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TYPE PRODUCT(S) : I, D, H, F, N, R, S Insecticide/Nematicide

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. S. Lewis(21)

PRODUCT NAME(S) Nemacur (Fenamiphos)

COMPANY NAME Mobay Corporation

SUBMISSION PURPOSE Submission of TFS (Level I) protocols for:

Nemacur 10G: Golf Courses in Florida

Nemacur 15G: Citrus Orchards in Florida

SHAUGHNESSEY NO. CHEMICAL, & FORMULATION % A.I.

US EPA ARCHIVE DOCUMENT



ECOLOGICAL EFFECTS REVIEW

Chemical: Fenamiphos

100.0 Submission Purpose

The Registrant (Mobay Corporation) has submitted a proposed protocol for conducting a field study to evaluate the effects of Nemacur 15G on birds and other wildlife associated with citrus orchards in Florida. The study must be conducted to satisfy Subdivision E Guidelines for Wildlife and Aquatic Organisms (71-5) as specified in the Fenamiphos Reregistration Standard (see EEB's chapter of the standard prepared by R. Felthousen as well as subsequent reviews).

101.0 Proposed Protocol

Scope and Objectives

Mobay Chemical Corporation (Agricultural Chemicals Division) has prepared a protocol to determine if Nemacur 15G is likely to cause acute mortality among avian and small mammal species under realistic field-use conditions. Emphasis will be placed on determining if the presumption of unreasonable adverse effects of Nemacur 15G use on wildlife can be negated.

Specific objectives for 1988 are to delineate potential study sites, characterize bird and mammal communities, and to refine techniques to be used in the 1989 screening study. Study objectives for 1989 will be to determine the species of birds and mammals in and around treated test areas, to assess treatment-related mortality and to determine environmental concentrations by measuring residue levels in soil, water, wildlife food items and carcasses of dead or moribund animals from the treated area.

Study Area

Sixteen potential study sites in Florida will be characterized in 1988. A site will consist of at least 10 acres of turf that is bordered or interspersed with high quality wildlife habitat. Criteria for site selection will include:

1. a large geographic area having a history of citrus production.
2. Orchards bordered by sufficient area of wildlife habitat and relatively high populations of a variety of wildlife species.

3. orchards relatively isolated from situations where use of other cholinesterase inhibiting pesticides is likely.

4. negligible potential for presence of resident endangered or threatened species.

5. cooperative landowners

Experimental Design

The experimental design described in the protocol is for conducting a Level I field study (screening study) to determine acute effects on wildlife. During the 1988 growing season, a minimum of 16 citrus orchards will be characterized for use in both screening and definitive studies. Results of the study will determine if further testing is required.

A total of eight sites will be chosen for conducting the screening study during 1989. Separate untreated control fields will not be used for the screening study. Pretreatment sampling will serve as the basis for comparison with posttreatment sampling. The effect level used in the study will be treatment-related mortality of 20% or greater. Mortality less than 20% will be considered no effect. Presence of residues will be considered confirmation that death was treatment related. For small mammal populations, no effect level will be specified. However, the number of carcasses found and live animals trapped per unit effort, will be compared between pre- and posttreatment periods.

Materials and Methods

Application Methods, Use Rates and Calibration

Nemacur 15G will be applied in accordance with use directions on the EPA approved label. One application will be made at the maximum label use rate of 20 lbs. a.i./acre within the band. Granules will be incorporated into the soil as recommended on the label. Calibration of application equipment will be confirmed by study personnel prior to application to deliver the nominal treatment rate. The use of other pesticides will be selected so as to pose minimum hazard to wildlife and reduce interference with residue analysis.

Batch and control numbers will be recorded from the commercial containers for each application. If analyses of the formulated product are not available, a sample of approximately 10 g will be collected.

Avian Monitoring

The protocol proposes to conduct two types of bird censuses: (1) counts of birds using the portion of the field where routine carcass searches will be made, and (2) variable circular plot (VCP) censuses as described by Ramsey and Scott, 1979. The purpose of conducting the survey in the carcass search area is to obtain raw counts of the birds using the carcass search area. These counts will then be used to estimate the total number of individuals exposed to the chemical treatment of the search area. The VCP census will be used to estimate species densities in both the treated field and adjacent habitat. VCP censuses will only be performed in the morning to maximize detection.

