Grüss	Schwabenheim, 1966	0.6 (600 l water/ha)	1	21	<0.07	
		0.3 (600 l water/ha)	1	21	<0.07	
		0.6 (600 l water/ha)	1	14	<0.07	
		0.3 (600 l water/ha)	1	14	<0.22	
Head lettuce/	Schwabenheim, 1966	0.24 (600 l water/ha)	1	7	1.58; 0.61	
		0.12 (600 l water/ha)	1	7	0.89; 1.17	
		0.24 (600 l water/ha)	1	4	1.92; 2.53	
		0.12 (600 l water/ha)	1	4	0.94; 0.95	
Head lettuce/Hilmar	Schwabenheim, 1969	0.04 kg ai/hl	1	0	8.6	0.02
				4	1.98	0.23
				7	0.44	0.16
				10	0.12	0.08
				14	0.08	0.06
				21	0.07	0.06
Head lettuce/Hilmar	Schwabenheim, Germany/ 1969	0.04 kg ai/hl	6 (7 day, 3 day, 4 day, 3 day, 4 day interval)	0	3.76	0.09
				4	2.37	0.24
				7	0.71	0.19
				10	0.12	0.08
				14	0.10	0.07
				21	0.03	0.02
Head lettuce/Laibacher Eis	Schwabenheim, 1973	0.24 (600 l water/ha)	2 (15 day interval)	0	2.97	0.22
				4	0.94	0.23
				7	0.10	0.05
				14	≤0.02	0.02
Head lettuce/Maikönig Treib	Schwabenheim, Germany/ 1973	0.52 (1300 l water/ha)	1	0	8.80	0.16
				4	4.84	0.60
				7	2.25	0.51
				14	0.53	0.31
				21	<0.02	0.05
Head lettuce/Primeur	Schwabenheim, Germany/ 1973	0.40 (1000 l water/ha)	2 (28 day interval)	0	8.80	0.16
				4	4.84	0.60
				7	2.25	0.51
				14	0.53	0.31
				21	≤0.02	0.05

Crop/Variety	Location/Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Head lettuce/Attraktion	Shcwabenheim, 1969	0.24	6 (7 day, 4 day, 3 day, 4 day, 3 day interval)	0	5.32	<0.02
				4	0.54	0.08
				7	0.29	0.08
				10	0.13	0.07
				14	0.02	<0.02
				21	≤0.02	≤0.02
Head lettuce/Aurelia	Limburgerhof, 1969	0.04 kg ai/hl	1	0	4.70	
				3	1.40	
				4	0.40	
				7	0.30	
				14	0.02	
Head lettuce/Verpia	Limburgerhof, 1982	0.24 (600 l water/ha)	2 (14 day interval)	0	8.17	0.24
				7	0.12	<0.05
				14–28	≤0.05	≤0.05
Head lettuce/Capitan	Mengen, 1982	0.24 (600 l water/ha)	2 (11 day interval)	0	7.08	0.06
				7	2.96	0.27
				14	0.96	0.22
				21	0.24	0.06
				28	0.07	0.03
Head lettuce/Hilds Neckar-riesen	Schwabenheim, 1982	0.24 (500 l water/ha)	2 (14 day interval)	0	4.97	0.29
				7	1.52	0.96
				14	0.26	0.60
				21	≤0.02	0.03
				28	<0.02	<0.02
Head lettuce/Victoria Krieg	Schwabenheim, 1983	0.24 (400 l water/ha)	2 (14 day interval)	0	4.54	0.04
				7	0.12	0.05
				14–28	≤0.02	≤0.02
Head lettuce/Soraya[1]	Limburgerhof, 1983	0.24 (600 l water/ha)	2 (17 day interval)	0	~~7.71~~	~~0.33~~
				7	~~0.20~~	~~0.06~~
				14	~~0.06~~	~~2.53~~
				21	~~<0.05~~	~~1.80~~
				26	~~<0.05~~	~~1.61~~

[1]Total residue increased from day 7 to day 14 and the ratio of omethoate to dimethoate is anomalous.

Legume vegetables

The DTF reported numerous field trial on peas in 1994-1996 in Northern Europe, and Cheminova reported four trials in 1993 in the USA. DFG method 236 with gel permeation clean-up was used for the European trials and the ABC method with a charcoal/Celite clean-up in the USA. The results are shown in Table 44.

GAP for peas in Northern Europe ranges from a single application rate of 0.20 kg ai/ha in Belgium and The Netherlands to 0.32 kg ai/ha in Denmark and 0.34 kg ai/ha in the UK. The number of applications is unspecified in Belgium and Denmark, 3 in The Netherlands and 6 in the UK. The PHI is 14 days in Denmark and the UK and 21 days in Belgium and The Netherlands. GAP for peas in the USA specifies one foliar application at 0.19 kg ai/ha, with a 0-day PHI for peas and pods.

Table 44. Residues of dimethoate and omethoate in or on peas from the foliar application of dimethoate EC formulations.

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Control recovery range, %	Reference/ comments
Middelfart, Denmark/ 1994/ Polar Vining	0.336	2 (14 d interval)	0	3.35 whole plant	0.108 whole plant	D/pod: 109, 128 O/pod: 97, 103 D/seed: 69, 75 O/seed: 66, 70 D/straw: 70, 91 O/straw: 69, 105 (0.01, 0.1 mg/kg)	Heyer and Schreitmuller, 1996, Doc. 533-5208.
			3	0.406 whole plant	0.145 whole plant		
			7	0.129 whole plant	0.108 whole plant		
			10	0.109 whole plant	0.069 whole plant		
			14	0.156 whole plant	0.071 whole plant		
			28 (commercial harvest)				
			14	<0.119 empty pod	0.049 empty pod		
			14	0.027 whole pod	0.015 whole pod		
			14	<0.01 seed	<0.01 seed		
			14	0.438 straw	0.134 straw		
Stratford upon Avon, UK/ 1994/ Scout Vining	0.348 0.344	2 (14 day interval)	0	8.52 whole plant	0.212 whole plant	D/whole plant: 80–110, n = 10 O/whole plant: 75-129, n= 12 D/empty pod: 58-99, n=3 O/empty pod: 68-81, n=3 D/whole pod: 79-97, n=3 O/whole pod: 61-80, n=3 D/seed:73-91, n=4 O/seed: 70–100, n=4 D/straw: 68-73, n=2 O/straw: 64-80, n=2 (0.01–0.1 mg/kg, except 0.01-3 mg/kg whole plant)	Heyer and Schreitmuller, 1996, Doc. 533-5209
			3	2.67 whole plant	0.242 whole plant		
			7	0.380 whole plant	0.092 whole plant		
			10	0.303 whole plant	0.139 whole plant		
			14	0.035 whole plant	0.025 whole plant		
			14	0.053 empty pod	0.012 empty pod		
			14	0.026 whole pod	0.022 whole pod		
			14	<0.01 seed	<0.01 seed		
			14	0.259 straw	0.155 straw		
Cropredy, UK/ 1994/ Solara Combining	0.340 0.344	2 (14 d interval)	0	3.703 whole plant	0.133 whole plant		
			3	1.172 whole plant	0.225 whole plant		
			7	0.218 whole plant	0.139 whole plant		
			10	0.022 whole plant	0.147 whole plant		
			14	0.065 empty pod	0.082 empty pod		
			14	0.018 whole pod	0.026 whole pod		
			14	<0.01 seed	<0.01 seed		
			14	0.670 straw	0.642 straw		
Goch, 1994/ Lambado vining	0.336	2 (14 d interval)	0	2.54 whole plant	0.069 whole plant	D/whole plant: 86, 114 O/whole plant: 59, 95 D/whole pod: 92, 120 O/whole pod: 73, 82 D/seed: 74, 101. O/seed: 71, 90 D/straw: 90, 108 O/straw: 97, 108 (0.01, 0.1 mg/kg (0.01, 0.1 mg/kg, except 0.01-9.9 mg/kg	Heyer and Schreitmuller, 1996, Doc. 533-5210.
			3	0.64 whole plant	0.302 whole plant		
			7	0.12 whole plant	0.113 whole plant		
			10	0.08 whole plant	0.098 whole plant		

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Control recovery range, %	Reference/ comments
			14	<0.01 whole plant	<0.01 whole plant		
			14	<0.01 empty pod	<0.01 empty pod		
			14	≤0.01 whole pod	≤0.01 whole pod		
			14	<0.01 seed	<0.01 seed		
			14	<0.01 straw	<0.01 straw		
Brienen, 1995/ Mantracto Vining	0.374 0.363 0.370 0.371	4 (16, 6, 12 d interval)	0	7.10 whole plant	0.38 whole plant	D/whole plant: 67-94, n=8 O/whole plant: 55-86, n=8 D/whole pod: 75-84, n=4 O/whole pod: 58-74, n=4 D/straw: 76-95, n=3 O/straw: 49-74, n=3	Melkebeke, 1997, Doc. 533-5211; Melkebeke and. Geuijen, 1997, Doc. 533-5212; Lystbaek, 1997, Doc. 581-012; Bitz, 1997, Doc. 581-011.
			3	4.00 whole plant	0.36 whole plant		
			7	0.78 whole plant	0.36 whole plant		
			14	0.60 whole plant	0.11 whole plant		
			21	0.23 whole plant	0.05 whole plant		
			7	0.37 whole pod	0.61 whole pod		
			14	0.09 whole pod	0.03 whole pod		
			21	0.11 whole pod	0.05 whole pod		
			14	0.20 straw	0.12 straw		
			21	0.15 straw	0.03 straw		
Bedburg-Hau Louisendorf, 1995/ Avriso vining	0.331 0.376 0.366 0.364	4 (16, 6, 12 d interval)	0	5.15 whole plant	0.17 whole plant		
			3	2.13 whole plant	0.32 whole plant		
			7	0.89 whole plant	0.42 whole plant		
			14	0.05 whole plant	0.10 whole plant		
			21	0.02 whole plant	0.04 whole plant		
			7	0.21 whole pod	0.06 whole pod		
			14	0.04 whole pod	0.02 whole pod		
			21	<0.01 whole pod	<0.01 whole pod		
			14	0.03 straw	0.08 straw		
			21	0.02 straw	0.02 straw		
Vierlingsbeek, Netherlands/ 1995/ Polo vining	0.352 0.370 0.339 0.350	4 (18, 10, 20 d interval)	0	3.50 whole plant	0.15 whole plant		
			3	1.18 whole plant	0.31 whole plant		
			7	0.57 whole plant	0.27 whole plant		
			14	0.10 whole plant	0.13 whole plant		

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Control recovery range, %	Reference/ comments
			21	0.09 whole plant	0.12 whole plant		
			7	0.27 whole pod	0.06 whole pod		
			14	0.11 whole pod	0.03 whole pod		
			21	0.03 whole pod	0.04 whole pod		
			14	0.07 straw	0.19 straw		
			21	0.06 straw	0.07 straw		
Dennington, UK/ 1995/ Trek vining	0.345 0.361 0.347 0.352	4 (14, 13, 16 d interval)	0	4.16 whole plant	0.67 whole plant		
			3	1.04 whole plant	0.08 whole plant		
			7	0.30 whole plant	0.25 whole plant		
			14	0.06 whole plant	0.09 whole plant		
			21	0.03 whole plant	0.02 whole plant		
			7	0.13 whole pod	0.02 whole pod		
			14	0.04 whole pod	0.02 whole pod		
			21	<0.01 whole pod	0.01 whole pod		
			14	0.07 straw	0.12 straw		
			21	0.04 straw	0.02 straw		
Hojer, Denmark/ 1995/ Bodel combining	0.371 0.364 0.382 0.360	4 (14, 12, 11 d interval)	0	7.58 whole plant	0.39 whole plant	D/whole plant: 74-95, n=6, 0.01–8 mg/kg O/whole plant: 64-90, n=6, 0.01–0.5 mg/kg D/seed: 90 at 0.1 mg/kg O/seed: 81 at 0.01 mg/kg; 63 at 0.1 mg/kg	
			14	2.10 whole plant	0.29 whole plant		
			21	1.19 whole plant	0.14 whole plant		
			14	0.19 whole pod	0.20 whole pod		
			21	0.18 whole pod	0.12 whole pod		
			14	<0.01 seed	0.24 seed		
			21	<0.01 seed	<0.01 seed		
			14	1.37 straw	0.24 straw		
			21	2.03 straw	0.25 straw		
Wageningen, Netherlands/ 1996/ Delta combining	0.333 0.333 0.333 0.323	4 (10, 13, 14 d interval)	0	5.40 whole plant	0.35 whole plant		
			14	2.85 whole plant	0.18 whole plant		
			21	0.53 whole plant	0.036 whole plant		
			14	1.42 whole pod	0.18 whole pod		
			21	0.64 whole pod	0.052 whole pod		
			14	<0.01 seed	<0.01 seed		
			21	<0.01 seed	<0.01 seed		
			14	4.5 straw	0.24 straw		
			21	1.29 straw	0.052 straw		
Hillsboro, Oregon, US/ 1993/	0.19	1	0	0.39 0.50 0.44 average whole pod	0.02 0.02 whole pod	D/whole pod: 80-100, n=7 (0.01-3.0 mg/kg) O/whole pod: 83-120, n=7 (0.01-3.0mg/kg) D/vine: 70-100, n=9 (0.01-10 mg/kg). O/vine: 50-120, n = 9n=9 (0.01-10 mg/kg) D/hay: 70-100, n=9 (0.01-10 mg/kg). O/hay: 60-140,	Rice *et al.*, 1994, CHA-Doc. 170-DMT/ Two entries per cell are duplicate samples

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Control recovery range, %	Reference/ comments
			0	5.26 5.45 5.36 average vine	0.16 0.18 0.17 average vine		
			0	11.48 10.16 10.8 average hay	1.56 1.20 1.38 average hay		Hay contained 32.4% moisture
			3	0.22 0.19 0.10 average whole pod	0.07 0.06 0.06 average whole pod		
			3	2.97 3.78 3.38 average vine	0.39 0.45 0.42 average vine		
			3	5.867 7.67 6.76 average hay	1.01 1.76 1.38 average hay		
			7	0.09 0.08 0.08 average whole pod	0.10 0.09 0.10 average whole pod		
			7	2.06 1.18 1.62 average vine	0.47 0.36 0.42 average vine		
			7	5.92 2.03 3.98 average hay	1.06 0.86 0.96 average hay		
Moses Lake, Washington, US/ 1993	0.19	1	0	0.52 0.48 0.50 average whole pod	<0.01 ≤0.01 whole pod		
			0	4.34 4.83 4.58 average vine	0.05 0.03 0.04 average vine		
			0	10.49 9.22 9.86 average hay	0.49 0.26 0.38 average hay		Hay contained 23.9% moisture
			3	0.26 0.25 0.26 average whole pod	0.07 0.07 whole pod		
			3	1.83 2.53 2.18 average vine	0.25 0.21 0.23 average vine		
			3	5.25 6.956.10 average hay	0.39 0.37 0.38 average hay		
			7	0.19 0.20 0.20 average whole pod	0.10 0.09 0.10 average whole pod		
			7	3.58 3.38 3.48 average vine	0.43 0.21 0.32 average vine		
			7	5.15 4.47 4.81 average hay	0.52 0.280.40 average hay		

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Control recovery range, %	Reference/ comments
Lake Mills, Wisconsin, US/ 1993	0.19	1	0	0.39 0.34 0.36 average whole pod	0.02 0.02 whole pod		
			0	4.44 6.87 5.66 average vine	0.19 0.19 vine		
			0	1.68 1.64 1.66 average hay	0.75 0.76 0.76 average hay		Hay contained 58.0% moisture
			3	0.22 0.20 0.21 average whole pod	0.08 0.08 whole pod		
			3	1.43 0.87 1.15 average vine	1.13 0.54 1.0 average vine		
			3	0.95 1.25 1.10 average hay	0.59 0.80 0.70 average hay		
			7	0.10 0.09 0.10 average whole pod	0.06 0.07 0.06 average whole pod		
			7	0.27 0.18 0.22 average vine	0.40 0.36 0.38 average vine		
			7	0.40 0.33 0.36 average hay	0.78 0.72 0.75 average hay		
Verona, Wisconsin, US/ 1993	0.19	1	0	0.29 0.25 0.27 average whole pod	0.02 0.02 whole pod		
			0	5.84 6.52 6.18 average vine	0.29 0.35 0.32 average vine		
			0	8.08 10.40 9.24 average hay	1.51 1.82 1.66 average hay		Hay contained 35.2% moisture (11% expected).
			3	0.15 0.15 whole pod	0.07 0.07 whole pod		
			3	2.24 2.14 2.19 average vine	0.86 0.76 0.81 average vine		
			3	0.90 0.75 0.82 average hay	0.30 0.28 0.29 average hay		
			7	0.02 0.03 0.02 average whole pod	0.04 0.04 whole pod		
			7	0.10 0.09 0.10 average vine	0.06 0.12 0.09 average vine		

Location/Year/ Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Control recovery range, %	Reference/ comments
			7	0.09 0.17 0.13 average hay	0.07 0.13 0.10 average hay		

The DTF provided summary information only on supervised field trials on French beans in Germany (Pistel and Bleif, 1993). GAP for French beans in Germany was not reported, but GAP for beans (broad, French and runner) in the UK is 2 x 0.34 kg ai/ha, and in Denmark 0.30 kg ai/ha, both with a 14-day PHI. None of the trials complied with these conditions.

Table 45. Residues of dimethoate and omethoate from the foliar application of a dimethoate EC formulation to French beans in Germany.

