EFF 3/91

DP Barcode: D167459

Shaughnessy No.: 129016

Date out of EFGWB: MAR 24

3/24/92

TO: J. Miller/S. Robins
Product Manager #23
Registration Division (H7507C)

FROM: Paul Mastradone, Chief
Chemistry Review Section #1
Environmental Fate and Ground Water Branch

THRU: Hank Jacoby, Chief
Environmental Fate and Ground Water Branch
Environmental Fate and Effects Division (H7507C)

Attached, please find the EFGWB review of ...

Reg./File #: 62719-EUP-RG formerly 464-EUP-RNG

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

Type Product: Herbicide

Common Name: XRD-498

Company Name: DowElanco Chemical Company

Purpose: Application for corn and soybean Experimental Use Permit

Date Received: 13 Aug. 1991 Date Completed:

Action Code: 710

EFGWB #(s): 91-0846

Total Reviewing Time: 28.5 days

Deferrals to: ___Ecological Effects Branch, EFED

___Science Integration and Policy Staff, EFED

___Non-Dietary Exposure Branch, HED

___Dietary Exposure Branch, HED

___Toxicology Branch

1. CHEMICAL:

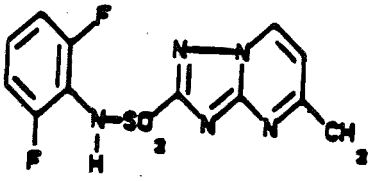
Chemical name: N-(2,6-difluorophenyl)-5-methyl-1,2,4-triazolo[1,5a] pyrimidine-2-sulfonamide

CAS no.: 98967-40-9

Common name: XRD-498; XRM-5019

Trade name: DR-0238-5651/K-170,711

Chemical structure:



Physical/Chemical properties of active ingredient:

Physical characteristics:	Light tan power
Molecular formula:	$C_{12}H_9F_2N_5O_2S$
Molecular weight:	325.3
Melting point:	253°C
Vapor Pressure:	0.8 X 10^{-15} mm Hg at 20°C
Solubility:	49.1 mg/L at pH 2.5 (25°C) 5.65 g/L at pH 7.0 (25°C)

Octanol/water partition coefficient: = 1.62

2. TEST MATERIAL:

See individual DER's

3. STUDY/ACTION TYPE:

Application for corn and soybean Experimental Use Permit.

4. STUDY IDENTIFICATION:

Lade, D.H. XRD-5019 AND DE-498 (EPA PESTICIDE CHEMICAL CODE 129016) APPLICATION FOR EXPERIMENTAL USE PERMIT AND PETITION FOR TEMPORARY TOLERANCE. Submitted by DowElanco Chemical Company, Midland, MI; Received by EPA 19 June 1991; MRID No. 41931700.

Wolt, J.; Shepler, K.; Woodburn, K.; Chari, S.; and Ruzo, L.O. SUNLIGHT PHOTODEGRADATION OF [^{14}C-PYRIMIDINE]XRD-498 IN A BUFFERED AQUEOUS SOLUTION AT pH 5 AND 7. Performed by Pharmacology and Toxicology Research Laboratory, Richmond, CA; Submitted by DowElanco; Midland, MI; Study completed in 1991; Received by EPA 19 June 1991; MRID 41931726.

Wolt, J.; Shepler, K.; Woodburn, K.; Chari, S.; and Ruzo, L.O. SUNLIGHT PHOTODEGRADATION OF [^{14}C-ANILINE]XRD-498 IN A BUFFERED AQUEOUS SOLUTION AT pH 5 AND 7. Performed by Pharmacology and Toxicology Research Laboratory, Richmond, CA; Submitted by DowElanco; Midland, MI; Study completed in 1991; Received by EPA 19 June 1991; MRID 41931727.

Wolt, J.; Shepler, K.; Marx, M.; McGovern, P.; and Ruzo, L.O. PHOTODEGRADATION OF [^{14}C-PYRIMIDINE]XRD-498 ON SOIL BY NATURAL SUNLIGHT. Performed by Pharmacology and Toxicology Research Laboratory, Richmond, CA under PTRL Report No. 208W; Submitted by DowElanco; Mid land, MI under Dow Protocol No. 89088; Study completed on 29 January 1991; Received by EPA 19 June 1991; MRID 41931728.

Wolt, J.; Shepler, K.; Sripriya, C. McGovern, P.; and Ruzo, L.O. PHOTODEGRADATION OF [^{14}C-ANILINE]XRD-498 ON SOIL BY NATURAL SUNLIGHT. Performed by Pharmacology and Toxicology Research Laboratory, Richmond, CA under PTRL Report No. 209W; Submitted by DowElanco; Mid land, MI under Dow Protocol No. 89089; Study completed on 16 May 1991; Received by EPA 19 June 1991; MRID 41931729.

Wolt, J.; Shepler, K.; and Yung, V. PHOTODEGRADATION OF [^{14}C-ANILINE] XRD-498 ON SOIL BY NATURAL SUNLIGHT. Performed by Pharmacology and Toxicology Research Laboratory, Richmond, CA under PTRL Report No. 258W; Submitted by DowElanco; Midland, MI under Dow Protocol No. 90096; Study completed on 16 May 1991; Received by EPA 19 June 1991; MRID 41931730.

Lehmann, R.G.; Holbrook, D.L.; Altscheffel, S.A.; Batzer, F.R.; Brown, S.M.; White, F.H. AEROBIC SOIL METABOLISM OF ANILINE-LABELED DE-498 IN HOYTVILLE SOIL. Preformed and Submitted by DowElanco; Midland, MI under Dow Protocol No. 89002; Study completed on 31 May 1991; Received by EPA 19 June 1991; MRID 4191731.

