DP Barcode :D169325
PC Code No. :108501
EFGWB Out : DEC 19 1991

To: Walter Waldrop
Product Manager PM 71
Special Review and Reregistration Division (H7508W)

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

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

Attached, please find the EFGWB review of...

Reg./File # :241-243

Chemical Name :Pendimethalin

Type Product :Herbicide

Product Name :Prowl

Company Name :American Cyanamid

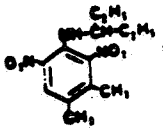
Purpose :Review of protocol for combined 164-2 and 72-7 studies in rice.

Action Code :665 EFGWB #(s): 92-0034 Total Review Time: 3 days

EFGWB Guideline/MRID Summary Table: The review in this package contains...											
161-1		162-1		164-1		165-1		166-1			
161-2		162-2		164-2	Protocol review	165-2		166-2			
161-3		162-3		164-3		165-3		166-3			
161-4		162-4		164-4		165-4		167-1			
201-1		163-1		164-5		165-5		167-2			
202-1		163-2									

1. CHEMICAL:

Chemical Name: N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzene
CAS No.: 40487-42-1
Common Name: Pendimethalin
Trade Name: Prowl, Stomp
Chemical Structure:



Molecular Formula: $C_{13}H_{19}N_3O_4$
Physical/Chemical Properties of Active Ingredient:

Molecular Weight: 281.31
Physical state: Crystalline
Color: Orange-yellow
Vapor pressure: 4 MPa (25 °C)
Solubility: <0.5 ppm (20 °C), 700 g/L acetone
Octanol/water partition coefficient: N/A
Formulations: 4 EC

2. TEST MATERIAL: N/A

3. STUDY/ACTION TYPE:

Review of protocol for combined 164-2 and 72-7 studies in rice.

4. STUDY IDENTIFICATION:

Gingher, Barbara. 1991. Protocol for aquatic field dissipation (164-2) in a rice field in Arkansas. American Cyanamid, Princeton, New Jersey (EFGWB 92-0034).

5. REVIEWED BY:

James A. Breithaupt
Agronomist, Review Section #3
OPP/EFED/EFGWB

Signature: James A. Breithaupt
Date: 12/17/91

6. APPROVED BY:

Akiva Abramovitch, Ph.D.
Chief, Review Section #3
OPP/EFED/EFGWB

Signature: Akiva Abramovitch
Date: DEC 17 1991

7. CONCLUSIONS:

EFGWB has the following comments on the protocol:

A total of three (3) sites will be required by EFGWB for the 164-2 data requirement. These sites in Louisiana and Arkansas should provide realistic worst-case scenario estimates for the environmental fate of pendimethalin-propanil tank mixes. The following table describes the site location, prospective soil texture, and intended target of drainage.

SITE	SOIL TEXTURE AND SERIES	TARGET OF DRAINAGE
Arkansas	Crowley silt loam	Non-esturarine
South Louisiana	Crowley silt loam	Estuarine
North Louisiana	Clay (or predominate member of Sharkey association used to grow rice)	Non-esturine

EFGWB JUSTIFICATION FOR SITE AND SOIL SELECTION

The Crowley silt loam is the predominate rice-growing soil in SOUTH Louisiana and in Arkansas. The NORTH Louisiana site should be conducted on the predominate soil in the Sharkey Association used to grow rice. The rate of pendimethalin to be applied in combination with propanil to both silt loam and clay soils is 1.5-2.0 pints/A of Prowl 4EC (0.75-1 pound ai/A). According to the October 1990 label, pendimethalin/propanil combinations are not registered for usage in California, water-seeded rice, rice patties that support fish or crawfish' production, or on muck/peat soils.

Tillage of a clay soil that is not sodic results in the formation of aggregates, whereas tillage of a silt loam soil results in detached individual particles (powder). According to Stokes's Law of Sedimentation, silt particles (diameter of 0.002-0.05 mm) should theoretically stay in suspension for approximately 27 days. Since the clay aggregates have a larger diameter than silt particles and a greater interaction with other soil particles, less clay would be lost to erosion and the environment. Assuming identical application and management practices, clay soils generally have a higher organic matter content than silt loam soils. Since the same rate of pendimethalin is used for both soils and pendimethalin is adsorbed more tightly to clay and organic material than to silt, similar or lower off-site aqueous concentrations would probably be observed on a clay soil site. However, the predominate soil from each region should be used to demonstrate actual worst-case scenarios for each region.

OTHER COMMENTS

EFGWB does not have enough information on the specific sites in question. Some site considerations include drainage patterns, placement of well head (source water) with respect to the field of interest, water quality, soil variability, and distance to water bodies. The drainage pattern should favor the flow of water from the control and treated plots into different ponds/locations in bayous. If the water flow from the well head has high

salt/$CaCO_3$ concentrations, then the soil near the well head will likely have different chemical and/or physical properties than soil away from the well head. Therefore, some differences in degradation rate of pendimethalin may occur as a result of a soil property gradient from the water quality.

Soil samples from the field should be divided into increments of 0-3 and 3-6 inches of depth if possible. At least 6 soil cores from each "quadrant" (approximately 1/4 acre) should be taken per sampling interval. The registrant was not specific about the location of sampling (e.g. random sampling, sampling on transect, etc.).

Composited soil/sediment samples were not planned for 2 and 4 days after application (p.11) and should be taken.

In section 6.15 of the protocol, the registrant referenced stability data in soil, water, and sediment. The registrant should provide the data to EFGWB with the proposed study.

In section 8.2 of the protocol, the registrant indicated that the word "bayou" may mean pond or drainage canal. The maximum concentration of pesticide in the environment will likely be observed in a closed system.

