10-1-93 File

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

OCT 1 1993

OFFICE OF
PREVENTION, PESTICIDES AND
TOXIC SUBSTANCES

MEMORANDUM

SUBJECT: Pendimethalin: Reevaluation of Tier 2 terrestrial phytotoxicity studies.

FROM: Anthony F. Maciorowski, Chief
Ecological Effects Branch
Environmental Fate and Effects Division (H7507C)

TO: Walter Waldrop, PM 71
Reregistration Branch
Special Review and Reregistration Division (H7508W)

Background

American Cyanamid Company is requesting reevaluation of Tier 2 terrestrial phytotoxicity studies (MRID Nos. 423722-01,02,03) which were originally classified by EEB as invalid (T. Perry, 10/14/92). These studies did not fulfill guideline requirements due to the lack of a "water only" control when acetone was used as a solvent. In EEB's response (3/22/93) to the registrant's initial rebuttal of the study review, it was stated that these studies could be upgraded to supplemental/core (depending on the study) if the registrant could provide information demonstrating that the concentrations of acetone used were not phytotoxic to the plant species tested.

Reevaluation

The registrant has provided additional information in the form of researchers' observations and additional study abstracts/references which demonstrate that the concentration of acetone used in the studies were not phytotoxic to the plant species tested (see attached). Therefore, these studies may be upgraded to supplemental/core depending on the study. Citations for each study and its conclusions are listed below.

1) Chetram, R.S. and J.A. Gagne. 1992. A Tier 2 Plant Phytotoxicity Study For Seedling Emergence Using AC 92,533. Laboratory Study No. BL91-453. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by American Cyanamid Company, Princeton, NJ. MRID No. 423722-01.

CONCLUSIONS: This study is scientifically sound and meets the requirements for a Tier 2 seedling emergence test using nontarget plants.

Percent emergence: Fourteen DAT, the most sensitive species was ryegrass, with NOEC, LOEC, EC_{25}, and EC_{50} values of 0.02, 0.04, 0.03, and 0.08 lb ai/A, respectively.

Percent survival: At 21 DAT, the most sensitive species was again ryegrass. The NOEC, LOEC, EC_{25}, and EC_{50} values for ryegrass were 0.02, 0.04, 0.06, and 0.15 lb ai/A, respectively.

Phytotoxicity rating: Ryegrass was also the most sensitive species with respect to damage. The NOEC and LOEC were 0.02 and 0.04 lb ai/A, respectively. No EC values were determined from the phytotoxicity data.

Plant height: The most sensitive species was ryegrass, with NOEC, LOEC, EC_{25}, and EC_{50} values of 0.01, 0.02, 0.05, and 0.24 lb ai/A, respectively.

Plant weight: The most sensitive species was again ryegrass, with NOEC, LOEC, EC_{25}, and EC_{50} values of 0.01, 0.02, 0.02, and 0.03 lb ai/A, respectively.

2) White, T.L. and J.A. Gagne. 1992. A Tier 2 Plant Phytotoxicity Study For Seed Germination Using AC 92,553. Laboratory Study No. BL91-471. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by American Cyanamid Company, Princeton, NJ. MRID No. 423722-02.

CONCLUSIONS: This study is scientifically sound and fulfills the guideline requirements for a Tier 2 Seed Germination Phytotoxicity Test using nontarget plants. Ryegrass germination was the most sensitive parameter with NOEC, LOEC, EC_{25}, and EC_{50} values of 0.25, 0.50, 0.82, and 3.5 lb ai/A, respectively.

3) Canez, V.M. and J.A. Gagne. 1992. A Tier 2 Plant Phytotoxicity Study For Vegetative Vigor Using AC 92,553. Laboratory Study No. BL91-454. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by American Cyanamid Company, Princeton, NJ. MRID No. 423722-03.

CONCLUSIONS: This study is scientifically sound but does not meet the guideline requirements for a Tier 2 vegetative vigor nontarget phytotoxicity test as the NOEC for lettuce dry weight was not determined.

