17 JUN 1993

Date Out:

DP Barcode: D168599
Chemical Code: 121601

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action

To: J. Miller/J. Mays, PM #23
Registration Division (H7505C)

From: Paul Mastradone, Section Chief
Chemistry Review Section 1
Environmental Fate & Ground Water Branch/EFED (H7507C)

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

Henry Jacoby 6/17/93

Attached, please find the EFGWB review of...

Common Name:	Acetochlor	**Trade name:**	
Company Name:	ICI Americas Inc.		
ID #:	010182-		
Purpose:	Review of environmental fate data submitted in support of Section 3 registration.		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Herbicide	010	91-0940	10 days

STATUS OF STUDIES IN THIS PACKAGE:

Guideline #	MRID	Status[1]
161-2	41565145	A
161-3	41565146	A
162-2	41565148 41778301	U
164-1	41565152	U
164-1	41565153	U
164-1	41592012	U
164-1	41592013	U
165-4	41565154	A

STATUS OF DATA REQUIREMENTS ADDRESSED IN THIS PACKAGE:

Guideline #	Status[2]

[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 W=Waived

1. CHEMICAL:

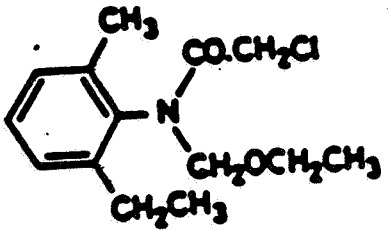
Chemical name: 2-Chloro-2'-methyl-6'-N-ethoxymethylacetanilide

CAS no.: 34256-28-1

Common name: Acetochlor

Trade name: ICIA5676

Chemical structure:



Formulation: Acetochlor.....70.9%
Inert Ingredients.....29.1%

Physical/Chemical properties of active ingredient:

Physical characteristics: Colorless thick liquid, aromatic odor

Molecular formula: $C_{14}H_{20}ClNO_2$

Molecular weight: 269.8

Vapor Pressure: 4.4×10^{-5} mm Hg

Solubility: 233 mg/L at 25°C

Octanol/water partition coefficient: 3.0

2. TEST MATERIAL:

See individual DER's

3. STUDY/ACTION TYPE:

To review environmental fate studies (photodegradation in water, photodegradation on soil, anaerobic soil metabolism, terrestrial field dissipation, and accumulation in fish) submitted to support Section 3 Registration.

4. STUDY IDENTIFICATION:

Chotalia, R.L. and Weissler, M.S. ACETOCHLOR: PHOTOLYSIS IN AQUEOUS SOLUTION AT pH 7. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK under Laboratory Project ID 88JH448; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 28 June 1989; Received by EPA on 10 July 1990; MRID No. 41565145.

Hawkins, D.R., Kirkpatrick, D., Dean, G.M. and Meller, S.J. THE PHOTODEGRADATION OF ^{14}C-ACETOCHLOR ON SOIL. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 2 April 1990; Received by EPA on 10 July 1990; MRID No. 41565146.

Hawkins, D.R., Kirkpatrick, D., and Dean, G.M. THE METABOLISM OF ^{14}C-ACETOCHLOR IN SANDY LOAM SOIL UNDER ANAEROBIC CONDITIONS. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 14 July 1989; Received by EPA on 10 July 1990; MRID No. 41565148.

Skidmore, M. ADDENDUM TO STUDY ENTITLED: THE METABOLISM OF ^{14}C-ACETOCHLOR IN SANDY LOAM SOIL UNDER ANAEROBIC CONDITIONS. Submitted by ICI Americas, Inc., Wilmington, DE; Addendum date 4 February 1991; Received by EPA 8 February 1991; MRID No. 41778301.

Zilka, S.A., Wilson, B., Hoag, R.E., Coombes, L.E., and Simmons, N.D. ACETOCHLOR: DISSIPATION OF RESIDUES IN USA SOIL UNDER FIELD CONDITIONS - LELAND, MISSISSIPPI. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK under Laboratory Project ID 5676-88-SD-01; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 9 May 1990; Received by EPA 10 July 1990; MRID No. 41565152.

Wilson, B., Dhillon, E., Bolygo, E., Pay, J., and Simmons, N.D. ACETOCHLOR: RESIDUES OF OXANILIC ACID AND SULPHONIC ACID METABOLITES UNDER FIELD CONDITIONS IN LELAND, MISSISSIPPI. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK under Laboratory Project ID 5676-88-SD-01; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 25 May 1990; Received by EPA 10 July 1990; MRID No. 41565153.

Zilka, S.A., Wilson, B., Hoag, R.E., Stafford, J., and Simmons, N.D. ACETOCHLOR: DISSIPATION OF RESIDUES IN USA SOIL UNDER FIELD CONDITIONS - CHAMPAIGN, ILLINOIS. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK under Laboratory Project ID 5676-88-SD-01; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 9 May 1990; Received by EPA 10 July 1990; MRID No. 41592012.

Wilson, B., Dhillon, E., Bolygo, E., Pay, J., and Simmons, N.D. ACETOCHLOR: RESIDUES OF OXANILIC ACID AND SULPHONIC ACID METABOLITES UNDER FIELD CONDITIONS IN CHAMPAIGN, ILLINOIS. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK under Laboratory Project

ID 5676-88-SD-01; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed 25 May 1990; Received by EPA 10 July 1990; MRID No. 41592013.

Hamer, M.J., Farrelly, E., Lijzen, J., and Hill, I.R. ACETOCHLOR: AN INVESTIGATION OF ACCUMULATION AND ELIMINATION IN BLUEGILL SUNFISH IN A FLOW-THROUGH SYSTEM. Performed by ICI Agrochemicals, Bracknell, Berkshire, UK under Laboratory Project ID 89JH292; Sponsored and Submitted by ICI Americas, Inc., Wilmington, DE; Study completed on 25 May 1990; Received by EPA 10 July 1990; MRID No. 41565154.

5. REVIEWED BY:

Gail Maske
Chemist, Review section #2
OPP/EFED/EFGWB

Signature: _____
Date: 17 JUN 1991

6. APPROVED BY:

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

Signature: Paul J. Mastradone
Date: 17 JUN 1991

7. CONCLUSIONS:

The review of these environmental fate studies is in response to the New Chemical Screen memorandum (WGM;03/18/91). The memorandum stated that acetochlor environmental fate studies (photodegradation in water, photodegradation on soil, anaerobic soil metabolism, terrestrial field dissipation, and accumulation in fish) submitted in support of Section 3 registration for terrestrial nonfood crop use would be reviewed in full.

Photodegradation in water (161-2)

The photodegradation in water study is scientifically valid and can be used to fulfill data requirements (161-2). No further photodegradation in water data are needed for acetochlor at this time.

Acetochlor photodegraded very slowly in sterile aqueous buffered (pH 7) solutions when exposed to a continuous light source (xenon arc lamp) for 861 hours (35 days, equivalent to 30 days of Florida summer sun). After 861 hours, 88.8% of the applied acetochlor remained undegraded in solution, compared to 98.9% in the dark control after 30 days incubation. In the light exposed samples, four unidentified degradates each comprised a maximum of 0.09-3.9% (0.09-0.390 ppm) of applied radioactivity. At termination of the study, volatilized radioactivity reached 5.1% of the applied. Acetochlor made up 87.2% of this volatilized material (4.4% of applied).

Photodegradation on soil (161-3)

The photodegradation on soil study is scientifically valid and can be used to fulfill data requirements (161-3). No further photodegradation on soil data for acetochlor are needed at this time.

Acetochlor photodegraded very slowly when applied to sandy loam soil and exposed to a continuous light source (xenon arc lamp) for 14 days (reported to be 33 days Florida summer sun) at 25°C. In the light exposed and dark control soils, acetochlor decreased from 97.8% of the applied at initiation of study to 85.6% and 87.0%, respectively, at 14 days posttreatment. Four unidentified degradates were isolated from the soils at ≥7.8% of the applied. After 14 days of light exposure, 4.62% of the applied radioactivity had volatilized, primarily as carbon dioxide (4.22%). In the dark control at 14 days posttreatment, 2.31% of the applied had volatilized; the majority of volatiles (2.22% of the applied) were organic compounds trapped by the foam plugs.

Anaerobic soil metabolism (162-2)

The anaerobic soil metabolism study is scientifically valid and can be used as supplemental data. However, it can not be used to fulfill data requirements at this time for the following reasons:

To fully understand the anaerobic metabolism, the [^{14}C]residues (≥0.01 ppm) in the floodwater, which comprised 25.8-27.8% of the applied radioactivity (2.6-2.8 ppm), need to be characterized.

A discrepancy in the rate of degradation between one sample and three other samples was believed by the registrant to be a result of a difference in redox potential (+50 mV and -30mV) of the samples. However, the Agency believes this is a narrow range for redox potential (Lindsay, W. CHEMICAL EQUILIBRIA IN SOILS. Publ. by John Wiley & Sons, Inc.; 1979.). In addition, this data does not appear to explain the discrepancy in the rate of degradation since there was not sufficient data furnished (e.g. pH's, monitoring of soil vitality, test limits and variations, etc.) to evaluate the registrant's claim. Furthermore, another acetochlor-anaerobic metabolism study reviewed (MRID 41338501) indicates that acetochlor has much shorter half-lives (17.3- 20.4 days) when applied to silt loam, silty clay loam, and sandy loam soils and incubated under anaerobic conditions. There are insufficient data to explain this discrepancy, as well.

Only one-dimensional normal and reverse phase TLC analysis was conducted. There was no comfirmation analysis performed to verify the results of this study.

The above concerns need to be adequately addressed for the study to fulfill the data requirement.

Acetochlor degraded with a registrant-calculated half-life of 230 days in sandy loam soil that was incubated anaerobically (flooded) in the dark for

5

61 days following an aerobic incubation period of 30 days. Three nonvolatile degradates were identified in the soil, N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) oxamic acid (compound 17), at a maximum of 14.2% immediately prior to flooding; N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide-2-sulphonic acid (compound 24) at a maximum of 2.6% at 0 and 30 days postflooding; and N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide (compound 31) at a maximum of 19.1-22.1% at 61 days postflooding. Unidentified acetochlor residues in the floodwater comprised 26-28% (2.3-2.8 ppm) of the applied radioactivity. Volatilization from the soils decreased in response to flooding; from the soil incubated for the entire 91-day experiment, an average of 2.70% of the applied was evolved during the 30-day aerobic period and an average of 0.88% was evolved during the 61-day anaerobic period.

Terrestrial field dissipation (164-1)

These terrestrial field dissipation studies are scientifically valid and can be used as supplemental data. However, they can not be used to fulfill data requirements (164-1). Soil samples were only analyzed for two degradates, oxanilic and sulphonic acid. Numerous degradates were identified in the metabolisms studies at concentrations greater than 10% of applied and/or ≥0.01 ppm, and should be analyzed for in the field dissipation studies to fully understand the dissipation of acetochlor. In addition, storage stability data for degradates were not furnished. Samples were stored for up to 462 days before analysis. Storage stability data indicated that acetochlor was stable for 390 days. The registrant stated that the freezer storage stability study for parent acetochlor was on-going at the time these documents were submitted to the EPA.

