File 10-13-95

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

1. **CHEMICAL:** Sulfentrazone (129081)

2. **TEST MATERIAL:** Sulfentrazone technical; 94.2%

3. **CITATION:**

Author:	Chetram, R.S.
Date:	1992
Title:	Tier 2 vegetative vigor nontarget phytotoxicity study using F6285 technical
Laboratory:	Pan-Agricultural Laboratories, Inc., Madera, CA
Lab. Report #:	BL91-474
Sponsor:	FMC Corporation, Princeton, NJ
MRID No.:	433454-12 (report) 437836-02 (raw data)

4. **REVIEWED BY:**

William Erickson
Biologist
EEB/EFED/EPA

Signature: W. Erickson

Date: 10/13/95

5. **APPROVED BY:**

Harry Craven
Section Head 4
EEB/EFED/EPA

Signature: Harry F. Craven

Date:

6. **STUDY PARAMETERS/RESULTS SYNOPSIS:**

Definitive study duration:	21 days
Species tested:	oat, ryegrass, corn, onion, soybean, lettuce, tomato, radish, cabbage, cucumber
Most sensitive species:	cucumber
Measurement endpoint:	dry weight
EC_{25}:	0.00052 lb ai/acre
95% CI:	0.00024-0.0011 lb ai/acre
NOEC:	0.00044 lb ai/acre
Slope:	2.28

7. **CONCLUSION:** The study is scientifically sound and fulfills the guideline requirement for a Tier 2 plant vegetative vigor study.

8. **ADEQUACY OF THE STUDY:** Core.

9. **MAJOR GUIDELINE DEVIATIONS:** None.

10. MATERIALS AND METHODS:

Test Organisms:

Guideline Criteria	Reported Information
Species: (6 dicots in 4 families including soybean and rootcrop; 4 monocots in 2 families including corn)	Monocots: corn, ryegrass, oat, onion Dicots: soybean, tomato, cucumber, radish, lettuce, cabbage
No. plants per rep.: (5) No. reps per dose: (3)	5 plants per rep; 4 reps per dose
Source of seed reported?	yes

Test System:

Guideline Criteria	Reported Information
Solvent:	acetone
Test site:	greenhouse
Soil type:	pasteurized sandy loam (0.3% organic matter) with perlite added to facilitate drainage
Fertilizer:	none reported
Pot size and description:	plastic pots (7.5 x 7.5 x 6.0 cm)
No. plants per pot:	5
Method of pesticide application:	spray booth equipped with a single TeeJet 8001-E nozzle and a compressed air cylinder
Watering method and frequency: (under foliage)	watered by hand as needed during first 48 h after treatment; thereafter, watered using a HydroRain controlled irrigation system
Test duration:	21 days
Growth stage at application: (past first true leaf stage)	1-3 true leaf stage

Test Design:

Guideline Criteria	Reported Information
Dose range: (2X or 3X)	3X
Doses: (at least 5)	6
Controls: (negative and solvent)	solvent control
Parameters observed and measured	shoot weight (dry), shoot height, survival, phytotoxic symptoms
Maximum labeled application rate:	0.375 lb ai/acre (from label)

11. REPORTED RESULTS:

Guideline Criteria	Reported Information
NOEC Observed?	yes
Measured Initial Chemical Concentrations? (optional)	yes
Raw data included? (Y/N)	yes (tomato data in MRID# 433454-12; others in MRID# 437836-02)
Quality Assurance Measures?	yes

Shoot weight (dry), shoot height, plant survival: The measurement endpoint with the most sensitive EC_{25} value is tabulated below for each of the 10 species. The most sensitive monocot and dicot species are highlighted in bold.

Statistical Methods: EC_{25} - regression analysis
NOEC - Dunnett's Test

Species	Endpoint	EC_{25} (lb ai/A)	NOEC (lb ai/A)
Monocots:			
corn	dry weight	0.24	0.167
ryegrass	dry weight; plant height	0.051	0.019
oat	dry weight	0.023	0.019

Species	Endpoint	EC_{25} (lb ai/A)	NOEC (lb ai/A)
onion	**dry weight**	**0.0067**	**0.006**
Dicots:			
soybean	dry weight	0.0044	0.00133
lettuce	dry weight	0.020	0.006
cabbage	dry weight	0.0099	0.006
radish	dry weight	0.044	0.019
cucumber	**dry weight**	**0.0015**	**0.00133**
tomato	dry weight	0.0024	0.00133

Phytotoxic symptoms: Ten days after treatment, all crops exhibited significant symptoms, mainly foliar desiccation and burning. NOECs (lb ai/acre) in order of increasing sensitivity are as follows:

corn (0.167) < lettuce = radish = oat = ryegrass (0.019) < cabbage = onion (0.006) < tomato = soybean (0.00133) < cucumber (0.00044)

Mortality: Plant Mortality (no. dead plants out of 20 total) by day 21 is tabulated below.

Species	Dose (lb ai/acre)						
	0	0.002	0.006	0.019	0.056	0.167	0.50
corn	0	0	0	0	0	0	12
ryegrass	0	0	0	0	0	11	20
oat	0	0	0	0	0	0	12
onion	1	2	4	7	12	20	20
soybean	0	0	0	0	0	0	5
lettuce	0	0	0	0	4	17	20
radish	0	0	0	0	0	1	6
cabbage	0	0	0	0	2	10	19
cucumber	0	0	0	6	20	20	20
tomato	0	0	0	0	19	20	20

12. **REVIEWER'S ANALYSIS:**

Statistical Methods: (results attached)
EPA/OPP/EFED Nuthatch Program
EC_{25} - weighted nonlinear regression
NOEC - Williams' Test

Species	Endpoint	EC_{25} (lb ai/A)	NOEC (lb ai/A)
Monocots:			
corn	dry weight	0.18	0.056
ryegrass	dry weight	0.045	0.019
oat	dry weight	0.033	0.006
onion	**dry weight**	**0.012**	**0.006**
Dicots:			
soybean	dry weight	0.0044	0.0013
lettuce	dry weight	0.025	0.006
cabbage	dry weight	0.011	0.006
radish	dry weight	0.057	0.019
cucumber	**dry weight**	**0.00052**	**0.00044**
tomato	dry weight	0.012	0.0013

Most sensitive dicot: cucumber
Endpoint: dry weight
EC_{25}: 0.00052 lb ai/acre
95% C.L.: 0.00024-0.0011 lb ai/acre
NOEC: 0.0004 lb ai/acre
Slope: 2.28

Most sensitive monocot: onion
Endpoint: dry weight
EC_{25}: 0.012 lb ai/acre
95% C.L.: 0.0056-0.025 lb ai/acre
NOEC: 0.006 lb ai/acre
Slope: 2.44

12. **REVIEWER'S CONCLUSIONS:** The study is scientifically sound and fulfills the guideline requirement for a Tier 2 vegetative vigor study. Cucumber was the most sensitive species for both dry weight (EC_{25} = 0.00052 lb ai/acre) and plant height (EC_{25} = 0.0032 lb ai/acre) measurement endpoints, but soybean (dry weight EC_{25} = 0.0044 lb ai/acre) also was highly sensitive.

