DATA EVALUATION RECORD

1.   **CHEMICAL:** Glufosinate.
     Shaughnessy No. 128850.

2.   **TEST MATERIAL:** HOE 039866; Ammonium-DL-homoalanin-
     4yl(methyl)phosphinate; Trade name: Ignite Technical (CAS
     NO. 77182-82-2); 96.2% active ingredient; solid, white
     powder.

3.   **STUDY TYPE:** Vegetative Vigor Nontarget Phytotoxicity Test -
     Tier 2. Species Tested: Soybean, Carrot, Tomato, Cucumber,
     Cabbage, Oat, Corn, and Onion.

4.   **CITATION:** Chetram, R.S. 1989. HOE 039866: Tier II
     Vegetative Vigor Nontarget Phytotoxicity Study. Laboratory
     Project ID No. LR89-45. Conducted by Pan-Agricultural
     Laboratories, Inc., Madera, CA. Submitted by Hoechst
     Celanese Corporation, Somerville, NJ. MRID No. 413961-13.

5.   **REVIEWED By:**

     Judy Awong, Ph.D.   Signature: Judy Awong.
     Staff Scientist
     KBN Engineering and   Date: 6/13/90
     Applied Sciences, Inc.

6.   **APPROVED BY:**

     Pim Kosalwat, Ph.D.   Signature: P. Kosalwat
     Staff Toxicologist
     KBN Engineering and   Date: 6/13/90
     Applied Sciences, Inc.

     Henry T. Craven, M.S.   Signature: R.C. Cisto   M. Kerwood
     Supervisor, EEB/HED   12/24/9
     USEPA   Date: 12/20/9

                                       18 hrs

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7. **CONCLUSIONS:** The study was conducted in a scientifically sound manner. The major inadequacy of the study pertains to the use of only eight plant species instead of the recommended ten plant species as outlined in the SEP guidelines. Minor inconsistencies were detected which did not affect the results of the study.

NOEC values for carrot and tomato were 0.05 lb ai/A HOE 039866. The NOEC values for soybean, cucumber, cabbage, and onion were 0.1 lb ai/A, while the value for corn was 0.2 lb ai/A. The NOEC for oat was 0.8 lb/A, the highest concentration tested. The EC25 and EC50 values for soybean, carrot, tomato, cucumber, cabbage, corn, and onion were <0.75 lb ai/A which is the maximum application rate for HOE 039866. The EC25 and EC50 for oat was >0.75 lb ai/A. Based on the study results, a Tier-III study is required.

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

9. **BACKGROUND:**

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

11. **MATERIALS AND METHODS:**

    A.   **Test Plants:** Dicotyledon plants are represented by soybean, carrot, tomato, cucumber, and cabbage. Monocotyledon plants are represented by corn, oats, and onion. Cultivars, lot number, source, and germination ratings were provided in the report.

    B.   **Test System:** Seeds of each crop were planted in plastic pots (Com-Pack M1725, Black, 7.5 x 7.5 x 6.0 cm) filled with Supersoil, a pasteurized potting soil comprised of fir bark, redwood, Canadian peat, and sand. An analysis of the soil was provided in the report. 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 six species were planted at a depth of 1.3 cm. After planting, the pots were placed outdoors on a bench and covered with bird netting. Seedlings were allowed to grow to the appropriate stage of growth (1-3 true leaves). Prior to treatment, each pot was thinned to five plants of uniform height and stage of growth.

The test spray solution was prepared by dissolving 398.6 mg HOE 039866 in 200 ml of distilled water/Triton X-100 (1000 ppm). Serial dilutions were made of the maximum solution to achieve the lower application rates. A belt sprayer equipped with a single TeeJet 8001-E nozzle was used to apply a single treatment. A nozzle height of 12 inches and a nozzle pressure of 50 psi were used to achieve a spray swath of 20 inches.

Specific study parameters such as photoperiod, temperature, relative humidity and irrigation schedules were included in the report.

C. **Dosage**: HOE 039866 was applied at the rates of 0, 0.05, 0.1, 0.2, 0.4, and 0.8 lb ai/A to all eight plant species. Treatment application rates were calculated on the percent active ingredient of the technical material (i.e., 96.2% ai).

D. **Design**: Each crop/treatment combination was replicated three times (10 seeds/pot, 3 pots/treatment level). After treatment, the pots were randomized within crops and among treatments and placed in a greenhouse. Seedling height was recorded prior to treatment and 21 days after treatment. Phytotoxicity ratings were recorded at 7, 14, and 21 days after treatment. Twenty-one days after treatment, the plants within treatment replicates (pots) were cut at 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.

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 for each 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.

E. **Statistics**: Percent detrimental effect was calculated using the following equation:

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

The percent increase in height from day-0 reading was calculated using the following equation:

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

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

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

A one-way analysis of variance model for data with equal subsamples was used to analyze the data. The percent detrimental effect values on each replicate mean were input into a SAS probit analysis procedure to calculate EC values.

12. <u>REPORTED RESULTS</u>: Table A (attached) lists the NOEC, EC25, and EC50 values, along with the parameters in which these concentrations were observed. Detailed results for each specific parameter are described below.

<u>Phytotoxicity rating</u>. Table 13 (attached) summarizes the NOEC values of HOE 039866 for mean phytotoxicity rating. Treatment of all plant species with HOE 039866 at a concentration of 0.1 lb ai/A resulted in a significant effect ($p < 0.05$) on the day-21 mean phytotoxicity rating of tomato. Treatment with the maximum concentration of 0.8 lb ai/A resulted in a significant effect ($p < 0.05$) on the 21 day mean phytotoxicity rating of all crops except oat. Crops listed (with NOEC, lb ai/A) in order of increasing sensitivity to HOE 039866 based on phytotoxicity rating NOEC values, are as follows:

oat (0.8) < soybean (0.4) < corn (0.2) < carrot = cucumber = cabbage = onion (0.1) < tomato (0.05)

<u>Plant height</u>. Table 14 (attached) summarizes the NOEC, EC25 and EC50 of HOE 039866 on plant height. Treatment of the eight plant species with HOE 039866 at a concentration of 0.1 lb ai/A resulted in a significant effect ($p < 0.05$) on plant height of carrot and tomato at the 21 day observation period. Treatment at a concentration of 0.4 lb ai/A resulted in a significant effect ($p < 0.05$) on plant height of carrot, tomato, cucumber, cabbage, corn, and onion at test termination (21 days). Treatment with the maximum concentration of 0.8 lb ai/A resulted in a significant effect ($p < 0.05$) in all plant species except oat. Oat was the least sensitive species to HOE 039866 while carrot and tomato were the most sensitive. Plant species listed (with NOEC, lb ai/A) in order of increasing sensitivity to HOE