Acetochlor (7 lb ai/gal EC), applied at 3 lb ai/A to plots of silt loam soil that were later planted to corn, dissipated with a calculated half-life of 36 days. Acetochlor was not detected (<0.01 mg/kg) below the 3.5-inch depth in any sample at any sampling interval except at 0.01-0.02 mg/kg in the 5.5- to 27.5-inch depth at 14 days posttreatment. In the 0- to 3.5-inch soil layer, acetochlor was 1.23-3.20 mg/kg immediately posttreatment, 1.71-2.39 mg/kg at 27 days, 0.54-1.04 mg/ kg at 62 days, 0.03-0.1 mg/kg at 90 days and 0.01 mg/kg at 362 days.

The soils were analyzed for two degradates (oxanilic acid and sulphonic acid) which were at maximums of 0.11-0.25 mg/kg and 0.02-0.06 mg/kg, respectively, at 90 days posttreatment in the top 3.5 inches of soil, and were below the limits of detection (<0.02 mg/kg) at 189 days (Tables 3 and 4). In the 3.5- to 7.0-inch soil depth samples, oxanilic acid was <0.02-0.02 mg/kg and 0.05-0.14 mg/kg at 6 and 90 days posttreatment, respectively; sulphonic acid was 0.02-0.08 mg/kg at 90 days. Oxanilic acid and sulphonic acid were not detected below the 7.0-inch soil depth at any sampling interval.

Acetochlor (7 lb ai/gal EC), applied at 3 lb ai/A to plots of clay loam soil that were later planted to corn, dissipated with a calculated half-life of 26 days. Acetochlor was not detected (<0.01 mg/kg) below the 3.5-inch depth in any sample at any sampling interval. In the 0- to 3.5-inch soil layer, acetochlor was 2.36-4.52 mg/kg immediately posttreatment, 1.20-

2.18 mg/kg at 28 days, 0.65-1.71 mg/kg at 56 days, 0.41-0.61 mg/kg at 84 days, and 0.04-0.06 mg/kg at 390 days.

The soils were analyzed for two degradates, oxanilic acid and sulphonic acid which were at maximum concentrations of 0.50-0.83 mg/kg at 84 days posttreatment and 0.07-0.11 mg/kg at 168 days, respectively, in the top 3.5 inches of soil, and were below the limits of detection (<0.02 mg/kg) at 390 days (Tables 3 and 4). In the 3.5- to 7.0-inch depth samples, oxanilic acid was <0.02-0.08 mg/kg and <0.02-0.06 mg/kg at 84 and 168 days posttreatment, respectively; sulphonic acid was <0.02-0.05 mg/kg and 0.05-0.10 mg/kg at 84 and 168 days. Oxanilic acid and sulphonic acid were not detected below the 7.0-inch soil depth at any sampling interval.

Accumulation in fish (165-4)

This fish accumulation study is scientifically valid and can be used as supplemental data. Although radioactive residues in the fish tissues were not adequately characterized (only those residues corresponding to acetochlor were quantified) the data requirement can be considered fulfilled based on present data and acetochlor's low octanol/water coefficient (3.0). No further fish accumulation data for acetochlor are needed at this time.

Acetochlor residues (uncharacterized) accumulated in bluegill sunfish exposed to 11 ppb of acetochlor, with maximum mean bioconcentration factors of 40x, 780x, and 150x for edible, nonedible, and whole fish tissues, respectively. After 28 days of exposure to pesticide-free water, only 2-33% of the accumulated [^{14}C]residues remained in the fish tissue.

In another fish accumulation study (MRID 00131388), similar data was reported. Bioconcentration factors of 84x, 35x, and 150x were reported for whole fish, fillet, and viscera.

Environmental Fate Assessment

This environmental fate assessment is based on acceptable (hydrolysis, photodegradation in water, photodegradation on soil, and leaching, adsorption/desorption) and supplemental data (aerobic and anaerobic soil metabolism and terrestrial field dissipation). The major route of dissipation for acetochlor appears to be microbial mediated degradation (aerobic metabolism-$t_{1/2}$=≈13 days) with mineralization to CO_2. Laboratory degradation data indicate that although acetochlor degrades by biotic processes it is stable to abiotic processes (hydrolysis and photolysis). In addition, laboratory mobility data indicate that acetochlor is very mobile to moderately mobile (Kds ranged from 0.05-5.48 in soils having percent organic matter ranging from 0.77-5.4). The mobility appears to be inversely related to organic matter and pH (Koc=24-124, respectively). Aged batch equilibrium and column leaching data also indicate acetochlor metabolites are mobile. However, supplemental field dissipation data indicate acetochlor and its residues were not detected below the 0-7 inch depth level.

Acetochlor appears to be stable to hydrolysis ($t_{1/2}$=>24 months) and photolysis (at 30 days 88.8% of applied remained undegraded in pH 7 solution and

85.6% of applied undegraded on sandy loam soil). However, acetochlor degraded in aerobic soil ($t_{1/2}$=8 to 13.5 days). Presently there is a discrepancy in reported anaerobic metabolism half-lives for acetochlor ($t_{1/2}$=230 days vs 17.3-20.4 days). Additional anaerobic metabolism data are needed to confirm the anaerobic soil metabolic half-life. Field dissipation data indicate that acetochlor metabolizes fairly rapid in the environment ($t_{1/2}$=<3 days on California sandy soil to 36 days on silt and clay loam soils in Mississippi and Illinois). N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)-oxalic acid and N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)acetamide-2-sulphonic acid, and N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide are the major degradates. These metaoblites reached a maximum level of 20%, 13%, and 22.1% of applied radioactivity after 60 and 180 days, respectively. Degradates appear to decline to 8% of the applied radioactivity after one year. Carbon dioxide accounted for at least 8 to 11% of applied radioactivitiy during the aerobic metabolism testing period. Minor unidentified metabolites were discernible in metabolism studies. Therefore, the laboratory and field data are consistent.

Acetochlor appears be moderately to very mobile (coarse sand soil (Kd=0.05-0.26 with %OM=0.77), loamy sand (Kd=0.53-3.34 with %OM=1.9), sand (Kd=0.93-5.48 with %OM=1.5), sandy loam (Kd=1.14-3.02 with %OM=2.6), clay (Kd=3.77-4.93 with %OM=5.4), sandy loam (Kd=7.90-37.8 with %OM=8.0) when applied to soil. Kd values for acetochlor and the two metabolites (sulphonic and oxanilic acid) appear to be dependent on the organic matter content and pH of the soil (Koc=24, 17, 20, 31, and 124 for coarse sand, loamy sand, sand, sandy loam, and high organic sandy loam soils, respectively). Adsorption was higher in acid and high organic matter content soils. Soil column data of aged and unaged acetochlor reflected the correlation between organic matter content and adsorption. The Freundlick K values and % of material leached ≥30 cm were 2.7 and 29.7 forsilty clay loam, 1.6 and 42.4 for sandy loam soil, 1.1 and 55.3 for silt loam, and 0.4 and 96.0 for sandy soils, respectively. Therefore, soil adsorption/desorption and column leaching studies indicate that acetochlor is moderately mobile to immobile when applied to soils with higher organic matter content (≥3.4%) and very mobile when applied to soils with lower organic matter content (≈0.7%). Aged batch equilibrium and column leaching data indicate similar results the for acetochlor metabolites. Acetochlor and its residues were not detected below the 0-7 inch depth level in field dissipation data.

In rotational crop data the amount of acetochlor uptake decreased as time of posttreatment planting increased. Five month rotational crops residues ranged from 0.03 to 1.13 ppm for all experiments, while those from the 1 year rotational crops ranged from 0.01 to 0.63 ppm. Uptake of acetochlor in soybeans foliage and grain at harvest was 1.2 ppm and 0.2 ppm, respectively. Residues in barley grain and straw were 0.2 ppm and 0.4 to 1.13 ppm, respectively. In cabbage, radishes, and radish greens the residues ranged from 0.09 ppm to 0.2 ppm, 0.03 to 0.04 ppm, 0.16 to 0.18 ppm, respectively. Furthermore, acetochlor residues were reported to accumulate in bluegill sunfish exposed to 11 ppb of acetochlor, with maximum mean bioconcentration factors of 40x, 780x, and 150x for edible, nonedible, and whole fish tissue, respectively. Depuration of accumulated acetochlor residues varied from 2 to 33% by day 28.

8. RECOMMENDATIONS:

The registrant should be informed of the following:

a. The anaerobic soil metabolism and terrestrial soil metabolism studies are not acceptable to fulfill the data requirements.

b. The photodegradation in water, photodegradation on soil, and accumulation in fish studies are acceptable to fulfill the data requirement.

c. The status of the Environmental Fate Data Requirements for acetochlor (ICI registrant) for terrestrial food crop use and terrestrial nonfood crop use is as follows:

Environmental Fate Data Requirements	Status of Data Requirement	MRID No.
Degradation Studies-Lab		
161-1 Hydrolysis	Fulfilled (WGM;01/18/91)	41565144
161-2 Photodegradation in water	Fulfilled (WGM;06/15/93)	41565145
161-3 Photodegradation on soil	Fulfilled (WGM;06/15/93)	*41565146
Metabolism Studies-Lab		
162-1 Aerobic (Soil)	Not Fulfilled (WGM;01/18/91)	41565147
162-2 Anaerobic (Soil)	Not Fulfilled (WGM;06/15/93)	41565148 41778301
Mobility Studies		
163-1 Leaching, Adsorption/ Desorption	Fulfilled (WGM;01/18/91)	41565149
163-2 Volatility-lab	Not Required (PRD;04/24/89)	
Dissipation Studies		
164-1 Field	Not Fulfilled (WGM;06/15/93)	41565152 41565153 41592012 41592013
164-4 Combination & tank mixes	Not Submitted[2]	
Accumulation Studies		
165-1 Rotational crops-confined	Not Submitted[1]	
165-4 In fish	Fulfilled (WGM;06/15/93)	41565154

[1] Confined accumulation study is required for terrestrial feed or food crop uses and terrestrial nonfood crop uses when it is reasonably foreseeable that any food or feed corp may be subsequently planted on the site of pesticide application.

[2] Acetochlor is used in combination with the safener, dichlormid.

9. BACKGROUND:

ICI Agricultural Products, Wilmington, DE is requesting registration of acetochlor for noncrop use and for use on corn crops. ICI began developing acetochlor use for registration as a herbicide in 1988.

A new chemical screen for ICI's acetochlor for terrestrial noncrop use was just completed (November 1990). EFGWB requested that the acetochlor new chemical screen request be withdrawn and a complete package for conditional registration be submitted.