In section 8.8, the registrant mentioned a separation zone of "at least 2 buffer cuts" between treated and non-treated areas. The sites selected should have drainage patterns that will allow drainage from each area into separate bodies of water.

The planned sampling intervals for pendimethalin and its degradates in environmental media in the protocol were consistent with the environmental fate data and should provide adequate data for determination of the half-life of pendimethalin in water and soil. The rate of pendimethalin to be applied is the maximum labeled rate in rice of 1 lb ai/A.

The following experts in the fields of agriculture and wetlands provided vital information for the completion of this review.

Bollich, Pat. Agronomist, Rice Research Station, Crowley, Louisiana, Louisiana State University Cooperative Extension Service. Mr. Bollich addressed soil texture differences between North and South Louisiana, cultural practices, and geographical distribution of water-seeded vs dry-seeded rice in Louisiana.

Crawford, Steve. Weed Scientist, St. Joseph Experiment Station, Louisiana State University Cooperative Extension Service. Dr. Crawford addressed cultural practice issues, weed control, and geographical distribution of water-seeded vs dry-seeded rice in Louisiana.

Faud, Wade. Pasture and Forage Agronomist, Louisiana Cooperative Extensive Service. Mr. Faud provided a copy of the Rice Production, Insect Control, and Weed Control Handbook from Louisiana.

9. **BACKGROUND**: (from EFGWB 91-0312, 6/27/91)

Pendimethalin is a dinitroaniline herbicide registered for use on terrestrial food + feed, aquatic food, and fiber crops as well as ornamental plants (including Christmas tree plantations) and non-agricultural areas (including lawns, industrial sites, road, utility, and railroad rights-of-way, etc.) to control annual grasses and some broadleaf weeds. Pendimethalin is applied as a preemergence and/or postemergence treatment for these crops, either broadcast or as a preemergence application. Single active ingredient formulations include a 4 lbs/gallon emulsifiable concentrate. Pendimethalin is not toxic to bees or birds, but is toxic to fish.

10. **DISCUSSION OF INDIVIDUAL STUDIES**: N/A

11. **COMPLETION OF ONE-LINER**: N/A

12. **CBI INDEX**: N/A

Feagley, Sam. Professor, Soil Chemistry, Department of Agronomy, Louisiana State University, Baton Rouge, Louisiana. Dr. Feagley has been working with the Louisiana Department of Environmental Quality on a project dealing with rice production and water quality.

Oliver, Dick. Weed Scientist, Department of Agronomy, University of Arkansas, Fayetteville, Arkansas. Dr. Oliver sent a copy of the University of Arkansas Weed Control Recommendations.

Patrick, Bill. Professor, Wetlands Institue, Louisiana State University, Baton Rouge, Louisiana. Dr. Patrick is an internationally-known wetlands expert. He provided information on the texture of soils to be used in the Louisiana studies and the reasons for their selection.

Wells, Bobby. Professor, Department of Agronomy, University of Arkansas, Fayetteville, Arkansas. Dr. Wells addressed general rice production practices in Arkansas, soil properties, and irrigation. He sent a copy of the Rice Production Handbook from Arkansas.

ENVIRONMENTAL FATE ASSESSMENT (from attached EFGWB # 91-0312, 6/27/91)

The major degradative pathway appears to be through photodegradation in water ($t_{1/2}$=21 days). Pendimethalin was stable to all other degradative processes: hydrolysis at pH's 5, 7, and 9, photodegradation on soil, aerobic soil metabolism ($t_{1/2}$=1322 days), and anaerobic soil metabolism (98 % of parent remaining after 60 days). Pendimethalin in terrestrial field dissipation studies was moderately persistent and relatively immobile ($t_{1/2}$=34 days and no leaching below 6 inches). Accumulation of residues occurred in rotated lettuce, snap beans, radishes, carrots, and wheat using rotation intervals of 30-365 days. Bioaccumulation in bluegill sunfish was 1400X (edible), 5800X (non-edible), and 5100X (whole fish).

NOTE: There is a large discrepancy between the half-life in the laboratory aerobic soil study ($T_{1/2}$=1322 days) and the half-life during terrestrial field dissipation ($T_{1/2}$=34 days). The difference is important since hydrolysis and photodegradation on soil did not contribute significantly to the degradation of pendimethalin in laboratory studies.

8. RECOMMENDATIONS:

Inform the registrant that:

(1) The registrant should modify the protocol as specified in the CONCLUSIONS section. The status of data requirements is presented in EFGWB 91-0312 (attached),

(2) validation of the analytical method(s) for environmental media that contain both propanil and pendimethalin is necessary. Also, the registrant should submit information about the potential interactions of pendimethalin and propanil when mixed in the tank.

DP BARCODE: D169325 REREG CASE #

CASE: 819421 DATA PACKAGE RECORD DATE: 10/02/91
SUBMISSION: S404313 BEAN SHEET Page 1 of 2

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REREGISTRATION ACTION: 665 PROTOCOL REVIEW - REREG
CHEMICALS: 108501 Pendimethalin (N-(1-ethylpropyl)-3,4-dimethyl-2,6

ID#: 108501
COMPANY:
PRODUCT MANAGER: 71 WALTER WALDROP 703-308-8062 ROOM: CS1 3B3
PM TEAM REVIEWER: TERRI STOWE 703-308-8043 ROOM: CS1 3D5
RECEIVED DATE: 07/18/90 DUE OUT DATE: 10/16/90

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 169325 EXPEDITE: Y DATE SENT: 10/02/91 DATE RET.: / /
CHEMICAL: 108501 Pendimethalin (N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrob
DP TYPE: 001 Submission Related Data Package
ADMIN DUE DATE: 12/11/91 CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	10/09/91	/ /
BRAN: EFGB	/ /	/ /
SECT: CRS3	/ /	/ /
REVR :	/ /	/ /
CONTR:	/ /	/ /

* * * DATA REVIEW INSTRUCTIONS * * *

*********** ATTENTION: FOR IMMEDIATE REVIEW **************

Please review the environmental fate portion of the Pendimethalin PROTOCOL which combines GLN 72-7B Actual Field Testing - Aquatic Organisms AND GLN 164-2 AQUATIC FIELD DISSIPATION (SEDIMENT) studies. This protocol was originly sent to EFGWB on 03/26/91 but was not reviewed for the 06/27/91 comprehensive review for Pendimethalin.

