METHAMIDOPHOS (100)

[see also ACEPHATE (095)]

EXPLANATION

Methamidophos was first evaluated in 1976, with further reviews of residue aspects in 1979, 1981, 1984, 1990 and 1994. The 1994 JMPR withdrew the previous recommendations for MRLs for broccoli, Brussels sprouts, head cabbages, cauliflower, citrus fruits, egg plant, melons except watermelon, peaches and tomato which had been held at Step 7B by the 1992 CCPR (ALINORM 93/24, para 119-123). The manufacturer indicated that information on GAP and residue data would be available to support new MRLs for these commodities. This information was provided to the Meeting, together with information on analytical methods and residues in food in commerce or at consumption.

METHODS OF RESIDUE ANALYSIS

Analytical methods

In the supervised trials homogenized samples were extracted with ethyl acetate or a water-acetone mixture. The water-acetone extract was filtered and, after the addition of sodium chloride, partitioned with chloroform or methylene chloride. The samples were cleaned up on a silica gel column and analysed by GLC (Leary, 1971; Möllhoff, 1971; Luke, 1975; Lai and Fowler, 1989; Blass, 1994).

Recoveries of both methamidophos and acephate were generally >70% and the limit of determination was 0.01-0.02 mg/kg.

Stability of pesticide residues in stored analytical samples

The stability of methamidophos was studied in vegetables, pulses, oil seed, animal products, cereals and grasses as part of the stability studies on acephate. All samples except pinto beans and eggs were from crops or animals which had been treated with acephate. Pinto beans and eggs were fortified. Storage was for periods ranging from 28 days to more than a year at -20°C (Lai, 1987, 1988, 1989).

The results of the trials did not establish the stability of methamidophos in the treated commodities, because they contained substantially higher residues of acephate than of methamidophos and there was a possibility that acephate was degraded to methamidophos during storage. Methamidophos was stable in pinto beans and eggs at -20°C for periods of 461 and 175 days respectively, but was unstable in cow kidneys and cotton seed. The results are given in Table 1.

Table 1. Stability of acephate and methamidophos in samples stored at -20°C.

Commodity	Compound[1]	Storage period, days	Initial concentration[2], mg/kg	% of initial residue remaining	Reference
Celery	A	364	0.26-4.40	87-97	56
	M	364	0.02-0.29	243-300	
Celery	A	94	4.16-4.40	106-116	55
	M	94	0.23-0.29	93-148	
Snap beans	A	548	0.30-0.39	76.7-82.1	57
	M	548	0.12-0.15	75.0-80.0	
Snap beans	A	69	0.30-0.39	73.3-84.6	55
	M	69	0.12-0.15	75.0-86.7	
Pinto beans (dry)	A	461	0.23-0.24[3]	95.0-95.0	57
	M	461	0.09-0.10[3]	80.0-90.0	
Pigeon peas	A	418	8.11-9.74	104-110	55
	M	418	0.94-1.07	108-111	
Bell peppers	A	386	3.67-3.83	103-112	
	M	386	0.51-0.53	131-136	
Brussels sprouts	A	272	1.61-2.06	84-88	
	M	272	0.03-0.03	100-100	
Cotton seed	A	48	0.38-0.82	73.2-86.8	
	M	48	0.02-0.03	0.0-0.0	
Grass	A	269	0.52-0.70	78.6-100	
	M	269	0.10-0.14	78.6-90	
Bermuda grass	A	61	0.62-0.72	108.1-122.2	
	M	61	0.11-0.11	109.1-116.7	
Bermuda grass	A	60	1.88-2.85	98.2-101.6	
	M	60	0.31-0.44	102.3-106.5	
Fresh hay	A	58	6.95-7.36	72.0-85.8	
	M	58	0.49-0.54	75.5-83.3	
Spent hay	A	58	2.81-2.91	96.2-96.4	
	M	58	0.33-0.36	90.9-91.7	
Lettuce	A	28	0.29-0.31	84-93	
	M	28	0.02-0.02	50-100	
Rice grain	A	506	1.09-1.19	81-126	
	M	506	0.21-0.23	96-124	
Rice straw	A	507	0.17-0.21	90-94	
	M	507	0.06-0.06	83-83	
Eggs	A	175	0.15-0.16[3]	96.8-103	55
	M	175	0.07-0.08[3]	93.3-93.3	
Cow milk	A	202	0.04-0.79	98.7-150	
	M	202	0.02-0.12	58.3-100	
Cow kidneys	A	172	0.26-0.73	71.2-73.1	
	M	172	0.02-0.07	50.0-60.0	
Cow muscle	A	193	0.11-0.40	90.5-112	
	M	193	0.01-0.03	100-100	

[1] A: Acephate M: Methamidophos
[2] Initial concentrations were the residues found in the commodity at harvest or collection, except in pinto beans and eggs in which acephate and methamidophos were added to the untreated commodities
[3] Fortified separately with acephate and methamidophos

USE PATTERN

Information on use patterns was provided by the governments of Germany, The Netherlands and Poland and the manufacturers.

The use patterns for peaches, broccoli, head cabbages, cauliflowers, melons, egg plants and tomatoes are shown in Table 2.

Table 2. Registered uses of methamidophos on peaches, broccoli, head cabbages, cauliflowers, melons, egg plants and tomatoes. All spray applications.

Crop	Country	Form.	Application				PHI, days
			kg ai/ha	kg ai/hl	No.	Interval, days	
Peaches	Australia	EC		0.029	-	-	21
	France	SL	0.5				21
	Greece	SL	0.68				21
	Italy	EC	0.38-0.6				21
	Portugal	SL	0.8-1.0				21
	Spain	SL	0.75-1.1	0.05-0.075			35
	Uruguay	SL		0.036-0.06			28
Broccoli	Brazil	SL	0.3-0.6	0.06			21
	Canada	SL	0.53-1.1				14
	Mexico	SL	0.6-0.9				21
	USA	SL	0.56				14
	USA	SL	>0.56-1.1				21
	Venezuela	SL	0.24	0.06-0.12			14
Cabbages	Australia	SL	0.64-1.2	0.058-0.11	-	10	7
	Bolivia	EC	0.6				14
	Brazil	SL	0.3-0.6	0.06			21
	Canada	SL	0.53-1.1				7
	El Salvador	SL	0.6-0.84	0.06-0.09			15
	Germany	SL	0.36	0.09	2		14
	Indonesia	LC	0.19-0.49				14
	Mexico	SL	0.6-0.9				35
	New Zealand	SL	0.6-0.9				7
	Philippines	SL	0.56-1.9	0.11-0.19			15
	Poland	SL	0.22	0.036-0.11	1		21
	Thailand	SL	0.6-1.2				21
	USA	SL	0.56-1.1				35
Cauliflowers	Australia	SL	0.64-1.2	0.058-0.11	-	10	7
	Brazil	SL	0.3-0.6	0.06			21

Crop	Country	Form.	Application				PHI, days
			kg ai/ha	kg ai/hl	No.	Interval, days	
	Canada	SL	0.53-1.1				7
	Germany	SL	0.36	0.09	2		21
	Greece	SL	0.48-0.72	0.06-0.09			21
	Mexico	SL	0.6-0.9				28
	Philippines	SL	0.56-1.9	0.11-0.19			15
	USA	SL	0.56-1.1				28
	Venezuela	SL	0.24	0.06-0.12			14
Melons	Dominican Republic	SL	0.36				3
	Ecuador	SL	0.48-0.6				15
	Mexico	SL	0.6-0.9				7
	Uruguay	SL		0.048			14
	Venezuela	SL	0.6				14
Egg plants	Greece	SL	0.48-0.72				21
	Mexico	SL	0.6-0.9				14
	Philippines	SL	0.56-1.9	0.11-0.19			28
	Thailand	SL	0.6-1.2				21
	Venezuela	SL	0.6				14
Tomatoes	Australia	SL	0.32-1.2	0.029-0.11	-	14	4
	Brazil	SL	0.3-0.6	0.06			21
	Chile	SL	0.3-0.6				15
	Dominican Republic	SL	0.6-0.9				14
	Ecuador	SL	0.48-0.6				15
	El Salvador	SL	0.6-0.84	0.06-0.09			7
	Greece	SL	0.48-0.72				21
	Guatemala	SL	0.6-0.84	0.06-0.09			21
	Honduras	SL		0.06-0.09			21
	Mexico	SL	0.6-0.9				7
	New Zealand	SL	0.6-0.9				3
	Nicaragua	SL	0.6-0.84	0.06-0.09			21
	Peru	SL	0.6-1.2	0.12-0.18			14
	Philippines	SL	0.56-1.9	0.11-0.19			28
	Portugal	SL	0.6-1.2				21
	Spain	SL		0.05-0.075			7
	Thailand	SL	0.45-0.9				21
	Uruguay	SL	0.24-0.48	0.024-0.048			28
	Venezuela	SL	0.6				14

RESIDUES RESULTING FROM SUPERVISED TRIALS

Data from many supervised trials on peaches, broccoli, head cabbages, cauliflowers, melons, egg plants and tomatoes were submitted or resubmitted to the Meeting, but some reports lacked important information so the Meeting did not evaluate trials which lacked data on analytical recoveries or those with abnormally high residues in control samples and for which no representative chromatograms were supplied. In such cases. it was not clear whether the control samples were contaminated or the analysis was at fault. The trials which were considered to be unsuitable for evaluation are shaded in the Tables.

Residues in crops

Peaches. Ten supervised trials were carried out in Italy and Spain. The summarized data are shown in Table 3.

Table 3. Residues of methamidophos in peaches. All SL formulations.

