12-2-93

MRID No. 425734-01

DATA EVALUATION RECORD

1. **CHEMICAL:** Acetochlor.
Shaughnessey No. 121601.

2. **TEST MATERIAL:** Acetochlor technical (2-chloro-N-ethoxymethyl-N-(2-ethyl-6-methylphenyl) acetamide); Batch No. QUE-9001-1482-T; 92.07% active ingredient; a dark brown liquid. 92.07% TECHNICAL (M)

3. **STUDY TYPE:** 123-1. Non-Target Plants: Seed Germination/ Seedling Emergence Phytotoxicity Test - Tier 2. Species Tested: soybean, lettuce, radish, tomato, cucumber, cabbage, oat, ryegrass, corn, and onion.

4. **CITATION:** Cañez, V.M. 1992. Tier 2 Seed Germination/ Seedling Emergence Nontarget Phytotoxicity Study Using Acetochlor. Laboratory Study No. BL91-466. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by Monsanto Company, St. Louis, MO. EPA MRID No. 425734-01.

5. **REVIEWED BY:**

Mark A. Mossler, M.S.
Agronomist
KBN Engineering and
Applied Sciences, Inc.

Signature: M. Mossler
Date: 9/22/93

6. **APPROVED BY:**

Pim Kosalwat, Ph.D.
Senior Scientist
KBN Engineering and
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Signature: P. Kosalwat
Date: 9/22/93

Henry T. Craven, M.S.
Supervisor, EEB/EFED
USEPA

Signature: Michael Davy 9/29/93
Date: H T Craven 12/2/93

7. **CONCLUSIONS:** These studies are scientifically sound and meet the requirements for Tier-2 seed germination and seedling emergence tests using non-target plants.

Seed Germination: The most sensitive species was ryegrass. The 6-day NOEL, LOEL, EC_{25}, and EC_{50} for ryegrass germination were 0.04, 0.11, 0.08, and 0.14 lb ai/A, respectively. All dicot species (including the root crop, radish) had 6-day NOEL, LOEL, EC_{25}, and EC_{50} values of 3.0, >3.0, >3.0, and >3.0 lb ai/A, respectively.

Seedling Emergence:
Seedling Emergence and Survival: By 14 DAT, the most sensitive dicot species was cucumber, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.33, 1.0, 0.42, and 0.86 lb ai/A, respectively. The most sensitive monocot species was ryegrass, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0046, 0.0093, 0.0059, and 0.013 lb ai/A, respectively. The root crop (radish) was not affected by acetochlor, with a subsequent NOEL, LOEL, EC_{25}, and EC_{50} of 3.0, >3.0, >3.0, and >3.0 lb ai/A, respectively.

By 21 DAT, the most sensitive dicot species was lettuce, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0093, 0.019, 0.022, and 0.11 lb ai/A, respectively. The most sensitive monocot species was onion, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.037, 0.11, 0.046, and 0.063 lb ai/A, respectively. The root crop (radish) was not affected by acetochlor, with a subsequent NOEL, LOEL, EC_{25}, and EC_{50} of 3.0, >3.0, >3.0, and >3.0 lb ai/A, respectively.

Plant Phytotoxicity: The most sensitive dicot species was lettuce, with NOEL and LOEL values of 0.004 and 0.005 lb ai/A, respectively. Ryegrass was the most sensitive monocot species, with an NOEL and LOEL of 0.0023 and 0.0046 lb ai/A, respectively. Radish had NOEL and LOEL values of 0.33 and 1.0 lb ai/A, respectively.

Plant height: The most sensitive dicot species was lettuce, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0020, 0.0040, 0.0034, and 0.0084 lb ai/A, respectively. The most sensitive monocot species was ryegrass, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0023, 0.0046, 0.0026, and 0.0046 lb ai/A, respectively. Radish had NOEL, LOEL, EC_{25}, and EC_{50} values of 0.11, 0.33, 0.60, and 2.8 lb ai/A, respectively.