Phytotoxicity rating: The most sensitive species with respect to plant damage were equally lettuce and ryegrass. The NOEC and LOEC for these two species were 0.063 and 0.13 lb ai/A, respectively.

No EC values were determined from the phytotoxicity data.

Percent survival: Although the species with the lowest NOEC was ryegrass, onion was determined to be the most sensitive species with respect to survival. The NOEC, LOEC, EC_{25}, and EC_{50} for onion were 1.0, 2.0, 1.4, and 4.5 lb ai/A, respectively. All EC values listed as ND in Table VIII should be considered as >4.0 lb ai/A.

Plant height: The most sensitive species with respect to height was ryegrass. The NOEC, LOEC, EC_{25}, and EC_{50} for ryegrass were 0.063, 0.13, 0.10, and 0.64 lb ai/A, respectively. All EC values listed as ND in Table VIII should be considered as >4.0 lb ai/A.

Dry weight: The NOEC for lettuce dry weight was not determined as the lowest rate applied was significantly different from the control. The NOEC for lettuce dry weight was therefore <0.063 lb ai/A.

Excluding lettuce, the most sensitive species with respect to dry weight was ryegrass. The NOEC, LOEC, EC_{25}, and EC_{50} for ryegrass were 0.06, 0.13, 0.035, and 0.21 lb ai/A, respectively. All EC values listed as ND in Table VIII should be considered as >4.0 lb ai/A, except for tomato, in which case the maximum rate of 4.0 lb ai/A serves as a reasonable estimate of the EC_{50}.

Summary

The guideline requirements for seed germination and seedling emergence (123-1 a,b) have been fulfilled. The guideline requirement for vegetative vigor (123-2), however, is still outstanding as the NOEC for lettuce dry weight was not determined. Lettuce should be retested along with at least two species having acceptable NOEL, LOEL, EC_{25} and EC_{50} values to insure comparability of results.

The status of all applicable data requirements for pendimethalin can be found in the attached table. If you have any questions, please contact Tracy Perry at 305-6451 or Henry Craven at 305-5320.

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Date: ~~10/07/92~~ 10/1/93
Case No: 819421
Chemical No: 108501

PHASE IV
DATA REQUIREMENTS FOR
ECOLOGICAL EFFECTS BRANCH

Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
6 Basic Studies in Bold					
71-1(a) Acute Avian Oral, Quail/Duck	(TGAI)	A,B,C,D	YES	00059739	NO
71-1(b) Acute Avian Oral, Quail/Duck	(TEP)	-	-	-	-
71-2(a) Acute Avian Diet, Quail	(TGAI)	A,B,C,D	YES	00026674	NO
71-2(b) Acute Avian Diet, Duck	(TGAI)	A,B,C,D	YES	00026675	NO
71-3 Wild Mammal Toxicity	(TGAI)	-	-	-	-
71-4(a) Avian Reproduction Quail	(TGAI)	-	-	-	-
71-4(b) Avian Reproduction Duck	(TGAI)	-	-	-	-
71-5(a) Simulated Terrestrial Field Study	(TEP)	-	-	-	-
71-5(b) Actual Terrestrial Field Study	(TEP)	-	-	-	-
72-1(a) Acute Fish Toxicity Bluegill	(TGAI)	A,B,C,D	YES	00106764	NO
72-1(b) Acute Fish Toxicity Bluegill	(TEP)	D	YES	00037927, FAOPEN01	NO
72-1(c) Acute Fish Toxicity Rainbow Trout	(TGAI)	A,B,C,D	YES	00160764	NO
72-1(d) Acute Fish Toxicity Rainbow Trout	(TEP)	D	YES	FAOPEN01, 00037927	NO
72-2(a) Acute Aquatic Invertebrate Toxicity	(TGAI)	A,B,C,D	YES	FAOPEN05	NO
72-2(b) Acute Aquatic Invertebrate Toxicity	(TEP)	D	YES	260404	NO
72-3(a) Acute Estu/Mari Tox Fish	(TGAI)	A,D	YES	FAOPEN02	NO
72-3(b) Acute Estu/Mari Tox Mollusk	(TGAI)	A,D	YES	FAOPEN03	NO
72-3(c) Acute Estu.Mari Tox Shrimp	(TGAI)	A,D	YES	FAOPEN03	NO

