THIOPHANATE-METHYL (077)

[See also BENOMYL (069) and CARBENDAZIM (072)]

EXPLANATION

Thiophanate-methyl was first evaluated in 1973 and has been reviewed on 4 other occasions. The 1988 JMPR initiated a re-evaluation of residues arising from the use of benomyl, carbendazim and thiophanate-methyl, all to be expressed as carbendazim, in response to concerns expressed at the 1988 CCPR (ALINORM 89/24, para. 82-84). The 1989 CCPR requested that the recommendations for a group MRL for carbendazim in cereals should be replaced by separate MRLs for individual crops, while at the 1992 CCPR (ALINORM 93/24, para. 105) several MRLs were held at step 7B pending further review by the JMPR. Although some information was provided for the 1990 JMPR, the Meeting concluded that it would be premature to review the compounds until all of the required data became available and consideration was deferred to the 1992 JMPR. However, because of the workload on that Meeting, the re-evaluation was again postponed until the 1993 JMPR. The data submitted for the 1990 and 1992 JMPRs, together with additional data provided in 1993, have now been reviewed with particular attention to the GAP information and some new residue data.

USE PATTERN

Information on the uses of thiophanate-methyl was provided by the manufacturer, Nippon Soda (1993), and also by the European Commission (EC, 1993), and several countries (Canada, 1993; Finland 1993; Germany, 1993; Netherlands, 1993; New Zealand, 1993; Spain, 1993). This is summarized in Tables 1-3 and clearly shows the extensive applications of this fungicide. Post-harvest uses on pome and stone fruits and potatoes are registered in some countries. MRLs for pome and stone fruits were held at step 7B by the 1988 CCPR. The other 7B commodities, bean fodder, berries and other small fruits, cereal grains, citrus fruits, head lettuce, mushrooms, peppers, pineapples, sugar beet leaves or tops and tomatoes, are not subject to post-harvest treatments with thiophanate-methyl.

Table 1. Thiophanate-methyl - registered use rates and patterns on fruit.

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
Citrus fruits							
Oranges	Japan	WP	70	[23-70g/hl]	7	1	
Pome fruits							
Apple	Belgium	SC/WP	50/70	[50-60g/hl]	1	14	
	Bulgaria	WP	70	0.7-1.05	2	14	
	Canada	WP	70	0.44-1.6	-	1-7	
	Denmark	EC	70	[50g/hl]	>1	14	
	France	SC	45	[70g/hl]	-	-	

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
	Germany	SC	50	0.525	3	10	Before ripening
		WP	70	[42-70g/hl]	-	14	
	Greece	WP	70	0.1-1.25	7-8	14	Foliar spray
				[50g/hl]	1	-	Post-harvest
	Ireland	WP	50	0.25-1.1	-	-	Foliar spray
				[100g/hl]	-	-	Post-harvest
	Italy	WP	70	[40-50g/hl]	-	-	Every 8-10 days
	Japan	WP	70	[35-70g/hl]	-	1	
	Netherlands	WP/EC	70/50	0.7-1.05	2	14	Crop treatment
				0.28-0.42	1-2	-	Mildew treatment
				0.7-2.1	1-2	-	Trees after harvest
				[100-105g/hl]	1	60	Post-harvest
	New Zealand	WP	50	max. 0.375	1-2	7	
	Portugal	WP	70	[70-105g/hl]	2-3	7	
	Spain	WP	70	0.52-1.05	-	15	
	USA	SC/WP/DG	46-85	0.78-1.18	-	-	
Loquat	Japan	WP	70	[70-85g/hl]	3	14	
Pear	Belgium	SC/WP	50/70	[50-60g/hl]	1	14	
	Denmark	EC	70	[50g/hl]	>1	14	
	France	SC	45	[70g/hl]	-	-	
	Germany	SC	50	0.525	3	10	Before ripening
	Ireland	WP	50	0.25-1.1	-	-	Foliar spray
				[100g/hl]	-	-	Post-harvest
	Italy	WP	70	[40-50g/hl]	-	-	Every 8-10 days
	Japan	WP	70	[35-70g/hl]	-	1	
	Netherlands	WP/EC	70/50	0.7-1.05	2	14	Crop treatment
				0.28-0.42	1-2	-	Mildew treatment
				0.7-2.1	1-2	-	Trees after harvest
				[100-105g/hl]	1	60	Post-harvest
	New Zealand	WP	50	max. 0.375	1-2	7	
	Portugal	WP	70	[70-105g/hl]	2-3	7	
	Spain	WP	70	0.52-1.05	-	15	

