#109702

FILE #109702

Date Out EFB: 20 JUL 1984

TO: Tim Gardner/Adam Heyward
Product Manager 17
Registration Division
TS-767

FROM: Samuel M. Creeger, Chief
Review Section No. 1
Exposure Assessment Branch
Hazard Evaluation Division

Attached please find the environmental fate review of:

Reg./File No.: 10182-80 and -68

Chemical: Cypermethrin

Type Product: Insecticide

Product Name: Ammo 2.5 EC

Company Name: FMC Corporation

Submission Purpose: Request waiver from field dissipation study of soil degradation products.

ZBB Code: Other

ACTION CODE: 450

Date in: 7/11/84

EFB # 4434, 4435

Date Completed: 7/20/84

TAIS (level II)	Days
63	2.5

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

1

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Attached please find the environmental fate review of:

Reg./File No.: 10182-64 and -65

Chemical: Cypermethrin

Type Product: Insecticide

Product Name: Ammo 2.5 EC

Company Name: FMC Corporation

Submission Purpose: Request waiver from field dissipation study of soil degradation products.

ZBB Code: Other

ACTION CODE: 450

Date in: 7/11/84

EFB # 4436, 4437

Date Completed: 7/20/84

TAIS (level II)	Days
63	2.5

Deferrals To:

_____ Ecological Effects Branch

_____ Residue Chemistry Branch

_____ Toxicology Branch

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1.0 INTRODUCTION

FMC Corp. has submitted a response to previous EAB review of their applications for registration of Ammo 2.5 EC (Cypermethrin, as a. i.) as an insecticide.

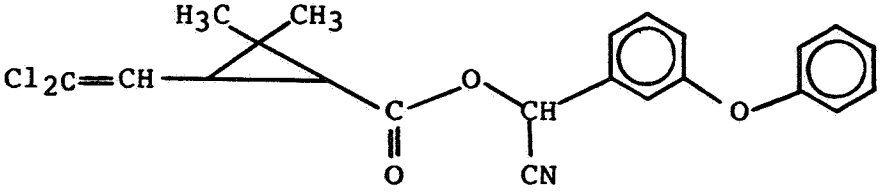
EAB, in the review dated 4/29/82, concluded that the field dissipation study was inadequate since the soil was analyzed for residues of cypermethrin *per se* and not for the major degradation products. However, EAB recommended for conditional registration for use on cotton provided the registrant submit data on the formation and decline of degradates of cypermethrin under field conditions.

EAB, in the review dated 5/4/83, concluded that the registrant must provide either data on the formation and decline of degradation products under field conditions or submit an adequate justification as why such analyses were not done.

1.1 Chemical

Common name: (±)-a-cyano-3-(phenoxyphenyl)methyl (±)-*cis*, *trans*-3-(2,2-dichloroethenyl)-2,2-dimethyl cyclopropanecarboxylate.

Chemical structure:



Formulation: Ammo 2.5 EC is formulated with 30.6% active ingredient (*cis*/*trans* ratio: 55% (±) *cis* and min. 45% (±) *trans*. Formulation contains 2.5 lbs. active ingredient per gallon.

2.0 DIRECTIONS FOR USE

See previous EAB reviews for specific use directions.

3.0 DISCUSSION

FMC Corp. has submitted reasons why a field dissipation study monitoring formation and decline of degradation

products is not necessary. Their (edited) rationale is based on the following:

3.1 Numerous aerobic soil metabolism studies in the laboratory have shown that cypermethrin generally degrades with a half-life of 1 to 4 weeks. In field studies cypermethrin was found to degrade with a half-life of 4 to 12 days. It can be seen that, for cypermethrin, the laboratory studies either give a good prediction or actually underestimate the rate at which this insecticide degrades in the field.

3.2 Studies have shown that ester cleavage is the major initial degradation process in the aerobic degradation of cypermethrin in soil. The products are cis- and trans-3-(2,2-dichlorovinyl)-2,2-dimethylcyclopropanecarboxylic acid (DCVA) and a-cyano-3-phenoxybenzyl alcohol. The latter compound is readily degraded to 3-phenoxybenzaldehyde which in turn is readily oxidized to 3-phenoxybenzoic acid (3-PB Acid). Both DCVA and 3-PB Acid are also major degradation products of permethrin (a close analog of cypermethrin). Aerobic soil metabolism of both cypermethrin and permethrin show that DCVA and 3-PB Acid are in turn degraded to carbon dioxide. However, in one clay soil 3-PB Acid had a half-life of 12 weeks rather than 1 to 4 weeks. Thus rapid degradation of cypermethrin detected under field conditions provides a very strong indication that rapid mineralization of degradation products will also occur in the field.

3.3 Field rotation crop studies have shown that when representative crops are planted in soils treated up to 30 days earlier with 0.5 lb a.i./A they contained no residues of DCVA or 3-PB Acid when harvested at maturity. This is excellent confirmation that under field conditions residues of DCVA and 3-PB Acid will not persist in the soil.

The ready degradation of DCVA in soil is also confirmed by the field rotational crop studies carried out with permethrin. No residues of this compound were detected in crops planted more than 30 days after treatment.

3.4 Toxicity studies with aquatic and mammalian species indicate that the environmental impact of the degradates of cypermethrin is negligible compared to that of cypermethrin.

FMC Conclusion: Cypermethrin invaribly degrades faster under field conditions than it does in the laboratory. The degradates are transient and have been shown in the laboratory to mineralize rapidly. Residues of neither cypermethrin nor its degradation products could be detected in various rotational crops planted 30 days after soil treatment. This confirms that degradates do not persist in soil.

3.5 FMC aslo included additional studies in this submission. Data reviewed here are included in EPA Accession No. 253700.

