UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

01/08/99

MEMORANDUM

SUBJECT: Malathion: PC Code 057701, Case 0248. Magnitude of Residues in/on avocados, beans (dry), blueberries, grapes, grasses, onions (dry bulb), onions (green), rice, spring wheat, winter wheat (OPPTS 860.1500) and an orange processing study (OPPTS 860.1520), DP Barcode Nos. D208772, D208242, D208233, D209529 and D210188.

FROM: Manying Xue, Chemist
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THROUGH: Francis B. Suhre, Branch Senior Scientist
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TO: Paula Deschamp, Biologist
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Attached is a review of field trial data depicting the magnitude of residues of malathion and malaoxon in/on avocados (1994, MRID 43383501), beans, dry (1994, MRID 43417601), blueberries (1994, MRID 43372601), grapes (1994, MRID 43383401), grasses (1994, MRID 43362601), onions, dry bulb (1994, MRID 43350401), onions, green (1994, MRID 43383301), rice (1994, MRID 43468101), spring wheat (1994, MRID 43414901), and winter wheat (1994, MRID 43350402). In addition, an orange processing study (1994, MRID 43451701) was submitted and reviewed.

The review was prepared by Dynamac Corporation under contract to HED. The adequacy in fulfilling residue chemistry data requirements was evaluated for malathion reregistration. This information has undergone secondary review in CEB1 and has been revised to reflect Agency's policy.

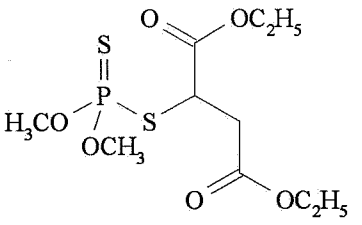
(1)

The submitted field residue data for all the commodities are adequate provided appropriate label revisions are made for malathion reregistration. Additional field trial data for wheat hay are required. The data demonstrated that combined residues of malathion and malaoxon did not exceed the established tolerances in/on most submitted commodities; the exceptions are grass forage, grass hay and rice grain. CEB1 has also reassessed tolerances for all the commodities in this submission (see recommendation section).

In addition, a tolerance for rice hulls has been assessed at 150 ppm based on the rice field trial data (MRID 43468101) and rice processing study (MRID 43562301).

cc: Xue, Malathion List A File, SF, RF, D. Lateulere (SRRD)
RDI: ResChemTeam: 01/07/99 :FBSuhre 01/08/99
7509C: CEBI: Mxue :CM-2: RM 816F: 703 305-6198: 01/08/99

MALATHION



PC No. 057701; Case 0248

(DP Barcode D208772)
(DP Barcode D208242)
(DP Barcode D208233)
(DP Barcode D209529)
(DP Barcode D210188)

REGISTRANT'S RESPONSE TO RESIDUE CHEMISTRY DATA REQUIREMENTS

BACKGROUND

In response to the Malathion Reregistration Standard Guidance Document, dated 2/88, Cheminova Agro A/S, through its authorized representatives Jellinek, Schwartz & Connolly, Inc., submitted field residue data for: avocados (1994, MRID 43383501), beans, dry (1994, MRID 43417601), blueberries (1994, MRID 43372601), grapes (1994, MRID 43383401), grasses (1994, MRID 43362601), onions, dry bulb (1994, MRID 43350401), onions, green (1994, MRID 43383301), rice (1994, MRID 43468101), spring wheat (1994, MRID 43414901), and winter wheat (1994, MRID 43350402). In addition, an orange processing study (1994, MRID 43451701) has also been submitted. We note that MRID 43468101 (field residue data for rice) was submitted to replace MRID 43366601 (submitted under DP Barcode D208242). Some of these references were also submitted in compliance with FIFRA Section 6(a)(2) to report detectable residues of malaoxon in/on some commodities following malathion applications according to registered uses. Data from these submissions are evaluated herein for adequacy in fulfilling residue chemistry data requirements for the reregistration of malathion. The Conclusions and Recommendations stated below pertain only to the above submissions.

Tolerances for residues in/on food/feed commodities are currently expressed in terms of malathion *per se* (*O,O*-dimethyl dithiophosphate of diethyl mercaptosuccinate) [40 CFR §180.111, §185.3850, §185.7000, and §186.3850]. The HED Metabolism Committee has

determined that the parent compound malathion and the metabolite malaoxon are the compounds to be regulated in plant commodities.

CONCLUSIONS

Magnitude of the Residue in Plants

Avocados

1a. The submitted field residue data (MRID 43383501) for avocados are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use pattern for use of the EC formulation on avocados, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for avocados. The combined residues of malathion and malaoxon were <0.08ppm in/on avocados harvested 7 days following the last of two foliar applications, with a 30-day retreatment interval, using the 5 lb/gal EC formulation at 4.7 lb ai/A/application in 200 gal of water/A with ground equipment.

1b. Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for avocados will be required for reregistration purposes. The available data will support a maximum of two foliar applications per growing season, with a 30-day retreatment interval and a 7-day PHI, using the 5lb/gal EC formulation at 4.7 lb ai/A/application in 200 gal of water/A with ground equipment.

Beans, dry

2a. The submitted field residue data (MRID 43417601) for beans (dry) are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use pattern for use of the RTU formulation on dry beans, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for beans. The combined residues of malathion and malaoxon were <0.02-0.74 ppm in/on mature dry beans harvested 1 day following the last of three foliar applications, with ~7-day retreatment intervals, of the 9.79 lb/gal RTU formulation using aerial ULV equipment at 0.61 lb ai/A/application. The maximum combined residues of malathion and malaoxon of 1.27 ppm were obtained from dry bean samples harvested 4 days following the above described treatment regime.

2b. No field residue data are available for beans forage and bean hay; however, the Agency has concluded that the only bean that significant source of animal feed are are cowpeas (Table 1 in OPPTS 860.1000, Residue Chemistry Test Guidelines). Therefore, no further field trials are required for beans provided that the labels of all products used on beans are amended to state that the use of malathion is restricted to beans grown for

human consumption only. The established tolerances on cowpeas forage and hay should be revoked contingent upon this label amendment.

Blueberries

4a. The submitted field residue data (MRID 43372601) for blueberries are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use patterns for use of the EC and ULV formulations on blueberries, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for blueberries. The combined residues of malathion and malaoxon were 0.29-7.19 ppm in/on blueberries harvested 1 day following the last of four foliar applications, with a 4-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 20 gal of water/A with ground equipment, and were 2.78 ppm in/on blueberries harvested 8 hours following the last of seven foliar applications, with a 10-day retreatment interval, using the 5 lb/gal EC formulation at 0.63 lb ai/A/application with 1.5 qt/A of protein hydrolysate bait in 20 gal of water/A with ground equipment; and were <0.07-7.48 ppm in/on blueberries harvested 3 hours following the last of five foliar applications, with a 10-day retreatment interval, at 0.76 lb ai/A/application using aerial ULV equipment. Combined residues were <0.02-0.52 ppm in/on blueberries harvested 4 days following the same treatment schedule.

4b. Provided that label revisions are made for the 5 lb/gal EC and 9.79 lb/gal RTU formulations to reflect the use patterns used in the current field trials, no additional field residue data for blueberries will be required for reregistration purposes. The available data will support: (I) following the last of four foliar applications, with a 4-day retreatment interval, a 1 day PHI, using the 5 lb/gal EC formulation at 0.63 lb ai/A/application with 1.5 qt/A of protein hydrolysate bait in 20 gal of water/A with ground equipment; and (ii), following the last of five foliar applications, with a 10-day retreatment interval, a 0-day PHI, of the 9.79 lb/gal RTU formulation at 0.76 lb ai/A using aerial ULV equipment.

Grapes

5a. The submitted field residue data (MRID 43383401) for grapes are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use pattern the registrant wishes to support for grapes, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for grapes. The combined residues of malathion and malaoxon were <0.34-2.78 ppm in/on grapes harvested 3 days following the last of two foliar applications, with a 14-day retreatment interval, using the 5 lb/gal EC formulation at 1.88 lb ai/A/application in 200 gal of water/A with ground equipment.

5b. Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for grapes will be required for reregistration purposes. The available data will support a maximum of two foliar applications per growing season, with a 14-day retreatment interval and a 3-day PHI, using the 5 lb/gal EC formulation at 1.88 lb ai/A/application in 200 gal of water/A with ground equipment.

Grasses

6a. The submitted field residue data (MRID 43362601) for grasses are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use pattern for grasses, indicate that the combined residues of malathion and malaoxon exceeded the established tolerances (presently expressed as malathion *per se*) of 135 ppm for grass forage and hay. The combined residues of malathion and malaoxon were $<$2.05-130.06 ppm in/on grass forage and $<$1.95-264 ppm in/on grass hay harvested 3 hours following a single foliar application using the 5 lb/gal EC formulation at 1.25 lb ai/A in 30 gal of water/A with ground equipment, and were $<$10.05-$<$190.16 ppm in/on grass forage and 27.07-130.70 ppm in/on grass hay harvested 3 hours following one foliar application of the 9.79 lb/gal RTU formulation at 0.92 lb ai/A using aerial ULV equipment.

6b. Provided that label revisions are made for the 5 lb/gal EC and 9.79 lb/gal RTU formulations to reflect the use patterns used in the current field trials, no additional field residue data for grass forage and hay will be required for reregistration purposes. The available data will support: (I) a maximum of one foliar application per growing season, with a 0-day PHI, using the 5 lb/gal EC formulation at 1.25 lb ai/A in 30 gal of water/A with ground equipment; and (ii) a maximum of one foliar application per growing season, with a 0-day PHI, of the 9.79 lb/gal RTU formulation at 0.92 lb ai/A in 30 gal of water/A using aerial ULV equipment.

Onions, dry bulb

7a. The submitted field residue data (MRID 43350401) for onions (dry bulb) are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use pattern the registrant wishes to support for onions, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for onions. The combined residues of malathion and malaoxon were $<$0.03-$<$0.60 ppm in/on bulb onions harvested 3 days following the last of five foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application (1x the maximum registered single application rate) in 30 gal of water/A with ground equipment.

7b. Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for bulb onions will be required for reregistration purposes. The available data will support a maximum of five foliar applications per growing season, with a 7-day retreatment interval and a 3-day PHI, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application in 30 gal of water/A with ground equipment.

Onions, green

8a. The submitted field residue data (MRID 43383301) for onions (green) are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use pattern the registrant wishes to support for onions, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for onions (including green onions). The combined residues of malathion and malaoxon were <0.20-4.88 ppm in/on green onions harvested 3 days following the last of five foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application in 30 gal of water/A with ground equipment.

8b. Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for green onions will be required for reregistration purposes. The available data will support a maximum of five foliar applications per growing season, with a 7-day retreatment interval and a 3-day PHI, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application in 30 gal of water/A with ground equipment.

Rice

9a. The submitted field residue data (MRID 43468101) for rice are adequate to satisfy malathion reregistration. The submitted field residue data, reflecting the maximum use patterns the registrant wishes to support for rice, indicate that the combined residues of malathion and malaoxon exceeded the established tolerance (presently expressed as malathion *per se*) of 8 ppm for rice grain. The combined residues of malathion and malaoxon were 1.17-3.99 ppm in/on rice grain harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment, and were <0.30-26.18 ppm in/on rice grain harvested 14 days following the last of three foliar applications, with a 7-day retreatment intervals, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment. However, the tolerance for rice grain will be reassessed based on the residue data from ULV formulation treatment. If the registrant want to support only for the use of EC formulation on rice, the tolerance for rice can be greatly reduced.

