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TO: T. Luminello  
Product Manager 50  
Registration Division (H7505C)

FROM: Michael Barrett, Acting Chief *Michael R Barrett*  
Ground-Water Section  
Environmental Fate & Ground-Water Branch/EFED (H7507C)

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

Attached, please find the EFGWB review of:

Reg./File #: \_\_\_\_\_

Chemical Name: Acifluorfen

Type Product: Herbicide

Company Name: Rhone-Poulenc Ag Company and BASF Corporation

Purpose: Review final report of small-scale prospective ground-water monitoring study.

Date Received: 7-11-89 ACTION CODE: 660

Date Completed: 11-16-89 EFGWB #(s): 90701

Monitoring study requested: X Total Review Time: 5 days

Monitoring study voluntarily:     

- Deferrals To: \_\_\_\_\_ Biological Effects Branch  
                  \_\_\_\_\_ Science Integration & Policy Staff, EFED  
                  \_\_\_\_\_ Non-Dietary Exposure Branch, HED  
                  \_\_\_\_\_ Dietary Exposure Branch, HED  
                  \_\_\_\_\_ Toxicology Branch, HED

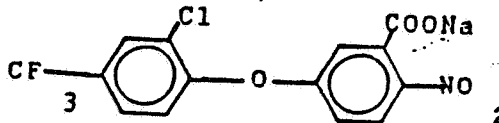
1. CHEMICAL:

Chemical name: Sodium-5-{2-chloro-4-(trifluoromethyl)-phenoxy}-2-nitrobenzoate

Common name: acifluorfen-sodium salt

Trade name: Blazer/Tackle

Structure:



2. TEST MATERIAL:

Not Applicable.

3. STUDY/ACTION TYPE:

Review of final report of small-scale prospective ground-water monitoring study for Acifluorfen-sodium.

4. STUDY IDENTIFICATION:

Title: A Small Scale Prospective Field Dissipation and Groundwater Monitoring Study With Acifluorfen-Sodium, the Active Ingredient of TACKLE Brand Herbicide and BLAZER Brand Herbicide.

Author: Frank Norris, Ph.D

Submitted by: Rhone-Poulenc Ag Company  
Environmental Chemistry Department  
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for: Rhone-Poulenc Ag Company and  
BASF Corporation, Agricultural Chemicals

Identifying No.: 000359-00708

Action Code: 660

Accession Number: 41172801

Record Number: 249075

Date Sent to EFED: 7-31-89

5. REVIEWED BY:

Elizabeth Behl  
Hydrogeologist  
OPP/EFED/EFGWB/Ground-Water Section

Signature: Elizabeth Behl

Date: 11/13/89

6. APPROVED BY:

Michael R. Barrett  
Acting Chief  
OPP/EFED/EFGWB/Ground-Water Section

Signature: Michael R. Barrett

Date: 11/16/89

## 7. CONCLUSIONS:

The objective of this review is to assess the final report of the small-scale prospective ground-water study of acifluorfen in Wisconsin. Acifluorfen sodium was applied at the maximum use rate (0.84 kgai/ha) on soybeans in an irrigated sand soil. The study was conducted under worst case conditions. Rainfall was 150 percent of the historical average for the study period, and was especially high in the first 2 months. In order to grow soybeans on this soil it was necessary to irrigate during the growing season. Irrigation was discontinued at the end of August.

Herbicide residues were detected in soils in the 0 - 0.3 m and 0.3 - 0.6 m sampling intervals. Residues were detected in ground water at levels of 1 to 46 ppb. Residues were also found in soil-water samples collected in lysimeters. One well was installed upgradient, and contained no pesticide residues. The ground-water detects were uniformly distributed in the field and pesticide residues appear to have been transported down gradient. Residues were detected in the 3-month sampling interval, and continued to increase until April 1989 (10 months after application), when the final sample was collected.

Rhone-Poulenc believes that residues reached ground water at this site because of "preferential flow or channelling through the coarse sand subsoils". They conclude that residues can reach ground water at other sites where "significant preferential flow occurs in subsoils". The Ground Water Section believes that sufficient data were not presented to substantiate this claim. Furthermore, the pattern of downward transport of pesticides observed in this study are typical of that expected in many agricultural fields and in soils other than the sandy soils present at the study site.

Results of the prospective monitoring study indicate that pesticide residues are reaching ground water by typical mechanisms under the worst case conditions represented by this site. The report is acceptable with amendments to be provided by Rhone-Poulenc.

## 8. RECOMMENDATIONS:

Representatives of Rhone-Poulenc should submit the following information:

- 1) More information to document claims about preferential flow including, where available: textural analyses of soils, measurements of soil hydraulic conductivity, location of soil samples.
- 2) Maps showing location of all monitoring or sampling points and clearly differentiating between them. This should include cluster wells, lysimeters, and soil borings. Maps may indicate new wells or soil cores taken in separate phases of sampling.
- 3) Revise Tables 6a-e so that they indicate which samples were duplicate analyses, which were composited samples, and individual analyses of non-composited samples, when available.

## 9. BACKGROUND:

Tackle, manufactured by RPAC, is a selective post-emergence herbicide registered for use on soybeans and rice at application rates of 0.125 to 0.75 # ai/acre since 4/86. Blazer, manufactured by BASF, is a selective pre- and post-emergence herbicide for a wide spectrum of annual broadleaf weeds and grasses in soybeans, peanuts, and other large-seeded legumes.

