MRID No. 438891-01

DATA EVALUATION RECORD
VEGETATIVE VIGOR EC_{25} TEST
§ 123-1 (TIER II)

1. **CHEMICAL:** Imazapyr (isopropylamine salt) PC Code No.: 128829

2. **TEST MATERIAL:** Arsenal® (AC 252,925) Purity: 23.3%

3. **CITATION:**

Author: E. Feutz and V.M. Cañez
Title: Tier 2 Nontarget Plant Vegetative Vigor Phytotoxicity Study Using AC 252,925 in a 2AS Formulation
Study Completion Date: November 3, 1995
Laboratory: ABC Laboratories, Inc., Columbia, MO
Sponsor: American Cyanamid Company, Princeton, NJ
Laboratory Report ID: 42125
MRID No.: 438891-01
DP Barcode: D231368

4. **REVIEWED BY:** Mark Mossler, M.S., Toxicologist,
KBN Engineering and Applied Sciences, Inc.

Signature: [signature] **Date:** 12/11/96

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

Signature: P. Kosalwat **Date:** 12/19/96

5. **APPROVED BY:**

Signature: [signature] **Date:** 8/11/97

6. **STUDY PARAMETERS:**

Definitive Study Duration: 28 days

7. **CONCLUSIONS:** This study is scientifically sound and ~~but~~ ~~does not~~ fulfills the guideline requirements for a Tier II vegetative vigor study with terrestrial plants. TEP testing required for these 3 species only (A/94).

Results Synopsis:

Most sensitive monocot: Onion
Most sensitive parameter: Dry weight
EC_{25}: 0.012 lb ai/A
Slope: N/A
NOEL: 0.005 lb ai/A

2055087

Most sensitive dicot: Sugar beet
Most sensitive parameter: Dry weight
EC_{25}: 0.002 lb ai/A
Slope: Not reported
NOEL: 0.001 lb ai/A

8. **ADEQUACY OF THE STUDY**

   A. **Classification:** Supplemental for a formulated product.

   B. **Rationale:** Only three species rather than the recommended ten species were tested.

   C. **Repairability:** Yes. If "core" data concerning the other seven species exists, then the entire study may be upgraded to the **Core for a formulated product** category.

9. **GUIDELINE DEVIATIONS:** The maximum application rate was only listed in the protocol section and only three species were tested.

10. **SUBMISSION PURPOSE:**

11. **MATERIALS AND METHODS:**

   A. **Test Organisms**

Guideline Criteria	Reported Information
Species 6 dicots in 4 families, including soybean and a rootcrop; 4 monocots in 2 families, including corn.	Dicots: soybean and sugar beet Monocots: onion
Number of plants per rep 5	5
Source of Seed	Commercial suppliers

   B. **Test System**

Guideline Criteria	Reported Information
Solvent	None
Site of test	Greenhouse

Guideline Criteria	Reported Information
Planting method / type of pot	Planted in 15-cm diameter rounds pots
Method of application	Track sprayer
Method of watering Under foliage	Drip-emitters and manual irrigation on an "as needed" basis
Growth stage at application Past first true leaf stage	Second true-leaf stage

C. **Test Design**

Guideline Criteria	Reported Information
Dose range 2x or 3x	2x
Doses At least 5	6 or 7, ranging from 0.00025 to 0.46 lb active ingredient (ai)/A
Controls Negative and solvent	Negative and formulation blank control
Replicates per dose At least 3	4 replicates
Duration of test 14 days	28 days
Were observations made at least weekly?	Only "final" rating reported
Maximum labeled rate	1.5 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

Guideline Criteria	Reported Information
Phytotoxic observations	Yes
Were initial chemical concentrations measured? (Optional)	Yes, measured concentrations of all tests ranged from 97 to 108% of nominal
Were adequate raw data included?	Yes

Results for the most sensitive parameter* of each species

Species	Parameter	EC_{25} (lbs ai/A)	NOEL (lbs ai/A)
Soybean	shoot length	0.043	0.002
Sugar beet	shoot dry weight	0.002	0.001
Onion	shoot dry weight	0.035	0.018

*Determination of the most sensitive parameter is based on EC_{25} values.

Observations: Symptoms of Arsenal® toxicity were mainly manifest as stunting of plants with some chlorosis. Complete plant death was also noted at some application rates.

Statistical Results:

Statistical Method: Dunnett's test for mean separation, nonlinear least squares regression for EC values.

Most sensitive monocot: onion — Parameter: weight
EC_{25} 95% C.L.: 0.0097-0.061 lb ai/A — Probit Slope: N/A

Most sensitive dicot: sugar beet — Parameter: weight
EC_{25} 95% C.L.: 0.0017-0.0024 lb ai/A — Probit Slope: N/A

13. **VERIFICATION OF STATISTICAL RESULTS:** All comparisons were made against the formulation control utilizing nominal application rates. Probit and nonlinear regression analysis were used for EC value determination/verification for soybean and onion. Linear interpolation was used to determine the EC_{25} for sugar beet shoot length and dry weight. Williams' test was used to determine/confirm the NOEL values.