9b. Provided that label revisions are made for the 5 lb/gal EC formulation and 9.79 lb/gal RTU formulation to reflect the use patterns used in the current field trials, no additional field residue data for rice grain will be required for reregistration purposes. The available data will support: (I) a maximum of three foliar applications per growing season, with a 7-day retreatment interval and 7-day PHI, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment; and (ii) a maximum of three foliar applications per growing season, with a 7-day retreatment interval and a 14-day PHI, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

9c. The combined residues of malathion and malaoxon were <0.56-4.31 ppm in/on rice straw harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment, and were <1.15-57.77 ppm in/on rice straw grown in AR and LA and harvested 14 days following the last of three foliar applications, with a 7-day retreatment intervals, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

Wheat (spring and winter)

10a. The submitted field residue data (MRIDs 43414901 & 43350402) for wheat grain, forage and straw are adequate to satisfy malathion reregistration. However, the guideline OPPTS 860 identifies that wheat hay is also a raw agricultural commodity of wheat. Therefore, field residue data (a minimum of 15 trials) are required for wheat hay. For additional guidance on sampling and geographic locations for field trials, the registrant should consult the guideline OPPTS 860.1500. The tolerance for wheat grain will be reassessed based on residue data from Post-H treatment.

10b. The submitted field residue data (MRIDs 43414901 & 43350402), reflecting the maximum use patterns the registrant wishes to support for spring and winter wheat, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for wheat grain. The combined residues of malathion and malaoxon were <0.03-0.15 ppm in/on spring and winter wheat grain harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment, and were <0.02-0.34 ppm in/on spring and winter wheat grain harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

10c. Provided that label revisions are made for the 5 lb/gal EC formulation and 9.79 lb/gal RTU formulation to reflect the use patterns used in the current field trials, no additional field residue data for wheat grain will be required for reregistration purposes. The

available data will support: (I) up to three foliar applications per growing season, with a 7-day retreatment interval and a 7-day PHI, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application with ground equipment; and (ii) up to three foliar applications per season, with a 7-day retreatment interval and a 7-day PHI, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

10d. The combined residues of malathion and malaoxon were <0.10-<0.14 ppm in/on spring and winter wheat forage and were <0.10-9.69 ppm in/on spring and winter wheat straw harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment. The combined residues of malathion and malaoxon were <0.10-<2.35 ppm in/on spring and winter wheat forage and were 1.06-34.38 ppm in/on spring and winter wheat straw harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

Orange Processed Commodities

11a. The submitted orange processing study (MRID 43451701) is adequate to satisfy reregistration requirements for magnitude of the residue in citrus processed commodities. The data indicate that the combined residues of malathion and malaoxon concentrated in oil (>208x) and dried pulp (9.5x) processed from oranges bearing detectable residues. The combined residues of malathion and malaoxon concentrated marginally in molasses (1.4x) but reduced in juice (<0.1x) and peel (<0.6x) processed from oranges bearing detectable residues.

11b. The available processing data suggest that tolerances are needed for the combined residues of malathion and malaoxon in citrus oil and dried pulp. Acceptable field residue data (MRID 43078701) on the magnitude of malathion and malaoxon residues in/on oranges have been submitted and evaluated (D199259, D203021, and D203620; R. Perfetti; 9/6/94). The review indicated that the HAFT is <1.91ppm; therefore the tolerances should be 400 ppm for orange oil, and orange dries pulp should be established at 20 ppm.

11c. A tolerance of 50 ppm has been established [40 CFR §186.3850(a)] for residues of malathion *per se* in dehydrated citrus pulp for cattle feed as a result of the application of malathion to bagged citrus pulp during storage. The registrant indicates that the use of malathion on dehydrated citrus pulp (Post-H) is no longer support. CEB1 recommends that the tolerance for dried citrus pulp should be revoked.

RECOMMENDATIONS

The residue data from this submission demonstrated that the combined residues of malathion and malaoxon in/on the most food commodities did not exceed the established tolerance. According to the highest residues found in/on each commodity, the malathion tolerances are reassessed as follows:

Commodities	**Existing Tolerance** (ppm)	**Reassessed Tolerance** (ppm)
Avocados	8	0.2
Beans,dry	8	2
Cowpea, forage	135	Revoke
Cowpea, hay	135	Revoke
Blueberries	8	8
Grasses		
Forage	135	200
Hay	135	270
Grapes	8	4
Onion		
Green	8	6
Bulb	8	1
Rice		
Grain	8	30
Straw	None	60
Hulls	None	150
Wheat		
Grain	8	8
Forage	None	4
Straw	None	50
Hay	None	To be determined
Orange	8	4
Oil	None	400
Dried pulp	None	20
Dried pulp(Post-H)	50	Revoke

CEB1 notes that the tolerance for rice grain has greatly increased from 8 ppm to 30 ppm. If the registrant want to support only for the use of EC formulation on rice, the tolerance for rice can be reduced to 6 ppm.

DETAILED CONSIDERATIONS

Residue Analytical Methods

The raw agricultural commodities from the submitted field trials were analyzed for residues of malathion and its malaoxon metabolite using a GLC method with flame photometric detection (FPD). The limit of quantitation (LOQ) for each compound was 0.01 ppm, except for the forage, hay, and straw of grasses and cereal grains where the LOQ was 0.05 ppm for each compound. These methods use a DB-5 capillary column and flame photometric detection in the phosphorous mode, and are essentially identical to the American Cyanamid Method M-1886. Adequate method descriptions as well as acceptable radiovalidation data using samples from an alfalfa metabolism study have been submitted and evaluated (D196878, R. Perfetti, 2/28/94) for the American Cyanamid Method M-1886.

Concurrent method validation was conducted by EN-CAS Analytical Laboratories, Inc. (Winston-Salem, NC) to determine the suitability of the EN-CAS methods for residue data collection purposes. Untreated samples of RACs from the respective field trials and processed fractions from the orange processing study were fortified with malathion and malaoxon at various levels. Apparent residues of malathion and malaoxon each were nondetectable (<0.01 ppm or <0.05 ppm) in/on all untreated samples of RACs and processed fractions except in one green onion sample and one rice grain sample where residues were 0.05 and 0.01 ppm, respectively. Representative chromatograms, sample calculations, and standard curves were provided. The recovery data are presented in Tables 1. These data suggest that the EN-CAS methods are adequate for malathion and malaoxon data collection for avocados, beans (dry), blueberries, grapes, grasses, onions (green and bulb), oranges and orange processed commodities, rice, and wheat (spring and winter).

Table 1. Concurrent method recoveries of EN-CAS Method Nos. ENC-21/94, ENC-15/94, ENC-8/93, ENC-14/94, ENC-2/94, ENC-11/93, ENC-7/94, ENC-16/94, ENC-12/94, and ENC-8/94 from various matrices fortified with malathion and malaoxon.

Raw Agricultural Commodity	Fortification Level (ppm)		Percent Recovery	
	Malathion	Malaoxon	Malathion	Malaoxon
Avocados	0.01	0.01	74, 76	100, 100
	2.0	0.05	71	90
	2.0	0.10	72	94
Beans, dry	0.01	0.01	54, 77, 79, 95, 104	84, 88, 88, 88, 109
	0.10	0.02	75	63
	0.25	0.025	77, 93	99, 112
	0.50	0.05	93, 95	88, 93
	1.0	0.02	84, 85	93, 95
	1.0	0.10	91	80
	4.0	0.20	75	95
Blueberries	0.01	0.01	83, 102	91, 94
	0.02	0.01	103	112
	0.05	0.05	86	96
	0.10	0.10	82	91
	0.20	0.02	72	85
	0.30	0.03	81	100
	0.50	0.05	73, 75	75, 102
	1.0	0.10	74, 79	75, 79
	1.0	1.0	93	88
	5.0	5.0	113	106
	10.0	1.0	83	80
Grapes	0.01	0.01	80, 110, 112	74, 98, 112
	0.20	0.02	88	92
	0.50	0.05	82, 86	83, 87
	1.0	0.10	76, 86	78, 84
	2.0	0.10	71	70
	5.0	0.40	85	82
Grass, forage	0.05	0.05	84	98
	0.50	0.05	90, 95	86, 103
	1.0	0.10	88, 93	98, 102
	2.0	0.20	98	97
	5.0	0.05	91	120
	10	1.0	86	94
	50	0.20	86	92
	50	0.50	98	103
	100	5.0	80	90
	300	1.0	93	96

(continued)

Table 1 *(continued)*.

Raw Agricultural Commodity	Fortification Level (ppm)		Percent Recovery	
	Malathion	Malaoxon	Malathion	Malaoxon
Grass, hay	0.05	0.05	81	87
	0.50	0.05	83, 98	90, 104
	1.0	0.10	80, 92	95, 105
	2.0	0.20	89	73
	5.0	0.05	71	101
	10	1.0	76	91
	50	0.50	72	84
	100	5.0	74	93
	300	--	87	--
Onions, bulb	0.01	0.01	95	100
	0.02	0.02	88	90
	0.05	0.01	83	101
	0.10	0.02	79	91
	0.20	0.01	78	106
	0.50	0.05	93	91
	1.0	0.10	86	88
	2.0	0.20	79	79
Onions, green	--	0.01	--	105
	--	0.03	--	85
	0.01	0.01	63, 80, 89	73, 94, 102
	0.50	0.05	87, 94	70, 82
	1.0	0.02	86	98
	1.0	0.10	87, 92	79, 82
	2.0	0.02	78	67
	10	0.05	95	98
Oranges	0.01	0.01	111, 124	71, 101
	2.0	--	87	--
	5.0	0.10	82	82
	10	0.10	85	90
Oranges, oil	0.01	0.01	106	81
	0.50	0.05	75	94
	50	--	93	--
Oranges, dried pulp	0.05	0.05	119	120
	3.0	0.05	99	121
Oranges, juice	0.01	0.01	96	86
	1.0	0.05	78	89
Oranges, peel	0.01	0.01	136	115
	10	0.05	72	82

(continued)

Table 1 *(continued)*.

Raw Agricultural Commodity	Fortification Level (ppm)		Percent Recovery	
	Malathion	Malaoxon	Malathion	Malaoxon
Oranges, molasses	0.01	0.01	87, 88	99, 116
	0.20	0.05	74	85
	1.0	0.05	56	104
Rice, grain	0.01	0.01	80	101
	0.05	0.05	99	99
	0.50	0.01	86	115
	1.0	0.05	96	121
	1.0	0.10	88	98
	10	0.20	89	103
	30	1.0	90	96
	50	0.50	92, 96	101, 119
	100	1.0	85	105
Rice, straw	0.05	0.05	114	116
	0.50	0.05	78	96
	0.50	0.20	97	107
	1.0	0.05	88, 94	97, 106
	1.0	0.10	81	98
	5.0	0.50	91	98
	10	1.0	91	96
	100	0.50	90, 93	93, 107
Wheat, spring, grain	0.01	0.01	75, 89	67, 83
	2.0	0.10	86, 95	84, 92
Wheat, winter, grain	0.01	0.01	81, 82, 107	75, 94, 106
	0.02	0.01	80	77
	0.05	0.01	77	90
	0.05	0.02	83	89
	0.20	0.02	111	86
	0.50	0.01	85	114
	0.50	0.02	77	79
	0.50	0.05	83	88
	1.0	0.05	78, 90	74, 104
Wheat, spring, forage	0.05	0.05	95, 120	96, 110
	1.0	0.10	96	103
	5.0	0.10	83	90

(continued)

Table 1 *(continued)*.

