122804
_____
SHAUGHNESSY NO.

## EEB REVIEW

DATE: IN ___8/6/85___ OUT __OCT 2 9 1985__

FILE OR REG. NO._____618-OG; 618-OU_____

PETITION OR EXP. PERMIT NO._____

DATE OF SUBMISSION_____7/12/85_____

DATE RECEIVED BY HED_____8/2/85_____

RD REQUESTED COMPLETION DATE____10/30/85_____

EEB ESTIMATED COMPLETION DATE____10/23/85_____

RD ACTION CODE/TYPE OF REVIEW____120/New Chemical_____


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

DATA ACCESSION NO(S)._____258746_____

PRODUCT MANAGER NO._____15-La Rocca_____

PRODUCT NAME(S)__Affirm Fire Ant Bait and Insecticide-Avermectin__


COMPANY NAME_____Merck Sharp and Dohme Research Laboratories____

SUBMISSION PURPOSE__Resubmission of Applications For Registration

of Affirm (618-OG), (618-OU). Data Reviews


| SHAUGHNESSY NO. | CHEMICAL & FORMULATION | % A.I. |
|---|---|---|
| 122804 | Abamectin | 0.011% |
|  |  |  |
|  |  |  |
|  |  |  |

/

ECOLOGICAL EFFECTS BRANCH

REVIEW

Avermectin

**100      Submission Purpose and Label Information**

**100.1   Submission Purpose and Pesticide Use**

Avermectin is the active ingredient in Affirm Fire Ant Bait (618-OG) and Affirm Fire Ant Insecticide (618-OU). Both are proposed to be used to control imported fire ants on turf, lawns, and nonagricultural areas. This excludes pastures rangelands and croplands.

**100.2   Formulation Information**

Both products have the following formulation.

Active Ingredient

Abamectin [A mixture of avermectins containing $> 80\%$ avermectin $B_1$ a (5-O-demethyl-avermectin $A_1$ a) and $\leq 20\%$ avermectin $B_1$b (5-O-demethyl-25-de(1-methylpropyl)-25-(1-methylethyl)avermectin $A_1$a)] . . . . . . . . . . . . . . . . . . . . .      0.011%

Inert Ingredient  . . . . . . . . . . . . . . . . .      99.989%

1 lb of Affirm contains 50 mg abamectin (0.00011 lbs)

Both are formulated into ███████████

**100.3   Application Methods, Directions, Rates**

Affirm is a stomach insecticide which acts slowly to reduce fire ant colonies. An effective fire ant insecticide should be slow acting so that the bait can be passed by the workers throughout the ant colony and eventually to the queen. Affirm is toxic to fire ants; however, it is most effective against the fire ant queen and causes an immediate halt of egg production and disappearance of worker brood. The disappearance of worker ants leads to the decline and eventual elimination of the fire ant colony.

Apply when ants are actively foraging [typically when soil temperatures are greater than 60 °F (15 °C)] or consult your State agricultural experiment station or State extension service for optimum timing of application.

Apply after dew or rainfall has dried off for maximum effectiveness. For best results, do not apply if rainfall is anticipated within 4 to 6 hours after application.

Affirm Fire Ant Insecticide Bait (618-OG) is packaged in 25-lb containers.

BROADCAST APPLICATION - Apply 1 pound of Affirm per acre (1 lb/A) using properly calibrated aerial or ground equipment to assure proper dosage and uniform distribution.

INDIVIDUAL MOUND TREATMENT - Use 5 to 7 tablespoons of Affirm per mound. Sprinkle the bait uniformly over the mound and for a distance of approximately 2 feet out from the base of the mound. Apply at a rate of 1 lb of bait per acre. Do not contaminate kitchen utensils with this product.

Affirm Fire Ant Insecticide (618-OU) is packaged in 1 lb containers.

BROADCAST APPLICATION - Sprinkle Affirm uniformly on turf, lawns, and nonagricultural areas. Do not exceed 1 lb of bait per acre.