Program: NUTHATCH
Path : C:\NUTHATCH
Date : 10/13/95

Toxicity measurement for continuous endpoints, using weighted nonlinear regression, weighting proportional to predicted means.

Reference

R.D. Bruce and D.J. Versteeg. 1992. A statistical procedure for modeling continuous toxicity data. Env. Tox. and Chem. 11:1485-1494.

ONI-WT.DAT : ONION PLANT WEIGHT

Raw data:

ONION PLANT WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.086
0.125
0.084
0.104
0.002
0.082
0.094
0.086
0.124
0.006
0.089
0.09
0.07
0.08
0.019
0.015
0.03
0.088
0.071
0.056
0
0.016
0.053
0.013
0.167
0
0
0
0
0.5
0
0
0
0

ONI-WT.DAT : ONION PLANT WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.0998			
0.002	0.0965	0.2433	N.S.	
0.006	0.0823	1.31	N.S.	
0.019	0.051	3.649	<0.005	*
0.056	0.0205	5.932	<0.005	*
0.167	0	7.467	<0.005	*
0.5	0	7.467	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0025	0.00064	0.0097	0.29	0.26
EC5	0.0047	0.0016	0.014	0.23	0.33
EC25	0.012	0.0056	0.025	0.16	0.48
EC50	0.022	0.013	0.037	0.11	0.60

Slope = 2.44 Std.Err. = 0.512

Goodness of fit: p = 0.79 based on DF= 4.0 21.
ONI-WT.DAT : ONION PLANT WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.0998	0.0956	0.00416	100.	0.00
0.00200	4.00	0.0965	0.0951	0.00141	99.5	0.528
0.00600	4.00	0.0823	0.0878	-0.00551	91.8	8.19
0.0190	4.00	0.0510	0.0542	-0.00324	56.7	43.3
0.0560	4.00	0.0205	0.0157	0.00479	16.4	83.6
0.167	4.00	0.00	0.00156	-0.00156	1.64	98.4
0.500	4.00	0.00	4.65e-05	-4.65e-05	0.0486	100.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.20451	25.000	0.0081805
Means Lack-of-Fit	0.015240	4.0000	0.0038100
Within Groups	0.18927	21.000	0.0090130

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.095593	0.0093680	1.0000	-0.62570	0.43020
log10 EC50 =	-1.6518	0.10947	-0.62570	1.0000	-0.69642
Bruce&V. SIGMA =	0.40951	0.085881	0.43020	-0.69642	1.0000

Starting Values 0.099750 -1.7039 0.54264

CAB-WT.DAT : CABBAGE PLANT WEIGHT

Raw data:

CABBAGE PLANT WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.732
0.571
0.519
0.842
0.002
0.7
0.818
0.54
0.609
0.006
0.534
0.497
0.534
0.669
0.019
0.396
0.499
0.36
0.52
0.056
0.281
0.272
0.215
0.171
0.167
0.076
0.137
0.304
0.216
0.50
0.12
0
0
0

CAB-WT.DAT : CABBAGE PLANT WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.666	.		
0.002	0.666	-0.005535	N.S.	
0.006	0.558	1.587	N.S.	
0.019	0.444	3.28	<0.005	*
0.056	0.235	6.365	<0.005	*
0.167	0.183	7.126	<0.005	*
0.5	0.03	9.388	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.00062	8.5E-05	0.0045	0.42	0.14
EC5	0.0021	0.00042	0.010	0.34	0.20
EC25	0.011	0.0040	0.032	0.22	0.35
EC50	0.037	0.019	0.075	0.15	0.50

Slope = 1.31 Std.Err. = 0.219

Goodness of fit: p = 0.45 based on DF= 4.0 21.
CAB-WT.DAT : CABBAGE PLANT WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.666	0.674	-0.00808	100.	0.00
0.00200	4.00	0.667	0.642	0.0252	95.2	4.83
0.00600	4.00	0.558	0.573	-0.0147	85.0	15.0
0.0190	4.00	0.444	0.438	0.00601	64.9	35.1
0.0560	4.00	0.235	0.276	-0.0410	40.9	59.1
0.167	4.00	0.183	0.133	0.0500	19.8	80.2
0.500	4.00	0.0300	0.0475	-0.0175	7.04	93.0

!!!Warning: EC1 not bracketed by doses evaluated.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.84474	25.000	0.033790
Means Lack-of-Fit	0.13147	4.0000	0.032868
Within Groups	0.71327	21.000	0.033965

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.67408	0.060513	1.0000	-0.78948	0.59140
log10 EC50 =	-1.4277	0.14708	-0.78948	1.0000	-0.74234
Bruce&V. SIGMA =	0.76512	0.12840	0.59140	-0.74234	1.0000

Starting Values 0.66637 -1.4271 0.77024

SOY-HT.DAT : SOYBEAN PLANT HEIGHT

Raw data:

SOYBEAN PLANT HEIGHT
6
4
4
4
4
4
4
CONTROL
349
430
354
429

```
0.00015
408
406
388
382
0.00044
358
350
369
422
0.0013
392
370
407
362
0.0040
363
383
371
353
0.012
278
322
368
280
```

SOY-HT.DAT : SOYBEAN PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	393	.		
0.00015	393	-0.1268	N.S.	
0.00044	379	0.5419	N.S.	
0.0013	379	0.5419	N.S.	
0.004	368	1.061	N.S.	
0.012	312	3.62	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0014	0.00013	0.014	0.50	0.093
EC5	0.0037	0.0010	0.014	0.27	0.27
EC25	0.016	0.0092	0.028	0.11	0.58
EC50	0.044	0.0098	0.19	0.31	0.23

Slope = 1.54 Std.Err. = 0.801

Goodness of fit: p = 0.82 based on DF= 3.0 18.