Plant dry weight: The most sensitive dicot species was lettuce, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0010, 0.0020, 0.0016, and 0.0044 lb ai/A, respectively. The most sensitive monocot species was ryegrass, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0006, 0.0012, 0.0013, and 0.0025 lb ai/A, respectively. Radish had NOEL, LOEL, EC_{25}, and EC_{50} values of 0.04, 0.11, 0.10, and 0.49 lb ai/A, respectively.

8. **RECOMMENDATIONS:** N/A.

9. **BACKGROUND:**

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

11. MATERIALS AND METHODS:

A. Test Plants: Dicotyledon plants were represented by six species from five families (i.e., soybean, lettuce, radish, tomato, cucumber, and cabbage). Monocotyledon plants were represented by four species from two families (i.e., corn, oat, ryegrass, and onion). Cultivars, lot numbers, seed sources, and germination ratings were provided in the report.

B. Test System:

Seed Germination: Two circles of blue blotter were placed in the bottom of a glass petri plate (100 x 15 mm). The highest concentration test solution was prepared in a 5% acetone/95% deionized water solution and then diluted serially with this same solvent mixture to achieve the lower concentration solutions. Twelve milliliters of the test solution were added to each plate of soybean, cucumber, oat, and corn. Ten milliliters were added to plates of lettuce, radish, tomato, cabbage, ryegrass, and onion.

Ten seeds of each crop were added to each petri plate within 80 minutes of test solution preparation. The plates containing crops with the same concentration were then impartially placed in plastic boxes (31 x 23 x 10 cm) with raised mesh bottoms and tight-fitting lids to prevent moisture loss. Water was added to the bottom of each box to increase humidity. The petri plates were incubated at 23-25°C, except lettuce, which was incubated at 20°C. All crops were incubated for six days.

Seedling Emergence: Ten seeds of each crop were planted in plastic pots (7.5 x 7.5 x 6.0 cm), filled with sterilized sandy loam soil (pH 7.5, 0.7% organic matter) and perlite obtained from the laboratory facility. A plexiglass template was used to create planting holes in the soil, allowing for uniform planting depth and seed distribution. Soybean, cucumber, oat, and corn were planted at a depth of 2.5 cm, while the remaining six species were planted at a depth of 1.3 cm. Each treatment replicate was placed on an aluminum tray which was placed in the spray plot. The spray plot was 45.5 x 15.5 in. (i.e., 4.9 ft^2).

All applications were performed in a spray booth equipped with a single nozzle. A nozzle height of 10.5 inches and a nozzle pressure of 35 psi were used. The test spray solutions were prepared by diluting the

material in a 75% acetone/25% deionized water solution. The plants were sprayed at the equivalent of 468 l/ha (50 GPA) within 137 minutes after solution preparation.

The pots were hand watered (5-18 ml/pot) during the first 48 hours to facilitate movement of the test material to the seed zone. After 48 hours, the pots were watered four times a day and a total of 6-22 ml of water was used to irrigate each pot per day. During the emergence study, temperature ranged from 14 to 38°C and the relative humidity ranged from 31 to 96%.

C. **Dosage:** In both seed germination and seedling emergence tests, acetochlor was applied at the rates of 0.037, 0.11, 0.33, 1.0, and 3.0 lb active ingredient (ai)/acre (A) to all plant species. For the emergence test, two continuation studies were performed. Acetochlor at rates ranging from 0.00025 to 0.037 lb ai/A was applied to pots containing selected species. The reported maximum application rate of acetochlor was 3.0 lb ai/A.

D. **Design:**
Seed Germination: Each treatment/crop combination was replicated four times (i.e., 10 seeds/plate, 4 plates/ treatment). After 6 days of incubation, the percentage of germinated seeds was determined by counting the number of seeds which had radicle lengths of 5 mm or greater.

