



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

OFFICE OF CHEMICAL SAFETY AND  
POLLUTION PREVENTION

MEMORANDUM

Date: 6/23/10

SUBJECT: **Fenamiphos:** Revised Human Health Risk Assessment for Imported Commodities.

**PC Code:** 100601

**Decision No.:** 394717

**Petition No.:** Not Applicable

**Risk Assessment Type:** Single Chemical/ No  
Aggregate

**TXR No.:** Not Applicable

**MRID No.:** None

**DP Barcode:** 377426

**Registration No.:** NA

**Regulatory Action:** Tolerance Reassessment

**Case No.:** 0333

**CAS No.:** 22224-92-6

**40 CFR:** 180.349

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**Executive Summary**

The Health Effects Division has performed a revised human health risk assessment for fenamiphos (ethyl 3-methyl-4-(methylthio) phenyl-1-(methylethyl) phosphoramidate), an organophosphate (OP) insecticide. The previous risk assessment *Fenamiphos: Human Health Risk Assessment for Imported Commodities*, D353552, 6/17/09, has been revised herein to reflect 1) new toxicological points of departure (PoDs) based on benchmark dose analyses, 2) registrant support for imported banana, grape and pineapple (no longer supporting citrus and garlic) and 3) refinements to the dietary assessment including incorporation of new field trial data for bananas and grapes and incorporation of percent crop treated information for all the commodities.

There are no active U.S. registrations for fenamiphos. The tolerance reassessment decision for fenamiphos was issued in a Federal Register Notice dated September 17, 2008 (FRL-8375-2). Under this notice all domestic tolerances were to be revoked by December 31, 2009. The current

registrant, Bayer, had expressed interest in continuing to support tolerances for import purposes for the following: banana; citrus, group 10, garlic, grape and pineapple. The established tolerances for residues of fenamiphos on these commodities (40 CFR §180.349) were to remain to allow any of these commodities bearing residues of fenamiphos to be legally imported into the U.S. However, Bayer has more recently expressed interest in only supporting tolerances for the imported commodities banana, grape, and pineapple and not those for citrus and garlic. This assessment considers only food as a potential route of exposure to fenamiphos and only considers banana, grape, and pineapple commodities. Residential, occupational, and aggregate exposure assessments are not warranted and were not performed.

For the acute and chronic dietary risk assessment, the toxicity points of departure (PoDs) were derived by benchmark dose analysis of the currently available data (acute neurotoxicity in rats and 1 year chronic dog study) and are based on cholinesterase inhibition in red blood cells (adult animals). An uncertainty factor of 100 (10x interspecies extrapolation and 10x intraspecies variability) is required for this assessment. Additionally, a 10x FQPA factor is applied for the lack of a required comparative cholinesterase assay (CCA). The resulting aPAD (acute population adjusted dose) is 0.00011 mg/kg/day and the resulting cPAD (chronic PAD) is 0.00003 mg/kg/day.

Acute and chronic dietary risk assessments were conducted for the imported crops of interest (banana, grape, and pineapple). Recently submitted field trial data (banana and grape) and FDA monitoring data (pineapple) were used to derive anticipated residues on foods. Usage and import analyses provided by BEAD were used for determining percent crop treated (% CT). Default or empirical processing factors were also used where applicable. For nondetectable (below the limit of detection, or LOD) residues, values were calculated as ½ LOD for the portion of the crop assumed to be treated with fenamiphos and zero for the portion assumed to be untreated.

**The acute dietary risk assessment indicates exposures to imported food treated with fenamiphos exceed HED's level of concern for infants and children** (age subgroups 1-2 and 3-5). Children 1-2 years of age were observed to be the most highly exposed population subgroup with exposures at **220% of the aPAD**. The chronic dietary risk estimates did not exceed HED's level of concern. The most highly exposed population (children ages 1-2) resulted in an estimate of 9.7% of the cPAD.

HED has determined what data remain outstanding to support the tolerances for these imported commodities. For toxicology, a comparative cholinesterase assay (CCA) is required to address uncertainties with regard to susceptibility in the young animals. An immunotoxicity study is also required based on the Revised Part 158 Toxicology Data Requirements for Conventional Pesticides. For residue chemistry, additional field trials for foliar application to grapes are needed to support tolerances for imported grape commodities (see Data Gaps section of this document for details).

Once the required CCA data for fenamiphos are received and evaluated for suitability for use in risk assessment, a BMD analysis will likely be performed to derive more refined toxicological PoDs. In addition to reevaluation of the PoDs, HED recommends that, once all outstanding data have been received, the uncertainty and safety factors be reevaluated.

## Hazard Identification

The toxicology profile of fenamiphos demonstrates that, fenamiphos, like other organophosphates has anticholinesterase activity in all species tested including mice, rats, rabbits and dogs. Technical fenamiphos is placed in Toxicity Category I for oral and dermal toxicity and in Toxicity Category II for inhalation toxicity. Fenamiphos causes mild eye irritation and therefore is placed in Toxicity Category III. It is not irritating to the skin (Toxicity Category IV) and is not a dermal sensitizer.

Inhibition of plasma, erythrocyte and/or brain cholinesterase (ChE) activity occurs by all routes of exposure (oral, dermal and inhalation) following acute, subchronic and chronic exposures. Following subchronic or chronic oral exposures, dogs were shown to be the most sensitive species with the Lowest Observed Adverse Effect Levels (LOAEL) for ChE inhibition occurring at a dose of 0.03 mg/kg/day. There is no evidence of increased susceptibility to rat or rabbit fetuses following prenatal in utero exposure or following pre-/ postnatal exposure to rats for two generations. In these studies maternal or parental No Observed Adverse Effect Levels (NOAELs) are lower or equivalent to the developmental or offspring NOAELs. At the time of the 1999 HED risk assessment a developmental neurotoxicity (DNT) study was not required. However, as noted in the 2002 IRED a Data Call-In Notice (DCI) had been sent to registrants of organophosphate pesticides registered under FIFRA (August 6, 1999 64FR42945-42947, August 18 64FR44922-44923) requiring developmental neurotoxicity studies; for fenamiphos, these data were due in 2003. A developmental neurotoxicity screening study was received in 2004 (MRID 46203401). This study has not undergone formal Agency review as the requirement for the DNT has since been waived. The results of this study would not be expected to have an impact on the current risk assessment as the NOAEL of 0.2 mg/kg/day identified in the DNT (based on LOAEL of 0.9 mg/kg/day for maternal RBC ChEI) is greater than the BMDL<sub>10</sub> currently selected for chronic oral exposure assessments (0.03 mg/kg/day based on RBC ChEI).

There is now a requirement for a comparative cholinesterase assay (CCA) study (in lieu of a DNT study). The CCA is needed to evaluate any potential for increased cholinesterase sensitivity in juvenile animals compared with that of adult animals. CCA studies have been submitted to HED for more than 20 other OPs and for many of these OPs the CCAs have shown juveniles to be more sensitive than adults. The CCA study remains a toxicology data gap for fenamiphos. In the 2002 IRED, the FQPA safety factor (10x) for enhanced susceptibility of infants and children (as required by FQPA) was reduced to 1x for fenamiphos based on the currently available hazard and exposure data. However, in 2006, the OP cumulative risk assessment (OP CRA) indicated that a 10x FQPA safety factor is appropriate for fenamiphos and other OPs lacking CCA data. A 10x FQPA safety factor has been applied in this current assessment.