SOY-HT.DAT : SOYBEAN PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	391.	387.	3.21	100.	0.00

0.000150	4.00	396.	387.	8.74	100.	0.00730
0.000440	4.00	375.	387.	-12.1	99.9	0.104
0.00130	4.00	383.	384.	-0.930	99.1	0.933
0.00400	4.00	368.	366.	1.43	94.5	5.48
0.0120	4.00	312.	312.	-0.305	80.6	19.4

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	49.622	21.000	2.3629
Means Lack-of-Fit	2.4504	3.0000	0.81679
Within Groups	47.172	18.000	2.6206

Directly-fitted parameters and Asymptotic Covariances

Parameter		Estimate	Std.Err.	Correlations		
Control Mean	=	387.29	8.5471	1.0000	0.33681	0.49324
log10 EC50	=	-1.3598	0.31099	0.33681	1.0000	0.95605
Bruce&V. SIGMA	=	0.64880	0.33709	0.49324	0.95605	1.0000
Starting Values		393.25	-1.1190	0.94411		

CUC-WT.DAT : CUCUMBER PLANT WEIGHT

Raw data:

```
CUCUMBER PLANT WEIGHT
6
4
4
4
4
4
4
CONTROL
7.291
5.057
6.662
2.831
0
5.963
8.016
4.588
2.651
.00015
5.819
4.727
6.339
5.709
0.00044
5.605
3.882
3.628
3.932
0.0013
1.899
2.513
2.668
1.942
0.0044
```

0.270
1.374
0
0

CUC-WT.DAT : CUCUMBER PLANT WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	5.47	.		
0.00015	5.47	-0.1102	N.S.	
0.00044	4.26	1.392	N.S.	
0.0013	2.26	3.885	<0.005	*
0.0044	0.411	6.176	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	9.7E-05	2.1E-05	0.00044	0.32	0.22
EC5	0.00019	5.8E-05	0.00064	0.25	0.30
EC25	0.00052	0.00024	0.0011	0.16	0.46
EC50	0.0010	0.00061	0.0017	0.11	0.59

Slope = 2.28 Std.Err. = 0.521

Goodness of fit: p = 0.90 based on DF= 2.0 19.

CUC-WT.DAT : CUCUMBER PLANT WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	5.38	5.49	-0.109	100.	0.00
0.000150	4.00	5.65	5.33	0.316	97.1	2.88
0.000440	4.00	4.26	4.38	-0.121	79.8	20.2
0.00130	4.00	2.26	2.23	0.0219	40.7	59.3
0.00440	4.00	0.411	0.411	0.000117	7.48	92.5

!!!Warning: EC1 not bracketed by doses evaluated.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	9.2209	21.000	0.43909
Means Lack-of-Fit	0.10611	2.0000	0.053055
Within Groups	9.1148	19.000	0.47973

Directly-fitted parameters and Asymptotic Covariances

Parameter		Estimate	Std.Err.	Correlations		
Control Mean	=	5.4910	0.47764	1.0000	-0.61443	0.42161
log10 EC50	=	-2.9897	0.10906	-0.61443	1.0000	-0.64827

Bruce&V. SIGMA = 0.43946 0.10054 0.42161 -0.64827 1.0000

Starting Values 5.4711 -2.9951 0.42555

SOY-WT.DAT : SOYBEAN PLANT WEIGHT

Raw data:

SOYBEAN PLANT WEIGHT
6
4
4
4
4
4
4
CONTROL
2.906
5.172
3.736
5.573
0.00015
5.104
5.129
4.322
2.814
0.00044
3.396
2.985
3.540
5.410
0.0013
4.685
4.230
4.547
3.708
0.0040
3.115
3.140
3.140
3.307
0.012
1.878
2.219
2.391
1.569

SOY-WT.DAT : SOYBEAN PLANT WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	4.35	.		
0.00015	4.34	0.007594	N.S.	
0.00044	4.06	0.4795	N.S.	
0.0013	4.06	0.4795	N.S.	
0.004	3.18	1.977	0.04	*
0.012	2.01	3.936	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.00049	4.4E-05	0.0054	0.50	0.091
EC5	0.0012	0.00022	0.0067	0.36	0.18
EC25	0.0044	0.0020	0.0098	0.17	0.45
EC50	0.011	0.0068	0.017	0.097	0.63

Slope = 1.73 Std.Err. = 0.644

Goodness of fit: p = 0.70 based on DF= 3.0 18.

SOY-WT.DAT : SOYBEAN PLANT WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	4.35	4.25	0.0968	100.	0.00
0.000150	4.00	4.34	4.25	0.0950	99.9	0.0653
0.000440	4.00	3.83	4.22	-0.383	99.2	0.806
0.00130	4.00	4.29	4.01	0.279	94.4	5.57
0.00400	4.00	3.18	3.28	-0.109	77.3	22.7
0.0120	4.00	2.01	1.99	0.0206	46.9	53.1

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	3.3468	21.000	0.15937
Means Lack-of-Fit	0.24932	3.0000	0.083107
Within Groups	3.0975	18.000	0.17208

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	4.2500	0.24644	1.0000	-0.41781	0.49371
log10 EC50 =	-1.9656	0.097304	-0.41781	1.0000	0.094643
Bruce&V. SIGMA =	0.57805	0.21519	0.49371	0.094643	1.0000

Starting Values 4.3468 -1.9785 0.70673

ONI-HT.DAT : ONION PLANT HEIGHT

Raw data:

ONION PLANT HEIGHT
7
4
4
4
4
4
4
CONTROL
101
104
82
112
0.002

84
100
95
114
0.006
82
90
78
76
0.019
32
39
93
72
0.056
0
31
75
26
0.167
0
0
0
0
0.5
0
0
0
0

ONI-HT.DAT : ONION PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	99.8	.		
0.002	98.3	0.1213	N.S.	
0.006	81.5	1.476	N.S.	
0.019	59	3.295	<0.005	*
0.056	33	5.397	<0.005	*
0.167	0	8.065	<0.005	*
0.5	0	8.065	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0053	0.0016	0.017	0.25	0.30
EC5	0.0091	0.0035	0.024	0.20	0.38
EC25	0.020	0.011	0.038	0.13	0.53
EC50	0.034	0.022	0.053	0.094	0.64

Slope = 2.87 Std.Err. = 0.633

Goodness of fit: p = 0.36 based on DF= 4.0 21.