INDIVIDUAL MOUND TREATMENT - Use 5 to 7 tablespoons of Affirm per mound. Sprinkle the bait uniformly over the mound and for a distance of approximately 2 feet out from the base of the mound. Do not apply more than 1 lb of bait per acre. Do not contaminate kitchen utensils with this product.

## 100.4  Target Organism

Fire Ants

## 100.5  Precautionary Labeling

### ENVIRONMENTAL HAZARDS

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

## 101  Hazard Assessment

## 101.1  Discussion

Fire ants occur throughout the South from eastern Texas to the east coast. This use provides for control of fire ants on turf, lawns, and nonagricultural areas. In their "Response to the Ecological Effects Branch Review"

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(July 12, 1985, Accession No. 258746) Merck, Sharp, and Dohme Research Laboratories specifically states that this use excludes applications to pastures, rangelands, and croplands (page 4). This restriction substantially reduces exposure potential compared to the original registration request (EEB review dated June 29, 1984), which included pastures and rangelands.

Affirm may be applied by aerial equipment (618-OG). Use rate is 0.00011 lbs ai per acre. It is a granular product so drift will not be a problem.

Abamectin (MK-936) may persist in the field with a half-life of a month. This was based on a field dissipation study reviewed by EAB (September 5, 1985 review). However, based on anther EAB review (August 28, 1985), it is reported that abamectin has a photolytic half-life of 3.5 to 12 hours (section 10.1c). Apparently, as long as it is on the soil or other surfaces and exposed to light it will degrade rapidly. Also, it degrades rapidly in an aqueous solution.

Based on discussions with Dr. Akiva Abramovitch of EAB and EAB's reviews, abamectin breaks down initially to the avermectin $B_1a$ isomer (p. 6, EAB review, March 28, 1984, EUP on citrus) in a short time (< 12 hrs). Then this and other primary degradates have half-lives of a similar order of magnitude (p. 3, EAB review, August 28, 1985). Evidently, after 27 hours or so, the primary degradate is the polar metabolite (pages 10 to 13 of Merck, Sharpe, and Dohme Research Laboratories document "Response to the Ecological Effects Branch Review" Accession No. 258746).

Avermectin bioaccumulates only slightly (110 x maximum) in fish. Dupuration is 95 percent in 14 days.

122804    Avermectin
Rational for data requests :
- Fire Ants is an extensive use
- Aerial application
- Very highly toxic
- a slow working product.
- Could be exposure of none unaffected habitats

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## Summary of Toxicity

| Species | Test Material | Results | Category |
|---|---|---|---|
| Bobwhite quail | 91% | $LD_{50}$ > 2000 mg/kg | Core |
| Bobwhite quail | 91% | $LC_{50}$ = 3102 ppm | Core |
| Mallard duck | 91% | $LC_{50}$ = 383 ppm | Core |
| Bluegill | 91% | $LC_{50}$ = 9.6 ppb | Core |
| Rainbow trout | 91% | $LC_{50}$ = 3.2 ppb | Core |
| Daphnia | 91% | $LC_{50}$ = 0.34 ppb | Core |
| Daphnia | MK-936 Teh | $LC_{50}$ = 0.22 ppb | Core |
| Daphnia | Avermectin $B_1a$ | $LC_{50}$ = 0.42 ppb | Core |
| Daphnia | Polar metabolite* | $LC_{50}$ = 4.2 ppb (binomial) | Core |
| | | 21.0 ppb (moving average) | Core |
| Daphnia | Moderately polar | 6.3 ppb | Core |
| Daphnia | Nonpolar metabolite | 25.4 ppb | Core |
| Daphnia | Thin film polar metabolite* | 76.7 ppb | Core |
| Shrimp, mysid | | $LC_{50}$ = 0.2 ppb | Core |
| Fathead minnow | | $LC_{50}$ = 15 ppb | Core |
| Oyster embryo larvae | 48-hr | $LC_{50}$ = 430 ppb | Core |

Avermectin is highly toxic to very highly toxic to mammals (mouse $LD_{50}$ = 13 to 23 mg/kg; rat $LD_{50}$ = 10 to 11 mg/kg; weanling rat $LD_{50}$ = 1.5 mg/kg). It has an effect on reproduction in rats at 0.1 to 0.5 mg/kg/day.

