CARBENDAZIM (072)/THIOPHANATE-METHYL (077)

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EXPLANATION

Carbendazim and its related compounds, benomyl and thiophanate-methyl, were evaluated by the 1998 JMPR as part of the CCPR Periodic Review Programme. That Meeting estimated MRLs (expressed as carbendazim) for barley, barley straw and fodder, cucumber, gherkin, pome fruits, rape seed and tomato, on the basis of carbendazim residue data.

The 2003 JMPR received information on GAP and national MRLs from the governments of Germany and the Netherlands. The government of Thailand submitted GAP data and residues data from new supervised trials on asparagus, mangoes and chilli peppers. GAP data, supervised residue trials of post-harvest use on mangoes and national MRLs were received from the government of Australia.

USE PATTERN

Information on registered uses was reported to the Meeting by Australia (Bodnaruk, 2003a), Thailand (Chirapanda, 2003), the Netherlands (Muller, 2003) and Germany (Anonymous, 2003) and is shown in Table 1.

Table 1. Registered uses of carbendazim – foliar spraying, post-harvest treatment and soil drenching.

Crop G/F	Country	Form, ai g/l or g/kg	Application				PHI days
			Method	Rate kg ai/ha	Spray conc. kg ai/hl	No.	
Apples F	Netherlands	SC, 500	spraying, 6 and 2 weeks before harvest	0.25-0.75	0.025	2	14
Apples F	Netherlands	SC, 500	post harvest shower treatment on harvested fruit		0.05	1	60
Apples F	Netherlands	SC, 500	in autumn after harvest during leaf fall	0.3-0.45	0.03	1	
Asparagus F	Germany	SE, 80 [1/]	dipping of plant material, pre-plant	0.12		1	
Asparagus F	Thailand	WP, 500	overall spraying	0.38	0.05	every 5-7 days	5
Barley F	Germany	SC, 125 [2/]	spraying, up to end of heading	0.10	0.017-0.05	2	42
Barley, winter F	Germany	SC, 360	spraying, from end of tillering to 2 nodes detectable	0.18	0.045	1	56
Barley, winter F	Germany	SE, 80 [1/]	spraying, from end of tillering to 2 nodes detectable	0.12	0.03	1	56
Barley, winter F	Germany	SC, 125 [2/]	spraying, from end of tillering to 2 nodes detectable	0.15	0.038	1	42
Caraway F	Netherlands	SC, 500	spraying of aerial parts, shortly before flowering	0.40	0.067-0.20	1	
Courgettes G	Netherlands	SC, 500	spraying of aerial parts, interval 10 – 14 days	0.13-0.38	0.025	1-2	3
Eggplant G	Netherlands	SC, 500	spraying of aerial parts, interval 10 – 14 days	0.13-0.38	0.025	1-2	3
Eggplants G	Netherlands	WP, 250 [3/]	spraying of aerial parts, interval 7 – 14 days	0.13-038	0.0025	1-2	3
Grapes F	Germany	WP, 250 [4/]	spraying or low-volume spraying	0.13-0.50	0.031	2	35
Mangoes	Australia (QLD, NSW, WA, NT only)	SC, 500	post-harvest dipping of fruits		0.05	1	
Mangoes F	Thailand	WP, 500 SC, 500	foliar spraying, flowering stage	1.3-1.5	0.025	every 10-14 days	7

Crop G/F	Country	Form, ai g/l or g/kg	Application				PHI days
			Method	Rate kg ai/ha	Spray conc. kg ai/hl	No.	
Melons G	Netherlands	SC, 500	spraying of aerial parts, interval 10 – 14 days	0.13-0.38	0.025	1-2	3
Mushrooms G	Netherlands	SC, 500	soil drench, after casing	5	0.05	1	
Mushrooms G	Netherlands	SC, 500	spraying of aerial parts	1.3	0.013	1-2	5
Pears F	Netherlands	SC, 500	spraying, 6 and 2 weeks before harvest	0.25-0.75	0.025	2	14
Pears F	Netherlands	SC, 500	post harvest shower treatment on harvested fruit		0.05	1	60
Pears F	Netherlands	SC, 500	in autumn after harvest during leaf fall	0.3-0.45	0.03	1	
Potatoes, seed F	Netherlands	SC, 500	spraying of aerial parts	0.40	0.067-0.20	1	
Rape seed, winter F	Germany	SC, 360	spraying, full flowering	0.36	0.09-0.12	1	56
Rape seed F	Netherlands	SC, 500	spraying of aerial parts, shortly before flowering	0.40	0.067-0.2	1	
Rye F	Germany	SC, 125 [2/]	spraying, up to end of heading	0.10	0.017-0.05	2	42
Rye, winter F	Germany	SC, 360	spraying, from end of tillering to 2 nodes detectable	0.18	0.045	1	56
Rye, winter F	Germany	SE, 80 [1/]	spraying, from end of tillering to 2 nodes detectable	0.12	0.03	1	56
Rye, winter F	Germany	SC, 125 [2/]	spraying, from end of tillering to 2 nodes detectable	0.15	0.038	1	42
Strawberries G	Netherlands	SC, 500	spraying of aerial parts, interval 10 -14 days	0.15-0.18	0.03	2-3	14
Sugar beet F	Netherlands	SC, 500	spraying of aerial parts	0.25	0.042-0.13	1-2	28
Tomatoes G	Netherlands	SC, 500	spraying of aerial parts	0.1-0.3	0.02	1-3	3
Tomatoes G	Netherlands	WP, 250 [3/]	spraying of aerial parts, interval 7 – 14 days	0.13-038	0.0025	1-2	3
Vegetables (except as otherwise specified) F	Thailand	WP, 500	overall spraying	0.25-0.50	0.025-0.05		5
Wheat F	Germany	SE, 80 [1/]	spraying, up to end of heading	0.12	0.03	2	42
Wheat F	Germany	SC, 125 [2/]	spraying, up to end of heading	0.10	0.017-0.05	2	42
Wheat, winter F	Germany	SC, 360	spraying, from end of tillering to 2 nodes detectable	0.18	0.045	1	56
Wheat, winter F	Germany	SC, 125 [2/]	spraying, from end of tillering to 2 nodes detectable	0.15	0.038	1	42
Wheat, winter F	Germany	SE, 80 [1/]	spraying, from end of tillering to 2 nodes detectable	0.12	0.03	1	56
Wheat, winter F	Germany	WG, 600	spraying, from end of tillering to 2 nodes detectable	0.18	0.045	1	56
Wheat (spring and winter) F	Netherlands	SC, 500	spraying of aerial parts, from coming into year till beginning blossoming	0.25	0.042-0.13	1	35
Wheat (spring and winter) F	Netherlands	WP, 60 [7/]	spraying of aerial parts, end of tillering, 1 node detectable	0.24	0.04-0.12	1	35
Wheat (spring and winter) F	Netherlands	WP, 60 [5/]	spraying of aerial parts, from emergence of ear till beginning of flowering	0.24	0.04-0.12	1	35

F = field; G = glasshouse.

