

US EPA ARCHIVE DOCUMENT

Date Out:

Chemical Code:108501  
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*CEB*

**ENVIRONMENTAL FATE AND GROUND WATER BRANCH**

**Review Action**

**AUG 9 1993**

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

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 8/9/93*

Attached, please find the EFGWB review of...

<b>Common Name:</b>	Pendimethalin	<b>Trade name:</b>	Prowl
<b>Company Name:</b>	American Cyanamid		
<b>ID #:</b>	108501		
<b>Purpose:</b>	Upgrade to Laboratory and Field Studies.		

<b>Type Product:</b>	<b>Action Code:</b>	<b>EFGWB #(s):</b>	<b>Review Time:</b>
Insecticide	629, 635, 660	92-0595, -0741, -1201, 93-0600	5

**STATUS OF STUDIES IN THIS PACKAGE:**

**STATUS OF DATA REQUIREMENTS  
ADDRESSED IN THIS PACKAGE:**

Guideline #	MRID	Status <sup>1</sup>
161-2	TRID 4470100-011	I
161-3	00153764	A
162-1	40185104	A
162-2	40185105	U
162-3	40813501	U
163-1	00153765	I
164-1	41755204, -05	U
165-1	41806801	A
165-3	Waiver	A

Guideline #	Status <sup>2</sup>
161-2	N
161-3	S
162-1	S
162-2	P
162-3	P
163-1	N
164-1	P
165-1	S
165-3	S

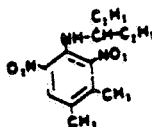
<sup>1</sup>Study Status Codes:

A=Acceptable U=Upgradeable C=Ancillary I=Invalid.

<sup>2</sup>Data Requirement Status Codes: S=Satisfied P=Partially satisfied N=Not satisfied R=Reserved W=Waived.

1. CHEMICAL:

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



Molecular Formula: C<sub>13</sub>H<sub>19</sub>N<sub>3</sub>O<sub>4</sub>  
Physical/Chemical Properties of Active Ingredient:

Molecular Weight: 281.31  
Physical state: Crystalline  
Color: Orange-yellow  
Vapor pressure:  $2.9 \times 10^{-6}$  Torr (20 °C)  
Solubility: <0.5 ppm (20 °C), 700 g/L acetone  
Octanol/water partition coefficient: Not Available  
Formulations: 4 EC

2. TEST MATERIAL: Not Applicable

3. STUDY/ACTION TYPE:

Status of laboratory and field studies.

4. STUDY IDENTIFICATION: Not Applicable

5. REVIEWED BY:

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

Signature: James Breithaupt  
Date: 6/2/93

6. APPROVED BY:

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

Signature: Akiva Abramovitch  
Date: JUL 29 1993

## 7. CONCLUSIONS:

The hydrolysis (161-1) data requirement was satisfied in the registration standard (3/85). Pendimethalin is stable to hydrolysis at pH 5, 7, and 9.

The aqueous photolysis study (TRID 470100-011, 6/27/91) provided useful information on the persistence of parent pendimethalin ( $T_{1/2}$ =21 days) under artificial light that favorably simulates natural sunlight. However, the data requirement remains unsatisfied since none of the 18 degradates present at 0.5-6 % of the applied amount were identified and the samples are no longer available for analysis.

The soil photolysis study (MRID 00153764, 6/27/91) is now acceptable since the recently-submitted spectrum of the xenon lamp used in the study closely simulates sunlight. Pendimethalin was stable to photolysis on a sandy loam soil.

The aerobic soil metabolism study (MRID 40185104, 6/27/91) is now acceptable. The study provided useful information on the persistence of pendimethalin in soil and the identification of degradates that are formed. Approximately 83 % of the applied radioactivity was present as parent at the end of the study (365 days). The identified degradates were 2,6-dinitro-3,4-xylidine, 4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitrobenzylalcohol, and 4-[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid at  $\leq 2.3$  % of the applied radioactivity. The aerobic soil metabolism study was considered upgradeable on 6/27/91 pending identification of the degradates present at low levels.

The anaerobic soil metabolism study (MRID 40185105, 6/27/91) may be upgraded if the registrant can reconcile the persistence of pendimethalin in anaerobic soil (98 % remaining at 60 days) with its degradation in the anaerobic aquatic-metabolism study (MRID 40813501,  $t_{1/2}$  of 60 days).

Pendimethalin was persistent in anaerobic sandy loam soil. About 98 % of parent pendimethalin remained after 60 days of anaerobic incubation. The identified degradates were 2,6-dinitro-3,4-xylidine, 4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitrobenzylalcohol, and 4-[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid.

The anaerobic aquatic metabolism study (40813501, 6/27/91) may be upgraded for the rice use. The registrant should identify the predominant degradates and reconcile the degradation of pendimethalin under anaerobic aquatic conditions with its stability to hydrolysis, aerobic soil metabolism, and anaerobic soil metabolism.

Parent pendimethalin was 50-58 % of the applied radioactivity at the end of the study. Pendimethalin was exposed to aerobic soil conditions for 7 days, followed by 9 weeks of anaerobic aquatic conditions. The study was conducted according to the actual aquatic use pattern (rice) and label directions. The study was rejected on 6/27/91 because of conflict with guideline protocol and since no degradates were identified.

The aerobic aquatic metabolism (162-4) data requirement was waived on 1/7/86 for the rice use since aerobic aquatic conditions are not prevalent in rice culture.

The leaching-adsorption-desorption (163-1) data requirement is not satisfied with MRID 00153765 because the soils were improperly sieved to  $\leq 0.5$  mm in diameter (6/27/91), which may increase surface area and therefore adsorption. Guidelines call for the sieving of soils to pass a 2 mm diameter-size sieve for this study. Since pendimethalin is persistent in aerobic soil, aged soil mobility data is not necessary and the leaching-adsorption-desorption data requirement may be satisfied with only an unaged batch equilibrium study.

The laboratory volatility (163-2) data requirement was satisfied on 6/27/91 with an acceptable study (MRID 00153766). The rate of volatilization of pendimethalin was  $5 \times 10^{-5}$  ug/cm<sup>2</sup>/hour.