The nonpolar metabolite has an $LD_{50}$ of > 48 mg/kg in mice.
The polar* metabolite has an $LD_{50}$ of > 5000 mg/kg in mice.

* The polar metabolite is the last one formed and is what the parent becomes after about 27 hours.

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## 101.2  Likelihood of Adverse Effects to Nontarget Organisms Terrestrial

As a granular, Avermectin will not occur as a residue on terrestrial food items.  The primary route of exposure would be through direct ingestion.

At the label rates there would be 50 mg of ai per acre.  Assuming an $LD_{50}$ of 10 mg/kg for an adult mammal, a 1 kg mammal would have to eat all the granules in 8712 ft$^2$.

$$\frac{10 \text{ mg/kg}}{50 \text{ mg/acre}} = 0.2 \times 43,560 \text{ ft}^2/\text{acre} = 8712 \text{ ft}^2$$

Assuming an $LD_{50}$ for young mammals of 1.5 mg/kg, a 2 oz young mammal would have to eat 0.085 mg avermectin to equal the $LD_{50}$.  A 2 oz rat would have to eat all the granules in 74 ft$^2$ (7' x 10' plot).

$$\frac{0.085 \text{ mg}}{50 \text{ mg/acre}} = 0.0017 \times 43,560 = 74 \text{ ft}^2$$

Avermectin is less toxic to birds than to mammals so birds of equivalent size would have to eat more granules to receive a lethal dose.  It is unlikely that birds or mammals would eat enough granules to experience an acute effect.

Avermectin breaks down rapidly in the presence of light.  Therefore, if it is on the soil surface or on plant surfaces, it is expected to breakdown before it can have any adverse chronic effects to terrestrial organism.

### Aquatic

Direct application to water may occur and would result in the following residues:

| Depth | Concentration (in standing water) |
|---|---|
| 6 inches | 0.08 ppb |
| 1 feet | 0.04 ppb |
| 3 feet | 0.01 ppb |

These levels are below the lowest $LC_{50}$'s available (daphnia = 0.22 ppb; shrimp = 0.20 ppb).  The concentrations in flowing water would be less also.  Runoff may occur but would result in residues even lower than those from direct application.  These residues would not have an adverse acute effect on either freshwater or estuarine organisms.

Avermectin is expected to photodegrade in water within a few days. Therefore, no adverse chronic effects to aquatic or estuarine organisms are expected. The degradation products are less toxic than the parent and tend to become less toxic as they continue to degrade.

## 101.3 Endangered Species

These proposed uses are not expected to have an adverse effect on endangered species because of the low use rate. Avermectin will not be available to endangered terrestrial species at levels great enough to have an adverse effect. It will not occur in water at concentrations great enough to have an adverse effect on endangered aquatic species.

## 101.4 Adequacy of Toxicity Data

The registrant submitted a "Response to the Ecological Effects Branch Review" July 12, 1985, Accession No. 258746. That document included a report of six acute studies with Daphnia magna. The test materials were Avermectin MK-936, Avermectin $B_1a$, and degradates of Avermectin. The tests were validated as scientifically sound and they fulfilled the guideline requirements for acute testing with an aquatic invertebrate and degradation products. They resulted in the following $LC_{50}$ values.

| Test Material | Binomial | Moving Average | Probit |
|---|---|---|---|
| MK-936 #a | 0.22 ppb | 0.24 ppb | * |
| Avermectin $B_1a$ #2 | 0.62 ppb | 0.61 ppb | * |
| Repeat Sample #2 | 0.42 ppb | 0.47 ppb | 0.54 ppb |
| ** Polar Met. Sample #3 | 4.2 ppb | 21.0 ppb | * |
| ** Mod Polar Sample #4 | 7.1 ppb | 6.3 ppb | * |
| ** Nonpolar Sample #5 | 25.9 ppb | 25.4 ppb | * |
| ** Thin Film Meta. #6 | 76.7 ppb | 76.7 ppb | 66.5 |

 * Since the goodness-of-fit probability is less than 0.05, results of the probit method are not used.
** Metabolites of avermectin.

