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(1)

# EEE BRANCH REVIEW

DATE: IN 12/1/78 OUT 12/15/78 IN ____ OUT ____ IN ____ OUT ____

FISH & WILDLIFE ENVIRONMENTAL CHEMISTRY EFFICACY

FILE OR REG. NO. _____

PETITION OR EXP. PERMIT NO. 1016-EUP-52(LE) (9G2152)

DATE DIV. RECEIVED 11/17/78

DATE OF SUBMISSION _____

DATE SUBMISSION ACCEPTED _____

TYPE PRODUCT(S): (I,) D, H, F, N, R, S Insecticide on cotton and soybeans

DATA ACCESSION NO(S). 097645

PRODUCT MGR. NO. 12

PRODUCT NAME(S) Larvin 500 Insecticide

COMPANY NAME Union Carbide Corp., Ag. Products Div.

SUBMISSION PURPOSE Experimental Use Permit

CHEMICAL & FORMULATION Ethanimidothioic acid, N, $N^1$-[thiobis[(methylimino)carbonyloxy]] bis dimethyl ester 44%

100.0 Pesticidal Use

For the experimental control of certain lepidopterous pests on cotton and soybeans.

100.1 Application Method/Directions/Rates

100.2 To prepare for spraying, fill tank about one-half full of water. Add LARVIN 500 Insecticide according to use directions and mix thoroughly by mechanical or hydraulic agitation.

Apply when insects first appear. Repeat as needed, usually at 5 to 7 day intervals for most pests. Use sufficient water to obtain adequate and uniform coverage. Low rates are for small plants or early infestations. Higher rates are for larger plants or more established pest populations. For air application, 3 to 5 gallons of spray per acre are suggested.

Physical compatibility of LARVIN 500 with other pesticides is not fully known but it has been used effectively with common insecticides and miticides. Before preparing tank-mix combinations, add a small amount of LARVIN 500 Insecticide to water and then add the other pesticide. DO NOT USE MIXTURES THAT CURDLE, PRECIPITATE OR GREASE. Unstable under highly alkaline conditions.

## SUGGESTIONS FOR EXPERIMENTAL USE

Note: It is a violation of Federal law to use this product in a manner inconsistent with its labeling.

| CROP | INSECT | DOSAGE PER ACRE LARVIN 500 fluid ounces | DOSAGE PER ACRE LARVIN 500 pounds active | SUGGESTED TIMING AND COMMENTS |
|---|---|---|---|---|
| Cotton | Beet armyworm<br>Bollworm<br>Budworm<br>Cabbage looper | 11 to 29 | 0.33 to 0.9 | Use lower rates for early infestations and newly hatched larvae. As worm pressure increased from 15 to 22 ounces (0.45 to 0.675 pounds) per acre. Use maximum rate for emergency reduction of established worms. Apply on schedule basis. Follow good pest management practices. |
| | Cotton Leaf-perforator<br>Pink bollworm | 22 to 29 | 0.67 to 0.9 | Apply as insect infestations occur. Additional treatments may be required. |
| Soybeans | Beet armyworm<br>Corn earworm<br>Green cloverworm<br>Soybean looper<br>Velvetbean caterpillar<br>Fall armyworm | 7.5 to 15 | 0.23 to 0.45 | Apply when insects begin to reach economic damaging levels. Follow good pest management practices. As worm populations just begin to cause economic damage, use lowest rates. Repeat with this rate or increase, depending on infestations. |

NOTE: TO AVOID ILLEGAL RESIDUES IN OR ON:

COTTON: Do not allow livestock to graze fields. Do not apply less than 7 days before harvest.

SOYBEANS: Do not feed forage to livestock. Do not apply less than 28 days before harvest.

100.3 Precautionary Labeling

PRECAUTIONARY STATEMENTS

HANDLING - Wear clean clothing daily. Wash thoroughly after handling and before eating or smoking. Pilots should not assist in handling or loading.

PROTECTION OF ENVIRONMENT - This product is moderately toxic to fish and wildlife. Keep away from ponds, lakes or streams. Do not contaminate bodies of water when cleaning spray equipment or disposing of waste. Do not apply where runoff is likely. Avoid direct application to foraging honeybees or bee hives. Apply late in evening or early morning where honeybees visits fields or orchards.