Havens, P.L. and Miller, J.R. AEROBIC SOIL METABOLISM OF $_{14}$C-(ANILINE)-DE-498 IN TWO SOILS. Preformed and Submitted by DowElanco; Midland, MI under Laboratory Project ID ENV91006.00; Study completed on 7 June 1991; Received by EPA 19 June 1991; MRID 41931732.

Wolt, J.D.; Schwake, J.D.; Batzer, F.R.; Brown, S.M.; McKendry, L.H.; Miller, J.R.; Roth, G.A.; and Stanga, M.A. ANAEROBIC AQUATIC METABOLISM OF XRD-498 [N-(2,6-DIFLUOROPHENYL)-5-METHYL-(1,2,4)TRIAZOLO (1,5-a)PYRIMIDINE-2-SULFONAMIDE. Preformed and Submitted by DowElanco; Midland, MI under Dow Protocol No. 89080; Study completed on 14 June 1991; Received by EPA 19 June 1991; MRID 41931733.

Hamburg, A.W., Byrne, S.L., and Harding, R.M. [5-^{14}C]DE-498 CONFINED ACCUMULATION STUDY IN ROTATIONAL CROPS: CONFIRMATION OF THE VALIDITY OF THE RESULTS FROM THE ORIGINAL STUDY STARTED ON MAY 5, 1987, AND REPORTED ON GH-C 2170 (30- AND 120-DAY PHASES) AND GH-C 2244 (365-DAY PHASE. Performed and Submitted by DowElanco; Midland, MI under Project ID 90069; Study completed on 14 June 1991; Received by EPA 19 June 1991; MRID 41931739.

Lehmann, R.G.; Balcer, J.L.; Duebelbeis, D.O.; Flora, E.A.; Foster, D.R.; Harnick, B.J.; Olberding, E.L.; Swanson, M.; and Wray, M.W. TERRESTRIAL FIELD DISSIPATION OF DE-498. Preformed and Submitted by DowElanco; Midland, MI under Laboratory Project ID ENV87034/AN and ENV88075/AN; Study completed on 12 June 1991; Received by EPA 19 June 1991; MRID 41931735.

5. REVIEWED BY:

Gail Maske
Chemist, Review section #1
OPP/EFED/EFGWB

Signature: _____
Date: _____

6. APPROVED BY:

Paul Mastradone, Chief
Review section #1
OPP/EFED/EFGWB

Signature: _____
Date: _____

7. CONCLUSIONS:

The registrant, DowElanco, is requesting an Experimental Use Permit (EUP) for use of XRD-498 on corn and soybeans during the 1992-1993 use season. Concurrently, the registrant is requesting the establishment of a temporary tolerance for expected residues of XRD-498 in/on these crops during the EUP. Data was also submitted to fulfill the data requirements for Section 3 registration.

Based on the degradates not being of toxicological concern (verbal conversation with E. Doyle; EPA:Tox Branch; 7 February 1991), and the limited area of the EUP request, there are sufficient data to support the EUP on corn and soybeans.

EFGWB, in order to fully understand the environmental fate of XRD-498, will need for registration that the pattern of formation and decline of degradates and XRD-498 be explained. This would require that for registration of XRD-498 new aerobic soil metabolism studies that fully explain

the pattern of formation and decline of degradates and XRD-498 be completed. These new studies probably should be carried out at much higher application rates (e.g. 12X or higher), or a new test methodology developed that would increase the detection limit for the degradates.

Based on XRD-498 degrading into two separate rings, studies are needed and were submitted using the radiolabelled aniline portion and the radiolabelled pyrimidine portion. The conclusions of the following environmental fate studies are given below:

a. Photodegradation in Water (161-2)

The photodegradation in water studies (MRID 41931726 and 41931727) are acceptable to meet Subdivision N Data Requirement. No further photodegradation in water data for XRD-498 is required at this time.

Two photodegradation in water studies for XRD-498, one using [^{14}C-pyrimidine]XRD-498 and the other using [^{14}C-aniline]XRD-498, were submitted. In both studies, XRD-498 appeared to be stable to aqueous photolysis. However, there was a notable difference in reported half-lives for pH 5 buffered solutions and pH 7 buffered solutions (half-lives of 151 and 161 days were reported for pH 5, half-lives of 326 and 727 days were reported for pH 7) which indicated that XRD-498 may be more susceptible to photolysis at pH 5 than pH 7. However, because of the limited degradation of XRD-498 and the large degree of extrapolation these difference in half-lives may not be significant.

b. Photodegradation on Soil (161-3)

Photodegradation on soil studies (MRIDs 41931728, 41931729, and 41931730) when reviewed alone would not be acceptable to fully Subdivision N Data Requirement. However, when combined the photodegradation on soil studies are acceptable to meet Subdivision N Data Requirement. Therefore, no further photodegradation on soil data for XRD-498 is required at this time.

Three photodegradation in soil studies for XRD-498, two using [^{14}C-aniline]XRD-498 and one using [^{14}C-pyrimidine]XRD-498, were submitted. The data indicated that photodegradation is not a significant degradation pathway, but does contributed some to the degradation of XRD-498. The reported extrapolated half-lives were all ≈90 days for the light exposed XRD-498 when applied to non-sterile and sterile soil. The photodegradates were CO_2 (not >2.7% of applied) and numerous unidentified degradates which were present in insignificant amounts (none >6% of applied radioactivity).

c. Aerobic Soil Metabolism (162-1)

The aerobic soil metabolism studies (MRIDs 41931731 and 41931732) are marginally acceptable for EUP. However, the studies are not acceptable to fulfill the data requirement for section 3 for the following reason:

The pattern of formation and decline of degradates and XRD-498 are not clearly presented in the study.