Two estuarine studies were submitted October 3, 1985. The results are included in the "Summary of Toxicity."

## 101.5 Adequacy of Labeling

The Environmental Hazards label should include a statement about toxicity to wildlife because avermectin is highly toxic to mammals.

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

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Furthermore, EEB is concerned that the term "non-agricultural" may not be interpreted as excluding rangeland and pastureland. We performed our hazard assessment assuming these areas will not be treated. Also, EEB assumes one application with possible retreatment in 3 to 4 months per year. The label should specify both these limitations.

## 102    Conclusions

EEB has completed a full risk assessment (3(c)(5) finding) of the proposed registration of Affirm Fire Ant Bait (6180G and 618-OU) to control imported fire ants. Based upon the available data and use information EEB concludes that the proposed use provides for minimal hazards to nontarget organisms provided the label is modified as shown in 101.5 above: i.e., (1) the Environmental Hazards labeling is added/modified; (2) the label carries an exclusion for application to rangeland and pastureland; and (3) the label states that one application, with possible retreatment in 3 to 4 months, per year is recommended.


Daniel Rieder     10/29/85
Daniel Rieder
Wildlife Biologist, Section 2
EEB/HED


Norm Cook     10·31·85
Norm Cook
Section Head, Section 2
EEB/HED

Michael Slimak     11/4/85
Michael Slimak
Chief, Ecological Effects Branch
Hazard Evaluation Division

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## DATA EVALUATION REPORT

## ECOLOGICAL EFFECTS BRANCH

1.  CHEMICAL: Affirm
        Sha. No: 122804

2.  TEST MATERIAL: Avermection $B_1$, Avermectin $B_{1a}$ Standard and
                4 photodegradates.

3.  STUDY/ACTION TYPE: 48-hour $LC_{50}$ with Daphnia magna

4.  STUDY ID: Author: Naimie, Hussein, Susan Anton, and
                    Larry Kaelin
        Title: Results of Daphnid Bioassay of MK-0936, Avermectin
            $B_{1a}$ Standard, Polar and Nonpolar Metabolites from a
            Water Photolysis Reaction of Avermectin $B_{1a}$ Standard.
        Laboratory: Merck, Sharp and Dohme Research Laboratory
        Study No./Date: Appendix 2 of Acc. No. 258746 / July, 1985
        Study submitted to EPA by: Merck, Sharp and Dohme
                        Laboratories
        Acc. No: 258746

5.  REVIEWED BY: Daniel Rieder       Signature: _Daniel Rieder_ 11/5/85
                Wildlife Biologist
                EEB/HED           Date: _____

6.  APPROVED BY: Norman Cook     Signature: _Norman Cook_
                Head-Section 2
                EEB/HED          Date: _11·5·85_

7.  CONCLUSIONS: This study is scientifically sound.
                See Table I for reported $LC_{50}$'s.
                These results support registration of Affirm.

| TEST MATERIAL | BINOMIAL | MOVING AVERAGE | PROBIT |
|---|---|---|---|
| MK-936 #1 ---------- | 0.22 ppb -- | 0.24 ppb ---- | * |
| Avermectin Bla #2 --- | 0.62 ppb -- | 0.61 ppb ---- | * |
| Repeat Sample #2 ---- | 0.42 ppb -- | 0.47 ppb ---- | * |
| Polar Met Sample #3 - | 4.2 ppb -- | 21.0 ppb ---- | * |
| Mod. Polar Sample #4 ---------- | 7.1 ppb -- | 6.3 ppb ---- | * |
| Nonpolar Sample #5 -- | 25.9 ppb -- | 25.4 ppb ---- | * |
| Thin Film Meta. #6 -- | 76.7 ppb -- | 76.7 ppb ---- | 66.5 |

* Since the goodness of fit probability is less than
  0.05, results of the probit method are not used.

