FENVALERATE EAB REVIEW dated 2/1/86 pp 144-153

Shaughnessy No: 109301

EAB Log-Out Date: FEB - 1 1986

Signature: [signature] for SMC

To: George LaRocca
Product Manager #15
Registration Division (TS-767C)

From: Emil Regelman Acting Chief
Review Section 3
Exposure Assessment Branch
Hazard Evaluation Division (TS-769C)

Attached please find the EAB review of...

Reg./File# : 201 - URI

Chemical : Fenvalerate

Type Product: Insecticide

Product Name: Pydrin

Company Name: Shell Oil Co.

Purpose: Review of (1) Aerobic soil metabolism study using the old (present) compound [redacted] Add radishes, collards to label; (3) Change/remove crop rotation restriction label statement and (4) New rotation crop statement

ACTION CODE: 166
From: 9/10/85 (# 5858)
TO: 12/18/85 (# 6121)

EAB # (s): 5822, 5858, 5879; 5459, 5919 and 6121

Date Completed: 1/31/86

TAIS CODE: 61; 65

Monitoring requested: ______

Total Reviewing Time: 8.0 Days

Monitoring voluntarily: ______

Deferrals To:

____ Ecological Effects Branch

____ Residue Chemistry Branch

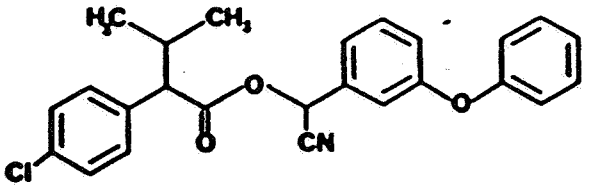
____ Toxicology Branch

1. CHEMICAL: Common name: Fenvalerate

Chemical name: 4"-Chloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy)phenylacetonitrile

Trade name(s): Pydrin, SD 43775 (Shell Chemical Co.); Belmark (Shell International Chemical Co.); Sumicidin, Sumitly, Sumipower (Sumitomo Chemical Co.).

Structure:



Formulations: Pydrin (SD 43775) formulations 2.4 lb ai/gal EC and 4 lb ai/gal ULV concentrate (Shell Chemical Co.).

Physical/Chemical properties:
Empirical formula: $C_{25}H_{22}ClNO_3$
Molecular weight: 419.9
Physical state: Clear viscous yellow or brown liquid at 23° C; mild chemical odor.
Density: 1.17 g/ml at 23°C
Vapor pressure: 1.1×10^{-8} mm/hg at 25°C
Solubility: in water, <1 mg/l at 20°C
in acetone, chloroform, cyclohexane, ethanol, and xylene, >1 g/kg
in hexane, 155 g/kg at 23°C

Stability: Stable to heat and sunlight
Stable to moisture
More stable in acid (pH 4) than alkaline solution

2. TEST MATERIAL: phenoxy-phenyl labeled ^{14}C fenvalerate

3. STUDY/ACTION TYPE: [redacted] to register radishes and collards, and 3) to change crop rotation label statement.

145

4. STUDY IDENTIFICATION: 1) Lee, P.W., S.M. Stearns, and W.R. Powell. June, 1985. Comparative aerobic soil metabolism [redacted] Report MO-RIR-22-011-85. Shell Development Company. Modesto, California. Accession No. 258842.

2) Previously Reviewed and Accepted (9/28/81)

Lee, P.W. Aerobic and anaerobic soil metabolism of ^{14}C chlorophenyl SD 43775. Report No. TIR-106-79.

5. REVIEWED BY:

John Jordan, Ph.D.
Microbiologist
EAB/HED/OPP

Signature: John Jordan

Date: 2/4/86

6. APPROVED BY:

Emil Regelman
Chief (acting)
Review Section #3, EAB/HED/OPP

Signature: [signature]

Date: FEB 14 1986

7. CONCLUSIONS:

The aerobic soil metabolism study referenced in section 4 (study identification) was submitted for comparison of the registrants' [redacted]

In a previous report the EAB reviewer was concerned that the proposed [redacted]

The registrant stated that there is no difference in the fate of the [redacted] the registrant must complete the field dissipation study and present an analysis of all the data to show no significant difference.

Acceptable Studies

1) Aerobic soil metabolism
2) Leaching adsorption/desorption
3) Anaerobic soil metabolism
4) Hydrolysis
5) Soil photolysis
6) Fish accumulation
7) Field dissipation
8) Rotation crops

Partially Acceptable

1) Aqueous photolysis (Photo-products required)
2) Terrestrial field dissipation using the SS isomer in three locations required (now in progress)

Data Gaps:

1) Partial, photolysis in water -- photoproducts identification/ quantification required

2) Additional field dissipation study using [redacted] three locations required -- now in progress

Crop Rotation restriction:

12 months required from last application to plant root crops that are not on the label--Additional crop rotation study required to consider removal of label restriction, e.g., a root crop cold study can be repeated using table beets for a comparison with the hot study which used beets.

Root crops on the label, and all grain and leafy vegetable rotation crops, may be planted immediately following last application.