Results for the most sensitive parameter of each species

Species	Parameter	EC_{25} (lbs ai/A)	NOEL (lbs ai/A)
Soybean	shoot length	0.034	0.008
Sugar beet	dry weight	0.002	0.001
Onion	dry weight	0.012	0.005*

*The NOEL for onion dry weight is the EC_5 from the probit analysis.

Results for most sensitive parameter of most sensitive species

	Monocot	Dicot
Species	onion	sugar beet
Parameter	dry weight	dry weight
EC_{25} (lb ai/A)	0.012	0.002
95% C.I. (lb ai/A)	0.003-0.046	0.0017-0.0024
Probit Slope	N/A	N/A
NOEL (lb ai/A)	0.005	0.001

14. REVIEWER'S COMMENTS: This study is scientifically sound ~~but~~ and ~~does not~~ fulfills the guideline requirements. ~~Only three of the recommended ten test species were included in the study design. Therefore, this~~ study is classified as ~~supplemental~~ **for a formulated product.**

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onion shoot length
File: oni 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	237.667	237.667	244.429
2	0.008 lb ai/A	4	249.500	249.500	244.429
3	0.018 lb ai/A	4	187.250	187.250	187.250
4	0.041 lb ai/A	4	155.500	155.500	155.500
5	0.091 lb ai/A	4	116.250	116.250	116.250
6	0.21 lb ai/A	4	34.500	34.500	34.500

onion shoot length
File: oni 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.	244.429				
0.008 lb ai/A	244.429	0.202		1.74	k= 1, v=17
0.018 lb ai/A	187.250	1.508		1.82	k= 2, v=17
0.041 lb ai/A	155.500	2.457	*	1.85	k= 3, v=17
0.091 lb ai/A	116.250	3.631	*	1.87	k= 4, v=17
0.21 lb ai/A	34.500	6.076	*	1.87	k= 5, v=17

s = 43.780
Note: df used for table values are approximate when v > 20.

Note: 0.018 lb ai/A

onion shoot length

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0026	0.0011	0.0046
EC 5.00	0.0067	0.0035	0.0102
EC10.00	0.0111	0.0066	0.0157
EC15.00	0.0156	0.0101	0.0210
EC50.00	0.0661	0.0548	0.0801
EC85.00	0.2810	0.2052	0.4443
EC90.00	0.3957	0.2743	0.6810
EC95.00	0.6570	0.4201	1.2873
EC99.00	1.7009	0.9282	4.2776

$Y = 6.94 + 1.65(x)$

$EC_{15} = 0.026$ lb ai/A

onion shoot length 1

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OBS	CONC	LOG_CONC	Y1	Y2	Y3	Y4	Y5	Y6
1	0.000	.	.	189	271	253	.	.
2	0.018	-1.74473	174	149	206	220	.	.
3	0.041	-1.38722	124	164	111	223	.	.
4	0.091	-1.04096	140	88	60	177	.	.
5	0.210	-0.67778	88	0	50	0	.	.

MODEL: COUNT = CO * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)

WEIGHTED REGRESSION

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Non-Linear Least Squares Iterative Phase

Dependent Variable COUNT Method: Gauss-Newton

Iter	LOG_EC50	SIGMA	CO	Weighted SS
0	-1.180000	0.606000	237.700000	312.385356
1	-1.123032	0.496420	227.080130	317.797494
2	-1.103823	0.471999	222.502570	319.998141
3	-1.096447	0.462212	220.990693	320.843128
4	-1.093222	0.458058	220.350096	321.203382
5	-1.091789	0.456228	220.077053	321.363388
6	-1.091145	0.455410	219.955562	321.435218
7	-1.090855	0.455042	219.906288	321.467606
8	-1.090724	0.454876	219.884515	321.482238
9	-1.090665	0.454801	219.874711	321.488854
10	-1.090638	0.454767	219.870193	321.491846
11	-1.090626	0.454751	219.868046	321.493199
12	-1.090620	0.454744	219.867134	321.493812
13	-1.090618	0.454741	219.866783	321.494089
14	-1.090617	0.454740	219.866640	321.494214
15	-1.090616	0.454739	219.866581	321.494271
16	-1.090616	0.454739	219.866557	321.494296
17	-1.090616	0.454739	219.866547	321.494308
18	-1.090616	0.454739	219.866542	321.494313
19	-1.090616	0.454738	219.866540	321.494315

