

6-29-95



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

JUN 29 1995

OFFICE OF  
PREVENTION, PESTICIDES AND  
TOXIC SUBSTANCES

**MEMORANDUM**

**SUBJECT:** Ethion Anticipated Residues in Citrus Juices for DRES Analysis.  
CBRS No.: 15797  
DP Barcode No.: D216940  
Chemical No.: 058401  
Reregistration Case No.: 0090

*Bonnie Cropp-Kohlligian*

**FROM:** Bonnie Cropp-Kohlligian, Environmental Scientist  
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Chemistry Branch II: Reregistration Support  
Health Effects Division [7509C]

**THRU:** William J. Hazel, Ph.D., Section Head  
Reregistration Section II  
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*W. J. Hazel*

**TO:** Paula Deschamp, Section Head  
Risk Characterization and Analysis Branch  
Health Effects Division [7509C]

RCAB has requested that CBRS provide anticipated residue (AR) estimates for ethion residues of concern in citrus juices calculated using average citrus field trial residue levels and the processing factor for ethion residues of concern in citrus juice for a dietary risk analysis. [Note: The use of average field trials to calculate anticipated residues for acute analysis may be questionable for crops such as oranges which can be consumed as a single serving.]

The ethion anticipated residue (AR) estimates for citrus juices calculated as per RCAB's request are provided below in TABLE I.



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contains at least 50% recycled fiber

*1/14*

TABLE I: Anticipated Residue Level Estimates of Ethion Residues of Concern in Citrus Juices.				
Food Name	Food Code	Residue Data Source	% Crop Treated <sup>a</sup>	Anticipated Residues (ppm) <sup>b</sup>
Grapefruit-juice	02002JA	Field Trial Data/Processing Data	100	0.14
Lemons-juice	02004JA	Field Trial Data/Processing Data	100	0.20
Limes-juice	02004JA	Field Trial Data/Processing Data	100	0.18
Oranges-juice	02006JA	Field Trial Data/Processing Data	100	0.22
Tangerines-juice	02008JA	Field Trial Data/Processing Data	100	0.20 <sup>c</sup>

a BEAD report was previously made available to RCAB for evaluation.

b Estimates based on the maximum processing factor for residues of ethion, ethion monooxon, and ethion dioxon in citrus juice (0.08x) multiplied by the average combined residue levels of ethion, ethion monooxon, and ethion dioxon determined from field trial studies reflecting the currently registered maximum application rate and minimum PHI for the use of ethion on citrus (EPA Reg. No. 279-1254; last EPA Acceptance date 12/21/94).

c Lemons data translated to tangerines.

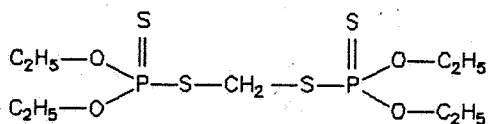
## DETAILED CONSIDERATIONS

### BACKGROUND

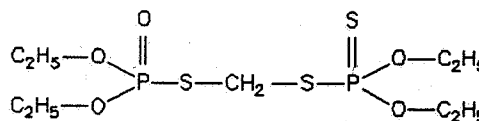
The qualitative nature of the residue in citrus is adequately understood based on an acceptable orange metabolism study. These data indicate that residues are not translocated from treated leaves or fruits. Residues in oranges are found primarily in the peel (>99% of the TRR in the mature fruit), and ethion *per se* is the major terminal residue (ca. 70-80%). Ethion monooxon and ethion dioxon are minor metabolites, each accounting for <1% of the total terminal residue on the day of treatment and 9% and 3% of the TRR respectively, 90 days posttreatment.

Tolerances for residues of ethion in or on raw agricultural commodities, animal products and processed products are currently expressed in terms of the residues of ethion, including its oxygen analog (S-[[diethoxyphosphinothioyl)-thio]methyl] O,O-diethylphosphorothioate). [Source: 40 CFR §180.173, §185.2750, and §186.2750.] The Agency has determined that the current tolerance expression does not need to be amended to include ethion dioxon and, in a separate action, has recommended that the currently established tolerance for citrus fruits be increased from 2 ppm to 5 ppm based on available field trial data.