Seedling Emergence: Each crop/treatment combination was replicated four times (i.e., 10 seeds/pot, 4 pots/ treatment level). Forty-eight hours after treatment, the pots were randomized in a greenhouse. Trays were rotated 180° twice weekly to reduce phototropism.

The percentage of the ten seeds planted in each pot which emerged was calculated for each treatment at 10 and 14 days after treatment (DAT). Seedling height and survival were measured 21 DAT and phytotoxicity ratings were recorded 10, 14, and 21 DAT for all species. Twenty-one DAT, the plants within treatment replicates (pots) were cut at the soil level and dried in pre-weighed foil sheets at 100°C for a minimum of 48 hours.

The phytotoxicity ratings evaluated five observable toxic effects: 0-indicates no effect; 1-indicates slight plant effect; 2-indicates a moderate effect (e.g., mild stunting or chlorosis); 3-indicates a severe effect with recovery possible; 4-indicates a

total effect (very poor vigor); and 5-moribund or plant death.

Germination and spray treatment solutions were collected from each study. The samples were analyzed for acetochlor using gas chromatography.

E. Statistics: All calculations are based on nominal rates. All data were entered into a computer spreadsheet. The spreadsheet calculated replicate means, treatment means, percent effects, standard deviations, and analysis of variance tables. Treatment means were used to calculate the percent effect resulting from the treatment. The percent effect was calculated using the following equation:

$$\% \text{ effect} = \frac{(\text{treatment mean} - \text{control mean})}{\text{control mean}} \times 100$$

A randomized complete block analysis of variance (ANOVA) was performed on treatment level x replicate means. Prior to analysis, phytotoxicity data were converted to the proportion of the maximum rating. When the ANOVA indicated a significant difference from the control, treatment means were subjected to a one-tailed comparison test (Dunnett's) to determine which treatments were significantly ($p< 0.05$) different from the control. The no-effect-level (NOEL) was determined as the highest treatment rate not statistically different from the control or the rate below which 25% inhibition was witnessed.

The percent detrimental effect values were input into a computer program which fit the data to various mathematical equations. The least squares error of fit and F-value were used as criteria to judge which equation provided the best representation of the response. The selected equation was used to determine the EC_{25} and EC_{50} values.

12. REPORTED RESULTS: Results of the analytical measurements are presented in Tables I through VI (attached). Recoveries ranged from 82 to 121% of nominal. Recoveries of fortified solutions ranged from 76 to 117% of nominal.

Seed Germination: No significant difference in percent germination existed between controls and any treatment level for all species except oat and ryegrass. The NOELs for these two species were 0.33 and 0.11 lb ai/A, respectively. The NOEL for the remaining eight species was 3.0 lb ai/A.

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The EC_{25} and EC_{50} values for oat and ryegrass were 0.53 and 0.89 and 0.12 and 0.16 lb ai/A, respectively.

Seedling Emergence:
Percent Emergence and Survival: By the end of 14 days, four of the species tested demonstrated significant reductions in emergence. The NOELs for percent emergence (in lb ai/A) for the test species, in increasing sensitivity, are:

soybean = lettuce = radish = tomato = cabbage = corn (3.0) < cucumber (0.33) < oat (0.037) < onion (0.019) < ryegrass (0.0046).

Due to lack of definite dose-response relationships, regression analysis was only conducted for cucumber, onion, oat, and ryegrass. The EC values for these species are presented in Table XVIII (attached).

By the end of 21 days, eight species demonstrated significant reductions in survival at some rate(s) of acetochlor. The NOELs for percent survival (in lb ai/A) for the test species, in increasing sensitivity, are:

radish = tomato (3.0) < soybean = cucumber = cabbage = corn (1.0) < oat (0.11) < onion (0.037) < ryegrass (0.019) < lettuce (0.0093).

Due to lack of significant rate effects, regression analysis was only conducted for lettuce, onion, cucumber, and corn. The EC values for these species are presented in Table XVIII.

