8-29-91

MRID No. 414035-03

DATA EVALUATION RECORD

1. **CHEMICAL:** Facet (BAS 514 H). 974 Shaughnessey No. 128947-3.

2. **TEST MATERIAL:** BAS 514 H (quinchlorac); Sample No. 150732; 96.5% purity; a white powder.

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

4. **CITATION:** Chetram, R.S. 1989. Tier 2 Vegetative Vigor Nontarget Phytotoxicity Test BAS 514 00H. Laboratory Project No. LR89-03A. Conducted by Pan-Agricultural Laboratories, Inc., Madera, CA. Submitted by BASF Corporation, Research Triangle Park, NC. EPA MRID No. 414035-03.

5. **REVIEWED By:**

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

Signature: Mark Mossler
Date: 4/2/91

Charles Smith 8/27/91

6. **APPROVED BY:**

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

Signature: P. Kosalwat
Date: 4/2/91

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

Signature:
Date: Henry T. Craven 8/28/91

10 lbs

1

7. **CONCLUSIONS:**

Vegetative Vigor: This study is scientifically sound and meets the requirements for a Tier 2 vegetative vigor test using non-target plants. Tomato was the most sensitive species with respect to phytotoxicity. The NOEC value for phytotoxicity (in lb ai/A) for tomato is 0.00125.

Lettuce was the most sensitive species with respect to plant height. The NOEC, EC_{25}, and EC_{50} values (in lb ai/A) for lettuce height are 0.05, 0.028, and 0.069, respectively.

Tomato was the most sensitive species with respect to plant dry weight. The NOEC, EC_{25}, and EC_{50} values (in lb ai/A) for tomato dry weight are 0.005, 0.007, and 0.03, respectively.

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

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

B. **Test System:**

Seedling Establishment: Seeds of each crop were planted in plastic pots (7.5 x 7.5 x 6.0 cm) and filled with a sterilized commercial soil mix. A plexiglass template was used to create planting holes in the soil, thus allowing for uniform planting depth and seed distribution. Soybean and corn were planted at a depth of 2.5 cm, while the remaining eight species were planted at a depth of 1.3 cm. An analysis of the soil was provided in the report. After emergence, each pot was thinned to five plants/pot. The ten plant species were allowed to grow for 7-20 days before treatment to allow each species to attain the 1-3 true leaf stage.

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).

All applications were performed with a belt sprayer equipped with a single 8001-E nozzle. A nozzle height of 12 inches and a nozzle pressure of 50 psi were used. The test spray solutions were prepared by dissolving the test material in 190 ml of water and 10 ml acetone. Lower application rates were then prepared by dilution. 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. Throughout the study, the plants were fertilized (20-20-20, N-P-K) weekly at the rate of 1.0 tsp/gal.

C. **Dosage:** BAS 514 H was applied at a rate of 0, 0.125, 0.25, 0.5, 1.0, and 2.0 lb ai/A. A continuation study was conducted on soybean, lettuce, carrot, tomato, and cucumber. Rates for this study were ten times less than the original rates. A second continuation study was conducted on lettuce, tomato, and carrot to determine NOEC values. The rates for this study were 100 times less than those in the original study. Treatment application rates were calibrated on the percent purity of the technical material.

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 within crops and among treatments and placed in an on-site greenhouse.

Plant height was measured by extending the seedling to its maximum height and recording the height to the nearest millimeter. The mean plant height was calculated at 0, 7, 14, and 21 days after application.

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 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.

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 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:

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

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 the data. Treatment mean separation was achieved using either SAS or the LOTUS 1-2-3 spreadsheet.

The percent effect values were input into a SAS probit analysis program.

12. **REPORTED RESULTS:**

Phytotoxicity rating: Statistical analysis of the 21 day

phytotoxicity ratings demonstrated that all plant species except onion were significantly ($p < 0.05$) affected by BAS 514 H at the maximum application rate of 2.0 lb ai/A when compared to the controls. A continuation study was conducted to determine an NOEC value for cucumber while two continuation studies were required to achieve an NOEC for carrot, tomato, and lettuce. Onion exhibited the least sensitivity to the test material, resulting in an NOEC of 2.0 lb ai/A. Tomato was the most sensitive species tested. The NOEC values (in lb ai/A) for the ten tested species were:

onion (2.0) < ryegrass (1.0) < oat (0.5) < cabbage (0.25) < soybean = corn (0.125) < cucumber (0.0125) < lettuce (0.005) < carrot (0.0025) < tomato (0.00125).

