Date Out:

Chemical Code:121601
DP Barcode:D197606

ENVIRONMENTAL FATE AND GROUND WATER BRANCH

Review Action JAN 26 1994

To: Robert Taylor PM 25
Registration Division (H7505C)

From: Akiva Abramovitch, Section Head
Chemistry Review Section 3
Environmental Fate & Ground Water Branch/EFED (H7507C)

Thru: Henry Jacoby, Chief
Environmental Fate & Ground Water Branch/EFED (H7507C) Henry Jacoby 1/26/94

Attached, please find the EFGWB review of...

Common Name:	Acetochlor	Trade name:	
Company Name:	Acetochlor Registration Partnership (Zeneca and Monsanto)		
ID #:	279-3084		
Purpose:	Registrant's Response to 12/7/93 Review.		

Type Product:	Action Code:	EFGWB #(s):	Review Time:
Herbicide	101		3 days

STATUS OF STUDIES IN THIS PACKAGE: REQUIREMENTS

Guideline #	MRID	Status[1]
162-1	41565147 41963316 41963317 ACC. 099814	A
162-2	41338501 41565148 41778301	A
164-1	41565152 41565153 41592012 41592013 42549917 42549918 42573402	A

STATUS OF DATA ADDRESSED IN THIS PACKAGE:

Guideline #	Status[2]
162-1	S
162-2	S
164-1	S

[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: Common name:

Acetochlor.

Chemical name:

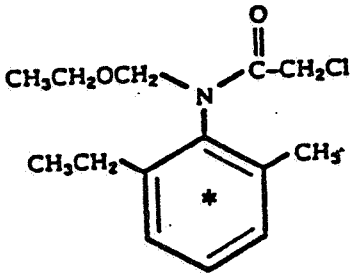
2-Chloro-N-ethoxymethyl-6'-ethylacet-o-toluidide or
N-(ethoxymethyl)-2'-methyl-6'-ethyl-2-chloroacetanilide.

Trade name(s):

ICIA-5676, SC-5676, Harness, Top-Hand

Structure:

ICIA-5676.



Formulations:

7 lb ai/gal EC.

Physical/Chemical properties:

Molecular formula:	$C_{14}H_{20}ClNO_2$.
Molecular weight:	269.8.
Physical state:	Straw colored liquid (ICI Americas, Inc.)
Solubility:	(25°C) 379 mg/L water (ICI Americas, Inc); also soluble in acetone, benzene, chloroform, ethanol and ethyl acetate.

2. TEST MATERIAL:

Active ingredient.

3. STUDY/ACTION TYPE:

The Acetochlor Registration Partnership submitted 162-1 and 164-1 studies for registration.

4. STUDY IDENTIFICATION:

Robbins, A.J. and M.C.G. Lane. 1991. Acetochlor: adsorption and desorption of 5676/48. The thioacetic acid sulfoxide metabolite. In soil. Laboratory Project No. 90JH209. Unpublished study performed and submitted by ICI Americanas, Inc., UK.

Upgrade to:

Hawkins, D.R., D. Kirkpatrick, and G.M. Dean. 1991. The metabolism of ^{14}C-acetochlor in sandy loam soil under aerobic conditions. HRC Report No. ISN 185/90535. Unpublished study performed by Huntingdon Research Centre, Ltd., Cambridgeshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (41963317)

Hawkins, D.R., D. Kirkpatrick, G.M. Dean, and J. Riseborough. 1991. The metabolism of ^{14}C-acetochlor in silty clay loam soil under aerobic conditions, Part II. HRC Report No. STR 19/901756. Unpublished study performed by Huntingdon Research Centre, Ltd., Cambridgeshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (41963316)

Lauer, R. 1992. Stability of acetochlor and its metabolites in soil during frozen storage. Laboratory Project No. MSL-11981. Unpublished study performed by Monsanto Company, St. Louis, MO, and submitted by ICI Americas, Inc., Wilmington, DE. (42549907)

Lauer, R., and P.H. Lau. 1992. Terrestrial field dissipation study of acetochlor and its soil metabolites following preemergent application of MON 8437 to field corn. Laboratory Project No. MSL-12089. Unpublished study performed by Monsanto Company, St. Louis, MO, and Stewart Agricultural Services, Inc., Macon, MO; and submitted by ICI Americas, Inc., Wilmington, DE. (42573402)

Skidmore, M. 1989. The metabolism of ^{14}C-acetochlor in silty clay loam soil under aerobic conditions. HRC Report No. STR 19/881751. Unpublished study performed by Huntingdon Research Centre, Ltd., Cambridgeshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (41565147)

Veal, P., S. Grout, and N.D. Simmons. 1992a. Acetochlor: Residues of thioacetic acid sulphoxide soil metabolite under field conditions in Champaign, Illinois, 1988. Laboratory Project No. 5676-88-SD-01. Report No. RJ1031B. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (42549917)

Veal, P., S. Grout, and N.D. Simmons. 1992b. Acetochlor: Residues of thioacetic acid sulphoxide soil metabolite under field conditions in Leland, Mississippi, 1988. Laboratory Project No. 5676-88-SD-01. Report No. RJ1030B. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (42549918)

Zilka, S.A., B. Wilson, R.E. Hoag, B. Rodriguez, and N.D. Simmons. 1990. Acetochlor: Dissipation of residues in USA soil under field conditions - Visalia, California, 1988. Laboratory Project No. 5676-88-SD-01. Report No. RJ0821B. Unpublished study performed by ICI Agrochemicals, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (42549915)

