TEBUCONAZOLE (189)

EXPLANATION

Tebuconazole is a triazole fungicide used as a seed dressing and spray. It was reviewed for the first time in 1994. Maximum residue levels were estimated for a number of commodities of plant and animal origin. New information on formulations, analytical methods and registered uses and data from additional supervised trials and processing studies are reviewed below.

Formulations

Table 1 shows the main types of formulation registered for use internationally. EW = emulsion, oil in water; EC = emulsifiable concentrate; FS = flowable concentrate for seed treatment; DS = powder for dry seed treatment; SC = suspension or flowable concentrate; WG = water-dispersible granule; WP = wettable powder.

Table 1. Formulations of tebuconazole.

Form.	Active ingredient(s)	Concentration	Form.	Active ingredient(s)	Concentration
1.5 DS	tebuconazole	1.5 %	29 FS	tebuconazole triflumuron	25 g/l 4 g/l
2 DS	tebuconazole	2 %	29 FS	tebuconazole cypermethrin	25 g/l 4 g/l
2.5 DS	tebuconazole	2.5 %	29 DS	tebuconazole triflumuron	% 0.4 %
015 ES	tebuconazole	15 g/l	29 DS	tebuconazole cypermethrin	% 0.4 %
2 WS	tebuconazole	2 %	29 DS	tebuconazole triflumuron	% 0.4 %
0.26 FS	tebuconazole	26 g/l	3.6 F	tebuconazole	38.7 %
2.6 FS	tebuconazole	260 g/l	250 EC/ 25 EC	tebuconazole	250 g/l
060 FS	tebuconazole	60 g/l	25 WP	tebuconazole	25 %
025 FS/ 2.5 FS	tebuconazole	25 g/l	250 EW/25 EW	tebuconazole	250 g/l
040 FS	tebuconazole triazodine	20 g/l 20 g/l	430 SC	tebuconazole	432 g/l
61.9 WS	tebuconazole captane anthraquinone	% % 22.5 %	375 FS	tebuconazole imidacloprid triazoxide	15 g/l 350 g/l 10 g/l
5 WS	tebuconazole imazalil	2 % 3 %	50 WG	tebuconazole dichlofluanid	10 % 40 %
515 FS	tebuconazole thiram	15 g/l 500 g/l	50 WG/ 50 WP	tebuconazole tolylfluanid	10 % 40 %
035 ES	tebuconazole imazalil	15 g/l 20 g/l	225 EC	tebuconazole triadimefon	125 g/l 100 g/l
315 FS	tebuconazole guazatine	15 g/l 300 g/l	375 EC	tebuconazole triadimenol	250 g/l 125 g/l
500 EC	tebuconazole fenpropidin	200 g/l 300 g/l	400 EC	tebuconazole prochloraz	133 g/l 267 g/l
500 EC	tebuconazole propiconazole	250 g/l 250 g/l	030 FS	tebuconazole fludioxonil	5 g/l 25 g/l

Form.	Active ingredient(s)	Concentration	Form.	Active ingredient(s)	Concentration
060 FS	tebuconazole fludioxonil cyprodinil	10 g/l 25 g/l 25 g/l	050 FS	tebuconazole fludioxonil difenoconazole	5 g/l 25 g/l 20 g/l
45 DF	tebuconazole	45 %	45 WG	tebuconazole	45 %
250 EW	tebuconazole	250 g/l	25 WG	tebuconazole	25 %
25 EW	tebuconazole	250 g/l	65 WP	tebuconazole tolylfluanid	15 % 50 %
290 EC	tebuconazole tridemorph	125 g/l 165 g/l	300 SC	tebuconazole carbendazim	167 g/l 133 g/l

METHODS OF RESIDUE ANALYSIS

Tebuconazole is determined in plant material and soil by gas chromatography (GLC) after extraction with organic solvents and clean-up on columns of various materials.

Brennecke (1991) developed a method (No. 00249) for the determination of tebuconazole, dichlofluanid and tolylfluanid in plant material. The sample is cleaned up by a laboratory robot system using liquid-solid extraction on diatomaceous earth and column chromatography on silica gel, after the active ingredients are extracted with acetone or dichloromethane. Aqueous samples such as beverages are transferred directly to the robot. Quantification is by GLC with a thermionic nitrogen/phosphorus detector (NPD). The recoveries from untreated control samples of paprika, peaches, peach juice, tomatoes, grapes, must, wine and zuccini fortified with 0.02 to 5.0 mg/kg of tebuconazole were 80 to 109%. The LOD (limit of determination) was 0.02 mg/kg in all commodities.

Maasfeld and Minor (1992) revised Method No. 0007 (Maasfeld, 1987) reported in 1994 and developed a special extraction procedure for the determination of tebuconazole in peanuts and their processed products. Tebuconazole is extracted from crude and refined peanut oil with hexane and partitioned into acetonitrile. Soapstock samples are extracted with ethyl acetate and partitioned sequentially against N HCl and hexane/acetonitrile. All extracts are cleaned up on gel permeation and silica gel columns and the residues are determined by GLC with an NPD. The recoveries from untreated control samples fortified at 0.05 mg/kg were 82-94% with LODs for peanuts, oil and soapstock of 0.01-0.05 mg/kg.

A method (No. F60) originally developed for the determination of fuberidazole, fluotrimazole and triadimefon in plant material and soil samples (Specht, 1977) can also be used for the determination of tebuconazole. The sample is extracted with acetone/water and the compound partitioned into dichloromethane. After clean-up on a Florisil column the residue is determined by GLC with an NPD. The LOD was 0.05 mg/kg with a mean recovery of 87.4%.

Analytical methods for the determination of tebuconazole in plums and garlic were described by Mestres *et al*. (1995) and Mestres and Reulet (1996a,b) respectively. Samples were extracted with dichloromethane/ethyl acetate, the extract was concentrated and the residues dissolved in ethyl acetate. There was no further clean-up. Tebuconazole was again determined by gas chromatography with an NP thermionic detector. Recoveries after fortification of control plum samples with 0.04 and 0.45 mg/kg were 99% and 97%, and the limit of determination was 0.02 mg/kg. Recoveries from untreated garlic samples fortified with 0.013-0.4 mg/kg were 91-110% and the LOD was 0.015 mg/kg.

An analytical method for the determination of tebuconazole in onions was described by Delgado (1991). Samples were extracted with acetone and purified by partitioning with cyclohexane/ethyl acetate. After evaporation, the residue was dissolved in toluene and determined by gas chromatography with a nitrogen phosphorus detector. The recoveries from control samples fortified with 0.02 and 0.38 mg/kg were 108% and 106%, and the LOD was 0.02 mg/kg.

USE PATTERN

Table 2 shows the registered uses of tebuconazole on the crops for which trials are reviewed in this evaluation as of February 1997. The list has been largely extended since 1994 for bananas, peaches and pears.

Table 2. Registered uses of tebuconazole. Ai = active ingredient; F = field; G = greenhouse; - = not stated; N.A. = not applicable. Application is by foliar spray unless otherwise indicated.

Crop	Country	Product	Application				PHI, days
			No.	Max. rate, kg ai/ha	kg ai/hl	F/G	
Apples	Brazil	25 WP	1-4	0.09-0.15	0.0075-0.013	F	20
	France	25 WG	1-4	0.03-0.11	0.0075	F	21
	Indonesia	25WP	8	0.125-0.25	-	F	10
	Israel	25WP	1-3	0.05	-	F	21
		50 WP	1-2	0.05	-		21
	Italy	25 WG	1-4	0.28	0.0186	F	30
	Spain	25 WG	4-6	0.1-0.15	0.01-0.015	F	21
	Turkey	25 WP	1-2	0.09-0.13	0.0062	F	14
Bananas[1]	Australia	430 SC	5-6	0.1	0.1-0.5	F	1
	Cameroon	250 EW	1-3	0.1	-	F	0
	Colombia	250 EW	6-8	0.1	0.71-0.83	F	0
	Costa Rica	250 EW	4-8	0.1	0.53-0.83	F	-
	Ecuador	250 EW	6-8	0.1	0.71-0.83	F	0
	Guatemala	250 EW/EC	2-8	0.1	0.33-1	F	0
	Honduras	250 EW	2-8	0.1	0.33-1	F	0
	Indonesia	250 EC	1-4	0.05-0.1	0.01-0.02	F	10
	Ivory Coast	250 EW	1-6	0.1	-	F	-
	Nicaragua	250 EC/EW	2-8	0.1	0.33-1	F	0
	Philippines	250 EC	6-8	0.075-0.125	0.25-0.42	F	-
	USA	45 WG	6.7 [2]	0.1	0.13	F	0
Barley [3] (seed treatment)	Australia	2.9 DS/ 29 FS	1	0.0025	-	F	N.A.
	Belgium	040 FS	1	0.003	-	F	N.A.
	Chile	2WS/515FS	1	0.003/0.0022-0.003	-	F	N.A.
	France	375 FS	1	0.003	-	F	N.A.
	Germany	040 FS	1	0.002	-	F	N.A.
	Great Britain (UK)	040 FS	1	0.003	-	F	N.A.
	Ireland	025 FS	1	0.003	-	F	N.A.
	Italy	035 ES/515FS	1	0.003	-	F	N.A.
	South Africa	025 FS/015ES	1	0.0025/0.0026	-	F	N.A.
	Spain	025 FS	1	0.003-0.004	-	F	N.A.
	USA	0.26FS/2.6 FS	1	0.002	-	F	N.A.
Cherries	USA	45 WG	1-6	0.25	0.0067	F	0
Cucumber	Chile	250 EW	1-2	0.125 -0.375	0.0125-0.025	F	14
		375 EC	1-2	0.083 -0.125	-	F	35
	Israel	50 WP	1-3	0.15	0.015	F or G	14
	Spain	50 WP	1-3	0.2-0.3	0.02-0.03	F or G	7
Garlic	Brazil	25 WP	1-4	0.25	0.025-0.05	F	14
	Israel	250 EC	1-3	0.19	-	F	21