Location/Year /Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Limburgerhof 1969 Orbit	0.04 kg ai/hl	1	0	0.60	<0.02
			4	0.50	<0.02
			7	0.50	<0.02
			17	0.10	<0.02
			24	<0.02	<0.02
Schwabenheim 1969 Saxa	0.04 kg ai/hl	6 (7 day, 4 day, 3 day, 3 day, 4 day interval)	0	0.20	0.02
			4	0.12	0.02
			7	0.14	0.04
			10	0.05	0.03
			14	<0.02	0.04
			21	<0.02	0.02
Schwabenheim 1974 Saxa	0.04 kg ai/hl	2 (20 day interval)	0	0.73	<0.02
			4	0.23	0.02
			7	0.14	0.05
			14	0.03	0.02
			21	<0.02	0.04

<u>Pulses</u>

Baron (1987) applied a 480 g/l EC formulation in 190 l/ha of water to mung bean foliage in Enid, Oklahoma, USA, in 1985. One plot was treated at a rate of 0.56 kg ai/ha and a second at 1.12 kg ai/ha. Samples were taken 14 and 37 days after the application. The pods were mature at the time of treatment. Results were provided only for the 0.56 kg ai/ha treatment and the 37-day PHI. A concurrent storage stability study showed very poor recoveries of both dimethoate (27–60% at 0.10 and 0.50 mg/kg) and omethoate (19–67% at 0.63 mg/kg fortification stored (frozen?) for 18 months. This closely approximated the storage period of the field trial samples. A standard method of analysis was used (Zweig). Analytical recoveries of omethoate were 71-85% at 0.15 mg/kg and of dimethoate 77–85% at 0.066 mg/kg. The residues from the 0.56 kg ai/ha treatment, 37-day PHI, were <0.02 mg/kg dimethoate and <0.07 mg/kg omethoate. The demonstrated lack of storage stability and the summary nature of the report make the study unacceptable. US GAP is 0.56 kg ai/ha, 0-day PHI.

<u>Root and tuber vegetables</u>

Information on GAP was made available for Australia (beetroot, potatoes, root vegetables, silverbeet), Belgium (potatoes, red beet, sugar beet), Columbia (potatoes), Denmark (beetroot, red beet, swede), The Netherlands (beetroot, fodder beet, sugar beet), Germany (fodder beet, potatoes, sugar beet), Hungary (sugar beet), Switzerland (fodder beet, sugar beet), Mexico (potatoes), Morocco (red beet), Reunion (red beet, sugar beet), the UK (potatoes, red beet, sugar beet, swede, turnip), USA (potatoes, turnip) and Sweden (sugar beet).

The DTF reported field trials on potatoes in Germany, Denmark, the UK and The Netherlands (Flatt, 1996, 1997; Bitz, 1997; Melkebeke and Geuijen, 1997). The results are shown in Table 46. All samples were analysed by DFG method 236 for omethoate and dimethoate. The validated limit of quantification for both omethoate and dimethoate was 0.01 mg/kg. Control recoveries in 1994 at 0.02 and 0.1 mg/kg were 103–125% for dimethoate and 97–115% for omethoate. Recoveries in 1995 were 98–115% for dimethoate and 70–87% for omethoate (n = 5, 0.005–0.2 mg/kg).

The DTF also supplied summary reports of potato trials in Germany in the 1970s and early 1980s (Pistel and Bleif, 1993). These are included in Table 46, although no details of the field conditions, sampling, sample handling and storage, or method of analysis were given.

GAP in Germany, Denmark, The Netherlands and the UK is similar with application rates of 0.20–0.34 kg ai/ha and a 14–21-day PHI. The number of applications is unspecified in Denmark, 1 in Germany, 2 in the UK and 4 in The Netherlands.

Table 46. Residues in or on potatoes grown in Northern Europe after the foliar application of dimethoate.

Location/ Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
North Rhine-Westphalia, Germany 1994	0.34 (220 l water/ha)	2 (14 day interval)	7	0.01	<0.01	Second application at beginning of flowering. Samples stored frozen for 275 days before analysis.
			14	<0.01	<0.01	
Fyn, Denmark 1994	0.34 (220 l water/ha)	2 (30 day interval)	7	0.03	<0.01	Stored frozen for 128 days before analysis.
			14	<0.01	<0.01	
Nierswalde (Goch), Germany 1995	0.33 (216 l water/ha) 0.35 (227 l water/ha)	2 (14 day interval)	14, 21, 28	<0.01	<0.01	Stored frozen for 7 months before analysis
Renkum, The Netherlands 1995	0.34 (217 l water/ha) 0.33 (213 l water/ha)	2 (14 day interval)	14, 21, 28	<0.01	<0.01	Stored frozen for 7 months before analysis
Martlesham, UK 1995	0.33 (211 l water/ha) 0.32 (210 l water/ha)	2 (14 day interval)	14, 21, 28	<0.01	<0.01	Stored frozen for 7 months before analysis.
Schwabenheim, Germany 1982	0.32-0.48 (500 l water/ha)	2 (14 day interval)	0–35	<0.02	<0.02	Summary results.
Schwabenheim, Germany 1973	0.48 (800 l water/ha) 0.40 (1000 l water/ha) 0.32 (1000 l water/ha)	3 (37 day, 75 day interval)	0–28	<0.02	<0.02	Summary results
Honingen, Germany 1973	0.32 (600 l water/ha) 0.40 (600 l water/ha) 0.48 (600 l water/ha)	3 (29 day, 37 day interval)	0	0.06	0.02	Summary results
			7	0.70	<0.01	
			14	0.02	<0.01	
			21	0.02	<0.01	
			28	0.01	<0.01	
Schwabenheim, Germany 1973	0.48 (800 l water/ha) 0.40 (1000 l water/ha) 0.32 (1000 l water/ha)	3 (7 day, 75 day interval)	0–28	<0.02	<0.02	Summary results
Schwabenheim, Germany 1982	0.48 0.40 0.32 (500 l water/ha)	3 (14 day interval)	0–35	<0.02	<0.02	Summary results
Ersingen, Germany	0.48	3 (14 day, 13	0-35	<0.01–0.01	<0.01–0.01	Summary results

Location/ Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
1982	0.40 0.32 (400 l water/ha)	day interval)				
Dirmstein, Germany 1982	0.48 0.40 0.32 (400 l water/ha)	3 (14 day interval)	0	<0.01	<0.01	
			7	0.01	0.01	
			14	≤0.01	0.02	
			21	0.02	<0.01	
			28–36	<0.01	<0.01	

Cheminova reported data on turnips (Samoil, 1998). Turnips were treated three times with a 480 g ai/l EC formulation of dimethoate, each application being 0.28 kg ai/ha. The trials were in 1994 in Arkansas, California, Florida, Georgia, Ohio (2 trials) and Texas, USA. The volume per ha varied with the location: Arkansas 300 l /ha, California 550 l/ha, Florida 280 l/ha, Georgia 470 l/ha, Ohio 500 l/ha, 650 l/ha, Texas 280 l/ha. The samples were analysed by the ABC method. Recoveries from tops and roots fortified at 0.1, 0.5 and 5.0 mg/kg were reported to be 69–124% and 75–109% respectively for dimethoate and 78–123% and 81–108% but no details for omethoate were provided. The results are shown in Table 47.

Samples were stored frozen up to 10 months before extraction and analysis. Storage stability tests for ≥382 days with tops and roots fortified at 0.1 and 5 mg/kg with dimethoate and omethoate showed the residues to be stable.

The US GAP for turnips is 0.28 kg ai/ha with a 14-day PHI. The trials were conducted at the maximum rate and minimum PHI.

Table 47. Residues of dimethoate and omethoate in or on turnip tops and roots after foliar application of dimethoate EC (3 x 0.28 kg ai/ha).

Location/year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Fayetteville, Arkansas 1994	0.28	3 (7 day interval)	14	≤0.1 top ≤0.1 root	≤0.1 top ≤0.1 root
Salinas, California 1994	0.28	3 (7 day interval)	14	≤0.1 top ≤0.1 root	≤0.1 top ≤0.1 root
Gainesville, Florida 1994	0.28	3 (7 day interval)	14	0.532; 0.562 top ≤0.1 root	0.207; 0.210 top ≤0.1 root
Tifton, Georgia 1994	0.28	3 (7 day interval)	14	0.114; 0.179 top ≤0.1 root	(0.068; 0.092) top ≤0.1 root
Willard, Ohio 1994	0.28	3 (8-10 day interval)	14	≤0.1 top ≤0.1 root	≤0.1 top ≤0.1 root
Willard, Ohio 1994	0.28	3 (7 day interval)	14	≤0.1 top ≤0.1 root	≤0.1 top ≤0.1 root
Weslaco, Texas 1994	0.28	3 (8–9 day interval)	14	≤0.1 top ≤0.1 root	≤0.1 top ≤0.1 root

The DTF reported sugar beet trials in Northern Europe (Flatt, 1995; Melkebeke and Geuijen, 1995; Bitz, 1997). An EC formulation was applied to sugar beet foliage twice at 14- or 15-day intervals at 0.42 kg ai/ha at three locations. Samples of whole plants, leaves and roots were analysed by DFG method 236, with charcoal clean-up. The results are shown in Table 48. Concurrent tests at 0.01-0.2 mg/kg showed recoveries of 98–109% for dimethoate in roots and 74–118% in leaves, and 60–88% for omethoate in roots and 72-76% in leaves. In the 1994 trials recoveries from roots (0.02 and 0.10 mg/kg, n = 6) were 93-115%, mean 103%, for dimethoate, and 71–95%, mean 81%, for omethoate. Recoveries from whole plants (0.10 and 2.52 mg/kg, n = 6) were 89-111%, mean 99% for dimethoate and 63-92%, mean 75%, for omethoate.

The DTF also reported sugar beet trials in Germany in the 1970s and early 1980s (Pistel and Bleif, 1993). These are included in Table 48, although no details of the field conditions, sampling, sample handling and storage, or method of analysis were given.

The GAP for sugar beet in Germany specifies 1 application of 0.16 kg ai/ha with a 35-day PHI, in The Netherlands a maximum of 3 foliar applications of 0.40 kg ai/ha with no stated PHI, in the UK 1 or 2 foliar applications at 0.40 kg ai/ha with the last application before 30 June, and in Belgium 0.20 kg ai/ha with no maximum number of applications and a 21-day PHI.

Table 48. Residues of dimethoate and omethoate in sugar beet after foliar treatment with a dimethoate EC formulation (2 x 0.42 kg ai/ha).

Location Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
Goch, Germany 1995	0.419 (448 l/ha) 0.424 (455 l/ha)	2 (14 day interval)	0	7.0 whole plant	0.25 whole plant	
			3	0.79 whole plant	0.23 whole plant	
			14	<0.01 root <0.02 leaf	<0.01 root 0.11 leaf	
			28 and 35	<0.01 root <0.01 leaf	<0.01 root <0.01 leaf	
Renkum, Netherlands 1995	0.433 (464 l/ha) 0.439 (470 l/ha)	2 (15 day interval)	0	10. whole plant	0.29 whole plant	
			3	1.7 whole plant	0.20 whole plant	
			13	<0.01 root 0.06 est. leaf	<0.01 root 0.17 leaf	
			27	<0.01 root <0.01 leaf	<0.01 root 0.02 leaf	
			34	<0.01 root <0.01 leaf	<0.01 root <0.01 leaf	
Coney Weston, UK 1995	0.413 (443 l/ha) 0.418 (448 l/ha)	2 (14 day interval)	0	8.8 whole plant	0.21 whole plant	
			3	1.6 whole plant	0.23 whole plant	
			14	<0.01 root 0.10 est. leaf	<0.01 root 0.05 leaf	
			28	<0.01 root <0.01 leaf	<0.01 root <0.01 leaf	
			35	<0.01 root 0.03 leaf	<0.01 root <0.01 leaf	
East Midlands, UK 1994 Saxon	0.084 (220 l water/ha) 0.40 (450 l water/ha)	2 (20 day interval)	0	8.65 whole plant	0.05 whole plant	12-14 expanded true leaves growth stage.
			3	0.68 whole plant	0.09 whole plant	
			14	<0.01 whole plant	0.04 whole plant	
			28	<0.01 root	<0.01 root	
			89	<0.01 root	<0.01 root	Normal harvest
North Rhine-Westphalia, Germany 1994 Evita	0.084 (220 l water/ha) 0.40 (450 l water/ha)	2 (14 day interval)	0	4.67 whole plant	0.19 whole plant	0–2 weeks after full crop cover (stage 46)
			3	1.59 whole plant	0.31 whole plant	
			14	0.11 whole plant	0.20 whole plant	
			28	<0.01 root	<0.01 root	
			35	<0.01 root	<0.01 root	
			93	<0.01	<0.01	Normal harvest

Location Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
Fyn, Denmark 1994 Matador	0.084 0.40	2 (interval 11 days)	0	5.57 whole plant	0.06 whole plant	0-2 weeks after full crop cover (stage 45)
			3	2.75 whole plant	0.22 whole plant	
			14	0.04 whole plant	0.06 whole plant	
			28	≤0.01 root	≤0.01 root	
			35	<0.01 root, leaf	<0.01 root, leaf	
			93	<0.01 root	<0.01 root	Normal harvest
Christinenthal, Germany 1972 Polybeta	0.32	2 (interval 19 days)	0–107	<0.01	<0.01	Summary information only.
Limburgerhof, Germany 1982 Kawemono	0.32 (400 l water/ha)	4 (interval 35, 2, 8 days)	0	5.33 leaf <0.05 root	<0.05 leaf <0.05 root	First application after 8 true leaf stage. Summary information only
			15-35	Leaf <0.05 Root <0.05	Leaf <0.05 Root <0.05	
Schwabenheim, Germany 1982 Kawemono	0.32 (400 l water/ha)	4 (interval 20 d, 14 d, 9 d)	0	Leaf 7.16 plant<0.02	Leaf 1.14 plant<0.02	8 true leaf stage. Summary information only
			14	Leaf <0.02 plant<0.02	Leaf 0.46 Plant <0.02	
			21	Leaf <0.02 plant <0.02	Leaf 0.22 Plant <0.02	
			28	plant<0.02 Leaf <0.02	Leaf 0.09 Plant <0.02	
			35	plant<0.02 Root <0.02	Leaf 0.05 Plant <0.02	
Schwabenheim, Germany 1972	0.32 (800 l water/ha)	2 (interval 21 days)	0	Root <0.02 Top 2.80	Root <0.02 Top 0.23	Normal harvest 46 days after last treatment. Summary information only.
			14	Root <0.02 Top <0.02	Root <0.02 Top 0.03	
			28	Root <0.02 Top <0.02	Root <0.02 Top 0.03	
			42	Root <0.02 Top <0.02	Root <0.02 Top <0.02	
			56	Root <0.02 Top <0.02	Root <0.02 Top <0.02	
Offstein, 1982 Monopur	0.32 (400 l water/ha)	4 (interval 13, 15, 20 days)	0	Plant 3.60	Plant 0.09	Summary information only. 10 true leaf stage at first treatment.
			7	Plant 0.18	Plant 0.04	
			14	Plant 0.01	Plant 0.01	
			21	Plant <0.01	Plant <0.01	
			28	Plant <0.01	Plant <0.01	
			36	Beet <0.01 Foliage <0.01	Beet <0.01 Foliage <0.01	

The DTF supplied summary reports of field trials on carrots in Germany in the 1970s and early 1980s (Pistel and Bleif, 1993). The results are shown in Table 49, although no details were given. Germany supplied summary information on trials on radishes and long radishes (Table 50).

GAP for carrots in Germany requires two applications at 0.24 kg ai/ha or 0.04 kg ai/hl, with a 14-day PHI. No GAP was reported for radishes. CLICK HERE for continue

Table 49. Residues from the application of a dimethoate EC formulation to carrots, in Germany.

Location Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Hurth-Fischenich, 1979 Lange rote Stumpfe	0.6 (600 l water/ha)	2 (13 day interval)	14	0.097	0.053
			21	0.014	0.006
			28	0.006	0.004
Schmiden, 1979 Tip-Top	0.6	2 (14 day interval)	14	0.127	
			21	<0.001	
			28	<0.001	
Lubeck, 1979 Lange rote Stumpfe ohne Herz	0.6 (600 l water/ha)	2 (14 day interval)	14	0.02	0.02
			21	0.007	<0.002
			28	0.002	<0.002
Mainz, 1979 Lange rote Stumpfe ohne Herz	0.68 (650 l water/ha)	2 (28 day interval)	14	0.001	<0.002
			21	<0.001	<0.002
			28	<0.001	<0.002
Merdingen, 1979 Kieler rote	0.6 (600 l water/ha)	2 14 day interval)	14	0.001	<0.002
			21	<0.001	<0.002
			28	<0.001	<0.002
Koln-Auweiler, 1979 Touchon	0.6 (600 l water/ha)	2 (14 day interval)	14	0.013	0.002
			21	0.014	0.013
			28	0.006	0.012
Oldenburg, 1979 Nantaise	0.6 (600 l water/ha)	2 (14 day interval)	14	0.006	0.004
			21	0.007	0.002
			28	0.002	<0.002
Buttelborn, 1979 Fanal	0.6 (600 l water/ha)	2 (14 day interval)	14	0.019	0.004
			21	0.021	0.002
			28	0.027	<0.002
Hallbergmoos, 1979 Winterperfektion	0.6 (600 l water/ha)	2 (14 day interval)	14	0.008	0.003
			21	<0.001	<0.002
			28	<0.001	<0.002
Limburgerhof, 1982 Mokum	8 (watering) (20000 l water /ha)	1	21	0.59	<0.05
			29	0.38	<0.05
			35	0.20	<0.05
			42	0.12	<0.05
			49	0.06	<0.05
Schwabenheim, 1982 Rotin	8 (watering) (20000 l water/ha)	1	21	<0.02	0.06
			28–56	<0.02	<0.02
Mengen, 1982 Hilds Fanal	8 (watering, 20000 l water/ha) 0.24 (spray) 0.24 (spray, 600 l water/ha)	3 31 day 14 day interval	0–35	≤0.01	≤0.01
Reichenau, 1982 Nantaise	8 (watering, 20000 l water/ha) 0.24 (spraying) 0.24 (spraying, 600 l water/ha)	 31 day interval 14 day interval	0–35	≤0.01	≤0.01
Kiel, 1973 Lange Stumpfe ohne Herz	8 (watering, 20000L water/ha)	2 (21 day interval)	28	0.06	<0.01
			42	0.05	<0.01

Table 50. Residues from the application of a dimethoate EC formulation to long radishes and radishes in Germany.

