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OFFICE OF  
PREVENTION, PESTICIDES, AND  
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Expedited Preliminary Benefit Analysis of Fenamiphos for  
Selected Use Sites

FROM: Allen L. Jennings, Director *Allen L. Jennings*  
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TO: Lois Rossi, Director  
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Attached is a brief and expedited benefit analysis of six sites, citrus, cotton, grapes, peaches, tobacco, and turf that account for approximately 90 percent of the fenamiphos usage. These sites represent high volume and/or high use rate fenamiphos use sites.

cc: R. Esworthy  
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**Expedited Preliminary Benefit Analysis of  
Fenamiphos for Selected Use Sites**

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**October 12, 1995**

## SUMMARY OF CONCLUSIONS

- o The typical fenamiphos application rates currently used by growers are generally comparable to the proposed maximum risk-reduction rates. Accordingly, the proposed rates would therefore be considered efficacious for all or most of the current fenamiphos users (Page 6).
- o Using the available alternatives, significant yield and/or quality losses are not anticipated in the near future in all or most of the major fenamiphos usage states for citrus, cotton, tobacco and turf and in one of the three major usage states for peaches (CA) (Page 7).
- o Suitable alternatives are lacking and will likely result in significant yield and/or quality losses for all the major fenamiphos usage on grapes, and most of the current usage on peaches (MI,NC) and some of the usage on citrus (CA). In the future, the usage of fenamiphos could increase significantly on peaches in CA, if the current increase in ring and lesion nematode populations continues. Suitable alternative control measures do not exist for these nematodes at the present time and could lead to significant yield losses in the future without fenamiphos (Page 7).
- o Because fenamiphos has a number of desirable/unique features, it is one of the principal nematode control agents used on grapes, peaches, tobacco and turf and is the primary alternative to the current principal nematode control agents used on citrus and cotton. Accordingly, the level of fenamiphos importance on these sites could increase significantly, if certain alternatives become unavailable in the future (Page 7).
- o As requested, BEAD estimated the economic impacts from the loss of fenamiphos qualitatively. These estimates show that moderate to significant impacts are limited to peaches, citrus, and grapes. All other sites (cotton, tobacco, and turf) will likely incur minimal impacts. Additionally, on the six sites analyzed, there may be small niches where fenamiphos provides the only adequate control available. The number and severity of pest pressure in these areas is unknown at this time (Page 9).

## INTRODUCTION

This summary and the attached tables were prepared as a result of an expedited preliminary analysis of the benefits associated with fenamiphos (Nemacur®). The analysis assumes the pesticide would be canceled, existing stocks would be recalled, and alternatives would be readily available at a reasonable price. This analysis involves six high volume and/or high use rate sites (i.e., citrus, cotton, grapes, peaches, tobacco, turf). These use sites account for about 90 percent of the total U.S. usage (1.28 million - 1.75 million pounds a.i.) on about 78 percent of the fenamiphos treated acreage (284,000 - 443,000 acres). Nineteen additional sites account for the remainder of the fenamiphos usage.

## BIOLOGICAL ASPECTS

This section discusses the registered fenamiphos formulations and use sites, typical formulations, application types, methods and rates utilized by growers, relative effectiveness and yield impact estimates associated with the principal alternatives, and the registrant's current risk-reduction proposal. In this analysis, most of the information on current fenamiphos use, principal alternatives and the projected yield impacts associated with the alternatives were based on crop specialist opinions (i.e., published and unpublished documents and personal communications) from most of the eight states associated with the predominant fenamiphos usage on the selected sites (i.e., CA, FL, GA, MI, NC, SC, TX, VA). See Attachment A for a list of the state extension service crop specialists who provided verbal and/or written information used in this analysis.

## Registered Uses

Fenamiphos is a systemic, non-fumigant, nematocide-insecticide available as 10 and 15 percent granular and 35 percent emulsifiable concentrate (3 lbs a.i./gallon) formulations.

Fenamiphos is currently registered for control of nematodes and certain insect pests on twenty-five sites. The specific crop uses included in this assessment are citrus, cotton, grapes, peaches, tobacco, and turf. Other labeled crop uses include apples, asparagus, bananas, beets, cabbage, Brussels sprouts, cherries, nectarines, eggplant, garlic, kiwifruit, okra, ornamentals (many), peanuts, peppers (non-bell), pineapple, plantain, raspberries, and strawberries. Registrations are pending for eight additional crops (i.e., almonds, broccoli, cauliflower, pecans, peppers [bell], plums/prunes, potatoes [Irish] and walnut).

## Pest Management

In general, one or more specific types of plant-parasitic nematodes were cited by crop specialists as the major target pest(s) associated with current fenamiphos usage on each of the six use sites included in this assessment. The major nematode target pests frequently varied between the states for a specific crop. Based on the crop specialist responses, it appears that the current usage on citrus, tobacco, and turf is not significantly influenced by the insect pest claims on these crops. However, the use of fenamiphos to control thrips on cotton may be important in some states, since thrips are cited as one of the major insect pests on cotton in the Southeastern States. As part of their risk-reduction proposal, the registrant is deleting the claim for control of mole crickets on turf. See Table 2 for details on the specific nematode target pests and claimed insect pests for fenamiphos, major fenamiphos usage states for each site and the typical formulations, treatment methods, and rates associated with fenamiphos and its principal alternatives.