Crop	Country	Product	Application				PHI, days
			No.	Max. rate, kg ai/ha	kg ai/hl	F/G	
	Spain	250 EW	1	0.5 (soil drench)	-	F	-
Grapes	Brazil	25 WP	4-7	0.25-0.38	0.025	F	14
	Chile	250 EW	1-2	0.31-0.44	-	F	14
	France	250 EW	1 -3	0.075-0.1	0.011-0.075	F	14
	Germany	50 WP	3-4	0.15-0.5	0.025	F	35
	Israel	250 EC 50 WP	1-3	0.05 0.15	0.05 0.015	F	21/14
	Italy	25 WG	1-4	0.1-0.38	0.01-0.038	F	50
	South Africa	375 EC	1-8	0.013-0.09	0.05-0.036	F	14/35[4]
		300 SC	1-2	0.063-0.19	-	F	28
	Spain	250 EW 50 WP	1-3 1-3	0.063-0.13 0.25-0.38	- -	F F	21 21
Oats [3] (seed treatment)	Australia	2.9 DS/29 FS	1	0.0025	-	F	N.A.
	Chile	515 FS	1	0.0022-0.003	-	F	N.A.
	Germany	040 FS	1	0.003	-	F	N.A.
	Ireland	025 FS	1	0.003	-	F	N.A.
	Italy	035ES/515 FS	1	0.003	-	F	N.A.
	Spain	025 FS	1	0.003	-	F	N.A.
	USA	0.26FS/2.6 FS	1	0.002	-	F	N.A.
Onion	Brazil	25 WP	1-4	0.25	0.025-0.05	F	14
	Israel	250 EC	1-2	0.19	-	F	21
	New Zealand	250EW/430SC	2-3	0.38	0.038	F	35
	South Africa	250 EW	1-6	0.19	0.038	F	-
	Spain	250 EW	1	0.5 (soil drench)	-	F	-
Peaches and nectarines	Chile	250 EC/EW	1	0.38-0.53	0.031-0.044	F	35
	France	25 WG	1-3	0.063-0.15	0.013	F	7
	Italy	25 WG	1-2	0.15-0.3	0.013-0.025	F	15
	Peru	250 EW	1-3	0.125	0.0125	F	21
	USA	45 WG	1-6	0.25	0.0067	F	0
Peanuts	Australia	430 SC	1-5	0.075 -0.189	0.075-0.189	F	21
	Argentine	250 EC	3-5	0.13	0.052-0.087	F	35
	Brazil	25 WP	2-3	0.13	0.042-0.063	F	30
	Guatemala	250 EW	2-3	0.13- 0.19	-	F	21
	Indonesia	250 EC	1-6	0.13- 0.25	0.025-0.05	F	10
	Israel	250 EC	1-3	0.25	-	F	21
	Nicaragua	250 EW	2-3	0.13- 0.19	-	F	21
	South Africa	250 EW	1-5	0.1-0.15	0.02-0.42	F	14
	USA	3.6 F	1-4	0.23	0.25	F	14
Pears	Israel	25 WP	1-3	0.05	-	F	21
	Italy	25 WG	1-4	0.15-0.28	0.01-0.19	F	15
	Spain	25 WG	4-6	0.1-0.15	0.01-0.015	F	21
	Turkey	25 WP	1-2	0.09-0.13	0.0062	F	14
Plums	Israel	250 EC	1-3	0.05	-	F	21
Sweet peppers	Spain	50 WP	1-3	0.2 -0.3	-	F or G	7
Wheat [3] (seed treatment)	Argentina	2 WS	1	0.0025	0.167-0.125	F	N.A.
	Australia	2.9 DS/29DS	1	0.0025	-	F	N.A.
	Chile	2 WS/515FS	1	0.003/0.0022-0.003	-	F	N.A.
	Ireland	025 FS	1	0.003	-	F	N.A.
	Italy	035 ES/515 FS	1	0.003	-	F	N.A.
	South Africa	025 FS/015 ES	1	0.0012/0.0013	-	F	N.A.
	Spain	025 FS	1	0.003-0.004	-	F	N.A.
	USA	0.26FS/2.6FS	1	0.002	-	F	N.A.

[1]Numbers of treatments are numbers/year. Numbers per application cycle are restricted to a maximum of four
[2]Average no./year

[3]Application rate, kg ai/100 kg
[4]14 days for table grapes, 35 days for wine grapes

RESIDUES RESULTING FROM SUPERVISED TRIALS

In 1994 residue data were submitted on pome fruit (apples and pears), stone fruit (apricots and peaches), grapes, bananas, onions, beans, peas, cucumbers, summer squash, egg plants, sweet peppers, tomatoes, potatoes, cereal grains (barley, maize, oats, rice, rye and wheat), peanuts, and rape. Because trials data were insufficient and/or information on GAP was lacking, MRLs were recommended only for grapes, summer squash (zucchini), tomatoes, barley, rye, wheat, peanuts and rape seed.

The data from new residue trials are discussed by crop group and summarized in Tables 3 to 17. Trials with the same entry in the Tables were carried at the same site. Unless otherwise indicated, all trials were with foliar sprays. Underlined residues are from trials according to GAP (±30%) and were used to estimate maximum residue levels. Double-underlined residues are from maximum treatments allowed by GAP and were used to estimate STMR levels.

Pome fruits

Apples (Table 3). Four trials were conducted in Brazil within or above the recommended rate (1-4 applications of 0.09-0.15 kg ai/ha) giving residues from below the LOD (0.1 mg/kg) to 0.5 mg/kg at a PHI of 20 or 21 days.

In two trials in Canada with six applications of 0.23 kg ai/ha the residues after 86 days were below the LOD (0.01 mg/kg) and 0.02 mg/kg.

In two trials in France at 1.5 and twice the recommended GAP the residues were 0.09 and 0.06 mg/kg after 21 (GAP) and 28 days respectively. In Germany, seven trials according to the proposed use (1-4 applications of 0.1-0.15 kg ai/ha) and four trials at lower rates gave residues at a PHI of 56 days from below the LOD (0.02 mg/kg) to 0.04 mg/kg. In ten trials in Korea above the recommended rate (1-3 applications of 1.0 kg ai/ha) the residues at a PHI of 21 days varied from 0.04-0.14 mg/kg.

In two trials in Italy and one in Spain according to GAP the residues were 0.12-0.18 mg/kg at a PHI of 28 or 21 days.

In sixteen trials in the USA at a nominal rate according to the proposed use (0.13-0.25 kg ai/ha) residues after intervals from the GAP PHI of 75 days to 129 days were below the limit of determination (0.01 mg/kg) except in one trial at an actual rate of 0.44 kg ai/ha where 0.02 mg/kg was found. In two other trials with half and twofold application rates the residues were <0.01 mg/kg.

Table 3. Residues of tebuconazole in apples. Whole fruit analysed.

Country Report No. (year) States	Application				PHI, days	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl			
Brazil (1990)	25 WP	8	0.075	0.0075	0 3 7 14 21	0.1/ 0.1/ <0.1/ <0.1 <0.1	BRA-118154-A/

Country Report No. (year) States	Application				PHI, days	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl			
Brazil (1990)	25 WP	8	0.15	0.015	14 21	<0.1 <0.1	BRA-118154-B
(1992)		4	0.15	0.015	20	0.2	BRA-138194-B
(1992)		4	0.3	0.03	20	0.5	BRA-138194-B
Canada (1989)	45 WG	6	0.23	0.0068	86	0.02	510-FR046-89D
Canada (1989)	45 WG	6	0.23	0.0068	86	0.01	510-FR047-89D
		3	0.15	0.015	0 28	0.10 0.06	0282-93
Germany RA-2972/94	50 WG	4	0.15	0.01	0 56	0.23 <0.02	0458-94
(1994)		4	0.15	0.01	0 56	0.39 <0.04	0459-94
		4	0.15-0.17	0.05	0 56	0.05 <0.02	0457-94
RA-2069/93 (1993)	50 WP	4	0.01	0.0008	0 14 28 56 65/67	0.27/0.22 0.07/0.03 0.02/0.02 <0.02/<0.02 <0.02/<0.02	0047-93/ 0130-93
		4	0.01	0.0008	0 14 28 56 65/67	0.25/0.15 0.06/0.04 0.04/0.03 0.02/<0.02 0.02/	0131-93/ 0132-93
RA-2001/94 (1994)		4	0.15-0.16	0.01-0.05	0 14 28 56	0.06 0.02 <0.02 <0.02	0001-94
		4	0.15-0.16	0.01-0.05	0 14 28 56 63	0.19 0.04 0.02 <0.02 <0.02	0002-94
		4	0.15-0.16	0.01-0.05	0 14 28 56 63	0.07 <0.02 <0.02 <0.02 <0.02	0003-94
		4	0.15-0.16	0.01-0.05	0 14 28 56 63	0.21 0.08 0.07 0.03 0.02	0004-94
Italy RA-2062/93 (1993)	25 WG	4	0.25	0.017	0 7 10 14 21 28	0.23 0.14 0.10 0.14 0.17 0.12	0031-93
		4	0.25	0.017	0 7 10 14 21 28	0.53 0.51 0.40 0.39 0.22 0.13	0284-93
Korea[1] (1992)	25 WP	3	1.25	0.025	14 21 28	0.15 0.04 0.04	KOR-R2104-93 KOR-R2103-93 KOR-R2102-93

