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EEB REVIEW

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

DATA ACCESSION NO(S). 400696-09, 400696-10

PRODUCT MANAGER NO. G. LaRocca (15)

PRODUCT NAME(S) Agrimec (Abamectin, Avermectin, MK-936)

COMPANY NAME Merck, Sharp & Dohme Research Laboratories
Merck & Company, Inc.

SUBMISSION PURPOSE Submission of data to support proposed registration of cotton use.

SHAUGHNESSY NO.	CHEMICAL & FORMULATION	% AI
	Abamectin	

ECOLOGICAL EFFECTS BRANCH
RISK ASSESSMENT

100.0 Submission Purpose

100.1 Pesticide Use

The registrant, Merck & Company, proposes to register Abamectin as a miticide on cotton.

100.2 Formulation Information

Abamectin is formulated in AGRIMEC 0.15 EC. Agrimec® is 2% Avermectin B_1. Avermectin B_1 is synonymous with Abamectin and MK-936. Agrimec® contains 0.15 lb abamectin/gal. This is equivalent to 0.001171875 lb ai/fl. oz.

100.3 Application Methods, Directions, Rates

Use 8 to 16 fl. oz. Agrimec®/A depending on size of the plant and density of the foliage. Apply with ground sprayers in sufficient water to provide thorough coverage. Begin when mites are first noticed and repeat (up to three times) if necessary.

8 oz ≈ 0.01 lb ai
16 oz ≈ 0.02 lb ai

100.4 Target Organism

Mites.

100.5 Precautionary Labeling

This pesticide 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 wind 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 it to drift to blooming crops or weeds if bees are visiting the treatment area.

101.0 Hazard Assessment

101.1 Discussion

Cotton is grown throughout the Southern United States from California to Georgia and South Carolina.

Agrimec would be applied by ground equipment at 8 to 16 fl oz/A. This is equivalent to approximately 0.01 to 0.02 lb ai/A. The label indicates a maximum of three applications per season. The final treatment must be at least 20 days preharvest.

Even though Abamectin is short-lived in some environmental compartments, chronic exposure is possible through repeated applications.

101.2 Likelihood of Adverse Effects to Nontarget Organisms

The following summarizes the available toxicity information on Abamectin.

Acute Test Results

Species	T.M.	Result
Bobwhite quail	Tech.	> 2000 mg/kg
Mallard duck	Tech.	85 mg/kg
Bobwhite quail	Tech.	3102 ppm
Mallard duck	Tech.	383 ppm
Mouse	Tech.	13-23 mg/kg
Rat	Tech.	10-11 mg/kg
Nonpolar metabolite		> 48 mg/kg
Polar metabolite		> 5000 mg/kg
Bluegill	Tech.	9.6 ppb
Rainbow trout	Tech.	3.2 ppb
Daphnia magna	Tech.	0.22-0.34 ppb

Avermectin $B_{1}a$	0.42 ppb	---Degradates of Abamectin
Polar metabolite	4.2 ppb	
Moderately polar metabolite	6.3 ppb	
Nonpolar metabolite	25.4 ppb	
Thin-film polar metabolite	76.7 ppb	
8 a -hydroxy Avermectin $B_{1}a$	25.5 ppb	

Acute Test Results (cont'd)

Species		Result
Mysid shrimp	Tech.	0.2 ppb
Sheepshead minnow	Tech.	15 ppb
Oyster embryo-larvae	Tech.	430 ppb
Earthworm (Eisenia foetida)	Tech.	18 ppm (28-day LC50) 33 ppm (14-day LC50) 62 ppm (7-day LC50)

Chronic Tests

Rat 1-generation rep.	Tech.	NOEL = 0.1 mg/kg/day LEL = 0.2 mg/kg/day
Avian reproduction	Tech.	NOEL = 12 ppm LEL = 64 ppm (reduced egg production)
Daphnia magna	Tech.	MATC > 0.03 < 0.09 ppb 100% mortality at 0.09 ppb
Rainbow Trout	Tech.	Early life stge 0.52-0.96 ppb

Summary of Environmental Fate

[From Draft Pesticide Fact Sheet No. 84 for Avermectin B_1]

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

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

Leaching tendency: minimal

Not likely to bioaccumulate.

