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122804
SHAUGHNESSEY NO.

REVIEW NO.

EEB BRANCH REVIEW

DATE: IN 9-30-85 OUT 4/10/86

FILE OR REG. NO. 618-OA

DATE OF SUBMISSION 8-14-85

DATE RECEIVED BY HED 9-24-85

RD REQUESTED COMPLETION DATE 1-13-86

EEB ESTIMATED COMPLETION DATE 1-06-86

RD ACTION CODE/TYPE OF REVIEW 115

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

PRODUCT MANAGER NO. G. LaRocca

PRODUCT NAME Avid

COMPANY NAME Merck, Sharp and Dohme

SUBMISSION PURPOSE Proposed full registration of new chemical for use on flower crops and foliage plants

SHAUGHNESSEY NO.	CHEMICAL, FORMULATION	% A.I.
122804	Abamectin	

ECOLOGICAL EFFECTS BRANCH REVIEW

Avid 0.15 EC

100 Submission Purpose and Label Information

100.1 Submission Purpose and Pesticide Use

The registrant, Merck Sharp and Dohme, Inc. proposes to register Abamectin (a.i. in Avid) for use as a miticide/insecticide on flower crops and foliage plants.

100.2 Formulation Information

Avid is 2% Abamectin

100.3 Application Methods, Directions, Rates

Apply to greenhouse, shadehouse and field grown flowers and ornamentals. Use 8-16 fluid oz. per acre. This is equivalent to 0.01 to 0.02 lbs. a.i. per acre. The label does not mention aerial application, so this was not included in the hazard assessment. The label does instruct users to repeat application as necessary for control.

100.4 Target Organisms

Leafminers, Two-spotted spider mites.

100.5 Precautionary Labeling

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

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

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 Hazard Assessment

101.1 Discussion

This proposed registration would allow the use of Avid 0.15 EC which is 2% Abamectin, on flowers and ornamentals. Application rate is 0.01-0.02 lbs. a.i. per acre.

The registrant further qualified the use pattern by explaining* that it includes only field flowers and greenhouse/shadehouse non-woody foliage plants. Such restrictions must be placed on the label.

* telephone conversation with Louis Grosso of Merck Sharp and Dohme, 3/24/86

2

Flowers are grown commercially (Florida and New Jersey) primarily in light sandy soils.* ** The states with the highest acreages are Florida (8,292 acres), California (6236 acres), and New Jersey (1500 acres) according to the 1974 Census of Agriculture, U.S. Summary Data. This represents essentially all the outdoor exposure associated with this proposed use.

Cut flowers in Florida are grown mostly in the southwestern region near Fort Myers and Naples*. In New Jersey, flowers are grown south of Trenton**. According to the 1978 Census of Agriculture-California County Summary Data, the California counties with the highest acreages are:

San Diego	2369 acres
Ventura	1249 acres
Kern	1560 acres

101.2 Likelihood of Adverse Effects to Nontarget Organisms

Abamectin is very highly toxic to:		
fish	bluegill	LC50=3.2 ppb
aquatic invertebrates	Daphnia magna	LC50=0.22 ppb
	Daphnia magna	MATC >0.03<0.09 ppb
estuarine invertebrates	Mysid shrimp	LC50=0.2 ppb
mammals	mouse	LD50=13 mg/kg
	weanling rat	LD50=1.5 mg/kg
	It affects rat reproductive success at 0.1 to 0.5 mg/kg/day	
It is highly toxic to birds	Mallard ducks	LC50=383 ppm

Aquatic Exposure

Runoff is expected to be minimal from these sandy soils and should not result in hazardous exposure of aquatic organisms to Abamectin. A field dissipation study submitted by Merck Sharp and Dohme was reviewed by EAB (Akiva Abramovitch, March 18, 1986). It suggested that Abamectin would not leach past 4 inches in soils where flowers are grown. However, the soil was not characterized therefore the dissipation study results are not useful in a hazard assessment. Potential leaching of the active ingredient through the soil and laterally into surface water represents the primary route of exposure of aquatic organisms to Abamectin. The field dissipation study could show that this would not occur if the soil type is identified as a light sandy soil. But even if abamectin does reach surface water from these flower fields, the extent of adverse effects to aquatic organisms would be minimal because of the small acreage involved and the low use rate.