Overall only a limited number of chemical and non-chemical control measures were considered by crop specialists to be the projected alternatives. The chemical alternatives included four fumigants (i.e., chloropicrin, 1,3-dichloropropene [1,3-D or Telone®], metam-sodium, and methyl bromide) and four non-fumigants (i.e., aldicarb, carbofuran, ethoprop, and oxamyl). The major non-chemical control measures addressed were drip irrigation, resistant rootstocks, and organic soil amendments. The projected principal alternatives varied from crop to crop and in many cases also varied from state to state. See Tables 2 and 3 for the current fenamiphos and projected alternatives use information for each of the six sites.

Current pest management practices associated with fenamiphos use on the selected sites (Table 2) were compared with the proposed risk-reduction use patterns (Table 1). Reductions in the application and/or seasonal rates were proposed for three of the six crops (i.e., citrus, grapes, peaches). Although some of the typical grower use rates for specific site-state-method of applications were slightly higher or lower, most were generally comparable to the proposed application rates on all six crops. The few instances where typical application rates are significantly lower than the proposed maximum rates pertain to citrus and grape chemigation treatments in CA (67 percent lower rates) and band treatment of peaches in NC (60 percent lower rate).

Reportedly about 30 percent of the 68,000 acres of peaches currently planted with the root-knot nematode resistant rootstock "Nemaguard" are experiencing significant buildups of ring or lesion nematodes in California. Since Nemaguard is commonly being planted in new and replanted peach orchards and suitable

alternative control measures are lacking for these two nematodes, the future demand for fenamiphos in CA is likely to increase significantly in the future, if these nematodes are determined to be economically important pests.

### Comparative Performance

There appears to be at least one control measure considered to be suitable for all of the current fenamiphos usage on cotton, tobacco and turf and most of the usage on citrus (FL). Suitable alternatives are lacking for all of the current fenamiphos usage on grapes, most of the fenamiphos usage on peaches, and some of the current usage on citrus (CA). The principal alternatives cited by crop specialists commonly varied from state to state, for uses on citrus and peaches, due to differing target pests and/or environmental conditions. See Table 3 for the projected yield and/or quality impacts associated with the principal alternatives cited for each of the six sites. It is noteworthy to mention that the primary chemical alternatives are aldicarb, 1,3-dichloropropene (1,3-D or Telone®), and methyl bromide which are subject to pending Agency actions (i.e., Special Reviews of aldicarb and 1,3-D, and ozone depletion phaseout of methyl bromide). Accordingly, the future availability of these chemicals as fenamiphos alternatives is uncertain.

In addition to the usual yield and quality impacts associated with using alternative control measures, a significant decrease in tree/vine life is likely for perennial fruit crops (i.e., citrus, grapes and peaches) when suitable alternatives are lacking. This was specifically cited by crop specialists as a potential problem on peaches in MI and NC, if fenamiphos was cancelled.

Relative to the fumigant and non-fumigant alternatives, fenamiphos has certain desirable/unique features, as follows: no waiting period required before planting; no special application equipment requirements; can be applied to established plants (postplant application); upward and downward systemic movement in plants; also controls certain aboveground insect pests on certain crops; significantly lower application rates than the fumigants and some of the non-fumigants; one of the most effective non-fumigants; only non-fumigant registered for use on a large number of food crops, including a number of minor use crops; has a number of pending new uses on food crops; and is the only non-fumigant registered for use in chemigation systems.

## Risk-Reduction Proposal

The registrant has proposed to modify existing fenamiphos use patterns as well as further restrict the formulations available for use on certain sites, as a means of reducing risks to man and the environment. For the selected sites, reduced application and seasonal rates were proposed for the uses on citrus, grapes and peaches. Other types of risk-reduction measures were also proposed (e.g., measures to reduce pesticide runoff, establishment of surface and drinking well water buffer zones, reduction in the maximum acreage treated per day, reduction in the number of applications per year, and limits on the timing and frequency of applications), one or more of which apply to all of the six sites. Since the Agency will be evaluating the adequacy of this proposal to significantly reduce risks, the use profile information presented in this benefits assessment (Table 1.) reflects the proposed changes on the selected sites. See Attachment B for a summary of the general and specific risk mitigation proposals that affect the crops in this assessment. For reference purposes, the current RED document contains a use profile which reflects the currently registered labels.

## ECONOMIC ASPECTS

The following economic analysis should be considered, as requested, a qualitative analysis in relative terms for the selected sites. The estimated impacts have been qualified at the bottom line only, without presenting the specific data to support these estimates. The costs of application were not considered due to incomplete information; thus, yield impacts were the primary criterion for determining the qualitative estimates.

### Aggregate Analysis

The impacts of the six sites cannot be estimated on an aggregate level considering the impacts were not quantified. The aggregate reduction in growers' income in the U.S. is unknown due to a lack of available information such as the percentage of fenamiphos usage that would shift to each of the alternatives.