Bluegill	69X	Whole fish
	30X	Fillet
	110X	Viscera

The recently submitted degradation and fate study by Wildlife International (September 23, 1986) indicated that once it reaches aquatic habitat, Abamectin will bind to sediment and dissipate from the water column generally within 2 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/A, the following residues (ppm) may occur on terrestrial food items.

	Short Grass	Long Grass	Leafy Crops	Insects Forage	Seed Pods	Fruit
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 0.02 lb. ai/acre. The levels on citrus were all less than 0.0026 ppm.

1984 cotton	after day	1985 cotton	after day	celery	after day
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 Kenaga. 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 (3 per season, no interval specified), chronic exposure is possible, however, there is, apparently rapid dissipation from surfaces exposed to light.

5

Birds

These residues do not exceed the lowest avian dietary LC_{50} of 383 ppm nor the avian reproduction NOEL of 12 ppm. Therefore, no acute or chronic hazard to birds is not expected.

Mammals

Using an acute oral LD_{50} of 10 mg/kg for adult rats, the following 1-day adult LC_{50} values (ppm) were calculated* for selected mammals. The weanling 1 day LC50 values were based on a 1.5 mg/kg LD50 for weanling rats. The weight and food consumption data are from Davis and Golly (1963).

	1-day LC50(ppm)		
Grazing Herbivores	adult	weanling	Rep. NOEL
Meadow vole	16	2.5	0.16 ppm
Swamp rabbit	24	3.6	0.24
Deer	412	61.4	4.12
Granivores			
Red squirrel	142	21.3	1.4
Omnivores			
Deer mouse	51	7.7	0.5
Marsh rice rat	218	32.6	2.2
Raccoon	470	70.8	4.7
Insectivores			
Least shrew	9	1.4	0.09
Carnivore			
Least weasel	40	6	0.40

* ppm = LD_{50} x wt (g) / consumption in 1 day (g)

The extrapolated adult LC_{50}'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. The third column in the table is the extrapolated reproductive NOEL's (ppm)† based on the rat 1-generation reproductive test. Based on this, it is likely that when feeding on food items containing typical residues, grazing

† ppm = NOEL x wt (g) / consumption in 1 day (g)

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 result in minimal acute effects to adult mammals. However, acute effects may occur to young grazers and chronic effects may occur to certain grazing herbivores, omnivores and insectivores. These effects are not expected to be unreasonable because residues of Abamectin have been shown to be short-lived on vegetation

Aquatic

Runoff

Because of its low solubility (7.8 ppb) and high octanol/water partition coefficient (9.9×10^3), minimal Abamectin runoff is expected; i.e., 0.1 percent (0.001). Based on this, the scenario of 10 treated acres draining into a 1 acre pond 6 feet deep yields the following estimated concentration.

10 (acres) X 0.02 (lb. ai/acre) X 0.001 (runoff) X 61 (ppb)= 0.012 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

Rainbow trout LC_{50} = 3.2 ppb.

Rainbow Trout early life stage NOEL = 0.52 ppb.

Drift

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

Summary

Based on the above assessment, it is considered unlikely that nonendangered aquatic or estuarine organisms will experience adverse acute or chronic effects. Nonendangered mammals and birds are not expected to be affected acutely; however, certain mammals and possibly reptiles and amphibians may experience chronic effects through exposure from repeated applications. These effects are not expected to be unreasonable and should not result in substantial degradation of populations of small mammals.

101.3 Endangered Species Considerations

The avian endangered species trigger is the chronic NOEL of 12 ppm. The maximum residues on terrestrial food items do not exceed this level. Therefore, effects to endangered bird species are not expected.

The mammalian endangered species trigger is the extrapolated reproductive NOEL for various mammal types (see previous table on mammal toxicity levels). However, according to the cotton cluster, no endangered mammalian or reptile species are exposed to pesticides used on cotton. Terrestrial stages of endangered amphibians may be as sensitive as mammals and could therefore occasionally ingest material containing residues exceeding their chronic NOEL. However, these residues are not expected to persist long enough to result in chronic exposure.

Note that the maximum bioaccumulation factor of 110X for fish is not directly applicable to accumulation of residues through ingested food. Bioaccumulation through ingestion occurs at a substantially lower rate than through ambient exposure. Therefore, carnivorous birds, mammals, and reptiles would not likely be affected by this use. Terrestrial organisms feeding on aquatic organisms that had accumulated maximum residues would ingest, at worst, material containing 1.3 ppb (110 X 0.012 ppb) which is less than the lowest calculated NOEL for insectivores of 90 ppb (0.09 ppm).