Location Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Long Radish					
Mainz-Bretzenheim, 1988 Minovase Summereross Nr. 3	0.2 ml of 0.04% solution per m watering (0.08 g ai/m)	1	0	2.8	<0.05
			7	3.1	<0.05
			14	0.5	<0.05
			21	<0.1	<0.05
			27	<0.1	<0.05
Frankfurt, 1988 Rex	0.2 ml of 0.04% solution per m watering	1	0	13	0.3
			7	3.1	0.2
			14	0.8	0.2
			21	0.1	<0.05
			28	<0.1	<0.05
München, 1988 Rex	0.2 ml of 0.04% solution per m watering	1	0	11	
			7	2.7	0.2
			14	1.4	<0.05
			21	0.5	<0.05
			28	0.4	<0.05
Berlin-Britz, 1988 Rex	0.2 ml of 0.04% solution per m watering	1	0	18	0.2
			7	1.3	<0.05
			14	0.4	<0.05
			21	<0.05	<0.05
			28	<0.05	<0.05
Braunschweig, 1988 April Cross	0.2 ml of 0.04% solution per m watering	1	0	3.2	<0.05
			7	2.9	<0.05
			14	1.9	<0.05
			21	0.2	<0.05
			28	<0.1	<0.05
Bankholzen, 1988 Neckarruhm	5.0 (12500 l water/ha)	1	0	59.	0.3
			7	2.1	0.1
			14	1.1	<0.05
			21	0.4	<0.05
			28	0.2	<0.05
Braunschweig, 1988 Rex	0.2 ml of 0.04% solution per m watering	1	0	3.1	0.3
			7	1.9	<0.05
			14	2	<0.05
			21	0.3	<0.05
			28	0.2	<0.05
Saarlouis-Lisdorf, 1988 April Cross	0.2 ml of 0.04% solution per m watering	1	0	26.	0.6
			7	1.4	<0.05
			14	0.8	<0.05
			21	0.3	<0.05
			28	<0.05	<0.05
Radish					
Schifferstadt, 1966 Weisser Neckarruhm	2 (drenching. 5000 l water/ha)	2 (30 day interval)	0	2.14	<0.02
			7	0.79	0.09
			13	0.54	0.10
			20	<0.1	<0.02
Schwabenheim, 1966	0.16 g/m	1	21	0.19	

Location Year Variety	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
	0.4 l water/m				
		2 (28 day interval)	21	0.12	
Braunschweig, 1988 April Cross	0.2 g/m 0.5 l water/m	1	0	3.2	<0.10
			7	2.9	<0.1
			14	1.9	<0.1
			21	0.2	<0.1
			28	<0.1	<0.1
Braunschweig, 1988 Rex	0.2 g/m 0.5 l water/m	1	0 (root + foliage)	3.1	0.30
			7 (root)	1.9	<0.1
			14	2.0	<0.1
			21	0.3	<0.1
			28	0.2	0.1
München, 1988 Rex	0.2 g/ 0.5 l water/m	1	0	11	0.20
			7	2.7	<0.1
			14	1.4	<0.1
			21	0.5	<0.1
			28	0.4	<0.1
Saarlouis-Lisdorf, 1988 April Cross	0.2 g/m 0.5 l water/m	1	0 (root + foliage)	26	0.6
			7 (root)	1.4	<0.1
			14	0.8	<0.1
			21	0.3	<0.1
			28	<0.1	<0.1
Mainz-Bretzenheim, 1988 Minorase Summercross No. 3	0.2 g/m 0.5 l water/m	1	0	2,8	<0.1
			7	3.1	<0.1
			14	0.5	<0.1
			21	<0.1	<0.1
			28	<0.1	<0.1
Moos, 1988 Necharruhm	5 (drenching, 12500 l water/ha)	1	0 (root + foliage)	59	0.3
			7 (root + foliage)	2.1	0.1
			14 (root)	1.1	<0.1
			21	0.4	<0.1
			28	0.2	<0.1
Frankfurt, 1988 Rex	0.2 g/m 0.5 l water/m	1	0 (root + foliage)	13	0.30
			7 (root + foliage)	3.1	0.20
			14 (root + foliage)	0.8	0.20
			21 (root + foliage)	0.1	<0.05
			28 (root + foliage)	<0.1	<0.05
Berlin-Britz, 1988 Rex	0.2 g/m 0.5 l water/m	1	0 (root + foliage?)	18	0.20
			7	1.3	<0.1
			14	0.4	<0.1
			21	<0.1	<0.1
			28	<0.1	<0.1
Schwabenheim, 1971 Saxa	0.04 g ai/hl	1	14	0.22; 0.13	
			21	0.16; 0.11	
Schwabenheim, 1971 Eiszapfen	0.04 g ai/hl	2 (7 day interval)	14	0.04; 0.06	
			21	0.03; <0.02	

Stalk and stem vegetables

Cheminova reported field trials on asparagus in Washington, Indiana, North Carolina and New York, where a 480 g ai EC formulation was applied 4-6 times at 0.56 and 1.12 kg ai/ha (Samoil, 1994). The applications were made post-harvest to the plants. Samples were analysed by standard methods (Steller and Pasarela, 1972; Zweig) with the results shown in Table 51. The samples were stored frozen. Storage studies were said to be adequate to cover the storage period for all samples except those in New York, but only the New York period was reported (627 days).

GAP is 5 x 0.56 kg ai/ha, 180-day PHI.

Table 51. Residues of dimethoate and omethoate in or on asparagus from the foliar application of dimethoate EC formulation in the USA.

Location Year	Application rate, kg ai/ha	No. of applications	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Comments
Vincennes, Indiana 1984	0.56	6	208	≤0.02	≤0.02	Method (Steller): Blend with methylene chloride, clean-up on silica gel with Darco G-60, GLC with FPD. Dimethoate recovery: 82-98% at 0.05 mg/kg; 95-111% at 0.10 mg/kg. Omethoate recovery: 89-107% at 0.05 mg/kg; 89-126% at 0.10 mg/kg. Storage stability: 110-125% recovery of dimethoate, 94-109% of omethoate, 171 days.
	1.12	6	208	<0.02	<0.02	
Raleigh, North Carolina 1987	0.38	4	207	<0.03	<0.12	Method (Zweig): blend with methylene chloride, change to acetone, GLC with FPD. Dimethoate recovery 77-102%, 0.5-1 mg/kg. Omethoate recovery 75-102%, 0.84–1.7 mg/kg.
	0.76	4	214	≤0.03	≤0.12	
Geneva, New York 1985	0.56	5	260-270	≤0.02	≤0.02	Method: Stetten. Dimethoate recovery 85-109%. Omethoate 72-82%, 0.1-0.4 mg/kg. Storage stability: dimethoate recovery 106-108%, omethoate 72-91% after 417 days, 0.2 mg/kg. Samples stored 627 days.
	1.12	5	260 – 270	<0.02	<0.02	
Yakima, Washington 1984	0.56	5	196	≤0.02	≤0.02	Method and storage stability, as Indiana
	1.12	5	196	<0.02	<0.02	

The Netherlands provided summary information in English on indoor trials with Witloof chicory in 1972 and 1983 and a complete report in Dutch. Analysis involved extraction with ethyl acetate, concentration of the extract and GLC with thermionic detection (1972) or flame photometric detection (1984). The results are given in Table 52. GAP for Witloof sprouts is 1 x 5.0 kg ai/ha, 21-day PHI.

Table 52. Residues from the application of a 400 g/l EC dimethoate formulation to Witloof chicory sprouts in The Netherlands.

Location Year Variety Note	Application rate, kg ai/ha	No. of treatments	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Recovery at
Groerbeek, 1972 West Friden low temperature forcing	5.0 (10000 l water/ha)	2 (5 day interval)	36	0.12 range 0.11–0.15	0.12 range 0.11-0.14	D: 90% at 0.1 O: 80% at 0.1 (n = 10)
Groerbeek, 1972 West Friden high temperature forcing	5.0 (10000 l water/ha)	2 (19 day interval)	50	0.14 (range 0.13-0.15)	0.15 range 0.13–0.18	
Brakel, 1972	5.0 (10000 l water/ha)	2 (36 day interval)	36	0.16 range 0.14-0.18	0.21 range 0.19-0.24	
Brakel, 1973	5.0 (10000 l water/ha)	2 (34 day interval)	35	0.14 range 0.10-0.22	0.16 range 0.12-0.20	
Alkmaar, 1983 Liber L.O. water culture	?	1	20	0.40 range 0.19-0.62	0.32 range 0.25-0.44	D: 107% at 0.25 (n = 2) 104% at 0.5 (n = 2) O: 103% at 0.4 (n = 4) 96% at 0.8 (n = 4)

Cereal grains

GAP was reported for Argentina (cereals, sorghum), Australia (cereals), Denmark (cereals, maize), Sweden (cereals), the UK (cereals, wheat), Columbia (maize, wheat), Hungary (maize), The Netherlands (maize, rye), Reunion (maize, rice, sorghum), the USA (maize, sorghum, wheat), New Zealand (rice), Germany (rye, wheat) and Mexico (maize, sorghum, wheat).

Chemninova reported field trials on sorghum in the USA (Rice *et al.*, 1994). Six trials were conducted in 1993 in Kansas, Nebraska and Texas, where a 480 g/l EC formulation of dimethoate was applied three times at 7 day intervals at 0.56 kg ai/ha. Ground equipment was used to apply a water dilution of 140-190 l/ha. Grain, forage and hay were collected at 28-days.

Samples were stored frozen and analysed within 3.5 months by the ABC method. The results are shown in Table 53. GAP is 3 x 0.56 kg ai/ha, 28-day PHI.

Table 53. Residues in or on sorghum from the foliar application of a dimethoate EC formulation at 3 x 0.56 kg ai/ha, 28 day PHI, in USA.

Location Year	Dimethoate, mg/kg	Omethoate, mg/kg	Concurrent fortification recovery		
			Fortification range, mg/kg/ No. of analyses	Dimethoate range, mean	Omethoate range, mean
GRAIN					
Peru, Kansas 1993	≤0.01	≤0.01	0.01 – 3 8	90–100 97	89–110 98
Sedan, Kansas 1993	≤0.01	≤0.01			
York, Nebraska 1993	Sample lost	Sample lost			

Location Year	Dimethoate, mg/kg	Omethoate, mg/kg	Concurrent fortification recovery		
			Fortification range, mg/kg/ No. of analyses	Dimethoate range, mean	Omethoate range, mean
Osceola, Nebraska 1993	<0.01	<0.01			
Uvalde, Texas 1993	<0.01	<0.01			
Idalou, Texas 1993	<0.01	<0.01			
FORAGE					
Peru, Kansas 1993	0.01; <0.01 mean 0.01	<0.01	0.01 – 0.20 8	85–92 87	78–110 91
Sedan, Kansas 1993	0.01; 0.02 mean 0.02	<0.01			
York, Nebraska 1993	<0.01	<0.01			
Osceola, Nebraska 1993	<0.01	<0.01			
Uvalde, Texas 1993	<0.01	<0.01			
Idalou, Texas 1993	<0.01	<0.01			
HAY					
Peru, Kansas 1993	<0.01	<0.01	0.01, 0.05, 0.20	90, 102, 90 94	110, 100, 86 99
Sedan, Kansas 1993	<0.01	<0.01			
York, Nebraska 1993	<0.01	<0.01			
Osceola, Nebraska 1993	<0.01; 0.01 mean 0.01	<0.01			
Uvalde, Texas 1993	<0.01	<0.01			
Idalou, Texas 1993	<0.01	<0.01			

The DTF reported supervised field trials for the application of dimethoate to barley in Northern Europe in 1995–1996 (Blitz, 1997; Melkebeke, 1997; Melkebeke and Geuijen, 1997). Eight trials were conducted in Denmark, Germany, The Netherlands and the UK, where winter and spring barley were treated 4 times with dimethoate at rates of 0.66–0.74 kg ai/ha for the first two applications and 0.32–0.37 kg ai/ha for the third and fourth applications. The last application was made at the soft dough growth stage. Samples of whole plants, ears, residual plants, grain and straw taken on the day of the final application and at subsequent intervals were analysed by a method on the basis of DFG method 236 for which validation data were listed in the Analytical Methods Section. The results are shown in Table 54.

The DTF also supplied a summary report of a barley field trial in Germany in 1982 (Pistel and Bleif, 1993) but no details were given. The data were excluded from the Table because the sample descriptions were imprecise (e.g. “corn”).

Table 54. Residues of dimethoate and omethoate in or on barley from four foliar application of a dimethoate EC formulation in Northern Europe. About 250 l water/ha.

Location Year Variety	Application, kg ai/ha	Interval, days	Sample	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Louisendorf, 1995 Winter barley, Catania	0.74 0.74 0.37 0.34	 6 4 13	Plant (without root)	0	5.31	0.07
			Grain	14	1.43	0.06
			Straw	14	2.81	0.07
			Plant	14	2.68	0.07
			Grain	21	0.64	0.02
			Straw	21	0.93	0.02
Doorwerth, Netherlands 1995 Spring barley, Reggea	0.72 0.72 0.36 0.35	 7 24 38	Plant	0	5.37	0.03
			Grain	14	0.10	≤0.01
			Straw	14	0.13	≤0.01
			Plant	14	0.13	<0.01
			Grain	21	0.03	<0.01
			Straw	21	0.03	<0.01
Martlesham, UK 1995 Winter barley, Halanon	0.73 0.72 0.35 0.33	 4 3 51	Plant	0	7.08	0.05
			Grain	14	0.49	≤0.01
			Straw	14	1.59	0.03
			Plant	14	0.90	0.02
			Grain	21	0.46	<0.01
			Straw	21	1.64	0.04
Fyb, Denmark 1996 Winter barley, pastoral	0.68 0.68 0.34 0.34	 9 12 28	Plant	0	5.07	0.04
			Grain	14	0.73	0.10
			Straw	14	0.44	0.11
			Plant	14	0.58	0.10
			Grain	21	0.02	0.06
			Straw	21	0.92	0.09
			Grain	28	0.12	0.02
			Straw	28	0.25	0.03
			Plant	28	0.22	0.03
Posterhold, Netherlands 1996 Spring barley, magda	0.68 0.68 0.34 0.34	 13 9 19	Plant	0	8.27	0.14
			Grain	14	0.03	0.01
			Plant	14	0.09	0.01
			Grain	21	<0.01	<0.01
			Straw	21	0.02	<0.01
			Grain	28	<0.01	<0.01
			Straw	28	0.02	<0.01
			Plant	28	0.03	<0.01

Location Year Variety	Application, kg ai/ha	Interval, days	Sample	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg
Tudderen, 1996 Winter barley, Babylon	0.68 0.68 0.34 0.34	 13 9 19	Plant	0	7.35	0.18
			Grain	14	0.41	0.03
			Straw	14	0.55	0.03
			Plant	14	0.75	0.05
			Grain	21	0.40	0.01
			Straw	21	0.16	0.03
			Plant	21	0.65	0.02
			Grain	28	0.29	0.01
			Straw	28	0.37	0.01
			Plant	28	0.11	0.03
Steventon, UK 1996 Winter barley, Halcyon	0.69 0.71 0.34 0.32	 8 14 31	Plant	0	5.94	0.04
			Grain	14	0.07	0.02
			Straw	14	0.88	0.07
			Plant	14	0.40	0.04
			Grain	21	0.0;9	0.02
			Straw	21	0.64	0.03
			Plant	21	0.55	0.03
			Grain	28	0.07	0.02
			Straw	28	0.76	0.03
			Plant	28	0.42	0.02
Bentley, UK 1996 Winter barley, Manitou	0.66 0.67 0.35 0.33	 7 13 28	Plant	0	4.24	0.04
			Grain	14	0.06	0.01
			Straw	14	0.20	0.03
			Plant	14	0.11	0.03
			Grain	21	0.02	<0.01
			Straw	21	0.19	0.01
			Plant	21	0.19	0.02
			Grain	28	0.02	<0.01
			Straw	28	0.18	<0.01
			Plant	28	0.14	0.02

GAP for barley in The Netherlands is a single application at 0.20 kg ai/ha with a 14-day PHI, in the UK 4 foliar applications of 0.34 kg ai/ha with a 14-day PHI, in Denmark 0.80 kg ai/ha with no specified PHI, and in Sweden 0.32 kg ai/ha with a 28-day PHI. GAP for Germany was not reported.

The DTF reported two supervised field trials on the application of dimethoate to maize in Denmark (Heyer, 1995; Bitz, 1997). Dimethoate was applied once at 0.32 kg ai/ha and samples of whole plants (above ground), cobs and grain taken at intervals were stored frozen until analysed by DFG method 236, a period of about 5 months. Concurrent fortified control samples were also analysed. The results are shown in Table 55.

GAP for maize in Denmark specifies foliar treatment at 0.30-0.32 kg ai/ha with a 14-day PHI. The PHIs of the grain samples in the trials are much longer at 28 and 35 days.

Table 55. Residues of dimethoate and omethoate in or on maize commodities from the foliar application of a dimethoate EC formulation at 0.32 kg ai/ha in Denmark in 1994.