Zilka, S.A., B. Wilson, R.E. Hoag, O.H. Kirsch, and N.D. Simmons. 1990. Acetochlor: Dissipation of residues in USA soil under field conditions - Goldsboro, North Carolina, 1988. Laboratory Project No. 5676-88-SD-01. Report

No. RJ0822B. Unpublished study performed by ICI Agrochemicals, Bracknell, Berkshire, UK, and submitted by ICI Americas, Inc., Wilmington, DE. (42549916)

5. REVIEWED BY:

James Breithaupt
Agronomist, Review Section 3
EFGWB/EFED/OPP

Signature: James Breithaupt
Date: 1/26/94

6. APPROVED BY:

Akiva Abramovitch
Chief, Review Section 3
EFGWB/EFED/OPP

Signature: Akiva Abramovitch
Date: JAN 26 1994

7. CONCLUSIONS:

Summary of Data Requirements and Eligibility for Registration on Corn.

The outstanding data requirements for registration are small-scale prospective ground water monitoring (166-1) and spray drift (201-1, 202-1). The information enclosed in this submission is sufficient to upgrade the aerobic soil metabolism, anaerobic soil metabolism and terrestrial field dissipation studies to acceptable status.

The updated data does not change our concerns with respect to potential ground water contamination. The submitted studies show mobility of parent acetochlor, and greater mobility and persistence of the three main degradates. Mitigation steps have been taken to prevent acetochlor use on coarser soils (sand, loamy sand, sandy loam) to reduce the possibility of ground water contamination. However, the these mitigation steps may not be effective, given the large potential use area of acetochlor.

The Ground Water Section of EFGWB is concerned that acetochlor, a B2 carcinogen, is likely to leach to ground water if used as proposed. Acetochlor exceeds the levels-of-concern (LOC's) for mobility and persistence set forth by the New Paradigm. Acetochlor also appears likely to exceed risk-based concerns: potential risk to fish, non-target plants, and human health. These concerns are detailed in a memo from EFED Division director Anne Barton to Steven Johnson, dated January 25, 1994. The 1/25/94 memo also proposes a ground-water label advisory and adherence to State Management Plans as mitigation measures against acetochlor leaching to ground water, and small-scale prospective ground-water studies in four states to better evaluate the chemical's leaching potential.

Submitted Studies in this Review

Leaching-Adsorption-Desorption (163-1), MRID 42963319, DER 1, Acceptable .

The aged soil mobility data requirement is now satisfied for acetochlor and its major degradates with the submission of mobility information on the degradate thioacetic acid sulfoxide. Zeneca and Monsanto previously submitted

soil mobility data on parent acetochlor and the degradates oxanilic acid (oxamic acid) and sulfonic acid that were reviewed on 5/11/90, 1/18/91, and 6/17/93. It is not a normal practice for EFGWB to accept mobility data on sterilized soils. However, sterilization was necessary in this case because thioacetic acid sulfoxide degrades rapidly by microbial degradation.

Thioacetic acid sulfoxide ([ethoxymethyl(6-ethyl-o-tolyl)carbamoylmethyl sulphinyl] acetic acid) was very mobile in gamma-irradiation sterilized sand, sandy loam, and clay loam soils (0.77-8 % OM) with Freundlich K_{ads} values of 0.1-0.4. Freundlich K_{des} values ranged from 0.62-1.8 for the studied soils. These soils included Lilly Field sand (0.77 % OM), French A sand (1.5 % OM), French B sandy loam (8 % OM), Frensham sandy loam (1.9 % OM), East Jubilee sandy loam (2.6 % OM), and Old Paddock clay (5.4 % OM).

Laboratory mobility data also indicate that acetochlor and the oxanilic acid (N-ethoxymethyl-N-(2'-ethyl-6'-methylphenyl)oxamic acid) and sulfonic acid (ethoxymethyl(6-ethyl-o-tolyl)carbamoylmethane sulphonic acid) degradates are potentially mobile in soil, based on the Monsanto study (MRID 40198502, reviewed on 5/11/90) and the Zeneca study (MRID 41565149, reviewed on 1/18/91). The oxanilic acid and sulfonic acid degradates were more mobile than parent acetochlor in the Zeneca study. Freundlich K_{ads} values ranged from 0.19 - 1.2 for oxanilic acid with K_{oc} values of 17 - 124. Also, the sulfonic acid degradate was very mobile in the above soils (K_{ads} values of 0.23 - 1.6) but was only moderately mobile in East Jubilee sandy loam with a K_{ads} value of 6.4. The K_{oc} values for sulfonic acid ranged from 21 - 430.

In the Monsanto study, acetochlor was very mobile in Lintonia sand (0.7 % OM, K_{ads}=0.4), Ray silt loam (1.2 % OM, K_{ads}=1.1), Spinks sandy loam (2.4 % OM, K_{ads}=1.6), and Drummer silty clay loam (3.4 % OM, K_{ads}=2.7) soils. In the Zeneca study, acetochlor was very mobile in Lilly Field coarse sand (0.77 % OM, K_{ads}=1.90), French A sand (1.5 % OM, K_{ads}=1.90), Frensham loamy sand (1.9 % OM, K_{ads}=0.81), moderately mobile in East Jubilee sandy loam (2.6 % OM, K_{ads}=6.3) and Old Paddock clay (5.4 % OM, K_{ads}=7.5), and immobile in French B sandy loam (8 % OM, K_{ads}=20). The Koc_{ads} values ranged from 74 - 428, also indicating potential mobility. However, in the desorption phase, acetochlor was only moderately mobile in Lilly Field coarse sand and East Jubilee sandy loam (K_{des} values of 5.8 and 6.3, respectively) and immobile in the other soils (K_{des} values of 20 - 124). In the soil column leaching portion of the Monsanto study, acetochlor concentrations in the soil increased with depth. Acetochlor reached 30, 42, 55, and 96 % of the applied amount in the leachate from the above silty clay loam, sandy loam, silt loam, and sandy soils, respectively.