Chemical structures for ethion and ethion monooxon are provided below:



Ethion



Ethion monooxon

### USE INFORMATION

The 4 lb/gal EC (EPA Reg No. 279-1254; Last EPA Acceptance Date 12/21/94) specifies a maximum seasonal application rate of 9 lb ai/A/year and a maximum single application rate of 3 lb ai/A, with a 90-day minimum interval between consecutive applications. Applications may include up to 0.7% oil and may be made using aerial or ground equipment at a minimum of 10 and 250 gal/A, respectively. The PHI is 0 days for oranges and grapefruit and 15 days for lemons, limes, tangerines, and tangelos. Use is restricted to citrus grown in FL and TX only.

### ANTICIPATED RESIDUES FOR CITRUS FRUITS

Available field trial data reflecting the currently registered maximum use rate of ethion on citrus were used in the determination of the ethion anticipated residue level estimates for citrus fruits.

#### Oranges.

FMC Corporation (1991; MRID 42411404) submitted data from nine tests conducted in FL(6) and TX(3) depicting residues of ethion, ethion monooxon, and ethion dioxon in or on oranges harvested 0-150 days following the last of two, three, or four foliar applications of ethion each applied at 3 lb ai/A at 90 day intervals for total application rates of 6, 9, and 12 lb ai/A/year (0.7x, 1x, and 1.3x, respectively). Ethion (4 or 8 lb/gal EC) was applied in 250 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored at -18 °C for 270-535 days (8.9-17.6 months) until extraction and analysis. Residues of ethion, ethion monooxon, and ethion dioxon were determined using a modified version of FMC Method P-1183M. The detection limit reported for the method in these tests was 0.1 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on oranges receiving the above applications were corrected for average method recoveries of 83.8%, 86.8%, and 91.8%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.1 ppm) on all treated samples. The combined residues of ethion and its monooxon analog were 1.92-4.19 ppm in or on six samples of oranges harvested the same day that the last of 3 foliar applications was applied, for a total application rate of 9 lb ai/A/year (1x). Residues declined to 0.43-1.0 ppm by 150 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable (<0.1 ppm) in or on 33 control samples.

FMC Corporation (1992; MRID 42411405) submitted additional data from eight tests conducted in FL(4) and TX(4) depicting residues of ethion, ethion monooxon, ethion dioxon in or on oranges harvested 0-150 days following the last of two or three foliar sprays of ethion each applied at 3 lb ai/A at 80- to 91- day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively). In all tests, the second application, made during the summer, included 0.5% oil. The 4 lb/gal EC formulation (EPA Reg. No. 279-1254) was applied in 210-254 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored in field facilities at -25 to -1 °C for 1-71 days, after which samples were transferred to storage at -18 °C. The total storage interval for all samples was 219-360 days (7.2-11.8 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined using a modified version of FMC Method P-1183M. The detection limit reported for the method in these tests was 0.05 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on oranges receiving the above applications were corrected for average method recoveries of 96.8%, 92.7%, and 88.9%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.05 ppm) on all treated samples. The combined residues of ethion and its monooxon analog were 1.24-3.30 ppm in or on eight samples of oranges harvested the same day that the last of three foliar applications was applied, for a total application rate of 9 lb ai/A/year (1x). Residues declined to 0.63-1.40 ppm by 60 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable (<0.05 ppm) in or on 35 control samples; however, apparent residues of ethion in or on one control sample were 0.062 ppm.

FMC Corporation submitted data (1992; MRID 42411406) from six tests conducted in FL depicting residues of ethion, ethion monooxon, and ethion dioxon in or on oranges harvested from 0-191 days following the last of three or four foliar sprays of ethion. Ethion formulated as a 4 lb/gal EC (EPA Reg. No. 279-1254) was applied at 3 lb ai/A at 90-day intervals in 250 gal/A using ground equipment, with two exceptions. The second application in each test was applied at 2.1 lb ai/A at 175 gal/A and the interval between the third and fourth spray was 192 days. As a result, the total application rates for the three and four foliar applications were 8.1 and 11.1 lb ai/A/year (0.9x and 1.2x), respectively. In each test, the second spray applied during the summer also included 0.5% oil.