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
Stone fruits	Bulgaria	WP	70	0.7	1	14	
	France	SC	45	[70g/hl]	-	-	
	Germany	SC	50	[35g/hl]	3	10	
	Greece	WP	70	0.75-1.25	3-4	14	
				[50g/hl]	1	14	Post-harvest
	Italy	WP	70	[40-50g/hl]	1	15	
	New Zealand	WP	50	max. 0.5	3	-	Up to shuck fall
	Spain	WP	70	0.52-1.05	-	21	
Apricots	Canada	WP	70	1.2	1-2	1	
	USA	SC/WP/DG	46-85	1.18	5	1	
Cherries	Belgium	SC	50	[50g/hl]	1	14	
	Canada	WP	70	1.2	1-2	1	
	Denmark	SC	70	[50g/hl]	3-4	14	
	Japan	WP	70	[47-70g/hl]	3	14	
	Netherlands	WP	70	0.7-1.05	2	-	
	USA	SC/WP/DG	46-85	1.18	5	1	
Peach	Canada	WP	70	1.2	1-2	1	
	Japan	WP	70	[47-70g/hl]	-	1	
	USA	SC/WP/DG	46-85	1.18-1.73	5	1	
Plums	Canada	WP	70	1.2	1-2	1	
	Denmark	SC	70	[50g/hl]	3-4	14	
	Japan	WP	70	[47-70g/hl]	3	14	
	USA	SC/WP/DG	46-85	1.18	5	1	
Berries and other small fruits							
Blackberries	Canada	WP	70	0.77	-	1	7-10 day intervals
Blueberries	Canada	WP	70	0.77	1-3	60	
Currants, Black	Bulgaria	WP	70	0.35	1	14	
Currants, Black, Red, White	Denmark	SC	70	[50g/hl]	4	14	
	Finland	SC	70	[490g/hl]	-	14	Greenhouse
Gooseberry	Denmark	SC	70	[50g/hl]	4	14	
	Finland	SC	70	[490g/hl]	-	14	Greenhouse
Grapes	Bulgaria	WP	70	0.7-1.4	4	14	
	France	SC	45	[140g/hl]	-	-	
	Germany	WP	70	[28-56g/hl]	-	14	
	Greece	WP	70	0.25-1.05	5-6	14	

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
	Italy	WP	70	[40-50g/hl]	>1	15	
	Japan	WP	70	[35-70g/hl]	3	14	
	Portugal	WP	70	[140g/hl]	-	7	
	Spain	WP	70	0.52-1.25	-	21	Wine grapes
Raspberries	Canada	WP	70	0.77	-	1	7-10 day intervals
	Denmark	SC	70	[50g/hl]	4	14	
Strawberry	Belgium	SC	50	[50g/hl]	-	-	
	Bulgaria	WP	70	0.7	3	14	
	Canada	WP	70	0.77	-	1	3-10 day intervals
	Czecho-slovakia	WP	70	[80g/hl]	-	-	
	Denmark	SC	70	1	3	14	
	Germany	WP	70	[70g/hl]	-	14	
	Greece	WP	70	0.42-0.7	3	14	Field or greenhouse
	Netherlands	WP/EC	50-70	0.33-0.7	2-3	14	Field
				0.42-0.7	2-3	14	Greenhouse
	Spain	WP	70	0.52-1.05	-	15	
	USA	SC/WP/DG	46-85	0.59-0.78	-	1	
Tropical and sub-tropical fruits							
Fig	Japan	WP	70	[47-70g/hl]	-	7	
Persimmon	Japan	WP	70	[47-70g/hl]	-	1	
Avocado	New Zealand	WP	50	max. 0.875	3	14	
Banana	France	SC	45	0.3	-	-	
	Spain	WP	70	[35-70g/hl]	-	21	
		EC	45	[27-31g/hl]	-	-	Post-harvest
Kiwifruit	Japan	WP	70	[70g/hl]	5	-	

Table 2. Thiophanate-methyl - registered use rates and patterns on vegetables.

