EFED Document

2002073

MRID No. 416732-01

DATA EVALUATION RECORD

1. **CHEMICAL:** Propiconazole.
Shaughnessey No. 122101.

2. **TEST MATERIAL:** Propiconazole technical; 1-[(2-[2,4-dichlorophenyl]-4-propyl-1,3-dioxolan-2-yl)methyl]-1H-1,2,4-triazole; CAS No. 60207-90-1; Lot No. FL-850083; 92.0% purity; an amber colored oily liquid.

3. **STUDY TYPE:** Non-Target Plants: Vegetative Vigor Phytotoxicity Test - Tier 2. Species Tested: Soybean, Lettuce, Carrot, Tomato, Cucumber, Cabbage, Oat, Ryegrass, Corn, Onion.

4. **CITATION:** Maggio, R.M. 1990. Tier 2 Vegetative Vigor Nontarget Phytotoxicity Study Using Propiconazole. Laboratory Study No. LR90-418. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by Ciba-Geigy Corporation, Greensboro, NC. EPA MRID No. 416732-01.

5. **REVIEWED BY:**

Kathryn F. Valente, M.S. **Signature:** Kathryn F. Valente
Biologist
Ecological Effects Branch **Date:** July 21, 1992
Environmental Fate and Effects Division (H7507C)

6. **APPROVED BY:**

Allen Vaughan **Signature:** Allen W. Vaughan
Acting Head, Section 2
Ecological Effects Branch **Date:** 7.23.92
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Henry T. Craven, M.S. **Signature:**
Head, Section 4
Ecological Effects Branch **Date:**
Environmental Fate and Effects Division (H7507C)

7. **CONCLUSIONS:** This study is scientifically sound [redacted] the requirements for a Tier 2 vegetative vigor test using non-target plants.

Phytotoxicity: Lettuce, carrot, tomato, oat, and corn were unaffected by propiconazole. Soybean, cucumber, cabbage,

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5. **REVIEWED BY:**

Thomas A. Bewick
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Date: 6/22/92

Kathryn F. Boltz 6/29/92

6. **APPROVED BY:**

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Henry T. Craven, M.S.
Supervisor, EEB/EFED
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Signature: Henry T. Craven
Date: 7/22/92

7. **CONCLUSIONS:** This study is scientifically sound but does not meet the requirements for a Tier 2 vegetative vigor test using non-target plants. The maximum labeled use rate was not specified.

and ryegrass were the most sensitive species with an NOEC and lowest-observed-effect concentration (LOEC) of 0.167 and 0.5 lb ai/A, respectively.

Plant Height: Lettuce and carrot were unaffected by the maximum tested rate of propiconazole. The most sensitive species was soybean, with NOEC, LOEC, EC_{25}, and EC_{50} values of 0.056, 0.167, 0.16, and 0.61 lb ai/A, respectively.

Plant Dry Weight: Lettuce, carrot, tomato, oat, ryegrass, corn, and onion did not respond to the maximum rate of propiconazole. The most sensitive species was cabbage with NOEC, LOEC, EC_{25}, and EC_{50} values of 0.056, 0.167, 0.039, and 0.773 lb ai/A, respectively.

8. **RECOMMENDATIONS:** The information concerning the maximum labeled use rate needs to be submitted.

9. **BACKGROUND:** ~~This study was submitted in support of reregistration of products containing propiconazole.~~

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., ryegrass, oat, corn, and onion). Dicotyledon plants were represented by six species from six families (i.e., soybean, lettuce, carrot, cabbage, tomato, and cucumber). Cultivars, seed sources, lot numbers, and germination ratings were provided in the report.

B. **Test System:** Seeds of each crop were planted in plastic pots (7.5 x 7.5 x 6.0 cm) filled with a sterilized soil (pH of 7.7-7.8 and organic matter content of 0.5-0.6%) and perlite. A plexiglass template was used to create planting holes in the soil, thus 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 2.3 cm. After emergence, each pot was thinned to five plants/pot. The plant species were allowed to grow for 7 to 17 days until they had 1 to 3 true leaves before treatment. Each treatment replicate was placed on an aluminum tray (6.125 x 31.125 cm). The sprayed area was 3.21 ft x 1.67 ft (i.e., 5.36 ft^2).

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All applications were performed with a belt sprayer equipped with a single nozzle. A nozzle height of 12 inches and a nozzle pressure of 50 psi were used. The spray solutions were prepared by dissolving propiconazole in a 13% acetone/well water solution. The plants were sprayed at the equivalent of 468 l/ha (50 gpa) of water.