ICIA5676 6.4 EC herbicide is a novel combination of the chloroacetamide, acetochlor, and the antidote, dichlormid. The acetochlor will be used to control many annual grasses, yellow nutsedge and certain broadleaf weeds in transplanted junipers and yews and corn while the dichlormid provides reduces the phytotoxicity of the herbicide. The broadcast rate varies according to the organic matter content and type of soil to be treated.

Acetochlor is toxic to aquatic life, but is less toxic to bees.

10. DISCUSSION:

None

11: COMPLETION OF ONE-LINER:

No one-liner is attached.

12: CBI APPENDIX:

N/A

ONE-LINER

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ACETOCHLOR (ICI)
Last Update on June 14, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer:	Section Head:	Date:

Common Name:ACETOCHLOR (ICI)
Smiles Code:
PC Code # :121601 CAS #:34256-82-1 Caswell #:

Chem. Name :2-CHLORO-N-(ETHOXYMETHYL)-N-(2-ETHYL-6-METHYL-PHENYL)-ACETAMIDE
Action Type:HERBICIDE

Trade Names:ICIA5676
(Formul'tn):
Physical State: STRAW COLOURED LIQUID

Use :POSTEMERGENCE BROADLEAVED WEED CONTROL
Patterns :
(% Usage) :
:

Empirical Form: $C_{14}H_{20}NO_2Cl$
Molecular Wgt.: 269.80 Vapor Pressure: 4.40E -5 Torr
Melting Point : °C Boiling Point: °C
Log Kow : 3.0 pKa: @ °C
Henry's : E Atm. M3/Mol (Measured) 7.00E -8 (calc'd)

Solubility in ...				Comments
Water	2.23E 2	ppm	@20.0 °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
ACETOCHLOR (ICI)
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[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Photolysis (161-2, -3, -4)
[V] Water:INSIGNIFICANT
[ ] :
[ ] :
[ ] :

[V] Soil :INSIGNIFICANT
[ ] Air :

Aerobic Soil Metabolism (162-1)
[S] SILTY CLAY LOAM:13.5 DAYS
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Anaerobic Soil Metabolism (162-2)
[S] SANDY LOAM: RELATIVELY STABLE-230 DAYS
[ ]
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Anaerobic Aquatic Metabolism (162-3)
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Aerobic Aquatic Metabolism (162-4)
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Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ACETOCHLOR (ICI)
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[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Soil Partition Coefficient (Kd) (163-1)

	SOIL	%OM	Kd
[V]	COARSE SAND	0.77	0.05 TO 0.26
[ ]	LOAMY SAND	1.9	0.53 TO 3.34
[ ]	SANDY LOAM	2.6	1.14 TO 3.02
[ ]	CLAY	5.4	3.77 TO 4.93
[ ]	SAND	1.5	0.93 TO 5.48

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

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[S] SILT LOAM SOIL: 36 DAYS FROM UPPER 3.5"
[S] CLAY LOAM SOIL: 26 DAYS FROM UPPER 3.5"
[ ]
[ ]
[ ]
[ ]
[ ]
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Aquatic Dissipation (164-2)
[ ]
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Forestry Dissipation (164-3)
[ ]
[ ]

Environmental Fate & Effects Division
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ACETOCHLOR (ICI)
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Long-Term Soil Dissipation (164-5)
[ ]
[ ]

Accumulation in Rotational Crops, Confined (165-1)
[ ]
[ ]

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

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

Bioaccumulation in Fish (165-4)
[S] BIOCONCENTRATION FACTORS: 40 FOR EDIBLE; 780X FOR NONEDIBLE
[ ] 150X FOR WHOLE FISH - 2 TO 33% AT 28 DAY DEPURATION REMAINED

Bioaccumulation in Non-Target Organisms (165-5)
[ ]
[ ]

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

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

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
ACETOCHLOR (ICI)
Last Update on June 14, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

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

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

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

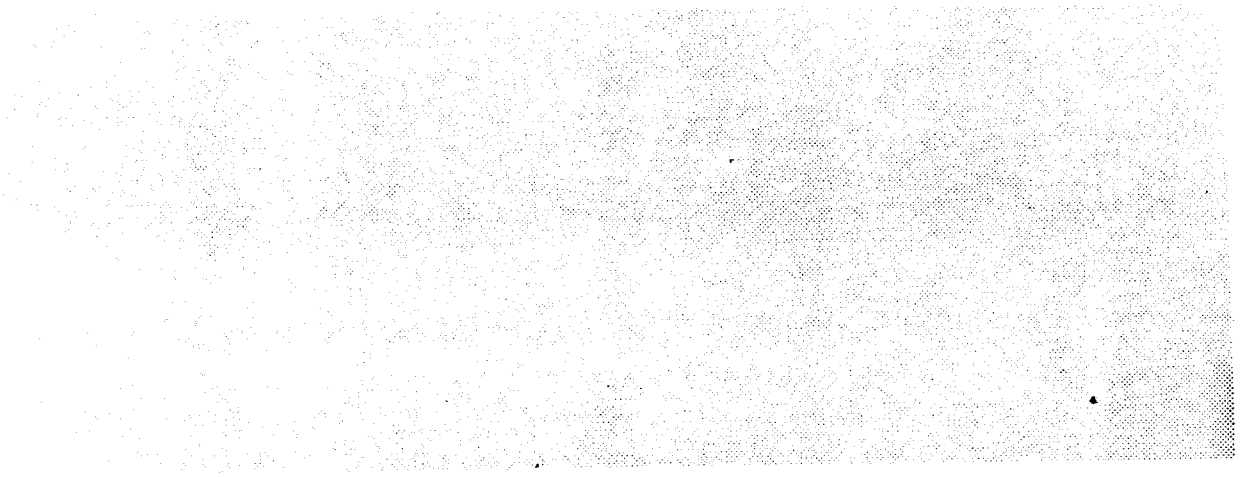
Spray Drift, Field Evaluation (202-1)
[ ]
[ ]
[ ]
[ ]

Degradation Products

MULTIPLE DEGRADATES. MAJOR DEGRADATES WERE METHYL OXANILIC ACID, SULFINYLACETIC ACID, AND SULFOACETANILIDE

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ACETOCHLOR (ICI)
Last Update on June 14, 1993
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

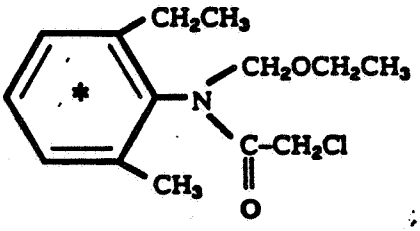
Comments



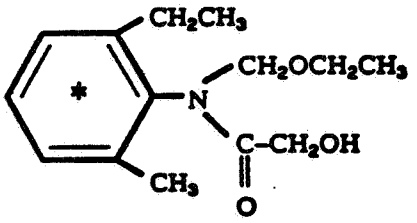
References: ENVIRONMENTAL FATE STUDIES; FARM CHEMICAL HANDBOOK
Writer : WGM

FIGURE 1

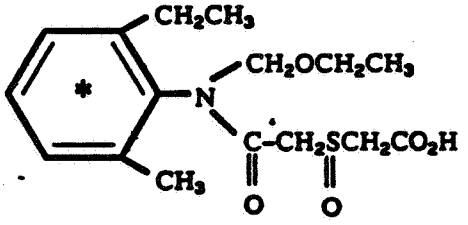
Proposed biotransformation pathway for ^{14}C-acetochlor in soil



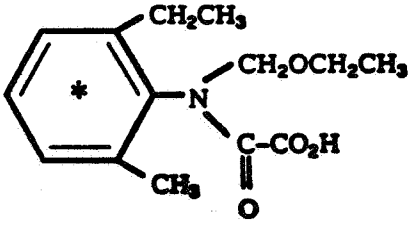
acetochlor



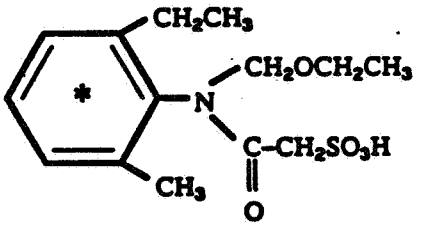
Compound 20
N-(ethoxymethyl)-2'-ethyl-6'-methyl-2-hydroxyacetanilide



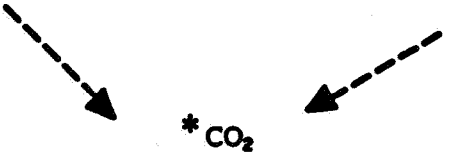
Compound 48
[ethoxymethyl(6-ethyl-o-tolyl) carbamoylmethylsulphinyl] acetic acid



Compound 17
N-ethoxymethyl-N-(2'-ethyl-6'-methylphenyl)oxamic acid



Compound 24
ethoxymethyl(6-ethyl-o-tolyl) carbamoylmethanesulphonic acid



* Denotes position of ^{14}C-label

TABLE OF CONTENTS

ACETOCHLOR

Table of Contents

		Page
Introduction		
Scientific Studies		
1.	Photodegradation in water. (Chotalia and Weissler, 41565145)	1.1
2.	Photodegradation on soil. (Hawkins et al., 41565146)	2.1
3.	Anaerobic soil metabolism. (Hawkins et al., 41565148; Skidmore, 41778301)	3.1
4.	Terrestrial field dissipation (Leland, MS). (Zilka et al., 41565152; Wilson et al., 41565153)	4.1
5.	Terrestrial field dissipation (Champaign, IL). (Zilka et al., 41592012; Wilson et al., 41592013)	5.1
6.	Accumulation in laboratory fish. (Hamer et al., 41565154)	6.1

DATA EVALUATION RECORD

STUDY 1

CHEM 121601 Acetochlor §161-2

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 41565145
Chotalia, R.L., and M.S. Weissler. 1989. Acetochlor: Photolysis in aqueous solution at pH 7. Laboratory Project ID 88JH448. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas Inc., Wilmington, DE.

DIRECT REVIEW TIME = 10

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EDITED BY: K. Ferguson TITLE: Task Leader
W. Martin Staff Scientist

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SIGNATURE:

CONCLUSIONS:

Degradation - Photodegradation in Water

The photodegradation in water study is scientifically valid and can be used to fulfill data requirements (161-2). No further photodegradation in water data are needed for acetochlor at this time.

Acetochlor photodegraded very slowly in sterile aqueous buffered (pH 7) solutions when exposed to a continuous light source (xenon arc lamp) for 861 hours (35 days, equivalent to 30 days of Florida summer sun). After 861 hours, 88.8% of the applied acetochlor remained undegraded in solution, compared to 98.9% in the dark control after 30 days incubation. In the light exposed samples, four unidentified degradates each comprised a maximum of 0.09-3.9% (0.09-0.390 ppm) of applied radioactivity. At termination of the study, volatilized radioactivity reached 5.1% of the applied. Acetochlor made up 87.2% of this volatilized material (4.4% of applied).

