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Shaug. No.

EEB REVIEW

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TYPE PRODUCT Insecticide/miticide

PRODUCT MANAGER D. Stubbs (41)

PRODUCT NAME Agrimec 0.15 EC (Avermectin)

COMPANY NAME Fla. Dept. of Agriculture and Consumer Services

SUBMISSION PURPOSE Proposed Section 18 for use on tomatoes
in Florida

SHAUGHNESSEY NO.	CHEMICAL	%AI
<u>122804</u>	<u>Abamectin</u>	<u></u>
<u></u>	<u></u>	<u></u>

ECOLOGICAL EFFECTS BRANCH REVIEW
SECTION 18

Avermectin

100 Section 18 Application

100.1 Nature and Scope of Emergency

The State of Florida requests a specific exemption to use Avermectin on tomatoes in Florida. The leafminers have become a serious pest and has become resistant to existing pesticides. Avermectin is expected to be able to control this pest.

100.2 Target Organism

Leafminers

100.3 Date, Duration

March, 1988 to December, 1988.

100.4 Application Methods, Direction, Rates

Use rate would be 0.01 to 0.02 lb. ai/acre (8-16 fl. oz. formulated product per acre). Repeat applications could be made at 7-day intervals not to exceed 0.2 lb. ai/acre, or ten applications.

100.5 Treatment Area

Tomato acreage in Florida in 1987 was 53,550 acres. This is expected to remain constant throughout the next year. There are 5 separate growing areas.

Dade (FTC Dist. I)	11,650 A
Southwest (FTC Dist. III)	15,200 A
Ft. Pierce-Pompano (FTC Dist. II)	4,600 A
Palmetto-Ruskin (FTC Dist. IV)	19,450 A
North Florida (Quincy)	2,650 A

The crop growing season is almost continuous with the major shipping period occurring from November through June with over 50% of production shipped from March through June.

100.6 Precautionary Labeling

The following statement would be on the label:

"This product is toxic to fish and wildlife. Keep out of lakes, ponds or streams. Do not contaminate water by cleaning of equipment or disposal of wastes.

Do not apply when weather conditions favor drift from target areas.

This product is highly toxic to bees exposed to direct treatment or residues on blooming crops or weeds. Do not apply this product or allow drift to blooming crops or weeds if bees are visiting the treatment area."

101 Hazard Assessment

101.1 Discussion

Avermectin would be applied at 0.02 lb. ai/acre. The maximum number of applications would be 10 per season at 7 day intervals.

101.2 Likelihood of Adverse Effects on Nontarget Organisms

The following summarizes the known toxicity information on avermectin.

Acute Tests

Bobwhite quail	LD50>2000 mg/kg
Mallard duck	LD50= 85 mg/kg

Bobwhite quail	LC50=3102 ppm
Mallard duck	LC50= 383 ppm

Mouse	LD50= 13-23 mg/kg
Rat	LD50= 10-11 mg/kg
Nonpolar metabolite / rat	LD50> 48 mg/kg
Polar metabolite / rat	LD50>5000 mg/kg

Bluegill	LC50=9.6 ppb
Rainbow trout	LC50=3.2 ppb

<u>Daphnia magna</u>	LC50 0.22-0.34 ppb	
Avermectin B1a	0.42 ppb)	
Polar metabolite	4.2 ppb)	
Moderately polar metabolite	6.3 ppb)	
Nonpolar metabolite	25.4 ppb)	> degradates of abamectin
Thin-film polar metabolite	76.7 ppb)	
8 a-hydroxy avermectin B1a	25.5 ppb)	

Mysid shrimp	LC50= 0.2 ppb
Sheepshead minnow	LC50= 15 ppb
Oyster embryo-larvae	LC50= 430 ppb

Earthworm (Eisenia foetida)

LC50= 18 ppm 28-day
33 ppm 14-day
62 ppm 7-day

Chronic Tests

Rat 1-generation reproduction

NOEL=0.1 mg/kg/day
LEL=0.2 mg/kg/day

Avian reproduction test

NOEL=12 ppm
LEL=64 ppm (reduced egg prod.)

Daphnia magna life-cycle

MATC>0.03<0.09 ppb

Rainbow trout early life stage MATC>0.52<0.96 ppb

Summary of Environmental Fate Information

(From Draft Pesticide Fact Sheet No. 84 for Avermectin B1)

Solubility: 7.8 ppb
Octanol/Water
Partition Coefficient: 9.9×10^3
Photolyses: $t_{1/2} < 1$ day
Hydrolysis: minimal

Soil metabolism: Aerobic $t_{1/2}$ approx. 2 months
Anaerobic is slower

Leaching tendency: minimal
Accumulation: Bluegill 69X whole fish
30X fillet
110X viscera

An aquatic degradation and fate study¹ indicated that once it reaches aquatic habitat, abamectin will bind to sediment and dissipate from the water column generally within two weeks. However, once in sediment, it may persist with an approximate maximum half-life of 52 days.