Raw Agricultural Commodity	Fortification Level (ppm)		Percent Recovery	
	Malathion	Malaoxon	Malathion	Malaoxon
Wheat, winter, forage	0.05	0.05	89, 96, 106	96, 106, 113
	0.50	0.05	86, 87, 88, 100	89, 99, 99, 103
	1.0	0.10	81, 85, 88, 98	90, 96, 98, 101
	5.0	0.05	100	96
	5.0	0.10	91	104
	5.0	0.20	84	88
Wheat, spring, straw	0.05	0.05	96, 108, 110	96, 97, 109
	1.0	0.10	80	94
	50	0.10	99	100
	100	0.50	91	83
Wheat, winter, straw	0.05	0.05	79, 82, 90, 93, 110	90, 94, 96, 102, 122
	2.0	0.05	74	110
	5.0	0.20	80	87
	10	0.10	89	99
	20	0.20	74, 90	89, 122
	20	2.0	73	70
	25	0.50	86	99

Storage Stability Data

Samples from the submitted field trials were transferred to frozen storage within 1-8.2 hours of sample collection and then shipped via freezer truck to the analytical laboratory where they were stored frozen prior to residue analysis. However, bulb onion samples from the OR trial were dried in the field for 11-14 days prior to freezing (as per local practice), and grass hay samples were air dried for 2-9 days before freezing. The oranges collected for the processing study were shipped the day of harvest to the processing facility where they were stored at ambient temperatures (16-21 C) for no more than 7 days until processing. Processed samples were stored frozen (-23 C) and shipped frozen to the analytical laboratory where they were stored frozen prior to residue analysis. The maximum storage intervals prior to residue analysis of commodities collected from various field trials are presented in Table 2.

The Cheminova Agro A/S has previously submitted storage stability data representing all types of raw agricultural and processed commodities for which malathion is registered (D223392, 9/23/97, W. Smith). The available storage stability data indicate that residues of malathion and malaoxon are relatively stable under frozen storage conditions (-5 C) for at least 12 months in/on: cottonseed and cottonseed meal, hulls, and bleached and deodorized oils; wheat straw, bran, flour, middlings, and shorts; leaf lettuce; potato tubers; tomatoes and tomato catsup, juice, and

dried pomace. The only significant decline in residue was observed in/on wheat grain and forage when compared to day-0 recovery values; residues of malathion *per se* declined ~33-36% in/on wheat grain and ~15-17% in/on wheat forage following 12 months of storage.

The samples from the submitted avocados, beans (dry), blueberries, grapes, grasses, onions (dry bulb), onions (green), rice, spring wheat, winter wheat and an orange processing study were stored in frozen condition between 2-18 months. CEB1 previouly concluded that storage stability is not an issue because of the short storage intervals for most samples and because the reregistration requirements for storage stability data for raw agricultural and processed commodities have already been fulfilled. Therefore, no further storage stability data are required.

Table 2. Storage intervals prior to residue analysis of commodities collected from various field trials.

Raw Agricultural Commodity	MRID	Storage Condition	Storage Interval
Avocados	43383501	-29 to -7 C	~8-9 months
Beans	43417601	-33 to -3 C	~7-11 months
Blueberries	43372601	-32 to -1 C	~1-4 months
Grapes	43383401	-29 to -7 C	~4-8 months
Grass forage and hay	43362601	-38 to 0 C	~2-18 months
Onions, dry bulb	43350401	-33 to 6 C	~1-8 months
Onions, green	43383301	-34 to -6 C	~2-8 months
Oranges and processed orange fractions	43451701	-27 to -3 C	~4-8 months
Rice grain and straw	43468101	-34 to 2 C	~4-17 months
Wheat, spring	43414901	-31 to -3 C	~6-10 months
Wheat, winter	43350402	-34 to -3 C	~3-11 months

Magnitude of the Residue in Plants

Avocados

Established tolerance: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on avocados [40 CFR §180.111].

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified one Cheminova malathion end-use product, a 57% or 5 lb/gal EC formulation, registered for use on avocados. The 5 lb/gal EC formulation is registered for multiple foliar applications to established avocados at 4.7 lb ai/A/application or 0.94 lb ai/100 gal/application (not to exceed 500 gal of water/A). A 7-day PHI is in effect. The label does not specify a maximum seasonal rate or maximum number of applications that may be made per growing season.

Discussion of the data: Cheminova submitted data (1994; MRID 43383501) from two trials conducted in CA depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on avocados. A field trial in FL was also planned, but was canceled when Hurricane Andrew destroyed the intended avocado grove site. Mature avocados from the CA test sites were harvested 7 and 14 days following the last of two foliar applications to established avocado orchards, with a 30-day retreatment interval, of the Platte 5 lb/gal EC formulation at 4.7 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 200 gal of water/A using an airblast sprayer. Adequate raw data pertaining to field trial information, application of the test substance, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated avocados were frozen (-29 to -13 C) within 1 hour of collection and shipped frozen (-7 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 253-265 days (~8-9 months). Residues in/on treated and untreated avocados (with pits removed) were determined using EN-CAS Method No. ENC-21/94. The results of the avocado field trials are presented in Table 3. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on four untreated samples.

Geographic representation is adequate since the test state of CA accounted for 84% of the 1991-1992 U.S. avocado production *(1992 USDA Agricultural Statistics)*.

Table 3. Residues of malathion and its metabolite malaoxon in/on avocados following multiple foliar applications using the 5 lb/gal EC formulation.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	2 foliar applications, with a 30-day retreatment interval, at 4.7 lb ai/A/application (1x) in 200 gal of water/A using ground equipment.	**7-Day PTI**			
		CA-1	0.07	<0.01	<0.08
		CA-2	0.07	<0.01	<0.08
		14-Day PTI			
		CA-1	0.05	<0.01	<0.06
		CA-2	0.05	<0.01	<0.06

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43383501), reflecting the maximum use pattern for avocados, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for avocados. The

combined residues of malathion and malaoxon were <0.08 ppm in/on avocados harvested 7 days following the last of two foliar applications, with a 30-day retreatment interval, using the 5 lb/gal EC formulation at 4.7 lb ai/A/application in 200 gal of water/A with ground equipment.

Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for avocados will be required for reregistration purposes. The available data will support a maximum of two foliar applications per growing season, with a 30-day retreatment interval and a 7-day PHI, using the 5 lb/gal EC formulation at 4.7 lb ai/A/application in 200 gal of water/A with ground equipment.

Beans (Dry)

Established tolerance: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on beans [40 CFR §180.111].

Use patterns: The 9.79 lb/gal RTU formulation is registered for multiple foliar applications to succulent and dried beans at 0.15-0.61 lb ai/A/application using ground or aerial ULV equipment. A 1-day PHI is in effect. Neither label specifies a maximum seasonal rate or maximum number of applications that may be made per growing season.

Discussion of the data: Cheminova submitted data (1994; MRID 43417601) from ten trials conducted in CA(3), ID(1), MI(3), NE(2), and NY(1) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on the following varieties of dry beans: black-eyed beans, cranberry beans, light red kidney beans, navy beans, and pinto beans. Mature dry beans were harvested 1, 4, 7, and 14 days following the last of three foliar applications, with ~7-day retreatment intervals, using the 9.79 lb/gal RTU formulation with an aerial ULV equipment at 0.61 lb ai/A/application (1x the maximum registered single application rate for this formulation). Adequate raw data pertaining to field trial information, application of the test substance, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated dry beans were frozen (-33 to -9 C) within 4 hours of collection and shipped frozen (-3 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 199-324 days (~7-11 months). Residues in/on treated and untreated dry beans were determined using EN-CAS Method No. ENC-15/94. The results of the dry bean field trials are presented in Table 4. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on ten untreated samples.

Geographic representation is adequate since the test states of CA(9%), ID(9%), MI(19%), NE(12%), and NY(2%) along with neighboring states of CO(10%), MN(6%), and ND(23%) accounted for ~90% of the 1991 U.S. dry bean production (*1992 USDA Agricultural Statistics*).

Table 4. Residues of malathion and its metabolite malaoxon in/on dry beans following multiple foliar applications of the 9.79 lb/gal RTU formulation.

Formulation	Application Parameters	Trial Site (Bean Type)	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV.	**1-Day PTI**			
		CA-1 (Black-eyed)	0.62	<0.01	<0.63
		CA-2 (Black-eyed)	0.73, 0.71	0.02, 0.02	0.74, 0.73
		CA-3 (Black-eyed)	0.42	<0.01	<0.43
		ID (Pinto)	0.39	<0.01	<0.40
		MI-1 (Navy)	0.36	<0.01	0.37
		MI-2 (Cranberry)	0.05	<0.01	<0.06
		MI-3 (Navy)	0.07	<0.01	<0.08
		NE-1 (Navy)	<0.01	<0.01	<0.02
		NE-2 (Navy)	<0.01	<0.01	<0.02
		NY (Kidney)	0.05	<0.01	<0.06
		4-Day PTI			
		CA-1 (Black-eyed)	0.34	0.02	0.36
		CA-2 (Black-eyed)	0.66, 1.2	0.03, 0.07	0.70, 1.27
		CA-3 (Black-eyed)	0.16	<0.01	<0.17
		ID (Pinto)	0.29	0.01	0.30
		MI-1 (Navy)	0.04	<0.01	<0.05
		MI-2 (Cranberry)	<0.01	<0.01	<0.02
		MI-3 (Navy)	0.02	<0.01	<0.03
		NE-1 (Navy)	<0.01	<0.01	<0.02
		NE-2 (Navy)	0.02	<0.01	<0.03
		NY (Kidney)	<0.01	<0.01	<0.02
		7-Day PTI			
		CA-1 (Black-eyed)	0.48	0.02	0.49
		CA-2 (Black-eyed)	0.38	0.01	0.39
		CA-3 (Black-eyed)	0.28	<0.01	<0.29
		ID (Pinto)	0.02	<0.01	<0.03
		MI-1 (Navy)	<0.01	<0.01	<0.02
		MI-2 (Cranberry)	<0.01	<0.01	<0.02
		MI-3 (Navy)	<0.01	<0.01	<0.02
		NE-1 (Navy)	0.10	<0.01	<0.11
		NE-2 (Navy)	<0.01	<0.01	<0.02
		NY (Kidney)	0.16	<0.01	<0.17

Table 4 *(continued)*.

Formulation	Application Parameters	Trial Site (Bean Type)	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV.	**14-Day PTI**			
		CA-1 (Black-eyed)	0.23	<0.01	<0.24
		CA-2 (Black-eyed)	0.12	<0.01	<0.13
		CA-3 (Black-eyed)	0.39	<0.01	0.40
		ID (Pinto)	0.13	<0.01	<0.14
		MI-1 (Navy)	<0.01	<0.01	<0.02
		MI-2 (Cranberry)	0.01	<0.01	<0.02
		MI-3 (Navy)	0.01	<0.01	<0.02
		NE-1 (Navy)	<0.01	<0.01	<0.02
		NE-2 (Navy)	0.10	<0.01	<0.11
		NY (Kidney)	<0.01	<0.01	<0.02

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43417601), reflecting the maximum use pattern the registrant wishes to support for use of the RTU formulation on dry beans, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for beans. The combined residues of malathion and malaoxon were <0.02-0.74 ppm in/on mature dry beans harvested 1 day following the last of three foliar applications, with ~7-day retreatment intervals, of the 9.79 lb/gal RTU formulation using aerial ULV equipment at 0.61 lb ai/A/application. The maximum combined residues of malathion and malaoxon of 1.27 ppm were obtained from dry bean samples harvested 4 days following the above described treatment regime.

No field residue data are available for beans forage and bean hay; however, the Agency has concluded that the only bean that significant source of animal feed are are cowpeas (Table 1 in OPPTS 860.1000, Residue Chemistry Test Guidelines). Therefore, no further field trials are required for beans provided that the labels of all products used on beans are amended to state that the use of malathion is restricted to beans grown for human consumption only. The established tolerances on cowpeas forage and hay should be revoked contingent upon this label amendment.