Country Report No. (year) States	Application				PHI, days	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl			
					35	0.04	KOR-R2101-93
		4	1.25	0.025	21 28	0.08 0.05	KOR-R2106-93 KOR-R2105-93
		5	1.25	0.025	21 28	0.14 0.07	KOR-R2108-93 KOR-R2107-93
		6	1.25	0.025	21 28	0.13 0.12	KOR-R2110-93 KOR-R2109-93
Spain (1994)	25 WG	6	0.11	0.01	0 7 14 21 28	0.41 0.35 0.24 <u>0.18</u> 0.16	0367-94
USA[2] BR106219	45 DF	6	0.16	0.0067	129	<0.01	FCA-FR100-91H
(1992) CA,		6	0.16	0.034	75	<0.01	HIN-FR071-91H
IN, MI , NY		6	0.25	0.0067	106	<0.01	454-FR067-91H
PA, VA ,		6	0.25	0.0067	102	<0.01	454-FR099-91H
and WA		6	0.25	0.055	127	<0.01	455-FR068-91H
		6	0.25	0.11	77	<0.01	757-FR069-91D
		6	0.21	0.0055	119	<0.01	757-FR102-91D
		6	0.25	0.013	104	<0.01	758-FR070-91D[3]
		6	0.19	0.040	103	<0.01	855-FR101-91D
MR100067	45 DF	6	0.12	0.019	84	<0.01	HIN-FR014-89D
(1990)		6	0.055	0.0067	125	<0.01	STF-FR015-89D
IN, KS, MI,		6	0.13	0.016	115	<0.01	751-FR010-89D
NC, NY, PA,		6	0.15	0.0067	92	<0.01	757-FR011-89D
and WA		6	0.19	0.020	92	<0.01	758-FR012-89D
		6	0.19	0.0067	109	<0.01	855-FR013-89D
		6	0.027	0.0067	104	<0.01	454-FR007-89D[4]
		6	0.44	0.0067	104	0.02	454-FR008-89D
MR100066 (1990) KS	45 DF	6	0.50	0.034	125	<0.01	STF-FR017-89D

[1]All trials were at the same site, with one PHI/trial
[2]0.25 kg ai/kg nominal rate. Actual rates differed owing to different tree sizes
[3] 0.50 kg ai/kg nominal rate
[4] <0.12 kg ai/kg nominal rate

<u>Pears (Table 4)</u>. In a trial in Spain according to GAP (4-6 x 0.1-0.15 kg ai/ha, 21-day PHI) the residue at 21 days was 0.09 mg/kg. Four trials in the USA according to the proposed use (0.13-0.25 kg ai/ha nominal rate) yielded residues after 74 to 106 days from below the LOD (0.01 mg/kg) to 0.03 mg/kg. Two other trials at a nominal rate <0.09 kg ai/ha (actual rates 0.024 and 0.075 kg ai/ha) showed similar results.

Table 4. Residues of tebuconazole in pears. Whole fruit analysed.

Country Report No. (year) States	Application				PHI, days	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl			
Spain (1994)	25 WG	6	0.1-0.14	0.01	0 7 14 21 28	0.33 0.27 0.15 <u>0.09</u> 0.04	0368-94
USA[1] MR100069	45 DF	6	0.20	0.0068	106	<0.01	451-FR018-89D
		6	0.024	0.0068	84	<0.01	454-FR019-89D[2]

Country Report No. (year) States	Application				PHI, days	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl			
(1989) CA, MI, NY, OR and WA		6	0.075	0.0033	63	0.02	457-FR021-89D[2]
		6	0.20	0.022	104	<0.01	758-FR022-89D
		6	0.19	0.0067	74	0.01	855-FR023-89D
		6	0.086	0.0068	83	0.03	455-FR020-89D

[1]0.19 kg ai/kg nominal rate. Actual rates differed owing to different tree sizes
[2] <0.09 kg ai/kg nominal rate

Stone Fruits

Cherries (Table 5). Five trials were conducted in Italy at or below the proposed use rate (1- 2 applications of 0.28 kg ai/ha). At the proposed PHI of 7 days the residues were 0.18 and 0.20 mg/kg in the fruit without stone and 0.29 and 0.33 mg/kg in the whole fruit. In another trial the residues after 5 days were 0.50 and 0.40 mg/kg in the fruit without stone and whole fruit respectively.

Twelve trials in the USA were slightly below the GAP nominal rate (1-6 applications of 0.25 kg ai/ha) with one trial at a lower rate. Residues in the whole fruit at a PHI of 0 days were between 0.09 and 3.1 mg/kg.

Table 5. Residues of tebuconazole in cherries.

Country Report No. (year) States	Application				PHI, days	Sample[1]	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl				
Italy RA-2019/92 (1992)	25 WG	2	0.19	0.019	0 5 10 14	fruit/ whole fruit	0.59/0.48 0.50/0.40 0.29/0.25 0.26/0.22	0289-92
RA2067/93 (1993)		2	0.19	0.019	0 3 7 10	fruit	0.30 0.23 0.18 0.16	0029-93
		2	0.19	0.019	0 7	fruit	0.26 0.20	0290-93
RA-2075/96 (1996)		2	0.28	0.019	0 3 7 10	whole fruit	0.62 0.35 0.29 0.30	0592-96
		2	0.28	0.019	0 3 7 10	whole fruit	0.67 0.30 0.33 0.22	0594-96
USA[2] MR99826 (1989)	45 DF	6	0.19	0.020	0 3 7 10/14	whole fruit	0.41 0.60 0.25 0.17	451-FR024-89D
CA, MI, NY, OR and WA		6	0.19	0.020	0 3 7 10/14	whole fruit	0.61 0.40 0.39 0.07	855-FR029-89D
		7	0.19	0.0067	0 3 7 14	whole fruit	3.1 2.0 1.2 1.2	454-FR025-89D
		6	0.056	0.003	0	whole fruit	1.0	456-FR026-89D[3]

Country Report No. (year) States	Application				PHI, days	Sample[1]	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl				
					3 7 14		0.85 0.78 0.55	
		6	0.16	0.017	0 3 7 14	whole fruit	0.40 0.50 0.14 0.09	758-FR027-89D
		6	0.19	0.067	0 3 7 14	whole fruit	0.53 0.34 0.19 0.03	855-FR028-89D
MR99826-1 (1991) CA, ID, MI, NY, OR,		6	0.16	0.022	0 1 3 7	whole fruit	0.09 0.12 0.08 0.08	FCA-FR013-91D
WA and WI		6	0.25	0.054	0 1 3 7	whole fruit	1.4 1.4 1.3 0.97	451-FR011-91D
		6	0.063	0.0067	0	whole fruit	0.19	451-FR018-91D
		6	0.15	0.0067	0 1 3 7	whole fruit	0.31 0.19 0.08 0.06	454-FR012-91D
		6	0.19	0.010/0.040	0 1 3 7	whole fruit	0.92 0.67 0.70 0.33	758-FR014-91D
		6	0.19	0.010/0.040	0 1 3 7	whole fruit	0.76 0.86 0.71 0.52	855-FR017-91D
		6	0.16	0.034	0 1 3 7	whole fruit	1.2 0.47 0.32 0.13	851-FR015-91D

[1]Fruit: fruit without stone; whole fruit: fruit with stone
[2] 0.19 kg ai/ha nominal rate. Actual rates differed owing to different tree sizes
[3] Nominal rate <0.095 kg ai/ha

Peaches and Nectarines (Table 6). In two trials on peaches in France at nearly twice the GAP rate the residues in fruit with and without the stone at a PHI of 7 days were 0.09-0.11 mg/kg.

In Italy, one trial was conducted on peaches and two on nectarines with four applications instead of the one or two allowed by GAP. The residues after 7 or 10 days were <0.02-0.17 mg/kg.

In seven trials on peaches in the USA the applications rates were slightly below the GAP nominal rate (0.25 kg ai/kg). Residues in the whole fruit at a PHI of 0 days were 0.20-0.81 mg/kg. One trial with a lower application rate gave a residue of 0.04 mg/kg.

Table 6. Residues of tebuconazole in peaches and nectarines.

Country, Report No.,	Application	PHI,	Sample[1]	Residues,	Trial

(year), Fruit, States	Product	No	kg ai/ha	kg ai/hl	days		mg/kg	Reference
France (1988) peaches	25 WP	3	0.28/ 0.25	0.025	7 7	fruit/ whole fruit	0.10/0.11 0.09/0.11	0448-88/ 0449-88
Italy (1996) peaches	25 WG	4	0.28	0.019	0 3 7 10	whole fruit	0.18 0.34 0.06 0.14	0591-96
(1993) nectarines		4	0.28	0.019	0 7	whole fruit	0.34 0.17	0590-96
		4	0.28	0.019	0 3 7 10	fruit	0.09 0.05 0.06 <0.02	0289-93
USA [2] MR103208 (1990) peaches OR, WA, CA, SC, PA, MI, GA .	45 DF	6	0.13	0.0069	0 3 7 14	whole fruit	0.81 0.54 0.38 0.27	FCA-FR013-90D
		6	0.13	0.0069	0 3 7 14	whole fruit	0.34 0.26 0.17 0.12	451-FR007-90D
		6	0.18	0.0067	0	whole fruit	0.44	752-FR010-90D
		6	0.03	0.0063	0 3 7 14	whole fruit	0.04 0.03 0.02 <0.01	454-FR008-90D
		6	0.19	0.035	0 3 7 14	whole fruit	0.46 0.41 0.18 0.07	455-FR009-90D
		6	0.05	0.0067	0 3 7 18	whole fruit	0.26 0.09 0.03 0.03	752-FR014-90D
		6	0.19	0.026/ 0.022	0 3 7 14	whole fruit	0.20 0.12 0.13 0.04	757-FR011-90D
		6	0.19	0.026/ 0.022	0 3 7 14	whole fruit	0.21 0.17 0.16 0.04	855-FR012-90D

[1]Fruit: fruit without stone; whole fruit: fruit with stone
[2]0.19 kg ai/kg nominal rate. Actual rates differed owing to different tree sizes

Plums (Table 7). In nine trials in France at a higher rate (in 1988, 1991 and 1992) or a higher spray concentration (in 1994) than the proposed use (1-3 applications of 0.13-0.15 kg ai/ha) the residues were 0.03-0.40 mg/kg in fruit with or without the stone at a PHI of 7 days. In another ten trials according to the proposed use the corresponding residues were below the LOD (0.01 or 0.02 mg/kg) to 0.1 mg/kg after 7 to 79 days.

Three trials in Italy according to the proposed use (1-2 applications of 0.28 kg ai/ha) gave residues from 0.03-0.11 mg/kg at a PHI of 7 days.

Table 7. Residues of tebuconazole in plums.

