ACEPHATE (095)

[see also METHAMIDOPHOS]

EXPLANATION

Acephate 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 the MRLs for broccoli, Brussels sprouts, head cabbages, cauliflower, citrus fruits and tomato which had been held at Step 7B by the 1989 CCPR (ALINORM 89/24A, para 126). The manufacturer has 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, cleaned up on a silica gel column and determined by GLC. If necessary, additional clean-up was by acetonitrile-hexane partitioning. Acephate and methamidophos were determined separately in the same sample (Lai and Fowler, 1989). Recoveries of both acephate and its metabolite methamidophos 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 acephate and methamidophos was studied in vegetables, pulses, oilseed, animal products, cereals and grasses for periods ranging from 28 days to more than a year at -20°C. All samples except pinto beans and eggs were taken from crops which had been treated with acephate or from animals which had been dosed with acephate. Pinto beans and eggs were fortified with acephate and methamidophos (Lai, 1987, 1988, 1989a).

In general, acephate was stable in a wide range of macerated or ground commodities when stored at -20°C, even for periods exceeding a year. The results are summarized 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	35
	M	364	0.02-0.29	243-300	
Celery	A	94	4.16-4.40	106-116	34
	M	94	0.23-0.29	93-148	
Snap beans	A	69	0.30-0.39	73.3-84.6	
	M	69	0.12-0.15	75.0-86.7	
Snap beans	A	548	0.30-0.39	76.7-82.1	36
	M	548	0.12-0.15	75.0-80.0	
Pinto beans (dry)	A	461	0.23-0.24[3]	95.0-95.0	
	M	461	0.09-0.10[3]	80.0-90.0	
Pigeon peas	A	418	8.11-9.74	104-110	34
	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	
Lettuce	A	28	0.29-0.31	84-93	
	M	28	0.02-0.02	50-100	
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	108-122	
	M	61	0.11-0.11	109-117	
Bermuda grass	A	60	1.88-2.85	98-102	
	M	60	0.31-0.44	102-106.5	
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	
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	
	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 pinto beans and eggs which were added to untreated commodities

[3] Fortified separately with acephate and methamidophos

USE PATTERN

Information on use patterns was provided by the governments of The Netherlands and Poland and the manufacturers. The use patterns for citrus fruits, broccoli, Brussels sprouts, head cabbages, cauliflowers and tomatoes are summarized in Table 2.

Table 2. Registered uses of acephate on citrus fruits, broccoli, Brussels sprouts, head cabbages, cauliflowers and tomatoes.

Crop	Country	Form	Application					PHI, days
			Type	kg ai/ha	kg ai/hl	No.	Interval, days	
Citrus fruits	Italy	SP	Spray		0.024-0.036			21
	Japan	WP	Spray		0.025-0.05	3		30
	New Zealand	SP	Spray		0.075			14
	Venezuela	SP	Spray		0.06-0.12			5
Broccoli	Australia	SP	Spray	0.98	0.098	-	10-14	14
	Brazil	SP	Spray	0.38-0.75	0.075			14
	Italy	SP	Spray		0.034-0.064			21
	Japan	WP	Spray		0.05	3		14
	South Africa	SP	Spray	0.26-0.38			7-10	3
	Venezuela	SP	Spray	0.38-0.75				5
Brussels sprouts	Australia	SP	Spray	0.98	0.098	-	10-14	3
	Netherlands	WP	Spray	0.75		6	7	28
	South Africa	SP	Spray	0.26-0.38			7-10	3
	USA	SP	Spray	0.56-1.1				14
Cabbages	Australia	SP	Spray	0.98	0.098	-	10-14	3
	Brazil	SP	Spray	0.38-0.75	0.075			14
	France	WP	Spray		0.075			7
	Japan	WP	Spray		0.025-0.05	3		7
	Netherlands	WP	Spray	0.75		6	7	14
	New Zealand	SP	Spray	0.75-1.1	0.075		7-10	7
	Poland	SP	Spray	0.50-0.75		2		14
	South Africa	SP	Spray	0.26-0.38			7-10	3
	Venezuela	SP	Spray	0.38-0.75				5
Cauliflowers	Australia	SP	Spray	0.98	0.098	-	10-14	3
	Brazil	SP	Spray	0.38-0.75	0.075			14
	Italy	SP	Spray		0.034-0.064			21
	Japan	WP	Spray		0.05	3		14
	Netherlands	WP	Spray	0.75		6	7	14
	New Zealand	SP	Spray	0.75-1.1	0.075		7-10	7
	South Africa	SP	Spray	0.26-0.38			7-10	3
	USA	SP	Spray	0.56-1.1				14
	Venezuela	SP	Spray	0.38-0.75				5
Tomatoes	Australia	SP	Spray	0.98	0.098	-	10-14	3
	Brazil	SP	Spray	0.38-0.75	0.075			7

Crop	Country	Form	Application					PHI, days
			Type	kg ai/ha	kg ai/hl	No.	Interval, days	
	Canada	SP	*	0.9	0.045			*
	Japan	WP	Spray		0.025-0.05	3		1
Tomatoes	New Zealand	SP	Spray	0.75	0.075		14	3
	Poland	SP	Spray	0.75		1		14
	Poland (Glasshouse)	SP	Spray		0.075	1		14
	South Africa	SP	Spray	0.56-1.5	0.056-0.075		10	3
	Spain	SP	Spray		0.038-0.11			14
	Venezuela	SP	Spray	0.38-0.75				5

* Transplant water treatment: no PHI specified

RESIDUES RESULTING FROM SUPERVISED TRIALS

Data from many supervised trials on citrus fruits, broccoli, Brussels sprouts, head cabbages, cauliflowers and tomatoes were submitted or resubmitted to the Meeting. However some reports lacked important information such as recovery data or representative chromatograms. The Meeting did not evaluate trials which lacked data on analytical recoveries or in which recoveries were below 70%, or trials 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.

Trials which were unsuitable for evaluation are shown shaded in the Tables.

Residues in crops

Citrus fruits. Thirteen supervised trials were carried out in Argentina (lemons), Brazil (sweet oranges), Greece (sweet oranges), Japan (Satsuma mandarins, sour oranges, Yuzu (i.e. lemons and limes), and Natsudaidai) and New Zealand (clementines). The results are shown in Table 3.

Table 3. Residues of acephate in citrus fruits.