100.4 Proposed EUP Program

The registrant proposes to use 2107 quarts (2202 pounds a.i.) of Larvin 500 Insecticide in twenty states to control various insect pests on cotton and soybeans. The states and amounts to be used are as follows:

| State | Number of Locations | | Total Number of Acres in Test | | Total Quarts[1] LARVIN 500 | |
|---|---|---|---|---|---|---|
| | Cotton | Soybeans | Cotton | Soybeans | Cotton | Soybeans |
| Alabama | 2 | 2 | 20 | 20 | 96 | 22 |
| Arizona | 2 | - | 20 | - | 48 | - |
| Arkansas | 4 | 2 | 430* | 20 | 288 | 22 |
| California | 2 | - | 20 | - | 72 | - |
| Florida | - | 1 | - | 10 | - | 11 |
| Georgia | 3 | 2 | 30 | 20 | 192 | 22 |
| Illinois | - | 2 | - | 20 | - | 11 |
| Indiana | - | 2 | - | 20 | - | 11 |
| Iowa | - | 1 | - | 10 | - | 6 |
| Kentucky | - | 1 | - | 10 | - | 6 |
| Louisiana | 4 | 2 | 40 | 20 | 256 | 22 |
| Mississippi | 3 | 2 | 30 | 20 | 200 | 22 |
| Missouri | 2 | 2 | 20 | 20 | 108 | 22 |
| Nebraska | - | 1 | - | 10 | - | 6 |
| N. Carolina | 2 | 1 | 20 | 10 | 128 | 11 |
| Oklahoma | 2 | 2 | 20 | 20 | 64 | 22 |
| S. Carolina | 2 | 2 | 20 | 20 | 146 | 22 |
| Tennessee | 2 | 1 | 20 | 10 | 80 | 6 |
| Texas | 3 | 1 | 30 | 10 | 168 | 11 |
| Virginia | - | 1 | - | 10 | - | 6 |
| Total | 33 | 28 | 730 | 280 | 1846 | 261 |

1 Average of 0.63 lbs ai/a/application for cotton and 0.35 lb ai/a/application for soybeans; estimated usage dependent on population dynamics history

* Includes 400-acre pest management program; ie., 0.25 and 0.33 lb ai/a; one application each in mid-June.

100.4.1 Objectives of Proposed Program

The program has the following objectives:

a. To determine effect of LARVIN 500 on lepidoptera insects attacking cotton and soybeans by aerial application on a schedule basis in accordance to IPM practices.

b. To confirm absence of phytotoxicity from proposed label dosage rates at multipe applications of LARVIN 500.

c. To determine magnitude of residues in or on cottonseed, cotton gin trash, soybean forage, seed and straw, and soil from multiple applications of LARVIN 500.

d. To compare effect on maturity, yield, quality and overall growth characteristics on cotton and soybeans with standard products now in commercial use.

e. To record impact on beneficial organisms and other non-target species in cotton and soybean plantings.

f. To determine role of LARVIN 500 in IPM programs on cotton and soybeans.

100.4.2. Duration/Date/Amount Shipped

The EUP program is proposed for two years, with shipment of 2107 quarts (2202 lbs. a.i.) to commence May 1, 1979.

100.4.4 Target

Lepidoptera pests on cotton and soybeans are the primary targets (i.e., Heliothis, Spodoptera and Plusia species). also, on cotton, the effects on other pest (i.e., Bucculatrix) will be determined as well as the effects of Larvin 500 on Plathypena scabra and Anticarsia gemmatalis on soybeans.

100.4.3 Application Procedures

This proposed EUP involves the aerial application of Larvin 500 insecticide on selected 10 acre sires in 13 states to control lepidopterous pests on cotton and in 18 states to control similar pests on soybeans.

On cotton the average application rate is 0.63 lbs. active ingredient per application with 1 to 4 applications, depending on the infestation level. From 11 to 29 ozs. (0.39 to 0.9 lbs. a.i.) of this 44% product will be applied per acre of cotton to control the beet armyworm, bollworm, budworm and cabbage looper. For the cotton leaf perforator and the pink bollworm, 22 to 29 ozs. (0.67 to 0.9 lbs. a.i.) of the product will be applied. In one state, Arkansas, a 400 acre plot will be treated with one application in mid-June at 0.25 and 0.33 lbs a.i.

