Chemical Code: **129016** Date Out: 6/1/93

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: Robert Taylor, PM #25
Registration Division (H7505C)

From: Elizabeth Behl, Section Chief
Ground Water Technology Section
Environmental Fate & Ground Water Branch/EFED (H7507C)

E Behl

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

Henry Jacoby 6/2/93

Attached, please find the EFGWB review of...

DP Barcode:	D166604, D182848, D189831, D190325.		
Common Name:	flumetsulam (DE-498)	**Trade name:**	Broadstrike
Company Name:	DowElanco Corporation		
ID #:	062719-EEG		
Purpose:	Review of various submissions relating to two small-scale prospective ground-water monitoring studies. Includes partial progress reports for ground-water monitoring studies in IN and NC. (draft review completed 5/28/93)		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Herbicide	100, 101, 117	91-0772, 92-1372, 93-0567, 93-0619	6 days

STATUS OF STUDIES IN THIS PACKAGE:

Guideline #	MRID	Status[1]
None	41931737	A
166-1	unknown	U

STATUS OF DATA REQUIREMENTS:

[illegible]	Status[2]
166-1	R

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

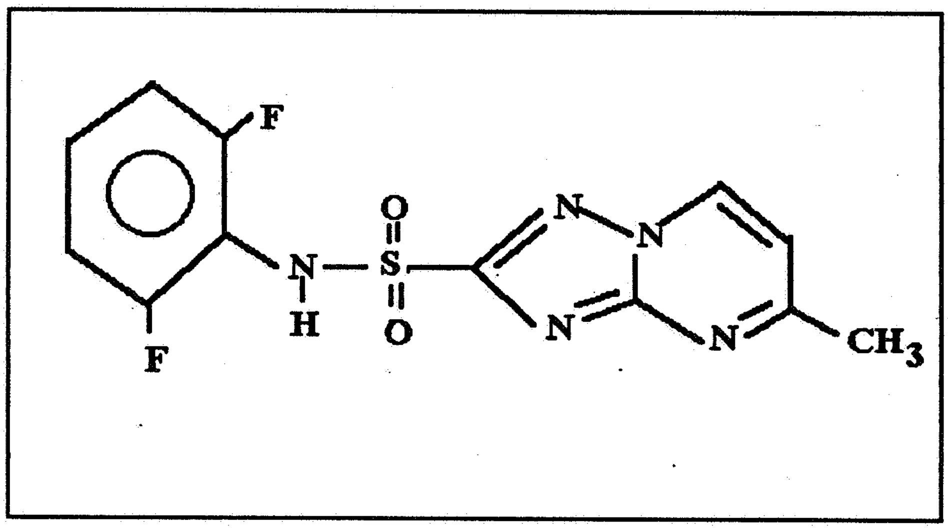
1. CHEMICAL:

Common Name: flumetsulam (company designation = DE-498)

Trade Name: Broadstrike

Chemical Name: N-(2,6-difluorophenyl)-5-methyl-1,2,4-triazolo (1,5a)pyrimidine-2-sulfonamide

Structure:



2. TEST MATERIAL:

formulated products.

3. STUDY/ACTION TYPE:

Registrant has submitted a partial progress report for two small-scale prospective ground-water monitoring studies and various data from supplemental studies (including a large number of PRZM simulations that they conducted as part of Monte Carlo analysis of the likelihood of flumetsulam leaching over major soybean production areas).

4. STUDY IDENTIFICATION:

All of the following submissions are being reviewed here:

Sub. # 1. Ground-water monitoring study protocol. DP BarCode = D166604. EFGWB # 91-0772. MRID unknown.

a. Lade, Dennis H. 1991. Letter dated 7/2/91 to Joanne I. Miller (PM-23).

b. Buttler, Imo W., et al. 1991. Study Protocol: A small-scale prospective ground-water monitoring study for DE-498; Part A: Investigation to select sites for a small-scale prospective ground-water monitoring.

c. Buttler, Imo W., et al. 1991. Study Protocol: A small-scale prospective ground-water monitoring study for DE-498; Monitoring of the prospective study sites.

