

US EPA ARCHIVE DOCUMENT

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: LaRocca/Heyward, PM # 15
Registration Division (H7505C)

From: Akiva Abramovitch, Section Chief
Chemical Review Section 3
Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief
Environmental Fate & Ground Water Branch/EFED (H7507C)

Henry Jacoby 5/4/93

Attached, please find the EFGWB review of...

DP Barcode:	D179734, D181933		
Common Name:	Esfenvalerate	Trade name:	Asana
Company Name:	E.I. du Pont		
ID #:	MRID# 352-503, 352-515		
Purpose:	submission of anaerobic soil metabolism and leaching/adsorption/desorption data		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
insecticide	627, 575	92-1087, 92-1301	

**STATUS OF STUDIES IN THIS PACKAGE:
REQUIREMENTS:**

STATUS OF DATA

Guideline #	MRID	Status ¹
162-2	423968-01	A
163-1	423502-01	A

	Status ²
161-1	S
161-2	S
161-3	S
162-1	S
163-1	S
164-1	S
165-4	P

¹Study Status Codes: A=Acceptable U=Upgradeable C=Ancillary I=Invalid.
²Data Requirement Status Codes: S=Satisfied P=Partially satisfied N=Not satisfied R=Reserved.



ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Deluse/Dobbins, PM # 52
Reregistration Division (H7505C)

From: Akiva Abramovitch, Section Chief
Chemical Review Section 3
Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief *Henry Jacoby 5/4/93*
Environmental Fate & Ground Water Branch/EFED (H7507C)

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¹Study Status Codes:

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1. CHEMICAL:

chemical name: (S)-cyano(3-phenoxyphenyl)methyl-(S)-4-chloro- α (1-methylethyl)benzeneacetate

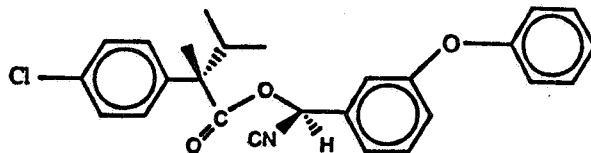
common name: Esfenvalerate

trade name: Asana[®]

structure:

CAS #: 51630-38-1

Shaughnessy #: 109301



2. TEST MATERIAL: discussed in DERs

3. STUDY/ACTION TYPE:

submission of anaerobic soil metabolism and mobility studies

4. STUDY IDENTIFICATION:

Gaddamidi, V. and Bookhart, S.W. Anaerobic Soil Metabolism of Esfenvalerate. performed and submitted by E.I. du Pont de Nemours and Co. Wilmington, DE rec'd EPA 7/13/92 under MRID# 423968-01

Merritt, R.L. Leaching Studies of SD 43775 and Selected Reference Pesticides by Soil Thin-Layer Chromatography. performed by Nelson Laboratories, Stockton, CA. submitted by E.I. du Pont de Nemours and Co., Inc. received EPA 6/10/92 under MRID# 423502-01.

5. REVIEWED BY:

Typed Name: E. Brinson Conerly-Perks
Title: Chemist, Review Section 2
Organization: EFGWB/EFED/OPP

E.B. Conerly-Perks
4/8/93

6. APPROVED BY:

Typed Name: Akiva Abramovitch
Title: Section Head, Review Section 3
Organization: EFGWB/EFED/OPP

Akiva Abramovitch

7. CONCLUSIONS:

DATA REQUIREMENTS FROM PREVIOUS REVIEWS:

In a previous review, EFGWB had noted a contradiction between the accepted hydrolysis study and the dark control in the accepted aqueous photolysis study. The hydrolysis study indicates stability, whereas the dark control in the aqueous photolysis study yields a half-life of 13.8 days. Attached material explains the discrepancy satisfactorily. In the case of the hydrolysis study, the starting material was essentially all active isomer (S,S') which underwent racemization during the experimental period, but was otherwise untransformed. All isomers were measured and reported. In the case of the photolysis study, only active isomer was reported, and the other isomers which had arisen through the racemization process were not taken into account. This deficiency is removed.