In addition to the CCA study an immunotoxicity study is now required based on the Revised Part 158 Toxicology Data Requirements for Conventional Pesticides for the reasons specified in the attachment 1. According to one review of the issue of immunotoxicity associated with the chemical class of organophosphates, immunotoxicity is a potential concern for this class of chemicals (Galloway, T. and R. Handy (2003) Immunotoxicity of Organophosphorous Pesticides. *Ecotoxicology* 12:345-363). Fenamiphos is currently regulated based on a BMDL<sub>10</sub> of 0.11 mg/kg/day for acute dietary exposure and a BMDL<sub>10</sub> of 0.03 mg/kg/day for chronic dietary exposure. HED does not believe that the special series 870.7800 immunotoxicity study

will result in NOAELs less than the current PoDs selected for fenamiphos and an additional uncertainty factor (UF<sub>DB</sub>) for database uncertainties does not need to be applied at this time.

Fenamiphos is classified as a Group E chemical (i.e., evidence of non carcinogenicity for humans) based on no evidence of carcinogenicity in two adequate studies in mice and rats. Mutagenicity studies show that fenamiphos is not mutagenic either in vivo or in vitro. Metabolism studies in the rat indicated no major differences between oral and intravenously administered fenamiphos. Fenamiphos is degraded and/or eliminated within 48 hours postdosing and does not accumulate in tissues. The major metabolites were sulfoxides and sulfates.

Dose-response modeling (i.e. benchmark dose, or BMD, analysis) is preferred over the use of NOAEL/LOAELs in order to establish toxicological points of departure. NOAELs and LOAELs do not necessarily reflect the relationship between dose and response for a given chemical and are highly dependent on dose selection in that they are limited to the doses included in a study. A benchmark dose analysis of the studies used in the previous fenamiphos risk assessment has been performed. For the purpose of supporting fenamiphos tolerances on imported commodities, only acute and chronic dietary PoDs are required. For the acute dietary exposure and risk assessment, the toxicity PoD selected is a BMDL<sub>10</sub> (0.11 mg/kg) based on cholinesterase inhibition in red blood cells (male-female grouped; adult) from an acute neurotoxicity study in rats. For the chronic dietary exposure and risk assessment, the toxicity PoD selected is BMDL<sub>10</sub> (0.030mg/kg) based on cholinesterase inhibition in red blood cells (male-female grouped; adult) from a 1-year chronic toxicity study in dogs. An uncertainty factor of 100 (10x interspecies extrapolation and 10x intraspecies variability) is required for this assessment. Additionally, a 10x FQPA factor is applied for the lack of CCA data. The resulting aPAD (acute population adjusted dose) is 0.00011 mg/kg/day and the resulting cPAD (chronic PAD) is 0.00003 mg/kg/day.

Once the required CCA data for fenamiphos are received and evaluated for suitability for use in risk assessment, a BMD analysis will likely be performed to derive more refined PoDs. In addition to reevaluation of the PoDs, HED recommends that, once all outstanding data have been received, the uncertainty and safety factors be reevaluated. The PoDs used in the current assessment are presented in Table 1 below.

| <b>Table 1. Summary of Toxicological Points of Departure for Fenamiphos Use in Dietary Exposure Assessment.</b> |                                                                                                                                                                                         |                                                                                                         |                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Exposure Scenario</b>                                                                                        | <b>POD , UF</b>                                                                                                                                                                         | <b>FQPA Safety Factor</b>                                                                               | <b>Study and Toxicological Effects</b>                                                                                                                                                            |
| Acute Dietary<br><u>All populations</u>                                                                         | BMDL <sub>10</sub> = 0.11 mg/kg/day<br><br>UF = 100 (10x UF <sub>A</sub> and 10x UF <sub>H</sub> )<br><br><b>Acute RfD</b> = $\frac{\text{BMDL}_{10}}{\text{UF}}$<br>= 0.0011 mg/kg/day | FQPA SF = 10x<br><br><b>aPAD</b> = $\frac{\text{aRfD}}{\text{FQPA SF}}$<br>=<br><b>0.00011mg/kg/day</b> | <b>Acute Neurotoxicity Study in Rats</b><br>BMDL <sub>10</sub> (0.11 mg/kg) based on cholinesterase inhibition in red blood cells (male-female grouped; adult)<br>(BMD <sub>10</sub> =0.27 mg/kg) |

| Table 1. Summary of Toxicological Points of Departure for Fenamiphos Use in Dietary Exposure Assessment. |                                                                                                                                                                                  |                                                                                                         |                                                                                                                                                                                                    |
|----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Exposure Scenario                                                                                        | POD , UF                                                                                                                                                                         | FQPA Safety Factor                                                                                      | Study and Toxicological Effects                                                                                                                                                                    |
| Chronic Dietary <u>all populations</u>                                                                   | $BMDL_{10} = 0.030 \text{ mg/kg/day}$<br>$UF = 100 (10 \times UF_A \text{ and } 10 \times UF_H)$<br>$Chronic \text{ RfD} = \frac{BMDL_{10}}{UF}$<br>$= 0.0003 \text{ mg/kg/day}$ | $FQPA \text{ SF} = 10 \times$<br>$cPAD = \frac{cRfD}{FQPA \text{ SF}}$<br>$= 0.00003 \text{ mg/kg/day}$ | <b>1-Year Chronic Toxicity Study in Dogs</b><br>$BMDL_{10}$ (0.030mg/kg) based on cholinesterase inhibition in red blood cells (male-female grouped; adult).<br>$(BMD_{10} = 0.072 \text{ mg/kg})$ |
| Cancer                                                                                                   |                                                                                                                                                                                  | N/A                                                                                                     |                                                                                                                                                                                                    |

POD= Point of Departure. BMD= benchmark dose; estimated dose at which 10% ChE inhibition is observed;  $BMDL_{10}$  = the lower 95% confidence interval. UF = uncertainty factor.  $UF_A$  = extrapolation from animal to human (interspecies).  $UF_H$  = potential variation in sensitivity among members of the human population (intraspecies). RfD= Reference dose. PAD = population adjusted dose (a = acute, c = chronic). N/A = not applicable.

## Residue Chemistry

Tolerances are currently established in 40CFR 180.349 for the “combined residues of the nematocide Fenamiphos (ethyl 3-methyl-4-(methylthio)phenyl (1- methylethyl) phosphoramidate) and its cholinesterase inhibiting metabolites ethyl 3-methyl-4-(methylsulfinyl)phenyl (1- methylethyl)phosphoramidate and ethyl 3-methyl-4-(methylsulfonyl)phenyl (1-methylethyl) phosphoramidate” for numerous fruits, vegetables, and livestock commodities (Attachment 3).

Product and Residue Chemistry Chapters were previously prepared for the Fenamiphos RED (D187029, 1/25/94, C. Olinger). The qualitative nature of the residue in plants is adequately understood. The terminal residues of concern are fenamiphos, fenamiphos sulfoxide, and fenamiphos sulfone. Adequate enforcement methods are available for the determination of residues of fenamiphos and its cholinesterase-inhibiting metabolites in/on plant and animal commodities.