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable COUNT

Source	DF	Weighted SS	Weighted MS
Regression	3	2687.0000000	895.6666667
Residual	16	321.4943155	20.0933947
Uncorrected Total	19	3008.4943155	
(Corrected Total)	18	1216.4482668	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
LOG_EC50	-1.0906157	0.139142082	-1.38558228	-0.79564914
SIGMA	0.4547385	0.148223385	0.14052052	0.76895648
CO	219.7974180	33.012820228	149.81371325	289.78112276

MODEL: COUNT = CO * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)

WEIGHTED REGRESSION

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Asymptotic Correlation Matrix

Corr	LOG_EC50	SIGMA	CO
LOG_EC50	1	-0.697714899	-0.814901548
SIGMA	-0.697714899	1	0.6163527512
CO	-0.814901548	0.6163527512	1

MODEL: COUNT = CO * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)

SUMMARY OF NONLINEAR REGRESSION

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OBS	CONC	LOG_EC50	SIGMA	CO	RESID_SS	EC50
1	0	-1.09062	0.45474	219.797	321.494	0.081168

MODEL: YOUNG = CO * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)

WEIGHTED REGRESSION

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Non-Linear Least Squares Iterative Phase

Dependent Variable COUNT Method: Gauss-Newton

Iter	LOG_EC25	SIGMA	CO	Weighted SS
0	-1.585000	0.606000	237.700000	310.579438
1	-1.457674	0.495929	227.057922	318.072961
2	-1.422014	0.471893	222.482075	320.002318
3	-1.408137	0.462165	220.983409	320.847230
4	-1.402149	0.458038	220.326861	321.205147
5	-1.399497	0.456219	220.035607	321.364178
6	-1.398309	0.455406	219.904910	321.435573
7	-1.397774	0.455040	219.845994	321.467767
8	-1.397532	0.454875	219.819382	321.482311
9	-1.397422	0.454800	219.807351	321.488886
10	-1.397373	0.454766	219.801909	321.491861
11	-1.397351	0.454751	219.799448	321.493206
12	-1.397341	0.454744	219.798334	321.493815
13	-1.397336	0.454741	219.797831	321.494090
14	-1.397334	0.454740	219.797603	321.494214
15	-1.397333	0.454739	219.797500	321.494271
16	-1.397333	0.454739	219.797453	321.494296
17	-1.397332	0.454739	219.797432	321.494308
18	-1.397332	0.454739	219.797422	321.494313
19	-1.397332	0.454739	219.797418	321.494315

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable COUNT

Source	DF	Weighted SS	Weighted MS
Regression	3	2687.0000000	895.6666667
Residual	16	321.4943155	20.0933947
Uncorrected Total	19	3008.4943155	
(Corrected Total)	18	1216.4482669	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
LOG_EC25	-1.3973323	0.220832610	-1.86547417	-0.92919039
SIGMA	0.4547385	0.148223385	0.14052052	0.76895648
CO	219.7974180	33.012820221	149.81371325	289.78112272

MODEL: YOUNG = CO * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)

WEIGHTED REGRESSION

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Asymptotic Correlation Matrix

Corr	LOG_EC25	SIGMA	CO
LOG_EC25	1	-0.892335126	-0.792487497
SIGMA	-0.892335126	1	0.6163527512
CO	-0.792487497	0.6163527512	1

onion shoot length 7

MODEL: YOUNG = CO * PROBNORM ((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	-1.39733	0.45474	219.797	321.494	0.040056

MODEL: YOUNG = CO * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)

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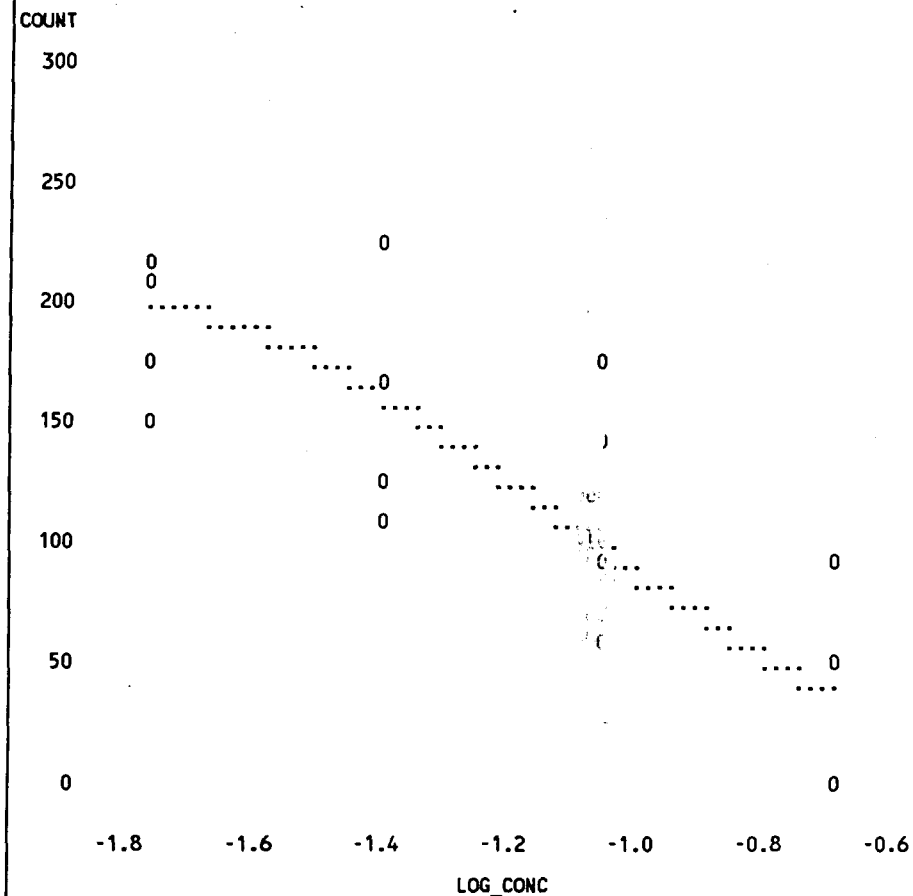
Plot of COUNT*LOG_CONC. Symbol used is '0'.
Plot of PRED*LOG_CONC. Symbol used is '.'.



