3/21/91 Copy : 121011

MRID No. 416851-04

DATA EVALUATION RECORD

1. **CHEMICAL:** Clethodim.
Shaughnessey No. 059639.

2. **TEST MATERIAL:** Select (Clethodim); CAS No. 99129-21-2; 82.4% purity; a brown-amber liquid.

123-1a

3. **STUDY TYPE:** Non-Target Plants: Seed Germination/Seedling Emergence Phytotoxicity Test - Tier 2. Species Tested: Oat, Ryegrass, Corn, Onion.

4. **CITATION:** Chetram, R.S. 1990. Tier 2 Seed Germination/ Seedling Emergence Nontarget Phytotoxicity Study Using SELECT (Clethodim). Laboratory Project No. LR 89-55B. Conducted by Pan-Agricultural Laboratories, Inc., Fresno, CA. Submitted by Valent USA Corporation, Walnut Creek, CA. EPA MRID No. 416851-04.

5. **REVIEWED By:**

Richard C. Petrie
Agronomist
EEB/EFED

Signature: Richard C. Petrie
Date: 3/21/91

6. **APPROVED BY:**

Charles Lewis, Acting Head,
Section 3,
EEB/EFED

Signature: Charles Lewis
Date: 3/22/91

7. **CONCLUSIONS:**

Seed Germination: This study meets the requirements for a Tier 2 seed germination test using non-target plants. Clethodim at the maximum application rate of 0.25 lb ai/A did not significantly affect the germination of any species except ryegrass. The NOEC for this species was 0.0156 lb ai/A. Radicle length of corn, oat, and ryegrass was significantly affected by clethodim. The respective NOECs are 0.0125, 0.0063, and 0.0031 lb ai/A. The NOEC for onion radicle length is 0.25 lb ai/A.

Seedling Emergence: This study meets the requirements for a Tier 2 seedling emergence test using non-target plants. Percent emergence of corn and onion was not affected by clethodim, and the subsequent NOEC for these two species is 0.25 lb ai/A. Oat and ryegrass were affected and had NOECs of 0.0625 and 0.0313 lb ai/A, respectively.

Only onion was unaffected by clethodim in the phytotoxicity ratings. Oat, ryegrass and corn were all affected and had subsequent NOEC values of 0.125, 0.0313, and 0.0125 lb ai/A, respectively.

Again, onion plant height was not significantly affected by clethodim. Therefore, the NOEC for onion is 0.25 lb ai/A. Ryegrass, corn, and oat height were all affected by clethodim with oat being very sensitive. The NOEC values for these three species are 0.0313, 0.0125, and 0.0063 lb ai/A, respectively.

Plant dry weight was not affected for onion. Ryegrass, corn and oat were significantly affected when compared to controls. Corn and oat were equally the most sensitive. The NOEC values for the species are, in lb ai/A:

onion (0.25) < ryegrass (0.0313) < oat = corn (0.0125).

8. **RECOMMENDATIONS:** No further Tier II seed germination/ seedling emergence studies are required.

9. **BACKGROUND:** Because clethodim is active on grasses only, the registrant was given the opportunity to demonstrate this by performing Tier I tests on dicot species only; as long as Tier II tests were conducted on the required monocot species.

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

11. **MATERIALS AND METHODS:**

A. **Test Plants:** Monocotyledon plants were represented by four species from two families (i.e., oat, ryegrass, corn and onion. Lot number, cultivar, 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 test solutions were prepared with deionized water and acetone. Fifteen milliliters of the test solution were added to each plate of oat and corn. Ten milliliters were added to plates of ryegrass and onion.

Ten seeds of each crop were added to each petri plate after the test solution was absorbed into the paper. The plates were then randomly placed in plastic boxes (12.25 x 9.0 x 4.1 inches) with tightly fitting lids to prevent moisture loss. The petri plates were incubated in the dark at 25 ±1°C for 7 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 soil obtained from the laboratory facility. A plexiglass template was used to create planting holes in the soil, thus allowing for uniform planting depth and seed distribution. An analysis of the soil was provided in the report. Each treatment replicate was placed on an aluminum tray (6.125 x 31.125 cm). The spray plot was 3.21 x 1.67 ft (i.e., 5.36 ft^2).

