

US EPA ARCHIVE DOCUMENT

Date Out:EFB:

NOV 17 1981

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To: Product Manager 23 Mountfort
TS-767

From Dr. Willa Garner *lll*
Chief, Review Section No. 1
Environmental Fate Branch

Attached please find the environmental fate review of:

Reg./File No.: 707-EUP-OI

Chemical: Acifluorfen, ethyl ester of

Type Product: Herbicide

Product Name: RH-8817 2EC

Company Name: Rohm & Haas

Submission Purpose: EUP - use on soybeans

ZBB Code: Sec. 5

ACTION CODE: 705

Date in: 9/1/81

EFB # 930

Date Completed: NOV 17 1981

TAIS (level II) Days

Deferrals To:

52

10

Ecological Effects Branch

Residue Chemistry Branch

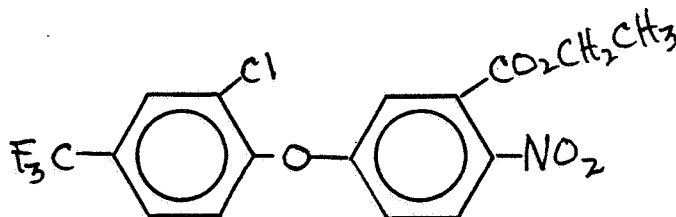
Toxicology Branch

1.0 Introduction

Chemical Name and Type Pesticide: acifluorfen, ethyl ester of, 2-nitro-5(2-chloro-4-trifluoromethylphenoxy)-benzoate, herbicide.

Trade Name: RH-8817 2EC Herbicide

Chemical Structure:



The applicant requests a experimental use permit (EUP) for the new herbicide RH-8817 (ethyl ester of acifluorfen) for use on soybeans. The program will involve 700 pounds of RH-8817 active ingredient on 1,020 acres. See attached sheets for more details.

2.0 Directions for Use

See attached pages

3.0 Discussion of Data

3.1 HYDROLYSIS

- 3.1.1 Hydrolysis Study of RH-8817, C.K. Hofmann, 25 May 1979, Technical Report No. 34H-79-15, Tab. #17, Section D, Acc, #070260.

Experimental Procedure

Aqueous solutions of ¹⁴C-RH-8817 at 1 ppm and 0.1 ppm were buffered at pH 4, 7, and 10. Solutions of each concentration were incubated in the dark for 30 days at 22°C and 45°C. Samples taken on day 0, 1, 2 (pH 10 samples only), 3, 7, 14, 21, and 30 were analyzed for radioactivity by LSC and degradation products by TLC.

Results

At pH 10, ¹⁴C-RH-8817 hydrolyzed quite readily to ¹⁴C-RH-5781, the corresponding acid. At ambient temperature (22°C), the half-life was 1.4 days. At 45°C, the half-life decreased to 0.3 days.

Acifluorfen

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At pH 7, slight hydrolysis to RH-5781 occurred at 45°C (half-life 70 days), but not at ambient temperature.

At pH 4, no hydrolysis of ^{14}C -RH-8817 occurred at either temperature.

The fate of ^{14}C -RH-8817 in this experiment was dependent on both pH and temperature factors. When degradation due to hydrolysis did occur, the only product formed was the acid, ^{14}C -RH-5781. The sodium salt of RH-5781 is RH-6701, whose environmental fate has been well established.

Conclusion

Hydrolysis of RH-8817 occurs at alkaline pH, but very little at neutral pH.

The study satisfies this data requirement.

3.2 AEROBIC AND ANAEROBIC SOIL METABOLISM

- 3.2.1 RH-8817 Laboratory Soil Metabolism Study, W.M. Peirson, 18 September 1979, Technical Report No. 34H-79-21, Tab #12, Section D, Acc. #070259.