### Site Level Analysis

The states that have the highest fenamiphos usage by state for the six chosen sites are as follows: Citrus - FL (81%) and CA (19%); Cotton - TX (69%), CA (20%), SC (7%) and NC (4%); Grapes - CA (99%); Peaches - CA (33%), MI (33%), and NC (33%); Tobacco - NC (58%), GA (19%), SC (19%), and VA (3%); and Turf - Uncertain. Please see Table 3 for percent of U.S. total and percent of site treated figures.

The percentage of fenamiphos used that would be replaced by each alternative was determined by specialist opinion verified by

current usage where possible. BEAD was able to qualify the impacts with a reasonable degree of certainty.

The economic impacts associated with the removal of fenamiphos from the market depends highly on the site in question. Cotton, tobacco, peaches in CA, and turf are projected to incur minor impacts; however, grapes, citrus, and peaches in MI and NC are expected to incur moderate to significant impacts.

Long term impacts are possible in citrus and peach growing orchards and the peach export market could be affected due to a drastic decrease in tree life. No significant consumer impacts or other non-user economic impacts are expected on the remainder of the six sites evaluated however, further analysis would be required to confirm this assertion.

#### LIMITATIONS OF ANALYSIS

Although the desired benefits/impacts information was obtained for most of the site-state combinations, we were not able to obtain complete information for any of the six sites. Insufficient information was available to verify the mixer/loader and applicator exposure information previously provided by the registrant. Virtually all of the typical fenamiphos use, projected alternatives, and comparative product performance information was derived from crop specialists and was not accompanied by any supporting data. Since the percentage of each crop treated in each of the major usage states is generally low, the information provided by the respective crop specialists is likely to be based on a very limited amount of information, which may not adequately reflect typical use.

The extent to which the preplant fumigant and non-chemical control measures are truly alternatives for the perennial fruit crops is uncertain. This is due to the fact that the available data are not detailed enough to indicate the extent to which these control measures have been or are currently being used on fenamiphos treated fields during the same crop cycle. If they are commonly used in conjunction with fenamiphos then they should not be considered alternatives.

The future availability of several of the most suitable alternatives cited for use on citrus (FL), cotton, peaches, and tobacco (i.e., aldicarb, 1,3-D [Telone®], and methyl bromide) is uncertain, pending Agency decisions which may result in cancellation/unavailability of one or more of these pesticides. Also, the economic analysis assumes that alternatives to fenamiphos will be readily available at a competitive price.

The projection of the percentage of the usage of the alternatives if fenamiphos were to be cancelled is difficult to estimate because many of the alternatives are non-chemical controls for



which we have little or no current usage data. Also, since fenamiphos and its chemical alternatives have nematocidal as well as insecticidal and fungicidal properties, in-house usage data bases display data as either an insecticide or a nematocide and not both. This causes it to be nearly impossible to estimate potential usage of the alternatives based on current usage.

### CONCLUSIONS

The typical fenamiphos application rates currently used by growers are generally comparable to the proposed maximum risk-reduction rates. Accordingly, the proposed rates would therefore be considered efficacious for all or most of the current fenamiphos users. The typical application rates were significantly lower (up to 67 percent lower) than the proposed maximum risk-reduction rates in only two instances (i.e., crop-state-method of application combinations. This would indicate that further reductions in the maximum fenamiphos use rates may result in decreased levels of performance in most instances.

Using the available alternatives, significant yield and/or quality losses are not anticipated in the near future in all or most of the major fenamiphos usage states for citrus, cotton, tobacco and turf and in one of the three major usage states for peaches (CA). Suitable alternatives are lacking and will likely result in significant yield and/or quality losses for all the major fenamiphos usage on grapes, and most of the current usage on peaches (MI, NC) and some of the usage on citrus (CA). In the future, the usage of fenamiphos could increase significantly on peaches in CA, since the commonly planted root-knot nematode resistant rootstock appears to be vulnerable to lesion and ring nematodes. Since suitable alternative control measures do not exist for these two nematodes at the present time significant yield losses are possible in the future without fenamiphos.

Because fenamiphos has a number of desirable/unique features (e.g., can be applied to established plants, is suitable for chemigation applications, does not require specialized application equipment, and possesses systemic activity in plants), it is one of the principal nematode control agents used on grapes, peaches, tobacco and turf and is the primary alternative to the current principal nematode control agents used on citrus and cotton. Accordingly, the level of fenamiphos importance on these sites could increase significantly, if certain alternatives become unavailable in the future. See Comparative Performance section for a more detailed list of desirable/unique fenamiphos features.

As requested, BEAD estimated the economic impacts from the loss of fenamiphos qualitatively. There were areas however, that a qualitative analysis was not possible (i.e., cost of application scenarios and projected usage of some alternatives).

Considering areas where BEAD was able to retrieve data, estimates show that moderate to significant impacts are limited to peaches, citrus, and grapes. All other sites (cotton, tobacco, and turf) will likely incur minimal impacts. Additionally, on the six sites analyzed, there may be small niches where fenamiphos provides the only adequate control available. The number and severity of pest pressure in these areas is unknown at this time.

