

DATA EVALUATION RECORD  
VEGETATIVE VIGOR EC<sub>25</sub> TEST  
§ 123-1 (TIER II)

1. **CHEMICAL:** Mesotrione PC Code No.: 122990

2. **TEST MATERIAL:** ZA1296 4SC (WF2381) Purity: 40.7%

3. **CITATION:**

Author: D. Teixeira  
Title: ZA1296: Determination of Effects on  
Seedling Emergence and Vegetative Vigor  
of Ten Plant Species

Study Completion Date: September 22, 1997

Laboratory: Springborn Laboratories, Inc., Wareham,  
MA

Sponsor: ZENECA Ag Products, Wilmington, DE

Laboratory Report ID: 97-5-6985

MRID No.: 445051-19

DP Barcode: D245475

4. **REVIEWED BY:** Mark Mossler, M.S., Toxicologist,  
Golder Associates Inc.

**Signature:** *M. Mossler*

**Date:** 8/25/98

**APPROVED BY:** Pim Kosalwat, Ph.D., Senior Scientist,  
Golder Associates Inc.

**Signature:** *P. Kosalwat*

**Date:** 8/25/98

5. **APPROVED BY:** *James Goodyear*

**Signature:**

**Date:** 7/18/00

6. **STUDY PARAMETERS:**

**Definitive Study Duration:** 14 days

7. **CONCLUSIONS:** This study is scientifically sound and fulfills the guideline requirements for a Tier II vegetative vigor test with terrestrial plants.

**Results Synopsis:**

Most sensitive dicot: Tomato

Most sensitive parameter: Phytotoxicity

EC<sub>25</sub>: 0.0002 lb ai/A

NOEL: 0.0001 lb ai/A

Most sensitive monocot: Onion  
 Most sensitive parameter: Phytotoxicity  
 EC<sub>25</sub>: 0.0009 lb ai/A  
 NOEL: 0.0001 lb ai/A

8. ADEQUACY OF THE STUDY:

A. Classification: Core.

B. Rationale: N/A.

C. Repairability: N/A.

9. GUIDELINE DEVIATIONS: Some of the rate progressions were four-fold, rather than the recommended two-fold.

10. SUBMISSION PURPOSE:

11. MATERIALS AND METHODS:

A. Test Organisms

Guideline Criteria	Reported Information
<b>Species</b> 6 dicots in 4 families, including soybean and a rootcrop; 4 monocots in 2 families, including corn.	<b>Dicots:</b> cabbage, cucumber, lettuce, soybean, tomato, turnip <b>Monocots:</b> corn, oat, onion, ryegrass
<b>Number of plants per rep</b> 5	5
<b>Source of Seed</b>	Various commercial suppliers

B. Test System

Guideline Criteria	Reported Information
<b>Solvent</b>	None
<b>Site of test</b>	Growth chamber
<b>Planting method / type of pot</b>	Planted in 13-cm polypropylene pots (top diameter)
<b>Method of application</b>	0.084 mL of solution/pot applied by belt sprayer
<b>Method of watering</b>	Subirrigation

Guideline Criteria	Reported Information
Growth stage at application 1-3 true leaf stage.	1-3 true leaf stage

## C. Test Design

Guideline Criteria	Reported Information
Dose range 2x or 3x	2x or 4x: rates ranging from 0.00008 to 0.31 lb active ingredient (ai)/A
Doses At least 5	5 or 6
Controls Negative and solvent	Negative and formulation blank control groups
Replicates per dose At least 3	3 replicates
Duration of test 14 days	14 days
Were observations made at least weekly?	Yes
Maximum labeled rate	0.31 lb ai/A

## 12. REPORTED RESULTS:

Guideline Criteria	Reported Information
Quality assurance and GLP compliance statements were included in the report?	Yes
Was an NOEL observed for each species?	Yes
Phytotoxic observations	Yes
Were initial chemical concentrations measured? (Optional)	Yes, recoveries ranged between 99 and 130% of nominal
Were adequate raw data included?	Replicate phytotoxicity data were not reported

Results for the most sensitive parameter\* of each species

Species	Parameter	EC <sub>25</sub> (lbs ai/A)	NOEL (lbs ai/A)
Cabbage	whole plant dry weight	0.0024	0.0015
Cucumber	"	0.0044	0.00033
Lettuce	shoot length	0.00073	0.00033
Soybean	whole plant dry weight	0.0094	0.0013
Tomato	shoot length	0.0028	0.00037
Turnip	whole plant dry weight	0.0024	0.0015
Corn	dry weight=length	>0.31	0.31
Oat	whole plant dry weight	0.24	0.16
Onion	"	0.0010	0.0015
Ryegrass	"	0.11	0.077

\*Determination of the most sensitive parameter is based on EC<sub>25</sub> values.