A new study is required to fulfill the data requirement for registration. This study must address the formation and decline of degradates and XRD-498 which may require a much higher application rate.

Two aerobic soil metabolism studies for XRD-498, one using [^{14}C-aniline]XRD-498 and one using [^{14}C-pyrimidine]XRD-498 have been submitted. The [^{14}C-pyrimidine]XRD-498 study was reviewed (WGM;06/22/90) earlier. Both the [^{14}C-pyrimidine]XRD-498 and the [^{14}C-aniline]XRD-498 studies reported similar results. Half-lives of ≈2 to 3 months were reported when radiolabelled XRD-498 (aniline and pyrimidine rings) was applied to clay, sandy clay loam, and silt loam soils. Five degradates were noted to be present in small quantities (not >2.2% of applied, 0.005 ppm) by the authors.

d. Anaerobic Aquatic Metabolism (162-3)

The anaerobic aquatic metabolism study is not acceptable to meet Subdivision N Data Requirement for the following reason:

The metabolite (degradate [12]), which reached a maximum concentration of 52% of applied radioactivity by day 360 posttreatment, was only tentatively identified. The identity of this metabolite must be confirmed.

The registrant must satisfactorily address the deficiency above for the study to fulfill the data requirement. If the registrant does not address the above deficiency, a new anaerobic metabolism study is required to fulfill the data requirement.

Both [^{14}C-aniline] and [^{14}C-pyrimidine]XRD-498 data was presented separately in this study. However, based on the data from both radiolabelled rings being almost identical, the data was summarized as one study. Radiolabelled XRD-498 had a half-life of 183 days when applied to clay soil at 26°C and 75% of 1/3 bar moisture. There was one anaerobic metabolite which was greater than 10% of applied radioactivity and/or 0.01 ppm. The metabolite was tentatively identified as [N-(2,6-difluorophenyl)-4,5,6,7-tetrahydro-5-hydroxy-5-methyl-(1,2,4)triazolo(1,5-a)pyrimidine-2-sulfonamide] (See Table VI). No anaerobic half-life for the metabolite was calculated due to the continued formation up to 360 days posttreatment. Under aerobic conditions this metabolite exhibited a half-life of 2 days in comparison to an aerobic soil metabolism half-life of ≈80 for XRD-498. Therefore, anaerobic conditions appear to not contributed to the degradation of parent XRD-498, but does contribute to the degradation of its major degradate.

e. Terrestrial Field Dissipation (164-1)

The terrestrial field dissipation study is not acceptable to meet Subdivision N Data Requirement for the following reasons:

The data was reported in terms of total residues. The degradate(s) was not characterized.

The pattern of decline and formation of parent and degradate(s) were not addressed.

A new terrestrial field dissipation study is required to fulfill the data requirement which addresses the above deficiencies. A much higher application rate probably would be required for this study.

XRD-498 had reported half-lives of 1.5 months, <1 week, 3 months, and 1.5 months when applied to sandy clay loam soil in Midland, MI; silty clay loam soil in Geneseo, IL; silt loam in Wayside, MS; and silt loam in Burdette, MS, respectively. XRD-498 did not appear to leach at Geneseo and Wayside (See Tables IV and V) test sites, despite ample rainfall during the testing period. Trace leaching (<5 ppb) to 18" of soil depth at Midland was found (See Table III), while XRD-498 moved more apparently through the soil profile at Burdette, with levels of 7 ppb in the 12-18" soil depth samples after 2 weeks, and an isolated detection <2.5 ppb in the 3-4 foot soil depth samples after 3 months (See Table VI). In summary, in well drained, low organic matter soil with rainfall shortly after application, XRD-498 may exhibit some leaching in the soil. Additionally, XRD-498 appears to degrade faster in soils with higher pH and lower organic carbon.

f. The confined rotational crops study is not acceptable to meet Subdivi sion N Data Requirement for the following reasons:

The degradates were not identified.

The registrant must satisfactorily address the deficiency above for the study to fulfill the data requirement. If the registrant does not address the above deficiency, a new confined rotational crops study is required to fulfill the data requirement.

In this study, the results, where the application rate was confirmed by analysis of soil samples taken immediately after application rate, were reported similar to the results from MRID 41263232. There was limited accumulated of XRD-498 (<0.005 ppm) when planted in 30 day aged treated soil. Three degradates, which were labelled as Components A, B, C were quantified. However, these degradates were only tentatively identified or not identified. Components A and B were present at >10% of applied and/or ≥0.01 ppm. Total XRD-498 residues were ≤100 ppb.

g. Based on the following studies not conforming to current guideline data requirements or the data not presently needed to fulfill the data requirement, the following studies were not reviewed in detail at this time. However, these will be reviewed at a later data and may used as supplemental data at that time.

Fontaine, D.D., Lehmann, R.G., and Miller, J.R. THE SOIL ADSORPTION OF A WEAKLY ACIDIC ORGANIC COMPOUND XRD-498. Performed and Submitted by DowElanco, Midland, MI under Laboratory project ID 87062; Study completed on 25 March 1991; Received by EPA 19 June 1991; MRID 41931734.

Fontaine, D.D. A COMPUTER MODELING ASSESSMENT OF THE MOBILITY OF DE-498 IN THREE MAJOR SOYBEAN GROWING REGIONS OF THE UNITED

STATES. Performed and Submitted by DowElanco, Midland, MI under Laboratory Project ID GH-C 2547; Study completed on 12 June 1991; Received by EPA 19 June 1991; MRID 41931737.