Avian Crop Use

Avian use patterns will be recorded in both 1988 and 1989 to determine avian utilization in citrus orchards.

Monitoring Small Mammals

A small mammal trapping study will be included in 1989 to monitor species composition and abundance. Abundance will be estimated using catch per unit effort of time. Sherman livetraps (7.6 cm X 8.9 cm X 23 cm), baited with a mixture of peanut butter and sunflower seeds, will be used. Three trap lines, consisting of 10 stations with two traps per station will be set-up within the treated area and three will be placed in the adjacent habitat. Each line will consist of 10 stations placed approximately 15m apart with two traps per station. A total of 120 traps will be placed on each replicate. Trapping periods will be three trap nights in length.

General Wildlife Observations

In 1988 and 1989, general observations of wildlife use including visual and aural cues, scat, track sign, and flying birds, on and around the study fields will be recorded whenever noted during the course of the study. All observations of affected birds made throughout the study will be recorded and the signs of toxicity described.

Carcass Searches

Carcass searches will be conducted on all eight test sites in 1989. A plot comprising at least 25% of each orchard will be searched. The exact search area will be calculated based on avian abundance estimates and search efficiency as suggested by Fite et al. (1987). All signs of mortality, including feather spots (10 or more feathers at one location, indicating predation or scavenging), will be recorded.

Carcass search plots will extend 10 m into adjacent habitat on at least one side of the orchard. Each plot will be searched systematically by walking along predetermined routes in the plot until the entire plot has been covered. The same plots will be used for searching throughout the study.

Carcass Search Area

The amount of acreage searched will be sufficiently large so that at least two carcasses will be found if mortality is greater than or equal to 20%. This area will be calculated based on species abundance and search efficiency estimates obtained in 1988.

Carcass Detectability

In order to determine carcass detectability, the predator removal and searcher efficiency aspects of the study will be incorporated into one trial. Twenty-five carcasses of one to several species will be placed randomly within the carcass search area as determined for each replicate. Each bird will be marked so that it can easily be identified in hand as part of the trial.

Ten carcasses will be placed within the first three days after application, ten carcasses will be placed 4 to 7 days after application and the remaining five carcasses will be placed out eight to ten days after application.

Carcass searches will be conducted on scheduled days. Carcass detectability will be calculated based on the total number of marked carcasses recovered during the study. Only carcasses containing residues will be used in calculations to determine the proportion of the bird population killed. Search efficiency trials will be conducted on three sites in 1988 and on all study sites in 1989.

Monitoring Environmental Residues

In 1989, residues of fenamiphos will be measured in selected samples of soil, water, plant parts and, if possible, invertebrates and small mammals from all eight test fields. Carcasses of dead and moribund birds and mammals also will be collected (if present) for residue analysis, provided carcass condition permits. Residue samples will be collected from each of the eight replicates in this study. Two residue sampling station, randomly located, will be established on each replicate.

Soils

Soil samples (at least 300g) will be collected from the top one inch of the soil surface from two sample stations on each replicate.

Water

When available, approximately 250 ml water sample will be collected from each replicate, placed in an appropriate container, and frozen. The water sample will be collected from sources on or immediately adjacent to test sites.

Vegetation

Samples of plants in the adjacent habitats will be collected from the two sampling stations on each replicate. A total of 100 g of material will be collected per sample.

Invertebrates

Attempts will be made to collect approximately 10 g of invertebrates on scheduled sampling days. Sampling methods include sweep nets and/or pit traps.

Small Mammals

Twenty snap traps will be used to collect small mammals from each replicate. These traps will be placed in an area of the site away from the living trapping stations.

Carcasses

All fresh carcasses found will be analyzed for residues.

Meteorological Conditions

Weather data will be obtained from the nearest NOAA weather station for the duration of the study.

Data Analysis

Raw numbers of birds, densities, relative abundances and species richness will be reported for each replicate. Avian mortality will be calculated for each site using a modification of the "DREAP" equation. The modified equation is $P=C/(B \times E)$, where P is the proportion of individuals affected, C is the number of carcasses found during searches, B is the bounded count estimate of the number of birds exposed, and E is the proportion of placed carcasses not removed by scavengers and found during carcass searches.