On soybeans the application rate varies from 7.5 to 15 ozs. (0.23 to 0.45 lbs. a.i.) .1 to 2 applications to control the beet armyworm, corn earworm, green cloverworm, soybean looper, velvet bean caterpillar and fall armyworm.

Protective treatment will begin in July 1979 in the Rio Grande Valley, Texas. This will continue through August and September for both cotton and soybeans. Plot size for each crop is 10 acres/location with 1 to 4 locations/state and crop with the exception of the 400 acre plot in Arkansas where a single application on cotton will be compared with Dipel®.).

100.4.5 Geographical Site Features

| State | Number of Locations | x Acres | x Appl. | Sub-Total[1] (Qts.)+ | Waste (Qts.) = | Total (Qts.) |
|---|---|---|---|---|---|---|
| Alabama (c) | 2 | 10 | 6 | 72 | 24 | 96 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Arkansas (c) | 3 | 10 | 6 | 108 | 36 | 144 |
| c | - | 400 | 1* | 132 | 12* | 144 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Arizona (c) | 2 | 10 | 3 | 36 | 12 | 48 |
| California (c) | 3 | 10 | 3 | 54 | 18 | 72 |
| Florida (s) | 1 | 10 | 2 | 7 | 4 | 11 |
| Georgia (c) | 3 | 10 | 8 | 144 | 48 | 192 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Illinois (s) | 2 | 10 | 1 | 7 | 4 | 11 |
| Indiana (s) | 2 | 10 | 1 | 7 | 4 | 11 |
| Iowa (s) | 1 | 10 | 1 | 4 | 2 | 6 |
| Kentucky (s) | 1 | 10 | 1 | 4 | 2 | 6 |
| Louisiana (c) | 4 | 10 | 8 | 192 | 64 | 256 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Mississippi (c) | 3 | 10 | 8 | 152 | 48 | 200 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Missouri (c) | 2 | 10 | 6 | 84 | 24 | 108 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Nebraska (s) | 1 | 10 | 1 | 4 | 2 | 6 |
| North Carolina (c) | 2 | 10 | 8 | 96 | 32 | 128 |
| (s) | 1 | 10 | 2 | 7 | 4 | 11 |

100.4.5 Geographical Site Features (continued)

| | | | | | | |
|---|---|---|---|---|---|---|
| Oklahoma (c) | 2 | 10 | 4 | 48 | 16 | 64 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| South Carolina (c) | 2 | 10 | 9 | 108 | 38 | 146 |
| (s) | 2 | 10 | 2 | 14 | 8 | 22 |
| Tennessee (c) | 2 | 10 | 5 | 60 | 20 | 80 |
| (s) | 1 | 10 | 1 | 4 | 2 | 6 |
| Texas (c) | 3 | 10 | 7 | 126 | 42 | 168 |
| (s) | 1 | 10 | 2 | 7 | 4 | 11 |
| Virginia (s) | 1 | 10 | 1 | 4 | 2 | 6 |
| | | | | | | 2107 |

33=(c)= Cotton 28=(s)= Soybeans

1 Average of 0.631b ai/a/application for cotton annd 0.35 1b ai/a/application for soybeans.

* One spray @ 0.33 1b ai/a, 250 acres; one spray @ 0.25 1b ai/a, 250 acres; estimated 3 plane loads each. Each of the requirements are based on estimated applications normally used in IPM programs for control of major worm species.

101.0 Chemical and Physical Properties

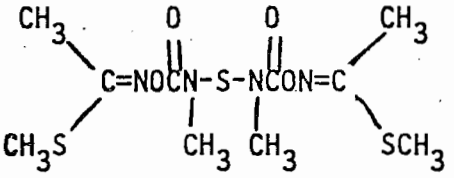
101.1 Chemical Name

Ethanimidothioic acid, N, $N^1$ - [thiobis[(methylimine)carbonyloxy]]bix -dimethyl ester

101.2 Common Name

Larvin 500 Insecticide

101.3 Structural Formula



101.4 Molecular Weight

354.3

101.5 Physical State

a. Form : Crystalline powder
b. Color: White
c. Odor : Slightly sulfurous

101.6 Solubility

| Solvent | Percent Solubility at 25oC |
|---|---|
| Acetone | 0.8% |
| Acetonitrile | 2.0% |
| Ethyl acetate | 0.2% |
| Ethyl ether | <0.1% |
| Methanol | 0.3% |
| Methylene chloride | 15% |
| Water | Approximately 35 ppm |
| Xylene | 0.3% |