The fish endangered species trigger is the early life stage NOEL of 0.52 ppb. Residues in water are not expected to exceed this concentration. Aquatic stages of endangered amphibians may be as sensitive as fish and would therefore not be expected to experience adverse effects, either.

The endangered freshwater mussel trigger is 1/20 the oyster embryolarvae EC_{50}, or 21.5 ppb (430 ppb/20 = 21.5 ppb). Estimated concentrations in the sediment and water column do not exceed this level. No effects are expected to endangered mussels.

The endangered aquatic invertebrate (crustacean) trigger is the Daphnia magna life cycle NOEL of 0.03 ppb. Residues in water are not expected to exceed this concentration.

It is assumed that Abamectin would affect exposed endangered insect species. However, based on the crop cluster, cotton is not grown adjacent to habitat of endangered insects. Therefore, no effects are expected.

Summary

The use of Abamectin on cotton at 0.02 lb ai/A is not expected to affect endangered terrestrial vertebrate species or aquatic species.

101.4 Adequacy of Toxicity Data

The available data were adequate to complete this risk assessment. The requirement for an avian reproduction test has been fulfilled.

Two studies were provided with this submission, an aquatic fate study and a fish early life-stage study.

1. Degradation of Abamectin in Simulated Aquatic Habitat:

This study is scientifically sound and provides useful information for the environmental fate of Abamectin and for estimating aquatic exposure. It does not fulfill any EEB data requirement. The results of the study show that 10 percent drift from 0.025 lb ai/A could result in a maximum water and sediment concentration of 1.04 ppb and 0.158 ppb, respectively. Runoff immediately after application could result in maximum residues of 0.0358 and 0.73 ppb for water and sediment (assuming 1% runoff). Aged (90 hr) runoff would not result in detectable (< 0.001) residues in water and may result in a maximum concentration of 0.014 ppb in sediment.

2. Fish Early Life Stage Test with Rainbow Trout:

This test is scientifically sound and fulfills the Guideline requirement for a fish early life stage toxicity test. The test shows an MATC of > 0.52 < 0.96 ppb based on the effects of Abamectin on trout fry growth. Survival was significantly reduced at 2.2 ppb but not 0.96 ppb.

101.5 Adequacy of Labeling

The environmental hazard statement on the proposed label is sufficient.

103.0 Conclusions

The EEB has reviewed the proposed registration of Abamectin on cotton. Based on the available data, EEB concludes that the proposed use provides for minimal hazards to nontarget, nonendagered organisms. The EEB has also concluded that this use is unlikely to effect endangered or threatened species.

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REFERENCE

Davis, D.E.; Golly, F.B. (1963) Principles of Mammalogy. Reinhold Publ. Corp., NY.

DATA EVALUATION REPORT

1. Chemical: Abamectin

2. Test Material: MK-936 0.15 EC

3. Study Type: Degradation and Fate Study with Abamectin in Large Tubs of Water and Sediment

4. Study ID: Wislocki, Peter. Degradation of Abamectin in a Field Study Simulating Both Drift and Runoff. Performed by Merck, Sharp & Dohme Laboratories No. 2; Wildlife International, Inc., No. 105-133; Analytical Biochemistry Laboratories Nos. 344741, 344742, and 344743; Report dated September 23, 1986; Accession No. 400696-10.

5. Reviewed By: Daniel Rieder
Wildlife Biologist
EEB/HED
Signature: Daniel Rieder
Date: 9-11-87

6. Approved By: for Norman J. Cook
Section Head,
Section II
EEB/HED
Signature: Allen W. Vaughan
Date: 9.14.87

7. Conclusion:

This study is scientifically sound and provides useful information for the environmental fate of Abamectin and for estimating aquatic exposure. It does not fulfill any EEB data requirement. The results of the study show that 10 percent drift from 0.025 lb ai/A could result in a maximum water and sediment concentration of 1.04 ppb and 0.158 ppb, respectively. Runoff immediately after application could result in maximum residues of 0.0358 and 0.73 ppb for water and sediment (assuming 1% runoff). Aged (90 hr) runoff would not result in detectable (< 0.001) residues in water and may result in a maximum concentration of 0.014 ppb in sediment.