ONI-HT.DAT : ONION PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	99.8	91.9	7.89	100.	0.00
0.00200	4.00	98.3	91.8	6.41	100.	0.0202
0.00600	4.00	81.5	90.5	-8.97	98.5	1.51
0.0190	4.00	59.0	70.5	-11.5	76.7	23.3
0.0560	4.00	33.0	24.6	8.36	26.8	73.2
0.167	4.00	0.00	2.19	-2.19	2.38	97.6
0.500	4.00	0.00	0.0373	-0.0373	0.0406	100.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	200.18	25.000	8.0072
Means Lack-of-Fit	35.791	4.0000	8.9477
Within Groups	164.39	21.000	7.8281

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	91.856	8.0850	1.0000	-0.55176	0.36311
log10 EC50 =	-1.4671	0.094282	-0.55176	1.0000	-0.66523
Bruce&V. SIGMA =	0.34820	0.076765	0.36311	-0.66523	1.0000
Starting Values	99.750	-1.5598	0.71134		

TOM-HT.DAT : TOMATO PLANT HEIGHT

Raw data:

TOMATO PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL
135
127
137
129
0.002
117
126
117
116
0.006
104
117
112
121
0.019
105
92
92
98
0.056
0
0

0
21
0.167
0
0
0
0
0.50
0
0
0
0

TOM-HT.DAT : TOMATO PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	132	.		
0.002	119	3.096	<0.005	*
0.006	114	4.406	<0.005	*
0.019	96.8	8.395	<0.005	*
0.056	5.25	30.19	<0.005	*
0.167	0	31.44	<0.005	*
0.5	0	31.44	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.010	0.0068	0.015	0.082	0.68
EC5	0.013	0.0098	0.018	0.067	0.73
EC25	0.020	0.016	0.025	0.048	0.80
EC50	0.027	0.023	0.032	0.036	0.84

Slope = 5.41 Std.Err. = 0.675

Goodness of fit: p = 0.76 based on DF= 4.0 21.

TOM-HT.DAT : TOMATO PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	132.	122.	10.5	100.	0.00
0.00200	4.00	119.	122.	-2.52	100.	4.63e-08
0.00600	4.00	114.	121.	-7.99	100.	0.0202
0.0190	4.00	96.8	96.7	0.0224	79.6	20.4
0.0560	4.00	5.25	5.25	-0.00221	4.32	95.7
0.167	4.00	0.00	0.00112	-0.00112	0.000918	100.
0.500	4.00	0.00	4.11e-10	-4.11e-10	3.38e-10	100.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	72.521	25.000	2.9008

Means Lack-of-Fit	5.9336	4.0000	1.4834
Within Groups	66.588	21.000	3.1708

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	121.52	5.4267	1.0000	-0.46744	0.33128
log10 EC50 =	-1.5684	0.036280	-0.46744	1.0000	-0.63477
Bruce&V. SIGMA =	0.18468	0.023020	0.33128	-0.63477	1.0000
Starting Values	132.00	-1.7476	0.37832		

LET-HT.DAT : LETTUCE PLANT HEIGHT

Raw data:

LETTUCE PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL
59
54
54
50
0.002
56
57
53
55
0.006
58
55
60
55
0.019
61
54
57
54
0.056
53
34
50
25
0.167
0
0
15
0
0.50
0
0
0
0

12

LET-HT.DAT : LETTUCE PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	55.8			
0.002	55.8	-0.3441	N.S.	
0.006	55.8	-0.3441	N.S.	
0.019	55.8	-0.3441	N.S.	
0.056	40.5	3.154	<0.005	*
0.167	3.75	11.58	<0.005	*
0.5	0	12.44	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.023	0.013	0.041	0.12	0.56
EC5	0.033	0.020	0.052	0.099	0.63
EC25	0.054	0.039	0.075	0.068	0.73
EC50	0.077	0.061	0.097	0.050	0.79

Slope = 4.44 Std.Err. = 0.727

Goodness of fit: p = 1.0 based on DF= 4.0 21.

LET-HT.DAT : LETTUCE PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	54.3	55.8	-1.53	100.	0.00
0.00200	4.00	55.3	55.8	-0.528	100.	9.67e-11
0.00600	4.00	57.0	55.8	1.22	100.	4.36e-05
0.0190	4.00	56.5	55.6	0.919	99.6	0.353
0.0560	4.00	40.5	40.6	-0.113	72.8	27.2
0.167	4.00	3.75	3.71	0.0379	6.66	93.3
0.500	4.00	0.00	0.00826	-0.00826	0.0148	100.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	60.680	25.000	2.4272
Means Lack-of-Fit	0.39114	4.0000	0.097785
Within Groups	60.289	21.000	2.8709

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	55.778	2.9388	1.0000	-0.42634	0.27506
log10 EC50 =	-1.1152	0.049666	-0.42634	1.0000	-0.61289
Bruce&V. SIGMA =	0.22499	0.036823	0.27506	-0.61289	1.0000
Starting Values	55.750	-1.1233	0.21442		

TOM-WT.DAT : TOMATO PLANT WEIGHT

Raw data:

TOMATO PLANT WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.755
0.952
0.889
0.724
0.002
0.565
0.575
0.67
0.59
0.006
0.388
0.566
0.501
0.603
0.019
0.369
0.29
0.269
0.456
0.056
0
0
0
0.076
0.167
0
0
0
0
0.50
0
0
0
0

TOM-WT.DAT : TOMATO PLANT WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.83			
0.002	0.6	4.842	<0.005	*
0.006	0.514	6.642	<0.005	*
0.019	0.346	10.19	<0.005	*
0.056	0.019	17.07	<0.005	*
0.167	0	17.47	<0.005	*
0.5	0	17.47	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0045	0.0023	0.0087	0.14	0.51
EC5	0.0068	0.0040	0.012	0.11	0.59
EC25	0.012	0.0086	0.018	0.075	0.70
EC50	0.019	0.014	0.024	0.053	0.78

Slope = 3.77 Std.Err. = 0.618

!!!Poor fit: p = 0.0089 based on DF= 4.0 21.

