Data Evaluation Report on the acute toxicity of Penoxsulam metabolite (BST) to aquatic vascular plants *Lemna gibba*

PMRA Submission #:{.....} EPA MRID#: 45831105

Data Requirement:

PMRA Data Code:	{.....}
EPA DP Barcode:	D288160
OECD Data Point:	{.....}
EPA MRID:	45831105
EPA Guideline:	123-2

Test material: Penoxsulam metabolite Purity: 100%
Common name: BST
Chemical name: IUPAC: Not reported
CAS name: Not reported
CAS No.: Not reported
Synonyms: Not reported

Primary Reviewer: Rebecca Bryan
Staff Scientist, Dynamac Corporation
Signature: Rebecca Bryan
Date: 11/21/03

QC Reviewer: Dana Worcester
Staff Scientist, Dynamac Corporation
Signature: Dana Worcester
Date: 11/21/03

Primary Reviewer: ~~Bill Erickson~~
{EPA/OECD/PMRA} J. GOODYEAR
Date: {.....} Goodyear

Secondary Reviewer(s):{.....}
{EPA/OECD/PMRA}
Date: {.....}

Company Code {.....} [For PMRA]
Active Code {.....} [For PMRA]
EPA PC Code ~~199031~~ 119031

Date Evaluation Completed: {dd-mmm-yyyy}

CITATION: Hoberg, J.R. 2002. XDE-638 Metabolite (BST) - Toxicity to Duckweed, *Lemna gibba*. Unpublished study performed by Springborn Laboratories, Inc., Wareham, Massachusetts. Laboratory Project Identification No. 12550.6171/Project No. 011237. Study submitted by The Dow Chemical Company for Dow AgroSciences, LLC Midland, Michigan. Experimental start date December 19, 2001 and experimental termination date January 7, 2002. The final report issued February 8, 2002.

EXECUTIVE SUMMARY:

In a 14-day acute toxicity study, freshwater aquatic vascular plants Duckweed, *Lemna gibba* G3, were exposed to Penoxsulam metabolite (BST) at mean measured concentrations <0.014 (<LOQ, negative and solvent controls), 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L under static conditions. Nominal concentrations were 0 (negative and solvent controls), 0.10, 0.26, 0.64, 1.6, 4.0, and 10 mg/L. After 14 days, the mean frond number percent inhibitions compared to the pooled controls were 18, 3, 9, 9, 6, and 10% in the 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L treatment groups, respectively. The percent reductions for frond number were significant in all treatment groups, however, significance did not exceed 10% in the highest treatment group. The mean growth rate percent inhibitions compared to the pooled controls were 5, 2, 5, 5, 0, and 2% in the 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L treatment groups, respectively. The mean dry weight percent inhibitions compared to the pooled controls were 26, 11, 10, 8, 0, and 19% in the 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L treatment groups, respectively. The percent reduction for growth rate was significantly reduced at the lowest treatment level and not significantly reduced for dry weight at any treatment level.

The NOAEC was not determined, the LOAEC was 0.10 mg/L, the EC_{05} was not determined, and the EC_{50} was >6.2 mg/L. This toxicity study is scientifically sound, but it does not satisfy guideline §123-2 for an aquatic vascular plant study with *Lemna gibba* because a NOAEC could not be determined (for frond number and growth rate) and the US EPA-recommended Probit method (for determining EC_x values) could not be used to determine EC_{05} values, due to the non-monotonic nature of the responses. As a result, this study is classified as SUPPLEMENTAL.

Results Synopsis

Test Organism: *Lemna gibba* G3
Test Type: Static

Number of fronds:
NOAEC: not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50}: >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Growth rates (day 7):
NOAEC: <0.10 mg/L
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50}: >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Plant biomass (dry weight):
NOAEC: <0.10 mg/L
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50}: >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Endpoint(s) Affected: Frond number and growth rate

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The test protocol was based on the following guidelines: OECD Proposed Guideline 221 and U.S. EPA-FIFRA Pesticide Assessment Guidelines, Subdivision J, Hazard Evaluation: Nontarget Plants Guidelines 122-2 and 123-2. The following deviations from U.S. EPA Guideline 123-2 are noted:

1. The pretest health of the test organism was not reported.

2. The definitive test was conducted under static conditions and the test solution was not renewed as recommended.

3. A NOAEC could not be determined for frond number and growth rate, due to significant reductions at the lowest treatment level. EC_{05} values could not be determined for these endpoints using the US EPA-recommended Probit method, due to their non-monotonic response.