One control and two treated samples were collected from each test and stored in field facilities at  $\leq -22$  °C for 6-122 days, after which samples were transferred to storage at  $-18$  °C. The total storage interval for all samples was 134-287 days (4.4-9.4 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined using FMC Method P-1183M. The detection limit reported for the method was 0.05 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on oranges were not corrected for average method recoveries. Concurrent method recoveries for ethion, monooxon ethion, and ethion dioxon were 97%, 98%, and 101%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable ( $< 0.05$  ppm) in or on all treated samples. The combined residues of ethion and its monooxon analog were 1.65-4.20 ppm in or on six samples of oranges harvested the same day that the last of four foliar applications was applied, for a total application rate of 11.1 lb ai/A/year (1.2x). Residues declined to 0.95-2.25 ppm by 21 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable ( $< 0.05$  ppm) in or on 18 control samples; however, apparent residues of ethion in or on six control samples were 0.09-0.17 ppm.

#### Grapefruit.

FMC Corporation (1991; MRID 42411407) submitted data from eight tests conducted in FL(4) and TX(4) depicting residues of ethion, ethion monooxon, and ethion dioxon in or on grapefruit harvested 0-150 days following the last of two or three foliar sprays, using ground equipment in 250 gal/A, of the 4 or 8 lb/gal EC formulation at 3 lb ai/A/application at 90-day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively).

One control and two treated samples were collected from each test and stored at  $-18$  °C for 287-529 days (9.4-17.4 months) until extraction and analysis. Residues of ethion, ethion monooxon, and ethion dioxon were determined using a modified version of FMC Method P-1183M. The detection limit in these tests was 0.1 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on grapefruit receiving the above applications were corrected for average method recoveries of 85.6%, 91.0%, and 100.0%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable ( $< 0.1$  ppm) on all treated samples. The combined residues of ethion and its monooxon analog were 1.26-3.44 ppm in or on eight samples of grapefruit harvested the same day that the last of three foliar applications was applied, for a total application rate of 9 lb ai/A/year (1x). Residues declined to 0.23-0.81 ppm by 150 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable ( $< 0.1$  ppm) in or on 18 control samples; however, apparent residues of ethion in or on eight control samples were 0.1-0.5 ppm.

FMC Corporation submitted data (1992; MRID 42411408) from eight tests conducted in FL(4) and TX(4) depicting residues of ethion, ethion monooxon, and ethion dioxon in or on grapefruit

harvested 0-150 days following the last of two or three foliar sprays of ethion each applied at 3 lb ai/A at 80 -to 91-day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively). In all tests, the second application, made during the summer, included 0.5% oil. The 4 lb/gal EC formulation (EPA Reg. No. 279-1254) was applied in 210-254 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored in field facilities at -25 to -1 °C for 1-72 days, after which samples were transferred to storage at -18 °C. The total storage interval for all samples was 232-358 days (7.6-11.8 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined using FMC Method P-1183M. The detection limit in these tests was 0.05 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on grapefruit receiving the above applications were corrected for average method recoveries of 89.9%, 84.8%, and 86.8%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.05 ppm) on all treated samples. The combined residues of ethion and its monooxon analog were 0.46-1.73 ppm in or on eight samples of grapefruit harvested the same day that the last of three foliar applications was applied, for a total application rate of 9 lb ai/A/year (1x). Residues declined to 0.34-1.0 ppm by 60 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable (<0.05 ppm) in or on 35 control samples; however, apparent residues of ethion in or on one control sample were 0.069 ppm.