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
Vegetables	Spain	WP	70	[35-70g/hl]	-	21	
Bulb vegetables							
Leek	Belgium	WP/SC	50-70	[500g/hl]	-	-	Plant dipping
	Finland	SC	70	[980g/hl]	-	14	
	Netherlands	WP/SC	50-70	[140g/hl]	1	-	Plant dipping
Onion, Bulb	Finland	SC	70	[140g/hl]	1	14	Immersion treatment
	Japan	WP	70	[70-140g/hl]	-	1	
	Netherlands	WP	18-70	0.55-0.7	2	28	Crop treatment
		WP/EC	70	[210g/hl]	1	-	Plant dipping
			35-70	[1.4g/kg seed]	1	-	Seed dressing
Brassica vegetables							
Brassicas	Ireland	WP	50	[500g/hl]	-	-	Root dip
	Netherlands	WP	35	[1.4g/kg seed]	1	-	Seed dressing
Cabbages	Finland	SC	70	0.98	-	14	
	Japan	WP	70	[47-70g/hl]	2	3	
Fruiting vegetables	Spain	WP	70	0.52-1.05	-	3	Field or Greenhouse
Cucurbits	USA	SC/WP/DG	46-85	0.2-0.39	-	7	
Cucumber	Belgium	WP/SC	50-70	1	1	3	
	Bulgaria	WP	70	0.35	1	14	
	Czecho-slovakia	WP	70	[75g/hl]	-	21	
	Greece	WP	70	0.3-1.05	3	14	Field or Greenhouse
	Finland	SC	70	[490g/hl]	-	14	
	Japan	WP	70	[35-47g/hl]	-	1	
	Netherlands	DP	10	0.7-2.1	1-5	3	
Gherkin	Belgium	WP/SC	50-70	1	1	3	
	Netherlands	DP	10	0.7-2.1	1-5	3	
Melons	Belgium	WP/SC	50-70	1	1	3	
	France	SC	45	[35g/hl]	-	-	
	Japan	WP	70	[35-47g/hl]	-	1	
	Netherlands	DP	10	0.7-2.1	1-5	3	
		WP	70	[0.7g/plant]	1-3	-	Soil drench
Squash, Summer	Netherlands	DP	10	0.7-2.1	>1	3	

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
Watermelon	Japan	WP	70	[35-47g/hl]	-	1	
Fruiting vegetables, other than Cucurbits							
Peppers	Japan	WP	70	[35-47g/hl]	-	1	
	Netherlands	DP	10	0.7-2.1	>1	3	
				0.75-1	>1	3	Dusting
Egg plant	Greece	WP	70	0.42-0.7	4-5	14	Fruit ripening
				[0.2-0.3l/plant]	1	-	2-3 leaves
	Japan	WP	70	[35-47g/hl]	-	1	
	Netherlands	WP	70	0.7-2.1	-	3	10-14 day intervals
Mushrooms	Netherlands	WP/EC	50-70	3.5	1-2	5	After 1st/2nd flush
				10.5	1	5	Soil drench
Okra	Japan	WP	70	[47-70g/hl]	3	1	
Tomato	Finland	SC	70	[490g/hl]	-	14	
	Greece	WP	70	0.42-1.4	4-5	14	Fruit ripening
				[0.2-0.3l/plant]	1	-	2-3 leaves
	Japan	WP	70	[35-47g/hl]	-	1	
	Netherlands	WP/EC	50-70	0.63-1,24	>1	3	
Leafy vegetables							
Chinese cabbage	Japan	WP	70	[47g/hl]	2	7	
Lettuce	Japan	WP	70	[35-47g/hl]	2	7	
Legume vegetables	Spain	WP	70	0.52-1.05	-	7	
Common bean	Canada	WP	70	1.2-1.6	1-2	-	For dry beans
		WP	14	[0.73g/kg seed]	1	-	Seed dressing
	Netherlands	WP/EC	50-70	1.05-2.1	2	14	Crop treatment
		WP	35	[0.7g/kg seed]	1	-	Seed dressing
	USA	SC/WP/DG	46-85	1.18-1.57	2	14	
Garden pea	Belgium	WP/SC	50-70	0.8	-	7	
	Japan	WP	70	[35-47g/hl]	4	7	
Soya bean	USA	SC/WP/DG	46-85	0.39-0.78	2	-	
Lentil	Czecho-slovakia	SC	50	0.25	-	-	