Experimental Procedure

Two radioactive preparations of RH-8817 (^{14}C labeled in the trifluoromethyl group and uniformly in the nitrophenyl ring) along with ^{14}C ring labeled 2,4-D as a reference compound were incorporated at 1 and 10 ppm in silt loam and sandy loam soils. These soils were incubated in flasks which were supplied with oxygen and which were equipped to trap evolved carbon dioxide. Carbon dioxide traps were analyzed periodically for ^{14}C -RH-8817, and for total CO_2 to compare respiratory microbial activity of treated and untreated soils. Analysis of soils in in Table 1.

Fortifications of ^{14}C -RH-8817 and ^{14}C -2,4-D in silt loam soil were made at 1 ppm to examine degradation in sterile soil and in flooded, anaerobic soil.

At intervals, samples of each soil treatment were removed, radioassayed and extracted. Extracted residues were characterized by thin layer chromatography.

Acifluorfen

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Results

After 182 days under aerobic conditions, 12% and 7.5% of the ^{14}C label had mineralized to $^{14}\text{CO}_2$ in silt loam and sandy loam soils, respectively. No appreciable difference in soil respiratory activity (as measured by CO_2 trap titrations) was observed in treated soils compared to untreated control soils.

Metabolite characterization of the soil sample revealed a rapid decline of RH-8817 occurred with a corresponding increase of RH-5781 (the acid hydrolysis products), polar products and minor degradation products. The half-life of RH-8817 in aerobic silt loam soil was about 18 days and in sandy loam silt soil it ranged from 31.7 to 38.3 days. See Table 2, 3, and 4.

Residues in anaerobic soil and water extracts consisted primarily of polar material. RH-8817 levels averaged 10% in soil and 1.3% in water at the conclusion of this test.

RH-8817 degrades to RH-5781, the sodium salt of which is RH-6201 (Blazer herbicide), a previously well-studied pesticide.

Conclusions

RH-8817 degraded fairly rapidly ($T_{1/2} = 18, 38$ in silt and sand, respectively) aerobically in silt and sandy loam soils. There were not enough data points to determine $T_{1/2}$ anaerobically.

The study satisfies this data requirement.

3.3 ROTATIONAL CROP STUDY

- 3.3.1 Rotation Crop Studies in Soil Previously Incorporated with ^{14}C -RH-8817, R.J. Anderson, Technical Report No. 34H-77-16, 20 June 1977, Tab #11, Section D, Acc. #070259.

Experimental Procedure

Two representatives of three different crop types (leafy vegetable, root and grain planted into the same soil which had received the preplant incorporation treatments described in the reference. The soil involved at the Newtown Farm is in area M-1 and is characterized in Table 10. It is a Lawrenceville silt loam in an area affected by 0-3% slopes. The reference study was the preplant incorporated application of the two radiolabel forms to soil used for growing soybeans. The rotated crops were planted the next growing season (7 months).

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Samples of the plants were taken at various stages of growth and at the normal harvest time for the particular crop. These samples were analyzed by combustion and radioassay to determine the presence of any radioactive residues.

Results

In most of the samples, the CF₃ labeled version of the RH-8817 molecule was in evidence while the CO version was not. See Tables 5 and 6. The consistent absence of residues from the ¹⁴C labeled compound possibly indicated the loss of the carbonyl carbon. The nature of the trace radioactive residue from CF₃ was not identified. While Tables 7-9 show a measurable uptake of radioactivity, the maximum values were very low. In soil samples, the residues for both forms of the labeled RH-8817 declined by about one-third.

Conclusion

Radio labeled RH-8817 yielded only very small quantities of residues in various rotation crops.

The study satisfies this data requirement and supports a seven month rotational crop interval.

3.4 LEACHING

- 3.4.1 Laboratory Leaching Study with Soil Aged RH-8817 Residues, W.M. Peirson, Technical Report No. 34H-79-17, 25 July 1979, Tab #14, Section D, Acc. #070260.