Country, Report No., (year)	Application				PHI	Sample[1]	Residues,	Trial
	Product	No	kg ai/ha	kg ai/hl	days		mg/kg	Reference
France (1988)	25 WP	3	0.25	0.025	7	Fruit/ whole fruit	0.40/0.35	0450-88
(1991)		3	0.25	0.025	0 3 7	fruit	0.11 0.14 0.24	0391-91
(1991)		3	0.25	0.025	0 3 7	fruit	0.39 0.17 0.38	0392-91
(1991)		3	0.25	0.025	3 7	fruit	0.17 0.28	0393-91
		3	0.21-0.33	0.019	0 7 14 0 7 14	fruit whole fruit 	0.09 0.03 0.03 0.09 0.03 0.03	0412-92
RA-2109/93 (1993)	25 WG	3	0.13-0.15	0.012-0.013	0 5 7 14 7 14	fruit whole fruit 	0.03 0.02 <0.02 <0.02 <0.02 <0.02	0479-93
		3	0.13-0.15	0.012-0.013	0 5 7 14 7 14	fruit whole fruit 	0.03 <0.02 0.03 <0.02 0.03 <0.02	0480-93
		1	0.13	0.013	49/77	fruit	<0.01/ <0.01	RPRUN932-03-C/ RPRUN933-02-C
(1994)		3	0.13	0.031	7 14	fruit	0.23 0.20	RPRUN294-06-A RPRUN294-07-A
(1993)	25 WG	2	0.13	0.025	29	fruit	<0.01/ <0.01	RPRUN932-03-A/ RPRUN932-03-B
		1	0.13	0.025	12	fruit	<0.01/0.03	RPRUN933-02-A/ RPRUN933-02-B
(1994)		3	0.13	0.025	7 14	fruit	0.1 0.1	RPRUN294-06-B RPRUN294-07-B
Italy (1992)	25 WG	2	0.3	0.019	0 7 10 14	fruit/ whole fruit	0.15/0.14 0.10/0.09 0.09/0.08 0.05/0.05	0284-92
RA-2067/93 (1993)		2	0.3	0.019	0 3 7 10	fruit	0.13 0.04 0.03 0.03	0035-93
		2	0.3	0.019	0 7	fruit	0.23 0.11	0291-93

[1]Fruit: fruit without stone; whole fruit: fruit with stone.

Grapes (Table 8). Fifteen trials were conducted in the USA with eight applications of 0.13 kg ai/ha, the proposed use pattern. The residues at a PHI of 13 or 14 days were between 0.10 and 3.95 mg/kg.

Table 8. Residues in bunches of grapes from trials with eight applications of 45 WG formulation of tebuconazole in the USA (CA, MI, NC, NY, OR and WA) at 0.13 kg ai/ha.

Report no. (year)	Application kg ai/hl	PHI, days	Residues, mg/kg	Trial reference
MR107132 (1995)	0.026	7 14 21	0.20 0.20 0.15	FCA-FR006-91D
	0.027	7 14 21	0.84 0.67 0.55	454-FR001-91D
	0.027	6 13 19	2.85 3.95 4.63	457-FR002-91D
	0.0090	7 14 25	1.72 1.77 1.67	458-FR003-91D
	0.014	7 14 21	0.85 0.94 0.74	751-FR098-91D
MR95677 (1988)	0.014	7 14 21	0.37 0.27 0.18	758-FR004-91D
	0.027	7 14 21	0.51 0.56 0.21	855-FR005-91D
	0.014	14 21	0.43 0.28	151-FR087-87D
	0.045	14 21	0.29 0.46	151-FR008-87D
	0.0067	14 21	0.37 0.27	451-FR089-87D
	0.045	14 21	0.56 1.0	454-FR090-87D
	0.027	14 21	1.5 0.56	456-FR092-87D
	0.0090	14 21	1.2 1.4	457-FR093-87D
	0.019-0.029	14 20	0.39 0.41	458-FR094-87D
	0.014	14 21	0.10 0.07	855-FR095-87D

Bananas (Table 9). The list of registered use of tebuconazole in bananas has been largely extended since 1994 (Table 2). Tebuconazole is registered in the USA for use on bagged bananas. In Australia, bagging before spraying is recommended to minimise fruit marking.

A total of six trials were conducted in Australia. In one trial according to GAP (5-6 applications of 0.1 kg ai/ha) the residues in the peel, pulp and whole fruit were at the limit of determination (0.01 mg/kg) at the GAP PHI of 1 day. In four trials at a higher rate, the residues were <0.05 and 0.03 mg/kg at a PHI of 1 day in bagged bananas (two trials). In two trials with unbagged bananas the residues were 0.16 mg/kg in the whole fruit and 0.14 and 0.17 mg/kg in the pulp.

In two trials in Brazil with five applications of 0.13 or 0.25 kg ai/ha the residues in pulp were below the limit of determination (<0.1 mg/kg) after 14 days.

In six of seven trials in the USA according to GAP with five applications of 0.1 kg ai/ha, the residues in the whole fruit, peel and pulp were [0.01 mg/kg at a PHI of 0 days. In the seventh trial the residue in the whole fruit was 0.03 mg/kg.

Table 9. Residues of tebuconazole in bananas. Bananas were bagged unless otherwise indicated.

Country, Report No. (year)	Application				PHI, days	Sample[1]	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl				
Australia (1988)	250 EC	4	0.075	0.0015	0	peel/pulp	<0.05/<0.05	AUS-43-88C
					1		<0.05/<0.05	
					3		<0.05/<0.05	
					5		<0.05/<0.05	
					7		<0.05/<0.05	
					10		<0.05/<0.05	
					14		<0.05/<0.05	
		4	0.15	0.003	0	peel/pulp	<0.05/<0.05	AUS-43-88D
					1		<0.05/<0.05	
					3		<0.05/<0.05	
					5		<0.05/<0.05	
					7		<0.05/<0.05	
					10		<0.05/<0.05	
					14		<0.05/<0.05	
(1992)	250 EW	6	0.1	0.046	0	whole fruit	0.03	AUS-40-90-E
					1		0.01	
					3		<0.01	
					5		<0.01	
					7		<0.01	
					0	peel	0.03	
					1		0.01	
					3		<0.01	
					5		<0.01	
					7		<0.01	
					0	pulp	0.03	
					1		0.01	
					3		<0.01	
					5		<0.01	
					7		0.01	
		6	0.2	0.093	0	whole fruit	0.03	AUS-40-90-G
					1		0.03	
					3		0.01	
					5		0.01	
					7		<0.01	
					0	peel	0.02	
					1		0.02	
					3		0.01	
					5		0.02	
					7		<0.01	
					0	pulp	0.03	
					1		0.03	
					3		0.01	
					5		0.01	
					7		<0.01	
		6	0.2	0.093	0	whole fruit	0.08	AUS-40-90-F (unbagged)
					1		0.16	
					3		0.10	
					5		0.08	
					7		0.03	
					0	peel	0.05	
					1		0.21	
					3		0.20	
					5		0.06	

Country, Report No. (year)	Application				PHI, days	Sample[1]	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl				
					7		0.02	
					0	pulp	0.10	
					1		0.14	
					3		0.06	
					5		0.09	
					7		0.02	
		6	0.2	0.093	0	whole fruit	0.15	AUS-40-90-H (unbagged)
					1		0.16	
					3		0.25	
					5		0.14	
					7		0.07	
					0	peel	0.18	
					1		0.13	
					3		0.32	
					5		0.16	
					7		0.06	
					0	pulp	0.14	
					1		0.17	
					3		0.22	
					5		0.13	
					7		0.06	
Brazil	250 EC	5	0.13	0.83	14	pulp	<0.1	BRA-140382-A
(1993)		5	0.25	1.67	14	pulp	<0.1	BRA-140382-B
USA MR99827 (1989) Hawaii, Puerto Rico	45 WG	5	0.1	0.045-0.053	0	whole fruit unwashed	<0.01	458-FR057-88D1
					7		<0.01	
					14		<0.01	
					0	whole fruit washed	<0.01	
					7		<0.01	
					14		<0.01	
					0	peel unwashed	0.01	
					7		0.01	
					14		<0.01	
					0	pulp unwashed	<0.01	
					7		<0.01	
					14		<0.01	
USA MR99827 (1989) Hawaii, Puerto Rico	45 WG	5	0.1	0.045-0.053	0	whole fruit unwashed	<0.01	458-FR058-88D1
					7		0.01	
					14		0.02	
					0	whole fruit washed	<0.01	
					7		0.01	
					14		<0.01	
					0	peel unwashed	<0.01	
					7		0.02	
					14		0.02	
					0	pulp unwashed	0.01	
					7		0.01	
					14		0.02	
USA MR99827 (1989) Hawaii, Puerto Rico	45 WG	5	0.1	0.045-0.053	0	whole fruit unwashed	<0.01	458-FR057-88D1
					7		<0.01	
					14		<0.01	
					0	whole fruit washed	<0.01	
					7		<0.01	
					14		<0.01	
					0	peel unwashed	0.01	
					7		0.01	
					14		<0.01	
					0	pulp unwashed	<0.01	
					7		<0.01	

Country, Report No. (year)	Application				PHI, days	Sample[1]	Residues, mg/kg	Trial Reference
	Product	No	kg ai/ha	kg ai/hl				
					14		<0.01	
USA MR99827 (1989) Hawaii, Puerto Rico	45 WG	5	0.1	0.045- 0.053	0 7 14 0 7 14 0 7 14 0 7 14	whole fruit unwashed whole fruit washed peel unwashed pulp unwashed	<u>≤0.01</u> 0.01 0.02 <0.01 0.01 <0.01 <0.01 0.02 0.02 <u>0.01</u> 0.01 0.02	458-FR058- 88D1
USA MR99827 (1989) Hawaii, Puerto Rico	45 WG	5	0.1	0.045- 0.053	0 7 14 0 7 14 0 7 14 0 7 14	whole fruit unwashed whole fruit washed peel unwashed pulp unwashed	<<u>0.01</u> <0.01 <0.01 <0.01 <0.01 <0.01 0.01 0.01 <0.01 <u>≤0.01</u> <0.01 <0.01	750-FRO59- 88D1
USA MR99827 (1989) Hawaii, Puerto Rico	45 WG	5	0.1	0.045- 0.053	0 7 14 0 7 14 0 7 14 0 7 14	whole fruit unwashed whole fruit washed peel unwashed pulp unwashed	<<u>0.01</u> <0.01 <0.01 <0.01 <0.01 <0.01 0.01 0.01 <0.01 <u>≤0.01</u> <0.01 <0.01	750-FRO60- 88D1
MR99827-1 (1991) Hawaii, Puerto Rico	45 WG	5	0.1	0.031- 0.043	0 7 14 0 7 14	whole fruit unwashed whole fruit washed	<u>0.03</u> 0.03 0.04 0.03 0.03 0.03	458-FR007- 91D
MR99827-1 (1991) Hawaii, Puerto Rico	45 WG	5	0.1	0.031- 0.043	0 7 14 0 7 14	whole fruit unwashed whole fruit washed	<u>≤0.01</u> <0.01 <0.01 <0.01 <0.01 <0.01	458-FR008- 91D
		5	0.1	0.031- 0.043	0 7 14	whole fruit unwashed/ washed	<0.01 <0.01 <0.01	750-FR009- 91D

Bulb vegetables

Garlic (Table 10). In four trials in Brazil with five and six applications at 0.25 and 0.50 kg ai/ha the residues were below the LOD (0.05 mg/kg) after a PHI of 14 days. GAP calls for 1-4 foliar applications of 0.25 kg ai/ha. Five trials in France according to the proposed use (1-2 foliar applications of 0.25 kg ai/ha) gave residues from below the LOD (0.02 mg/kg) to 0.06 mg/kg after a PHI of 21 days.

