

MARCH 9, 1988

DYNAMAC
CORPORATION

FENVALERATE ADDENDUM

Final Report

**Task 1: Review and Evaluation of
Individual Studies**

**Task 2: Environmental Fate
Assessment**

Contract No. 68-02-4250

MARCH 9, 1988

Submitted to:
Environmental Protection Agency
Arlington, VA 22202

Submitted by:
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Rockville, MD 20852

INTRODUCTION

Fenvalerate is a contact insecticide for use on a variety of field, vegetable, and orchard crops, ornamentals, forests, terrestrial noncrop sites, and domestic and commercial indoor and outdoor sites. Application rates range from 0.05 to 0.75 lb ai/A. 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.

DATA EVALUATION RECORD

FENVALERATE

STUDY 1

CHEM 109301

Fenvalerate

BRANCH EAB

FORMULATION--00--ACTIVE INGREDIENT

FICHE/MASTER ID 40443801

CONTENT CAT 01

Stevenson, I.E. 1987. Photodegradation of [chlorophenyl(U)-¹⁴C]DPX-GB800 in water at pH 5. Du Pont Report No. AMR-868-87. Prepared and submitted by E.I. du Pont de Nemours and Company, Inc., Wilmington, DE.

SUBST. CLASS = S

DIRECT RVW TIME = 10

(MH) START DATE

END DATE

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CONCLUSIONS:

Degradation - Photodegradation in Water

This study is acceptable and fulfills EPA Data Requirements for Registering Pesticides by providing information on the photodegradation of fenvalerate under artificial light in an aqueous pH 5 solution.

SUMMARY OF DATA BY THE REVIEWER:

Chlorophenyl-labeled [¹⁴C]fenvalerate (DPX-GB800, radiochemical purity 97%), at 0.0015 ppm, degraded with a registrant-calculated half-life of 6 days in sterile aqueous pH 5 buffered solutions maintained at 25 ± 1°C and irradiated continuously for 7 days using a filtered artificial light source (xenon burner). The intensity of the artificial light source was equivalent to 96%

of the corresponding energy of natural sunlight (637 watts/m²) measured at noon on a midsummer day in Wilmington, Delaware. At 7 days posttreatment, fenvalerate comprised 47.1% of the recovered radioactivity. Major degradates identified were 4-chloro- α -(1-methylethyl)benzeneacetic acid (CPIA; maximum concentration 27.2%), 4-chloro- β -(1-methylethyl)- α -(3-phenoxyphenyl)-benzenepropanenitrile (decarboxy-fenvalerate; maximum concentration 12.6%), and rac-cyano(3-phenoxyphenyl)methyl 4-chloro- α -(1-methylethyl)benzeneacetate (racemic fenvalerate; maximum concentration 21.6%). Volatiles accounted for up to 0.47% of the recovered radioactivity during the study. In the dark control, [¹⁴C]fenvalerate degraded with a registrant-calculated half-life of 13.8 days; 71.6% of the recovered radioactivity was undegraded fenvalerate at 7 days posttreatment.

DISCUSSION:

Additional solutions (prepared as described previously) were exposed in water-jacketed (25 \pm 1°C) borosilicate photolysis vessels with quartz lids on a roof of a building in Wilmington, Delaware. The results obtained were used by the registrant for qualitative, comparative purposes only. The following results were obtained: the concentration of parent material declined with time; 4-chloro- α -(1-methylethyl)benzeneacetic acid was the main degradate formed; radioactive decarboxy-fenvalerate and other stereoisomers were formed in lesser amounts; and no significant CO₂ or radioactive volatile organic degradates were formed.