**Table 1. PROPOSED FENAMIPHOS RISK-REDUCTION USE PROFILE<sup>1/</sup>**  
(Proposed by Miles, Inc. 10/26/94 and amended by their 1/6/95 letter)

CROP	PESTS	FORMULATION	METHOD OF APPLICATION (TIMING)	PROPOSED APPLICATION RATE (LBS AI/A) <sup>2/</sup>	COMMENTS <sup>3/</sup>
CITRUS	Nematodes, suppression of Citrus root weevil complex (including Fuller rose beetle)	3EC [Granular proposed to be cancelled]	Band & incorp., band width = 50% of row spacing (postplant)	2.5-5.0 (FL); 5.0-7.5 (other states)	<p>PHI = 30 days; In CA, do not apply to Kumquat, Tangelo or Citrus hybrids; see also Florida limitations<sup>4/</sup>;</p> <p>Band: maximum seasonal rate = the maximum application rate; maximum of 2 applications per season</p> <p><u>Chemigation:</u> seasonal limit = 3-6 lbs ai/acre (FL= 3-4.5 lbs); maximum of 4 applications/season; RAI = 30 days;</p>
			Chemigation [low pressure irrigation] (postplant)	1.5-3.0 (all states)	



**Table 1. PROPOSED FENAMIPHOS RISK-REDUCTION USE PROFILE"**  
(Proposed by Miles, Inc. 10/26/94 and amended by their 1/6/95 letter)

COTTON	Nematodes, Thrips	3EC	18" Band Soil Inject. (preplant)	1.5-3.0 (40" rows)	CA only; maximum rate of 3 lbs ai/A (any row spacing)
			IF or covered Band, or 6-12" Band & Inc. (at planting)	0.75-2.2 (40" rows)	EC label also recommends an at planting tank mix with Treflan applied as a 12- 18" band
		15G	IF (at planting)	1.0-1.5 (40" rows)	
GRAPES	Nematodes	3EC	Chemigation [low pressure irrigation] (postplant)	1.5-3.0	PHI = 2 days; Band: maximum of 6 lbs ai/A/season; Chemigation: 1-4 applications/ season; 3-6 lbs ai/A/season; RAI = 30 days
			Band & Incorp., band width = 50% of row spacing (postplant)	3.0-6.0	

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**Table 1. PROPOSED FENAMIPHOS RISK-REDUCTION USE PROFILE"**  
(Proposed by Miles, Inc. 10/26/94 and amended by their 1/6/95 letter)

PEACHES	Nematodes	3EC	Band & Incorp., band width equal to 50% of row spacing (postplant); incorporate mechanically or with irrigation	5.0-7.5	PHI = 45 days; Band: 7.5 lbs ai/A/year; Chemigation: 1-4 applications per season; 3-6 lbs ai/A/season; RAI = 30 days
			Chemigation [low pressure irrigation] (postplant)	1.5-3.0	
TOBACCO (excludes shade tobacco)	Nematodes, suppression of Aphids	3EC	Broadcast & Incorp. (preplant)	4.0-6.0	label also recommends two tank mixes with insecticides (chlorpyrifos, ethoprop)
TURF (Sod farms, Golf courses, Cemeteries, Industrial grounds)	Nematodes	10G	Broadcast & Incorp. w/irrigation (postplant)	10	1-2 applications per year; Other restrictions apply <sup>3/</sup>

**Table 1. PROPOSED FENAMIPHOS RISK-REDUCTION USE PROFILE<sup>1/</sup>**  
(Proposed by Miles, Inc. 10/26/94 and amended by their 1/6/95 letter)

TURF (Golf courses, Sod farms)	Nematodes	3EC	Broadcast (coarse spray) & Incorp. w/irrigation (postplant)	10	1-2 applications per year; Not recommended for use on tees and greens; Other restrictions apply <sup>2/</sup>
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Abbreviations: Incorp. = Incorporate; IF = In-furrow; RAI = repeat application interval; PHI = preharvest interval

- 1/ Proposed use profile being used to conduct reassessments of risks.
- 2/ Where specific row spacings are listed for specific rates, these rates will vary inversely with changes in the row spacing utilized. The row spacings listed were obtained from the labels and documents published by one or more major production states and are presumed to reflect commonly used row spacings. Preliminary estimates of overall seasonal rates, calculated from national usage data (i.e., total pounds applied ÷ total acres treated, for each crop), are: Citrus = 6.2 lbs/A; Cotton = 0.75 lbs/A; Peaches = 11.5 lbs/A; Grapes = 1.3 lbs/A; Tobacco = 3.4 lbs/A; no information available on turf usage.
- 3/ The following general use restrictions apply to all labeled crops, except turf and ornamentals: "When used on erodible soils, best management practices for minimizing runoff should be employed. Consult your local Soil Conservation Service for recommendations in your use area."; "Do not apply within 100 feet of the following aquatic areas: lakes, reservoirs, rivers, permanent streams, marshes, natural ponds and estuaries."; "Do not cultivate within 10 feet of an aquatic area to allow growth of a vegetative filter strip."