Hamburg, A.W.; Miller, J.H.; Lardie, T.S.; and Baldwin, W.S. [^{14}C] XRD-498: CONFINED ACCUMULATION STUDY ON ROTATIONAL CROPS PLANTED AT 365 DAYS AFTER SOIL TREATMENT. Performed and Submitted by DowElanco, Midland, MI under Project ID GH-C 2244 and Protocol 87058; Study completed on 18 September 1989; Received by EPA 19 June 1991; MRID 41931738.

ENVIRONMENTAL FATE ASSESSMENT

Available data are insufficient to fully assess the environmental fate of XRD-498 at this time. Based upon a review of the submitted studies for both the [^{14}C-aniline]XRD and the [^{14}C-pyrimidine]XRD ring, some of which were found to be supplemental, XRD-498 appears to be persistent (hydrolysis-$t_{1/2}$=>>60 days, aerobic soil metabolism-2 to 3 months, anaerobic aquatic metabolism-183 days, field dissipation-$t_{1/2}$=1.5 to 3 months) and very mobile. In twenty-three soils ranging in texture from sandy loam to clay the adsorption coefficients (K_d) ranged from 0.05 to 2.42, and K_{oc} values ranged from 5 to 182. Only one degradate has been found to be present at a maximum concentration of 10% of applied. The degradate was seen in the anaerobic aquatic study and was only tentatively identified. No mobility data has been submitted on this degradate. However, in supplemental data furnished an aerobic half-life of ≈2 days was reported. Field dissipation data indicated similar half-lives of 1.5 to 3 months and mobility in well drained-low organic content soils for XRD-498. In summary, XRD-498 may exhibit some leaching in the environment. Additionally, XRD-498 appears to degrade faster in soils with higher pH and lower organic carbon content.

Based on an octanol/water coefficient of 1.62, XRD-498 is not expected to accumulate in fish. In addition, confined rotational crops data indicated XRD-498 may accumulate at concentrations of ≈≤10 ppb in 365 day posttreatment and ≈≤100 ppb in the 30- and 120-days posttreatment) in rotational crops.

8. RECOMMENDATIONS:

a. The photodegradation in water studies (MRIDs 41937126 and 41931727) and photodegradation on soil studies (MRID 41931730) are acceptable to fulfill the data requirements for XRD-498.

b. The aerobic soil metabolism study in combination (MRID 41931731 and 41931732) are marginally acceptable for the EUP only.

c. The aerobic soil metabolism, anaerobic aquatic metabolism, and the terrestrial field dissipation are not acceptable to fulfill the respective data requirements.

d. Aged mobility data is needed for the anaerobic metabolism degradate (degradate [12]) which was only tentatively identified for fulfill-

ment of the mobility data requirement. Other aged mobility data may be needed, as well, pending evaluation of additional data.

e. The status of the Environmental Fate Data Requirements for an experimental use (terrestrial food crop) permit is as follows:

Environmental Fate Data Requirement	Status of Data Requirement	MRID No.
Degradation Studies-Lab		
161-1 Hydrolysis	Fulfilled (WGM;02/02/90)	41263229
Metabolism Studies-Lab		
162-1 Aerobic soil	Fulfilled[1] (WGM;06/22/90) (WGM;03/24/92)	41263230 41931731 41931732
162-3 Anaerobic aquatic	Not Fulfilled (WGM;03/24/92) Satisfied for EUP	41931733
Mobility Studies		
163-1 Leaching, Adsorption/ Desorption	Fulfilled for unaged (WGM;06/22/90)	41263231 41290403
Accumulation Studies		
165-1 Rotational crops-confined	Not required for EUP[2] (WGM;02/02/90)	41263232
165-4 in Fish	Waived (WGM;06/22/90)	

[1] EFGWB, in order to fully understand the environmental fate of XRD-498, will require for registration that the pattern of formation and decline of degradates and XRD-498 be explained. Therefore, for registration of XRD-498 new aerobic soil metabolism and terrestrial field dissipation studies are needed. These studies probably will require a much higher application rates.

[2] The rotational crops data are not required for crop destruct EUP's. However, supplemental data has been submitted and a new study will be submitted in August 1991.

f. The status of the Environmental Fate Data Requirements for terrestrial food and feed crops use pattern is as follows:

Environmental Fate Data Requirement	Status of Data Requirement	MRID No.
Degradation Studies-Lab		
161-1 Hydrolysis	Fulfilled (WGM;02/02/90)	41263229

Con't-- Environmental Fate Data Requirement	Status of Data Requirement	MRID No.
161-2 Photodegradation in water	Fulfilled (GJT;03/24/92)	41931726 41931727
161-3 Photodegradation on soil	Fulfilled (WGM·03/24/92)	41931728 41931729 41931730
161-4 Photodegradation in air	Not Submitted[1]	
Metabolism Studies-Lab		
162-1 Aerobic soil	Not Fulfilled (WGM;06/22/90) (WGM;03/24/92)	41263230 41931731 41931732
162-3 Anaerobic aquatic	Not Fulfilled (WGM;03/24/92)	41931733
Mobility Studies		
163-1 Leaching, Adsorption/ Desorption	Partially Fulfilled[2] (WGM;06/22/90)	41263231 41290403
163-2 Volatility-lab	Not Submitted[1]	
163-3 Volatility-field	Not Submitted[1]	
Dissipation Studies-field		
164-1 Soil	Not Fulfilled (WGM;03/24/92)	41931735
Accumulation Studies		
165-1 Rotational crops-confined	Not Fulfilled (WGM;02/02/90) (WGM;03/24/92)	41263232 41931739
165-4 in Fish	Waived (WGM;06/22/90)	

[1] Based on the low vapor pressure (0.8×10^{-15} mm Hg) and toxicological classification of ≥3, there would be sufficient data to support a waiver request for these studies.