Root and tuber vegetables							
Beets	Germany	WP	70	[63-126g/hl]	3	14	
Celeriac	Netherlands	WP/EC	50-70	0.7	2-3	28	
Potato	Canada	DP	10	[0.5kg/tonne]	1	-	Seed pieces
	Finland	SC	70	[1.4kg/hl]	1	14	Immersion treatment
				[84g/tonne]	1	14	Fogging
	Japan	WP	70	[47-70g/hl]	5	7	
	Netherlands	DP	5	[75g/tonne]	1	60	Post-harvest
		EC/WP	35-70	[70-75g/tonne]	1	60	Post-harvest
Scorzonera	Netherlands	WP	70	0.7	3	14	
Sugar beet	Bulgaria	SC	50	0.5-0.6	1	14	
		WP	70	0.7	1	14	
	Czecho-slovakia	WP	70	0.2-0.3	-	21	
	Japan	WP	70	[23-35g/hl]	5	7	
	Spain	WP	70	0.52-1.05	-	21	
	USA	SC/WP/DG	46-85	0.29-0.39	-	21	
Stalk and stem vegetables							
Celery	Japan	WP	70	[47g/hl]	2	7	
	USA	SC/WP/DG	46-85	0.39	4	7	

Table 3. Thiophanate-methyl - registered use rates and patterns on cereals, nuts and seeds.

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
Cereals	Bulgaria	SC	50	1	1	14	
		WP	70	0.7	1	14	
	Finland	SC	70	0.28	-	14	
				[1.4 g/kg seed]	1	14	Seed dressing
	Germany	SC	50	0.5	1	56	
		WP	70	0.35	1	14	
Barley	Belgium	WP/SC	6.5-20	0.2-0.5	1-2	28-42	
	Czecho-slovakia	SC	50	0.38	-	-	
		WP	70	0.5	-	-	
	Germany	SC	50	0.5	1	56	Winter barley
	UK	SC	16.7	0.5	2	-	
		SC	50	0.7	2	-	Winter barley
Oats	Belgium	WP/SC	6.5-20	0.2-0.5	1-2	28-42	

Crop	Country	Application				PHI,	Comments
		Form.	Concn.	kg ai/ha	No.	days	
Rye	Denmark	SC	70	0.35-0.7	1	14	
	Germany	SC	50	0.5	1	56	Winter rye
Triticale	Belgium	WP/SC	6.5-20	0.2-0.5	1-2	28-42	
Wheat	Belgium	WP/SC	6.5-20	0.2-0.5	1-2	28-42	
	Czecho-slovakia	SC	50	0.5	-	-	
		WP	70	0.8	-	-	
	Denmark	SC	70	0.35-0.7	1	14	
	Germany	SC	50	0.5	1	56	Winter wheat
	Japan	WP	70	[35-70g/hl]	3	14	
	Netherlands	WP/EC	50	0.7-0.75	1	35	
	UK	SC	16.7	0.5	2	-	
		SC	50	0.7	2	-	Winter wheat
Oilseed							
Peanut	Japan	WP	70	[35-47g/hl]	4	7	
	USA	SC/WP/DG	46-85	0.39	2	-	
Soya bean	Japan	WP	70	[47-100g/hl]	4	14	
Seed for beverages and sweets							
Tea, Green	Japan	WP	70	[35-47g/hl]	2	7	

RESIDUES RESULTING FROM SUPERVISED TRIALS

Fruits - See Table 4.

Apple. Residues in apples treated in Germany were below 1 mg/kg after 7 days and below 0.5 mg/kg from 14 days onwards.

Pear. In 4 trials in Germany in 1984, residues were below 0.6 mg/kg at 7 days.

Cherry. Residues were about 1 mg/kg at 7 days but below 0.4 mg/kg thereafter.

Plums. Treated plums showed a maximum residue of 0.2 mg/kg after 7 days during 4 trials in Germany in 1973.

Grapes. In sixteen trials on grapes in Germany in 1972, residues were generally in the range 0.5 to 2.9 mg/kg at intervals of from 7 to 90 days.

Strawberry. Data from Germany (1971-72) and The Netherlands (1972) showed residues up to 3 mg/kg at 7 days and 1 mg/kg at 14 days.

