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EEB BRANCH REVIEW

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PRODUCT MANAGER NO. R. Mountfort (23)

PRODUCT NAME Goal 1.6E Goal 2E

COMPANY NAME Rohm & Haas

SUBMISSION PURPOSE Submission of Sediment Bioassay Protocol for Review

SHAUGHNESSEY NO.	CHEMICAL, FORMULATION	% A.I.
111601	Oxyfluorfen	

(1)

ECOLOGICAL EFFECTS BRANCH
REVIEW

GOAL

100 Submission Purpose

The registrant, Rohm & Haas Company, submitted a protocol for review. The protocol is a 96-hour sediment bioassay procedure for determining the toxicity of Goal when it is incorporated into sediment. This test was requested by Dan Rieder in the January 22, 1985 review for the use of Goal on noncrop areas. The purpose is to determine through testing if sediment-bound Goal is acutely toxic to fish (bluegill), a planktonic invertebrate (Daphnia magna), or a benthic invertebrate (in this case they propose to use Chironomous sp.) at expected exposure levels and multiples thereof. The results of this study will be evaluated along with other toxicity, exposure, and chemistry data, as well as fate modeling, to assess the acute risk to aquatic organisms from the use of Goal.

101 Hazard Assessment

Discussion of Data Requirement

As the ability to estimate aquatic exposure improves using such models as SWRRB and EXAMS, EEB is required to assess hazard to aquatic ecosystems based on residues in various compartments. These models provide expected pesticide levels not only in the water column, but also in the suspended particulate matter and sediment as sorbed chemical. However, there is no firm concensus within the aquatic-toxicological community indicating the significance of these estimated residue levels. The requested sediment bound toxicity test will provide information on the acute effects of sediment bound pesticide levels on various types of organisms. The levels to be tested in this case will be based on actual measured levels from a field study. There will be three test levels, one fifth the expected residue level, the expected residue level and five times the expected level. The response of the organisms to these levels, with accompanying measured concentrations, will provide a response at various levels surrounding the expected exposure levels. Two different types of sediment are proposed representing typical sediments with both low and high organic content.

2

If the test organisms, Daphnia magna, bluegill or the benthic species, possibly Chironomous sp., die in response to this exposure, this exposure will be considered hazardous to the test organisms. If the test organisms do not die during the 96-hour exposure, it will be assumed that the contaminated sediment was not hazardous and that possibly sediment bound Goal may not be toxicologically available at expected exposure levels. Such information will be incorporated in future risk assessments with Goal.

103 Conclusions

Ecological Effects Branch (EEB) has reviewed the sediment toxicity test protocol and has the following comments/requirements.

1. The protocol calls for treating the soil (4.5 cm deep) in a Pyrex tray at the application rate (assumed 2 lb ai/acre) for the low concentration and 2X the application rate for the high concentration. This rate will clearly provide a worst case exposure scenario but will only be useful if no adverse effects are observed. If adverse effects occur, it will be difficult to relate them to expected concentration in the environment. Rather than applying it at label rates, EEB recommends applying the ai to sediment at rates necessary to obtain concentrations based on measured residues from field monitoring studies. Concentrations of 690 ppb were measured in "pond edge" sediment and 20 ppb in "pond middle" sediment after Goal was applied at (presumably) 1 lb ai/acre (see review dated January 22, 1985). Based on this, maximum sediment concentrations should be 1380 ppb (2 lbs ai/acre x 690 ppb). Therefore, more realistic sediment concentrations should be 276 ppb (one-fifth maximum expected level), 1380 ppb and 6900 ppb (five times maximum expected concentrations).

Furthermore, the protocol suggests spraying the soil surface and placing the tray in the aquaria undisturbed. EEB requires that the active ingredient (ai) be mixed into the sediment thoroughly and this mixture added to the filled aquaria. Then allow the sediment to settle naturally for 24 hours before beginning the study.

2. EEB requires three test levels rather than two test levels.

3

3. The protocol indicates that the soil type used will be according to the sponsor's needs. EEB requires that two types of sediment be used, one with a low organic content (0.5% organic material) and one with higher organic content (3% organic material). Field soil is not acceptable. EEB recommends that the sediments be synthesized according to Taub, Frieda B. and Michael E. Crow, (1980) Synthesizing Aquatic Microcosms, In Microcosms in Ecological Research-Selected papers from a symposium held at Augusta, Georgia, November 8-10, 1978, John P. Geisy, Jr. Ed. Published by Technical Information Center, U.S. Department of Energy. If natural sediments are used, they must be characterized in detail and sterilized.

With two types of sediment, that would require 24 aquaria, 12 for each type of sediment. That would allow for three replicates at three test levels and an untreated control.

4. EEB questions waiting 48 hours following application of the test material to the sediment before placing the sediment in the water. The sediment must be added to the aquaria as soon as the test material is thoroughly mixed with the sediment.

5. The benthic organism used in this bioassay must be tested in an acute (five concentrations and a control) clean water 48-hour or 96-hour test to determine an LC_{50}. This is necessary to determine how sensitive the benthic organism is to the test material. It will also allow application of the bioassay results to other organisms of known sensitivity.

6. The protocol proposes to use Chironomous sp. as the benthic organism. EEB has reviewed several references pertaining to sediment toxicity testing with benthic organisms and none of them used or recommended the use of Chironomous sp.

Malueg, K.W., G.S Schuytema, J.H. Gakstatter and D.F Krawczyk (1983) Effects of Hexagenia on Daphnia Response in Sediment Toxicity Tests. In Environmental Toxicology and Chemistry, Vol. 2, pp. 73-82.

Prater, Bayliss L. and Max A. Anderson (1977) A 96-hour Bioassay of Otter Creek, Ohio. In Journal of Water Pollution Control Federation. 49:2099-2106.

Prater, Bayliss L. and Robert A. Hoke (1980) A Method for the Biological and Chemical Evaluation of Sediment Toxicity. In Contaminants and Sediments, Volume 1. Editor Robert A. Blake. Ann Arbor Science Pub., Inc.

While Chironomous sp. are ubiquitous, they tend to be tolerant of high pollution levels in general and may not be representative of the more sensitive benthic organisms. The 48-hour acute LC_{50} will be useful in determining its sensitivity. If it is shown to be quite insensitive, i.e., 100 times less sensitive than Daphnia magna, then the test may have to be rerun with a more sensitive benthic organism.

7. Residue analysis must be performed on both the water and sediment every 48 hours. That is, at 0 hours, 48 hours, and 96 hours.

8. The location of the fish cage must be changed so the circulating water will flow through it as well as the daphnid cages. It would be a nested cage setup with the daphnid container within the fish cage.

9. The proposed chi-square statistics are not recommended. The resulting mortality data and other responses should be analyzed by performing an analysis of variance.

10. The temperature and lighting regime must be identified and appropriate for warmwater test species.

The above changes should be considered tentative. The registrant should resubmit a protocol based on these changes. In the meantime, EEB is going to submit this protocol along with our recommendations to the EPA Office of Research and Development Laboratories for review. We advise the registrant to postpone conducting this study until we have agreed on a protocol.

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5

RIN 0637-00

EFED Review - Oxyfluorfen

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