Material balances for the light exposed and dark control solutions were ≥96.7% of the applied radioactivity.

METHODOLOGY:

Uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 97.4%, specific activity 2250 Bq/ug, ICI) dissolved in acetonitrile was added at 10 ppm to borosilicate glass vials containing aliquots (8 mL) of a sterile 0.01 M phosphate pH 7 buffer solution. The vials were capped with quartz lids, placed in a steel-jacketed water-cooled photolysis unit, connected in series, and continuously irradiated using a filtered xenon arc lamp (Heraeus Suntest Accelerated Exposure Machine Table Unit; Figures 2-4, 7, and 9). The average light intensity of the xenon lamp was 15.1-19.6 Wm^{-2}/nm, and 27.60-35.86 hours of irradiation from the lamp was stated to be equivalent to 12 hours of Florida summer sunlight (Table II; Figure 6). Throughout the study, humidified, CO_2-free air was drawn through the photolysis tubes, then through a polyurethane foam plug and tubes of 1 M HCl, 2-methoxyethanol, and ethanolamine (2 tubes). The temperature of the irradiated solutions was maintained at 25 ± 1 C using two thermocouples submerged in the photolysis tubes. Also, [^{14}C]acetochlor was added to scintillation vials containing the buffer solution; a portion of these vials was wrapped in aluminum foil and placed in a constant-temperature room in the dark at 25 ± 1 C to serve as dark controls, the remainder were analyzed at approximately 1 hour post-treatment as "zero time" samples. Duplicate irradiated solutions were collected following 0, 211, 498, 599, and 861 hours of irradiation (equivalent to 0, 7, 14, 21, and 30 days of sunlight); dark control samples were analyzed after 30 days of incubation. At each sampling interval, the trapping solutions were replaced with fresh solution.

Aliquots of each sample were analyzed for total radioactivity using LSC, and for specific compounds using one-dimensional TLC on normal-phase silica gel plates developed with n-hexane:acetone (1:1) or chloroform:methanol (95:5), and on reverse-phase plates developed with methanol:water (80:20). The samples were chromatographed both with and without an acetochlor reference standard. Radioactive zones on the TLC plates were characterized using both autoradiography and radiochromatogram scanning. Additional aliquots of the 0- and 861-hour irradiated solutions and the 30-day dark control solution were analyzed by GC/MS.

The trapping solutions were analyzed by LSC. The foam plugs were extracted with three times by sonication with methanol for 10 minutes, concentrated *in vacuo*, filtered, and analyzed using LSC and TLC as described.

DATA SUMMARY:

Uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 97.4%) photodegraded very slowly in sterile aqueous buffered (pH 7) solutions that were continuously irradiated with a xenon arc light source for 861 hours (35 days; reported to be equivalent to 30 days of Florida summer sun) at 25 ± 1 C. After 861 hours of irradiation, 88.8% of applied radioactivity was recovered from the solution as acetochlor, compared to 98.9% in the dark control after 30 days of incubation (Tables IV and V). In the irradiated solution, four unidentified degradates each comprised a maximum of 0.9-3.9% of the applied (Table IV). After 861 hours of irradiation, volatilized [^{14}C]residues totaled 5.1% of the applied; of this, 87.2% of the volatiles (4.4% of the applied) were acetochlor (Table III). During the study, material balances in the irradiated and dark control solutions were ≥96.7% of the applied (Table III).

COMMENTS:

1. Sterility of photolysis solutions throughout the study was confirmed by inoculation on nutrient agar plates.

2. The samples were irradiated with an xenon arc lamp using continuous irradiation. Sunlight is an intermittent light source. The use of an intermittent light source in some cases results in slightly more degradation due to microbial degradation during the dark phase and short term continuation of the photodegradation process during the dark phases. At this time, acetochlor is considered persistent to aqueous photolysis.

3. Unidentified degradates reached a maximum of 0.9% to 3.9% (0.09-0.39 ppm) of applied radioactivity during the testing period. Metabolites in metabolism studies should be identified at concentrations ≥0.01 ppm.

RIN 2556-94 ACETOCHLOR REVIEW (12/6/01)

Page_____ is not included in this copy.

Pages 24 through 34 are not included.

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____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

✓ FIFRA registration data.

____ The document is a duplicate of page(s) _____.

____ The document is not responsive to the request.

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

DATA EVALUATION RECORD

STUDY 2

CHEM 121601 Acetochlor §161-3

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 41565146
Hawkins, D.R., D. Kirkpatrick, G.M. Dean, and S.J. Mellor. 1990. The photodegradation of ^{14}C-acetochlor on soil. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

DIRECT REVIEW TIME = 8

REVIEWED BY: L. Parsons TITLE: Staff Scientist

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SIGNATURE:

CONCLUSIONS:

Degradation - Photodegradation on Soil

The photodegradation on soil study is scientifically valid and can be used to fulfill data requirements (161-3). No further photodegradation on soil data for acetochlor are needed at this time.

Acetochlor photodegraded very slowly when applied to sandy loam soil and exposed to a continuous light source (xenon arc lamp) for 14 days (reported to be 33 days Florida summer sun) at 25°C. In the light exposed and dark control soils, acetochlor decreased from 97.8% of the applied at initiation of study to 85.6% and 87.0%, respectively, at 14 days posttreatment. Four unidentified degradates were isolated from the soils at ≥7.8% of the applied. After 14 days of light exposure, 4.62% of the applied radioactivity had volatilized, primarily as carbon dioxide (4.22%). In the dark control at 14 days posttreatment, 2.31% of the applied had volatilized; the majority of volatiles (2.22% of the applied) were organic compounds trapped by the foam plugs.

Material balances in the light exposed and control soils were ≥94.0% of the applied during the testing period.

METHODOLOGY:

An aqueous slurry of sieved (355 um) sandy loam soil (61.7% sand, 20.2% silt, 18.1% clay, 2.9% organic matter, pH 6.04, CEC 9.1 meq/100 g) was spread onto glass plates (6 x 5 cm, divided in half with masking tape) to a depth of 1 mm and air-dried. The masking tape was removed from the plates, creating two sections/plate, and the soil was treated at 29 ug/cm^2 with a mixture of uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 97.4-98.4%, specific activity 16.4 Ci/mol, ICI) plus nonlabeled acetochlor dissolved in acetone. To serve as a dark control, ten soil plates were placed in a ventilated glass column and incubated in the dark at 25 ± 5 C (Figure 4). The remaining soil plates were placed on the bottom of a water-cooled, ventilated aluminum box that was covered with a quartz glass lid (Figure 1). The soils were continuously irradiated with a filtered xenon arc lamp (Heraeus Suntest Accelerated Exposure Unit; Figure 1); the average light intensity of the xenon lamp was 51.86-55.72 Wm^{-2}, and 9.71-10.43 hours of continuous irradiation were reported to equal 1 day of Florida summer sunlight (Table I, Figure 2). Throughout the study, humidified, CO_2-free air was drawn through the photolysis chamber, then through a polyurethane foam plug and tubes of ethyl digol, 10% KOH, and ethanolamine:2-ethoxyethanol (1:3, v:v; two tubes). The temperature of the irradiated soil was maintained at 25 ± 5 C using a thermocouple imbedded in soil of the same type and thickness as the test plates positioned in the irradiation apparatus. Duplicate irradiated soil samples were collected after 2, 3.8, 6.6, 10.5, and 13.5 days of irradiation (equivalent to 0, 4.6, 9.3, 15.4, 24.7 and 33.4 days of Florida sunlight); dark controls were collected at 0, 2, 4, 7, 11, and 14 days posttreatment. The trapping solutions and foam plugs were replaced at each sampling interval.

On the day of sampling, the soils were scraped from the glass plates and extracted twice with acetonitrile (three times for the time 0 sample) by shaking, each time for 15 minutes at room temperature; the slurries were centrifuged, and the extracts were removed and combined. The extracted soils were further extracted twice with acetonitrile:water (7:3, v:v) by shaking; the extracts were combined. Duplicate aliquots of the extracts were analyzed for total radioactivity using LSC; the remaining acetonitrile and acetonitrile:water solutions were combined and stored at <-15 C for up to 8 weeks prior to further analysis. Extracts were analyzed for specific compounds using one-dimensional TLC on normal-phase silica gel plates developed with toluene:acetonitrile:acetic acid (85:10:5) or chloroform:methanol:acetic acid (70:30:3), and on reverse-phase octadecyl silane plates developed with acetonitrile:water:acetic acid (45:50:5). The samples were co-chromatographed with an acetochlor reference standard. Radioactive zones on the TLC plates were characterized using both autoradiography and radiochromatogram scanning. Additional aliquots of the extracts from the immediate posttreatment and 7- and 10-day irradiated soils were analyzed by HPLC using a Spherisorb S5 ODS column, a mobile phase of acetonitrile:aqueous (pH 5) ammonium formate (1:1, v:v), and UV and radioactivity detection. The extracted soil was analyzed by LSC following combustion.

The foam plugs were extracted twice with acetone using sonication for 15 minutes. The foam plug extracts and trapping solutions were analyzed for total radioactivity using LSC. The KOH trapping solutions were precipitated with barium chloride to determine CO_2 evolution.

DATA SUMMARY:

Uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 97.4-98.4%) did not photodegrade on sandy loam soil plates that were continuously exposed to a light source (xenon arc lamp) for approximately 13.5 days (reported to be equivalent to 33.4 days of Florida summer sun) at 25 ± 5 C. In the light exposed and dark control soils, acetochlor decreased from 97.8% of the applied at time 0 to 85.6 and 87.0%, respectively, at approximately 14 days posttreatment (Table VI). In both treatments, at least four degradates were isolated but not identified in the soils; no single degradate comprised ≥7.8% of the applied (Tables VII-X). Unextracted [^{14}C]residues were generally ≤4.9% of the applied, except for 8.8 and 12.9% in duplicate soils exposed to light for approximately 11 days (Tables II and III). After 14 days of light exposure, 4.62% of the applied had volatilized, primarily as carbon dioxide (4.22%; Table IV). In the dark control at 14 days posttreatment, 2.31% of the applied had volatilized; the majority of volatiles (2.22% of the applied) were organic compounds trapped by the foam plugs (Table V). During the study, material balances in the light exposed and control soils were ≥94.0% of the applied (Tables II and III).

COMMENTS:

1. The study author estimated that the half-lives for acetochlor in the light exposed and dark control soils were 96.6 days of Florida summer sunlight and 155 days, respectively. These estimates are of limited value because the calculations involve extrapolation considerably beyond the duration of the experiment. Data are often incapable of accurately predicting trends outside of their range because small differences are magnified and reactions which appear to be linear may, in fact, be curvilinear.

2. The test samples were exposed to a continuous light source. Sunlight is an intermittent light source. The use of an intermittent light source in some cases results in slightly more degradation due to microbial degradation during the dark phase and short term continuation of the photodegradation process during the dark phases. At this time, acetochlor is considered persistent to soil photolysis.