Table 4. Residues of thiophanate-methyl in fruit from supervised trials.

Crop	Country 'Year	Application			No. of trials	Residues (mg/kg as carbendazim) at interval (days) after last application	Ref.
		Form	kg/ha	No			
Apple	Germany '72	WP 70	1.4	8-11	4	0.4-1.0(7), 0.35-0.4(10), 0.35-0.4(14)	Nippon Soda 1993
	'75	WP 70	0.7	3-4	4	0.2-0.4(7), 0.1-0.3(14,21,28)	
			1.05	3-4	4	0.2-0.4(7), 0.1-0.5(14), <0.1-0.3(21,28)	
			1.05	11-13	6	0.3-0.6(7), 0.2-0.5(14), 0.1-0.4(21),	
						0.3-0.6(28)	
	'84	SC 50	0.53	3	6	<0.05-0.44(7), <0.05-0.48(10-14)	
		WP 70	0.53	3	6	<0.05-0.48(7), <0.05-0.50(10-14)	
Pear	Germany '84	SC 50	0.53	3	2	<0.05,0.6(7), <0.05-0.34(10-14)	Nippon Soda 1993
		WP 70	0.53	3	2	<0.05,0.51(7), <0.05-0.34(10-14)	
Cherries	Germany '73	WP 70	1.05	4	2	0.9,1.0(7), 0.3(14), 0.3(21)	Nippon Soda 1993
			1.4	4	2	1.0,1.1(7), 0.4(14), 0.2(21)	
Plums	Germany '73	WP 70	1.05	4	2	0.18,0.2(7), <0.1(14), <0.1,0.1(21)	Nippon Soda 1993
			1.4	4	2	0.2(7), <0.1,0.1(14), <0.1,0.1(21)	
Grapes	Germany '72	WP 70	1.05	3	1	0.9(68)	Nippon Soda 1993
			1.05	4	1	0.5(90)	
			1.05	5	2	0.9,1.2(7), 0.8,1.5(10), 1.1,1.5(14)	
			1.05	5	2	0.7(80), 0.4(87)	
			1.05	8	1	1.3(27)	
			1.4	3	1	2.0(68)	
			1.4	4	1	0.8(90)	
			1.4	5	2	1.4,1.6(7), 1.0,1.8(10), 1.5,1.8(14)	
			1.4	5	4	0.6(54), 0.5(61), 0.9(80), 0.5(87)	
			1.4	8	1	1.8(27)	
Strawberry	Germany '71	WP 70	1.4	4	2	0.9,1.6(7), 0.5,1.0(10), 0.8,1.0(14)	Nippon Soda 1993
	'72	WP 70	1.4	4	2	1.0,3.0(7), 1.0,2.7(10), 1.0(14)	
			1.4	1	1	2.2(5), 2.0(7), 1.6(10)	
	N'lands '72	WP 70	1.05	4	1	0.67-0.98(7), 0.42-0.89(15)	Netherlands 1993
				5	1	1.0-2.9(7), 0.64-0.98(14)	

Vegetables - See Table 5.

Onion. At 60 days PHI, residues in 2 trials in The Netherlands were below 0.03 mg/kg.

Cucumber. Plant treatments in Finland in 1984 gave residues up to 0.07 mg/kg after 7 days. In Germany, in 1972 and 1977, one trial gave a maximum of 0.7 mg/kg at 10 days, while another 8 trials did not yield any residues above 0.2 mg/kg from 2 to 14 days after application.

Gherkin. Residues were from 0.3 to 1.0 mg/kg at 3 days PHI in a trial in The Netherlands in 1972.

Brussels sprouts. Two trials in The Netherlands in 1972 showed up to 5.2 mg/kg at 21 days PHI.

Mushrooms. Up to 0.25 mg/kg was found in two trials in The Netherlands in 1972.

Peppers. One trial in Spain in 1989 showed residues were below the limit of determination (0.01 mg/kg) from 1 to 15 days PHI.

Tomato. Plant treatments in Finland in 1984 gave 0.05 and 0.06 mg/kg after 14 and 10 days, respectively.

Lettuce. Residues in lettuce in Germany in 1973 reached 4.4 mg/kg at 7 days and 1.5 mg/kg at 10 days.

Broad bean. A residue of 10 mg/kg was found in one trial in Finland in 1980.