NOTE: 1088 obs had missing values. 1015 obs hidden.

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	5	0 0.21 0.018 0.041 0.091

Number of observations in data set = 30

NOTE: Due to missing values, only 19 observations can be used in this analysis.

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

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General Linear Models Procedure

Dependent Variable: RESPONSE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	4	85246.46491	21311.61623	10.63	0.0004
Error	14	28078.16667	2005.58333		
Corrected Total	18	113324.63158			

R-Square	C.V.	Root MSE	RESPONSE Mean
0.752232	31.66695	44.78374	141.4211

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DOSE	4	85246.46491	21311.61623	10.63	0.0004

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DOSE	4	85246.46491	21311.61623	10.63	0.0004

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	RESPONSE Mean	RESPONSE SD
0	3	237.666667	43.0967903
0.21	4	34.500000	42.7512183
0.018	4	187.250000	31.9517866
0.041	4	155.500000	50.3355408
0.091	4	116.250000	52.3346603

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= 14 MSE= 2005.583
Critical Value of Dunnett's T= 2.341

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

DOSE Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
0.018 - 0	-130.50	-50.42	29.66	
0.041 - 0	-162.25	-82.17	-2.09	***
0.091 - 0	-201.50	-121.42	-41.34	***
0.21 - 0	-283.25	-203.17	-123.09	***

onion dry weight
File: oni 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	0.988	0.988	0.988
2	0.008 lb ai/A	4	0.849	0.849	0.849
3	0.018 lb ai/A	4	0.773	0.773	0.773
4	0.041 lb ai/A	4	0.482	0.482	0.482
5	0.091 lb ai/A	4	0.304	0.304	0.304
6	0.21 lb ai/A	4	0.060	0.060	0.060

onion dry weight
File: oni 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.	0.988				
0.008 lb ai/A	0.849	0.602		1.74	k= 1, v=17
0.018 lb ai/A	0.773	0.931		1.82	k= 2, v=17
0.041 lb ai/A	0.482	2.187	*	1.85	k= 3, v=17
0.091 lb ai/A	0.304	2.955	*	1.87	k= 4, v=17
0.21 lb ai/A	0.060	4.011	*	1.87	k= 5, v=17

s = 0.303
Note: df used for table values are approximate when v > 20.

NOEL = 0.018 lb a.i./A, lowest NOEL > EC_{25} from non-linear regression. Therefore NOEL = probable EC_5 (0.005 lb a.

onion dry weight

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0021	0.0012	0.0032
EC 5.00	0.0049	0.0032	0.0068
EC10.00	0.0078	0.0055	0.0103
EC15.00	0.0107	0.0079	0.0136
EC50.00	0.0403	0.0343	0.0475
EC85.00	0.1515	0.1199	0.2046
EC90.00	0.2072	0.1586	0.2941
EC95.00	0.3296	0.2390	0.5052
EC99.00	0.7871	0.5125	1.4036

$Y = 7.51 + 1.80(x)$

$EC_{25} = 0.0177$ [illegible]

onion dry weight 13
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OBS	CONC	LOG_CONC	Y1	Y2	Y3	Y4	Y5	Y6
1	0.000	.	.	0.575	1.170	1.220	.	.
2	0.008	-2.09691	0.574	0.476	1.165	1.181	.	.
3	0.018	-1.74473	0.511	0.595	0.935	1.050	.	.
4	0.041	-1.38722	0.185	0.409	0.204	0.130	.	.
5	0.091	-1.04096	0.286	0.280	0.141	0.509	.	.
6	0.210	-0.67778	0.155	0.000	0.083	0.000	.	.