Country Year	Application			PHI, days	Residues	Reference
	No.	kg ai/ha	kg ai/hl			
Italy 1994	2	0.68	0.057	0[1]	0.19	36
				0	1.1	
				7	0.41	
				14	0.26	
				21	0.16	
				28	0.11	
Italy 1994	2	0.68	0.057	0[1]	0.13	37
				0	0.67	
				21	0.12	
				28	0.06	
Italy 1994	2	0.6	0.05	0[1]	0.12	34
				0	0.39	
				21	0.09	
				28	0.04	
Italy 1994	2	0.6	0.05	0[1]	0.41	31
				0	0.95	
				7	0.55	
				14	0.28	
				21	0.27	
				28	0.13	
Spain 1994	2	0.6	0.048	0[1]	0.26	33
				0	1.3	
				6	0.59	
				14	0.27	
				21	0.09	
				28	0.09	
Spain 1994	2	1	0.054	0[1]	0.6	35
				0	1	
				21	0.27	
				28	0.15	
	1	0.72	0.048	28	<0.01	1

Country Year	Application			PHI, days	Residues	Reference
	No.	kg ai/ha	kg ai/hl			
Spain 1995				35	<0.01	
	1	1.1	0.072	28	0.11	
				35	0.07	
Spain 1995	1	0.86	0.048	28	0.12	1
				35	0.24	
	1	1.3	0.072	28	0.4	
				35	0.76	

[1] Sampling just before last application

Broccoli. Eighteen supervised trials were carried out in Brazil, Canada, Mexico and the USA. The results are shown in Table 4.

Table 4. Residues of methamidophos in broccoli.

Country Year	Application				PHI, days	Residues[1]	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
Brazil 1987	SL	5	0.6	0.06	0	1.6	27[2]
					14	<0.01	
					21	<0.01	
					28	<0.01	
		5	1.2	0.12	21	<0.01	
Brazil 1995	SL	3	0.6	0.06	21	0.2	76
		3	1.2	0.12	21	0.6	
Canada 1995	EC	3	1.08		14	0.01, 0.01	79[3]
Canada 1972	EC	8	1.12	0.12	0	13.05	2[4]
					3	5.87	
					7	1.88	
					14	0.13	
Canada 1972	EC	8	1.12	0.14	0	0.95	3[4]
					3	0.94	
					7	0.99	
					14	0.41	
Mexico 1995	EC	2	0.9	0.3	21	<0.01, 0.08	46[4]
USA 1974	SC	5	1.12		0	2.15(H), 2.85(L)	12[4]
					7	0.92(H), 3.64(L)	
					14	0.42(H), 2.24(L)	
					21	0.14(H), 0.88(L)	
					28	0.04(H), 0.45(L)	
USA 1974	SC	3	1.12	0.48	21	0.06(H), 0.75(L)	11[4]
					28	0.09(H), 0.54(L)	

Country Year	Application Form.	No.	kg ai/ha	kg ai/hl	PHI, days	Residues[1]	Reference
					35	0.02(H), 0.24(L)	
					42	0.03(H), 0.07(L)	
	SC	3	1.12	0.34	14	0.03(H), 0.74(L)	4[4]
USA 1973					21	0.01(H), 0.11(L)	
					28	<0.01(H), 0.06(L)	
					35	<0.01(H), 0.03(L)	
					42	<0.01(H), <0.01(L)	
	SC	6	1.12	0.34	0	1.55(H), 7.15(L)	6[4]
USA 1973					7	1.10(H), 0.01(L)	
					14	0.12(H), 0.22(L)	
					21	0.02(H), 0.11(L)	
					28	<0.01(H), 0.02(L)	
	SC	3	1.12	0.2	14	<0.01(H), 0.54(L)	8[4]
USA 1973					21	<0.01(H), 0.06(L)	
					27	0.02(L)	
	SC	3	1.12	0.27	14	2.84(H), 4.98(L)	9[4]
USA 1974					21	0.01(H), <0.01(L)	
					26	<0.01(H), <0.01(L)	
					35	0.02(H), 0.04(L)	
					42	<0.01(H), 0.02(L)	
	SC	3	1.12	0.12	14	0.28	14[4]
USA 1973					21	0.02	
					28	0.03	
					35	0.01	
	SC	5	1.12	0.2	0	1.32(H), 22.93(L)	5[4]
USA 1973					7	0.33(H), 2.51(L)	
					13	0.15(H), 1.14(L)	
	SC	5	1.12	0.12	0	1.52	13[4]
USA 1974					7	0.21	
					14	0.05	
					21	0.01	
	SC	5	1.12	0.27	0	2.65(H), 7.3(L)	10[4]
USA 1974					7	2.53(H), 9.07(L)	
					14	1.27(H), 7.62(L)	
					21	<0.01(H), 0.08(L)	
					28	<0.01(H), <0.01(L)	

[1] (H) head (L) leaves
[2] The data were also submitted to the 1990 JMPR
[3] The 2 results were from duplicate plots. The higher values of each pair were used to estimate both maximum residue levels and STMRs
[4] No data on analytical recoveries

Head cabbages. Six supervised trials were carried out in Argentina, Brazil, Germany and Mexico. The results are shown in Table 5.

Table 5. Residues of methamidophos in head cabbages.

Country, Year	Application				PHI, days	Residues[1]	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
Argentina 1995	EC	1	0.6	0.16	14 21 30	<0.05 <0.05 <0.05	63[1]
Brazil 1995	SL	3	0.6	0.06	21	0.08	77
		3	1.2	0.12	21	0.2	
Germany 1977	SL	3	0.36	0.06	0 7 14 21 28	1.95 0.23 0.2 0.06 0.07	15
Germany 1977	SL	3	0.36	0.06	0 7 14 21 28	<0.01 0.16 0.03 0.02 0.05	16
Mexico 1995	EC	2	0.9	0.3	35	<0.01, 0.02	65[1,2]

[1] No data on analytical recoveries
[2] The 2 results were from duplicate plots. The higher value was used to estimate both maximum residue levels and STMRs

Cauliflowers. Eleven supervised trials were carried out in Brazil, France, Germany, Mexico and the USA. The results are shown in Table 6.

Table 6. Residues of methamidophos in cauliflowers.

Country Year	Application				PHI, days	Residues[1]	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
Brazil 1987	SL	6	0.6	0.06	0 14 21 28	2.5 <0.01 <0.01 <0.01	23[2]

Country Year	Application				PHI, days	Residues[1]	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
		6	1.2	0.12	21	<0.01	
	SL	3	0.6	0.06	21	0.5	75
Brazil 1995		3	1.2	0.12	21	0.6	
	SL	1	0.94	0.06	14	0.64, 1.06	53[3]
France 1988		1	0.75	0.06	21	0.29, 0.84	
		2	0.75	0.06	21	0.19, 0.23	
	SL	2	0.36	0.06	0	2.15	17[4]
Germany					3	1.1(H), 1.6(L)	
1978					7	0.55	
					14	0.3	
					21	0.04	
					28	<0.01	
	SL	2	0.36	0.06	0	0.35	18[4]
Germany					3	0.25(H), 1.25(L)	
1978					7	0.07	
					14	0.02	
					21	0.01	
					28	<0.01	
	SL	2	0.36	0.06	0	0.55	19
Germany					7	0.01	
1978					14	<0.01	
					21	≤0.01	
					28	<0.01	
Mexico 1995	EC	2	0.9	0.3	35	0.07, 0.12	66[5]
	SL	9	1.12	N.S	0	0.19(H), 16.05(L)	7[5]
USA 1973					7	0.23(H), 9.38(L)	
					14	0.26(H), 6.01(L)	
					21	0.11(H), 5.5(L)	
					28	0.07(H), 1.55(L)	

[1] (H) head (L) leaves
[2] The data were also submitted to the 1990 JMPR
[3] The 2 results were from duplicate plots
[4] Data were also submitted to the 1981 JMPR
[5] No data on analytical recoveries

Melons. Four supervised trials were carried out in Argentina, Mexico and Spain. The results are shown in Table 7.

Table 7. Residues of methamidophos in melons.

Country Year	Application				PHI, days	Residues[1]	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
Argentina	EC	1	0.6	0.16	14 21	0.98 0.44	70[1]
Mexico 1995	EC	2	0.9	0.3	7	0.23 1.63	71[1,2]
Spain 1995	SL	3	1.2	0.08	7	0.11	72
Spain 1995	SL	3	1.2	0.08	0 3 7	0.32 0.19 0.11	73

[1] No data on analytical recoveries
[2] The 2 results were from duplicate plots

Egg plants. Seven supervised trials were carried out in Argentina, Mexico, Spain and the USA. The results are shown in Table 8.

Table 8. Residues of methamidophos in egg plants.

Country Year	Application				PHI, days	Residues	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
	EC	1	0.6	0.16	14	<0.05	I.67[1]
Argentina					21	<0.05	
1995					30	<0.05	
Mexico 1995	EC	2	0.9	0.3	14	0.77, 0.95	68[1,2]
Mexico 1995	EC	2	0.9	0.3	14	0.28, 0.34	69[1,2]
	EC	4	0.6	0.045	0	0.18	51
Spain 1987					3	0.1	
					7	0.05	
					10	0.04	
	SL	7	1.12	0.3	3	0.17	24[3]
USA 1987					7	0.12	
					14	0.06	
					21	0.04	
	SL	7	1.12	0.08	3	0.11	25[3]
USA 1987					7	0.1	
					14	0.06	
					21	0.03	
	SL	7	1.12	0.38	3	0.13	22[3]
USA 1987					7	0.12	
					14	0.12	

Country Year	Application				PHI, days	Residues	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
					21	0.06	

[1] No data on analytical recoveries
[2] The 2 results were from duplicate plots
[3] Data were also submitted to the 1990 JMPR

Tomatoes. Twenty five supervised trials were carried out in Australia, Brazil, France, Italy, Mexico, Spain and Turkey. The results are shown in Table 9.

Table 9. Residues of methamidophos in tomatoes.