Common bean. Two trials in Spain in 1988 and 1990 gave residues from <0.01 to 0.38 mg/kg at 7 days and <0.01 to 0.06 mg/kg at 14 or 15 days.

Carrot. Less than 0.03 mg/kg was found in one trial in Finland in 1980.

Celeriac. Up to 0.58 mg/kg at 11 days PHI and up to 0.07 mg/kg at 21 days were found in The Netherlands in 1971.

Potato. Pre-planting treatment in The Netherlands in 1973 led to no residue (<0.05 mg/kg) in the tubers after 90 or 120 days PHI. In 1977 post-harvest treatment, also in The Netherlands, gave <0.2 mg/kg in the peeled tubers but 1.2 to 2.4 mg/kg in the removed peel.

Sugar beet. Seven trials in Germany from 1972 to 1977 showed up to 0.7 mg/kg in the roots after 69 days; at 14 days, a maximum of 3.4 mg/kg occurred in the leaves and tops.

Hops. Residues of about 6 mg/kg were found 26 days after treatment in Germany in 1972.

Table 5. Residues of thiophanate-methyl in vegetables from supervised trials.

Crop	Country 'Year	Application			No.of trials	Residues (mg/kg as carbendazim) at interval (days) after last application	Ref.
		Form	kg/ha	No			
Onions	N'lands '72	WP 70	0.75	2	2	<0.03 (60)	Netherlands, 1993
Cucumber	Finland '84	WP 70	4g/ plant	2	1	0.04(4), 0.07(7), 0.04(14)	Finland, 1993
	Germany '72	WP 70	0.7	1	2	0.5(7), 0.6,0.7(10), 0.4(15)	Nippon Soda, 1993
			0.7	2	4	<0.2(2,3,6,10)	
	'77	WP 70	0.42	4	4	<0.1(2,4,7,10,14)	
Gherkin	N'lands '72	WP 70	1.4	3	1	0.24-1.0(3)	Netherlands, 1993
Brussels sprouts	N'lands '72	WP 70	1.4	2	2	2.1-4.4(21), 3.5-5.2(21)	Netherlands, 1993
Mushroom	N'lands '72	WP 70	1.4g/ sq m	1	2	0.14-0.25(21), 0.17-0.24(21)	Netherlands, 1993
Peppers	Spain '89	EC 45	1.01	1	2	<0.01(1,5,11,15)	Spain, 1993
Tomato	Finland '84	WP 70	0.33g/plant	1	1	0.06(10)	Finland, 1993
			0.33g/plant	2	1	0.05(14)	
Lettuce	Germany '73	WP 70	0.7	3	2	0.9,3.8(2-3), 0.6,4.4(7), 0.5,1.5(10)	Nippon Soda, 1993
Broad bean	Finland '80	WP 70	0.7	1	1	10(7)	Finland, 1993
Common bean	Spain '88	EC 45	1.01	1	1	0.38(7), 0.11(11), 0.06(15)	Spain, 1993
	'90	EC 45	1.01	1	1	0.03(3), <0.01(7,10,14)	
Carrot	Finland '81	WP 70	1.0	1	1	<0.03(1)	Finland, 1993
Celeriac	N'lands '71	WP 70	0.7	8	1	<0.04-0.07(21)	Netherlands, 1993
			0.7	12	1	<0.04-0.58(11)	
Potato	N'lands '73	DP 20	0.6g/ kg	1	2	<0.05(90,120) [Pre-planting]	Netherlands, 1993
	'77	WP 70	70g/ tonne	1	1	<0.2 peeled tubers (120) [Post-harvest]	
						1.2-2.4 peel (120) [Post-harvest]	
Sugar beet	Germany '72	WP 70	0.35	2	3	<0.2(7,10,14,22) roots	Nippon Soda, 1993
						0.8-2.7(7), 1.8-3.6(10), 1.9-3.4(14)leaves	
	'75	WP 70	0.35	1	2	0.5, 0.7(69)	
	'76	WP 11.7	-	1	1	0.3(74)	
	'77	WP 70	1.05	1	1	0.1(55)	
Hops	Germany '72	WP 70	0.79	2	1	4.6,(17), 6.1(26)	Nippon Soda, 1993
			1.05	2	1	4.8(17), 5.8(26)	

Cereals - See Table 6.