Oat and corn were planted at a depth of 2.5 cm, while ryegrass and onion were planted at a depth of 1.3 cm. All applications were performed with a belt sprayer equipped with a single nozzle. A nozzle height of 12 inches and a nozzle pressure of 40-50 psi were used. The test spray solutions were prepared by dissolving clethodim technical in deionized water and acetone. The plants were sprayed at the equivalent of 468 L/ha (50 gpa) of water.

The pots were watered three times a day and a total of 18 ml of water was used to irrigate each pot per day.

C. **Dosage:** Clethodim was applied at a rate of 0.25, 0.125, 0.0625, 0.0313, 0.0156 and 0 lb ai/A to all plant species. An additional study was conducted on corn and oat in which rates of 0.025, 0.013, 0.006, 0.003 and 0.002 lb ai/A of were applied. Treatment application rates were adjusted for the percent purity of the test material (82.4%).

D. **Design:**

Seed Germination: Each treatment/crop combination was replicated three times (i.e., 10 seeds/plate, 3 plates/treatment). After 7 days of incubation, the seeds were removed from the petri plates and the radicle lengths were measured to the nearest millimeter. Percent seed germination and mean radicle length were calculated for all germinated seeds. Seeds were considered germinated if the radicle was at least 5 mm long.

Seedling Emergence: Each crop/treatment combination was replicated three times (i.e., 10 seeds/pot, 3 pots/treatment level). The percentage of the ten seeds planted in each pot which emerged was calculated for each treatment. After treatment, the pots were randomized within crops and among treatments and placed in an on-site greenhouse.

The percentage of the ten seeds planted in each pot which emerged was calculated for each treatment. Seedling height and phytotoxicity ratings were recorded at 7, 14, and 21 days after treatment for all species. Twenty-one days after treatment, the plants within treatment replicates (pots) were cut at the soil level and dried in a pre-weighed paper bag at 70°C for a minimum of 48 hours. After drying, the dry weight of the plant material was recorded.

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; and 4-indicates a total effect or plant death.

Temperature, relative humidity, photoperiod, and illuminance during the period of growth were provided in the report.

E. **Statistics:** All data were entered into a Lotus 1-2-3 spreadsheet. The spreadsheet calculated replicate means, treatment means, standard deviations, and analysis of variance tables. Treatment means were used to calculate the percent detrimental effect resulting from the treatment. The percent detrimental effect was calculated using the following equation:

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

An analysis of variance table was constructed using the Lotus 1-2-3 raw data spreadsheet. A one-way analysis of variance (ANOVA) model for data with equal subsamples was used to analyze data from the seed germination (radicle length and percent germination) and seedling emergence (percent emergence, phytotoxicity). A one-way analysis of variance model for data with unequal subsamples was used to analyze the seedling height and dry weight data. The percent effect values were input into a probit analysis program. The program ignores positive values and transforms the dose by natural logarithms. For seedling emergence, the probit is calculated using all data points, for all other parameters, the probit is calculated using replicate means.

12. **REPORTED RESULTS:**

Seed Germination: Treatment of seeds with clethodim at the rate of 0.25 lb ai/A did not result in a significant decrease in percent germination ($p < 0.05$) of oat, corn, or onion. The NOEC for percent germination for these species was 0.25 lb ai/A. Ryegrass demonstrated a significant decrease in percent germination at the 0.0313 lb ai/A rate. The resulting NOEC for ryegrass percent germination was 0.0156 lb ai/A. Due to the lack of rate response by corn, oat, and onion, no EC values could be determined. The EC_{25} and EC_{50} values for ryegrass were 0.013 and 0.025, respectively.