* In Bibliographic Citation column indicates study may be upgradeable

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PHASE IV
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Data Requirements	Composition[1]	Use Pattern[2]	Does EPA Have Data To Satisfy This Requirement? (Yes, No)	Bibliographic Citation	Must Additional Data Be Submitted under FIFRA3(c)(2)(B)?
72-3(d) Acute Estu/Mari Tox Fish	(TEP)	A,D	YES	FAOPEN02	NO
72-3(e) Acute Estu/Mari Tox Mollusk	(TEP)	A,D	YES	FAOPEN03	NO
72-3(f) Acute Estu/Mari Tox Shrimp	(TEP)	A,D	YES	FAOPEN04	NO
72-4(a) Early Life-Stage Fish	(TGAI)	-	-	-	-
72-4(b) Live-Cycle Aquatic Invertebrate	(TGAI)	A,D	YES	00100504	NO
72-5 Life-Cycle Fish	(TGAI)	A,D	YES	00037940	NO
72-6 Aquatic Org. Accumulation	(TGAI)	A,D	NO	-	YES[3]
72-7(a) Simulated Aquatic Field Study	(TEP)	-	-	-	-
72-7(b) Actual Aquatic Field Study	(TEP)	D	NO	-	NO[4]
122-1(a) Seed Germ./Seedling Emerg.	(TGAI)	-	-	-	-
122-1(b) Vegetative Vigor	(TGAI)	-	-	-	-
122-2 Aquatic Plant Growth	(TGAI)	-	-	-	-
123-1(a) Seed Germ./Seedling Emerg.	(TGAI)	A,B,C,D	NO	42372201, 42372202	NO
123-1(b) Vegetative Vigor	(TGAI)	A,B,C,D	NO	42372203	YES[5]
123-2 Aquatic Plant Growth	(TGAI)	A,B,C,D	NO	42137101, 423722-(04-07)	NO
124-1 Terrestrial Field Study	(TEP)	-	-	-	-
124-2 Aquatic Field Study	(TEP)	-	-	-	-
141-1 Honey Bee Acute Contact	(TGAI)	A,B,C	YES	00099890	NO
141-2 Honey Bee Residue on Foliage	(TEP)	-	-	-	-
141-5 Field Test for Pollinators	(TEP)	-	-	-	-

* In Bibliographic Citation column indicates study may be upgradeable

1.Composition: TGAI = Technical grade of the active ingredient; PAIRA = Pure active ingredient, radiolabeled; TEP = Typical end-use product

2.Use Patterns: A = Terrestrial Food Crop; B = Terrestrial Feed Crop; C = Terrestrial Non-Food Crop; D = Aquatic Food Crop; E = Aquatic Non-Food Outdoor; F = Aquatic Non-Food Industrial; G = Aquatic Non-Food Residential; H = Greenhouse Food Crop; I = Greenhouse Non-Food Crop; J = Forestry; K = Outdoor Residential; L = Indoor Food; M = Indoor Non-Food; N = Indoor Medical; O = Indoor Residential; Z = Use Group for Site 00000

3. THIS STUDY IS REQUIRED IN ORDER TO SUPPORT THE RICE USE.

4. The aquatic field study has been waived by the Agency as recommended by the Ecological Fate and Effects Task Force.

5. Lettuce should be retested along with at least two species having acceptable NOEL, LOEL, EC_{25} and EC_{50} values to insure comparability of results.