Plant Phytotoxicity: By the end of the 21 day test period, all species demonstrated significant signs of phytotoxicity at some rate(s) of acetochlor tested. The NOELs for phytotoxicity (in lb ai/A) for the test species, in increasing sensitivity, are:

corn (1.0) < radish = soybean (0.33) < tomato = cabbage (0.11) < cucumber = oat (0.019) < onion (0.0093) < lettuce (0.004) < ryegrass (0.0023).

No EC values were computed from the phytotoxicity data.

Plant Height: By the end of 21 days, all of the test species demonstrated significant reductions in height at multiple rates of acetochlor. The NOELs for plant height (in lb ai/A) for the test species, in increasing sensitivity, are:

radish (0.11) < soybean = tomato = corn (0.037) < cabbage = cucumber (0.019) < oat = onion (0.0093) < ryegrass (0.0023) < lettuce (0.0020).

Regression analysis was conducted for all species. The EC values are presented in Table XVIII.

Plant Dry Weight: By the end of 21 days, all of the test species demonstrated significant reductions in dry weight at multiple rates of acetochlor. The NOELs for plant weight (in lb ai/A) for the test species, in increasing sensitivity, are:

soybean = radish = tomato = corn (0.037) < onion (0.019) < cabbage = oat (0.0093) < cucumber (0.0046) < lettuce (0.0020) < ryegrass (0.0012).

Regression analysis was conducted for all test species. The EC values are presented in Table XVIII.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:
A no-effect level was reached for each parameter measured for all crops tested. The lowest NOEL for each parameter was as follows: percent germination - ryegrass (0.11 lb ai/A); percent emergence - ryegrass (0.0046 lb ai/A); percent survival - lettuce (0.0093 lb ai/A); phytotoxicity - ryegrass (0.0023 lb ai/A); plant height - lettuce (0.0020 lb ai/A); plant dry weight - ryegrass (0.0012 lb ai/A).

Statements of Compliance with Good Laboratory Practices (40 CFR Part 160) and Quality Assurance were provided.

14. REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:

A. Test Procedure: The test procedures generally adhered to the SEP and Subdivision J guidelines, except for the following:

Only one parameter (germination) was measured or recorded for the germination study.

It was not stated if the control pots were sprayed with a 75% acetone/25% deionized water solution for the emergence study. Similarly, it was not stated if the control seeds for the germination study were treated with a 5% acetone/deionized water solution. The protocol submitted with the study indicated that control plants would be sprayed with deionized water, with an appropriate solvent if necessary.

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Consequently, a negative control was not included in the test design.

The rate dilution progression for the base study for both the emergence and germination studies was 3x, rather than the recommended 2x.

B. **Statistical Analysis:** Probit analysis was conducted on radish, lettuce and ryegrass dry weight data (the most sensitive parameter for root crop, dicot, and monocot species, respectively) to determine the EC values. Probit analysis was also conducted for ryegrass germination. The results of the reviewer are slightly more conservative than those of the author's for all but radish dry weight (see attached printouts). Analysis of variance and Dunnett's or Williams' test were used to verify the NOEL and lowest-observed-effect level (LOEL) for radish, lettuce, and ryegrass dry weight and ryegrass and tomato germination. When the NOEL reported by the author was greater than the reported EC_{25}, the NOEL was taken to be the rate below the predicted EC_{25}. The results are the same as those of the author except for ryegrass dry weight (see attached printouts). In this case, the NOEL and LOEL were 0.0006 and 0.0012 lb ai/A, respectively.

C. **Discussion/Results:** Results of the chemical analyses indicated that the actual concentrations were near nominal concentrations (attached). The reviewer therefore believes that the nominal concentrations are representative of actual rates applied and accepts the results in terms of nominal concentrations.

Seed Germination: The most sensitive species was ryegrass. The 6-day NOEL, LOEL, EC_{25}, and EC_{50} for ryegrass germination were 0.04, 0.11, 0.08, and 0.14 lb ai/A, respectively. All dicot species (including the root crop, radish) had 6-day NOEL, LOEL, EC_{25}, and EC_{50} values of 3.0, >3.0, >3.0, and >3.0 lb ai/A, respectively. All of the values labeled ND for percent germination in Table XVIII should be listed as >3.0 lb ai/A.