8. RECOMMENDATIONS:

[redacted]

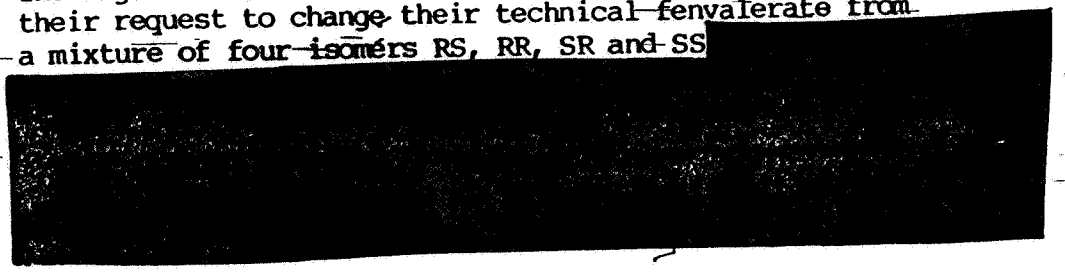
B. The rotation crop restriction statement must be amended to include the information in the conclusion under section (7), rotation crop restriction.

C. Registration of radishes and collards are contingent upon receipt of satisfactory photo-products identification and quantification. Photolysis (aqueous) is only partially satisfied, and a partial data gap exists.

9. BACKGROUND:

A. Introduction:

The registrant, Shell Oil Company, submitted data in support of their request to change their technical fenvalerate from a mixture of four isomers RS, RR, SR and SS



The registrant claims there are no environmental fate differences between the racemic mixture of Pydrin, 2.4 EC, and the single SS isomer 1.9 EC Pydrin. Shell, Inc. submitted aerobic soil metabolism data comparing the proposed SS isomer and the present racemic compound. The comparative study, Lee, P . W., S. M Stearns, and W. R. Powell, 1985, and a previous aerobic metabolism study are cited in the Study Identification, point No. 4.

The same registrant also 1) requested the addition of radishes and collards to the label, 2) proposed removal of the crop rotation restriction for root crops, and, 3) requests were received from R.D. to review the proposed label and to revise it in line with the data base.

B. Directions for Use:

Fenvalerate is a contact insecticide for use on a variety of field, vegetable, and orchard crops, ornamentals, forests, terrestrial noncrop sites, and domestic and commerical indoor and outdoor sites. Application rates range from 0.05 to 0.75 lb ai/A. Fenvalerate may be formulated with petroleum distillates. Single active ingredient formulations consist of 2.4 lb ai/gal EC, 8.6% impregnated materials, and 0.01% RTU. Fenvalerate is generally surface applied by ground equipment or aircraft. The 2.4 lb ai/gal EC is a restricted use pesticide and applicators must be certified or under the direct supervision of applicators certified to apply fenvalerate. Fenvalerate is highly toxic to bees.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

See attached review dated November 27, 1985

11. COMPLETION OF ONE-LINER:

One-liner has not been initiated

12. CBI APPENDIX:

The complete package contains hard copy which must be considered as CBI.

DYNAMAC CORPORATION

ENVIRONMENTAL FATE AND EXPOSURE ASSESSMENT OF FENVALERATE

Final Report

REVIEW AND EVALUATION OF DATA SUBMITTED SUBSEQUENT TO THE INITIAL REVIEW

Contract No. 68-01-6679

NOVEMBER 27, 1985

Submitted to:
Environmental Protection Agency
Arlington, VA 22202

Submitted by:
Dynamac Corporation
Enviro Control Division
The Dynamac Building
11140 Rockville Pike
Rockville, MD 20852

STUDY I:

Lee, P.W., S.M. Sterns, and W.R. Powell, June, 1985. Comparative aerobic soil metabolism of SD 43775 (racemic) and SD 47443 (A-Alpha). Report MO-RIR-22-011-85, Shell Development Company. Modesto, California. Accession No. 258842.

CONCLUSION:

Metabolism-Aerobic Soil:

1. [^{14}C]SD 47443 (radiopurity >99%), a compound containing only the SS isomer of 4'''-choloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy)phenylacetonitrile (fenvalerate), degraded with a half-life of 75 days in silt loam soil moistened to ~81% of field capacity and incubated in the dark at 25° + 1°C. Degradates included $^{14}CO_2$ (21.5% of applied at a day 90), 4'''-chloro-(2'''-isopropyl) phenylaceto-2-(3'-hydroxyphenoxy) phenylacetonitrile, 4'''-chloro-(2'''-isopropyl) phenylaceto-2- (3'-phenylacetonitrile, 4'''-chloro-(2'''-isopropyl) phenylaceto-2-(3'phenoxy phenylacetamide, 4-(hydroxyphenoxy) benzoic acid, and 3-phenoxybenzoic acid (each <2% of the applied).

   This study fulfills EPA Data Requirements for Registering Pesticides by providing information on the aerobic metabolism of the SS isomer, SD 47443, in soil.