Crop, country, year	Application				PHI, days	Residues[1]		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Lemon Argentina 1995	SP	1	0.88	0.13	10 31	<0.1 <0.1		66[2]
Orange Brazil 1994	SP	2	1.23	0.056	14 21 28	0.2 0.2 0.1		70
		2	2.46	0.11	14	0.5		

Crop, country, year	Application				PHI, days	Residues[1]		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
					21 28	0.3 0.1		
Orange Greece 1995	SP	2	1.2	0.031	20	0.23	0.05	67

Satsuma mandarin Japan 1992	WP	3	2.5	0.05	30 45 60 	0.628(F) 0.50(P) <u>0.60(W)</u> 0.584(F) 0.41(P) 0.55(W) 0.564(F) 0.22(P) 0.50(W)	0.068(F) 0.09(P) 0.07(W) 0.052(F) 0.05(P) 0.05(W) 0.037(F) 0.02(P) 0.03(W)	49[3]
Satsuma mandarin Japan 1992	WP	3	2.5	0.05	30 45 60 	1.22(F) 0.68(P) <u>1.12(W)</u> 0.992(F) 0.44(P) 0.88(W) 0.623(F) 0.17(P) 0.52(W)	0.102(F) 0.14(P) 0.11(W) 0.062(F) 0.06(P) 0.06(W) 0.034(F) 0.02(P) 0.03(W)	48[3]
Sour oranges Japan 1993	WP	3	2.5	0.05	30 45 60	<u>0.134</u> 0.016 0.012	0.031 <0.005 <0.005	45
Yuzu Japan 1993	WP	3	2.5	0.05	30 45 60	<u>0.546</u> 0.261 0.104	0.044 0.019 0.010	55
Natsudaidai Japan 1992	WP	3	1.65	0.033	30 45 60 	0.121, 0.140(F) 0.166, 0.35(P) <u>0.132, 0.20(W)</u> 0.108, 0.114(F) 0.082, 0.15(P) 0.101, 0.12(W) 0.044, 0.048(F) 0.036, 0.04(P) 0.042, 0.05(W)	0.010, 0.013(F) 0.024, 0.06(P) 0.013, 0.03(W) 0.007, 0.009(F) 0.01, 0.02(P) 0.008, 0.01(W) <0.005,<0.005(F) <0.005, <0.01(P) <0.005, <0.01(W)	50[3,4]
		3	2.5	0.05	30 45 60 	0.222, 0.403(F) 0.59, 0.59(P) <u>0.301, 0.45(W)</u> 0.144, 0.217(F) 0.142, 0.22(P) 0.144, 0.22(W) 0.119, 0.170(F) 0.16, 0.19(P) 0.175, 0.13(W)	0.017, 0.021(F) 0.09, 0.15(P) 0.033, 0.06(W) 0.010, 0.015(F) 0.026, 0.04(P) 0.013, 0.02(W) 0.010, 0.011(F) 0.03, 0.03(P) 0.015, 0.02(W)	
Natsudaidai Japan 1993	WP	3	1.7	0.033	30 45 60 	0.295, 0.475(F) 6.00, 8.42(P) <u>2.02, 2.95(W)</u> 0.173, 0.274(F) 2.53, 5.22(P) 0.90, 1.83(W) 0.238, 0.342(F) 3.55, 4.51(P) 1.25, 1.62(W)	0.036, 0.047(F) 0.82, 0.972(P) 0.27, 0.334(W) 0.024, 0.027(F) 0.42, 0.532(P) 0.15, 0.186(W) 0.028, 0.030(F) 0.531, 0.56(P) 0.182, 0.19(W)	51[3,4]

		3	2.5	0.05	30	0.264, 0.270(F)	0.020, 0.028(F)	
						4.88, 5.36(P)	0.682, 0.81(P)	
						1.67, 1.86(W)	0.230, 0.26(W)	
					45	0.433, 0.610(F)	0.054, 0.055(F)	
						5.88, 6.47(P)	0.78, 0.86(P)	
						2.06, 2.31(W)	0.265, 0.29(W)	
					60	0.334, 0.552(F)	0.042, 0.050(F)	
						3.55, 7.22(P)	0.56, 0.915(P)	
						1.35, 2.60(W)	0.21, 0.316(W)	
Mandarin New Zealand 1996	SP	7	2.7	0.075	14	2.59, 3.34	0.23, 0.29	68

[1] (F) Flesh (P) Peel (W) Whole
[2] No data on analytical recoveries
[3] The data were also submitted to the 1994 JMPR
[4] The 2 results were from duplicate analyses carried out in different laboratories. The higher values of each pair were used to estimate maximum residues and the means to estimate STMRs

Broccoli. Fourteen supervised trials data were carried out in Australia, Brazil, France, Italy, Japan and Spain. The results are shown in Table 4.

Table 4. Residues of acephate in broccoli.

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
	SP	6	0.98	0.21	7	<0.02, <0.02	<0.02, <0.02	62[1]
Australia					14	<0.02, 0.02	<0.02, 0.02	
1995					21	0.12, 0.32	0.04, 0.08	
					28	<0.02, <0.02	<0.02, <0.02	
		6	2	0.41	7	3.0, 3.1	0.41, 0.52	
					14	1.6, 3.4	0.34, 0.52	
					21	0.29, 0.58	0.06, 0.17	
					28	0.02, 0.02	<0.02, <0.02	
	SP	1	0.75	0.075	0	7.3		72
Brazil 1995		3	0.75	0.075	7	2.3		
					14	0.2		
					21	<0.1		
		1	1.5	0.15	0	11.8		
		3	1.5	0.15	7	6.5		
					14	0.3		
					21	<0.1		
France 1992	SP	3	0.75	0.25	7	0.32		46[2]
	SP	3	0.75	0.25	7	0.03		47[2]
	SP	3	0.73	0.22	0	2.2	0.13	78
France 1995					3	0.25	0.08	

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
					7	0.15	0.05	
					14	0.03	0.02	
France 1995	SP	3	0.75	0.25	0	0.37	<0.01	77
					3	0.06	0.01	
					7	<0.01	<0.01	
					14	<0.01	<0.01	
Italy 1991	WP	1	0.47	0.047	28	0.45	0.2	45[3]
		1	0.94	0.094	28	1.21	0.46	
Japan 1993	WP	3	1.25	0.05	7	0.488, 0.742	0.138, 0.166	53[3,4]
					14	0.070, 0.158	0.017, 0.040	
					21	0.016, 0.028	0.008, 0.008	
Japan 1993	WP	3	1.25	0.05	7	4.22, 6.29	0.962, 1.49	52[3,4]
					14	1.28, 1.66	0.415, 0.566	
					21	1.15, 1.24	0.470, 0.529	
Spain 1995	SP	3	1.1	0.11	14	0.05	0.03	63
Spain 1996	WP	3	1	0.091	0	5.6	0.2	79
					3	4.8	0.28	
					7	2.5	0.31	
					14	1.2	0.32	
					21	0.33	0.15	

[1] The 2 results were from duplicate plots. The higher values of each pair were used to estimate both maximum residues and STMRs
[2] Analytical recovery was too low
[3] The data were also submitted to the 1994 JMPR
[4] The 2 results were from duplicate analyses carried out in different laboratories. The higher values of each pair were used to estimate maximum residues and the means to estimate STMRs

Brussels sprouts. The results of ten supervised trials in Australia, Belgium, South Africa and the USA are shown in Table 5.