Small mammal trapping data will be summarized and presented. Number of individuals captured and species richness will be reported for each replicate. Catch per unit effort (number of mammals trapped per 100 trap nights) will be calculated and compared pre and posttreatment on the test fields.

Study Evaluation

Because of the time required to prepare a comprehensive, point by point review, the following is only a cursory discussion relative to the adequacy of the proposed protocol. The EEB believes the following comments are warranted and show that the protocol needs considerable revision before it can be used to generate the data needed to satisfy the study requirement.

Objectives

The stated objective of the study is to determine if Nemacur is likely to cause acute mortality among avian and small mammal species under realistic agricultural conditions. The protocol then goes on to say that emphasis will be placed on determining if Nemacur presents an unreasonable adverse effect to wildlife. This view differs considerably from the purpose of such a study as stated in the Guidance Document which is : The screening study is designed primarily to demonstrate that hazard, suggested by the lower tier laboratory or pen studies, does not exist under actual use conditions. It is not, as suggested in the protocols, to determine if effects are occurring (See Fite Memorandum dated 3-10-89).

Further indication of misunderstanding related to the objective of the screening study is where the protocols indicate that field techniques are not specific enough to detect a 20% population effect. The Guidance Document suggests that screening studies should be designed to have a high probability to detect a 20% effect in exposed species if it occurs and therefore if minimal replications are monitored and no effects are detected the Agency can conclude with a relatively high degree of confidence that effects are occurring below concern levels. Screening studies, as proposed in the Guidance Document, are not intended to address population effects or quantify the percent affected as suggested in these protocols. The misunderstanding may come from the discussion on interpreting the results in the Guidance Document when effects are found. In these cases, using the information collected in the field studies, an attempt will be made to put the results in perspective, if possible, to help indicate what additional data are needed, if any (See Fite Memorandum dated 3-10-89).

Experimental Design

The protocol proposes to conduct the study on only eight test sites (replicates) in 1989. The EEB notes that this is the minimum number of test sites needed to satisfy the Level I (screening) field study data requirements and

that 14 test sites are recommended (See Guidance Document by Fite et. al, 1987). Fewer than 14 test sites may be used provided there is sufficient justification to show that the sites selected are biased toward situations likely to present the greatest risk.

One of the primary considerations, when determining how many test sites are required, is bird density. Although the report contains a list of avian and mammalian species, which are most likely to utilize the study area, it does not identify the species or the numbers of animals which, because of their feeding habits or other behavior, are at greatest risk from actually utilizing the area (i.e., any baseline data). This is critical because sufficient numbers of birds must be present on the study area in order to detect an impact if it occurs. Selecting a study area simply because it has adjacent habitat may not be adequate to insure that sufficient numbers of birds or mammals will be utilizing the study area during treatment.

Application Methods, Use Rates and Calibration

The protocol specifies that the use of other pesticides will be selected so as to pose minimum hazard to wildlife and reduce interference with residue analysis. The EEB does not believe it appropriate to conduct a study where more than the test chemical will be applied because other pesticides may mask, reduce, or enhance the toxicological effects of the test material. If other pesticides are to be used, positive control plots (i.e. plots where only these pesticide(s) will be applied) must be incorporated into the study design so that effects from such chemicals can be segregated from those of the test material. The EEB notes that the current protocol does not include the use of control plots for such purposes.

The EEB notes that the protocol specifically mentions that it is the objective of the study to determine if Nema-cur Spray Concentrate is likely to cause acute mortality among avian and small mammal species under realistic agricultural conditions. It would therefore seem appropriate for the protocol to address what levels of pest infestation will be used to trigger initiation of the study. It has been EEBs' experience that all too often field studies are conducted when the target pest is not present in sufficient numbers to warrant treatment. This is important because it reflects the ecological conditions at the time of the test. Such conditions may have great bearing on the outcome of the study and need to be considered in the hazard assessment process.

The protocol does not mention whether or not spray drift

cards will be placed on the study area to determine the amount of pesticide actually being applied.