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8. RECOMMENDATIONS: NA

9. BACKGROUND:

This test was performed to demonstrate the toxicity of Avermectin and its photo-degradates. Avermectin has a fairly short half-life, <24hrs in sunlight. EEB was concerned with the toxicity of the photodegradates. Daphnids were used since they were more sensitive to avermectin than the fish.

10. DISCUSSION OF INDIVIDUAL TESTS: The tests are discussed together in the following sections.

11. TEST METHODS/MATERIALS

Test Material: Avermectin (MK-936), Avermectin B1a Standard, and 4 Photo-degradates.

Percent active Ingredient: Assumed 100% a.i.
See attachment 1 for test material description.

Test Organism

Species: Daphnia magna        Age/Stage: <24 hours
Acclimation: at 20°+ 1°C      Source: EPA's stock culture
Number/concentration: 20              at Duluth

Test Containers: glass

Size: 400 ml containing      Organisms per container: 10
      300 ml water           Replicates: 2
Aerated: No

Test Conditions

Photoperiod: 12 hrs/day      Way test was begun: organisms
Temperature: 20°C                added to test solution.
Controls: Solvent            Measured Concentrations: No
      Control only           Test Solution: Reconstituted
Solvent: Methanol or                hard water
      acetone
References:

1. "Standard Method for the Examination of Water and Wastewater", 16th Edition, prepared and published jointly by APHA, AWWA, WPCF, 1985.

2. "Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms", Environmental Monitoring and Support Laboratory - Cincinnati, Ohio, EPA-600/4-83-000, Third editions, May 1983.

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3. "Methods for Acute Toxicity Tests with Fish, Macroinvertebrates and Amphibians", National Water Quality Laboratory, EPA-660/3-75-009, April 1975.

12. REPORTED RESULTS:
    See attachment 2
       Table 1 48-hour $LC_{50}$'s summary
     Raw Mortality Data
       Table 2 MK-936
       Table 3 Avermectin $B_{1a}$ Standard
       Table 4 Avermectin $B_{1a}$ Standard (repeat)
       Table 5 Polar and Moderately polar degradates
       Table 6 Non-Polar, and Polar metobolite from thin film dish.

13. STUDY AUTHOR'S CONCLUSIONS:

Photodegradates of Avermectin are less toxic to Daphnids than parent.

14. REVIEWER DISCUSSION

   a. Methods/Procedures: The procedures were acceptable. The test materials were Avermectin (MK-936), Avermectin $B_{1a}$ and its photodegrates.

   Attachment 1 for a description of the 6 test materials. Basically the photodegradate test materials were generated by exposing the parent to light either in an aqueous solution (Samples 3, 4, and 5) or as a thin film (Sample 6). Both methods of exposure produce the same degradates although in different propotions. The reported concentrations for samples 2-6 were based on radio activity and are this considered to be in ppb of 100% a.i.

   The reviewer notes that samples 3 and 4 were tested with one concurrent control as were samples 5 and 6. This does not detract from the validity of the test as the controls were run on the same day as the tests they support. The controls were solvent controls.

   Some of the spans between concentrations are greater than normally desired, (i.e. each concentration greater more than 60% greater than nest lower concentration) see test concentrations for samples 3, 4, 5, and 6.

   b. Statistics: Independent statistics were conducted. The results are attached. (Attachment 3)

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c. Discussion/Results:

The results of reviewer statistics using Stephans $LC_{50}$ computer program, are as follows. They generally support the statistics reported.