These deviations do not affect the validity of the study; however, the inability to establish a NOAEC and/or EC_{05} value impacted the acceptability .

COMPLIANCE: Signed and dated GLP, Quality Assurance and No Data Confidentiality statements were provided.

A. MATERIALS:

1. Test Material Penoxsulam metabolite (BST)

Description: Not reported

Lot No./Batch No. : E1167-37

Purity: 100%

Stability of Compound
Under Test Conditions: Day 0 measured concentrations ranged from 96 to 100% of nominal concentrations (except 59% of nominal for 10 mg/L test concentration) and day 14 measured concentrations ranged from 105 to 119% of nominal concentrations (except 63% of nominal for 10 mg/L test concentration). The mean measured concentrations were 100 to 110% of nominal (except 62% of nominal for 10 mg/L test concentration).

(OECD requires water solubility, stability in water and light, pKa, Pow, vapor pressure of test compound)
OECD requirements were not reported.

Storage conditions of test chemicals: Stored at room temperature in a dark ventilated cabinet.

2. Test organism:

Name: Duckweed, *Lemna gibba* *(EPA requires a vascular species: Lemna gibba.)*
Strain, if provided: G3
Source: Laboratory cultures (original supplier: University of Toronto, Toronto, Canada)
Age of inoculum: 7 days old

Method of cultivation: 20X Algal Assay Procedure (AAP) Medium

B. STUDY DESIGN:

a) Range-finding Study: No range-finding study was conducted.

b) Definitive Study

Table 1 . Experimental Parameters

Parameter	**Details**	**Remarks** *Criteria*
Acclimation period: culturing media and conditions: (same as test or not) health: (any toxicity observed)	Continuous culture 20X Algal Assay Procedure (AAP) Medium; same as test. Not reported	
Test system static/static renewal/ renewal rate for static renewal:	Static	*EPA expects the test concentrations to be renewed every 3 to 4 days (one renewal for the 7 day test, 3-4 renewals for the 14 day test).*
Incubation facility	Environmental chamber	
Duration of the test	14 days	*EPA requires a duration of 14 days. Seven day studies will be accepted for review by the Agency.*
Test vessel material: (glass/polystyrene) size: fill volume:	Sterile crystallizing dishes 270 mL 100 mL	
Details of growth medium name: pH at test initiation: pH at test termination: Chelator used: Carbon source:	20X Algal Assay Procedure (AAP) Medium 7.8-8.0 (Table 2, p. 23) 8.4-8.9 Yes $NaHCO_3$	*EPA recommend the following culture media:* *Modified hoagland's E+ or 20X-AAP.*
If non-standard nutrient medium was used, detailed composition provided (Yes/No)	Not applicable	

Parameter	Details	Remarks *Criteria*
Dilution water source/type: pH: water pretreatment (if any): Total Organic Carbon: particulate matter: metals: pesticides: chlorine:	 Sterile deionized water 7.5 ± 0.1 pH adjusted using 0.1 *N* hydrochloric acid 0.47-1.0 mg/L (December 2001 and January 2002 analysis) N/A Not detected Not detected N/A	*EPA recommends a pH of ~5.0. A solution pH of 7.5 is acceptable if type 20X-AAP nutrient media is used.*
Indicate how the test material is added to the medium (added directly or used stock solution)	Stock solution	
Aeration or agitation	Not reported.	
Sediment used **(for rooted aquatic vascular plants)** origin: textural classification (% sand, silt and clay): organic carbon (%): geographic location:	Not applicable	
Number of replicates control: solvent control: treatments:	 3 3 3	
Number of plants/replicate	5 plants per replicate	*EPA requires 5 plants.*
Number of fronds/plant	3 fronds per plant (15 total fronds per replicate)	*EPA requires 3 fronds per plant.*
Test concentrations nominal: measured:	 0 (negative and solvent controls), 0.10, 0.26, 0.64, 1.6, 4.0, and 10 mg/L <0.014 (<LOQ, negative and solvent controls), 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L	The study author reports the 10 mg/L treatment group test solution was inadvertently diluted more than required, which resulted in lower recovery at day 0 (59%). *EPA requires at least 5 test concentrations with a dose range of 2X or 3X progression.*
Solvent (type, percentage, if used)	Dimethylformamide (DMF),	