Sub. # 2. Fontaine, D.D. 1991. A Computer Modeling Assessment of the Mobility of DE-498 in Three Major Soybean Growing Regions of the United States. 6/12/93. DP Barcode = D182848. EFGWB# 92-1372. MRID 41931737.

Sub. # 3. Response to EFGWB Leaching Assessment and EFGWB Environmental Fate Review of 3/12/93. DP Barcode = D189831. EFGWB# 93-0567. MRID unknown.

a. Lade, Dennis H. 1993. Letter dated 3/29/93 to Joanne I. Miller (PM-23).

b. Wolt, Jeffry D. 1993. Response to Environmental Fate and Ground Water review for flumetsulam. Memorandum dated 3/29/93 to Dennis H. Lade with accompanying notes.

Sub. # 4. Response to EFGWB Leaching Assessment of 3/12/93 emphasizing relationship of DowElanco field data to their modeling efforts. DP Barcode = 190325. EFGWB# 93-0619. MRID unknown.

a. Lade, Dennis H. 1993. Letter dated 4/13/93 to Joanne I. Miller (PM-23).

b. Buttler, Imo W. 1993. Memorandum dated 3/30/93 to Dennis H. Lade with accompanying notes.

c. Cooper, Sandra C. et al. 1992. Progress Report (North Carolina): A small-scale prospective ground-water monitoring study for DE-498 (Dated 10/1/92). Report is incomplete.

d. Cooper, Sandra C. et al. 1992. Progress Report (Indiana): A small-scale prospective ground-water monitoring study for DE-498 (Dated 10/1/92). Report is incomplete.

5. REVIEWED BY:

Michael R. Barrett, Ph.D. Signature: [signature]
Chemist
OPP/EFED/EFGWB/Ground-Water Section Date: 6/1/93

6. APPROVED BY:

Elizabeth Behl
Acting Section Chief
OPP/EFED/EFGWB/Ground-Water Section

Signature: EBehl

Date: 6/2/93

7. CONCLUSIONS:

Available data indicate that flumetsulam has a higher propensity to leach in a wide variety of soils than other herbicides known to have leached to ground water at numerous locations.

Insufficient information has been submitted to fully evaluate the progress of the small-scale prospective ground-water monitoring studies being conducted by DowElanco. GWTS must defer all conclusions about the behavior of flumetsulam at the test sites until such time as DowElanco submits a complete report with a complete description of procedures and complete analytical data from these studies. DowElanco declined to do so to support the submissions reviewed herein (telephone conversation of Steve Robbins, Product Reviewer, EPA; with Dennis Lade, Registration Manager, DowElanco), but has promised to submit a complete report when it is ready. We have attempted to draw some preliminary conclusions from the data submitted for review.

After receiving and reviewing a total, complete final report for the DowElanco ground-water monitoring studies, GWTS will consider the relevance of any fate and transport modeling efforts by DowElanco in determining the likelihood of flumetsulam leaching at sites throughout the expected use area. Modeling reports should be accompanied by complete disclosure of inputs used, and any outputs that could reasonably be expected to be of interest to regulators. GWTS will compare results from the field studies with PRZM simulations and evaluate the suitability of the model to describe flumetsulam behavior.

8. RECOMMENDATIONS:

Small-scale prospective ground-water monitoring studies are appropriate for flumetsulam, which has the characteristics of pesticides known to leach to ground water. The Agency may require further ground-water monitoring studies to evaluate the extent of the hazard of flumetsulam leaching to ground water. However, GWTS will consider whether the two voluntary studies DowElanco is conducting can fulfill some of these data requirements. The registrant should continue all soil, soil-water, and ground-water sampling at the study sites until the environmental fate of flumetsulam has been completely described. Failure to do so may render the studies unusable to meet ground-water monitoring study data requirements.

The registrant must:

- Immediately submit full progress reports on their two ground-water monitoring studies.
- When submitting the progress reports and final report, include all information which they wish to be considered in reviewing the study (the submission should be a self-contained package).
- Propose a ground-water label advisory, such as:

  This chemical demonstrates the properties and characteristics associated with chemicals detected in ground water. The use of this chemical in areas where soils are permeable, particularly where the water table is shallow, may result in ground-water contamination.