Terrestrial Exposure

If abamectin is applied at 0.02 lb. ai/acre, the following residues may occur on terrestrial food items.

¹ Wislocki, Peter. Degradation of Abamectin in a Field Study Simulating Both Drift and Runoff. Report date September 23, 1986; Accession Number 400696-10

	<u>Short Grass</u>	<u>Long Grass</u>	<u>Leafy Crops</u>	<u>Insects Forage</u>	<u>Seed Pods</u>	<u>Fruit</u>
Maximum	4.8	2.2	2.5	1.16	0.24	0.14
Typical	2.5	1.8	0.7	0.66	0.06	0.03

The registrant has provided residue data on cotton, celery and citrus fruits. The treatment rates were varied, however, the following table provides extrapolated residue values (ppm) as if the application rates were all 0.02 lb. ai/acre. The levels on citrus were all less than 0.0026 ppm.

<u>1984 cotton</u>	<u>after day</u>	<u>1985 cotton</u>	<u>after day</u>	<u>celery</u>	<u>after day</u>
1.16	0	2.33	0	0.057	0
0.09	2	0.116	3	0.016	1
0.05	4	0.111	6	0.008	3
0.024	9	0.026	17	0.006	5
0.014	16	0.006	34	0.003	7
0.006	32			0.001	14

The values on celery (presumably stalks) and citrus are low, as would be expected on large fleshy plant material. The celery levels are equivalent to the fruit column from Kenega's nomograph. The residues on cotton foliage match the estimated residues on leafy crops. Therefore, the estimated residues on grasses are assumed to be accurate. Since multiple applications are permitted on the label (at 7 day intervals, no maximum specified), chronic exposure is possible. However, rapid degradation in light ($t^{1/2} < 1$ day) should preclude accumulation on food items between treatments.

Birds

These residues do not exceed the lowest avian dietary LC50 of 383 ppm nor the avian reproductive NOEL of 12 ppm. Therefore, no acute or chronic hazard to birds is expected.

Mammals

Using an acute oral LD50 of 10 mg/kg for adult rats the following 1-day adult LC50 values (ppm) were calculated² for selected mammals. The weanling 1 day LC50 values were based on a 1.5 mg/kg LD50 for weanling rats. The third column in the table is the extrapolated reproductive NOEL's (ppm) based on the rate

² LC50 (ppm) = LD50 X wt (g) / consumption in one day (g).

1-generation reproductive test³. The weight and food consumption data are from Davis and Golly (1963).

<u>Grazing Herbivores</u>	1 day LC50 (ppm)		Rep. NOEL (ppm)
	<u>adult</u>	<u>weanling</u>	
Meadow vole	16	2.5	0.16
Swamp rabbit	24	3.6	0.24
Deer	412	61.4	4.12
<u>Granivores</u>			
Red squirrel	142	21.3	1.4
<u>Omnivores</u>			
Deer mouse	51	7.7	0.5
Marsh rice rat	218	32.6	2.2
Raccoon	470	70.8	4.7
<u>Insectivores</u>			
Least shrew	9	1.4	0.09
<u>Carnivore</u>			
Least weasel	40	6	0.4

The extrapolated adult LC50's are not exceeded by the estimated residues on terrestrial food items. The estimated residues on short grass equal the LC50 for weanling meadow voles. Therefore acute effects may occur to certain young mammals. Based on the extrapolated reproductive NOEL's, it is likely that when ingesting food items containing typical residues, grazing herbivores, omnivores, and insectivores of small size would receive greater than their reproductive NOEL. Granivores and carnivores would not likely ingest food with residues greater than their reproductive NOEL. Based on this, it is likely that the use of Abamectin at 0.02 lb. ai/A would acute effects may occur to young grazers and chronic effects may occur to certain grazing herbivores, omnivores and insectivores. Even though avermectin is relatively short-lived in light, it is likely that small mammals will experience adverse effects.

Aquatic

Because of its low solubility (7.8 ppb) and high octanol water partition coefficient (9.9×10^3), minimal transport of

³ Reproductive NOEL = rat NOEL X wt (g) / consumption in one day (g).

also because
Ha. is flat, sandy
soil.

abamectin by runoff (i.e. 0.1 % 0.001) is expected. Based on a scenario of 10 treated acres draining into a 1 acre pond 6 feet deep, the following concentration is derived.

$$10 \text{ acres} \times 0.02 \text{ lb ai/A} \times 0.001 \times 61 \text{ ppb}^4 = 0.012 \text{ ppb}$$

This is less than the aquatic invertebrate chronic NOEL of 0.03 ppb. It is also less than the LC50 for shrimp, oysters and Daphnia magna. It does not exceed the lowest fish LC50 nor the ~~fathead chronic~~ NOEL. It does not exceed 0.1 of the fish early life stage NOEL.