Country, Year	Application				PHI, days	Residues	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
Australia 1995	EC	6	1.2	0.44	1 3 5 7	0.70, 0.77 0.75, 0.96 0.64, 0.74 0.66, 0.74	II.74[1]
		6	2.4	0.88	1 3 5 7	1.20, 1.70 0.96, 3.10 1.70, 1.70 1.90, 4.10	
Brazil 1988	SL	3	0.6	0.06	0 4 7 14 21	0.03 <0.01 <0.01 <0.01 <0.01	26
		3	1.2	0.12	21	<0.01	
Brazil 1995	SL	3	0.6	0.06	21	0.3	78
		3	1.2	0.12	21	1.2	
France 1988	SC	1	0.44	0.06	13 20	0.04, 0.04 0.03, 0.04	54[1]
		2	0.44	0.06	20	0.05, 0.06	
France 1988	SC	1	1.3	0.06	14 21	<0.02, <0.02 0.07, 0.08	52[1]
		2	1.3	0.06	21	<0.02, <0.02	
Italy 1988	EC	2	0.49	0.049	0 14 21	0.053 0.027 0.018	28[2]
Mexico 1995	EC	3	0.9	0.3	7	0.02, 0.03	62[1,2]

Country, Year	Application				PHI, days	Residues	Reference
	Form.	No.	kg ai/ha	kg ai/hl			
Spain 1986		2	0.72	0.045	1 3 7	<0.02 <0.02 <0.02	41
Spain 1986		4	0.73	0.045	1 3 7	0.03 0.03 <0,02	45
Spain 1986	SC	2	1	0.06	1 3 7	0.22 0.44 0.14	46
		4	0.98	0.06	1 3 7	0.15 0.07 0.12	
Spain 1986	SL	2	0.9	0.045	1 3 7	0.51 0.42 0.22	42[3]
Spain 1986	SL	4	0.91	0.045	1 3 7	0.46 0.4 0.47	43[3]
Spain 1986	SL	2	0.73	0.045	1 3 7	0.36 0.37 0.3	44[3]
Spain 1986	SL	4	0.73	0.045	1 3 7	0.84 0.54 0.39	45[3]
Spain 1986	SC	2	1.11	0.06	1 3 7	0.77 0.56 0.54	48[3]
Spain 1986	SC	4	1	0.06	1 3 7	0.83 0.81 0.4	49[3]
Spain 1984 Glasshouse	EC	3	1	0.05	0 3 8 14	0.2 0.22 0.32 0.2	21[4]
Spain 1984 Glasshouse	EC	3	1	0.05	0 3 8 14	0.25 0.25 0.29 0.29	20[4]
Turkey 1989	SL	2	0.6	0.06	0 7 14	0.17 0.1 <0.01	29

[1] The 2 results were from duplicate plots. The higher values from each pair were used to estimate both maximum residues and STMRs
[2] No data on analytical recoveries
[3] Abnormally high control values and no sample chromatograms
[4] The data were also submitted to the 1990 JMPR

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

Peaches. Two studies on processing, one carried out in Italy, the other in Spain, were submitted to the Meeting. The harvested peaches were processed in the laboratory according to typical commercial practices, the outlines of which were as follows.

Washed fruit: sorting → washing → washed fruit.

Jam: washed fruit → peeling → stoning → cutting → cooking (3-4 minutes at 100°C) → jam.

Preserve: washed fruit → peeling → stoning → pasteurizing → preserve.

Juice: washed fruit → stoning → crushing → heating → pressing → centrifuging → diluting → pasteurizing → juice.

The results are shown in Table 10.

Table 10. Residues of methamidophos in processed products of peaches.

Field application, Country, Year	Sample	Residues, mg/kg	Reference
0.68 kg ai/ha	Fruit	0.11	36
0.057 kg ai/hl	Washed fruit	0.08	
2 applications	Juice[1]	0.05	
PHI 28 days	Jam	0.10	
Italy 1994	Preserve	0.09	
0.6 kg ai/ha	Fruit	0.09	33
0.048 kg ai/hl	Washed fruit	0.05	
2 applications	Juice[1]	0.02	
PHI 28 days	Jam	0.03	
Spain 1994	Preserve	0.02	

[1] Diluted with same volume water

Vegetables. Cooking studies were carried out on three vegetables containing acephate and methamidophos (Crossley, 1971). Field-treated samples of tomatoes, cabbages and broccoli were analyzed for acephate and methamidophos before and after boiling for 30 minutes. The results are shown in Table 11.

Table 11. Residues of acephate and methamidophos in vegetables before and after 30 minutes boiling.

Commodity	Residues, mg/kg			
	Acephate		Methamidophos	
	Before boiling	After boiling	Before boiling	After boiling
Tomatoes	0.93, 1.13	0.93, 1.09	0.12, 0.14	0.13, 0.15
Cabbages	2.08, 2.20	2.06, 2.08	0.22, 0.22	0.24, 0.25
Broccoli	8.38, 9.92	8.02, 7.12	0.98, 1.17	1.00, 1.10

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

National monitoring data

The government of The Netherlands reported monitoring data on methamidophos in several crops. The results are shown in Table 12.

Table 12. Monitoring data for methamidophos on several crops in The Netherlands, 1991-1994.

Commodity	Samples analyzed	No. in which residues found[1]	Detection frequency, %	Mean residues[2], mg/kg
Peaches	379	14	3.7	0.01, 0.02[3]
Nectarines	288	12	4.2	0.01
Grapes	999	5	0.5	<0.01
Strawberries	2976	2	0.07	<0.01
Tomatoes	330	2	0.6	<0.01
Sweet peppers	571	8	1.4	<0.01
Cucumbers	985	4	0.4	<0.01
Lettuce	865	6	0.7	<0.01, 0.02[3]
Celery	202	1	0.5	<0.01
Beans	1086	3	0.3	<0.01

[1] LOD = 0.01 mg/kg
[2] For samples with residues below the LOD, half the LOD is taken for the calculation of the mean residues
[3] Means for 1991-1993 and 1994 respectively

Market basket surveys

Market basket surveys for acephate and methamidophos were carried out in the USA in 1984 and 1985 (Lai, 1989c). From 26 to 62 commodities including fresh vegetables, fresh fruit, canned food,

meat and dairy products were collected from 24 locations. Acephate and methamidophos were found at or above the limit of determination (0.01 mg/kg) in samples of 6 and 7 commodities respectively. The residues found are shown in Table 13.

Table 13. Residues of acephate and methamidophos found at or above the limit of determination in market basket surveys carried out in the USA, 1984 and 1985 (Lai, 1989c).

Commodity	Residues, mg/kg		Reference
	Acephate	Methamidophos	
Cantaloupe	0.03	0.02, 0.02, 0.03, 0.10	57-3
Celery	0.01, 0.03, 0.04	0.04	
Cucumbers	-	0.04, 0.06	
Crisphead lettuce	0.01, 0.09	0.02	
Tomatoes	0.01, 0.02	0.02, 0.02, 0.03, 0.04, 0.10, 0.17	
Green sweet peppers	0.06, 0.72	0.02, 0.03, 0.26	
Canned snap beans	0.01, 0.02	0.01	

Farm gate to consumer studies

Farm gate to consumer studies were carried out on five crops in the USA in 1985 and 1986 (Lai, 1989b). Lettuce, snap beans, cauliflowers, Brussels sprouts and bell peppers were treated with acephate at the highest label rate and monitored for residues from harvest through typical commercial processes to the consumer. The results are shown in Table 14 (identical to Table 13 in the monograph on acephate but repeated for convenience).

Table 14. Residues of acephate and methamidophos in crisphead lettuce, snap beans, bell peppers, cauliflowers and Brussels sprouts from farm gate to consumer, USA (Lai, 1989b).

Application, Year	Description (Location)	Acephate		Methamidophos	
		mg/kg	% of field	mg/kg	%of field
0.63 + 1.12 kg ai/ha	Whole head lettuce (field)	0.30	100	0.02	100
	Head + cap leaf (cooler)	0.05	17	0.00	0
2 applications	Head + cap leaf (distributor)	0.06	20	0.00	0
PHI 21 days	Head + cap (market)	0.04	13	0.00	0
1985	Head + cap (supermarket shelf)	0.03	10	0.00	0
0.84 kg ai/ha	Fresh snap beans (field)	0.29	100	0.06	100
2 applications	Fresh snap beans (market)	0.10	35	0.02	36
PHI 24 days	Fresh snap beans (processing plant)	0.13	46	0.03	55
1985	Canned snap beans	0.05	18	0.02	36
	Frozen snap beans in butter sauce	0.03	11	0.00	0
1.5 kg ai/ha	Bell peppers (field)	3.8	100	0.52	100
7 applications	Bell peppers (packing shed)	2.8	75	0.43	83
PHI 9 days	Bell peppers (distributor)	2.7	71	0.45	87

Application, Year	Description (Location)	Acephate		Methamidophos	
		mg/kg	% of field	mg/kg	%of field
1986	Bell peppers (supermarket)	3.1	83	0.51	97
1.12 kg ai/ha	Cauliflower head (field)	0.80	100	0.10	100
6 applications	Trimmed head (cooler)	0.34	42	0.04	40
PHI 14 days	Curd after coring (processor)	0.33	41	0.04	40
1986	Curd after processing and freezing	0.25	31	0.04	40
	Processing waste	0.73	91	0.10	95
1.12 kg ai/ha	Fresh Brussels sprouts (field)	1.85	100	0.03	100
6 applications	Fresh sprouts after sorting	0.79	43	0.02	67
PHI 14 days	Sorting waste	1.6	86	0.02	67
1986	Sprouts after blanching & freezing	0.13	7	0.01	33
	Processing waste	9.4	508	0.15	500

NATIONAL MAXIMUM RESIDUE LIMITS

The following national MRLs were reported to the Meeting.