A meeting has been scheduled for Thursday, October 31, 1991 at 2 p.m. in Conference Room #1 on the third floor of Crystal Station I to discuss both the EEB and EFGWB portion of the protocol. It would be greatly appreciated if the review of the EFGWB portion of the protocol could be completed by COB on Friday, October 25, 1991. This will allow enough time to FAX the review to the registrant for discussion at the meeting.

If you have any problems meeting this schedule, please contact me as soon as possible. Please send a copy of the review to: Terri Stowe
SRRD/RB (H7508W)
3rd fl. - Crystal Station I
308 - 8043

7

HO Namvakhs
12/4

DP Barcode :D 169325

PC Code No. : _____

Date Out : _____

TO: _____
Product Manager _____
Registration Division (H7505C)

expedite
10/25.

FROM: Akiva Abramovitch, Head
Chemistry Review Section #3
Environmental Fate and Groundwater Branch

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

Attached, please find the EFGWB review of...

Reg./File # : _____

Chemical Name : Pendimethalin

Type Product : _____

Product Name : _____

Company Name : _____

Purpose : _____

: _____

: _____

Date Received: ___/___/___ EFGWB#: 92-0034 Time (days): ___.___

Deferrals to:

____ EEB/EFED ____ DEB/HED ____ TB1/HED

____ SIPS/EFED ____ OREB/HED ____ TB2/HED

8

DP BARCODE: D169325 REREG CASE #

CASE: 819421 DATA PACKAGE RECORD DATE: 10/02/91
SUBMISSION: S404313 BEAN SHEET

* * * DATA REVIEW INSTRUCTIONS * * *

THANK YOU!!!

For the attached reregistration case, please identify all applicable data requirements and note those for which adaquate data have not been submitted to the Agency.

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

DP BC	BRANCH/SECTION	DATE OUT	DUE BACK	INS	CSF	LABEL

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
PENDIMETHALIN
Last Update on June 14, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

LOGOUT	Reviewer: JAB	Section Head:	Date: 12/17/91

Common Name:PENDIMETHALIN
PC Code # :108501 CAS #:40487-42-1 Caswell #:

Chem. Name :N-(1-ETHYLPROPYL)-3,4-DIMETHYL-2,6-DINITROBENZENEAMINE

Action Type:Herbicide

Trade Names:PROWL
(Formul'tn):G, DISPERSABLE GRANULAR, EC
Physical State:

Use Patterns (% Usage) :WEEDS - SOYBEANS, COTTON, CORN, BEANS, PEANUTS, POTATOES, :RICE, SORGHUM, SUNFLOWER, TOBACCO, ORNAMENTALS, NON-BEARING :FRUIT AND NUT, VINEYARDS, i.e. Terr Food/Non-Food, Aquatic :Food.

Empirical Form: $C_{13}H_{19}N_3O_4$
Molecular Wgt.: 281.31 Vapor Pressure: 2.90E -6 Torr
Melting Point : °C Boiling Point: °C
Log Kow : pKa: @ °C
Henry's : 2.22E -5 Atm. M3/Mol (Measured) 2.15E -6 (calc'd)

Solubility in ...				Comments
Water	0.50E	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 Reviewed for Reg. Std. 3/85.
[V] pH 7.0:STABLE
[V] pH 9.0:STABLE
[ ] pH :
[ ] pH :
[ ] pH :

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
PENDIMETHALIN
Last Update on June 14, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Photolysis (161-2, -3, -4)
[S] Water:T1/2= 21 days after exposure to Xenon lamp.
[ ] : Reviewed 6/91.
[ ] :
[ ] :

[S] Soil :Stable on sandy loam soil, exposed to Xenon lamp.
[ ] Air :

Aerobic Soil Metabolism (162-1)
[S] T1/2= 1322 days in sandy loam soil. Reviewed 6/91.
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Anaerobic Soil Metabolism (162-2)
[S] Relatively stable (parent was 98.0% of applied after 60 days
[ ] anaerobic incubation. Reviewed 6/91.
[ ]
[ ]
[ ]
[ ]
[ ]

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

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

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
PENDIMETHALIN
Last Update on June 14, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Soil Partition Coefficient (Kd) (163-1)
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

Soil Rf Factors (163-1)
[S] AGED RESIDUES WERE IMMOBILE Reviewed for Reg Std 3/85.
[ ] IN SdLm COLUMN AFTER LEACHING
[ ] WITH 22.5" OF WATER IN 45 DAY
[ ]
[ ]
[ ]

Laboratory Volatility (163-2)
[V] rate was 2.1 x E-3 ug/cm sq/hour over 24 hour period.
[ ] Reviewed 6/91.

Field Volatility (163-3)
[ ]
[ ]

Terrestrial Field Dissipation (164-1)
[S] T1/2= 34 days in sandy loam in CA; no leaching below 6 inches.
[ ] Reviewed 6/91.
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]
[ ]

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

Forestry Dissipation (164-3)
[ ]
[ ]

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

Accumulation in Rotational Crops, Confined (165-1)
[S] Residues accumulated in lettuce, snap beans, radishes, carrots,
[ ] wheat planted 30-365 days in sandy loam soil. Rev'd 6/91.