Parameter	Details	Remarks *Criteria*
	0.10 mL/L	
Method and interval of analytical verification	HPLC; days 0 and 14.	
Test conditions temperature: photoperiod: light intensity and quality:	 23-26°C continuous light 7900-8800 lux	 *EPA temperature: 25 °C* *EPA photoperiod: continuous* *EPA light: 5.0 Klux (±15%)*
Reference chemical (if used) name: concentrations:	None	
Other parameters, if any	None	

2. Observations:

Table 2: Observation parameters

Parameters	Details	Remarks/Criteria
Parameters measured (e.g.: number of fronds, plant dry weight or other toxicity symptoms)	Number of fronds, toxicity symptoms, and terminal dry weights.	
Measurement technique for frond number and other end points	Direct counts and weights.	
Observation intervals	Days 7 and 14.	
Other observations, if any	None	
Indicate whether there was an exponential growth in the control	Yes	
Were raw data included?	Replicate data provided.	

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

After 14 days, the mean frond number percent inhibitions compared to the pooled controls were 18, 3, 9, 9, 6, and 10% in the 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L treatment groups, respectively. The percent reductions for frond number were significant in all treatment groups, however, significance did not exceed 10% in the highest treatment group. The mean

growth rate percent inhibitions compared to the pooled controls were 5, 2, 5, 5, 0, and 2% in the 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L treatment groups, respectively. The mean dry weight percent inhibitions compared to the pooled controls were 26, 11, 10, 8, 0, and 19% in the 0.10, 0.27, 0.68, 1.7, 4.2, and 6.2 mg/L treatment groups, respectively. The percent reductions for growth rate and dry weight were not significant in any treatment group.

Table 3: Effect of Penoxsulam metabolite (BST) on frond number and dry weight of Duckweed, *Lemna gibba*

Treatment[1] (estimated measured and nominal concentration) mg/L	Initial frond number/test solution	Mean frond number at			Mean Growth Rate ($days^{-1}$)	Mean Biomass (dry weights, g)
		7 days	14 days	% inhibition at 14 days		
Negative control (dilution water)	15	307	714	---	0.44	0.1082
Solvent control	15	327	797	---	0.44	0.1349
0.10 (0.10)	15	271	657*	18	0.42	0.0902
0.27 (0.26)	15	297	776*	3	0.43	0.1087
0.68 (0.64)	15	283	725*	9	0.42	0.1098
1.7 (1.6)	15	280	725*	9	0.42	0.1121
4.2 (4.0)	15	312	750*	6	0.44	0.1216
6.2 (10)	15	297	720*	10	0.43	0.0985
Reference chemical (if used)	Not applicable					

[1] Nominal concentrations are in parentheses.

* Significantly reduced compared to the solvent control (Williams' Test). However, significance did not exceed 10% in the highest treatment group.

Table 4: Statistical endpoint values.

Statistical Endpoint[a]	frond No.	growth rate (day 7)	dry weight
NOAEC or EC_{05} (mg/L)	Not determined	Not determined	Not determined
LOAEC (mg/L)	0.10	0.10	0.10
EC_{50} (mg/L) (95% C.I.)	>6.2	>6.2	>6.2
EC_{05} (mg/L) (95% C.I.)	Not determined	Not determined	Not determined
Reference chemical NOAEC IC_{50}/EC_{50}	Not applicable	Not applicable	Not reported

[a] Statistical data based on measured test concentrations.

B. REPORTED STATISTICS: A t-test was used to compare the dilution water (negative) and solvent controls. The controls were pooled for growth rate and dry weight statistical analyses. The solvent control was used for comparison of mean frond number. The data was analyzed for normality using the Shapiro-Wilk's Test and homogeneity of variance using Bartlett's Test. The Williams' test was used to compare the treatment groups to the pooled control or solvent control. The NOAEC and LOAEC were determined from significance data. The EC_{50} was empirically estimated to be greater than the highest concentration tested (no concentrations with >50% inhibition). The reported statistics were based on the mean measured test concentrations..