Country	Commodity	MRL, mg/kg	Commodity	MRL, mg/kg
Argentina	Alfalfa forage	0.1	Melon	0.5
	Alfalfa seed	0.1	Olive oil	0.1
	Almond	0.1	Peppers, Sweet	0.5
	Bean	0.1	Pome fruit	0.1
	Cereals	0.05	Potato	0.1
	Citrus fruit	0.5	Rice	0.05
	Clover forage	2	Soya	0.1

	Cotton seed	0.1	Stone fruit	0.1
	Garlic	0.1	Sunflower	0.1
	Grape	0.1	Tomato	0.5
	Leafy + other stem vegetables	0.2		
Australia	Egg plant	1	Goat milk	0.01*
	Sugar beet	0.05	Hops dry	5
	Brussels sprouts	1	Lettuce	1
	Cabbages	1	Peaches	1
	Cattle fat	0.01*	Peanut	0.02*
	Cattle meat	0.01*	Peanut fodder	10
	Cattle meat by-products	0.01*	Peanut forage	10
	Cattle milk	0.01*	Peppers, Sweet	2
	Cauliflowers	1	Potato	0.25
	Celery	2	Rape seed	0.1
	Citrus fruit	0.5	Sheep meat	0.01*
	Cotton seed	0.1	Sheep meat by-products	0.01*
	Cucumber	0.5	Sheep milk	0.01*
	Goat fat	0.01*	Soya	0.1
	Goat meat	0.01*	Tomatoes	2
	Goat meat by-products	0.01*	Tree tomatoes	0.01*
Austria	All food of animal origin	0.01	Other plant commodities	0.05
	Hops	5		
Belgium	Cabbages	0.1	Other plant commodities	N.D.[1]
	Hops	5		
Brazil	Bean	0.01	Peanut	0.1
	Broccoli	1	Peppers, Sweet	0.4
	Cabbages	1	Potato	0.1
	Cabbages, white	1	Soya	0.01
	Cauliflowers	1	Tomatoes	0.3
	Cotton seed	0.1		
Canada	Bean	0.3	Lettuce	1
	Egg plant	0.5	Melons	0.1*
	Broccoli	1	Peppers, Sweet	1
	Brussels sprouts	1	Potato	0.1*
	Cabbages	0.5	Rape seed	0.1*
	Cauliflowers	0.5	Tomatoes	0.5
	Cucumber	0.5		
Chile	Sugar beet	0.1	Peaches	1
	Cattle fat	0.01*	Potato	0.1
	Cattle meat	0.01*	Rape	0.1
	Goat fat	0.01*	Sheep fat	0.01*
	Goat meat	0.01*	Sheep meat	0.01*
	Lettuce, head	2	Tomatoes	2
	Milk	0.01*		
Cyprus	Egg plant	1	Lettuce	1
	Beets (Beta vulgaris) leaf	1	Meat	0.01
	Beets (Beta vulgaris) root	0.1	Milk	0.01
	Cabbages	1	Peaches	1
	Cauliflowers	2	Pepper, cayenne	1
	Celery	2	Peppers, Sweet	1

	Citrus fruit	0.5	Potato	0.1
	Cucumber	1	Tomatoes	2
Denmark	Artichoke	0.01*T	Meat, preparations of	0.01*
	Egg plant	0.2	Milk	0.01*
	Bean dry	0.01*T	Milk products	0.01*
	Berries and small fruits	0.01*	Mushroom	0.01*
	Berry, wild	0.01*	Nuts	0.01*
	Bulb vegetables	0.01*		
	Cabbages, Head	0.5	Other leafy vegetables	0.01*
	Cereals	0.01*	Other oil seed	0.01*
	Chicory, Witloof	0.01*	Other pulses	0.01*
	Citrus fruit	0.2	Other solanaceae	0.01*
	Corn, Sweet	0.01*	Other stem vegetables	0.01*
	Cotton	0.1	Other tropical/subtropical fruits	0.01*
	Cucurbits with edible peel	1	Pea dry	0.01*T
	Cucurbits with inedible peel	0.01*	Peppers, Sweet	0.01*T
	Eggs without shell	0.01*	Pome fruit	0.01*T
	Escarole	0.2	Potato	0.01*
	Flowering brassicas	0.01*T	Poultry fat	0.01*
	Grape	0.01*T	Poultry meat	0.01*
	Herbs	0.01*	Poultry meat by-products	0.01*
	Hops	2	Root and tuber vegetables	0.01*
	Kohlrabi	0.01*	Rubus species (Cane fruit)	0.01*
	Leafy brassicas	0.01*T	Spinach & similar	0.01*
	Leek	0.01*T	Stone fruit	0.01*T
	Legume vegetables	0.01*T	Strawberry	0.01*T
	Lentil dry	0.01*	Tea	0.1*
	Mammalian, fat	0.01*	Tomatoes	0.5
	Mammalian, meat	0.01*	Watercress	0.01*
	Mammalian, meat by-products	0.01*		
European Union	Artichoke	0.01*T	Meat, preparations of	0.01*
	Egg plant	0.2	Milk	0.01*
	Bean dry	0.01*T	Milk products	0.01*
	Berries and small fruits	0.01*	Mushroom	0.01*
	Berry, wild	0.01*	Nuts	0.01*
	Bulb vegetables	0.01*	Other cucurbits	0.01*
	Cabbages, Head	0.5	Other leafy vegetables	0.01*
	Cereals	0.01*	Other oil seed	0.01*
	Chicory, Witloof	0.01*	Other pulses	0.01*
	Citrus fruit	0.2	Other solanaceae	0.01*
	Corn, Sweet	0.01*	Other stem vegetables	0.01*
	Cotton	0.1	Other tropical/subtropical fruits	0.01*
	Cucumber	1	Pea, dry	0.01*T
	Cucurbits with inedible peel	0.01*	Peppers, Sweet	0.01*T
	Eggs with shell	0.01*	Pome fruit	0.01*T
	Flowering brassicas	0.01*T	Potato	0.01*
	Grape	0.01*T	Poultry fat	0.01*
	Herbs	0.01*	Poultry meat	0.01*
	Hops	2	Poultry meat by-products	0.01*
	Kohlrabi	0.01*	Root and tuber vegetables	0.01*

	Leafy brassicas	0.01*T	Rubus species (Cane fruit)	0.01*
	Leek	0.01*T	Spinach & similar	0.01*
	Legume vegetables	0.01*T	Stone fruit	0.01*T
	Lentil dry	0.01*	Strawberry	0.01*T
	Lettuce	0.2	Tea	0.1*
	Mammalian, fat	0.01*	Tomatoes	0.5
	Mammalian, meat	0.01*	Watercress	0.01*
	Mammalian, meat by-products	0.01*		
Finland	Fruit	0.2	Vegetables	0.2
France	Egg plant	0.2	Other fruits	0.01
	Cabbages, Head	0.5	Other oil seed	0.01
	Cereals	0.01	Other vegetables	0.01
	Citrus fruit	0.2	Pome fruit	0.3
	Cotton	0.1	Potato	0.01
	Cucumber	1	Stone fruit	0.3
	Grape	0.3	Tea	0.1
	Hops	2	Tomatoes	0.5
	Lettuce	0.2		
Germany	Animal fat	0.01	Lettuce, head	0.2
	Egg plant	0.2	Meat	0.01
	Cabbages, Head	0.5	Meat, preparations of	0.01
	Cauliflowers	0.2	Milk	0.01
	Citrus fruit	0.2	Milk products	0.01[2]
	Cotton seed	0.1	Other plant commodities	0.01
	Cucumber	1	Peaches	1
	Egg products	0.01[2]	Peppers, Sweet	1
	Eggs	0.01	Pome fruit	0.2
	Hops	2	Tea	0.1
	Leafy brassicas	0.2	Tomatoes	0.5
India	Cotton seed	0.1	Safflower seed	0.1
Israel	Egg plant	1	Garlic	0.1
	Beet, Sugar	0.05	Melons	1
	Brassica vegetables	1	Onion, Bulb	0.1
	Celery	2	Peppers, Sweet	1
	Cotton seed	0.1	Potato	0.1
	Cucumber	0.5	Tomatoes	2
Italy	Artichoke	0.01*T	Meat, preparations of	0.01*
	Egg plant	0.2	Milk	0.01*
	Bean dry	0.01*T	Milk products	0.01*
	Beet, Sugar	0.15	Mushroom	0.01*
	Berries and small fruits	0.01*	Nuts	0.01*
	Berry, wild	0.01*	Other cucurbits with edible peel	0.01*
	Bulb vegetables	0.01*	Other leafy vegetables	0.01*
	Cabbages, Head	0.5	Other oil seed	0.01*
	Cereals	0.01*	Other solanaceae	0.01*
	Chicory, Witloof	0.01*	Other stem vegetables	0.01*
	Citrus fruit	0.2	Pea	0.01*T
	Corn, Sweet	0.01*	Peppers, Sweet	0.01*T
	Cotton seed	0.1	Pome fruit	0.15[3]
	Cucumber	1	Potato	0.01*

	Cucurbits with inedible peel	0.01*	Poultry fat	0.01*
	Eggs	0.01*	Poultry meat	0.01*
	Flowering brassicas	0.01*T	Poultry meat by-products	0.01*
	Herbs	0.01*	Pulses	0.01*
	Hops	2	Root and tuber vegetables	0.01*
	Kohlrabi	0.01*	Rubus-Species (Cane fruit)	0.01*
	Leafy brassicas	0.01*T	Spinach & similar	0.01*
	Leek	0.01*T	Stone fruit	0.15[3]
	Legume vegetables	0.01*T	Strawberry	0.15[3]
	Lentil dry	0.01*	Tea	0.1*
	Lettuce	0.2	Tomatoes	0.5*
	Mammalian fat	0.01*	Tropical and subtropical fruits	0.01*
	Mammalian meat	0.01*	Watercress	0.01*
	Mammalian meat by-products	0.01*		
Japan	Beet, Sugar	0.05	Lettuce	1
	Broccoli	1	Other fruits	0.1
	Cabbages	1	Peaches	1
	Cauliflowers	1	Potato	0.25
	Cotton seed	0.1	Rape	0.1
	Hops	5	Soya	0.05
Kenya	Cattle fat	0.01*T	Milk	0.01*T
	Cattle meat	0.01*T	Sheep fat	0.01*T
	Goat fat	0.01*T	Sheep meat	0.01*T
	Goat meat	0.01*T		
Luxembourg	Cabbages	0.1	Potato	0.01
Malaysia	Egg plant	1	Peaches	0.25
	Citrus fruit	0.5	Pepper, cayenne-	1
	Cucumber	1	Peppers, Sweet	1
	Fat and oil edible	0.1	Potato	0.1
	Melons, water-	0.5	Tomatoes	1
Mexico	Alfalfa	2	Cotton	0.1
	Egg plant	1	Cucumber	1
	Broccoli	1	Lettuce, head	1
	Brussels sprouts	1	Melons	0.5
	Cabbages	1	Potato	0.1
	Capsicum (Peppers, Chilli)	1	Soya	0.05
	Cauliflowers	1	Tomatoes	1
	Celery	1		
Netherlands	Aubergine	0.2	Lettuce	0.2
	Cabbages, Head	0.5	Melons	1
	Citrus fruit	0.2	Other plant commodities	N.D.[1]
	Cotton seed	0.1	Tea	0.1*
	Flowering brassicas	0.1	Tomatoes	0.5
	Hops	2		
New Zealand	Brassica vegetables	1	Leafy vegetables	0.5
	Citrus fruit	0.5	Potato	0.1
	Fruiting vegetables except tomatoes	0.2	Tomatoes	0.1
Spain	Artichoke	0.2	Other cucurbits with inedible peel	0.01
	Egg plant	0.2	Other leafy vegetables	0.01