The pots were initially (first 48 hours after treatment) hand-watered to avoid washing propiconazole from the leaves. Subsequently, the pots were watered three times a day. Each pot received 22 ml of water the first week, 35 ml the second week, and 40 ml the third week.

C. **Dosage:** Propiconazole was applied at rates of 0.0185, 0.056, 0.167, 0.5 and 1.5 lb active ingredient (ai)/acre (A) to all plant species for the initial study. Treatment rates were adjusted for the percent purity of the test material (92%).

D. **Design:** Each crop/treatment combination was replicated three times (i.e., 5 plants/pot, 3 pots/treatment level). After treatment, the pots were randomized in an on-site greenhouse.

Plant height was measured by extending each seedling to its maximum height and recording the height to the nearest millimeter. The mean plant height was calculated at 0 and 21 days after treatment (DAT).

Plant phytotoxicity was monitored at 7, 14, and 21 days after treatment. 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.

Twenty-one days after treatment, the plants within treatment replicates (pots) were cut at the soil level and dried in pre-weighed aluminum sheets at 70°C for a minimum of 48 hours.

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

E. **Statistics:** An analysis of variance table was constructed using the Lotus 1-2-3 raw data spreadsheet. A one-way analysis of variance model for data with

equal subsamples was used. The F-value from the analysis of variance table and an F table were used to determine whether the treatments were significantly different ($p < 0.05$). Means were separated by using Duncan's New Multiple Range Test.

Treatment means were used to calculate the percent effect resulting from the treatment. The percent effect was calculated using the following equation:

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

Plant heights taken prior to treatment were used as a baseline to calculate the percent effect on growth at the 21 day observation period. The percent increase in height from the 0 day reading was calculated using the following equation:

$$\% \text{ increase} = \frac{(\text{21 day mean} - \text{0 day mean})}{\text{0 day mean}} \times 100$$

The percent effect on growth was calculated for each treatment using the following equation:

$$\% \text{ effect} = \frac{(\text{treat. \% increase} - \text{cont. \% increase})}{\text{control \% increase}} \times 100$$

The percent detrimental effect values were entered into a probit analysis program. The program ignores positive values and transforms the dose by natural logarithms. For plant height and dry weight, the probit transformed values were calculated using replicate means.

12. **REPORTED RESULTS:**

Phytotoxicity rating: The results of the phytotoxicity ratings are presented in Tables 1 and 2 (attached). The 21-day NOEC for lettuce, tomato, oat, and corn was 1.5 lb ai/A. Carrot showed a significant difference between the control and the 0.5 lb ai/A rate due to minor phytotoxicity on one plant in each replicate in that treatment group. However, there was no significant difference between the control and the maximum dose for carrot at the 21 day observation period, resulting in an NOEC of 1.5 lb ai/A. The 21-day NOEC for onion was 0.5 lb ai/A, and 0.167 lb ai/A for soybean, cucumber, cabbage, and ryegrass.

Plant height: The results of the plant height data for all ten crops are presented in Tables 3 and 4 (attached). The

NOEC for lettuce and carrot was 1.5 lb ai/A. The NOEC for oat was 0.5 lb ai/A. Tomato, cucumber, cabbage, and corn had an NOEC of 0.167 lb ai/A. The NOEC for soybean and onion was 0.056 lb ai/A, and 0.0185 lb ai/A for ryegrass.

Propiconazole caused height reduction of greater than 25% at the two highest concentrations (1.5 and 0.5 lb ai/A) on soybean, tomato, cucumber, cabbage, ryegrass, and onion.

Due to a lack of significant rate effects in plant height or a true dose response, EC_{25} and EC_{50} values were not determined for lettuce, carrot, tomato, and oat. The other crops exhibited a significant dose response and the EC values are presented in Table 7 (attached).

Plant dry weight: The results of the plant dry weight data are presented in Tables 5 and 6 (attached). The NOEC for lettuce, cucumber, cabbage, oat, ryegrass, corn, and onion was 1.5 lb ai/A. Tomato produced some vigorous plants in the 0.167 lb ai/A treatment that resulted in significance between this rate and all others including the control. The NOEC as defined by this study for tomato was 1.5 lb ai/A. An increase in dry weight of carrot from 16% to 39% resulted in significance between the control and 0.0185, 0.056, 0.167, and 1.5 lb ai/A treatment rates. This response was due to vigorous plants produced at those rates. Treatment of carrot with propiconazole did not result in any detrimental effects in plant dry weight. The NOEC for carrot was 1.5 lb ai/A. The NOEC for cucumber was 0.167 lb ai/A and 0.056 lb ai/A for cabbage, based on biological significance. The NOEC for soybean was 0.056 lb ai/A.