Plant height: Statistical analysis of the 21 day plant height data showed a significant effect on plant height for all species except cabbage, oat, ryegrass, and onion. The subsequent NOEC value for these species was 2.0 lb ai/A. A study continuation was conducted on soybean, lettuce, and cucumber to achieve an NOEC value for these species. The most tolerant species with respect to plant height were cabbage, oat, ryegrass, and onion. The most sensitive species was lettuce. The NOEC values (in lb ai/A) for the ten species were:

cabbage = oat = ryegrass = onion (2.0) < corn (0.5) < carrot (0.25) < cucumber (0.2) < tomato (0.125) < soybean (0.1) < lettuce (0.05).

All species tested except oat and ryegrass exhibited a plant height dose response. Due to lack of response by oat and ryegrass, EC values could not be determined for these species. The EC values for the remaining species are presented in Table 32 (attached).

Plant dry weight: Statistical analysis of the 21 day plant dry weight data showed a significant effect on plant dry weight for all species except cabbage, oat, ryegrass, and onion. A study continuation was conducted to determine an NOEC for cucumber. Two study continuations were required to determine an NOEC value for lettuce, carrot, and tomato. The most tolerant species with respect to plant dry weight were cabbage, oat, ryegrass, and onion. The most sensitive species was tomato. The NOEC values (in lb ai/A) for the ten species were:

cabbage = oat = onion = ryegrass (2.0) < corn (0.5) <

soybean (0.125) < lettuce = carrot (0.02) < cucumber (0.0125) < tomato (0.005).

All species tested except ryegrass exhibited a dry weight dose response. Subsequently, no EC values could be determined for ryegrass. The EC values for the remaining nine species are presented in Table 33 (attached).

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** No conclusions were made by the author.

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 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 report states that the spray area is 5.36 ft^2, however, the dimensions given in the report are 12 x 20 inches. It is assumed by the reviewer that the spray plot was actually 3.21 x 1.67 feet.

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 tomato (the most sensitive species) data for dry weight (attached). The result obtained by the use of Dunnett's test for the NOEC value is in agreement with the author's.

The EC_{25} value obtained by use of probit analysis is in near agreement with the author's. The EC_{50} value obtained by the reviewer is less than the EC value obtained by the author. Since 0.03 lb ai/A is a more conservative estimate and will better protect non-target plants, the EC_{50} value for tomato dry weight will be taken to be 0.03 instead of 0.095 lb ai/A.

C. **Discussion/Results:**

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

Phytotoxicity rating: Based on phytotoxicity ratings, all plants except onion demonstrated a significant increase in damage from the highest rate of application (2.0 lb ai/A). Onion was the most tolerant species while tomato was the most sensitive based on the NOEC value.

Plant height: Cabbage, oat, ryegrass, and onion were equally tolerant of BAS 514 H at the maximum application rate with regard to plant height. Lettuce was the most sensitive species based on the NOEC value.

Plant dry weight: Cabbage, oat, ryegrass, and onion were equally tolerant of BAS 514 H at the maximum application rate with regard to plant dry weight. Tomato was the most sensitive species affected based on the NOEC value.

D. **Adequacy of the Study:**

(1) Classification: Core.

(2) Rationale: N/A.

(3) Repairability: N/A.

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

EFED Review dated 8/29/91 (Vegetative Vigor - Quinclorac)

Page____ is not included in this copy.

Pages 8 through 9 are not included.

The material not included contains the following type of information:

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tomato dry weight

Summary Statistics and ANOVA

Transformation = None

Group (rate lb ai/A)	n	Mean	s.d.	cv%
1 = control	3	2.0407	.1537	7.5
2 .00125	3	2.0197	.2071	10.3
3 .0025	3	1.7743	.4150	23.4
4 .005	3	1.7543	.3575	20.4
5* .01	3	1.5127	.1569	10.4
6* .02	3	1.2303	.0779	6.3

NOEC = 0.005 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

Minumum detectable difference for Dunnett's test = -.525184
This difference corresponds to -25.74 percent of control

Between groups sum of squares = 1.438484 with 5 degrees of freedom.

Error mean square = .066197 with 12 degrees of freedom.

Bartlett's test p-value for equality of variances = .351

tomato dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0005	0.0002	0.0009
EC 5.00	0.0016	0.0009	0.0024
EC10.00	0.0031	0.0020	0.0041
EC15.00	0.0048	0.0035	0.0062
EC50.00	0.0309	0.0212	0.0569
EC85.00	0.1976	0.0944	0.7017
EC90.00	0.3066	0.1338	1.2781
EC95.00	0.5875	0.2241	3.1111
EC99.00	1.9902	0.5877	16.5461

$y = 6.94 + 1.28x$

y = % probit inhibition

x = log (rate

$EC_{25} = 0.009$ lb ai/A