11

		Maximum Concentrations (ppb)*
Drift	Water	1.04
	Sediment	0.158
Immediate Runoff	Water	0.0358
	Sediment	0.73
Aged (90-hr) Runoff	Water	< 0.001
	Sediment	0.014

*Extrapolated values calculated from measured residues from exaggerated rates.

8. Recommendation: N/A

9. Background:

This study was performed to better define the environmental fate of Abamectin in the aquatic environment.

10. Discussion of Individual Test: N/A

11. Materials and Methods:

See Attachment 1 for detailed methods and protocol.

This study involved the use of 11 large oblong tubs 3' x 8' x 2' deep. These tubs were set partially into the ground with a soil berm mounded up around the outside. This was to reduce temperature variation. The bottom of each tank was lined with 1" of clay loam soil and 2" of sandy clay loam soil on top. Each tank was filled with approximately 1135 L of pond water. This meant a water depth of approximately 20".

(1135 L ≈ 300 gal)
(7.482 gal = 1 ft^3)
(300 gal = 40 ft^3)
(3' x 8' = 24 ft^2)
(40 ft^3/24 ft^3 =1.67' deep)
(1.67' = 20 inches)

Three different types of application were made.

a. Simulated drift, 10 percent of 0.025 lb ai/A applied directly to the water.

b. Immediate runoff.

c. Aged runoff, treated soil allowed to set for 90 hr before being added to the tubs.

The runoff loading assumed that 1 percent of the applied ai (0.025 lb ai/A) would transport from a 10-acre field into a 1-acre pond. This was accomplished by spraying Abamectin at 1 percent of 0.025 lb ai/A rate to two (replicate) 0.1" layers of soil. One replicate-treated layer was added immediately to three tubs; the second replicate was aged outdoors for 90 hr (3.75 days) before being added to the tubs.

For each method of dosing, three tubs were used. Each of the three was dosed at the following exaggerated rates.

Method	Tub No.	Rate (lb ai/A)	Factor No. x Normal*
Drift	1	0.01	4X
	2	0.03	12X
	3	0.1	40X
	4	Control	
Immediate runoff	1	0.025	10X
	2	0.075	30X
	3	0.25	100X
	4	Control (for both runoff methods)	
Aged runoff	1	0.025**	10X
	2	0.075	30X
	3	0.25	100X

*Exaggerated rates were used to facilitate "apparent" greater sensitivity in chemical analysis since all measured residues and limit of detection can be divided by this factor to determine actual residues.

**Nominal loading rates at time of spraying before 90-hr aging outdoors. Photolysis resulted in substantial degradation so actual loading was very low (see results section).

Residue samples from the drift and immediate runoff tubs were collected on days 0, 1, 2, 4, 8, 15, 31, and 52; samples from the aged tubs were collected on days 0, 1, 3, 7, 14, 30, and 51. See Attachment 2 for a detailed sampling schedule.

Physical and chemical water measurements were made at the beginning and end of the study.

No statistics were performed on the data generated during the study.

12. Reported Results:

The physical and chemical parameters are reported in Attachment 3, Attachment 4 presents a detailed results discussion, and Attachment 5 shows the measured residues.

13. Study Author's Conclusion:

Attachment 6 presents the study author's conclusions. The author concludes that the study indicates minimal risk to the aquatic environment under field conditions when Abamectin is used at 0.025 lb ai/A.

14. Reviewer's Discussion and Interpretation of the Study:

a. Test Procedures - This study was performed to answer certain specific questions on the environmental fate of Abamectin such as how long it might persist in the water column or in sediment and how quickly it partitions between water and sediment. It was designed to provide this information after Abamectin had been applied to the simulated aquatic habitat as drift and runoff. It was not designed to fulfill any EEB guideline requirement. The procedure was adequate to provide the data for which it was designed. However, the sediment samples were collected by core samples taking a core 3" deep.

b. Statistical Analysis - The author did not statistically manipulate the results.

I averaged the residues between tanks for the drift and immediate (unaged) runoff. There were essentially no residues detected in aged runoff tanks. The standard deviation and upper 95 percent level was calculated. This upper level represents the concentration below which 95 percent of the residues would be, based on these three replicates. Each actual measured residue was divided by the appropriate factor to equate actual loading. In cases where two of the three replicates had detectable residues, the "ND" was assumed to be just below the level of detection. The following table shows the results of this calculation.