- Propose geographic areas and / or soil types where the likelihood of significant flumetsulam parent or degradate leaching is greatest. Some geographic restrictions on flumetsulam use may be necessary, depending on the outcome of the review of the complete, final ground-water monitoring study report by Ground-Water Technology Section (GWTS).
- Propose a bioassay for determining whether residue levels leaching through the soil profile can be toxic to sensitive crops or other nontarget plants.

9. BACKGROUND:

In 1991, DowElanco Corp. submitted a short protocol outlining their plans for two, self-initiated, small-scale prospective ground-water monitoring studies for flumetsulam. More recently (March 1993), GWTS conducted a brief Leaching Assessment for this chemical. DowElanco has submitted a response to the GWTS assessment accompanied by selected data from environmental fate studies as well as their two ground-water monitoring studies which are still in progress.

10. DISCUSSION:

I. Ground-Water Monitoring Studies

Only a generic, non-specific protocol and parts of a single progress report have been submitted for both of the flumetsulam ground-water monitoring studies that are apparently still in progress. Therefore, this review will briefly discuss what we have learned from previous studies, highlight DowElanco's conclusions, and make preliminary comments; final conclusions and recommendations will have to await a more complete submission of information by DowElanco.

A. Description of Study Sites

Both of the test sites appear to be located in fields with highly permeable, loamy sand to sand soils with the water table generally less than 15 feet from the land surface. The registrant provides brief description of the instrumentation on the sites. An **unacceptable deviation** from the normal protocol is that monitoring well clusters were located adjacent to, rather than directly on the treated area.

B. Application of Test Material

Flumetsulam was stated to have been applied preemergent to a corn crop at the Indiana site at 0.15 ai/acre [sic] on June 17, 1991. Flumetsulam was stated to have been applied preemergent to a soybean crop at 0.16 ai/acre [sic] on June 26, 1991. If DowElanco meant the units for the application rate to be pounds, this would be equivalent to an initial, average soil concentration of flumetsulam in the upper 6 inches of 75 to 80 ng g^{-1} (ppb) of soil at the test sites(assuming the weight of a 6-inch acre slice of soil to be 2,000,000 pounds).

C. Residue Analyses.

No results of analyses of soil, soil-water, or ground-water samples have been included in the excerpts of the progress reports submitted by DowElanco. DowElanco did, however, in a letter to the Agency, present some of their own conclusions with selective presentation of their results to date. They concluded: "Given some time to degrade and adsorb, flumetsulam appeared to have much less potential to leach, as demonstrated by the results from the Indiana groundwater study site... The leaching of trace amounts of flumetsulam under the test conditions present at the North Carolina site, namely highly permeable soil, low organic matter, and very high amounts of precipitation received soon after application, is consistent with probablistic modeling assessments that we conducted... Even under the worst-case conditions at the North Carolina test site, flumetsulam did not reach groundwater present at 13 feet below the soil surface."

Even though DowElanco's submission is very preliminary and selective, it is appropriate to make some preliminary (but not yet definitive) observations from information in their letter. These are as follows:

The initial residues detected immediately after application apparently varied from 14 to 33 ng g^{-1} at Indiana and 27 to 55 ng g^{-1} at the North Carolina site [Figures 15 and 16, volume 4b (see

Study Identification section of this review), no page number, EFGWB# 93-0619]. Percent recovery of the applied herbicide was not discussed. The figure descriptions do not indicate whether the values plotted represent residues from analysis of a single sample or average values for several sample analyses conducted at a single time. The data were submitted only in the form of graphs and appear to demonstrate that about 20 to 25% of the applied flumetsulam may have persisted a year after application. These values might represent (not specified in the figures) the total residues DowElanco calculated (procedure unspecified) over the entire upper 120 cm. If this is the case, then they provide a more accurate estimate of field degradation than a field dissipation half-life calculated only from residues in the upper several cm of soil. This dissipation or degradation rate did not follow pseudo first-order kinetics over a year's time frame (not surprising since winter degradation should be much slower than summer degradation), but may provide a reasonable depiction of the dissipation rate over the 3 or 4 months after application at the Indiana site. In contrast, at the North Carolina site, there appeared to be no significant difference in residues measured monthly from 30 to 330 days after application. (DowElanco's figures contain what are apparently error bars about each data point depicted, indicating the lack of a significant decline in residues over this period.)