DP BARCODE: D194636 REREG CASE # 0187

CASE: 819421 DATA PACKAGE RECORD DATE: 09/01/93
SUBMISSION: S447080 BEAN SHEET Page 1 of 1

* * * CASE/SUBMISSION INFORMATION * * *

CASE TYPE: REREGISTRATION ACTION: 627 GENERIC DATA SUBMISSION
CHEMICALS: 108501 Pendimethalin (ANSI) 100.00 %

ID#: 108501
COMPANY:
PRODUCT MANAGER: 71 WALTER WALDROP 703-308-8062 ROOM: CS1 3B3
PM TEAM REVIEWER: JANE MITCHELL 703-308-8061 ROOM: CS1 3C6
RECEIVED DATE: 08/25/93 DUE OUT DATE: 10/24/93

* * * DATA PACKAGE INFORMATION * * *

DP BARCODE: 194636 EXPEDITE: N DATE SENT: 09/01/93 DATE RET.: / /
CHEMICAL: 108501 Pendimethalin (ANSI)
DP TYPE: 001 Submission Related Data Package
CSF: N LABEL: N

ASSIGNED TO	DATE IN	DATE OUT
DIV : EFED	09/02/93	/ /
BRAN: EEB	09/02/93	/ /
SECT:	/ /	/ /
REVR :	9/9/93	/ /
CONTR:	/ /	/ /

ADMIN DUE DATE: 10/31/93
NEGOT DATE: 10/31/93
PROJ DATE: / /

* * * DATA REVIEW INSTRUCTIONS * * *

Registrant is submitting additional arguments concerning validity of tier 2 seed germination/seedling emergence. Requesting reevaluation in light of arguemnts presented. Any questions please contact Jane Mitchell on 308-8061.

* * * DATA PACKAGE EVALUATION * * *

No evaluation is written for this data package.

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

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

DP Barcode : D194636
PC Code No : 108501
EEB Out :

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

From: Anthony F. Maciorowski, Chief
Ecological Effects Branch/EFED (H7507C)

Attached, please find the EEB review of...

Reg./File # : 108501
Chemical Name : Pendimethalin
Type Product : Herbicide
Product Name :
Company Name : American Cyanamid Company
Purpose : Reevaluation of Tier 2 terrestrial plant studies.

Action Code : 627 Date Due : 10/24/93
Reviewer : Tracy Perry

EEB Guideline/MRID Summary Table: The review in this package contains an evaluation of the following:

GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT	GDLN NO	MRID NO	CAT
71-1(A)			72-2(A)			72-7(A)		
71-1(B)			72-2(B)			72-7(B)		
71-2(A)			72-3(A)			122-1(A)		
71-2(B)			72-3(B)			122-1(B)		
71-3			72-3(C)			122-2		
71-4(A)			72-3(D)			123-1(A)	42372201, 42372202	Y
71-4(B)			72-3(E)			123-1(B)	42372203	S
71-5(A)			72-3(F)			123-2		
71-5(B)			72-4(A)			124-1		
72-1(A)			72-4(B)			124-2		
72-1(B)			72-5			141-1		
72-1(C)			72-6			141-2		
72-1(D)						141-5		

Y=Acceptable (Study satisfied Guideline)/Concur
P=Partial (Study partially fulfilled Guideline but additional information is needed
S=Supplemental (Study provided useful information but Guideline was not satisfied)
N=Unacceptable (Study was rejected)/Nonconcur

CYANAMID

THIS SUBMISSION CONTAINS NO 40 CFR 158 DATA

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

August 25, 1993

Ms. Jane Mitchell
Reregistration Branch I
Special Review and Reregistration Branch
Office of Pesticide Programs
U. S. Environmental Protection Agency
Crystal Mall No. 2
1921 Jefferson Davis Highway
Arlington, VA 22202

Re: Pendimethalin Reregistration Standard; Case #0187
90-Day Response to LS to MG Letter of April 28, 1993 Concerning
EEB Phytotoxicity Studies 40 CFR 158 , Guideline Nos. 123-1A and
123-1B

Dear Ms. Mitchell:

Thank you for your letter of April 28, 1993 and copies of the reviews of the Tier 2 Phytotoxicity studies for Pendimethalin (enclosed for your convenience as Exhibit 1). While we are grateful that the Agency has reviewed the arguments offered in our rebuttal and accepted the Tier 2 Aquatic Plant Studies (Guideline 123-2, MRID Numbers 42372205-42372207), we are disappointed that the EEB did not concur with our conclusions on three other studies, namely Tier 2 Seed Germination/Seedling Emergence (Guideline 123-1A MRID Numbers 42372201-42372202) and Vegetative Vigor (Guideline 123-1B MRID Number 42372203).