[1/] Germany: 80 g/l carbendazim + 300 g/l prochloraz.

[2/] Germany: 125 g/l carbendazim + 250 g/l flusilazole.

[3/] Netherlands: 250 g/kg carbendazim + 250 g/kg diethofencarb.

[4/] Germany: 250 g/kg carbendazim + 250 g/kg diethofencarb.

[5/] Netherlands: 165 g/l carbendazim + 100 g/l imazalil.
[6/] Netherlands: 16.7 g/kg carbendazim + 10 g/kg imazalil.
[7/] Netherlands: 60 g/kg carbendazim + 500 g/kg mancozeb.

RESIDUE ANALYSIS

Analytical methods

Carbendazim residues were analyzed in trials from Thailand by the method of Wong (1999) or the official multi-residue method of the Netherlands (Anonymous, 1998). After extraction with acetone and clean-up by liquid-liquid partition with dichloromethane and petroleum ether (ratio 1:1), the aqueous layer was extracted with dichloromethane. Determination was by HPLC-UV at 254 nm. Recoveries from asparagus were 75-105%, while those from chilli peppers and mango were 97-102%, with LOQs of 0.01-0.02 mg/kg.

In Australian trials on mangoes, two methods were used. The analytical method used in trial AH990014/01 (Bodnaruk, 2001) involved the samples being extracted with methanol/ethyl acetate. Residues of carbendazim and the breakdown product, 2-aminobenzimidazole (2-AB), in the extract were determined by LC-MS/MS. The LOQ was reported to be 0.01 mg/kg. Recoveries from mango flesh, fortified at 0.2, 1.0 and 3.2 mg/kg, were 107, 97 and 120% for carbendazim and 119, 127 and 114% for 2-AB. The method of Doan and Hargreaves (2002) was used in trials AH990014/02 and AH990014/03 (Bodnaruk 2002 and 2003b). Carbendazim and 2-AB were extracted with methanol, partitioned into ethyl acetate/methanol and the compounds were determined using HPLC and UV detection. The LOQ was estimated to be 0.2 mg/kg. Recoveries at 0.2 mg/kg were 87-101%.

Residues in stored analytical samples

The stability of residues in frozen stored analytical samples was investigated by Bodnaruk (2002), who found that carbendazim residues were stable over the storage period of 6 weeks (Table 2).

Table 2. Storage stability of carbendazim in mangoes (Bodnaruk, 2002).

Rate (kg ai/hl)	Part of fruit	Weight (g)	carbendazim residues (mg/kg)	
			original	re-analyzed after 6 weeks
Control	Peel	686.2	< 0.2	< 0.2
	Flesh	1689.9	< 0.2	< 0.2
	Seed	485.6		
Dip 0.05	Peel	787.7	23.0	24.3
	Flesh	1611.4	1.4	1.3
	Seed	467.0		
Control	Peel	813.8	< 0.2	< 0.2
	Flesh	1864.3	< 0.2	< 0.2
	Seed	475.4		
Dip 0.05	Peel	860.1	11.0	11.3
	Flesh	1495.8	4.8	3.8
	Seed	491.8		

RESIDUES RESULTING FROM SUPERVISED TRIALS ON CROPS

The Meeting received information on supervised field trials on:

Table 3	Mangoes	Australia, post-harvest dipping
Table 4	Mangoes	Thailand, foliar spraying
Table 5	Chilli peppers	Thailand, foliar spraying
Table 6	Asparagus	Thailand, overall spraying

Where residues were not detected, data are recorded in the Tables as below the LOQ. Residue data, application rates and spray concentrations have generally been rounded to 2 significant figures or, for residues near the LOQ, to 1 significant figure. Although trials included control plots, no control sample data are recorded, except where residues in control samples exceeded the LOQ. Residues are recorded unadjusted for procedural recovery. Double-underlined residues are from treatments according to GAP and are valid for estimating maximum residue levels.

Post-harvest dipping trials on mango from Australia were well documented, with field and analytical reports. Harvested fruit were immersed for 5 minutes in a dip containing 0.05 kg ai/hl, at 52°C, before removal and air-drying. Samples of the dip solution, pre- and post dipping, were collected and analyzed. Whole fruit were weighed; the seeds, skin and flesh were separated and weighed; and their weight percentages were calculated (except, in trial Bodnaruk 2001, weight percentages were calculated for skin and flesh combined).

Table 3. Carbendazim (MBC) and 2-aminobenzimidazole (2-AB) residues in mangoes from supervised trials of post-harvest dipping in Australia (Bodnaruk 2001, 2002 and 2003b).

Mangoes	Application		Fruit		Residue, mg/kg		
Location, year, variety, reference	Form.	kg ai/hl	Part	Weight (g)	MBC	2-AB	Whole fruit [1/]
Collinsville, Qld, 2001, cv. Keitt,	SC	0.05	Skin + flesh	3939	3.3	<0.01	3.0
Bodnaruk, 2001, AH990014/01, site 1			Seed	424			
Mapee, Qld, 2001	SC	0.05	Skin	1528	8.5	<0.01	3.1
Keitt			Flesh	4489	1.7	<0.01	
Bodnaruk, 2001, AH990014/01, site 2			Seed	655			
Northey, Qld, 2002	SC	0.05	Skin	1391.5	4.7	<0.2	1.6
Keitt			Flesh	2901.9	0.21	<0.2	
Bodnaruk, 2002, AH990014/02, site 1			Seed	789.5			
Northey, Qld, 2002	SC	0.05	Skin	950.8	4.6	<0.2	1.2
Palmer			Flesh	2399.5	0.29	<0.2	
Bodnaruk, 2002, AH990014/02, site 2			Seed	725.5			
Speewah, Qld, 2003	SC	0.05	Skin	548.8	4.25	4.22	1.3
Kensington Pride			Flesh	1462.6	0.5	0.28	
Bodnaruk, 2003b, AH990014/03, trial 1			Seed	310.2			
Kollinsville, Qld, 2003	SC	0.05	Skin	800.5	6.1	0.39	1.9
Kensington Pride			Flesh	1341	0.4	0.11	
Bodnaruk, 2003b, AH990014/03, trial 2			Seed	761.5			

[1/] Residue level in whole fruit =
(residue level in skin x skin weight + residue level in flesh x flesh weight) ÷ (skin weight + flesh weight + seed weight); the values represent carbendazim residues *per se*, without 2-AB.

Trials in Thailand on mango, chilli peppers and asparagus were well documented, with field reports but laboratory reports were submitted as summaries only. Field reports provided data on the sprayer used, plot size, residue sample size and sampling dates. Periods between sampling and analysis were recorded for all trials. Dates of analyses were also provided. Samples were analyzed immediately after receipt in the laboratory.

Table 4. Carbendazim residues in mangoes from supervised trials in Thailand, conducted with 7-day intervals between applications (Pimpan 2001a, 2001b 2002a, 2002b and 2002c).