A fish bioaccumulation study does not fulfill the requirement. It deviates from more typical fish bioaccumulation studies in several major ways:

- 1) analysis was done only on whole fish; no data were provided re edible parts or viscera.
- 2) the test species was carp.
- 3) the method of confirmation of residue identities was TLC, rather than a more definitive method such as GS or HPLC
- 4) the test material underwent [unavoidable] transformation in solution.

The study may become acceptable if the following conditions are met:

- a) if additional data can be provided demonstrating how the material taken up partitions between edible and visceral portions of the fish
- b) if it can be demonstrated that the TLC method used for confirmation is adequate in this case
- c) if satisfactory comparison can be made between carp and bluegill.

bcp

Esfenvalerate 92-1087, 92-1301

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DATA BASE ASSESSMENT

CHEMICAL PROCESSES -- can be satisfied by data on the racemic mixture

hydrolysis -- satisfied -- MRID# 409993-03 reviewed for the Phase IV project (EBC, 3/20/91) indicates stability at pH 5, 7, and 9

photolysis in water -- satisfied -- data on racemic mixture -- half-life of 6 days at pH 5 vs a dark control with (hydrolytic) half-life of 13.8 days. The apparent discrepancy between the hydrolysis study and this one is discussed above.

leaching/adsorption/desorption -- a current study is discussed in this review. The requirement was previously satisfied by data on the racemic mixture -- aged and unaged via column leaching studies -- immobile in sand, sandy loam, loam, and silt loam; 88% was found in the top 3 cm after leaching with 20 cm of water. The study discussed in this review supports these conclusions.

PROCESSES WITH A BIOLOGICAL COMPONENT -- must be tested with the S,S-isomer

soil photodegradation -- satisfied for the S,S-isomer -- the study indicates stability to photodegradation on soil. In an unacceptable study previously reviewed, the half-life of [racemic] phenoxyphenyl labelled compound was 14-28 days on sandy loam soil.

aerobic soil metabolism -- satisfied for the racemic mixture and the S,S-isomer -- in a silt loam soil the isolated S,S-isomer degrades with a $t_{1/2}$ of 75 days. When followed as part of the racemic mixture this same isomer has a $t_{1/2}$ of 95 days under otherwise similar conditions.

anaerobic soil metabolism -- although previous reviews RESERVED this data requirement for the S,S-isomer, the applicant has submitted a study discussed in this review -- in a previous study on the racemic mixture, the $t_{1/2}$ was similar to that during aerobic metabolism (75 - 90 days). The available data from two aerobic metabolism studies and the anaerobic metabolism study are consistent in suggesting that metabolism will not be a major mode of degradation. The study currently submitted is acceptable to fulfill the requirement for anaerobic soil metabolism. The anaerobic half-life is estimated to be 77 days, with CO₂ as the only significant degradate (ca. 36% of applied at 30 days anaerobic incubation).

terrestrial field dissipation -- satisfied for the S,S-isomer -- discussed below. A first $t_{1/2}$ of 14 days is indicated -- $t_{1/2}$ of the racemic mixture 25 days in sandy loam (AZ), 34 days in clay loam (OK), 54 days in silt loam (LA), and 54 days in sandy loam (AL).

confined accumulation in rotational crops -- no longer an EFGWB data requirement -- NOT SATISFIED for the S,S-isomer -- residue from the racemic mixture detected at levels to 0.061 ppm.

field accumulation in rotational crops -- no longer an EFGWB data requirement -- NOT SATISFIED for the S,S-isomer -- no residues from the racemic mixture (lod 0.01 ppm)

fish bioaccumulation -- NOT SATISFIED for either the racemic mixture or the S,S-isomer, but may be upgraded by additional information. The additional information must provide a comparison between carp and blugill patterns of accumulation and depuration.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES: see also DER

DATA EVALUATION REVIEW 1

- I. Study Type: soil metabolism, aerobic and anaerobic, 162-1, 162-2
II. Citation:

Gaddamidi, V. and Bookhart, S.W. Anaerobic Soil Metabolism of Esfenvalerate. performed and submitted by E.I. du Pont de Nemours and Co. Wilmington, DE received EPA 7/13/92 under MRID# 423968-01

- III. Reviewer:
Typed Name: E. Brinson Conerly-Perks
Title: Chemist, Review Section 3
Organization: EFGWB/EFED/OPP

E.B. Conerly-Perks
3/30/93

- IV. Conclusion:

The study is acceptable to fulfill the requirement for anaerobic soil metabolism. The anaerobic half-life is estimated to be 77 days, with CO₂ as the only significant degradate (ca. 36% of applied at 30 days anaerobic incubation).