Observations: Signs of test material toxicity included chlorosis and necrosis.

Statistical Results

Statistical Method: Dunnett's test or Bonferroni's test was used for mean separation, and regression analysis was used to determine the EC values. Comparisons were made to the negative control.

Most sensitive dicot: lettuce                      Parameter: shoot length  
EC<sub>25</sub> 95% C.L.: 0.00017 - 0.0026 lb ai/A      Probit slope: N/A

Most sensitive monocot: onion                      Parameter: plant weight  
EC<sub>25</sub> 95% C.L.: 0.00005 - 0.014 lb ai/A      Probit slope: N/A

13. **VERIFICATION OF STATISTICAL RESULTS:** All analyses were based on measured application rates and comparisons were made to the formulation blank control. Williams' test or visual interpretation was used to determine NOEL values. Linear

interpolation or probit analysis was used for initial EC<sub>25</sub> determination and appropriate responses were remodeled using non-linear regression analysis.

Results for the most sensitive parameter of each species

Species	Parameter	EC <sub>25</sub> (lbs ai/A)	NOEL (lbs ai/A)
Cabbage	whole plant dry weight	0.0033	0.0015
Cucumber	phytotoxicity	0.0051	0.0003*
Lettuce	whole plant dry weight	0.0013**	0.0003**
Soybean	"	0.0036	0.0001***
Tomato	phytotoxicity	0.00023	0.00010*
Turnip	"	0.00078	0.00023***
Corn	length = dry weight	>0.31	0.31
Oat	whole plant dry weight	0.27**	0.16
Onion	phytotoxicity	0.0009	0.0001***
Ryegrass	whole plant dry weight	0.070	0.039*

\*Determined by visual interpretation.

\*\*Determined by linear interpolation.

\*\*\*Based on the probit EC<sub>5</sub> value.

Results for most sensitive parameter of most sensitive species

	Monocot	Dicot
Species	onion	tomato
Parameter	phytotoxicity	phytotoxicity
EC <sub>25</sub> (lb ai/A)	0.0009	0.0002
95% C.I. (lb ai/A)	could not be determined	could not be determined
Probit Slope	1.0	0.9
NOEL (lb ai/A)	0.0001	0.0001

14. **REVIEWER'S COMMENTS:** The results are scientifically sound and fulfill the guideline requirements. The study is classified as Core.

cabbage dry weight

File: cab Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Form. Con.	3	0.182	0.182	0.182
2	0.0015 lb ai/A	3	0.172	0.172	0.172
3	0.0052 lb ai/A	3	0.112	0.112	0.112
4	0.019 lb ai/A	3	0.042	0.042	0.042
5	0.077 lb ai/A	3	0.036	0.036	0.036
6	0.31 lb ai/A	3	0.033	0.033	0.033

cabbage dry weight

File: cab Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Form. Con.	0.182				
0.0015 lb ai/A	0.172	0.738		1.78	k= 1, v=12
0.0052 lb ai/A	0.112	5.215	*	1.87	k= 2, v=12
0.019 lb ai/A	0.042	10.388	*	1.90	k= 3, v=12
0.077 lb ai/A	0.036	10.845	*	1.92	k= 4, v=12
0.31 lb ai/A	0.033	11.051	*	1.93	k= 5, v=12

s = 0.016

Note: df used for table values are approximate when v > 20.

*NOEL = 0.0015 1/6 ai/A*

cabbage dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	0.0006	0.0003	0.0009
EC 5.00	0.0013	0.0008	0.0018
EC10.00	0.0019	0.0013	0.0025
EC15.00	0.0025	0.0019	0.0032
EC50.00	0.0079	0.0066	0.0096
EC85.00	0.0247	0.0187	0.0363
EC90.00	0.0323	0.0236	0.0504
EC95.00	0.0482	0.0333	0.0822
EC99.00	0.1019	0.0628	0.2069

$EC_{25} = 0.0038$  lb ai/A

cabbage dry weight

OBS	CONC	LOG_CONC	Y1	Y2	Y3	Y4	Y5	Y6
1	0.0000	-2.82391	0.2127	0.1512	0.1807	.	.	.
2	0.0015	-2.28400	0.1970	0.1568	0.1611	.	.	.
3	0.0052	-2.28400	0.1022	0.1078	0.1247	.	.	.
4	0.0190	-1.72125	0.0423	0.0380	0.0462	.	.	.