102.0 Behavior in the Environment

(As of 12/12/78 Environmental Fate Branch has not completed a review of this proposed EUP, - personal communication with Ron Ney)

103.0 Toxicological Properties

103.1 Mammalian Toxicity [ck. Tox. Branch]

| Species | Test | Results | Test Material |
|---|---|---|---|
| Rat | AcuteOral $LD_{50}$ | $Ld_{50}$ 160 (98.1 -261)mg/Kg. | Technical |
| Rat | " | " 171 (116 -254)mg/Kg. | " " |
| Rat | " | " 180 (83.7 -386)mg/Kg. | " " |
| Mouse | " | " 226 (148 -346)mg/Kg. | " " |
| Guinea pig | " | " 160 (94.3 -271)mg/Kg. | " " |
| Rat | Acute dermal toxicity | " >1600 mg/Kg. | |
| Rabbit | " " | " >3200 mg/Kg. | |

Note: Pages C11 through C11 of Acc. No. 097646 also record test results on Acute inhalation toxicity (rat), Primary eye irritation (rabbit), Primary dermal irritation (rabbit); subchronic oral dosing (rat, mouse, dog), teratogenicity studies (rat), Mutagenicity studies (salmonella); acute mammalian tests on the 75% wettable powder formulated product Toxicity test results of the metabolites of Larvin 500 (methomyl, methomyl sulfoxide, methomyl N - methylol, methomyl oxime and a cetonitrile are also given.

103.1.2 Bird

| Species | Test | Results | Test Material |
|---|---|---|---|
| (a) Bobwhite quail | AcuteOral $LD_{50}$ | 2241mg/Kg. (1525-3264) | Technical |
| (b) Bobwhite quail | Subacute Dietary $LC_{50}$ | >5620ppm | Technical |
| (c) Mallard duck | Subacute Dietary $LC_{50}$ | >5620ppm | Technical |
| (d) Peking duck | Subchronic - 8day Dietary $LC_{50}$ | 1890ppm | Technical grade methomyl (metabolite) |
| (e) Bobwhite quail | " " | 3680ppm | " " " |

103.1.3 Fish

| Species | Test | Results | Test Material |
|---|---|---|---|
| (a) Fathead minnow | Acute 24 hr. $LC_{50}$ | 4mg/Hr. | Technical grade methomyl (metabolite) |
| (b) Bluegill Sunfish | Acute 96 hr. | 0.875ppm | " " " |
| (c) Rainbow trout | " " " | 3.4ppm | " " " |
| (d) Goldfish | " " " | 0.1ppm | " " " |

104.0 Hazard Assessment

104.1 Discusion

Larvin 500 Insecticide is a toxicant proposed for use in controlling lepidopterous pests on cotton and soybeans.

On cotton the expected residues vary from 29 to 120 ppm (leaves and leafy crops) when Larvin 500 is applied at 11 to 29 fluid ounces per acre. As seen on the chart below the expected residues on short rangegrass vary from 55 to 230 ppm for the proposed application rates. This could be a "worse case situation"should the product drift onto any adjacent fields with short grasses.

On soybeans the expected residues vary from 2.8 to 5.5 ppm (pod containing seeds) when the material is applied at 7.5 to 15 fluid ounces per acre. On short grasses the residues would vary from 55 to 108ppm as seen below.

The expected residues ppm on vegetation for the two crops are as follows:

| Crop | Short Range-grass | Long Grass | Leaves & Leafy Crops | Forage Clover Alfalfa | Pod Containing seeds |
|---|---|---|---|---|---|
| Cotton | | | | | |
| @ 0.23 lbs. a.i./acre | 55 | 25 | 29 | 13 | 2.8 |
| 0.9 lbs. a.i./acre | 230 | 105 | 120 | 57 | 11.5 |
| Soybeans | | | | | |
| @ 0.23 lbs. a.i./acre | 55 | 25 | 29 | 13 | 2.8 |
| @0.45 lbs. a.i./acre | 108 | 50 | 57 | 27 | 5.5 |

104.1.1 Likelihood of Exposure to Nontarget Organisms

A number of animals and birds frequent cotton crops according to Wm. Gusey's "Wildlife Utilization of Croplands" (Environmental Conservation Department, Shell Oil Co., Nov. 1972). Among these, deer and rabbits utilize this crop generally the year around, feeding lightly from May through August.