Table 1. Statistical Manipulation of Residue Data From Simulated Drift and Runoff Study

Drift

	Day							
	0	1	2	4	8	15	31	52
Water Mean	0.547	0.052	0.019	0.018	ND	0.013	ND	ND
Upper 95% lmt	1.804	0.120	0.034	0.041	ND	0.051	ND	ND
Sediment Mean	0.160	*	0.141	ND	ND	ND	ND	ND
Upper 95% lmt	0.420	*	0.416	ND	ND	ND	ND	ND

Immediate Runoff

	Day							
	0	1	2	4	8	15	31	52
Water Mean	0.021	0.011	0.018	0.034	0.018	ND	ND	ND
Upper 95% lmt	0.061	0.021	0.062	0.088	0.065	ND	ND	ND
Sediment Mean	0.132	*	0.417	0.336	0.316	0.474	0.222	0.228
Upper 95% lmt	0.255	*	0.951	1.357	0.975	1.197	0.753	0.668

c. Discussion/Results - Tables 2, 3, and 4 present the results by replicate and day. The concentrations were divided by the appropriate exaggeration factor so those in the table represent actual levels.

The fact that the sediment samples extended all the way to the bottom means the reported residues are much lower than if the top few centimeters of sediment were collected. It is unlikely that Abamectin would move down through the sediment. It is therefore assumed that all the Abamectin in the sediment was in the upper one-half inch. To correct for this and to try to determine what actual exposure levels to benthic organisms may be, each residue level is multiplied by 6, as there are 6 "1/2 inch" layers in 3 inches of sediment. Tables 5, 6, and 7 present the results of these extrapolations.

This test shows that Abamectin will, once it reaches aquatic habitat, tend to bind to particles and transport to the sediment. However, it did remain in the water column for 15 and 31 days in the drift and immediate runoff tanks, respectively. In sediment, Abamectin persisted over 52 days in the immediate runoff tanks. While abamectin degrades rapidly in sunlight, once it binds to sediment it becomes very persistent.

16

Table 2. Abamectin Residues in Water and Sediment of Tanks Subjected to Drift at 10% of 0.025 lb ai/acre.

DRIFT

		CONCENTRATION (PPB) AFTER DAY (Extrapolated to label rates)							
Rep.	Sample	0	1	2	4	8	15	31	52
A	water	0.2575	0.0600	N.D.	N.D.	N.D.	0.0275	N.D.	N.D.
B	water	1.0417	0.0708	0.0142	0.0092	N.D.	N.D.	N.D.	N.D.
C	water	0.3425	0.0263	0.0183	0.0193	0.0073	0.0025	N.D.	N.D.
A	sediment	N.D.	*	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
B	sediment	0.1583	*	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
C	sediment	0.0723	*	0.0910	0.0678	0.0778	0.0423	0.0425	N.D.

Table 3. Abamectin Residues in Water and Sediment of Tanks Subjected to Immediate Runoff at 1% of 0.025 lb. ai/acre.

IMMEDIATE RUNOFF

		CONCENTRATION (PPB) AFTER DAY (Extrapolated to label rates)							
Rep.	Sample	0	1	2	4	8	15	31	52
A	water	0.02	N.D.	0.01	0.052	0.01	0.011	N.D.	N.D.
B	water	0.0083	0.0143	0.0087	0.0153	0.008	0.0117	0.0033	N.D.
C	water	0.0352	0.0078	0.0352	0.0352	0.0368	0.0128	0.0024	N.D.
A	sediment	0.17	*	0.33	0.73	0.38	0.47	0.14	0.27
B	sediment	0.087	*	0.6267	0.0627	0.5033	0.7233	0.43	0.3533
C	sediment	0.14	*	0.293	0.214	0.066	0.228	0.095	0.061

Table 4. Abamectin Residues in Water and Sediment of Tanks Subjected to Aged Runoff at 1% of 0.025 lb. ai/acre.