Treatment of onion seed with clethodim did not result in a significant difference ($p < 0.05$) in radicle length from the control. Consequently, no EC values could be determined and the NOEC for onion radicle length was 0.25 lb ai/A. Oat, ryegrass, and corn demonstrated a dose dependent response. Additional tests determined that the NOEC for corn, oat, and ryegrass were 0.0125, 0.0063, and 0.0031 lb ai/A, respectively. The EC values are listed in Table 6

(attached).

Seedling Emergence:

Percent emergence: Statistical analysis of the 21 day percent emergence data shows a significant decrease ($p < 0.05$) for oat and ryegrass at the 0.125 and 0.0625 lb ai/A rate, respectively. There was no significant difference in percent emergence between control and any treatment level for corn and onion. The NOECs (in lb ai/A) for the four species are:

corn = onion (0.25) < oat (0.0625) < ryegrass (0.0313).

The EC values are listed in Table 6.

Phytotoxicity rating: Statistical analysis of the 21 day phytotoxicity ratings show no significant increase ($p < 0.05$) in mean phytotoxicity for onion. The NOEC levels (in lb ai/A) for the species are:

onion (0.25) < oat (0.125) < ryegrass (0.0313) < corn (0.0125).

The EC values are listed in Table 6.

Plant height: Treatment of the soil surface with clethodim did not result in a significant effect on plant height between the control and any treatment level for onion at the 21 day period. Oat, corn, and ryegrass did significantly differ from the controls. Oat and corn were very sensitive to clethodim. The NOEC (in lb ai/A) values for the four species are:

onion (0.25) < ryegrass (0.0313) < corn (0.0125) < oat (0.0063).

The EC values are listed in Table 6.

Plant dry weight: Statistical analysis of the plant dry weight data show no significant difference ($p < 0.05$) between the control plants and onion. Dry weight of corn and oat were very sensitive to clethodim, leading again to the additional test being conducted. The NOEC values (in lb ai/A) for the four species are:

onion (0.25) < ryegrass (0.0313) < corn = oat (0.0125).

The EC values are listed in Table 6.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** "A no effect concentration was achieved for oat, corn, ryegrass and onion in every parameter measured."

The Quality Assurance Unit of Pan-Agricultural Laboratories, Inc., was responsible for the assurance of compliance with Good Laboratory Practice (GLP) Standards. A statement of compliance to GLP and QA were enclosed in the report.

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

A. **Test Procedure:** The test procedures followed the SEP and Subdivision J guidelines, except for the following:

All plants in each replicate were weighed together, then the total weight was divided by the total number of plants to obtain each replicate mean value. The plants should have been individually weighed so the variation among plants within each replicate could be accounted for in the statistical analysis of the data.

B. **Statistical Analysis:** Statistical analyses were conducted on ryegrass (the most sensitive species) data for radicle length and oat height for seedling emergence (attached). The results are in agreement with the author's except for the EC values for oat height. The reviewer obtained higher values than those of the author. Consequently, the EC_{25} and EC_{50} values of 0.004 and 0.048 lb ai/A will be taken to be the correct values for oat plant height.

C. **Discussion/Results:**

Seed Germination: This study is scientifically sound and meets the requirements for Tier 2 testing. Treatment of the seeds with clethodim affected only ryegrass. However, oat, ryegrass, and corn did exhibit significantly different radicle lengths when compared to the controls. Ryegrass was the most sensitive species with respect to radicle length.

Seedling Emergence:

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Phytotoxicity rating: Based on phytotoxicity ratings, only onion was not affected by clethodim application at any rate. Corn was the most sensitive to clethodim application. Ryegrass and oat were also significantly different from the controls at intermediate rates of clethodim.

Percentage of emerged seedlings: Oat and ryegrass were significantly ($p < 0.05$) affected by clethodim application after 21 days. Onion and corn were not affected by clethodim at any application rate. Ryegrass was the most sensitive species affected.