Blueberries

Established tolerance: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on blueberries [40 CFR §180.111].

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified two Cheminova malathion end-use products, a 57% or 5 lb/gal EC formulation) and a 95% or 9.79 lb/gal RTU formulation, registered for use on blueberries.

The 5 lb/gal EC formulation is registered for up to five foliar applications to blueberries at 0.94-1.25 lb ai/A/application or 0.47-0.63 lb ai/100 gal/application (not to exceed 200 gal of water/A), with a 4- or 5-day retreatment interval, with ground equipment. The same formulation is also registered for multiple foliar applications to blueberries grown in the Northeast U.S. at 0.63 lb ai/100 gal/application plus 1.5 qt/A of protein hydrolysate bait with a maximum finished spray volume not to exceed 100 gal of water/A. The established PHIs are 8 hours when used in the Northeast U.S. with protein hydrolysate bait and 1 day for other uses.

The 9.79 lb/gal RTU formulation is registered for multiple foliar applications to blueberries at 0.76 lb ai/A/application using ground or aerial ULV equipment. A 0-day PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established for this formulation.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company. The 5 lb/gal EC formulation is registered for multiple foliar applications to blueberries at 0.94-2 lb ai/A/application in a minimum of 200 gal of water/A with ground equipment or in 2 gal of water/A using aerial equipment. A 1-day PHI has been established. A maximum seasonal rate or maximum number of applications per growing season has not been established. This formulation was used as one of the test substances in the blueberry field trials.

Discussion of the data: Cheminova submitted data (1994; MRID 43372601) from a total of eleven trials conducted in ME(5), MI(4), and OR(2) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on blueberries. Blueberries were harvested 3 hours to 14 days following the last of: (I) four foliar applications with a 4-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.25 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 20 gal of water/A with ground equipment; (ii) seven foliar applications, with a 10-day retreatment interval, using the Platte 5 lb/gal EC formulation at 0.63 lb ai/A/application with 1.5 qt/A of protein hydrolysate bait (1x the maximum registered single application rate for this type of application of the Cheminova EC formulation) in 20 gal of water/A with ground equipment; or (iii) five foliar applications, with a 10-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.76 lb ai/A/application (1x the maximum registered single application rate for this formulation) using aerial ULV equipment. Adequate raw data pertaining to field trial information, application of the test substances, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated blueberries were frozen (-32 to -1 C) within 5.3 hours of collection and shipped frozen (-30 to -3 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 35-112 days (~1-4 months). Residues in/on treated and untreated blueberries were determined using EN-CAS Method No. ENC-8/93. The results of the blueberry field trials are presented in Table 5. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on seven untreated samples.

No production statistics were available for blueberries (*1992 USDA Agricultural Statistics*); however, blueberry field trials were conducted in Regions 1, 5, and 12 which collectively represent the major U.S. blueberry production ("EPA Guidance on Number and Location of Domestic Crop Field Trials for Establishment of Pesticide Residue Tolerances" issued 6/2/94).

Table 5. Residues of malathion and its metabolite malaoxon in/on blueberries following multiple foliar applications using the 5 lb/gal EC and 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	4 foliar applications, with a 4-day retreatment interval, at 1.25 lb ai/A/application (1x) in 20 gal of water/A using ground equipment.	**1-Day PTI**			
		ME-1	3.2	0.05	3.25
		ME-2	7.05	0.14	7.19
		MI-1	1.4	0.02	1.42
		MI-2	0.26	0.03	0.29
		OR-1	0.17, 0.29	0.02	0.18, 0.32
		OR-2	1.2	0.03, 0.02	1.18
		4-Day PTI			
		ME-1	0.56	0.03	0.59
		ME-2	2.2	0.1	2.3
		MI-1	0.09	<0.01	<0.10
		MI-2	0.05	<0.01	<0.06
		OR-1	0.12	0.01	0.13
		OR-2	0.31	0.01	0.32
		7-Day PTI			
		ME-1	0.32	0.02	0.34
		ME-2	0.99	0.07	1.07
		MI-1	0.08	<0.01	<0.09
		MI-2	0.02	<0.01	<0.03
		OR-1	0.09	<0.01	<0.10
		OR-2	0.13	<0.01	<0.14
		14-Day PTI			
		ME-1	0.32	0.02	0.34
		ME-2	0.76	0.05	0.81
		MI-1	0.04	<0.01	<0.05
		MI-2	0.01	<0.01	<0.02
		OR-1	0.02	<0.01	<0.03
		OR-2	0.09	<0.01	<0.10
5 lb/gal EC	7 foliar applications, with a 10-day retreatment interval, at 0.63 lb ai/A/application with 1.5 qt/A of protein hydrolysate bait (1x) in 20 gal of water/A using ground equipment.	**8-Hour PTI**			
		ME-2	2.8	0.03	2.78
		4-Day PTI			
		ME-2	0.39	0.01	0.40
		7-Day PTI			
		ME-2	0.16	0.01	0.17
		14-Day PTI			
		ME-2	0.14	0.01	0.15

(continued)

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
9.79 lb/gal RTU	5 foliar applications, with a 10-day retreatment interval, at 0.76 lb ai/A/application (1x) using aerial ULV equipment.	**0-day (3-Hour) PTI**			
		ME-1	4.0	0.02	4.02
		ME-2	7.45	0.03	7.48
		MI-1	0.55	<0.01	<0.56
		MI-2	0.06	<0.01	<0.07
		4-Day PTI			
		ME-1	0.43	<0.01	<0.44
		ME-2	0.51	0.01	0.52
		MI-1	0.05	<0.01	<0.06
		MI-2	<0.01	<0.01	<0.02
		7-Day PTI			
		ME-1	0.18	<0.01	<0.19
		ME-2	0.24	0.01	0.25
		MI-1	0.15	<0.01	<0.16
		MI-2	<0.01	<0.01	<0.02
		14-Day PTI			
		ME-1	0.07	<0.01	<0.08
		ME-2	0.45	0.02	0.47
		MI-1	0.02	<0.01	<0.03
		MI-2	<0.01	<0.01	<0.02

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43372601), reflecting the maximum use patterns the registrant wishes to support for use of the EC formulation on blueberries, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for blueberries. The combined residues of malathion and malaoxon were 0.02-7.19 ppm in/on blueberries harvested 1 day following the last of four foliar applications, with a 4-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 20 gal of water/A with ground equipment, and were 2.78 ppm in/on blueberries harvested 8 hours following the last of seven foliar applications, with a 10-day retreatment interval, using the 5 lb/gal EC formulation at 0.63 lb ai/A/application with 1.5 qt/A of protein hydrolysate bait in 20 gal of water/A with ground equipment.

The submitted field residue data, reflecting the maximum use pattern for the use of the RTU formulation on blueberries and the established 0-day PHI, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as

malathion *per se*) of 8 ppm for blueberries. The combined residues of malathion and malaoxon were <0.02-7.48 ppm in/on blueberries harvested 3 hours following the last of five foliar applications, with a 10-day retreatment interval, at 0.76 lb ai/A/application using aerial ULV equipment. Combined residues were <0.01-0.52 ppm in/on blueberries harvested 4 days following the same treatment schedule.

Provided that label revisions are made for the 5 lb/gal EC and 9.79 lb/gal RTU formulations to reflect the use patterns used in the current field trials, no additional field residue data for blueberries will be required for reregistration purposes. The available data will support: (I) following the last of four foliar applications, with a 4-day retreatment interval, a 1 day PHI, using the 5 lb/gal EC formulation at 0.63 lb ai/A/application with 1.5 qt/A of protein hydrolysate bait in 20 gal of water/A with ground equipment; and (ii), following the last of five foliar applications, with a 10-day retreatment interval, a 0-day PHI, of the 9.79 lb/gal RTU formulation at 0.76 lb ai/A using aerial ULV equipment.

Grapes

Established tolerance: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on grapes [40 CFR §180.111].

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified one Cheminova malathion end-use product, a 57% or 5 lb/gal EC formulation, registered for use on grapes. The 5 lb/gal EC formulation is registered for: (I) multiple foliar applications to established grape orchards at 0.94-1.88 lb ai/A/application or 0.94 lb ai/100 gal/application (not to exceed 200 gal of water/A); and (ii) root dip treatment of overwintering grape nursery stocks at 1.88 lb ai/100 gal. A 3-day PHI is in effect. The label does not specify a maximum seasonal rate or the maximum number of applications that may be made per growing season.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company. The 5 lb/gal EC formulation is registered for multiple foliar applications to grapes at 0.94 lb ai/A/application in 200 to 275 gal of water/A. A 3-day PHI has been established. A maximum seasonal rate or maximum number of applications per growing season has not been established. This formulation was used as the test substance in the grape field trials.

Discussion of the data: Cheminova submitted data (1994, MRID 43383401) from six trials conducted in CA(4), NY(1), and WA(1) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on grapes. Mature grape fruits were harvested 3, 7, and 14 days following the last of two foliar applications to commercial and established grape orchards, with a 14-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.88 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 200 gal

of water/A using a tractor-mounted or airblast sprayer. Adequate raw data pertaining to field trial information, application of the test substance, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated grapes were frozen (-29 to -12 C) within 3 hours of collection and shipped frozen (-7 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. For subsampling prior to residue analysis, samples were thawed overnight in a refrigerator to remove grape stems. Grapes were homogenized in a food chopper with dry ice which was allowed to sublime prior to subsampling; the time required for sample homogenization ranged from 30 to 45 minutes. Following subsampling, samples were returned to the freezer. The intervals between harvest and residue analysis were 134-233 days (~4-8 months). Residues in/on treated and untreated grapes were determined using EN-CAS Method No. ENC-14/94. The results of the grape field trials are presented in Table 6. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on six untreated samples.

Geographic representation is adequate since the test states of CA(90%), NY(3%), and WA(4%) accounted for 97% of the 1991 U.S. grape production *(1992 USDA Agricultural Statistics)*.

Table 6. Residues of malathion and its metabolite malaoxon in/on grapes following multiple foliar applications using the 5 lb/gal EC formulation.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	2 foliar applications, with a 14-day retreatment interval, at 1.88 lb ai/A/application (1x) in 200 gal of water/A using ground equipment.	**3-Day PTI**			
		CA-1	0.33	<0.01	<0.34
		CA-2	1.2	0.02	1.22
		CA-3	0.78	0.03	0.81
		CA-4	1.65, 2.65	0.07, 0.13	1.72, 2.78
		NY	0.58	0.01	0.59
		WA	0.94	0.01	0.95
		7-Day PTI			
		CA-1	0.14	<0.01	<0.15
		CA-2	0.52	0.03	0.55
		CA-3	0.98	0.05	1.03
		CA-4	1.7	0.12	1.82
		NY	0.19	<0.01	<0.20
		WA	0.69	<0.01	<0.70
		14-Day PTI			
		CA-1	0.10	<0.01	<0.11
		CA-2	0.41	0.04	0.45
		CA-3	0.32	0.04	0.36
		CA-4	0.49	0.06	0.55
		NY	0.22	<0.01	<0.23
		WA	0.81	0.01	0.82

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43383401), reflecting the maximum use pattern for grapes, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for grapes. The combined residues of malathion and malaoxon were 0.01-2.78 ppm in/on grapes harvested 3 days following the last of two foliar applications, with a 14-day retreatment interval, using the 5 lb/gal EC formulation at 1.88 lb ai/A/application in 200 gal of water/A with ground equipment.

Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for grapes will be required for

reregistration purposes. The available data will support a maximum of two foliar applications per growing season, with a 14-day retreatment interval and a 3-day PHI, using the 5 lb/gal EC formulation at 1.88 lb ai/A/application in 200 gal of water/A with ground equipment.