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

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

Bioaccumulation in Fish (165-4)
[V] Bioaccum Factors: 1400X (edible), 5800X (nonedible), 5100X (whole
[ ] fish). Reviewed 6/91.

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

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

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

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

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

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
PENDIMETHALIN
Last Update on June 14, 1991
[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

In aerobic soil: 2,6-dinitro-3,4-xylidine (CL 84,846)
4-[C1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid (CL 99,900)
4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitro-benzyl alcohol (CL 202,347)

Environmental Fate & Effects Division
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY
PENDIMETHALIN
Last Update on June 14, 1991
[V] = Validated Study [S] = Supplemental Study [U] = USDA Data

Comments

Freezer Storage Stability Study: pendimethalin was stable up to two years when frozen -15 to -20 C. Recovery was 81-100%. Rev'd 6/91.

References: EPA REVIEWS, Reg. Std. and 6/91.
Writer : H. Manning

DP Barcode :D162977
:D162897
:D159912
:D159805
:D155563
:D161966

JUN 27 1991

PC Code No.: 108501

Date Out of EAB:_____

TO: Lois Rossi/Terri Stowe
Product Manager 74
Registration Division (H7505C)

FROM: Akiva D. Abramovitch, Ph.D., Chief
Environmental Chemistry Review Section #3
Environmental Fate and Ground Water Branch

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

Attached, please find the EFGWB review of...

Reg./File # : Submission No. S393409, S388375, S388218, S381787,

Common Name : Pendimethalin.

Type Product : Herbicide.

Product Name : Prowl, Squadron, Accotab, Go-Go San, Herbadox, Sipaxol, Stomp, Wax-Up, AC 92,553.

Company Name : American Cyanamid Company.

Purpose : Addendum to the pendimethalin registration standard.

Date Received: 9/12/90 EFGWB #: 90-0875, 91-0303, 91-0312, 91-0366, 91-0484, 91-0492, 91-0438 Time (days): 22

Deferrals to:

____EEB/EFED _____DEB/HED _____TB1/HED

____SIPS/EFED _____OREB/HED _____TB2/HED

Use this form for individual studies & to submit pesticide applications.

United States Environmental Protection Agency
Office of Pesticide Programs
Washington, DC 20460

Data Review Record

Confidential Business Information - Does not contain National Security Information (E.O. 12065)

Pack Number	Date Received

1. Product Name

Chemical Name: FENDIMETHALIN (ITEM 3)

2. Identifying Number	3. Record Number	4. Action Code	5. MRID/ Accession Number	6. Study Guideline or Narrative
EPA # 2167	263458	660	00153763	GLN 161-3
		660	00153764	GLN 161-3
		660	40155104	GLN 162-1
		660	40155105	GLN 163-3
		660	40313501	GLN 163-3
		660	00153765	GLN 162-1
		660	00153766	GLN 162-2
		660	00155282	GLN 165-4

7. Reference No.	8. Date Rec'd (EPA)	9. Prod/Review Mgr/DCI	10. PM/RM Team No.	11. Date to HED/ EFED/RD/BEAD	12. Proj Return Date	13. Date Returned to RD/SRRD
1	7/15/90	T. STONE	74	9/11/90	12/11/90	

Instructions

PLEASE REVIEW ~~ATTACHED~~ ABOVE DATA IN ORDER TO REVIEW 161-2 AQUATIC (SEDIMENT) DISSIPATION STUDY PREVIOUSLY SUBMITTED, (SEE ATTACHED REVIEW),

This Section Applies to Review of Studies Only

14. Check Applicable Box

- [ ] Adverse 6(a)(2) Data (405)
- [ ] Special Review Data (870)
- [X] Generic Data (Reregistration)(660)
- [ ] Product Specific Data (Reregistration)(655)

15. No. of Individual Studies Submitted: 1

16. Have any of the above studies *(in whole or in part)* been previously submitted for review?

- [ ] Yes *(Please identify the study(ies))*
- [X] No

17. Related Actions

18.	To	Type of Review	19. Reviews Also Sent to		20. Data Review Criteria
HED		Science Analysis & Coordination	[ ] SAC	[ ] PC	A. Policy Note No. 31
		Toxicology/HFA	[ ] TOX/HFA	[ ] PL	[ ] 1 = data which meet 6(a)(2) or meet 3(c)(2)(B) flagging criteria
		Toxicology/IR	[ ] TOX/IR		
		Dietary Exposure	[ ] DEB	[ ] EA	
		Nondietary Exposure	[ ] NDE	[ ] AC	
EFED		Ecological Effects		[ ] BA	[X] 2 = data of particular concern from registration standard
	X	Environmental Fate & Groundwater	[ ] EEB		
SRRD		Special Review	[ ] EFGWB		[ ] 3 = data necessary to determine tiered testing requirements
		Reregistration			
		Generic Chemical Support	[ ] SR		
RD		Insecticide-Rodenticide	[ ] RER		B. Section 18
		Fungicide-Herbicide	[ ] GSC		[ ] 1 = data in support of section 3 in lieu of section 18
		Antimicrobial			
		Product Chemistry	[ ] IR		C. Inert Ingredients
		Precautionary Labeling	[ ] FH		[ ] 1 = data in support of continued use of List 1 inert
BEAD		Economic Analysis	[ ] AM		
		Analytical Chemistry			
		Biological Analysis			

- [ ] Confidential Statement of Formula (EPA Form 8570-4) Attached *(Trade Secrets)*
- [ ] Label Attached

EPA Form 8570-17 (Rev. 11-88)
Previous editions are obsolete.

White - Data Coordinator
Yellow - Data Review Section
Pink - PM/RM/DCI
Green - Return with completed review

1. CHEMICAL: Common name:

Pendimethalin.

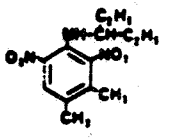
Chemical name:

N-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitrobenzenamine.

