

US EPA ARCHIVE DOCUMENT

DATA EVALUATION RECORD

1. **CHEMICAL:** Profenofos.
Shaughnessey No. 111401.

2. **TEST MATERIAL:** Profenofos technical (Curacron); 0-(4-bromo-2-chlorophenyl)-0-ethyl-s-propyl phosphorothioate; CAS No. 108-90-7; 90.4% purity; an amber oily liquid.

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

4. **CITATION:** Chetram, R.S. 1990. Tier 2 Seed Germination Nontarget Phytotoxicity Study Using Profenofos Technical (Curacron). Laboratory Report No. LR90-409. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by Ciba-Giegy Corporation, Greensboro, NC. EPA MRID No. 416273-06.

5. **REVIEWED BY:**

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Signature: *Mark Mossler*
Date: 4/9/91

6. **APPROVED BY:**

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Henry T. Craven, M.S.
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Date: 6/19/91

10 hrs /

7. CONCLUSIONS:

Seed Germination: This study is scientifically sound and meets the requirements for a Tier 2 seed germination test using non-target plants. Based on percent germination, all ten tested species were equally tolerant of profenofos at the maximum rate of 1.0 lb ai/A. Due to this tolerance, no dose responses were exhibited and consequently, no EC values could be determined.

Seven species were equally tolerant to the maximum rate of 1.0 lb ai/A with respect to radicle length. The NOEC for lettuce and oat was 0.333 lb ai/A. Cabbage was the most sensitive species, with an NOEC value of 0.0123 lb ai/A. Because of the variability of the dose responses in cabbage, and the lack of responses in the remaining species, no EC values could be determined.

8. RECOMMENDATIONS: N/A.

9. BACKGROUND: N/A.

10. DISCUSSION OF INDIVIDUAL TESTS: N/A.

11. MATERIALS AND METHODS:

A. Test Plants: Dicotyledon plants were represented by six species from six families (i.e., soybean, lettuce, carrot, tomato, cucumber, and cabbage). Monocotyledon plants were represented by four species from two families (i.e., corn, oat, ryegrass, and onion). Cultivars, seed sources, lot numbers, 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, and then diluted with water from a well located at the testing facility. 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, carrot, tomato, cabbage, 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 containing crops with the same concentration 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, except lettuce, which was incubated at 20 ±1°C.

- C. **Dosage:** Profenofos was applied at a rate of 1.0, 0.333, 0.111, 0.037, 0.0123, and 0.0 lb ai/A to all plant species. Two drops of Triton X-100 were added to each concentration to aid solubilization.
- 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.
- E. **Statistics:** All data were entered into a Lotus 1-2-3 spreadsheet. The spreadsheet calculated replicate and treatment means, 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:

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

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 to analyze the data (percent germination and radicle length). Means were separated by using Duncan's New Multiple Range Test.

Due to the lack of significant rate effects and a lack of a true dose response on each of the parameters (germination and radicle length) measured, a probit analysis was neither conducted nor EC₂₅ and EC₅₀ values determined for any of the ten crops.

12. REPORTED RESULTS:

Seed Germination: There was no significant ($p < 0.05$) difference between the control and any concentration for soybean, lettuce, carrot, tomato, cucumber, cabbage, oat, ryegrass, corn, and onion. The no-effect concentration as defined by this study for each of the ten crops was 1.0 lb ai/A. Due to the lack of significant rate effects and a lack of a true dose response, a probit analysis was neither conducted nor EC values determined for all ten species.

Radicle Length: Soybean, carrot, tomato, oat, ryegrass, corn, and onion showed no significant difference between the control and any of the rates tested. Lettuce showed a significant difference between the control and the maximum concentration of 1.0 lb ai/A, therefore, the NOEC was reached at 0.333 lb ai/A. Cabbage demonstrated a significant reduction in radicle length at the 0.037, 0.333, and 1.0 lb ai/A rates, thus the NOEC value for cabbage was 0.0123 lb ai/A. Statistical analysis of oat radicle length data did not indicate a significant reduction however, radicles were 32% shorter in the 1.0 lb ai/A treatments. The NOEC value for oat was therefore 0.333 lb ai/A. Crops listed in order of increasing sensitivity to profenofos, based on radicle length no-effect concentration (lb ai/A) are:

soybean = carrot = tomato = cucumber = ryegrass = corn =
onion (1.0) < lettuce = oat (0.333) < cabbage (0.0123).

Due to a lack of significant rate effects and a lack of true dose response, a probit analysis was neither conducted nor EC values determined on all ten species tested.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:

"A no-effect concentration was reached for soybean, lettuce, carrot, tomato, cucumber, cabbage, oat, corn, ryegrass, and onion."

The Quality Assurance Unit of Pan-Agricultural Laboratories, Inc., was responsible for the assurance of compliance with Good Laboratory Practice (GLP) Standards. Statements of compliance to GLPs 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.

B. Statistical Analysis: Dunnett's pairwise comparison test was conducted on the data for cabbage radicle length. The results (attached) are in agreement with the author's.

C. Discussion/Results:

Seed Germination: This study meets the requirements for a Tier 2 seed germination study using non-target plants. All ten species were equally tolerant of profenofos, with a subsequent NOEC value of 1.0 lb ai/A. No EC values could be determined.

Radicle length: Seven of the ten tested species were equally tolerant of profenofos, with a subsequent NOEC value of 1.0 lb ai/A. Lettuce demonstrated a significant reduction of radicle length at the 1.0 lb ai/A rate of profenofos. Although oat did not show a significant reduction in radicle length, the percent effect at 1.0 lb ai/A was -32%. Therefore, both lettuce and oat had an NOEC value of 0.333 lb ai/A. Cabbage demonstrated a significant reduction at three rates of profenofos. The NOEC value for cabbage was determined to be 0.0123 lb ai/A.

D. Adequacy of the Study:

- (1) Classification: Core.
- (2) Rationale: N/A.
- (3) Repairability: N/A.

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

cabbage radicle length

Summary Statistics and ANOVA

Transformation = None

Group	n	Mean	s.d.	cv%
1 = control	3	41.0000	5.2915	12.9
2 <i>0.0123</i>	3	49.3333	5.5076	11.2
3* <i>0.037</i>	3	24.6667	6.6583	27.0
4 <i>0.111</i>	3	40.3333	2.0817	5.2
5* <i>0.333</i>	3	30.6667	4.7258	15.4
6 <i>1.0</i>	3	31.6667	3.7859	12.0

NOEC = 0.0123 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

Minimum detectable difference for Dunnett's test = -9.988419
This difference corresponds to -24.36 percent of control

Between groups sum of squares = 1190.277778 with 5 degrees of freedom.

Error mean square = 23.944444 with 12 degrees of freedom.

Bartlett's test p-value for equality of variances = .819