DowElanco indicated that flumetsulam was not detected in soil-water or ground water at the Indiana test site. At the North Carolina site, flumetsulam was detected in soil-water samples collected from 3-, 6-, 9-, and 12-foot depths with suction lysimeters (Figure 19, Vol. 4b of submission). Maximum residues detected at any sample time were about 5, 0.6, 0.6, and 0.3 µg L^{-1} at the 3-, 6-, 9-, and 12-foot depths, respectively. Appearance of flumetsulam in soil-water at different times was simultaneous with the bromide tracer, but it is unclear whether flumetsulam was significantly less persistent at lower depths. DowElanco indicated that flumetsulam was not detected in the monitoring wells (located adjacent to the treated area) at 0.1 µg L^{-1} or greater up to 1 year after application. Given that flumetsulam residues were consistently detected in on-site lysimeters, we conclude that had wells been located within the treated area, flumetsulam residues would likely have been detected in ground water.

II. Other Field Studies

A. Summary of available studies

DowElanco previously submitted four field dissipation studies which were reviewed and accepted by EFGWB March 24, 1993. In Submission 4b DowElanco provided a synopsis of final results for two Canadian field dissipation studies as well as interim results for two studies in the United States.

DowElanco evaluated flumetsulam degradation rates at each field dissipation and ground-water monitoring study site to see whether a consistent relationship could be determined for soil pH and organic matter after correcting for the effect of soil temperature on the degradation of flumetsulam. Flumetsulam Kd values were also calculated from soil pH and organic matter at each site. However, no direct measurements of Kd were made for comparison with the calculated values. These procedures are not described in this report, but DowElanco cites published and unpublished reports for details. A complete description of such procedures should accompany DowElanco's final report, if they wish these results to be considered in conjunction with the ground-water monitoring study results.

DowElanco does not indicate whether the two field dissipation studies still in progress are intended to meet any specific data requirement by the Agency. DowElanco omitted information on the specific location of these studies, but did indicate they were in the states of Minnesota and Mississippi. DowElanco stated that in these studies, unlike previous field dissipation studies, irrigation has been applied to ensure that total water added to the site by precipitation plus irrigation exceeds 125% of the average. Details on their irrigation scheme were not provided.

B. Conclusions

DowElanco has demonstrated in laboratory studies that soil organic matter and soil-water ionization state can significantly influence flumetsulam mobility and persistence. DowElanco has not demonstrated that these relationships are so strong that the effect on flumetsulam behavior of all other environmental factors can be ignored. These studies are not adequate to replace small-scale ground-water monitoring studies, but may provide useful supplementary information. If DowElanco wishes information from these laboratory studies to be used to support their modeling efforts, the complete reports with details on materials and methods and analytical results should be included.

III. Review of "A Computer Modeling Assessment of the Mobility of DE-498 in Three Major Soybean Growing Regions of the United States" (MRID 41931737, report dated 6/12/93).

A. Introduction

A detailed review of this report is not appropriate at this time because a full report on the results of ground-water monitoring studies has not yet been received. GWTS does not believe there is adequate scientific basis to conclude that such modeling efforts can provide accurate predictions of pesticide behavior for any soil at any location in the United States. Nevertheless, a short review of the modeling effort does seem appropriate here, because it is based on a significant amount of laboratory data that provides important insight into some factors affecting flumetsulam behavior in soils.