#### Lemons.

FMC Corporation (1992; MRID 42411409) submitted data from two tests conducted in FL depicting residues of ethion, ethion monooxon, and ethion dioxon in or on lemons harvested 0-90 days following the last of two or three foliar sprays of ethion each applied at 3 lb ai/A at 90 day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively). In all tests, the second application, made during the summer, included 0.5% oil. Ethion formulated as a 4 lb/gal EC (EPA Reg. No. 279-1254) was applied in 248-260 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored in field facilities at -24 to -11 °C for 3-62 days, after which samples were transferred to storage at -18 °C. The total storage interval for all samples was 281-326 days (9.2-10.7 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined using a modified version of FMC Method P-1183M. The detection limit in these tests was 0.05 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on lemons receiving the above applications were corrected for average method recoveries of 100.0%, 88.5%, and 83.9%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.05 ppm) on all treated samples. Combined residues of ethion and its monooxon analog were 1.66 and 1.81 ppm in or on two samples of lemons harvested 15 days

after the last of three foliar applications, totaling 9 lb ai/A/year (1x). Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable (<0.05 ppm) in or on five control samples.

FMC Corporation (1992; MRID 42411410) submitted data from two tests conducted in FL depicting residues of ethion, ethion monooxon, ethion dioxon in or on lemons harvested from 0-180 days following the last of two or three foliar sprays of ethion. Ethion formulated as a 4 lb ai/gal EC (EPA Reg. No. 279-1254) was applied at 3 lb ai/A at 91-day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively). In all tests, the second application, made during the summer, included 0.5% oil. Ethion was applied in 250 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored in field facilities at  $\leq -22$  °C for 14-130 days, after which samples were transferred to storage at -18 °C. The total storage interval for all samples was 180-269 days (5.9-8.8 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined FMC Method P-1183M. The detection limit in these tests was 0.05 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on lemons were not corrected for average method recoveries. Concurrent method recoveries for ethion, ethion monooxon, and ethion dioxon were 99%, 102%, and 105%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.05 ppm) on all treated samples. The combined residues of ethion and its monooxon analog were 1.94 and 4.39 ppm in or on two samples of lemons harvested 15 days after the last of three foliar applications, totaling 9 lb ai/A/year (1x). Residues declined to 0.96-1.56 ppm by 91 days posttreatment. Apparent residues of ethion, monooxon ethion, and dioxon ethion were nondetectable (<0.05 ppm) in or on seven control samples; however, apparent residues of ethion in or on four control samples were 0.07-0.22 ppm.

#### Limes.

FMC Corporation submitted data (1992; MRID 42411411) from six tests conducted in FL depicting residues of ethion, ethion monooxon, ethion dioxon in or on limes harvested 0-166 days following the last of two or three foliar sprays of ethion each applied at 3 lb ai/A at 89-95 day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively). In all tests, the second application, made during the summer, included 0.5% oil. Ethion formulated as a 4 lb/gal EC (EPA Reg. No. 279-1254) was applied in 246-253 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored in field facilities at -26 to -10 °C for 9-81 days, after which samples were transferred to storage at -18 °C. The total storage interval for all samples was 240-392 days (7.9-12.9 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined using a modified version of FMC Method P-1183M. The detection limit reported in these tests was 0.05 ppm for each analyte. Residues

of ethion, ethion monooxon, and ethion dioxon in or on limes receiving the above applications were corrected for average method recoveries of 94.7%, 93.2%, and 95.2%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.05 ppm) on all treated samples. The combined residues of ethion and its monooxon analog were 1.11-2.27 ppm in or on six samples of limes harvested 15 days after the last of three foliar applications, totaling 9 lb ai/A/year (1x). Residues declined to 0.45-0.85 ppm by 76 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable (<0.05 ppm) in or on 27 control samples; however, apparent residues of ethion in or on seven control samples were 0.092-0.249 ppm.

FMC Corporation submitted data (1992; MRID 42411412) from six tests conducted in FL depicting residues of ethion, ethion monooxon, ethion dioxon residues in or on limes harvested from 0-184 days following the last of 2 or 3 foliar sprays of ethion. Ethion formulated as a 4 lb ai/gal EC (EPA Reg. No. 279-1254) was applied at 3 lb ai/A at 92 day intervals, for total application rates of 6 or 9 lb ai/A/year (0.7x and 1x, respectively). In all tests, the second application, made during the summer, included 0.5% oil. Ethion was applied in 250 gal/A using ground equipment.