TOM-WT.DAT : TOMATO PLANT WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.830	0.662	0.168	100.	0.00
0.00200	4.00	0.600	0.662	-0.0619	100.	0.0133
0.00600	4.00	0.514	0.641	-0.126	96.8	3.22
0.0190	4.00	0.346	0.321	0.0246	48.5	51.5
0.0560	4.00	0.0190	0.0235	-0.00454	3.56	96.4
0.167	4.00	0.00	0.000108	-0.000108	0.0164	100.
0.500	4.00	0.00	2.38e-08	-2.38e-08	3.60e-06	100.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.66134	25.000	0.026454
Means Lack-of-Fit	0.30460	4.0000	0.076150
Within Groups	0.35674	21.000	0.016988

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.66196	0.040788	1.0000	-0.49556	0.30031
log10 EC50 =	-1.7309	0.052524	-0.49556	1.0000	-0.62724
Bruce&V. SIGMA =	0.26546	0.043580	0.30031	-0.62724	1.0000

Starting Values 0.83000 -2.0564 0.73230

CUC-HT.DAT : CUCUMBER PLANT HEIGHT

Raw data:

CUCUMBER PLANT HEIGHT
6
4
4
4
4
4
4
CONTROL
244
212
217
162
0.00015

```
225
242
180
149
0.00044
217
220
216
214
0.0013
208
167
163
194
0.0040
139
118
147
143
0.012
24
88
0
0
```

CUC-HT.DAT : CUCUMBER PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	209	.		
0.00015	208	0.04151	N.S.	
0.00044	208	0.04151	N.S.	
0.0013	183	1.221	N.S.	
0.004	137	3.415	<0.005	*
0.012	28	8.574	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.00094	0.00032	0.0028	0.22	0.34
EC5	0.0016	0.00067	0.0037	0.18	0.43
EC25	0.0032	0.0019	0.0055	0.11	0.59
EC50	0.0054	0.0038	0.0076	0.073	0.71

Slope = 3.08 Std.Err. = 0.701

Goodness of fit: p = 0.87 based on DF= 3.0 18.

CUC-HT.DAT : CUCUMBER PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	209.	204.	4.64	100.	0.00
0.000150	4.00	199.	204.	-5.11	100.	8.48e-05

0.000440	4.00	217.	204.	12.7	100.	0.0410
0.00130	4.00	183.	198.	-15.2	97.1	2.90
0.00400	4.00	137.	133.	3.60	65.2	34.8
0.0120	4.00	28.0	28.6	-0.643	14.0	86.0

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	244.70	21.000	11.652
Means Lack-of-Fit	9.2145	3.0000	3.0715
Within Groups	235.48	18.000	13.082

Directly-fitted parameters and Asymptotic Covariances

Parameter		Estimate	Std.Err.	Correlations		
Control Mean	=	204.11	12.946	1.0000	-0.50475	0.33500
log10 EC50	=	-2.2709	0.072522	-0.50475	1.0000	-0.63283
Bruce&V. SIGMA	=	0.32446	0.073789	0.33500	-0.63283	1.0000
Starting Values		208.75	-2.3089	0.35668		

Program: NUTHATCH
Path : C:\NUTHATCH
Date : 10/16/95

Toxicity measurement for continuous endpoints, using weighted nonlinear regression, weighting proportional to predicted means.

Reference

R.D. Bruce and D.J. Versteeg. 1992. A statistical procedure for modeling continuous toxicity data. Env. Tox. and Chem. 11:1485-1494.

RYE-WT.DAT : RYEGRASS DRY WEIGHT

Raw data:

RYEGRASS DRY WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.18
0.2
0.159
0.277
0.002
0.187
0.171
0.222
0.271
0.006
0.199
0.223
0.269
0.198
0.019
0.212
0.215
0.287
0.292
0.056
0.096
0.104
0.175
0.152
0.167
0.027
0.008
0.038
0.008
0.5
0
0
0
0

RYE-WT.DAT : RYEGRASS DRY WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.223	.		
0.002	0.223	-0.7223	N.S.	
0.006	0.223	-0.7223	N.S.	
0.019	0.223	-0.7223	N.S.	
0.056	0.132	2.802	0.0063	*
0.167	0.0203	7.126	<0.005	*
0.5	0	7.911	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.015	0.0082	0.029	0.13	0.53
EC5	0.024	0.014	0.040	0.11	0.60
EC25	0.045	0.032	0.062	0.071	0.71
EC50	0.069	0.054	0.087	0.051	0.79

Slope = 3.59 Std.Err. = 0.531

Goodness of fit: p = 0.43 based on DF= 4.0 21.
RYE-WT.DAT : RYEGRASS DRY WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.204	0.222	-0.0185	100.	0.00
0.00200	4.00	0.213	0.222	-0.00973	100.	1.80e-06
0.00600	4.00	0.222	0.222	-0.000211	100.	0.00730
0.0190	4.00	0.252	0.217	0.0341	97.7	2.27
0.0560	4.00	0.132	0.139	-0.00720	62.5	37.5
0.167	4.00	0.0203	0.0185	0.00178	8.30	91.7
0.500	4.00	0.00	0.000220	-0.000220	0.0989	99.9

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.20287	25.000	0.0081149
Means Lack-of-Fit	0.032243	4.0000	0.0080608
Within Groups	0.17063	21.000	0.0081252

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.22248	0.011070	1.0000	-0.46253	0.29134
log10 EC50 =	-1.1633	0.050661	-0.46253	1.0000	-0.62386
Bruce&V. SIGMA =	0.27873	0.041222	0.29134	-0.62386	1.0000
Starting Values	0.22262	-1.1859	0.28922		

RAD-HT.DAT : RADISH PLANT HEIGHT

Raw data:

RADISH PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL
80
90
87
83
0.002
89
79
87
85
0.006
80
92
86
95
0.019
85
85
86
78
0.056
83
77
82
80
0.167
79
63
78
80
0.50
48
50
59
57

RAD-HT.DAT : RADISH PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	86.1	.		
0.002	86.1	-0.2896	N.S.	
0.006	86.1	-0.2896	N.S.	
0.019	83.5	0.401	N.S.	
0.056	80.5	1.203	N.S.	
0.167	75	2.673	0.0085	*
0.5	53.5	8.421	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.028	0.0096	0.083	0.23	0.34
EC5	0.076	0.037	0.15	0.15	0.49
EC25	0.31	0.24	0.39	0.053	0.78
EC50	0.81	0.59	1.1	0.065	0.73

Slope = 1.60 Std.Err. = 0.299

Goodness of fit: p = 0.70 based on DF= 4.0 21.