3. Unidentified degradates reached a maximum of 2.8% to 7.8% (29 $\mu g/cm^2$ applied) of applied radioactivity during the testing period. Metabolites in metabolism studies should be identified at concentrations ≥0.01 ppm.

4. EFGWB prefers that [^{14}]residues in samples be separated by chromatographic methods (such as TLC, HPLC, and GC) with at least three solvent systems of different polarity, and that specific compounds isolated by chromatography be identified using a confirmatory method such as MS in addition to comparison to the R_f of reference standards.

   In this study, the samples were analyzed using normal and reverse phase TLC which were co-chromatographed with all the reference standards. The radioactivity was quantified using radio-TLC analyzer which were confirmed by reference to autoradiograms. Confirmation by MS was not included in the residue analysis. However, confirmation by HPLC using a Spherisorb S5 ODS column, a mobile phase of acetonitrile:aqueous (pH 5) ammonium formate (1:1, v:v), and UV and radioactivity detection was conducted. GC/MS was performed in the aqueous photolysis study.

RIN 2556-94 ACETOCHLOR REVIEW (12/6/01)

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____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

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The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

DATA EVALUATION RECORD

STUDY 3

CHEM 121601 Acetochlor §162-2

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 41565148
Hawkins, D.R., D. Kirkpatrick, and G.M. Dean. 1989. The metabolism of ^{14}C-acetochlor in sandy loam soil under anaerobic conditions. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

STUDY ID 41778301
Skidmore, M. 1991. Addendum to study entitled: The metabolism of ^{14}C-acetochlor in sandy loam soil under anaerobic conditions. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

DIRECT REVIEW TIME = 12

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APPROVED BY: G. Maske-Love
TITLE: Chemist
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SIGNATURE: 6/93

CONCLUSIONS:

Metabolism - Anaerobic Soil

The anaerobic soil metabolism study is scientifically valid and can be used as supplemental data. However, it can not be used to fulfill data requirements at this time for the following reasons:

To fully understand the anaerobic metabolism, the [^{14}C]residues (≥0.01 ppm) in the floodwater, which comprised 25.8-27.8% of the applied radioactivity (2.6-2.8 ppm), need to be characterized.

A discrepancy in the rate of degradation between one sample and three other samples was believed by the registrant to be a result of a difference in redox potential (+50 mV and -30mV) of the samples. However, the Agency believes this is a narrow range for redox potential (Lindsay, W. CHEMICAL EQUILIBRIA IN SOILS. Publ. by John Wiley & Sons, Inc.; 1979.). In addition,this data does not appear to explain the discrepancy in the rate of degradation since there was

56

not sufficient data furnished (e.g. pH's, monitoring of soil vitality, test limits and variations, etc.) to evaluate the registrant's claim. Furthermore, another acetochlor-anaerobic metabolism study reviewed (MRID 41338501) indicates that acetochlor has much shorter half-lives (17.3- 20.4 days) when applied to silt loam, silty clay loam, and sandy loam soils and incubated under anaerobic conditions. There are insufficient data to explain this discrepancy, as well.

Only one-dimensional normal and reverse phase TLC analysis was conducted. There was no comfirmation analysis performed to verify the results of this study.

The above concerns need to be adequately addressed for the study to fulfill the data requirement.

Acetochlor degraded with a registrant-calculated half-life of 230 days in sandy loam soil that was incubated anaerobically (flooded) in the dark for 61 days following an aerobic incubation period of 30 days. Three nonvolatile degradates were identified in the soil, N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) oxamic acid (compound 17), at a maximum of 14.2% immediately prior to flooding; N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide-2-sulphonic acid (compound 24) at a maximum of 2.6% at 0 and 30 days postflooding; and N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide (compound 31) at a maximum of 19.1-22.1% at 61 days postflooding. Unidentified acetochlor residues in the floodwater comprised 26-28% (2.3-2.8 ppm) of the applied radioactivity. Volatilization from the soils decreased in response to flooding; from the soil incubated for the entire 91-day experiment, an average of 2.70% of the applied was evolved during the 30-day aerobic period and an average of 0.88% was evolved during the 61-day anaerobic period.

METHODOLOGY:

Sieved (2 mm) sandy loam soil (63.5% sand, 20.3% silt, 16.2% clay, 2.98% organic matter, pH 6.12, CEC 9.1 meq/100 g) was weighed (60 g) into 250-mL bottles, surface-treated at approximately 10.3 ppm with uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 93.7-97.3%, specific activity 16.4 Ci/mol, ICI), and moistened to 75% of 0.33 bar. The sample bottles were attached to individual continuous air-flow systems (flow rate not specified); humidified air was drawn through the sample bottle, then through two foam plugs and tubes of ethyl digol and ethanolamine:2-ethoxyethanol (1:3, v:v; two tubes). The treated soils were incubated in the dark at 22.5 ± 1 C for 30 days and remoistened as necessary. After 30 days of aerobic incubation, the test soils were flooded (2-cm depth) with degassed distilled water, then incubated for an additional 60 days in the dark at 22.5 ± 1 C. Duplicate soil samples were collected at 0, 30, 60, and 91 days posttreatment (-30, 0, 30 and 61 days postflooding); the redox potentials of the flooded soils were determined immediately after sampling. The foam plugs and trapping solutions were sampled and replaced at 7, 14, 22, 30, 44, 60, and 91 days posttreatment.

Flooded samples were centrifuged, and aliquots of the water were analyzed by LSC. The soils were extracted sequentially with acetonitrile (three times for the time 0 sample) by shaking for approximately 30 minutes at room temperature, with acetonitrile:water (7:3, v:v) by shaking for 30 minutes, and with acetonitrile:water in a Soxhlet apparatus overnight. Duplicate aliquots of the extracts were analyzed for total radioactivity using LSC. All room- temperature extractions were done on the day of sampling, the Soxhlet extractions were done within 8 days of sampling, and the extracts were stored frozen at <-15 C for up to 16 weeks before further analysis by TLC.

Prior to TLC analysis, the soil extracts were combined, concentrated by rotary evaporation, and purified using a C-18 sorbent column eluted with 0.01 M sodium acetate buffer and methanol (Figure 1). The resulting aqueous and methanol eluates were radioassayed, and the methanol eluate was concentrated under a stream on nitrogen. The methanol solutions were analyzed for specific compounds using one-dimensional TLC on normal-phase silica gel plates developed with toluene:acetonitrile:acetic acid (85:10:5) or chloroform:methanol: acetic acid (70:30:3), and on reverse-phase octadecyl silane plates developed with acetonitrile:water:acetic acid (45:50:5). The samples were chromatographed with an acetochlor reference standard. Radioactive zones on the TLC plates were characterized using both autoradiography and radiochromatogram scanning. The extracted soils were analyzed using LSC following combustion.

The foam plugs were extracted twice with acetone using sonication for 15 minutes. The foam plug extracts and trapping solutions were analyzed for total radioactivity using LSC.

DATA SUMMARY:

Uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 97.4%), at 10 ppm, was relatively stable in sandy loam soil that was incubated anaerobically (flooded) in the dark at 22.5 ± 1 C for 61 days following an aerobic incubation of 30 days; the registrant-calculated half-life was 230 days. [^{14}C]Acetochlor was 93.0-95.7% of the applied immediately posttreatment and 51.1-52.4% at 30 days posttreatment (immediately prior to flooding); acetochlor ranged from 33.3 to 44.5% at 30 and 61 days postflooding with no discernable pattern of degradation (Tables IV and V). Three degradates were identified:

N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) oxamic acid (compound 17), at a maximum of 14.2% immediately prior to flooding;

N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide-2-sulphonic acid (compound 24) at a maximum of 2.6% at 0 and 30 days postflooding; and

N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl) acetamide (compound 31) at a maximum of 19.1-22.1% at 61 days postflooding

(Tables IV, V, and VI). Unextracted [^{14}C]residues in the soil were <12% of the applied during the aerobic portion of the study and 14.2-20.0% during the anaerobic portion (Table I). Volatilization from the soils decreased in response to flooding; from the soil incubated for the entire 91-day experiment, an average of 2.70% of the applied was evolved during the 30-day aerobic period and an average of 0.88% was evolved during the 61-day anaerobic period (Table II). [^{14}C]Residues in the floodwater comprised 25.8-27.8% of the applied radioactivity (2.3-2.8 ppm) but were not characterized (Table I). During the study, material balances were 94.0-100.9% of the applied (Table I).

COMMENTS:

1. Total [^{14}C]acetochlor residues in the floodwater were found to comprise 25.8-27.8% (2.6-2.8 ppm) of the applied radioactivity, but were not separated into individual compounds that could be identified and

quantified. To fully understand the metabolism, EFGWB needs all metabolites present at concentrations ≥0.01 ppm identified.

2. EFGWB prefers that [^{14}]residues in samples be separated by chromatographic methods (such as TLC, HPLC, and GC) with at least three solvent systems of different polarity, and that specific compounds isolated by chromatography be identified using a confirmatory method such as MS in addition to comparison to the R_f of reference standards.

   In this study, the samples were analyzed using one-dimensional TLC on normal-phase silica gel plates developed with toluene:acetonitrile: acetic acid (85:10:5) or chloroform:methanol:acetic acid (70:30:3), and on reverse-phase octadecyl silane plates developed with acetonitrile:water:acetic acid (45:50:5). The samples were chromatographed with an acetochlor reference standard. Radioactive zones on the TLC plates were characterized using both autoradiography and radiochromatogram scanning.

3. The rate of volatilization from the soils was not consistent between samples, apparently because two pumps producing markedly different air flow rates (rates not defined) were used. During the 30 days of aerobic incubation, 9% and 14% of the applied was volatilized from two soil samples and only 2.5-4% was evolved from four soil samples; the rate of volatilization was directly related to the pump to which the samples were connected. Unfortunately, the two soils exhibiting the high rate of volatilization were destructively sampled at 30 days posttreatment, while the soils were still aerobic, so that the effect of flooding on volatilization could only be evaluated with data from the low-rate soils.

4. Using data from this study (30 days aerobic incubation followed by 61 days anaerobic incubation), the study authors calculated a half-life of 230 days for acetochlor under anaerobic conditions. However, these statistical estimations of the anaerobic half-life of acetochlor are of limited value because the calculations involve extrapolation beyond the experimental time limits of the study. Data are often incapable of accurately predicting trends outside of their range because small differences are magnified and reactions which appear to be linear may, in fact, be curvilinear.

5. The redox potentials of the flooded soils were determined when those soils were sampled. Three of the four samples (duplicate samples at 30 and 61 days postflooding) had redox potentials ≤-30 mV; the fourth (flask 21), sampled at 61 days postflooding, had a redox potential of +50 mV, indicating that the soil was not anaerobic. Compared to flask 22 (from the same sampling interval), acetochlor degraded more rapidly and volatilization was greater from flask 21. Therefore, the data from flask 21 was not considered or cited for this review.