MANGOES	Application					Growth stage	Commodity analyzed	PHI, days	Residue, mg/kg
Location, year, variety, reference	Form	kg ai/ha	Water l/ha	kg ai/hl	No.				
Nakornchaisri, 2001	SC	1.5	5000	0.03	6	mature	fruit without seed	0	0.85
Namdokmai								2	0.90
Pimpan, 2001a, RT 44 13 F CBZ-I								4	1.1
								6	1.1
								9	0.80
								13	0.46
								20	0.23
Kanchanaburi, 2001	SC	1.5	5000	0.03	6	mature	fruit without seed	0	0.75
Namdokmai								2	1.2
Pimpan, 2001b, RT 44 13 F CBZ-II								4	1.0
								6	0.72
								9	0.61
								13	0.38
								20	0.16
Suphanburi, 2002	SC	1.5	5000	0.03	5	mature	fruit without seed	0	0.87
Namdokmai								3	1.3
Pimpan, 2002a, RT 45 08 F CBZ-III								7	0.70
								10	0.37

MANGOES Location, year, variety, reference	Application					Growth stage	Commodity analyzed	PHI, days	Residue, mg/kg
	Form	kg ai/ha	Water l/ha	kg ai/hl	No.				
Banglane, 2002 Namdokmai Pimpan, 2002b, RT 45 08, F CBZ-IV	SC	1.5	5000	0.03	5	mature	fruit without seed	0 3 7 10	0.84 1.2 0.72 0.54
Bangpae, 2002 Namdokmai Pimpan, 2002c, RT 45 08 F CBZ-V	SC	1.5	5000	0.03	5	mature	fruit without seed	0 3 7 10	0.76 1.2 0.71 0.37

Table 5. Carbendazim residues in chilli peppers from supervised trials in Thailand, conducted with 7-day intervals between applications (Phaikaew 2000, 2001 2002a, 2002b and 2002c).

PEPPERS, CHILLI Location, year, reference.	Application					Growth stage	Commodity analyzed	PHI, days	Residue, mg/kg
	Form	kg ai/ha	Water l/ha	kg ai/hl	No.				
Dumneun-Saduag, 2000 Phaikaew, 2000, RT 43 24 V CBZ-I	WP	0.5	1000	0.05	4	mature	fruit	0 1 3 5 7 10 15 21	1.6 1.3 1.1 0.82 0.98 0.35 0.08 0.02
Tha-muang, 2001 Phaikaew, 2001, RT 44 10 V CBZ-II	WP	0.5	1000	0.05	4	mature	fruit	0 1 3 5 7 10 15 21	2.5 2.3 1.1 0.87 0.70 0.65 0.47 0.19
Songpeenong, 2002 Phaikaew, 2002a, RT 45 01 V CBZ-III	WP	0.5	1000	0.05	4	mature	fruit	0 1 3 5 7 10 15 21	2.3 2.0 1.4 0.78 0.47 0.16 0.07 0.03
Tung tong, 2002 Phaikaew, 2002b, RT 45 01 V CBZ-IV	WP	0.5	1000	0.05	4	mature	fruit	0 3 5 7 10	2.1 1.3 0.63 0.30 0.09
Tha-loa, 2002 Phaikaew, 2002c, RT 45 01 V CBZ-V	WP	0.5	1000	0.05	4	mature	fruit	0 3 5 7 10	1.9 1.3 0.55 0.31 0.08

Table 6. Carbendazim residues in asparagus from supervised trials in Thailand, conducted with 7-day intervals between applications (Pimpan 1995 and 1996, Doungkeaw 2000 and 2001).

ASPARAGUS Location, year, variety, reference	Application					Commodity analyzed	PHI, days	Residue, mg/kg
	Form	kg ai/ha	Water l/ha	kg ai/hl	No.			
Kanchanaburi, 1995 Green asparagus Pimpan, 1995, RT 38 11 V CBZ-I	WP	0.38	1000	0.038	5	Young stem	0 1 3 5 7 10 15	1.3 0.98 0.41 0.09 0.04 <0.02 <0.02
Kanchanaburi, 1996 Green asparagus Pimpan, 1996, RT 39 09 V CBZ-II	WP	0.38	1000	0.038	5	Young stem	0 1 3 5 10 15	1.1 0.77 0.12 0.05 <0.02 <0.02
Damaem sadauk, 2000 Green asparagus Doungkeaw, 2000, RT 43 23 V CBZ-III	WP	0.38	1000	0.038	4	Young stem	0 1 3 5	0.49 0.29 0.06 <0.01
Damaem sadauk, 2000 Green asparagus Doungkeaw, 2000, RT 43 23 V CBZ-III	WP	0.75	750	0.1	4	Young stem	0 1 3 5	0.72 0.36 0.17 <0.01
Tamaka, 2001 Green asparagus Doungkeaw, 2001, RT 44 12 V CBZ-IV	WP	0.38	1000	0.038	4	Young stem	0 1 3 5 7 10	4.7 1.2 0.33 0.08 0.03 0.01
Tamaka, 2001 Green asparagus Doungkeaw, 2001, RT 44 12 V CBZ-IV	WP	0.75	750	0.1	4	Young stem	0 1 3 5 7 10	7.6 3.0 0.53 0.27 0.08 0.04

NATIONAL MAXIMUM RESIDUE LIMITS

The national MRLs listed in Table 7 were supplied by the governments of Australia, Germany and the Netherlands.

Table 7. National MRLs.

Country	Residue definition	Commodity	MRL, mg/kg
Australia	Sum of carbendazim and 2-amino-benzimidazole, expressed as carbendazim	Litchis	10
		Mangoes	5
		Meat (mammalian)	0.2
		Milks	0.1*
		Mushrooms	10
		Papayas	T 20
		Peanuts	0.2
		Pome fruit	5
		Poultry meat	0.1*
		Poultry, Edible offal of	0.1*
		Stone fruit	10
		Sugar cane	0.1

Country	Residue definition	Commodity	MRL, mg/kg
Australia (continued)		Tree nuts	T 0.1
		Vegetables (except broad bean)	3
		Legume animal feeds	T 25
		Kaffir lime leaves	T 3
		Lemon balm	T 3
		Lemon grass	T 3
		Lemon verbena	T 3
		Tumeric, roots	T 3
		Avocados	3
		Bananas	1
		Berries and other small fruits (except grapes)	5
		Broad beans (dry)	T 0.5
		Cereal grains	0.05*
		Chick-peas (dry)	T 0.5
		Citrus fruit	10
		Custard apples	T 1
		Edible offal (mammalian)	0.2
		Eggs	0.1*
		Fruiting vegetables, cucurbits	2
		Fruiting vegetables, other that cucurbits	2
		Ginger root	10
		Grapes	3
		Herbs	T 3
		Lentils (dry)	T 0.5
Germany	Sum of carbendazim, benomyl and thiophanate-methyl, expressed as carbendazim	Other plant commodities	0.05
		Tea	0.1
		Soya beans	0.2
		Zucchini	0.3
		Barley, cucumber, eggplant, melon, pumpkin	0.5
		Bananas, burdock, cauliflowers, celery, lettuce, onions, peas, potatoes, tomatoes, turnips, mushrooms	1
		Strawberries,	1.5
		Stone fruit	2
		Grapes	3
		Citrus	5
Netherlands	Sum of carbendazim, benomyl and thiophanate-methyl, expressed as carbendazim	Others	0.1
		Soybeans	0.2
		Courgettes	0.3
		Brussels sprouts, eggplant, melon, plums, tomatoes, winter squash	0.5
		Apricots, bananas, cucumber, mushrooms, peaches, nectarines	1
		Beans (dry), celery, table and wine grapes, pome fruit, rhubarb	2
		Head cabbage	3
		Citrus fruit, lettuce	5

T = temporary.