[2] The mobility of degradates has not been addressed.

9. BACKGROUND:

General Background

XRD-498 is a selective herbicide proposed for use to control broadleaf weeds in soybeans and field corn. The single active ingredient formulations is 75% G. XRD-498 may be applied using preplant incorporation, preemergence, or postemergence treatment. Proposed application rates are 0.03-0.13 lb ai/A for preplant incorporation and preemergence treatment; postemergence rates on field corn are 0.015-0.062 lb ai/A, and postemer-

gence rates on soybeans are 0.0078-0.015 lb ai/A. Application is by ground spray; sufficient agitation should be maintained during mixing and spraying to ensure a uniform spray mixture. When applied for preplant incorporation, XRD-498 should be incorporated into the top 2 to 3 inches of the final seedbed. Preemergence and postemergence applications are made by broadcast spraying. Livestock should not be allowed to graze in treated areas, and harvest-treated silage or grain should not be fed to meat or dairy animals.

10. DISCUSSION:

EUP

XRM-5019, which is a water granular formulation containing 75% XRD-498 by weight, is to be applied as a preemergence, preplant, and post-emergence herbicide from 1 March 1992 to December 1993. XRM-5019 is to control velvetleaf, cocklebur, ragweeds, morning glory, triazine resistant lambsquarter, and pigweed in soybeans and corn. Plots established with research application equipment will be approximately 10 ft x 50 ft each using three replicates. Plots established with commercial application equipment will be one or more acres with generally no replicates. Acreage is requested in a total of 33 soybean and corn producing states with majority of the acreage (62%) in the Midwest soybean growing region. Additional acreage lies in the southern and north eastern coastal states. The states selected for testing encompass the top 20 soybean producing states, plus several additional states selected on basis of presence of target weed species. These states also represent a broad range of growing conditions, cultural practices, soil types, and weed problems (See Table 1). A total of 1765 soybean growing acres, 730 acres in the 1992 growing season and 1035 acres in the 1993 growing season, will be treated with a total of 159.65 pounds , 66.1 pounds in 1992 and 93.55 pounds in 1993, of XRM-5019; and a total of 2135 corn growing acres, 965 acres in the 1992 growing season and 1165 acres in the 1993 growing season, will be treated with a total of 192.50 pounds, 87.25 pounds in 1992 growing season and 105.25 pounds in the 1993 growing season, of XRM-5019. This corresponds to 3900 acres to be treated with a total of 352.15 lbs of XRM-5019 (≈264 pounds XRD-498) used. Application will be carried out with ground equipment at an application rate of 0.04 to 0.09 lb/acre or 0.03 to 0.07 lb ai/A XRD-498.

During the course of the EUP, XRM-5019 will be evaluated using commercial and farmer application equipment in different cultural conditions, different climate conditions, different types of user/application, different incorporation equipment, different spray volumes, and different soil conditions. In addition, tank mix and sequential use product interactions and formulation compatibility, liquid fertilizer compatibility, various timing of applications, one vs two pass incorporation, utility on conservation compliance acres, effects of other soil parameters, effects on rotational crops, such as corn and wheat, control of triazine resistant weeds, and potential to replace atrazine or reduce atrazine application rate by the use of XRD-498 will be determined. Furthermore, pH response, organic matter response, crop response, efficacy clarification, yield from large trials, performance comparisons to other products will be evaluated.

Confined Rotational Crops Data (165-1)

The registrant responded to the confined rotational crops review (WGM;02/02/90) which stated MRID 41263232 had the following deficiencies:

1. The application rate in the original study was calculated from the experimental application parameters rather than measured by analysis of soil cores taken at initial time of application.

2. Storage stability data were not provided even though harvested crop fractions and soil sample were stored frozen until analysis.

3. All tissue samples having total ^{14}C-residues values >0.01 ppm were not characterized.

DowElance and the Agency, with representatives from EFGWB, had a conference on 1 May 1990. During the meeting it was agreed that the data from the original 1987 study (MRID 41263232 could be validated by repeating only the 30 day phase of a confined rotational crops study with [5-^{14}C]DE-498 with the above deficiencies addressed (minutes of meeting).

In the new study, the results, where the application rate was confirmed by analysis of soil samples taken immediately after application, were reported similar to the results from MRID 41263232. Three degradates which were labelled as Components A, B, and D were quantified. However, these degradates were only tentatively identified or not identified. Components A and B were present at 10% of applied and/or 0.01 ppm. Therefore, in order to fulfill the data requirement these degradates should be identified or determined to be more than one degradate at >10% of applied as believed by the author.

11: COMPLETION OF ONE-LINER:

See attached one-liner.