Table 5. Residues of acephate in Brussels sprouts.

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Australia 1995	SP	6	0.98	0.21	1	2.8, 3.9	0.3, 0.3	58[1]
					3	2.6, 7.1	0.2, 0.4	
					5	1.1, 2.2	0.1, 0.2	
					7	4.8, 11.5	0.8, 1.0	
		6	2	0.41	1	20.3, 20.5	1.0, 1.3	
					3	13.0, 15.1	0.9, 0.9	
					5	9.5, 18.5	0.6, 1.4	
					7	10.1, 15.8	0.9, 1.2	
	SP	6	0.98	0.24	1	0.58, 0.78	0.05, 0.09	64[1,2]

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Australia 1995					3	0.43, 1.33	0.05, 0.12	
					5	0.82, 1.04	0.07, 0.09	
					7	1.32, 1.51	0.10, 0.11	
		6	2	0.49	1	1.39, 1.58	0.13, 0.13	
					3	2.1, 2.6	0.15, 0.17	
					5	1.74, 3.54	0.13, 0.22	
					7	1.67, 2.34	0.12, 0.15	
Belgium 1972	SP	1		0.025	3	0.06, 0.09	0.83, 0.95	40[1,3]
South Africa 1972	SP	3	0.56	0.056	1	2.59, 3.05	0.07, 0.10	4[3]
					4	2.58, 2.92	0.12, 0.14	
					8	0.42, 1.43	0.03, 0.09	
					14	1.15, 1.28	0.08, 0.10	
					21	0.37, 0.74	0.04, 0.06	
USA, Trimmed heads	SP	5	1.1	0.24	0	4.7, 5.5	0.22, 0.23	1[1]
					3	0.62, 0.73	0.05, 0.06	
					7	0.16, 0.43	0.04, 0.04	
					14	0.10, 0.23	0.01, 0.0	
		5	2.2	0.48	0	2.9, 4.4	0.09, 0.11	
					3	0.33, 0.40	0.03, 0.03	
					7	0.45, 0.54	0.05, 0.02	
					14	0.03, 0.10	<0.01, <0.01	
Trimmings	SP	5	1.1	0.24	0	5.6, 7.0	0.26, 0.17	
					3	0.20, 0.28	0.04, 0.03	
					7	0.21, 0.34	0.04, 0.03	
					14	0.10, 0.15	0.01, 0.02	
		5	2.2	0.48	0	1.9, 4.6	0.08, 0.11	
					3	0.35, 0.55	0.04, 0.04	
					7	0.29, 0.43	0.03, 0.02	
					14	0.04, 0.05	<0.01, 0.01	
Trash	SP	5	1.1	0.24	0	22.2, 22.6	0.60, 0.59	
					3	1.98, 3.03	0.24, 0.32	
					7	0.50, 0.52	0.07, 0.07	
					14	0.20, 0.70	0.04, 0.10	
		5	2.2	0.48	0	6.28, 7.52	0.18, 0.24	
					3	0.93, 1.55	0.15, 0.21	
					7	0.38, 0.55	0.09, 0.14	
					14	0.21, 0.46	0.10, 0.05	
USA 1971	SP	8	1.1	0.27	0	2.28, 2.41	0.06, 0.07	3[1]
					3	2.19, 2.71	0.08, 0.10	
					7	0.58, 1.15	0.05, 0.08	
USA 1971	SP	9	1.1	0.4	0	1.41, 2.75	0.09, 0.20	4[1,4]
					3	1.03, 1.31	0.05, 0.07	
					7	0.16, 0.21	0.02, 0.03	

[1] Duplicate results were from duplicate plots. Only summary data were submitted

[2] No information on control samples and no sample chromatograms

[3] Abnormally high control values and no sample chromatograms

Head cabbages. The results of 11 supervised trials in Brazil, France, Germany, Japan and The Netherlands are shown in Table 6.

Table 6. Residues of acephate in head cabbages.

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Brazil 1994	SP	3	0.26	0.075	7 14 21	<0.05 <0.05 <0.05		71
		3	0.52	0.15	7 14 21	<0.05 <0.05 <0.05		
France 1976	SP	3	0.75	0.075	0 7 10 14	0.83, 1.13 0.63, 1.08 0.36, 1.25 0.80, 0.93	0.03, 0.05 0.04, 0.07 0.04, 0.09 0.08, 0.09	24[1]
France 1973	SP	1	0.53	0.05	0 7 14 21	1.26 0.16 0.54 0.04	0.1 0.03 0.09 0.02	12
France 1974	SP	3	0.45	0.075	7	0.02, 0.03 0.05	0.01, 0.01 0.01	20[1]
France 1974	SP	1	0.45	0.075	7	0.02, 0.03 0.08	0.01, 0.01 0.01	19[1]
Germany 1976	SP	3	0.25 + 0.5 + 0.25	0.025 + 0.05 + 0.025	0 7 10 14 21	0.04 0.03 0.06 0.03 0.03	<0.01 <0.01 0.01 <0.01 <0.01	13
Germany 1976	SP	3	0.25 + 0.5 + 0.25	0.025 + 0.05 + 0.025	0 7 10 14 21	0.13 0.02 0.03 0.03 <0.02	<0.01 <0.01 <0.01 <0.01 <0.01	25
Japan 1988	WP	3	0.9	0.05	6 13 19	0.057, 0.083 0.028, 0.032 0.022, 0.101	0.010, 0.010 0.006, 0.008 <0.005, 0.016	44[2,3]
Japan 1987	WP	3	0.75	0.05	7 14 21	0.492, 0.664 0.276, 0.460 0.131, 0.139	0.096, 0.138 0.069, 0.140 0.044, 0.057	43[2,3]
Netherlands 1972	SP	1	0.75	0.075	14	0.313, 0.331	0.038, 0.050	5[1,3]

[1] The 2 results were from duplicate plots. The higher values of each pair were used to estimate both maximum residues and STMRs

[2] The 2 results were from duplicate analyses carried out in different laboratories. The higher values of each pair were used to estimate maximum residues and the means to estimate STMRs
[3] The data were also submitted to the 1994 JMPR

Cauliflower. The results of seventeen supervised trials carried out in Australia, Brazil, France, Germany, Japan and The Netherlands are shown in Table 7.

Table 7. Residues of acephate in cauliflower.