Grasses

Established tolerances: Tolerances of 135 ppm have been established for residues of malathion *per se* in/on grass forage and hay [40 CFR §180.111].

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified two Cheminova malathion end-use products, a 57% or 5 lb/gal EC formulation and a 95% or 9.79 lb/gal RTU formulation, registered for use on pasture and range grasses (such as barnyardgrass, canarygrass, fescue, orchardgrass, red top, timothy, and yellow foxtail).

The 5 lb/gal EC formulation is registered for multiple foliar applications to grasses at: (I) 0.63-0.94 lb ai/A/application in a minimum of 30 gal of water/A with ground equipment or in 5 gal of water/A using aerial equipment; and (ii) 0.94-1.25 lb ai/A/application in 1 gal of diesel fuel oil/A. A 0-day PGI/PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established.

The 9.79 lb/gal RTU formulation is registered for multiple foliar applications to grasses at 0.15-0.92 lb ai/A/application using ground or aerial ULV equipment. A 0-day PGI/PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company. The 5 lb/gal EC formulation is registered for multiple foliar applications to pasture and range grasses at 0.94-1.25 lb ai/A/application in a minimum of 10 gal of water/A with ground equipment or in 2 gal of water/A using aerial equipment. A 0-day PHI has been established. A maximum seasonal rate or maximum number of applications per growing season has not been established. This formulation was used as one of the test substances in the grass field trials.

Discussion of the data: Cheminova submitted data (1994, MRID 43362601) from 20 trials conducted in AR(2), KS(2), KY(2), MO(2), NY(2), OK(2), PA(2), SD(2), TN(2), and VA(2) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on pasture and rangeland grass forage and hay. The grass species used in these trials include fescue, bluegrass, Bermudagrass, and other varieties which are considered representative of the test states.

Mature grass forage was harvested from each test location 3 hours following: (I) one foliar application using the Platte 5 lb/gal EC formulation at 1.25 lb ai/A (1x the maximum registered single application rate for the Cheminova EC formulation) in 30 gal of water/A with ground equipment; or (ii) one foliar application of the 9.79 lb/gal RTU formulation at 0.92 lb ai/A (1x the maximum registered single application rate for this formulation) using aerial ULV equipment.

Subsamples of the harvested forage samples from each test plot were air-dried for 2-9 days to generate hay samples. The moisture content (as percentage of fresh weight of untreated samples) was determined to be 42-83% (mean=66%) for forage and 14-68% (mean=30%) for hay. Moisture levels of 10-18% are generally considered typical for grass hay, suggesting that some of the hay samples from this study may have been incompletely dried compared to commercial hay. Adequate raw data pertaining to field trial information, application of the test substances, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were also provided for each test. The harvested treated and untreated grass forage were frozen (-38 to 0 C) within 5 hours of collection; grass hay was dried before freezing. Forage and hay samples were shipped frozen (-3 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 45-544 days (~2-18 months). Residues in/on treated and untreated grass forage and hay were determined using EN-CAS Method No. ENC-2/94. The results of the grass field trials are presented in Table 7. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on 10 untreated samples of grass forage and nondetectable (<0.05 ppm each) in/on 10 untreated samples of grass hay.

Geographic representation is adequate. The field tests were conducted in states requested in the Malathion Guidance Document. The test states of AR(3%), KS(4%), KY(6%), MO(8%), NY(3%), OK(5%), PA(3%), SD(4%), TN(4%), and VA(3%) plus the neighboring states of GA(3%) and TX(13%) accounted for the major U.S. hay (other than alfalfa) production (*1992 USDA Agricultural Statistics*).

Table 7. Residues of malathion and its metabolite malaoxon in/on grass forage and hay following one foliar application using the 5 lb/gal EC and 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site (Grass Type)	Forage Residues (ppm) [a]			Hay Residues (ppm) [a]		
			Malathion	Malaoxon	Combined	Malathion	Malaoxon	Combined
5 lb/gal EC	Harvested 3 hours following 1 foliar application at 1.25 lb ai/A (1x) in 30 gal of water/A using ground equipment.	AR (Bermudagrass)	25	0.23	25.23	6.0	0.08	6.08
		KS (Tall fescue)	72	<0.05	<72.05	4.0	<0.05	<4.05
		KY (Mixed)	2.0	<0.05	<2.05	1.9	<0.05	<1.95
		MO (Mixed: primarily fescue)	68	0.06	68.06	58	0.19	58.19
		NY (Mixed: primarily timothy)	29	0.06	29.06	24	0.34	24.34
		OK (Tall fescue)	22	0.05	22.05	42	0.15	42.15
		PA (Tall fescue)	130	0.06	130.06	257	0.8	264.13
		SD (Mixed: sweet clover, blue grama, needlegrass, buffalo grass, and wheatgrass)	55	0.06	55.06	36	0.12	36.12
		TN (Bermudagrass)	34	0.18	34.18	61	0.52	61.52
		VA (Fescue)	75	0.05	75.05	66	0.73	66.73
9.79 lb/gal RTU	Harvested 3 hours following 1 foliar application at 0.92 lb ai/A (1x) using aerial ULV equipment.	AR (Bermudagrass)	80	0.07	80.07	30	0.14	30.14
		KS (Tall fescue)	83	<0.05	<83.05	33.5	<0.05	33.55
		KY (Mixed)	19	<0.05	<19.05	33	<0.05	<33.05
		MO (Mixed: primarily fescue)	68	<0.05	<68.05	55	0.16	55.16
		NY (Mixed: primarily timothy)	10	<0.05	<10.05	68	0.34	68.34
		OK (Tall fescue)	44	<0.05	<44.05	54	<0.05	<54.05
		PA (Tall fescue)	190	0.16	190.16	130	0.70	130.70
		SD (Mixed: sweet clover, blue grama, needlegrass, buffalo grass, and wheatgrass)	74	0.06	74.06	46	0.08	46.08
		TN (Bermudagrass)	30	<0.05	<30.05	100	0.34	100.34
		VA (Fescue)	38	<0.05	<38.05	27	0.07	27.07

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43362601), reflecting the maximum use pattern for grasses, indicate that the combined residues of malathion and malaoxon exceeded the established tolerances (presently expressed as malathion *per se*) of 135 ppm for grass forage and hay. The combined residues of malathion and malaoxon were <2.05-130.06 ppm in/on grass forage and <1.95-264 ppm in/on grass hay harvested 3 hours following a single foliar application using the 5 lb/gal EC formulation at 1.25 lb ai/A in 30 gal of water/A with ground equipment, and were <10.05-<190.16 ppm in/on grass forage and 27.07-130.70 ppm in/on grass hay harvested 3 hours following one foliar application of the 9.79 lb/gal RTU formulation at 0.92 lb ai/A using aerial ULV equipment.

Provided that label revisions are made for the 5 lb/gal EC and 9.79 lb/gal RTU formulations to reflect the use patterns used in the current field trials, no additional field residue data for grass forage and hay will be required for reregistration purposes. The available data will support: (I) a maximum of one foliar application per growing season, with a 0-day PHI, using the 5 lb/gal EC formulation at 1.25 lb ai/A in 30 gal of water/A with ground equipment; and (ii) a maximum of one foliar application per growing season, with a 0-day PHI, of the 9.79 lb/gal RTU formulation at 0.92 lb ai/A in 30 gal of water/A using aerial ULV equipment.

Onions (Bulb and Green)

Established tolerances: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on onions (including green onions) [40 CFR §180.111].

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified one Cheminova malathion end-use product, a 57% or 5 lb/gal EC formulation, registered for use on onions. The 5 lb/gal EC formulation is registered for multiple foliar applications to onions at 0.94-1.56 lb ai/A/application. A 3-day PHI is in effect. The label does not specify a maximum seasonal rate or the maximum number of applications that may be made per growing season.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company. The 5 lb/gal EC formulation is registered for multiple foliar applications to onions at 0.94-1.88 lb ai/A/application in a minimum of 10 gal of water/A with ground equipment or in 2 gal of water/A using aerial equipment. A 3-day PHI has been established. A maximum seasonal rate or maximum number of applications per growing season has not been established. This formulation was used as the test substance in the onion field trials.

Discussion of the data (bulb onions): Cheminova submitted data (1994, MRID 43350401) from six trials conducted in CA(2), NE(1), NY(1), OR(1), and TX(1) depicting the magnitude

of the residue of malathion and its metabolite malaoxon in/on bulb onions. Mature whole onion bulbs were harvested 3, 7, and 14 days following the last of five foliar applications to onion plants, with a 7-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.56 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 30 gal of water/A with ground equipment. Adequate raw data pertaining to field trial information, application of the test substance, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The collected samples from OR, as per local practice, were field-dried for 11 days (3-day PTI samples) or 14 days (7- and 14-day PTI samples) prior to freezing and shipment to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). All samples from other test locations were frozen (-33 to 6 C) within 1 hour of collection and shipped frozen (-29 to -3 C) to the analytical laboratory. At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 36-239 days (~1-8 months). Residues in/on treated and untreated bulb onions were determined using EN-CAS Method No. ENC-11/93. The results of the bulb onion field trials are presented in Table 8A. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on six untreated samples.

Geographic representation is adequate since the test states of CA(<0.5%), NE(<0.5%), NY(11%), OR(24%) and TX(3%) plus the neighboring states of CO(15%), NM(9%), and WA(12%) accounted for 75% of the 1991 U.S. dry bulb onion production *(1992 Agricultural Statistics)*.

Table 8A. Residues of malathion and its metabolite malaoxon in/on bulb onions following multiple foliar applications using the 5 lb/gal EC formulation.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	5 foliar applications, with a 7-day retreatment interval, at 1.56 lb ai/A/application (1x) in 30 gal of water/A using ground equipment.	**3-Day PTI**			
		CA-1	0.08	<0.01	<0.09
		CA-2	0.35	0.02	0.37
		NE	0.37	<0.01	<0.38
		NY	0.59	<0.01	<0.60
		OR	0.02	<0.01	<0.03
		TX	0.11	<0.01	<0.12
		7-Day PTI			
		CA-1	0.03	<0.01	<0.04
		CA-2	0.42	0.02	0.44
		NE	0.16	<0.01	<0.17
		NY	0.24	<0.01	<0.25
		OR	<0.01	<0.01	<0.02
		TX	0.03	<0.01	<0.04
		14-Day PTI			
		CA-1	0.02	<0.01	<0.03
		CA-2	0.23	0.02	0.25
		NE	0.05	<0.01	<0.06
		NY	0.11	<0.01	<0.12
		OR	<0.01	<0.01	<0.02
		TX	<0.01	<0.01	<0.02

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43350401), reflecting the maximum use pattern the registrant wishes to support for onions, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for onions. The combined residues of malathion and malaoxon were <0.03-<0.60 ppm in/on bulb onions harvested 3 days following the last of five foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application (1x the maximum registered single application rate) in 30 gal of water/A with ground equipment.

Provided that label revisions are made for the 5 lb/gal EC formulation to reflect the use pattern used in the current field trials, no additional field residue data for bulb onions will be required

for reregistration purposes. The available data will support a maximum of five foliar applications per growing season, with a 7-day retreatment interval and a 3-day PHI, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application in 30 gal of water/A with ground equipment.

Discussion of the data (green onions): Cheminova submitted data (1994, MRID 43383301) from six trials conducted in CA(2), NE(1), NY(1), OR(1), and TX(1) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on green onions. Green onions were harvested 3, 7, and 14 days following the last of five foliar applications to green onion plants, with a 7-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.56 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 30 gal of water/A with ground equipment. Adequate raw data pertaining to field trial information, application of the test substance, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated green onions were frozen (-34 to -6 C) within 1.3 hours of collection and shipped frozen (-6 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 52-242 days (~2-8 months). Residues in/on treated and untreated green onions were determined using EN-CAS Method No. ENC-7/94. The results of the green onion field trials are presented in Table 8B. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on six untreated control samples. Residues of malathion were detected at 0.05 ppm in/on one sample of untreated green onion; residues of malaoxon were nondetectable (<0.01 ppm) in/on the same sample.