Location/ Variety	Sample	PHI, days	Dimethoate, mg/kg	Omethoate, mg/kg	Concurrent analytical recoveries, %		
					Range, mg/kg No. (n)	Dimethoate	Omethoate
Rojleskovvej, Middefart, Denmark Earliking E1 (sugar maize)	Whole plant (aerial)	0	13.2	<0.01	0.01–5 (D) 9 0.01 – 0.20 (O) 8	82–118 99	59–82 67
		7	0.52	0.093			
		16	0.023	<0.01			
		21	0.024	<0.01			
		28, 35	<0.01	<0.01			
	Cob	28	<0.01	<0.01	0.01, 0.20 2	91, 92	90, 76
		35	<0.01	<0.01			
	Grain	28	<0.01	<0.01	0.01, 0.20 2	100, 94	90, 72
		35	<0.01	<0.01			
Hyllehojvej, Middelfart, Denmark Earliking E1 (sugar maize)	Whole plant (aerial)	0	12.3	<0.01	As first trial		
		7	0.22	0.032			
		16	0.18	0.060			
		21	0.12	0.062			
		28, 35	<0.01	<0.01			
	Cob	28	<0.01	<0.01	As first trial		
		35	<0.01	<0.01			
	Grain	28	<0.01	<0.01	As first trial		
		35	<0.01	<0.01	As first trial		

The DTF reported field trials on wheat in Northern Europe (Melkebeke and Geuijen, 1997; Flatt, 1996; Bitz, 1997). Four applications of an EC formulation were made to plots in four countries in 1995, the first two applications at 0.68 kg ai/ha and the second two at 0.34 kg ai/ha. The final applications were carried out at the soft to hard dough stage, about 14 days before commercial harvest, except in Germany in 1994 where the final treatment was at the medium milk stage. Samples of whole plants (except roots), grain, ears and residual parts and straw taken at intervals after the last application were stored frozen until analysed by DFG method 236. Analytical recoveries were determined concurrently. The results are shown in Table 56.

The DTF also supplied summary reports of trials in Germany in the 1970s and 1982 (Pistel and Bleif, 1993) but no details were given. The results are shown in Table 56.

GAP for wheat in Germany is 2 x 0.24 kg ai/ha, 21-day PHI; in The Netherlands, 1 x 0.20 kg ai/ha, 14-day PHI; in the UK, 4 x 0.68 kg ai/ha at low volume or 4 x 0.34 kg ai/ha high volume, 14-day PHI; in Denmark 0.80 kg ai/ha, no PHI.

Table 56. Residues of dimethoate and omethoate in or on wheat fractions from the foliar application of a dimethoate EC formulation (2 x 0.68 kg ai/ha + 2 x 0.34 kg ai/ha) in Northern Europe.

Location Year Variety	Application rate, kg ai/ha	Interval, days	Sample	PHI, days	Dimethoate[1], mg/kg	Omethoate[1], mg/kg
Wilson, UK 1994 Winter wheat, Riband	0.68 0.68 0.34 0.34 (250 l water/ha)	15 8 35	Whole plant	0	4.66	0.02
				3	1.15	0.12
				7	0.92	0.09
				Harvest (24-28)	0.24	0.03
			Ear/residual	14	0.37/	0.03/
			Grain	21	0.03	<0.01
				Harvest (24-28)	0.02	<0.01
			Straw	21	0.71	0.04

Location Year Variety	Application rate, kg ai/ha	Interval, days	Sample	PHI, days	Dimethoate[1], mg/kg	Omethoate[1], mg/kg
				Harvest (24-28)	0.65	0.05
Aston-on-Trent, UK 1994 Spring wheat, Candenza	0.68 0.69 0.34 0.34 (250 l water/ha)	 15 6 39	Whole plant	0	7.39	0.02
				3	2.23	0.03
				7	2.38	0.05
				Harvest (24-28)	1.55	0.06
			Ear/residual	14	1.61	0.04
			Grain	21	0.23	<0.01
				Harvest (24-28)	0.19	<0.01
			Straw	21	1.90	0.05
				Harvest (24-28)	1.96	0.05
Middelfart, Denmark 1994 Winter wheat, Marabu	0.68 0.68 0.34 0.34 (250 l water/ha)	 16 6 48	Whole plant	0	3.60	0.34
				3	2.03	0.06
				7	1.66	0.06
				14	1.13	0.05
				Harvest (24-28)	0.22	0.01
			Ears/residual	14	1.31/	0.05/
			Grain	21	0.04	<0.01
				Harvest (24-28)	0.02	<0.01
			Straw	21	1.41	0.04
				Harvest (24-28)	0.48	0.02
Goch, Germany 1994 Winter wheat, Haven	0.68 0.68 0.34 0.34 (250 l water/ha)	 13 16 46	Whole plant	0	5.81	0.01
				3	3.02	0.11
				7	1.75	0.13
				14	0.74	0.08
				Harvest (24-28)	0.19	0.01
			Ear/residual	14	0.91/	0.11/
			Grain	21	0.06	≤0.01
				Harvest (24-28)	0.07	<0.01
			Straw	21	0.24	0.02
				Harvest (24-28)	0.28	0.01
Hojer, Denmark 1995 Winter wheat, Hussar	0.74 0.74 0.37 0.36	 7 15 58	Whole plant	0	7.03	0.04
				3	6.65	0.08
				7	5.32	0.09
				14	5.20	0.12
				21	3.32	0.11
			Ear/residual	7	5.52/5.99	0.09/0.10
			Grain	14	0.10	≤0.01
				21	0.10	<0.01
			Straw	14	8.95	0.17
				21	6.78	0.16
Brienen, Germany 1995 Winter wheat, Grif	0.75 0.74 0.38 0.35	 6 20 54	Whole plant	0	7.35	0.02
				3	1.46	0.03
				7	1.44	0.04
				14	1.50	0.05
				21	1.03	0.05
			Ear/residual	7	1.96/1.30	0.05/0.03
			Grain	14	0.12	≤0.01
				21	0.12	<0.01
			Straw	14	2.37	0.08
				21	2.11	0.06

Location Year Variety	Application rate, kg ai/ha	Interval, days	Sample	PHI, days	Dimethoate[1], mg/kg	Omethoate[1], mg/kg
Marknesse, Netherlands 1995 Spring wheat, Minaret	0.72 0.72 0.36 0.36	 7 31 42	Whole plant	0	5.60	0.09
				3	3.17	0.20
				7	2.16	0.14
				14	1.62	0.13
				21	1.41	0.12
			Ear/residual	7	2.10/2.27	0.24/0.04
			Grain	14	0.11	0.01
				21	0.11	0.02
			Straw	14	2.23	0.13
				21	2.69	0.15
Badingham, UK 1995 Winter wheat, Riband	0.72 0.72 0.34 0.36	 7 15 63	Whole plant	0	4.73	0.02
				3	2.77	0.05
				7	3.20	0.08
				14	3.03	0.09
				21	2.03	0.10
			Ear/residual	7	2.94/4.24	0.08/0.06
			Grain	14	0.09	≤0.01
				21	0.09	<0.01
			Straw	14	4.42	0.12
				21	3.32	0.11
Kleindarlbach, Germany 1974 Kolibri	0.26 (600 l water/ha)	2 (interval 14 day)	Grain	15	0.01	0.04
			Straw	15	0.19	0.03
			grain	24	≤0.01	0.02
			Straw	24	0.12	0.02
Jerxheim, Germany 1970 Jubilar	0.18 (450 l water/ha)	1	Grain (?)	48	<0.02	
Obersuelzen, Germany 1982 Vuka	0.24 (400 l water/ha)	2 9 (interval 17 day)	Plant	0	3.27	0.08
			Plant	13	0.12	0.09
			Plant	20	0.06	0.04
			Plant 28	28	0.02	0.02
			Grain	56	<0.01	<0.01
			Straw	56	<0.01	<0.01
?, Germany 1982 Okapi	0.24 (400 l water/ha)	2 (interval 16 day)	r.a.c. (?)	0	2.28	0.07
				14	0.09	0.09
				21	0.01	0.02
				28	0.02	<0.01
				35	<0.01	<0.01
				51	<0.01	0.01
Schwabenheim, Germany 1971 Kolibri	0.24	2 (interval 15 day)	Grain	65	<0.02	
			Straw	65 (?)	<0.02	
Schwabenheim, Germany 1971 Kolibri	0.24 (600 l water/ha)	2 (interval 15 day)	Grain	50	<0.02	
			Straw	50	<0.05	

Location Year Variety	Application rate, kg ai/ha	Interval, days	Sample	PHI, days	Dimethoate[1], mg/kg	Omethoate[1], mg/kg
Schwabenheim, Germany 1971 Kolibri	0.24	3 (interval 14 day, 7 day)	Grain	14–35	<u>≤0.02</u>	
			Straw	14	<0.02	
			Straw	21	0.24	
			Straw	35	0.21	
Kleinkarlback, Germany 1974 Kolibri	0.26 (600 l water/ha)	2 (interval 14 day)	r.a.c. (?)	15	0.01	0.04
				24	<0.01	0.02
Talling, Germany 1974 Kolibri	0.24	2 (interval 7 day)	r.a.c. (?)	14	<0.02	<0.02
				21	<0.02	<0.02
Obersulzen, Germany 1982 Vuka	0.24 (400 l water/ha)	2 (interval 7 day)	Plant	0	3.27	0.08
			Plant	13	0.12	0.09
			Plant	20	0.06	0.04
			Plant	28	0.02	0.02
			Grain	56	<0.01	<0.01
			Straw	56	<0.01	<0.01
Ruchheim, Germany 1982 Vuka	0.24 (400 l water/ha)	2 (interval 13 day)	Plant	0	1.96	0.12
			Plant	13	0.05	0.05
			Plant	20	<0.05	<0.05
			Plant	27	<0.05	<0.05
			Grain	35-42	<u>≤0.05</u>	<u>≤0.05</u>
			Straw	35-42	<u>≤0.05</u>	<u>≤0.05</u>

[1]<u>Concurrent recoveries 1994</u>
Grain (0.1-0.5 mg/kg, n=8) dimethoate 81-95%, mean 88%; omethoate 67-79%, mean 72%
Ear (0.02-0.50, n=4) dimethoate 82-96%, mean 90%; omethoate 64-70%, mean 67%
Whole plant (0.10-2.5, n=17) dimethoate 74-96%, 88%; omethoate 60-87%, mean 70%
Straw (0.20-1.02, n=6), dimethoate 93-108%, mean 102%; omethoate 63-91%, mean 76%
<u>Concurrent recoveries 1995</u>
Grain (0.01–0.2, n = 4) dimethoate 80–110%, mean 96%; omethoate 78-97%, mean 84%
Ear (0.01, 2.5, n = 2) dimethoate 112, 101%; omethoate 64, 87%
Whole plant (0.01–6, n = 9) dimethoate 72–125%, mean 96%; omethoate 66–95%, mean 82%
Straw (0.01, n = 2) dimethoate 83, 82%; omethoate 59–88%, mean 70%.

Feeding studies

No information.

FATE OF RESIDUES IN STORAGE AND PROCESSING

In storage

No information. CLICK HERE for continue

In processing

Cheminova reported processing studies on oranges, tomatoes, potatoes, cotton seed, maize and wheat, all with dimethoate EC formulations containing 480 g ai/l applied at about five times the GAP rate.

In the study on oranges (Rice, *et al.*, 1994) dimethoate (480 ai/l EC) was applied to orange trees with ground equipment in southern Florida in 1993 at 4.5 g ai/. About 1880 l of spray mix was applied per hectare so that the rate was about 8.5 kg ai/ha. Two applications were made with a 14-day retreatment interval. The PHI was 14 days. Oranges and processed commodities were analysed by the ABC method, with celite/charcoal used for clean-up. The residue on the unwashed oranges was 1.82 mg/kg dimethoate and 0.17 mg/kg omethoate. The water content of the oranges was 82.3%.

The oranges (400 kg) were processed by a standard commercial procedure within 18 days of harvest. The fruits were washed and then extracted with an FMC in-line juice extractor equipped with continuous water-spray nozzles. The juice stream passed continuously from the extractor through a modified FMC Model 35 finisher with a 0.05 cm screen to remove the frits. The oil/water emulsion was next passed over a shaker screen feeder to remove additional insoluble fibres (peel frits). The oil/water emulsion was allowed to stand for 5 or more hours and the lower water phase was drained and the concentrated oil emulsion centrifuged (laboratory scale) to yield cold-pressed oil. Peel from the extractor was collected in 200 l drums. A fraction was chopped in a Fitzpatrick comminuting machine, yielding wet pulp which was mixed with a lime slurry at the rate of 0.3% lime and passed through a press. The press cake was dried in a triple-pass direct-fired drier at 143°C.

The results are given in Table 57. Samples were stored frozen and analysed within 30 days.

Table 57. Residues of omethoate and dimethoate in the processed commodities of oranges treated with dimethoate (2 x 8.5 kg ai/ha, 14 day PHI, about 4x GAP rate).

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate, mg/kg, mean and (duplicates)	Control analyses		Processing factors
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %	
Oranges (unwashed)	1.44 (1.07; 1.82)	0.01–0.50 8	95–110 101	0.14 (0.12; 0.17)	0.01–0.50 8	82 –120 100	-
Oranges (washed)	1.50 (1.98; 1.03)			0.16 (0.20; 0.12)			1.0, 1.1
Juice	0.20 (0.20; 0.21)	0.01–0.50 7	102–110 107	0.03 (0.03; 0.03)	0.01–0.50 7	90–107 99	0.14; 0.21
Dried pulp	3.05 (3.18; 2.92)	0.01–0.50 7	69–84 79	0.24 (0.24; 0.24)	0.01–0.50 7	63–80 72	2.1; 1.7
Molasses	8.43 (8.14; 8.73)	0.01–0.50 7	70–100 87	0.88 (0.71; 1.06)	0.01–0.50 7	66–101 90	5.8; 6.3
Oil	0.28 (0.18; 0.29)	7 0.01–0.50	80 – 100 93	<0.01 (<0.01; <0.01)	0.01 – 0.50 7	65–120 79	0.19; <0.07

In a tomato processing study (Rice and Willliams, 1995) dimethoate was applied as a foliar spray 4 times to tomatoes at 2.8 kg ai/ha in the San Joaquin Valley, central California, USA. The retreatment interval and the PHI were 7 days. The applications were made with about 185 l of spray. Analyses were by the ABC method within 31 days of processing.

Control and treated tomatoes (340-350 kg) were treated by a simulated commercial process. They were washed in a four step sequence of flume and spray, then crushed and heated to 91°C (hot break). The hot crush mixture was filtered, yielding tomato juice and wet pomace. Part of the pomace was dried on trays in a dehydrator (30 hours at 68°C). A portion of the juice was canned (50 minutes at 115°C), and another condensed to purée in a vacuum evaporator. The percentage of National

Tomato Soluble Solids (NTSS) was determined and some of the purée was canned. Some was condensed to paste in a vacuum kettle, and a third portion (1.5 kg) was combined with other ingredients (1.7 kg) to prepare ketchup.

The results are given in Table 58. The tomatoes were processed within 24 hours of harvest and samples were analysed within 31 days of processing. The residues in all control samples were <0.01 mg/kg.

Table 58. Residues of dimethoate and omethoate in tomatoes and tomato processed commodities from the foliar application of dimethoate (2.8 kg ai/ha, 7 day PHI, 5 x GAP rate).

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate,' mg/kg, mean and (duplicates)	Control analysis		
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %	Processing factors
Tomato	0.18	0.01–0.50 7	80–96 89	0.06	0.01–0.50 7	100–116 110	-
Juice	0.02	0.01 and 0.50 2	100; 97	<0.01	0.01 and 0.50 2	110; 104	0.11; 0.17
Wet pomace (64% water)	0.11	0.01 and 0.50 4	83–93 89	0.02	0.01 and 0.50 4	85–110 100	0.61; 0.33
Dry pomace (2.4% water)	0.10	0.01 – 0.50 7	70–104 87	0.01	0.01 – 0.50 7	70 –114 97	0.56; 0.17
Purée	0.30	0.01 and 0.50 2	80; 97	0.06	0.01 and 0.05 2	80; 114	1.7; 1
Paste	0.53	0.01 – 0.50 7	90–110 98	0.08	0.01–0.50 7	60–107 88	2.9; 1.4
Ketchup	0.33	0.01 and 0.50 2	90; 101	0.06	0.01 and 0.50 2	60; 106	1.8; 1

In a potato processing study by Rice *et al.* (1994) dimethoate was applied to potato plants in the Yakima Valley of Washington, USA, in 1993 at 2.8 kg ai/ha three times at 7-day intervals with ground equipment. About 190 l of water mixture was applied per hectare. The pre-harvest interval was 0 days. Samples from control and treated plots were analysed for dimethoate and omethoate by the ABC method. The potatoes were processed within 39 days of harvest, and the processed commodities extracted for analysis within 26 days of processing and then analysed within 6 days. All samples were stored frozen until analysis.

A 20-kg sample of potatoes was processed into chips by a process that simulated commercial practice, although they were not a variety that chippers would use. The potatoes were washed, culled, peeled with an abrasive peeler, and inspected to remove rotten potatoes and green tissue. A restaurant-style cutter was used to slice the potatoes into chips of about 1.6 mm thickness, which were placed in a tub of warm water to remove surface starch. The chips were deep-fried in fat at 177°C for 60–90 seconds, drained on a draining tray and salted. The commercial process uses a continuous deep fat fryer at 185°C for 60 seconds.