12: CBI APPENDIX:

N/A

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
XRD 498
Last Update on November 13, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer:	Section Head:	Date:

Common Name:XRD 498
PC Code # : 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: 15.00E Torr
Melting Point : °C Boiling Point: °C
Log Kow : Kow = 1.62 pKa: @ °C
Henry's : E Atm. M3/Mol (Measured) 1.14E -3 (calc'd)

Solubility in ...				Comments
Water	5.65E 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
XRD 498
Last Update on November 13, 1991
[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 to 115 days
[ ] Air :

Aerobic Soil Metabolism (162-1)
[V] T1/2 23 days in sandy loam
[V] T1/2 60 days in clay
[V] T1/2 93 days in silt loam
[V] T1/2 102 days in loam
[ ]
[ ]
[ ]

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

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

Aerobic Aquatic Metabolism (162-4)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
XRD 498
Last Update on November 13, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Soil Partition Coefficient (Kd) (163-1)
[V] 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)
[S] half-life=1.5 months to 3 months
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Aquatic Dissipation (164-2)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Forestry Dissipation (164-3)
[ ]
[ ]

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
XRD 498
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[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

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

Accumulation in Rotational Crops, Confined (165-1)
[S] limited accumulation (<0.005 ppm) when planted at 30 days post-
[ ] treatment

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)
[ ]
[ ]

Ground Water Monitoring, Prospective (166-1)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Small Scale Retrospective (166-2)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Large Scale Retrospective (166-3)
[ ]
[ ]
[ ]
[ ]

Ground Water Monitoring, Miscellaneous Data (158.75)
[ ]
[ ]
[ ]

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
XRD 498
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[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Field Runoff (167-1)
[ ]
[ ]
[ ]
[ ]

Surface Water Monitoring (167-2)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Droplet Spectrum (201-1)
[ ]
[ ]
[ ]
[ ]

Spray Drift, Field Evaluation (202-1)
[ ]
[ ]
[ ]
[ ]

Degradation Products

See attached sheet.

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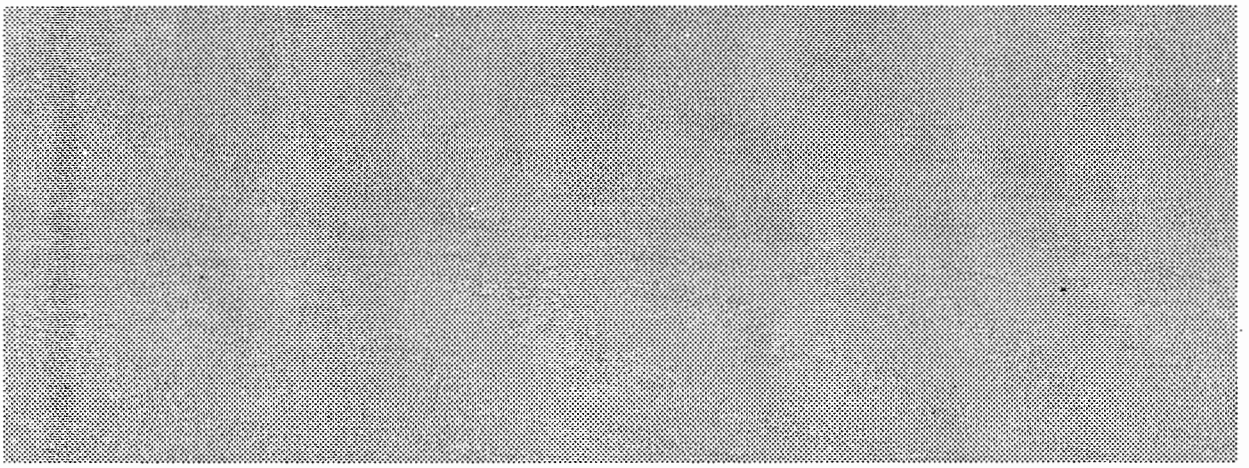
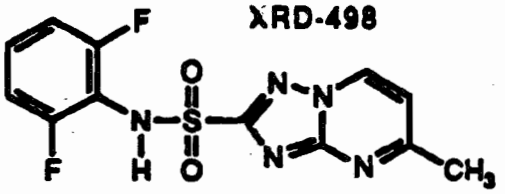
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
XRD 498
Last Update on November 13, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Comments



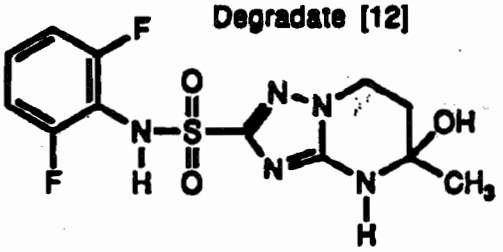
References: EPA reviews of studies
Writer : J. Hannan/GML

XRD-498

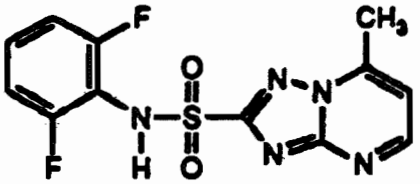


N-(2,6-difluorophenyl)-5-methyl-(1,2,4)triazolo(1,5-a)-pyrimidine-2-sulfonamide

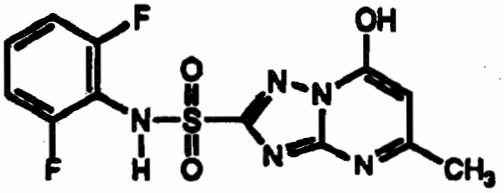
Degradate [12]



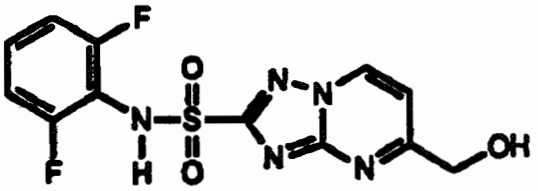
N-(2,6-difluorophenyl)-4,5,6,7-tetrahydro-5-hydroxy-5-methyl-(1,2,4)triazolo(1,5-a)-pyrimidine-2-sulfonamide



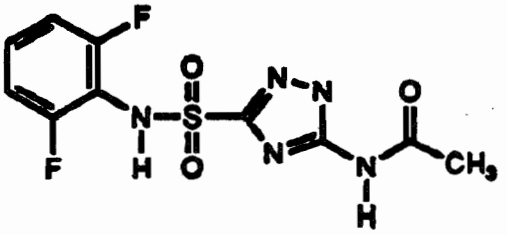
N-(2,6-difluorophenyl)-7-methyl-(1,2,4)triazolo(1,5-a)-pyrimidine-2-sulfonamide