- V. Materials and Methods:

ABSTRACT

A soil metabolism study of [chlorophenyl(U)-¹⁴C]esfenvalerate was conducted using Hanford sandy loam soil from Oakdale, CA, to determine the rate and pattern of degradation under anaerobic and aerobic conditions.

Each vessel containing moist sandy loam soil was treated with [¹⁴C]esfenvalerate to obtain 2.5 ppm concentration in the soil. This concentration of esfenvalerate was equivalent to an application rate of 5 lb/ai/A which is 10 times the recommended seasonal label use rate of Asana[®] XL insecticide.

Day-0 soil samples were taken as soon as practically possible following treatment with the esfenvalerate test solution. The test vessels were stored in the dark at ca. 25°C and purged continuously with humidified air. After 30 days of initial treatment, anaerobic conditions were established in half of the test systems by flooding with water, purging the system with nitrogen gas, and sealing. The remaining test systems were maintained under aerobic conditions for a total period of 90 days from the day of treatment. Anaerobic soils were taken at the intervals of Day 37, 44, 60, and 90 days after treatment with the test substance. Aerobic soils were sampled at Day 0 and at the intervals of 30, 37, 44, 60, and 90 days after treatment. ¹⁴CO₂ was evolved during aerobic and anaerobic incubation phase were captured in 1 N sodium hydroxide traps and quantitated.

After 90 days of soil incubation (30 days aerobic and 60 days anaerobic), esfenvalerate comprised 33.5% (0.84 ppm) of applied radioactivity. ¹⁴CO₂ was the only degradation product of esfenvalerate identified in this study and comprised 36.2% (0.91 ppm) in Day 60 anaerobic samples. Esfenvalerate degraded under anaerobic conditions with first half-life of 77 days.

The evolution of ¹⁴CO₂ increased from 30.7% (0.77 ppm) in the Day-30 aerobic samples to 49.7% in the Day-90 aerobic samples. Esfenvalerate was degraded at a faster rate under aerobic conditions with a first half-life of 37 days and comprised 25.6% (0.64 ppm) of applied radioactivity in Day-90 samples.

materials:

test compound -- Esfenvalerate uniformly labelled with ¹⁴C in the chlorophenyl group (spec. act 66.3 μCi/mg, radiopurity 97.5%). The test solution consisted of chlorophenyl labelled and unlabelled esfenvalerate in acetone at a specific activity of 26.109 μCi/mg (57,962 dpm/μg).

methods:

test system -- Hanford sandy loam soil (Oakdale, CA) was collected from the top 6-inch depth. It was passed through a 2-mm sieve and stored in a moist state at ambient temperatures in a greenhouse until use. Soil was dosed at 2.5 ppm (1.25 μg/50 gm dry weight) which represented ca. 10x the recommended seasonal label use rate.

Page _____ is not included in this copy.

Pages 6 through 10 are not included.

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 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.
 - FIFRA registration data.
 - The document is a duplicate of page(s) _____.
 - The document is not responsive to the request.
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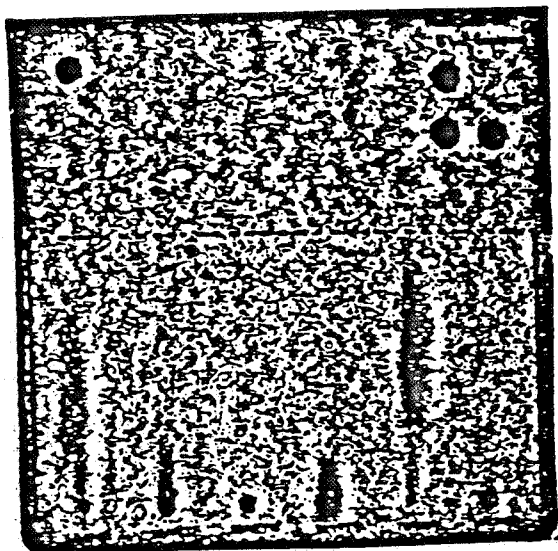
The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

mobile in Hanford and Iowa soils and very mobile in Walla Walla and Tujunga soils. The mobility classifications are based on the parameters listed in Table 4 (attached).