Previously-Submitted Studies

Aerobic Soil Metabolism (162-1, Acceptable, MRID's 41963316, 41963317, 41565147, Acc. 099814).

The aerobic soil metabolism data requirement is now satisfied with the upgrading data to the studies that were reviewed on 12/7/93. The registrant provided studies showing the formation mechanism of the newly-detected soil degradate thioacetic acid sulfoxide and the other sulfur-containing degradate, sulfonic acid. According to the registrant, these degradates of acetochlor are formed

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by glutathione conjugation and subsequent catabolism of the resulting conjugate. The sulfur containing compounds from acetochlor formed at 11% (6% sulfonic acid and 5% thioacetic acid sulfoxide) and 22% (12% sulfonic acid and 10% thioacetic acid sulfoxide) in sandy loam and silty clay loam, respectively. These compounds were also formed in the field studies.

Zeneca and Monsanto submitted studies to satisfy the 162-1 data requirement for the Acetochlor Registration partnership. A Zeneca study (MRID 41963317) was a new 162-1 study conducted on a sandy loam soil. Another Zeneca study (MRID 41963316) contained a reanalysis of the soil samples from MRID 41565147 (reviewed on 1/18/91) for an additional degradate, thioacetic acid sulfoxide. This degradate was detected when the analytical methodology was changed. The Monsanto study (Acc. #099814, reviewed on 5/11/90) also provided information on acetochlor and its degradates thioacetic acid sulfoxide, sulfonic acid, and oxanilic acid. **These were rearrangement products of one amino moiety of the acetochlor molecule.**

In the Zeneca study, acetochlor persistence in aerobic soil increased with increasing application rate. In sandy loam soil with 2.9 % organic matter, acetochlor applied at 10.5 ppm (7.5X rate, x=1.4 ppm,) degraded with a first half-life of 110 days, followed by a second half-life of 245 days. When acetochlor was applied at 50 ppm (36X rate) to sandy loam soil, the half-life was 300 days (MRID 41963317, DER 1). However, in silty clay loam soil with 4.1 % organic matter, the half-lives of acetochlor were 14 and 55 days for the 4.5 ppm (3.2X rate) and 41 ppm (29X rate) soil concentrations, respectively (MRID's 41565147 and 41963316, DER 2). A previous Monsanto 162-1 study (Acc. #099814) reports half-lives of 8-12 days in Ray silt loam (1.2 % OM), Drummer silty clay loam (3.4 % OM), and Spinks sandy loam (2.4 % OM) soils treated with 3 ppm (2X rate) of acetochlor.

In sandy loam and silty clay loam soils, three polar degradates were identified: oxanilic acid, sulfonic acid, and thioacetic acid sulfoxide. In sandy loam soil, an additional degradate was identified: N-(ethoxymethyl)-2'-ethyl-6'-methyl-2-hydroxyacetanilide (Compound 20). These were rearrangement products of an alkyl chain of the amino moiety. The oxamic acid, sulfonic acid, and thioacetic sulfoxide degradates reached maximum levels of 11 %, 6 %, and 5 % in the Zeneca sandy loam soil by 90, 60, and 120 days, respectively. These degradates also reached maximum levels of 17, 12 , and 10 % in the Zeneca silty clay loam soil by 60, 180, and 120 days, respectively.

According to the proposed label (attached), acetochlor is to be applied to medium-textured soils (loam, silt, silt loam) and fine-textured soils (silty clay loam, sandy clay loam, silty clay, sandy clay, clay loam, and clay) with 1.5-6 % OM. The application rates are 1.5-2.2 lbs ai/A for medium-textured soils and 1.75-2.2 lbs ai/A for fine-textured soils. Acetochlor may also be applied at 2.8-3.2 lbs ai/A to all soils with 6-10 % OM, regardless of soil texture. The application rate is 3.2 lbs ai/A for soils with >10 % OM, regardless of texture. The 162-1 studies in the 12/7/93 review conducted by both Zeneca and Monsanto encompass the range of soils to be treated with acetochlor.

Anaerobic Soil Metabolism (162-2, MRID's 41338501, 41565148, 41778301, Satisfied)

The anaerobic soil metabolism data requirement is now satisfied for acetochlor. Both Zeneca and Monsanto previously submitted 162-2 studies (MRID 41338501, Monsanto study, reviewed on 5/9/90) and MRID's 41565148 and 41778301 (Zeneca studies, reviewed on 6/17/93)), but neither study contained characterization and identification of the residues associated with the floodwater. However, the soil mobility and terrestrial field dissipation studies provide adequate persistence and mobility information on acetochlor and its major degradates. Therefore, conducting another 162-2 study is not necessary.