MATERIALS AND METHODS

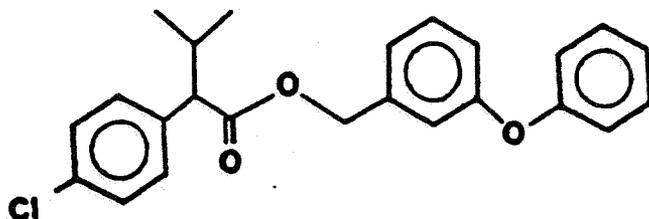
MATERIALS AND METHODS:

Chlorophenyl-labeled [^{14}C] fenvalerate (DPX-GB800 radiochemical purity 97%, specific activity 128 Ci/mg, Sumitomo Chemical Co., Ltd.) was added at 0.0015 ppm to sterile aqueous buffered solutions adjusted to pH 5. Aliquots (100-mL) of the treated solutions were placed in silanized borosilicate Erlenmeyer flasks which were maintained at 25 $^{\circ}\text{C}$ by circulating water. The samples were irradiated continuously in a Suntest apparatus (Heraeus GmbH, Hanover, Germany) equipped with a xenon burner, filter, and a parabolic reflector (Figure 1). The integrated intensity 9 inches below the lamp (300-800 nm) was 612 watts/m 2 ; the registrant stated that this was equivalent to 96% of the corresponding energy on a clear midsummer day in Wilmington, Delaware. One of the Erlenmeyer flasks containing the 0.0015 ppm solution was attached to a gas collection system (air-flow rate unspecified) containing ethylene glycol and 0.1 N sodium hydroxide solution. The remaining flasks were closed with borosilicate glass stoppers. For dark controls, similar solutions were placed in stoppered flasks wrapped in aluminum foil and incubated in the dark at 25 $^{\circ}\text{C}$; volatiles were not measured. The irradiated and dark control solutions were sampled at 0, 1, 2, 3, 5, and 7 days posttreatment. The trapping solution was changed at each sampling interval.

Aliquots of the Day 0, 1, and 2 samples were analyzed for total radioactivity by LSC. The irradiated and dark control solutions were extracted three times with hexane and the extracts were pooled. The aqueous solution was acidified to pH 3.5 extracted three times with ethyl acetate, and the resulting extracts were pooled. The glassware was rinsed several times with small portions of methyl cyanide to remove radioactivity that had become adsorbed to the glass. These rinsings were pooled and the radioactivity in the pooled solutions and in the extracted aqueous solution was measured by LSC. The organic solutions were combined and concentrated, and the radioactivity was measured using LSC. The combined organic concentrate was analyzed by TLC on silica gel plates using two developing solvent systems: hexane:ether (100:5) and hexane:acetone:concentrated acetic acid (25:25:1), in addition to analysis by HPLC. Unlabeled standards were co-chromatographed with the organic concentrate (TLC), or immediately before the organic concentrates (HPLC). The TLC plates were scanned and autoradiographed. Radioactive areas were located by autoradiography, scraped, and quantified using LSC.

DETAILED TEST METHODOLOGY DELETED FROM PAGES 7 THROUGH 23

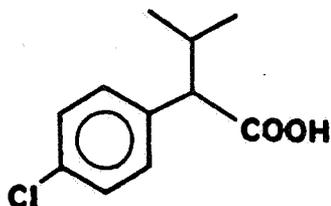
APPENDIX
STRUCTURES OF FENVALERATE AND ITS DEGRADATES



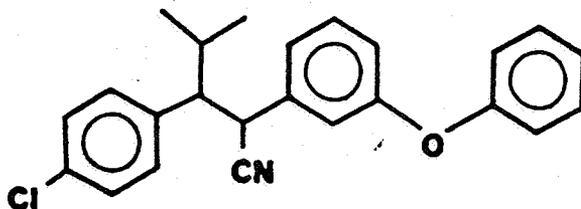
Cyano(3-phenoxyphenyl)
4-chloro- α -(1-methylethyl)-
benzeneacetate
(Fenvalerate, DPX-GB800)

and

rac-cyano(3-phenoxyphenyl)-methyl
4-chloro- α -(1-methylethyl)-
benzeneacetate
(Racemic fenvalerate)



4-chloro- α -(1-methylethyl)-
benzeneacetic acid
(CPLA)



4-chloro- β -(1-methylethyl)- α -(3-phenoxyphenyl)-
benzenepropanenitrile
(Decarboxy-fenvalerate)