The field volatility (163-3) data requirement was waived on 6/27/91 because the acute toxicities are in Toxicology Classes 3 or 4.

The terrestrial field dissipation (164-1) data requirement may be satisfied if the registrant can reconcile the half-lives in the aerobic soil metabolism study (1322 days) and in terrestrial field dissipation studies (34 days) and analyzes the soil samples for the aerobic soil metabolism degradates 2,6-dinitro-3,4-xylidine, 4-[(1-ethylpropyl)amino]-2-methyl-3,5-dinitrobenzylalcohol, and 4-[(1-ethylpropyl)amino]-3,5-dinitro-o-toluic acid.

Pendimethalin was apparently not mobile in field plots of sandy loam soils in California. The reviewer could not find an apparent reason for the large difference in the degradation rates of pendimethalin in the laboratory and the field since the hydrolysis and soil photolysis studies indicated little or no degradation of pendimethalin.

The registrant submitted an analytical method validation for pendimethalin on soil in this review (MRID 42261901, DER 1) to supplement the submitted and reviewed 164-1 studies (6/27/91). The method appears to be valid, with soil recoveries ranging from 96 through 115 % over a fortification range of 0.10 through 5 ppm with a detection limit of 0.005 ppm. The overall average recovery was 101 %.

The registrant may satisfy the aquatic field dissipation (164-2) data requirement for rice with one study in dry-seeded rice in Southern Arkansas on a Crowley silt loam soil. A Southern Arkansas site would provide representative information on the fate of pendimethalin used in rice since this sole aquatic use is very limited in area. Also, the required maximum rate (1 lb ai/A) is normally applied to both silt loam and clay soils. The soil and water samples should be analyzed for parent pendimethalin and the predominant degradates from acceptable anaerobic soil metabolism and anaerobic aquatic metabolism studies.

A combination aquatic field dissipation/aquatic residue monitoring (164-2/72-7) protocol was reviewed and approved with EFGWB modifications on 12/19/91. This combination protocol review imposed 2 studies in Louisiana

and one in Southern Arkansas to satisfy both the 164-2 and 72-7 data requirements and was designed to monitor both estuarine and non-estuarine exposure to pendimethalin from the rice use. However, the aquatic residue monitoring data requirement was waived on 7/7/93. The portions of the protocol involving sampling of the bayou water and sediment pertain to the 72-7 data requirement and are therefore no longer required. The registrant may choose to sample the bayou water and sediment to provide EFGWB with additional information to improve our fate assessment.

The registrant also addressed some specific issues in the proposed study. The registrant feels that field spikes do not add value to the procedure of conducting a 164-2 study. Even though the use of field spikes is not required by EFGWB, field spikes may provide valuable quality control, and EFGWB recommends that the registrant include them in the study.

The 12/19/91 protocol review requested tank-mix interaction information since pendimethalin and propanil are routinely tank mixed. The registrant responded that the requested information does not affect the proposed 164-2 study since only pendimethalin will be used in the study. EFGWB agrees that the tank-mix interaction data are not needed for the 164-2 study.

The **confined crop accumulation (165-1)** data requirement is satisfied for root and grain crops with MRID 41806801. Total pendimethalin residues in the rotational crops snap beans, radishes, carrots, winter wheat, and spring wheat were 0.02 - 0.52, 0.02 - 0.09, 0.02 - 0.59, 0.01 - 0.19, and 0.02 - 0.15 ppm respectively.

EFGWB has no acceptable information for accumulation in leafy vegetable crops. The Product Manager should consult the Health Effects Division to determine the need for confined crop accumulation data on leafy vegetables, since HED is now reviewing all new 165-1 and 165-2 studies.

The **field crop accumulation (165-2)** data requirement is still unsatisfied in this review. The Product Manager should consult the Health Effects Division to determine the need for this study, since the Health Effects Division is now reviewing all new 165-1 and 165-2 studies.

The **accumulation in irrigated crops (165-3)** data requirement may be waived since the current label prevents use of pendimethalin-treated water as irrigation in crops not registered for pendimethalin use.

The **bioaccumulation in fish (165-4)** data requirement was satisfied with an acceptable study (MRID 00156726) on 6/27/91. Bioaccumulation in bluegill sunfish was 1400X (edible), 5800X (non-edible), and 5100X (whole fish). Approximately 90 % depuration occurred by 14 days.

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

Pendimethalin was stable to most 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 of anaerobiosis). Pendimethalin in terrestrial field dissipation studies was moderately persistent but relatively immobile

( $t_{1/2}$ =34 days and no leaching below 6 inches). The major degradative pathway appears to be through photodegradation in water ( $t_{1/2}$ =21 days).

**NOTE:** There is an unexplained discrepancy between the demonstrated persistence in the laboratory studies and the half-life during terrestrial field dissipation ( $T_{1/2}$ =34 days) studies. The difference in half-lives is important since hydrolysis, photodegradation on soil, and biodegradation did not contribute significantly to the degradation of pendimethalin in laboratory studies.

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).

## 8. **RECOMMENDATIONS:**

Inform the registrant that:

(1) The hydrolysis (161-1, 3/85), soil photolysis (161-3, this review), aerobic soil metabolism (162-1, this review), laboratory volatility (163-2, 6/27/91), and fish bioaccumulation (165-4, 6/27/91) data requirements are satisfied. The registrant should see the CONCLUSIONS section above for further details on all environmental fate data requirements.

(2) The aqueous photolysis (161-2) data requirement remains unsatisfied since no degradates were identified and since the samples are no longer available. Soil mobility (163-1) may be satisfied with only unaged data since pendimethalin is stable in aerobic soil.

(3) The anaerobic soil metabolism (162-2), anaerobic aquatic metabolism (162-3), and terrestrial field dissipation (164-1) studies may be upgraded.

(4) The aquatic field dissipation (164-2) data requirement may be satisfied with one (1) study on a Crowley silt loam in Southern Arkansas.