No production statistics were available for green onions (*1992 USDA Agricultural Statistics*); however, green onion field trials were conducted in Regions 1, 6, 9, 10, and 12 which collectively represent 80% of the U.S. green onion production ("EPA Guidance on Number and Location of Domestic Crop Field Trials for Establishment of Pesticide Residue Tolerances" issued 6/2/94).

Table 8B. Residues of malathion and its metabolite malaoxon in/on green onions following multiple foliar applications using the 5 lb/gal EC formulation.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	5 foliar applications, with a 7-day retreatment interval, at 1.56 lb ai/A/application (1x) in 30 gal of water/A using ground equipment.	**3-Day PTI**			
		CA-1	4.5, 4.9	0.02, 0.01	4.52, 4.88
		CA-2	0.18	0.02	0.20
		NE	0.19	<0.01	<0.20
		NY	0.35	<0.01	0.36
		OR	2.5	0.02	2.47
		TX	0.69	0.03	0.72
		7-Day PTI			
		CA-1	0.97	0.01	0.98
		CA-2	0.17	0.01	0.18
		NE	0.01	<0.01	<0.02
		NY	0.23	<0.01	<0.24
		OR	0.22	<0.01	<0.23
		TX	0.11	0.01	0.12
		14-Day PTI			
		CA-1	0.27	<0.01	<0.28
		CA-2	0.02	<0.01	<0.03
		NE	<0.01	<0.01	<0.02
		NY	0.03	<0.01	<0.04
		OR	0.02	<0.01	<0.03
		TX	<0.01	<0.01	<0.02

[a] Each residue value represents one sample.

The submitted field residue data (MRID 43383301), reflecting the maximum use pattern for onions, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for onions (including green onions). The combined residues of malathion and malaoxon were <0.20-4.88 ppm in/on green onions harvested 3 days following the last of five foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application in 30 gal of water/A with ground equipment.

Provided that label revisions are made for the 5 lb/gal EC formulation (EPA Reg. No. 4787-20) to reflect the use patterns used in the current field trials, no additional field residue data for green onions will be required for reregistration purposes. The available data will support a maximum of

five foliar applications per growing season, with a 7-day retreatment interval and a 3-day PHI, using the 5 lb/gal EC formulation at 1.56 lb ai/A/application in 30 gal of water/A with ground equipment.

Rice

Established tolerance: Tolerances of 8 ppm have been established for residues of malathion *per se* in/on rice grain and wild rice [40 CFR §180.111]. No tolerance has been established for residues of malathion in/on rice straw.

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified two Cheminova malathion end-use products, a 57% or 5 lb/gal EC formulation and a 95% or 9.79 lb/gal RTU formulation, registered for use on rice.

The 5 lb/gal EC formulation is registered for multiple foliar applications to rice at 0.63-1.56 lb ai/A/application in a minimum of 30 gal of water/A with ground equipment or in 2 gal of water/A using aerial equipment. The first application may be made shortly after the first rice blades appear on the surface of water; subsequent applications may be made as needed. A 7-day PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established.

The 9.79 lb/gal RTU formulation is registered for multiple foliar applications to rice at 0.61 lb ai/A/application using ground or aerial ULV equipment. For rice grown in LA and TX only, application may be made during early milk and dough stage using aerial equipment only. A 7-day PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company (EPA Reg. No. 34704-108). The 5 lb/gal EC formulation is registered for multiple foliar applications to rice at 0.63-1.56 lb ai/A/application in a minimum of 10 gal of water/A with ground equipment or in 2 gal of water/A using aerial equipment. The first application may be on rice seedlings; subsequent applications may be made as needed during early milk and dough stage. A 7-day PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established. This product was one of the test substances used in the rice field trials.

Discussion of the data: Cheminova submitted data (1994, MRID 43468101) from twelve trials conducted in AR(4), CA(4), and LA(4) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on rice grain and straw. In the "Summary" section of this submission, the registrant states that the treatment parameters from these field trials were selected to allow harmonization of the use patterns for all cereal grains as Cheminova intends to support a crop group tolerance for cereal grains.

Rice grain was harvested 7 and 14 days following the last of: (I) three foliar applications, with a 7-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.25 lb ai/A/application (0.8x the maximum registered single application rate for the Cheminova EC formulation) in 30 gal of water/A with ground equipment; or (ii) three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application (1x the maximum registered single application rate for this formulation) using aerial ULV equipment. Rice straw was also collected at the time of grain harvest and was not dried prior to freezing. Adequate raw data pertaining to field trial information, application of the test substances, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated rice grain and straw were frozen (-34 to 2 C) within 3.5 hours of collection and shipped frozen (<-7 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 109-528 days (~4-17 months). Residues in/on treated and untreated samples were determined using EN-CAS Method No. ENC-12/94. The results of the field trials are presented in Table 9A for rice grain and Table 9B for rice straw. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on five untreated grain samples. Residues of malathion were detected at 0.01 ppm in/on one sample of untreated rice grain; residues of malaoxon were nondetectable (<0.01 ppm) in/on the same sample. Apparent residues of malathion and malaoxon were nondetectable (<0.05 ppm each) in/on six untreated straw samples.

Geographic representation is adequate since the test states of AR(43%), CA (16%), and LA(16%) accounted for 75% of the 1991 U.S. rice grain production (*1992 Agricultural Statistics*).

Table 9A. Residues of malathion and its metabolite malaoxon in/on rice grain following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (0.8x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		AR-1	1.95	0.12	2.07
		AR-2	1.2	0.10	1.30
		CA-1	1.1	0.07	1.17
		CA-2	3.4	0.18	3.58
		LA-1	1.9	0.09	1.99
		LA-2	3.9	0.09	3.99
		14-Day PTI			
		AR-1	1.7	0.11	1.81
		AR-2	1.4	0.16	1.56
		CA-1	2.3	0.17	2.47
		CA-2	4.8	0.33	5.13
		LA-1	0.55	0.04	0.59
		LA-2	1.8	0.05	1.85
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		AR-1	2.4	0.04	2.44
		AR-2	6.1	0.08	6.18
		CA-1	17.5	0.12	17.62
		CA-2	26	0.13, 0.18	14.13, 26.18
		LA-1	0.45	0.01	0.46
		LA-2	7.2	0.05	7.25
		14-Day PTI			
		AR-1	2.8	0.08	2.88
		AR-2	4.7	0.1	4.71
		CA-1	15.67, 25.25	0.22, 0.27	15.89, 25.49
		CA-2	11, 14.5	0.13, 0.17	11.13, 14.67
		LA-1	0.29	<0.01	<0.30
		LA-2	3.6	0.04	3.64

[a] Each residue value represents one sample, unless otherwise indicated.
[b] Residue values in parentheses represent multiple analyses of a single sample.

Table 9B. Residues of malathion and its metabolite malaoxon in/on rice straw following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (0.8x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		AR-1	1.2	<0.05	<1.25
		AR-2	1.2	0.06	1.26
		CA-1	4.1	0.21	4.31
		CA-2	4.1	0.13	4.23
		LA-1	0.51	<0.05	<0.56
		LA-2	0.7	<0.05	<0.75
		14-Day PTI			
		AR-1	0.57	<0.05	<0.62
		AR-2	0.52	<0.05	<0.57
		CA-1	2.5	0.20	2.70
		CA-2	5.4	0.18	5.58
		LA-1	0.59	<0.05	<0.64
		LA-2	0.22	<0.05	<0.27
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		AR-1	8.7	0.06	8.76
		AR-2	6.4	0.05	6.45
		CA-1	45, 49	0.17, 0.19	45.17, 49.19
		CA-2	33.5	0.17	33.67
		LA-1	2.3	<0.05	<2.35
		LA-2	11	<0.05	<11.05
		14-Day PTI			
		AR-1	4.1	<0.05	<4.15
		AR-2	3.0	<0.05	<3.05
		CA-1	41, 57	0.22, 0.27	41.22, 55.77
		CA-2	37	0.12	37.12
		LA-1	1.1	<0.05	<1.15
		LA-2	2.9	<0.05	<2.95

[a] Each residue value represents one sample, unless otherwise indicated.

The submitted field residue data (MRID 43468101), reflecting the maximum use patterns the registrant wishes to support for rice, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for rice grain. The combined residues of malathion and malaoxon were 1.17-3.99 ppm in/on rice grain harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment, and were <0.30-26.18 ppm in/on rice grain harvested 14 days following the last of three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

Provided that label revisions are made for the 5 lb/gal EC formulation and 9.79 lb/gal RTU formulation to reflect the use patterns used in the current field trials, no additional field residue data for rice grain will be required for reregistration purposes. The available data will support: (I) a maximum of three foliar applications per growing season, with a 7-day retreatment interval and 7-day PHI, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment; and (ii) a maximum of three foliar applications per growing season, with a 7-day retreatment interval and a 14-day PHI, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

The combined residues of malathion and malaoxon were <0.56-4.31 ppm in/on rice straw harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment, and were <1.15-57.77 ppm in/on rice straw harvested 14 days following the last of three foliar applications, with a 7-day retreatment intervals, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

Wheat

Established tolerance: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on wheat grain [40 CFR §180.111]. No tolerances have been established for residues of malathion in/on wheat forage, hay, and straw.

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified two Cheminova malathion end-use products, a 57% or 5 lb/gal EC formulation and a 95% or 9.79 lb/gal RTU formulation, registered for use on wheat.

The 5 lb/gal EC formulation is registered for multiple foliar applications to wheat at 0.63-1.25 lb ai/A/application in a minimum of 30 gal of water/A with ground equipment or in 5 gal of water/A using aerial equipment. A 7-day PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established.

The 9.79 lb/gal RTU formulation is registered for multiple foliar applications to wheat at 0.15-0.61 lb ai/A/application using ground or aerial ULV equipment. A 7-day PHI is in effect. A maximum seasonal rate or maximum number of applications per growing season has not been established.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company. The 5 lb/gal EC formulation is registered for multiple foliar applications to wheat at 0.94-1.25 lb ai/A/application in a minimum of 10 gal of water/A with ground equipment or in 2 gal of water/A using aerial equipment. A 7-day PHI has been established. A maximum seasonal rate or maximum number of applications per growing season has not been established. This formulation was used as one of the test substances in the wheat field trials.

Discussion of the data (spring wheat): Cheminova submitted data (1994, MRID 43414901) from seven trials conducted in ND(5) and WA(2) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on spring wheat grain, forage, and straw. These commodities were harvested 7 and 14 days following the last of: (I) three foliar applications, with a 7-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.25 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 30 gal of water/A with ground equipment; or (ii) three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application (1x the maximum registered single application rate for this formulation) using aerial ULV equipment. Adequate raw data pertaining to field trial information, application of the test substances, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated spring wheat commodities were frozen (-31 to -11 C) within 1.4 hours of collection and shipped frozen (≤-3 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 196-310 days (~7-10 months). Residues in/on treated and untreated samples were determined using EN-CAS Method No. ENC-8/94. The results of the field trials are presented in Table 10A for spring wheat grain, Table 11A for spring wheat forage, and Table 12A for spring wheat straw. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on four untreated grain samples. Apparent residues of malathion and malaoxon were nondetectable (<0.05 ppm each) in/on each of four untreated forage and straw samples.