AGED RUNOFF (90 HRS)

		CONCENTRATION (PPB) AFTER DAY (Extrapolated to label rates)							
Rep.	Sample	0	1/4	1	3	7	14	30	51
A	water	N.D.	N.D.	N.D.	†	†	†	†	†
B	water	N.D.	N.D.	N.D.	†	†	†	†	†
C	water	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
A	sediment	N.D.	*	N.D.	†	†	†	†	†
B	sediment	N.D.	*	N.D.	†	†	†	†	†
C	sediment	N.D.	*	N.D.	0.014	N.D.	N.D.	N.D.	N.D.

* No sample collected
† Sample not analyzed

Table 5. Abamectin Residues in Water and Sediment of Tanks Subjected to Drift at 10% of 0.025 lb ai/acre. All sediment values multiplied by 6, see Reviewers' Discussion.

DRIFT

		CONCENTRATION (PPB) AFTER DAY (Extrapolated to label rates)							
Rep.	Sample	0	1	2	4	8	15	31	52
A	water	0.2575	0.0600	N.D.	N.D.	N.D.	0.0275	N.D.	N.D.
B	water	1.0417	0.0708	0.0142	0.0092	N.D.	N.D.	N.D.	N.D.
C	water	0.3425	0.0263	0.0183	0.0193	0.0073	0.0025	N.D.	N.D.
A	sediment	<0.6	*	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
B	sediment	0.9498	*	<0.198	N.D.	N.D.	N.D.	N.D.	N.D.
C	sediment	0.4338	*	0.546	0.4068	0.4668	0.2538	0.255	<0.06

Table 6. Abamectin Residues in Water and Sediment of Tanks Subjected to Immediate Runoff at 1% of 0.025 lb. ai/acre. All sediment values multiplied by 6, see Reviewers' Discussion.

IMMEDIATE RUNOFF

		CONCENTRATION (PPB) AFTER DAY (Extrapolated to label rates)							
Rep.	Sample	0	1	2	4	8	15	31	52
A	water	0.02	N.D.	0.01	0.052	0.01	0.011	N.D.	N.D.
B	water	0.0083	0.0143	0.0087	0.0153	0.008	0.0117	0.0033	N.D.
C	water	0.0352	0.0078	0.0352	0.0352	0.0368	0.0128	0.0024	N.D.
A	sediment	1.02	*	1.98	4.38	2.28	2.82	0.84	1.62
B	sediment	0.522	*	3.7602	0.3762	3.0198	4.3398	2.58	2.1198
C	sediment	0.84	*	1.758	1.284	0.396	1.368	0.57	0.366

Table 7. Abamectin Residues in Water and Sediment of Tanks Subjected to Aged Runoff at 1% of 0.025 lb. ai/acre. All sediment values multiplied by 6, see Reviewers' Discussion.

AGED RUNOFF (90 HRS)

		CONCENTRATION (PPB) AFTER DAY (Extrapolated to label rates)							
Rep.	Sample	0	1/4	1	3	7	14	30	51
A	water	<0.01	N.D.	N.D.	†	†	†	†	†
B	water	<0.0033	N.D.	N.D.	†	†	†	†	†
C	water	<0.001	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
A	sediment	<0.6	*	N.D.	†	†	†	†	†
B	sediment	<0.198	*	N.D.	†	†	†	†	†
C	sediment	<0.06	*	N.D.	0.084	N.D.	N.D.	N.D.	N.D.

* No sample collected
† Sample not analyzed

d. Adequacy of Study

1) Classification - Supplemental.

2) Rationale - This test does not fulfill any Guideline requirement but provides useful data for evaluating the environmental fate of Abamectin.

3) Reparability - Not reparable.

15. Completion of One-Liner for Study: Not completed.

16. CBI Appendix: The attachments are CBI.

Attachments

Avermectin science review

Page _____ is not included in this copy.

Pages 20 through 56 are not included in this copy.

The material not included contains the following type of information:

___ Identity of product inert ingredients

___ Identity of product impurities

___ Description of the product manufacturing process

___ Description of product quality control procedures

___ Identity of the source of product ingredients

___ Sales or other commercial/financial information

___ A draft product label

___ The product confidential statement of formula

___ Information about a pending registration action

X FIFRA registration data

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DATA EVALUATION REPORT

1. Chemical: Abamectin 122804

2. Test Material: MK-936 Technical 91% ai

3. Study Type: Early Life Stage with Rainbow Trout

4. Study ID: McAllister, William A.; Coble, Paul; Seidel, Alan; Bunch, Brenda. Early Life Stage Toxicity of Avermectin B_1 (MK-936 Technical) to Rainbow Trout (Salmo gairdneri) in a Flow-Through System. Performed by Analytical Biochemistry Laboratories, Inc; submitted to EPA by Merck, Sharp & Dohme; August 6, 1986; Report No. 33195; Accession No. 400696-09.