In the Monsanto study, the anaerobic half-lives of acetochlor ranged from 17-21 days in Ray silt loam (1.2 % OM), Drummer silty clay loam (3.4 % OM), and Spinks sandy loam (2.4 % OM) soils. Only 6-14 % of the applied acetochlor remained after the aerobic phase. About 10-20 % of the total residues were found in the water. Zeneca submitted two 162-2 studies with a calculated anaerobic half-life of 230 days in sandy loam soil with 3 % OM; 50 % of the applied acetochlor was present after the aerobic phase. Up to 25 % of the applied radioactivity was found in the water. The Acetochlor Registration Partnership stated that the additional persistence in the Zeneca study ($T_{1/2}$=230 days vs $T_{1/2}$=17-21 days in the Monsanto study) was caused by decreasing microbial activity in the East Jubilee sandy loam soil. However, it seems unlikely that the 6.5 % decrease in active biomass by 7 months would cause an 11-13X increase in persistence over the Monsanto results.

Terrestrial Field Dissipation (164-1) MRID's 41565152, 41565153, 41592012, 41592013, 42549917, 42549918, 42573402), Reviewed on 12/7/93.

The terrestrial field dissipation data requirement for the 7 EC formulation is now satisfied for the use on corn with the submitted 164-1 studies that were conducted at 5 sites in the U.S. Leaching of the degradates oxanilic acid and sulfonic acid to 18 inches of depth was observed at the Elwood, Illinois site in a silt loam soil (1.7 % OM). The registrant stated that mechanical drag (sample contamination) was the reason for detections to 18 inches at the Elwood, Illinois site. However, the pattern of detections to 18 inches was indicative of leaching, not sample contamination.

Acetochlor was moderately persistent in field soil with half-lives of 8-9 days in sandy loam (MRID's 42549916, 42549915), 14-36 days in silt loam (MRID's 42549918, 42573402), and 26 days in clay loam (MRID 42549917) soils that were treated with 3-4.3 lbs ai/A. These field persistence results are inconsistent with the laboratory aerobic soil metabolism results that indicate a faster rate of degradation/binding of acetochlor in fine-textured soils than in coarse-textured soils. This may indicate leaching in coarse soils.

Environmental Fate Assessment for Acetochlor

EFGWB is particularly concerned with the potential mobility of acetochlor and its degradates. Acetochlor with a water solubility of 223 mg/l and Kd values of 0.4-2.7 in various soils including sandy loam, loamy sand, silt loam and silty clay soils. Acetochlor also leached through soil columns. The degradates

are expected to have even higher mobility based on structural features. Field studies have provided results that appear to be inconsistent with the laboratory data with respect to mobility. In at least one study, leaching of oxamic acid (oxanilic acid) and sulfonic acid and thioacetic acid sulfoxide was observed to a depth of 18 inches in a silt loam soil in Illinois containing 1.7% organic matter. However, no leaching was observed in another silt loam soil in Mississippi containing only 0.5% organic matter.

The major routes of dissipation for acetochlor appear to be microbially-mediated degradation and potential leaching. Laboratory degradation data indicate that acetochlor does not degrade by abiotic processes (hydrolysis and photolysis). While acetochlor has relatively short half lives in fine-textured aerobic soil, it may be moderately persistent in coarser soils and was shown to be mobile in laboratory mobility studies and one terrestrial field dissipation study.

Acetochlor persistence in a confined soil system appears to increase with coarser soil texture and increased application rate. The current label also specifies that acetochlor not be used on sand, sandy loam, and sandy loam soils with <6 % organic matter. The half-lives in aerobic soils for the 3, 4.5, 10.5, 41, and 50 ppm application rates were 8-12, 14, 110-245, 55, and 300 days, respectively. However, the most **representative** aerobic soil half-life is 8-14 days determined in the Monsanto study conducted in Ray silt loam (1.2 % OM), Drummer silty clay loam (3.4 % OM), and Spinks sandy loam (2.4 % OM) soils treated with 3 ppm (~2X label rate) of acetochlor. The 8-14 day half-life represents the labeled application rate and the soils to be treated with acetochlor. The longer half-lives were found only at exaggerated application rates (7.5-36X) labeled rates to coarser, lower OM soils. The aerobic soil metabolism degradates oxanilic acid (oxamic acid), sulfonic acid, and thioacetic acid sulfoxide degradates of acetochlor. **These degradates were rearrangement products of one amino moiety of the acetochlor molecule.**

The oxanilic acid, sulfonic acid, and thioacetic acid sulfoxide degradates were more mobile than parent acetochlor in the Zeneca study. Freundlich K_{ads} values ranged from 0.19 - 1.2 for oxanilic acid with K_{oc} values of 17 - 124. Also, the sulfonic acid degradate was very mobile in the above soils (K_{ads} values of 0.23 - 1.6) but was only moderately mobile in East Jubilee sandy loam with a K_{ads} value of 6.4. The K_{oc} values for sulfonic acid ranged from 21 - 430. Thioacetic acid sulfoxide was very mobile in sand, sandy loam, and clay loam soils (0.77-8 % OM) with Freundlich K_{ads} values of 0.1-0.4. Freundlich K_{des} values ranged from 0.62-1.8 for the studied soils.

Acetochlor (7 EC formulation) was moderately persistent in the field with half-lives of 8-9 days in sandy loam, 14-36 days in silt loam, and 26 days in clay loam soils that were treated with 3-4.3 lbs ai/A. Neither parent acetochlor or the degradate thioacetic acid sulfoxide was observed to be mobile in the five field studies. The oxanilic acid and sulfonic acid degradates were detected to 18 inches of depth in an Elliott silt loam soil in Illinois. No degradate mobility was observed in the other four terrestrial field dissipation studies conducted on sandy loam, silty clay loam, and clay loam soils. These field results are inconsistent with the laboratory aerobic soil metabolism results that indicate a faster rate of degradation/binding of acetochlor in fine-textured soils than in coarse-textured soils. Some undetected leaching

may be occurring in coarse soils.