* telephone conversation with Dr. Nell, Ornamental Horticulture Department, University of Florida, Gainesville, FL. 904-392-1831.
** telephone conversation with Mr. Lacey, Ext. Horticulturist, Rutgers - The State University in New Brunswick. 201-932-9726.

101.3 Endangered Species Considerations

Due to the low use rate, this proposed use will not have an adverse effect on endangered terrestrial species.

Endangered aquatic species should not be affected since none occur near major flower growing areas and there is very limited acreage involved.

101.4 Adequacy of the Toxicity Data

The available data were adequate to perform a hazard assessment for this use.

Three tests were submitted for review:

1. Test type:	Aquatic invertebrate reproduction
Test Material:	H-Avermectin reported as 100% measured a.i.
Species:	Daphnia magna
Results:	MATC >0.03<0.09 ppb. All daphnids exposed to 0.09 were dead by day 5. All daphnids at the two lowest test concentrations (0.029 and 0.030 ppb) were small and pale in coloration compared to the controls.
Category:	Core

2. Test type:	Fish 96-hour LC50
Test Material:	91% ai
Species:	Channel catfish
Results:	LC50=0.024 ppm (95% C.L.=0.018-0.032 ppm)
Category:	Core

3. Test type:	Fish 96-hour LC50
Test Material:	91% ai
Species:	Carp (Cyprinus carpio)
Results:	LC50=0.042 ppm (95% C.L.=0.032-0.056 ppm)
Category:	Supplemental (inappropriate species)

101.5 Adequacy of Labeling

The environmental hazard label statement is adequate. However, the label should identify the proposed use sites and specifically exclude application to woody ornamentals and outdoor nurseries.

103 Conclusion

EEB has completed a full risk assessment (3(c)(5) Finding) of the proposed registration of Abamectin for use on flower crops and foliage plants. Based on available data and use information EEB concludes that the proposed use will result in minimal hazards to nontarget organisms provided that the use site is specifically identified as mentioned in section 101.5 (above) and aerial application is not permitted.

Daniel Rieder 4/10/86
Daniel Rieder
Wildlife Biologist, Section 2
Ecological Effects Branch
Hazard Evaluation Division

Norman Cook 4.15.86
Norm Cook
Section Head, Section 2
Ecological Effects Branch
Hazard Evaluation Division

Michael Slimak 4/15/86
Michael Slimak
Chief, Ecological Effects Branch
Hazard Evaluation Division

Data Evaluation Record

1. Chemical: H-Avermectin

2. Test Material: Test concentrations are reported as micrograms of ^{3}H-Avermectin per liter

3. Study Type: Aquatic Invertebrate Life-Cycle

   Species Tested: Daphnia magna

4. Study I.D.:

   Study Title: The Chronic Toxicity of ^{3}H-Avermectin to Daphnia magna.

   Laboratory: EG and G Bionomics

   Study No.: Bionomics Study #047-0583-H15-130

   Date of Study: November 1983, revised November 1984

   Study Sponsor: Merck Sharp and Dohme Research Laboratories

   Study Location: Acc #259364

5. Reviewed By:

   Daniel D. Rieder
   Wildlife Biologist
   EEB/HED

   Signature: Daniel Rieder
   Date: 1/31/86

6. Approved By:

   Norm J. Cook
   Supervisory Biologist
   EEB/HED

   Signature: Norman J. Cook
   Date: 4-17-86

7. Conclusions:

   This study is scientifically sound. Th is study showed that MD-936 is acutely toxic at >0.029 ppb ($\bar{x}$ measured with radio-labled chemical). All daphnids exposed to concentrations of 0.093 ppb ^{3}H-Avermectin were dead by exposure day 5. The number of offspring produced by daphnids exposed to the two lowest measured treatment levels (0.030 and 0.029 ppb), was unaffected when compared to the number of offspring produced by daphnids in the negative control. At the tests termination, all surviving daphnids in the two lowest treatment levels were small and had pale coloration as compared to daphnids in the negative control.