An additional sample was processed into granules (flakes) and wet peel. The variety, Russet Burbank Venhuizen, is a high-solids potato not suitable for the fresh market but very suitable for processing into granules. A 20-kg sample was tub-washed, sorted and steamed for 45 sec at 85 psi, then scrubbed with an abrasive peeler to remove the loosened peel. The collected peel was pressed and blended with cut trim waste to yield wet peel. About 18 kg of peeled potatoes were cut into 1.3 cm slabs with a restaurant-style slicer and spray-washed with cold water for 30 sec to remove free starch. The slices were cooked in a 120 l steam-jacketed kettle at 74°C for 20 minutes and cooled, and a 15 kg aliquot steam-cooked at 100°C for 45 minutes. The potatoes were mashed in a Hobart grinder and mixed with food additives. The commercial process would add granules at this stage to absorb moisture and to separate individual potato cells, but this would dilute the processed sample with foreign granules. The granules were therefore prepared by taking a 1 kg sub-sample of the mashed potatoes and drying to 10% moisture on a fluid bed dryer at 93°C, yielding about 400 g. The dried sample was mixed with 1 kg of mashed potatoes and the fluid bed drying process was repeated. The addition and drying procedure was conducted a total of 5 times to produce 1.5 kg of dehydrated potato flakes. The flakes were screened with 30 and 60 mesh screens and the product retained by the 60 mesh was taken as the potato granule fraction.

Tubers, chips, granules and wet and dry peel were analysed by the ABC method. The method was validated for dimethoate and omethoate in tubers, dry peel and chips at 0.01, 0.05 and 0.50 mg/kg, and in granules and wet peel at 0.01–1.0 mg/kg. Concurrent recoveries were determined for tubers only. The results are shown in Table 59.

Table 59. Residues of omethoate and dimethoate in potatoes and their processed commodities from treatment with a dimethoate EC formulation at 3 x 2.8 kg ai/ha, 0-day PHI.

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate,' mg/kg, mean and (duplicates)	Control analysis		Concentra-tion factor (dimethoate)
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %	
Tubers (79% water)	0.09[1]	0.01; 0.1 concurrent	100; 100	<0.01	0.01; 0.10 concurrent	80; 119	-
Granules (5% water)	0.01	0.01-1.0 9	90-106 98	<0.01	0.01-1.0 9	101-130 112	0.12 (D)
Chips (4% water)	<0.01	0.01-0.50 7	91-120 100	<0.01	0.01-0.50 7	77-130 96	0.12 (D)
Wet peel (83% water)	0.02	0.01-1.0 9	85-97 89	<0.01	0.01-1.0 9	80-120 010	0.23 (D)
Dry peel (6% water)	0.06	0.01-0.50 7	80-93 83	<0.01	0.01-0.50 7	76-100 87	0.67 (D)

[1] Washing reduced the residue to 0.07 mg/kg

In a cotton seed processing study (Rice *et al.*, 1994) dimethoate was applied twice to cotton in Uvalde, Texas, USA in 1993 at a rate of 2.8 kg ai/ha (140 l/ha) with a 13-day retreatment interval. Cotton seed was harvested 14 days after the second application and processed 44 days after harvest. The processed commodities were extracted for analysis within 42 days of processing, and the seed within 80 days of harvest. All samples were stored frozen.

Processing was by procedures that simulated commercial practice. The cotton seed was saw ginned to remove the lint and the delinted seed mechanically cracked and screened to separate hulls from kernels. The kernels plus some residual hulls were heated, flaked and extracted with hexane. The spent flakes were treated with forced warm air to remove residual hexane. The crude oil was miscella-refined. About 52 kg cotton was ginned and delinted to produce 17.5 kg delinted seed which yielded 11.4 kg kernels and 5.52 kg hulls. Solvent extraction of 11 kg kernels gave 2.3 kg crude oil and 8.3 kg meal.

Samples were analysed by the ABC method. The method was validated for dimethoate and omethoate in meal, hulls and oil at 0.01–0.50 mg/kg and for dimethoate only in soapstock at 0.02 and 0.05 mg/kg. Recoveries of omethoate from soapstock were not acceptable. Concurrent recoveries were determined for cotton seed only. Results were reported for delinted but not for crude cotton seed; they should also . Data should have been provided for the crude seed. The results are shown in Table 60.

Table 60. Residues of dimethoate and omethoate in cotton seed and its processed commodities from the foliar application of a dimethoate EC formulation at 2 x 2.8 kg ai/ha with a PHI of 14 days.

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate, mg/kg, mean and (duplicates)	Control analysis		Concen-tration factor (dimethoate)
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %	
Delinted cotton seed	0.03	0.01 concurrent	90	<0.01	0.01 concurrent	80	-
Meal	0.04	0.01 – 0.50 7	78–90 83	<0.01	0.01 – 0.50 7	66–90 82	1.4
Hulls	0.08	0.01 – 0.50 7	83–90 87	<0.01	0.01 – 0.50 7	81 – 100 90	2.7
Crude oil	0.02	0.01 – 0.50 7	90–120 105	<0.01	0.01 – 0.50 7	99–140 116	0.67
Refined oil	<0.01	-	-	<0.01	-	-	0.34
Soapstock	<0.02	0.02 – 0.05 4	70-82 76	Not determined	0.03 – 0.05 4	28–40 31	0.67

In a maize processing study (Rice *et al.*, 1994). Dimethoate was applied three times to field corn in Danville, Iowa, USA in 1993, at 2.8 kg ai/ha (190 l/ha). The retreatment interval was 7 days and the PHI was 14 days.

The maize was both dry milled and wet milled by batch processes that resemble the commercial continuous processes. Whole corn grain samples were dried, aspirated and screened. For dry milling, the whole grain was conditioned to 20–22% moisture and impact-milled in a Ripple mill, then dried (70^{o}C for 30 min) and passed over a 0.32 cm screen. The retained material was a mixture of large grits, germ and hull (bran) and was separated into the three components by aspiration and additional milling. Material that passed through the screen was processed into medium and small grits, coarse meal, meal and flour by sifting through a series of sieves. The germ was conditioned to 12% moisture, heated to 105^{o}C, flaked and pressed in an expeller t liberate part of the crude oil. The residual presscake with oil was extracted 3 times with hexane at 60^{o}C. The miscella was separated into crude oil and hexane at 90^{o}C in a laboratory vacuum evaporator or rotary evaporator and the oil was heated to 176^{o}C to remove hexane. The remaining presscake was air-dried and ground to form meal. The crude oil from the expeller was combined with the crude oil from the hexane extraction and refined according to AOCS method Ca9a52, yielding refined oil and soapstock.

A second batch of dried, aspirated and screened maize was processed by wet milling. The grain was steeped in water containing 0.2% sulfur dioxide at 54^{o}C for 22–48 hours. The product was ground in a Bauer mill and floated in salt water to remove the germ. The germ was dried (90^{o}C) to a final moisture content of 7–10%. The cornstock was ground twice in a mill containing 0.48 and 0.32 cm screens. Material retained by the 0.32 cm screen was collected and dried as bran. The cornstock passing through the 0.32 cm screen was further milled and screened. Material passing through a 43 micron screen was considered to be a starch and gluten mixture. The mixture was refrigerated to allow the starch and gluten to settle from the water. The starch and gluten were then separated by batch centrifugation. The germ fraction was adjusted to 12% moisture, heated to 105^{o}C, flaked and pressed in an expeller. This produced crude oil and presscake. The presscake was treated as in dry milling.

The maize was stored frozen and processed within three months of harvest. The maize and processed commodities were analysed by the ABC method within 12 days of processing. The method was validated by the concurrent analysis of fortified control samples of grain, grits, meal, flour, starch and crude oil (produced by wet and dry milling). The results are shown in Table 61. Grain dust (aspirated grain fractions) was not analysed: it accounted for about 1% of the grain weight.

Table 61. Residues of dimethoate and omethoate in maize and its processed commodities from the foliar application of a dimethoate EC formulation at 2 x 2.8 kg ai/ha, 14 day PHI.

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate, mg/kg, mean and (duplicates)	Control analysis		Concentration factor (dimethoate)
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %	
Corn grain	0.06	0.01 – 0.50 7	80–92 87	<0.01	0.01 – 0.50 7	77–100 86	
Grits	0.02	0.01 – 0.50 7	87–94 90	<0.01	0.01 – 0.50 7	83 – 110 92	0.34
Meal	0.02	0.01 – 0.50 7	76–100 88	<0.01	0.01 – 0.50 7	74 – 100 88	0.34
Flour	0.02	0.01 – 0.50 7	91–100 96	<0.01	0.01 – 0.50 7	82 – 120 101	0.34
Starch	<0.01	0.01 – 0.50 7	80–90 86	<0.01	0.01 – 0.50 7	80–100 86	0.17
Crude oil (wet milled)	<0.01	0.01 – 0.50 7	78–90 87	<0.01	0.01 – 0.50 7	66–100 78	0.17
Refined oil (wet milled)	<0.01	Not determined		<0.01	Not determined		0.17
Crude oil (dry milled)	0.02	0.01, 0.02 2	120 90	0.03	0.01, 0.02 2	90 70	0.34 >3 (omethoate)
Refined oil (dry milled)	<0.01	Not determined		<0.01	Not determined		0.17

In a wheat processing study (Rice *et al.*, 1994) dimethoate was applied once at 2.1 kg ai/ha with ground equipment in 177 l water/ha. The PHI was 37 days and 50-kg samples were stored frozen until processed 48 days after harvest.

The batch processing was designed to mimic the continuous commercial process. Whole wheat samples were cleaned by aspiration and screening. The aspirated grain dust was separated by sieving but not analysed. The cleaned grain was adjusted to 16% moisture, milled and sieved. This produced bran (730 micron screen retention), middlings (390 and 240 micron screen retentions), low grade flour (132 micron screen retention) and patent flour (below 132 microns). The middlings were reduced to flour with a roller mill (4 passes, with sieving each time). The final material retained by the 390 and 240 micron screens was considered to be shorts and the fractions retained and passed by 132 micron filter were designated as before. The low grade flour and patent flour from the reducing steps were combined with the corresponding flours from the break steps. Conditioned wheat weighing 2.4 kg was processed into bran (3.5 kg), shorts (7.8 kg), low grade flour (6.1 kg), patent flour (3.1 kg) and middlings (1.8 kg).

The processed commodities were stored frozen for 21–64 days before analysis by the ABC method. Concurrent fortified control samples were also analysed. The results are shown in Table 62. Processing factors could not be calculated because none of the samples contained quantifiable residues.

Table 62. Residues of Dimethoate and Omethoate in or on Wheat Processed Commodities from the Foliar Application of a Dimethoate EC formulation at 2.1 kg ai/ha (5X), 37 day PHI (GAP = 0.42 kg ai/ha, 35 day PHI).

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate, mg/ kg, mean and (duplicates)	Control analysis	
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %
Grain	<0.01	0.01-0.5 7	90-96 92	<0.01	0.01, 0.05	103-120 110

Sample	Dimethoate, mg/kg, mean and (duplicates)	Control analysis		Omethoate, mg/kg, mean and (duplicates)	Control analysis	
		Range, mg/kg No.	Recovery range and mean, %		Range, mg/kg No.	Recovery, %
Bran	<0.01	0.01, 0.05	90,86 concurrent	<0.01	0.01-0.5 7	100, 88 concurrent
Middlings	<0.01	0.01-0.5 7	80-99 93	<0.01	0.01-0.5 7	91-100 97
Shorts	<0.01	0.01-0.5 7	90-102 95	<0.01		92-120 106
Low grade flour	<0.01			<0.01	0.02-0.5 7	
Patent flour	<0.01	0.02-0.5 7	78-140 92 (sd 23)	<0.01	0.02-0.5 7	77-124 93 (sd 17)

Residues in the edible portion of food commodities

No information except as indicated in the supervised trials and processing studies.

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

Australia provided monitoring data on residues in commodities in trade. An outbreak of papaya fruit fly in the Cairns district of Queensland in 1995 led to the enactment of a plant quarantine zone, with fruit exported from the zone being treated with dimethoate or fenthion post-harvest dips or sprays at 400 mg/l. Commodities from north Queensland delivered to the Brisbane markets were monitored for residues of dimethoate, fenthion and malathion. Analytical method PPQ-02 was used to determine dimethoate + omethoate, with a reporting limit of 0.01 mg/kg. The ranges of residues found is shown in Table 63. (Hamilton *et al.*, 1998).

Table 63. Monitoring data for dimethoate + omethoate in or on fruit and vegetables exported from the Queensland quarantine zone, 11/95–06/96, following disinfestation treatment with a dimethoate post-harvest spray or dip (400 mg/l).

Commodity	Total no. of samples	Number of samples with dimethoate ranges, mg/kg								
		≤0.01	>0.01 – ≤0.02	>0.02 – ≤0.05	>0.05– ≤0.1	>0.1 – ≤0.2	>0.2 – ≤0.5	>0.5 – ≤1.0	>1.0- ≤2.0	>2.0- ≤5.0
Avocado	96	61	1	9	7	16	2			
Banana	211	2	1	1		1	512	114	38	3
Carambola	15					1	2	1	7	4
Egg plant	7						4	1	2	
Lime	32					2	15	13	2	
Litchi	106	9			1	3	8	61	2	
Mango	121	59	5	7	14	10	21	4	1	
Passion fruit	60						17	22	18	3
Paw paw	247	9	3	83	96	44	9	1	2	
Pomelo	7	1		1	1	1	3			
Pumpkin	6			1	2	2	1			
Rambutan	16					1	2	4	8	1
Sapote	7				1	1	4	1		
Star apple	5					1	2	1	1	
Zucchini	8						1	1	6	

Dimethoate was included in the onion monitoring programme of the Australian National Residue Survey. Dimethoate and omethoate were absent (<0.01 mg/kg dimethoate, <0.05 mg/kg omethoate) from 47 samples taken in 1995 (Hamilton *et al.*, 1998).

Australia reported information on residues in food as consumed (Hamilton *et al.,* 1998). The 1994 Australian Market Basket Survey estimated the total dietary intake of certain pesticides for six different sub-populations. Simulated diets for these groups were developed from the National Dietary Surveys and each of the foods in the diet was prepared for consumption and analysed for dimethoate and other selected pesticides. Dimethoate was found in 9 commodities: apple juice (0.0013 mg/kg average, 0.02 mg/kg max), green beans (0.0004 mg/kg average, 0.01 mg/kg max), blueberries (0.0211 mg/kg average, 0.07 mg/kg max), white cabbage (0.0029 mg/kg average, 0.05 mg/kg max), sweet peppers (0.0029 mg/kg average, 0.03 mg/kg max), seeded grapes (0.0046 mg/kg average, 0.11 mg/kg max), lettuce (0.0031 mg/kg average, 0.03 mg/kg max), peaches (0.0611 mg/kg average, 0.22 mg/kg max) and pears (0.0042 mg/kg average, 0.10 mg/kg max). The estimated intake as a percentage of the ADI of 0.02 mg/kg bw/day ranged from 0.1% for adult males and boys and girls aged 12 years to 0.5% for toddlers aged 2 years. Details were not provided.

The Netherlands provided summary information on surveys for residues of dimethoate in food in commerce for the period 1994–1996. No details were provided. The information is given in Table 64.

Table 64. Residues of dimethoate in food in commerce in The Netherlands, 1994–1996.

Commodity	No. of samples analysed	Samples with residues <LOD (0.05 mg/kg)	Samples with Residues 0.05-1 mg/kg	Samples with residues >1 mg/kg	Mean residue, mg/kg
Grapefruit	301	299	2	0	<0.05
Tangerines	560	536	24	0	<0.05
Oranges	902	822	80	0	<0.05
Lemons	243	231	12	0	<0.05
Apples	1495	1464	31	0	<0.05
Cherries	252	234	18	0	<0.05
Peaches	252	248	4	0	<0.05
Nectarines	221	216	5	0	<0.05
Plums	437	437	0	0	<0.05
Grapes	667	619	46	2	<0.05
Strawberries	2378	2371	7	0	<0.05
Blackberries	244	243	0	1	<0.05
Currants (red, black, white)	450	443	7	0	<0.05
Avocados	125	123	2	0	<0.05
Kiwi	223	221	2	0	<0.05
Litchis	35	32	3	0	<0.05
Mangoes	191	188	2	1	<0.05
Passion fruit	40	40	0	0	<0.05
Other fruits and products	385	373	12	0	<0.05
Radishes	1010	1008	2	0	<0.05
Garlic	35	35	0	0	<0.05
Onions (small)	97	95	2	0	<0.05
Tomatoes	1108	1108	0	0	<0.05
Peppers	1525	1519	6	0	<0.05
Cucumbers	951	947	4	0	<0.05
Gherkins/pickle	43	42	1	0	<0.05
Courgettes	296	203	3	0	<0.05
Melons	390	382	8	0	<0.05
Watermelons	19	18	7	0	<0.05
Broccoli	154	153	1	0	<0.05
Cauliflower	348	347	1	0	<0.05
Chinese cabbage	297	287	10	0	<0.05
Other leaf cabbage	99	98	1	0	<0.05
Kohlrabi	31	31	0	0	<0.05
Lambs lettuce	268	267	1	0	<0.05
Lettuce	3306	3284	20	2	<0.05
Iceberg lettuce	471	445	26	0	<0.05

Commodity	No. of samples analysed	Samples with residues <LOD (0.05 mg/kg)	Samples with Residues 0.05-1 mg/kg	Samples with residues >1 mg/kg	Mean residue, mg/kg
Endive	1137	1128	9	0	<0.05
Spinach	440	437	1	2	0.09
Watercress	10	9	1	0	<0.05
Witloof (chicory)	457	428	29	0	0.14
Parsley	368	365	3	0	<0.05
Other herbs	148	143	5	0	<0.05
Beans (fresh, with pod)	617	581	36	0	<0.05
Beans (fresh, without pod)	39	35	4	0	<0.05
Peas (fresh, with pod)	46	45	1	0	<0.05
Peas (fresh, without pod)	123	114	8	1	<0.05
Other legumes (fresh)	8	7	1	0	<0.05
Celery	233	230	3	0	<0.05
Fennel	52	52	0	0	<0.05
Leek	441	440	1	0	<0.05
Other stem vegetables	341	338	3	0	<0.05
Mushrooms	384	383	1	0	<0.05
Beans	2	1	1	0	<0.05
Other pulses (dried)	42	41	1	0	<0.05
Other arable products	699	692	7	0	<0.05
Maize	37	37	0	0	<0.05

The Netherlands also supplied similar information on residues of omethoate in food in commerce for the same period (Table 65).