We would request the Agency to reevaluate the Guideline 123-1 studies in light of the arguments presented below. The primary reason for declaring these studies invalid was the lack of a <u>water only</u> control to determine the effects of the solvent, acetone, which was used to apply the test substance. Although this statement is correct, we believe that its significance to this study is minimal, if any, based on the following considerations :

1. Most of the studies were conducted at temperatures where the rate of evaporation of acetone is rapid. Thus, there would be insufficient residual solvent to cause any measurable effects.

2. Even if acetone did have an effect, the statistical analysis and data interpretation would not change from what is presented in the report. In studies where water and solvent controls are commonly used (e.g., aquatic plant, oyster shell deposition, and aquatic organism studies), statistical analysis is conducted to determine differences between the controls. If no difference is detected, the control data are pooled and all analyses are conducted comparing the pooled controls. If a statistical difference is observed, all treatments are

compared to the solvent control to eliminate or negate the effect of the solvent on the test system from the interpretation of the results. Therefore, if acetone did have an effect, the analysis would have been the same as what is presented in the report. In each case, the treatments would be compared to the solvent control, either through direct statistical comparison or statistical comparison following pooling of the solvent control data with statistically similar data (water control data). Therefore, the conclusions drawn by the authors and the statistical determinations of the NOEC levels and the EC values would not change from those already presented.

Our responses to the insignificance of the role of the solvent on the overall results in each of these studies is reiterated below:

A Tier 2 Plant Phytotoxicity Study For Seedling Emergence Using AC 92,533. EPA MRID No. 423722-01.

The above study was classified as invalid due to the lack of a water only control to determine the effects of the solvent used to apply the test substance. The March 23, 1993, review states that the action of acetone cannot be determined unless a water control is available for comparison.

Prior to the application of the test substance, seeds were planted to a depth of 1.3 cm for small seeded plant species and 2.5 cm for large seeded plant species. The test compound was dissolved in acetone; a commonly used solvent in the conduct on plant phytotoxicity studies. Acetone is a very volatile solvent and once evaporation occurs, usually within minutes of application, it has no residual phytotoxic properties.

The test substance was applied to the surface of the soil at the equivalent rate of 50 gallons per acre. This corresponds to 0.18 mL of acetone per pot. If the worst case scenario is assumed and none of the acetone evaporated during the time between application of the test substance to each of the eight treatments and four replicates, movement of treated pots outdoors and into the greenhouse, and the initial irrigation of 12 mL (as presented in the report), the concentration reaching the seeds would be 1.5% acetone. The possibility of no evaporation of the acetone occurring during the above time frame in a 21 °C greenhouse (the minimum temperature recorded during the test) is minimal.

If acetone did affect the seeds, the effect would be noted during germination and early emergence when the concentration of acetone was highest and undiluted by repeated irrigation. The germination and emergence percentage of seeds of all of the plant species

exposed to the acetone control was greater than or equal to the germination percentage documented by the seed supplier. The 10 plant species tested exhibited a mean emergence percentage of 96% while the supplier's mean germination percentage was 91%. The three researchers conducting the study, who individually have a Master's in Plant Pathology, a Doctorate in Seed Physiology, and a Doctorate in Plant Pathology, are trained to detect subtle phytotoxic effects and have conducted numerous Nontarget Plant Phytotoxicity tests. Of the 440 control seeds exposed to acetone, 423 (96%) emerged and only 12 (3%) of the emerging plants exhibited phytotoxic symptoms. The remaining 411 (97%) emerged plants grew normally and obtained phytotoxicity ratings of zero, indicating normal plant growth. The visual phytotoxicity ratings are absolute assessments and are based on the researcher's experience and criteria of a normal plant. The data demonstrate that the seeds germinated and emerged at a rate equal to or exceeding the anticipated 91% germination percentage specified by the supplier and that 97% of the control plants that did emerge developed in a normal and expected manner.