8. Recommendations: N/A

9. Background: This study was provided to support registration.

10. Individual Studies: N/A

11. Methods and Materials:

A. Test Material: The test material was Tritium labeled Avermectin (91.43% a.i.). Test concentrations are reported as micrograms of ^{3}H-Avermectin per liter of test solution (ppb).

B. Test Organisms: The test organisms were obtained for laboratory stock cultured at E.G. and G. Twenty Daphnia magna (< 24 hrs old) were placed in each aquarium at test initiation. Four aquaria, 80 organisms, were used per level.

C. Test Conditions: Flow-through, at a rate of 4.6 aquarium volumes per 24-hr. Four 1.75-liter glass aquaria per level (5 concentrations, nominal 0.021, 0.042, 0.085, 0.17, and 0.34 ppb) and a negative and solvent control (acetone). Lighting was 16 hrs light and 8 hrs darkness. Test temperature was 21±1°C. Food was provided at 0.5 ml yeast and 2 ml algal suspension 3 times daily (weekdays) and 2 times daily (weekends).

D. Test Solution: Fortified/filtered well water.

A 48-hr acute study was conducted to determine what levels should be used in a chronic study.

Statistics: Weekly survival data, transformed to arc sign $\sqrt{\text{percentage}}$ and the determination of cumulative production of offspring per female derived during the chronic toxicity test, where subjected to analysis of variance according to Steel and Torrie (1960)*. If significant differences were observed, the Dunnett's procedure was used to determine which treatments, if any, were significantly different from the controls.

* Steel, R.G.D. and J.H. Torrie. 1960. Principles and Procedures of Statistics. McGraw-Hill, New York: 481 pp.

12. Reported Results:

48-hr acute toxicity test results:

LC_{50} = 0.31 ppb (95% conf limits = 0.25 - 0.37 ppb)
See Table 1 for acute mortality data.
See Table 2 for water quality analysis. The Do remained sufficiently high throughout the test.

All organisms died in the three highest levels by day 5. See Table 3. The cumulative offspring per female was not significantly less at 0.043 and 0.021 ppb, but there was 64% mortality at 0.042 ppb, and 11% mortality at 0.021 ppb. Surviving daphnids at these lower levels were small and pale in color compared to those in the negative and solvent control. See Table 5 for results of test solution analysis.

13. Study Authors Conclusions:

MK-936 is acutely toxic at <0.042 ppb.
MK-936 does not affect reproduction at 0.042 ppb or lower.

He explained the discrepancy between the nominal concentrations and measured concentrations at the 2 lower test levels as possibly caused by the solubility of the test material in the dilution water and the possible interaction between the test material and the added food suspension (absorption).

14. Reviewers Discussion:

A. Test Procedures: The test procedure was acceptable.

B. Statistical Analysis:

The statistics performed on the data are appropriate and the results match the raw data.

C. Discussion of Results:

The measured concentrations are shown in Table 5. They averaged 0.030, 0.029, 0.093, 0.19, and 0.38 ppb for the nominal levels of 0.021, 0.042, 0.085, 0.017, and 0.34 ppb respectively. Therefore, I consider the highest level that did not cause reproductive effects to be 0.030 ppb. However, there was an observed effects to the daphnids at these levels compared to the controls, the daphnids in the 0.030 and 0.029 ppb appeared smaller and had pale coloration. On the basis of statistically significantly differences, the reproductive MATC is >0.030 <0.093 ppb. The NOEL is <0.029 ppb, however. Furthermore, ^{3}H-Avermectin is acutely toxic to daphnids at $\geq$ 0.030 ppb.

8

D. Adequacy of the Study:

The study fulfills the 72-4 guideline requirement for an aquatic invertebrate life-cycle study.

15. Completion of One Liner for Study: Done

16. CBI Appendix: The attached tables are CBI.

Avermectin science review

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Pages 10 through 15 are not included in this copy.