Plant height: Plant height was not significantly affected in onion when compared to the control. Ryegrass, corn, and oat were all affected by intermediate to low rates of clethodim. The most sensitive species was oat.

Plant dry weight: Plant dry weight was not significantly affected in onion when compared to controls. Ryegrass, oat and corn were all affected by clethodim application. Oat and corn were equally sensitive to clethodim.

These studies are scientifically sound and comply with the Subdivision J guideline requirements for a Tier 2 non-target seedling emergence test.

D. Adequacy of the Study:

(1) Classification: Core.

(2) Rationale: N/A.

(3) Repairability: N/A.

15. COMPLETION OF ONE-LINER: N/A.

DATA EVALUATION RECORD

1. **CHEMICAL:** Clethodim.
Shaughnessey No. 059639.

2. **TEST MATERIAL:** Select (Clethodim); CAS No. 99129-21-2; 82.4% purity; a brown-amber liquid.

3. **STUDY TYPE:** Non-Target Plants: Seed Germination/Seedling Emergence Phytotoxicity Test - Tier 2. Species Tested: Oat, Ryegrass, Corn, Onion.

4. **CITATION:** Chetram, R.S. 1990. Tier 2 Seed Germination/ Seedling Emergence Nontarget Phytotoxicity Study Using SELECT (Clethodim). Laboratory Project No. LR 89-55B. Conducted by Pan-Agricultural Laboratories, Inc., Fresno, CA. Submitted by Valent USA Corporation, Walnut Creek, CA. EPA MRID No. 416851-04.

5. **REVIEWED By:**

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

Signature: Mark Mossler
Date: 3/8/91

6. **APPROVED BY:**

Pim Kosalwat, Ph.D.
Senior Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature: P. Kosalwat
Date: 3/8/91

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

Signature:
Date:

20 hrs.

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7. **CONCLUSIONS:**

Seed Germination: This study meets the requirements for a Tier 2 seed germination test using non-target plants. Clethodim at the maximum application rate of 0.25 lb ai/A did not significantly affect the germination of any species except ryegrass. The NOEC for this species was 0.0156 lb ai/A. Radicle length of corn, oat, and ryegrass was significantly affected by clethodim. The respective NOECs are 0.0125, 0.0063, and 0.0031 lb ai/A. The NOEC for onion radicle length is 0.25 lb ai/A.

Seedling Emergence: This study meets the requirements for a Tier 2 seedling emergence test using non-target plants. Percent emergence of corn and onion was not affected by clethodim, and the subsequent NOEC for these two species is 0.25 lb ai/A. Oat and ryegrass were affected and had NOECs of 0.0625 and 0.0313 lb ai/A, respectively.

Only onion was unaffected by clethodim in the phytotoxicity ratings. Oat, ryegrass and corn were all affected and had subsequent NOEC values of 0.125, 0.0313, and 0.0125 lb ai/A, respectively.

Again, onion plant height was not significantly affected by clethodim. Therefore, the NOEC for onion is 0.25 lb ai/A. Ryegrass, corn, and oat height were all affected by clethodim with oat being very sensitive. The NOEC values for these three species are 0.0313, 0.0125, and 0.0063 lb ai/A, respectively.

Plant dry weight was not affected for onion. Ryegrass, corn and oat were significantly affected when compared to controls. Corn and oat were equally the most sensitive. The NOEC values for the species are, in lb ai/A:

onion (0.25) < ryegrass (0.0313) < oat = corn (0.0125).

8. **RECOMMENDATIONS:** A Tier 3 study is required.

9. **BACKGROUND:** N/A.

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

11. **MATERIALS AND METHODS:**

A. **Test Plants:** Monocotyledon plants were represented by four species from two families (i.e., oat, ryegrass, corn and onion. Lot number, cultivar, 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 test solutions were prepared with deionized water and acetone. Fifteen milliliters of the test solution were added to each plate of oat and corn. Ten milliliters were added to plates of ryegrass and onion.