Due to a lack of significant differences in plant dry weight or a lack of a true dose response, probit analysis was not conducted, nor EC_{25} and EC_{50} values determined on lettuce, carrot, tomato, oat, ryegrass, and corn. Soybean, cucumber, cabbage, and onion did exhibit a significant dose response. The EC_{25} and EC_{50} values for these crops are listed in Table 7.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** No other conclusions other than those stated above or tabularized were made by the study author.

The Quality Assurance Unit of Pan-Agricultural Laboratories, Inc., was responsible for the assurance of compliance with Good Laboratory Practice (GLP) Standards as set forth in 40 CFR Part 160. Statements 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: The rate progression was three-fold instead of two-fold and the maximum use rate was not specified. The three-fold rate progression was requested by the sponsor after consultation with the EPA (page 3, attached). The maximum use rate was obtained by the reviewer from the current labeling, and is 0.9 lb a.i./A, based on 4 applications at 0.225 lb a.i./A. Additionally, it was not stated if the control plants were sprayed with a 13% acetone solution.

B. **Statistical Analysis:** Probit and mean comparison (Dunnett's) analyses were conducted on soybean height data (attached). This species parameter was determined to be the most sensitive based on the EC_{50} value. The percent effect on growth was more sensitive than total plant height; therefore, this response was used rather than total plant height. The reviewer's results are either in agreement with or slightly more conservative than those of the author.

C. **Discussion/Results:**

Phytotoxicity rating: Lettuce, carrot, tomato, oat, and corn were unaffected by propiconazole. Soybean, cucumber, cabbage, and ryegrass were equally the most sensitive species with an NOEC of 0.167 lb ai/A. The EC_{25} and EC_{50} values were not determined.

Plant height: The maximum responses of cucumber, cabbage, and ryegrass were less than 50%; therefore, the reported EC_{50} values for these species are invalid. The EC_{50} should be reported as >1.5 lb ai/A for these species.

Lettuce and carrot were unaffected by the maximum rate of propiconazole. The NOEC (0.0185 lb ai/A) for ryegrass was lower than the NOEC (0.056 lb ai/A) for soybean. However, due to the lack of a rate response by ryegrass, soybean was determined to be the most sensitive species. The EC_{25} and EC_{50} for soybean was 0.16 and 0.61 lb ai/A, respectively.

Plant dry weight: The maximum responses of cucumber, soybean, and onion were less than 50%; therefore, the reported EC_{50} values for these species are invalid. The EC_{50} should be reported as >1.5 lb ai/A for these species.

Lettuce, carrot, tomato, oat, ryegrass, corn, and onion did not respond to the maximum rate of propiconazole. The most sensitive species was cabbage with an NOEC, EC_{25}, and EC_{50} of 0.056, 0.039, and 0.773 lb ai/A, respectively.

This study is scientifically sound and meets the requirements for a Tier 2 vegetative vigor test using non-target.

D. **Adequacy of the Study:**

(1) **Classification:** Core

(2) **Rationale:** N/A

(3) **Repairability:** N/A

15. **COMPLETION OF ONE LINER:** Yes, 7/21/92.

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SOYBEAN-VEGETATIVE VIGOR-PLANT HEIGHT-PROPICONAZOLE

Summary Statistics and ANOVA

Transformation = None

Group rate (lb ai/A)	n	Mean	s.d.	cv%
1 = control	3	357.6667	12.8970	3.6
2 0.0185	3	356.3333	4.9329	1.4
3 0.056	3	332.3333	13.8684	4.2
4* 0.167	3	286.6667	16.2891	5.7
5* 0.5	3	214.3333	29.8719	13.9
6* 1.5	3	124.0000	5.2915	4.3

NOEC = 0.056 lb ai/A
LOEC = 0.167 lb ai/A

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

rates given in lb ai/A

Minumum detectable difference for Dunnett's test = -33.005331
This difference corresponds to -9.23 percent of control

Between groups sum of squares = 129833.111111 with 5 degrees of freedom.

Error mean square = 261.444444 with 12 degrees of freedom.

Bartlett's test p-value for equality of variances = .213

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soybean height based on percent effect of growth

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0058	0.0023	0.0111
EC 5.00	0.0227	0.0120	0.0359
EC10.00	0.0470	0.0287	0.0677
EC15.00	0.0768	0.0512	0.1050
EC50.00	0.6115	0.4646	0.8529
EC85.00	4.8716	2.9233	9.9914
EC90.00	7.9598	4.4563	18.1283
EC95.00	16.4751	8.2966	43.9617
EC99.00	64.4728	26.4651	232.8851

$Y = 5.25 + 1.15(x)$

Y = probit % inhibition

x = log (rate)

$EC_{25} = 0.16$ 16 ai/A