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Australia 1995	SP	6	0.98	0.24	1	1.15, 1.50	0.11, 0.11	65[1]
					3	0.47, 0.81	0.05, 0.09	
					5	0.64, 0.80	0.09, 0.10	
					7	0.72, 1.37	0.12, 0.20	
		6	2	0.49	1	3.19, 4.93	0.31, 0.39	
					3	2.82, 3.37	0.26, 0.32	
					5	1.14, 3.33	0.17, 0.36	
					7	2.34, 2.39	0.27, 0.28	
Brazil 1995	SP	1	0.75	0.075	0	5.3		73
		3	0.75	0.075	7	1.2		
					14	0.1		
					21	<0.1		
		1	1.5	0.15	0	7.1		
		3	1.5	0.15	7	2.3		
					14	0.3		
					21	<0.1		
France 1975	SP	1	0.5	0.03	14	0.03	<0.01	22[2]
France 1988	SP	1	0.94	0.075	14	1.33, 1.64	0.19, 0.22	32[1,3,4]
					21	1.04, 1.06	0.20, 0.17	
		2	0.94	0.075	21	0.35, 0.41	0.14, 0.20	
France 1995	SP	3	0.73	0.23	7	0.15	0.03	81
France 1995	WP	3	0.75	0.42	0	0.2	0.01	80
					2	0.21	0.02	
					4	0.14	0.02	
					7	0.1	0.01	
France 1995	WP	3	0.75	0.32	0	0.42	0.04	86
					2	0.09	0.02	
					4	0.07	0.02	
					7	0.03	0.01	
Germany 1976	SP	3	0.25 + 0.5 + 0.25	0.025 + 0.05 + 0.025	0	0.45	0.03	26[2]
					7	0.12	0.02	
					10	0.31	0.06	
					14	0.39	0.06	
					21	0.04	0.01	
Japan 1995	WP	3	1	0.05	14	0.006, 0.008	<0.005, 0.006	60[5]
					21	<0.005,< 0.005	<0.005, <0.005	
					28	<0.005, <0.005	<0.005, <0.005	

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Japan 1995	WP	3	1	0.05	14 21 28	0.586, 0.724 0.240, 0.290 0.162, 0.206	0.228, 0.214 0.088, 0.082 0.059, 0.071	61[5]
Netherlands 1972	SP	1	0.75	0.075	14	0.041, 0.117	0.008, 0.018	6[1,2]

Netherlands	SP	4	0.76	0.094	13	0.03	<0.01	82
1995		3	0.77	0.094	28	<0.01	<0.01	
Netherlands	SP	4	0.76	0.094	13	0.02	<0.01	83
1995		3	0.76	0.094	28	<0.01	<0.01	
Netherlands	SP	4	0.76	0.094	14	≤0.01	<0.01	84
1995		3	0.75	0.094	28	<0.01	<0.01	
Netherlands	SP	4	0.76	0.094	11	0.11	0.03	85
1995		3	0.76	0.094	19	0.03	<0.01, 0.01	

[1] The 2 results were from duplicate plots. The higher values of each pair were used to estimate both maximum residue levels and STMRs
[2] The data were also submitted to the 1994 JMPR
[3] Abnormally high control values and no sample chromatograms
[4] The data were also submitted to the 1990 JMPR
[5] The 2 results were from duplicate analyses carried out in different laboratories. The higher values of each pair were used to estimate maximum residues and the means to estimate STMRs

Tomatoes. Forty supervised trials were carried out in Australia, Brazil, Canada, France, Japan, South Africa, Spain and the USA. The results are given in Table 8.

Table 8. Residues of acephate in tomatoes.

Country, year	Application				PHI, days	Residues		Reference and Remarks
	Form.	No.	kg ai/ha	kg ai/hl		Acephate	Methamidophos	
Australia 1995	SP	6	0.98	0.35	1	1.1, 1.6	0.23, 0.30	69[1]
					3	1.5, 1.8	0.40, 0.50	
					5	0.85, 0.88	0.23, 0.26	
					7	1.2, 1.6	0.33, 0.43	
		6	2	0.7	1	1.9, 2.8	0.37, 0.58	
					3	0.76, 0.77	0.22, 0.23	
					5	1.6, 2.6	0.47, 0.55	
					7	2.1, 2.2	0.53, 0.54	
Brazil 1994	SP	3	0.3	0.075	3	<0.05		74
					7	≤0.05		
					14	<0.05		
		3	0.6	0.15	3	<0.05		
					7	<0.05		
					14	<0.05		
Canada 1980	WP	3	0.55	0.069	3	0.79	0.06	56[2,3]
					7	0.75	0.02	
					14	0.22	0.04	
		3	1.1	0.14	3	0.94	0.05	
					7	1.1	0.03	
					14	0.68	0.02	

Canada 1980	WP	3	0.55	0.069	3 7 14	0.47 0.46 0.21	0.11 0.14 0.01	57[2,3]
		3	1.1	0.14	3	0.71	0.15	
					7 14	0.72 0.06	0.21 0.03	
France 1973	SP	1	0.3	0.03	0 7	2.08 0.13	<0.02 <0.02	7
					13 20	0.07 0.06	<0.02 <0.02	
France 1973	SP	1	0.5	0.05	0 7 13 20	0.93 0.06 0.05 0.07	0.03 0.02 0.02 0.03	8
France 1973	SP	1	0.53	0.053	0 7 13 20	0.49 0.15 0.1 <0.05	0.02 0.02 0.04 0.03	9
France 1974	SP	2	0.83	0.05	1 3 7 10 15 21	0.38, 0.63, 0.72 0.19, 0.41, 0.43 0.14, 0.29, 0.36 0.12, 0.18, 0.36 0.11, 0.21 0.29 0.10, 0.14 0.19	0.02, 0.02 0.02 0.02, 0.02 0.02 0.02, 0.03 0.03 0.03, 0.03 0.04 0.03, 0.05 0.06 0.03, 0.04 0.06	14[1]
France 1974	SP	2	0.83	0.05	1 7	0.42, 0.56, 0.65, 0.53 0.08, 0.17 0.17, 0.17	0.01, 0.01 0.03, 0.04 0.01, 0.02 0.03, 0.03	10[1]
France 1974	SP	1	0.9	0.075	7	0.46, 0.61	0.04, 0.05	15[1,4]
France 1974	SP	3	0.9	0.075	7	1.10, 1.48	0.22, 0.25	16[1,4]
France 1974	SP	1	0.45	0.075	7	0.34, 0.38	0.06, 0.08	17
France 1974	SP	3	0.45	0.075	7	0.24, 0.32	0.08, 0.10	18
France 1974	SP	1	0.5	0.05	14	0.09	0.02	21
France 1974	SP	3	0.76	0.075	0 7 10 14	0.68, 0.77 0.35, 0.45 0.26, 0.48 0.27, 0.38	0.09, 0.11 0.11, 0.14 0.12, 0.17 0.13, 0.16	24[1]
France 1986	SP	1	0.75	0.075	14 21	0.39, 0.45 0.19	0.12, 0.16 0.04	27[1]
France 1986	SP	1	0.62	0.075	15 21	0.09, 0.26 0.06, 0.08	0.02, 0.04 0.03, 0.03	28[1]