Acetochlor residues 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 tissue, respectively. By 28 days of depuration, 33 % remained in the edible portion, 2 % remained in the non-edible, and 10 % remained in whole fish.

In confined rotational crop data, the range of accumulation concentrations were 0.08-0.09 ppm (lettuce), 0.23-0.67 ppm (radish foliage), 0.14-0.30 ppm (radish roots), 0.14-0.38 ppm (wheat forage), 0.97-2.88 ppm (wheat straw), 0.05-0.10 ppm (wheat grain), and 0.78-1.37 ppm (wheat chaff). The major residues in the crops were the acetochlor metabolites CP 92,429 (2-hydroxy-N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)acetamide) and CP 91,301 (N-(2-ethyl-6-methylphenyl)oxamic acid. In field rotational crop data, no residues were detected in wheat and sorghum (detection limit=0.03 ppm). The combined residues reached maximum concentrations of 0.769 ppm in forage, 0.128 ppm in seed, and 1.217 ppm in soybean hay.

8. RECOMMENDATIONS

Inform the Acetochlor Registration Partnership that:

a. The Environmental Fate data requirements are satisfied for the registration of acetochlor for use on corn with the exception of small-scale prospective ground water monitoring (166-1) and spray drift (201-1, 202-1). The data from submitted studies raise concern about the potential mobility of acetochlor and its degradates in soil combined with the large potential use area on corn. **Restrictions for using acetochlor on sand, sandy loam and loamy sand soils** have already been imposed on the label. However, this mitigating step may not prevent ground water contamination given the large potential use area of acetochlor. Leaching of acetochlor degradates was observed in a silt loam soil containing 1.7% organic matter to a depth of 18 inches. Acetochlor is resistant to chemical degradation (hydrolysis and photodegradation) and long half lives were also observed in some anaerobic and aerobic metabolism studies conducted with coarser soils or with higher application rates.

Status of Data Requirements for Acetochlor for the Acetochlor Registration Partnership.

Satisfied:

Hydrolysis (161-1); MRID 41565144, 1/18/91. Stable at pH's 5, 7, and 9.

Photodegradation in water (161-2); MRID 41565145, 6/17/93). Stable in pH 7 buffer solution irradiated for 30 days. Acetochlor was 89 % of the applied radioactivity by 30 days of irradiation.

Photodegradation on soil (161-3); MRID 41565146, 6/17/93. Stable on sandy loam soil with only 13 % degradation by 33 days of irradiation.

Aerobic Soil Metabolism (162-1); MRID's 41565147 and 41963316, this review. Half-life of 14 days in silty clay loam soil. The identified degradates were oxanilic acid, sulfonic acid, and thioacetic acid sulfoxide. MRID 41963317, this review. First half-life of 110 days, followed by a second half-life of 245 days in sandy loam soil. The identified degradates were oxanilic acid, sulfonic acid, and thioacetic acid sulfoxide. Accession No. 099814 (Monsanto study), 5/11/90. Half-lives of 8-12 days in sandy loam, silt loam, and silty clay loam.

Anaerobic soil metabolism (162-2); MRID's 41338501, 41565148, 41778301, 41963318, 5/9/90 and 6/17/93. Half-life of 230 days in sandy loam soil under anaerobic conditions. The identified degradates in soil were oxanilic acid (oxamic acid), sulfonic acid, thioacetic acid sulfoxide, N-(ethoxymethyl)-N-(2-ethyl-6-methylphenyl)acetamide, and ethoxymethyl (6-methyl-o-tolyl)carbamoylmethyl-thioacetic acid (reduction product). The registrant should characterize and identify the residues associated with flood water the applied radioactivity in the flood water that contained up to 25.8 % of the applied radioactivity and explain why acetochlor was much more persistent in the Zeneca studies ($T_{1/2}$ of 230 days) than in the Monsanto study ($T_{1/2}$ of 17-21 days).

Leaching/Adsorption/Desorption (163-1); MRID 41565149, 1/18/91. Acetochlor was very mobile in sandy and loamy sand soils with Freundlich K_{ads} values of 0.8-1.9 and moderately mobile to immobile in sandy loam and clay soils with K_{ads} values of 5.9-20. K_{oc} values ranged from 74-428 for acetochlor, 17-124 for oxanilic acid, and 21-68 for sulfonic acid. Oxanilic acid and sulfonic acid were very mobile in all soils with K_{ads} values of 0.19-1.2 and 0.23-1.6, respectively. Thioacetic acid sulfoxide was very mobile in sand, sandy loam, and clay loam soils (0.77-8 % OM) with Freundlich K_{ads} values of 0.1-0.4. Freundlich K_{des} values ranged from 0.62-1.8 for the studied soils.

Terrestrial Field Dissipation (164-1); MRID's 41565152, 41592012, 41592013 41565153, 426499917, 42549918, 42573402. Half-lives of 3-36 days in sandy loam, silt loam, and clay loam soils. The degradates oxanilic acid, sulfonic acid, and thioacetic acid sulfoxide leached to 18 inches of depth in an Elliott silt loam soil (1.7 % OM, pH 5.7). However, no other study showed any apparent leaching of parent or degradates.

Confined (165-1) and Field (165-2) Rotational Crops; MRID's 42549919 and 42591501, respectively. These data requirements are satisfied according to 8/23/93 memorandum from the Health Effects Division (Attachment 1).

Bioaccumulation in Fish (165-4); MRID 41565154. 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; 2-33% of the accumulated [^{14}C]residues remained in the fish tissue.