   MATERIALS AND METHODS:

   Either phenoxyphenyl-labeled [^{14}C] fenvalerate (Pydrin, SD 43775, radiopurity >99%, specific activity 36.0 mCi/mg), which is a racemic mixture [redacted] of 4'''-chloro-2'''-isopropyl) phenylaceto-2-(3'-phenoxy)phenylacetonitrile, or phenoxyphenyl-labeled [^{14}C]SD 47443 (MO 70616, radiopurity >99%, specific activity 35.0 mCi/mg), which is ~98 the SS isomer of 4'''-chloro-(2'''-isopropyl) phenylaceto-2-(3'-phenoxy)phenylacetonitrile, were added at 20.2 and 4.96 ppm, respectively, to flasks of silt loam soil 36% sand, 48% silt, 16% clay, 1.3% organic matter, pH 5.7, CEC 7.6 meg/100 g). The soil samples were moistened to ~81% of field capacity and mixed throughly, and the flasks were connected to a continuous air flow system 150 ml/hour); humidified air passed over the treated soil, then through an ethanolamine CO_2 trap. The treated soils were incubated in the dark at 25 ± 1°C, and sampled 0, 14, 30, 60, and 90 days posttreatment.

The ethanolamine was analyzed directly for $^{14}CO_2$ using LSC. The soil samples were extracted three times with methanol by shaking at room temperature; the methanol extracts were combined, concentrated by evaporation, and mixed (~1:1) with a saturated sodium chloride solution. This mixture was partitioned three times with chloroform. The chloroform extract was dried over anhydrous sodium sulfate, concentrated and separated using two-dimensional TLC on silica gel plates developed in hexane:acetone:acetic acid (25:25:1), toluene:ether: acetic acid (75:25:1), or hexane:ether (20:1). The TLC plates were visualized by autoradiography; radioactive areas were scraped and identified by GC with an electron capture detector and by HPLC. Extracted soil samples were analyzed for bound radioactivity using LSC following combustion.

REPORTED RESULTS:

[^{14}C] 47443, a compound containing only the SS isomer of 4''-chloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy) phenylacetonitrile, degraded with a half-life of 75 days (r^2 = 0.95) in silt loam soil moistened to ~81% of field mosture capacity (Table 1). In contrast, the SS isomer, when applied to the soil as part of racemic mixture of of the SS, RR, RS, and SR isomers of 4''-chloro- (2'''-isopropyl) phenyl-aceto-2-(3'-phenoxy)phenylnitrile (fenvalerate, SD 43775), degraded with a half-life of 95 days (r^2 = 0.99) under similar conditions.

After 90 days of incubation, 21.5% of the applied [^{14}C]SD 47443 was evolved as $^{14}CO_2$ and 27.5% was bound to the soil (Table 2). Degradates, each detected (detection limit not specified) at <2% of the applied, were identified as:

(1) 4''-chloro-(2'''-isopropyl)phenylaceto-2-(3'-hydroxyphenoxy) phenylactonitrile.

(2) 4'''- chloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy)phenyl-acetamide.

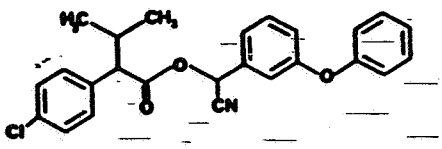
(3)-phenoxybenzoic acid, and 4-(hydroxyphenoxy)benzoic acid (no quantitative data provided) (Figure 1).

DISCUSSION:

1. Detection limits and recoveries from fortified soil samples were not reported.

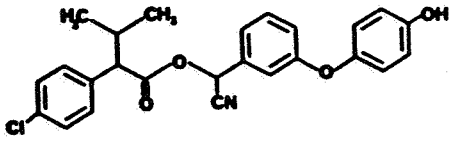
2. Quantitative data were not provided for the degradates. However, the concentration of each degradate of the SS isomer (SD 47443) may have been less than 0.1 ppm (2% of 5 ppm applied).

3. Although the study was not of sufficient duration to establish the half-life of the entire racemic mixture, it did establish the half-life of the isomer of interest (SS).



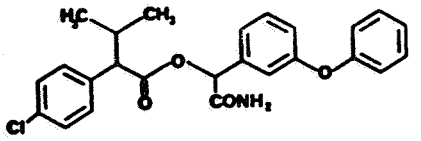
4''-Chloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy)phenylacetonitrile

(All isomers; SD 43775, SD 47443)



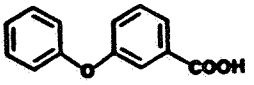
4''-Chloro-(2'''-isopropyl)phenylaceto-2-(3'-hydroxyphenoxy)phenylacetonitrile

(SD 48838)



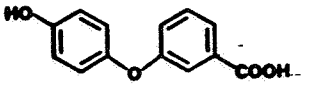
4''-Chloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy)phenylacetamide

(SD 47117)



3-Phenoxybenzoic acid

(SD 44607)



4-(Hydroxyphenoxy)benzoic acid

(SD 46116)

Figure 1. 4''-Chloro-(2'''-isopropyl)phenylaceto-2-(3'-phenoxy)phenylacetonitrile and its degradates.