B. Previous Preliminary Leaching Assessment

GWTS previously reviewed the behavior of flumetsulam in the environment and its potential to leach to ground water (3/12/93, no DP Barcode assigned, a copy is attached to the present review). From our previous review, we concluded that flumetsulam clearly may have some of the environmental fate characteristics associated with compounds which leach to ground water. In early all agricultural soils, flumetsulam Kd values are below 1 and Koc values are below 75 (based on laboratory studies in 22 soils submitted by DowElanco; DowElanco has submitted summaries of these data with Submissions # 2 and 3 reviewed here). DowElanco-calculated half-lives ranged from 13 to 130 days with the half-life exceeding 60 days in 6 soils and 90 days in 3 soils. The half-life they calculated was below 30 days in 7 of the 22 soils. Flumetsulam, in many if not most of the tested soils, has the environmental fate characteristics normally associated with pesticides that leach to ground water. The actual extent of leaching is, of course, dependent on soil permeability and structure, timing of recharge events, and other environmental factors. Small-scale prospective ground-water monitoring studies are clearly appropriate for this chemical, since they can more reliably determine the environmental conditions under which flumetsulam may leach to ground water.

C. Additional comments on DowElanco modeling

GWTS supports the general concept of identification of use areas (and the corresponding soils, meteorology, soil properties, etc.) and a range of parameters for properties affecting the behavior of pesticides in the environment, followed by stochastic (Monte Carlo) simulations to determine the probability of a defined endpoint as an index of leaching, However, simulation modeling should never be expected to replace or eliminate the need for ground-water monitoring studies to support registrations of chemicals with a propensity to leach. There are a tremendous number of assumptions that are made in modeling, many of which are totally unverifiable. Other researchers may obtain quite different results with assumptions that are equally reasonable.

D. GWTS response to DowElanco comments on GWTS Preliminary Leaching Assessment of 3/11/93

1. DowElanco totally misunderstands EFGWB's concern regarding their attempts to correlate of soil organic matter and pH data with flumetsulam degradation half-life. The data are insufficient to establish a predictive relationship of flumetsulam persistence with soil properties (Table 1). Only Kd, which is a chemical-specific value and hence not truly an independent variable, was somewhat strongly correlated with half-life. We did not refer to the representativeness of the range of pH and organic matter values associated with DowElanco's test soils. Rather, we indicated that the range of properties appeared to be too narrow to establish a statistically significant relationship. Perhaps if soils with more extreme properties had been used, such a relationship could have been established.

Table 1. Relationship of various parameters of soil and flumetsulam to flumetsulam degradation rate (all values given in terms of R squared, the correlation coefficient).

"Independent" variable (type in parenthesis)	Type of regression	
	Linear	Exponential
pH + O.C. (soil)	0.49	0.57
pH (soil)	0.36	0.38
Kd (flumetsulam & soil specific)		0.83

2. DowElanco does not explain the basis for their selection of flumetsulam half-lives in the lower soil layers for their modeling.

3. DowElanco is correct that the ranking of flumetsulam leaching potential relative to other pesticides may vary at different sites. However, by their own admission, flumetsulam is only weakly adsorbed (Kd < 1) in most agricultural soils and has a half-life of from 1 to 4 months in the majority of soils that they tested. We commend DowElanco for conducting these extensive studies of flumetsulam behavior in a wide variety of soils. However, we do not believe that the data justify predicting flumetsulam behavior from **soil properties alone.**

4. We strongly disagree with DowElanco's contention that "the relative comparisons between the molecules mentioned do not appear realistic even for this specific site." The soil at the modeled site was slightly alkaline and flumetsulam would almost certainly be completely ionized. In such a situation, **DowElanco's own estimate** of Koc for flumetsulam is 12. Therefore, we believe that DowElanco is incorrect and

inconsistent when they state that the values used in modeling (Koc of 8 to 20) were unrealistically low.

5. Dow also complains about our selection of half-lives of 30 to 120 days. We believe the selection of these values is justified for the following reasons:

* flumetsulam degradation half-life exceeded 30 days in approximately 75% of the soils tested.

* flumetsulam half-life cannot be reliably predicted from measurable soil properties alone. Flumetsulam degradation will also be influenced by soil microenvironment, weather, etc.

* in the particular type of scheme used, different half-lives could not be used for different soil layers. Our experience and an abundance of articles in the literature tell us that this leads to a serious underestimate of the depth of leaching. We attempted to get some perspective on this by looking also at comparisons using anaerobic half-lives, which were often several times longer than root-zone aerobic degradation half-lives.