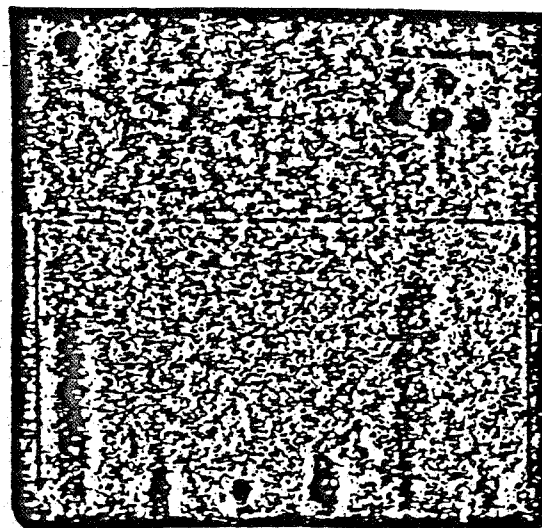
VII. Reviewer's Comments:

- 1) EFGWB does not usually encourage the submission of soil TLC studies, since batch adsorption/desorption and column leaching studies provide information which is more useful for modeling. However, the data requirement has been previously fulfilled, and the current study is consistent with it. The study was apparently submitted to provide information for a surface water run-off assessment.
- 2) The report is somewhat brief, lacking details related to the test and reference compound solution preparation, but this does not invalidate the study.

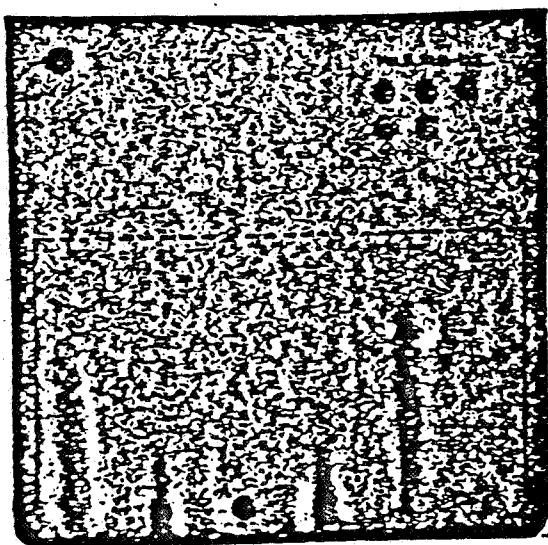
VIII. CBI Information Addendum: attached



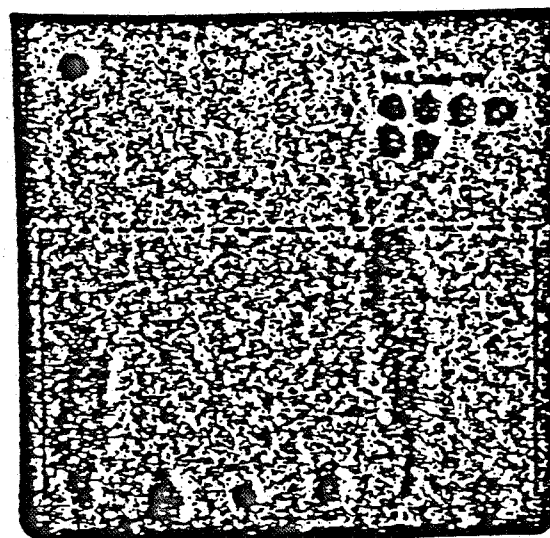
Walla Walla



Hanford



Iowa



Tujunga

Figure 1. POLAROID COPIES OF EACH SOIL RADIOAUTOGRAM

12
Data II

2 of 4

-21-102-77

Results and Discussion:

SD 43775 as well as SD 3417 are immobile in all soils tested, compared to SD 7859 and SD 11831, which have low mobility in all soils tested, SD 15418 with intermediate mobility in Hanford and Iowa soils and slightly higher mobilities in the Walla Walla and Tujunga soils, and SD 9129, which is classified as mobile in Hanford and Iowa soils and very mobile in Walla Walla and Tujunga soils. The mobility classifications are based on the parameters listed in Table 4.