	Bean dry	0.01	Other legume vegetables	0.01
	Bean pods and/or immature seeds	0.1	Other oil seed	0.01
	Beet, Sugar	0.05	Other pulses	0.01
	Berry, wild	0.01	Other solanaceae	0.01
	Bulb vegetables	0.01	Other stem vegetables	0.01
	Cabbages	0.5	Pea, dry	0.01
	Cereals	0.01	Pea, pods and/or immature seeds	0.2
	Chicory, Witloof	0.01	Peppers, Sweet	1
	Citrus fruit	0.2	Pome fruit	0.2
	Corn, Sweet	0.01	Potato	0.01
	Cotton seed	0.1	Root and tuber vegetables	0.01
	Cucumber	1	Rubus species (Cane fruit)	0.01
	Flowering brassicas	0.01	Spices	0.01
	Food, dry	0.01	Spinach & similar	0.01
	Forage crops a. straw	0.01	Stimulant plants	0.01
	Grape	0.01	Stone fruit	0.2
	Herbs	0.01	Strawberry	0.01
	Hops	2	Sugar cane	0.01
	Kohlrabi	0.01	Tea	0.1
	Leafy brassicas	0.01	Tea plant infusion	0.1
	Leek	0.05	Tobacco	0.01
	Lettuce	0.2	Tomatoes	0.5
	Mushroom	0.01	Tropical and subtropical fruits	0.01
	Nuts	0.01	Watercress	0.01
	Other berries and small fruits	0.01		
Sri Lanka	Bean	1	Cowpea	1
	Beets (Beta Vulgaris)	1	Potato	0.1
	Cabbages	1		
Sweden	Fruit	0.2	Vegetables	0.2
	Potato	0.02*		
Taiwan	Asparagus	0.1	Longan	0.2
	Bamboo	0.1	Mango	0.2
	Bean, Mung	0.03	Mustard	0.1
	Bean, Adzuki	0.03	Onion	0.1
	Cabbages	0.5	Pe-tsai	0.1
	Cabbages, Chinese	0.5	Peanut	0.03
	Carrot	0.1	Potato	0.1
	Cauliflowers	0.5	Radish	0.1
	Celery	0.5	Rape	0.5
	Dasheen	0.1	Rice	0.5
	Garlic	0.5	Shallot	0.5
	Ginger	0.1	Soya	0.03
	Leek	0.5	Spinach	0.5
	Litchi	0.2	Water spinach	0.5
UK	Almond	0.01*	Mushrooms, wild, edible	0.01*
	Asparagus	0.01*	Mustard seed	0.01*
	Egg plant	0.2	Nut, para-	0.01*
	Avocado	0.01*	Walnut	0.01*
	Banana	0.01*	Oats	0.01*

	Barley	0.01*	Olive	0.01*
	Beetroot	0.01*	Onion	0.01*
	Berry, wild	0.01*	Orange	0.2
	Blackberry	0.01*	Other berries and small fruits	0.01*
	Blueberry	0.01*	Other brassica vegetables	0.5
	Boysenberry	0.01*	Other bulb vegetables	0.01*
	Brussels sprouts	0.5	Other cereals except rice	0.01*
	Cabbages, Head	0.5	Other citrus fruits	0.2
	Cardoon	0.01*	Other cucurbits with edible peel	0.01*
	Carrot	0.01*	Other cucurbits with inedible peel	0.01*
	Cashew nut	0.01*	Other herbs	0.01*
	Celeriac	0.01*	Other leafy vegetables	0.01*
	Celery	0.01*	Other nuts	0.01*
	Celery, bleached	0.01*	Other oil seed	0.01*
	Chard, Swiss	0.01*	Other pulses	0.01*
	Chervil, Garden	0.01*	Other root & tuber vegetables	0.01*
	Chestnut	0.01*	Other solanaceae	0.01*
	Chicory, Witloof	0.01*	Other stem vegetables	0.01*
	Chives	0.01*	Other tropical/subtropical fruits	0.01*
	Coconut	0.01*	Parsley, leaf	0.01*
	Corn, Sweet	0.01*	Parsley, turnip-rooted	0.01*
	Cotton seed	0.1	Parsnip	0.01*
	Cranberry	0.01*	Passion fruit	0.01*
	Cress, Garden	0.01*	Peanut	0.01*
	Cucumber	1	Pecan nut	0.01*
	Cumquat (Kumquat)	0.01*	Pine	0.01*
	Currant, Red, White, Black	0.01*	Pineapple	0.01*
	Date	0.01*	Pistachio	0.01*
	Eggs	0.01*	Pomegranate	0.01*
	Escarole	0.01*	Poppy seed	0.01*
	Fennel, Italian	0.01*	Potato, early	0.01*
	Fig	0.01*	Potato, ware	0.01*
	Flax/Linseed seed	0.01*	Pomelo	0.2
	Garlic	0.01*	Pumpkin	0.01*
	Gherkin	0.01*	Radish	0.01*
	Gooseberry	0.01*	Rape seed	0.01*
	Grapefruit	0.2	Raspberry	0.01*
	Hazel nut	0.01*	Rhubarb	0.01*
	Hops	2	Rice	0.01*
	Horseradish	0.01*	Rutabaga	0.01*
	Kiwifruit	0.01*	Rye	0.01*
	Kohlrabi	0.01*	Salsify, black	0.01*
	Lamb's lettuce	0.01*	Sesame seed	0.01*
	Lemon	0.2	Shallot	0.01*
	Lentil	0.01*	Soya	0.01*
	Lettuce	0.2	Spinach & similar	0.01*
	Lime, sour	0.2	Spring onion	0.01*
	Lychee	0.01*	Sunflower seed	0.01*
	Macadamia nut	0.01*	Sweet potato	0.01*
	Maize (Corn)	0.01*	Tea	0.01*
	Mandarin	0.2	Tomatoes	0.5

	Mango	0.01*	Topinambur	0.01*
	Meat	0.01*	Triticale	0.01*
	Meat, preparations of	0.01*	Turnip, edible	0.01*
	Melons	0.01*	Watercress	0.01*
	Melons, water-	0.01*	Wheat	0.01*
	Milk	0.01*	Yam	0.01*
	Mushrooms, cultivated	0.01*	Zucchini	0.01*
Uruguay	Tomatoes	0.1		
USA	Aubergine	1	Cotton seed	0.1*
	Beet, Sugar, root	0.02	Cucumber	1
	Beet, Sugar, tops or leaves	0.5	Lettuce	1
	Broccoli	1	Melons	0.5
	Brussels sprouts	1	Pepper, Cayenne	1
	Cauliflowers	1	Peppers, Sweet	1
	Cabbages	1	Potato	0.1*
	Celery	1	Tomatoes	1

* At or about the limit of determination; negligible residue tolerance
T Temporary MRL
[1] <0.01 mg/kg
[2] MRL refers to the whole product
[3] If not adopted by 01.01.1998, will become 0.01 mg/kg

APPRAISAL

Methamidophos was first evaluated in 1976, with further reviews of residue aspects in 1979, 1981, 1984, 1990 and 1994. The 1994 JMPR withdrew the previous recommendations for MRLs for broccoli, Brussels sprouts, head cabbages, cauliflower, citrus fruits, eggplant, melons except watermelon, peaches and tomato which had been held at Step 7B by the 1992 CCPR (ALINORM 93/24, para 119-123). The manufacturer indicated that information on GAP and residue data would be available to support new MRLs for these commodities. This information was provided to the Meeting, together with information on analytical methods and residues in food in commerce or at consumption.

Analytical methods

Samples from the supervised trials were analysed by GLC. Recoveries of both acephate and methamidophos were generally >70%, with limits of determination of 0.01-0.02 mg/kg.

These methods were considered suitable for use in supervised trials and for enforcement.

Stability of residues in stored analytical samples

Studies of the storage stability of acephate and methamidophos were carried out with vegetables, pulses, oilseed, animal products, cereals and grasses using samples which had been treated with acephate. The stability of methamidophos in the macerated or ground samples was not established by the results as most of the samples contained substantially higher residues of acephate than of methamidophos, and there may have been some conversion of acephate to methamidophos during

storage.

Validity of data

In view of the difficulty of determining methamidophos caused by its high polarity, the Meeting did not evaluate trials which lacked data on analytical recoveries or in which recoveries were below 70%, trials without analysis of control samples and/or sample chromatograms, or trials with abnormally high control values and for which sample chromatograms were not supplied.

Supervised trials

Where data were available from applications of both methamidophos and acephate the results of trials with methamidophos are discussed first and the acephate trials are indicated by a sub-heading. Trials on citrus fruits and Brussels sprouts were with acephate only and are considered last.