6. The study authors stated that an application of 10 ppm was equivalent to a field rate of 2.9 kg/ha.

7. There was an apparent typographical error in the soil characterization. The cation exchange capacity in terms of me/100 g. The Dynamac reviewer understood this to mean meq/100 g.

RIN 2556-94 ACETOCHLOR REVIEW (12/6/01)

Page_____ is not included in this copy.

Pages 60 through 69 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

✓ FIFRA registration data.

____ The document is a duplicate of page(s) _____.

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The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

DATA EVALUATION RECORD

STUDY 4

CHEM 121601 Acetochlor §164-1

FORMULATION--12--EMULSIFIABLE CONCENTRATE (EC)

STUDY ID 41565152
Zilka, S.A., B. Wilson, R.E. Hoag, L.E. Coombes, and N.D. Simmons. 1990. Acetochlor: Dissipation of residues in USA soil under field conditions - Leland, Mississippi, 1988. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

STUDY ID 41565153
Wilson, B., P. Dhillon, E. Bolygo, J. Pay, and N.D. Simmons. 1990. Acetochlor: Residues of oxanilic acid and sulphonic acid metabolites under field conditions in Leland, Mississippi, 1988. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

DIRECT REVIEW TIME = 8

REVIEWED BY: L. Parsons TITLE: Staff Scientist

EDITED BY: W. Martin TITLE: Staff Scientist
K. Ferguson Task Leader

APPROVED BY: W. Spangler TITLE: Project Manager

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APPROVED BY: G. Maske-Love
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TEL: 703-305-5245

SIGNATURE:

CONCLUSIONS:

Field Dissipation - Terrestrial

This terrestrial field dissipation study is scientifically valid and can be used as supplemental data. However, it can not be used to fulfill data requirements (164-1). Soil samples were only analyzed for two degradates, oxanilic and sulphonic acid. Degradates discernible in the metabolisms studies at concentrations greater than 10% of applied and/or ≥0.01 ppm should be analyzed for in the field dissipation study to fully understand the dissipation of acetochlor. In addition, storage stability data for degradates were not furnished. Samples were stored for up to 462 days before analysis. Storage stability data indicated that acetochlor was stable for 390 days. The registrant stated that the freezer storage stability study for parent acetochlor was on-going at the time this document was submitted to the EPA.

Acetochlor (7 lb ai/gal EC), applied at 3 lb ai/A to plots of silt loam soil that were later planted to corn, dissipated with a calculated half-life of 36 days. Acetochlor was not detected (<0.01 mg/kg) below the 3.5-inch depth in any sample at any sampling interval except at 0.01-0.02 mg/kg in the 5.5- to 27.5-inch depth at 14 days posttreatment. In the 0- to 3.5-inch soil layer, acetochlor was 1.23-3.20 mg/kg immediately posttreatment, 1.71-2.39 mg/kg at 27 days, 0.54-1.04 mg/ kg at 62 days, 0.03-0.1 mg/kg at 90 days and 0.01 mg/kg at 362 days.

The soils were analyzed for two degradates (oxanilic acid and sulphonic acid) which were at maximums of 0.11-0.25 mg/kg and 0.02-0.06 mg/kg, respectively, at 90 days posttreatment in the top 3.5 inches of soil, and were below the limits of detection (<0.02 mg/kg) at 189 days (Tables 3 and 4). In the 3.5- to 7.0-inch soil depth samples, oxanilic acid was <0.02-0.02 mg/kg and 0.05-0.14 mg/kg at 6 and 90 days posttreatment, respectively; sulphonic acid was 0.02-0.08 mg/kg at 90 days. Oxanilic acid and sulphonic acid were not detected below the 7.0-inch soil depth at any sampling interval.

Ancillary Study - Freezer Storage Stability

1. Freezer storage stability studies are not specifically required by Subdivision N guidelines.

2. Acetochlor was stable in samples frozen at <-18 C for up to 390 days; recoveries ranged from 79-109% with no discernable pattern.

3. This study is scientifically sound. Based on the information provided by this study, soil samples containing acetochlor may be stored frozen for approximately 390 days without degradation of the parent compound.

4. No additional freezer storage stability data are required for parent acetochlor in soil unless samples are stored for considerably longer than 390 days.

METHODOLOGY:

Field Dissipation - Terrestrial

Acetochlor (7.0 lbs ai/gallon EC, ICI) was applied at a nominal rate of 3 lbs ai/A to a plot (30 feet x 100 feet) of silt loam soil (26-38% sand, 52-62% silt, 10-14% clay, 0.5-0.9% organic matter, pH 6.7-7.1, CEC 6.5-8.5 meq/100 g) in Leland, Mississippi, on April 28, 1988. The herbicide was applied with a tractor-mounted spray boom and was incorporated to a depth of 2 inches immediately after application. After incorporation, the plot was planted to corn and the soil was rolled smooth. An untreated control plot (20 feet x 100 feet) was located 30 feet upwind from the treated plot. The treated plot was subdivided into three subplots that were separated by a buffer zone four rows wide. Seven cores were taken from the 0- to 15.5-inch soil depth of each subplot (2-inch diameter, 0- to 3.5-inch depth; 1-inch diameter, 3.5- to 15.5-inch depth) and three cores were taken from the 15.5- to 42-inch depth of each subplot (2-inch diameter) at 0, 7, 14, and 28 days, and 2, 3, 6, and 12 months posttreatment; the 15.5- to 42-inch cores were not taken at time 0. From the control plot, ten cores were collected from the 0- to 15.5-inch depth plus six cores were collected from the 15.5- to 42-inch depth at each sampling interval. The upper soil cores (0- to 3.5- and 3.5- to 15.5-inch depths) were collected with hand-held zero-contamination corers; subsurface cores (15.5- to 42-inch depth) were collected with

hydraulic coring equipment. The upper cores were divided into 0- to 3.5-, 3.5- to 7.0-, 7.0- to 10.5-, and 10.5- to 15.5-inch segments; subsurface cores were divided into 15.5- to 27.5-and 27.5- to 42.0-inch segments. Soil samples were frozen at ≤-18 C after sampling, then transfered to the laboratory. In the labora-tory, the samples were thawed briefly, and cores from each subplot were composited by depth and sampling interval. The composited cores were sieved (0- to 3.5-inch depth samples through a 2.0-mm screen, 3.5- to 15.5-inch depth samples through a 4.0-mm screen); and subsurface samples were mixed by hand. Samples were refrozen for up to 462 days at ≤-18 C; the samples were thawed for 2 hours prior to extraction.

Soil samples were extracted with acetonitrile:water (1:1, v:v) by shaking for 30 minutes at room temperature. Soil samples with a higher clay content were extracted with acetonitrile:water (3:1, v:v). Soil extracts were removed by vacuum filtration and the aqueous layer was partitioned against methylene chloride. The organic phase was removed and evaporated to dryness under vacuum, and the residues were redissolved in hexane. Aliquots of the hexane solution were analyzed using GC with nitrogen detection. The detection limit was 0.01 mg/kg. The recovery of acetochlor from soil samples fortified at 0.01-2.0 mg/kg was 81-140% (Table 1).

To determine the concentration of oxanilic and sulphonic acid in the samples, soil samples were extracted with acetonitrile:water (1:1, v:v) containing 40 mM ammonium acetate by shaking for 30 minutes at room temperature. The extract was removed by centrifugation, then purified on a Bond-elut column washed with water. The purified extract was analyzed by reverse-phase HPLC on a Hypersil SAS C_1 column eluted with acetonitrile:water (30:70, v:v) containing 10 mM PIC (tetrabutyl-ammonium-phosphate ion pair) with UV (220 nm) detection.

Ancillary Study - Freezer Storage Stability

In an ancillary experiment, subsamples of soil collected from the control plots were fortified with acetochlor at 0.05 mg/kg, 0.20 mg/kg, and 1.0 mg/kg. Samples were analyzed after 11, 32, 123, 184, and 390 days of frozen storage using the procedures previously described.

DATA SUMMARY:

Field Dissipation - Terrestrial

Acetochlor (7.0 lbs ai/gallon EC), at 3 lbs ai/A, dissipated with a registrant-calculated half-life of 36 days from the upper 3.5 inches of plots of silt loam soil in Mississippi that were treated in April, 1988, and immediately tilled to a 2-inch depth and planted to corn. In the 0- to 3.5-inch soil layer, acetochlor was 1.23-3.20 mg/kg immediately posttreatment, 1.71-2.39 mg/kg at 27 days, 0.54-1.04 mg/kg at 62 days, 0.03-0.1 mg/kg at 90 days and 0.01 mg/kg at 362 days (Table 2). Acetochlor was not detected (<0.01 mg/kg) below the 3.5-inch depth in any sample at any sampling interval except at 0.01-0.02 mg/kg in the 15.5- to 27.5-inch depth at 14 days posttreatment (Table 2).

The soils were analyzed for two degradates:

oxanilic acid and

sulphonic acid

which were at maximums of 0.11-0.25 mg/kg and 0.02-0.06 mg/kg, respectively, at 90 days posttreatment in the top 3.5 inches of soil, and were below the limits of detection (<0.02 mg/kg) at 189 days (Tables 3 and 4). In the 3.5- to 7.0-inch soil depth samples, oxanilic acid was <0.02-0.02 mg/kg and 0.05-0.14 mg/kg at 6 and 90 days posttreatment, respectively; sulphonic acid was 0.02-0.08 mg/kg at 90 days. Oxanilic acid and sulphonic acid were not detected below the 7.0-inch soil depth at any sampling interval.

The seasonal water table for this site was >6.5 ft deep, and the average slope was 0.2%. The maximum air temperature was 101 F, the minimum air temperature was 19 F. During the study, rainfall plus irrigation was 52.99 inches. Soil temperatures ranged from 37 to 102 F at the 2-inch depth and 46 to 91 F at the 8-inch depth.

Ancillary Study - Freezer Storage Stability

Acetochlor was stable in soil frozen for up to 390 days. Soil samples fortified with acetochlor at 0.05 mg/kg and 0.20 mg/kg were analyzed after 11-184 days of frozen storage; the concentration of acetochlor in these soil samples ranged from 79 to 107% of the applied. One set of samples fortified with acetochlor at 1.0 mg/kg was analyzed after 390 days of frozen storage; the concentration of acetochlor in these samples was 109% of the applied (Table 5).

COMMENTS:

Field Dissipation - Terrestrial

1. The soil samples in this study were stored up to 462 days before analysis. Parent acetochlor was shown to be stable during 390 days of freezer storage. However, freezer storage stability of the degradates oxanilic acid and sulphonic acid was not determined. Acceptable freezer storage stability data must be provided for oxanilic acid and sulphonic acid for the maximum length of storage.

2. EFGWB prefers that [^{14}C]residues in samples be separated by chromatographic methods (such as TLC, HPLC, and GC) with at least three solvent systems of different polarity, and that specific compounds isolated by chromatography be identified using a confirmatory method such as MS in addition to comparison to the R_f of reference standards.