Seedling Emergence: There appeared to be unfavorable growth conditions for onion in the base study. This was reflected in the decrease in survival of the onion control plants. However, the reviewer does not believe that this influenced the overall results for this species since the most sensitive parameter (height) was determined in the continuation study.

Seedling Emergence and Survival: By 14 DAT, the most sensitive dicot species was cucumber, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.33, 1.0, 0.42, and 0.86 lb ai/A, respectively. The most sensitive monocot species was ryegrass, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0046, 0.0093, 0.0059, and 0.013 lb ai/A, respectively. The root crop (radish) was not affected by acetochlor, with a subsequent NOEL, LOEL, EC_{25}, and EC_{50} of 3.0, >3.0, >3.0, and >3.0 lb ai/A, respectively. All of the values labeled ND for emergence in Table XVIII should be listed as >3.0 lb ai/A.

By 21 DAT, the most sensitive dicot species was lettuce, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0093, 0.019, 0.022, and 0.11 lb ai/A, respectively. The most sensitive monocot species was onion, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.037, 0.11, 0.046, and 0.063 lb ai/A, respectively. The root crop (radish) was not affected by acetochlor, with a subsequent NOEL, LOEL, EC_{25}, and EC_{50} of 3.0, >3.0, >3.0, and >3.0 lb ai/A, respectively. The reviewer also determined that reasonable estimates of the EC_{25} and EC_{50} for ryegrass and oat survival were 0.055 and 0.074, and 0.33 and 0.56 lb ai/A, respectively. All of the values labeled ND for survival in Table XVIII should be listed as >3.0 lb ai/A.

Plant Phytotoxicity: The most sensitive dicot species was lettuce, with NOEL and LOEL values of 0.004 and 0.005 lb ai/A, respectively. Ryegrass was the most sensitive monocot species, with an NOEL and LOEL of 0.0023 and 0.0046 lb ai/A, respectively. Radish had NOEL and LOEL values of 0.33 and 1.0 lb ai/A, respectively. No EC values were determined from the phytotoxicity data.

Plant height: The most sensitive dicot species was lettuce, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0020, 0.0040, 0.0034, and 0.0084 lb ai/A, respectively. The most sensitive monocot species was ryegrass, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0023, 0.0046, 0.0026, and 0.0046 lb ai/A, respectively. Radish had NOEL, LOEL, EC_{25}, and EC_{50} values of 0.11, 0.33, 0.60, and 2.8 lb ai/A, respectively. All of the values labeled ND for plant height in Table XVIII should be listed as >3.0 lb ai/A.

Plant dry weight: The reviewer determined an EC_{25} value of 0.032 lb ai/A for cabbage dry weight. The

NOEL for soybean dry weight was reported to be 0.037 lb ai/A. Fourteen percent inhibition was observed at this rate. Since the height data almost parallels the dry weight data, and the NOEL for this parameter (height) was found to be 0.037 lb ai/A, the reviewer accepts this value as the NOEL for both parameters.

The most sensitive dicot species was lettuce, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0010, 0.0020, 0.0016, and 0.0044 lb ai/A, respectively. The most sensitive monocot species was ryegrass, with NOEL, LOEL, EC_{25}, and EC_{50} values of 0.0006, 0.0012, 0.0013, and 0.0025 lb ai/A, respectively. Radish had NOEL, LOEL, EC_{25}, and EC_{50} values of 0.04, 0.11, 0.10, and 0.49 lb ai/A, respectively. All of the values labeled ND for plant dry weight in Table XVIII should be listed as >3.0 lb ai/A.

These studies are scientifically sound and meet the requirements for Tier-2 seed germination and seedling emergence tests using non-target plants.

D. **Adequacy of the Study:**

(1) Classification: Core.