RAD-HT.DAT : RADISH PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	85.0	85.3	-0.293	100.	0.00
0.00200	4.00	85.0	85.3	-0.292	100.	0.00155
0.00600	4.00	88.3	85.3	2.99	100.	0.0332
0.0190	4.00	83.5	84.9	-1.40	99.5	0.461
0.0560	4.00	80.5	82.6	-2.07	96.8	3.19
0.167	4.00	75.0	73.6	1.37	86.3	13.7
0.500	4.00	53.5	53.8	-0.300	63.1	36.9

!!!Warning: EC50 not bracketed by doses evaluated.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	8.6805	25.000	0.34722
Means Lack-of-Fit	0.83503	4.0000	0.20876
Within Groups	7.8455	21.000	0.37360

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	85.293	1.3871	1.0000	0.042961	0.45118
log10 EC50 =	-0.092128	0.065231	0.042961	1.0000	0.75076
Bruce&V. SIGMA =	0.62569	0.11724	0.45118	0.75076	1.0000

Starting Values 86.083 -0.093014 0.65677

OAT-HT.DAT : OAT PLANT HEIGHT

Raw data:

OAT PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL
343
334
310

303
0.002
261
349
288
332
0.006
302
335
308
341
0.019
328
263
311
305
0.056
244
248
310
338
0.167
253
175
268
147
0.5
0
0
134
37

OAT-HT.DAT : OAT PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	323	.		
0.002	315	0.265	N.S.	
0.006	315	0.265	N.S.	
0.019	302	0.6874	N.S.	
0.056	285	1.242	N.S.	
0.167	211	3.702	<0.005	*
0.5	42.8	9.268	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.042	0.016	0.11	0.20	0.39
EC5	0.069	0.033	0.15	0.16	0.48
EC25	0.14	0.088	0.22	0.099	0.63
EC50	0.23	0.17	0.31	0.065	0.74

Slope = 3.18 Std.Err. = 0.665

Goodness of fit: p = 0.97 based on DF= 4.0 21.
OAT-HT.DAT : OAT PLANT HEIGHT

5

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	323.	310.	12.6	100.	0.00
0.00200	4.00	308.	310.	-2.44	100.	3.16e-09
0.00600	4.00	322.	310.	11.6	100.	2.57e-05
0.0190	4.00	302.	310.	-8.10	100.	0.0301
0.0560	4.00	285.	302.	-16.8	97.4	2.62
0.167	4.00	211.	207.	3.90	66.7	33.3
0.500	4.00	42.8	43.4	-0.669	14.0	86.0

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	387.49	25.000	15,499
Means Lack-of-Fit	8.7686	4.0000	2.1922
Within Groups	378.72	21.000	18.034

Directly-fitted parameters and Asymptotic Covariances

Parameter		Estimate	Std.Err.	Correlations		
Control Mean	=	309.94	16.203	1.0000	-0.45632	0.29947
log10 EC50	=	-0.64104	0.064593	-0.45632	1.0000	-0.62037
Bruce&V. SIGMA	=	0.31485	0.065907	0.29947	-0.62037	1.0000

Starting Values 322.50 -0.72146 0.41745

CRN-HT.DAT : CORN PLANT HEIGHT

Raw data:

CORN PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL
269
286
297
267
0.002
280
269
280
299
0.006
265
294
268
295
0.019
267
247
267
292
0.056

264
271
244
246
0.167
269
235
229
269
0.5
129
124
191
146

CRN-HT.DAT : CORN PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	281	.		
0.002	281	-0.08365	N.S.	
0.006	281	-0.05576	N.S.	
0.019	268	0.8551	N.S.	
0.056	256	1.747	N.S.	
0.167	251	2.175	0.026	*
0.5	148	9.833	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.064	0.028	0.15	0.18	0.43
EC5	0.12	0.067	0.22	0.12	0.56
EC25	0.29	0.23	0.38	0.051	0.78
EC50	0.55	0.47	0.64	0.033	0.85

Slope = 2.50 Std.Err. = 0.509

Goodness of fit: p = 0.47 based on DF= 4.0 21.

CRN-HT.DAT : CORN PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	280.	274.	5.48	100.	0.00
0.00200	4.00	282.	274.	7.73	100.	5.17e-08
0.00600	4.00	281.	274.	6.23	100.	4.57e-05
0.0190	4.00	268.	274.	-5.99	100.	0.0128
0.0560	4.00	256.	272.	-16.2	99.3	0.657
0.167	4.00	251.	247.	3.18	90.2	9.83
0.500	4.00	148.	148.	-0.418	53.9	46.1

!!!Warning: EC50 not bracketed by doses evaluated.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	43.378	25.000	1.7351
Means Lack-of-Fit	6.4277	4.0000	1.6069
Within Groups	36.951	21.000	1.7596

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	274.27	5.0611	1.0000	-0.20106	0.36730
log10 EC50 =	-0.26162	0.033193	-0.20106	1.0000	0.39791
Bruce&V. SIGMA =	0.39930	0.081142	0.36730	0.39791	1.0000
Starting Values	280.88	-0.24699	0.63209		

OAT-WT.DAT : OAT DRY WEIGHT

Raw data:

OAT DRY WEIGHT
7
4
4
4
4
4
4
4
CONTROL
1.294
1.331
0.913
1.2
0.002
1.019
1.372
1.172
1.186
0.006
1.176
0.989
1.083
1.123
0.019
1.051
0.765
0.887
1.079
0.056
0.546
0.48
0.817
0.834
0.167
0.453
0.375
0.462
0.27
0.5
0
0
0.162
0.082

OAT-WT.DAT : OAT DRY WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	1.19	.		
0.002	1.19	-0.01417	N.S.	
0.006	1.09	0.9454	N.S.	
0.019	0.946	2.463	0.013	*
0.056	0.669	5.309	<0.005	*
0.167	0.39	8.187	<0.005	*
0.5	0.061	11.58	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0039	0.0014	0.011	0.22	0.35
EC5	0.0095	0.0041	0.022	0.18	0.44
EC25	0.033	0.019	0.056	0.11	0.59
EC50	0.079	0.055	0.11	0.074	0.70

Slope = 1.79 Std.Err. = 0.225

Goodness of fit: p = 0.47 based on DF= 4.0 21.