France 1988	SP	1	0.55	0.075	13 20	<0.05, <0.05 <0.05, 0.12	<0.02, <0.02 <0.02, <0.02	30[1]
		2	0.55	0.075	20	0.09, 0.22	<0.02, 0.05	
France 1988	SP	1	1.64	0.075	14 21	0.40, 0.44 0.05, 0.08	0.06, 0.07 0.06, 0.07	31[1]
		2	1.64	0.075	21	0.54, 0.95	0.32, 0.44	
France 1992	SP	3	0.75	0.075	2	0.4		75
France 1992	SP	3	0.75	0.075	0 1 2 5 7	0.8 0.91 0.94 0.59 0.74		76
Japan 1985	WP	3	0.9	0.05	1 3 7	0.597, 1.03 0.703, 0.878 0.720, 0.893	0.063, 0.082 0.060, 0.072 0.072, 0.106	42[3,5]
Japan 1984	WP	3	0.75	0.05	1 3 7	0.225, 0.687 0.566, 0.867 0.352, 0.648	0.027, 0.059 0.058, 0.084 0.085, 0.123	42[3,5]
South Africa 1973	SP	5	0.38	0.013	0 1 2 3 7	0.16 0.14 0.16 0.12 0.14	0.04 0.03 0.03 0.03 0.03	11[3]
		5	0.75	0.026	3	0.23	0.07	
Spain 1995	SP	3	1.1	0.11	14	0.05	0.03	59
USA 1987	SP	8	1.12	0.4	3	1.4	0.08	29
USA 1990	SP	6	1.12	0.21-0.27	3 5 	0.50, 0.63 0.65, 0.69 0.36, 0.40 0.70, 0.73	0.12, 0.17 0.17, 0.18 0.12, 0.12 0.19, 0.19	90[1]
USA 1990	SP	6	1.12	0.21-0.27	3 5 	0.60, 0.64 0.75, 0.98 0.36, 0.49 0.63, 0.64	0.17, 0.18 0.23, 0.27 0.12, 0.16 0.19, 0.22	87[1]
USA 1989	SP	6	1.12	0.14-0.22	3 5 	0.69, 1.0 1.1, 1.3 0.76, 0.87 0.89, 1.00	0.12, 0.17 0.19, 0.25 0.16, 0.19 0.18, 0.20	88[1]
USA 1989	SP	6	1.12	0.096-0.19	3 5 	0.33, 0.43 0.47, 0.53 0.25, 0.28 0.29, 0.32	0.14, 0.18 0.23, 0.26 0.13, 0.15 0.18, 0.21	89[1]

USA 1990	SP	6	1.12	0.19-0.2	3 5	0.46, 0.66 0.57, 0.62	0.09, 0.14 0.16, 0.19	91[1]
USA 1990	SP	6	1.1	0.1-0.25	3	0.19, 0.20 0.24, 0.27	0.06, 0.06 0.08, 0.09	92[1]
USA 1993	SP	6	1.12	0.38-0.41	3	0.22, 0.28	0.06, 0.09	93[1]
USA 1993	SP	6	1.12	0.39-0.42	3	0.45, 0.47	0.09, 0.09	94[1]
USA 1993	SP	6	1.12	0.4	3	0.33, 0.51	0.07, 0.13	95[1]

[1] Multiple results were from replicate plots. The highest values of each set were used to estimate both maximum residue levels and STMRs
[2] Only summary data were submitted
[3] The data were also submitted to the 1994 JMPR
[4] Abnormally high control values and no sample chromatograms
[5] The 2 results were from duplicate analyses carried out in different laboratories. The higher values of each pair were used to estimate maximum residues and the means to estimate STMRs

FATE OF RESIDUES IN STORAGE AND PROCESSING

In processing

Tomatoes. In three studies in the USA harvested tomatoes were processed in the laboratory by typical commercial practices, but details were not provided. The results are given in Table 9.

Table 9. Residues of acephate and methamidophos in processed fractions of tomatoes, USA.

Application, year	Sample	Residues, mg/kg		Reference
		Acephate	Methamidophos	
1.12 kg ai/ha 0.4 kg ai/hl 8 applications PHI: 3 days 1987	Whole fruit	1.4	0.08	29
	Washed fruit	1.8	0.9	
	Canned whole fruit	0.54	0.04	
	Canned juice	1.3	0.08	
	Bulk paste	5.6	0.43	
	Canned purée	2.5	0.17	
	Wet pomace	0.84	0.04	
	Dry pomace	1.4	0.09	
1.12 kg ai/ha 6 applications PHI: 3 days	Whole fruit	0.36, 0.36	0.15, 0.17	91
	Washed fruit	0.34, 0.37	0.15, 0.18	
	Peeled fruit	0.25, 0.48	0.12, 0.24	
	Canned whole fruit	0.18, 0.27	0.11, 0.17	
	Canning waste	0.70, 0.75	0.06, 0.06	
1.12 kg ai/ha 0.096-0.19 kg ai/hl 6 applications PHI: 3 days	Whole fruit	0.49, 0.56	0.23, 0.28	89
	Washed fruit	0.54, 0.65	0.26, 0.33	
	Peeled fruit	0.24, 0.48	0.13, 0.25	
	Canned whole fruit	0.28, 0.25	0.18, 0.19	
	Canning waste	0.81, 1.1	0.26, 0.43	

Cooking studies were carried out on three vegetables containing acephate and methamidophos (Crossley, 1971). Field-treated tomatoes, cabbage and broccoli were analyzed for acephate and methamidophos before and after boiling for 30 minutes. The results are given in Table 10.

Table 10. Residues of acephate and methamidophos in crops before and after 30 minutes boiling.

Crop	Acephate, mg/kg		Methamidophos, mg/kg	
	Before cooking	After cooking	Before cooking	After cooking
Tomatoes	0.93, 1.13	0.93, 1.09	0.12, 0.14	0.13, 0.15
Cabbage	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 acephate in several crops (Table 11).

Table 11. Monitoring data on acephate in several crops in The Netherlands, 1991-1994.

Commodity	Samples analyzed	Number in which residues found[1]	Detection frequency, %	Mean residues[2], mg/kg
Peaches	379	16	4.2	0.04, <0.02[3]
Nectarines	401	19	4.7	<0.02, 0.02[3]
Plums	536	2	0.4	<0.02
Grapes	1335	18	1.3	<0.02
Tomatoes	330	4	1.2	<0.02
Lettuce	865	10	1.2	0.03, 0.05[3]
Endive	511	2	0.4	<0.02

[1] LOD = 0.02 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. 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 6 and 7 commodities respectively (Table 12).