(2) Rationale: N/A.

(3) Repairability: N/A.

15. **COMPLETION OF ONE-LINER:** Yes, 9-17-93.

ACETOCHLOR

Page_____ is not included in this copy.

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tomato germination
File: tom Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.334	0.067	2.104
Within (Error)	18	0.571	0.032	
Total	23	0.905		

Critical F value = 2.77 (0.05,5,18)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

tomato germination
File: tom Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	control	1.335	0.925		
2	0.037	1.335	0.925	0.000	
3	0.11	1.085	0.775	1.986	
4	0.33	1.310	0.925	0.200	
5	1.0	1.154	0.800	1.432	
6	3.0	1.431	0.975	-0.763	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

tomato germination
File: tom Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	control	4			
2	0.037	4	0.209	22.6	0.000
3	0.11	4	0.209	22.6	0.150
4	0.33	4	0.209	22.6	0.000
5	1.0	4	0.209	22.6	0.125
6	3.0	4	0.209	22.6	-0.050

NOEL = 3.0 16 ai/A

LOEL = >3.0 16 ai/A

ryegrass germination
File: rye Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	5.122	1.024	31.415
Within (Error)	18	0.587	0.033	
Total	23	5.709		

Critical F value = 2.77 (0.05,5,18)
Since F > Critical F REJECT Ho:All groups equal

ryegrass germination
File: rye Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	control	1.185	0.850		
2	0.037	0.946	0.650	1.866	
3	0.11	1.069	0.725	0.908	
4	0.33	0.357	0.125	6.479	*
5	1.0	0.079	0.000	8.657	*
6	3.0	0.079	0.000	8.657	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

ryegrass germination
File: rye Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	control	4			
2	0.037	4	0.267	31.4	0.200
3	0.11	4	0.267	31.4	0.125
4	0.33	4	0.267	31.4	0.725
5	1.0	4	0.267	31.4	0.850
6	3.0	4	0.267	31.4	0.850

NOEL = 0.11 lb ai/A
LOEL = 0.33 lb ai/A

ryegrass germination

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0203	0.0123	0.0291
EC 5.00	0.0358	0.0243	0.0474
EC10.00	0.0484	0.0348	0.0618
EC15.00	0.0594	0.0443	0.0740
EC50.00	0.1405	0.1180	0.1656
EC85.00	0.3326	0.2753	0.4222
EC90.00	0.4078	0.3311	0.5353
EC95.00	0.5516	0.4331	0.7648
EC99.00	0.9720	0.7095	1.5081

$y = 2.36 + 2.77(x)$

y = probit % inhibition

$x = \log(\text{rate})$

$EC_{25} = 0.0816$ ai/A

radish dry weight
File: rad Transform: NO TRANSFORM

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	5.350	1.070	37.117
Within (Error)	18	0.519	0.029	
Total	23	5.869		

Critical F value = 2.77 (0.05,5,18)
Since F > Critical F REJECT Ho:All groups equal

radish dry weight
File: rad Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	control	1.757	1.757		
2	0.037	1.636	1.636	1.010	
3	0.11	1.334	1.334	3.525	*
4	0.33	0.936	0.936	6.842	*
5	1.0	0.764	0.764	8.273	*
6	3.0	0.440	0.440	10.971	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

radish dry weight
File: rad Transform: NO TRANSFORM

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	control	4			
2	0.037	4	0.289	16.5	0.121
3	0.11	4	0.289	16.5	0.423
4	0.33	4	0.289	16.5	0.822
5	1.0	4	0.289	16.5	0.993
6	3.0	4	0.289	16.5	1.317

NOEL = 0.037 lb a.i./A

LOEL = 0.11 lb a.i./A

radish dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0034	0.0011	0.0075
EC 5.00	0.0155	0.0070	0.0272
EC10.00	0.0345	0.0185	0.0544
EC15.00	0.0594	0.0353	0.0874
EC50.00	0.5864	0.4487	0.7875
EC85.00	5.7911	3.5691	11.3422
EC90.00	9.9554	5.6980	21.8111
EC95.00	22.2169	11.3434	57.7349
EC99.00	100.1291	40.9407	361.2332

