EEB File

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109303
SHAUGHNESSEY NO.

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REVIEW NO.

EEB REVIEW

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FILE OR REG. NO 89-KS-03

PETITION OR EXP. NO.

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

DATA ACCESSION NO(S).

PRODUCT MANAGER NO. D.Stubbs (41)

PRODUCT NAME(S) ASANA XL

COMPANY NAME State of Kansas

SUBMISSION PURPOSE Proposed §18s for use on winter wheat

| SHAUGHNESSEY NO. | CHEMICAL, & FORMULATION | % A.I. |
|---|---|---|
| 109303 | Esfenvalerate | 24% |

100.1 Submission Purpose

The State of Kansas is requesting an emergency exemption (Section 18) for the use of esfenvalerate (ASANA XL) on winter wheat.

100.2 Application Rate/Methods/Directions

ASANA is to be applied at a rate of 0.03 - 0.05 lb ai/A, one application per season. A maximum of 107,300 acres of wheat fields will be treated in the following counties.

| | |
|---|---|
| Cheyenne | Hamilton |
| Rawlins | Kearney |
| Sherman | Stanton |
| Thomas | Grant |
| Wallace | Morton |
| Logan | Stevens |
| Wichita | |
| Greenley | |

Treatments for Army cutworm and Pale Western cutworm may be required from late winter through May 21, 1989.

100.3 Target Organism

Pale western cutworm, and the army cutworm.

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 Kansas is requesting an emergency exemption for the use of ASANA, the 2S-XS isomer of esfenvalerate, on winter wheat to control cutworms. Esfenvalerate (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 application of 0.05 lb ai/A, once per season, on 197,300 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.

An assessment of the potential environmental risk of a pesticide must include actual or estimated values of exposure. At present, DuPont Agricultural Products is conducting an aquatic mesocosm experiment in order to evaluate the ecological effects of pydrin/ASANA on non-target aquatic organisms. Since, this study has not been completed, EEB has calculated estimated environmental concentrations (EEC) of ASANA residues on wheat fields following ground and aerial application (Appendix I). These calculations suggest that at 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 and chronic toxicity values suggest that ASANA use on winter wheat may result in environmental residues that exceed aquatic toxicity concerns by one-to-three orders of magnitude. Until the mesocosm data are evaluated, it appears that this ASANA use could adversely effect aquatic organisms through runoff and drift from adjacent fields.

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 wheat 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 wheat-growing area of Kansas have numerous farm ponds and lakes which serve as nesting and feeding points for several species of waterfowl during the months of March through May. Nesting birds are sensitive to nutrient needs at this time and rely upon aquatic invertebrates as a chief source of protein and calcium (Swanson et al. 1979). The environmental persistence of ASANA and its high toxicity to aquatic organisms suggests that unrestricted use of this pesticide on Kansas wheat fields could impact a significant waterfowl food base and possibly affect waterfowl recruitment.

101.2 Endangered Species

Based upon the information found in the EEB Endangered Species File, it appears that this use of ASANA should not impact endangered species. The counties listed in section 100.2 do not contain species that are likely to be directly or indirectly impacted.

107.0 Conclusions

EEB has completed its evaluation of this Section 18 request for the use of ASANA on winter wheat in Kansas. Expected environmental residues were calculated in order to assess the potential hazard of ASANA to avian and aquatic organisms. According to these calculations, ASANA use on winter wheat may result in residues that exceed aquatic toxicity concerns by one to three orders of magnitude. Although this use of ASANA should not be directly toxic to birds, there is a possibility of indirect effects to the aquatic invertebrate food base used by waterfowl. Therefore use of ASANA at 0.05 lb.ai/A on wheat fields could result in an increased risk to aquatic organisms and waterfowl in lakes and streams adjacent to these fields.

Endangered species concerns appear to be slight. The counties listed in section 100.2 do not contain species that are likely to be directly or indirectly impacted by this use.

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

## REFERENCES

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**NOTE TO DON STUBBS:**

I would like to emphasize our concern over the proposed use of ASANA under a section 18 in Wyoming and Kansas on wheat and barley, and wheat, respectively. 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, we are concerned that the direct effects on aquatic invertebrates (important food base for young waterfowl) could indirectly affect waterfowl recruitment if the application coincided with the breeding season. We believe that this proposed use could provide significant risk to aquatic organisms and breeding waterfowl in these two states.

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