N-(2,6-difluorophenyl)-5-methyl-7-hydroxy-(1,2,4)triazolo(1,5-a)-pyrimidine-2-sulfonamide



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



N-(2,6-difluorophenyl)-(1,2,4)triazolo-3-acetamide-2-sulfonamide

DATA EVALUATION RECORD

STUDY IDENTIFICATION:

Wolt, J.D., K. Woodburn, S. Chari, K. Shepler, and L.O. Ruzo. 1991. Sunlight Photodegradation of [^{14}C-Pyrimidine]XRD-498 in a Buffered Aqueous Solution at pH 5 and 7. Study performed by Pharmacology and Toxicology Research Laboratory-West, Richmond, California, and submitted by Dow Elanco North American Environmental Chemistry Laboratory, Midland, Michigan. MRID No. 419317-26.

TYPE OF STUDY: Photolysis in Water (161-2)

REVIEWED BY:

George Tompkins, Entomologist
Review Section 1, EFGWB, EFED
Signature: George Tompkins
Date:

APPROVED BY:

Paul J. Mastradone, Section Chief
Review Section 1, EFGWB, EFED
Signature: Paul J Mastradone
Date:

CONCLUSIONS:

1. EFGWB concludes that the submitted study satisfies the environmental fate data requirements for aqueous photolysis of the ^{14}C-pyrimidine ring system portion of XRD-498. This study, combined with the following study on the aqueous photolysis of the ^{14}C-aniline ring system portion of XRD-498 (MRID No. 419317-27), satisfies the aqueous photolysis data requirements.

2. The results of the study indicate that XRD-498 is stable to aqueous photolysis with half-lives of 164 days in pH 5 buffer and 326 days in pH 7 buffer.

3. After 30 days exposure to natural sunlight in pH 5 buffer, an average of 89.8% of the applied radioactivity was recovered as parent XRD-498; and at pH 7, 90.9% of the applied radioactivity was recovered as parent material. None of the unknown degradates exceeded 6.3% of the applied radioactivity.

MATERIALS AND METHODS:

Sterile buffer solutions (0.01 M sodium acetate pH 5; 0.01 M KH_2PO_4, pH 7) in deionized water were fortified with [^{14}C-pyrimidine]XRD-498 (radiopurity=10.9 mCi/mmol, chemical purity=99.3%) to 17.1 ppm for the pH 5 and 19.4 ppm for the pH7 solutions. Aliquots (10 ml) of the test solutions were aseptically transferred to quartz sample tubes (irradiated

samples) or pyrex sample tubes (dark control samples which were wrapped in foil). All samples were immersed in a distilled water bath at a 60° vertical angle. A temperature controlled waterbath was used maintaining the solutions at an average temperature of 24.7±0.1°C (pH 5) and 24.8±0.1°C (pH 7). The apparatus containing the samples was exposed to natural sunlight (37°45'N latitude, and 122°26'W longitude). The pH 5 test solutions were irradiated with sunlight between 9 April and 9 May 1990 with a cumulative light energy of 421.01 watt-minute/cm^2. The pH 7 test solutions were irradiated with sunlight between 26 February and 28 March 1990 with a cumulative light energy of 273.87 watt-minute/cm^2. A gas collection system was used to trap volatiles; air was drawn through sterilized bacterial filters into both the light and dark sample tubes and then into separate sets (light and dark) of three traps (ethylene glycol, 10% H_2So_4, and 10% NaOH). Duplicate test solutions were sampled at 0,4,10,16,22,and 30 days (pH5) and 0,4,10,17,22 and 30 days (pH 7) after application.

After irradiation, the sample solutions, combined with an acetonitrile (1 ml) rinse of their respective sample holders, were examined by LSC and then assayed by HPLC. Selected samples were also analyzed by 2-dimensional TLC for product confirmation. Plates were developed in two dimensions using first dichloromethane/methanol, 9:1 (v/v) and then toluene/ethyl formate/formic acid, 5:7:1 (v:v:v) as elutants.

REPORTED RESULTS:

1. After 30 days exposure to natural sunlight, in pH 5 buffer, 89.8% of the applied radioactivity was recovered as parent XRD-498; and in pH 7 buffer, 90.9% of the applied radioactivity was recovered as parent XRD-498. None of the unknown degradates exceeded 6.3% of the applied radiocarbon (Fig 7 to 9).

2. The authors report a mean material balance recovery of 99.5±2.5% and 98.7±3.3% of the applied radioactivity in the pH 5 and pH 7 solutions, respectively (Tables II, IIA). No radiocarbon was detected in the ethylene glycol traps at levels greater than 0.05%.

3. The extrapolated photolysis half-life for XRD-498 in pH 5 buffer was 164 days (Fig 10). In pH 7 buffer, XRD-498 demonstrated an extrapolated half-life of 326 days (Fig 10 a).

DISCUSSION:

1. EFGWB concludes that this study is scientifically valid and partially satisfies the data requirement for an aqueous photolysis study by providing information on aqueous photolysis of [^{14}C-pyrimidine]XRD-498 in buffered aqueous solutions at pH5 and 7. The results of the study indicate that after 30 days exposure to natural sunlight at pH 5, >89.7% of the applied radioactivity was recovered as parent XRD-498, and at pH 7,> 90.8% of the applied radioactivity was recovered as parent XRD-

498.

2. Based on the results of the study, EFGWB concludes that [^{14}C-pyrimidine]XRD-498 will be stable to photolysis in the aqueous environment.