6. DowElanco expresses some concern about our source of data for the table which begins at the bottom of page 2 of our leaching assessment. GWTS believes it is unreasonable to make an issue of this for the following reasons. There are real but practically insignificant differences between these data and those provided in Table 1 of their 3/29/93 letter. If DowElanco really thinks these small differences are important they should recognize that they themselves are responsible for the differences. These data were taken from Figure 5 on page 29 of the Environmental Fate section of a document they gave to us at a 3/17/92 meeting. The reason these data had to be interpolated from a figure was because there were no tables included with this data in their document. At the time this quick review was done, this was the only document we had.

7. The characteristics of the soil for the Kansas modeling site we used were quite different from those in the Soils5 database which DowElanco used to compare with our results. The GWTS soil information was from a specific site with good soil characterization data.

8. DowElanco somewhat misrepresents our position in the first paragraph of the second page of their 3/29/93 letter. We agree that there appears to be a fairly consistent relationship between flumetsulam Kd in a soil and its degradation rate in a soil, based on the data submitted by DowElanco. However, the Kd is not entirely a soil property! The Kd, of course, is a property

measuring the interaction of a given pesticide with the organic matter and adsorbing mineral colloids of a given soil. Correlation between the soil properties (i.e., percent organic matter and pH) is much weaker. This is not surprising since:

* Kd takes into account the adsorptivity of flumetsulam as well as the adsorption capacity of the soil.
* Soil pH measurements are to some extent a function of the method used and the conditioning of the soil before measurement.
* Not all organic matter has the same adsorption capacity, and the type of organic matter present can influence the type of soil microorganisms present which may in turn influence the rate of microbial degradation of flumetsulam.

9. We want to encourage the continued collection of the type of data that DowElanco has engaged in for flumetsulam. With regards to their probability modeling, our chief concern is not with what they did, but with how they restricted the data for output. That is why it is important that all modeling submissions should be accompanied by (1) complete input files, (2) sources of values used for all input parameters, and (3) output files that are complete enough to allow the reviewer to make his or her own judgement about the significance of the results.

E. Flumetsulam Environmental Fate Characteristics in Perspective with Relationship to Other Herbicides known to Leach to Ground Water

The mobility (adsorptivity) and persistence of flumetsulam is in the range of other herbicides know to leach to ground water (Table 2). Table 2 includes soil organic carbon partition coefficients (Koc) and degradation half-lives of flumetsulam calculated by DowElanco for 4 of 22 soils they evaluated flumetsulam behavior in. The four soils selected include the ones with the highest and lowest soil adsorption coefficients of for all soils tested. Included in the table are two other low-rate herbicides, chlorsulfuron and triasulfuron. Low-rate herbicides are difficult to detect in the environment. A concern is that phytotoxic levels of herbicides could occur in ground water without ever being detected.

Table 2. Comparison of range of flumetsulam persistence and adsorptivity values with average values for other compounds known to leach to ground water.

Herbicide	Koc	Soil degr. $t_{1/2}$, days	Subsoil degradat. $t_{1/2}$, days
flumetsulam:[1] Crofton A	5	30	183
Canisteo	10	46	183
Milford	32	88	183
Crofton B	74	130	183
alachlor	120	18	4
atrazine	100	100	159
bromacil	32	225	120
chlorsulfuron[2]	32	45	365
dicamba	2	58	28
metribuzin	60	45	112
metolachlor	200	120	78
triasulfuron	39	86	284

[1]c = Values given for 4 of the 22 soils for which DowElanco submitted values for from laboratory studies.
[2] = Not detected in ground water but known to leach and suspected ground-water contaminant.

We compared the propensity of flumetsulam to leach in four soils (the same soils as represented in Table 1) to four other herbicides (each used on corn or soybeans and known to leach to ground water) using the Groundwater Ubiquity Score or GUS Index (Figure 1) (Gustafson (1989). The GUS Index uses a hyperbolic function of pesticide Koc and half-life to discriminate between pesticides which are or are not likely to leach significantly. In all four soils, flumetsulam is clearly much more likely to leach than alachlor (soybeans), atrazine (corn), metolachlor (soybeans), and metribuzin (corn and soybeans), major crops used on are given in parentheses after each herbicide. Each of these four herbicides have been found to reach ground water as a result of agricultural use at numerous locations throughout the United States. They are more easily detected than the newer, low-rate herbicides, but the phytotoxicological significance of residues of low-rate herbicides such as flumetsulam which may leach to ground water is likely to be at least as great.