Barley. In 7 trials on barley in Germany from 1973 to 1982, almost all residue determinations were below the respective limit (0.05 to 0.1 mg/kg); only one sample showed a positive residue of 0.1 mg/kg at 79 days.

Rye. In 5 trials in Germany in 1977 and 1983, all residues were below the limits of determination of 0.1 or 0.05 mg/kg.

Wheat. Out of 26 trials on Summer and Winter wheat in Germany from 1973 to 1983, only two positive residues, of 0.04 and 0.05 mg/kg, were found in grain; all other results being below the limits of determination which ranged from 0.2 to 0.05 mg/kg. Similarly, in two trials in The Netherlands the residues were below 0.03 mg/kg in the grain; residues in straw were up to 0.16 mg/kg.

Table 6. Residues of thiophanate-methyl in cereals from supervised trials.

Crop	Country 'Year	Application			No. of trials	Residues (mg/kg as carbendazim) at interval (days) after last application	Ref.
		Form	kg/ha	No			
Barley	Germany '73	WP 70	1.75	1	1	<0.1 (98-91)	Nippon Soda 1993
	'81	SC 50	0.5	1	2	<0.01-0.1 (77-92)	
			0.62	1	2	<0.05 (77-92)	
	'82	WP 17.5	0.35	1	1	<0.05 (56-63)	
		WP 70	0.35	1	1	<0.05 (56-63)	
Rye	Germany '77	WP 11.7	0.34	1	1	<0.1 (35-42)	Nippon Soda 1993
			0.68	1	1	<0.1 (35-42)	
			1.71	1	1	<0.1 (35-42)	
			3.42	1	1	<0.1 (35-42)	
	'83	SC 50	0.5	2	1	<0.05 (42)	
Wheat, Summer	Germany '73	WP 70	1.75	2	1	<0.1 (50-59)	Nippon Soda 1993
	'75	WP 11.7	0.35	2	1	<0.1 (35-56)	
		WP 17.5	0.35	2	1	<0.1 (35-56)	
		WP 70	0.35	2	1	<0.1 (67)	
	'76	WP 11.7	0.35	2	2	<0.1 (21-42)	
		WP 17.5	0.35	2	2	<0.1 (21-42)	
		WP 70	0.7	2	3	<0.1 (14-42)	
	'77	WP 11.7	0.34	1	1	<0.1 (35-42)	
			0.68	1	1	<0.1 (35-42)	
			1.71	1	1	<0.1 (35-42)	
			3.42	1	1	<0.1 (35-42)	
	'83	SC 50	0.5	2	1	<0.05 (42)	
	N'lands '72	WP 70	1.4	1	1	<0.03(35) grain; 0.06-0.16 straw	Netherlands 1993
	'74	WP 18	0.5	1	1	<0.03(35) grain; 0.06-0.09 straw	
Wheat, Winter	Germany '72	WP 70	0.5	3	1	<0.2 (56-136)	Nippon Soda 1993
	'73	WP 70	0.35	1	1	<0.1 (62)	
			1.75	1	1	<0.1 (62)	
			1.75	2	1	<0.1 (59-62)	
	'81	SC 50	0.5	2	1	<0.01-0.04 (78-99)	
			0.62	2	1	<0.05-0.05 (78-99)	
	'82	WP 17.5	0.35	1	1	<0.1 (56-63)	

Crop	Country 'Year	Application			No. of trials	Residues (mg/kg as carbendazim) at interval (days) after last application	Ref.
		Form	kg/ha	No			
		WP 70	0.35	1	1	<0.05 (88)	
	'83	SC 50	0.5	2	2	<0.05-0.08 (35-49)	

RESIDUES IN FOOD IN COMMERCE OR AT CONSUMPTION

In monitoring and selective studies in Hungary in 1990 to 1992 (Hungary, 1993), residues of thiophanate-methyl were found in 17 out of 31 samples of strawberries examined, with a mean of about 0.5 mg/kg compared to the MRL of 2 mg/kg. One sample of raspberries contained 0.25 mg/kg and thiophanate-methyl was just observable in one lettuce sample. In these studies, 124 samples of fruit and vegetables were examined, of which 105 contained no residue above the limit of determination.

NATIONAL MAXIMUM RESIDUE LIMITS

Information on the following MRLs was provided to the Meeting.