3. In this study it was mentioned on page 26 that the degradation rate of [^{14}C-pyrimidine]XRD-498 in dark control for pH 7 is in Figure 11 a. However, this figure was not included in the text, nor did the page numbering sequence indicate that it was to be included (should have been on p.67).

DATA EVALUATION RECORD

STUDY IDENTIFICATION:

Wolt, J.D., K. Woodburn, S. Chari, K. Shepler, and L.O. Ruzo. 1991. Sunlight Photodegradation of [^{14}C-Aniline]XRD-498 in a Buffered Aqueous Solution at pH 5 and 7. Study performed by Pharmacology and Toxicology Research Laboratory-West, Richmond, California, and submitted by Dow Elanco North American Environmental Chemistry Laboratory, Midland, Michigan. MRID No. 419317-27.

TYPE OF STUDY: Photolysis in Water (161-2)

REVIEWED BY:

George Tompkins, Entomologist
Review Section 1, EFGWB, EFED
Signature: George Tompkins
Date:

APPROVED BY:

Paul J. Mastradone, Section Chief
Review Section 1, EFGWB, EFED
Signature: Paul J Mastradone
Date:

CONCLUSIONS:

1. EFGWB concludes that the submitted study satisfies the environmental fate data requirements for aqueous photolysis of the ^{14}C-aniline ring system portion of XRD-498. This study, combined with the previous study on the ^{14}C-pyrimidine ring system portion of XRD-498 (MRID No. 419317-26), completes and satisfies the aqueous photolysis data requirements.

2. The results of the study indicate that XRD-498 is stable to aqueous photolysis with half-lives of 151 days in pH 5 buffer and 727 days in pH 7 buffer.

3. After 30 days exposure to natural sunlight in pH 5 buffer, an average of 91.05% of the applied radioactivity was recovered as parent XRD-498; and at pH 7, 94.4% of the applied radioactivity was recovered as parent material. None of the unknown degradates exceeded 6.3% of the applied radioactivity.

MATERIALS AND METHODS:

Sterile buffer solutions (0.01 M sodium acetate pH 5; 0.01 M KH_2PO_4, pH 7) in deionized water were fortified with [^{14}C-aniline]XRD-498 (radiopurity=28.0 mCi/mmol, chemical purity=98.8%) to 20.17 ppm for the pH 5 and 20.84 ppm for the pH7 solutions. Aliquots (10 ml) of the test solutions were aseptically transferred to quartz sample tubes (irradiated

samples) or pyrex sample tubes (dark control samples which were wrapped in foil). All samples were immersed in a distilled water bath at a 60° vertical angle. A temperature controlled waterbath was used maintaining the solutions at an average temperature of 24.7±0.1°C (pH 5) and 24.8±0.1°C (pH 7). The apparatus containing the samples was exposed to natural sunlight (37°45'N latitude, and 122°26'W longitude). The pH 5 test solutions were irradiated with sunlight between 9 April and 9 May 1990 with a cumulative light energy of 421.01 watt-minute/cm^2. The pH 7 test solutions were irradiated with sunlight between 26 February and 28 March 1990 with a cumulative light energy of 273.87 watt-minute/cm^2. A gas collection system was used to trap volatiles; air was drawn through sterilized bacterial filters into both the light and dark sample tubes and then into separate sets (light and dark) of three traps (ethylene glycol, 10% H_2So_4, and 10% NaOH). Duplicate test solutions were sampled at 0,4,10,16,22,and 30 days (pH5) and 0,4,10,17,22 and 30 days (pH 7) after application.

After irradiation, the sample solutions, combined with an acetonitrile (1 ml) rinse of their respective sample holders, were examined by LSC and then assayed by HPLC. Selected samples were also analyzed by 2-dimensional TLC for product confirmation. Plates were developed in two dimensions using first dichloromethane/methanol, 9:1 (v/v) and then toluene/ethyl formate/formic acid, 5:7:1 (v:v:v) as elutants.

REPORTED RESULTS:

1. After 30 days exposure to natural sunlight, in pH 5 buffer, 91.05% of the applied radioactivity was recovered as parent XRD-498; and in pH 7 buffer, 94.45% of the applied radioactivity was recovered as parent XRD-498. None of the unknown degradates exceeded 6.3% of the applied radiocarbon (Fig 7 to 9).

2. The authors report a mean material balance recovery of 99.6±3.3% and 99.1±3.3% of the applied radioactivity in the pH 5 and pH 7 solutions, respectively (Tables II, IIA). The maximum radiocarbon detected in the ethylene glycol and H_2SO_4 traps was 0.3% and 0.1% respectively.

3. The extrapolated photolysis half-life for XRD-498 in pH 5 buffer was 151 days (Fig 11). In pH 7 buffer, XRD-498 demonstrated an extrapolated half-life of 727 days (Fig 11 a).

DISCUSSION:

1. EFGWB concludes that this study is scientifically valid and partially satisfies the data requirement for an aqueous photolysis study by providing information on aqueous photolysis of [^{14}C-aniline]XRD-498 in buffered aqueous solutions at pH5 and 7. The results of the study indicate that after 30 days exposure to natural sunlight at pH 5, >91.0% of the applied radioactivity was recovered as parent XRD-498, and at pH 7,> 94.4% of the applied radioactivity was recovered as parent XRD-498. This study

combined with the study on the ^{14}C-pyrimidine ring system portion of XRD-498 (MRID No. 419317-26) complete the data requirements for aqueous photolysis.

2. Based on the results of the study, EFGWB concludes that [^{14}C-aniline]XRD-498 will be stable to photolysis in the aqueous environment.