Ten seeds of each crop were added to each petri plate after the test solution was absorbed into the paper. The plates were then randomly placed in plastic boxes (12.25 x 9.0 x 4.1 inches) with tightly fitting lids to prevent moisture loss. The petri plates were incubated in the dark at 25 ±1°C for 7 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 soil obtained from the laboratory facility. A plexiglass template was used to create planting holes in the soil, thus allowing for uniform planting depth and seed distribution. An analysis of the soil was provided in the report. Each treatment replicate was placed on an aluminum tray (6.125 x 31.125 cm). The spray plot was 3.21 x 1.67 ft (i.e., 5.36 ft^2).

Oat and corn were planted at a depth of 2.5 cm, while ryegrass and onion were planted at a depth of 1.3 cm. All applications were performed with a belt sprayer equipped with a single nozzle. A nozzle height of 12 inches and a nozzle pressure of 40-50 psi were used. The test spray solutions were prepared by dissolving clethodim technical in deionized water and acetone. The plants were sprayed at the equivalent of 468 L/ha (50 gpa) of water.

The pots were watered three times a day and a total of 18 ml of water was used to irrigate each pot per day.

C. **Dosage:** Clethodim was applied at a rate of 0.25, 0.125, 0.0625, 0.0313, 0.0156 and 0 lb ai/A to all plant species. An additional study was conducted on corn and oat in which rates of 0.025, 0.013, 0.006,

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0.003 and 0.002 lb ai/A of were applied. Treatment application rates were adjusted for the percent purity of the test material (82.4%).

D. **Design:**

Seed Germination: Each treatment/crop combination was replicated three times (i.e., 10 seeds/plate, 3 plates/treatment). After 7 days of incubation, the seeds were removed from the petri plates and the radicle lengths were measured to the nearest millimeter. Percent seed germination and mean radicle length were calculated for all germinated seeds. Seeds were considered germinated if the radicle was at least 5 mm long.

Seedling Emergence: Each crop/treatment combination was replicated three times (i.e., 10 seeds/pot, 3 pots/treatment level). The percentage of the ten seeds planted in each pot which emerged was calculated for each treatment. After treatment, the pots were randomized within crops and among treatments and placed in an on-site greenhouse.

The percentage of the ten seeds planted in each pot which emerged was calculated for each treatment. Seedling height and phytotoxicity ratings were recorded at 7, 14, and 21 days after treatment for all species. Twenty-one days after treatment, the plants within treatment replicates (pots) were cut at the soil level and dried in a pre-weighed paper bag at 70°C for a minimum of 48 hours. After drying, the dry weight of the plant material was recorded.

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; and 4-indicates a total effect or plant death.

Temperature, relative humidity, photoperiod, and illuminance during the period of growth were provided in the report.

E. **Statistics:** All data were entered into a Lotus 1-2-3 spreadsheet. The spreadsheet calculated replicate means, treatment means, standard deviations, and analysis of variance tables. Treatment means were used to calculate the percent detrimental effect resulting from the treatment. The percent detrimental effect was

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calculated using the following equation:

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

An analysis of variance table was constructed using the Lotus 1-2-3 raw data spreadsheet. A one-way analysis of variance (ANOVA) model for data with equal subsamples was used to analyze data from the seed germination (radicle length and percent germination) and seedling emergence (percent emergence, phytotoxicity). A one-way analysis of variance model for data with unequal subsamples was used to analyze the seedling height and dry weight data. The percent effect values were input into a probit analysis program. The program ignores positive values and transforms the dose by natural logarithms. For seedling emergence, the probit is calculated using all data points, for all other parameters, the probit is calculated using replicate means.

12. **REPORTED RESULTS:**

Seed Germination: Treatment of seeds with clethodim at the rate of 0.25 lb ai/A did not result in a significant decrease in percent germination ($p < 0.05$) of oat, corn, or onion. The NOEC for percent germination for these species was 0.25 lb ai/A. Ryegrass demonstrated a significant decrease in percent germination at the 0.0313 lb ai/A rate. The resulting NOEC for ryegrass percent germination was 0.0156 lb ai/A. Due to the lack of rate response by corn, oat, and onion, no EC values could be determined. The EC_{25} and EC_{50} values for ryegrass were 0.013 and 0.025, respectively.

