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PRODUCT MANAGER NO. 41

PRODUCT NAME(S) ASANA XL

COMPANY NAME Department of Agriculture of Oklahoma

SUBMISSION PURPOSE Sec. 18 - Oklahoma Use to control pale western cutworm on winter wheat

SHAUGHNESSEY NO.	CHEMICAL, & FORMULATION	% A.I.
109303	Es - fenvalerate	

100.1 Submission Purpose

The Oklahoma Department of Agriculture is requesting an emergency exemption (Section 18) for the use of ASANA XL (esfenvalerate) to control army cutworms (Euxoa auxiliaris) on winter wheat.

100.2 Application Rate/Methods/Directions

Esfenvalerate is to be applied at a rate of 0.03 - 0.05 lbs ai/A. One applications per season is expected either by air or ground equipment. The pesticide will not be applied within one-eight mile from any lake or flowing stream. The maximum expected acres to be treated are 1,000,000. Anticipated time for treatment is from March 1, 1990 to May 1, 1990.

100.3 Target Organism

Army cutworm (Euxoa auxiliaris)

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.

100.5 Hazard Assessment

The State of Oklahoma is requesting an emergency exemption for the use of ASANA XL on winter wheat. This proposed Section 18 calls for an application of 0.03 - 0.05 lb ai/A, once per season, on one million acres if an outbreak of cutworms occurs.

The counties involved include Alfalfa, Beaver, Beckham, Blaine, Caddo, Canadian, Cleveland, Cimarron, Comanche, Cotton, Custer, Dewey, Ellis, Garfield, Garvin, Grady, Grant, Greer, Harmon, Harper, Jackson, Jefferson, Kay, Kingfisher, Kiowa, Logan, Major, McClain, Noble, Oklahoma, Roger Mills, Stephens, Texas, Tillman, Washita, Woods and Woodward.

101.1 Likelihood of Adverse Effects to Nontarget Organisms

Although the acute/chronic fish and wildlife data base for ASANA is not complete, studies have shown that this isomer of fenvalerate appears to have similar fate and toxicity parameters as the parent compound. Therefore, the Agency will rely upon fenvalerate data base in evaluating the potential hazard of ASANA use to nontarget terrestrial and aquatic organisms.

Aquatic Toxicity

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

Fenvalerate is a neurotoxicant and effector of ion permeability, (Miller and Adams 1982) and appears to interact with sodium gates (Lawrence and Casida 1983). Laboratory testing has shown that fenvalerate is very highly toxic to freshwater aquatic organisms as noted in acute toxicity values that ranged from 0.032 ug/L (*Daphnia magna*) to 2.35 ug/L (fathead minnow) (Mayer and Ellersieck 1986). This very high toxicity has also been documented in acute marine studies. Schimmel et al. (1983) found that fenvalerate was acutely toxic to mysid shrimp, *Mysidopsis bahia* at 0.008 (0.005 - 0.01) ug/L and pink shrirp, *Penaeus duorarum*, at 0.84 (0.66 - 1.2) ug/L. They further found that acute toxicity values for estuarine fish ranged from 5.0 (0.55 - 5.3) ug/L for sheepshead minnow, *Cyprinodon variegatus*, and 0.31 (0.21 - 0.40) ug/L for Atlantic silversides, *Menidia menidia*.

An evaluation of sublethal fenvalerate exposure to aquatic invertebrate larval development and metabolism was conducted by McKenney and Hamaker (1984). They concluded that exposure to 0.0001 and 0.0002 ug/L can result in alterations in metabolic-salinity patterns of larval grass shrimp, *Palaemonetes pugio*. This reduces 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.

An assessment of the potential environmental risk of a pesticide must include actual or estimated values of exposure. Smith et al. (1983) noted that fenvalerate concentration in runoff from a sugarcane-insect IPM system could present a toxicity problem to aquatic organisms. Although the toxicity of fenvalerate may be reduced as a result of sorption to sediment, Coulon (1982) found that this reduction was only 2-fold, and does not eliminate aquatic hazard.

The Ecological Effects Branch (EEB) has calculated estimated environmental concentrations (EEC) of ASANA residues on winter wheat following ground and aerial application (Appendix I). These calculations suggest that at 0.05 lb ai/A (highest application level) 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 suggests that ASANA use on winter wheat may result in environmental residues that exceed aquatic toxicity concerns, especially to aquatic invertebrates, through runoff and drift from fields adjacent to aquatic systems.