The tolerance reassessment decision for fenamiphos was issued in a Federal Register Notice dated September 17, 2008 (FRL-8375-2). Under this notice all domestic tolerances were to be revoked by December 31, 2009; however, several imported commodities treated with fenamiphos would continue to have tolerances: banana; citrus fruit, group 10; garlic; grape; grape, raisin; and pineapple. Bayer has more recently expressed interest in only supporting tolerances for the imported banana, grape, and pineapple commodities and not those for citrus and garlic.

In support of the remaining tolerances, HED has reviewed the available crop field trial data that were originally submitted in support of U.S. uses on banana, citrus fruit, garlic, grape, and

pineapple for their adequacy in supporting the foreign use patterns identified in the Fenamiphos Import GAP table (received from Bayer 7/25/08; email to Eric Miederhoff). A summary of the GAP and conclusions regarding the adequacy of existing crop field trials for imports can be found in the 6/17/09 *Fenamiphos: Human Health Risk Assessment for Imported Commodities*. Actual labels reflecting fenamiphos use in foreign countries were not available to HED at that time and those labels were requested in that assessment. Since that review, foreign labels have been submitted (*Nemacur® Foreign Product Labels and Nemacur® Foreign Use Information to Support Fenamiphos Import Tolerances in/on Bananas, Grapes & Pineapples*, document in email from Bayer to E. Miederhoff, dated 1/25/10) as well as new field trial submissions to support the use of fenamiphos on banana (MRID 47844402; D353551, 6/16/10, D.Drew) and grape (MRID 47844401; D353551, 6/16/10, D.Drew). HED compared the use patterns in the submitted foreign labels to all the available field trial data (for bananas, grapes and pineapple only) with respect to trial locations, formulation type, application rate and timing, and PHI (preharvest interval). HED has also considered the significance of the country, in which use is registered, as a source of U.S. imports. The residue chemistry conclusions below supersede those found in the 2009 risk assessment:

### Banana

The available field trial data are adequate to support the established tolerance for fenamiphos on banana imports at 0.10 ppm. (Banana field trial data are summarized in Table A1, Attachment 2.)

The foreign labels identify soil/ground and trunk base uses on bananas in Belize, Costa Rica, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, and the Philippines. The U.S. imports ~97% of its bananas from Central and South America; U.S. imports from the Philippines would be negligible. No field trial data are required to support uses on banana in the Philippines.

For uses registered in Mexico and Central and South America, the available data from 23 trials conducted in Costa Rica, Colombia, Ecuador, Guatemala, Mexico, Windward Islands and Hawaii, reflecting application of the granular (5%, 10%, or 15% G) and emulsifiable concentrate (400 g/L EC) formulations at rates of 2.8-54 g ai/plant (maximum seasonal rate in the trials was equivalent to 96 lbs ai/A, based on 2000 plant/ha) and PHIs of 0-195 days are sufficient to support uses of the 10-15%G and 400EC formulations in the countries with fenamiphos use on bananas. In the subject trials pertinent to geographical locations of current fenamiphos use the maximum fenamiphos residues were 0.04 ppm in/on banana peel. Residues were nondetectable (<LOQ) in field trials that sampled whole fruit.

[Source on banana imports: "Fruit and Tree Nuts Situation and Outlook Yearbook", USDA, 2006].

### Grape

The available field trial data (81 trials) reflecting soil application of the 15% G and 3lb/gal EC formulation of fenamiphos in the U.S. and the 240 g/L capsule suspension (CS) in the U.S., Chile, and Mexico will adequately support the established tolerances for imported grape at 0.10 ppm and raisin at 0.30 ppm. However, the data do not support the current foliar uses in Mexico (Bayer Submission Label No. 06-E, Nemacur 400 CE). (Grape field trial data are summarized in Table A2, Attachment 2.)

The available foreign labels identify soil uses on grapes in Argentina, Australia, Chile, Mexico, and South Africa and foliar uses in Mexico. With the exception of South Africa, these countries are considered to be significant suppliers of imported fresh grapes, grape juice, and/or wine for the U.S.

The available grape field trials reflecting fenamiphos uses in the U.S., Chile, and Mexico are acceptable for covering the current foreign soil application uses because the extensive trials cover the climatic conditions and agricultural practices expected to occur in the major grape exporting countries. The field trials include applications of both G, EC and CS formulations and cover a wide range of PHIs (0-279 days). In addition, the field trial data include numerous tests with seasonal application rates of 4.7-40 lb ai/A/season. The maximum seasonal rates for soil applications in the major exporting countries range from 3.6 lb ai/A to 10.7 lb/ai/A (with 0-100 day PHIs). *However, the data do not include any tests reflecting foliar application of fenamiphos; therefore, additional data are required to support the foliar uses on grapes in Mexico.*

Acceptable processing data for grape are also available, indicating that fenamiphos residues may concentrate by up to 2.5x in raisins. Based on the maximum observed residues in the grape field trials (0.09 ppm) and the above processing factor, the available residue data will support the current 0.3 ppm tolerance for raisins.

[Source on grape imports: "Fruit and Tree Nuts Situation and Outlook Yearbook", USDA, 2006].

### Pineapple

The available field trial data reflecting soil and/or foliar application of the 15% G and 3 lb/gal EC formulations of fenamiphos in the U.S. (HI) will support the established tolerance of 0.30 ppm for imported pineapple. (Pineapple field trial data are summarized in Table A3, Attachment 2.)

The submitted foreign labels identify soil uses on pineapple in Costa Rica, Guatemala, Mexico, Nicaragua, Panama, and the Philippines. Costa Rica, Guatemala, and Mexico are all significant suppliers of imported fresh pineapple, and the Philippines are a significant source of imported canned pineapple.

The fenamiphos uses on pineapples in the major exporting countries typically specify a single soil application per season of a 10% or 15%G or 400 g/L EC formulation at maximum rates of 2.4-12.5 lb ai/A (2.8-14 kg/ha) and with PHIs of 30-180 days

The available field trial data from HI (44 trials) reflect combined applications of G formulations as a preplant or at-planting soil application followed by repeated foliar applications of the EC formulation. Seasonal application rates in the HI field trials range from 15-100 lb ai/A, with most trials including maximum application rates of 20-43 lb ai/A, which are equivalent to 2x-3x the maximum foreign use rates. The HI field trial data include numerous tests having both shorter (27-36 days) and longer (139-270 days) PHIs. Residues of fenamiphos in pineapple ranged from nondetectable to 0.18 ppm.

Although the available data are geographically restricted, the data will support most of the foreign use on pineapples because the field trial data reflect uses at exaggerated rates (2x-3x). The data will adequately support soil applications of fenamiphos (G and EC) in Central America Mexico and the Philippines at up to 12.5 lb ai/A/season (14 kg/ha).

[Source on pineapple imports: "Fruit and Tree Nuts Situation and Outlook Yearbook", USDA, 2007].

## Dietary Exposure

Probabilistic acute and refined chronic dietary risk assessments were conducted to evaluate exposure from food residues of fenamiphos using the version 2.03 Dietary Exposure Evaluation Model (DEEM-FCID) (D353550, 6/23/10, P.Savoia). This assessment included dietary exposure from the consumption of imported banana, grape, and pineapple commodities treated with the insecticide fenamiphos. Drinking water was not included in the dietary assessment since there are no registered uses of fenamiphos in the U.S.