Several studies have been conducted in which acetone was used as a carrier for growth regulators and fungicides (Exhibit 2 References 1-6). These studies indicate that infusion of seeds with 100% acetone did not affect germination or emergence. In many of these cases, the acetone assisted the test substance to penetrate the embryo, often resulting in enhanced germination or disease control. Therefore, it could be argued that if acetone was present in the seed zone, the phytotoxic effects of pendimethalin may have been enhanced as a result of increased penetration into the seed.

In summary, the evaporation rate of acetone at temperatures equal to or exceeding 21°C would indicate that the seeds were not exposed to acetone. The germination and emergence rates of all plant species met or exceeded the rate documented by the seed supplier. The control plants emerged and developed in a normal and expected manner. The above information indicates that acetone did not affect the control plants but even if acetone did have an effect, the statistical analysis and data interpretation would not change from what is presented in the report.

A Tier 2 Plant Phytotoxicity Study For Seed Germination Using AC 92,533.EPA MRID No. 423722-02.

The above study was classified as invalid due to the lack of a water only control to determine the effects of the solvent used to apply the test substance. The March 23, 1993, review states that the action of acetone cannot be determined unless a water control is available for comparison.

The test was conducted by dissolving the test compound in hexane and applying the appropriate amount to the blue blotter paper. After the hexane had totally evaporated, the test substance was diluted with 5% acetone. The seeds were placed directly into the 5% acetone solution to allow germination.

A seed is considered germinated if radicle elongation is equal to or greater than 5 mm. The test is designed to determine the effects of the test substance on seed germination. Many of the seeds tested produce radicles in excess of 50 mm within five days of imbibition of water. The germination percentage of seeds of seven of the plant species exposed to 5% acetone was greater than or equal to the germination percentage documented by the seed supplier. An additional two plant species were within 5% of the germination rate documented by the supplier. Cabbage was the only plant species to exhibit slightly reduced germination. The 10 plant species tested exhibited a mean germination percentage of 93% while the supplier's mean germination percentage was 91%. Therefore, the data demonstrate that the seeds germinated at a rate approximately equal to or exceeding the anticipated germination percentage of the supplier and were not affected by the 5% acetone.

Several studies have been conducted in which acetone was used as a carrier for growth regulators and fungicides (Exhibit 2 References 1-7). These studies indicate that infusion of seeds with 100% acetone did not affect germination or emergence. Papavizas and Lewis (2) reported that infusion of soybean seeds with 100% acetone for up to 30 minutes did not cause phytotoxic symptoms. In many of these cases, the acetone assisted the test substance to penetrate the embryo, often resulting in enhanced germination or disease control. Therefore, it could be argued that since acetone was present during exposure; the phytotoxic effects of pendimethalin may have been enhanced as a result of increased penetration into the seed.

In summary, the mean germination rate of all plant species exceeded the rate documented by the seed supplier. The above information indicates that acetone did not affect the control seeds but even if acetone did have an effect, the statistical analysis and data interpretation would not change the results from what is presented in the report.

A Tier 2 Plant Phytotoxicity Study For Vegetative Vigor Using AC 92,533. EPA MRID No. 423722-03.

The above study was classified as invalid due to the lack of a water only control to determine the effects of the solvent used to apply the test substance. The March 23, 1993, review states that the action of acetone cannot be determined unless a water control is available for comparison.