OAT-WT.DAT : OAT DRY WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	1.18	1.15	0.0325	100.	0.00
0.00200	4.00	1.19	1.15	0.0378	99.8	0.217
0.00600	4.00	1.09	1.13	-0.0330	97.7	2.28
0.0190	4.00	0.946	0.997	-0.0513	86.5	13.5
0.0560	4.00	0.669	0.696	-0.0271	60.5	39.5
0.167	4.00	0.390	0.322	0.0677	28.0	72.0
0.500	4.00	0.0610	0.0871	-0.0261	7.56	92.4

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.76990	25.000	0.030796
Means Lack-of-Fit	0.11550	4.0000	0.028874
Within Groups	0.65440	21.000	0.031162

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	1.1520	0.057294	1.0000	-0.66066	0.46914
log10 EC50 =	-1.1036	0.074390	-0.66066	1.0000	-0.68087
Bruce&V. SIGMA =	0.55929	0.070450	0.46914	-0.68087	1.0000
Starting Values	1.1859	-1.1418	0.59271		

RYE-HT.DAT : RYEGRASS PLANT HEIGHT

Raw data:

RYEGRASS PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL
123
131
107
142
0.002
119
113
119
147
0.006
139
121
132
133
0.019
123
114
144
138
0.056
79
75
102
97
0.167
40
16
27
11
0.5
0
0
0
0

RYE-HT.DAT : RYEGRASS PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	128	.		
0.002	128	-0.2398	N.S.	
0.006	128	-0.2398	N.S.	
0.019	128	-0.2398	N.S.	

0.056	88.3	4.36	<0.005	*
0.167	23.5	11.89	<0.005	*
0.5	0	14.62	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.017	0.011	0.027	0.097	0.63
EC5	0.027	0.019	0.040	0.078	0.69
EC25	0.053	0.042	0.068	0.052	0.78
EC50	0.085	0.072	0.10	0.036	0.84

Slope = 3.34 Std.Err. = 0.335

Goodness of fit: p = 0.60 based on DF= 4.0 21.

RYE-HT.DAT : RYEGRASS PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	126.	128.	-1.84	100.	0.00
0.00200	4.00	125.	128.	-3.09	100.	2.68e-06
0.00600	4.00	131.	128.	3.67	100.	0.00600
0.0190	4.00	130.	126.	4.05	98.5	1.48
0.0560	4.00	88.3	92.9	-4.66	72.8	27.2
0.167	4.00	23.5	21.0	2.54	16.4	83.6
0.500	4.00	0.00	0.654	-0.654	0.513	99.5

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	51.904	25.000	2.0761
Means Lack-of-Fit	6.1310	4.0000	1.5328
Within Groups	45.773	21.000	2.1797

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	127.59	4.1886	1.0000	-0.47635	0.31141
log10 EC50 =	-1.0699	0.036066	-0.47635	1.0000	-0.65059
Bruce&V. SIGMA =	0.29951	0.030075	0.31141	-0.65059	1.0000

Starting Values 127.81 -1.0858 0.33721

CAB-HT.DAT : CABBAGE PLANT HEIGHT

Raw data:

CABBAGE PLANT HEIGHT
7
4
4
4
4
4
4
4
CONTROL

69
72
69
81
0.002
76
71
69
70
0.006
66
68
73
79
0.019
68
65
71
65
0.056
48
56
42
47
0.167
12
32
49
23
0.5
13
0
0
0

CAB-HT.DAT : CABBAGE PLANT HEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	72.8	.		
0.002	71.5	0.2326	N.S.	
0.006	71.5	0.2326	N.S.	
0.019	67.3	1.023	N.S.	
0.056	48.3	4.559	<0.005	*
0.167	29	8.141	<0.005	*
0.5	3.25	12.93	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.012	0.0043	0.032	0.21	0.37
EC5	0.023	0.010	0.050	0.17	0.45
EC25	0.059	0.035	0.097	0.11	0.60
EC50	0.11	0.080	0.16	0.072	0.71

Slope = 2.36 Std.Err. = 0.371

Goodness of fit: p = 0.64 based on DF= 4.0 21.
CAB-HT.DAT : CABBAGE PLANT HEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	72.8	70.8	2.00	100.	0.00
0.00200	4.00	71.5	70.8	0.749	100.	0.00180
0.00600	4.00	71.5	70.7	0.841	99.9	0.132
0.0190	4.00	67.3	68.4	-1.11	96.6	3.39
0.0560	4.00	48.3	54.1	-5.81	76.4	23.6
0.167	4.00	29.0	24.4	4.61	34.5	65.5
0.500	4.00	3.25	4.52	-1.27	6.39	93.6

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	71.319	25.000	2.8527
Means Lack-of-Fit	7.7812	4.0000	1.9453
Within Groups	63.537	21.000	3.0256

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	70.753	3.7757	1.0000	-0.55753	0.37744
log10 EC50 =	-0.94666	0.071841	-0.55753	1.0000	-0.65667
Bruce&V. SIGMA =	0.42406	0.066778	0.37744	-0.65667	1.0000
Starting Values	72.750	-0.98437	0.45529		

CRN-WT.DAT : CORN DRY WEIGHT

Raw data:

CORN DRY WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.641
0.625
0.744
0.747
0.002
0.787
0.709
0.659
0.807
0.006
0.645
0.767
0.662
0.707
0.019
0.645
0.514

0.681
0.68
0.056
0.582
0.678
0.654
0.477
0.167
0.589
0.549
0.437
0.657
0.5
0.219
0.244
0.393
0.287