(5) The confined crop accumulation (165-1) data requirement is now satisfied for root and grain crops. The Product Manager should consult the Health Effects Division to determine the need for confined crop accumulation data on leafy vegetables and for field crop accumulation data (165-2), since HED is now reviewing all new 165-1 and 165-2 studies.

(6) The accumulation in irrigated crops (165-3) data requirement may be waived since the current label prevents the use of pendimethalin-treated water for irrigation in crops not registered for pendimethalin use. Field volatility (163-3) was waived on 6/27/91.

## 9. **BACKGROUND:**

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:** Not Applicable
11. **COMPLETION OF ONE-LINER:** One-liner was updated.
12. **CBI INDEX:** Not Applicable





NO 40 CFR 158 DATA ARE IN THIS SUBMISSION

American Cyanamid Company  
Agricultural Research Division  
P.O. Box 400  
Princeton, NJ 08543-0400  
(609) 799-0400

February 27, 1992

Ms. Lois Rossi  
Chief, Reregistration Branch  
Special Review and Reregistration Division (H7508C)  
Office of Pesticide Programs  
U.S. Environmental Protection Agency  
Crystal Mall, Bldg. No. 2  
1921 Jefferson Davis Highway  
Arlington, VA 22202

Re: Pendimethalin Registration Standard; Case # 0187  
EPA Letter Dated January 21, 1992; EFGWB Review

Dear Ms. Rossi:

American Cyanamid is writing in response to the EPA letter, received January 24, 1992, concerning pendimethalin environmental fate reviews.

The EPA letter (attached) provided a list of studies along with the status and due dates for upgrade or reconduct. Although EPA offers the possibility of study upgrading, it must be pointed out that the ability to upgrade does not really exist because of the length of time that has elapsed since the studies were submitted. The ability to upgrade in these instances involves regenerating most of the study since the samples/extracts either no longer exist or would be too old to be considered valid.

In order to resolve the study specific issues, as well as the broader issues related to the substantial completeness of the environmental fate data base for pendimethalin as discussed below, we request a meeting with appropriate Reregistration and EFGWB personnel on March 18 or 19, 1992.

Our specific response for each study follows:

161-1 Hydrolysis: EPA states and we agree that the study is acceptable and fulfills the data requirements.

161-2 Photodegradation - Water: EPA states the study can be upgraded. We do not agree. This study was submitted in 1985 and we do not believe it is upgradable because additional data from earlier time intervals are not available. Even if samples had been retained, which they have not, they would be of no value after this length of time. If EPA determines that data at earlier time intervals is essential, we propose reconduct of the study with a due date of 2/24/93 (one year is the time generally allowed by EPA for this study).

161-3 Photodegradation - Soil: EPA states the study is upgradable. We agree and will upgrade the study by providing additional information on the light source by 6/30/92.

162-1 Aerobic Soil Metabolism: EPA states the study can be upgraded. We do not agree, but instead believe the study is acceptable in its present form, with no additional work needed to upgrade it. The reasons for our position are presented below.

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To begin with, we do not understand the request for identification of the soil extract component(s) ( $R_f = 0.15$ ) present at 0.01 ppm (0.6%). It is clear that current Agency guidelines do not require this.

Next, we fail to see any useful purpose for any further characterization of the soil extract component(s) ( $R_f = 0.07$ ) present at 0.04 ppm (2.2%) or of volatiles in the ethylene glycol trap at 0.02 ppm (1.0%).

We believe that this study clearly fulfills the current guidelines for identification or characterization at the appropriate levels of detection. Furthermore, it appears more than adequate for Agency use in determining significant metabolites formed under aerobic soil conditions in the laboratory, which would allow progress to upper tiered studies.

162-2 Anaerobic Soil Metabolism: EPA states that the study is upgradable. EFGWB found that this study is scientifically sound but does not completely meet the guidelines due to uncharacterized residue in organic and aqueous soil extracts at up to 0.05 ppm; characterization of these extracts is needed to upgrade the study.

The study was submitted in 1987 and the extracts in question no longer exist, nor would they be useful after this length of storage. Thus, the study would need to be rerun to obtain the extracts. However, despite the minor deficiencies that EPA has pointed out, we believe the study still provides adequate data to determine significant metabolites under these laboratory conditions, which would allow progress to higher tiered studies.

162-3 Anaerobic Aquatic Metabolism and 162-4 Aerobic Aquatic Metabolism: EPA states that 162-3 should be repeated and that 162-4 is overdue. We do not agree with either statement for the following reasons.

The requirement for these studies is related to the rice use only. Hence we proposed to perform a study which covered both study aspects and conformed with the somewhat unique use of pendimethalin on rice as described below.

Pendimethalin is used in rice to control weeds prior to application of water to the field; its use advantage is that it allows flooding to be delayed for up to seven days after treatment (please see the enclosed PROWL® herbicide label, page 26). Thus, the protocol proposed leaving the treated soil in aerobic conditions for one week before conversion to anaerobic conditions.

As the present EFGWB reviewer correctly notes, EPA agreed to the anaerobic aquatic study modification and waived the aerobic aquatic requirement because the proposed study would provide more useful data in this case. Based upon this protocol agreement and study waiver, we performed and submitted the appropriate study.

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Also, the correct chronology of events is important:

1. 1982 - received EPA letter that the proposed protocol for this combined study was approved and that the guideline aerobic aquatic study was waived,
2. 1984 - data submission (EPA ID #252623 & 255814),
3. 1985 - Registration Standard (RS) issues,
4. 1986 - EPA letter (page 4) stating that the 1984 study was not adequate and should be redone and that the aerobic aquatic study was not needed,
5. 1986 - agreement to reconduct the test,
6. 1988 - submission of new study (MRID #40813501), and
7. 1992 - EPA letter that the anaerobic aquatic study is unacceptable and that the aerobic aquatic study is overdue. In other words, having done the two year study using an EPA approved protocol, we were now to go back and do it again, strictly by the guidelines.

We understand the need for studies to provide EPA with laboratory and field data on various aspects of a compound's fate in the environment and that 162-3 and 162-4 provide some of the general laboratory data. However, we do not see the point of penalizing a registrant for attempting to provide this information in manner more consistent with a product's use and after receiving Agency permission to do so.