5. Reviewed By: Daniel Rieder
Wildlife Biologist
EEB/HED
Signature: Daniel Rieder
Date: 9-11-87

6. Approved By: for Norman J. Cook
Section Head,
Section II
EEB/HED
Signature: Allen W. Vaughan
Date: 9.14.87

7. Conclusions:

This test is scientifically sound and fulfills the Guideline requirement for a fish early life stage toxicity test. The test shows an MATC of > 0.52 < 0.96 ppb based on the effects of Abamectin on trout fry growth. Survival was significantly reduced at 2.2 ppb but not 0.96 ppb.

8. Recommendation: N/A

9. Background:

This study was submitted to support registration.

10. Discussion of Individual Test: N/A

11. Materials and Methods:

A 60-day posthatch early life stage study was conducted on rainbow trout using Abamectin (91%). There were 20 eggs placed in egg cups in 4 replicates (80 eggs) per concentration. Mean measured test concentrations were 0.15, 0.28, 0.52, 0.96, and 2.2 ppb. A control and solvent control (acetone) were run concurrently. Abnormal or physical changes and mortality were monitored daily.

Glass aquaria (four per level) measuring 24 x 16 x 20.5 cm deep and holding 18 L were used. Test aquaria were submersed in a water bath to maintain constant temperature of 12 $\pm$ 2 °C. Photoperiod was 16 hr/light and 8 hr/dark. Aerated well water was delivered to the test aquaria at an average rate of 42 mL/min/replicate resulting in a replacement rate of 7.6 times in 24 hours. See Attachment 1 for detailed procedures.

12. Reported Results:

The MATC > 0.52 < 0.96 ppb for growth of trout fry. Survival was significantly reduced at 2.2 ppb but not 0.96 ppb. See Attachment 2 for reported results. See Attachment 3 for tables showing measured concentrations, water quality measurements, and observed effects.

The results were analyzed with a one-way analysis of variance to determine if significant differences ($a = 0.05$) existed between the control and treatment levels. If treatment effects were indicated, Tukey's HSD multiple means comparison test was used to determine which exposure levels differed from the controls.

13. Study Authors' Conclusions/QA Measures:

See Attachment 4.

14. Reviewer's Discussion and Interpretation of the Study:

a. Test Procedure - The test procedure was generally acceptable and the data were reported in an acceptable manner. The following items, identified as important

in the fish early life stage Standard Evaluation Procedure, were not discussed in this study:

1) How the eggs were collected, i.e., from substrate or stripped from females;

2) Whether feeding was discontinued 24 hours pretermination; and

3) Time to swim-up not reported.

These deficiencies in reporting do not substantially affect the value of the test in indicating the chronic toxicity of Abamectin.

b. Statistical Analysis - Visual analysis of the data indicates the reported statistics accurately reflect the results of the test.

c. Discussion/Results - The test indicates that Abamectin adversely affects fish fry growth at 0.96 ppb and significantly reduces survival of young fish at 2.2 ppb. Mortality related to dose began on day 29. Mortality in the 2.2 ppb test level was markedly higher than the other test levels and the controls.

Hatching began on day 9 in all test levels and was essentially complete (95%) by day 12. There were no effects to hatching success at any test levels.

The test shows the fish early life stage MATC to be $> 0.52 < 0.96$ ppb for fish fry development and $> 0.96 < 2.2$ ppb for survival.

d. Adequacy of Study

Classification - Core. The registrant is, however, requested to submit data to eliminate the noted deficiencies in reporting. These include:

- Indicate how the eggs were obtained, i.e., stripped from females or collected from substrate;

- Indicate if feeding was discontinued at 24 hours pretermination; and

- Indicate the "time to swim-up."

15. Completion of One-Liner for Study: Completed

16. CBI Appendix: The attachments are CBI.

Attachments

Avermectin science review

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Pages 61 through 81 are not included in this copy.

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