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039866, based on plant height NOEC values, are as follows:

oat (0.8) < soybean (0.4) < cucumber = corn (0.2) < cabbage = onion (0.1) < carrot = tomato (0.05)

All plant species except corn exhibited a plant height dose-response relationship. Crops listed (with EC50, lb ai/A) in order of increasing sensitivity to HOE 039866, based on plant height EC50 values, are as follows:

oat (282) < soybean (1.94) < corn (0.525) < cabbage (0.506) < cucumber (0.488) < tomato (0.260) < onion (0.183) < carrot (0.174)

Plant dry weight. The NOEC, EC25, and EC50 of HOE 039866 for plant dry weight are summarized in Table 15 (attached). Treatment of the eight plant species with HOE 039866 at a concentration of 0.1 lb ai/A resulted in a significant effect (p < 0.05) in plant dry weight of carrot and tomato. Treatment at a concentration of 0.4 lb ai/A resulted in a significant effect (p < 0.05) in plant dry weight of soybean, carrot, tomato, cucumber, cabbage, and onion. Treatment with the maximum concentration of 0.8 lb ai/A resulted in a significant effect (p < 0.05) in plant dry weight of all species except oat. Oat was the least sensitive while carrot and tomato were the most sensitive. Plant species listed (with NOEC, lb ai/A) in order of increasing sensitivity to HOE 039866, based on dry weight NOEC values, are as follows:

oat (0.8) < corn (0.4) < cucumber (0.2) < soybean = cabbage = onion (0.1) < carrot = tomato (0.05)

All plant species exhibited a dry weight dose-response relationship. Plants listed (with EC50, lb ai/A) in order of increasing sensitivity to HOE 039866, based on dry weight EC50 values, are as follows:

oat (5.31) < onion (1.60) < corn (0.59) < soybean (0.437) < cabbage (0.315) < cucumber (0.273) < carrot (0.211) < tomato (0.185)

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**
No conclusions were stated by the author. The study was inspected by the Quality Assurance Unit of Pan-Agricultural Labs, Inc. on several occasions to assure compliance with Good Laboratory Practice (GLP) Standards.

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

A. **Test Procedure:** The test procedures followed the SEP and Subdivision J guidelines except for one major inadequacy.

o Eight plant species were tested (five dicotyledons and three monocotyledons) instead of the recommended ten species listed in the SEP guidelines.

The following minor discrepancies were also observed in the report:

o In the results and discussion section, it was stated that "Treatment with the maximum concentration of 0.8 lb ai/A resulted in a significant affect (p < 0.05) in plant height of all species except oat" (page 24, line 14). This should read "....resulted in a significant effect (p < 0.05) in plant dry weight of all species except oat.

o Discrepancies were found in the numbering of Tables. The results and discussion section refers to Tables 16, 17, and 18 which are not found in the report. These should be Tables 13, 14 and 15, respectively.

B. **Statistical Analysis:** Statistical analyses were conducted by the reviewer for selected species and parameters using the analysis of variance with Tukey's, Bonferroni's and Dunnett's tests (attached). The results were in general agreement with those presented by the author.

EC25 and EC50 values for selected species were calculated by the reviewer using a Lotus 1-2-3 regression analysis (attached). The results were in general agreement with those presented by the author except for the calculated EC25 value for cabbage based on plant height (Table 14). The reviewer's calculated EC25 value of 0.212 lb ai/A is not in agreement with the author's EC25 value of 1.19 lb ai/A.

C. **Discussion/Results:** This report is considered to be scientifically valid. Treatment with the maximum concentration of 0.8 lb ai/A resulted in a significant effect (p < 0.05) on the 21 day mean phytotoxicity rating of all crops except oat. The same effect was observed for plant height and plant dry weight at the 21 day observation period. Oat was the least sensitive plant species to HOE 039866 while carrot and tomato

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b

were the most sensitive.

Based on the author's and the reviewer's statistical analyses, the NOEC values for carrot and tomato were 0.05 lb ai/A HOE 039866. The NOEC values for soybean, cucumber, cabbage, and onion were 0.1 lb ai/A, while the value for corn was 0.2 lb ai/A. The NOEC for oat was 0.8 lb/A, the highest concentration tested. The EC25 and EC50 values for soybean, carrot, tomato, cucumber, cabbage, corn, and onion were <0.75 lb ai/A which is the maximum application rate for HOE 039866. The EC25 and EC50 for oat was >0.75 lb ai/A. Based on the study results, a Tier-III study is required.

D. **Adequacy of the Study:**

(1) **Classification:** Supplemental.

(2) **Rationale:** SEP and Subdivision J guidelines recommend the testing of ten plant species. This report included only eight plant species.

(3) **Repairability:** Pending satisfactory explanations on the stated inadequacies in Sections 14.A.

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

The following table lists the lowest observed no-effect concentration (lb ai/A). EC_{25} and EC_{50} values, along with the parameter in which these concentrations were observed.

Plant Species	No-effect Concentration	Parameter[y] Measured	EC_{25}	Parameter Measured	EC_{50}	Parameter Measured
Soybean	0.1	dw	0.205	dw	0.437	dw
Carrot	0.05	ph,dw	0.063	dw	0.174	ph
Tomato	0.05	ph,pr,dw	0.086	dw	0.185	dw
Cucumber	0.1	pr	0.161	dw	0.273	dw
Cabbage	0.1	ph,pr,dw	0.168	dw	0.315	dw
Oat	0.8	ph,pr,dw	0.994	dw	5.31	dw
Corn	0.2	ph,pr	0.310	ph	0.525	ph
Onion	0.1	ph,pr,dw	0.106	ph	0.183	ph

[y] ph - plant height, pr - phytotoxicity ratings, dw - dry weight determinations.

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Table 13. Statistical no effect concentration* (lb ai/A) and the the mean phytotoxicity rating** at that concentration rate of HOE 039866 on plants 21 days prior to harvest.

Plant Species	No-effect Concentration	Mean Phytotoxicity Rating
Soybean	0.4	0.1
Carrot	0.1	0.9
Tomato	0.05	0.2
Cucumber	0.1	0.3
Cabbage	0.1	0.1
Oat	0.8	0.3
Corn	0.2	0.0
Onion	0.1	0.3

* Highest treatment concentration which was statistically similar to the control, according to Duncan's New Multiple Range Test (p< 0.05).

** Phytotoxicity ratings based on 0-4 scale, with 0 = no effect, 1 = slight effect limited to one leaf, 2 = moderate effect on whole plant, 3 = severe effect on whole plant, and 4 = total effect or plant death.