MODEL: COUNT = CO \* PROB NORM ((LOG\_EC50 - LOG\_CONC) / SIGMA)  
WEIGHTED REGRESSION

Non-Linear Least Squares Iterative Phase  
Method: Gauss-Newton

Iter	LOG_EC50	SIGMA	CO	Weighted SS
0	-2.102000	0.477000	0.182000	0.021386
1	-2.122722	0.532470	0.184303	0.020024
2	-2.120616	0.530497	0.184042	0.020031
3	-2.120780	0.530735	0.184063	0.020030
4	-2.120762	0.530709	0.184061	0.020030
5	-2.120764	0.530712	0.184061	0.020030
6	-2.120764	0.530711	0.184061	0.020030
7	-2.120764	0.530711	0.184061	0.020030

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Weighted SS	Weighted MS
Regression	3	1.5207000000	0.5069000000
Residual	9	0.0200304153	0.0022256017
Uncorrected Total	12	1.5407304153	
(Corrected Total)	11	0.4529253570	

Asymptotic Correlation Matrix

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95% Confidence Interval Lower	Upper
LOG_EC50	-2.120764112	0.06940786150	-2.277769387	-1.9637512848
SIGMA	0.530711468	0.08079103880	0.3479478861	0.7134750504
CO	0.184060759	0.01078773430	0.1596570009	0.2084645170

Model: COUNT = CO \* PROB NORM ((LOG\_EC50 - LOG\_CONC) / SIGMA)  
SUMMARY OF NONLINEAR REGRESSION

OBS	CONC	LOG_EC50	SIGMA	CO	RESID_SS	EC50
1	0	-2.12076	0.53071	0.18406	0.020030	.0075724

Model: .YOUNG = CO \* PROB NORM ((LOG\_EC25 - LOG\_CONC) / SIGMA - 0.67449)  
WEIGHTED REGRESSION

Non-Linear Least Squares Iterative Phase  
Method: Gauss-Newton

Iter	LOG_EC25	SIGMA	CO	Weighted SS
0	-2.420000	0.477000	0.182000	0.021306

1	-2.481786	0.532639	0.184292	0.020024
2	-2.478417	0.530487	0.184041	0.020031
3	-2.478757	0.530736	0.184063	0.020030
4	-2.478724	0.530709	0.184061	0.020030
5	-2.478724	0.530712	0.184061	0.020030
6	-2.478724	0.530711	0.184061	0.020030
7	-2.478724	0.530711	0.184061	0.020030

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Weighted SS	Weighted MS
Regression	3	1.5207000000	0.5069000000
Residual	9	0.0200304153	0.0022256017
Uncorrected Total	12	1.5407304153	
(Corrected Total)	11	0.4529253570	

Asymptotic Correlation Matrix

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95% Confidence Interval Lower	Upper
LOG_EC25	-2.478723690	0.11252630612	-2.7332780455	-2.2241693349
SIGMA	0.530711468	0.08079103882	0.3479478862	0.7134750506
CO	0.184060759	0.01078773430	0.1596570009	0.2084645171

Model: YOUNG = CO \* PROB NORM ((LOG\_EC25 - LOG\_CONC) / SIGMA - 0.67449)  
SUMMARY OF NONLINEAR REGRESSION

OBS	CONC	LOG_EC25	SIGMA	CO	RESID_SS	EC25
1	0	-2.47872	0.53071	0.18406	0.020030	.0033211

Plot of COUNT\*LOG\_CONC. Symbol used is '0'.  
Plot of PRED\*LOG\_CONC. Symbol used is '0'.

COUNT	0.225
0.200	0
0.175	0
0.150	0



0.125

0.100

0.075

0.050

0.025

-3.0 -2.8 -2.6 -2.4 -2.2 -2.0 -1.8 -1.6

NOTE: 1125 obs had missing values. 1046 obs hidden.  
cabbage dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL

12:40 Tuesday, July 21, 1998

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
DOSE	4	0 0.019 0.0015 0.0052

Number of observations in data set = 24

NOTE: Due to missing values, only 12 observations can be used in this analysis.

cabbage dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL

General Linear Models Procedure

Dependent Variable: RESPONSE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	0.03720180	0.01240060	31.25	0.0001
Error	8	0.00317467	0.00039683		
Corrected Total	11	0.04037646			
R-Square		C.V.	Root MSE	RESPONSE Mean	
0.921373	15.71961	0.019921		0.126725	

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DOSE	3	0.03720180	0.01240060	31.25	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
DOSE	3	0.03720180	0.01240060	31.25	0.0001

cabbage dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL

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General Linear Models Procedure

Level of DOSE	N	Mean	SD
0	3	0.18153333	0.03075847
0.019	3	0.04216667	0.00410163
0.0015	3	0.17163333	0.02207314
0.0052	3	0.11156667	0.01171338

cabbage dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL

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General Linear Models Procedure

Dunnett's One-tailed T tests for variable: RESPONSE

NOTE: This tests controls the type I experimentwise error for comparisons of all treatments against a control.