CRN-WT.DAT : CORN DRY WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.715	.		
0.002	0.715	-0.4748	N.S.	
0.006	0.695	-0.1112	N.S.	
0.019	0.63	1.098	N.S.	
0.056	0.598	1.695	N.S.	
0.167	0.558	2.432	0.015	*
0.5	0.286	7.477	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.024	0.0064	0.088	0.28	0.27
EC5	0.054	0.021	0.14	0.20	0.39
EC25	0.18	0.11	0.28	0.097	0.63
EC50	0.40	0.31	0.52	0.055	0.77

Slope = 1.89 Std.Err. = 0.415

Goodness of fit: p = 0.27 based on DF= 4.0 21.
CRN-WT.DAT : CORN DRY WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.689	0.684	0.00532	100.	0.00
0.00200	4.00	0.740	0.684	0.0566	100.	0.000659
0.00600	4.00	0.695	0.684	0.0115	100.	0.0275
0.0190	4.00	0.630	0.680	-0.0498	99.4	0.607
0.0560	4.00	0.598	0.648	-0.0502	94.7	5.26
0.167	4.00	0.558	0.523	0.0347	76.5	23.5
0.500	4.00	0.286	0.294	-0.00805	43.0	57.0

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.28669	25.000	0.011468
Means Lack-of-Fit	0.059877	4.0000	0.014969
Within Groups	0.22681	21.000	0.010801

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.68393	0.022353	1.0000	-0.43989	0.41881
log10 EC50 =	-0.39486	0.055288	-0.43989	1.0000	-0.023454
Bruce&V. SIGMA =	0.52882	0.11618	0.41881	-0.023454	1.0000
Starting Values	0.71487	-0.44942	0.79775		

RAD-WT.DAT : RADISH DRY WEIGHT

Raw data:

RADISH DRY WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.724
0.79
0.966
0.807
0.002
0.763
0.536
0.779
0.76
0.006
0.679
0.874
0.695
0.799
0.019
0.762
0.74
0.652
0.75
0.056
0.66
0.475
0.516
0.572
0.167
0.37
0.311
0.498
0.605
0.50
0.229
0.251
0.251
0.287

22

RAD-WT.DAT : RADISH DRY WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.822	.		
0.002	0.736	1.324	N.S.	
0.006	0.736	1.324	N.S.	
0.019	0.726	1.472	N.S.	
0.056	0.556	4.089	<0.005	*
0.167	0.446	5.776	<0.005	*
0.5	0.255	8.72	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0023	0.00037	0.014	0.38	0.16
EC5	0.0086	0.0022	0.034	0.29	0.26
EC25	0.057	0.028	0.12	0.15	0.48
EC50	0.21	0.14	0.32	0.085	0.67

Slope = 1.18 Std.Err. = 0.205

Goodness of fit: p = 0.54 based on DF= 4.0 21.

RAD-WT.DAT : RADISH DRY WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.822	0.779	0.0427	100.	0.00
0.00200	4.00	0.710	0.773	-0.0631	99.2	0.831
0.00600	4.00	0.762	0.753	0.00876	96.7	3.35
0.0190	4.00	0.726	0.696	0.0305	89.3	10.7
0.0560	4.00	0.556	0.587	-0.0317	75.4	24.6
0.167	4.00	0.446	0.429	0.0170	55.1	44.9
0.500	4.00	0.255	0.259	-0.00410	33.2	66.8

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.34332	25.000	0.013733
Means Lack-of-Fit	0.045515	4.0000	0.011379
Within Groups	0.29781	21.000	0.014181

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.77907	0.034988	1.0000	-0.69541	0.58880
log10 EC50 =	-0.66932	0.084589	-0.69541	1.0000	-0.39172
Bruce&V. SIGMA =	0.84749	0.14752	0.58880	-0.39172	1.0000

Starting Values 0.82175 -0.76212 1.0896

LET-WT.DAT : LETTUCE DRY WEIGHT

Raw data:

LETTUCE DRY WEIGHT
7
4
4
4
4
4
4
4
CONTROL
0.60100000
0.51400000
0.65000000
0.49000000
0.002
0.48900000
0.58400000
0.51600000
0.55200000
0.006
0.51100000
0.57800000
0.59700000
0.49000000
0.019
0.48600000
0.40000000
0.39400000
0.43300000
0.056
0.22600000
0.15900000
0.24600000
0.14400000
0.167
0.00000000
0.00000000
0.03300000
0.00000000
0.50
0.00000000
0.00000000
0.00000000
0.00000000

LET-WT.DAT : LETTUCE DRY WEIGHT

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	0.564			
0.002	0.54	0.7498		N.S.
0.006	0.54	0.7498		N.S.

23

0.019	0.428	4.212	<0.005	*
0.056	0.194	11.5	<0.005	*
0.167	0.00825	17.27	<0.005	*
0.5	0	17.52	<0.005	*

"*"=Significant; "N.S."=Not Significant.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC1	0.0080	0.0050	0.013	0.097	0.63
EC5	0.013	0.0089	0.019	0.078	0.69
EC25	0.025	0.020	0.032	0.051	0.78
EC50	0.041	0.034	0.048	0.036	0.84

Slope = 3.28 Std.Err. = 0.323

Goodness of fit: p = 0.51 based on DF= 4.0 21.

LET-WT.DAT : LETTUCE DRY WEIGHT

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.564	0.540	0.0236	100.	0.00
0.00200	4.00	0.535	0.540	-0.00490	100.	0.000844
0.00600	4.00	0.544	0.538	0.00553	99.7	0.311
0.0190	4.00	0.428	0.466	-0.0377	86.3	13.7
0.0560	4.00	0.194	0.176	0.0174	32.7	67.3
0.167	4.00	0.00825	0.0121	-0.00382	2.23	97.8
0.500	4.00	0.00	9.58e-05	-9.58e-05	0.0177	100.

Analysis of Weighted Variance

Source	SS	DF	MS
Residual	0.20550	25.000	0.0082200
Means Lack-of-Fit	0.028765	4.0000	0.0071913
Within Groups	0.17673	21.000	0.0084159

Directly-fitted parameters and Asymptotic Covariances

Parameter	Estimate	Std.Err.	Correlations		
Control Mean =	0.54015	0.018896	1.0000	-0.51116	0.33364
log10 EC50 =	-1.3887	0.035762	-0.51116	1.0000	-0.65661
Bruce&V. SIGMA =	0.30453	0.029961	0.33364	-0.65661	1.0000

Starting Values 0.56375 -1.4399 0.36941