For these assessments, anticipated residues were derived from crop field trial data for fenamiphos conducted abroad on bananas and grapes along with FDA surveillance monitoring results (2004-2008) for pineapples (existing PDP monitoring data for pineapples could not be used as PDP did not analyze for all of the fenamiphos metabolites of concern). Usage and import analyses provided by BEAD were used for determining percent crop treated (% CT) (No Barcode, 4/7/10, and D353556, 4/28/10, J. Alsadek). Default or empirical processing factors were also used where applicable. For nondetectable (below the limit of detection, or LOD) residues, anticipated residue values were calculated as  $\frac{1}{2}$  LOD for the portion of the crop assumed to be treated with fenamiphos and zero for the portion assumed to be untreated. Point estimates were used for chronic residue inputs and residue distribution files were used for acute inputs.

| <b>Table 2. Summary of Anticipated Residue (AR) Levels and Percent Crop Treated Data for Fenamiphos.</b> |                                     |                             |                                  |                                                |                           |                           |
|----------------------------------------------------------------------------------------------------------|-------------------------------------|-----------------------------|----------------------------------|------------------------------------------------|---------------------------|---------------------------|
| <b>Commodity</b>                                                                                         | <b>1/2LOD<sup>1</sup><br/>(ppm)</b> | <b>Chronic AR<br/>(ppm)</b> | <b>Number<br/>of<br/>Samples</b> | <b>Number<br/>of<br/>Detects<br/>(&gt;LOD)</b> | <b>Source</b>             | <b>% Crop<br/>Treated</b> |
| Banana                                                                                                   | 0.0016                              | 0.0018                      | 50                               | 4                                              | Field trials <sup>2</sup> | 8% <sup>5</sup>           |
| Grape, fresh                                                                                             | 0.0016                              | 0.00447                     | 20                               | 2                                              | Field Trials <sup>3</sup> | 4% <sup>5</sup>           |
| Grape, juice                                                                                             |                                     |                             |                                  |                                                |                           | 1.5% <sup>5</sup>         |
| Grape, wine                                                                                              |                                     |                             |                                  |                                                |                           | 1% <sup>5</sup>           |
| Grape, raisin                                                                                            |                                     |                             |                                  |                                                |                           | 12% <sup>6</sup>          |
| Pineapple                                                                                                | 0.015                               | 0.015                       | 42                               | 0                                              | FDA <sup>4</sup>          | 29% <sup>5</sup>          |

<sup>1</sup>  $\frac{1}{2}$  LOD for fenamiphos sulfone. The field trial data collection method is a common moiety method that converts all residues of fenamiphos to the sulfone constituent for quantitation.

<sup>2</sup> Field trial study data acquired during the 2008 growing season determining the magnitude of fenamiphos residue in/on banana, MRID No. 47844402.

<sup>3</sup> Field trial study data acquired during the 2008 growing season determining the magnitude of fenamiphos residue in/on grapes, MRID No. 47844401.

<sup>4</sup> FDA surveillance monitoring data from 2004-2008 which reports no detectable concentrations for any fenamiphos residues of concern found in/on imported pineapple commodities. Anticipated residue based on  $\frac{1}{2}$  LOD.



<sup>5</sup> Screening level usage analyses provided by BEAD for determining fenamiphos % CT data on banana, grape, and pineapple imports (Usage Reports from J. Alsadek, 04/07/2010 & 04/28/2010).

<sup>6</sup> 2004-2006 average domestic consumption of imported commodity found in the USDA "Tree and Fruit Nut Situation and Outlook Yearbook, 2007".

The resulting acute dietary exposure estimate exceeds 100% of the aPAD at the 99.9<sup>th</sup> percentile of exposure concern for infants and children (1-2 years old and 3-5 years old). For the most highly exposed population subgroup, children 1-2 years of age, acute dietary risk was estimated to be 220% of the aPAD with an exposure of 0.000239 mg/kg/day. The chronic dietary exposure estimates were well below the 100% of the cPAD for each population subgroup. For children 1-2 years of age, the chronic dietary risk estimate was 9.7% of the cPAD with an exposure of 0.000003 mg/kg/day.

| <b>Table 3. Summary of Dietary Exposure and Risk for Fenamiphos</b> |                                                                     |               |                                         |               |
|---------------------------------------------------------------------|---------------------------------------------------------------------|---------------|-----------------------------------------|---------------|
| <b>Population Subgroup</b>                                          | <b>Acute Dietary<sup>1</sup><br/>(99.9<sup>th</sup> Percentile)</b> |               | <b>Chronic Dietary<sup>2</sup></b>      |               |
|                                                                     | <b>Dietary Exposure<br/>(mg/kg/day)</b>                             | <b>% aPAD</b> | <b>Dietary Exposure<br/>(mg/kg/day)</b> | <b>% cPAD</b> |
| General U.S. Population                                             | 0.000077                                                            | 70            | 0.000001                                | 1.8           |
| All Infants (< 1 year old)                                          | 0.000157                                                            | 140           | 0.000001                                | 4.7           |
| Children 1-2 years old                                              | <b>0.000239</b>                                                     | <b>220</b>    | <b>0.000003</b>                         | <b>9.7</b>    |
| Children 3-5 years old                                              | 0.000167                                                            | 150           | 0.000002                                | 6.2           |
| Children 6-12 years old                                             | 0.000086                                                            | 78            | 0.000001                                | 2.9           |
| Youth 13-19 years old                                               | 0.000046                                                            | 42            | 0.000000                                | 0.9           |
| Adults 20-49 years old                                              | 0.000043                                                            | 39            | 0.000000                                | 1.0           |
| Adults 50+ years old                                                | 0.000034                                                            | 30            | 0.000000                                | 1.0           |
| Females 13-49 years old                                             | 0.000052                                                            | 47            | 0.000000                                | 1.1           |

<sup>1</sup> Acute dietary analysis derived from a 0.00011 mg/kg/day aPAD.

<sup>2</sup> Chronic dietary analysis derived from a 0.00003 mg/kg/day cPAD.

A critical commodity contribution analysis was made for the most highly exposed population subgroup children 1-2 years of age. It indicates that grape-raisin, pineapple juice, grape juice, and pineapple cooked-canned are the most significant dietary risk drivers of fenamiphos comprising 34%, 20%, 13%, and 10% of the total exposure respectively.

## **Residential Exposure**

There are no residential uses of fenamiphos in the U.S.

## **Aggregate Risk Assessment**

There are no registrations for fenamiphos in the U.S. Therefore, the only human exposure to fenamiphos in the U.S. is in imported foods treated with fenamiphos. The dietary risk assessment for fenamiphos is described previously in this document. Once the additional toxicity and residue data have been received, a new dietary assessment may be necessary.

## **Occupational Exposure**

There are no registrations of fenamiphos in the U.S., so there are no concerns for occupational exposure in the U.S.

## **Tolerance Assessment and International Harmonization**

A summary of U.S. tolerances and Codex Maximum Residue Limits (MRLs) is attached to this document (Attachment 3). There are no Mexican or Canadian MRLs for fenamiphos.