3.5.1 Dissipation of Cypermethrin Residues in Soil. M. A. Tilka. April 29, 1982. FMC Study No. RAN 0046. Reference 1.

Procedure

Test plots in three sites, New York, Arkansas, and California, were treated with a single application of Ammo 2.5 EC at rate of 2 lb. a.i./A. Soil characteristics are given in Table 1. At specified intervals soil core samples were taken from 0-6 and 6-12 inch soil depths. Soil samples were frozen until analysis.

Analysis of soil samples included extraction with acetone: hexane solution, cleanup by gel permeation and column chromatography. Analysis of extracted residues was by GLC equipped with an electron capture detector.

Results

Rainfall and temperature data are presented. Recovery levels averaged 81 $^{+}$ 11% (range 58% - 100%) from samples spiked at 0.02, 0.5 and 2.0 ppm fortification.

The author reports that cypermethrin residues declined rapidly over the first 14 days of the test then the rate of degradation slowed over the remaining period. There appeared to be no significant movement of residues into the 6-12 inch soil depth. See Tables 2-5.

Conclusion

This study is deficient in that the soil samples were not analyzed for the residues of the two major soil degradation products, DCVA and 3-PB Acid. Also, the application rate was not according to the directions included on the label (for cotton application or any subsequent registration application).

However, the data show that the parent compound, cypermethirn, degrades in soil under field conditions.

3.5.2 FMC included data on the formation and decline of the two soil degradation products of cypermethrin. Soil samples from two locations included in the field dissipation study reviewed above (Section 3.5.1) were analyzed for DCVA and 3-PB Acid.

Dissipation of Dichlorovinyl Acid and m-Phenoxybenzoic Acid Residues in soil. G. R. Kinnee. June 20, 1984. FMC Report No. RAN-0129. Reference 2.

Procedure

Soil samples from the California and New York test plots in the study reviewed above (in 3.5.1) and held in storage were extracted with methanol:water solution partitioned with methylene chloride, acid hydrolyzed then derivatized with pentafluorobenzyl bromide. Extracts were cleaned up with column chromatography. Analyses for DCVA and 3-PB Acid were by capillary GLC equipped with electron capture detector.

Results

The author reports the method sensitivities for cis and trans-DCVA and 3-PB Acid were 0.05 ppm each. The method detectability was 0.01 ppm for the isomers and 0.02 ppm for 3-PB Acid. The method recoveries averaged 77%, 78% and 79% for cis-DCVA, trans-DCVA and 3-PB Acid, respectively.

The author reports that, in the 0-6 inch soil core, the maximum residues in the New York soil were 0.11 ppm total DCVA (cis- + tans-) and 0.09 ppm 3-PB Acid at day of application. Residue levels declined thereafter. In the California soil maximum level of total DCVA residues (0.06 ppm) in the 0-6 inch soil core were found at day of application. At day of application the residue level of 3-PB Acid was 0.06 ppm in the 0-6 inch soil core. This level increased to 0.19 ppm by day 29 then declined thereafter. See Table 6.

In both soils, residues in the 6-12 inch soil core were less than method sensitivity but equal to or greater than method detectability.

Conclusion

EAB conludes that this study is incomplete. It appears that the soil samples were held for almost 2 years in frozen storage before analysis. Therefore, storage stability data are needed for cis- and trans-DCVA and 3-PB Acid for a period approximating the length of time the soil samples were held in storage. In order for this study to be acceptable, the storge stability data must show that no significant degradation of these residues occur during the storage period.

4.0 CONCLUSION

4.1 EAB agrees with the registrant that cypermethrin degrades in soil maintained under aerobic conditions in the laboratory. However, EAB concluded that the half-life ranged from 2 to 8 weeks. The data also indicate that degradation products DCVA and 3-PB Acid which formed further mineralized to CO_2 in soil under laboratory conditions.

EAB agrees with the registrant that cypermethrin degrades rapidly in the field with a half-life of 4 to 12 days.

EAB agrees that the field study with rotational crops show no detectable residues in the crops when planted up to 30 days after treatment. However, EAB does not agree with the conclusion that lacking residues in rotational crops mans that residues are not present in the soil.

4.2 EAB does not consider the data from laboratory studies sufficient to waive the field data requirement for formation and decline of degradation products of cypermethrin under field conditions.

EAB notes that permethrin has the same degradation products after the a-cyano-3-PB Acid degrades to 3-PB Acid. EAB could consider data from the field dissipation study for permethrin as acceptable to satisfy the question on cypermethrin had that study analyzed for DCVA and 3-PB Acid. However, EAB review of that study showed that no analyses were conducted for degradation products.

4.3 The study submitted for formation and decline of DCVA and 3-PB Acid is incomplete. It appears that the soil samples were frozen for approximately 2 years before analyses. Before this study can be accepted, storage

stability data will be necessary to show that residues of DCVA and 3-PB Acid are stable over a storage period approximating the time these samples were stored under similar conditions.

5.0 RECOMMENDATION

EAB does not consider the registant's reason for not conducting an additional field dissipation study adequate. Therefore, EAB considers this data requirement still unfilled.

EAB can recommend for conditional registration of additional uses for cypermethrin provided the registrant agree to conduct a field dissipation study in two areas of typical use and analyze the soil for formation and decline of the cypermethrin degradation products.

In lieu of this study, the registrant can submit storage stability data covering a period approximating the time period the soil was stored frozen in the study submitted. To be acceptable, the data must show that residues of DCVA and 3-PB Acid are stable over the storage period.

Clinton Fletcher
Review Section No. 1
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Hazard Evaluation Division

Cypermethrin EAB review

Page_____ is not included in this copy.

Pages 9 through 13 are not included.

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____ Identity of product impurities.

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____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

X FIFRA registration data.

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