Table 14. Statistical no-effect concentration* (lb ai/A) rate of HOE 039866 on plant height, along with EC25 and EC50 values.

Plant Species	No-effect Concentration	EC25	EC50
Soybean	0.4	0.620	1.94
Carrot	0.05	0.067	0.174
Tomato	0.05	0.101	0.260
Cucumber	0.2	0.284	0.488
Cabbage	0.1	1.19	0.506
Oat	0.8	11.9	282
Corn	0.2	0.310	0.525
Onion	0.1	0.106	0.183

* Highest treatment concentration which was statistically similar to the control, 21 days after treatments, according to Duncan's New Multiple Range Test ($p < 0.05$).

Table 15. Statistical no-effect concentration* (lb ai/A) rate of HOE 039866 on plant dry weight, along with EC25 and EC50 values.

Plant Species	No-effect Concentration	EC25	EC50
Soybean	0.1	0.205	0.437
Carrot	0.05	0.063	0.211
Tomato	0.05	0.086	0.185
Cucumber	0.2	0.161	0.273
Cabbage	0.1	0.168	0.315
Oat	0.8	0.994	5.31
Corn	0.4	0.401	0.590
Onion	0.1	0.533	1.60

* Highest treatment concentration which was statistically similar to the control, 21 days after treatment, according to Duncan's New Multiple Range Test (p < 0.05).

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ANOVA - for onion - phytotoxicity data at day 21

Analysis of Variance   File: hoeoniph   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: PH

* Indicates statistics are collapsed over this factor

Factors:	T	R	Treatment	N	Mean	S.D.
	*	*	Glufosinate (lb ai/A)	90	1.6333	1.8929
	1	*	Control	15	0.0000	0.0000
	2	*	0.05	15	0.0000	0.0000
	3	*	0.10	15	0.2667	0.7037
*	4	*	0.20	15	2.3333	1.9149
*	5	*	0.40	15	3.2000	1.3202
. *	6	*	0.80	15	4.0000	0.0000
	*	1		30	1.5667	1.8511
	*	2		30	1.7667	1.9241
	*	3		30	1.5667	1.9597
	1	1		5	0.0000	0.0000
	1	2		5	0.0000	0.0000
	1	3		5	0.0000	0.0000
	2	1		5	0.0000	0.0000
	2	2		5	0.0000	0.0000
	2	3		5	0.0000	0.0000
	3	1		5	0.4000	0.8944
	3	2		5	0.4000	0.8944
	3	3		5	0.0000	0.0000
	4	1		5	2.8000	1.7889
	4	2		5	2.6000	1.9494
	4	3		5	1.6000	2.1909
	5	1		5	2.2000	1.7889
	5	2		5	3.6000	0.8944
	5	3		5	3.8000	0.4472
	6	1		5	4.0000	0.0000
	6	2		5	4.0000	0.0000
	6	3		5	4.0000	0.0000

Fmax for testing homogeneity of between subjects variances: Not defined

Analysis of Variance   Dependent variable: PH

Source	df	SS (H)	MSS	F	P
Between Subjects	89	318.9000			
T (TRT)	5	236.2333	47.2467	48.320	0.0000
R (REP)	2	0.8000	0.4000	0.409	0.6682
TR	10	11.4667	1.1467	1.173	0.3210
Subj w Groups	72	70.4000	0.9778		

* Indicates significant effect. ($p < 0.05$)

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FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	0.000	6	4.000
2	0.000		
3	0.267		
4	2.333		
5	3.200		

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 = 2			
1 < 3			
1 < 4	0.0100	0.0000	0.0100
1 < 5	0.0100	0.0000	0.0100
1 < 6	0.0100	0.0000	0.0100
2 < 3			N.A.
2 < 4	0.0100	0.0000	N.A.
2 < 5	0.0100	0.0000	N.A.
2 < 6	0.0100	0.0000	N.A.
3 < 4	0.0100	0.0000	N.A.
3 < 5	0.0100	0.0000	N.A.
3 < 6	0.0100	0.0000	N.A.
4 < 5			N.A.
4 < 6	0.0100	0.0003	N.A.
5 < 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	1.567
2	1.767
3	1.567

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 = 3			
2 > 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

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ANOVA for tomato - phytotoxicity data at day 21.

Analysis of Variance   File: hoetomph   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: PH

* Indicates statistics are collapsed over this factor

Factors: T R   *Treatment:-*

T	R		N	Mean	S.D.
*	*	Glufosinate (lb ai/A)	90	1.7444	1.7194
1	*	Control	15	0.0000	0.0000
2	*	0.05 lb ai/A	15	0.2000	0.7746
3	*	0.10 "	15	0.6000	0.9856
*4	*	0.20 "	15	2.2667	0.8837
*5	*	0.40 "	15	3.4000	0.7368
*6	*	0.80 "	15	4.0000	0.0000
*	1		30	1.7667	1.8134
*	2		30	1.7000	1.7050
*	3		30	1.7667	1.6955
1	1		5	0.0000	0.0000
1	2		5	0.0000	0.0000
1	3		5	0.0000	0.0000
2	1		5	0.0000	0.0000
2	2		5	0.0000	0.0000
2	3		5	0.6000	1.3416
3	1		5	0.4000	0.8944
3	2		5	0.6000	0.8944
3	3		5	0.8000	1.3038
4	1		5	2.6000	1.1402
4	2		5	2.2000	0.8367
4	3		5	2.0000	0.7071
5	1		5	3.6000	0.5477
5	2		5	3.4000	0.5477
5	3		5	3.2000	1.0954
6	1		5	4.0000	0.0000
6	2		5	4.0000	0.0000
6	3		5	4.0000	0.0000

Fmax for testing homogeneity of between subjects variances: Not defined

Analysis of Variance   Dependent variable: PH

Source	df	SS (H)	MSS	F	P
Between Subjects	89	263.1222			
T (TRT)	5	222.5889	44.5178	85.247	0.0000
R (REP)	2	0.0889	0.0444	0.085	0.9191
TR	10	2.8444	0.2844	0.545	0.8536
Subj w Groups	72	37.5999	0.5222		

* Indicates significant effect ($p < 0.05$)

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FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	0.000	6	4.000
2	0.200		
3	0.600		
4	2.267		
5	3.400		

		Bon-	
Comparison	Tukey-A*	ferroni	Dunnett
1 < 2			
1 < 3			
1 < 4	0.0100	0.0000	0.0100
1 < 5	0.0100	0.0000	0.0100
1 < 6	0.0100	0.0000	0.0100
2 < 3			N.A.
2 < 4	0.0100	0.0000	N.A.
2 < 5	0.0100	0.0000	N.A.
2 < 6	0.0100	0.0000	N.A.
3 < 4	0.0100	0.0000	N.A.
3 < 5	0.0100	0.0000	N.A.
3 < 6	0.0100	0.0000	N.A.
4 < 5	0.0100	0.0009	N.A.
4 < 6	0.0100	0.0000	N.A.
5 < 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

  For Dunnett's test only the P-values .05 and .01 are possible
  and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	1.767
2	1.700
3	1.767

		Bon-	
Comparison	Tukey-A*	ferroni	Dunnett
1 > 2			
1 = 3			
2 < 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

  For Dunnett's test only the P-values .05 and .01 are possible
  and only for comparisons with the control mean (level 1).