   In this study, the soil samples were analyzed using GC with nitrogen detector. To determine the concentration of oxanilic and sulphonic acid in the samples, soil samples were extracted with acetonitrile: water (1:1, v:v) containing 40 mM ammonium acetate. The purified extract was analyzed by reverse-phase HPLC on a Hypersil SAS C_1 column.

3. Since no pesticide application records were available to the registrant from this site, soil samples were collected and analyzed for unspecified residues. The study authors stated that no residues were detected.

4. Acetochlor was applied in a tank-mix with corn safener R25788.

5. During the study, the test site was disked and cultivated several times (Table 6). The plots were treated with atrazine (1.50 lb ai/A) on May 12, 1988 and glyphosate (100 mL/gallon) on June 6, 1988.

6. There is a typographical error in Table 7. The silt content of the soil from pit 11 is 56% (Table 8), not 36% silt as cited in the table.

Ancillary Study - Freezer Storage Stability

The study author provided storage stability data for 390 days of freezer storage and stated that further analysis would be carried out at 548 and 730 days after sample fortification. These data should be submitted to the EPA when available.

RIN 2556-94 ACETOCHLOR REVIEW (12/6/01)

Page_____ is not included in this copy.

Pages 75 through 91 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

✓ FIFRA registration data.

____ The document is a duplicate of page(s) _____.

____ The document is not responsive to the request.

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

DATA EVALUATION RECORD

STUDY 5

CHEM 121601 Acetochlor §164-1

FORMULATION--12--EMULSIFIABLE CONCENTRATE (EC)

STUDY ID 41592012
Zilka, S.A., B. Wilson, R.E. Hoag, J. Safford, and N.D. Simmons. 1990. Acetochlor: Dissipation of residues in USA soil under field conditions - Champaign, Illinois, 1988. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

STUDY ID 41592013
Wilson, B., P. Dhillon, E. Bolygo, J. Pay, and N.D. Simmons. 1990. Acetochlor: Residues of oxanilic acid and sulphonic acid metabolites under field conditions in Champaign, Illinois, 1988. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

DIRECT REVIEW TIME = 14

REVIEWED BY: L. Parsons TITLE: Staff Scientist

EDITED BY: C. Cooke TITLE: Staff Scientist
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TEL: 703-305-5245

SIGNATURE:

CONCLUSIONS:

Field Dissipation - Terrestrial

This terrestrial field dissipation study is scientifically valid and can be used as supplemental data. However, it can not be used to fulfill data requirements (164-1). Soil samples were only analyzed for two degradates, oxanilic and sulphonic acid. Degradates discernible in the metabolisms studies at concentrations greater than 10% of applied and/or ≥0.01 ppm should be analyzed for in the field dissipation study to fully understand the dissipation of acetochlor. In addition, storage stability data for degradates were not furnished. Samples were stored for up to 462 days before analysis. Storage stability data indicated that acetochlor was stable for 390 days. The registrant stated that the freezer storage stability study for parent acetochlor was on-going at the time this document was submitted to the EPA.

Acetochlor (7 lb ai/gal EC), applied at 3 lb ai/A to plots of clay loam soil that were later planted to corn, dissipated with a calculated half-life of 26 days. Acetochlor was not detected (<0.01 mg/kg) below the 3.5-inch depth in any sample at any sampling interval. In the 0- to 3.5-inch soil layer, acetochlor was 2.36-4.52 mg/kg immediately posttreatment, 1.20-2.18 mg/kg at 28 days, 0.65-1.71 mg/kg at 56 days, 0.41-0.61 mg/kg at 84 days, and 0.04-0.06 mg/kg at 390 days.

The soils were analyzed for two degradates, oxanilic acid and sulphonic acid which were at maximum concentrations of 0.50-0.83 mg/kg at 84 days posttreatment and 0.07-0.11 mg/kg at 168 days, respectively, in the top 3.5 inches of soil, and were below the limits of detection (<0.02 mg/kg) at 390 days (Tables 3 and 4). In the 3.5- to 7.0-inch depth samples, oxanilic acid was <0.02-0.08 mg/kg and <0.02-0.06 mg/kg at 84 and 168 days post-treatment, respectively; sulphonic acid was <0.02-0.05 mg/kg and 0.05-0.10 mg/kg at 84 and 168 days. Oxanilic acid and sulphonic acid were not detected below the 7.0-inch soil depth at any sampling interval.

Ancillary Study - Freezer Storage Stability

1. Freezer storage stability studies are not specifically required by Subdivision N guidelines.

2. Acetochlor was stable in samples frozen at <-18 C for up to 390 days; recoveries ranged from 79-109% with no discernable pattern.

3. This study is scientifically sound. Based on the information provided by this study, soil samples containing acetochlor may be stored frozen at <-18 C for up to 390 days without degradation of the parent compound.

4. No additional freezer storage stability data are required for parent acetochlor in soil unless samples are stored for considerably longer than 390 days.

METHODOLOGY:

Field Dissipation - Terrestrial

Acetochlor (7.0 lbs ai/gallon EC, ICI) was applied at a nominal rate of 3 lbs ai/A to a plot (30 feet x 100 feet) of clay loam soil (17-29% sand, 44-52% silt, 27-33% clay, 2.8-3.7% organic matter, pH 6.2-6.9, CEC 15.1-17.7 meq/100 g) in Champaign, Illinois on May 5, 1988. The herbicide was applied with a tractor-mounted spray boom and was incorporated to a depth of 2 inches immediately after application. After incorporation, the plot was planted to corn and the soil was rolled smooth. An untreated control plot (10 feet x 100 feet) was located 20 feet from the treated plot. The treated plot was subdivided into three subplots that were separated by a buffer zone 10 feet wide. Seven cores were taken from the 0- to 15.5-inch soil depth of each subplot (2-inch diameter, 0- to 3.5-inch depth; 1-inch diameter, 3.5- to 15.5-inch depth) and three cores were taken from the 15.5- to 42-inch depth of each subplot (2-inch diameter) at 0, 7, 14, and 28 days, and 2, 3, 6, and 12 months posttreatment; the 15.5-to 42-inch cores were not taken at time 0. From the control plot, ten cores were collected from the 0- to 15.5-inch depth plus six cores were collected from the 15.5- to 42-inch depth at each sampling interval. The upper soil cores (0- to 3.5- and 3.5- to 15.5-inch depths) were collected with hand-held zero contamination corers; subsurface cores (15.5-

to 42-inch depth) were collected with hydraulic coring equipment. The upper cores were divided into 0- to 3.5-, 3.5- to 7.0-, 7.0- to 10.5-, and 10.5- to 15.5-inch segments; subsurface cores were divided into 15.5- to 27.5, and 27.5-to 42.0 inch segments. Soil samples were frozen at ≤-18 C after sampling, then transferred to the laboratory. In the laboratory, the samples were thawed briefly, and cores from each subplot were composited by depth and sampling interval. The composited cores were sieved (0- to 3.5-inch depth samples through a 2.0-mm screen, 3.5- to 27.5-inch depth samples through a 4.0-mm screen); and subsurface samples were mixed by hand. Samples were refrozen for up to 462 days at ≤-18 C; the samples were thawed for 2 hours prior to extraction.

Soil samples were extracted with acetonitrile:water (1:1, v:v) by shaking for 30 minutes at room temperature. Soil samples with a higher clay content were extracted with acetonitrile:water (3:1, v:v). Soil extracts were removed by vacuum filtration and the aqueous layer was partitioned against methylene chloride. The organic phase was removed and evaporated to dryness under vacuum, and the residues were redissolved in hexane. Aliquots of the hexane solution were analyzed using GC with nitrogen detection. The detection limit was 0.01 mg/kg. The recovery of acetochlor from soil samples fortified at 0.025-0.5 mg/kg was 58-139% (Table 1).

To determine concentration of oxanilic and sulphonic acid in the samples, soil samples were extracted with acetonitrile:water (1:1, v:v) containing 40 mM ammonium acetate by shaking for 30 minutes at room temperature. The extract was removed by centrifugation, then purified on a Bond-elut column washed with water. The purified extract was analyzed by reverse-phase HPLC on a Hypersil SAS C$_1$ column eluted with acetonitrile:water (30:70, v:v) containing 10 mM PIC (tetrabutyl-ammonium-phosphate ion pair) with UV (220 nm) detection.

Ancillary Study - Freezer Storage Stability

In an ancillary experiment, subsamples of soil collected from the control plots were fortified with acetochlor at 0.05 mg/kg and 0.20 mg/kg or at 1.0 mg/kg. Samples were taken for analysis at 11, 32, 123, 184, and 390 days of frozen storage using the procedures previously described.

DATA SUMMARY:

Field Dissipation - Terrestrial

Acetochlor (7.0 lbs ai/gallon EC) at 3 lbs ai/A, dissipated with a registrant-calculated half-life of 26 days from the upper 3.5 inches of plots of clay loam soil in Illinois that were treated on May 5, 1988, and immediately tilled to a 2-inch depth and planted to corn. In the 0- to 3.5-inch soil layer, acetochlor was 2.36-4.52 mg/kg immediately posttreatment, 1.20-2.18 mg/kg at 28 days, 0.65-1.71 mg/kg at 56 days, 0.41-0.61 mg/kg at 84 days, and 0.04-0.06 mg/kg at 390 days (Table 2). Acetochlor was not detected (<0.01 mg/kg) below the 3.5-inch depth in any sample at any sampling interval.

The soils were analyzed for two degradates:

oxanilic acid and

sulphonic acid

which were at maximum concentrations of 0.50-0.83 mg/kg at 84 days posttreatment and 0.07-0.11 mg/kg at 168 days, respectively, in the top 3.5 inches of soil, and were below the limits of detection (<0.02 mg/kg) at 390 days (Tables 3 and 4). In the 3.5- to 7.0-inch depth samples, oxanilic acid was <0.02-0.08 mg/kg and <0.02-0.06 mg/kg at 84 and 168 days posttreatment, respectively; sulphonic acid was <0.02-0.05 mg/kg and 0.05-0.10 mg/kg at 84 and 168 days. Oxanilic acid and sulphonic acid were not detected below the 7.0-inch soil depth at any sampling interval.

The seasonal water table for this site fluctuates from 0-8 ft deep, and the average slope is 1.5%. The maximum air temperature was 107 F, the minumum air temperature was -10 F. During the study, rainfall plus irrigation was 53.28 inches. Soil temperatures ranged from 27 to 111 F at the 2-inch depth and 34 to 94 F at the 8-inch depth.

Ancillary Study - Freezer Storage Stability

Acetochlor was stable in soil frozen for up to 390 days. Soil samples fortified with acetochlor at 0.05 mg/kg and 0.20 mg/kg were analyzed after 11-184 days of frozen storage; the concentration of acetochlor in these soil samples ranged from 79 to 107% of the applied. One set of samples fortified with acetochlor at 1.0 mg/kg was analyzed after 390 days of frozen storage; the concentration of acetochlor in these samples was 109% of the applied (Table 5).