One control and two treated samples were collected from each test and stored in field facilities at  $\leq -21$  °C for 88-288 days, after which samples were transferred to storage at -18 °C. The total storage interval for all samples was 132-315 days (4.3-10.3 months). Residues of ethion, ethion monooxon, and ethion dioxon were determined using FMC Method P-1183M. The detection limit in these tests was 0.05 ppm for each analyte. Residues of ethion, ethion monooxon, and ethion dioxon in or on limes were not corrected for average method recoveries. Concurrent method recoveries for ethion, ethion monooxon, and ethion dioxon were 96%, 100%, and 101%, respectively.

Study results are summarized in the attached Appendix I. Residues of ethion dioxon were nondetectable (<0.05 ppm) on all treated samples. Combined residues of ethion and its monooxon analog were 0.99-3.10 ppm in or on six samples of limes harvested 15 days after the last of three foliar applications, totaling 9 lb ai/A/year (1x). Residues declined to 0.10-0.84 ppm by 90 days posttreatment. Apparent residues of ethion, ethion monooxon, and ethion dioxon were nondetectable (<0.05 ppm) in or on 33 control samples; however, apparent residues of ethion in or on two control samples were 0.08 and 0.21 ppm.

### Summary

Based on the available citrus field trial data (MRIDs 42411404-12) reflecting the currently registered maximum application rate and minimum PHI for use of ethion on citrus, the average combined residues of ethion, ethion monooxon, and ethion dioxon found in/on oranges, grapefruit, lemons, and limes are provided below in TABLE II.



TABLE II: Average combined residues of ethion, ethion monooxon, and ethion dioxon found in or on citrus fruits harvested at the minimum PHI following multiple foliar applications of ethion at 3 lb ai/A using ground equipment at 175-250 gal/A.

Crop (MRIDs)	Application Rate <sup>a</sup> (lb ai/A/year)	Posttreatment Interval <sup>b</sup> (days)	No. of Samples	Average Combined Residue Level <sup>c</sup>
<b>Oranges</b>				
(42411404)	12.0 (1.3x) <sup>d</sup>	0	6	2.5
	9 (1x)	0	6	3.1
(42411405)	9 (1x)	0	6	2.3
(42411406)	11.1 (1.2x) <sup>d</sup>	0	6	3.3
<b>2.8 AVERAGE</b>				
<b>Grapefruit</b>				
(42411407)	9 (1x)	0	8	2.2
(42411408)	9 (1x)	0	8	1.1
<b>1.7 AVERAGE</b>				
<b>Lemons</b>				
(42411409)	9 (1x)	15	2	1.8
(42411410)	9 (1x)	15	2	3.2
<b>2.5 AVERAGE</b>				
<b>Limes</b>				
(42411411)	9 (1x)	15	6	1.9
(42411412)	9 (1x)	15	6	2.4
<b>2.2 AVERAGE</b>				

<sup>a</sup>The maximum label use rate for citrus crops is 9 lb ai/A/year applied as three foliar sprays each at 3 lb ai/A at 90 day intervals (EPA Reg. No. 279-1254; Last EPA Acceptance Date 12/21/94).

<sup>b</sup>The currently labeled PHI is 0 days for oranges and grapefruit and 15 days for lemons, limes, tangerines, and tangelos (EPA Reg. No. 279-1254; Last EPA Acceptance Date 12/21/94).

<sup>c</sup>Sum of the average residue levels of ethion, ethion monooxon, and ethion dioxon.

<sup>d</sup>Maximum seasonal rate. Represents 4 applications with the last application at 3 lb ai/A (1x the maximum single application rate).

**PROCESSING FACTOR FOR CITRUS JUICE**

An orange processing study (MRID 00155850) was submitted and reviewed by the Agency (memo by C. Deyrup dated 7/1/86). These data indicate that ethion residues of concern do not concentrate in citrus juice during processing. These data are deemed adequate to demonstrate potential concentration/reduction for the combined residues of ethion, ethion monooxon, and ethion dioxon in citrus juice and have been summarized below in TABLE III. [Note: No storage stability data are available to support these processing data.]