onion dry weight 14
MODEL: COUNT = C0 * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)
WEIGHTED REGRESSION
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Non-Linear Least Squares Iterative Phase
Dependent Variable COUNT Method: Gauss-Newton

Iter	LOG_EC50	SIGMA	C0	Weighted SS
0	-1.398000	0.555000	0.988000	2.198497
1	-1.529807	0.603442	1.017921	2.306620
2	-1.524622	0.586117	1.013884	2.327690
3	-1.526590	0.587955	1.015341	2.327406
4	-1.526328	0.587720	1.015138	2.327442
5	-1.526362	0.587750	1.015165	2.327438
6	-1.526358	0.587746	1.015161	2.327438
7	-1.526358	0.587747	1.015162	2.327438
8	-1.526358	0.587747	1.015162	2.327438

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable COUNT

Source	DF	Weighted SS	Weighted MS
Regression	3	11.834000000	3.944666667
Residual	20	2.327438280	0.116371914
Uncorrected Total	23	14.161438280	
(Corrected Total)	22	8.676932507	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
LOG_EC50	-1.526358197	0.19325301900	-1.9294738932	-1.1232425010
SIGMA	0.587746861	0.15652393835	0.2612461071	0.9142476146
C0	1.015161796	0.18401964453	0.6313064368	1.3990171559

Asymptotic Correlation Matrix

Corr	LOG_EC50	SIGMA	C0
LOG_EC50	1	-0.753811879	-0.835639129
SIGMA	-0.753811879	1	0.5974549203
C0	-0.835639129	0.5974549203	1

onion dry weight 15
MODEL: COUNT = C0 * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)
SUMMARY OF NONLINEAR REGRESSION
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OBS	CONC	LOG_EC50	SIGMA	C0	RESID_SS	EC50
1	0	-1.52636	0.58775	1.01516	2.32744	0.029761

onion dry weight 16
MODEL: YOUNG = C0 * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)
WEIGHTED REGRESSION
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Non-Linear Least Squares Iterative Phase
Dependent Variable COUNT Method: Gauss-Newton

Iter	LOG_EC25	SIGMA	C0	Weighted SS
0	-1.770000	0.555000	0.988000	2.198842
1	-1.937091	0.60391	1.017890	2.305883
2	-1.919877	0.586071	1.013853	2.327704
3	-1.923170	0.587960	1.015346	2.327405
4	-1.922738	0.587719	1.015138	2.327442
5	-1.922794	0.587750	1.015165	2.327438
6	-1.922787	0.587746	1.015161	2.327438
7	-1.922788	0.58774	1.015162	2.327438
8	-1.922788	0.58774	1.015162	2.327438

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable COUNT

Source	DF	Weighted SS	Weighted MS
Regression	3	11.834000000	3.944666667
Residual	20	2.327438280	0.116371914
Uncorrected Total	23	14.161438280	
(Corrected Total)	22	8.676932508	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
LOG_EC25	-1.922787577	0.28151696039	-2.5100172411	-1.3355579127
SIGMA	0.587746861	0.15652393832	0.2612461070	0.9142476143
C0	1.015161796	0.18401964449	0.6313064367	1.3990171557

Asymptotic Correlation Matrix

Corr	LOG_EC25	SIGMA	C0
LOG_EC25	1	-0.892487089	-0.797697549
SIGMA	-0.892487089	1	0.5974549204
C0	-0.797697549	0.5974549204	1

onion dry weight 17
MODEL: YOUNG = C0 * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)
SUMMARY OF NONLINEAR REGRESSION
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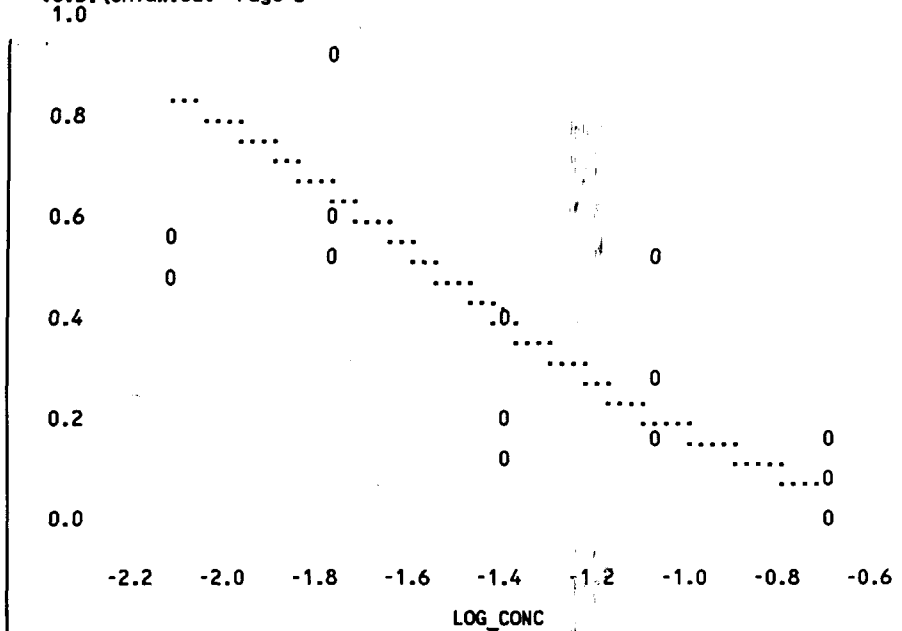
OBS	CONC	LOG_EC25	SIGMA	C0	RESID_SS	EC25
1	0	-1.92279	0.58775	1.01516	2.32744	0.011946