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ANOVA: for cabbage - phytoxicity data at day 21

Analysis of Variance   File: hoecabph   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: PH

* Indicates statistics are collapsed over this factor

Factors:	T	R	Treatment	N	Mean	S.D.
	*	*	Glufosinate (lb ai/A)	90	1.1556	1.2800
	1	*	Control (0.0)	15	0.0000	0.0000
	2	*	0.05	15	0.0000	0.0000
	3	*	0.10	15	0.1333	0.3519
*	4	*	0.20	15	1.8000	0.9411
*	5	*	0.40	15	2.0667	0.7037
*	6	*	0.80	15	2.9333	0.4577
	*	1		30	1.1333	1.2243
	*	2		30	1.1667	1.3412
	*	3		30	1.1667	1.3153
	1	1		5	0.0000	0.0000
	1	2		5	0.0000	0.0000
	1	3		5	0.0000	0.0000
	2	1		5	0.0000	0.0000
	2	2		5	0.0000	0.0000
	2	3		5	0.0000	0.0000
	3	1		5	0.2000	0.4472
	3	2		5	0.2000	0.4472
	3	3		5	0.0000	0.0000
	4	1		5	1.6000	0.8944
	4	2		5	1.8000	0.8367
	4	3		5	2.0000	1.2247
	5	1		5	2.2000	0.4472
	5	2		5	2.0000	1.2247
	5	3		5	2.0000	0.0000
	6	1		5	2.8000	0.4472
	6	2		5	3.0000	0.7071
	6	3		5	3.0000	0.0000

Fmax for testing homogeneity of between subjects variances: Not defined

Analysis of Variance   Dependent variable: PH

Source	df	SS (H)	MSS	F	P
Between Subjects	89	145.8222			
T (TRT)	5	121.8222	24.3644	75.614	0.0000
R (REP)	2	0.0222	0.0111	0.034	0.9664
TR	10	0.7778	0.0778	0.241	0.9909
Subj w Groups	72	23.2000	0.3222		

* Indicates significant effect ($p < 0.05$)

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Analysis of Variance   File: hoecabph   Date: 06-01-1990

FILTER: None

Post-hoc tests for factor T (TRT)

Level   Mean   Level   Mean
  1   0.000   6   2.933
  2   0.000
  3   0.133
  4   1.800
  5   2.067

                              Bon-
Comparison   Tukey-A*   ferroni   Dunnett
  1 = 2
  1 < 3
  1 < 4   0.0100   0.0000   0.0100
  1 < 5   0.0100   0.0000   0.0100
  1 < 6   0.0100   0.0000   0.0100
  2 < 3   N.A.
  2 < 4   0.0100   0.0000   N.A.
  2 < 5   0.0100   0.0000   N.A.
  2 < 6   0.0100   0.0000   N.A.
  3 < 4   0.0100   0.0000   N.A.
  3 < 5   0.0100   0.0000   N.A.
  3 < 6   0.0100   0.0000   N.A.
  4 < 5   N.A.
  4 < 6   0.0100   0.0000   N.A.
  5 < 6   0.0100   0.0013   N.A.

    * The only possible P-values are .01, .05 or .10 (up to 0.1000).
      A blank means the P-value is greater than 0.1000.

      For Dunnett's test only the P-values .05 and .01 are possible
      and only for comparisons with the control mean (level 1).

_____

Post-hoc tests for factor R (REP)

Level   Mean
  1   1.133
  2   1.167
  3   1.167

                              Bon-
Comparison   Tukey-A*   ferroni   Dunnett
  1 < 2
  1 < 3
  2 = 3   N.A.

    * The only possible P-values are .01, .05 or .10 (up to 0.1000).
      A blank means the P-value is greater than 0.1000.

      For Dunnett's test only the P-values .05 and .01 are possible
      and only for comparisons with the control mean (level 1).

17

ANOVA: for carrot - phytoxicity data for day 21

Analysis of Variance   File: hoecarph   Date: 05-31-1990

FILTER: None

N's, means and standard deviations based on dependent variable: PH

   * Indicates statistics are collapsed over this factor

Factors: T R	Treatment (Glufosinate) lb ai/A	N	Mean	S.D.
* *		90	1.4333	1.4994
1 *-	Control	15	0.0000	0.0000
2 *-	0.05	15	0.1333	0.5164
3 *-	0.10	15	0.8667	1.1255
✱ 4 *-	0.20	15	2.2000	1.0823
✱ 5 *-	0.40	15	2.2000	1.2649
✱ 6 *-	0.80	15	3.2000	1.0142
* 1		30	1.2667	1.5522
* 2		30	1.6667	1.5388
* 3		30	1.3667	1.4260
1 1		5	0.0000	0.0000
1 2		5	0.0000	0.0000
1 3		5	0.0000	0.0000
2 1		5	0.0000	0.0000
2 2		5	0.4000	0.8944
2 3		5	0.0000	0.0000
3 1		5	0.6000	0.8944
3 2		5	1.6000	1.3416
3 3		5	0.4000	0.8944
4 1		5	2.4000	1.5166
4 2		5	1.6000	0.8944
4 3		5	2.6000	0.5477
5 1		5	1.4000	1.5166
5 2		5	3.0000	0.7071
5 3		5	2.2000	1.0954
6 1		5	3.2000	1.0954
6 2		5	3.4000	1.3416
6 3		5	3.0000	0.7071

Fmax for testing homogeneity of between subjects variances: Not defined

Analysis of Variance   Dependent variable: PH

Source	df	SS (H)	MSS	F	P
Between Subjects	89	200.1000			
T (TRT)	5	125.4333	25.0867	29.905	0.0000
R (REP)	2	2.6000	1.3000	1.550	0.2177
TR	10	11.6667	1.1667	1.391	0.2006
Subj w Groups	72	60.4000	0.8389		

* Indicates significant effect ($p < 0.05$)

18

FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	0.000	6	3.200
2	0.133		
3	0.867		
4	2.200		
5	2.200		

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 < 3			0.0500
1 < 4	0.0100	0.0000	0.0100
1 < 5	0.0100	0.0000	0.0100
1 < 6	0.0100	0.0000	0.0100
2 < 3			N.A.
2 < 4	0.0100	0.0000	N.A.
2 < 5	0.0100	0.0000	N.A.
2 < 6	0.0100	0.0000	N.A.
3 < 4	0.0100	0.0026	N.A.
3 < 5	0.0100	0.0026	N.A.
3 < 6	0.0100	0.0000	N.A.
4 = 5			N.A.
4 < 6	0.0500	0.0573	N.A.
5 < 6	0.0500	0.0573	N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	1.267
2	1.667
3	1.367

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 < 3			
2 > 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

19

ANOVA : for onion – plant height data at day 21.