COMMENTS:

Field Dissipation - Terrestrial

1. The soil samples in this study were stored up to 462 days before analysis. Parent acetochlor was shown to be stable during 390 days of freezer storage. However, freezer storage stability of the degradates oxanilic acid and sulphonic acid was not determined. Acceptable freezer storage stability data must be provided for oxanilic acid and sulphonic acid for the maximum length of storage.

2. EFGWB prefers that [^{14}C]residues in samples be separated by chromatographic methods (such as TLC, HPLC, and GC) with at least three solvent systems of different polarity, and that specific compounds isolated by chromatography be identified using a confirmatory method such as MS in addition to comparison to the R_f of reference standards.

   In this study, the soil samples were analyzed using GC with nitrogen detector. To determine the concentration of oxanilic and sulphonic acid in the samples, soil samples were extracted with acetonitrile: water (1:1, v:v) containing 40 mM ammonium acetate. The purified extract was analyzed by reverse-phase HPLC on a Hypersil SAS C_1 column.

3. The soil characteristics cited in this study are topsoil data from Table I; however, the ranges from this table (17-29% sand, 44-52% silt, and 27-33% clay) suggest the soil is clay loam instead and is referred to as such in this review. Soil characterization to 48 inches was included in Table 6.

4. Acetochlor was applied in a tank-mix with corn safener R25788.

5. Pesticide application records were available for this site for four years prior to the study; atrazine, alachlor, and cyaniazine were applied once each year from 1984 to 1986. In 1987, butylate (5.0 lb

ai/A), atrazine (1.0 lb ai/A), cyanazine (2.0 lb ai/A), and tefluthrin (0.125 to 0.164 lb ai/A) were applied.

6. During the study, the test site was disked and cultivated several times (Table 7). The plots were treated with atrazine, pendimethalin, cyanazine, glyphosate, and paraquat (Table 8). The plot was cultivated on April 8, 1988. The plot was fertilized (100 lb ai/A urea) on April 25, 1988 and the urea was incorporated to 4-inch depth.

Ancillary Study - Freezer Storage Stability

The study author provided storage stability data for 390 days of freezer storage and stated that further analysis would be carried out at 548 and 730 days after sample fortification. This data should be submitted to the EPA when available.

RIN 2556-94 ACETOCHLOR REVIEW (12/6/01)

Page_____ is not included in this copy.

Pages 103 through 124 are not included.

The material not included contains the following type of information:

____ Identity of product inert ingredients.

____ Identity of product impurities.

____ Description of the product manufacturing process.

____ Description of quality control procedures.

____ Identity of the source of product ingredients.

____ Sales or other commercial/financial information.

____ A draft product label.

____ The product confidential statement of formula.

____ Information about a pending registration action.

✓ FIFRA registration data.

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The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

DATA EVALUATION RECORD

STUDY 6

CHEM 121601 Acetochlor §165-4

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 41565154
Hamer, M.J., E. Farrelly, J. Lijzen, and I.R. Hill. 1990. Acetochlor: An investigation of accumulation and elimination in bluegill sunfish in a flow-through system. Laboratory Project ID 89JH292. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE.

DIRECT REVIEW TIME = 8

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CONCLUSIONS:

Laboratory Accumulation - Fish

This fish accumulation study is scientifically valid and can be used as supplemental data. Although radioactive residues in the fish tissues were not adequately characterized (only those residues corresponding to acetochlor were quantified) the data requirement can be considered fulfilled based on present data and acetochlor's low octanol/water coefficient (3.0). No further fish accumulation data for acetochlor are needed at this time.

Acetochlor residues (uncharacterized) accumulated in bluegill sunfish exposed to 11 ppb of acetochlor, with maximum mean bioconcentration factors of 40x, 780x, and 150x for edible, nonedible, and whole fish tissues, respectively. After 28 days of exposure to pesticide-free water, only 2-33% of the accumulated [^{14}C]residues remained in the fish tissue.

In another fish accumulation study (MRID 00131388), similar data was reported. Bioconcentration factors of 84x, 35x, and 150x were reported for whole fish, fillet, and viscera.

METHODOLOGY:

Flow-through aquatic exposure systems were prepared using four 80-L glass aquaria. Dechlorinated water (pH 7.6-7.8, Table 9) was provided to each aquarium at 250 mL/minute. Two aquaria were continuously treated at a nominal rate of 11 ppb with uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 95.8-97.3%, specific activity 2.5 GBq/mmol, ICI) dissolved in methanol; the remaining two aquaria were treated with pesticide-free methanol only. Methanol in the water was 0.0014% by volume.

Bioconcentration of total residues determination: Juvenile bluegill sunfish (Lepomis macrochirus; mean length and weight 33 mm and 0.92 g, respectively) were held at approximately 20 C in flowing dechlorinated water for >1 week prior to the initiation of the experiment, then transferred into one treated and one control aquarium (125 fish/aquarium). Following a 28-day exposure period, the fish were transferred for an additional 28 days into flow-through aquaria containing pesticide-free water. During the exposure period, water from the treated and control aquaria was sampled daily and fish (7/aquarium) were sampled on days 1, 3, 7, 14, 21, 25, and 28. During the depuration period, fish that had been transferred from the treated aquarium were sampled on days 1, 3, 7, 10, 14, and 28.

Aliquots of the aquaria water were analyzed for total [^{14}C]residues using LSC. Additional aliquots were extracted three times with methylene chloride; the methylene chloride extracts were combined, and aliquots of the combined extracts and the extracted water were analyzed using LSC. The extracts were evaporated to dryness with rotary evaporation under vacuum, and the resulting residues were redissolved in methanol. Aliquots of the methanol solution were analyzed for total radioactivity using LSC, and for specific compounds using HPLC and TLC. HPLC analyses of the samples were done using a Spherisorb column eluted with acetonitrile:water (85:15, v:v) and with UV (216 nm) detection. One-dimensional TLC analyses were conducted using normal-phase silica gel plates developed with n-hexane:diethyl ether (60:40, v:v) or chloroform:methanol (95:5, v:v), and using reverse-phase Whatman KCF18F plates developed with methanol:water (80:20, v:v). An acetochlor reference standard was cochromatographed with the samples. [^{14}C]Residues on the plates were located using linear scanning.

The fish were rinsed with tap water prior to analysis. Three fish were analyzed in toto by LSC following combustion. The remaining four fish were divided into muscle (50% of the fish wet weight), viscera (8%), and "remainder" (fins, head, and gills), then analyzed by LSC following combustion.

Residue characterization: Twelve adult bluegill sunfish (approximate weight 20 g) were maintained in [^{14}C]acetochlor-treated and control aquaria (described above) for 28 days; there was no depuration period. Water from the aquaria was sampled daily and analyzed using LSC and TLC as described. Four and eight fish were removed from each aquarium at 21 and 28 days, respectively, and stored at <-18 C until analysis (storage time not provided). Prior to analysis, two fish from each sampling interval were thawed, weighed, and divided into muscle, viscera, and remainder. Similar tissues were combined, and the combined material was extracted three times with acetonitrile in a homogenizer and twice with acetonitrile:water (50:50, v:v). Aliquots of the extracts were by LSC, then concentrated either by rotary evaporation under vacuum or under a stream of air. Aliquots

of the concentrates were analyzed by LSC. Additional aliquots were analyzed using one-dimensional TLC on normal-phase systems silica gel plates developed in chloroform:methanol:formic acid:water (70:25:3:3, v:v:v:v) or chloroform:methanol:glacial acetic acid (90:10:3, v:v:v), and on reverse-phase Whatman KCF18F plates developed with methanol:water:acetic acid (70:20:10, v:v:v). Day 28 acetonitrile extracts were also analyzed using GC with nitrogen/rubidium bead detection. The extracted fish tissues were analyzed by LSC following combustion.

DATA SUMMARY:

[^{14}C]Acetochlor residues accumulated in bluegill sunfish exposed to uniformly ring-labeled [^{14}C]acetochlor (radiochemical purity 96.5-98.6%) at 11 ppb for 28 days under flow-through conditions. The maximum mean bioconcentration factors were 40x, 780x, and 150x for muscle, viscera, and whole fish tissues, respectively (Table 5). Maximum mean concentrations of total [^{14}C]residues occurred at 25 days for muscle and whole fish samples and were 0.478 ppm and 1.77 ppm, respectively; the maximum mean concentration for viscera samples occurred at 21 days and was 9.21 ppm (Table 5).

In the fish after 21 and 28 days of exposure, parent acetochlor was 9.8-18.9% of the extracted radioactivity (0.05-0.07 mg/kg) in the muscle, 4.3-5.9% (0.42-0.62 mg/kg) in the viscera, and 18.2-25% (0.16 mg/kg) in the remainder tissues (Table 8). Several unidentified polar degradates, three of which appeared to be "principal" (Figures 4 and 6). These degradates were neither identified nor quantified. After 21 and 28 days of incubation, 58-63% of the radioactivity was extracted (0.38-0.50 mg/kg) from the muscle tissues, 97-98% (9.78-10.58 mg/kg) from the viscera, 73-84% (0.65-0.86 mg/kg) from the remainder tissues (Table 7).

During the 28-day depuration period, the concentration of [^{14}C]acetochlor residues in the viscera declined 98% (from 8.61 mg/kg to 0.188 mg/kg). In the muscle, the concentration of [^{14}C]acetochlor residues was somewhat variable during the depuration period, declining by 50-58% (from 0.472 mg/kg to 0.198-0.236 mg/kg) at 3-7 days and 41-77% (to 0.156-0.277 mg/kg) at 10-28 days of depuration. In the whole fish, [^{14}C]acetochlor residues declined by 90% (1.560 mg/kg to 0.157 mg/kg) during the depuration period (Tables 5 and 6).

The mean concentration of [^{14}C]residues in the water during the exposure period was 11.81 ppb (Table 12). Parent acetochlor was 97-100% of the extracted radioactivity. In the water, 91-109% of the radioactivity was extracted; 1-9% remained in the aqueous phase (Tables 3 and 4).

Throughout the study the temperature of the treated water ranged from 18.5 to 21.5 C, the pH ranged from 7.6-7.8, and the dissolved oxygen content ranged from 7.4 to 9.1 mg/L (Table 10). Total [^{14}C]residues in the water during the exposure period ranged from 10.28 to 14.8 ppb in the main study and 7.99 to 12.20 ppb for the characterization study which used 20 g fish (Table 12).

COMMENTS:

1. Extractions and analysis were done to identify [^{14}C]residues in the tissue samples, but quantitative and qualitative data were provided only for parent acetochlor. The study author stated that there were

several polar degradates in the sample, three principle degradates that, with parent acetochlor, comprised "most" of the radioactivity. To fully understand the accumulation and depuration of acetochlor in fish, characterization of residues present at concentration $\geq$0.05 ppm is needed.

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