Geographic representation of data submitted for spring wheat is adequate since the test states of ND(49%) and WA(10%) plus the neighboring states of ID(5%), MN(11%), MT(14%), and SD(8%) accounted for ~97% of the 1991 U.S. spring wheat production *(1992 USDA Agricultural Statistics)*.

Discussion of the data (winter wheat): Cheminova Agro A/S submitted data (1994, MRID 43350402) from 26 trials conducted in KS(8), MT(4), OH(4), OK(6), and WA(4) depicting the magnitude of the residue of malathion and its metabolite malaoxon in/on winter wheat grain, forage, and straw. These commodities were harvested 7 and 14 days following the last of: (I) three foliar applications, with a 7-day retreatment interval, using the Platte 5 lb/gal EC formulation at 1.25 lb ai/A/application (1x the maximum registered single application rate for the Cheminova EC formulation) in 30 gal of water/A with ground equipment; or (ii) three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application (1x the maximum registered single application rate for this formulation) using aerial ULV equipment. Separate trials were conducted for forage and grain/straw because the application timing for forage was earlier than that needed for the mature grain. Adequate raw data pertaining to field trial information, application of the test substances, and sample-handling procedures were provided.

Intervals from sampling to shipment, homogenization, extraction, and analysis were provided for each test. The harvested treated and untreated winter wheat commodities were frozen (-34 to -8 C) within 8.2 hours of collection and shipped frozen (-29 to -3 C) to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 85-335 days (~3-11 months). Residues in/on treated and untreated samples were determined using EN-CAS Method No. ENC-8/94. The results of the field trials are presented in Table 10B for winter wheat grain, Table 11B for winter wheat forage, and Table 12B for winter wheat straw. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on seven untreated grain samples. Apparent residues of malathion and malaoxon were nondetectable (<0.05 ppm each) in/on seven untreated forage and straw samples.

Geographic representation of data submitted for winter wheat is adequate since the test states of KS(26%), MT(5%), OH(4%), OK(10%), and WA(3%) plus the neighboring states of CO(5%), ID(4%), MO(3%), NE(5%), and TX(6%) accounted for 71% of the 1991 U.S. winter wheat production *(1992 USDA Agricultural Statistics)*.

Table 10A. Residues of malathion and its metabolite malaoxon in/on spring wheat grain following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (1x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		ND-1	0.02	<0.01	<0.03
		ND-2	0.04	<0.01	<0.05
		WA	0.14	<0.01	<0.15
		14-Day PTI			
		ND-1	0.02	<0.01	<0.03
		ND-2	0.03	<0.01	<0.04
		WA	0.05	<0.01	<0.06
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		ND-1	0.10	<0.01	<0.11
		ND-2	0.22	<0.01	<0.23
		ND-3	0.09	<0.01	<0.10
		WA	<0.01	<0.01	<0.02
		14-Day PTI			
		ND-1	0.04	<0.01	<0.05
		ND-2	0.23	<0.01	<0.24
		ND-3	0.07	<0.01	<0.08
		WA	<0.01	<0.01	<0.02

[a] Each residue value represents one sample.

Table 10B. Residues of malathion and its metabolite malaoxon in/on winter wheat grain following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (1x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		KS-1	0.04	<0.01	<0.05
		KS-2	0.04	<0.01	<0.05
		MT	(0.06, 0.08) [b]	(<0.01, <0.01)	(<0.07, <0.09)
		OH	<0.01	<0.01	<0.02
		OK	0.09, 0.10	<0.01, <0.01	<0.10, <0.11
		WA	0.03	<0.01	<0.04
		14-Day PTI			
		KS-1	0.02	<0.01	<0.03
		KS-2	0.01	<0.01	<0.02
		MT	0.02	<0.01	<0.03
		OH	<0.01	<0.01	<0.02
		OK	0.02, 0.02	<0.01, <0.01	<0.03, <0.03
		WA	0.02	<0.01	<0.03
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		KS-1	0.05	<0.01	<0.06
		KS-2	0.04	<0.01	<0.05
		MT	0.08	<0.01	<0.09
		OH	0.03	<0.01	<0.04
		OK-1	0.20, 0.20	<0.01, <0.01	<0.21, <0.21
		OK-2	0.20, 0.33	<0.01, <0.01	<0.22, <0.34
		WA	<0.01	<0.01	<0.02
		14-Day PTI			
		KS-1	0.06	<0.01	0.07
		KS-2	0.03	<0.01	<0.04
		MT	0.02	<0.01	<0.03
		OH	0.17, 0.43	<0.01, <0.01	<0.18, <0.44
		OK-1	0.05	<0.01	<0.06
		OK-2	0.09	<0.01	<0.10
		WA	<0.01	<0.01	<0.02

[a] Each residue value represents one sample.

Table 11A. Residues of malathion and its metabolite malaoxon in/on spring wheat forage following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (1x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		ND-1	<0.05	<0.05	<0.10
		ND-2	<0.05	<0.05	<0.10
		WA	<0.05	<0.05	<0.10
		14-Day PTI			
		ND-1	<0.05	<0.05	<0.10
		ND-2	<0.05	<0.05	<0.10
		WA	<0.05	<0.05	<0.10
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		ND-1	1.3	<0.05	<1.35
		ND-2	0.19	<0.05	<0.24
		ND-3	2.4	<0.05	<2.45
		WA	<0.05	<0.05	<0.10
		14-Day PTI			
		ND-1	0.33	<0.05	<0.38
		ND-2	0.05	<0.05	<0.10
		ND-3	0.91	<0.05	<0.96
		WA	<0.05	<0.05	<0.10

[a] Each residue value represents one sample.

Table 11B. Residues of malathion and its metabolite malaoxon in/on winter wheat forage following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (1x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		KS-1	<0.05	<0.05	<0.10
		KS-2	<0.05	<0.05	<0.10
		MT	<0.05	<0.05	<0.10
		OH	0.09	<0.05	<0.14
		OK	0.05	<0.05	<0.10
		WA	<0.05	<0.05	<0.10
		14-Day PTI			
		KS-1	<0.05	<0.05	<0.10
		KS-2	<0.05	<0.05	<0.10
		MT	<0.05	<0.05	<0.10
		OH	<0.05	<0.05	<0.10
		OK	<0.05	<0.05	<0.10
		WA	<0.05	<0.05	<0.10
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		KS-1	0.41, 0.57	<0.05, <0.05	<0.46, <0.62
		KS-2	1.7, 1.50	<0.05, <0.05	<1.75, <2.0
		MT	0.27	<0.05	<0.32
		OH	0.23	<0.05	<0.28
		OK-1	2.3	<0.05	<2.35
		OK-2	1.7, 1.8	<0.05, <0.05	<1.75, <1.85
		WA	<0.05	<0.05	<0.10
		14-Day PTI			
		KS-1	0.16, 0.42	<0.05, <0.05	<0.21, <0.47
		KS-2	1.45, 2.3	<0.05, <0.05	<1.50, <2.35
		MT	<0.05	<0.05	<0.10
		OH	<0.05	<0.05	<0.10
		OK-1	0.36	<0.05	0.41
		OK-2	0.44, 2.90	<0.05, <0.05	<0.49, <2.95
		WA	<0.05	<0.05	<0.10

[a] Each residue value represents one sample.

Table 12A. Residues of malathion and its metabolite malaoxon in/on spring wheat straw following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (1x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		ND-1	2.5	<0.05	<2.55
		ND-2	0.81	<0.05	<0.86
		WA	9.4	0.29	9.69
		14-Day PTI			
		ND-1	1.4	<0.05	<1.45
		ND-2	1.0	<0.05	<1.05
		WA	3.8	<0.05	<3.85
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		ND-1	18	<0.05	18.0
		ND-2	8.4	<0.05	<8.45
		ND-3	32, 34.33	0.08, 0.05	32.08, 34.38
		WA	1.4	0.05	1.45
		14-Day PTI			
		ND-1	21	<0.05	<21.05
		ND-2	5.4	<0.05	<5.45
		ND-3	20, 30.67	<0.05, 0.08	<20.05,30.85
		WA	0.41	0.05	<0.46

[a] Each residue value represents one sample.

Table 12B. Residues of malathion and its metabolite malaoxon in/on winter wheat straw following multiple foliar applications using the 5 lb/gal EC or 9.79 lb/gal RTU formulations.

Formulation	Application Parameters	Trial Site	Residues (ppm) [a]		
			Malathion	Malaoxon	Combined
5 lb/gal EC	3 foliar applications, with a 7-day retreatment interval, at 1.25 lb ai/A/application (1x) in 30 gal/A of water using ground equipment.	**7-Day PTI**			
		KS-1	1.6	<0.05	<1.65
		KS-2	0.66	<0.05	<0.71
		MT	0.68	<0.05	<0.73
		OH	<0.05	<0.05	<0.10
		OK	2.20	<0.05	<2.25
		WA	3.2	0.13	3.33
		14-Day PTI			
		KS-1	1.2	<0.05	<1.25
		KS-2	0.36	<0.05	<0.41
		MT	0.35	<0.05	<0.40
		OH	<0.05	<0.05	<0.10
		OK	0.29	<0.05	<0.34
		WA	1.3	<0.05	<1.35
9.79 lb/gal RTU	3 foliar applications, with a 7-day retreatment interval, at 0.61 lb ai/A/application (1x) using aerial ULV equipment.	**7-Day PTI**			
		KS-1	6.5	<0.05	<6.55
		KS-2	7.2	<0.05	<7.25
		MT	3.2	<0.05	<3.25
		OH	1.7	<0.05	<1.70
		OK-1	11, 12	<0.05, <0.05	<11.55
		OK-2	3.2, 6.9	<0.05, <0.05	<3.25, <6.95
		WA	1.0	0.06	1.06
		14-Day PTI			
		KS-1	3.9	<0.05	<3.95
		KS-2	1.2	<0.05	<1.25
		MT	1.2	<0.05	<1.25
		OH	2.1	(<0.05, <0.05)	<2.15
		OK-1	8.1, 12	<0.05, <0.05	<8.15, <12.05
		OK-2	9.2, 15	<0.05, <0.05	<9.25, <15.05
		WA	0.15	<0.05	<0.20

a Each residue value represents one sample.

The submitted field residue data (MRIDs 43414901 & 43350402), reflecting the maximum use patterns the registrant wishes to support for spring and winter wheat, indicate that the combined residues of malathion and malaoxon did not exceed the established tolerance (presently expressed as malathion *per se*) of 8 ppm for wheat grain. The combined residues of malathion and malaoxon were <0.03-0.15 ppm in/on spring and winter wheat grain harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment, and were <0.02-0.34 ppm in/on spring and winter wheat grain harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

Provided that label revisions are made for the 5 lb/gal EC formulation and 9.79 lb/gal RTU formulation to reflect the use patterns used in the current field trials, no additional field residue data for wheat grain will be required for reregistration purposes. The available data will support: (I) up to three foliar applications per growing season, with a 7-day retreatment interval and a 7-day PHI, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application with ground equipment; and (ii) up to three foliar applications per season, with a 7-day retreatment interval and a 7-day PHI, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

The combined residues of malathion and malaoxon were <0.10-<0.14 ppm in/on spring and winter wheat forage and were <0.10-9.69 ppm in/on spring and winter wheat straw harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, using the 5 lb/gal EC formulation at 1.25 lb ai/A/application in 30 gal of water/A with ground equipment. The combined residues of malathion and malaoxon were <0.10-<2.35 ppm in/on spring and winter wheat forage and were 1.06-34.38 ppm in/on spring and winter wheat straw harvested 7 days following the last of three foliar applications, with a 7-day retreatment interval, of the 9.79 lb/gal RTU formulation at 0.61 lb ai/A/application using aerial ULV equipment.