Peaches. Four Italian trials with 0.6-0.68 kg ai/ha and a PHI of 21 days were according to GAP in France, Greece and/or Italy (0.38-0.68 kg ai/ha, 21 days PHI) and residues were 0.09-0.27 mg/kg. Five of the six Spanish trials (0.72-1.3 kg ai/ha, 28-35 days PHI) were according to Spanish GAP (0.75-1.1 kg ai/ha, 35 days PHI) with residues of <0.01-0.76 mg/kg. One of these, at 1.0 kg ai/ha, included a PHI of 21 days and was therefore comparable with Portuguese GAP (0.8-1.0 kg ai/ha, 21 days PHI). The residue was 0.27 mg/kg. The sixth Spanish trial was not according to Spanish GAP, but included conditions (0.6 kg ai/ha, 21 days PHI) which complied with GAP in France, Greece and Italy. The residue after 21 days was 0.09 mg/kg.

The residues in the 4 Italian trials carried out at maximum GAP were 0.09, 0.12, 0.16 and 0.27 mg/kg, and those in the five Spanish trials detailed above were 0.07, 0.09, 0.24, 0.27 and 0.76 mg/kg. The residues from the 9 trials in rank order (median underlined) were 0.07, 0.09, 0.09, 0.12, 0.16, 0.24, 0.27, 0.27 and 0.76 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.16 mg/kg for peaches, based on residues of methamidophos from the application of methamidophos.

Broccoli. Two Brazilian trials and one Canadian trial complied with their national GAP (Brazil 0.3-0.6 kg ai/ha, 0.06 kg ai/hl, 21 days PHI, Canada 0.53-1.1 kg ai/ha, 14 days PHI). The residues were <0.01 and 0.2 mg/kg in Brazil and 0.01 mg/kg in Canada.

Two Canadian (1972), one Mexican and nine American trials were also according to GAP (Mexico 0.6-0.9 kg ai/ha, 21 days PHI; USA 0.56-1.1 kg ai/ha, 14 or 21 days PHI). Residues were 0.13-0.41 mg/kg in Canada, <0.01-0.08 mg /kg in Mexico and <0.01-0.14 mg/kg in America. However information on analytical recoveries was lacking so the Meeting could not evaluate the trials.

Residues from the application of acephate. One Australian and two Japanese trials with acephate complied with GAP (Australia 0.98 kg ai/ha, 0.098 kg ai/hl, 14 days PHI; Japan 0.05 kg ai/hl, 14 days PHI). In the Australian trial the spray concentration of 0.21 kg ai/hl was higher than the GAP concentration but the dosage rate complied with GAP. The residues of methamidophos were <0.02-0.08 mg/kg and 0.017-0.566 mg/kg in Australia and Japan respectively. One Brazilian trial with acephate did not include data on methamidophos. Two French and two Spanish trials on acephate were reported but no information on GAP was available. An Italian trial did not comply with Italian

GAP.

The Meeting could not estimate a maximum residue level.

Cabbages. One Brazilian trial complied with GAP (0.3-0.6 kg ai/ha, 0.06 kg ai/hl, 21 days PHI). The residue was 0.08 mg/kg.

Two German supervised trials with 0.36 kg ai/ha, 0-28 days PHI, and 3 applications were comparable with German GAP (0.36 kg ai/ha, 14 days PHI, 2 applications) except in the number of applications. The Meeting considered that the additional application would not have a significant effect on the results. The residues were 0.05 and 0.2 mg/kg.

The results of seven US trials submitted to the 1990 JMPR were rejected by the 1994 JMPR. The present Meeting found the trial conditions (1.1 kg ai/ha, 6 application, 21-35 days PHI) were comparable with current GAP (0.56-1.1 kg ai/ha, 35 days PHI) and could evaluate the data. The residues were <0.01 (5) and <0.01-0.03 mg/kg in six trials and 0.76-1.1 mg/kg in the seventh. The Meeting agreed not to consider the residues from the seventh trial since they seemed to be of a different population from others and because of difficulties encountered with the evaluation of data without the original studies.

Four trials in Germany were not evaluated in 1990 but the trial conditions (0.3 kg ai/ha, 2 application, 0-28 days PHI) were comparable with GAP (see above). The residues were <0.01, <0.01, 0.01 and 0.09 mg/kg at 14 days PHI.

One Argentinian and one Mexican trial were comparable with Brazilian or Mexican GAP but information on analytical recoveries was lacking so the Meeting could not evaluate the trials.

Residues from the application of acephate. Three of four French and two Japanese trials with acephate complied with their national GAP (France 0.075 kg ai/hl, 7 days PHI; Japan 0.025-0.05 kg ai/hl, 7 days PHI). The residues of methamidophos were 0.01 (2) and 0.09 mg/kg in France and 0.010 and 0.138 mg/kg in Japan.

One supervised trial on acephate in The Netherlands (0.75 kg ai/ha, 14 days PHI, 1 application) was within the limits of GAP (0.75 kg ai/ha, 14 days PHI, 6 applications) and the residues of methamidophos were 0.038-0.050 mg/kg.

The residues of methamidophos from its application according to maximum GAP were 0.08 mg/kg in Brazil, <0.01 (5) and 0.03 mg/kg in the USA and <0.01 (2), 0.01, 0.05, 0.09 and 0.2 mg/kg in Germany.

The residues of methamidophos from the application of acephate according to maximum GAP were 0.01 (2) and 0.09 mg/kg in France, 0.010 and 0.117 mg/kg in Japan and 0.05 mg/kg in The Netherlands.

The residues from 19 trials in rank order were <0.01 (7), 0.01 (4), 0.03, 0.05 (2), 0.08, 0.09 (2), 0.12 and 0.2 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg and an STMR of 0.01 mg/kg, based on the residues of methamidophos from the use of acephate or methamidophos on cabbages.

Cauliflowers. Two Brazilian trials complied with GAP (0.3-0.6 kg ai/ha, 0.06 kg ai/hl, 21 days PHI). The residues were <0.01-0.5 mg/kg. Reports of three French trials were submitted without information on GAP.

Six supervised trials in Germany were reported to the 1981 JMPR. Reports of three were resubmitted to the present Meeting. The trial conditions (0.36 kg ai/ha, 2-3 applications, 0, 14, 21 and 28 days PHI) complied with GAP (0.36 kg ai/ha, 2 application, 21 days PHI). The residues were <0.01, <0.01 and 0.01 mg/kg (reported in the 1981 JMPR monograph) and <0.01, 0.01 and 0.04 mg/kg.

One supervised trial was carried out in Mexico, but there was no comparable GAP and recovery data were lacking. One American trial was reported to the Meeting and the conditions accorded with American GAP (0.56-1.1 kg ai/ha, 28 days PHI). The residue was 0.07 mg/kg, but again critical information, including recovery data, was lacking.

Residues from the application of acephate. One Australian and two Japanese supervised trials on acephate were according to national GAP (Australia 0.98 kg ai/ha, 0.098 kg ai/hl, 3 days PHI; Japan 0.05 kg ai/hl, 14 days PHI). In the Australian trial the spray concentration (0.24 kg ai/hl) was higher than the GAP concentration but the kg ai/ha rate complied with GAP. The residues of methamidophos were 0.05-0.20 mg/kg at PHIs of 3-7 days in Australia and <0.005-0.228 mg/kg at 14 days in Japan.

Five supervised trials in The Netherlands were according to GAP (0.75 kg ai/ha, 14 days PHI, 6 applications) except that there were only 1-4 applications, but it seems that the number of applications does not influence the residue significantly. The Meeting considered that the results were valid for the estimation of a maximum residue level and an STMR. The residues of methamidophos were <0.01-0.03 me/kg.

Four supervised trials in France and one in Germany were well conducted but the conditions were not comparable with any available GAP. One Brazilian trial with acephate did not include analyses for methamidophos.

The residues of the 2 Brazilian and 6 German trials with methamidophos at maximum GAP were <0.01 and 0.5 mg/kg, and <0.01(3), 0.01(2) and 0.04 mg/kg respectively. The residues of methamidophos from applications of acephate at maximum GAP were 0.2 mg/kg in Australia, 0.006 and 0.23 mg/kg in Japan and <0.01 (3), 0.03 and 0.018 in The Netherlands.

The residues from the 16 trials in rank order were 0.006, <0.01(7), 0.01(2), 0.018, 0.03, 0.04, 0.2, 0.23 and 0.5 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg and an STMR of 0.01 mg/kg for residues of methamidophos in cauliflower arising from the use of acephate or methamidophos.

Melons. Two Spanish trials were reported without information on relevant GAP.

Two supervised trials in Mexico were reviewed in 1990. The trial conditions (0.6 kg ai/ha, 0, 3, 7/8, and 14 days PHI) complied with GAP (0.6-0.9 kg ai/ha, 7 days PHI) and the residues were 0.05 and 0.08 mg/kg in the whole fruit, 0.06 mg/kg in the pulp and 0.13 mg/kg in the peel. In another

Mexican trial with the same conditions the residues were 0.23-1.63 mg/kg, but critical information including data on analytical recoveries was lacking.

A single supervised trial was carried out in Argentina, but there was no relevant GAP and critical information was again lacking.

The Meeting could not estimate a maximum residue level.

Egg plants. One Spanish, one Argentinian and three American trials were reported to the Meeting without information on relevant GAP.

Conditions in two Mexican trials were comparable to Mexican GAP (0.6-0.9 kg ai/ha, 14 days PHI) with residues of 0.28 and 0.95 mg/kg, but critical information was lacking.

The Meeting could not estimate a maximum residue level.

Tomatoes. An Australian trial was carried out at higher spray concentration (0.44 kg ai/hl) than GAP (0.029-0.11 kg ai/hl), but at a dose rate within the GAP range (0.32-1.2 kg ai/ha, 4 days PHI). The residues were 0.64-0.96 mg/kg at 3-5 days PHI.