## **Environmental Justice**

Potential areas of environmental justice concerns, to the extent possible, were considered in this human health risk assessment, in accordance with U.S. Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," [http://www.epa.gov/compliance/resources/policies/ej/exec\\_order\\_12898.pdf](http://www.epa.gov/compliance/resources/policies/ej/exec_order_12898.pdf). The Office of Pesticide Programs (OPP) typically considers the highest potential exposures from the legal use of a pesticide when conducting human health risk assessments, including, but not limited to, people who obtain drinking water from sources near agricultural areas, the variability of diets within the U.S. (including different ages, regions, and ethnicities), and people who may be exposed when harvesting crops. Should these highest exposures indicate potential risks of concern, OPP further refines the risk assessments to ensure that the risk estimates are based on the best available information.

## **Cumulative**

The Food Quality Protection Act (FQPA) requires the Agency to consider the cumulative risks of chemicals sharing a common mechanism of toxicity. Fenamiphos is a member of the organophosphate common mechanism group. The most recent cumulative risk assessment for the organophosphates was published on July 31, 2006 and is available at [http://www.epa.gov/pesticides/cumulative/2006-op/op\\_cra\\_main.pdf](http://www.epa.gov/pesticides/cumulative/2006-op/op_cra_main.pdf). Fenamiphos was not included in the 2006 cumulative risk assessment because of the cancellation of U.S. registrations.

## **Human Studies**

No studies were referenced in the most recent risk assessment that involved the intentional exposure of fenamiphos to humans. If any human studies are identified that should be

considered for the human health risk assessment, the Agency will ensure that all applicable regulatory requirements are met, including requirements for EPA ethics reviews or Human Studies Review Board reviews of certain research involving intentional exposure of human subjects.

## **Endocrine Disruptor Screening Program**

As required under FFDCA section 408(p), EPA has developed the Endocrine Disruptor Screening Program (EDSP) to determine whether certain substances (including pesticide active and other ingredients) may have an effect in humans or wildlife similar to an effect produced by a “naturally occurring estrogen, or other such endocrine effects as the Administrator may designate.” The EDSP employs a two-tiered approach to making the statutorily required determinations. Tier 1 consists of a battery of 11 screening assays to identify the potential of a chemical substance to interact with the estrogen, androgen, or thyroid (E, A, or T) hormonal systems. Chemicals that go through Tier 1 screening and are found to have the potential to interact with E, A, or T hormonal systems will proceed to the next stage of the EDSP where EPA will determine which, if any, of the Tier 2 tests are necessary based on the available data. Tier 2 testing is designed to identify any adverse endocrine related effects caused by the substance, and establish a dose-response relationship between the dose and the E, A, or T effect.

Between October 2009 and February 2010, EPA issued test orders/data call-ins for the first group of 67 chemicals, which contains 58 pesticide active ingredients and 9 inert ingredients. This list of chemicals was selected based on the potential for human exposure through pathways such as food and water, residential activity, and certain post-application agricultural scenarios. This list should not be construed as a list of known or likely endocrine disruptors.

Fenamiphos is not among the group of 58 pesticide active ingredients on the initial list to be screened under the EDSP. Under FFDCA sec. 408(p) the Agency must screen all pesticide chemicals. Accordingly, EPA anticipates issuing future EDSP test orders/data call-ins for all pesticide active ingredients.

For further information on the status of the EDSP, the policies and procedures, the list of 67 chemicals, the test guidelines and the Tier 1 screening battery, please visit the website: <http://www.epa.gov/endo/>.

## **Data Gaps**

### ***Toxicology***

- 870.6300 Comparative Cholinesterase Assay. This study is needed to address uncertainties with regard to susceptibility in the young animals.
- 870.7800 Immunotoxicity. This study is required based on the Revised Part 158 Toxicology Data Requirements for Conventional Pesticides.

### ***Residue Chemistry***

- 860.1500, Crop Field Trials: *Grapes*: additional data are required to support the foliar uses on grapes in Mexico.

## References

| Author    | Barcode | Date    | Title                                                                                                                                         |
|-----------|---------|---------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| --        | --      | 8/2006  | Organophosphorus Cumulative Risk Assessment – 2006 Update                                                                                     |
| --        | --      | 5/2002  | Interim Reregistration Eligibility Decision, Fenamiphos                                                                                       |
| J.Cruz    | D254614 | 3/29/99 | Preliminary Risk Assessment for Fenamiphos                                                                                                    |
| P.Savoia  | D353550 | 6/23/10 | Fenamiphos. Acute and Chronic Aggregate Dietary Exposure Assessment for the Consumption of Imported Banana, Grape, and Pineapple Commodities. |
| D.Drew    | D353551 | 6/16/10 | DER for MRID 47844402, Crop Field Trials-Grape                                                                                                |
| D.Drew    | D353551 | 6/16/10 | DER for MRID 47844402, Crop Field Trials-Banana                                                                                               |
| C.Olinger | D187029 | 1/25/94 | Product and Residue Chemistry Chapters for the Fenamiphos RED                                                                                 |