Avian Monitoring

The EEB has reservations about the use of the variable circular plot census method for determining species occurrence and abundance. Specifically, the protocol fails to detail why the method is appropriate for the various species being censused. The protocol does not provide sufficient justification for the use of the census techniques. In addition, it is unclear whether the assumptions for the technique are valid for the area being studied.

It is EEBs' opinion that the circular plot/transect method will only provide a crude indication of the relative abundance and occurrence of avian species. It must be remembered that there is a great degree of variability associated with avian use patterns at any given time for any given habitat type. Because of their transitory nature, the number of flocking or migratory birds that use an area can, at times overwhelm or "mask" the number of resident birds that used a habitat site.

The protocol proposes to use the bounded count method (as opposed to the DREAP formula) to estimate the number of birds exposed to chemical treatment. The argument for this is that because the DREAP method biases the number of birds exposed on the low side, the estimate of percent mortality is biased upward. It is EEB's opinion that the bounded count method biases bird exposure toward the high side and thus the estimate of the percent mortality is biased downward. Because the EEB believes it a much more prudent to err on the side of safety and because the branch does not believe that the primary assumption behind the bounded count method can be satisfied, the EEB does not concur with the protocols use of this method to determine the number of birds potentially exposed to the chemical.

Monitoring Small Mammals

The protocol fails to provide the necessary justification or rationale as to why small mammal abundance will be estimated using catch per unit of time. Is this useful in determining an actual effect? How sensitive is the method for determining an impact? What level of impact will be used to determine if an impact has occurred?

Carcass Searches

The protocol states that, "carcass searches will be conducted in plots located in field interiors, field perimeters and adjacent habitats". It is unclear to the EEB exactly what constitutes a plot? There is no mention as to how large or small such plots are in size. Of greater significance is that there is no mention as to how much of the total study area, especially adjacent habitat types, will be searched. The EEB questions what criteria were used to determine how much area must be searched to insure that birds are not dying well off-site. Was it based upon the territorial requirements of the bird species expected to utilize the study area or on the amount of area covered when censusing for species abundance and occurrence. The EEB points out that flocking birds (most blackbird species) and/or birds that roost (i.e., mourning doves) may actually utilize certain habitat types that are well away from the treatment area. These birds may be able to fly to such areas before they die. As such, unless these areas are thoroughly searched, the impact to certain species may go unnoticed. The protocol must clearly describe what constitutes the study area and how much of it will be searched.

The protocol explains that approximately 5 acres/replicate will be searched and that this acreage should be sufficiently large enough to find at least two carcasses if mortality is greater than or equal to 20%. Presumably, this calculation is based on the DREAP formula. If such is the case, the EEB questions why, if mortality is not detected, will additional acreage be searched? As written, the protocol is unclear as to why 5 acres will be searched to detect 20% mortality.

The EEB also questions how it would be possible to maintain the search pace (i.e., 20 meters per minute) in adjacent habitats where dense vegetation occurs?

Monitoring Environmental Residues

The protocol fails to provide justification or rationale for the number of samples being collected. For instance, only a total of 16 crop samples will be collected (i.e., 2 samples/ replicate). This hardly seems appropriate for determining the broad range of residues that occur under field conditions.

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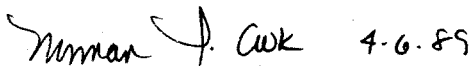
Summary

In summary, because; the stated objectives of the study are not in accordance with the purpose of the Level 1 study, the proposed protocol fails to provide sufficient discussion and/or justification as to why the eight test sites selected are biased toward situations likely to present the greatest risk, the circular plot census

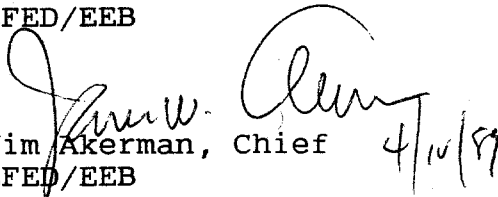
method may not be appropriate, the bounded count method for determining the number of birds exposed tends to bias impacts on the low side, it is not clear as to what constitutes the study area, and there appear to be insufficient number of samples to provide an adequate residue profile, the EEB concludes that the proposed protocol is inadequate for conducting a field study to determine the field effects of NemaCur to non-target organisms, when applied according to label directions.



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