$y = 5.24 + 1.04(x)$

y = % probit inhibition

x = log (rate)

EC_{25} = 0.13316 ai/A

ryegrass dry weight
File: rye Transform: SQUARE ROOT(Y)

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	control	4	0.202	0.449	0.449
2	0.00058	4	0.170	0.410	0.410
3	0.0012	4	0.160	0.399	0.399
4	0.0023	4	0.124	0.349	0.349
5	0.0046	4	0.053	0.230	0.230
6	0.0093	4	0.008	0.078	0.078
7	0.019	4	0.001	0.014	0.018
8	0.037	4	0.001	0.022	0.018

ryegrass dry weight
File: rye Transform: SQUARE ROOT(Y)

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
control	0.449				
0.00058	0.410	1.416		1.71	k= 1, v=24
0.0012	0.399	1.803	*	1.79	k= 2, v=24
0.0023	0.349	3.592	*	1.82	k= 3, v=24
0.0046	0.230	7.889	*	1.83	k= 4, v=24
0.0093	0.078	13.322	*	1.84	k= 5, v=24
0.019	0.018	15.500	*	1.84	k= 6, v=24
0.037	0.018	15.500	*	1.85	k= 7, v=24

s = 0.039
Note: df used for table values are approximate when v > 20.

NOEL = 0.0006 lb ai/A

LOEL = 0.0012 lb ai/A

ryegrass dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0003	0.0002	0.0004
EC 5.00	0.0005	0.0004	0.0007
EC10.00	0.0008	0.0006	0.0010
EC15.00	0.0010	0.0007	0.0012
EC50.00	0.0025	0.0021	0.0028
EC85.00	0.0063	0.0053	0.0079
EC90.00	0.0079	0.0065	0.0103
EC95.00	0.0111	0.0087	0.0152
EC99.00	0.0206	0.0150	0.0318

$Y = 11.58 + 2.52(x)$

Y = probit % inhibition

X = log (rate)

EC_{25} = 0.0013 lb a.i./A

lettuce dry weight
File: let Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.432	0.086	19.781
Within (Error)	18	0.079	0.004	
Total	23	0.511		

Critical F value = 2.77 (0.05,5,18)
Since F > Critical F REJECT Ho:All groups equal

lettuce dry weight
File: let Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	control	0.426	0.426		
2	0.0023	0.283	0.283	3.049	*
3	0.0046	0.223	0.223	4.338	*
4	0.0093	0.121	0.121	6.520	*
5	0.019	0.065	0.065	7.718	*
6	0.037	0.040	0.040	8.242	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

lettuce dry weight
File: let Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	control	4			
2	0.0023	4	0.113	26.5	0.143
3	0.0046	4	0.113	26.5	0.203
4	0.0093	4	0.113	26.5	0.305
5	0.019	4	0.113	26.5	0.361
6	0.037	4	0.113	26.5	0.385

NOEL = 0.0020 lb ai/A

LOEL = 0.0040 lb ai/A

However, EC_{05} = 0.0016, ∴ NOEL = 0.0010 lb ai/A and LOEL = 0.0020 lb ai/A

lettuce dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0001	0.0000	0.0003
EC 5.00	0.0004	0.0002	0.0006
EC10.00	0.0006	0.0003	0.0010
EC15.00	0.0009	0.0005	0.0014
EC50.00	0.0044	0.0034	0.0053
EC85.00	0.0206	0.0162	0.0285
EC90.00	0.0297	0.0223	0.0444
EC95.00	0.0511	0.0356	0.0862
EC99.00	0.1414	0.0842	0.3035

$y = 8.64 + 1.54(x)$

y = probit % inhibition

x = log (rate)

$EC_{25} = 0.0016$ lb a.i./A