Alpha= 0.05 Confidence= 0.95 df= 8 MSE= 0.000397  
Critical Value of Dunnett's T= 2.416  
Minimum Significant Difference= 0.0393

Comparisons significant at the 0.05 level are indicated by \*\*\*\*.

DOSE Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
0.0015 - 0	-0.04920	-0.00990	0.02940
0.0052 - 0	-0.10927	-0.06997	-0.03066
0.019 - 0	-0.17867	-0.13937	-0.10006

cucumber phytotoxicity

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	0.0002	0.0000	0.0005
EC 5.00	0.0006	0.0002	0.0015
EC10.00	0.0014	0.0004	0.0027
EC15.00	0.0023	0.0009	0.0041
EC50.00	0.0205	0.0148	0.0285
EC85.00	0.1797	0.1015	0.4794
EC90.00	0.3005	0.1531	0.9782
EC95.00	0.6438	0.2796	2.8315
EC99.00	2.6870	0.8568	20.9936

$$EC_{25} = 0.0051 \text{ lb ai/A}$$



soybean dry weight

File: soy Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Form. Con.	3	0.746	0.746	0.746
2	0.0013 lb ai/A	3	0.622	0.622	0.622
3	0.0026 lb ai/A	3	0.532	0.532	0.532
4	0.0049 lb ai/A	3	0.512	0.512	0.512
5	0.0097 lb ai/A	3	0.473	0.473	0.473
6	0.019 lb ai/A	3	0.463	0.463	0.463
7	0.039 lb ai/A	3	0.259	0.259	0.259

soybean dry weight

File: soy Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Form. Con.	0.746				
0.0013 lb ai/A	0.622	2.637	*	1.76	k= 1, v=14
0.0026 lb ai/A	0.532	4.561	*	1.85	k= 2, v=14
0.0049 lb ai/A	0.512	4.981	*	1.88	k= 3, v=14
0.0097 lb ai/A	0.473	5.816	*	1.89	k= 4, v=14
0.019 lb ai/A	0.463	6.029	*	1.90	k= 5, v=14
0.039 lb ai/A	0.259	10.352	*	1.91	k= 6, v=14

s = 0.058

Note: df used for table values are approximate when v > 20.

Since NOEL < 0.0013 lb ai/A, NOEL = probit EC<sub>5</sub> = 0.0001 lb ai/A

soybean dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	0.0000	0.0000	0.0001
EC 5.00	0.0001	0.0000	0.0004
EC10.00	0.0004	0.0001	0.0009
EC15.00	0.0009	0.0003	0.0016
EC50.00	0.0226	0.0155	0.0401
EC85.00	0.5627	0.2070	3.3316
EC90.00	1.2037	0.3757	9.6479
EC95.00	3.7139	0.9063	46.7549
EC99.00	30.7336	4.7051	906.5440

$EC_{25} = 0.0028$  lb ae/A

soybean dry weight

OBS	CONC	LOG_CONC	Y1	Y2	Y3	Y4	Y5	Y6
1	0.0000		0.7303	0.7683	0.7386			
2	0.0013	-2.88606	0.6185	0.6644	0.5827			
3	0.0026	-2.58503	0.4195	0.5436	0.6314			
4	0.0049	-2.30980	0.4912	0.4832	0.5609			
5	0.0097	-2.01323	0.4405	0.4255	0.5516			
6	0.0190	-1.72125	0.4708	0.5032	0.4136			
7	0.0390	-1.40894	0.2963	0.2523	0.2298			

MODEL: COUNT = CO \* PROB(NORM((LOG\_EC50 - LOG\_CONC) / SIGMA))

WEIGHTED REGRESSION 12:40 Tuesday, July 21, 1998

Non-Linear Least Squares Iterative Phase

Iter	LOG_EC50	SIGMA	CO	Weighted SS
0	-1.646000	0.746000	0.746000	0.177516
1	-1.646797	1.210152	0.736240	0.175055
2	-1.643009	1.198239	0.733509	0.175127
3	-1.642556	1.195899	0.733176	0.175126
4	-1.642464	1.195450	0.733111	0.175126
5	-1.642446	1.195363	0.733099	0.175126
6	-1.642442	1.195346	0.733096	0.175126
7	-1.642442	1.195343	0.733096	0.175126
8	-1.642441	1.195342	0.733096	0.175126

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Weighted SS	Weighted MS
Regression	3	10.816200000	3.605400000
Residual	18	0.175125699	0.009729206
Uncorrected Total	21	10.991325699	
(Corrected Total)	20	0.970650428	

Asymptotic Correlation Matrix

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95% Confidence Interval Lower	Upper
LOG_EC50	-1.6424416	0.12945012634	-1.9144042427	-1.3704785897
SIGMA	1.195342262	0.23685541996	0.6977307778	1.6929537460
CO	0.733095733	0.04776447486	0.6327469579	0.8334445077