Table 12. Residues of acephate and methamidophos found at or above the limit of determination in market basket surveys in the USA, 1984 and 1985.

Commodity	Residues, mg/kg		Reference
	Acephate	Methamidophos	
Cantaloupe	0.03	0.02, 0.02, 0.03, 0.10	38
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 pepper	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, 1989a). Lettuce, snap beans, cauliflowers, Brussels sprouts and bell peppers were treated with acephate at the highest label use rate and monitored for residues from the time of harvest through typical commercial processes to the consumer. The results are given in Table 13.

Table 13. Residues of acephate and methamidophos in crisphead lettuce, snap beans, bell peppers cauliflowers and Brussels sprouts from farm gate to consumer, USA.

Application Year	Description (Location)	Average residues, mg/kg			
		Acephate	% of field	Methamidophos	% of field
0.63 kg ai/ha	Whole head lettuce (field)	0.30	100	0.02	100
+ 1.12 kg ai/ha	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	74	0.43	83
PHI 9 days	Bell peppers (distributor)	2.7	71	0.45	87
1986	Bell peppers (supermarket)	3.1	82	0.51	97
1.12 kg ai/ha	Cauliflower head (field)	0.80	100	0.10	100
6 applications	Trimmed head (cooler)	0.34	43	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
Australia	Apples/Pears	0.02	Pepper	5
	Broccoli	5	Potato	0.5
	Cabbage	5	Soya beans	1
	Citrus	5	Sugar beet	0.1
	Cotton seed	2	Tomatoes	5
	Lettuce	10		
Brazil	Beans	0.5	Peanut	0.2
	Broccoli	0.5	Pepper	1
	Cabbage	0.5	Potato	0.2
	Cauliflower	0.5	Soya beans	1
	Cotton seed	0.2	Tomatoes	0.5
Canada	Beans	1	Cranberries	0.5
	Brussels sprouts	1.5	Lettuce	1
	Cabbage	0.3	Pepper	2
	Cauliflower	2	Potato	0.5
Chile	Beans	3	Cauliflower	2
	Brussels sprouts	3	Lettuce	10
	Cabbage	3	Pepper	4
EU[1]	Apples/Pears	0.02	Lettuce	1
	Beans	0.02	Peanut	0.02
	Broccoli	0.02	Peas	0.1
	Brussels sprouts	2	Pepper	0.02
	Cabbage	2	Potato	0.02
	Cauliflower	0.02	Soya beans	0.02
	Celery	0.02	Spinach	0.02
	Citrus	1	Stone fruit	0.02
	Cotton seed	0.02	Sugar beet	0.02
	Grapes	0.02	Tomatoes	0.5
	Hops	0.1		
France	Apples/Pears	1	Lettuce	1
	Artichoke	1	Potato	0.02
	Cabbage	2	Tea	0.1
	Citrus	1	Tomatoes	0.5
	Cotton seed	0.02		
Germany	Apples/Pears	1	Hops	15
	Grapes	1.5	Stone fruit	1
Hungary	Cabbage	0.5	Sugar beet	0.1
	Peas	0.1		
Israel	Cabbage	5	Onion	0.5

Country	Commodity	MRL, mg/kg	Commodity	MRL, mg/kg
	Corn	2	Pepper	5
	Garlic	0.5	Tomatoes	5
	Mango	2	Watermelon	5
Italy	Apples/Pears	1.5	Lettuce	1.5
	Broccoli	1.5	Potato	1.5
	Cabbage	1.5	Stone fruit	1.5
	Cauliflower	1.5	Sugar beet	1.5
	Citrus	1.5	Tobacco	1.5
	Grapes	1.5	Tomatoes	1.5
Japan	Beans	3	Onion	0.5
	Broccoli	5	Parsley	0.5
	Brussels sprouts	5	Peanut	0.2
	Cabbage	5	Peas	0.1
	Cauliflower	5	Pepper	5
	Celery	10	Persimmon	2
	Chinese cabbage	5	Potato	1
	Citrus	10	Radish (leaf)	10
	Corn	0.1	Radish (root)	1
	Cotton seed	2	Soya beans	0.5
	Cranberries	0.5	Spinach	5
	Cucumber	5	Sugar beet	0.1
	Egg plant	5	Tea	10
	Garlic	2	Tomatoes	5
	Grapes	5	Turnip (leaf)	10
	Horseradish	5	Turnip (root)	1
	Kale	5	Watermelon	0.5
	Kidney bean	3	Welsh onion	0.1
	Lettuce	5	Yam	0.5
	Mustard	5		
New Zealand	Avocado	1	Lettuce	6
	Cabbage	2	Potato	1
	Cauliflower	2	Tamarillo	0.5
	Citrus	5	Tomatoes	1
USA	Beans	3	Lettuce	10
	Brussels sprouts	3	Mint hay	15
	Cauliflower	2	Peanut	0.2
	Celery	10	Pepper	4
	Cotton seed	2	Soya beans	1
	Cranberries	0.5		
Venezuela	Broccoli	5	Lettuce	10
	Cabbage	10	Potato	5
	Cauliflower	5	Rice	5
	Citrus	5	Sesame	2
	Corn	5	Tobacco	1
	Cotton seed	2	Tomatoes	5

[1] Proposed MRLs

APPRAISAL

Acephate 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 the MRLs for broccoli, Brussels sprouts, head cabbages, cauliflowers, citrus fruits and tomatoes which had been held at Step 7B by the 1989 CCPR (ALINORM 89/24A, para 126). The manufacturer has 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 and acephate and its metabolite methamidophos were determined individually. 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.

Storage stability of analytical samples

Extensive storage stability studies were carried out with vegetables, pulses, oilseed, animal products, cereals and grasses. Acephate was shown to be stable in a wide range of macerated or ground commodities at -20°C.

Data validity

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 analyses of control samples, or trials with abnormally high control values and for which sample chromatograms were not supplied.

Field trials data

Only residues of acephate are discussed. Residues of methamidophos are discussed in the monograph on that compound.

Citrus fruits. Eight supervised trials, two on Satsuma mandarins, four on Natsudaidai, one on Kabosu (sour orange) and one on Yuzu (lemons or limes) were carried out in Japan. The trials on mandarins and Natsudaidai had already been submitted to the 1994 JMPR. The residues from trials according to GAP (0.025-0.05 kg ai/hl, 30 days PHI) were 0.60 and 1.12 mg/kg in mandarins, 0.13-2.95 mg/kg in Natsudaidai, 0.13 mg/kg in Kabosu and 0.55 mg/kg in Yuzu. A single New Zealand trial on mandarins was according to GAP (0.075 kg ai/hl, 14 days PHI) with a residue of 2.59-3.34 mg/kg (duplicate determinations). In another trial in New Zealand reported in the 1984 JMPR monograph the conditions (0.075 kg ai/hl, 26 days PHI) complied with GAP. The residue was 1.6 mg/kg.