Unsatisfied:

Prospective Ground Water Monitoring (166-1)

Spray Drift (201-1 and 202-1). Because the registrants in the Acetochlor Registration Partnership are members of the Spray Drift Task Force, EFGWB concurs with the request that the droplet size spectrum and field drift evaluation data submissions be delayed until the final report of the Task Force is to be submitted (December 1994). EFGWB agrees that these data requirements may be satisfied through the work of the Spray Drift Task Force, provided that HED or EEB have no need of these data in advance of the Task Force's final report to be submitted in December 1994. This recommendation is in accordance with PR Notice 90-3 (4/10/90), allowing registrants to fulfill the spray drift (201-1 and 202-1) data requirements through the Task Force. If the registrant elects to satisfy these data requirements through the Task Force, the procedures outlined in PR Notice 90-3 should be followed.

Waived:

Laboratory and Field Volatility (163-2 and 163-3). Waived on 4/24/89 because the vapor pressure (4.4×10^{-5} mm Hg) approximates the Agency's cutoff point of 1×10^{-6} mm Hg.

Combination & tank mixes (164-4). Waived on 12/7/93 because combination and tank-mix data are only required on a case-by-case basis.

9. BACKGROUND:

The Acetochlor Registration Partnership, a joint venture between Zeneca and Monsanto, is requesting registration of acetochlor for non-crop use and corn uses.

ICIA5676 6.4 EC herbicide is a novel combination of the chloroacetamide, acetochlor, and the [redacted] 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. According to the proposed label (attached), acetochlor is to be applied to medium-textured soils (loam, silt, silt loam) and fine-textured soils (silty clay loam, sandy clay loam, silty clay, sandy clay, clay loam, and clay) with 1.5-6 % OM.

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

10. DISCUSSION: Not Applicable

11: COMPLETION OF ONE-LINER: One-liner was updated.

12: CBI APPENDIX: Not Applicable

11

DATA EVALUATION RECORD 1

CHEM 121601 Acetochlor §163-1

FORMULATION--00--ACTIVE INGREDIENT

STUDY ID 41963319
Robbins, A.J. and M.C.G. Lane. 1991. Acetochlor: adsorption and desorption of 5676/48. The thioacetic acid sulfoxide metabolite. In soil. Laboratory Project No. 90JH209. Unpublished study performed and submitted by ICI Americas, Inc., UK.

REVIEWED BY: J. Breithaupt
TITLE: Agronomist
ORG: EFGWB/EFED/OPP
TEL: 703-305-5925

J. Breithaupt

APPROVED BY: A. Abramvitch
TITLE: Section Chief
ORG: EFGWB/EFED/OPP
TEL: 703-305-5975

SIGNATURE:

CONCLUSIONS:

Aged Mobility

1. The soil mobility data requirement is satisfied for acetochlor in this review with the submission of mobility information on the degradate thioacetic acid sulfoxide. It is not normal practice for EFGWB to accept soil mobility studies using sterilized soils. However, sterilizing the soils was necessary in this case because thioacetic acid sulfoxide degrades by microbial degradation.

2. Uniformly phenyl ring-labeled [^{14}C]thioacetic acid sulfoxide [[(ethoxymethyl-6-ethyl-o-tolyl)carbamoylmethyllmethylsulfinyl] acetic acid; radiochemical purity >97%], was very mobile in gamma-irradiation sterilized sand, sandy loam, and clay loam soils (0.77-8 % OM) with Freundlich K_{ads} values of 0.1-0.4. Freundlich K_{des} values ranged from 0.62-1.8 for the studied soils. These soils included Lilly Field sand (0.77 % OM), French A sand (1.5 % OM), French B sandy loam (8 % OM), Frensham sandy loam (1.9 % OM), East Jubilee sandy loam (2.6 % OM), and Old Paddock clay (5.4 % OM). According to the registrant, these UK soils are comparable in physical and chemical properties to soils from the Northeast (excluding New England), glaciated areas (Florida and Corn Belt), and delta (alluvial) areas of U.S.

METHODOLOGY:

Soil Preparation

Six soils were sieved to pass a 2-mm diameter size sieve. The soils were sterilized by gamma irradiation and stored at -20 ± 5 °C.

Preliminary Study

PTFE tubes containing 10 g of irradiated soil, 20 ml of 0.01 M $CaCl_2$, and 1.0 g/cm^3 thioacetic acid sulfoxide were equilibrated for 2, 4, 6, and 24 hours on a rotary shaker at 20 °C. At each interval, the tubes were removed from the shaker and the soil and water were analyzed for thioacetic acid sulfoxide.

Definitive Study

PTFE tubes containing 10 g of irradiated soil and 20 ml of 0.01 M $CaCl_2$ were treated with 0.4, 0.8, 1.2, 1.6, and 2.0 ug/g soil concentrations of thioacetic acid sulfoxide, and shaken for 24 hours on a rotary shaker at 20 °C. The tubes were then centrifuged and three 1-ml aliquots were removed from each tube. LSC was used to determine the distribution of radioactivity in the soil and the aqueous phases. The K_{ads} values were then calculated by the Freundlich equation.

Following the adsorption phase, two additional tubes were prepared for each conconcentration and soil combination. These tubes contained 10 g of irradiated soil, 20 ml of 0.01 M $CaCl_2$, were treated with 0.4, 0.8, 1.2, 1.6, and 2.0 ug/g soil concentrations of thioacetic acid sulfoxide, and were shaken for 24 hours on a rotary shaker at 20 °C. After shaking, the tubes were centrifuged and as much of the supernatant was removed as was possible. An equivalent amount of 0.01 M $CaCl_2$ was added and the tubes were shaken again for 24 hours and then centrifuged. The supernatants were removed and analyzed by LSC. The soil samples were stored frozen until required for analysis.