APPRAISAL

Carbendazim and its related compounds benomyl and thiophanate-methyl were evaluated by the 1998 JMPR under the CCPR Periodic Review Programme. The Meeting recommended MRLs (expressed as carbendazim) for barley, barley straw and fodder, cucumbers, gherkins, pome fruits, rape seed and tomatoes on the basis of carbendazim residue data; for beans (dry), garden peas (succulent seeds), grapes, pome fruits and wheat on the basis of thiophanate-methyl residue data; for bananas, Brussels sprouts, carrots, cattle meat, chicken fat, edible offal (mammalian), eggs, milks, oranges, peaches, pineapples, plums (including prunes), pome fruit, poultry meat, rice, rice straw and fodder and wheat straw and fodder on the basis of benomyl residue data.

The 1998 JMPR recommended the withdrawal of numerous MRLs, including those for apricots, asparagus, avocados, berries and other small fruits, broad beans (green pods and immature seeds), celery, cherries, coffee beans, common beans (pods and immature seeds), egg plants, hops, head lettuce, mangoes, melons, mushrooms, nectarines, bulb onions, peanuts, peanut fodder, peppers, potatoes, sugar beet, sugar beet leaves or tops, tree nuts and winter squash.

The present Meeting received information on GAP and national MRLs for carbendazim and thiophanate-methyl from the governments of Germany and The Netherlands. The thiophanate-methyl manufacturer reported US GAP (with labels), analytical methods, information on the stability of residues in stored analytical samples and new US supervised residue trials on cherries, summer squash, snap beans, soya beans, sugar beet and peanuts. The government of Thailand provided information on carbendazim use patterns and reported supervised trials on asparagus, mangoes and peppers. Information on GAP, national MRLs and residues of carbendazim from post-harvest trials on mangoes was reported by the government of Australia.

Analytical methods

The Meeting received descriptions and validation data for analytical methods for thiophanate-methyl and carbendazim. The methods rely on HPLC with UV detection and LC/MS/MS, and achieve LOQs of 0.01-0.05 mg/kg in crops.

Stability of pesticide residues in stored analytical samples

The Meeting received information on the stability of thiophanate-methyl and carbendazim residues in various crops (fruits, fruiting vegetables, leafy vegetables, roots, pulses, and cereal grains). The residues were generally stable for the duration of the tests, which encompassed the storage periods for samples in residue trials.

Definition of the residue

The 1998 JMPR defined the residues (for compliance with MRLs and dietary intake calculations) arising from the use of:

- benomyl as "sum of benomyl and carbendazim, expressed as carbendazim";
- carbendazim as "carbendazim";
- thiophanate-methyl as "sum of thiophanate-methyl and carbendazim, expressed as carbendazim".

At the 34th Session of the CCPR (2002), the Committee agreed to change the definition of the residue to "sum of benomyl, carbendazim and thiophanate-methyl, expressed as carbendazim".

All residue values quoted below were calculated as carbendazim.

Results of supervised trials on crops

Cherries. Thiophanate-methyl is registered in the USA for use on cherries 1-3 times at a rate of 0.78-1.2 kg ai/ha with a 1-day PHI. In eight trials in four states in 1996, with five applications at 1.2 kg ai/ha and 0.08-0.13 kg ai/hl for ground application, and 1.5-2.5 kg ai/hl for aerial application, and harvest at one day, the residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) were (median underlined) 0.38, 0.53, 0.60, 0.81, 1.5, 2.4, 2.7 and 9.1 mg/kg.

The Meeting estimated a maximum residue level of 10 mg/kg, an STMR of 1.16 mg/kg and an HR of 9.1 mg/kg for carbendazim residues in cherries.

Mangoes. Carbendazim is registered in Thailand for foliar use on mangoes several times at a rate of 1.5 kg ai/ha and a spray concentration of 0.03 kg ai/hl, with a PHI of 7 days. In 5 trials conducted in 2001 and 2002 in Thailand in accordance with GAP (6 x 1.5 kg ai/ha, 0.03 kg ai/hl, PHI 6-7 days), the residues were 0.70, 0.71, 0.72, 0.72 and 1.1 mg/kg in fruits without stones. The results could not be evaluated because the ratios of the weight of skin and flesh to whole fruit were not reported.

Post-harvest dipping of mangoes in carbendazim is registered in Australia, with a dip concentration of 0.05 kg ai/hl. Harvested fruit were dipped at a concentration of 0.05 kg ai/hl. The dip temperature was 52°C and the fruit were dipped for 5 minutes before removal and air-drying. Whole fruits were weighed and the stones then separated from skin and pulp. The peel, pulp and stones were weighed separately and their weight percentages calculated. Residues in whole fruit were (median underlined) 1.2, 1.3, 1.6, 1.9, 3.0 and 3.1 mg/kg and in the pulp (edible portion) 0.21, 0.29, 0.4, 0.5 and 1.7 mg/kg.

The Meeting estimated a maximum residue level of 5 mg/kg, an STMR of 0.4 mg/kg and an HR of 1.7 mg/kg for residues in mangoes.

Summer squash. Thiophanate-methyl is registered in the USA for use on summer squash several times at a rate of 0.2-0.39 kg ai/ha (PHI not stated). In ten trials in eight states in 1991, with eight applications at 0.38-0.40 kg ai/ha and harvest at one day, the residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) were (median underlined) <0.08, <0.08, 0.08, 0.08, 0.09, 0.10, 0.12, 0.12, 0.14 and 0.32 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg, an STMR of 0.095 mg/kg and an HR of 0.32 mg/kg for residues in summer squash.

Chilli peppers. Carbendazim is registered in Thailand for use on vegetables at a rate of 0.25-0.50 kg ai/ha, with a PHI of 5 days. In 5 trials conducted on chilli peppers in 2000-2002 in Thailand in accordance with GAP (4 x 0.5 kg ai/ha, PHI 5 days), the residues were median underlined) 0.55, 0.63, 0.78, 0.87 and 0.98 mg/kg.

The Meeting estimated a maximum residue level of 2 mg/kg, an STMR of 0.78 mg/kg and an HR of 0.98 mg/kg for residues in chilli peppers.