Two Brazilian trials reflected GAP (0.3-0.6 kg ai/ha, 0.06 kg ai/hl, 21 days PHI) and the residues were <0.01 and 0.3 mg/kg. In one of them the residue at 14 days PHI was determined and this could be related to GAP in Chile and Ecuador where the PHI is 15 days. The residue was <0.01 mg/kg. Four French supervised trials were reported without information on GAP, but the conditions were comparable with GAP in Portugal (0.6-1.2 kg ai/ha, 21 days PHI). The residues were <0.02, 0.03-0.04, 0.05-0.06 and 0.07-0.08 mg/kg.

Twelve Spanish trials at 0.045-0.06 kg ai/hl, 7-8 days PHI, complied with Spanish GAP (0.05-0.075 kg ai/hl, 7 days PHI) but six of them showed abnormally high control values and were without sample chromatograms, so were not used for the estimation of a maximum residue level. The residues from the other 6 trials were <0.02 (2), 0.12, 0.14, 0.29 and 0.32 mg/kg.

Trials in Italy and Mexico were comparable with Greek and Mexican Gap respectively but critical information was lacking. One supervised trial in Turkey was reported to the Meeting without information on relevant GAP.

Residues from the application of acephate. One Australian, one Spanish and two Japanese supervised trials with acephate reflected national GAP (Australia 0.98 kg ai/ha, 0.098 kg ai/hl, 3 days PHI; Japan 0.025-0.05 kg ai/hl, 1 days PHI; Spain 0.038-0.11 kg ai/hl, 14 days PHI). In the Australian trial the spray concentration (0.35 kg ai/hl) was high but the dose rate (kg ai/ha) accorded with GAP. The residues of methamidophos were 0.40 and 0.50 mg/kg in Australia and 0.03 mg/kg in Spain. In Japan the residues at 7 days (higher than at 1 and 3 days) were 0.072 and 0.106 mg/kg in one trial and 0.085 and 0.123 mg/kg in the other.

Seventeen French supervised trials with acephate were reported to the Meeting with no information on GAP, but four of them (0.62-0.83 kg ai/ha, 13-15 days PHI, 1-3 applications) could be related to Polish GAP (0.75 kg ai/ha, 14 days PHI, 1 application), since it seems that the number of application does not significantly affect the residue level. Furthermore these four and six other trials (0.03-0.075 kg ai/hl, 13-15 days PHI) were according to Spanish GAP (0.038-0.11 kg ai/hl, 14

days PHI). The residues of methamidophos at 13-21 days ranged from <0.02 mg/kg to 0.44 mg/kg.

The residues of methamidophos from its use at maximum GAP were 0.96 mg/kg in Australia, <0.01 and 0.3 mg/kg in Brazil, <0.02 and 0.08 mg/kg in France (according to Portuguese GAP) and 0.12, 0.14, 0.29 and 0.32 mg/kg in Spain.

The residues of methamidophos from the use of acephate at maximum GAP were 0.5 mg/kg in Australia, 0.089 and 0.104 mg/kg in Japan, 0.03 mg/kg in Spain, and 0.04, 0.06, 0.16 and 0.16 mg/kg in France.

The residues from the 17 trials in rank order were <0.01, <0.02, 0.03, 0.04, 0.06, 0.08, 0.089, 0.104, 0.12, 0.14, 0.16, 0.16, 0.29, 0.3, 0.32, 0.5 and 0.96 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR level of 0.12 mg/kg, based on the residues of methamidophos from the uses of acephate or methamidophos on tomatoes.

Residues of methamidophos in citrus fruits and Brussels sprouts resulting from the application of acephate

Citrus Fruits. Six supervised trials, two on Satsuma mandarins, two on Natsudaidai, one on Kabosu (sour orange) and one on Yuzu (lemons and limes), were carried out with acephate applied according to GAP in Japan. (0.025-0.05 kg ai/hl, 30 days PHI) The residues of methamidophos were 0.07 and 0.11 mg/kg in Satsuma mandarins, 0.06 and 0.33 mg/kg in Natsudaidai, 0.031 mg/kg in Kabosu and 0.044 mg/kg in Yuzu.

A single New Zealand residue trial with acephate on mandarins complied with GAP (0.075 kg ai/hl, 14 days PHI) and the residue of methamidophos was 0.29 mg/kg.

A trial in Greece with acephate on oranges reported without information on GAP, but the conditions (0.031 kg ai/ha, 20 days PHI) were comparable with Italian GAP (0.024-0.036 kg ai/hl, 21 days PHI). The residue of methamidophos was 0.05 mg/kg.

Since the Meeting was unable to estimate a maximum residue level for acephate in citrus fruits it could not estimate the maximum residue level of methamidophos arising from the use of acephate.

Brussels sprouts. Two Australian supervised trials with acephate were considered to be comparable with Australian GAP (0.98 kg ai/ha, 0.098 kg ai/hl, 3 days PHI) since the dose rate was 0.98 kg ai/ha although the spray concentration was high (0.21 kg ai/hl). The residues of methamidophos were 0.05-1.0 mg/kg. One of two US trials with acephate complied with US GAP (0.56-1.1 kg ai/ha, 14 days PHI). The residues of methamidophos on the trimmed heads were 0.01 and 0.02 mg/kg.

The results did not require any change of the existing CXL for Brussels sprouts (1 mg/kg).

Processing studies

Peaches. The concentration factors from 2 trials were 0.73 and 0.56 for washed fruit, 0.91 and 0.44 for juice, 0.91 and 0.33 for jam, and 0.82 and 0.22 for preserve. The mean concentration factors were

respectively 0.65, 0.68, 0.62 and 0.52. The Meeting estimated STMR-P levels of 0.10, 0.11, 0.10 and 0.08 mg/kg for washed fruit, juice, jam and preserve by calculation from the STMR for peaches (0.16 mg/kg) and the mean concentration factors.

In cooking studies on tomatoes, cabbages and broccoli, 30 minutes boiling had no measurable effect on the levels of methamidophos residues.

Monitoring data

In monitoring in The Netherlands a total of 8681 samples of peaches, nectarines, grapes, strawberries, tomatoes, sweet peppers, cucumbers, lettuce, celery and beans were analysed for methamidophos during 1991-1994. Detection frequencies ranged from 0.07% for strawberries to 4.2% for nectarines and the highest mean residue was 0.02 mg/kg, found in peaches and lettuce.

Market basket surveys

Market basket surveys for methamidophos were carried out at 24 locations in the USA in 1984 and 1985. Methamidophos was found in samples of 7 of 62 of collected commodities. The highest residue was 0.26 mg/kg in a sample of green sweet peppers.

RECOMMENDATIONS

Since methamidophos has been listed by ;the CCPR as a candidate for periodic review but not yet scheduled, and in view of the difficulties encountered by the present Meeting in evaluating the available data without the original studies, the Meeting recommended that the CCPR should schedule methamidophos for periodic review.

The Meeting estimated the maximum residue levels shown below for methamidophos on the basis of the residues found in supervised trials with applications of methamidophos and acephate.

Definition of the residue for compliance with MRLs and for estimation of dietary intake: methamidophos.

Commodity		Recommended MRL (mg/kg)		PHI, days	Estimated STMR, mg/kg, for dietary intake estimation
CCN	Name	New	Previous		
VB 0041	Cabbages, Head	0.5	W	14-35	0.01
VB 0404	Cauliflower	0.5	W	21	0.01
FS 0247	Peach	1[1]	W	21-35	0.16
VO 0448	Tomato	1	W	4-21	0.12

W: withdrawal recommended by 1994 JMPR

[1] Based on the residues from the use of methamidophos. The other recommendations are based on residues from the use of methamidophos or acephate

The estimated STMR-P levels for methamidophos in the food commodities listed in the Table below are recommended for use in estimates of dietary intake.

Raw agricultural commodity	STMR (mg/kg)	Processed commodity	STMR-P (mg/kg)
Peaches	0.16	Washed fruit	0.10
		Juice (100 % basis)	0.11
		Jam	0.10
		Preserve (canned fruit)	0.08

REFERENCES

(All unpublished unless a journal reference is given)

1. Agrevo, 1995. Residue Report for Monitor on Peaches in Spain, Residuos de Metamidofos en Melocoton Cultivado al Aire Libre Despues de Una Aplicacion con MONITIOR 60, (ESP002-1, ESP002-2).

2. Bayer, 1972a. Residue Report for Monitor on Broccoli in Canada, Chemagro Division of Baychem Corporation Residue Experiment 510-5700-72D, (35452).

3. Bayer, 1972b. Residue Report for Monitor on Broccoli in Canada, Chemagro Division of Baychem Corporation Residue Experiment 510-5702- 72D, (35379).

4. Bayer, 1973a. Residue Report for Monitor on Broccoli in USA Chemagro Division of Baychem Corporation Residue Experiment 363-5747-73D, (40773).

5. Bayer, 1973b. Residue Report for Monitor on Broccoli in USA Chemagro Division of Baychem Corporation Residue Experiment 461-5752-73D, (40896).

6. Bayer, 1973c. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 363-5751-73D, (40774).

7. Bayer, 1973d. Residue Report for Monitor on Cauliflower in USA, Chemagro Division of Baychem Corporation Residue Experiment 161-5771-73D, (39073).

8. Bayer, 1973e. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 461-5748-73D, (40893).

9. Bayer, 1974a. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 461-5748E-73D, (40894).

10. Bayer, 1974b. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 461-5752E-74D, (40898).

11. Bayer, 1974c. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 462-5749-74D, (40772).

12. Bayer, 1974d. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 462-5753-73D, (40771).

13. Bayer, 1974e. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 462-5754-74D,(40897).

14. Bayer, 1974f. Residue Report for Monitor on Broccoli in USA, Chemagro Division of Baychem Corporation Residue Experiment 762-5750-73D, (40895).