Treatment of onion seed with clethodim did not result in a significant difference ($p < 0.05$) in radicle length from the control. Consequently, no EC values could be determined and the NOEC for onion radicle length was 0.25 lb ai/A. Oat, ryegrass, and corn demonstrated a dose dependent response. Additional tests determined that the NOEC for corn, oat, and ryegrass were 0.0125, 0.0063, and 0.0031 lb ai/A, respectively. The EC values are listed in Table 6 (attached).

Seedling Emergence:

Percent emergence: Statistical analysis of the 21 day percent emergence data shows a significant decrease ($p < 0.05$) for oat and ryegrass at the 0.125 and 0.0625 lb ai/A

rate, respectively. There was no significant difference in percent emergence between control and any treatment level for corn and onion. The NOECs (in lb ai/A) for the four species are:

corn = onion (0.25) < oat (0.0625) < ryegrass (0.0313).

The EC values are listed in Table 6.

Phytotoxicity rating: Statistical analysis of the 21 day phytotoxicity ratings show no significant increase ($p < 0.05$) in mean phytotoxicity for onion. The NOEC levels (in lb ai/A) for the species are:

onion (0.25) < oat (0.125) < ryegrass (0.0313) < corn (0.0125).

The EC values are listed in Table 6.

Plant height: Treatment of the soil surface with clethodim did not result in a significant effect on plant height between the control and any treatment level for onion at the 21 day period. Oat, corn, and ryegrass did significantly differ from the controls. Oat and corn were very sensitive to clethodim. The NOEC (in lb ai/A) values for the four species are:

onion (0.25) < ryegrass (0.0313) < corn (0.0125) < oat (0.0063).

The EC values are listed in Table 6.

Plant dry weight: Statistical analysis of the plant dry weight data show no significant difference ($p < 0.05$) between the control plants and onion. Dry weight of corn and oat were very sensitive to clethodim, leading again to the additional test being conducted. The NOEC values (in lb ai/A) for the four species are:

onion (0.25) < ryegrass (0.0313) < corn = oat (0.0125).

The EC values are listed in Table 6.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** "A no effect concentration was achieved for oat, corn,

ryegrass and onion in every parameter measured."

The Quality Assurance Unit of Pan-Agricultural Laboratories, Inc., was responsible for the assurance of compliance with Good Laboratory Practice (GLP) Standards. A statement of compliance to GLP and QA were enclosed in the report.

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

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

All plants in each replicate were weighed together, then the total weight was divided by the total number of plants to obtain each replicate mean value. The plants should have been individually weighed so the variation among plants within each replicate could be accounted for in the statistical analysis of the data.

The Herbicide Handbook (WSSA '89) lists the maximum label rate of clethodim as 0.6 lb ai/A. If this is the case, these tests need to be conducted again at this maximum rate.

B. Statistical Analysis: Statistical analyses were conducted on ryegrass (the most sensitive species) data for radicle length and oat height for seedling emergence (attached). The results are in agreement with the author's except for the EC values for oat height. The reviewer obtained higher values than those of the author. Consequently, the EC_{25} and EC_{50} values of 0.004 and 0.048 lb ai/A will be taken to be the correct values for oat plant height.

C. Discussion/Results:

Seed Germination: This study is scientifically sound and meets the requirements for Tier 2 testing. Treatment of the seeds with clethodim affected only ryegrass. However, oat, ryegrass, and corn did exhibit significantly different radicle lengths when compared to the controls. Ryegrass was the most sensitive species with respect to radicle length.

Seedling Emergence:
Phytotoxicity rating: Based on phytotoxicity ratings, only onion was not affected by clethodim application at

any rate. Corn was the most sensitive to clethodim application. Ryegrass and oat were also significantly different from the controls at intermediate rates of clethodim.

