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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 Spray Concentrate: Tobacco in

North Carolina

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

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ECOLOGICAL EFFECTS REVIEW

Chemical: Fenamiphos (Nemacur)

100.0 Submission Purpose

The Registrant (Mobay Corporation) has submitted a proposed protocol for conducting a field study to evaluate the effects of Nemacur 3 Emulsifiable on birds and other wildlife on and around tobacco fields in North Carolina. 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, dated 2-13-87).

101.0 Proposed Protocol

Scope and Objectives

Mobay Chemical Corporation has contracted Wildlife International, Ltd. of Easton, Maryland to conduct the study. The protocol proposes a field test to: (1) monitor terrestrial wildlife, (2) monitor wildlife mortality, and (3) perform residue analysis to determine potential concentrations of fenamiphos in various components of the ecosystem.

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

The study area selected includes eight contiguous counties (Pitt, Wilson, Greene, Nash, Wayne, Johnston, Lenoir, and Edgecombe) located in the coastal plains region of North Carolina. The climate is one of mild winters and hot, moist summers. Normal annual precipitation is approximately 41 inches with most of the rainfall occurring between July and August. Average monthly temperatures range from 40 to 78 degrees F. Soils in the region are generally acidic and consist primarily of sandy-clay to sandy-clay loams. Topography is nearly level to gently sloping. Drainage ditches are used for irrigation and run-off.

Prominent vegetation is an evergreen-hardwood mix with the understory comprised mostly of woody plants, flowering plants and grasses. Other vegetation/habitats adjacent to the tobacco fields include fallow fields, grass/forb ditches and shrub/forb ditches.

Over ninety bird species and 79 mammalian species have been identified as occurring on the study area. In addition, a wide variety of herptofauna (28 amphibians and 42 reptiles) can typically be found in the general area.

Experimental Design

The experimental design used in the study is for a Level I field study (screening study) to determine acute hazards to wildlife. During the 1988 growing season, a minimum of 25 sites will be characterized for use in both screening and definitive (Level II) studies. Results of the screening study will determine if further testing is needed.

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.

The number of carcasses found and live animals trapped per unit effort, will be compared between pre- and posttreatment to determine impacts to small mammal populations. Again, presence of residues will be considered confirmation that death was treatment related.

Methods and Materials

Application Methods, Use Rates and Calibration

One preplant application of NemaCur Spray Concentrate at the maximum use rate of two gallons per acre (3 lbs. a.i./gal.) will be disced into the soil. Calibration of the equipment will be confirmed by Wildlife International Ltd. prior to application. The use of other pesticides will be selected so as to pose minimum hazard to wildlife and reduce interference with residue analysis.

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 then will 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.

Avian Crop Use

Avian use patterns will be recorded in both 1988 and 1989 to determine avian utilization of tobacco fields.

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 peanut butter and sunflower seeds will be used to trap the mammals. Three trap lines, consisting of 10 stations with two traps per station will be set-up within the treated field while the same number of traps will be established in the adjacent habitat. All total 120 traps will be placed on each treated site. Trapping periods will be three 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 fields in 1989.

Carcass searches will be conducted in plots located in field interiors, field perimeters (crop/adjacent habitat interfaces) and adjacent habitats. The search effort (time spent searching) per unit area will remain equal between plots in similar habitats. During each search, carcasses will be collected, identified, and stored frozen until shipped to the designated analytical laboratory for residue analysis. All signs of mortality, including feather spots (10 or more feathers at one location, indicating predation or scavenging), will be recorded.

Each plot will be searched by walking along predetermined routes in the plot until the entire plot has been covered. The rate of search will be approximately 20m per minute. The same plots will be used for searching throughout the study. A minimum of 3 hours will be spent searching each replicate, with 2 hours spent on field perimeters, one-half hour on the field interior and one-half hour in adjacent habitat.

Carcass Search Area

Approximately five acres will be searched for three man-hours on each replicate to access acute mortality should it occur. This amount of area is based on an average search rate of approximately 20 meters per minute and an average effective search width of six meters. This acreage should be large enough so that at least two carcasses will be found if mortality is >20%

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 or several species of birds will be placed randomly within the carcass search area as determined for each replicate. Ten carcasses will be placed within the first three days after application, ten carcasses will be placed four to seven 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.

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 or moribund animals will also be analyzed. Residue samples from each of eight replicates in the study. Four residue sampling stations, two approximately at 10 to 100 m in the field, and two approximately one meter into adjacent habitat, will be established on each replicate. Stations will be randomly located along the field perimeter on the side where overrun by application is most likely to occur. Residues will be collected within 24-hours of application.

Soils

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

Water

When available, approximately a 250 ml water sample will be collected from each replicate. Samples will be collected from sources on or immediately adjacent to test fields.

Crop

Crop foliage will be collected from the two sampling stations on each replicate. A total of 100 grams of material will be collected from each sample group at each station.

Plant parts from Adjacent Habitats

Samples of plants in the adjacent habitats will be collected from the two sampling stations on each replicate. Plant samples to be collected include reproductive parts and foliage. A total of 100 g of material will be collected from each sample group at each station.

Invertebrates

Attempts will be made to collect 10 g of insect material

from sweep nets or pit-traps at each sampling station on sampling days.

Small Mammals

Twenty snap traps will be used to collect small mammals from each replicate. Small mammals are being collected to evaluate exposure and the potential for secondary level poisoning of raptors.

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 individuals 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 in tables. 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 field tests.

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 Nemacur 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.

103.0

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

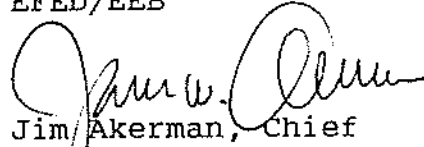
method may not be appropriate, the bounded count method for determining the number of birds exposed tends to bias impacts on the low side, it is not clear as to what constitutes the study area, and there appear to be insufficient number of samples to provide an adequate residue profile, the EEB concludes 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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 4.6.89

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