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___ 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

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DATA EVALUATION REPORT

ECOLOGICAL EFFECTS BRANCH

1. Chemical: MK-936

   Sha. No: 122804

2. Test Material: 91% a.i.

3. Study Type: Fish 96-hour LC_{50} with Channel catfish

4. Study ID: Author: McAllister, William A.

   Title: Acute Toxicity of MK-936 Technical and Channel Catfish (Ictalurus punctatus)

   Laboratory: Analytical Bio-Chem. Lab. Inc. Study No./Date: 39278/29 May, 85

   Study Submitted by: Merck, Sharp and Dohme Rsch. Lab. Acc No: 259364

5. Review By:

   Daniel D. Rieder
   Wildlife Biologist
   Ecological Effects Branch

   Signature: Daniel Rieder

   Date: April 17 '86

6. Approved By:

   Norman J. Cook
   Head-Section 2
   Ecological Effects Branch

   Signature: Norman J. Cook

   Date: 4-17-86

7. Conclusions: This study is scientifically sound. 96-hour LC_{50} = 0.024 ppm. 95% Confidence Limits = 0.018-0.032 ppm. This study will fulfill the guideline requirement for a warmwater fish acute 96-hour LC_{50}.

8. Recommendations: N/A

9. Background: This study was provided to support registration.

10. Discussion of Individual Tests: N/A

11. Methods/Materials:

a. Test Material: MK-936 Avermectin

Percent active ingredient: 91% a.i
Reported concentrations were corrected for sample purity.

b. Test Organism: Channel Catfish

Source: Northups Fish hatchery
Length: $\bar{X}$ = 36 ± 1.8 mm
Accululation: 14 days, 48-hrs without food
Organisms per container: 5
No./level : 10
Weight: $\bar{X}$ = 0.80 ± 0.11g
Loading: 0.267 g/liter

c. Test Containers: Glass

Size: 5 gallons with 15 liters
Aerated: No
Replicates: 2

d. Test Conditions: Static

Photoperiod: 16-hrs/day
Solvent: DMF
Temperature: 22° ± 1°C
Test Solution: reconstituted well water
Controls: Untreated and solvent
Ways test was begun: fish added to test solution within 30 minutes

Reference: Committee on Methods for Toxicity Tests with Aquatic Organisms. Methods of Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians. 1975. U.S. EPA, Ecol. Res. Ser. 660/3-75009.

American Public Health Association. 1980. Standard Methods for the Examination of Water and Wastewater. 15th ed. Washington, D.C. 1134 p.

e. Statistics: Stephan, C. E., K. A. Busch, R. Smith, J. Burke, and R. W. Andrews. 1978. A Computer Program for Calculating an LC_{50}. U. S. EPA, Duluth, MN, pre-publication manuscript, August, 1978.

12. Reported Results: 96-hr LC_{50} = 0.024 ppm
95% C.L = 0.018-0.032 ppm

CONCENTRATION PPM NOMINAL		MORTALITY 24 HRS		48 HRS		96 HRS	CONDITIONS DO	pH
- Control	--	0	--	0	--	0	---	--
- Solvent Control	-	0	--	0	--	0	---	--
- 0.0056	--	0	--	0	--	0	---	--
- 0.01	--	0	--	0	--	0	---	--
- 0.018	--	0	--	0	--	0	---	--
- 0.032	--	0	--	8	--	10	---	--
- 0.056	--	10	--	10	--	10	---	--
- 0.10	--	10	--	10	--	10	---	--

13. Study Author's Conclusions:

The NOEL was 0.01 ppm based on abnormal effects including, mortality, loss of equilibrium, fish on the bottom of the test chambers, and quiescence.

14. Reviewer Discussion:

a. Test Procedure: The test procedure was acceptable.

b. Statistical Analysis: The statistical analysis results compared well with raw mortality data.

c. Discussion/Results: The results show that MK-936 is very highly toxic to warmwater fish.

d. Adequacy: Core

15. Completion of One-liners: One-liner completed

16. CBI Appendix: N/A

DATA EVALUATION REPORT

ECOLOGICAL EFFECTS BRANCH

1. Chemical: Avermectin B1

   Sha. No: 122804

2. Test Material: 97% a.i.

3. Study Type: Fish 96-hour LC_{50} with Carp (Cyprinus carpio)

4. Study ID: Author: Douglas, Mark T. and Ian B. Pell

   Title: The Acute Toxicity of Avermectin B1. to Carp (Cyprinus carpio)
   Laboratory: Huntingdon Rsch Cent. Study No./Date: MSD 150-85381/20 May, 85
   Study Submitted by: Merck, Sharp and Dohme Rsch. Lab. Acc No: 259364

5. Review By:

   Daniel D. Rieder
   Wildlife Biologist
   Ecological Effects Branch

   Signature: Daniel Rieder
   Date: April 17, 1986

6. Approved By:

   Norman J. Cook
   Head-Section 2
   Ecological Effects Branch

   Signature: Norman J. Cook
   Date: 4-17-86

7. Conclusions: This study is scientifically sound. 96-hour LC_{50} = 0.042 ppm. 95% Confidence Limits = 0.032-0.056 ppm. This study will not fulfill the guideline requirement for a warmwater fish acute 96-hour LC_{50} because the test species is inappropriate.