15. Bayer, 1977a. Residue Report for Monitor on Cabbage in Germany, Report Form for Pesticide Residue Trials, (6700-77).
16. Bayer, 1977b. Residue Report for Monitor on Cabbage in Germany, Report Form for Pesticide Residue Trials, (6701-77).
17. Bayer, 1978a. Residue Report for Monitor on Cauliflower in Germany, Report Form for Pesticide Residue Trials, (6700-78).
18. Bayer, 1978b. Residue Report for Monitor on Cauliflower in Germany, Report From for Pesticide Residue Trials, (6701 -78).
19. Bayer, 1978c, Residue Report for Monitor on Cauliflower in Germany, Report From for Pesticide Residue Trials, (6702 -78).
20. Bayer 1984a. Residue Report for Monitor on Tomato in Spain (6705-84).
21. Bayer, 1984b. Residue Report for Monitor on Tomato in Spain (6704-84).
22. Bayer, 1987a. Residue Report for Monitor on Eggplant in USA, MONITOR - Magnitude of Residue, Crop Field Trial, (MN026-87D).
23. Bayer, 1987b. Residue Report for Monitor on Cauliflower in Brazil, SRA 5172 600 SL, (642/88).
24. Bayer, 1987c. Residue Report for Monitor on Eggplant in USA, MONITOR - Magnitude of Residue on Eggplant, (MN024-87D).
25. Bayer, 1987d. Residue Report for Monitor on Eggplant in USA, MONITOR - Magnitude of Residue, Crop Field Trial, (MN025-87D).
26. Bayer, 1988a. Residue Report for Monitor on Tomato in Brazil, SRA 5172 600 SL Tomate, (639/88).
27. Bayer, 1988b. Residue Report for Monitor on Broccoli in Brazil, SRA 5172 600 SL Broccoli, (649/88).
28. Bayer, 1988c. Residue Report for Monitor on Tomato in Italy, Report Form for Pesticide Residue Trials, (0202-88).
29. Bayer, 1989. Residue Report for Monitor on Tomato in Turkey, Berichtsbogen für Rückstandsuntersuchungen mit Pflanzenbehandlungsmitteln, (0042-89).
30. Bayer, 1994a. Residue Report for Monitor on Peaches in Italy, Determination of Residues of Tamaron 600 SL and Tamaron 200 SL on Peach Following Spray Application in Spain and Italy, (406724).
31. Bayer, 1994b. Residue Report for Monitor on Peaches in Italy, Report Form for Pesticide Residue Trials, (0675-94).
32. Bayer, 1994c. Residue Report for Monitor on Peaches in Italy, Determination of Residues of Tamaron 600 SL and Tamaron 200 SL on Peach Following Spray Application in Spain and Italy, (406759).
33. Bayer, 1994d. Residue Report for Monitor on Peaches in Spain, Report Form for Pesticide Residue Trials, (0403-94).
34. Bayer, 1994e. Residue Report for Monitor on Peaches in Italy, Report Form for Pesticide Residue Trials, (0674-94).
35. Bayer, 1994f. Residue Report for Monitor on Peaches in Spain, Report Form for Pesticide Residue Trials, (0404-94).
36. Bayer, 1994g. Residue Report for Monitor on Peaches in Italy, Report Form for Pesticide Residue Trials, (0672-94).
37. Bayer, 1994h. Residue Report for Monitor on Peaches in Italy, Report Form for Pesticide Residue Trials, (0673-94).
38. Bayer, 1994i. Residue Report for Monitor on Peaches in Spain, Determination of Residues of Tamaron 600 SL and Tamaron 200 SL on Peach Following Spray Application in Spain and Italy, (404039).
39. Bayer, 1994j. Residue Report for Monitor on Peaches in Spain, Determination of Residues of Tamaron 600 SL and Tamaron 200 SL on Peach Following Spray Application in Spain and Italy, (404047).
40. Blass, W., 1994. Method for the Determination of Residues of Methamidophos in Analytical Materials Originating from Plants including Processed Products. Method: 00350, Bayer.
41. Chevron, 1986a. Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2233#1).
42. Chevron, 1986b. Combination Residue Report for Monitor on Tomato in Spain, Residue Date Sheet, (TE-2236# 1).
43. Chevron, 1986c. Combination Residue Report for Monitor on Tomato in Spain, Residue Date Sheet, (TE-2236#2).
44. Chevron, 1986d. Combination Residue Report for Monitor on Tomato in Spain, Residue Date Sheet, (TE-2237#1).
45. Chevron, 1986e. Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2233#2).
46. Chevron, 1986f. Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2234# 1).
47. Chevron, 1986g. Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2234#2).
48. Chevron, 1986h. Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2238#1).
49. Chevron, 1986i. Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2238#2).
50. Chevron. 1986j. Combination Residue Report for Monitor on Tomato in Spain, Residue Data Sheet, (TE-2237#2).
51. Chevron, 1987. Residue Report for Monitor on Eggplant in Spain, Residue Data Sheet, (TE-2254).
52. Chevron, 1988a. Residue Report for Monitor on Tomato in France, Residue Data Sheet, (TE-2392).
53. Chevron, 1988b. Residue Report for Monitor on

Cauliflower in France, Residue Data Sheet, (TE-2372).
54. Chevron, 1988c. Residue Report for Monitor on Tomato in France, Residue Data Sheet, (TE-2376).
54-2. Crossley,J.1971. Effect of cooking on Residues of ORTHO 12.420 and its Metabolite (ORTHO 9006 in Edible Crop. Chevron Chemical Company. Unpublished
55. Lai, J.C. 1987. Storage Stability of Acephate in Frozen Crops, Milk and Tissues. Report #246A.
56. Lai, J.C. 1988. Storage Stability of Acephate in Frozen Celery Macerate. Report #246B.
57. Lai, J.C. 1989a. Storage Stability of Acephate in Frozen Macerated Beans. Report #246C.
57-2. Lai, J.C. 1989b. Farm Gate-to-Consumer Studies of Five ORTHENE-Treated Crops. Chevron Chemical Company.
57-3. Lai, J.C. 1989c. 1984 and 1985 Chevron Market Surveys. Chevron Chemical Company. Unpublished.

58. Lai, J.C. and Fowler, K.E.,1989. Determination of Acephate and Methamidophos in Crops, Water, and Milk. Method RM-12A-6. Chevron Chemical Company.
59. Leary, J.B., 1971. Gas Chromatographic Determination of Monitor (O, S- Dimethyl Phosphoramidothioate) Residues in Crops. J. Assoc. Off. Anal. Chem, **54**, 1396-1398.
60. Luke, M. A., Froberg, J. E. and Masumoto, H. T., 1975. Extraction and Cleanup of Organochlorine, Organophosphate, Organonitrogen, and Hydrocarbon Pesticides in Procedure for Determination by Gas Liquid Chromatography J.Assoc. Off. Anal. Chem, **58**, No. 5.
61. Möllhoff. E., 1971. Method for Gas Chromatographic Determination of Tamaron Residues in Plants. Method: 00155, old method no.:1029 Bayer. Pflanzenschutz-Nachrichten 24,256-262.
62. Tomen, 1995a. Residue Report for Monitor on Tomato in Mexico, Nivel de Residuos de MONITOR 60 CE Metamidophos en Frutos de Tomate, (EV173).
63. Tomen, 1995b. Residue Report for Monitor on Cabbage in Argentina, Efficacy Data Taken for Residues, Product Methamidophos Residues Crop: Cabbage, (65755).
64. Tomen, 1995c. Residue Report for Monitor on Broccoli in Mexico, Nivel de Residuas de MONITOR 60 CE Metamidophos en Cabezas de Brocoli, (EV176).
65. Tomen, 1995d. Residue Report for Monitor on Cabbage in Mexico, Nivel de Residuos de MONITOR 60 CE Metamidophos en Col, (EV175).
66. Tomen, 1995e. Residue Report for Monitor on Cauliflower in Mexico, Nivel de Residuos de MONITOR 60 CE Metamidophos en Coliflor, (EV174).
67. Tomen, 1995f. Residue Report for Monitor on Eggplant in Argentina, Residues, Crop: Eggplant, (65754).
68. Tomen, 1995g. Residue Report for Monitor on Eggplant in Mexico, Nivel de Residuos de MONITOR 60 CE Metamidophos en Frutos de Berenjena I, (EV177).
69. Tomen, 1995h. Residue Report for Monitor on Eggplant in Mexico, Nivel de Residuos de MONITOR 60 CE Metamidophos en Frutos de Berenjena II, (EV178).
70. Tomen, 1995i. Residue Report for Monitor on Melon in Argentina, Residue Trials, Product: Methamidophos, (Salto BS.AS. Province).
71. Tomen, 1995j. Residue Report for Monitor on Melon in Mexico, Nivel de Residuos de MONITOR 60 CE Metamidophos en Frutos de Melon, (EV172).
72. Tomen, 1995k. Residue Report for Monitor on Melon in Spain, Magnitude of the Residue of Methamidophos in Melon Raw Agricultural Commodity Following Foliar Applications, (EA950148).
73. Tomen, 1995l. Residue Report for Monitor on Melon in Spain, Magnitude of the Residue of Methamidophos in Melon Raw Agricultural Commodity (Decline Curve Study), (EA950149).

74. Tomen, 1995m. Residue Report for Monitor on Tomato in Australia, Determination of Methamidophos in Tomatoes (5151).
75. Tomen / Hokko, 1995a. Residue Report for Monitor on Cauliflower in Brazil, Analise de Residuos de Pesticidas, (Ibia-MG).
76. Tomen / Hokko, 1995b. Residue Report for Monitor on Broccoli in Brazil, Analise de Residues de Pesticidas, (Ibia-MG).
77. Tomen / Hokko, 1995c. Residue Report for Monitor on Cabbage in Brazil, Analise de Residuos de Pesticidas, (Ibia-MG).
78. Tomen / Hokko, 1995d. Residue Report for Monitor on Tomato in Brazil, Analise de Residuos de Pesticidas, (Ibia-MG).
79. UAP, 1995. Residue Report for Monitor on Broccoli in Canada, Methamidophos in Broccoli, (1529- 1). Unpublished.