For the reasons stated above, we do not agree that an aerobic aquatic metabolism study is required (or is overdue) or that conduct of another anaerobic aquatic study would provide any additional data significant for the regulation of pendimethalin. We believe that EPA has sufficient data on the fate of pendimethalin under these laboratory conditions to allow progress to higher tiered studies.

163-1 Leaching/Adsorp/Desorp: The reviewer states that this study is not acceptable because soils were sieved through a 0.5 mm rather than a 2.0 mm screen, thereby reducing the apparent mobility of pendimethalin. We do not agree that the study is of no value.

The preferred use of a 2 mm screen appears to come from the Acceptance Criteria issued in December 1989 (the study was submitted in October 1985). The use of this size screen is not mentioned in Subdivision N Guidelines or in the Addendum to Data Reporting (we are not aware of an SEP for the adsorption/desorption study). We believe that the Agency's concern is related to the possible selective removal of some sand particles when using a 0.5 mm sieve since this might make a compound appear to have a different mobility than it actually has. We agree that this is possible, and perhaps should be of some concern for a new active ingredient (a.i.). However, we do not believe that the possibility of some variation in the values from this laboratory experiment should cause concern for an a.i. registered since 1975. There are numerous confirmatory data, from the laboratory (anaerobic aquatic metabolism, MRID #40813501, which showed about 2% of applied radioactivity desorbed from soil into water), from terrestrial field studies (EPA ID # 41725204, 29035, 29032, 106782, 46281, 46295-a,c,d,e,f,i,k,l,m and n & 238510) and from aquatic field studies (MRID # 41245601), all of which demonstrate the relative aqueous immobility of pendimethalin.



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We believe that this body of data is sufficient for EPA to determine the relative immobility of pendimethalin. There is no need to redo this laboratory test which is generally used early in the registration process prior to the availability of other data.

163-2 Laboratory Volatility: EPA states and we agree that the study is acceptable and fulfills the data requirements.

163-3 Field Volatility: EPA states and we agree that the study is not required.

Before proceeding to the 164-series requirements, we must reiterate our position that the body of data contained in existing 161-, 162- and 163-series studies is sufficient to determine the general characteristics of pendimethalin under various laboratory conditions. It seems unlikely that reconduct of any of these studies would result in discovery of a previously undetected, significant metabolite. Please also keep in mind that existing 164-series data, whether acceptable or supplemental, generally bear out the trends suggested by the lower tiered studies

164-1 Terrestrial Field Dissipation: EPA states that the study is upgradable. We agree and believe now, as when the earlier (valid) field dissipation studies were performed (MRID #29035, 29032, 106782, 46281, 46295-a,c,d,e,f,i,k,l,m and n and 238510), that there are no significant metabolites that need to be analyzed for. We believe that analysis for pendimethalin only remains appropriate. As you may recall, the issue which could not be resolved for these earlier studies was the fact that guidelines now call for a sampling depth of three feet. Thus, as is reflected in the list in the EPA cover letter, and due to demonstrated relative immobility, Cyanamid was required to do one study, with sampling to three feet, to confirm earlier results. Two studies (MRID #41725204 and 41725205), instead of the required one, were submitted in 1989 because two were conducted for California registration purposes.

For your information, attached is a copy of the California Department of Food and Agriculture Status Sheet for these two studies; both are acceptable.

Based on the information above and to address one of the reviewer's comments for MRID #41725204 and 41725205, only the decline of pendimethalin needed to be monitored in these studies.

Next, as requested we will provide the method and validation which describe in detail the extraction, isolation and quantification of pendimethalin for these studies. We regret that it was not included in the earlier submission.

Thus, the above discussion and the additional method submission should allow at least MRID #41725204 to be upgraded to acceptable. This in itself will completely fulfill the 164-1 requirement for pendimethalin. No additional study is needed.



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164-2 Aquatic Field Dissipation: EPA states that a study is still required. Since EPA finds existing field data unacceptable, we look forward to a meeting to discuss the protocol for this study. However, until the results of several lower tiered tests are resolved the study cannot be started. Thus, unless the Agency wishes to reconsider its position on certain lower tiered studies, EPA's 1/31/94 timeline for this study cannot be met.

165-1 Confined Rotational Crop: EPA states that the study is upgradable. We do not agree. Unfortunately, it is not possible to upgrade the study since the samples necessary have not been retained. Regeneration of the samples would necessitate reconduct of the study.

However, although this study suffers from several relatively minor deficiencies, we believe it provides a reasonable amount of information on the fate of pendimethalin in rotational crops.

Furthermore, we would point out that pendimethalin already has existing tolerances on beans (succulent and dry), corn (sweet and field), potatoes, peanuts, rice, sorghum, soybeans, sunflowers and cotton, as well as pending tolerances for sugarcane, tomatoes, peas, safflower, wheat and barley. Thus, data already exist for a large number of important rotational crops.

We believe it is unlikely that reconduct of this study to correct minor deficiencies will provide data which would result in rotational crop restrictions different from those already on the PROWL labels.

However, if the Agency requires the study to be redone, despite the information provided above, we propose a due date of 2/24/94 (two years is the time generally allowed by EPA for this study). We must point out that if this issue is not resolved by the end of March 1992, additional time will be required as this field study needs to start early in the year.

165-3 Accumulation - Irrigated Crops: EPA states that this study is overdue because it was required in the RS. We do not agree that the irrigated crop study is required much less overdue. As EFGWB pointed out, it is true that this study was listed as required in the 1985 Registration Standard. However, an April 15, 1986 EPA letter (page 4, attached) stated that this requirement was withdrawn unless a significant degradation product was seen in the anaerobic aquatic study.

Perhaps the Agency inadvertently overlooked the 1986 letter in its review, since its only reference is back to 1985. In any event, our position is that since no significant degradate is present in the anaerobic aquatic study the irrigated crop study is not required.

165-4 Accumulation - Fish: EPA states and we agree that the study is acceptable and fulfills the requirements.