In soybeans, both rabbits and deer feed moderately, mainly in the fall and winter months. The acute oral $Ld_{50}$'s to mammals, as reported by the registrant varies from 160 to 226 mg/Kg. for the guinea pig and mouse, respectively. The dermal toxicity is reported as >1600 and >3200 mg/Kg. for the rat and rabbit, respectively.

The toxicological value of residues in the field do not exceed the potential dietary exposure which is calculated to be 640 and 90 4 ppm for the cited $Ld_{50}$'s (160 to 226 mg/Kg.)

A complete hazard assessment cannot be made at this time in the absence of an evaluation by the Environmental Fate Branch as of 12-12-78 (personal communication to Ron Ney).

104.1.2. Endangered Species Considerations

This assessment cannot be completed until the environmental fate data is reviewed. Aside from possible hazards to aquatic organisms, the experimental uses of this product should not adversely impact upon either mammal or avian species.

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104.1.3 Adequacy of Toxicity Data

See attached validation sheets and conclusion section (107.0). Generally the fish andd wildlife raw data and protocols were not submitted for review and validation.

104.1.4 Additional Data Required

See Conclusions (107.0)

107.0 Conclusions

The Environmental Safety Section does not object the issuance of this EUP. Prior to consideration for registration however, the following requirements must be filled:

(1) Submit all raw data and test protocols for the $LD_{50}$ test for Bobwhite quail, $LC_{50}$ tests for bobwhite quail and mallard duck, bluegill sunfish and rainbow trout.

(2) Submit the results of an aquatic invertebrate toxicity test (Daphnia).

(3) Specific label changes as seen in 107.3 below.

107.3 Labeling

The registrant has indicated stated: "Apply late in evening or early morning where honeybees visit fields or orchards". Does this imply that the product will be applied to orchards?

Because of the aquatic hazards, the following fish and wildlife precaution is suggested:

"This pesticide is toxic to fish and wildlife. Keep out of lakes, streams and ponds. Do not apply where runoff is likely to occur, or when weather conditions favor drift from areas treated. Avoid direct application to foraging honeybees or bee hives. Apply late in evening or early morning where honeybees visit treated fields. Do not contaminate bodies of water when cleaning spray equipment or disposing of wastes."

Raymond W. Matheny
Sec. 3 EEB 12-15-78 Raymond W. Matheny

Jim A Kerzman, Section Head
Sec. 1

Clayton Bushong, Acting Branch Chief
Ecological Effects Branch

## Validation Sheet

Formulation: Technical (UC51762)

Chemical Name: Larvin 500

Validator: Ray W. Matheny

Date: 12/12/78

Test Type: Avian Acute Oral $LC_{50}$

Test I.D. #: NA

Citation: Beavers, J.B. 1978, Wildlife International Ltd. (a letter to Dr. R. G. Haines, Union Carbide Corp., dated October 19, 1978). (within Acc. No. 097646).

Validation Category: Supplemental

| Result: | Species | Test | Confidence Limits |
|---|---|---|---|
| | Bobwhite Quail | Acute Oral 2241mg/Kg $LD_{50}$ | (1525 - 3264) |

Validation Category Rationale: The above test results only are given:

Category Repairability/Rationale: This test can be upgraded to core providing the registrant submit the raw data and test protocol and, upon validation, the $LD_{50}$ values are similar to those above.

Abstract: No raw data has been submitted.

Validation-Sheet

Formulation: Technical (UC51762)

Chemcial Name: Larvin 500

Validator: Ray W. Matheny

Date: 12/12/78

Test Type: Avian Subacute Dietary $LC_{50}$

Test I.D. #: NA

Citation: Beavers, J.B., 1978, Wildlife International Ltd., (a letter to Dr. R.G. Haines, Union Carbide Corp., dated October 19, 1978). (within Acc. No. 097646).

Validation Category: Supplemental

| Result: Species | Test | Confidence Limits |
|---|---|---|
| Bobwhite Quail | Subacute Dietary $LC_{50}$ >5620 | |
| Mallard Duck | Subacute Dietary $LC_{50}$ >5620 | |

Validation Category Rationale: The above test results only are given.

Category Repairability/Rationale: These tests may be upgraded to core providing the registrant submit raw data and test protocol and, upon validation, the test results are similar to those above.

Abstract: No raw data has been submitted.

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