Model: COUNT = CO \* PROB(NORM((LOG\_EC50 - LOG\_CONC) / SIGMA))

SUMMARY OF NONLINEAR REGRESSION 12:40 Tuesday, July 21, 1998

OBS	CONC	LOG_EC50	SIGMA	CO	RESID_SS	EC50
1	0	-1.64244	1.19534	0.73310	0.17513	0.022780

MODEL: YOUNG = CO \* PROB(NORM((LOG\_EC25 - LOG\_CONC) / SIGMA))

WEIGHTED REGRESSION 12:40 Tuesday, July 21, 1998

Non-Linear Least Squares Iterative Phase

Iter	LOG_EC25	SIGMA	CO	Weighted SS
0	-2.547000	1.348000	0.746000	0.176912
1	-2.463073	1.209227	0.736196	0.175108
2	-2.451114	1.198138	0.733492	0.175127
3	-2.449160	1.195879	0.733173	0.175126
4	-2.448779	1.195446	0.733111	0.175126
5	-2.448706	1.195362	0.733099	0.175126
6	-2.448691	1.195346	0.733096	0.175126
7	-2.448688	1.195343	0.733096	0.175126
8	-2.448688	1.195342	0.733096	0.175126

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Weighted SS	Weighted MS
Regression	3	10.816200000	3.605400000
Residual	18	0.175125699	0.009729206
Uncorrected Total	21	10.991325699	
(Corrected Total)	20	0.970650429	

Asymptotic Correlation Matrix

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95% Confidence Interval Lower	Upper
LOG_EC25	-2.448687814	0.22283265513	-2.9168387567	-1.9805368706
SIGMA	1.195342256	0.23685541900	0.6977307744	1.6929537386
CO	0.733095732	0.04776447482	0.6327469572	0.8334445068

Asymptotic Correlation Matrix

Corr	LOG_EC25	SIGMA	CO
LOG_EC25	1		
SIGMA	-0.820518113	1	
CO	-0.858206071	0.5743382351	1

MODEL: YOUNG = CO \* PROB(NORM((LOG\_EC25 - LOG\_CONC) / SIGMA))

SUMMARY OF NONLINEAR REGRESSION 12:40 Tuesday, July 21, 1998

OBS	CONC	LOG_EC25	SIGMA	CO	RESID_SS	EC25
1	0	-2.44869	1.19534	0.73310	0.17513	.0035589

MODEL: YOUNG = CO \* PROB(NORM((LOG\_EC25 - LOG\_CONC) / SIGMA))

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Plot of COUNT\*LOG\_CONC. Symbol used is '0'

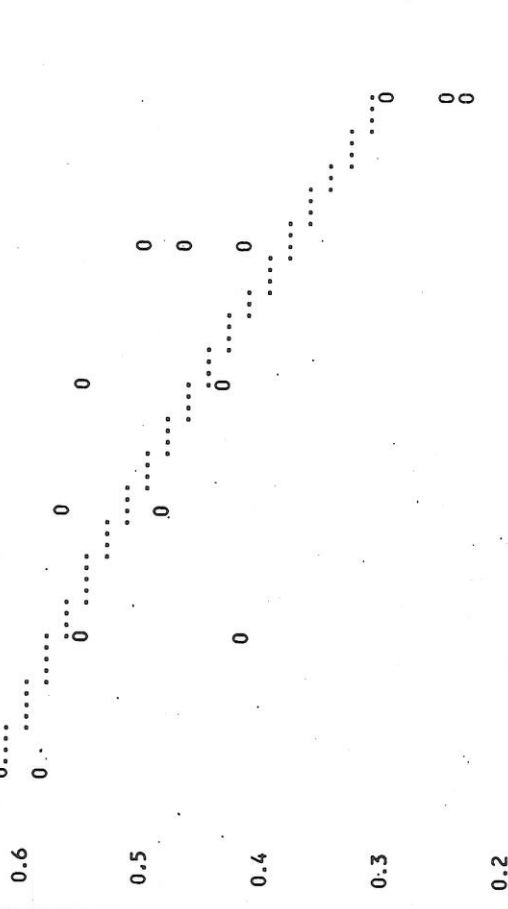
Plot of PRED\*LOG\_CONC. Symbol used is '0'

COUNT 0.8

0.7

0

19



NOTE: 1508 obs had missing values. 1439 obs hidden.  
 soybean dry weight  
 COMPARISON OF MEANS FOR NOEL DETERMINATION  
 TEST IF TREATMENT IS LESS THAN CONTROL  
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General Linear Models Procedure  
 Class Level Information

Class	Levels	Values
DOSE	7	0 0.019 0.039 0.0013 0.0026 0.0049 0.0097

Number of observations in data set = 42

NOTE: Due to missing values, only 21 observations can be used in this analysis.