Acetone is a commonly used solvent in the conduct on plant phytotoxicity studies. Acetone has no residual phytotoxic properties; therefore all phytotoxicity in a vegetative vigor study would result from acetone's ability to dissolve plant cuticle. Phytotoxic symptoms resulting from excessive exposure to acetone would be desiccation of leaf and apical meristem tissue. Leaf symptoms would include spotted areas of desiccation where the acetone had dissolved the leaf cuticle; allowing desiccation of the unprotected epidermal cells. The succulent nature of the apical meristem predisposes this tissue to desiccation injury. The dissolution of the plant cuticle by acetone would result in severe damage and potential destruction of the apical meristem. When injury to the apical meristem occurs, the symptoms become increasingly noticeable as the plant develops and the apical meristem expands.

Since no phytotoxicity was observed in any of the vegetative vigor study controls, the application of 0.18 mL of acetone to the control plants during the warm conditions occurring at application on June 19 in Madera, California was of insufficient quantity and exposure duration to result in phytotoxicity prior to evaporation. The use of acetone in this study did not result in any detrimental effects and should be considered a sufficient control.

The three researchers conducting the study, who individually have a Master's in Plant Pathology, a Doctorate in Seed Physiology, and a Doctorate in Plant Pathology, are trained to detect subtle phytotoxic effects and have conducted numerous Non target Plant Phytotoxicity tests. Of the 200 control plants exposed to acetone, only 12 (6%) plants exhibited phytotoxic symptoms during the 21 day test. The remaining 188 (94%) plants grew normally and obtained phytotoxicity ratings of zero, indicating normal plant growth. The visual phytotoxicity ratings are absolute assessments and are based on the researcher's experience and criteria of a normal plant. The lack of phytotoxic symptoms associated with acetone toxicity and the normal appearance and growth of the control plants indicate that the acetone did not affect the plants.

In summary, the control plants developed in a normal and expected manner and did not exhibit phytotoxicity symptoms associated with acetone toxicity. The above information again demonstrates that acetone did not affect the control plants but even if it did have an effect, the statistical analysis and data interpretation would not change from what is presented in the report.

These data demonstrate that the inclusion of the effects, if any, of acetone clearly represent a worse case situation and thus lend support to the argument that these studies are more than adequate in answering key questions in the evaluation of the environmental risks of

pendimethalin to non-target plants. It is our belief, that after reevaluation of this submission, the Agency will consider the requirements for these studies fulfilled. I would like to restate that repeating these studies will only cost more valuable time and resources without altering the bottom line decision on the toxicity of pendimethalin to these plants.

Thank you for your continued assistance with the reregistration of pendimethalin. If you have any further questions regarding this petition, please call me directly on extension 2321.

Respectfully submitted,

Zareen Ahmed

Zareen Ahmed
Product Registrations Manager
U. S. Plant Regulatory Affairs

ZA:dt

REFERENCES AND ABSTRACTS

1. Halloin, J. M. 1977. Effects on cottonseed of immersion in acetone or methylene chloride. Crop Science. 17(6): 867-869.

Acetone and methylene chloride, the use of which as carriers for growth regulators in seed treatment has been suggested, were tested for effects on intact seed, damaged seed or intact embryos of cotton (Gossypium hirsutum). Intact seeds after immersion in the solvents germinated normally but damaged seed and excised embryos were killed. Although oil O dye applied with solvents penetrated normal seeds it did not enter the embryos, but the dye readily entered excised embryos through the damaged nucellar layer. The solvents are regarded as suitable for use only on sound seed.

2. Papavizas, G. C. and Lewis, J. A. 1976. Acetone infusion of pyroxychlor into soybean seed for the control of Phytophthora megasperma var. sojae. Plant Disease Reporter. 60(6): 484-488.