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It is clear that a large body of data exist for pendimethalin and that the fate of this compound in the environment is largely understood even though a few areas may need to be augmented to bring the entire package up to today's more stringent standards.

In view of the specifics of this case, we ask that a determination be made under the 1990 Reregistration Policy - Science Criteria for Determining a Substantially Complete Data Base, wherein EPA considers a reregistration data base to be substantially complete when EPA has all the data needed to make a reasonable worst case risk assessment.

For the environmental fate area to be considered substantially complete, the policy says there must be:

- a full battery of the 10 or 11 laboratory and field dissipation studies\* needed to evaluate groundwater effects
- tests must use appropriate dose levels and answer basic fate questions relevant to a "weight of evidence" risk assessment, taking into account the registered use patterns and other available data

\* 161-1; 161-2; 161-3; 162-1; either both 162-2 and 162-3 and 162-3 or one of 164-1, 164-2 or 164-3; 162-4; 163-1; either 164-1, 164-2 or 164-3; 165-1; and 165-4.

The necessary data exist for pendimethalin. Thus, the environmental fate data base should be considered substantially complete and should not be considered to have significant data gaps; EPA has sufficient data to understand the fate, transport and dissipation of this compound in the environment.

Relative to the policy, pendimethalin appears to be a case where reregistration decisions can be made but additional higher tier data may be needed for confirmatory purposes. We believe that such a position would allow resolution of Case #0187 by 1997. If reconduct of lower tiered studies is mandated, it seems unlikely that all environmental fate studies can be completed by 1997.

Finally, in order to resolve study specific topics, as well as broader issues related to the substantial completeness of the environmental fate data base for pendimethalin, we reiterate our request for a meeting with appropriate Reregistration and EFGWB personnel on March 18 or 19, 1992. Please let me know which day (and what time) you prefer.

Respectfully submitted,

Barbara Gingher  
Product Registrations Manager  
U.S. Regulatory Affairs

BG:dt

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

JAN 21 1992

CERTIFIED MAIL

OFFICE OF  
PESTICIDES AND TOXIC  
SUBSTANCES

Barbara Gingher, Ph.D.  
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U.S. REGULATORY AFFAIRS

JAN 24 1992

SUBJECT: Pendimethalin Registration Standard - Environmental Fate Reviews

Dear Dr. Gingher:

The Agency has completed a comprehensive review of the studies pertaining to the environmental fate requirements of Pendimethalin. A copy of the review dated 06/27/91 is enclosed. Please refer to the review for specific comments. The status of the Pendimethalin environmental fate requirements are listed below:

GLN #	GUIDELINE NAME	GLN STATUS	DUE DATE
161-2	PHOTODEGRADATION - WATER	STUDY UPGRADABLE	06/30/92
161-3	PHOTODEGRADATION - SOIL	STUDY UPGRADABLE	06/30/92
162-1	AEROBIC SOIL METABOLISM	STUDY UPGRADABLE	06/30/92
162-2	ANAEROBIC SOIL METABOLISM	STUDY UPGRADABLE	06/30/92
162-3	ANAEROBIC AQUATIC METABOLISM	REPEAT STUDY REQUIRED	01/31/94
162-4	AEROBIC AQUATIC METABOLISM	OVERDUE - NEED STATUS	...
163-1	LEACH/ADSORP/DESORPTION	REPEAT STUDY REQUIRED	01/31/93
164-1	TERRESTRIAL FIELD DISSIPATION	STUDY UPGRADABLE	06/30/92
164-2*	AQUATIC FIELD DISSIPATION	REPEAT STUDY REQUIRED	01/31/94
165-1	CONFINED ROTATIONAL CROP	STUDY UPGRADABLE	06/30/92
165-3	ACCUMULATION - IRRIGATED CROPS	OVERDUE - NEED STATUS	

\* Per your 01/22/91 request for a meeting to discuss the protocol for this study, a meeting will be arranged as soon as the Ecological Effects Branch has completed its review of the Pendimethalin data base.

Within thirty (30) days of receipt of this letter, you must submit in writing a commitment to repeat the studies for Guidelines 162-3, 163-1 and 164-2 within the time frame specified in the preceeding table. The data necessary to upgrade studies for Guidelines 161-2, 161-3, 162-1, 162-2, 164-1 and 165-1 are due 06/30/92. In addition, you must provide a status report on studies for Guidelines 162-4 and 165-3 which were originally due on 04/30/87 and 10/30/87, respectively. Failure to adequately respond within 30 days may result in the issuance of a Notice of Intent to Suspend affecting your Pendimethalin registrations.

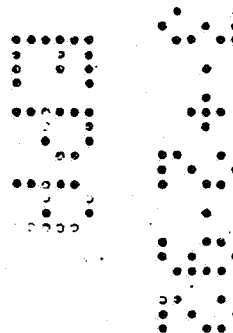
If you have any questions, please contact Terri Stowe of my staff at (703) 308 - 8043.

Sincerely yours,

*Lois Rossi*

Lois Rossi, Chief  
Reregistration Branch  
Special Review and  
Reregistration Division

Enclosure





CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE  
PESTICIDE REGISTRATION BRANCH

STATUS OF DATA SUBMITTED BY

AMERICAN CYANAMID CO

FOR PERMETHALIN

ID # ABR-125154-E, ABM-120111-E,  
ABM-121226-E R

<u>ACCEPTABLE</u>			<u>REQUIRED STUDIES (AB 2021)</u>	<u>DOCUMENT NUMBER</u>	<u>RECORD NUMBER</u>	<u>REPORT DATE</u>	<u>REC'D CDFA</u>
Yes	No	Review Pending					
—	—	—	1. Solubility (Water)	_____	_____	_____	_____
—	—	—	2. Vapor Pressure	_____	_____	_____	_____
—	—	—	3. Octanol-Water Partition Coefficient	_____	_____	_____	_____
—	—	—	4a. Soil Adsorption Coefficient (Parent Only)	_____	_____	_____	_____
—	—	—	4b. Soil Adsorption Coefficient (Degradates)	_____	_____	_____	_____
—	—	—	5. Henry's Law Constant	_____	_____	_____	_____
—	—	—	6. Hydrolysis	_____	_____	_____	_____
—	—	—	7. Photolysis on Soil	_____	_____	_____	_____
—	—	—	8. Photolysis in Water	_____	_____	_____	_____
—	—	—	9. Soil Metabolism (Aerobic)	_____	_____	_____	_____
—	—	—	10. Soil Metabolism (Anaerobic)	_____	_____	_____	_____
✓	—	—	11. Field Dissipation	<u>361-102,</u> <u>361-098,</u> <u>361-099</u>	<u>95173,</u> <u>95174,</u> <u>85608,</u> <u>90288</u>	_____	_____

NP= Not Provided  
NR= Not Required

See attached evaluation summary for comments regarding the above data submitted and evaluated pursuant to Article 15, Food and Agricultural Code.