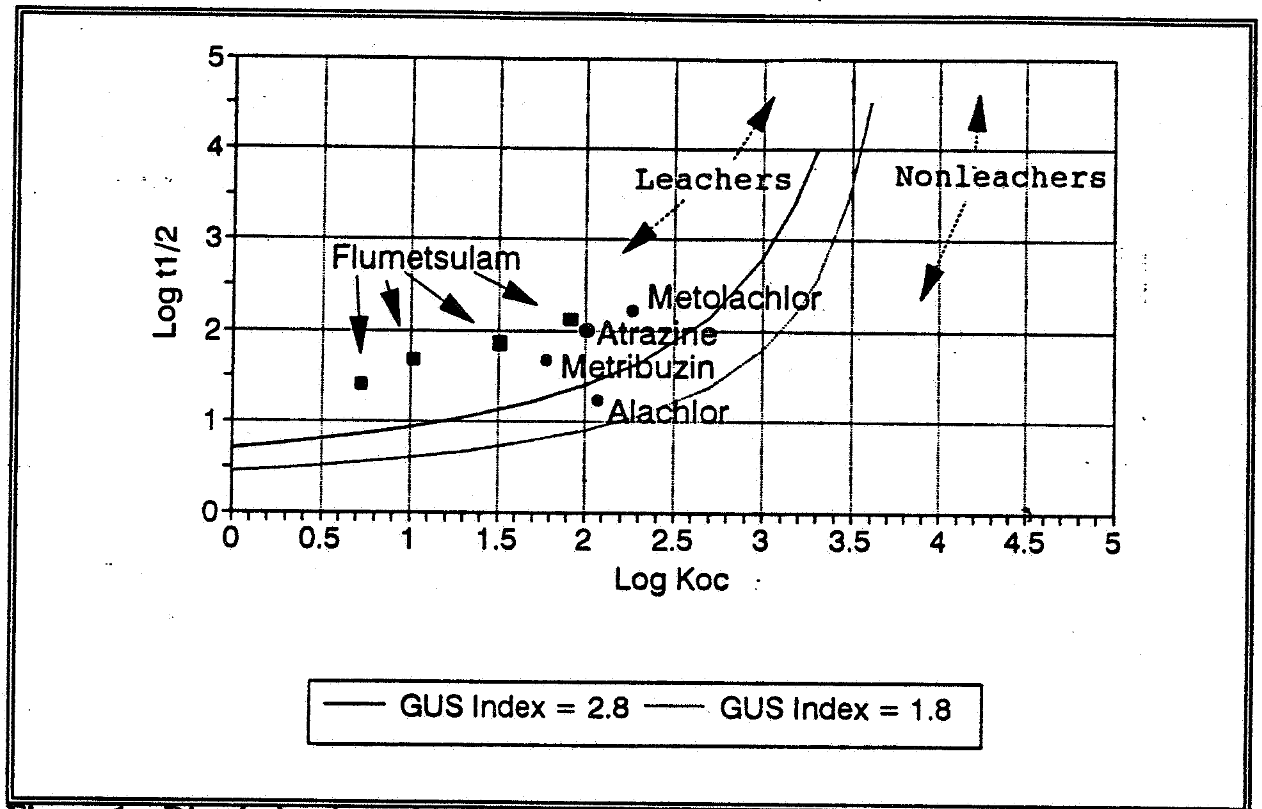


Figure 1. Discrimination of leachability of flumetsulam in four soils and major corn and soybean herbicides known to impact ground water using the GUS Index (Gustafson, 1989).

LITERATURE CITED

Gustafson, D.I. 1989. Groundwater Ubiquity Score: A simple method for assessing pesticide leachability. Environ. Toxicol. Chem. 8:339-357.