Commodity	Country and MRL, mg/kg				
	Bulg.	Czech.	Ger.	Neth.	Spain
Animal products				0.1*	
Apple	0.1				
Bananas					1
Barley		0.5	0.5		
Cereals	0.1			0.1*	
Citrus fruits				4	
Cucumbers		0.5			
Fruiting vegetables					2
Grapes (wine)					5
Legume vegetables					2
Mushrooms				0.5	
Other foods				0.1*	
Other fruits				3	
Other vegetables				3	2
Pome fruit			2		5
Potato				3	
Rye			0.5		
Stone fruit	0.1				5
Strawberry	0.1				5
Sugar beet	0.1	1			0.1
Wheat		0.5	0.5		
Countries: Bulg. Bulgaria; Czech. Czechoslovakia; Ger. Germany; Neth. Netherlands					
* = "At or about the limit of determination"					

APPRAISAL

Thiophanate-methyl was first evaluated in 1973 and has been reviewed on 4 other occasions. The 1988 JMPR initiated a re-evaluation of residues arising from the use of benomyl, carbendazim and thiophanate-methyl, all to be expressed as carbendazim, in response to concerns expressed at the 1988 CCPR (ALINORM 89/24, paras. 82-84). The 1989 CCPR requested that the recommendation for a group MRL for carbendazim in cereals should be replaced by recommendations for separate MRLs for individual crops, while at the 1992 CCPR (ALINORM 93/24, para. 105) several other MRLs were held at step 7B pending further review by the JMPR. Although some information was provided for the 1990 JMPR, that Meeting concluded that it would be premature to review the compounds until all of the required data became available and consideration was deferred to the 1992 JMPR. However, because of the work-load at that Meeting, the re-evaluation was again postponed until 1993. The data submitted for the 1990 and 1992 Meetings, together with additional data provided in 1993, have now been reviewed with particular attention to the information on GAP and some new residue data.

Information on GAP for thiophanate-methyl was provided from several sources, clearly showing the extensive applications of this fungicide. Post-harvest uses on pome and stone fruits and potatoes are registered in some countries. MRLs for pome and stone fruits were held at step 7B by the 1988 CCPR. The other 7B commodities, bean fodder, berries and other small fruits, cereal grains, citrus fruits, head lettuce, mushrooms, peppers, pineapples, sugar beet leaves or tops, and tomatoes, appear not to be subject to post-harvest treatments with thiophanate-methyl.

Data on residues in fruits were available for apples, pears, cherries, plums, grapes and strawberries, although most were obtained in the early 1970s. Of the Step 7B vegetables, limited data were given for head lettuce, mushrooms, peppers, sugar beet leaves, and tomatoes. An appreciable amount of data covered uses of thiophanate-methyl on cereals, the latest being obtained in 1983.

Some information was provided from Hungary on residues occurring in a few fruits and vegetables in commerce.

Any assessment of the residues from the use of thiophanate-methyl must also take into account those arising from benomyl and/or carbendazim, since all three pesticides yield carbendazim as the residue of prime importance. Recommendations are therefore dealt with under "carbendazim".

RECOMMENDATIONS

See the Appraisal for carbendazim.

FURTHER WORK OR INFORMATION

Desirable

1. Residue data from supervised trials of thiophanate-methyl using currently registered post-harvest treatments of appropriate fruits and vegetables.

2. Residue data from supervised trials of thiophanate-methyl at the currently registered rates of use on lettuce, peppers, tomatoes and sugar beet.

3. Supporting residue data from supervised trials of thiophanate-methyl at currently registered rates of use on all appropriate crops for which CXLs are listed.

REFERENCES

(All references are unpublished)

1. Canada, 1993. Data on GAP supplied by Canada for the JMPR.

2. EC, 1993. Data on GAP supplied by the European Commission for the JMPR.

3. Hungary, 1993. Data on residues supplied by Hungary for the JMPR.

4. Netherlands, 1993. Data on GAP supplied by The Netherlands for the JMPR.

5. New Zealand, 1993. Data on GAP supplied by New Zealand for the JMPR.

6. Nippon Soda, 1993. Data on GAP and residues supplied by Nippon Soda Co. Ltd., Japan, for the JMPR.

7. Spain, 1993. Data on GAP supplied by Spain for the JMPR.