Table 65. Residues of omethoate in food in commerce in The Netherlands, 1994–1996.

Commodity/MRL	No. of samples analysed	Samples with residues <LOD (0.05 mg/kg)	Samples with Residues 0.05-1 mg/kg	Samples with residues >1 mg/kg	Mean residue, mg/kg
Apples/0.2	1495	1491	3	1	<0.02
Cherries/0.4	252	251	1	0	<0.02
Grapes/0.1	667	660	5	2	<0.02
Strawberries/0.1	2378	2378	0	0	<0.02
Currants (red, black, white)/0.1	450	450	0	0	<0.02
Other fruits and products/0.2	385	384	1	0	<0.02
Tomatoes/0.2	1108	1108	0	0	<0.02
Peppers/0.2	1525	1519	6	0	<0.05
Cauliflower/0.2	348	347	1	0	<0.02
Chinese cabbage/0.2	297	296	1	0	<0.02
Kohlrabi/0.2	31	30	1	0	<0.02
Lettuce/0.2	3306	3305	1	0	<0.02
Iceberg lettuce/0.2	471	470	1	0	<0.02
Endive/0.2	1137	1136	1	0	<0.02
Spinach/0.4	440	439	0	1	<0.02
Witloof (chicory)/0.4	457	450	6	1	<0.02
Beans (fresh, with pod)/0.2	617	615	2	0	<0.02
Beans (fresh, without pod)/0.2	39	38	0)?)	0	<0.02
Peas (fresh, without pod)/0.2	123	121	1	1	<0.02

NATIONAL MAXIMUM RESIDUE LIMITS

National maximum residue limits were not reported by the DTF or Cheminova. National MRLs reported by the governments of Australia, Germany and The Netherlands are shown below.

Country	Commodity	MRL, mg/kg	Residue definition
DIMETHOATE (027)			
Australia	Cereal grains	0.05	Dimethoate + Omethoate, expressed as dimethoate (0.05 is the approximate LOD)
	Edible offal (mammalian)	0.05	
	Eggs	0.05	
	Fruiting vegetables, cucurbits	2	
	Fruits (except strawberry, litchi, peaches)	2	
	Litchi	5	
	Lupin (dry)	0.5	
	Lupin, forage	1	
	Meat (mammalian)	0.05	
	Milks	0.05	
	Oilseed (except peanut)	0.1	
	Peaches	T5	
	Peanut	0.05	
	Peppers sweet (capsicums)	1	
	Poultry, edible offal of	0.05	
	Poultry meat	0.05	
	Strawberry	5	
	Tomato	1	
	Vegetables (except lupin, dry; peppers, sweet; tomato)	2	
Germany	Vegetable	1	Dimethoate
	Fruit	1	
	Cereals	0.2	
	Tea	0.2	
	Other foods of plant origin	0.05	
The Netherlands	Fruit	1	Dimethoate (parent compound)
	Vegetables	1	
	Tea	0.2	
	Other food commodities	0.05	(0.05 is the LOD)
OMETHOATE (055)			
Australia	Cereal grains	0.05	Omethoate (0.05 is the approximate LOD)
	Edible offal (mammalian)	0.05	
	Eggs	0.05	
	Fruits	2	
	Legume animal feeds (fresh weight)	20	
	Lupin (dry)	0.1	
	Lupin forage	0.5	
	Meat (mammalian)	0.05	
	Milks	0.05	
	Miscellaneous fodder and forage crops (fresh weight)	20	
	Oilseed	0.05	
	Peppers, sweet (capsicums)	1	
	Poultry, edible offal of	0.05	
	Poultry meat	0.05	
	Straw, fodder (dry, and hay of cereal grains and other grass-like plants	20	
	Tomato	1	
	Vegetables (except lupin; peppers, sweet; tomato)	2	
Germany	Hops	10	
	Artichokes	0.4	
	Witloof	0.4	
	Spices	0.4	
	Cherries	0.4	
	Oilseeds	0.4	
	Spinach	0.4	
	Remaining vegetables	0.2	

Country	Commodity	MRL, mg/kg	Residue definition
	Remaining fruits	0.2	
	Small fruits and berries, except grapes	0.1	
	Leek	0.1	
	Tea	0.1	
	Root and tuber vegetable	0.1	
	Bulb vegetable	0.1	
	Other foods of plant origin	0.05	
The Netherlands	Cherries	0.4	Omethoate (parent compound)
	Table and wine grapes	0.1	
	Strawberries (other than wild)	0.1	
	Other small fruit and berries (other than wild)	0.1	
	Other fruit	0.2	
	Root and tuber vegetables	0.1	
	Onions	0.1	
	Spinach	0.4	
	Witloof	0.4	
	Leeks	0.1	
	Globe artichokes	0.4	
	Other vegetables	0.2	
	Tea	0.1	
	Other food commodities	0.02	(0.02 is the limit of determination)
FORMOTHION (042)			
Germany	Citrus fruit	0.2	Formothion
	Vegetable	0.1	
	Remaining fruit	0.1	
	Tea, tealike products	0.05	
	Other foods of plant origin	0.01	
The Netherlands[1]	Citrus fruit	0.2	Formothion
	Other fruit	0.1	
	Vegetables	0.1	
	Cereals	0.05	(0.05 is the limit of determination)
	Other food commodities	0 (0.05)	

[1]Not authorized for use in this country

APPRAISAL

Dimethoate, *O,O*-dimethyl *S*-methylcarbamoylmethyl phosphorodithioate, is a contact and systemic insecticide typically applied as an emulsifiable concentrate (EC) diluted in water at 0.3 – 0.7 kg ai/ha. The toxicology was reviewed in 1996 and an ADI of 0.002 mg/kg bw was allocated to the sum of dimethoate and omethoate, expressed as dimethoate. Omethoate, *O,O*-dimethyl *S*-methylcarbamoylmethyl phosphorothioate, is a metabolite of dimethoate and a systemic pesticide. Since 1986, the JMPR has estimated separate maximum residue levels for dimethoate and omethoate. Formothion, *S*-[formyl(methyl)carbamoylmethyl] *O,O*-dimethyl phosphorodithioate, is metabolized by plants to dimethoate and omethoate. No Codex MRLs or draft MRLs exist for formothion. Its toxicology was last reviewed in 1969 but no ADI was allocated.

The three compounds are now re-evaluated within the CCPR Periodic Review Programme, but as no information on formothion was submitted the evaluation refers only to dimethoate and omethoate.

Animal metabolism

Metabolism studies were reported for rats, goats and chickens. In the rat studies, three metabolites were identified in urine: *O,O*-dimethyl hydrogen phosphorothioate (7%), *O,O*-dimethyl hydrogen phosphorodithoate (25%) and dimethoate carboxylic acid (36%).

Leghorn chickens were given oral doses (0.9 mg/kg bw/day) of [*methoxy*-^{14}C]dimethoate for 7 days. The radioactive residue levels in the liver, muscle, fat, egg yolk (last day) and egg white (last day) were 0.64, 0.09, 0.038, 0.34 and 0.15 mg/kg respectively. The liver residue (0.82 mg/kg as dimethoate) was shown to consist mainly of phosphorylated natural products (33% of the TRR), omethoate (10% of the TRR) and dimethoate carboxylic acid (16% of the TRR). Phosphorylated natural products were significant proportions of the residue in muscle (36-46% of the TRR), egg white (50%), and egg yolk (35%). Dimethoate was not found in any of the samples. Omethoate was absent from muscle and fat, but found in egg whites at 3% of the TRR (0.004 mg/kg) and liver after protease treatment.

Dimethoate labelled on the methoxy carbons was administered orally to goats once daily for 3 consecutive days at 1.6 mg/kg bw/day. The concentrations of ^{14}C as dimethoate were liver 1.2 mg/kg, kidney 0.15 mg/kg, muscle 0.07 mg/kg, fat 0.05 mg/kg, and milk (48–60 h) 0.23 mg/kg. Much of the residue was characterized as phosphorylated natural products, 35% of the TRR in the liver, 32% in the kidneys, 53% in the muscle, and 53% in the milk. Dimethoate was not found in any sample and omethoate was found only in the liver (0.12 mg, 10% of the TRR) after protease treatment of the extraction residue. Urine was shown to contain dimethoate carboxylic acid, dimethyl hydrogen phosphorothioate and dimethyl hydrogen phosphate. The metabolism in both poultry and ruminants is consistent with the formation of the sulfoxides of omethoate and dimethoate carboxylic acid. The sulfoxides would react with nucleophiles, leading to phosphorylated natural products.

The Meeting concluded that the metabolism of dimethoate and omethoate in animals is adequately understood.

Plant metabolism

The metabolism of [^{32}P]dimethoate in sugar beet, maize, cotton, peas, potatoes and beans has been reported. The reports were summaries which did not provide the customary detail. Generally, the main components of the radiolabelled residue were dimethoate, omethoate, dimethoate carboxylic acid, dimethyl hydrogen phosphate and *O,O*-dimethyl hydrogen phosphorodithioate, indicating oxidation to omethoate, omethoate carboxylic acid and dimethoate carboxylic acid, and cleavage of the P-S linkage either before or after oxidation. A difference from animal metabolism is that the sulfoxide is apparently not formed.

Dimethoate is water-soluble and considerable translocation of foliar dimethoate might be expected. The metabolism studies with maize, cotton, potatoes and peas indicated the extent of penetration of residues into the leaves, but no detailed study on residue translocation was reported.

The Meeting concluded that the plant metabolism studies were incomplete, both because a detailed study was not provided and because translocation was not adequately addressed.

Environmental fate

Studies were reported on confined rotational crops, degradation, dissipation and mobility in soil, adsorption and desorption, photodegradation on soil, and aquatic dissipation.

In the confined rotational crop study, soil was treated with [^{14}C]dimethoate at a rate of 0.56 kg ai/ha. Lettuce, turnips and wheat were planted after 30 and 120 days and grown to maturity. The radioactive residues were highest in the 30-day plantings, ranging from 0.008 mg/kg as dimethoate in turnip roots to 0.045 mg/kg in wheat straw. A substantial proportion of each crop sample (30-60% of the TRR) was characterized as polar compounds or polar hydroxy compounds. The crops planted after 120 days showed very low radioactive residues, ranging from 0.001 mg/kg in turnip roots to 0.02 mg/kg in wheat straw.

The Meeting concluded that inadvertent residues in rotational crops would not be significant, that the low residue levels consisted mainly of polar metabolites and that dimethoate and omethoate concentrations under field conditions would be below 0.01 mg/kg, a typical lower limit of quantification.

When the degradation of [^{14}C]dimethoate in soil under aerobic and anaerobic conditions was studied its half-life in sandy loam soil under aerobic conditions was 2.4 days, with two products identified: dimethyl hydrogen phosphorothioate and *O*-demethyl-dimethoate. Radioactive carbon dioxide accounted for 75% of the applied radioactivity after 180 days, indicating mineralization as the ultimate fate. The half-life of dimethoate under anaerobic conditions (after two days of aerobic conditioning) was 4 days. The same products were identified.

Soil dissipation studies in the UK and the USA showed that dimethoate does not migrate readily below the top 15 cm and that the half-life is 2–4 days. In other studies half-lives of dimethoate in soil were 9.8 days in bean plots, 6.0 days in grape plots and 7.8 days in bare soil. A lysimeter test in Germany showed that radiolabelled dimethoate had little tendency to migrate downward through the soil, with 17% of the recovered radioactivity in the top 12 cm.

The Meeting concluded that dimethoate was degraded at a moderate rate in soil with a half-life of about 4 days, and that it migrates only slowly under normal agricultural conditions.

Leaching studies were reported with four types of soil. Dimethoate is readily leached, with the rate of leaching decreasing with increasing loam content of the soil, but leaching is offset by the short half-life in soil.

The half-lives of dimethoate in two water/sediment systems were 13 and 17 days. The only identified product was demethyl-dimethoate.

In a study of the photodegradation of dimethoate on soil the half-life in sunlight was 10 days, but the half-life in the dark was 8 days. The Meeting concluded that photodegradation was not significant.

Methods of residue analysis

Adequate methods exist for data collection, monitoring, and the enforcement of MRLs. The methods are similar and involve maceration of the substrate with solvent, typically acetone/water, and extraction of the (concentrated) macerate with chloroform or methylene chloride. Extracts are sometimes cleaned up on a column of celite or Florisil or by GPC. Some Australian methods use sweep co-distillation with ethyl acetate after the chloroform extraction, but this step destroys omethoate. The final extracts are analysed on a gas chromatograph equipped with a capillary column and a flame photometric detector (FPD). The typical lower limits of quantification are 0.01 mg/kg for both dimethoate and omethoate.

Extensive recovery data were presented for the most common methods.

Stability of stored analytical samples

The stabilities of dimethoate and omethoate on fortified analytical samples of tubers, oranges, sorghum grain, sorghum forage and cotton seed during frozen storage were determined. The Meeting concluded that dimethoate was stable on all these commodities for at least 1.7 years and that omethoate was also stable on all of them with the possible exception of cotton seed, from which a 20% loss may have occurred during the first 5 months with no subsequent decrease.

Definition of the residue

On the basis of the metabolism of dimethoate in plants and animals, the conclusions of the 1996 JMPR on the toxicology, the available analytical methods and the lack of significant data on omethoate *per se*, the Meeting concluded that the residue for compliance with MRLs should be defined as dimethoate. The MRLs for omethoate should be considered for withdrawal because no data were reported to support omethoate MRLs. For the estimation of dietary intake the residue is based on the sum of dimethoate and omethoate, each considered separately.

Residues resulting from supervised trials

Supervised trials were reported on oranges (post-harvest), apples, pears, cherries, plums, blueberries, strawberries, grapes, currants, avocados (post-harvest), litchis (post-harvest), chives, leeks, Brussels sprouts, cabbages, cauliflowers, broccoli, kohlrabi, cucumbers (post-harvest), zucchini (post-harvest), rockmelons (post-harvest), watermelons (post-harvest), tomatoes, sweet peppers, kale, spinach, chard, lettuce, peas, French beans, mung beans, potatoes, turnips, sugar beet, carrots, long radishes, asparagus, sorghum, barley, maize, wheat and witloof chicory.

Oranges. Post-harvest trials were reported from Australia. Only one residue was reported at the specified 0-day post-treatment holding period. The data were insufficient to estimate a maximum residue level or STMR. The Meeting recommended withdrawal of the existing CXLs for dimethoate and omethoate in citrus fruits.

Pome fruit (apples and pears). Supervised field trials on apples in The Netherlands and Germany were reported. Two trials in The Netherlands and 10 in Germany complied with GAP for apples and pears (3 x 0.02 kg ai/hl (0.30 kg ai/ha), 21-day PHI, and 3 x 0.04 kg ai/hl (0.6 kg ai/ha), 21-day PHI respectively). Two trials were reported with the use of omethoate on apples in The Netherlands, with residues as high as 0.1 mg/kg, but this is insufficient for the estimation of residues from the use of omethoate *per se*. Four supervised field trials in Germany with foliar application of dimethoate to pears complied with GAP. The residues of dimethoate in apples and pears in rank order were 0.01, 0.03, <0.05 (5), 0.06, 0.07, 0.08, 0.10, 0.14, 0.15, 0.16, 0.26 and 0.30 mg/kg. The residues of omethoate from the use of dimethoate were 0.04, <0.05 (6), 0.05 (2), 0.06 (2), 0.07, 0.08 and 0.13 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 0.5 mg/kg and an STMR of 0.065 mg/kg, and an STMR for omethoate of 0.05 mg/kg.

Cherries. In four supervised trials in the USA the application rate was about 7.7 times the GAP rate. Ten trials in Germany complied with GAP (3 x 0.04 kg ai/hl (0.6 kg ai/ha), 21-day PHI). The residues of dimethoate were <0.02, <0.05, <0.05, 0.03, 0.06, 0.06, 0.08, 0.13, 0.19 and 1.5 mg/kg, and those of omethoate were <0.01, 0.03, 0.05, 0.11, 0.27, 0.27, 0.28, 0.28, 0.28 and 0.46 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 2 mg/kg, and STMRs for dimethoate of 0.06 mg/kg and for omethoate of 0.27 mg /kg.

Plums. Four replicate trials in The Netherlands could not be used to estimate a maximum residue level because the PHI of 14 days was less than the GAP 21-day PHI and one of the trials showed a significant residue at 14 days. Twenty-three trials according to GAP (3 x 0.04 kg ai/hl (0.6 kg ai/ha), 14-day PHI) were reported from Germany, with residues of dimethoate of <0.02, <0.05 (6), 0.05, 0.06, 0.07, 0.09, 0.10, 0.11, 0.12 (2), 0.13 (2), 0.15, 0.24, 0.28, 0.36, 0.46 and 0.75 mg/kg and of omethoate of <0.02, <0.05 (10), 0.05 (3), 0.07, 0.08, 0.12 (2), 0.14, 0.17 and 0.22 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 1 mg/kg , an STMR for dimethoate of 0.10 mg/kg and an STMR for omethoate of 0.05 mg/kg.

Blueberries. Supervised field trials were reported from the USA. There is no current GAP.

Strawberries. Three varieties were treated at various rates in replicate plots in Australia, but the combined residue of dimethoate and omethoate was measured and only 3 residues were from GAP conditions (0.30 kg ai/ha, 1-day PHI). There were insufficient data to estimate a maximum residue limit or STMR and the Meeting recommended withdrawal of the CXL for strawberry.