Common beans (pods and/or immature seeds). Thiophanate-methyl is registered in the USA for use on beans 1-2 times at a rate of 0.78-1.6 kg ai/ha, with a PHI of 14 days for snap beans and 28 days for lima beans. In eleven trials in nine states in 1990, with two applications at 1.6 kg ai/ha and harvest at 14 days, the residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) were (median underlined) <0.08 (6), 0.09, 0.14, 0.16, 0.22 and 0.45 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg, an STMR of 0.08 mg/kg and an HR of 0.45 mg/kg for residues in common beans (pods and/or immature seeds).

Soya beans (dry). Thiophanate-methyl is registered in the USA for use on soya beans twice at a rate of 0.39-0.78 kg ai/ha (PHI not stated). The second application must be not later than 14 days after beans become visible in the pod. In twelve trials in twelve states in 1990, with three applications at 0.64-0.85 kg ai/ha and harvest at 14 days, the residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) were (median underlined) <0.08 (10), 0.25 and 0.31 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg and an STMR 0.08 mg/kg for residues in soya beans (dry).

Sugar beet. Thiophanate-methyl is registered in the USA for use on sugar beet several times at a rate of 0.39-0.78 kg ai/ha, with a PHI of 21 days. In eleven trials in seven states in 1997, with seed treatment and three foliar applications at 0.78-0.81 kg ai/ha and harvest at 21 days, the residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) were <0.08 (11) mg/kg.

The Meeting estimated a maximum residue level of 0.1* mg/kg, an STMR of 0.08 mg/kg and an HR of 0.08 mg/kg for sugar beet.

Asparagus. Carbendazim is registered in Thailand for use on asparagus at a rate of 0.38 kg ai/ha, with a PHI of 5 days. In 4 trials conducted in 1995-2001 in Thailand in accordance with GAP (4-5 x 0.38 kg ai/ha, PHI 5 days), the residues were (median underlined) <0.01, 0.05, 0.08 and 0.09 mg/kg.

The Meeting estimated a maximum residue level of 0.2 mg/kg, an STMR of 0.065 mg/kg and an HR of 0.09 mg/kg for residues of carbendazim in asparagus.

Peanuts. Thiophanate-methyl is registered in the USA for use on peanuts several times at a rate of 0.39 kg ai/ha, with a PHI of 14 days. Ten trials with six applications at 0.39 kg ai/ha were carried out in five states in 1991. Peanuts were harvested according to normal commercial practice. That is, the peanut plants were inverted, 14 days after the last treatment, the crop was allowed for dry for several days (0-7 days) in the field and then separate in-shell nuts and hay samples were taken. The concentrations of residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) in the kernels were <0.08 (10) mg/kg.

The Meeting estimated a maximum residue level of 0.1* mg/kg and an STMR of 0.08 mg/kg for residues in peanuts.

Soya bean fodder. The residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) in soya bean hay in the US trials on soya beans described above were <0.3, <0.3, 0.88, 0.95, 2.1, 2.6, 3.3, 3.8, 4.4, 4.8, 5.3 and 9.5 mg/kg.

The Meeting noted a label restriction against feeding (*"Do not graze or feed treated vines or hay to livestock"*) and did not estimate a maximum residue level. The previous recommendation (withdrawal of the Codex MRL) was confirmed.

Snap bean vines. Thiophanate-methyl is registered in the USA for use on beans once or twice at a rate of 0.78-1.6 kg ai/ha, with a PHI of 14 days for snap beans. In eleven trials in nine states in 1990, with two applications at 1.6 kg ai/ha and harvest at 14 days, the residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) in vines were <0.08, 0.62, 0.65, 2.0, 2.6, 2.7, 3.2, 4.0, 7.3, 8.1 and 11 mg/kg.

The Meeting noted that snap bean forage or fodder is not mentioned as a feed item in the FAO Manual (Appendix IX) and did not estimate a maximum residue level.

Peanut fodder. The residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) in peanut hay in the USA peanut trials described above were (median underlined) <0.8 (6), 0.91, 1.1, 1.6 and 2.1 mg/kg (fresh weight).

Allowing for the standard 85% dry matter content of peanut hay (FAO Manual, p. 148), the Meeting estimated a maximum residue level and an STMR (dry weight) for residues in peanut fodder of 3 and 0.94 mg/kg, respectively.

Sugar beet leaves or tops. The residues (sum of thiophanate-methyl and carbendazim, expressed as carbendazim) in the leaves and tops from the USA trials on sugar beet described above were (median underlined) 0.13, 0.16, 0.22, 0.24, 0.31, 0.33, 0.52, 0.69, 0.72, 0.84 and 2.2 mg/kg (fresh weight).

Allowing for the standard 23% dry matter in sugar beet tops (FAO Manual, p. 147), the Meeting estimated a maximum residue level and an STMR (dry weight) of 10 and 1.4 mg/kg, respectively, for residues in sugar beet leaves or tops.

Dietary burdens in farm animals

The 1998 JMPR estimated dietary burdens (calculated as benomyl) of 17, 18 and 2 mg/kg for dairy cattle, beef cattle and poultry, respectively, based on residues in the feed items wet citrus pulp, wet tomato pomace, raisin culls and raisin waste (JMPR residue evaluation 1998, p. 159).

The current Meeting estimated the dietary burden of carbendazim/thiophanate-methyl residues (expressed as carbendazim) in farm animals on the basis of the diets listed in Appendix IX of the FAO Manual. Calculation from MRLs and HRs provides the levels in feed for estimating MRLs for animal commodities, while calculation from STMRs in feed is suitable for estimating STMRs for animal commodities. The dry matter is taken as 100% when MRLs and STMRs are already expressed on the dry weight. In addition to the new residue data for sugar beet leaves or tops and peanut hay, the Meeting took into consideration the feed items for which maximum residue levels and STMRs were estimated by the 1998 JMPR.

Table 8. Estimated maximum dietary burden of farm animals.

Commodity	Codex commodity group	Residue (mg/kg)	Basis	% Dry matter	Residue, on dry wt (mg/kg)	% of diet			Residue contribution (mg/kg)		
						Beef cattle	Dairy cattle	Poultry	Beef cattle	Dairy cattle	Poultry
Apple pomace, wet [1/]	AB	1.3	Est. [2/]	40	3.25						
Barley	GC	0.5	MRL [3/]	88	0.568						
Barley straw and fodder, dry	AS	2	MRL [3/]	89	2.25						

Commodity	Codex commodity group	Residue (mg/kg)	Basis	% Dry matter	Residue, on dry wt (mg/kg)	% of diet			Residue contribution (mg/kg)		
						Beef cattle	Dairy cattle	Poultry	Beef cattle	Dairy cattle	Poultry
Citrus pulp, dry,[4/]	AB	8.6	Max. res. [2/]	91	9.4	20	20		1.88	1.88	
Peanut fodder	AL	3	MRL	100	3	25	50		0.75	1.5	
Rice, husked	GC	2	MRL [3/]	88	2.27	25	10	60	0.568	0.226	1.362
Rice straw and fodder, dry	AS	15	MRL [3/]	90	16.7	10	10		1.67	1.67	
Sugar beet leaves or tops	AV	10	MRL	100	10	20	10		2.0	1.0	
Wheat	GC	0.05*	MRL [3/]	89	0.056						
Wheat straw and fodder, dry	AS	1	MRL [3/]	88	1.14						
					TOTAL	100	100	60	6.9	6.3	1.4

[1/] Estimated by 1998 JMPR (residue evaluation p. 159): 2 mg/kg as benomyl, equivalent to 1.3 mg/kg as carbendazim.
[2/] Maximum residue estimated by 1998 JMPR (residue evaluation p. 159).
[3/] Recommended by 1998 JMPR.
[4/] Estimated by 1998 JMPR (residue evaluation p. 159): 13 mg/kg as benomyl, equivalent to 8.6 mg/kg as carbendazim.