The submitted field residue data (MRIDs 43414901 & 43350402) for wheat grain, forage and straw are adequate to satisfy malathion reregistration. However, the guideline OPPTS 860 identifies that wheat hay is also a raw agricultural commodity of wheat. Therefore, field residue data (a minimum of 15 trials) are required for wheat hay. For additional guidance on sampling and geographic locations for field trials, the registrant should consult the guideline OPPTS 860.1500. The tolerance for wheat grain will be reassessed based on residue data from Post-H treatment.

Magnitude of the Residue in Processed Food/Feed

Orange Processed Commodities

Established tolerances: A tolerance of 8 ppm has been established for residues of malathion *per se* in/on oranges [40 CFR §180.111]. A tolerance of 50 ppm has been established for residues of

malathion *per se* in dehydrated citrus pulp for cattle feed as a result of the application of malathion to bagged citrus pulp during storage [40 CFR §186.3850(a)]. The same 40 CFR section specifies that whether or not tolerances for residues of malathion on the fresh fruit have been established under Section 408 of FFDCA, the total residue of malathion in the dried citrus pulp shall not exceed 50 ppm.

Use patterns registered to Cheminova: A REFS search, conducted 1/23/95, identified one Cheminova malathion end-use product, a 57% or 5 lb/gal EC formulation, registered for use on oranges. The 5 lb/gal EC formulation is registered for multiple foliar applications to established orange orchards at 0.625-1.25 lb ai/100 gal, in 500 gal of water/A, or 3.13-6.25 lb ai/A. The formulation is also registered for multiple foliar applications at 1.56 lb ai/A in 200 gal/A. A 7-day PHI is in effect. The label does not specify a maximum seasonal rate or the maximum number of applications that may be made per season.

Other registered use patterns: The submission contained a specimen label for a 57% or 5 lb/gal EC formulation registered to Platte Chemical Company. The 5 lb/gal EC formulation is registered for multiple foliar applications to oranges at 0.78-1.25 lb ai/100 gal/A. A 7-day PHI has been established. A maximum seasonal rate or maximum number of applications per growing season has not been established. This formulation was used as the test substance in the orange processing study.

Discussion of the data: Cheminova submitted data (1994, MRID 43451701) pertaining to the potential for concentration of residues of malathion and its malaoxon metabolite in the processed commodities of oranges. In one test conducted in CA, whole oranges were harvested 7 days following the last of three foliar applications to mature and established orange orchards, with 30-day retreatment intervals, using the Platte 5 lb/gal EC formulation at 6.25 lb ai/A/application. The registrant claims that the application rate is 4x the maximum registered single application rate for the Cheminova EC formulation; however, an examination of the use pattern indicates that the applied rate is only 1x based on a maximum of 500 gallons/A of finished spray. In another test in CA, whole oranges were harvested 7 days following the last of three foliar applications to mature and established orange orchards, with a 30-day retreatment interval, using the Platte 5 lb/gal EC formulation at 12.5 lb ai/A/application (2x the maximum single application of the Cheminova EC formulation). The harvested orange samples were boxed and shipped at ambient temperature on the day of harvest to the National Food Laboratory, Inc. (Dublin, CA) for processing.

Oranges were processed according to simulated commercial procedures. Briefly, the fruits were flume-washed with commercial fruit-cleaning agent and then with municipal water. The washed fruits were abraded in an abrasion peeler to break the oil sacs, and the oil was collected by a water spray. The resulting oil/water emulsion was centrifuged, and the emulsion phase was collected and re-centrifuged to remove water and suspended solids. Water was discarded, solids were added to peel fractions, and oil was collected. The abraded fruits were processed in a juice extractor. The extracted juice was passed through a 0.020-inch screen to remove coarse pulp and

peel fragments, which were added to the peel fraction. An aliquot of the juice was heated (91-93 C), canned, and held at that temperature for 5 minutes to achieve commercial "sterilization." Cans were water-cooled and frozen.

The peels, solids from oil extraction, and juice finisher pulp (the peel fraction) were combined and mechanically shredded, mixed with CaOH to neutralize acidity, and screw-pressed to express the "peel-liquor." The peel liquor was concentrated by thermal/vacuum evaporation, and the concentrated molasses was collected. The pressed peel was dried at 60-69 C to <10% moisture, and collected as dried pulp. The registrant submitted adequate descriptions and material balance sheets for the processing procedures. The processed fractions were shipped frozen to the analytical laboratory (EN-CAS Laboratory, Winston-Salem, NC). At the analytical laboratory, samples were stored frozen (-27 to -12 C) prior to analysis. The intervals between harvest and residue analysis were 129-245 days (~4-8 months). Residues in/on treated and untreated oranges, and its processed commodities were determined using EN-CAS Method No. 16/94. The results of the orange processing study are presented in Table 13; only samples treated at 2x were processed. Apparent residues of malathion and malaoxon were nondetectable (<0.01 ppm each) in/on three untreated samples of whole oranges, and in two samples of oil and one sample each of juice, peel, and molasses processed from untreated oranges. Apparent residues of malathion and malaoxon were nondetectable (<0.05 ppm each) in/on one sample of dried pulp processed from untreated samples of whole oranges.

Table 13. Residues of malathion and malaoxon in/on oranges and orange processed commodities treated with three foliar applications, with a 30 day retreatment intervals, using the 5 lb/gal EC formulation at 12.5 lb ai/A/application (2x).

Orange Commodities	Residues (ppm) [a]			Concentration/Reduction Factors [b]		
	Malathion	Malaoxon	Combined	Malathion	Malaoxon	Combined
Whole oranges	0.18, 0.18 [0.18]	<0.01, <0.01 [<0.01]	<0.19, <0.18 [<0.19]	--	--	--
Oil	39, 41 [40]	0.04, 0.03 [0.04]	38.54, 40.08 [39.54]	219	>3.5	>208
Juice	<0.01, <0.01 [<0.01]	<0.01, <0.01 [<0.01]	<0.02, <0.02 [<0.02]	<0.06	--	0.1
Peel	0.09, 0.10 [0.10]	<0.01, <0.01 [<0.01]	<0.10, <0.11 [<0.11]	0.5	--	0.6
Dried pulp	1.7, 1.8 [1.75]	<0.05, <0.05 [<0.05]	<1.75, <1.85 [<1.80]	9.7	--	9.5
Molasses	0.25, 0.26 [0.26]	<0.01, <0.01, [<0.01]	<0.26, <0.27 [<0.27]	1.4	--	1.4

[a] Residue values in parentheses represent multiple analyses of a single sample. Bracketed values represent the average of all samples and analyses.

[b] Calculated by dividing residues found in processed fraction by the average residues found in whole oranges.

The submitted orange processing study (MRID 43451701) is adequate to satisfy reregistration requirements for magnitude of the residue in citrus processed commodities. The data indicate that the combined residues of malathion and malaoxon concentrated in oil (>208x) and dried pulp (9.5x) processed from oranges bearing detectable residues. The combined residues of malathion and malaoxon concentrated marginally in molasses (1.4x) but reduced in juice (<0.1x) and peel (<0.6x) processed from oranges bearing detectable residues.

The available processing data suggest that tolerances are needed for the combined residues of malathion and malaoxon in citrus oil and dried pulp. Acceptable field residue data (MRID 43078701) on the magnitude of malathion and malaoxon residues in/on oranges have been submitted and evaluated (D199259, D203021, and D203620; R. Perfetti; 9/6/94). The review indicated that the HAFT is <1.91ppm; therefore the tolerances should be 400 ppm for orange oil, and orange dried pulp should be established at 20 ppm.

A tolerance of 50 ppm has been established [40 CFR §186.3850(a)] for residues of malathion *per se* in dehydrated citrus pulp for cattle feed as a result of the application of malathion to bagged citrus pulp during storage. The registrant indicates that the use of malathion on dehydrated citrus pulp (Post-H) is no longer support. CEB1 recommends that the tolerance for dried citrus pulp should be revoked.

EPA MEMORANDA CITED IN THIS REVIEW

DP Barcode:	D196878
Subject:	Response to the Malathion Reregistration Standard: Radiovalidation of method in plants.
From:	R. Perfetti
To:	L. Rossi
Dated:	2/28/94
MRID(s):	42894601

DP Barcode:	D199259, D203021, and D203620
Subject:	Response to the Malathion Reregistration Standard: Magnitude of the Residue Studies.
From:	R. Perfetti
To:	E. Saito
Dated:	9/6/94
MRID(s):	43078702, 43108201, 43078701, and 43175501

MASTER RECORD IDENTIFICATION NUMBERS

Citations for the MRID document referred to in this review are presented below.

References (used):

43350401 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Bulb Onions Harvested After Ground Treatment: Lab Project Number: AA920115: 92-0043. Unpublished study prepared by American Agricultural Services, Inc. and EN-CAS Analytical Labs, Inc. 524 p.

43350402 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Winter Wheat Raw Agricultural Commodities Harvested After Ground and Aerial Treatment: Lab Project Number: AA920127: 92-0053. Unpublished study prepared by American Agricultural Services, Inc. and EN-CAS Analytical Labs, Inc. 1145 p.

43362601 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Grass Raw Agricultural Commodities Harvested After Ground and Aerial Treatment: Lab Project Number: AA920113: 92-0058. Unpublished study prepared by American Agricultural Services, Inc. and EN-CAS Analytical Labs. 648 p.

43372601 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and Its Metabolite Malaoxon in/on Blueberries Harvested after Ground and Aerial Treatment: Lab Project Number: AA920105: 92/0032. Unpublished study prepared by EN-CAS Analytical Laboratories and American Agricultural Services, Inc. 776 p.

43383301 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Green Onions Harvested After Ground Treatment: Lab Project Number: AA920116: 92-0035.Unpublished study prepared by American Agricultural Services, Inc. and EN-CAS Analytical Labs. 568 p.

43383401 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Grapes Harvested After Ground Treatment: Lab Project Number: AA920112: 92-0047. Unpublished study prepared by American Agricultural Services, Inc. and EN-CAS Analytical Labs. 495 p.

43383501 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Avocados Harvested After Ground Treatment: Lab Project Number: AA920102: 92-0057. Unpublished study prepared by American Agricultural Services, Inc. and EN-CAS Analytical Labs. 306 p.

43414901 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Spring Wheat Raw Agricultural Commodities Harvested After Ground and Aerial Treatment: Lab Project Number: AA920124: 92-0060. Unpublished study prepared by American Agricultural Services, Inc. and En-Cas Analytical Labs. 826 p.

43417601 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and its Metabolite Malaoxon in/on Dry Bean Seeds Harvested After Aerial Treatment: Lab Project Number: AA920104: 92-0034. Unpublished study prepared by American Agricultural Services and EN-CAS Analytical Labs. 714 p.

43451701 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and Its Metabolite Malaoxon in Orange Processed Commodities: Lab Project Number: AA920129: 92-0074. Unpublished study prepared by American Agricultural Services, Inc.; EN-CAS Analytical Labs; and The National Food Laboratory, Inc. 467 p.

43468101 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and Its Metabolite Malaoxon in/on Rice Raw Agricultural Commodities Harvested after Ground and Aerial Treatment: Lab Project Number: AA920120: 92/0039. Unpublished study prepared by EN-CAS Analytical Laboratories. 706 p.

References (not used):

[The reference listed below was replaced by MRID 43468101.]

43366601 Bookbinder, M. (1994) Magnitude of the Residue of Malathion and Its Metabolite Malaoxon in/on Rice Raw Agricultural Commodities Harvested after Ground and Aerial Treatment: Lab Project Number: AA920120: 92/0039. Unpublished study prepared by EN-CAS Analytical Laboratories. 706 p.