Table 4. PESTICIDE MOBILITY CLASSIFICATION FOR SOIL TLC PLATES

Frontal R _f Range	0.0-0.09	0.10-0.34	0.35-0.64	0.65-0.89	0.90-1.0
Description	Immobile	Low	Intermediate	Mobile	Very Mobile

RIM/lsg

R. L. Merritt
R. L. Merritt, Chemist

1) References:

Soil Survey, East Stanislaus Area by USDA Soil Conservation Service in cooperation with California Agricultural Experiment Station, September, 1964.

Soil Survey, Walla Walla County, Washington, by USDA Soil Conservation Service in cooperation with Washington Agricultural Experiment Station, February, 1964.

Soil Survey, Guthrie County, Iowa, by USDA Soil Conservation Service in cooperation with the Iowa Agricultural and Home Economics Experiment Station, April, 1974.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
FENVALERATE, ALSO ESFENVALERATE (S,S-ISOMER)

Last Update on April 5, 1993

[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Photolysis (161-2, -3, -4)

[S] Water: 41 DAYS

[] :
[] :
[] :

[V] Soil :>28 DAYS IN SUN OR ARTIF.

[] Air :

Aerobic Soil Metabolism (162-1)

[V] 65 DAYS IN SdIM

[V] 96 DAYS IN SiIm (IN ANOTHER

[] SiIm, 8 MONTHS)

[V] 25 DAYS IN SdIm IN ARKANSAS

[V] 34 DAYS IN ClIm IN OKLAHOMA

[V] 54 DAYS IN SdIm IN ALABAMA

[V] FOR ESFENVALERATE, 75 DAYS IN SILT LOAM

Anaerobic Soil Metabolism (162-2)

[V] RATES SIMILAR TO AEROBIC

[V] FOR ESFENVALERATE, 77 DAYS (CO2 ONLY IDENTIFIED DEGRADATE)

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Anaerobic Aquatic Metabolism (162-3)

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Aerobic Aquatic Metabolism (162-4)

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Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
FENVALERATE, ALSO ESFENVALERATE (S,S-ISOMER)

Last Update on April 5, 1993

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Long-Term Soil Dissipation (164-5)

[]
[]

Accumulation in Rotational Crops, Confined (165-1)

[V] PARENT AND METABOLITES ARE NEAR OR BELOW DETECTION
[] LIMITS WHEN PLANTED 30- AND 120-DAYS AFTER APPL.

Accumulation in Rotational Crops, Field (165-2)

[V] FENVALERATE NOT DETECTED IN BEET ROOT AND TOP SAM-
[] PLES PLANTED IMMEDIATELY AFTER 10 APPL. @ .2 LB AIA

Accumulation in Irrigated Crops (165-3)

[]
[]

Bioaccumulation in Fish (165-4)

[S] RAINBOW TROUT BCF: EDIBLE 407 X (90% PARENT) DEPURATION SLOW
[S] ESFENVALERATE: CARP WHOLE BODY BCF 3080-3650 X; DEP. T1/2 7-8 D.

Bioaccumulation in Non-Target Organisms (165-5)

[S] HIGHLY TOXIC TO BEES
[]

Ground Water Monitoring, Prospective (166-1)

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Ground Water Monitoring, Small Scale Retrospective (166-2)

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Ground Water Monitoring, Large Scale Retrospective (166-3)

[]
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Ground Water Monitoring, Miscellaneous Data (158.75)

[]
[]
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Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
FENVALERATE, ALSO ESFENVALERATE (S,S-ISOMER)

Last Update on April 5, 1993

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Comments

Fenvalerate was stable at pH'S 5,7,9 for 93.5 hours at 38 C.
Fenvalerate adsorbed strongly to glass, teflon, and polypropylene.

Soil Koc = 50d
Koc = 5300 (U)

References: EAB FILES
Writer : pjh