In five trials in Korea with 4 x 0.38 mg ai/ha, foliar spray, the residues varied from <0.01 mg/kg at 245 days to 1.4 mg/kg at 51 days. The residues in two trials with soil drenches at 3.3 kg ai/ha were <0.01 mg/kg at 275 days and 0.65 mg/kg at 51 days.

Table 10. Residues of tebuconazole in garlic. Bulbs analysed.

Country,	Application				PHI,	Residues,	Trial
(year)	Product	No	kg ai/ha	kg ai/hl	Days	mg/kg	Reference
Brazil (1992)	250 EC	5	0.25	0.05	14	<0.05	BRA-138740-A
		5	0.50	0.1	14	<0.05	BRA-138740-B
	25 WP	6	0.25	0.05	14	<0.05	BRA-140128-A
		6	0.50	0.1	14	<0.05	BRA-140128-B
France 1994	250 EC	2	0.25	0.041	21	<0.02	RAIL 0194-01
1995	250 EW	2	0.25	0.044	0 5 10 14 21	<0.02/<0.02 0.02 0.03 <0.02 <0.02/ 0.06	RAIL0195/ 84-1/ RAIL0195/ 09-1
1996		2	0.25	0.063	0 6 10 14 21	0.03/0.03 0.03 0.02 0.04 0.02/0.03	RAIL0195/ 84-2/ RAIL0195/ 09-2
Korea (1990) (1991)	250 EC	1	3.3 soil drench	0.017	275	<0.01	KOR-950-90
		1	0.38	0.025	245	<0.01	KOR-951-90
		2	0.38	0.025	90	0.01	KOR-952-90
		3	0.38	0.025	70	0.02	KOR-953-90
		3	0.38	0.025	51	0.15	KOR-954-90
		3	3.3 soil drench	0.017	51	0.65	KOR-955-90
		4	0.38	0.025	51	1.4	KOR-956-90

Onions (Table 11). In one trial in France, one in Germany, one in Italy and four in The Netherlands with 2 or 4 foliar applications of 0.19-0.25 kg ai/ha, close to the proposed German use pattern of 1 or 2 foliar applications at 0.25 kg ai/ha, the residues after 20-28 days were below the LOD (0.02 or 0.05 mg/kg).

In four trials in Brazil above the GAP rate (1-4 x 0.25 kg ai/ha), the residues were <0.1-0.3 mg/kg at a PHI of 14 days.

In two trials in New Zealand according to GAP (2-3 foliar applications of 0.38 kg ai/ha) the residues were 0.14 mg/kg at day 28 and below the LOD (0.05 mg/kg) after 76 days. In two trials in Australia at 0.50 kg ai/ha the residues were below the LOD (0.01 mg/kg) after 79 days and 0.3 mg/kg after 154 days.

In Spanish GAP application is by soil drench. In two trials with foliar applications the residues at 14 days were at or below the LOD (0.02 mg/kg).

Table 11. Residues of tebuconazole in onions. Bulbs analysed.

Country, Report No. (year)	Application				PHI	Residues,	Trial
	Product	No	kg ai/ha	kg ai/hl	days	mg/kg	Reference
Australia (1990)	250 EC	1	0.50	0.25	154	0.3	AUS-4-90
(1994)		2	0.50	0.20	79	<0.01	AUS-44-94
Brazil (1992)	250 EC	6	0.25	0.063	14	0.16	BRA-137021-A
			0.50	0.13	14	0.3	BRA-137021-B
		6	0.25	0.063	14	<0.1	BRA-136972-A
			0.50	0.13	14	0.3	BRA-136972-B
France RA-2085/96 (1996)	250 EW	2	0.25	0.089	0	1.3	0284-96
					5	0.13	
					10	0.05	
					14	<0.05	
					21	<0.05	
Germany (1996)	250 EW	2	0.25	0.042	0	<0.05	0345-96
					21	<0.05	
Italy (1989)	50 WG	2	0.25	0.025	0	0.05	0374-89
					10	<0.02	
					14	<0.02	
					20	<0.02	
New Zealand (1990)	250 EC	3	0.38	0.038	0	4.1	NSL-DECF
					6	0.69	
					13	0.36	
					20	0.28	
					28	0.14	
		3	0.38	0.038	76	<.05	NSL-ENDF3
Netherlands RA-2070/93 (1993)	50 WP	4	0.19-0.20	0.067	0	<0.02	0070-93
					7	<0.02	
					14	<0.02	
					21	<0.02	
					28	<0.02	
		4	0.19-0.20	0.067	0	<0.02	0296-93
					7	<0.02	
					14	<0.02	
					21	<0.02	
					28	<0.02	
		4	0.19-0.20	0.067	0	0.02/0.02	0298-93/
					28	<0.02/<0.02	0299-93
Spain (1991)	250 EC	2	0.50	0.05	14	<0.02	SPA-505-91
		2	0.50	0.05	14	0.02	SPA-707-91

Cucumbers (Table 12). In two trials in Italy according to the proposed rate (1-4 x 0.125 kg ai/ha) the residues were below the LOD (0.02 mg/kg) after 7 days. In five indoor trials in Spain according to GAP (1-3 x 0.2-0.3 kg ai/ha) the residues at a PHI of 7 days were 0.03-0.19 mg/kg.

Table 12. Residues of tebuconazole in cucumbers. Whole cucumbers analysed.

Country, Report No. (year)	Application				PHI,	Residues,	Trial
	Product	No	kg ai/ha	kg ai/hl	days	mg/kg	Reference
Italy RA-2066/93	25 WG	5	0.1	0.01	0	0.05	0028-93
					3	<0.02	

Country, Report No. (year)	Application				PHI,	Residues,	Trial
	Product	No	kg ai/ha	kg ai/hl	days	mg/kg	Reference
(1993)					7 10	<0.02 <0.02	
		5	0.1	0.01	0 7	0.08 <0.02	0294-93
Spain[1] RA-2022/92 (1992)	50 WP	3	0.3	0.02	0 3 7 10	0.47/0.24 0.23/ 0.19/0.08 0.10/0.04	0154-92/ 0156-92
		3	0.3	0.02	0 3 7 10	0.50 0.20 0.10 0.06	0155-92
RA-2071/93 (1993)		3	0.2-0.29	0.02	0 3 5 7 10	0.12 0.07 0.06 0.03 0.03	0355-93
		3	0.2-0.29	0.02	0 3 7	0.30 0.09 0.03	0356-93

[1]Indoor

Sweet peppers (Table 13). In three trials in Spain according to GAP (1-3 applications of 0.2-0.3 kg ai/ha) the residues were 0.07-0.14 mg/kg at a PHI of 7 days.

Table 13. Residues of tebuconazole in sweet peppers in Spain from 2 applications of 0.2 kg ai/ha of 50 WP (0.02 kg ai/hl). Whole peppers analysed.

Report No. (year)	PHI days	Sample analysed	Residues mg/kg	Trial Reference
RA-2022/92 (1992)	0 3 7 10	fruit	0.19 0.13 0.13 0.10	0151-92
	0 3 7 10	fruit	0.20 0.19 0.14 0.14	0152-92
	0 7 11	fruit	0.42 0.07 0.05	0153-92

Barley (Table 14). In eleven trials in the USA, seed was treated once at the GAP application rate of 0.0020 (10 trials) or 0.024 kg ai/100 kg (one trial). At harvest (81 to 129 days) the residues in the grain were below the LOD (0.01 or 0.02 mg/kg).

Table 14. Residues of tebuconazole in barley in the USA (CA, ID, MN, NE and WA) from 1 seed treatment.

Report No. (year)	Application Product	kg ai/100kg	PHI, days	Sample	Residues, mg/kg	Trial Reference
MR103841	31 FS	0.0020	44	forage	<0.03	FCA-FR044-91H
(1992)		0.0020	42	forage	<0.03	HIN-FR064-91H
			110	grain	≤0.02	
			110	straw	<0.05	
		0.0020	59	forage	<0.03	251-FR041-91H
			95	grain	≤0.02	
			95	straw	<0.05	
		0.0020	34	forage	<0.03	252-FR065-91H
			105	grain	≤0.02	
			105	straw	<0.05	
		0.0020	48	forage	<0.03	452-FR042-91H
			126	grain	≤0.02	
			126	straw	<0.05	
		0.0020	85	forage	<0.03	454-FR043-91
			129	grain	≤0.02	
			129	straw	<0.05	
MR99125 (1991)	312 SC	0.024	58	forage	<0.01	457-FR007-88H
			58	hay	0.27	
			93	grain	<0.01	
			93	straw	0.02	
		0.0020	38	forage	<0.01	251-FR003-88H
			40	hay	<0.01	
			81	grain	≤0.01	
			81	straw	<0.01	
		0.0020	31	forage	<0.01	452-FR004-88H
			36	hay	<0.01	
			98	grain	≤0.01	
			98	straw	<0.01	
		0.0020	60	forage	<0.01	453-FR005-88H
			60	hay	<0.01	
			104	grain	≤0.01	
			104	straw	0.04	
		0.0020	39	forage	<0.01	454-FR006-88H
			39	hay	<0.01	
			111	grain	≤0.01	
			111	straw	<0.01	

Oats (Table 15). In eleven trials in the USA according to GAP the residues in the grain at harvest (78 to 122 days) were below the LOD (0.01 mg/kg).