8. Recommendations: N/A

9. Background: This study was provided to support registration.

10. Discussion of Individual Tests: N/A

11. Methods/Materials:

a. Test Material: Avermectin B1

Percent active ingredient: 97% a.i

b. Test Organism: Carp (Cyprinus carpio)

Source: Avon Coarse Fish Farm
Length: $\bar{X}$ = 5.3 cm
Acclimation: 14 days, 24-hrs without food
Organisms per container: 10
No./level : 10
Weight: $\bar{X}$ = 5.34 g
Loading: 2.7 g/liter

c. Test Containers: Glass aquaria

Size: Volume test solution 20 liters
Aerated: Yes

d. Test Conditions: Flowthrough

Photoperiod: 16 hrs/day
Solvent: None mentioned
Temperature: 22 ± 1°C
Test Solution: dechlorinated tap water
Controls: Untreated
Ways test was begun: fish placed in prepared solution

e. Statistics: Thompson, and Weil (1952) Biometrics 8, 51-54.

12. Reported Results: 96-hr LC_{50} = 0.042 ppm
95% C.L = 0.032-0.056 ppm

CONCENTRATION PPM NOMINAL		MORTALITY 24 HRS		48 HRS		72 HRS		96 HRS		CONDITIONS DO	pH
-	Control	--	0	--	0	--	0	--	0	--	8.1	8.0
-	0.010	--	0	--	0	--	0	--	0	--	7.9	7.9
-	0.018	--	0	--	0	--	0	--	0	--	8.2	7.9
-	0.032	--	0	--	0	--	0	--	0	--	8.4	7.9
-	0.056	--	1	--	3	--	6	--	10	--	8.7	7.8
-	0.100	--	10	--	10	--	10	--	10	--	8.6	7.9

13. Study Author's Conclusions:

Marked reaction to exposure (other than death) were torpidity, sluggish swimming, loss of equilibrium, and increased pigmentation.

14. Reviewer Discussion:

a. Test Procedure: The test procedure was acceptable except that carp is not an appropriate test species.

b. Statistical Analysis: The statistical analysis results is consistent with the raw mortality data, see the attached printout.

c. Discussion/Results: This test shows that Avermectin B1 is very highly toxic to carp under flow-through conditions.

d. Adequacy: Supplemental

15. Completion of One-liners: One-liner completed

16. CBI Appendix: N/A

122804 MK-936 97% a.i. Avermectin B1a Carp 96-hour LC50

CONC.	NUMBER EXPOSED	NUMBER DEAD	PERCENT DEAD	BINOMIAL PROB.(PERCENT)
.1	10	10	100	9.765625E-02
.056	10	10	100	9.765625E-02
.032	10	0	0	9.765625E-02
.018	10	0	0	9.765625E-02
.01	10	0	0	9.765625E-02

THE BINOMIAL TEST SHOWS THAT .032 AND .056 CAN BE
USED AS STATISTICALLY SOUND CONSERVATIVE 95 PERCENT
CONFIDENCE LIMITS, BECAUSE THE ACTUAL CONFIDENCE LEVEL
ASSOCIATED WITH THESE LIMITS IS GREATER THAN 95 PERCENT

AN APPROXIMATE LC50 FOR THIS SET OF DATA IS 4.233201E-02

WHEN THERE ARE LESS THAN TWO CONCENTRATIONS AT WHICH THE
PERCENT DEAD IS BETWEEN 0 AND 100, NEITHER THE MOVING AVERAGE
NOR THE PROBIT METHOD CAN GIVE ANY STATISTICALLY SOUND RESULTS.

Avermectin science review

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