soybean dry weight  
 COMPARISON OF MEANS FOR NOEL DETERMINATION  
 TEST IF TREATMENT IS LESS THAN CONTROL  
 12:40 Tuesday, July 21, 1998

General Linear Models Procedure

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.40438347	0.06739725	20.35	0.0001
Error	14	0.04637088	0.00331221		
Corrected Total	20	0.45075435			

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DOSE	6	0.40438347	0.06739725	20.35	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
DOSE	6	0.40438347	0.06739725	20.35	0.0001

soybean dry weight  
 COMPARISON OF MEANS FOR NOEL DETERMINATION  
 TEST IF TREATMENT IS LESS THAN CONTROL  
 12:40 Tuesday, July 21, 1998

General Linear Models Procedure

Level of DOSE	N	Mean	SD
0	3	0.74573333	0.01997907
0.019	3	0.46253333	0.04536842
0.039	3	0.25946667	0.03382430
0.0013	3	0.62186667	0.04095392
0.0026	3	0.53150000	0.10646694
0.0049	3	0.51176667	0.04273831
0.0097	3	0.47253333	0.06888326

soybean dry weight  
 COMPARISON OF MEANS FOR NOEL DETERMINATION  
 TEST IF TREATMENT IS LESS THAN CONTROL  
 12:40 Tuesday, July 21, 1998

General Linear Models Procedure

Dunnett's One-tailed T tests for variable: RESPONSE  
 NOTE: This tests controls the type I experimentwise error for comparisons of all treatments against a control.

Alpha= 0.05 Confidence= 0.95 df= 14 MSE= 0.003312  
 Critical Value of Dunnett's T= 2.532  
 Minimum Significant Difference= 0.119

Comparisons significant at the 0.05 level are indicated by \*\*\*\*.

DOSE Comparison	Simultaneous Lower Confidence Limit		Difference Between Means		Simultaneous Upper Confidence Limit	
	Lower Limit	Upper Limit	Difference	Mean	Upper Limit	Lower Limit
0.0013 - 0	-0.24286	-0.12387	-0.12387	-0.00488	-0.00488	***
0.0026 - 0	-0.33322	-0.21423	-0.21423	-0.09524	-0.09524	***
0.0049 - 0	-0.35296	-0.23397	-0.23397	-0.11498	-0.11498	***
0.0097 - 0	-0.39219	-0.27320	-0.27320	-0.15421	-0.15421	***
0.019 - 0	-0.40219	-0.28320	-0.28320	-0.16421	-0.16421	***
0.039 - 0	-0.60526	-0.48627	-0.48627	-0.36728	-0.36728	***

tomato phytotoxicity

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	0.0000	0.0000	0.0000
EC 5.00	0.0000	0.0000	0.0001
EC10.00	0.0000	0.0000	0.0002
EC15.00	0.0001	0.0000	0.0003
EC50.00	0.0013	0.0005	0.0022
EC85.00	0.0191	0.0114	0.0499
EC90.00	0.0360	0.0188	0.1315
EC95.00	0.0919	0.0384	0.5666
EC99.00	0.5334	0.1420	9.0447

$$EC_{25} = 0.0002316 \text{ ai/A}$$

$$EC_5 = 0.0000216 \text{ ai/A}$$



turnip phytotoxicity

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	.0.0001		
EC 5.00	0.0002		
EC10.00	0.0004		
EC15.00	0.0005		
EC50.00	0.0018		
EC85.00	0.0066		
EC90.00	0.0090		
EC95.00	0.0142		
EC99.00	0.0332		

$$EC_{25} = 0.00078 \text{ lb ai/A}$$

$$EC_5 = 0.00023 \text{ lb ai/A}$$

oat dry weight

File: oat

Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Form. Con.	3	0.281	0.281	0.288
2	0.019 lb ai/A	3	0.294	0.294	0.288
3	0.039 lb ai/A	3	0.264	0.264	0.264
4	0.077 lb ai/A	3	0.258	0.258	0.258
5	0.16 lb ai/A	3	0.254	0.254	0.254
6	0.31 lb ai/A	3	0.198	0.198	0.198

oat dry weight

File: oat

Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Form. Con.	0.288				
0.019 lb ai/A	0.288	0.196		1.78	k= 1, v=12
0.039 lb ai/A	0.264	0.532		1.87	k= 2, v=12
0.077 lb ai/A	0.258	0.712		1.90	k= 3, v=12
0.16 lb ai/A	0.254	0.839		1.92	k= 4, v=12
0.31 lb ai/A	0.198	2.587	*	1.93	k= 5, v=12

s = 0.039

Note: df used for table values are approximate when v > 20.