TABLE III: Summary of Orange Processing Data Used to Determine Citrus Juice Processing Factor. <sup>a</sup>		
Residues Found in/on Whole Orange <sup>b</sup>	Residues Found in/on Juice	
	PPM	Processing Factor
0.94	ND	0.06x
0.78	ND	0.08x
0.86	ND	0.07x
0.84	ND	0.07x
0.86 AVE	ND AVE	0.07x AVE
<sup>a</sup> Total residue values represent combined residues of ethion, ethion monooxon, and ethion dioxon. Results of individual analyses are corrected for average method recovery. LODs for ethion, ethion monooxon, and ethion dioxon reported as 0.02 ppm. ND = Not Detected. For ND values, used combined LODs for ethion, ethion monooxon, and ethion dioxon in calculations.		
<sup>b</sup> Unwashed fruit.		

The average processing factor for the combined residues of ethion, ethion monooxon and ethion dioxon in citrus juice was 0.07x. The highest processing factor for the combined residues of ethion, ethion monooxon, and ethion dioxon in citrus juice was 0.08x.

cc: BLCKohlligian (CBRS), Ethion Registration Standard File, Ethion SF, RF, Circulate.

RDI: WJHazel:6/29/95 EZager:6/29/95

7509C:CBRS:BLCKohlligian:CM#2:Rm 805B:703-305-7462:6/29/95.

Appendix I. Residues of ethion, ethion monoaxon, and ethion dioxon found in or on citrus fruits harvested at various intervals following multiple foliar applications of ethion at 3 lb ai/A using ground equipment at 175-250 gal/A.

Crop (MRIDs)	Application Rate <sup>a</sup> (lb ai/A/year)	Posttreatment Interval <sup>b</sup> (days)	No. of Samples	Residues (ppm)				Average Combined Residue Level <sup>c</sup>
				Ethion	Ethion Monoaxon	Ethion Dioxon		
<u>Oranges</u> (42411404)	12.0 (1.3x) <sup>d</sup>	0	6	1.36 - 3.57	0.11 - 0.28	<0.10	<0.10	2.5
		7	6	0.70 - 2.60	0.12 - 0.30	<0.10	<0.10	---
		14	6	0.43 - 3.01	0.11 - 0.32	<0.10	<0.10	---
		21	6	0.49 - 1.91	0.11 - 0.21	<0.10	<0.10	---
	9 (1x)	0	6	1.82 - 4.00	<0.10 - 0.19	<0.10	<0.10	3.1
		15	6	1.73 - 2.08	0.10 - 0.21	<0.10	<0.10	---
		30	6	1.31 - 2.75	<0.10 - 0.17	<0.10	<0.10	---
		90	6	0.72 - 2.18	<0.10 - 0.22	<0.10	<0.10	---
		150	6	0.32 - 0.90	<0.10 - 0.17	<0.10	<0.10	---
		90	6	0.13 - 0.44	<0.10 - 0.14	<0.10	<0.10	---
<u>Oranges</u> (42411405)	6 (0.7x)	150	6	0.11 - 0.21	<0.10	<0.10	<0.10	---
		9 (1x)	8	1.66 - 3.190	<0.05 - 0.136	<0.05	<0.05	2.3
	9 (1x)	15	8	0.963 - 3.020	<0.05 - 0.181	<0.05	<0.05	---
		30	8	0.920 - 2.367	<0.05 - 0.124	<0.05	<0.05	---
		45-51	10	0.714 - 2.454	<0.05 - 0.189	<0.05	<0.05	---
		60	6	0.578 - 1.348	<0.05 - 0.078	<0.05	<0.05	---
		60-70	8	<0.05 - 0.789	<0.05 - 0.077	<0.05	<0.05	---
		90	8	<0.05 - 0.305	<0.05	<0.05	<0.05	---
		120	8	<0.05 - 0.304	<0.05	<0.05	<0.05	---
		141-150	8	<0.05 - 0.244	<0.05	<0.05	<0.05	---

Appendix I. (continued)