Table 15. Residues of tebuconazole in oats in the USA (IA, IL, IN, KS, MN, NE, NY, TX and WI). All trials with 1 seed treatment of 0.0020 kg ai/100kg.

Report No. (year)	Product applied	PHI, days	Sample	Residues, mg/kg	Trial Reference
MR103939 (1992)	31 FS	42	forage	<0.02	HIN-FR066-91H
		110	grain	≤0.01	
		110	straw	<0.06	
		59	forage	<0.02	251-FR045-91H
		95	grain	<0.01	
		95	straw	≤0.06	
		38	forage	<0.02	252-FR049-91H
		105	grain	≤0.01	
		105	straw	<0.06	

Report No. (year)	Product applied	PHI, days	Sample	Residues, mg/kg	Trial Reference
		39	forage	<0.02	255-FR046-91H
		105	grain	≤0.01	
		105	straw	<0.06	
		53	forage	<0.02	353-FR048-91H
		109	grain	≤0.01	
		109	straw	<0.06	
		30	forage	<0.02	853-FR047-91H
		83	grain	≤0.01	
		83	straw	<0.06	
MR99124 (1989)	312 SC	55	forage	<0.01	HIN-FR012-88H
		55	hay	<0.01	
		105	grain	≤0.01	
		105	straw	<0.01	
		57	forage	<0.01	STF-FR013-88H
		60	hay	<0.01	
		122	grain	≤0.01	
		122	straw	<0.01	
		51	forage	<0.01	151-FR009-88H
		51	hay	<0.01	
		120	grain	≤0.01	
		120	straw	<0.01	
		38	forage	<0.01	251-FR010-88H
		40	hay	0.02	
		88	grain	≤0.01	
		88	straw	<0.01	
		36	forage	<0.01	851-FR011-88H
		36	hay	<0.01	
		78	grain	≤0.01	
		78	straw	<0.01	

Wheat (Table 16). Six trials in the USA were according to GAP. At harvest (81 to 275 days) the residues in the grain were below the LOD (0.01/0.04 mg/kg).

Table 16. Residues of tebuconazole in wheat in the USA (IN, ID, MN and WA) from 1 seed treatment at 0.002 kg ai/100kg.

Report No. (year)	Application Product	PHI, days	Sample	Residues, mg/kg	Trial Reference
MR103917 (1992)	31 FS	192	forage	<0.02	HIN-FR028-91H
		275	grain/straw	≤0.04/<0.05	
		61	forage	<0.02	454-FR026-91H
		160	grain/straw	≤0.04/<0.05	
		59	forage	<0.02	851-FR032-91H
		95	grain/straw	≤0.04/<0.05	
MR98555 (1991)	312 SC	38	forage	0.04	251-FR001-88H
		40	hay	0.08	
		81	grain/straw	≤0.01/<0.01	
		31	forage	<0.01	452-FR002-88H
		36	hay	<0.01	
		98	grain	≤0.01	
		89	straw	<0.01	
		39	forage/hay	<0.01/ <0.01	454-FR042-88H
		111	grain/straw	≤0.01/ <0.01	

Peanuts (Table 17). In thirteen trials in the USA the number and rate of applications were above GAP (1-4 applications of 0.23 kg ai/ha). Residues in the kernels were from below the LOD (0.01 and 0.05 mg/kg) to 0.08 mg/kg after 7 to 14 days (the GAP PHI).

Table 17. Residues of tebuconazole in peanuts in the USA (AL, FL, GA, MS, OK and TX) from 7 applications of 3.6 F formulation.

Report No. (year)	Application		PHI	Sample	Residues,	Trial
	kg ai/ha	kg ai/hl	days		mg/kg[1]	Reference
MR 99129 (1991)	0.25	0.11 -0.13	5 14	kernels/hulls/hay	<0.02/0.38/10.6 <0.01/0.17/12.5	352-FR046-88D
	0.25	0.17-0.27	7 14	kernels/hulls/hay	0.04/0.08/28.8 0.08/1.8/17.0	353-FR047-88D
	0.25	0.17-0.27	7 14	kernels/hulls/hay	<0.01/0.18/2.5 <0.01/0.27/1.8	754-FR049-88D
	0.25	0.17-0.27	7 14	kernels/hulls/hay	0.05/2.0/8.4 0.03/2.2/5.0	BMS-FR050-88D
	0.26- 0.29	0.12 -0.14	3 7	kernels/hulls/hay	0.02/0.54/14.4 0.01/0.71/20.6	TGA-FR051-88D
MR100073 (1991)	0.25	0.13 -0.68	7 14	kernels/hulls/hay	0.05/0.56/7.9 0.03/0.37/5.1	VBL-FR042-89D
	0.25	0.53	6 13	kernels/hulls/hay	0.04/0.54/2.4 0.03/0.49/18.3	352-FR043-89D
	0.25	0.13 -0.68	7 14	kernels/hulls/hay	<0.01/0.02/10.9 <0.01/0.14/3.7	353-FR044-89D
	0.25	0.13 -0.68	7 14	kernels/hulls/hay	0.01/0.46/13.6 <0.01/0.45/11.3	TGA-FR045-89D
MR101344 (1991)	0.25 -0.30	0.12 -0.27	7 14	kernels/hulls/hay	<0.05/1.8/22.3 <0.05/1.2/9.1	353-FR016-90D
	0.25 -0.30	0.12 -0.27	7 14	kernels/hulls/hay	0.05/0.5/18.0 <0.05/0.55/15.5	751-FR017-90D
	0.25-0.30[2]	0.12 -0.27	7 14	kernels/hulls/hay	<0.05/0.28/13.4 <0.05/0.46/8.6	TGA-FR019-90D
	0.25 -0.30	0.12 -0.27	7 14	kernels/hulls/hay	0.05/0.79/13.9 <0.05/0.85/9.4	VBL-FR020-90D

[1]Although the trials exceeded GAP conditions, they were considered for estimating maximum residue levels
[2] The first two applications were at 0.057 kg ai/ha and 0.027 kg ai/hl

FATE OF RESIDUES IN STORAGE AND PROCESSING

In storage

No data were available

In processing

The trials reported in 1994 have been supplemented by trials on plums, grapes and peanuts.

Plums. Plum trees were treated three times with 0.25 kg ai/ha of a 25 WG formulation of tebuconazole. The initial residue (day 0) was 0.09 mg/kg. In the plums taken for processing (day 7) it was 0.03 mg/kg.

The plums were washed and stoned with a plum stoner. Plum jam was prepared on a household scale by cooking crushed plums with sugar. The industrial production of plum preserve was simulated on a laboratory scale. Washed, stoned and cut plums were autoclaved together with a sugar solution in preserving pans (4 minutes at 90°C). The preparation of dried prunes also simulated industrial processing. Washed plums were blanched, dipped in a potassium carbonate solution and oven-dried for 14-20 hours at 70-75°C. The results are shown in Table 18.

Table 18. Tebuconazole residues and processing factors in plums and processed products.

Product	Residue (mg/kg)	PF
Raw plums	0.03	--
Washed plums	0.02	0.7
Jam	0.03	1
Preserve	<0.02	<0.7
Dried prunes	0.14	4.7

Grapes. Grapes were treated four times with 0.25 kg ai/ha of a 45 WG formulation of tebuconazole. Samples for processing were taken immediately after the last application. The residues in the unprocessed grapes was 0.16 mg/kg. The grapes were processed to raisins (sun- and oven-dried), raisin waste (sun- and oven-dried), wet and dried pomace, and juice. Oven-drying was at 60ºC.

The preparation of grape juice involved separation of the stems, crushing the berries, enzymatic depectinization of the crushed berries, finishing or pressing, clarification after heating to about 80°C and settling for 4 to 6 weeks, separation by decantation, filtration, and canning after heating to about 90°C. The pomace resulting from finishing or pressing was dried in an air drier at about 60°C. The results are shown in Table 19.

Table 19. Tebuconazole residues and processing factors in grapes and processed products

Product	Residue (mg/kg)	PF
Grapes	0.16	--
Raisins, Sun- oven-dried	0.14 0.21	0.9 1.3
Raisin waste Sun- oven-dried	0.64 1.7	4 10.6
Pomace, wet dried	1.2 3.5	7.5 21.9
Juice	<0.08	<0.5

Three supervised trials in Germany followed by processing to must, wine and juice were reported in the 1994 monograph. The manufacturer resubmitted the data (Table 20) as the original figures were incorrect. The processing factors for must, juice and wine varied from 0.04 or <0.05 to 0.22.

Table 20. Effect on residues of processing grapes treated with 1 to 3 applications of 0.3-0.625 kg ai/ha 50 WG, PHI 49 days. Germany, 1989. Revised results.

Trial No.	Residues, mg/kg				
	Fruit	Must	Juice	Wine	Processing factor Must/Juice/Wine
0260-89	1.0	0.13	0.06	0.15	0.13/0.06/0.15
0261-89	0.46	0.07	0.02	0.07	0.15/0.04/0.15
0262-89	0.36	0.08	<0.02	0.05	0.22/<0.05/0.14

Peanuts. Plants were treated four times with Folicur 432 SC at an application rate of 1.26 kg ai/ha, five times the maximum allowed seasonal rate, to produce measurable residues. The plants were dug up 14 days after the last application and allowed to dry in the field for six days before final harvesting. The residues in unprocessed peanuts were 0.07 mg/kg.