Table 9. Estimated STMR dietary burden of farm animals.

Commodity	Codex commodity group	Residue (mg/kg)	Basis	% Dry matter	Residue, on dry wt (mg/kg)	% of diet			Residue contribution (mg/kg)		
						Beef cattle	Dairy cattle	Poultry	Beef cattle	Dairy cattle	Poultry
Apple pomace, wet [1/]	AB	0.6	STMR	40	1.5						
Barley	GC	0.05	STMR [2/]	88	0.057			75			0.0428
Barley straw and fodder, dry	AS	0.345	STMR [2/]	89	0.388						
Citrus pulp [3/]	AB	1.408	STMR	91	1.547	20	20		0.309	0.309	
Peanut fodder	AL	0.94	STMR	100	0.94	25	50		0.235	0.47	
Rice, husked	GC	0.05	STMR [2/]	88	0.057	25	10		0.01425	0.0057	
Rice straw and fodder, dry	AS	2.5	STMR [2/]	90	2.78	10	10		0.278	0.278	
Sugar beet leaves and tops	AV	1.4	STMR	100	1.4	20	10		0.28	0.14	
Wheat	GC	0.03	STMR [2/]	89	0.034						
Wheat straw and fodder, dry	AS	0.1	STMR [2/]	88	0.114						
					TOTAL	100	100	75	1.1	1.2	0.04

[1/] Basis: STMR for benomyl in pome fruit estimated by 1998 JMPR: 0.6 mg/kg expressed as carbendazim.
[2/] Estimated by 1998 JMPR
[3/] Basis: STMR for benomyl in oranges 0.325 mg/kg expressed as carbendazim estimated by 1998 JMPR. Calculation as described for MRL dietary burden in 1998 JMPR residue evaluation p. 159 (0.325 x 91/21= 1.408).

The calculated dietary burdens (residue concentrations in animal feed on dry weight basis) for MRL and STMR estimation, respectively, were: 6.9 and 1.1 mg/kg for beef cattle, 6.3 and 1.2 mg/kg for dairy cattle, and 1.4 and 0.04 mg/kg for poultry (calculated as carbendazim) or, expressed as benomyl, 10.5 and 1.7 mg/kg for beef cattle, 9.6 and 1.8 mg/kg for dairy cattle and 2.1 and 0.06 mg/kg for poultry. The newly calculated dietary burdens are within the same order of magnitude as those estimated by the 1998 JMPR.

Because the benomyl and carbendazim feeding studies submitted to the 1998 Meeting showed that measurable residues do not occur in animal commodities, the 1998 JMPR recommended MRLs at the LOQ of 0.05* mg/kg and STMR values of 0 for animal products like cattle meat, chicken fat, edible offal (mammalian), eggs, milks and poultry meat. The current Meeting confirmed these recommendations.

RECOMMENDATIONS

The Meeting estimated the maximum residue levels, STMR and HR values shown in Table 10. The maximum residue levels are recommended for use as MRLs.

Definition of the residue for compliance with MRLs and estimation of dietary intake:
sum of benomyl, carbendazim and thiophanate-methyl, expressed as carbendazim.

Table 10. Summary of recommendations.

Commodity		MRL, mg/kg		STMR or STMR-P, mg/kg	HR, mg/kg
CCN	Name	New	Previous		
VS 0621	Asparagus	0.2 C	W	0.065	0.09
FS 0013	Cherries	10 Th	W	1.16	9.1
VP 0526	Common beans (pods and/or immature seeds)	0.5 Th	W	0.08	0.45
SO 0697	Peanuts	0.1* Th	W	0.08	
AL 0697	Peanut fodder [1/]	3 Th	W	0.94	
VO 0444	Peppers, Chilli	2 C	0.1 [2/]	0.78	0.98
FI 0345	Mangoes	5 C	W	0.4	1.7
VD 0541	Soya beans (dry)	0.5 Th	W	0.08	
VC 0431	Squash, summer	0.5 Th	W	0.095	0.32
VR 0596	Sugar beet	0.1* Th	W	0.08	0.08
AV 0596	Sugar beet leaves or tops [1/]	10 Th	W	1.4	

[1/] Expressed on dry weight basis.
[2/] For peppers.
C: based on carbendazim use; Th: based on thiophanate-methyl use.

DIETARY RISK ASSESSMENT

Long-term intake

The residues of benomyl, carbendazim and thiophanate-methyl are all expressed as carbendazim, which has the lowest ADI (0-0.03 mg/kg bw/day). The International Estimated Daily Intakes (IEDI) for carbendazim, based on the STMRs estimated for 33 commodities by the 1998 and 2003 JMPR, for the five GEMS/Food regional diets were in range of 1 to 4 % of the ADI (Table 11). The Meeting concluded that the long-term intake of residues of carbendazim resulting from the uses considered by JMPR is unlikely to present a public health concern.

Table 11. International Estimated Daily Intakes (IEDIs) of carbendazim for the 5 GEMS/Food regional diets (ADI = 0-0.03 mg/kg bw/day).