## Attachment 1

### Rationale for Requiring an Immunotoxicity Study and Rationale for Requiring a Comparative Cholinesterase Assay

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Guideline Number: 870.7800</b><br><b>Study Title: Immunotoxicity</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Rationale for Requiring the Data</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <p>This is a new data requirement under 40 CFR Part 158 as a part of the data requirements for registration of a pesticide (food and non-food uses).</p> <p>The Immunotoxicity Test Guideline (OPPTS 870.7800) prescribes functional immunotoxicity testing and is designed to evaluate the potential of a repeated chemical exposure to produce adverse effects (i.e., suppression) on the immune system. Immunosuppression is a deficit in the ability of the immune system to respond to a challenge of bacterial or viral infections such as tuberculosis (TB), Severe Acquired Respiratory Syndrome (SARS), or neoplasia. Because the immune system is highly complex, studies assessing functional immunotoxic endpoints are helpful in fully characterizing a pesticide's potential immunotoxicity. These data will be used in combination with data from hematology, lymphoid organ weights, and histopathology in routine chronic or subchronic toxicity studies to characterize potential immunotoxic effects.</p>                                                                                                                                                                                       |
| <b>Practical Utility of the Data</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <p><b>How will the data be used?</b></p> <p>These animal studies can be used to select endpoints and doses for use in risk assessment of all exposure scenarios and are considered a primary data source for reliable reference dose calculation. For example, animal studies have demonstrated that immunotoxicity in rodents is one of the more sensitive manifestations of TCDD (2,3,7,8-tetrachlorodibenzo-p-dioxin) among developmental, reproductive, and endocrinologic toxicities. Additionally, the EPA has established an oral reference dose (RfD) for tributyltin oxide (TBTO) based on observed immunotoxicity in animal studies (IRIS, 1997).</p> <p><b>How could the data impact the Agency's future decision-making?</b></p> <p>If the immunotoxicity study shows that the test material poses either a greater or a diminished risk than that given in the interim decision's conclusion, the risk assessments for the test material may need to be revised to reflect the magnitude of potential risk derived from the new data.</p> <p>If the Agency does not have this data, a 10X database uncertainty factor may be applied for conducting a risk assessment from the available studies.</p> |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
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| <b>Guideline Number: Special Study</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Study Title: Comparative Cholinesterase Assay (CCA)</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Rationale for Requiring the Data</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <p>Fenamiphos is a member of the organophosphate (OP) family of pesticides. The mode of toxic action for OP pesticides is inhibition of the enzyme, acetylcholinesterase (AChE) via phosphorylation of the active site leading to accumulation of acetylcholine and to clinical signs of neurotoxicity.</p> <p>A DCI was issued in September 1999 for a developmental neurotoxicity study (DNT) for fenamiphos. However, HED has now determined that a CCA <u>is required</u> for fenamiphos. The CCA is needed to evaluate any potential for increased cholinesterase sensitivity in juvenile animals compared with that of adult animals. Inhibition of acetylcholinesterase (AChE) is the critical toxic effect for fenamiphos, and these CCA assays have generally been shown to be more sensitive than DNT studies for detecting AChE effects. CCA studies have been submitted to HED for more than 20 other organophosphates (OPs), and for many of these OPs the CCAs have shown juveniles to be more sensitive than adults. Based on this additional knowledge gained since 1999 and because there is food use for fenamiphos, a CCA <u>is required</u>.</p> <p>Typically for the OPs, the CCA includes several components: 1) Gestational exposures to pregnant dams followed by sacrifice at gestational day 20. Brain and blood ChE activity is measured in dams and fetuses; 2) Acute, direct dosing to post-natal day 11 and young adult rats. The acute study is typically accompanied by a range-finding and time to peak effect study; 3) Eleven (11) day repeated, direct, dosing to juvenile rats (PND 11-21) and young adult rats. Each study includes a control group and at least 3 treatment groups. The repeated study is typically accompanied by a range-finding and time to peak effect study. All three components are required for fenamiphos.</p> |
| <b>Practical Utility of the Data</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <p><b>How will the data be used?</b></p> <p>The new data generated in the CCA study would be used by EPA to determine whether there is differential sensitivity between juveniles and adults. The dietary risk assessments may be revised to incorporate new information provided by this study.</p> <p><b>How could the data impact the Agency's future decision-making?</b></p> <p>The newly generated CCA data could potentially change the 10x FQPA safety factor that would be applied in the risk assessments to a more precise ratio of the differential effect between juveniles and adults. If the Agency does not have the CCA data, a 10x FQPA safety factor would be applied for conducting risk assessments from the available studies. If the FQPA safety factor decreases, then this impacts the calculation of the Population Adjusted Dose and may decrease risk estimates in the dietary assessments for fenamiphos.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

## Attachment 2-Residue Chemistry Tables

| <b>Table A1. Summary of Available Data for Banana.</b> |                 |                        |                             |                                           |                                                                  |                                               |                                                     |                                  |
|--------------------------------------------------------|-----------------|------------------------|-----------------------------|-------------------------------------------|------------------------------------------------------------------|-----------------------------------------------|-----------------------------------------------------|----------------------------------|
| Formulation Type                                       | Application     |                        |                             |                                           | PHI, days                                                        | Location: No. Trials                          | Source of Data                                      | Max. Residues <sup>2</sup> (ppm) |
|                                                        | Type            | Method/Timing          | Max. No. Applic. per Season | Max. Seasonal Applic. Rate <sup>1</sup>   |                                                                  |                                               |                                                     |                                  |
| 5% G                                                   | Trunk base      | Broadcast incorporated | 2                           | 15 g ai/plant                             | 1 <sup>st</sup> : 32,62,92, 123,152, 183<br>2 <sup>nd</sup> : 26 | Guatemala: 1                                  | MRID 00025103<br>Reg. Std., 1/2/87, C. Trichilo     | ND                               |
| 10% G                                                  | Trunk base      | Broadcast              | 4                           | 36 g ai/plant                             | 1 <sup>st</sup> : 34,64,94 124,154, 184<br>4 <sup>th</sup> : 31  | Costa Rica: 1                                 |                                                     | 0.03 peel                        |
| 10% G                                                  | Trunk base      | Band                   | 1                           | 2.8, 5.6, or 11.2 g ai/plant              | 1,2,7,14, 30                                                     | Windward Islands: 4                           | MRID 00075270<br>Reg. Std., 1/2/87, C. Trichilo     | ND                               |
| 10% G                                                  | Soil/trunk base | Broadcast              | 1                           | 6, 9, & 12 g ai/plant (6.6-13.25 lb ai/A) | 1,3,7,14, 30<br>61,90, 195                                       | Costa Rica: 3                                 | MRID 00025112<br>Reg. Std., 1/2/87, C. Trichilo     | 0.03 peel                        |
| 5% G                                                   | Unspecified     | Unspecified            | 1                           | 10 g ai/plant                             | 1,3,7,14, 28, 61,88                                              | Ivory Coast: 1                                | MRID 00025114<br>Reg. Std., 1/2/87, C. Trichilo     | 0.10 peel<br>0.08 pulp           |
| 15% G                                                  | Trunk base      | Band                   | 1                           | 3 g ai/plant                              | 0, 14, 28, 60, 90                                                | Ecuador:2; Colombia:2; Mexico:1; Costa Rica:3 | MRID 47844402<br>D353551, 6/9/10, D.Drew            | ND (<0.02) whole fruit           |
| 15% G                                                  | Trunk base      | Band                   | 3                           | 13.5, 27, and 54 g ai/plant               | 15, 46, 74, 105, and 147                                         | HI: 3                                         | MRID 41575601<br>DEB No. 6965, 11/15/90, W. Anthony | ND                               |
| 3 lb/gal EC                                            | Trunk base      | Band                   | 3                           | 13.5, 27, and 54 g ai/plant               | 15, 46, 74, 105, and 147                                         | HI: 3                                         |                                                     | 0.04 peel                        |

<sup>1</sup> Based on a maximum planting density of ~2000 plants/ha, use rates of 6-54 g ai/plant would be equivalent to 12-108 kg ai/ha (10.7-96 kg ai/A).

<sup>2</sup> ND = Nondetectable; residues below the reported limit of detection/quantitation.