Grapes. Supervised field trials were reported from France and Germany, but without corresponding GAP. GAP for The Netherlands is 3 x 0.02 kg ai/hl (0.24-0.30 kg ai/ha), 21- or 28-day PHI. GAP for Hungary is 0.04 kg ai/hl (0.32 kg ai/ha) with a 14-day PHI. Seven trials in France were close to these conditions. The residues were 0.11, 0.18, 0.21, 0.48, 0.53, 0.89 and 1.2 mg/kg of dimethoate and <0.05, <0.05, 0.08, 0.11, 0.11, 0.14, 0.19 mg/kg of omethoate. The Meeting estimated a maximum residue level for dimethoate of 2 mg/kg, and STMRs for dimethoate of 0.48 mg/kg and for omethoate of 0.11 mg/kg.

Currants. Supervised field trials were carried out in Germany but no GAP was reported. GAP for The Netherlands is 3 x 0.24 kg ai/ha, 21-day PHI, but none of the German trials complied with it. The Meeting recommended withdrawal of the existing CXL for currant, black.

Sub-tropical fruits with inedible peel. Two supervised trials each on avocados, mangoes and litchis, post-harvest dips or high-volume sprays, were reported from Australia. The residues belonged to different populations and could not be combined for evaluation. There were therefore insufficient data to estimate maximum residue levels or STMRs.

Leeks. One supervised trial in Germany complied with GAP for The Netherlands, assuming an application of 1000 l of spray solution per ha. One trial was inadequate to estimate a maximum residue level or STMR.

Onions. Seven supervised field trials according to GAP (2 x 0.24 kg ai/ha, 14-day PHI) were reported from Germany. The residues were <0.01, 0.01, <0.02, <0.02, 0.04, <0.05 and <0.05 mg/kg of dimethoate and <0.01, <0.01, <0.02, <0.02, <0.02, <0.05 and <0.05 mg/kg of omethoate. The Meeting estimated a maximum residue level of 0.05* mg/kg for dimethoate and STMRs of 0.02 mg/kg for both dimethoate and omethoate.

Cauliflowers. Nine field trials on cauliflowers in Germany were not according to GAP. Eight trials in the UK complied with UK GAP for brassica vegetables (6 x 0.40 kg ai/ha, 7-day PHI). The residues were 0.02, 0.02, 0.03, 0.04, 0.09, 0.09, 0.11 and 0.34 mg/kg of dimethoate and <0.01 (8) and 0.01 mg/kg of omethoate. The Meeting estimated a maximum residue level of 0.5 mg/kg for dimethoate and STMRs of 0.065 mg/kg for dimethoate and 0.01 mg/kg for omethoate.

Broccoli. Only one supervised trial was reported, which did not comply with GAP. A maximum residue level or STMR could not be estimated.

Brussels sprouts. Four supervised field trials in Germany (GAP 0.24 and 0.36 kg ai/ha, 14-day PHI), three in The Netherlands (GAP 0.2 kg ai/ha repeated, 21-day PHI), one in the USA (GAP 6 x 1.12 kg ai/ha, 10-day PHI) and eight in the UK (GAP 6 x 0.40 kg ai/ha, 7-day PHI) complied with national GAP. The residue in the US trial (3.12 mg/kg) was an outlier and was not included. In one of the UK trials there was an unacceptable concentration of residue in the control. In the remaining trials the residues of dimethoate were 0.005, 0.009, 0.03, <0.05, <0.05, 0.05, 0.06, 0.07, 0.08, 0.10, 0.11, 0.17, 0.21 and 0.46 mg/kg, and those of omethoate were <0.01, <0.01, <0.01, 0.01, 0.02, 0.03, 0.03, 0.04, 0.07, 0.08, 0.09, 0.16, 0.30 mg/kg (omethoate was not determined in one of the German trials). The Meeting estimated a maximum residue level of 1 mg/kg for dimethoate and STMRs of 0.065 mg/kg for dimethoate and 0.03 mg/kg for omethoate.

Cabbage. Twelve supervised field trials on cabbages in Germany (8 Savoy and 4 head) complied with GAP (0.4 kg ai/ha, 42-day PHI or 2 x 0.24 kg ai/ha, 14-day PHI), as did eight on head cabbages in the

UK (6 x 0.40 kg ai/ha, 7-day PHI) and two in The Netherlands (0.2 kg ai/ha repeated, 21-day PHI). The residues in head cabbages were in two population groups, those in Germany and The Netherlands ranging from <0.01 to 0.07 mg/kg dimethoate and <0.01 to 0.02 mg/kg omethoate and those in the UK ranging from 0.04 to 1.2 mg/kg dimethoate and <0.01 to 0.64 mg/kg omethoate. In the UK trials only one residue (of omethoate) was below the LOD. In the German and Dutch trials, 4 of 6 dimethoate residues and 4 of 5 omethoate residues were below the LOD. The residues of dimethoate in the population with highest residue levels (UK) were 0.04, 0.07, 0.14, 0.25, 0.67, 0.82, 0.99 and 1.2 mg/kg, and those of omethoate in the same population were <0.01, 0.02, 0.04, 0.05, 0.28, 0.35, 0.63 and 0.64 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg for dimethoate and STMRs of 0.46 mg/kg for dimethoate and 0.165 mg/kg for omethoate on head cabbages except Savoy cabbage.

The residues of dimethoate on Savoy cabbages in Germany were <0.01 (2), <0.02 (4) and <0.05 (2) and of omethoate <0.01 (2), <0.02 (2), 0.13, 0.17, 0.31 and 0.66 mg/kg. The Meeting estimated maximum residue levels of 0.05* mg/kg for dimethoate and STMRs of 0.02 mg/kg for dimethoate and of 0.075 mg/kg for omethoate on Savoy cabbage.

Kohlrabi. Two supervised trials in Germany complied with UK GAP but were insufficient to estimate a maximum residue level or STMR.

Cucumbers, zucchini, cantaloupes. A single trial on each in Australia with post-harvest treatment was reported. One trial is insufficient for the estimation of a maximum residue level or STMR.

Watermelons. Two post-harvest trials in Australia at maximum GAP (400 mg/l dip, 0-day post-treatment interval) were inadequate for the estimation of a maximum residue level or STMR.

Tomatoes. Six post-harvest trials in Australia were according to GAP (400 mg dimethoate/l solution dip, 7-day post-treatment interval), but only dimethoate was determined. Fourteen trials in Germany complied with GAP (3 foliar applications, 0.24, 0.36, 0.48 kg ai/ha or 0.04 kg ai/hl, 3-day PHI). The 20 dimethoate residues in rank order were 0.01, 0.05 (2) 0.06 (2), 0.08, 0.12, 0.15, 0.19, 0.20, 0.22, 0.24, 0.26 (2), 0.31, 0.34, 0.41, 0.42, 0.80 and 1.3 mg/kg. The 14 omethoate residues were 0.01, 0.03 (3), 0.04, <0.05, 0.05 (3), 0.06, 0.09, 0.13, 0.14 and 0.32 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg for dimethoate and STMRs of 0.21 mg/kg for dimethoate and 0.05 mg/kg for omethoate.

Sweet peppers. Three trials in Australia with post-harvest dip treatment of sweet peppers were according to the Queensland GAP of 0.04 kg dimethoate per 100 l of dipping solution with no specified holding period. The Meeting concluded that three trials were inadequate for the estimation of maximum residue levels or STMRs and recommended withdrawal of the existing CXL for peppers.

Kale. Eight supervised field trials were carried out in Germany, but no relevant GAP was reported. The Meeting could not evaluate the data and recommended withdrawal of the existing CXL.

Chard, leaf lettuce. One trial in Germany on each crop was reported but without relevant GAP. The data were inadequate.

Head lettuce. Twelve supervised trials reported from Germany complied with GAP (2 x 0.24 kg ai/ha, 21-day PHI). One trial was not evaluated because the total residues increased substantially from 7 to 14 days and the dimethoate/omethoate ratio at 14 and 21 days was quite different from that in the other trials. The residues of dimethoate were <0.02 (7), <0.05 (2), 0.09 and 0.24 mg/kg, and those of omethoate were <0.02 (3), 0.02, 0.03, 0.03, <0.05, <0.05, 0.05, 0.06 and 0.10 mg/kg. The Meeting estimated a maximum residue level of 0.5 mg/kg for dimethoate and STMRs of 0.02 mg/kg for dimethoate and 0.03 mg/kg for omethoate.

Spinach. Two of four supervised trials in Germany complied with the GAP of The Netherlands (0.20 kg ai/ha, 21-day PHI). The Meeting considered the data inadequate and recommended the withdrawal of the existing CXL.

Peas. Supervised trials according to GAP were reported from Denmark (2 trials; GAP 0.32 kg ai/ha, 14-day PHI); the UK (3 trials; GAP 6 x 0.34 kg ai/ha, 14-day PHI); Germany (3 trials according to UK GAP); The Netherlands (2 trials; GAP 3 x 0.20 kg ai/ha, 21-day PHI) and the USA (4 trials; GAP 0.19 kg ai/ha, 0-day PHI). The dimethoate residues were <0.01, 0.018, 0.026, 0.027, 0.03, 0.04, 0.04, 0.09, 0.19, 0.27, 0.36, 0.44, 0.50 and 0.64 mg/kg, and the omethoate residues <0.01, <0.01, 0.015, 0.02 (5), 0.022, 0.026, 0.03, 0.04, 0.052 and 0.20 mg/kg. The Meeting estimated a maximum residue level of 1 mg/kg for dimethoate and STMRs of 0.065 mg/kg for dimethoate and 0.02 mg/kg for omethoate.

Beans. Three trials on French beans in Germany were not according to GAP. A single trial on mung beans in the USA complied with GAP (0.56 kg ai/ha, 0-day PHI). The data on beans were inadequate.

Potatoes. Nine trials in Germany (GAP 0.24 kg ai/ha, 14-day PHI) and one each in the UK (GAP 2 x 0.34 kg ai/ha), The Netherlands (GAP 4 x 0.20 kg ai/ha, 21-day PHI) and Denmark (GAP 0.30–0.32 kg ai/ha, 14-day PHI) were according to national GAP. The residues of dimethoate were <0.01 (6), 0.01, <0.02 (4) and 0.02 mg/kg and those of omethoate were <0.01 (6), 0.01, <0.02 (4) and 0.02 mg/kg. The Meeting estimated a maximum residue level of 0.05 mg/kg for dimethoate and STMRs of 0.01 mg/kg each for dimethoate and omethoate.

Turnips, turnip greens. Seven trials in the USA complied with GAP (0.28 kg ai/ha, 14-day PHI). The residues of dimethoate and omethoate in the roots were <0.1 mg/kg in all the samples. The Meeting estimated a maximum residue level for dimethoate of 0.1 mg/kg and STMRs of 0.1 mg/kg each for dimethoate and omethoate in garden turnips.

The residues of dimethoate on the turnip tops (greens) were <0.1 (5), 0.25 and 0.55 mg/kg and those of omethoate were <0.1 (6) and 0.20 mg/kg. The Meeting estimated a maximum residue level of 1 mg/kg for dimethoate and STMRs of 0.1 mg/kg each for dimethoate and omethoate in turnips greens.

Sugar beet roots and tops. Two trials in the UK complied with UK GAP (2 x 0.40 kg ai/ha, before June 30) and one each in Denmark and The Netherlands with Dutch GAP (3 x 0.40 kg ai/ha, no PHI). Most of the six trials in Germany (GAP 0.16 kg ai/ha, 35-day PHI) were at about twice the GAP rate, but could be included in the evaluation because the residues were at the limit of quantification at the appropriate PHI. The residues of dimethoate in the roots were <0.01 (7), <0.02 (2) and <0.05 mg/kg, and those of omethoate were <0.01 (7), <0.02 and <0.05 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 0.05 mg/kg and STMRs for dimethoate and omethoate of 0.01 mg/kg each in sugar beet (roots).

The residues of dimethoate on the tops were <0.01 (2), <0.02, <0.05, 0.06 and 0.10 mg/kg and those of omethoate <0.01 (2), <0.02, <0.05, 0.05 (2), and 0.17 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 0.1 mg/kg and STMRs for dimethoate and omethoate of 0.05 mg/kg each for sugar beet leaves or tops.

Carrots. Only two of 14 trials in Germany complied with GAP (2 x 0.24 kg ai/ha, 14-day PHI). The Meeting recommended withdrawal of the existing CXL.

Radishes. Twenty trials were carried out in Germany, but no GAP was reported for Germany or any other country. The Meeting could not estimate a maximum residue level or STMR.

Asparagus. In four supervised field trials in the USA which were according to GAP (5 x 0.56 kg ai/ha, 180-day PHI) the residues of dimethoate were <0.02 (3) and <0.03 mg/kg, and those of omethoate were <0.02 (3) and <0.12 mg/kg. In three additional trials at twice the GAP rate the residues of dimethoate and omethoate were all below the LOD (<0.02 mg/kg). The Meeting estimated a maximum residue level for dimethoate of 0.05* mg/kg and STMRs for dimethoate and omethoate of 0.02 mg/kg each.

Barley grain and straw. Supervised field trials according to GAP were reported from Denmark (GAP 0.80 kg ai/ha; 1 trial), The Netherlands (GAP 0.20 kg ai/ha, 14-day PHI; 2 trials), Germany (2 trials according to Dutch GAP) and the UK (GAP 4 x 0.34 kg ai/ha, 14-day PHI; 3 trials). The residues of dimethoate in the grain were 0.03, 0.06, 0.07, 0.10, 0.41, 0.49, 0.73 and 1.43 mg/kg and those of omethoate <0.01 (2), 0.01 (2), 0.02, 0.03, 0.06 and 0.10 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 2 mg/kg and STMRs of 0.255 mg/kg for dimethoate and 0.015 mg/kg for omethoate in barley grain.

The residues of dimethoate on the straw were 0.09, 0.13, 0.20, 0.44, 0.55, 0.88, 1.59 and 2.81 mg/kg and those of omethoate <0.01, 0.01, 0.03 (3), 0.07 (2) and 0.11 mg/kg. The Meeting estimated STMRs for straw of 0.495 mg/kg for dimethoate and of 0.03 mg/kg for omethoate.

Maize. Two supervised field trials were reported from Denmark, but the PHIs were at least twice the GAP interval. The Meeting could not estimate a maximum residue level or STMR.

Sorghum (grain, forage and hay). Six trials in the USA complied with GAP (3 x 0.56 kg ai/ha, 28-day PHI). All the residues of dimethoate and omethoate in the 5 samples of grain analysed were <0.01 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 0.01* mg/kg and STMRs of 0.01 mg/kg each for dimethoate and omethoate in sorghum grain.

The residues of dimethoate on the forage were <0.01 (4), 0.01 and 0.02 mg/kg and those of omethoate all <0.01 mg/kg. The residues of dimethoate on the hay were <0.01 (5) and 0.01 mg/kg and of omethoate all <0.01 mg/kg. The Meeting estimated STMRs for forage and hay of 0.01 mg/kg each for dimethoate and omethoate.

Wheat grain and straw. One trial each in The Netherlands, Denmark, the UK and Germany complied with UK GAP (4 x 0.68 kg ai/ha low volume, 4 x 0.34 kg ai/ha high volume, 14-day PHI) and three trials in Germany complied with German GAP (2 x 0.24 kg ai/ha, 21-day PHI). The residues of dimethoate in the grain were <0.01, <0.02 , <0.05, 0.09, 0.10, 0.11 and 0.12 mg/kg, and those of omethoate were <0.01 (3), 0.01, 0.02 and <0.05 mg/kg. The Meeting estimated a maximum residue level for dimethoate of 0.2 mg/kg and STMRs of 0.09 mg/kg for dimethoate and 0.01 mg/kg for omethoate in wheat grain.

The residues of dimethoate in or on the straw were <0.02, <0.05, 0.12, 2.23, 2.37, 4.42 and 8.95 mg/kg, and of omethoate <0.02, 0.02, <0.05, 0.08, 0.12, 0.13 and 0.17 mg/kg. The Meeting estimated a maximum residue level of 10 mg/kg for dimethoate and STMRs of 2.23 mg/kg for dimethoate and 0.08 mg/kg for omethoate in wheat straw and fodder, dry.

Chives. Five supervised field trials were carried out in Germany, but no GAP was reported for any country. No maximum residue level or STMR could be estimated.

Witloof chicory. Five trials in The Netherlands did not comply with GAP (5.0 kg ai/ha, 21-day PHI) because the PHIs all exceeded 35 days. The Meeting recommended withdrawal of the existing CXL for witloof chicory (sprouts).

Feeding studies

No feeding studies were reported but the studies of metabolism in hens and goats indicated that dimethoate and omethoate are extensively metabolized. Dimethoate was undetectable in all the samples and omethoate was found only in hen and goat livers and egg whites after protease treatment of the residue from the solvent extractions.

Possible ruminant feed items include apple pomace, barley grain and straw, wheat grain and straw, potato culls, processed potato waste, sorghum grain, forage and hay, sugar beet tops, molasses and pulp, and turnip roots and tops. Poultry feed may include barley grain and sorghum grain. There was no information available on residues in apple pomace, potato waste and culls or sugar beet molasses and pulp and potential residues in these commodities could not be estimated.

The maximum residues found in supervised field trials with feed items, e.g. wheat straw at 2 mg/kg dimethoate and 0.2 mg/kg omethoate and barley grain at 2 mg/kg dimethoate and 0.1 mg/kg omethoate, indicate that a dairy cow would receive about 7 ppm dimethoate and 0.2 ppm omethoate in the diet and poultry about 1.7 ppm dimethoate and 0.2 ppm omethoate. The metabolism studies were at levels equivalent to 10 ppm dimethoate in the diet for poultry and 30 ppm for goats, or about 5 and 15 times the highest estimated dietary burdens. In the metabolism studies, omethoate was found in liver (0.12 mg/kg in goats, 0.082 mg/kg in hens) and egg whites (0.004 mg/kg). From the calculated dietary burdens, the maximum omethoate residues are estimated to be 0.008 mg/kg in ruminant liver, 0.016 mg/kg in poultry liver, and 0.0008 mg/kg in egg whites.