Rainbow trout LC50=3.2 ppb

Rainbow trout early life stage NOEL=0.52 ppb

Since this is a ground application, drift is expected to be minimal and would not result in hazardous concentrations.

Summary

Based on the above assessment, nonendangered aquatic or estuarine organisms will experience minimal acute and chronic effects. This assessment does not take into account the new and unvalidated test results suggesting that abamectin is substantially more toxic to shrimp than previously thought⁵. Before EEB can complete future risk assessments for aquatic organisms, further information on these tests will be required.

Nonendangered birds will experience minimal acute and chronic effects. Large mammals would not experience adverse acute effects, nor would granivores or carnivores experience reproductive effects. However, weanling rodents (meadow voles) may experience acute effects, and grazing herbivores, omnivores and insectivores of small size would receive greater than their reproductive NOEL. This use of abamectin represents a hazard to these mammals and possibly certain exposed reptiles and terrestrial amphibians. Terrestrial field testing would be required before EEB could conclude safety from such exposure.

⁴ If 1 lb ai/acre is applied to 6 feet of water, the resulting concentration would be 61 ppb.

⁵ See review dated 12-30-87, 96-hour flow-through LC50's of 51 and 11 ppt were reported. No information on the test was provided.

101.3 Endangered Species Considerations

The endangered species triggers are:

<u>Group</u>	<u>Trigger</u>	
	<u>Rep. NOEL</u>	<u>Acute</u>
Birds	12 ppm	38.3 ppm (LC50 / 10)
Mammals,	0.09 ppm	0.14 ppm (LC50 / 10)
Reptiles & Terr. Amph.		
Fish	0.52 ppb	0.32 ppb (LC50 / 20)
Aquatic inv.	0.03 ppb	0.022 ppb (LC50 / 20)

Estimated residues on terrestrial food items are:

	<u>Short</u> <u>Grass</u>	<u>Long</u> <u>Grass</u>	<u>Leafy</u> <u>Crops</u>	<u>Insects</u> <u>Forage</u>	<u>Seed</u> <u>Pods</u>	<u>Fruit</u>
Maximum	4.8	2.2	2.5	1.16	0.24	0.14
Typical	2.5	1.8	0.7	0.66	0.06	0.03

Maximum residues do not exceed the avian endangered species triggers. Adverse effects to birds are not expected.

Maximum residues do exceed both the mammalian acute and chronic triggers. Adverse effects are expected to occur to endangered mammal (and reptile) species exposed to abamectin. Such exposure could occur through ingestion of treated material. This would include grazing herbivores, omnivores, insectivores and granivores. It is not likely to include carnivores (snakes or the Florida panther), since abamectin does not have a high bioaccumulation factor (69X: whole fish, 30X: fillet, 110X: viscera).

The following endangered mammal species occur in Florida:

<u>Species</u>	<u>Impact Likely?</u> ⁶
Key deer	No. Deer only exists on a few Key islands where <u>agriculture is minimal.</u>
Choctawhatchee beach mouse and Perdido Key beach mouse	Both occur in beach habitat along northern Florida Gulf coast.
Key Largo cotton mouse Key Largo woodrat.	Both occur near Key Largo where agriculture would not affect them.

⁶ Based on information in EEB files and a telephone conversation with Linda Walker, USFWS Jacksonville Field Station, 8-946-2580.

The estimated concentration in water adjacent to a treated tomato field would be 0.012 ppb.

$$10 \text{ acres} \times 0.02 \text{ lb ai/A} \times 0.001 \times 61 \text{ ppb}^7 = 0.012 \text{ ppb}$$

This concentration does not exceed any available trigger for endangered aquatic species. Adverse effects to this group is not expected. Neither are effects through loss of food material likely to occur to endangered birds feeding on aquatic organisms.

Summary

Based on available information, use of Abamectin in Florida on tomatoes is not expected to affect endangered species.

101.4 Adequacy of Data

The available data were adequate to quantify the risks of this section 18.

The Agency has become aware of additional test results suggesting that Avermectin is much more toxic to shrimp than originally thought. These data were not used to evaluate this Section 18 because they have not been validated. However, the EEB will not complete any more risk assessments (full registrations or Section 18's) until the studies have been provided and the question of toxicity to aquatic organisms in general has been adequately researched. This will likely require field (mesocosm) testing to determine if the sensitivity potentially demonstrated by shrimp is shared by other estuarine or freshwater species.

101.5 Adequacy of Labeling

The labeling statement is adequate.

⁷ If 1 lb ai/acre is applied to 6 feet of water, the resulting concentration would be 61 ppb.

103 Conclusions

The EEB has reviewed the Section 18 emergency exemption requested by Florida. Based on the use information, this exemption is expected to have minimal effects on nontarget, nonendangered species. Adverse effects to endangered species are not expected.

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