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 wildlife. 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
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 Port 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:

<table>
<thead>
<tr>
<th>County</th>
<th>Acres</th>
</tr>
</thead>
<tbody>
<tr>
<td>San Diego</td>
<td>2369</td>
</tr>
<tr>
<td>Ventura</td>
<td>1249</td>
</tr>
<tr>
<td>Kern</td>
<td>1560</td>
</tr>
</tbody>
</table>

101.2 Likelihood of Adverse Effects to Nontarget Organisms

Abamectin is very highly toxic to:

- **fish**
  - bluegill: $LC_{50}=3.2$ ppb
  - *Daphnia magna*: $LC_{50}=0.22$ ppb
  - *Daphnia magna*: $MATC > 0.03 < 0.09$ ppb

- **aquatic invertebrates**
  - mysid shrimp: $LC_{50}=0.2$ ppb
  - mouse: $LD_{50}=13$ mg/kg
  - weanling rat: $LD_{50}=1.5$ mg/kg

- **estuarine invertebrates**

- **mammals**
  - It affects rat reproductive success at 0.1 to 0.5 mg/kg/day

It is highly toxic to birds

- Mallard ducks: $LC_{50}=383$ 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.
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
Wildlife Biologist, Section 2
Ecological Effects Branch
Hazard Evaluation Division

Norm Cook 4/15/86
Section Head, Section 2
Ecological Effects Branch
Hazard Evaluation Division

Michael Slimak 4/15/86
Chief, Ecological Effects Branch
Hazard Evaluation Division
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: [Signature]
   Date: 1/31/86

6. Approved By:
   Norm J. Cook
   Supervisory Biologist
   EEB/HED
   Signature: [Signature]
   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 (X measured with radio-labeled 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 0.02, 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 sin $\sqrt{\text{percentage}}$ 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.

12. **Reported Results:**

48-hr acute toxicity test results:

$\text{LC}_{50} = 0.31 \text{ ppb (95\% conf limits = 0.25 - 0.37 ppb)}$

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 $<0.042 \text{ ppb}$.
MK-936 does not affect reproduction at 0.042 ppb or lower.

He explained the discrepancy between the nominal concentra-
tions 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 $>0.030 < 0.093 \text{ ppb}$. The NOEL is $<0.029 \text{ ppb}$, however. Furthermore, $^{3}\text{H-Avermectin}$ is acutely toxic to daphnids at $\geq 0.030 \text{ ppb}$. 
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.
Page _____ is not included in this copy.
Pages 10 through 15 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
___ The document is a duplicate of page(s) _________
___ The document is not responsive to the request

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.
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 LC50 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: [Signature]
   Date: April 17, 86

6. Approved By:
   Norman J. Cook
   Head-Section 2
   Ecological Effects Branch
   Signature: [Signature]
   Date: 4-17-86

7. Conclusions: This study is scientifically sound.
   96-hour LC50 = 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 LC50.

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: $\bar{X} = 36 \pm 1.8$ mm
      Accumulation: 14 days, 48-hrs without food
      Organisms per container: 5
      No./level: 10
      Weight: $\bar{X} = 0.80 \pm 0.11$g
      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: $22^\circ \pm 1^\circ$C
      Test Solution: reconstituted well water
      Controls: Untreated and solvent
      Ways test was begun: fish added to test solution within 30 minutes


12. **Reported Results:** 96-hr LC$_{50}$ = 0.024 ppm  
95% C.I. = 0.018-0.032 ppm  

<table>
<thead>
<tr>
<th>CONCENTRATION PPM</th>
<th>NOMINAL</th>
<th>24 HRS</th>
<th>MORTALITY 48 HRS</th>
<th>96 HRS</th>
<th>CONDITIONS</th>
<th>DO</th>
<th>pH</th>
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</table>

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
1. **Chemical:** Avermectin B1  
   **Sha. No:** 122804

2. **Test Material:** 97% a.i.

3. **Study Type:** Fish 96-hour LC50 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:** [Signature]
   **Date:** April 17, 1986

6. **Approved By:**  
   Norman J. Cook  
   **Head-Section 2**  
   **Ecological Effects Branch**  
   **Signature:** [Signature]
   **Date:** 4-17-86

7. **Conclusions:** This study is scientifically sound.  
   96-hour LC50 = 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 LC50 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

<table>
<thead>
<tr>
<th>CONCENTRATION</th>
<th>MORTALITY</th>
<th>CONDITIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPM</td>
<td>NOMINAL</td>
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<tr>
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</tr>
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<td>-</td>
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<tr>
<td>-</td>
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</tbody>
</table>
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

<table>
<thead>
<tr>
<th>CONC.</th>
<th>NUMBER EXPOSED</th>
<th>NUMBER DEAD</th>
<th>PERCENT DEAD</th>
<th>BINO MIAL PROB. (PERCENT)</th>
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<tbody>
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<td>.1</td>
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<td>9.765625E-02</td>
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</tr>
</tbody>
</table>

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 4.235201E-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

Page _____ is not included in this copy.
Pages 20 through 29 are not included in this copy.

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____ 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
X __ A draft product label
X __ The product confidential statement of formula
____ Information about a pending registration action
____ PIFRA registration data
____ The document is a duplicate of page(s) ________
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