4/ Florida Use Restrictions: a) "Apply between October 15 and April 30"; b) "Do not apply within 300 ft. of a drinking water well. If soils have a permeability rate greater than 20 inches per hour, do not apply within 1,000 ft of a drinking water well unless it is known or reasonably believed based on authoritative sources that such wells are either cased to 100 ft below ground level or a minimum of 30 ft below the water table."

5/ Only for use on golf courses and sod farms in CA; Do not apply more than 20 lbs ai/A/year; Do not treat more than 10 acres at a time on any golf course, with a 3-day minimum interval before an additional 10 acres (or less) can be treated; Do not apply w/in 10' of any surface body of water or fairway surface drains; Do not apply between noon and sunset during the heavy thunderstorm season (June thru September); On sod farms, treated turf should not be cut for sod or sod handled for 30 days after treatment; Do not apply product after soil has become saturated with water (reached field capacity); apply irrigation only so that puddling or runoff does not occur; Irrigation must be completed within 6 hours after treatment;

Table 2. Summary of Typical Use Rates for Fenamiphos and Projected Alternatives.<sup>1/</sup>

Site [Major Usage States]: Principal Target Pest(s)	Nematicides		Comments
	Fenamiphos MOA(F): Rate; Appl.#	Projected Alternative(s)- MOA(F): Rate; Appl.#	
CITRUS [FL, CA]: Nematodes (burrowing [FL], citrus [CA])	A) Postplant band (EC): 3-4.5 lbs ai/A; 1-2 appl [Note: proposed appl rates = 2.5-5/5-7.5 (FL/Other states) lbs ai/A, w/seasonal max. = max. rates] B) Postplant chemigation (EC): 1-4.5 lbs ai/A; 1-3 appl [Note: proposed rates = 1.5-3 lbs ai/A, season max. = 4.5/6 (FL/other states)]	1) Resistant rootstocks - FL, CA 2) Oxamyl- CA (EC): MOA, rate & # appl not reported	uncertain of the fenamiphos band treatment use rate in CA; both MOA's used in FL, chemigation is the predominant MOA in CA; typical application rates are comparable to slightly higher than the proposed risk-reduction rates; no information presented on the granular formulation because the use on citrus is proposed for cancellation.



Table 2. Summary of Typical Use Rates for Fenamiphos and Projected Alternatives."

Site [Major Usage States]: Principal Target Pest(s)	Nematicides		Comments
	Fenamiphos MOA(F): Rate; Appl. #	Projected Alternative(s) - MOA(F): Rate; Appl. #	
COTTON [TX, CA, SC, NC]: Nematodes (root-knot, reniform, sting, & Columbia lance), Thrips	Postplant IF or band (EC, 15G): 0.9-3 lbs ai/A 1 appl	1) aldicarb- at planting IF/band (15G): 0.5-1.5 [max. 1.8] lbs ai/A; 1 appl  2) 1,3-D (Telone®) preplant band (LF): 30-50.5 lbs ai/A; 1 appl	combined inputs from 1993 NAPIAP report on Cotton plus NC and SC crop specialists; typical fenamiphos use reported by Miles was very similar except that the rates were 0.7-3 for the EC formulation and 1.25 for the granular; no changes in cotton use rates in the risk- reduction proposal.

Table 2. Summary of Typical Use Rates for Fenamiphos and Projected Alternatives."

Site [Major Usage States]: Principal Target Pest(s)	Nematicides		Comments
	Fenamiphos MOA(F): Rate; Appl.#	Projected Alternative(s)- MOA(F): Rate; Appl.#	
GRAPES [CA]: Nematodes (root-knot, lesion, & citrus)	A) Postplant chemigation (mostly drip) (EC): 1 lb ai/A; 2-3 appl  B) Postplant band (width = 50% of row spacing) (EC): 3-6 lbs ai/A; 1 appl	1) Carbofuran Postplant band (4FL): 4-8 lbs ai/A; 1 appl  2) Drip Irrigation  3) Soil amendments (manure, compost): 10 Tons/A; 1 appl every other year  4) root-knot resistant rootstocks	86+% of fenamiphos usage is via chemigation; usage is increasing as acreage with drip irrigation increases; uncertain of the percentage of fenamiphos treated acreage which also receives a preplant fumigant treatment; typical use rates equal or less than proposed risk-reduction rates.

Table 2. Summary of Typical Use Rates for Fenamiphos and Projected Alternatives. <sup>1/</sup>

Site [Major Usage States]: Principal Target Pest(s)	Nematicides		Comments
	Fenamiphos MOA(F): Rate; Appl.#	Projected Alternative(s)- MOA(F): Rate; Appl.#	
PEACHES [CA,MI,NC]: Nematodes (root-knot, ring, lesion, & dagger)	A) Postplant chemigation (EC): 4.5 lbs ai/A; 1 appl [Note: proposed max. appl. rate = 3 lbs ai/A]  B) Postplant band (EC): 5 lbs ai/A; 2 appl	1) 1,3-D Preplant band (LF): 101-295 lbs ai/A; 1 appl  2) Metam-sodium preplant band (LF): 159 lbs ai/A; 1 appl  3) Oxamyl Preplant (L): 9-12 lbs ai/A; 1 appl & Post-plant [non-bearing] (L): 0.75-3 lbs ai/A; 4 appl  4) Organic Soil Amendments: unknown rates  5) Methyl bromide	chemigation treatment only applies to CA and is only used for the first 8 years; crop cycle with fenamiphos treatments may reach up to 20 years in CA; typical use rates vary from slightly below to slightly above the proposed risk-reduction rates.