11 FEBRUARY 1991  
Date

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CALIFORNIA DEPARTMENT OF FOOD AND AGRICULTURE  
PESTICIDE REGISTRATION BRANCH

EVALUATION SUMMARY  
GROUND WATER PROTECTION DATA  
(Article 15, Food and Agricultural Code)

Active Ingredient: Pendimethalin  
I.D. Nos: ABR-125154-E, ABM-120111-E, ABM-121226-E  
Document Nos: 361-102, 361-098, 361-099  
Company Name: American Cyanamid Company

This is in response to the rebuttal dated October 1, 1990.

Field Dissipation (Record Nos. 95173, 95174, 85608, 95288):

Registrant Response 1: A freezer storage stability study was submitted.

CDFA Comment: This point is satisfactory.

Registrant Response 2: Field spikes are not currently required by the EPA.

CDFA Comment: This point is satisfactory.

Registrant Response 3: The analytical method protocol was provided.

CDFA Comment: This point is satisfactory.

Registrant Response 4: Pendimethalin's half-life being shorter under actual use conditions than in a laboratory aerobic metabolism study was expected. An aerobic metabolism study measures only microbial breakdown; the half-life obtained is directly indicative of the microbial activity in the particular soil sample used. Microbial populations vary tremendously in the field, and the half-life measured in a field dissipation study is the sum of... degradation from multiple sources: microbial breakdown, photolysis, hydrolysis, etc. Hence, the shorter half-life observed under field conditions.

CDFA Comment: This point is satisfactory.

Conclusion: The study status has been upgraded to acceptable.

These studies were conducted in California.

  
REVIEWER

11 February 1991  
DATE

dr/pend1.011891

- B. The data referenced are unacceptable for various reasons, including no description of study site, no description of flood water level or proportion to treated soil area, and no inclusion of receiving water residues. The data indicate that pendimethalin residues are 50 parts per billion (ppb) in plot water when fields are treated at twice the recommended rate and flooded 8 days after treatment. Life-cycle data with finfish indicate that residues as low 10 ppb adversely affect reproduction.
- C. We are concerned that residues in receiving waters could exceed those which impair finfish reproduction. This concern arises from the fact that pendimethalin is relatively stable in aquatic environments, is applied aeriaily to rice fields (which could allow unacceptable drift to adjacent waters), flooding (flushing) of fields is recommended within 7 days of treatment and could commence almost immediately, and estimated concentrations in receiving waters are at 7 ppb.
- D. To negate these concerns, an aquatic residue study which addresses both drift exposure and drainage in receiving waters is required. A protocol for this study should be approved by the Agency prior to initiation of the investigation.

### III. ENVIRONMENTAL FATE

#### A. Anaerobic Aquatic Metabolism Data Gap

1. The referenced study previously reviewed was determined to be inadequate because the degradates were not identified. Also about 10 percent of the applied was unaccounted for.
2. This data gap is not satisfied.

#### B. Aerobic Aquatic Metabolism Data Gap

1. We agree that an aerobic aquatic metabolism study will not be needed to support the rice use since such conditions are not representative of the use pattern.

#### C. Field Volatility Data Gap

1. We agree to defer the field volatility data requirement until the results of the laboratory volatility study are reviewed.

#### D. Irrigated Crop Data Gap

1. We agree to withdraw the requirement for an irrigated crop study unless a significant degrate is identified in the anaerobic aquatic metabolism study.



APR 18 1986

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

OFFICE OF  
PESTICIDES AND TOXIC SUBSTANCES

American Cyanamid Company  
Agricultural Research Division  
P.O. Box 400  
Princeton, NJ 08540

APR 15 1986

Attention: Mark W. Galley

Gentlemen:

Subject: Prowl Herbicide Technical (Response to Registration Standard)  
EPA Registration No. 241-245  
Your Letters Dated June 28 and July 15, 1985

The scientific review and evaluation of the data submitted above have been completed. The following are our conclusions and/or comments.

I. RESIDUE CHEMISTRY

A. Plant Metabolism Data

1. We have reevaluated the plant metabolism data and agree with our previous conclusion that significant fractions of the extractable and unextractable radioactive residues found in plants were not identified.
2. We recommend that more rigorous acid, base, and/or enzymatic hydrolysis steps be included in the experimental methodology for the following reasons:
  - a. Unidentified extractable radioactivity was usually associated with highly polar material and, in some cases, reactions of this polar material with diazomethane indicated the presence of pendimethalin-related compounds.
  - b. Mild hydrolysis with acidic methanol (2% HCl/98% methanol) used in the initial extraction step described in the majority of the submitted metabolism studies did not release a sufficient percentage of the total radioactivity present in numerous tested plants.

3. The extractable and unextractable radioactivity encountered in representative plant tissues must be characterized or it must be demonstrated unequivocally that the unextractable residues are fragmentary components derived from radiolabeled pendimethalin that have been incorporated into naturally occurring plant products.

B. Metabolism Studies Utilizing Ruminants are Required

1. Our concern is that residues are present in liver and kidney from a goat dosed at a feeding level equivalent to 5X the maximum expected dietary intake of pendimethalin residues; these residues must be characterized.