| TEST MATERIAL | BINOMIAL | MOVING AVERAGE | PROBIT |
|---|---|---|---|
| MK-936 #1 ---------- | 0.22 ppb -- | 0.24 ppb ---- | * |
| Avermectin $B_{1a}$ #2 --- | 0.62 ppb -- | 0.61 ppb ---- | * |
| Repeat Sample #2 ---- | 0.42 ppb -- | 0.47 ppb ---- | * |
| Polar Met Sample #3 - | 4.2 ppb -- | 21.0 ppb ---- | * |
| Mod. Polar Sample #4 --------- | 7.1 ppb -- | 6.3 ppb ---- | * |
| Nonpolar Sample #5 -- | 25.9 ppb -- | 25.4 ppb ---- | * |
| Thin Film Meta. #6 -- | 76.7 ppb -- | 76.7 ppb ---- | 66.5 |

* Since the goodness of fit probability is less than 0.05, results of the probit method are not used.

The span between concentration does not detract from the usefulness of these tests. These tests show the toxicological relationship between the various metabolites of Avermectin. Generally, the metabolites are very highly toxic to daphnids but not as toxic as the parent.

d. Adequacy: These 6 tests are scientifically sound. They fulfill the guideline requirments for acute aquatic invertebrate tests with metabolites and parent material.


15. COMPLETION OF ONE-LINER: One liner completed


16. CBI APPENDIX: N/A

Attachment 1

Description of Test Materials

Avermectin science review

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Page _____ is not included in this copy.

Pages _14_ through _30_ are not included in this copy.

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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

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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.

Attachment 3

Reviewer Statistics

122804 AVERMECTIN  -    MK-936  SAMPLE 1    -  DAPHNIA MAGNA LC50
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| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|-------|----------------|-------------|--------------|-------------------------|
| 1     | 20             | 19          | 95           | 2.00272E-03             |
| .5    | 20             | 16          | 80           | .590897                 |
| .25   | 20             | 12          | 60           | 25.1722                 |
| .15   | 20             | 5           | 25           | 2.06947                 |
| .1    | 20             | 3           | 15           | .128841                 |
| .05   | 20             | 0           | 0            | 9.53674E-05             |
| .025  | 20             | 0           | 0            | 9.53674E-05             |
| .0125 | 20             | 1           | 5            | 2.00272E-03             |

THE BINOMIAL TEST SHOWS THAT .15 AND .5 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 .216849


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|------|---|------|------------------------------|--|
| 5 | .0629984 | .244389 | .19505 | .318288 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|------------|---|---|-----------------------------|
| 4 | .734858 | 6.07845 | 0 |

A PROBABILITY OF 0 MEANS THAT IT IS LESS THAN 0.001.


SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.


SLOPE  =            2.34779
95 PERCENT CONFIDENCE LIMITS = .335175    AND    4.36041


LC50 =    .234193
95 PERCENT CONFIDENCE LIMITS =  .0723611 AND  1.80344


LC10 =    .0673971
95 PERCENT CONFIDENCE LIMITS = 7.09307E-05 AND  .152915
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122804 AVERMECTIN  -  AVERMECTIN B1A  SAMPLE 2  - DAPHNIA MAGNA LC50
************************************************************************

| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|-------|----------------|-------------|--------------|-------------------------|
| 1     | 20             | 18          | 90           | .0201225                |
| .5    | 20             | 6           | 30           | 5.76592                 |
| .25   | 20             | 0           | 0            | 9.53674E-05             |
| .15   | 20             | 3           | 15           | .128841                 |
| .1    | 20             | 3           | 15           | .128841                 |
| .05   | 20             | 1           | 5            | 2.00272E-03             |
| .025  | 20             | 0           | 0            | 9.53674E-05             |
| .0125 | 20             | 1           | 5            | 2.00272E-03             |

THE BINOMIAL TEST SHOWS THAT .25 AND 1 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 .620028


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|------|---|------|------------------------------|--|
| 2    | .0760279 | .609065 | .516037 | .742589 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|------------|---|---|----------------------------|
| 5          | .980463 | 4.8714 | 0 |

A PROBABILITY OF 0 MEANS THAT IT IS LESS THAN 0.001.


SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE   =              1.59608
95 PERCENT CONFIDENCE LIMITS = .0156683    AND    3.1765

LC50 =    .631463

122804 AVERMECTIN — AVERMECTIN B1A SAMPLE 2 (REPEAT) DAPHNIA LC50
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| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|---|---|---|---|---|
| 1 | 20 | 14 | 70 | 5.76592 |
| .5 | 20 | 12 | 60 | 25.1722 |
| .25 | 20 | 4 | 20 | .590897 |
| .15 | 20 | 3 | 15 | .128841 |
| .1 | 20 | 0 | 0 | 9.53674E-05 |
| .05 | 20 | 1 | 5 | 2.00272E-03 |
| .025 | 20 | 0 | 0 | 9.53674E-05 |
| .0125 | 20 | 1 | 5 | 2.00272E-03 |

THE BINOMIAL TEST SHOWS THAT .25 AND +INFINITY 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 .423532


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|---|---|---|---|---|
| 2 | .374194 | .472116 | .285819 | .728122 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|---|---|---|---|
| 5 | .649947 | 3.54403 | 1.64437E-03 |

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE    =              1.69723
95 PERCENT CONFIDENCE LIMITS = .328935    AND    3.06552

LC50 =    .543658
95 PERCENT CONFIDENCE LIMITS =  .238436 AND  18.688

LC10 =    .0970616
95 PERCENT CONFIDENCE LIMITS =  .0010611 AND  .222816
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NOTE: THERE WAS CONTROL MORTALITY, BUT AT LEAST ONE
OF THE LOWER CONCENTRATIONS HAD ZERO MORTALITY.
THEREFORE, ABBOTT'S CORRECTION IS NOT APPLICABLE.

122804 AVERMECTIN  - POLAR METABOLITE  SAMPLE 3 -  DAPHNIA MAGNA LC50
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| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|-------|----------------|-------------|--------------|--------------------------|
| 100   | 20             | 20          | 100          | 9.53674E-05              |
| 10    | 20             | 1           | 5            | 2.00272E-03              |
| 5     | 20             | 12          | 60           | 25.1722                  |
| 1     | 20             | 4           | 20           | .590897                  |
| .5    | 20             | 0           | 0            | 9.53674E-05              |
| .3    | 20             | 0           | 0            | 9.53674E-05              |

THE BINOMIAL TEST SHOWS THAT 1 AND 100 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 4.18588


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G       | LC50    | 95 PERCENT CONFIDENCE LIMITS | |
|------|---------|---------|------------------------------|---------|
| 2    | .279044 | 21.0816 | 10.3396                      | 56.0744 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G       | H       | GOODNESS OF FIT PROBABILITY |
|------------|---------|---------|------------------------------|
| 6          | 1.34662 | 7.13779 | 0                            |

A PROBABILITY OF 0 MEANS THAT IT IS LESS THAN 0.001.


SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE   =                  1.35652
95 PERCENT CONFIDENCE LIMITS =-.217639   AND    2.93069

LC50 =    10.2629
95 PERCENT CONFIDENCE LIMITS = 0 AND +INFINITY

LC10 =    1.18865
95 PERCENT CONFIDENCE LIMITS = 0 AND   8.71067
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NOTE: BECAUSE THERE WAS CONTROL MORTALITY, AND NONE
 OF THE LOWER CONCENTRATIONS PRODUCED ZERO MORTALITY,
 THE DATA HAS BEEN SUBJECTED TO ABBOTT'S CORRECTION.

122804 AVERMECTIN  – MOD. POLAR MET.    SAMPLE 4 –   DAPHNIA MAGNA LC50
*******************************************************************

| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|-------|----------------|-------------|--------------|--------------------------|
| 100   | 19             | 19          | 100          | 1.90735E-04              |
| 10    | 19             | 14          | 73.6842      | .960541                  |
| 5     | 19             | 5           | 26.3158      | 3.17841                  |
| 1     | 19             | 4           | 21.0526      | .960541                  |
| .5    | 19             | 0           | 0            | 1.90735E-04              |
| .3    | 19             | 3           | 15.7895      | .221252                  |

THE BINOMIAL TEST SHOWS THAT 1 AND 10 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 7.07107


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|------|-----|------|-------|-------|
| 3 | .257031 | 6.28434 | 2.48171 | 16.0054 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|------------|------|--------|------------------------------|
| 5 | .591902 | 3.08122 | .0150918 |

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.