| <b>Table A2. Summary of Available Data for Grape.</b> |             |                        |                             |                            |           |                                   |                                                  |                                  |
|-------------------------------------------------------|-------------|------------------------|-----------------------------|----------------------------|-----------|-----------------------------------|--------------------------------------------------|----------------------------------|
| Formulation Type                                      | Application |                        |                             |                            | PHI, days | Location: No. Trials              | Source of Data                                   | Max. Residues <sup>1</sup> (ppm) |
|                                                       | Type        | Method/Timing          | Max. No. Applic. per Season | Max. Seasonal Applic. Rate |           |                                   |                                                  |                                  |
| 15% G                                                 | Soil        | Band                   | 1                           | 20-40 lb ai/A              | 152-216   | CA: 4                             | MRID 00028849, Reg. Std., 1/2/87, C. Trichilo    | ND                               |
|                                                       |             | In-furrow              | 1                           | 10-20 lb ai/A              | 187       | CA: 2                             |                                                  | 0.04                             |
| 3 lb/gal EC                                           | Soil        | Broadcast              | 2                           | 18 lb ai/A                 | 70        | CA: 1                             | MRID 00076988 Reg. Std., 1/2/87, C. Trichilo     | ND                               |
| 15% G                                                 | Soil        | Broadcast              | 1                           | 6-18 lb ai/A               | 58-91     | CA: 3                             | MRID 00098611 Reg. Std., 1/2/87, C. Trichilo     | ND <sup>2</sup>                  |
| 3 lb/gal EC                                           | Soil        | Broadcast              | 1                           | 6-18 lb ai/A               | 54-85     | CA: 3                             |                                                  | ND <sup>2</sup>                  |
| 15% G                                                 | Soil        | Broadcast incorporated | 1-3                         | 18 lb ai/A                 | 0-149     | CA: 19<br>NY: 1<br>OR: 3<br>OH: 1 | MRID 00105945 Reg. Std., 1/2/87, C. Trichilo     | 0.09                             |
| 3 lb/gal EC                                           | Soil        | Broadcast spray        | 1-3                         | 18-27 lb ai/A              | 0-145     | CA: 21<br>NY: 1<br>OR: 3<br>OH: 1 |                                                  | 0.07                             |
| 15% G                                                 | Soil        | Band or broadcast      | 1-2                         | 20 lb ai/A                 | 140       | CA: 3                             | MRID 00154528 Reg. Std., 1/2/87, C. Trichilo     | 0.014                            |
|                                                       |             |                        | 1                           | 40 lb ai/A                 | 60        | CA: 1                             |                                                  | 0.016                            |
| 3 lb/gal EC                                           | Soil        | Broadcast spray        | 1-3                         | 18 lb ai/A                 | 60        | CA: 3                             |                                                  | ND                               |
| 3 lb/gal EC                                           | Soil        | Banded                 | 2                           | 16.8 lb ai/A (processing)  | 7         | CA: 1                             | MRID 41194904 DEB No. 5790, 10/13/89, D. Edwards | 0.02                             |
| 240 g/L (2 lb/gal) CS                                 | Soil        | In-furrow              | 1                           | 4.5 lb ai/A                | 65-141    | US (Reg10): 3                     | MRID 47844401 D353551, 6/9/10, D.Drew            | ND (<0.02)                       |
|                                                       |             |                        |                             |                            |           | Chile: 5                          |                                                  | ND (<0.02)                       |
|                                                       |             |                        |                             |                            |           | Mexico: 2                         |                                                  | 0.038, 0.0226                    |

<sup>1</sup> ND = Nondetectable; residues below the reported limit of detection/quantitation.

<sup>2</sup> Samples analyzed for metabolites only.



| <b>Table A3. Summary of Available Data for Pineapple.</b> |               |                                                   |                             |                            |                                |                                   |                                                                                            |                                  |
|-----------------------------------------------------------|---------------|---------------------------------------------------|-----------------------------|----------------------------|--------------------------------|-----------------------------------|--------------------------------------------------------------------------------------------|----------------------------------|
| Formulation Type                                          | Application   |                                                   |                             |                            | PHI, <sup>2</sup> days         | Location: No. Trials <sup>3</sup> | Source of Data                                                                             | Max. Residues <sup>4</sup> (ppm) |
|                                                           | Type          | Method/ Timing <sup>1</sup>                       | Max. No. Applic. per Season | Max. Seasonal Applic. Rate |                                |                                   |                                                                                            |                                  |
| 15% G + 3 lb/gal EC                                       | Soil + Foliar | PPI + Broadcast spray                             | 1 + 4                       | 40 lb ai/A                 | 256                            | HI: 1 (plant)                     | MRID 00079585<br>Reg. Std., 1/2/87, C. Trichilo                                            | ND                               |
| 3 lb/gal EC                                               | Foliar        | Broadcast                                         | 4-8                         | 15-40 lb ai/A              | 159-256                        | HI: 4 (plant)<br>1 (ratoon)       |                                                                                            | ND                               |
| 5% or 10% G                                               | Soil          | Preplant                                          | 1                           | 80-100 lb ai/A             | 587-658                        | HI: 3 (plant)                     | MRID 00117406<br>Reg. Std., 1/2/87, C. Trichilo                                            | ND                               |
| 5 or 10% G/ 3 lb/gal EC + 3 lb/gal EC                     | Soil + Foliar | At planting broadcast + Broadcast spray or drench | 1 + 2                       | 40-75 lb ai/A              | 216-270                        | HI: 7 (plant)                     |                                                                                            | 0.03                             |
| 15% G/ 3 lb/gal EC + 3 lb/gal EC                          | Soil          | PPI + Drip irrigation                             | 1 + 7-8                     | 40-43 lb ai/A              | 27-34                          | HI: 5 (plant)                     | MRID 00121866<br>Reg. Std., 1/2/87, C. Trichilo                                            | ND                               |
| 3 lb/gal EC                                               |               | Drip irrigation                                   | 8-15                        | 40-43 lb ai/A              | 27-36                          | HI: 3 (plant)                     |                                                                                            | ND                               |
| 3 lb/gal EC                                               |               | Drip irrigation                                   | 7                           | 20 lb ai/A                 | 31 (2)<br>145 (3)              | HI: 5 (ratoon)                    |                                                                                            | ND                               |
| 15% G + 3 lb/gal EC                                       | Soil + Foliar | Preplant + Broadcast spray                        | 1 + 4-6                     | 40-50 lb ai/A              | 31 (1)<br>83 (1)<br>192-217(2) | HI: 4 (plant)                     | MRID 00134943<br>Reg. Std., 1/2/87, C. Trichilo                                            | 0.14                             |
| 3 lb/gal EC                                               | Foliar        | Broadcast spray                                   | 4-6                         | 15-30 lb ai/A              | 32 (4)<br>231-265 (3)          | HI: 7 (plant)                     |                                                                                            | 0.03                             |
| 15% G/ 3 lb/gal EC + 3 lb/gal EC                          | Soil + Foliar | PPI + Broadcast spray                             | 1 + 8-9                     | 40-43 lb ai/A              | 27-30                          | HI: 3 (plant)                     | MRID 00157805<br>RCB Nos. 720 and 721, 5/19/86, F. Suhre<br>Reg. Std., 1/2/87, C. Trichilo | 0.03                             |
| 3 lb/gal EC                                               | Foliar        | Broadcast spray                                   | 13-15                       | 37-43 lb ai/A              | 27-30                          | HI: 2 (plant)                     |                                                                                            | 0.04                             |
| 3 lb/gal EC                                               | Foliar        | Broadcast spray                                   | 6-8                         | 20 lb ai/A                 | 31-32 (2)<br>139 (3)           | HI: 5 (ratoon)                    |                                                                                            | 0.18                             |

<sup>1</sup> PPI = Preplant incorporated.

<sup>2</sup> Number of trials in parentheses.

<sup>3</sup> Plant = plant or main crop; ratoon = ratoon or second crop.