The systemic fungicide pyroxychlor applied to seed as a water slurry at dosages as low as 63 mg a.i.[active ingredient]/100 g seed reduced root rot of 'Amsoy' and 'Harosoy' soybeans caused by P. megasperma var. sojae (Pms). Pyroxychlor application to seed with gum arabic and another adherent resulted in better control than that obtained with water slurries. The best control of damping-off and root rot was obtained with the organic solvent infusion technique (infusion of pyroxychlor dissolved in acetone into soybean seed before planting). Acetone alone neither reduced nor increased infection. Treated seed stored in the laboratory and planted in fungus-free soil 1 month after infusion did not lose its germinability. Pyroxychlor in acetone did not affect root nodulation and did not cause phytotoxic symptoms on 7 soybeans cultivars even after a 30 min soak.

3. Persson, B. 1988. Enhancement of seed germination by plant growth regulators infused via acetone. Seed Science and Technology. 16(2): 391-404.

Seeds of 47 species of agricultural and horticultural crops, weeds and trees were collected in 1980-1981 near Uppsala, Sweden and infused with Ethrel [ethephon], kinetin, or GA3 dissolved in acetone, mostly at concn of 1 mM or with combinations of 2 or 3 of the chemicals. The germinability of the seeds was determined at constant temp. ranging between 10 and 40degC. The species were grouped and the data presented according to treatment responses. In 31 of the studied species infusion of hormonal substances decreased germination time while increasing percentage germination and the temp. range within which germination occurred. Some types of dormancy were broken by the treatment. Infusion failed to promote germination in hard coated leguminous seeds including Medicago falcata and Trifolium arvense and in woody dicotyledonous seeds requiring cold stratification. Solvent damage to seeds was observed in 4 species. It was concluded that organic infusion (permeation) of hormonal substances is a method widely applicable for use in overcoming seed dormancy and stimulating germination. The

hormonal effects are discussed in the light of the present hypotheses concerning regulation of dormancy and germination.

4. Petruzzelli, L. and Taranto, G. 1985. Effects of permeation with plant growth regulators via acetone on seed viability during accelerated aging. Seed Science and Technology. 13(1): 183-191.

   Wheat seeds treated with growth regulators dissolved in acetone were stored at 30degC and 14.5% seed moisture content for 35 days. With ethephon and GA, this treatment did not affect germination, but with ABA, germination was reduced to the same extent as in the aged control and acetone treated seeds. Differences in biochemical and physiological properties were consistent with the difference in germination and the results indicated that treatment with ethephon and GA prevented loss of viability.

5. Phillips, A. J. L. 1992. A comparison of dust and acetone infusion applications of tolclofos-methyl to bean seeds for the control of Rhizoctonia solani. Plant Pathology. 41(1): 35-40.

   Treatment of bean (Phaseolus vulgaris) seeds with tolclofos-methyl reduced pre-emergence mortality and hypocotyl rot caused by R. solani. The fungicide was effective when applied either as a dust treatment or by infusion in acetone solution. Neither the acetone infusion nor the dust application had any adverse effects on the germination of seeds sown in uninfested soil. Acetone infusion was effective after short periods of immersion (1 min) and with repeated use of the same solution, thus resulting in more efficient use of the fungicide. Both methods of fungicide application effectively controlled rhizoctonia diseases in the field.

6. Rehim, M. A. A., Rodriquez-Kabana, R., Backman, P. A., and Crawford, M. A. 1980. Improvement of peanut seed germination with hot water and acetone treatments. Proc. American Peanut Research and Education Society, Inc. 12(1): 65.

   The germination of groundnuts cv. Florunner seeds which were soaked in hot water (50 deg C) for 15-20 min or in aqueous acetone sol. (2.5-20% v/v) was compared with that of dry seeds or seeds soaked in water at 25 deg C for 20 min. Germination and seedling vigour were highest with the hot water or acetone treatments. Fungal growth on germinating seeds was reduced when the hot water or acetone treatments were followed by drying at 40 deg C.

7. TAO, K. -L. and Khan, A. A. 1974. Penetration of dry seeds with chemicals applied in acetone. Plant Physiology. 54(6): 956-958.

   In experiments with seeds of various species including Phaseolus vulgaris it was shown that acetone could carry IAA and GA through seed coats and that they could act on the embryo.