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Table 2. Summary of Typical Use Rates for Fenamiphos and Projected Alternatives. //

Site [Major Usage States]: Principal Target Pest(s)	Nematicides		Comments
	Fenamiphos MOA(F): Rate; Appl.#	Projected Alternative(s) - MOA(F): Rate; Appl.#	
TOBACCO [NC,GA,SC,VA]: Nematodes (root-knot, lesion, and Tobacco cyst)	Preplant broadcast (EC): 3-6 lbs ai/A; 1 appl	<p>1) Aldicarb At plant band (15G): 2.6-3 lbs ai/A; 1 appl</p> <p>2) Methyl bromide + chloropicrin Preplant band (LF): 57-76 &amp; 28-38 lbs ai/A respectively; 1 appl</p> <p>3) 1,3-D &amp; Chloropicrin Preplant band (LF): 57-76 &amp; 28-38 lbs ai/A, respectively; 1 appl</p> <p>4) Chloropicrin Preplant band (LF): 41.3 lbs</p>	Viability of using fenamiphos as a band application is currently being evaluated in VA (1 lb. ai/A); no changes in tobacco use rates included in the risk-reduction proposal.

Table 2. Summary of Typical Use Rates for Fenamiphos and Projected Alternatives.<sup>1/</sup>

Site [Major Usage States]: Principal Target Pest(s)	Nematocides		Comments
	Fenamiphos MOA(F): Rate; Appl.#	Projected Alternative(s)- MOA(F): Rate; Appl.#	
TURF [CA,MI]: Nematodes (sting & others)	Postplant broadcast (10G): 10 lbs ai/A; 1-2 appl	1) ethoprop- 10-20 lbs ai/A 1-2 appl	we were unable to determine the major fenamiphos usage states for this site; 1994 NAPIAP report on Ornamentals and Sod indicates that fenamiphos is not one of the major insecticide/nematicide ingredients used in sod production; no changes in turf use rates included in risk-reduction proposal.

ABBREVIATIONS KEY: 1,3-D= 1,3-dichloropropene (Telone® is a tradename associated with this active ingredient); appl= application(s); EC= emulsifiable concentrate; F= formulation; FL= flowable liquid; IF= in-furrow; L= liquid; LF= liquid fumigant; MOA= method of application; NAPIAP= National Agricultural Pesticide Impact Assessment Program

1/ Unless otherwise specified the use information presented was obtained from crop specialists in all/most of the states listed (i.e., major usage states for the respective sites). Wherever typical use rates exceed the proposed use rates, the latter are parenthetically in italics.

Table 3. Current Fenamiphos Usage and Projected Economic Impacts of Cancellation.<sup>1/</sup>

Site [Major Usage States]: Target Pest(s)	Extent of Usage <sup>2/</sup>		Projected Alternatives [% of Fenamiphos Usage replaced]	Yield and Economic Impacts	Comments
	Lbs AI/Year (000) (% of US total <sup>3/</sup> )	Acres Treated (000) (% of site treated <sup>4/</sup> )			
CITRUS [FL, CA]: Nematodes (burrowing [FL], citrus [CA])	325 - 405 (20 - 25)	45 - 75 (15)	1) Resistant rootstocks (CA, FL) [unknown] 2) Oxamyl (CA) [unknown]	Yield Impacts: 1) 5-10% losses; 2) unknown impacts Economic impacts: likely to be moderate.	About 1% of the resistant rootstock plantings in CA already have Citrus nematode biotypes which are capable of damaging roots.

Table 3. Current Fenamiphos Usage and Projected Economic Impacts of Cancellation.<sup>1/</sup>

Site [Major Usage States]: Target Pest(s)	Extent of Usage <sup>2/</sup>		Projected Alternatives [% of Fenamiphos Usage replaced]	Yield and Economic Impacts	Comments
	Lbs AI/Year (000) (% of US total <sup>3/</sup> )	Acres Treated (000) (% of site treated <sup>4/</sup> )			
COTTON [TX, CA, SC, NC]: Nematodes (root-knot, reniform, sting, Columbia lance) and Thrips	15 - 65 (<5)	20 - 90 (5 - 15)	1) aldicarb [>95] 2) 1,3-D [<5]	Yield Impacts: 1) 0% losses; 2) 20% yield gain, where thrips are not a problem, or 20% yield loss (or extra expense of using a thrip control measure) where thrips are a problem. Economic impacts: likely be minimal assuming aldicarb continues to be accessible.	percentage of fenamiphos treated fields which have potential thrip problems is unknown.