Avian Toxicity

The available data suggests that fenvalerate 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 Fenvalerate Residues on Avian Food and Dietary Intake (ppm) after an Application of 0.05 lb ai/A on Winter Wheat

Food Type	Residue (ppm)
Short Grass	14.0
Dense Foliage/ Small Insects	2.8
Large Insects	0.1

The maximum expected residues from the consumption of vegetation and insects (application rate of 0.05 lb ai/A) are expected to range from 0.1 to 14.0 ppm. These values show that ASANA use on winter wheat should not present a direct toxicity threat to birds since the expected residues are 6 to 3 orders of magnitude less than avian toxicity values. However, there is a possibility of indirect effects of ASANA exposure to aquatic invertebrates that serve as a food base for waterfowl. Since, ASANA is very toxic to aquatic organisms, drift or runoff from sprayed fields could effect a significant trophic level that certain waterfowl are dependent upon, especially in the spring during breeding.

101.2 Endangered Species

Based upon the information found in the EEB Endangered species file aquatic endangered species will not be found in the counties designated for spraying. Direct toxicity of ASANA to endangered birds does not appear to be a concern, however, an indirect effect via the disruption of a significant trophic level may effect the Least Tern (Sterna antillarum) and the Piping Plover (Charadrium melodus). Since, these birds nest and feed in aquatic areas, any impact on small fish and aquatic invertebrates may result in a reduction in natural food which could unnecessarily stress these birds and affect populations, especially during the spring breeding season.

The U.S. Fish and Wildlife Service has suggested the use of 1/8 mile buffer zones from aquatic habitat in order to protect this environment and mitigate impact to nontarget organisms. The EEB concurs with this action for ground but not for aerial applications. The unpredictability of wind conditions during aerial application can result in significant drift inspite of prescribed buffer zones. If this Section 18 is approved, the Oklahoma Department of Agriculture must contact the U.S. Fish and Wildlife regional office (Gary Halvorson, FTS: 474-2914) prior to any spraying in order to document the presence of endangered species in the area of concern.

107.0 Conclusions

EEB has completed its evaluation of this Section 18 request for the use of ASANA on winter wheat in Oklahoma. Expected environmental residues were calculated in order to assess the potential hazard of ASANA to avian and aquatic species. The expected residues from field runoff and drift exceed acute/chronic toxicity values for fish and aquatic invertebrates 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 from impacting an invertebrate food base that waterfowl are dependent upon. The U.S. Fish and Wildlife Service has suggested that buffer zones be used around aquatic habitats in order to mitigate any potential exposure to nontarget organisms. The EEB agrees to this use of buffer zones for ground but not for aerial applications. The unpredictability of wind conditions during aerial application can result in significant drift that may impact aquatic invertebrates and indirectly effect waterfowl.

Endangered species concerns were addressed in Section 101.2. Endangered aquatic species are not found in the counties that have been designated for spraying. However, two avian species, the Piping Plover and the Least Tern, may be affected indirectly by an alteration in their food base (aquatic invertebrates, small fish), especially during breeding season. If this Section 18 is approved, the Oklahoma Department of Agriculture must contact the U.S. Fish and Wildlife regional office (Gary Halvorson FTS 474-2914) for clarification as to the presence of endangered species in a target area prior to any applications.

Miachel Rexrode 3/30/90

Miachel Rexrode, Fishery Biologist
Ecological Effects Branch
Environmental Fate and Effects Division

Ann Stavola 3/30/90

Ann Stavola, Section Head
Ecological Effects Branch
Environmental Fate and Effects Division

James W. Akerman 3/30/90

James Akerman, Chief
Ecological Effects Branch
Environmental Fate and Effects Division

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,

$$\text{EEC} = \frac{61\ \text{ug/L} \times 0.0005\ \text{lb ai}}{1\ \text{lb ai}} = 0.03\ \text{ug/L}$$

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 06 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,

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

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Note to PM: Lately, several Section 18 requests for the use of ASANA have entailed millions of acres. EEB is concerned about this increase potential for exposure to nontarget organism and feels that a more thorough risk assessment is not possible until the required mesocosm data is reviewed and a Section 3 registration evaluated.