NOEL = 0.16 lb ai/A

onion phytotoxicity

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	0.0000	0.0000	0.0002
EC 5.00	0.0001	0.0000	0.0005
EC10.00	0.0002	0.0000	0.0008
EC15.00	0.0004	0.0000	0.0013
EC50.00	0.0041	0.0014	0.0108
EC85.00	0.0404	0.0143	0.4946
EC90.00	0.0695	0.0217	1.4045
EC95.00	0.1552	0.0392	6.7798
EC99.00	0.6997	0.1131	135.8779

$$EC_{25} = 0.0009 \text{ lb ai/A}$$

$$EC_5 = 0.0001 \text{ lb ai/A}$$

ryegrass dry weight

File: rye Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Form. Con.	3	0.060	0.060	0.060
2	0.019 lb ai/A	3	0.054	0.054	0.054
3	0.039 lb ai/A	3	0.051	0.051	0.051
4	0.077 lb ai/A	3	0.042	0.042	0.042
5	0.16 lb ai/A	3	0.036	0.036	0.036
6	0.31 lb ai/A	3	0.022	0.022	0.022

ryegrass dry weight

File: rye Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Form. Con.	0.060				
0.019 lb ai/A	0.054	0.536		1.78	k= 1, v=12
0.039 lb ai/A	0.051	0.814		1.87	k= 2, v=12
0.077 lb ai/A	0.042	1.641		1.90	k= 3, v=12
0.16 lb ai/A	0.036	2.171	*	1.92	k= 4, v=12
0.31 lb ai/A	0.022	3.359	*	1.93	k= 5, v=12

s = 0.014

Note: df used for table values are approximate when v > 20.

Since  $0.077 \text{ lb ai/A} > EC_{25}$ , NOEL =  $0.039 \text{ lb ai/A}$

ryegrass dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence	Upper Limits
EC 1.00	0.0037	0.0014	0.0069
EC 5.00	0.0118	0.0061	0.0181
EC10.00	0.0220	0.0135	0.0306
EC15.00	0.0335	0.0228	0.0440
EC50.00	0.1981	0.1565	0.2707
EC85.00	1.1716	0.7134	2.5098
EC90.00	1.7840	1.0109	4.2950
EC95.00	3.3266	1.6906	9.5410
EC99.00	10.7039	4.4187	42.7941

$EC_{25} = 0.063 \text{ lb a/A}$

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OBS	CONC	LOG_CONC	Y1	Y2	Y3	Y4	Y5	Y6
1	0.000	-1.72125	0.0594	0.0514	0.0699	.	.	.
2	0.019	-1.40894	0.0543	0.0850	0.0233	.	.	.
3	0.039	-1.11351	0.0567	0.0438	0.0438	.	.	.
4	0.077	-0.79588	0.0381	0.0448	0.0424	.	.	.
5	0.160	-0.50864	0.0322	0.0341	0.0411	.	.	.
6	0.310		0.0239	0.0204	0.0230	.	.	.

ryegrass dry weight 12:40 Tuesday, July 21, 1998

MODEL: COUNT = CO \* PROB NORM ((LOG\_EC50 - LOG\_CONC) / SIGMA)

WEIGHTED REGRESSION

Non-Linear Least Squares Iterative Phase

Method: Gauss-Newton

Iter	LOG_EC50	SIGMA	CO	Weighted SS
0	-0.703000	0.746000	0.060000	0.042648
1	-0.692881	0.695408	0.059541	0.042129
2	-0.692107	0.690975	0.059448	0.042134
3	-0.691966	0.690426	0.059438	0.042133
4	-0.691947	0.690355	0.059437	0.042133
5	-0.691945	0.690346	0.059437	0.042133
6	-0.691944	0.690344	0.059437	0.042133
7	-0.691944	0.690344	0.059437	0.042133

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Weighted SS	Weighted MS	Dependent Variable COUNT
Regression	3	0.796500000000	0.265500000000	
Residual	15	0.04213304801	0.00280886987	
Uncorrected Total	18	0.83863304801		
(Corrected Total)	17	0.12116999891		

Asymptotic Correlation Matrix

Corr	LOG_EC50	SIGMA	CO
LOG_EC50	1	-0.318320253	-0.744284417
SIGMA	-0.318320253	1	0.6380358182
CO	-0.744284417	0.6380358182	1

MODEL: COUNT = CO \* PROB NORM ((LOG\_EC50 - LOG\_CONC) / SIGMA)

SUMMARY OF NONLINEAR REGRESSION

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OBS	CONC	LOG_EC50	SIGMA	CO	RESID_SS	EC50
1	0	-0.69194	0.69034	0.059437	0.042133	0.20326

MODEL: YOUNG = CO \* PROB NORM ((LOG\_EC25 - LOG\_CONC) / SIGMA - 0.67449)