Peanut meal, crude oil, soapstock and refined oil were produced by procedures simulating commercial processing. The peanuts were mechanically hulled and pressed, yielding crude oil and presscake. The presscake was extracted to leave peanut meal and the crude oil was treated with sodium hydroxide to yield soapstock and alkali-treated oil. Refined oil was produced by bleaching and deodorising the alkali-treated oil. The results are shown in Table 20.

Table 21. Tebuconazole residues and processing factors in peanuts and processed products.

Product	Residue, mg/kg	PF
Nut meat	0.07	--
Meal	0.06	0.86
Soapstock	0.24	3.4
Crude oil	0.14	2.0
Refined oil	<0.01	<0.14

NATIONAL MAXIMUM RESIDUE LIMITS

In addition to those reported in 1994, the following national MRLs were reported to the Meeting.

Country	Commodity	MRL, mg/kg
Argentina	Barley, Oats	0.2
	Potato	0.01
Brazil	Bean, Garlic, Guava, Melon, Onion, Peanut, Pumpkin, Strawberry	0.1
	Beetroot	0.2
	Carrot	0.6
	Citrus fruit	5.0
	Grape	2.0
Cuba	Banana	0.2
Czech, Republic	Barley	0.05
	Barley straw	5.0
France	Apple	0.2
	Apricot	0.3
	Barley, Buckwheat (common), Oats, Rape, Rye, Triticale, Wheat	0.05
	Barley straw, Wheat straw	4.0

Country	Commodity	MRL, mg/kg
	Grape	0.5
	Peach	0.3 T
	Pea (field)	0.1 T
Italy	Apple, Pear	0.1
	Apricot	0.2 T
	Barley, Wheat	0.05 T
	Grape	1.0 T
	Peach	0.1 T
Japan	Apple, Banana, Barley, Onion, Pea (garden), Potato, Rye	0.2 T
	Apricot, Cherry	0.3 T
	Asparagus, Citrus fruit, Sugar beet, Grape fruit, Hop, Lemon, Lime, Maize, Mandarin, Mushroom, Oil plants(seed), Orange, Orange (Japanese summer), Strawberry, Sugar cane, Tea	0.05 T
	Aubergine, Sweet pepper, Wheat, Wheat flour	0.5 T
	Cucumber	0.02 T
	Ginger, Tomato, Spinach	1.0 T
	Grape	2.0 T
	Peanut, Japanese radish (root)	0.1 T
Netherlands	All food	0.05*
New Zealand	Rye grass (seed crops)	0.1
South Africa	Tomato	0.1
	Grape	0.5
	Mango	0.05
	Potato	0.2
USA	Banana, Barley, Oats, Wheat	0.05
	Barley (forage, hay and straw), Oats (forage, hay and straw), Wheat (forage, hay and straw), Peanut	0.1
	Cattle (kidney, liver and meat by-products)	0.2 T[1]
	Cherry, Peanut hull	4.0
	Grass (forage)	8.0[1]
	Grass (hay)	25.0[1]
	Milk	0.1[1]
	Nectarine, Peach	1.0

[1]Sum of tebuconazole (*RS*)-1-*p*-chlorophenyl-4,4-dimethyl-3-(1*H*-1,2,3-triazol-1-ylmethyl)pentane-3,5-diol (HWG 2061)
T: Temporary MRL

APPRAISAL

Tebuconazole is a triazole fungicide used as a seed dressing and spray. It was first evaluated in 1994 when use patterns, methods of residue analysis, results from supervised trials, studies of metabolism and environmental fate, and storage and processing data were reported by the manufacturer. MRLs were recommended for barley, barley straw and fodder, grapes, peanut, peanut fodder, rape seed, rye, rye straw and fodder, summer squash, tomatoes, wheat, wheat straw and fodder, cattle edible offal, meat and milk, and chicken edible offal, eggs and meat. In studies of metabolism in wheat, grapes and peanuts, tebuconazole was the significant residue. Information received since the 1994 evaluation was reviewed by the present Meeting.

New methods of analysis of plant materials and soil were reported. After extraction with organic solvents and clean-up on Florisil, C-18 or silica columns, and/or gel permeation chromatography, tebuconazole is determined by gas chromatography with a nitrogen-phosphorus detector. In some cases, no clean-up step was required. The limits of determination were 0.01-0.05 mg/kg.

Two hundred and eighteen trials were reported to the Meeting, with information on registered uses on the relevant crops. Processing studies were on plums, grapes and peanuts.

The Meeting concluded that the definition of the residue for compliance with MRLs and for estimations of dietary intake should be tebuconazole.

Supervised trials

Pome fruits

GAP is established for the use of tebuconazole on apples in Brazil, France and Indonesia and on apples and pears in Italy, Israel, Turkey and Spain. PHIs vary from 10 to 30 days. There are proposed uses on apples and pears in the USA and apples in Germany in which the recommended PHIs are 75 and 56 days respectively. Results from trials on pome fruits show that residues decrease continuously with time after sprayed applications of tebuconazole.

Apples. In one trial in Brazil, two in Italy and one in Spain according to local GAP (1 to 6 applications of 0.09-0.23 mg/kg ai/ha) the residues at a PHI of 20-21 or 28 days in rank order were 0.12, 0.13, 0.18 and 0.20 mg/kg. In one further trial in France according to current GAP which was reported to the 1994 Meeting, the residue at a PHI of 21 days was 0.06 mg/kg. In three trials in Brazil, two in France and ten in Korea with more applications and/or higher rates (up to 1.25 kg ai/ha) than recommended GAP the residues varied from 0.04-0.5 mg/kg with PHIs of 14 to 35 days.

In two trials in Canada, 18 in the USA and 11 in Germany with applications below, at, or above proposed GAP rates in Germany and the USA (1-6 x 0.1-0.25 kg ai/ha) most residues were below the LOD of 0.01-0.02 mg/kg, with 7 values of 0.02-0.04 mg/kg at PHIs of 56 days or longer.

Pears. In one trial in Spain according to GAP (4-6 applications of 0.1-0.15 kg ai/ha) the residue was 0.09 mg/kg at a PHI of 21 days. In six trials in the USA at or below the proposed rates the residues varied from below the LOD (0.01 mg/kg) to 0.03 mg/kg after PHIs of 63 to 106 days.

Three trials in Italy according to GAP (1-4 applications of 0.15-0.28 kg ai/ha, PHI 15 days) and one trial in France according to Spanish GAP were reported in 1994. The residues in Italy were 0.43, 0.12 and 0.20 mg/kg after 14, 10 and 10 days respectively, and in France <0.05 mg/kg after 14 and 30 days. As the residues in the pears appeared to decrease slowly the residues after 10 and 15 days would probably be similar.

As GAP for apples and pears is similar in countries with registrations for both the residues from trials according to GAP in the two crops can be considered to form a single population. The residues from trials according to established GAP in rank order (median underlined) were <0.05, 0.06, 0.09, 0.12 (2) 0.13, 0.18, 0.20 (2) and 0.43 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg and an STMR of 0.12 mg/kg for pome fruits.

Stone fruits

Tebuconazole is registered for use on peaches in Chile, France, Italy and Peru, on plums in Israel and on peaches and cherries in the USA. PHIs vary from 0 in the USA to 35 days in Chile. The results from trials on stone fruit show that residues after spray applications decrease steadily and fairly slowly.

Cherries. Tebuconazole is registered for use on cherries only in the USA. In five trials in Italy at or below proposed Italian GAP (1 or 2 applications of 0.28 kg ai/ha) the residues in the fruit with and without stone were 0.18-0.50 mg/kg after 5 to 7 days.

GAP in the USA allows 1-6 applications at a nominal rate of 0.25 kg ai/ha with a 0-day PHI. Twelve trials were carried out at a nominal rate of 0.19 kg ai/ha, the actual rate depending on the size of the trees. The residues at a PHI of 0 days in rank order were 0.09, 0.19, 0.31, 0.40, 0.41, 0.53, 0.61, 0.76 (median), 0.92, 1.2, 1.4 and 3.1 mg/kg (the last from 7 applications). The residues shown bold were from the highest actual application rates and have been used to estimate an STMR. The residue in another trial at half the application rate was 1.0 mg/kg at a 0-day PHI.

The Meeting estimated a maximum residue level of 5 mg/kg and an STMR of 0.76 mg/kg.

Peaches and nectarines. Two trials on peaches in France and one on peaches and two on nectarines in Italy were according to Italian GAP (1 or 2 x 0.15-0.3 kg ai/ha). The residues were below the LOD (0.02 mg/kg) to 0.17 mg/kg in stoned or whole fruit at a PHI of 7 to 10 days. In four trials on peaches in France according to current GAP, reported in 1994, the residues in stoned and whole fruit at a PHI of 7 days varied from 0.03-0.22 mg/kg.

In eight trials on peaches in the USA according to GAP (0.25 kg ai/ha) the residues in whole fruit at a PHI of 0 days were 0.20-0.81 mg/kg, and in one trial with an application below the GAP rate the residue was 0.04 mg/kg.

Residues from trials according to GAP in whole and stoned peaches in rank order were 0.03, 0.05, 0.11 (2), 0.13, 0.20, 0.21, 0.22, 0.26, 0.34, 0.44, 0.46 and 0.81 mg/kg.

The Meeting estimated a maximum residue level of 1 mg/kg and an STMR of 0.21 mg/kg for peaches.

Plums. Only Israel has a registered use for tebuconazole on plums. There is a proposed use in France.

In France the residues in the stoned or whole fruit from nine trials at a higher rate or spray concentration than the proposed use (1-3 applications of 0.13-0.15 kg ai/ha) were 0.03-0.38 mg/kg at a PHI of 7 days. In ten further trials according to the proposed use the residues were below the LOD (0.01 or 0.02 mg/kg) to 0.1 mg/kg after PHIs of 7 to 79 days.

As no trials according to approved GAP were reported, the Meeting could not estimate a maximum residue level.

Grapes. Tebuconazole is registered for use on grapes in Brazil, Chile, France, Germany, Israel, Italy, Spain and South Africa. The 1994 JMPR recommended an MRL of 2 mg/kg.