Trade name(s):

Prowl, Squadron, Accotab, Go-Go San, Herbadox, Sipaxol, Stomp, Wax-Up, AC 92,553.

Structure:



Formulations:

EC.

Physical/Chemical properties:

Molecular formula: $C_{13}H_{19}N_3O_4$.
Molecular weight: 281.3.
Physical state: orange-yellow crystals.
Melting Point: 54-58 C.
Vapor pressure: 4.0 mPa (25 C).
Solubility: <0.5 ppm in water (20 C), 700 g/L acetone, 77 g/L propan-2-ol, 628 g/L xylene.

2. TEST MATERIAL: Studies 1-8, and 10.: Active ingredient. Studies 9-11: End-Use Product.

3. STUDY/ACTION TYPE: Addendum to the pendimethalin registration standard.

4. STUDY IDENTIFICATION: [Studies by Lee (1989) and Smyth, et al. (1990) at end of list

Barringer, D.F. 1986. Prowl herbicide (AC 92,553): Isolation and identification of residues from bluegill sunfish exposed to radiolabeled pendimethalin in a flow-through study. Project No. 0463. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (00158235)

Forbis, A.D. 1986. Uptake, depuration, and bioconcentration of ^{14}C-AC 92,553 by bluegill sunfish (Lepomis macrochirus). Unpublished study

Laboratory Report No. C-3281/Protocol No. PR88CA02. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41725205)

Lee, T.M. 1989. Pendimethalin (CL 92, 553): Confined accumulation studies of carbon-14 labeled CL 92,553 in lettuce, wheat, carrots, radishes, and snap beans as representative rotational crops (Princeton, New Jersey). Laboratory project ID: CY 38. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ. (41806801)

Smyth, M., D. Koch, and J. Smith. 1990. Pendimethalin (AC 92,553): Freezer stability in soil. Laboratory Report No: C-3467. Performed by American Cyanamid Company, Princeton, NJ, and Analytical Bio-Chemistry Laboratories, Inc. Columbia, MO. and submitted by American Cyanamid Company, Princeton, NJ. (41725206)

5. REVIEWED BY:

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Signature: H. Manning

Date: JUN 27 1991

6. APPROVED BY:

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Chief
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Review Section #3

Signature: Akiva Abramovitch

Date: JUN 27 1991

7. CONCLUSION:

7.1 Study No. 1- Photodegradation in Water (00153763)

1. The study is not acceptable at this time to satisfy the 161-2 data requirement, but it may provide supplementary information. The study may be made acceptable if the registrant provides detailed information about the artificial light source and data from earlier sampling intervals showing the pattern of degradation of pendimethalin.

2. Pendimethalin photodegraded with a half-life of 21 days in water at 25 C continuously irradiated with artificial light (xenon arc lamp) for 28 days. There were up to 18 uncharacterized degradates present at = or < 6% of the applied radioactivity in the samples irradiated for 28 days. Pendimethalin did not degrade in the dark controls incubated at 25 C for 28 days.

7.2 Study No. 2-Photodegradation on Soil (00153764)

1. The study is not acceptable at this time to satisfy the 161-3 data requirement, but it may provide supplementary information. The study may be made acceptable if the registrant provides detailed information about

the artificial light as compared to natural sunlight.

2. Pendimethalin did not photodegrade on sandy loam soil that was continuously irradiated with artificial light (xenon arc lamps) for 4 weeks at 25 C. Pendimethalin also did not degrade in the dark controls incubated at 25 C for 4 weeks.

7.3 Study No. 3-Aerobic Soil Metabolism (40185104)

1. The study is not acceptable at this time to satisfy the 162-1 data requirement, but may provide supplementary information. The study may be made acceptable if the registrant identifies the degradates with R_f values of 0.15 present at 0.6% of the applied radioactivity (0.01 ppm) and 0.07 at 2.2% (0.04 ppm) in the soil extracts, and volatiles in the ethylene glycol trap at 1.0% (0.02 ppm).

2. Pendimethalin degraded with a half-life of 1322 days in sandy loam soil incubated in the dark at 24.8 +/- 0.8 C and 53-62% of 0.33 bar moisture capacity. The nonvolatile degradates identified were 2,6-dinitro-3,4-xylidine (CL 84, 846); 4-[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid (CL 99,900); and 4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitro-benzyl alcohol (CL 202,347).

7.4 Study No. 4-Anaerobic Soil Metabolism (40185105)

1. The study is not acceptable at this time to satisfy the 162-2 data requirement, but may provide supplementary information. The study may be made acceptable if the registrant identifies/characterizes the radioactivity in the acetonitrile extracts ("remainder") present at 0.05 ppm (2.7% of the applied radioactivity) in the "aqueous" phase present at 0.05 ppm (2.7% of applied).

However, this study may be replaced by an acceptable Anaerobic Aquatic Metabolism (162-2) study (see Study No. 5, below), since the aquatic study may be substituted for the soil study.

2. Pendiemthalin was relatively stable in sandy loam soil that was anaerobically (flooding plus nitrogen atmosphere) incubated in the dark for 60 days following an aerobic incubation period of 30 days. Three nonvolatile degradates were identified during the aerobic incubation period: 2,6-dinitro-3,4-xylidine (CL 84,846), 4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitro-benzyl alcohol (CL 202,347), and 4-[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid (CL 99,900).

7.5 Study No. 5-Anaerobic Aquatic Metabolism (40813501)

1. The study is not acceptable at this time to satisfy the 162-3 data requirement, but it may provide supplementary information. The study was not done according to Subdivision N Guidelines, therefore, it is not repairable and must be repeated.