Crop (MRIDs)	Application Rate <sup>a</sup> (lb ai/A/year)	Posttreatment Interval <sup>b</sup> (days)	No. of Samples	Residues (ppm)				Average Combined Residue Level <sup>c</sup>
				Ethion	Ethion Monooxon	Ethion Dioxon		
<u>Oranges</u> (42411406)	11.1 (1.2x) <sup>d</sup>	0	6	1.59 - 4.11	<0.05 - 0.09	<0.10	<0.10	3.3
		7	6	1.00 - 2.38	0.05 - 0.17	<0.10	<0.10	---
		14	6	0.84 - 3.24	0.05 - 0.19	<0.10	<0.10	---
		21	6	0.89 - 2.07	0.06 - 0.24	<0.10	<0.10	---
		15	6	0.98 - 2.37	0.18 - 0.29	<0.10	<0.10	---
		30	6	0.93 - 1.84	0.18 - 0.34	<0.10	<0.10	---
<u>Grapefruit</u> (42411407)	9 (1x)	60	6	0.51 - 1.70	0.19 - 0.42	<0.10	<0.10	---
		191	6	<0.05 - 0.53	<0.05 - 0.10	<0.10	<0.10	---
		0	8	1.16 - 3.34	<0.10 - 0.10	<0.10	<0.10	2.2
		15	8	0.68 - 2.09	<0.10 - 0.16	<0.10	<0.10	---
<u>Grapefruit</u> (42411408)	6 (0.7x)	30	8	0.95 - 1.60	<0.10 - 0.12	<0.10	<0.10	---
		90	8	0.43 - 0.97	<0.10 - 0.10	<0.10	<0.10	---
		150	8	0.13 - 0.71	<0.10	<0.10	<0.10	---
		90	8	0.10 - 0.78	<0.10 - 0.11	<0.10	<0.10	---
		150	8	<0.10 - 0.51	<0.10	<0.10	<0.10	---
		0	8	0.412 - 1.629	<0.05 - 0.105	<0.05	<0.05	1.1
<u>Grapefruit</u> (42411408)	9 (1x)	15	8	0.560 - 1.838	<0.05 - 0.132	<0.05	<0.05	---
		30	8	0.111 - 1.357	<0.05 - 0.114	<0.05	<0.05	---
		45	10	0.379 - 0.890	<0.05	<0.05	<0.05	---
		60	6	0.288 - 0.939	<0.05 - 0.067	<0.05	<0.05	---
		60-70	8	0.151 - 0.762	<0.05 - 0.10	<0.05	<0.05	---
<u>Grapefruit</u> (42411408)	6 (0.7x)	90	8	0.133 - 0.326	<0.05	<0.05	<0.05	---
		120	8	0.078 - 0.318	<0.05	<0.05	<0.05	---
		141-150	8	0.065 - 0.236	<0.05	<0.05	<0.05	---

Appendix I. (continued)

Crop (MRIDs)	Application Rate <sup>a</sup> (lb ai/A/year)	Posttreatment Interval <sup>b</sup> (days)	No. of Samples	Residues (ppm)				Average Combined Residue Level <sup>c</sup>
				Ethion	Ethion Monooxon	Ethion Dioxon		
<u>Lemons</u> (42411409)	9 (1x)	0	2	0.723 - 1.410	<0.05 - 0.058	<0.05	<0.05	1.2
		15	2	1.536, 1.737	0.069, 0.077	<0.05	<0.05	1.8
	6 (0.7x)	45	2	0.405, 0.523	<0.05, 0.060	<0.05	<0.05	---
		60	2	0.302, 0.385	<0.05, 0.057	<0.05	<0.05	---
		90	2	0.184, 0.236	<0.05	<0.05	<0.05	---
		0	2	3.80 - 5.39	0.11 - 0.16	<0.05	<0.05	4.9
<u>Lemons</u> (42411410)	9 (1x)	15	2	1.81, 4.04	0.13, 0.35	<0.05	<0.05	3.2
		29	2	2.34, 3.28	0.27, 0.32	<0.05	<0.05	---
	6 (0.7x)	45	2	2.98, 3.08	<0.05	<0.05	<0.05	---
		59	2	1.77, 2.00	<0.05	<0.05	<0.05	---
		91	2	0.82 - 1.40	<0.05 - 0.21	<0.05	<0.05	---
		60	2	1.21, 1.94	0.18, 0.29	<0.05	<0.05	---
<u>Limes</u> (42411411)	9 (1x)	91	2	0.96, 3.33	0.16, 0.35	<0.05	<0.05	---
		120	2	0.07, 0.08	<0.05	<0.05	<0.05	---
	6 (0.7x)	150	2	0.07, 0.08	<0.05	<0.05	<0.05	---
		180	2	0.08, 0.13	<0.05	<0.05	<0.05	---
		0	6	1.981 - 3.845	<0.05 - 0.159	<0.05	<0.05	3.2
		15	6	1.052 - 2.133	0.060 - 0.146	<0.05	<0.05	1.9
9 (1x)	30	6	1.163 - 1.782	0.065 - 0.123	<0.05	<0.05	---	
	45	6	0.620 - 1.394	<0.05 - 0.138	<0.05	<0.05	---	
	60	6	0.281 - 0.748	<0.05 - 0.094	<0.05	<0.05	---	
	76	4	0.400 - 0.765	<0.05 - 0.083	<0.05	<0.05	---	