C. Requirement for Residue of Pendimethalin and Its Metabolite in Edible Tissues of Catfish and Crayfish

1. We have reevaluated the fish metabolism data and found that they clearly demonstrated a short-term accumulation of pendimethalin residues in the viscera and edible muscle of fish.
2. We agree that extremely low levels of pendimethalin occur in water of flooded rice fields.
3. We wish to point out that total  $^{14}\text{C}$ -residues (expressed as pendimethalin equivalents) were 2.7 parts per million (ppm) in edible muscle of fish after 1 day of exposure to water containing residues of [ $^{14}\text{C}$ ] pendimethalin at 0.004 ppm; therefore, we do not agree that there is no potential for residues of pendimethalin in fish from use of pendimethalin on rice fields.
4. The detection of  $^{14}\text{C}$ -residues in fish exposed to radiolabeled material necessitates a requirement for residue studies with fish conducted, preferably, under natural field conditions.
5. As an alternative to the requested residue study using catfish and crayfish, a label restriction prohibiting use of pendimethalin on rice fields also used for production of fish could be imposed.

-D. Additional Processing Data for Oil Seed Commodities

1. The contention stated in your response is contradicted by a report where residues of 1.65 ppm in peanut hulls, 0.16 ppm in peanut seeds, and 0.21 ppm in mature plants were detected in plants grown in soil treated with the equivalent of 0.75 lb ai/A pendimethalin.

2. Analysis of the extract from peanut hulls (which contained 53% of the total radioactivity from application of [<sup>14</sup>C] pendimethalin) demonstrated that 20 percent of the extracted residues were either pendimethalin per se or CL 202,347.
3. The data discussed clearly show that detectable residues of these compounds may occur in the processed commodities obtained from peanuts following registered pendimethalin applications.
4. Since pendimethalin is a nonpolar compound, concentration in oil processed from seeds of crop plants seems quite possible. Therefore, we are requiring at least one processed food/feed study from raw agricultural commodity samples bearing field-treated detectable residues so that the concentration factor, if any, can be calculated for processed commodities.

#### E. Residue Data for Tobacco

1. Data were submitted for tobacco after the registered soil or layby application.
2. The Guid. lines (Subdivision O) specifically require that a residue profile for tobacco be provided, which includes the active ingredient and all significant plant metabolites of the active ingredient, translocated degradation products from soil, and photodegradation products. These studies are required even if residues are less than 0.1 ppm and should normally involve radioisotopic techniques.
3. No studies were submitted depicting pendimethalin residues in or on tobacco following the registered use involving direct foliar application for sucker control; such use would be expected to result in much higher residues than the registered soil and layby applications.
4. The data requested are still required, except that data involving pendimethalin residues of concern in or on green freshly harvested tobacco as a result of two treatments with the 3 lb/gal EC formulations at 1.5 lb ai/A will not be required if you choose to withdraw the registered foliar use for sucker control in tobacco.

## II. FISH AND WILDLIFE

- A. The aquatic residue monitoring study in rice fields treated with pendimethalin is still necessary.

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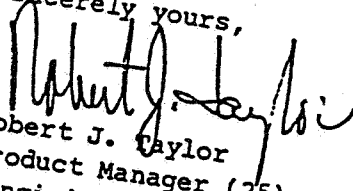
E. Field Dissipation (Soil) Data Gap

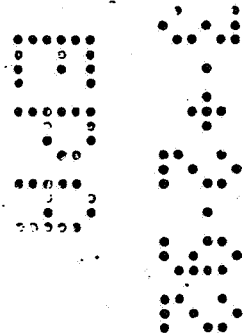
1. The analytical method determined total pendimethalin residues. It did not distinguish between degradates and the parent compound. This is important especially since the metabolism studies that have been submitted do not identify degradation products.

F. Long-Term Field Dissipation Data Gap

1. The first two studies are acceptable and fulfill the data requirements for long-term field dissipation although complete soil characteristics were not given.
2. The third study is invalid.
3. This data gap is satisfied.

Sincerely yours,

  
Robert J. Taylor  
Product Manager (25)  
Fungicide-Herbicide Branch  
Registration Division (TS-767C)



22

# NPC

**NPC, INCORPORATED**  
22636 GLENN DRIVE, SUITE 304  
STERLING, VIRGINIA 22170  
(703) 481-6802 VOICE • (703) 481-6806 FAX

May 21, 1992

Ms. Terry Stowe  
Special Review and Reregistration Division  
Office of Pesticide Programs (H7508C)  
Environmental Protection Agency  
Crystal Station 1, 3rd Floor  
2800 Jefferson Davis Highway  
Arlington, VA 22022

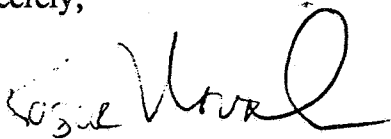
Dear Ms. Stowe:

RE: Letter of 4/10/92, Lois Rossi to Propanil Task Force regarding review of final protocol for the propanil confined rotational crop study.

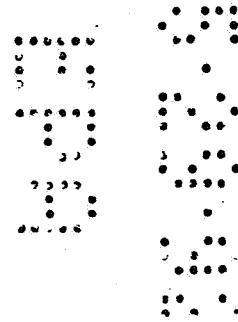
In the above mentioned letter and attached review the Agency cited two EFGWB memos numbered 92-0034 and 91-0667. 92-0034 was not provided with the letter and the copy of 91-0667 appears to be incomplete. To more fully understand the Agency's request for "method validation" it will be necessary to see a copy of EFGWB 92-0034. Can you provide me with copies of these memos.

If you have any questions, please do not hesitate to call.

Sincerely,



Roger Novak  
Technical Director, Propanil Task Force.



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DATA EVALUATION RECORD

STUDY 1

-----  
CHEM 108501

Pendimethalin

\$164-1

-----  
FORMULATION--00--ACTIVE INGREDIENT  
-----

STUDY ID (MRID 42261901)

Smith, J. July 6, 1984. Validation of GC Method M-1453 for the Determination of CL 92,553 Residues in Soil. Report No. C-2442. Unpublished study performed and submitted by American Cyanamid, Princeton, NJ.