2. Pendimethalin degraded in anaerobic silt loam soil, which had been treated and incubated aerobically for 1 week prior to establishment of anaerobic (flooding and nitrogen) conditions. Parent pendimethalin was

50-58% of the nominal application at 9 weeks posttreatment. Degradates were not identified.

7.6 Study No. 6- Leaching and Adsorption/Desorption (00153765)

1. The study is not acceptable to satisfy the 163-1 data requirement because the soils were sieved through a 0.5 mm screen sieve rather than a 2.0 mm sieve, thereby reducing the apparent mobility of pendimethalin. The study must be repeated.

7.7 Study No. 7- Laboratory Volatility (00153766)

1. The study is acceptable and fulfills the 163-2 data requirement.

2. Pendimethalin slowly volatilized from dry sandy loam soil incubated at 21 C, with a maximum air concentration of 0.54 ug/m^3 and a volatility rate of 5.0 x 10^{-5} ug/cm^2/hour when averaged over the initial 4.7-day sampling period. The cumulative loss of pendimethalin after 8.7 days was 3.3 ug, which was 0.05% of the applied. In moist sandy loam soil, pendimethalin volatilized at a maximum air concentration of 31 ug/m^3 and a volatility rate of 2.1 x 10^{-3} ug/cm^2/hour when averaged over the initial 24-hour sampling period.

A Field Volatility study (163-3) is not required because the acute toxicities are in Toxicity Category III or IV.

7.8 Study No. 8- Accumulation in Fish (00158235, 00156726)

1. The study is acceptable and fulfills the 165-4 data requirement.

2. Pendimethalin residues accumulated in bluegill sunfish exposed to 3.0 ppb of pendimethalin, with maximum mean bioconcentration factors of 1400X, 5800X, and 5100X for edible, nonedible, and whole fish tissues, respectively. Pendimethalin comprised 68.2-80.8% of the recovered radioactivity, and the degradate 4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitro-benzyl alcohol (CL 202,347) was 2.0-3.1% of the recovered activity. Depuration was rapid, with 87-91% of the accumulated [^{14}C]residues eliminated from the fish tissues by day 14 of the depuration period.

7.9 Study No. 9- Terrestrial Field Dissipation (41725204)

1. The study is not acceptable at this time to satisfy the 164-1 data requirement, but it may provide supplementary information. The study may be made acceptable for one of the two sites required for California if the registrant fully discusses the extraction procedure, isolation and quantification of degradates (at all sampling intervals).

2. Pendimethalin residues dissipated with a half-life of approximately 34 days from sandy loam soil located in an almond orchard in California that was treated with pendimethalin (Prowl, 4 lb/gal EC) at 4 lb ai/A. Pendimethalin residues did not appear to leach into soil horizons below 6 inches.

7.10 Study No. 10-Terrestrial Field Dissipation (41725205)

1. The study is unacceptable and cannot be used to satisfy the 164-1 data requirement. The data do not provide sufficient information to predict the fate of pendimethalin or its degradates. The data were too variable, the soil cores were not properly identified, and the sampling protocol was inappropriate. A new study is needed.

7.11 Study No. 11- Aquatic Field Dissipation (41245601)

1. Both the CA and LA portions of the study are unacceptable and cannot be used to satisfy the 164-2 data requirement. The data do not provide sufficient information to predict the fate of pendimethalin or its degradates. The sampling intervals were inadequate and the data too variable to assess the decline of pendimethalin. A new study is needed.

7.12 Study No. 12- Confined Rotational Crop (41806801)

1. The study is not acceptable at this time to satisfy the 165-1 data requirement, but may provide supplementary information. The study may be made acceptable if the registrant adequately identifies pendimethalin residues in the soil and crops.

2. [^{14}C]Pendimethalin residues accumulated in rotational lettuce, snap beans, radishes, carrots, and wheat that were planted 30-365 days after small field plots of sandy loam soil were treated with 3,4-dimethyl-labeled [^{14}C]pendimethalin at approximately 0.75 and 1.64 lb ai/acre (nominal rate 2 lb ai/A). In general, total [^{14}C]residues were greatest in the tissue of crops planted at 30 days posttreatment and decreased as the plants matured. The majority (58.6-91.9%) of the [^{14}C]residues in the plants were extractable, and the majority of the extractable residues were not identified.

7.13 Study No. 13- Freezer Storage Stability (Ancillary) (41725206)

1. Freezer storage stability studies are not specifically required by Subdivision N Guidelines, but are necessary when storage of samples occurs before analysis.

2. Pendimethalin (purity 99.5%) was stable when stored frozen (-15 to -20 C) in uncharacterized "composite control" soil at 0.5 ppm for up to 2 years. Recovery of pendimethalin from soil samples that were stored up to 2 years was 81-100%.

Preliminary Environmental Fate Assessment:

While only one fate study in this review was acceptable (Bioaccumulation in Fish) and many of the other studies may provide only supplemental information, a preliminary assessment of the environmental fate of pendimenthalin may be made.

The major degradative pathway appears to be through photodegradation in water (t1/2= 21 days). Pendimethalin was stable to all other degradative processes: hydrolysis at pH 5, 7, and 9, photodegradation on soil, aerobic

soil metabolism (t1/2= 1322 days), and anerobic soil metabolism (98.0% of parent remaining after 60 days). Pendimethalin in field dissipation studies was moderately persistent and relatively immobile (t1/2= 34 days; no leaching below 6 inches). Accumulation of residues occurred in rotated lettuce, snap beans, radishes, carrots, and wheat using rotation interval of 30-365 days. Bioaccumulation in bluegill sunfish was 1400X (edible tissue), 5800X (nonedible), and 5100X (whole fish).

NOTE: There is a large discrepancy between the half-life in the laboratory aerobic soil study (T1/2= 1322 days) and the half-life during terrestrial field dissipation (T1/2= 34 days). The difference is important since hydrolysis and photodegradation on soil did not contribute significantly to the degradation of pendimethalin in laboratory studies.

