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SHAUGHNESSEY NO.

13
REVIEW NO.

EEB REVIEW

DATE: IN 7-3-89 OUT JUL 14 1989

FILE OR REG. NO 89-MN-10

PETITION OR EXP. NO.

DATE OF SUBMISSION 6-26-89

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RD ACTION CODE/TYPE OF REVIEW 510

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

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. D. Stubbs (41)

PRODUCT NAME(S) Esfenvalerate

COMPANY NAME State of Minnesota

SUBMISSION PURPOSE Proposed P18 for use on small grains and conservation reserve: grasshopper control

| SHAUGHNESSEY NO. | CHEMICAL, & FORMULATION | % A.I. |
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100.1 Submission Purpose

The State of Minnesota Department of Department of Agriculture is requesting an emergency exemption (Section 18) for the use of ASANA XL on small grains and conservation reserves.

100.2 Application Rate/Methods/Directions

ASANA is to be applied at a rate of 0.03 - 0.05 lb ai/A, for a total of 60,000 to 120,00 lbs of active ingredient. A maximum of 4 million acres is proposed and would extend to the fifteenth of August. Label restrictions on small grains requires that treatment not exceed twenty-one days prior to harvest.

100.3 Target Organism

Two stripped grasshopper (Melanoplus bivittatus) and redlegged grasshopper (Melanopulus Femurrubrum).

100.4 Precautionary Labeling

This pesticide is toxic to wildlife and extremely toxic to fish. Use with care when applying in areas adjacent to any body of water. Do not apply directly to water. Do not apply when weather conditions favor drift from treated areas. Do not contaminate water by cleaning of equipment or disposal of wastes. Apply this product only as specified on this label.

101.0 Hazard Assessment

The state of Minnesota is requesting an emergency exemption for the use of ASANA, the 2S - XS isomer of pydrin, on small grains and conservation reserves. (Pydrin) is currently registered for use on a number of crops such as field corn, melons, peppers, potatoes, tomatoes, fruit and nut orchards, squash, cucumber, eggplant, beans, sweet corn, cotton, soybeans and peanuts. This proposed Section 18 use of ASANA calls for the maximum application of 0.05 lb. ai/A to be applied to 4 million acres.

101.1 Likelihood of Adverse Effects to Nontaraget Organisms

Although the acute/chronic fish and wildlife data base for ASANA is not complete, studies have shown that this isomer of pydrin appears to have similar fate and toxicity parameters. Therefore, the Agency will rely

upon pydrin data base in evaluating the potential hazard of ASANA use to nontarget terrestrial and aquatic organisms.

Aquatic Toxicity

Pydrin, a second generation pyrethroid, degrades in soil with a half-life of 6 months and undergoes hydrolysis after 24 days at ph 7.2. Pydrin strongly binds to sediment and particulate resulting in a soil/water partition coefficient greater than 15,000.

Pydrin is a neurotoxicant and effector of ion permeability (Miller and Adams, 1982) and appears to interact with sodium gates (Lawrence and Casido, 1983). Laboratory studies have shown that pydrin is very highly toxic to fish and aquatic organisms. Shimmel et al. (1983) found that pydrin was acutely toxic to mysid shrimp, Mysidopsis bahia, at 0.008 (0.005 - 0.01) ug/L and pink shrimp, Penaeus duorarum, at 0.84 (0.66 - 1.2) ug/L. They further found acute toxicity values for estuarine fish ranging from 5.0 (0.66 - 5.3) ug/L for sheepshead minnow, Cyprinodon variegatus, to 0.31 (0.21 - 0.40) ug/L for Atlantic silversides, Menidia menidia.

An evaluation of sublethal pydrin exposure to aquatic invertebrate larval development and metabolism was conducted by McKenney and Hamaker (1984). They concluded that there were alterations in metabolic-salinity patterns of larval grass shrimp, Palaemonetes pugio, exposed to 0.0001 and 0.0002 ug/L pydrin. These low levels of pydrin appeared to reduce the ecological fitness at this critical life stage by limiting the organisms' capacity to adapt to fluctuating salinity conditions that are normally encountered in estuarine waters.