Experimental Procedure

The objective of this study was to quantitatively determine the movement of residues of soil-aged RH-8817 through a soil column when subjected to daily one-half inch "rain-falls" over a period of 47 days.

Preparations of ¹⁴-RH-8817 (trifluoromethyl labeled and uniformly nitrophenyl ring labeled) and ¹⁴C ring labeled 2,4-D (reference compound) were fortified to silt loam soil at 1 ppm and aerobically aged for 30 days. After aging, duplicate 95 g quantities of each fortified soil were placed on the top of 12 inch columns of silt loam soil and one-half inch of water was added to the top of each column every working day for 47 calendar days. The leachates were collected each day and every third sample radioassayed. After 47 days, the soil columns were cut into segments and ¹⁴C residues determined by combustion radioassay. Table 11 shows analysis of test soil.

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Results

The first detectable ^{14}C residues in leachates occurred on day 14 for the ^{14}C -RH-8817 CF_3 columns at an extremely low level (0.0004 ppm calc. as RH-8817) and reached a high of only 0.0015 ppm. Leachate ^{14}C residues were not detected in ^{14}C -RH-8817 NPR columns until day 35 (0.0003 ppm) and never exceeded 0.0003 ppm. No ^{14}C residues were detected in ^{14}C residues were detected in ^{14}C -2, 4-D leachates. The residues remaining in the top two inches of the soil columns averaged 93.9% for ^{14}C -RH-8817 CF_3 , 94.8% for ^{14}C -RH-8817 NPR, and 100.0% for ^{14}C -2,4-D based on total recovered ^{14}C in the soil. The total ^{14}C leached from the columns averaged 1.0% for the CF_3 label and 0.07% for the NPR label based on total recovered ^{14}C . See Tables 12 and 13.

Conclusions

Soil-aged RH-8817 residues did not leach appreciably using soil columns.

- 3.4.2 Soil TLC Mobility Study with RD-8817, J.D. Fisher, Technical Report No. 344-79-27, 11 Oct. 1979, Tab #15, Section D, Acc. # 070260.

Experimental Procedure

The relative mobility of RH-8817 was determined through the use of soil thin layer chromatography plates. Glass plates were coated with thin uniform layers of five distinct soil types. The test compound and two reference compounds (herbicides 2,4-D and propanil) were spotted separately at one end and then each plate was developed in water by ascending chromatography. The extent of each compound's movement was determined by autoradiography. RH-8817 and the reference compounds were all ^{14}C -uniformly labeled in the halogenated phenyl ring. Table 14 shows the soil analysis.

Results

The summarized results are presented in Table 15. The Rf values for RH-8817 were 0 in all cases indicating no movement was observed in any soil type.

This procedure allows direct assessment of a compound's mobility relative to other established compounds'. Helling, who developed this technique, suggested arbitrary classes of mobility based upon TLC Rf values. In this system, RH-8817 would be classified as immobile (Class 1) and suggests that the herbicide should not leach in agricultural applications.

Acifluorfen

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Conclusion

There was no movement of RH-8817 in a TLC mobility study when tested in five soil types.

These two leaching studies satisfy this data requirement.

4.0 Executive Summary and Conclusions

RH-8817 hydrolyzed rapidly ($T_{1/2} = 1.4$ days) at pH 10, very slightly ($T_{1/2} = 70$ days) at pH 7, and not at all at pH 4. Degradation in aerobic soil was fairly rapid ($T_{1/2} = 18$ to 38 days). Rotational crop studies showed a very small amount (0.081 ppm) of uptake of the radioactive label. Leaching studies with soil columns showed very little leaching (0.0003 ppm, radioactive) and with TLC, no movement was detected.

5.0 Recommendation

EFB concurs with the proposed use under the experimental use permit for soybeans.

The rotational crop study will support a crop rotation interval of seven months.

Herbert L. Manning

Herbert L. Manning, Ph.D.

Review Section #1

EFB/HED