8.0 RECOMMENDATIONS:

8.1 Inform the registrant that the following studies are acceptable and fulfill the data requirements:

- Hydrolysis (Reviewed for Reg. Std. 3/85)
- Laboratory Volatility (00153766)
- Bioaccumulation in Fish (00158235, 00156726)
- Freezer Storage Stability (Ancillary) (41725206)

8.2 Inform the registrant that the studies shown below, while unacceptable at this time, may provide supplemental information. They may be made acceptable if the information requested in the DER is supplied:

- Photodegradation in Water (00153763)
- Photodegradation on Soil (00153764)
- Aerobic Soil Metabolism (40185104)
- Confined Rotational Crop (41806801)
- Anaerobic Soil Metabolism (40185105)
- Terrestrial Field Dissipation (41725204)

8.3 Inform the registrant that the following studies were not submitted, but are required:

- Aerobic Aquatic Metabolism (162-4)
- Accumulation in Irrigated Crops (165-3)
- Field Rotational Crop (165-2) [Confined had accumulated residues]

8.4 Inform the registrant that the following studies were reviewed and judged unacceptable and must be repeated:

- Adsorption/Desorption (00153765)
- Terrestrial Field Dissipation (41725205)
- Aquatic Field Dissipation (41245601)
- Anaerobic Aquatic Metabolism (40813501)

8.5 Inform the registrant that the following studies are reserved:

- Long Term Terrestrial Field Dissipation (164-5)

- Spray Drift data (201-1, 202-1)
- Ground Water Monitoring data (166-1, -2, -3)
- Surface Water Monitoring data (167-1, -2)

9. BACKGROUND:

A. Introduction- The studies reviewed above were submitted in response to the Registration Standard.

B. Directions for Use

Pendimethalin is a dinitroanaline herbicide registered for use on terrestrial food + feed, aquatic food, and fiber crops as well as ornamental plants (including Christmas tree plantations) and non-agricultural areas (including lawns, industrial sites, road, utility and railroad rights-of-way, etc.) to control annual grasses and some broadleaf weeds. Pendimethalin is applied as a preemergence and/or postemergence treatment for these crops, either broadcast or as a preemergence application. Single active ingredient formulations include emulsifiable concentrate. Pendimethalin is not toxic to bees or birds, but it is toxic to fish.

10. DISCUSSION OF INDIVIDUAL TESTS OR STUDIES:

Refer to attached reviews.

11. COMPLETION OF ONE-LINER:

The One-Liner was updated and is attached.

12. CBI APPENDIX:

All data reviewed here are considered "company confidential" by the registrant and must be treated as such.

Page 15 is not included in this copy.

Pages _____ through _____ 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 11

CHEM 108501 Pendimethalin §164-2

FORMULATION--12--EMULSIFIABLE CONCENTRATE (EC)

STUDY ID 41245601
Manuel, A. 1980. Analysis for residues of Prowl in soil and in water from Prowl treated rice fields. Laboratory report No. CY 17. Unpublished study performed and submitted by American Cyanamid Company, Princeton, NJ.

DIRECT REVIEW TIME =16

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CONCLUSIONS:

Dissipation - Aquatic Field

1. This study cannot be used to fulfill data requirements.

2. These data are considered to be of uncertain value and should not be used to predict the environmental behavior of pendimethalin and its degradates.

3. The portion of this study conducted in Texas is unacceptable for the following reason:

   the sampling intervals were inadequate to accurately establish the half-life of the test substance (>50% degraded between two sampling intervals).

The portion of this study conducted in Louisiana is unacceptable for the following reason:

the data were too variable to accurately assess the decline of pendimethalin under field conditions.

4. Since the problems with this study preclude the calculation of an accurate half-life for pendimethalin and cannot be resolved by the submission of additional data, a new study is required.

METHODOLOGY:

Texas site: Two vegetated plots (each 8 x 100 feet) of loam soil (52.0% sand, 40.0% silt, 8.0% clay, 0.7% organic matter, pH 4.9) located near Katy, Texas, were treated either with pendimethalin (Prowl; 4 lb/gallon EC, American Cyanamid) at 1.5 lb ai/A or with pendimethalin tank-mixed with propanil at 1.0 and 3.0 lb ai/A, respectively. The plots contained rice (Labelle variety) at the 2-4 leaf stage when the broadcast application was made on April 30, 1980. At 14 days posttreatment, the plots were flooded (water source not specified) to a depth of 3 inches. Water samples (approximately 1 pint/sample) were collected at 15, 29, and 42 days posttreatment (1, 15, and 28 days postflooding). Soil samples (0- to 3- and 3- to 6-inch depths) were collected prior to treatment and at 0, 3, 7, 14, 30, 60, and 94 days posttreatment using a 6-inch soil probe. The soil and water samples were stored frozen prior to shipment to the laboratory for analysis.

Louisiana site: One vegetated plot (6 x 40 feet) of clay soil (4.0% sand, 10.0% silt, 85.0% clay, 1.5% organic matter) located near Crowley, Louisiana, was treated with pendimethalin (Prowl, 4 lb/gallon EC, American Cyanamid) tank-mixed with propanil at 1 and 3.0 lb ai/A, respectively. The plot contained rice (Labelle variety) at the 2-3 leaf stage when the broadcast application was made on July 1, 1980. At 2 days posttreatment, the field was flooded (water source not specified) to a depth of 6 inches. Water samples (1 pint/sample) were collected at 3, 10, 17, and 31 days posttreatment (1, 8, 15, and 29 days postflooding). Soil samples (0- to 4-inch depth) were collected at 0, 3, 7, 14, 30, 60, and 115 days posttreatment using a 6-inch soil probe.