Jarvinen et al. (1988) evluated pydrin toxicity to fathead minnows, Pimephales promelas, following episodic and continuous exposure to the pesticide. Their results showed that a 48-hour exposure to pydrin at a concentration similar to a continuous exposure 96-hour $LC_{50}$ can cause adverse growth effects (50% deformities) within 30 days.

Scott et al. (1989) found that following a major runoff event in 1985 from agricultural land in coastal South Carolina a fish kill was observed (0.079 ug/L fenvalerate). They further showed that at 90.0 to 22.5 ppb, fenvalerate sediment concentrations significantly inhibited egg production in certain species of benthic copepods.

At present, DuPont Agriculture Products is conducting an aquatic mesocosm experiment in order to evaluate the ecological effects of pydrin/ASANA on nontarget aquatic organisms. Since, this study has not been completed, EEB has calculated estimated environmental concentrations (EEC) of ASANA residues on small grains following ground and aerial application (Appendix I). These calculations suggest that a 0.05 lb ai/A, the expected concentration of ASANA from both types of application are 0.03 and 0.154 ug/L, respectively. A comparison of these estimates with acute, chronic, and field toxicity values suggest that ASANA use on small grains may result in environmental residues that exceed aquatic toxicity concerns by one-to-three orders of magnitude.

Avian Toxicity

The available data suggests that pydrin is practically non-toxic to birds at an acute level (mallard $LC_{50}$ = 9932 ppm; Bobwhite quail $LC_{50}$ = 10,000 ppm). However, avian reproductive effects were found at 25 ppm. In assessing acute toxicity of ASANA to avian wildlife, EEB has estimated the potential exposure from residues by using Hoerger and Kenaga (1972 table of typical maximum residues on differing categories of vegetation (Table 1).

Table 1. Maximum Expected Pydrin Residues on Avian Food and Dietary Intake (ppm)

| Food Type | Residue (ppm) |
|---|---|
| Short Grass | 14 |
| Dense Foilage/ Small Insects | 2.8 |
| Large Insects | 0.06 |

The maximum expected residues from the consumption of vegetation and insects (application rate of 0.05 lb ai/A) are expected to range from 0.06 to 14 ppm. These values show that ASANA use on small grains should not present a direct toxicity threat to birds (expected residues are 6 to 3 orders of magnitude less than acute and chronic toxicity values). However, the high toxicity of ASANA to aquatic invertebrates and the possibility of exposure to aquatic environments from runoff and drift can result in an indirect effect to waterfowl recruitment.

The small-grain growing areas of Minnesota consist of numerous lakes and prairie pot holes. These wetlands can range in size from one to over ten acres and can serve as nesting and feeding areas for waterfowl. Nesting birds are sensitive to nutrient needs and rely

upon aquatic invertebrates from these wetlands as a chief source of protein and calcium (Swanson et al. 1979). The environmental persistence of ASANA and its high toxicity to aquatic life suggest that unrestricted use of this pesticide on Minnesota small grain and conservation areas could impact a significant waterfowl food base and affect waterfowl recruitment.

101.2 Endangered Species

This large scale application (4 million acreas) in Minnesota may have a critical impact on the following endangered species: piping plover (Charadrium melodus), Higgins' eye pearly mussel (Lampsilis higgins:, and the Iowa Pleistocene snail (Discus macclintocki). These organisms are found in the counties ok, Winona, Washington, Wabasha, Lake of the Woods, Houston, and St. Louis. Any spraying near prairie potholes, lakes or rivers may be detrimental to these endangered species. Before any ASANA is applied in these counties of concern, the Minnesota Department of Agriculture must contact Mr. Ron Rufsneider (FTS-725-3276) at the U.S. Fish and Wildlife Office for clarification as to the presence of these endangered species near fields that are to be sprayed.