Table 3. Current Fenamiphos Usage and Projected Economic Impacts of Cancellation.<sup>1/</sup>

Site [Major Usage States]: Target Pest(s)	Extent of Usage <sup>2/</sup>		Projected Alternatives [% of Fenamiphos Usage replaced]	Yield and Economic Impacts	Comments
	Lbs AI/Year (000) (% of US total <sup>3/</sup> )	Acres Treated (000) (% of site treated <sup>4/</sup> )			
GRAPES [CA]: Nematodes (root-knot, lesion, citrus)	95 - 150 (5 - 10)	75 - 105 (15 - 20)	1) carbofuran [5%] 2) drip irrigation [unknown] 3) soil amendments [unknown] 4) root-knot resistant rootstocks [unknown]	Yield impacts: 1) significant yield losses; 2) 6-12% yield losses; 3) 6-12 % yield losses; 4) 0-24% yield losses. Economic impacts: moderate to significant depending on the alternatives used.	Resistant rootstocks cost \$4/vine vs. \$0.55/vine for susceptible plants; planting rate equals 450-600 plants/acre.



Table 3. Current Fenamiphos Usage and Projected Economic Impacts of Cancellation.<sup>1/</sup>

Site [Major Usage States]: Target Pest(s)	Extent of Usage <sup>2/</sup>		Projected Alternatives [% of Fenamiphos Usage replaced]	Yield and Economic Impacts	Comments
	Lbs AI/Year (000) (% of US total <sup>3/</sup> )	Acres Treated (000) (% of site treated <sup>4/</sup> )			
PEACHES [CA, MI, NC]: Nematodes (root-knot, ring, lesion, dagger)	40 - 50 (<5)	3 - 5 (<1)	1) 1,3-D (CA, MI, NC) [<5] 2) methyl bromide (NC) [<5] 3) metam-sodium (MI) [unknown] 4) oxamyl (MI) [unknown] 5) soil amend-ments (MI) [unknown]	Yield Impacts: 1) variable impacts [yield increase in CA, 50% decrease in tree life in MI and NC]; 2) unknown yield impacts; 3) 50% decrease in tree life; 4&5) unknown yield impacts. Economic Impacts: in the long run, significant impacts are likely to occur mainly in MI and NC. No short run impacts are expected in CA.	the future availability of 1,3-D in CA is uncertain; the standard practice in CA is to plant root-knot resistant rootstocks, which are experiencing a buildup of ring or lesion nematodes, which may require fenamiphos treatment in the future.

Table 3. Current Fenamiphos Usage and Projected Economic Impacts of Cancellation.<sup>1/</sup>

Site [Major Usage States]: Target Pest(s)	Extent of Usage <sup>2/</sup>		Projected Alternatives [% of Fenamiphos Usage replaced]	Yield and Economic Impacts	Comments
	Lbs AI/Year (000) (% of US total <sup>3/</sup> )	Acres Treated (000) (% of site treated <sup>4/</sup> )			
TOBACCO [NC,GA,SC,VA]: Nematodes (root-knot, Tobacco Cyst and lesion), (?)Aphids	405 - 480 (25 - 30)	120 - 140 (25 - 35)	1) aldicarb [30%] 2) methyl bromide + chloropicrin [30%] 3) 1,3-D + chloropicrin [10%] 4) chloropicrin [10%] 5) 1,3-D [20%]	Yield Impacts: 1- 5) equal or greater yields are expected with any of the altern- atives. Economic Impacts: no impacts are expected in any of the states.	
TURF [CA,MI...]: Nematodes (sting & others)	400 - 600 (25 - 30)	20 - 30 (<1)	Ethoprop [unknown]	Yield Impacts: comparable plant growth (quantity and quality) is expected. Economic Impacts: no impacts are expected in any of the states.	

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Table 3. Current Fenamiphos Usage and Projected Economic Impacts of Cancellation."

Site [Major Usage States]: Target Pest(s)	Extent of Usage <sup>2/</sup>		Projected Alternatives [% of Fenamiphos Usage replaced]	Yield and Economic Impacts	Comments
	Lbs AI/Year (000) (% of US total <sup>3/</sup> )	Acres Treated (000) (% of site treated <sup>4/</sup> )			
Aggregate Summary	1,280 - 1,750 (85 - 90)	284 - 443 (75 - 80)		Economic impacts: the aggregate annual income loss to growers is unknown at this time. Moderate to significant impacts are possible for citrus, grape, and peach (MI and NC) growers. Minimal impacts are expected for the other sites.	There is very little information known on the potential usage of the alternatives because of no current usage data as well as the dual action of fenamiphos.

ABBREVIATIONS KEY: 1,3-D= 1,3-dichloropropene (Telone® is a tradename associated with this active ingredient).

1/ The sites represent those with the highest fenamiphos rates and/or usage.

2/ Based on 1990 - 1992 data. Totals may not add due to rounding.

3/ Percents were derived by dividing the pounds AI per year for each site by the total amount of fenamiphos applied to all sites annually (1,410,000 - 2,008,000 pounds AI)

- 4/ Percents were derived by dividing the acres treated annually for each site by the total number of fenamiphos acre treatments for all sites annually (362,000 - 575,000 acre treatments).

## REFERENCES

DPRA. AGCHEMPRICE - Current U.S.A. Prices of Non-Fertilizer Agricultural Chemicals. September, 1994.

NAPIAP. 1993. The Importance of Pesticides and Other Pest Management Practices in U.S. Cotton Production. June 1993.