Laboratory analyses: The water samples were analyzed using American Cyanamid Method M-631. An aliquot of each water sample was acidified with 0.1 N hydrochloric acid in aqueous sodium chloride. The acidified solution was partitioned twice with hexane; the hexane fractions were pooled and concentrated to dryness by rotary evaporation. The residues were redissolved in benzene, and an aliquot of the benzene solution was analyzed by GC with electron capture detection. For those samples which were found to contain interfering compounds, the benzene solution was concentrated to

dryness by rotary evaporation, and the residues were redissolved in hexane. The hexane solution was filtered through a Florisil column, then the column was eluted with hexane:benzene (80:20). The eluant was concentrated to dryness by rotary evaporation, and the residues were redissolved in benzene and analyzed by GC with electron capture detection. The limit of detection was 1.0 ppb.

The soil was analyzed using American Cyanamid Method M-520. A subsample of the soil was mixed with water and acidified methanol (2% hydrochloric acid in methanol) and shaken overnight; the ratio of the mixture was 1:2.5:7.5. The mixture was allowed to settle, then the supernatant was filtered. An aliquot of the filtrate was mixed (1:1) with 0.1 N hydrochloric acid and partitioned twice with hexane. The hexane fractions were pooled and concentrated to dryness by rotary evaporation; the resulting residues were dissolved in hexane and chromatographed on a Florisil column eluted with hexane:benzene (80:20). The eluant was concentrated to dryness by rotary evaporation; the residues were redissolved in benzene and analyzed by GC with electron capture detection. The limit of detection was 0.05 ppm.

DATA SUMMARY:

In Texas, pendimethalin (4 lb/gallon EC), applied at 1.5 lb ai/A alone or at 1.0 lb ai/A in combination with propanil, dissipated from plots of loam soil planted to rice with an observed half-life of 14-30 days (Table I). In 0- to 3- inch depth of the plots treated at 1.5 and 1.0 lb ai/A, pendimethalin was 0.69 and 0.47 ppm, respectively, immediately after treatment, 0.36 ppm at 14 days, and ≤0.05 ppm at 30 days; the rapid decrease coincided with the flooding of the plots at 15 days posttreatment (Table IA). Pendimethalin did not leach into the soil; in the 3- to 6-inch soil depths, pendimethalin was 0.24 and 0.14 ppm immediately posttreatment and ≤0.08 ppm at all other intervals in both plots. In the floodwater from the Texas plot treated with pendimethalin at 1.5 lb ai/A, pendimethalin was 0.00259 ppm and its degradate,

4-[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid (CL 99,900),

was 0.00242 ppm at 1 day postflooding (15 days posttreatment); both compounds were below the limit of detection (<0.001 ppm) at all other sampling intervals (Table IB). In the floodwater from the plot treated at 1.0 lb ai/A, pendimethalin was 0.0013 ppm 1 day after flooding (15 days posttreatment) and <0.0010 ppm at all other sampling intervals.

In Louisiana, the concentration of pendimethalin (4 lb/gallon EC) was extremely variable with no discernable pattern in a plot of clay soil that was planted to rice, treated with pendimethalin (4 lb/gallon EC) at 1.0 lb ai/A in combination with propanil, and flooded at 2 days posttreatment (Table IC). In 0- to 4- inch soil depth, pendimethalin

was 0.18 ppm immediately posttreatment, 0.06 ppm at 3 days, 0.19 ppm at 7 days, ≤0.06 ppm at 14 and 30 days, 0.14 ppm at 60 days, and 0.05 ppm at 115 days. Pendimethalin was <0.0010 ppm in the floodwater at all sampling intervals (Table ID).

COMMENTS:

General

1. The study author stated that pendimethalin tank-mixed with propanil was used as well as the single active ingredient formulation because the tank mixture is the only pendimethalin product registered for use on rice.

2. Storage stability data were not provided for pendimethalin in either the water or soil substrates. Also, details of the handling of the samples prior to freezer storage and the length of frozen storage were not reported.

Texas site

1. The sampling intervals were inadequate to assess the dissipation of pendimethalin in the soil. Pendimethalin exhibited no evidence of dissipation during the 14 days prior to flooding (0.25-0.47 ppm); the soil was not sampled again until 15 days postflooding, at which time the concentration of pendimethalin had decreased to 0.05 ppm.

2. The CEC of the soil was presented only as a numeric (6), the units were not reported.

3. The meteorological data were incomplete. Temperature data were reported only for April and May. The maximum temperature (air?) was 93 F; the minimum temperature was 46 F. There is a discrepancy in the rainfall plus irrigation data: on page 28, the cumulative precipitation for May 1980 was 3.50 inches; on page 47, it appeared that May rainfall was 10.08 inches. The cumulative rainfall plus irrigation for April through July was 27.56 or 34.14 inches.

4. The year prior to this study, the field plots were a pasture; no pesticides were used.

Louisiana site

1. The data were too variable to assess the dissipation of pendimethalin in the soil. The concentration of pendimethalin in the soil varied from <0.05 to 0.19 ppm with no discernable pattern throughout the course of the study.

2. The soil was not sampled deeply enough to assess the potential of pendimethalin to leach. The soil was sampled only to a depth of 4 inches and all of the soil samples contained pendimethalin.

3. The soil CEC and pH were not reported.

4. The test plot was planted to rice the year prior to the study; pesticide usage was not reported.

5. The meteorological data were incomplete; only the August weather was reported. The maximum temperature (air?) was 99 F, the minimum was 64 F; cumulative rainfall plus irrigation was 2.25 inches.

6. It appeared that no soil samples were taken prior to treatment to confirm that the site was not contaminated.

Page_____ is not included in this copy.

Pages 31 through 44 are not included.

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____ 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.

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