107.0 Conclusions

EEB has completed its evaluation of this Section 18 request for the use of ASANA on small grains and conservation land in Minnesota. The Minnesota Department of Agricultural plans to spray (aerial and ground) 4 million acres in order to combat a grasshopper infestation. However, it is the opinion of EEB that because of ASANA's toxicity to aquatic life, it's persistence in the environment and the magnitude of the emergency exemption program, there is a strong possibility that prairies potholes, lakes and rivers will be subject to ASANA drift and/or runoff that may impact fish and aquatic invertebrates. The EEB has calculated expected environmental residues from gound and aerial application of ASANA to fields. According to these calculations this use can result in residues to water that exceed aquatic toxicity concerns by one to three orders of magnitude. Similar fenvalerate application rates have resulted in a fish kill and an impact to macroinvertebrates, following a major runoff event from agricultural land in coastal South Carolina.

Although this proposed use of ASANA should not be directly toxic to birds, there is the possibility of indirect effects through an altered aquatic invertebrate food base used by waterfowl. Nesting birds are sensitive

to nutrient needs and rely upon aquatic invertebrates as a source of protein and calcium.

Endangered species concerns were addressed in Section 101.2. Before ASANA is used in the designaed counties of concern, the Minnesota Department of Agriculture must contact Mr. Ron Rufsneider (FTS-725-3276) at the U.S. Fish and Wildlife Office for clarification as to the distribution of the piping plover, the Iowa Pleistocene snail, and the Higgins' eye pearly mussel.

Miachel Rexrode, Fisheries Biologist
Ecological Effects Branch
Hazard Evaluation Division (H7507C)

Doug Urban, Section Head
Ecological Effects Branch
Hazard Evaluation Division (H7507C)

James Akerman, Chief
Ecological Effects Branch
Hazard Evaluation Division (H7507C)

7/14/89

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Appendix I - EEC Calculations for ASANA Use on Winter Wheat

I. Ground Application

Assumptions:

0.1% runoff
10 acre drainage basin
0.05 lb ai/A of ASANA

(A) Runoff

0.05 lb ai/A x 0.001 x 10 A = 0.0005 lbs ai total runoff
EEC of 1 lb ai, direct application to 1 A pond, 6-ft deep = 61
Therefore, EEC = $\frac{61 \text{ ug/L}}{1 \text{ lb ai}} \times \frac{0.0005 \text{ lb ai}}{1} = 0.03 \text{ug/L}$

II Aerial Application

Assumptions

| | |
|---|---|
| 0.1% | runoff |
| 60% | application efficiency |
| 10 | acre drainage basin |
| 5% | drift |
| 0.05 | lb ai/A of ASANA |

(A) Runoff

0.05 lb ai/A x 0.6 x 0.001 x 10 A = 0.00003 lb ai found in total runoff

(B) Drift

0.05 ai/A x 0.05 = 0.0025 lbs ai in total drift

Therefore, EEC = $\frac{61 \text{ ug/L}}{1 \text{ lb ai}} \times \frac{0.0025 \text{ lb ai}}{1} = \frac{0.154 \text{ ug/L}}{}$

## REFERENCES


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Note to Jim Tompkins:

I would like to emphasize our concern over the proposed use of ASANA under a Section 18 in Minnesota on small grains and conservation land. Our primary concern is for direct effects on aquatic organisms, since our exposure estimates exceed the established aquatic toxicity values by one to three orders of magnitude. Second, Field studies in South Carolina have resulted in fish kills following a major (Fenvalerate) runoff event from agricultural land. Third, we are concerned that the direct effects on aquatic invertebrates (important food base for young waterfowl recruitment if the application coincided with the breeding season. We believe that this proposed use could provide significant risk to aquatic organisms and indirect risk to waterfowl in Minnesota.

Douglas J. Urban 7/14/89

Douglas J. Urban, Section Head
Section III, EEB

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