Analysis of Variance   File: hoeoniht   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: HT

 * Indicates statistics are collapsed over this factor

Factors:	T	R	Treatment	N	Mean	S.D.
	*	*	Glufosinate (lb ai/A)	90	113.1222	87.0004
	1	*	Control	15	198.7333	21.3724
	2	*	0.05	15	182.8667	22.8874
	3	*	0.10	15	179.7333	34.2522
*	4	*	0.20	15	74.4000	70.0885
**	5	*	0.40	15	37.8667	54.5696
*	6	*	0.80	15	5.1333	9.2803
	*	1		30	120.5667	90.4684
	*	2		30	106.2333	84.8360
	*	3		30	112.5667	87.9819
	1	1		5	193.0000	22.1698
	1	2		5	200.2000	16.8434
	1	3		5	203.0000	27.5136
	2	1		5	199.6000	19.6545
	2	2		5	180.4000	15.2086
	2	3		5	168.6000	24.5723
	3	1		5	198.6000	16.9941
	3	2		5	153.0000	46.1628
	3	3		5	187.6000	16.4560
	4	1		5	55.2000	75.2708
	4	2		5	71.0000	64.6375
	4	3		5	97.0000	78.9683
	5	1		5	77.0000	68.1469
	5	2		5	32.8000	48.0541
	5	3		5	3.8000	8.4971
	6	1		5	0.0000	0.0000
	6	2		5	0.0000	0.0000
	6	3		5	15.4000	10.1882

Fmax for testing homogeneity of between subjects variances: Not defined

Analysis of Variance   Dependent variable: HT

Source	df	SS (H)	MSS	F	P
Between Subjects	89	673647.7500			
T (TRT)	5	531824.9400	106364.9840	66.819	0.0000
R (REF)	2	3095.5554	1547.7777	0.972	0.3876
TR	10	24114.7090	2411.4709	1.515	0.1507
Subj w Groups	72	114612.5620	1591.8412		

* Indicates significant effect ($p < 0.05$)

FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	198.733	6	5.133
2	182.867		
3	179.733		
4	74.400		
5	37.867		

		Bon-	
Comparison	Tukey-A*	ferroni	Dunnett
1 > 2			
1 > 3			
1 > 4	0.0100	0.0000	0.0100
1 > 5	0.0100	0.0000	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3			N.A.
2 > 4	0.0100	0.0000	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4	0.0100	0.0000	N.A.
3 > 5	0.0100	0.0000	N.A.
3 > 6	0.0100	0.0000	N.A.
4 > 5			N.A.
4 > 6	0.0100	0.0000	N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	120.567
2	106.233
3	112.567

		Bon-	
Comparison	Tukey-A*	ferroni	Dunnett
1 > 2			
1 > 3			
2 < 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

21

ANOVA: for tomato - plant height data at day 21.

Analysis of Variance   File: hoetomht   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: HT

* Indicates statistics are collapsed over this factor

Factors:	T	R	Treatment	N	Mean	S.D.
	*	*	Glufosinate (lb ai/A)	90	65.7556	33.7487
	1	*	Control	15	101.8667	13.0048
	2	*	0.05	15	103.5333	17.9000
	3	*	0.10	15	75.7333	23.5599
	4	*	0.20	15	49.2000	16.0187
	5	*	0.40	15	36.2667	9.9747
	6	*	0.80	15	27.9333	6.9946
	*	1		30	63.9667	34.4078
	*	2		30	64.5667	32.9113
	*	3		30	68.7333	34.8494
	1	1		5	101.0000	14.2302
	1	2		5	95.2000	3.2711
	1	3		5	109.4000	15.8524
	2	1		5	107.0000	10.4403
	2	2		5	96.8000	13.6638
	2	3		5	106.8000	27.2158
	3	1		5	73.2000	20.9690
	3	2		5	83.0000	32.2568
	3	3		5	71.0000	18.9868
	4	1		5	44.4000	9.2898
	4	2		5	50.4000	23.9019
	4	3		5	52.8000	13.9176
	5	1		5	31.8000	6.7602
	5	2		5	34.6000	1.6733
	5	3		5	42.4000	14.9766
	6	1		5	26.4000	5.3198
	6	2		5	27.4000	6.6558
	6	3		5	30.0000	9.4868

Fmax for testing homogeneity of between subjects variances: 371.61
Number of variances= 18   df per variance= 4.

Analysis of Variance   Dependent variable: HT

Source	df	SS (H)	MSS	F	P
Between Subjects	89	101368.6250			
T (TRT)	5	81073.9530	16214.7910	63.061	0.0000
R (REP)	2	404.4222	202.2111	0.786	0.4633
TR	10	1377.0443	137.7044	0.536	0.8604
Subj w Groups	72	18513.2109	257.1279		

* Indicates significant effect (p < 0.05)

22

Analysis of Variance   File: hoetomht   Date: 06-01-1990

FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	101.867	6	27.933
2	103.533		
3	75.733		
4	49.200		
5	36.267		

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 > 3	0.0100	0.0005	0.0100
1 > 4	0.0100	0.0000	0.0100
1 > 5	0.0100	0.0000	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3	0.0100	0.0000	N.A.
2 > 4	0.0100	0.0000	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4	0.0100	0.0004	N.A.
3 > 5	0.0100	0.0000	N.A.
3 > 6	0.0100	0.0000	N.A.
4 > 5			N.A.
4 > 6	0.0100	0.0081	N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

  For Dunnett's test only the P-values .05 and .01 are possible
  and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	63.967
2	64.567
3	68.733

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 < 3			
2 < 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

  For Dunnett's test only the P-values .05 and .01 are possible
  and only for comparisons with the control mean (level 1).

23

ANOVA: for cabbage - plant height data at day 21.