-----  
DIRECT REVIEW TIME = 4  
-----

REVIEWED BY: J. Breithaupt  
TITLE: Agronomist, Review Section 3  
ORG: EFGWB/EFED/OPP  
TEL: 305-5925



-----  
APPROVED BY: Akiva Abramovitch  
TITLE: Chief, Review Section 3  
ORG: EFGWB/EFED/OPP  
TEL: 305-5975  
-----

SIGNATURE:

CONCLUSIONS:

Method Validation

1. The study provides additional information on soil extraction of pendimethalin for the submitted and reviewed 164-1 studies (6/27/91).
2. Soil recoveries ranged from 96 to 115 % over a fortification range of 0.10 through 5 ppm with a detection limit of 0.005 ppm. The overall average recovery was 101 % .

METHODOLOGY:

Pendimethalin (CL 92,553) is extracted from moistened soil with acidic methanol. After filtration, a 25 ml aliquot of the extract was diluted with 25 ml of 0.1N hydrochloric acid and the solution was passed through a preconditioned C-18 solid phase extraction column, the pendimethalin being adsorbed onto the column. After rinsing the with water and drying, pendimethalin was eluted from the column using 1 % methanol in hexane. The column effluent was evaporated and the residue was taken up in one ml of hexane. The pendimethalin content of the solutions was determined using GC/NP using the external standard technique. The validated sensitivity of the method is-0.10 ppm.

DATA SUMMARY:

Soil recoveries ranged from 96 to 115 % over a fortification range of 0.10 through 5 ppm with a detection limit of 0.005 ppm. The overall average recovery was 101 % .

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Page \_\_\_\_\_ is not included in this copy.

Pages 25 through 37 are not included.

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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.

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Environmental Fate & Effects Division  
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY

**PENDIMETHALIN**

Last Update on June 21, 1993

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

LOGOUT	Reviewer: <i>JAB</i>	Section Head: <i>J</i>	Date:
--------	----------------------	------------------------	-------

Common Name: PENDINGMETHALIN

Smiles Code: c(c(c(c1N(=O)=O)C)C)c(N(=O)=O)c1NC(CC)CC

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 : WEEDS - SOYBEANS, COTTON, CORN, BEANS, PEANUTS, POTATOES,  
 Patterns : RICE, SORGHUM, SUNFLOWER, TOBACCO, ORNAMENTALS, NON-BEARING  
 (% Usage) : 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  
 [V] pH 7.0: STABLE  
 [V] pH 9.0: STABLE  
 [ ] pH :  
 [ ] pH :  
 [ ] pH :

Reviewed for Reg. Std. 3/85.

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Environmental Fate & Effects Division  
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY  
PENDIMETHALIN

Last Update on June 21, 1993

[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.
- [ ] : UP TO 18 DEGRADATES REACHED 0.5-6 5 OF APPLIED.
- [ ] : THESE WERE NOT IDENTIFIED.
- [ ] :

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

Aerobic Soil Metabolism (162-1)

- [V] T1/2= 1322 days in sandy loam soil. 83 % WAS REMAINING AT 365
- [ ] DAYS. IDENTIFIED DEGRADATES WERE 2,6-DINITRO-3,4-XYLIDINE,
- [ ] 4-[(1-ETHYLPROPYL)AMINO]-2-METHYL-3,5-DINITRO BENZYL ALCOHOL,
- [ ] AND 4-[(1-ETHYLPROPYL)AMINO]-3,5-DINITRO-o-TOLUIC ACID.
- [ ]
- [ ]
- [ ]
- [ ]

Anaerobic Soil Metabolism (162-2)

- [S] Relatively stable (parent was 98.0% of applied after 60 days
- [ ] of anaerobic incubation. IDENTIFIED DEGRADATES WERE 2,6-
- [ ] DINITRO-3,4-XYLIDINE, 4-[(1-ETHYLPROPYL)AMINO]-2-METHYL-3,5-
- [ ] DINITRO BENZYL ALCOHOL, AND 4-[(1-ETHYLPROPYL)AMINO]-3,5-
- [ ] DINITRO-o-TOLUIC ACID.
- [ ]
- [ ]
- [ ]

Anaerobic Aquatic Metabolism (162-3)

- [S] APPROXIMATELY 60 DAYS.
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

Aerobic Aquatic Metabolism (162-4)

- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]
- [ ]

Environmental Fate & Effects Division  
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY

PENDIMETHALIN

Last Update on June 21, 1993

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Soil Partition Coefficient (Kd) (163-1)

[ ]  
[ ]  
[ ]  
[ ]  
[ ]  
[ ]

Soil Rf Factors (163-1)

[S] AGED RESIDUES WERE IMMOBILE Reviewed for Reg Std 3/85.  
[ ] IN SdIm COLUMN AFTER LEACHING  
[ ] WITH 22.5" OF WATER IN 45 DAY  
[ ]  
[ ]  
[ ]

Laboratory Volatility (163-2)

[V] rate was  $5.0 \times E-5$  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.  
[ ]  
[ ]  
[ ]  
[ ]  
[ ]  
[V] THE SOIL EXTRACTION METHOD EXTRACTED 96-115 % OVER A CONC.  
[ ] RANGE OF 0.01 THROUGH 5 PPM.  
[ ]  
[ ]

Aquatic Dissipation (164-2)

[ ]  
[ ]  
[ ]  
[ ]  
[ ]  
[ ]

Forestry Dissipation (164-3)

[ ]  
[ ]

Environmental Fate & Effects Division  
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY

PENDIMETHALIN

Last Update on June 21, 1993

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

Long-Term Soil Dissipation (164-5)

[ ]  
[ ]

Accumulation in Rotational Crops, Confined (165-1)

[V] 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 21, 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

In aerobic soil: 2,6-dinitro-3,4-xylidine (CL 84,846)  
4-[Cl-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)

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Environmental Fate & Effects Division  
PESTICIDE ENVIRONMENTAL FATE ONE LINE SUMMARY

**PENDIMETHALIN**

Last Update on June 21, 1993

[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, JAB