Code	Commodity	STMR or STMR-P mg/kg	Diets: g/person/day. Intake = daily intake: µg/person									
			Mid-East		Far-East		African		Latin American		European	
			diet	intake	diet	intake	diet	intake	diet	intake	diet	intake
VS 0621	Asparagus	0.065	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.1
FI 0327	Bananas	0.03	8.3	0.2	26.2	0.8	21.0	0.6	102.3	3.1	22.8	0.7
GC 0640	Barley (fresh)	0.05	1.0	0.1	3.5	0.2	1.8	0.1	6.5	0.3	19.8	1.0
VD 0071	Beans (dry)	0.165	2.3	0.4	4.8	0.8	0.0	0.0	13.0	2.1	3.5	0.6
VB 0402	Brussels sprouts	0.065	0.5	0.0	1.0	0.1	0.0	0.0	1.1	0.1	2.7	0.2
VR 0577	Carrots	0.04	2.8	0.1	2.5	0.1	0.0	0.0	6.3	0.3	22.0	0.9
MM 0812	Cattle meat	0	14.6	0.0	2.7	0.0	10.4	0.0	30.0	0.0	63.3	0.0
FS 0013	Cherries	1.16	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0	3.5
VP 0526	Common bean (green pods and/or immature seeds)	0.08	3.5	0.3	0.8	0.1	0.0	0.0	4.0	0.3	12.0	1.0
VC 0424	Cucumbers	0.05	2.4	0.1	2.3	0.1	0.0	0.0	4.2	0.2	4.5	0.2
MO 0105	Edible offal (mammalian)	0	4.2	0.0	1.4	0.0	2.8	0.0	6.1	0.0	12.4	0.0
PE 0112	Eggs	0	14.6	0.0	13.1	0.0	3.7	0.0	11.9	0.0	37.6	0.0
VP 0529	Garden peas, shelled (immature seeds)	0.01	4.0	0.0	0.5	0.0	0.0	0.0	0.2	0.0	10.1	0.1
VC 0425	Gherkins	0.05	2.4	0.1	2.3	0.1	0.0	0.0	4.2	0.2	4.5	0.2
FB 0269	Grapes (fresh, wine, excluding dried grapes)	0.87	15.8	13.7	1.0	0.9	0.0	0.0	1.3	1.1	13.8	12.0
FI 0345	Mangoes	0.4	2.3	0.9	5.3	2.1	3.4	1.4	6.3	2.5	0.0	0.0
ML 0106	Milks	0	116.9	0.0	32.1	0.0	41.8	0.0	160.1	0.0	289.3	0.0
JF 0004	Orange juice	0.13	7.3	0.9	0.0	0.0	0.0	0.0	0.3	0.0	4.5	0.6

Code	Commodity	STMR or STMR-P mg/kg	Diets: g/person/day. Intake = daily intake: µg/person									
			Mid-East		Far-East		African		Latin American		European	
			diet	intake	diet	intake	diet	intake	diet	intake	diet	intake
FC 0004	Oranges, sweet, sour (incl. orange-like hybrids)	0.325	31.5	10.2	4.0	1.3	4.8	1.6	31.0	10.1	29.8	9.7
FS 0247	Peaches	0.255	1.3	0.3	0.3	0.1	0.0	0.0	0.4	0.1	6.3	1.6
SO 0697	Peanuts	0.08	0.3	0.0	0.2	0.0	2.3	0.2	0.3	0.0	3.0	0.2
VO 0444	Peppers, chilli	0.78	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
FI 0353	Pineapples (fresh)	0.03	0.0	0.0	9.3	0.3	2.6	0.1	15.5	0.5	1.3	0.0
FS 0014	Plums (fresh, prunes)	0.06	1.8	0.1	0.5	0.0	0.0	0.0	0.0	0.0	4.3	0.3
FP 0009	Pome fruits	0.6	10.8	6.5	7.5	4.5	0.3	0.2	6.5	3.9	51.3	30.8
PM 0110	Poultry meat	0	31.0	0.0	13.2	0.0	5.5	0.0	25.3	0.0	53.0	0.0
SO 0495	Rape seed	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
CM 0649	Rice, husked	0.05	0.0	0.0	1.8	0.1	34.7	1.7	21.0	1.1	2.5	0.1
VD 0541	Soya beans (dry)	0.08	4.5	0.4	2.0	0.2	0.5	0.0	0.0	0.0	0.0	0.0
VC 0431	Squash, summer	0.095	10.5	1.0	2.2	0.2	0.0	0.0	14.0	1.3	3.5	0.3
VR 0596	Sugar beet	0.08	0.5	0.0	0.0	0.0	0.0	0.0	0.3	0.0	2.0	0.2
VO 0448	Tomatoes (fresh, juice, paste, peeled)	0.16	81.5	13.0	7.0	1.1	16.5	2.6	25.5	4.1	66.6	10.7
GC 0654	Wheat	0.03	327.3	9.8	114.8	3.4	28.3	0.8	116.8	3.5	178.0	5.3
Total intake (µg/person)=				58.5		16.5		9.4		34.9		80.3
Bodyweight per region (kg bw) =				60		55		60		60		60
ADI (µg/person)=				1800		1650		1800		1800		1800
%ADI=				3.3		1.0		0.5		1.9		4.5
Rounded %ADI=				3		1		1		2		4

Short-term intake

The International Estimated Short Term Intake (IESTI) for carbendazim was calculated for the general population and for children up to 6 years old, using 31 food commodities for which maximum residue levels were estimated by the JMPR in 1998 and 2003 and for which consumption data were available. The results are shown in Tables 12 and 13. The Meeting concluded that an acute RfD may be necessary but, as it has not yet been established, the acute risk assessment for carbendazim could not be finalized.

Table 12. Assessment of risks to the general population from the short-term dietary intake of residues of carbendazim (acute RfD not established but may be necessary).

Codex Code	Commodity	STMR or STMR-P mg/kg	HR or HR-P mg/kg	Large portion diet			Unit weight			Variability factor	Case	IESTI µg/kg bw/day	% acute RfD, rounded
				Country	Body wt (kg)	Large portion, g/person	Unit wt, g	Country	Unit wt, edible portion, g				
VS 0621	Asparagus	-	0.09	NLD	63.0	398	25	FRA	13	3	2a	0.60	-
FI 0327	Bananas	-	0.44	SAF	55.7	613	708	USA	481	3	2a	12.45	-
GC 0640	Barley (fresh, flour, beer)	0.05	-	NLD	63.0	378	-	-	-	-	3	0.30	-
VD 0071	Beans (dry)	0.165	-	FRA	62.3	255	-	-	-	-	3	0.68	-
VB 0402	Brussels sprouts	-	0.27	NLD	63.0	394	14	UNK	10	-	1	1.69	-
VR 0577	Carrots	-	0.14	NLD	63.0	335	61	USA	50	3	2a	0.97	-
FS 0013	Cherries	-	9.1	FRA	62.3	375	5	FRA	4	-	1	54.78	-
PE 0112	Eggs (chicken eggs [1/])	-	0	FRA	62.3	219	-	-	-	-	1	0.00	-
VP 0526	Common beans (green pods and/or immature seeds)	-	0.45	NLD	63.0	431	-	-	-	-	1	3.08	-
VC 0424	Cucumbers	-	0.05	NLD	63.0	313	400	FRA	360	3	2b	0.75	-
MO 0105	Edible offal (mammalian)	-	0	FRA	62.3	277	-	-	-	-	1	0.00	-
VP 0529	Garden peas, shelled (immature seeds)	-	0.01	NLD	63.0	301	-	-	-	-	1	0.05	-
VC 0425	Gherkins	-	0.05	NLD	63.0	96	15	FRA	15	-	1	0.08	-