SLOPE  =            1.33909
95 PERCENT CONFIDENCE LIMITS = .308858    AND    2.36932


LC50 =    5.1397
95 PERCENT CONFIDENCE LIMITS =  1.21526 AND  84.1138


LC10 =    .578803
95 PERCENT CONFIDENCE LIMITS =  1.10776E-03 AND  2.07563
*******************************************************************

122804 AVERMECTIN - NONPOLAR MET.  SAMPLE 5  -  DAPHNIA MAGNA LC50
**********************************************************************

| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|--------|--------|------|------|-------------|
| 100 | 20 | 19 | 95 | 2.00272E-03 |
| 10 | 20 | 3 | 15 | .128841 |
| 5 | 20 | 1 | 5 | 2.00272E-03 |
| 1 | 20 | 1 | 5 | 2.00272E-03 |
| .5 | 20 | 1 | 5 | 2.00272E-03 |
| .3 | 20 | 0 | 0 | 9.53674E-05 |

THE BINOMIAL TEST SHOWS THAT 10 AND 100 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 25.9197


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G | LC50 | 95 PERCENT CONFIDENCE LIMITS | |
|------|------|------|------|------|
| 2 | .0871172 | 25.3619 | 17.2541 | 41.2346 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G | H | GOODNESS OF FIT PROBABILITY |
|------|------|------|------|
| 6 | .904526 | 3.89955 | 3.60817E-03 |

SINCE THE PROBABILITY IS LESS THAN 0.05, RESULTS CALCULATED
USING THE PROBIT METHOD PROBABLY SHOULD NOT BE USED.


SLOPE   =             1.56853
95 PERCENT CONFIDENCE LIMITS = .0767546    AND    3.0603


LC50 =    22.9291
95 PERCENT CONFIDENCE LIMITS =  3.77517 AND  2.69144E+07


LC10 =    3.55394
95 PERCENT CONFIDENCE LIMITS =  7.39678E-11 AND  15.0195
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122804 AVERMECTIN  – THIN FILM MET. SAMPLE 6     –  DAPHNIA MAGNA LC50
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| CONC. | NUMBER EXPOSED | NUMBER DEAD | PERCENT DEAD | BINOMIAL PROB.(PERCENT) |
|-------|----------------|-------------|--------------|--------------------------|
| 100   | 20             | 11          | 55           | 41.1901                  |
| 10    | 20             | 3           | 15           | .128841                  |
| 5     | 20             | 4           | 20           | .590897                  |
| 1     | 20             | 0           | 0            | 9.53674E-05              |
| .5    | 20             | 0           | 0            | 9.53674E-05              |
| .3    | 20             | 0           | 0            | 9.53674E-05              |

THE BINOMIAL TEST SHOWS THAT  10  AND +INFINITY 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 76.6549


RESULTS CALCULATED USING THE MOVING AVERAGE METHOD

| SPAN | G       | LC50    | 95 PERCENT CONFIDENCE LIMITS | |
|------|---------|---------|------------------------------|---------|
| 1    | .547919 | 76.6549 | 32.6799                      | 1537.85 |


RESULTS CALCULATED USING THE PROBIT METHOD

| ITERATIONS | G       | H | GOODNESS OF FIT PROBABILITY |
|------------|---------|---|------------------------------|
| 4          | .163366 | 1 | .588108                      |

SLOPE   =           1.11853
95 PERCENT CONFIDENCE LIMITS = .666434    AND    1.57062


LC50 =     66.4504
95 PERCENT CONFIDENCE LIMITS =  30.9148 AND  260.512


LC10 =     4.86491
95 PERCENT CONFIDENCE LIMITS =  1.56586 AND  9.93066
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