Data submitted as part of the Ground-Water-Data-Call-In (GWDCI) indicate that acifluorfen is both persistent and mobile. The Environmental Fate One-liner (8/27/86) states that the free acid readily leaches in soil column experiments, but the degradation products are considered not to leach. Samples are usually analyzed for the acifluorfen-sodium (the salt), acifluorfen (free acid), the amino metabolite (LS-82-5281), and the desnitro product (LS-82-5283).

Data reviewed for the Pesticides in Ground Water Database: Interim Report (1988) indicate that wells in 2 states have been analyzed for acifluorfen as a result of normal agricultural use. Acifluorfen has not been detected in these samples. EPA determined that the registrant should conduct a small-scale prospective monitoring study based on results of the GWDCI (9/15/87). Findings of pesticide residues in ground water during the prospective study, prompted the registrant to agree to conduct small-scale retrospective monitoring studies at different locations. The Registrant has indicated that they would restrict the sale of acifluorfen products in 8 counties in Wisconsin and 2 counties in New York.

## 10. DISCUSSION:

On October 11, representatives of Rhone-Poulenc (Karen Shearer, Russell Jones, and Frank Norris) and BASF (Jack Graham, and Karen Blundell) met with Chris Rice and Tom Luminello of OPP's Generic Chemical Support Branch and Elizabeth Behl and David Wells of OPP's Ground Water Section to discuss the final report on the prospective ground water monitoring study, and the on-going small-scale retrospective monitoring studies. Rhone-Poulenc responded to a series of questions by EFGWB related to the final report and agreed to supply additional information. Representatives of Rhone-Poulenc presented results of the first four months of monitoring at five retrospective monitoring sites.

Comments on the final report of the small-scale prospective study are discussed below in two groups: 1) comments related to preferential flow and 2) comments related to data presentation.

### Preferential Flow

In their final report, Rhone-Poulenc asserts that residues reached ground water at this site because of "preferential flow or channelling through the coarse sand subsoils". They conclude that residues can reach ground water at other sites where "significant preferential flow occurs in subsoils". The term "preferential flow" means that the normal transport of water

through media is short circuited, and instead flows through such features as worm holes, root holes, soil fractures, and highly permeable lenses or other zones in localized areas. Microscale inhomogeneities or anisotropies in the unsaturated zone do not result in preferential flow.

To support the hypothesis that "preferential flow" systems control ground water recharge and unsaturated zone flow at this site, a substantial number of soil samples would have to be analyzed. Furthermore, observations of such features as worm holes, root holes, and well developed soil structure that would significantly affect water flow should be documented. These features are quite common in an agricultural environment regardless of soil type. Therefore, the Ground Water Team asserts that incidences of contamination observed at monitoring study sites arising from the presence of these typical features cannot be dismissed.

Ascribing the source of contamination to "preferential flow or channeling" without supplying information as to field scale heterogeneity or the supposed source (geologic or anthropogenic) of alleged "channels" is purely hypothetical. The data presented to support this theory are not in any way conclusive. There are a myriad of other possibilities that may explain the detection of pesticides in ground water and soil water samples, but not in soil cores. Possibilities include the following:

- a) Detection limits of soil (10 ppb) and water (1 ppb) samples are not the same. Lysimeter samples indicate that most pesticide concentrations in soil water are below 10 ppb. Detection limit is allegedly more sensitive than originally thought, if this is not the case, residues may be present but not detected.
- b) Effect of compositing samples may mask actual detections that occur, but vary at the field scale because of soil heterogeneity or other scale effects.
- c) Soil sampling intervals are relatively insensitive. (0.0-0.3 m, 0.3-0.6 m, and 0.6-1.2 m)
- d) Sampling schedule may have been inadequate to track the movement of this highly mobile chemical.

The Ground Water Section needs information about soil heterogeneity in order to resolve the question of "preferential flow". Rhone-Poulenc agreed (meeting 10/11/89) to supply additional information about soil sampling and analysis. No measurements of saturated or unsaturated hydraulic conductivity were made in the field; therefore, an assessment of anisotropy is not possible. Sediment sieve analyses were performed, and this information will be provided to the Ground water Section.

### Data Presentation

Presentation of data should include summaries of data collected rather than just daily information. For longer periods of time, daily information is unwieldy and trends can be better seen graphically (in plots of concentrations versus time for example). The daily data is important and should be included as well as data summaries.

The site map (Figure 3) does not differentiate between locations of cluster wells, lysimeters, and soil borings. This information should be clearly shown on one map. Additional maps should indicate wells that were installed in separate phases of sampling.

Apparently (as discussed in meeting, 10/11/89) some of the soil samples were analyzed before compositing and other samples were composited, and duplicate samples were analyzed. This is not indicated in data tables (Table 6 a-e), and should be clarified.

It is not clear what happened on dates when the weather recording equipment failed (Table 3)? Did failure occur because of a large storm? What is the significance of dates when "nominal irrigation" is greater than measured rainfall plus irrigation?

The summary report states that "Trace levels of 0.002 to 0.016 ug/g (ppm) of the parent herbicide found in the 0.3 to 0.6 m depth." The initial concentration in the surface interval is reported to be 0.094 ppm. The reported concentration of pesticide in soil from that interval is 0.016 ppm, or 17 percent of the initial concentration.