Percentage of emerged seedlings: Oat and ryegrass were significantly ($p < 0.05$) affected by clethodim application after 21 days. Onion and corn were not affected by clethodim at any application rate. Ryegrass was the most sensitive species affected.

Plant height: Plant height was not significantly affected in onion when compared to the control. Ryegrass, corn, and oat were all affected by intermediate to low rates of clethodim. The most sensitive species was oat.

Plant dry weight: Plant dry weight was not significantly affected in onion when compared to controls. Ryegrass, oat and corn were all affected by clethodim application. Oat and corn were equally sensitive to clethodim.

These studies are scientifically sound and comply with the SEPs for a Tier 2 non-target seedling emergence test.

D. **Adequacy of the Study:**

(1) Classification: Core.

(2) Rationale: N/A.

(3) Repairability: N/A.

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

CLETHODIM

Page 17 is not included in this copy.

Pages _____ through _____ are not included in this copy.

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.

X FIFRA registration data.

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The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

ryegrass - radicle length

Summary Statistics and ANOVA

Transformation = None

Group	n	Mean	s.d.	cv%
rate (lb ai/A)				
1 = control	3	47.6667	5.1316	10.8
2 .0016	3	48.0000	7.0000	14.6
3 .0031	3	51.0000	1.7321	3.4
4* .0063	3	35.6667	6.4291	18.0
5* .0125	3	13.3333	3.2146	24.1
6* .025	3	6.6667	.5774	8.7

NOEC = 0.0031

*) the mean for this group is significantly less than
the control mean at alpha = 0.05 (1-sided) by Dunnett's test

Minumum detectable difference for Dunnett's test = -9.513635
This difference corresponds to -19.96 percent of control

Between groups sum of squares = 5544.944444 with 5 degrees of freedom.

Error mean square = 21.722222 with 12 degrees of freedom.

Bartlett's test p-value for equality of variances = .107

ryegrass radicle length

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0022	0.0005	0.0039
EC 5.00	0.0035	0.0012	0.0053
EC10.00	0.0044	0.0019	0.0064
EC15.00	0.0052	0.0025	0.0073
EC50.00	0.0101	0.0071	0.0150
EC85.00	0.0199	0.0138	0.0455
EC90.00	0.0233	0.0156	0.0611
EC95.00	0.0296	0.0187	0.0950
EC99.00	0.0461	0.0258	0.2212

EC_{25} = 0.006 16 ai/A

$Y = 12.05 + 3.53X$

Y = probit % effect

X = log (conc)

oat height

Summary Statistics and ANOVA

Transformation = None

Group	n	Mean	s.d.	cv%
rate (lb ai/A)				
1 = control	3	224.6667	12.5033	5.6
2*-.0016	3	146.0000	18.3576	12.6
3*-.0031	3	190.3333	58.0718	30.5
4*-.0063	3	204.0000	13.2288	6.5
5*.0125	3	141.6667	27.3922	19.3
6*.025	3	116.3333	45.6545	39.2

NOEC = 0.0063

*) the mean for this group is significantly less than the control mean at alpha = 0.05 (1-sided) by Dunnett's test

Minumum detectable difference for Dunnett's test = -69.098025
This difference corresponds to -30.76 percent of control

Between groups sum of squares = 26445.833333 with 5 degrees of freedom.

Error mean square = 1145.888889 with 12 degrees of freedom.

Bartlett's test p-value for equality of variances = .251

oat kelp

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0000		
EC 5.00	0.0000		
EC10.00	0.0002		
EC15.00	0.0005		
EC50.00	0.1219		
EC85.00	27.3123		
EC90.00	98.2724		
EC95.00	655.1395		
EC99.00	22995.0195		

EC_{25} = 0.004 16 mi/A.

$y = 5.40 + 0.44x$

y = probit % effect

x = log (conc.)