Environmental Fate & Effects Division PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY **FLUMETSULAM (XRD 498)** Last Update on May 10, 1993 [V] = Validated Study [S] = Supplemental Study [U] = USDA Data			
LOGOUT	Reviewer:	Section Head:	Date:

Common Name:FLUMETSULAM (XRD 498)
Smiles Code:
PC Code # :129016 CAS #:98967-40-9 Caswell #:

Chem. Name :N-(2,6-difluorophenyl)-5-methyl-1,2,4-triazolo[1,5a]
pyrimidine-2-sulfonamide
Action Type:Herbicide

Trade Names:
(Formul'tn):75% active ingredient
Physical State:

Use :to control broadleaf weeds in soybeans and field corn
Patterns :
(% Usage) :
:

Empirical Form: $C_{12}H_9F_2N_5O_2S$
Molecular Wgt.: 325.30 Vapor Pressure: E Torr
Melting Point : °C Boiling Point: °C
Log Kow : pKa: @ °C
Henry's : E Atm. M3/Mol (Measured)

Solubility in ...						Comments
Water	E	3	ppm	@25.0	°C	
Acetone	E		ppm	@	°C	
Acetonitrile	E		ppm	@	°C	
Benzene	E		ppm	@	°C	
Chloroform	E		ppm	@	°C	
Ethanol	E		ppm	@	°C	
Methanol	E		ppm	@	°C	
Toluene	E		ppm	@	°C	
Xylene	E		ppm	@	°C	
	E		ppm	@	°C	
	E		ppm	@	°C	

Hydrolysis (161-1)
[V] pH 5.0:Stable
[V] pH 7.0:Stable
[V] pH 9.0:Stable
[ ] pH :
[ ] pH :
[ ] pH :

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
FLUMETSULAM (XRD 498)
Last Update on May 10, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Photolysis (161-2, -3, -4)
[V] Water:extrapolated half-life=164 days
[ ] :
[ ] :
[ ] :

[V] Soil :extrapolated half-life=90
[ ] Air :

Aerobic Soil Metabolism (162-1)
[V] T1/2 22 to 130 days. The variation appears to be dependent upon
[ ] soil pH and organic matter content
[ ]
[ ] T1/2 102 days in loam
[ ]
[ ]
[ ]

Anaerobic Soil Metabolism (162-2)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Anaerobic Aquatic Metabolism (162-3)
[V] half-life =183 days
[ ]
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[ ]
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[ ]

Aerobic Aquatic Metabolism (162-4)
[ ]
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Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
FLUMETSULAM (XRD 498)
Last Update on May 10, 1993
[V] = Validated Study   [S] = Supplemental Study   [U] = USDA Data

Soil Partition Coefficient (Kd) (163-1)
[S] 0.05 to 2.42 from sandy loam to clay soils
[ ]
[ ]
[ ]
[ ]
[ ]

Soil Rf Factors (163-1)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[V] half-life=1.5 months to 3 months
[ ]
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Aquatic Dissipation (164-2)
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Forestry Dissipation (164-3)
[ ]
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Environmental Fate & Effects Division
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FLUMETSULAM (XRD 498)
Last Update on May 10, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Long-Term Soil Dissipation (164-5)
[ ]
[ ]

Accumulation in Rotational Crops, Confined (165-1)
[V] limited accumulation (<0.01 ppm) when planted at 30, 120, and 365
[ ] day posttreatment.

Accumulation in Rotational Crops, Field (165-2)
[ ]
[ ]

Accumulation in Irrigated Crops (165-3)
[ ]
[ ]

Bioaccumulation in Fish (165-4)
[ ]
[ ]

Bioaccumulation in Non-Target Organisms (165-5)
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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
FLUMETSULAM (XRD 498)
Last Update on May 10, 1993
[V] = Validated Study   [S] = Supplemental Study   [U] = USDA Data

Field Runoff (167-1)
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Surface Water Monitoring (167-2)
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Spray Drift, Droplet Spectrum (201-1)
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Spray Drift, Field Evaluation (202-1)
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Degradation Products

See attached sheet.

Comments

References: EPA reviews of studies
Writer : J. Hannan/GML