In 14 trials in the USA at the use pattern for which registration has been applied and a PHI of 14 days the residues were between 0.10 and 1.7 mg/kg, and in one further trial 4.0 mg/kg at 13 days.

As no additional results from trials according to GAP were reported, the Meeting made no change to the previous recommendation.

Bananas. Tebuconazole is registered for use on bananas in Australia, Cameroon, Colombia, Costa Rica, Ecuador, Guatemala, Honduras, Indonesia, the Ivory Coast, Nicaragua, the Philippines and the USA. A PHI of 0 or 1 day is recommended in all these countries.

In one trial in Australia and seven in the USA according to national GAP (5-7 applications of 0.1 kg ai/ha, bagged bananas) the residues in the whole fruit were <0.01 (6), 0.01 and 0.03 mg/kg and in the pulp <0.01 (5) and <0.05 mg/kg. Three other trials in Australia, one at a lower and two at a higher rate, gave similar results and could be used to support the results in the trials according to GAP. Two trials on unbagged bananas gave residues of 0.16 mg/kg in the whole fruit at a PHI of 1 day. Two trials in Brazil giving residues in the pulp below the LOD (0.1 mg/kg) after 14 days could not be evaluated owing to the lack of information on GAP.

The Meeting estimated a maximum residue level of 0.05 mg/kg and an STMR (based on residues in the pulp) of 0.01 mg/kg for tebuconazole in bananas.

Bulb vegetables

Tebuconazole is registered for use on garlic and onions in Brazil, Israel, and Spain (soil drench) and on onions in New Zealand and South Africa.

Garlic. In one trial in Brazil approximating GAP (1-4 applications of 0.25 kg ai/ha) and three others at a higher rate or with 6 applications the residues were below the LOD (0.05 mg/kg) after the GAP PHI of 14 days. Five trials in France according to proposed GAP gave residues from below the LOD (0.02 mg/kg) to 0.06 mg/kg after a PHI of 21 days.

In seven trials in Korea at various application rates and with spray or soil drench applications the residues were below the LOD after 275 days to 1.4 mg/kg after 51 days. No GAP was available with which to evaluate the trials.

The data from trials according to GAP were insufficient to estimate a maximum residue level.

Onions. In one trial in France, one in Germany, one in Italy and four in The Netherlands, at or close to the proposed German use pattern (1-2 foliar applications of 0.25 kg ai/ha), and in four trials in Brazil which exceeded GAP conditions (1-4 x 0.25 kg ai/ha) the residues after 14-28 days were below the LOD (0.02, 0.05, or 0.1 mg/kg) to 0.3 mg/kg. In Spain, where soil drench application is recommended, two trials with foliar applications gave residues at or below the LOD (0.02 mg/kg) after 14 days.

In two trials in New Zealand according to GAP (2-3 foliar applications of 0.38 kg ai/ha), the residues were 0.14 mg/kg at day 28 and below the LOD (0.05 mg/kg) after 76 days. The GAP PHI is 35 days. In two trials in Australia with 1 or 2 applications of 0.5 kg ai/ha, the residues were below the LOD (0.01 mg/kg) and 0.3 mg/kg after 79 and 154 days respectively.

There were insufficient data from trials according to GAP to estimate a maximum residue level.

Cucumbers. Tebuconazole is registered for use on cucumbers in Chile, Israel and Spain. PHIs vary from 7 to 35 days. There is a proposed use in Italy.

In two trials in Italy according to the proposed rate (1-4 applications of 0.125 kg ai/ha), the residues at a PHI of 7 days were below the LOD (0.02 mg/kg). Eight trials were in Spain according to current GAP (1-3 applications of 0.2-0.3 kg ai/ha), five indoor trials reported to the present Meeting and three field trials reported to the 1994 Meeting. The residues at a PHI of 7 days in rank order were <0.02, 0.02, 0.03 (2), 0.04, 0.08, 0.10 and 0.19 mg/kg.

The Meeting estimated a maximum residue level of 0.2 mg/kg and an STMR of 0.035 mg/kg.

Sweet peppers. Tebuconazole is registered for use on sweet peppers only in Spain, with 1-3 applications of 0.2-0.3 kg ai/ha.

In three trials in Spain reported to the present Meeting and four reported in 1994, all according to current GAP, the residues at a PHI of 7 days in rank order were 0.07, 0.13, 0.14 (2), 0.18, 0.23 and 0.36 mg/kg.

The Meeting estimated a maximum residue level of 0.5 mg/kg and an STMR of 0.14 mg/kg.

Cereal grains

Tebuconazole is registered for use on barley, oats and/or wheat as a seed or foliar treatment in many countries, including Australia, Spain, South Africa, Germany, the UK and the USA.

Barley. The 1994 JMPR recommended an MRL of 0.2 mg/kg based on residues from foliar applications.

In nine trials in the USA with seed treatment according to GAP the residues in grain samples were below the LOD (<0.01 (4) and 0.02 (5) mg/kg) at harvest (81 to 129 days). In one trial a 12-fold rate gave a residue of <0.01 mg/kg.

The Meeting did not change the 1994 estimate of 0.2 mg/kg as a maximum residue level.

Oats. In eleven trials with seed treatment in the USA according to GAP, all residues in grain samples were below the LOD (0.01 mg/kg) at harvest (78 to 122 days). The residues in straw and forage were also all below the LOD (0.01, 0.02 or 0.06 mg/kg). Residues in hay, determined in 5 trials, were <0.01 mg/kg in 4 trials and 0.02 mg/kg in the fifth.

Residues in the grain from trials with foliar treatments according to GAP (two in Australia and one in Sweden) reported to the 1994 Meeting were 0.06, 0.09 and 0.12 mg/kg.

On the basis of the US trials and the practical LOD for rye of 0.05 mg/kg indicated by the 1994 JMPR, the Meeting estimated a maximum residue level of 0.05* mg/kg for tebuconazole in oats. As the residues in straw, forage and hay from seed treatments were also below the LOD, except in one sample of hay, the Meeting estimated an STMR of 0 mg/kg for tebuconazole in oats. The Meeting recognized that these estimates would not accommodate foliar applications.

Wheat. The 1994 JMPR recommended an MRL of 0.05 mg/kg on the basis of residues from foliar applications.

In six trials with seed treatment according to GAP in the USA, the residues in grain samples at harvest (81 to 275 days) were below the LOD (0.01 or 0.04 mg/kg). The residues in 13 trials with foliar treatment in Germany and the UK reported to the 1994 JMPR, according to GAP at that time, were <0.05 mg/kg.

The Meeting confirmed the previous recommendation of 0.05 mg/kg as an MRL.

Peanuts. Tebuconazole is registered for use on peanuts in Australia, Argentina, Brazil, Guatemala, Indonesia, Israel, Nicaragua, South Africa and the USA. The 1994 JMPR recommended an MRL of 0.05 mg/kg.

In thirteen US trials with 7 applications, instead of the 4 allowed by GAP, at rates slightly above the authorized 0.23 kg ai/ha, the residues in the kernels at or about the GAP PHI of 14 days in rank order were <0.01 (4), 0.01, 0.03 (3), <0.05 (4) and 0.08 mg/kg.

The Meeting confirmed the 1994 JMPR recommendation, as it is unlikely that residues would exceed 0.05 mg/kg.

Processing

Plums. Plum trees were treated three times with 0.25 kg ai/ha. In a processing study of samples taken after 7 days residues were reduced by a factor of 0.7 in washed and preserved plums, remained unchanged in jam and were increased by a factor of 4.7 in dried prunes. The Meeting agreed that one study was not sufficient to estimate processing factors.

Grapes. Grapes taken after the last of four applications of 0.25 kg ai/ha were processed. Processing factors were 0.9 and 1.3 for sun- and oven-dried raisins respectively, <0.5 for juice, 4 and 10.6 for sun- and oven-dried raisin waste, 7.5 for wet pomace and 21.9 for dry pomace. Processing studies reviewed by the 1994 JMPR showed processing factors of 1.4 and 1.2 for sun- and oven-dried raisins, 0.04, <0.05, 0.06 and 0.4 for juice, 2.7 and 1.5 for sun- and oven-dried raisin waste, and 1.8 and 5.8 for wet and dry pomace.

Residues in grapes, must and wine were determined in 37 trials reported to the 1994 JMPR (2 to 5 applications of 0.3-0.625 kg ai/ha). In three of these trials juice was also analysed but the results were reported incorrectly by the company in 1994; the correct values were supplied for the present Meeting. The mean and individual processing factors from all the trials were juice <0.21 (0.04, <0.05, 0.06, 0.4, <0.5), raisins 1.2 (0.9, 1.2, 1.3, 1.4), raisin waste 4.7 (4, 10.6, 2.7, 1.5), wet pomace 4.7 (1.8, 7.5), dry pomace 13.9 (5.8, 21.9), must 0.36 (range 0.12-0.78), wine 0.25 (range 0.05-0.78).

On the basis of the draft MRL of 2 mg/kg for grapes and the processing factor of 1.2 for raisins, the Meeting estimated a maximum residue level of 3 mg/kg for tebuconazole in dried grapes.

Peanuts. Plants treated at 5 times the maximum rate gave processing factors of 0.9 for peanut meal, 3.4 for soapstock, 2.0 for crude oil and 0.1 for refined oil. The Meeting agreed that one study was not sufficient to estimate processing factors for peanut products.

RECOMMENDATIONS

The Meeting recommends the estimated residue levels shown below to be used as maximum residue limits (MRL) and for dietary intake calculation of tebuconazole in oats:

Definition of residue for estimation of maximum residue and dietary intake levels: tebuconazole

CCN	Commodity	MRL, mg/kg	PHI, days	STMR, mg/kg
Fl 0327	Banana	0.05	0/1	0.01[a]
FS 0013	Cherries	5	0	0.76
VC 0424	Cucumber	0.2	7	0.035
DF 0269	Dried Grapes	3	7	
GC 0647	Oats	0.05*	78-122	0
FS 0247	Peaches	1	0/7	0.1
FP 009	Pome fruits	0.5	15/21	0.12
VO 0445	Sweet Peppers	0.5	7	0.14

a. based on residues on edible portions.

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