<sup>4</sup> ND = Nondetectable; residues below the reported limit of detection/quantitation

### Attachment 3

| Summary of US and International Tolerances and Maximum Residue Limits :Fenamiphos                                                                                                                                                                                                                                                        |      |        |                                                   |                                                                            |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|---------------------------------------------------|----------------------------------------------------------------------------|
| US                                                                                                                                                                                                                                                                                                                                       |      | Canada | Mexico                                            | Codex                                                                      |
| <b>Residue Definition:</b>                                                                                                                                                                                                                                                                                                               |      |        |                                                   |                                                                            |
| 40CFR180.349<br>combined residues of the nematocide Fenamiphos (ethyl 3-methyl-4-(methylthio)phenyl (1- methylethyl) phosphoramidate) and its cholinesterase inhibiting metabolites ethyl 3-methyl-4-(methylsulfinyl)phenyl (1- methylethyl)phosphoramidate and ethyl 3-methyl-4-(methylsulfonyl)phenyl (1- methylethyl) phosphoramidate |      | None   | None (Numerous applications to soil, but no MRLs) | Sum of fenamiphos and its sulphoxide and sulphone, expressed as fenamiphos |
| <b>Commodity Tolerance (ppm) /Maximum Residue Limit (mg/kg)</b>                                                                                                                                                                                                                                                                          |      |        |                                                   |                                                                            |
| Commodity                                                                                                                                                                                                                                                                                                                                | US   | Canada | Mexico                                            | Codex                                                                      |
| Apple                                                                                                                                                                                                                                                                                                                                    | 0.25 |        |                                                   | 0.05 (*)                                                                   |
| Banana                                                                                                                                                                                                                                                                                                                                   | 0.10 |        |                                                   | 0.05 (*)                                                                   |
| Brussels sprouts                                                                                                                                                                                                                                                                                                                         | 0.10 |        |                                                   | 0.05                                                                       |
| Cabbage                                                                                                                                                                                                                                                                                                                                  | 0.10 |        |                                                   | 0.05                                                                       |
| Cherry                                                                                                                                                                                                                                                                                                                                   | 0.25 |        |                                                   |                                                                            |
| Citrus, oil                                                                                                                                                                                                                                                                                                                              | 25.0 |        |                                                   |                                                                            |
| Citrus, dried pulp                                                                                                                                                                                                                                                                                                                       | 2.5  |        |                                                   |                                                                            |
| Cotton, undelinted seed                                                                                                                                                                                                                                                                                                                  | 0.05 |        |                                                   | 0.05 (*)                                                                   |
| Eggplant                                                                                                                                                                                                                                                                                                                                 | 0.1  |        |                                                   |                                                                            |
| Garlic                                                                                                                                                                                                                                                                                                                                   | 0.50 |        |                                                   |                                                                            |
| Grapefruit                                                                                                                                                                                                                                                                                                                               | 0.60 |        |                                                   |                                                                            |
| Grape                                                                                                                                                                                                                                                                                                                                    | 0.10 |        |                                                   |                                                                            |
| Grape, raisin                                                                                                                                                                                                                                                                                                                            | 0.3  |        |                                                   |                                                                            |
| Lemon                                                                                                                                                                                                                                                                                                                                    | 0.60 |        |                                                   |                                                                            |
| Lime                                                                                                                                                                                                                                                                                                                                     | 0.60 |        |                                                   |                                                                            |
| Okra                                                                                                                                                                                                                                                                                                                                     | 0.30 |        |                                                   |                                                                            |
| Orange, sweet                                                                                                                                                                                                                                                                                                                            | 0.60 |        |                                                   |                                                                            |
| Peach                                                                                                                                                                                                                                                                                                                                    | 0.25 |        |                                                   |                                                                            |
| Peanut                                                                                                                                                                                                                                                                                                                                   | 0.02 |        |                                                   | 0.05 (*)                                                                   |
| Pineapple                                                                                                                                                                                                                                                                                                                                | 0.30 |        |                                                   |                                                                            |
| Pineapple, bran                                                                                                                                                                                                                                                                                                                          | 10.0 |        |                                                   |                                                                            |
| Raspberry                                                                                                                                                                                                                                                                                                                                | 0.1  |        |                                                   |                                                                            |
| Strawberry                                                                                                                                                                                                                                                                                                                               | 0.6  |        |                                                   |                                                                            |
| Tangerine                                                                                                                                                                                                                                                                                                                                | 0.60 |        |                                                   |                                                                            |
| Asparagus                                                                                                                                                                                                                                                                                                                                | 0.02 |        |                                                   |                                                                            |
| Beet, garden, roots                                                                                                                                                                                                                                                                                                                      | 1.5  |        |                                                   |                                                                            |
| Beet, garden, tops                                                                                                                                                                                                                                                                                                                       | 1.0  |        |                                                   |                                                                            |
| Cabbage, chinese, bok choy                                                                                                                                                                                                                                                                                                               | 0.5  |        |                                                   |                                                                            |
| Kiwifruit                                                                                                                                                                                                                                                                                                                                | 0.1  |        |                                                   |                                                                            |
| Pepper, nonbell                                                                                                                                                                                                                                                                                                                          | 0.6  |        |                                                   |                                                                            |
| Melon, except watermelon                                                                                                                                                                                                                                                                                                                 | -    |        |                                                   | 0.05                                                                       |
| <b>Residue Definition:</b>                                                                                                                                                                                                                                                                                                               |      |        |                                                   |                                                                            |

| Summary of US and International Tolerances and Maximum Residue Limits :Fenamiphos                                                                                                                                                                                                                                                                                                                                                                                                  |      |        |        |                                                   |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|--------|--------|---------------------------------------------------|
| US                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |      | Canada | Mexico | Codex                                             |
| combined residues of the nematocide Fenamiphos (ethyl 3-methyl-4-(methylthio)phenyl (1-methylethyl)phosphoramidate) and its cholinesterase-inhibiting metabolites ethyl 3-methyl-4-(methylsulfinyl)phenyl (1-methylethyl)phosphoramidate, ethyl 3-methyl-4-(methylsulfonyl)phenyl (1-methylethyl)phosphoramidate, ethyl 3-methyl-4-(methylthio)phenyl phosphoramidate, ethyl-4-(methylsulfinyl)phenyl phosphoramidate, and ethyl 3-methyl-4-(methylsulfonyl)phenyl phosphoramidate |      | None   | None   | As above                                          |
| Cattle, fat                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.05 |        |        |                                                   |
| Cattle, meat                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | 0.05 |        |        | 0.01 (*)<br>(meat from mammals other than marine) |
| Cattle, meat byproducts                                                                                                                                                                                                                                                                                                                                                                                                                                                            | 0.05 |        |        | 0.01 (*)<br>(Edible offal, mammalian)             |
| Goat, fat                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.05 |        |        |                                                   |
| Goat, meat                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.05 |        |        |                                                   |
| Goat, meat byproducts                                                                                                                                                                                                                                                                                                                                                                                                                                                              | 0.05 |        |        |                                                   |
| Hog, fat                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | 0.05 |        |        |                                                   |
| Hog, meat                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | 0.05 |        |        |                                                   |
| Hog, meat byproducts                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.05 |        |        |                                                   |
| Horse, fat                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.05 |        |        |                                                   |
| Horse, meat                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.05 |        |        |                                                   |
| Horse, meat byproducts                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.05 |        |        |                                                   |
| Milk                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | 0.01 |        |        | 0.005 (*)                                         |
| Sheep, fat                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | 0.05 |        |        |                                                   |
| Sheep, meat                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | 0.05 |        |        |                                                   |
| Sheep, meat byproducts                                                                                                                                                                                                                                                                                                                                                                                                                                                             | 0.05 |        |        |                                                   |
| Poultry meat                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | -    |        |        | 0.01 (*)                                          |
| Poultry, edible offal of                                                                                                                                                                                                                                                                                                                                                                                                                                                           | -    |        |        | 0.01 (*)                                          |
| Eggs                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | -    |        |        | 0.01 (*)                                          |