One trial in Greece was reported without information on GAP, but the trial conditions (0.031 kg ai/hl, 20 days PHI) were comparable to Italian GAP (0.024-0.036 kg ai/hl, 21 days PHI). The residue was 0.23 mg/kg. Two Brazilian trials were reported but there was no comparable GAP.

One supervised trial was carried out in Argentina, but there was no comparable GAP and

critical information on recoveries was lacking.

Since data on only four adequate additional trials (one Greek, two Japanese and one in New Zealand) were submitted, the Meeting could not recommend an MRL.

Broccoli and cauliflower. The Meeting agreed that the supervised trials on broccoli and cauliflower could be evaluated together because of the similarities in the use patterns and residue behaviour.

One Australian, one Brazilian and two Japanese trials on broccoli complied with national GAP (Australia 0.98 kg ai/ha, 0.098 kg ai/hl, 14 days PHI; Brazil 0.38-0.75 kg ai/ha, 0.075 kg ai/hl, 14 days PHI; Japan 0.05 kg ai/hl, 14 days PHI). In the Australian trial the spray concentration (0.21 kg ai/hl) was higher than the GAP concentration of 0.098 kg ai/hl but the rate in terms of kg ai/ha complied with GAP. Data on the Japanese trials had already been submitted to the 1994 JMPR. The residues were <0.02-0.32 mg/kg, 0.2 mg/kg and 0.07-1.66 mg/kg in the Australian, Brazilian and Japanese trials respectively.

Two French trials (0.73-0.75 kg ai/ha, 0.22-0.25 kg ai/hl, 0-14 days PHI) and two Spanish trials (1.0-1.1 kg ai/ha, 0.091-0.11 kg ai/hl, 0-21 days PHI) on broccoli were reported but information on GAP was not provided. Two Italian trials on broccoli which were submitted to the 1994 JMPR and resubmitted to the present Meeting did not comply with Italian GAP (0.034-0.064 kg ai/hl, 21 days PHI).

One Australian, one Brazilian and two Japanese trials on cauliflower were according to the relevant GAP (Australia 0.98 kg ai/ha, 0.098 kg ai/hl, 3 days PHI; Brazil 0.38-0.75 kg ai/ha, 0.075 kg ai/hl, 14 days PHI; Japan 0.05 kg ai/hl, 14 days PHI). In the Australian trial the spray concentration (0.24 kg ai/hl) again exceeded the GAP concentration but the kg ai/ha rate accorded with GAP. The residues were 0.47-1.37 mg/kg, 0.1 mg/kg and 0.006-0.72 mg/kg in Australia, Brazil and Japan respectively. Five trials in The Netherlands on cauliflower were submitted to the Meeting. One trial carried out in 1972 had been reported to the 1994 JMPR and was resubmitted this year. The trial conditions complied with GAP (0.75 kg ai/ha, 14 days PHI, 6 applications) except that there were only 1-4 applications. However the number of applications seems to have little influence on the residue of acephate. The residues were <0.01-0.12 mg/kg.

Four trials in France on cauliflower (0.50-0.75 kg ai/ha, 0.03-0.42 kg ai/hl and 0-14 days PHI) and one in Germany (0.25 kg ai/ha, 0.025 kg ai/hl and 0-21 days PHI) which had been submitted to the 1994 JMPR were resubmitted, but the trial conditions were not comparable with any relevant GAP.

The residues in one Australian, one Brazilian and 2 Japanese trials on broccoli at maximum GAP were 0.32, 0.2, 0.114 and 1.47 mg/kg respectively. Those in one Australian, one Brazilian, 2 Japanese and 5 Netherlands trials on cauliflower at maximum GAP were 1.37, 0.1, 0.007, 0.655, <0.01, 0.02, 0.03, 0.11 and 0.117 mg/kg respectively.

The residues in broccoli and cauliflower from the 13 trials in rank order were 0.007, <0.01, 0.02, 0.03, 0.1, 0.11, 0.114, 0.117, 0.2, 0.32, 0.655, 1.37 and 1.47 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg and an STMR level of 0.11 mg/kg for broccoli and cauliflower.

Brussels Sprouts. Two Australian trials complied with the Australian GAP application rate of 0.98 kg ai/ha although the spray concentration of 0.21 kg ai/hl was higher than the GAP concentration (0.098 kg ai/hl). The residues were 0.43-11.5 mg/kg at PHIs of 3 (GAP) to 7 days. One of two

American trials complied with American GAP (0.56-1.1 kg ai/ha, 14 days PHI) but the analyzed commodity (trimmed heads) was inappropriate for residue evaluation.

One trial in The Netherlands and three in South Africa according to GAP (0.75 kg ai/ha, 28 days PHI and 0.26-0.38 kg ai/ha, 3 days PHI respectively) were reported to the 1994 JMPR. The residues in The Netherlands were 0.29-0.94 mg/kg at 28 days and in South Africa 0.26-1.3 mg/kg at 7-28 days, and 0.95 and 1.4 mg/kg at 3 days.

The additional data were insufficient to estimate a maximum residue level.

Cabbages. One of two Brazilian trials, three of four French trials and two Japanese trials reflected appropriate GAP (Brazil 0.38-0.75 kg ai/ha, 0.075 kg ai/hl, 14 days PHI; France 0.075 kg ai/hl, 7 days PHI; Japan 0.025-0.05 kg ai/hl, 7 days PHI). In the Brazilian trial the dose rate of 0.26 kg ai/ha was lower than the GAP rate (0.75 kg ai/ha), but the spray concentration (0.075 kg ai/hl) complied with GAP. The data on the Japanese trials had already been submitted to the 1994 JMPR. The residues were <0.05 mg/kg, 0.02-1.25 mg/kg and 0.057-0.66 mg/kg in Brazil, France and Japan respectively.

Data from two German trials were submitted to the Meeting, but GAP was not available from Germany and the trial conditions were not comparable with other European GAP.

Data from one supervised trial in The Netherlands which had been submitted to the 1994 JMPR were resubmitted. The conditions (0.75 kg ai/ha, 14 days PHI, 1 application) accorded with GAP (0.75 ai/ha, 14 days PHI, 6 applications) except in the number of applications. The residues were 0.313-0.331 mg/kg.

Four supervised trials were carried out in New Zealand and the conditions in three of them (0.84 kg ai/ha, 0-7 days PHI; 1.1 kg ai/ha, 10 days PHI; 0.84 kg ai/ha, 16-23 days PHI) complied with GAP (0.75-1.1 kg ai/ha, 7 days PHI). The data were reported in the 1984 JMPR monograph. The residues were 0.8 mg/kg at 7 days, 1.2 mg/kg at 10 days and <0.4 mg/kg at 16 and 23 days respectively.