onion dry weight 18
MODEL: YOUNG = C0 * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)
13:52 Friday, December 13, 1996

Plot of COUNT*LOG_CONC. Symbol used is '0'.
Plot of PRED*LOG_CONC. Symbol used is '.'.



NOTE: 1442 obs had missing values. 1379 obs hidden.

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DOSE	6	0 0.21 0.008 0.018 0.041 0.091

Number of observations in data set = 36

NOTE: Due to missing values, only 23 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: RESPONSE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	2.71245332	0.54249066	9.07	0.0002
Error	17	1.01662442	0.05980144		
Corrected Total	22	3.72907774			

R-Square	C.V.	Root MSE	RESPONSE Mean
0.727379	47.52828	0.244543	0.514522

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DOSE	5	2.71245332	0.54249066	9.07	0.0002

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DOSE	5	2.71245332	0.54249066	9.07	0.0002

General Linear Models Procedure

Level of DOSE	N	RESPONSE Mean	RESPONSE SD
0	3	0.98833333	0.35882911
0.21	4	0.05950000	0.07472840
0.008	4	0.84900000	0.37631281
0.018	4	0.77275000	0.26032080
0.041	4	0.23200000	0.12210105
0.091	4	0.30400000	0.15219943

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= 17 MSE= 0.059801
Critical Value of Dunnett's T= 2.385

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

DOSE Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
0.008 - 0	-0.5847	-0.1393	0.3060	
0.018 - 0	-0.6609	-0.2156	0.2298	
0.091 - 0	-1.1297	-0.6843	-0.2390	***
0.041 - 0	-1.2017	-0.7563	-0.3110	***
0.21 - 0	-1.3742	-0.9288	-0.4835	***

soybean shoot length
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.	4	201.500	201.500	201.500
2	0.0036 lb ai/A	4	183.250	183.250	186.625
3	0.008 lb ai/a	4	190.000	190.000	186.625
4	0.018 lb ai/A	4	175.500	175.500	175.500
5	0.041 lb ai/A	4	139.000	139.000	139.000
6	0.091 lb ai/A	4	119.250	119.250	119.250
7	0.21 lb ai/A	4	110.750	110.750	110.750
8	0.46 lb ai/A	4	103.750	103.750	103.750

soybean shoot length
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.	201.500				
0.0036 lb ai/A	186.625	1.649		1.71	k= 1, v=24
0.008 lb ai/a	186.625	1.649		1.79	k= 2, v=24
0.018 lb ai/A	175.500	2.883	*	1.82	k= 3, v=24
0.041 lb ai/A	139.000	6.929	*	1.83	k= 4, v=24
0.091 lb ai/A	119.250	9.119	*	1.84	k= 5, v=24
0.21 lb ai/A	110.750	10.061	*	1.84	k= 6, v=24
0.46 lb ai/A	103.750	10.837	*	1.85	k= 7, v=24

s = 12.756
Note: df used for table values are approximate when v > 20.

NOEL: 0.008 lb ai/A

soybean shoot length

Estimated EC Values and Confidence Limits

Point	Conc.	Lower 95% Confidence Limits	Upper 95% Confidence Limits
EC 1.00	0.0017	0.0001	0.0048
EC 5.00	0.0060	0.0011	0.0116
EC10.00	0.0117	0.0037	0.0189
EC15.00	0.0184	0.0082	0.0267
EC50.00	0.1262	0.0846	0.3119
EC85.00	0.8636	0.3378	9.3983
EC90.00	1.3611	0.4649	21.2138
EC95.00	2.5709	0.7448	70.9895
EC99.00	9.4574	1.7973	686.0755

$Y = 6.12 + 1.24(x)$

$EC_{25} = 0.036$ ug/l

soybean shoot length 23
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OBS	CONC	LOG_CONC	Y1	Y2	Y3	Y4	Y5	Y6
1	0.000	.	214	180	218	194	.	.
2	0.018	-1.74473	183	154	160	205	.	.
3	0.041	-1.38722	155	136	131	134	.	.
4	0.091	-1.04096	118	113	120	126	.	.