WEIGHTED REGRESSION 12:40 Tuesday, July 21, 1998

Non-Linear Least Squares Iterative Phase

Method: Gauss-Newton

Dependent Variable COUNT

Iter	LOG_EC25	SIGMA	CO	Weighted SS
0	-1.202000	0.746000	0.060000	0.042583
1	-1.161885	0.695037	0.059540	0.042128
2	-1.158132	0.690943	0.059448	0.042134
3	-1.157648	0.690422	0.059438	0.042133
4	-1.157584	0.690354	0.059437	0.042133
5	-1.157576	0.690346	0.059437	0.042133
6	-1.157575	0.690344	0.059437	0.042133
7	-1.157575	0.690344	0.059437	0.042133

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics

Source	DF	Weighted SS	Weighted MS	Dependent Variable COUNT
Regression	3	0.796500000000	0.265500000000	
Residual	15	0.04213304801	0.00280886987	
Uncorrected Total	18	0.83863304801		
(Corrected Total)	17	0.12116999893		

Asymptotic Correlation Matrix

Corr	LOG_EC25	SIGMA	CO
LOG_EC25	1	-0.853667123	-0.841995372
SIGMA	-0.853667123	1	0.6380358185
CO	-0.841995372	0.6380358185	1

MODEL: YOUNG = CO \* PROB NORM ((LOG\_EC25 - LOG\_CONC) / SIGMA - 0.67449)

SUMMARY OF NONLINEAR REGRESSION

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OBS	CONC	LOG_EC25	SIGMA	CO	RESID_SS	EC25
1	0	-1.15757	0.69034	0.059437	0.042133	0.069571

MODEL: YOUNG = CO \* PROB NORM ((LOG\_EC25 - LOG\_CONC) / SIGMA - 0.67449)

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Plot of COUNT\*LOG\_CONC. Symbol used is 'O'.

Plot of PRED\*LOG\_CONC. Symbol used is 'I'.

COUNT	0
0.09	
0.08	
0.07	

0.06

0  
0  
0

0.05

0  
0

0.04

0  
0

0.03

0  
0

0.02

0  
0

-1.8 -1.6 -1.4 -1.2 -1.0 -0.8 -0.6 -0.4  
LOG\_CONC

NOTE: 1240 obs had missing values. 1170 obs hidden.  
ryegrass dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL  
12:40 Tuesday, July 21, 1998

General Linear Models Procedure  
Class Level Information

Class	Levels	Values
DOSE	6	0 0.16 0.31 0.019 0.039 0.077

Number of observations in data set = 36

NOTE: Due to missing values, only 18 observations can be used in this analysis.

ryegrass dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL  
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General Linear Models Procedure

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	0.00286342	0.00057268	3.07	0.0516
Error	12	0.00223643	0.00018637		
Corrected Total	17	0.00509985			
R-Square		C.V.	Root MSE	RESPONSE Mean	
		0.561472	30.85130	0.013652	0.044250

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Source	DF	Type I SS	Mean Square	F Value	Pr > F
DOSE	5	0.00286342	0.00057268	3.07	0.0516
Source	DF	Type III SS	Mean Square	F Value	Pr > F
DOSE	5	0.00286342	0.00057268	3.07	0.0516

ryegrass dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL  
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General Linear Models Procedure

Level of DOSE	N	Mean	SD
0	3	0.06023333	0.00927811
0.16	3	0.03580000	0.00468722
0.31	3	0.02243333	0.00181751
0.019	3	0.05420000	0.03085012
0.039	3	0.05106667	0.00660328
0.077	3	0.04176667	0.00339460

ryegrass dry weight  
COMPARISON OF MEANS FOR NOEL DETERMINATION  
TEST IF TREATMENT IS LESS THAN CONTROL  
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General Linear Models Procedure

Dunnett's One-tailed T tests for variable: RESPONSE

NOTE: This tests controls the type I experimentwise error for comparisons of all treatments against a control.

Alpha= 0.05 Confidence= 0.95 df= 12 MSE= 0.000186  
Critical Value of Dunnett's T= 2.502  
Minimum Significant Difference= 0.0279

Comparisons significant at the 0.05 level are indicated by \*\*\*\*.

DOSE Comparison	Simultaneous Confidence Limit		Difference Between Means	Simultaneous Upper Confidence Limit	
	Lower Limit	Upper Limit		Lower Limit	Upper Limit
0.019 - 0	-0.03392	-0.00603	0.02186	0.01872	
0.039 - 0	-0.03706	-0.00917	0.01847	0.00942	
0.077 - 0	-0.04636	-0.01847	0.00346	0.00346	
0.16 - 0	-0.05232	-0.02443	-0.03780	-0.00991	***
0.31 - 0	-0.06569	-0.03780			

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