The Meeting estimated maximum residue levels for ruminant and poultry commodities at the limit of determination, 0.05* mg/kg, for dimethoate. The residues are likely to be much less than 0.05 mg/kg, but the Meeting considered 0.05 mg/kg to be the practical limit of quantification that can be routinely achieved in the laboratory. The Meeting also estimated STMRs of 0 mg/kg each for dimethoate and omethoate in the same commodities.

Processing studies

Processing studies were reported on oranges, tomatoes, potatoes, cotton seed, maize and wheat. The raw wheat and cotton seed contained no quantifiable residues and processing factors could not be determined for these crops. The processing factors and estimated STMRs for the other processed commodities were as follows.

Processed Commodity	Processing factor		Raw agricultural commodity STMR, mg/kg		Processed commodity STMR, mg/kg	
	Dimethoate	Omethoate	Dimethoate	Omethoate	Dimethoate	Omethoate
Orange juice	0.14	0.21	Not available	Not available		
Orange oil	0.19	0.07	Not available	Not available		
Tomato juice	0.11	0.17	0.21	0.05	0.03	0.009
Tomato purée	1.7	1	0.21	0.05	0.4	0.05
Tomato paste	2.9	1.4	0.21	0.05	0.6	0.07
Tomato ketchup	1.8	1	0.21	0.05	0.4	0.05
Potato granules (flakes)	0.12	-	0.01	0.01	0.002	0.002
Potato chips	0.12	-	0.01	0.01	0.002	0.002
Refined cotton seed oil	0.34	-	Not available	Not available		
Maize meal	0.34	-	Not available	Not available		
Maize grits	0.34	-	Not available	Not available		
Maize flour	0.34	-	Not available	Not available		
Maize starch	0.17	-	Not available	Not available		
Refined maize oil	0.17	-	Not available	Not available		

RECOMMENDATIONS

On the basis of data from supervised trials the Meeting estimated the maximum residue levels for dimethoate listed below (first table).

No data were submitted to support the existing MRLs for omethoate and the Meeting accordingly recommended their withdrawal (second table).

The Meeting concluded that the combined intakes of dimethoate and omethoate, adjusted as explained below (Dietary Risk Assessment), might exceed the ADI for dimethoate. The maximum residue levels estimated for dimethoate are therefore recommended for use as MRLMs, not MRLs.

Definition of the residue for compliance with MRLs: dimethoate.

Definition of the residue for the estimation dietary intake: sum of dimethoate and omethoate, each considered separately.

Dimethoate

Commodity		Recommended MRLM, mg/kg		STMR, mg/kg
CCN	Name	New	Previous	
FP 0226	Apple	W[1]	1	
VS 0621	Asparagus	0.05*	-	0.02
FI 0327	Banana	W	1 Po	
GC 0640	Barley	2	-	0.255
AS 0640	Barley straw and fodder, dry	-	-	0.495
VR 0574	Beetroot	W	0.2	
VB 0402	Brussels sprouts	1	2	0.065
VB 0041	Cabbages, Head[2]	2	2	0.46
VB 0403	Cabbage, Savoy	0.05*	-	0.02
VR 0577	Carrot	W	1	
MO 0812	Cattle, Edible offal of	0.05*	-	0
VB 0404	Cauliflower	0.5	-	0.065
VS 0624	Celery	W	1	
FS 0013	Cherries	2	2	0.06
FC 0001	Citrus fruits	W	2	
FB 0278	Currant, Black	W	2	
PE 0112	Eggs	0.05*	-	0
FB 0269	Grapes	2	1	0.48
DH 1100	Hops, dry	W	3	
VL 0480	Kale	W	0.5	
VL 0482	Lettuce, Head	0.5	2	0.02
MF 0100	Mammalian fats (except milk fats)	0.05*	-	0
MM 0096	Meat of cattle, goats, horses, pigs and sheep	0.05*	-	0
ML 0107	Milk of cattle, goats and sheep	0.05*	-	0
OR 0305	Olive oil, refined	W	0.05*	
FT 0305	Olives	W	1	
DM 0305	Olives, processed	W	0.05*	
VA 0385	Onion, Bulb	0.05*	0.2	0.02
FS 0247	Peach	W	2	
FP 0230	Pear	W[1]	1	
VP 0063	Peas (pods and succulent = immature seeds)	1	0.5	0.065
VO 0051	Peppers	W	1 Po	
FS 0014	Plums (including Prunes)	1	0.5	0.1
FP 0009	Pome fruits	0.5	-	0.065
VR 0589	Potato	0.05	0.05	0.01

Commodity		Recommended MRLM, mg/kg		STMR, mg/kg
CCN	Name	New	Previous	
	Potato granules			0.002
	Potato chips			0.002
PO 0111	Poultry, Edible offal of	0.05*	-	0
PF 0111	Poultry fats	0.05*	-	0
PM 0110	Poultry meat	0.05*	-	0
MO 0822	Sheep, Edible offal of	0.05*	-	0
GC 0651	Sorghum	0.01*	-	0.01
AF 0651	Sorghum forage (green)	-	-	0.01
AS 0651	Sorghum straw and fodder, dry	-	-	0.01
VL 0502	Spinach	W	1	
FB 0275	Strawberry	W	1	
VR 0596	Sugar beet	0.05	0.05	0.01
AV 0596	Sugar beet leaves or tops	0.1	1 T	0.05
VO 0448	Tomato	2	1 Po	0.21
JF 0448	Tomato juice			0.03
	Tomato purée			0.4
	Tomato paste			0.6
	Tomato ketchup			0.4
VR 0506	Turnip, Garden	0.1	0.5	0.1
VL 0506	Turnip greens	1	-	0.1
GC 0654	Wheat	0.2	-	0.09
AS 0654	Wheat straw and fodder, dry	10	-	2.23
VS 0469	Witloof chicory (sprouts)	W	0.5	

[1]Replaced by recommendation for Pome fruits
[2]Except Savoy cabbage

Omethoate

Commodity		Recommended MRLM (mg/kg)		STMR (mg/kg)
CCN	Name	New	Previous	
FP 0226	Apple	W	2	
FS 0240	Apricot	W	2	
VS 0620	Artichoke, Globe	W	0.5	
VS 0621	Asparagus	-	-	0.02
FI 0327	Banana	W	0.2*	
GC 0640	Barley	-	-	0.015
AS 0640	Barley straw and fodder, dry	-	-	0.03
VP 0061	Beans, except broad bean and soya bean	W	0.2	
VB 0400	Broccoli	W	0.2	
VB 0402	Brussels sprouts	W	0.2	0.03
VB 0403	Cabbage, Savoy	-	-	0.075
VB 0041	Cabbages, Head	W	0.5 T	0.165
VR 0577	Carrot	W	0.05	
VB 0404	Cauliflower	W	0.2	0.01
VS 0624	Celery	W	0.1	
GC 0080	Cereal grains	W	0.05	
FS 0013	Cherries	W	2	0.27
FC 0001	Citrus fruits	W	2	
VC 0424	Cucumber	W	0.2	
FB 0278	Currant, Black	W	2	
FB 0269	Grapes	W	2	0.11
DH 1100	Hops, dry	W	3	
VL 0480	Kale	W	0.2	
VL 0482	Lettuce, Head	W	0.2	0.03
VL 0483	Lettuce, Leaf	W	0.2	
VA 0385	Onion, Bulb	W	0.5	0.02

Commodity		Recommended MRLM (mg/kg)		STMR (mg/kg)
FS 0247	Peach	W	2	
FP 0230	Pear	W	2	
VP 0063	Peas (pods and succulent = immature seeds)	W	0.1	0.02
VO 0051	Peppers	W	1	
FS 0014	Plums (including Prunes)	W	1	0.05
FP 0009	Pome fruits	-	-	0.05
VR 0589	Potato	W	0.05	0.01
	Potato chips			0.002
	Potato granules			0.002
GC 0651	Sorghum	-	-	0.01
AF 0651	Sorghum forage (green)	-	-	0.01
AS 0651	Sorghum straw and fodder, dry	-	-	0.01
VL 0502	Spinach	W	0.1	
FB 0275	Strawberry	W	1	
VR 0596	Sugar beet	W	0.05	0.01
AV 0596	Sugar beet leaves or tops	W	1T	0.05
VO 0448	Tomato	W	0.5	0.05
JF 0448	Tomato juice	-	-	0.009
	Tomato purée			0.05
	Tomato paste			0.07
	Tomato ketchup			0.05
VR 0506	Turnip, Garden	W	0.2	0.1
VL 0506	Turnip greens	-	-	0.1
GC 0654	Wheat	-	-	0.01
AS 0654	Wheat straw and fodder, dry	-	-	0.08
VS 0469	Witloof chicory (sprouts)	W	0.5	

FURTHER WORK OR INFORMATION

Desirable

A plant metabolism study that provides detailed results and includes data on translocation is highly desirable. A root crop is suggested.

DIETARY RISK ASSESSMENT

The Meeting considered approaches to the dietary risk assessment of mixed residues of dimethoate and omethoate, resulting from the use of dimethoate. Noting that the ADI for omethoate had been withdrawn by the JMPR (Evaluations 1996, Part II – Toxicological), the Meeting considered that it would be inappropriate to rely on the previous omethoate ADI in the dietary risk assessment. However, the Meeting noted that the toxicity of omethoate was generally about ten times that of dimethoate across a range of toxic endpoints dependent upon cholinesterase inhibition, reflecting the fact that it is an active metabolite of dimethoate. The Meeting considered that it would be appropriately conservative to multiply the omethoate component of the residue by a tenfold factor, for comparison of the combined residues with the current dimethoate ADI.

STMRs for dimethoate derived from residues of dimethoate in or on commodities have been combined with STMRs for omethoate derived from residues of omethoate arising from the use of dimethoate multiplied by a factor of 10. Dietary intakes estimated from the combined adjusted STMRs were compared with the dimethoate ADI (0.002 mg/kg bw).

The International Estimated Daily Intakes for the GEMS/Food European diet was 140% of the ADI. International Estimated Daily Intakes for the other four GEMS/Food regional diets were in the range of 10 to 80% of the ADI. The Meeting concluded that the combined dietary intakes of dimethoate and omethoate residues, expressed as described above, may exceed the ADI for dimethoate for the European diet. The recommended MRLs are therefore designated as MRLMs.

The Meeting identified wheat, tomatoes and potatoes as the main contributors to the dietary exposure.

REFERENCES

ABC laboratories, (1994). *A Compendium of Analytical Methods for the Determination of Dimethoate and Omethoate Residues in Crops and Soil by Gas Chromatography*. ABC Laboratories, Inc. Unpublished Cheminova Agro A/S report. (CHA Doc. No. 286 DMT).

Adair, T.H., Sprinkle, R.B., Toia, R.F. (1995). *A Confined Rotational Crop Study with 14C-Dimethoate using Lettuce, Turnips and Wheat.* Ptrl West, Inc., Plant Sciences, Inc., Proj. No. '413W, '94.186. Unpublished Cheminova Agro report. (CHA Doc. No: 191 DMT).

Baron, J.J. (1987). *Dimethoate - Magnitude of Residue on Mung Bean.* North Carolina State University, Pesticide Residue Res. Laboratory, Proj. No. 2215. Unpublished IR-4 report. (CHA Doc. No: 277 DMT).

Choban, R.G. (1989). *Petition Proposing a Tolerance for Dimethoate Use in Brussels Sprouts Production (Vol. 1). Dimethoate.* IR-4 Western Region Analytical Laboratory, Proj. No. A-27200-17-90 (Vol 1), IR-4 PR No. '155 (Vol 2).(CHA Doc. No: 278 DMT).

Jacobson, B. (1994), *Dissipation of Dimethoate in Soil under Field Conditions when Applied to Bare Ground in New York,* ABC Laboratories, Inc, Proj. No. 40971, Unpublished Cheminova Agro report. (CHA Doc. No: 188 DMT).

Jacobson, B. (1994), Dissipation of Dimethoate in Soil Under Field Conditions with Grain Sorghum in Texas, ABC Laboratories, Inc, Proj. No. 40972, Unpublished Cheminova Agro report. (CHA Doc. No: 189 DMT).

Jalali, K., Hiler. R. (1995). *Further Characterization of [14C] Dimethoate Residues in the 48-60 Hour Milk Extract from the Study Entitled: The Metabolism of [14C]Dimethoate in the Lactating Goat Following Oral Administration for 3 Consecutive Days.* PTRL West, Inc., Proj. No. '632W. Unpublished Cheminova Agro report. (CHA Doc. No: 223 DMT Amdt-1).

Jalali, K., Krautter, G.R., Cassidy, J.E. (1995). *The Metabolism of [14C]Dimethoate in Laying Hens Following Oral Administration for 7 Consecutive Days*. PTRL West, Inc., USA, Proj. No. '761E/412W. Unpublished Cheminova Agro report. (CHA Doc. No: 222 DMT).

Jalali, K., Krautterm, G.R., Cassidy, J.E. (1995). *The Metabolism of [14C]Dimethoate in the Lactating Goat Following Oral Administration for 3 Consecutive Days.* PTRL West, Inc., USA, Proj. No. '760E/411W. Unpublished Cheminova Agro report. (CHA Doc. No: 223 DMT).

Karren, J.B. (1986). *IR-4 Residue Data for Dimethoate on Cherries in Utah July, 1986.* Utah State University, Proj. No. 00446. Unpublished IR-4 report. (CHA Doc. No: 329 DMT).

Madsen, S. (1994). *Solubility of Dimethoate in Organic Solvents.* Analytical Bio-chemistry Laboratories Inc. Project No. 42040. Unpublished Cheminova Agro A/S report, CHA Doc. No. 221 DMT.

Rice, F. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Oranges and its Processed Commodities.* ABC Laboratories, Inc., Proj. No. 40898. Unpublished Cheminova Agro A/S report (CHA Doc. No. 177 DMT).

Rice, F., Beckerman, J., Williams, B.B. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Raw Agricultural Commodities of Peas.* ABC Laboratories, Inc., Proj. No. 40894. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 170 DMT).

Rice, F., Beckerman, J., Williams, B.B. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Raw Agricultural Commodities of Grain Sorghum.* ABC Laboratories, Inc., Proj. No. 40893. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 171 DMT).

Rice, F., Beckerman, J.M., Williams, B.B. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Raw Agricultural and Processed Commodities of White Potatoes.* ABC Laboratories, Inc., Proj. No. 40899, Unpublished Cheminova Agro A/S report (CHA-Doc. No. 175 DMT).

Rice, F., Beckerman, J.M., Williams, B.B. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Corn Grain and Its Processed Commodities.* ABC Laboratories, Inc., Proj. No. 40896. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 174 DMT).

Rice, F., Beckerman, J.M., Williams, B.B. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen*

Analog, Omethoate, in or on Wheat Grain and Its Processed Commodities. ABC Laboratories, Inc., Proj. No. 40895. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 176 DMT).

Rice, F., Beckerman, J.M., Williams, B.B. (1994). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Cottonseed and its Processed Commodities.* ABC Laboratories, Inc., Proj. No. 40897. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 180 DMT).

Rice, F., Williams, B.B. (1995). *Magnitude of the Residues of Dimethoate and Its Oxygen Analog, Omethoate, in or on Raw Agricultural and Processed Commodities of Tomatoes.* ABC Laboratories, Inc., Proj. No. 41489. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 226 DMT).

Samoil, K.S. (1994). *Petition Proposing a Tolerance for Dimethoate Use in Asparagus Production + Magnitude of Residue: Dimethoate.* IR-4, Rutgers University, Proj. No. 2457. (CHA Doc. No: 179 DMT).

Samoil, K.S. (1996). *Magnitude of Residue: Dimethoate on Blueberry. (Vol. 2: Magnitude of Residue of Dimethoate in Blueberries.* New Jersey Agricultural Experiment Station, Proj. No. 00028. Unpublished Cheminova Agro A/S report. (CHA Doc. No: 212 DMT).

Samoil, K.S. (1998). *Magnitude of Residue: Dimethoate on Turnip*. New Jersey Agricultural Experiment Station, IR-4 Proj. No. 04451. Only a summary of the draft report is submitted. A full report will be available mid 1998.

Samoil, K.S. (1997). *Magnitude of the residue: Dimethoate on Grass (Grown for Seed).* New Jersey Agricultural Experiment Station, IR-4 Proj. No. 06037. Only a summary of the report is submitted. A full report has been submitted to the US EPA and will be available mid 1998.

Skinner, W., Shepler, K. (1994). *Photodegradation of [14C]Dimethoate in/on Soil by Natural Sunlight*. PTRL West, Inc. Project No. '414W. Unpublished Cheminova Agro A/S report. (CHA Doc. No.173 DMT).

Williams, B.B. (1994). *Freezer Storage Stability Study for Dimethoate and Its Oxygen Analog, Omethoate, in Raw Agricultural Commodities.* ABC Laboratories, Inc., Proj. No. 40925. Unpublished Cheminova Agro A/S report (CHA-Doc. No. 185 DMT).

Williams, B.B. (1995). *Freezer Storage Stability Study for Dimethoate and Its Oxygen Analog, Omethoate, in Raw Agricultural Commodities. Supplemental Information for MRID 43348801.* ABC Laboratories, Inc., Proj. No. '40925-1. Unpublished Cheminova Agro A/S report, (CHA Doc. No. 185 DMT amdt-1).

Williams, B.B. (1996). *Freezer Storage Stability Study for Dimethoate and Its Oxygen Analog, Omethoate, in Raw Agricultural Commodities. No. 2 Supplemental Information for MRID 43348801*. ABC Laboratories Missouri, Proj. No. '40925-2. Unpublished Cheminova Agro A/S report, (CHA Doc. No. 185 DMT amdt-2).