NAPIAP. Unpublished. The Use and Importance of Nematicides in U.S. Citrus Production. Unpublished Draft.

Miles, Inc. 1994. Report entitled, "Nemacur Reregistration Data Eligibility Discussions".

Various in-house proprietary and non-proprietary pesticide usage data bases.

Attachment A

**STATE EXTENSION SERVICE CROP SPECIALISTS PROVIDING INFORMATION  
USED IN THIS ANALYSIS**

- 1] Becker, Ole - California turf information.
- 2] Bertrand, Paul - Georgia tobacco information.
- 3] Bird, George - Michigan peaches and turf information.
- 4] Johnson, Charles - Virginia tobacco information.
- 5] Koenning, Steven - North Carolina cotton information.
- 6] McKenry, Michael - California citrus, grapes and peaches information.
- 7] Melton, Thomas - North Carolina tobacco information.
- 8] Mueller, John - South Carolina tobacco information.
- 9] Noling, Joseph - Florida citrus information.
- 10] Ritchie, David - North Carolina peaches information.

Attachment B

**SUMMARY OF PROPOSED USE-RELATED RISK MITIGATION LABELING CHANGES  
FOR FENAMIPHOS (10/20/94 LABELING DRAFTS & 1/6/95 Letter)**

**ALL CROPS (Excluding Turf & Ornamentals) -**

*EC & 10G Formulations:*

- imposed the restriction "When used on erodible soils, best management practices for minimizing runoff should be employed. Consult your local Soil Conservation Service for recommendations in your use area.";
- imposed the restriction "Do not apply within 100 feet of the following aquatic areas: lakes, reservoirs, rivers, permanent streams, marshes, natural ponds and estuaries.";
- imposed the restriction "Do not cultivate within 10 feet of an aquatic area to allow growth of a vegetative filter strip."

**CITRUS -**

*EC Formulation:*

band treatment

- lowered maximum application rate, in states other than FL, from 10 to 7.5 lbs ai/A;
- lowered the dosage range in FL from 5 to 10 to 2.5 to 5 lbs ai/A
- lowered maximum seasonal rate, in states other than FL, from 10 to 7.5 lbs ai/A/season;
- imposed a restriction in FL prohibiting applications within 300 to 1,000 ft of a drinking water well (see label for precise language);
- lowered the maximum seasonal rate, in FL, from 10 to 5 lbs ai/A/season.

chemigation

- lowered the maximum application rate, in all states, from 4.5 to 3 lbs ai/A;
- lowered the maximum number of applications, in all states, from 6 to 4 per season;
- increased the repeat application interval, in all states, from 14 to 30 days;
- lowered the seasonal dosage range, in states other than FL, from 4.5 to 9 to 3 to 6 lbs ai/A/season;
- lowered the seasonal dosage range, in FL, from 4.5 to 10 to 3 to 4.5 lbs ai/A/season;
- imposed a restriction in FL prohibiting applications within 300 to 1,000 ft of a drinking water well (see label for precise language);

- imposed a limitation in FL that applications must be made between October 15 and April 30.

*15G Formulation:*

- proposed to cancel (band treatment).

**COTTON -**

*EC Formulation:*

- no changes proposed (in-furrow, covered or incorporated band, and soil injection [band] treatments).

*15G Formulation:*

- no changes proposed (in-furrow treatment).

**TOBACCO (excluding shade tobacco) -**

*EC Formulation:*

- no changes proposed (preplant broadcast treatment).

*Granular Formulations:*

- not registered.

**PEACHES -**

*EC Formulation:*

band treatment -

- changed dosage range from 5 to 10 to 5 to 7.5 lbs ai/A;
- reduced maximum amount applied/year from 10 to 7.5 lbs ai/A/year;

chemigation treatment -

- changed dosage range from 1.5 to 4.5 to 1.5 to 3 lbs ai/A;
- reduced the maximum no. of applications per season from 6 to 4;
- increased the repeat application interval from 14 to 30 days;
- lowered the minimum and maximum amounts applied per season from 4.5 to 9 to 3 to 6 lbs ai/A/season.

*Granular Formulations*

- not registered.



## GRAPES -

### *EC Formulation:*

#### band treatment -

- lowered the dosage rate from 9 lbs ai/A to 3 to 6 lbs ai/A;
- lowered the maximum amount/season from 9 to 6 lbs ai/A.

#### chemigation treatment -

- changed the dosage range from 0.75 to 3 lbs ai to 1.5 to 3 lbs ai/A;
- changed the total no. applications from one or more to 1 to 4 applications;
  - added a 30 day minimum interval between repeat applications.

### *Granular Formulations*

- not registered.

## TURF -

### *EC & 10G Formulations:*

#### broadcast treatment -

- imposed a 10 acre maximum treatment area on any golf course with a 3-day minimum interval before an additional 10 acres (or less) can be treated;
- imposed a prohibition against applications within 10 ft. of any surface body of water or fairway surface drain;
- imposed a prohibition against applications being made between noon and sunset during the heavy thunderstorm season (June thru September);
- delete claim for control of mole crickets.\*\*

\*\* Note: stated in their letter, but not reflected on labeling.

@PJL ENTER LANGUAGE = PCL