MODEL: COUNT = C0 * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)
WEIGHTED REGRESSION
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Non-Linear Least Squares Iterative Phase
Dependent Variable COUNT Method: Gauss-Newton

Iter	LOG_EC50	SIGMA	C0	Weighted SS
0	-0.900000	0.807000	201.500000	19.929888
1	-0.870683	0.884318	202.658305	19.730416
2	-0.870037	0.881387	202.457068	19.731543
3	-0.869959	0.881762	202.465432	19.731997
4	-0.869967	0.881721	202.464501	19.731949
5	-0.869966	0.881725	202.464603	19.731954
6	-0.869967	0.881725	202.464592	19.731953
7	-0.869967	0.881725	202.464593	19.731953

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable COUNT

Source	DF	Weighted SS	Weighted MS
Regression	3	2541.0000000	847.0000000
Residual	13	19.7319535	1.5178426
Uncorrected Total	16	2560.7319535	
(Corrected Total)	15	120.1692208	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
LOG_EC50	-0.8699666	0.1048812487	-1.09654859	-0.64338454
SIGMA	0.8817246	0.2076569256	0.43310940	1.33033989
C0	202.4645930	8.7300667915	183.60444158	221.32474433

Asymptotic Correlation Matrix

Corr	LOG_EC50	SIGMA	C0
LOG_EC50	1	0.5578392377	-0.3539355
SIGMA	0.5578392377	1	0.4199942249
C0	-0.3539355	0.4199942249	1

MODEL: COUNT = C0 * PROBNORM ((LOG_EC50 - LOG_CONC) / SIGMA)
SUMMARY OF NONLINEAR REGRESSION
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OBS	CONC	LOG_EC50	SIGMA	C0	RESID_SS	EC50
1	0	-0.86997	0.88172	202.465	19.7320	0.13491

MODEL: YOUNG = C0 * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)
WEIGHTED REGRESSION
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Non-Linear Least Squares Iterative Phase
Dependent Variable COUNT Method: Gauss-Newton

Iter	LOG_EC25	SIGMA	C0	Weighted SS
0	-1.444000	0.807000	201.500000	19.925602
1	-1.467134	0.884354	202.658617	19.730326
2	-1.464523	0.881385	202.457005	19.731539
3	-1.464698	0.881762	202.465439	19.731998
4	-1.464679	0.881721	202.464500	19.731949
5	-1.464681	0.881725	202.464603	19.731954
6	-1.464681	0.881725	202.464592	19.731953
7	-1.464681	0.881725	202.464593	19.731953

NOTE: Convergence criterion met.

Non-Linear Least Squares Summary Statistics Dependent Variable COUNT

Source	DF	Weighted SS	Weighted MS
Regression	3	2541.0000000	847.0000000
Residual	13	19.7319535	1.5178426
Uncorrected Total	16	2560.7319535	
(Corrected Total)	15	120.1692208	

Parameter	Estimate	Asymptotic Std. Error	Asymptotic 95 % Confidence Interval Lower	Upper
LOG_EC25	-1.4646810	0.1192826260	-1.72237531	-1.20698673
SIGMA	0.8817246	0.2076569256	0.43310940	1.33033989
C0	202.4645930	8.7300667915	183.60444158	221.32474433

Asymptotic Correlation Matrix

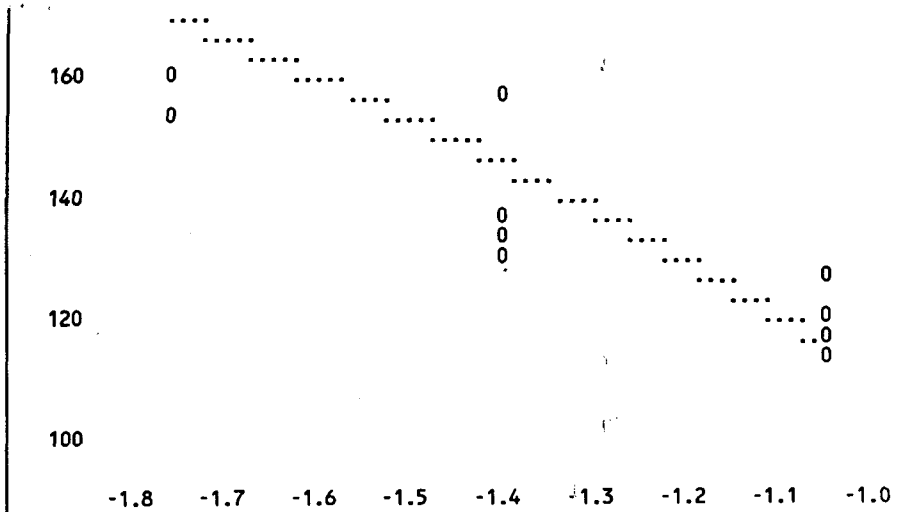
Corr	LOG_EC25	SIGMA	C0
LOG_EC25	1	-0.68371771	-0.804363971
SIGMA	-0.68371771	1	0.4199942249
C0	-0.804363971	0.4199942249	1