The soils were analyzed by combustion analysis. Samples (0.25 g) were combusted and the resulting CO_2 was trapped in 2-hydroxymethyl amine and quantified by LSC. The average efficiency for the samples combusted was 92 %.

TLC with three different solvent systems was used to determine the presence or extent of degradation of parent compound. These solvent systems were chloroform:methanol:water:formic acid, chloroform:methanol:ethanoic acid, and ethyl acetate:n-propanol:water.

DATA SUMMARY:

Uniformly phenyl ring-labeled [^{14}C]thioacetic acid sulfoxide [[(ethoxymethyl-6-ethyl-o-tolyl)carbamoylmethyllmethylsulfinyl] acetic acid; radiochemical purity >97%], was very mobile in gamma-irradiation sterilized sand, sandy loam, and clay loam soils (0.77-8 % OM) with Freundlich K_{ads} values of 0.1-0.4. Freundlich K_{des} values ranged from 0.62-1.8 for the studied soils. These soils included Lilly Field sand (0.77 % OM), French A sand (1.5 % OM), French B sandy loam (8 % OM), Frensham sandy loam (1.9 % OM), East Jubilee sandy loam (2.6 % OM), and Old Paddock clay (5.4 % OM). According to the registrant, these UK soils are comparable in physical and chemical properties to soils from the Northeast (excluding New England), glaciated areas (Florida and Corn Belt), and delta (alluvial) areas of U.S.

There was very little degradation of thioacetic acid sulfoxide in the sterilized soils with the exception of the East Jubilee sandy loam soil. Up to 15 % of the applied thioacetic acid sulfoxide degraded in the sterilized East Jubilee sandy loam soil with no apparent explanation from the registrant. Also, the degradate(s) was not identified.

COMMENTS:

1. The soils in this study included Lilly Field sand (0.77 % OM), French A sand (1.5 % OM), French B sandy loam (8 % OM), Frensham sandy loam (1.9 % OM), East Jubilee sandy loam (2.6 % OM), and Old Paddock clay (5.4 % OM). According to the registrant, these UK soils are comparable in physical and chemical properties to soils from the Northeast (excluding New England), glaciated areas (Florida and Corn Belt), and delta (alluvial) areas of U.S.

2. Up to 15 % of the thioacetic acid sulfoxide degraded in the sterilized East Jubilee sandy loam soil. The registrant did not provide an explanation for this unexpected degradation, given the fact that the soil was sterilized using gamma-irradiation..

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

Page_____ is not included in this copy.

Pages 15 through 21 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.

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
ACETOCHLOR (ARP)
Last Update on January 4, 1994
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer: JAB	Section Head:	Date:

Common Name:ACETOCHLOR (ARP)
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:HARNESS, TOPHAND, SURPASS
(Formul'tn): 7 EC
Physical State: STRAW-COLORED LIQU9ID

Use :CORN-100 %
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
[ ] pH 7.0:STABLE
[ ] pH 9.0:STABLE
[ ] pH :
[ ] pH :
[ ] pH :

dd

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

[V] Soil :STABLE
[ ] Air :

Aerobic Soil Metabolism (162-1)
[V] 14 DAYS IN SILTY CLAY LOAM (ICI)
[ ] 110 DAYS FOLLOWED BY 245 DAYS FOR SANDY LOAM (ICI)
[ ] 8-12 DAYS IN RAY, DRUMMER, AND SPINKS SOILS (MON)
[ ]
[ ]
[ ]
[ ]

Anaerobic Soil Metabolism (162-2)
[V] 230 DAYS IN SANDY LOAM SOIL. IDENTIFIED DEGRADATES WERE
[ ] OXANILIC ACID, SULFONIC ACID, AND N-(ETHOXYMETHYL)-N-(2-ETHYL-
[ ] 6-METHYLPHENYL)ACETAMIDE. (ICI)
[V] 17-21 DAYS IN SANDY LOAM, SILT LOAM, AND SILTY CLAY LOAM.
[ ]
[ ]
[ ]

Anaerobic Aquatic Metabolism (162-3)
[ ]
[ ]
[ ]
[ ]
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[ ]

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

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Soil Partition Coefficient (Kd) (163-1)

	TEXTURE	OM	pH	Kads	Koc	OX ACID	SULF ACID
[ ]	LILLY FIELD SD	0.77	5.4	1.9	428	0.55	0.30
[ ]	FRENSHAM LM SD	1.90	6.3	0.81	74	0.19	0.23
[ ]	EAST JUBILEE SD LM	2.6	6.5	5.9	389	1.20	6.40
[ ]	OLD PADDOCK	5.4	6.8	7.5	239	0.77	1.60
[ ]	FRENCH A (CRS SD)	1.5	5.7	1.9	216	0.27	0.27
[ ]	FRENCH B (SD LM)	8.0	5.3	20	422	0.91	1.10

[V] MOBILITY INFORMATION FOR THIOACETIC ACID SULFOXIDE
[ ] FREUNDLICH Kads VALUES OF 0.1-0.4 FOR ABOVE SOILS.
[ ]
[ ]
[ ]

Laboratory Volatility (163-2)
[ ]
[ ]

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[V] 8-36 days at 5 sites in U.S. No leaching below 12 inches in
[ ] 4 of the sites. The degradates oxanilic acid and sulfonic acid
[ ] leached to 18 inches of depth in silt loam soil in Illinois.
[ ]
[ ]
[ ]
[ ]
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[ ]

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

Forestry Dissipation (164-3)
[ ]
[ ]

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

Accumulation in Rotational Crops, Confined (165-1)
[V] CONCENTRATION IN CROPS WERE 0.09 PPM IN LETTUCE, 0.14-0.67 PPM
[ ] IN RADISH, 0.05-2.88 PPM IN WHEAT.