Appendix I. (continued)

Crop (MRIDs)	Application Rate <sup>a</sup> (lb ai/A/year)	Posttreatment Interval <sup>b</sup> (days)	No. of Samples	Residues (ppm)					Average Combined Residue Level <sup>c</sup>
				Ethion	Ethion Monooxon	Ethion Dioxon			
Limes (42411412)	6 (0.7x)	45	6	0.616 - 1.266	0.092 - 0.185	<0.05	<0.05	---	
		60	6	0.152 - 0.414	<0.05 - 0.168	<0.05	<0.05	---	
		90	6	0.082 - 0.346	<0.05 - 0.097	<0.05	<0.05	---	
		120	6	<0.05 - 0.197	<0.05	<0.05	<0.05	---	
	9 (1x)	150	6	<0.05	<0.05	<0.05	<0.05	---	
		166	4	<0.05 - 0.084	<0.05	<0.05	<0.05	---	
		0	6	1.67 - 4.80	0.08 - 0.18	<0.05	<0.05	5.7	
		15	6	0.84 - 2.83	0.08 - 0.27	<0.05	<0.05	2.4	
		30	6	0.74 - 1.83	<0.05 - 0.15	<0.05	<0.05	---	
		46	6	0.47 - 1.72	0.09 - 0.19	<0.05	<0.05	---	
6 (0.7x)	60	6	0.30 - 1.13	0.06 - 0.23	<0.05	<0.05	---		
	90	6	<0.05 - 0.64	<0.05	<0.05	<0.05	---		
	44	6	0.30 - 0.78	0.08 - 0.17	<0.05	<0.05	---		
	61	6	0.17 - 0.60	0.05 - 0.15	<0.05	<0.05	---		
	92	6	0.11 - 0.33	<0.05 - 0.11	<0.05	<0.05	---		
	122	6	0.07 - 0.31	<0.05 - 0.17	<0.05	<0.05	---		
6 (0.7x)	154	6	<0.05 - 0.13	<0.05	<0.05	<0.05	---		
	184	6	<0.05 - 0.09	<0.05	<0.05	<0.05	---		

<sup>a</sup> The maximum labeled seasonal use rate for citrus crops is 9 lb ai/A/year applied as three foliar sprays each at 3 lb ai/A at 90 day intervals (EPA Reg. No. 279-1254; last EPA Acceptance date 12/21/94).

<sup>b</sup> The currently labeled PHI is 0 days for oranges and grapefruit and 15 days for lemons, limes, tangerines, and tangelos (EPA Reg. No. 279-1254; last EPA Acceptance date 12/21/94).

<sup>c</sup> Sum of the average residue levels of ethion, ethion monooxon, and ethion dioxon. Only calculated for data which represent the maximum use rate and minimum PHI.

<sup>d</sup> Maximum seasonal rate. Represents 4 applications with the last application at 3 lb ai/A (1x the maximum single application rate).