Analysis of Variance   File: hoecabht   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: HT

  * Indicates statistics are collapsed over this factor

Factors: T R	Treatment	N	Mean	S.D.
* *	Glufosinate (1b ai/A)	90	53.9444	19.1765
1 *-	Control (0.0)	15	70.8667	8.3910
2 *-	0.05	15	71.2667	6.6705
3 *-	0.10	15	65.9333	10.9705
4 *-	0.20	15	47.1333	12.0408
5 *-	0.40	15	38.1333	14.7157
6 *-	0.60	15	30.3333	6.6189
* 1		30	55.3667	18.7699
* 2		30	52.2000	19.5014
* 3		30	54.2667	19.7640
1 1		5	77.4000	6.1482
1 2		5	65.2000	4.8683
1 3		5	70.0000	9.5131
2 1		5	67.6000	3.6469
2 2		5	72.2000	9.1214
2 3		5	74.0000	5.6569
3 1		5	63.8000	15.5467
3 2		5	63.0000	6.8920
3 3		5	71.0000	9.1378
4 1		5	53.8000	12.7554
4 2		5	46.4000	12.5220
4 3		5	41.2000	9.3648
5 1		5	36.2000	11.7771
5 2		5	39.2000	21.5337
5 3		5	39.0000	12.1861
6 1		5	33.4000	3.4351
6 2		5	27.2000	9.5237
6 3		5	30.4000	5.1769

Fmax for testing homogeneity of between subjects variances: 39.30
Number of variances= 18   df per variance=   4.

Analysis of Variance   Dependent variable: HT

Source	df	SS (H)	MSS	F	P
Between Subjects	89	32728.7246			
T (TRT)	5	23760.3203	4752.0640	44.078	0.0000
R (REP)	2	155.0889	77.5444	0.719	0.4943
TR	10	1050.9111	105.0911	0.975	0.4766
Subj w Groups	72	7762.4043	107.8112		

* Indicates significant effect $(p < 0.05)$

24

FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	70.867	6	30.333
2	71.267		
3	65.933		
4	47.133		
5	38.133		

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 > 3			
1 > 4	0.0100	0.0000	0.0100
1 > 5	0.0100	0.0000	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3			N.A.
2 > 4	0.0100	0.0000	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4	0.0100	0.0000	N.A.
3 > 5	0.0100	0.0000	N.A.
3 > 6	0.0100	0.0000	N.A.
4 > 5			N.A.
4 > 6	0.0100	0.0006	N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	55.367
2	52.200
3	54.267

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 > 2			
1 > 3			
2 < 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

25

ANOVA: for carrot – plant height data at day 21.

Analysis of Variance   File: hoecarhh   Date: 05-31-1990

FILTER: None

N's, means and standard deviations based on dependent variable: PH

 * Indicates statistics are collapsed over this factor

Factors:	T	R	Treatment Glufosinate (lb ai/A)	N	Mean	S.D.
	*	*		90	59.9222	40.2959
	1	*	– Control	15	106.8667	21.3303
	2	*	– 0.05	15	93.3333	23.8827
*	3	*	– 0.10	15	67.1333	29.0243
*	4	*	– 0.20	15	41.9333	25.4936
*	5	*	– 0.40	15	35.1333	26.8617
*	6	*	– 0.60	15	15.1333	17.7718
	*	1		30	63.4667	38.2079
	*	2		30	57.4333	46.8348
	*	3		30	58.8667	36.1851
	1	1		5	95.8000	17.5983
	1	2		5	126.4000	15.2414
	1	3		5	98.4000	18.1879
	2	1		5	103.0000	12.4700
	2	2		5	81.2000	33.0257
	2	3		5	95.8000	21.0167
	3	1		5	75.4000	24.0790
	3	2		5	58.0000	42.1426
	3	3		5	68.0000	20.0499
	4	1		5	42.4000	28.7106
	4	2		5	48.8000	25.8109
	4	3		5	34.6000	25.6476
	5	1		5	53.6000	29.8211
	5	2		5	18.6000	14.4499
	5	3		5	33.2000	25.5871
	6	1		5	10.6000	14.7241
	6	2		5	11.6000	25.9384
	6	3		5	23.2000	9.6540

Fmax for testing homogeneity of between subjects variances: 19.06
Number of variances= 18   df per variance=   4.

Analysis of Variance   Dependent variable: PH

Source	df	SS (H)	MSS	F	P
Between Subjects	89	144514.4840			
T (TRT)	5	94743.2500	18948.6504	33.431	0.0000
R (REP)	2	596.1555	298.0778	0.526	0.5962
TR	10	8365.4443	836.5444	1.476	0.1651
Subj w Groups	72	40809.6250	566.8004		

* Indicates significant effect ($p < 0.05$)

26

FILTER: None

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	106.867	6	15.133
2	93.333		
3	67.133		
4	41.933		
5	35.133		

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 > 2			
1 > 3	0.0100	0.0004	0.0100
1 > 4	0.0100	0.0000	0.0100
1 > 5	0.0100	0.0000	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3	0.0500	0.0535	N.A.
2 > 4	0.0100	0.0000	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4	0.1000	0.0745	N.A.
3 > 5	0.0100	0.0069	N.A.
3 > 6	0.0100	0.0000	N.A.
4 > 5			N.A.
4 > 6	0.0500	0.0437	N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

Post-hoc tests for factor R (REP)

Level	Mean
1	63.467
2	57.433
3	58.867

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 > 2			
1 > 3			
2 < 3			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible
and only for comparisons with the control mean (level 1).

ANOVA: for carrot - plant dry weight data at day 21

Analysis of Variance   File: hoecardw   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: DW

* Indicates statistics are collapsed over this factor

Factors: T Treatment:	N	Mean	S.D.
* Glufosinate (lb ai/A)	18	21.2778	10.7145
1-Control	3	36.0000	9.5394
2-0.05	3	31.3333	4.5092
3- 0.10	3	21.6667	5.1316
4 - 0.20	3	15.6667	2.0817
5 - 0.40	3	13.6667	2.8868
6 - 0.80	3	9.3333	0.5774

Fmax for testing homogeneity of between subjects variances: 273.00
Number of variances= 6   df per variance= 2.

Analysis of Variance   Dependent variable: DW

Source	df	SS (H)	MSS	F	P
Between Subjects	17	1951.6111			
T (TRT)	5	1650.2778	330.0556	13.144	0.0002
Subj w Groups	12	301.3333	25.1111		

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	36.000	6	9.333
2	31.333		
3	21.667		
4	15.667		
5	13.667		

✱ Indicates significant effect (p < 0.05)

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 > 2			
1 > 3	0.0500	0.0659	0.0500
1 > 4	0.0100	0.0052	0.0100
1 > 5	0.0100	0.0024	0.0100
1 > 6	0.0100	0.0005	0.0100
2 > 3			N.A.
2 > 4	0.0500	0.0366	N.A.
2 > 5	0.0100	0.0155	N.A.
2 > 6	0.0100	0.0027	N.A.
3 > 4			N.A.
3 > 5			N.A.
3 > 6	0.1000		N.A.
4 > 5			N.A.
4 > 6			N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.   28

For Dunnett's test only the P-values .05 and .01 are possible

ANOVA: for cucumber - plant dry weight at day 21.