Codex Code	Commodity	STMR or STMR-P mg/kg	HR or HR-P mg/kg	Large portion diet			Unit weight			Variability factor	Case	IESTI µg/kg bw/day	% acute RfD, rounded
				Country	Body wt (kg)	Large portion, g/person	Unit wt, g	Country	Unit wt, edible portion, g				
FB 0269	Grapes (fresh, dried, excluding wine)	-	1.9	AUS	67.0	513	125	FRA	118	3	2a	21.21	-
FI 0345	Mangoes	-	1.7	FRA	62.3	567	207	USA	139	3	2a	23.04	-
ML 0106	Milks	0	-	USA	65.0	2466	-	-	-	-	3	0.00	-
FC 0004	Oranges, sweet, sour (incl. orange-like hybrids) [2/]	-	0.63	USA	65.0	564	131	USA	96	3	2a	7.32	-
FS 0247	Peaches	-	1	SAF	55.7	685	98	USA	85	3	2a	15.36	-
SO 0697	Peanuts	0.08	-	FRA	62.3	161	-	-	-	-	3	0.21	-
FP 0009	Pome fruits (pear [1/])	-	2.4	USA	65.0	693	166	USA	151	3	2a	36.74	-
VO 0444	Peppers, chilli	-	0.98	USA	65.0	90	45	USA	43	3	2a	2.66	-
FI 0353	Pineapples (fresh, canned, juice, dried)	-	0.03	JPN	52.6	371	472	USA	245	3	2a	0.49	-
FS 0014	Plums (fresh, prunes)	-	0.34	USA	65.0	413	66	USA	62	3	2a	2.81	-
PM 0110	Poultry meat	-	0	AUS	67.0	431	-	-	-	-	1	0.00	-
SO 0495	Rape seed	0	-	-	-	-	-	-	-	-	3	-	-
CM 0649	Rice, husked	0.05	-	JPN	52.6	319	-	-	-	-	3	0.3	-
VD 0541	Soya beans (dry)	0.08	-	JPN	52.6	159	-	-	-	-	3	0.24	-
VC 0431	Squash, summer	0.095	-	FRA	62.3	343	196	USA	186	3	2a	-	-
VR 0596	Sugar beet	-	0.08	-	-	-	-	-	-	-	-	-	-
VO 0448	Tomatoes (fresh, juice, paste, peeled)	-	0.22	USA	65.0	391	105	FRA	102	3	2a	2.01	-
GC 0080	Cereal grains (Wheat [1/])	0.03	-	USA	65.0	383	-	-	-	-	3	0.18	-

[1/] Highest consumed commodity represents group when consumption is not available.
[2/] HR for whole orange fruit, no residue data for edible portion available.

Table 13. Assessment of risks to children up to 6 years from the short-term dietary intake of residues of carbendazim (acute RfD not established but may be necessary).

Codex Code	Commodity	STMR or STMR-P mg/kg	HR or HR-P mg/kg	Large portion diet			Unit weight			Variability factor	Case	IESTI µg/kg bw/day	% acute RfD, rounded
				Country	Body wt (kg)	Large portion, g/person	Unit wt, g	Country	Unit wt, edible portion, g				
VS 0621	Asparagus	-	0.09	USA	15.0	178	25	FRA	13	3	2a	1.22	-
FI 0327	Bananas	-	0.44	JPN	15.9	312	708	USA	481	3	2b	25.89	-
GC 0640	Barley (fresh, flour, beer)	0.05	-	AUS	19.0	14	-	-	-	-	3	0.04	-
VD 0071	Beans (dry)	0.165	-	FRA	17.8	209	-	-	-	-	3	1.94	-
VB 0402	Brussels sprouts	-	0.27	NLD	17.0	213	14	UNK	10	-	1	3.38	-
VR 0577	Carrots	-	0.14	FRA	17.8	205	61	USA	50	3	2a	2.40	-
FS 0013	Cherries	-	9.1	FRA	17.8	297	5	FRA	4	-	1	151.70	-
PE 0112	Eggs (chicken eggs [1/])	-	0	FRA	17.8	134	-	-	-	-	1	0.00	-
VP 0526	Common beans (green pods and/or immature seeds)	-	0.45	NLD	17.0	184	-	-	-	-	1	4.87	-
VC 0424	Cucumbers	-	0.05	NLD	17.0	162	400	FRA	360	3	2b	1.43	-
MO 0105	Edible offal (mammalian)	-	0	FRA	17.8	203	-	-	-	-	1	0.00	-
VP 0529	Garden peas, shelled (immature seeds)	-	0.01	NLD	17.0	146	-	-	-	-	1	0.09	-
VC 0425	Gherkins	-	0.05	NLD	17.0	56	15	FRA	15	-	1	0.16	-
FB 0269	Grapes (fresh, dried, excluding wine)	-	1.9	AUS	19.0	342	125	FRA	118	3	2a	57.70	-
FI 0345	Mangoes	-	1.7	AUS	19.0	207	207	USA	139	3	2a	43.35	-
ML 0106	Milks	0	-	USA	15.0	1286	-	-	-	-	3	0.00	-

Codex Code	Commodity	STMR or STMR-P mg/kg	HR or HR-P mg/kg	Large portion diet			Unit weight			Variability factor	Case	IESTI µg/kg bw/day	% acute RfD, rounded
				Country	Body wt (kg)	Large portion, g/person	Unit wt, g	Country	Unit wt, edible portion, g				
FC 0004	Oranges, sweet, sour (incl. orange-like hybrids [2/])	-	0.63	UNK	14.5	495	131	USA	96	3	2a	29.82	-
FS 0247	Peaches	-	1	AUS	19.0	315	98	USA	85	3	2a	25.58	-
SO 0697	Peanuts	0.08	-	USA	15.0	78	-	-	-	-	3	0.41	-
FP 0009	Pome fruits (pears [1/])	-	2.4	UNK	14.5	279	166	USA	151	3	2a	96.18	-
VO 0444	Peppers, chili	-	0.98	AUS	19.0	31	45	USA	43	3	2b	4.72	-
FI 0353	Pineapples (fresh, canned, juice, dried)	-	0.03	JPN	15.9	216	472	USA	245	3	2b	1.22	-
FS 0014	Plums (fresh, prunes)	-	0.34	FRA	17.8	254	66	USA	62	3	2a	7.23	-
PM 0110	Poultry meat	-	0	AUS	19.0	224	-	-	-	-	1	0.00	-
SO 0495	Rape seed	0	-	-	-	-	-	-	-	-	3	-	-
CM 0649	Rice, husked	0.05	-	FRA	17.8	223	-	-	-	-	3	0.63	-
VD 0541	Soya beans (dry)	0.08	-	JPN	15.9	88	-	-	-	-	3	0.44	-
VC 0431	Squash, summer	0.095	-	AUS	19.0	219	196	USA	186	3	2a	-	-
VR 0596	Sugar beet	-	0.08	-	-	-	-	-	-	-	-	-	-
VO 0448	Tomatoes (fresh, juice, paste, peeled)	-	0.22	USA	15.0	159	105	FRA	102	3	2a	5.32	-
GC 0080	Cereal grains (Wheat [1/])	0.03	-	USA	15.0	151	-	-	-	-	3	0.30	-

[1/] Highest consumed commodity represents group when consumption is not available.
[2/] HR for whole orange fruit, no residue data for edible portion available.

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