MODEL: YOUNG = C0 * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)
SUMMARY OF NONLINEAR REGRESSION
13:52 Friday, December 13, 1996

OBS	CONC	LOG_EC25	SIGMA	C0	RESID_SS	EC25
1	0	-1.46468	0.88172	202.465	19.7320	0.034302

MODEL: YOUNG = C0 * PROBNORM ((LOG_EC25 - LOG_CONC) / SIGMA - 0.67449)
13:52 Friday, December 13, 1996

Plot of COUNT*LOG_CONC. Symbol used is '0'.
Plot of PRED*LOG_CONC. Symbol used is '.'.



NOTE: 723 obs had missing values. 652 obs hidden

General Linear Models Procedure
Class Level Information

Class	Levels	Values
DOSE	4	0 0.018 0.041 0.091

Number of observations in data set = 24

NOTE: Due to missing values, only 16 observations can be used in this analysis.

General Linear Models Procedure

Dependent Variable: RESPONSE

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	3	16233.68750	5411.22917	21.52	0.0001
Error	12	3016.75000	251.39583		
Corrected Total	15	19250.43750			

R-Square	C.V.	Root MSE	RESPONSE Mean
0.843289	9.983765	15.85547	158.8125

Source	DF	Type I SS	Mean Square	F Value	Pr > F
DOSE	3	16233.68750	5411.22917	21.52	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
DOSE	3	16233.68750	5411.22917	21.52	0.0001

General Linear Models Procedure

Level of DOSE	N	RESPONSE Mean	RESPONSE SD
0	4	201.500000	17.7670106
0.018	4	175.500000	23.3023604
0.041	4	139.000000	10.8627805
0.091	4	119.250000	5.3774219

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= 251.3958
Critical Value of Dunnett's T= 2.287
Minimum Significant Difference= 25.644

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

DOSE Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
0.018 - 0	-51.64	-26.00	-0.36	***
0.041 - 0	-88.14	-62.50	-36.86	***
0.091 - 0	-107.89	-82.25	-56.61	***

sugar beet shoot length
File: sug Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Form. Con.	4	149.750	149.750	149.750
2	0.00025 lb ai/A	4	146.750	146.750	146.750
3	0.0005 lb ai/A	4	142.000	142.000	142.625
4	0.001 lb ai/A	4	143.250	143.250	142.625
5	0.002 lb ai/A	4	135.250	135.250	135.250
6	0.004 lb ai/A	4	52.000	52.000	52.000
7	0.008 lb ai/A	4	28.250	28.250	28.250

sugar beet shoot length
File: sug 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.	149.750				
0.00025 lb ai/A	146.750	0.216		1.72	k= 1, v=21
0.0005 lb ai/A	142.625	0.514		1.80	k= 2, v=21
0.001 lb ai/A	142.625	0.514		1.83	k= 3, v=21
0.002 lb ai/A	135.250	1.046		1.84	k= 4, v=21
0.004 lb ai/A	52.000	7.049	*	1.85	k= 5, v=21
0.008 lb ai/A	28.250	8.762	*	1.85	k= 6, v=21

s = 19.610
Note: df used for table values are approximate when v > 20.

NOEL = 0.002 lb ai/A

sugar beet dry weight
File: sug Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Form. Con.	4	4.798	4.798	4.903
2	0.00025 lb ai/A	4	4.995	4.995	4.903
3	0.0005 lb ai/A	4	4.916	4.916	4.903
4	0.001 lb ai/A	4	4.587	4.587	4.587
5	0.002 lb ai/A	4	3.802	3.802	3.802
6	0.004 lb ai/A	4	0.860	0.860	0.860
7	0.008 lb ai/A	4	0.315	0.315	0.315

sugar beet dry weight
File: sug 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.	4.903				
0.00025 lb ai/A	4.903	0.214		1.72	k= 1, v=21
0.0005 lb ai/A	4.903	0.214		1.80	k= 2, v=21
0.001 lb ai/A	4.587	0.427		1.83	k= 3, v=21
0.002 lb ai/A	3.802	2.019	*	1.84	k= 4, v=21
0.004 lb ai/A	0.860	7.984	*	1.85	k= 5, v=21
0.008 lb ai/A	0.315	9.090	*	1.85	k= 6, v=21

s = 0.697
Note: df used for table values are approximate when v > 20.

NOEL = 0.001 lb ai/A