The residues found in one Brazilian, 3 French and 2 Japanese trials carried out at the maximum conditions complying with GAP were <0.05, 0.05, 0.08, 1.25, 0.07 and 0.578 respectively. Although the trial in The Netherlands was with a single application instead of the six allowed, the residue data could be used for the estimation of an STMR since the number of applications was not considered to be significant. The residue was 0.331 mg/kg. Two of the New Zealand trials also could be used for the estimation of an STMR. The residues were 0.8 and 1.2 mg/kg.

The residues from the 9 trials in rank order were <0.05, 0.05, 0.07, 0.08, 0.331, 0.578, 0.8, 1.2 and 1.25 mg/kg. The Meeting estimated a maximum residue level of 2 mg/kg and an STMR level of 0.33 mg/kg for acephate in cabbages

Tomatoes. GAP in several countries had changed since 1994. Current GAP and additional data on supervised trials were submitted to the Meeting. One Australian, one Brazilian, one Spanish and two Japanese trials reflected GAP (Australia 0.98 kg ai/ha, 0.098 kg ai/hl, 3 days PHI; Brazil 0.38-0.75 kg ai/ha, 0.075 kg ai/hl, 7 days PHI; Japan 0.025-0.05 kg ai/hl, 1 day PHI; Spain 0.038-0.11 kg ai/hl, 14 days PHI). The Australian spray concentration (0.35 kg ai/hl) was higher than the GAP concentration but the dose rate (kg ai/ha) complied with GAP. The data from the Japanese trials had been submitted to the 1994 JMPR and were resubmitted. The residues were 1.5-1.8 mg/kg, <0.05

mg/kg, 0.225-1.03 mg/kg and 0.05 mg/kg in Australia, Brazil, Japan and Spain respectively.

Seventeen trials in France 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) complied with Polish GAP (0.75 kg ai/ha, 14 days PHI, 1 application) except in the number of applications which did not appear to influence the residues significantly. The residues were 0.09-0.45 mg/kg. A further ten of the French trials, at 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) and showed residues of <0.05-0.95 mg/kg. Data on two South African trials reported in 1994 were resubmitted. The conditions in one trial (0.75 kg ai/ha, 3 days PHI) were according to GAP (0.56-1.5 kg ai/ha, 3 days PHI). The residue was 0.23 mg/kg. Data on ten American and two Canadian trials were submitted, but there was no relevant GAP. The Canadian trials had already been reported to the 1994 Meeting.

One supervised trial in New Zealand reported in the 1994 monograph was at 1.0 kg ai/ha, 0.067 kg ai/hl with 1-16 days PHI, close to the conditions of GAP (0.75 kg ai/ha, 0.075 kg ai/hl, 3 days PHI): the residues were 0.19 and 0.93 mg/kg at 3 and 7 days PHI.

The Meeting decided not to use the data from the Australian trials, only one of which complied with GAP, for the estimation of a maximum residue level because their population was different from that of the others and there were insufficient data.

The residues (mg/kg) in the 9 trials with treatments at maximum levels complying with GAP were <0.05 (Brazil), 0.814 and 0.717 (Japan), 0.05 (Spain), 0.26, 0.29, 0.38 and 0.45 (France), and 0.93 (New Zealand).

The residues from the 9 trials in rank order were <0.05, 0.05, 0.26, 0.29, 0.38, 0.45, 0.717, 0.814 and 0.93 mg/kg. The Meeting estimated a maximum residue level of 1 mg/kg and an STMR level of 0.38 mg/kg for acephate in tomatoes.

Processing studies

Tomatoes. The concentration factors from 3 trials were 1.29, 0.99 and 1.13 for washed fruit and 0.39, 0.63 and 0.50 for canned whole fruit. The mean concentration factors were 1.14 and 0.51 respectively. Washing appears to have no significant effect on the residue. The Meeting estimated an STMR-P of 0.19 mg/kg for canned tomatoes by applying the mean concentration factor to the STMR for tomatoes (0.38 mg/kg). The concentration factor for peeled tomatoes was calculated to be 0.85 from two trials, but the Meeting did not estimate an STMR-P because peeled tomato is only an intermediate product.

Concentration factors for canned juice, bulk paste, canned purée, wet pomace and dry pomace were 0.93, 4.0, 1.79, 0.60 and 1.0 from a single trial and STMR-P levels were calculated as 0.35, 1.52, 0.68, 0.23 and 0.38 respectively.

Cooking studies were carried out on tomatoes, cabbage and broccoli. Boiling for thirty minutes had no measurable effect on the residue levels of acephate.

Monitoring data

A total of 4,357 samples of peaches, nectarines, plums, grapes, tomatoes, lettuce and endive were monitored for acephate in The Netherlands in 1991-1994. The detection frequency ranged from 0.4% for plums and endive to 4.7% for nectarines and the highest mean residue was 0.05 mg/kg in lettuce in 1994.

Market basket survey

A market basket survey for acephate and methamidophos was carried out at 24 locations in the USA in 1984 and 1985. Acephate was found in 6 of 62 collected commodities; the highest residue was 0.72 mg/kg in green sweet peppers.

Farm gate to consumer studies

Farm gate to consumer studies on 5 commodities were carried out in the USA in 1985. Residues of acephate were reduced by 90% from field to supermarket in lettuce, 82% from field to canned product in snap beans, 13% from field to supermarket in bell peppers, 69% from field to processing and freezing in cauliflower and 93% from field to blanching and freezing in Brussels sprouts.

RECOMMENDATIONS

The Meeting estimated the maximum residue and STMR levels shown below. The maximum residue levels are recommended for use as MRLs.

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

Commodity		Maximum residue level, mg/kg		PHI, days	STMR, mg/kg[1]
CCN	Name	New	Previous		
VB 0400	Broccoli	2	W[2]	14	0.11
VB 0041	Cabbages, Head	2	W	7-14	0.33
VB 0404	Cauliflower	2	W	3-14	0.11
VO 0448	Tomato	1	W	1-14	0.38

[1] Since separate maximum residue levels and STMRs have been estimated for methamidophos, arising from the use of either acephate or methamidophos, the risk arising from methamidophos residues should be assessed separately against the methamidophos ADI and acute RfD

[2] Earlier recommendation for MRL withdrawn by 1994 JMPR

The estimated STMR-P levels listed below for acephate in processed commodities are recommended for use in estimates of dietary intake.

Raw agricultural commodity	STMR (mg/kg)	Processed commodity	STMR-P (mg/kg)
Tomato	0.38	Canned tomato	0.19
		canned juice	0.35
		bulk paste	1.52
		canned puree	0.68
		wet pomace	0.23
		dry pomace	0.38

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