Analysis of Variance   File: hoecucdw   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: DW

* Indicates statistics are collapsed over this factor

Factors: T   *Treatment*

	N	Mean	S.D.
Glufosinate (16 ai /A)	18	312.8333	196.6392
1 - Control	3	447.0000	89.6883
2 - 0.05	3	562.0000	89.2693
3 - 0.10	3	385.6667	69.3710
4 - 0.20	3	338.6667	50.2129
¥ 5 - 0.40	3	86.0000	21.7025
¥ 6 - 0.80	3	57.6667	30.3535

Fmax for testing homogeneity of between subjects variances: 17.08
Number of variances= 6   df per variance=   2.

Analysis of Variance   Dependent variable: DW

Source	df	SS (H)	MSS	F	P
Between Subjects	17	657338.5000			
T (TRT)	5	607860.5000	121572.1020	29.485	0.0000
Subj w Groups	12	49478.0000	4123.1665		

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	447.000	6	57.667
2	562.000		
3	385.667		
4	338.667		
5	86.000		

¥ Indicates significant effect (p <0.05)

Comparison	Tukey-A*	Bonferroni	Dunnett
1 < 2			
1 > 3			
1 > 4			
1 > 5	0.0100	0.0003	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3	0.0500	0.0852	N.A.
2 > 4	0.0500	0.0171	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4			N.A.
3 > 5	0.0100	0.0016	N.A.
3 > 6	0.0100	0.0008	N.A.
4 > 5	0.0100	0.0067	N.A.
4 > 6	0.0100	0.0028	N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.

For Dunnett's test only the P-values .05 and .01 are possible

ANOVA: for cabbage – plant dry weight data at day 21

Analysis of Variance   File: hoecabdw   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: DW

    * Indicates statistics are collapsed over this factor

Factors: T	Treatment (Glufosinate) lb ai/A	N	Mean	S.D.
*		18	58.0000	29.2454
1 – Control		3	83.0000	5.2915
2 – 0.05		3	87.0000	9.6437
3 – 0.10		3	85.3333	3.2146
4 – 0.20		3	42.6667	2.8868
5 – 0.40		3	32.0000	5.5678
6 – 0.80		3	18.0000	3.6056

Fmax for testing homogeneity of between subjects variances: 11.16
Number of variances= 6   df per variance=   2.

Analysis of Variance   Dependent variable: DW

Source	df	SS (H)	MSS	F	P
Between Subjects	17	14540.0000			
T (TRT)	5	14172.6660	2834.5332	92.598	0.0000
Subj w Groups	12	367.3340	30.6112		

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	83.000	6	18.000
2	87.000		
3	85.333		
4	42.667		
5	32.000		

* Indicates significant effect (p < 0.05)

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 < 2			
1 < 3			
1 > 4	0.0100	0.0000	0.0100
1 > 5	0.0100	0.0000	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3			N.A.
2 > 4	0.0100	0.0000	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4	0.0100	0.0000	N.A.
3 > 5	0.0100	0.0000	N.A.
3 > 6	0.0100	0.0000	N.A.
4 > 5			N.A.
4 > 6	0.0100	0.0024	N.A.
5 > 6	0.1000		N.A.

    * The only possible P-values are .01, .05 or .10 (up to 0.1000).
      A blank means the P-value is greater than 0.1000.   30

    For Dunnett's test only the P-values .05 and .01 are possible

ANOVA – for tomato – plant dry weight at day 21

Analysis of Variance   File: hoetomdw   Date: 06-01-1990

FILTER: None

N's, means and standard deviations based on dependent variable: DW

* Indicates statistics are collapsed over this factor

Factors:		N	Mean	S.D.
T	Treatment			
*	Glufosinate (lb ai/A)	18	37.0000	23.6519
1 –	Control	3	66.0000	11.7898
2 –	0.05	3	65.6667	1.5275
** 3 –	0.10	3	40.3333	10.0664
* 4 –	0.20	3	23.3333	3.0551
* 5 –	0.40	3	16.0000	1.0000
* 6 –	0.80	3	10.6667	3.0551

Fmax for testing homogeneity of between subjects variances: 139.00
Number of variances= 6   df per variance=   2.

Analysis of Variance   Dependent variable: DW

Source	df	SS (H)	MSS	F	P
Between Subjects	17	9510.0000			
T (TRT)	5	8985.3330	1797.0667	41.102	0.0000
Subj w Groups	12	524.6670	43.7222		

Post-hoc tests for factor T (TRT)

Level	Mean	Level	Mean
1	66.000	6	10.667
2	65.667		
3	40.333		
4	23.333		
5	16.000		

* Indicates significant effect (p<0.05)

Comparison	Tukey-A*	Bon-ferroni	Dunnett
1 > 2			
1 > 3	0.0100	0.0074	0.0100
1 > 4	0.0100	0.0000	0.0100
1 > 5	0.0100	0.0000	0.0100
1 > 6	0.0100	0.0000	0.0100
2 > 3	0.0100	0.0082	N.A.
2 > 4	0.0100	0.0000	N.A.
2 > 5	0.0100	0.0000	N.A.
2 > 6	0.0100	0.0000	N.A.
3 > 4	0.1000		N.A.
3 > 5	0.0100	0.0112	N.A.
3 > 6	0.0100	0.0023	N.A.
4 > 5			N.A.
4 > 6			N.A.
5 > 6			N.A.

* The only possible P-values are .01, .05 or .10 (up to 0.1000).
  A blank means the P-value is greater than 0.1000.   31

  For Dunnett's test only the P-values .05 and .01 are possible

EC_{50} & EC_{25} Determinations :-

```
 1
 2   g1u/carrot/dry weight
 3
 4   TRT(conc)  %effect  log conc  probit(%effect)
 5        0        0       0.00
 6     0.05      -14      -1.30        3.92
 7      0.1      -42      -1.00        4.8
 8      0.2      -56      -0.70        5.15
 9      0.4      -61      -0.40        5.28
10      0.8      -72      -0.10        5.58
11
12             Regression Output:
13   Constant                       5.828332
14   Std Err of Y Est               0.248408
15   R Squared                      0.886368
16   No. of Observations                   5
17   Degrees of Freedom                    3
18
19   X Coefficient(s)   1.262332
20   Std Err of Coef.   0.260949
06-Jun-90   10:10 AM
```