Accumulation in Rotational Crops, Field (165-2)
[V] TOTAL RESIDUES WERE <DETECTION LIMIT (0.03 PPM). CONCENTRATIONS
[ ] RANGED FROM 0.128 PPM TO 0.769 PPM IN SOYBEAN PARTS.

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

Bioaccumulation in Fish (165-4)
[V] 40X, 780X, AND 150X FOR EDIBLE, NON-EDIBLE, AND WHOLE FISH,
[ ] RESPECTIVELY. 66-98 % DEPURATION BY 28 DAYS.

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

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

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

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

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

Environmental Fate & Effects Division
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ACETOCHLOR (ARP)
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Field Runoff (167-1)
[ ]
[ ]
[ ]
[ ]

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

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

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

Degradation Products

OXANILIC ACID
SULFONIC ACID
THIOACETIC ACID SULFOXIDE
C02
OTHER MINOR PRODUCTS

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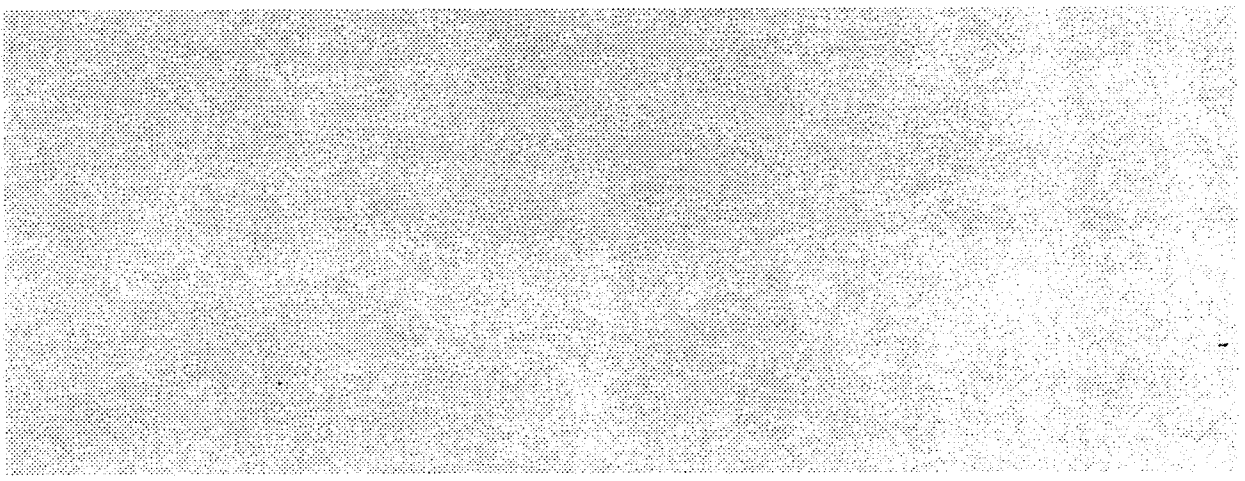
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Comments



References: EFGWB REVIEWS
Writer : JAB

DP BARCODE: D197606

CASE: 015532 DATA PACKAGE RECORD DATE: 01/26/94
SUBMISSION: S455198 BEAN SHEET Page 1 of 1

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REGISTRATION ACTION: 101 RESB NC-FOOD/FEED USE
RANKING : 25 POINTS (KO)
CHEMICALS: 121601 Acetochlor (ANSI) 81.1500%

ID#: 066478-E ACETOCHLOR EC
COMPANY: 066478 ACETOCHLOR REGISTRATION PARTNERSHIP
PRODUCT MANAGER: 25 ROBERT TAYLOR 703-305-6800 ROOM: CM2 241
PM TEAM REVIEWER: VICKIE WALTERS 703-305-5704 ROOM: CM2 257
RECEIVED DATE: 12/13/93 DUE OUT DATE: 06/21/94

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 197606 EXPEDITE: Y DATE SENT: 12/15/93 DATE RET.: / /
CHEMICAL: 121601 Acetochlor (ANSI)
DP TYPE: 001 Submission Related Data Package
CSF: N LABEL: Y

ASSIGNED TO	DATE IN	DATE OUT	ADMIN DUE DATE: 04/14/94
DIV : EFED	12/16/93	/ /	NEGOT DATE: / /
BRAN: EFGB	12/16/93	01/26/94	PROJ DATE: / /
SECT: CRS3	12/16/93	01/26/94	
REVR : JBREITHA	12/16/93	01/26/94	
CONTR:	/ /	/ /	

* * * DATA REVIEW INSTRUCTIONS * * *

Attention Jim Briethaupt:
Response to your review dated 12/7/93

* * * DATA PACKAGE EVALUATION * * *

No evaluation is written for this data package

* * * ADDITIONAL DATA PACKAGES FOR THIS SUBMISSION * * *

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL
197604	TSCB/TS-2	12/15/93	04/14/94	Y	N	Y
197605	TSCB/TS-2	12/15/93	04/14/94	Y	N	Y