Regression Equation :-

$$Y = 5.83 + 1.26X$$

Calculated EC_{50} = 0.221 lb ai/A

Calculated EC_{25} = 0.065 lb ai/A

32

EC_{50} & EC_{25} values determination :-

```
 1
 2    cabbage/dry weight
 3
 4    TRT(conc)  %effect  log conc  probit(%effect)
 5        0         0       0.00
 6       0.05       5      -1.30
 7       0.1        4      -1.00
 8       0.2      -48      -0.70         4.95
 9       0.4      -61      -0.40         5.28
10       0.8      -78      -0.10         5.77
11
12              Regression Output:
13    Constant                      5.87552
14    Std Err of Y Est              0.065319
15    R Squared                     0.987468
16    No. of Observations                  3
17    Degrees of Freedom                   1
18
19    X Coefficient(s)   1.361990
20    Std Err of Coef.   0.153433
06-Jun-90   10:59 AM
```

Regression Equation :

$$Y = 5.88 + 1.36 X$$

Calculated EC_{50} = 0.229 lb ai/A

Calculated EC_{25} = 0.074 lb ai/A

EC_{50} & EC_{25} determination:

```
 1
 2    glu/cucumber/dry weight
 3
 4    TRT(conc)  %effect  log conc  probit(%effect)
 5         0         0      0.00
 6        0.05       26    -1.30
 7        0.1       -14    -1.00        3.92
 8        0.2       -24    -0.70        4.29
 9        0.4       -81    -0.40        5.88
10        0.8       -87    -0.10        6.13
11                Regression Output:
12
13    Constant                      6.552624
14    Std Err of Y Est              0.406988
15    R Squared                     0.910698
16    No. of Observations                  4
17    Degrees of Freedom                   2
18
19    X Coefficient(s)   2.730624
20    Std Err of Coef.   0.604627
06-Jun-90   02:39 PM
```

Regression Equation :

$$Y = 6.55 + 2.73 X$$

Calculated EC_{50} = 0.27 lb ai/A

Calculated EC_{25} = 0.15 lb ai/A

EC_{50} & EC_{25} determination :-

```
1
2    glu/tomato/dry weight
3
4    TRT(conc)  %effect  log conc  probit(%effect)
5        0         0       0.00
6        0.05     -2      -1.30        2.95
7        0.1     -39      -1.00        4.72
8        0.2     -65      -0.70        5.39
9        0.4     -76      -0.40        5.71
10       0.8     -83      -0.10        5.95
11
12              Regression Output:
13   Constant                     6.56702
14   Std Err of Y Est             0.559139
15   R Squared                    0.838955
16   No. of Observations                5
17   Degrees of Freedom                 3
18
19   X Coefficient(s)   2.32202
20   Std Err of Coef.   0.587367
06-Jun-90  10:05 AM
```

Regression Equation :

$$Y = 6.57 + 2.32 X$$

Calculated EC_{50} = 0.213 lb ai/A

Calculated EC_{25} = 0.108 lb ai/A.

EC_{50} & EC_{25} determination:

```
1
2    glu/cabbage/plant height
3
4    TRT(conc)  %effect  log conc  probit(%effect)
5         0         0      0.00
6         0.05      0     -1.30
7         0.1      -7     -1.00          3.52
8         0.2     -34     -0.70          4.59
9         0.4     -46     -0.40          4.9
10        0.8     -58     -0.10          5.2
11
12             Regression Output:
13   Constant                       5.527231
14   Std Err of Y Est               0.296942
15   R Squared                      0.890293
16   No. of Observations                   4
17   Degrees of Freedom                    2
18
19   X Coefficient(s)    1.777231
20   Std Err of Coef.    0.441141
07-Jun-90  01:02 PM
```

Regression Equation:-

$$Y = 5.53 + 1.78 X$$

Calculated EC_{50} = 0.503 lb ai/A

Calculated EC_{25} = 0.212 lb ai/A.

EC$_{50}$ & EC$_{25}$ determination :-

~~glu/carrot/plant height~~

```
 1
 2
 3
 4    TRT(conc)  %effect  log conc  probit(%effect)
 5           0        0      0.00
 6        0.05      -13     -1.30      3.87
 7         0.1      -37     -1.00      4.67
 8         0.2      -61     -0.70      5.28
 9         0.4      -67     -0.40      5.44
10         0.8      -86     -0.10      6.08
11
12              Regression Output:
13    Constant                  6.273080
14    Std Err of Y Est          0.189270
15    R Squared                 0.961632
16    No. of Observations              5
17    Degrees of Freedom               3
18
19    X Coefficient(s)   1.724080
20    Std Err of Coef.   0.198826
07-Jun-90  01:05 PM
```

Regression Equation :

$$Y = 6.27 + 1.72\, X$$

Calculated EC$_{50}$ = 0.182 lb ai/A

Calculated EC$_{25}$ = 0.074 lb ai/A

EC_{50} & EC_{25} determination :-

```
1
2    glu/onion/plant height
3
4    TRT(conc)  %effect  log conc  probit(%effect)
5         0        0       0.00
6       0.05       -8      -1.30      3.59
7        0.1      -10      -1.00      3.72
8        0.2      -63      -0.70      5.33
9        0.4      -81      -0.40      5.88
10       0.8      -97      -0.10      6.88
11
12              Regression Output:
13   Constant                    7.109365
14   Std Err of Y Est            0.352817
15   R Squared                   0.953391
16   No. of Observations               5
17   Degrees of Freedom                3
18
19   X Coefficient(s)   2.903365
20   Std Err of Coef.   0.370629
07-Jun-90   01:09 PM
```

Regression Equation :-

$$Y = 7.11 + 2.90 X$$

Calculated EC_{50} = 0.187 lb ai/A

Calculated EC_{25} = 0.109 lb ai/A

EC$_{50}$ & EC$_{25}$ determination:-

```
1
2     glu/tomato/plant height
3
4     TRT(conc)  %effect  log conc  probit(%effect)
5          0        0      0.00
6       0.05        2     -1.30
7        0.1      -25     -1.00        4.33
8        0.2      -52     -0.70        5.05
9        0.4      -65     -0.40        5.39
10       0.8      -73     -0.10        5.61
11
12              Regression Output:
13   Constant                    5.856565
14   Std Err of Y Est            0.181493
15   R Squared                   0.929877
16   No. of Observations                4
17   Degrees of Freedom                 2
18
19   X Coefficient(s)    1.388565
20   Std Err of Coef.    0.269629
07-Jun-90   12:57 PM
```

Regression Equation :.

$$Y = 5.86 + 1.39 X$$

Calculated EC$_{50}$ = 0.241 lb ai/A

Calculated EC$_{25}$ = 0.079 lb ai/A