C. VERIFICATION OF STATISTICAL RESULTS:

Statistical method: Frond number, growth rate, and dry weight data satisfied the assumptions of ANOVA (i.e., normal distribution and variance homogeneity); the LOAEC values were determined using ANOVA (dry weight), followed by Dunnett's test (frond number; equal replicates) or Bonferroni's test (growth rate; unequal replicates) via TOXSTAT statistical software. For all endpoints, the solvent control was compared to the negative control using a Student's t-test and, with the exception of frond number (for which a significant difference was found), no difference was found so the two were pooled for comparison to treatment; for frond number, the solvent control group was compared to the treatment groups. While reductions equaled or exceeded 5% in at least one treatment group for all endpoints, the responses were not monotonic so EC_{05} values could not be determined using the Probit method via Nuthatch software. Reductions did not exceed 50% for any endpoint, so the EC_{50} could be visually determined for all endpoints.

Number of fronds:
NOAEC: Not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50} : >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Growth rates (day 7):
NOAEC: Not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50} : >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Plant biomass (dry weight):
NOAEC: Not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50} : >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Endpoint(s) Affected: Frond number and growth rate

D. STUDY DEFICIENCIES:

There were significant reductions in frond number and growth rate at the lowest treatment level; a NOAEC was not determined in this study and an EC_{05} value could not be determined for these endpoints, due to the non-monotonic nature of the responses (using the Probit method).

E. REVIEWER'S COMMENTS:

The reviewer's conclusions regarding the NOAEC values for frond production and growth rate did not agree with the study author's; these endpoints were significantly reduced at the lowest treatment level, so a NOAEC could not be determined. Furthermore, EC_{05} values could not be determined for these endpoints using the US EPA-recommended Probit method. As a result, this study is classified as SUPPLEMENTAL, but it need not be repeated.

The study author reports the 10 mg/L treatment group test solution was inadvertently diluted more than required, which resulted in lower recovery at day 0 (59%).

The amount of test substance was limited , so further tests to determine EC_{50} were not performed. The study author reported these test results define the toxicity of the metabolite relative to the parent compound.

The test was conducted according to U.S. EPA Good Laboratory Practice Regulations with the following exception: The data for routine water contaminant screening analysis was not collected in accordance to GLP procedures. A GLP statement was provided.

F. CONCLUSIONS: This toxicity study is scientifically sound, but it does not satisfy the U.S. EPA Guideline Subdivision J, §123-2 for an aquatic vascular plant study with *Lemna gibba* because a NOAEC could not be determined (for frond number and growth rate) and the US EPA-recommended Probit method (for determining EC_x values) could not be used to determine EC_{05} values, due to the non-monotonic nature of the responses. As a result, this study is classified as SUPPLEMENTAL.

Number of fronds:
NOAEC: not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50}: >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Growth rates (day 7):
NOAEC: Not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50}: >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Plant biomass (dry weight):
NOAEC: Not determined
LOAEC: 0.10 mg/L
EC_{05}/IC_{05}: could not be determined 95% C.I.: N/A
EC_{50}/IC_{50}: >6.2 mg/L 95% C.I.: N/A
Slope: N/A

Endpoint(s) Affected: Frond number and growth rate

III. REFERENCES:

ASTM. 2000. Standard practice for conducting acute toxicity tests with fishes, macroinvertebrates, and amphibians. Standard E729-88a, American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, Pennsylvania.

Horning, W.B. and C.I. Weber, 1985. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. EPA/600/4-89/014. Environmental Monitoring and Support Laboratory, U.S. Environmental Protection Agency, Cincinnati, Ohio.

Hillman, W.S. 1961. The Lemnacea, or duckweeds. *Bot. Rev.* 27:221-287.

Miller, W.E., J.C. Green and T. Shiroyama. 1978. The *Selenastrum capricornutum* Printz algal assay bottle test. EPA 600/9-78-018. U.S. Environmental Protection Agency, Corvallis, Oregon.

OECD. 1997. Good Laboratory Practices as acknowledged in the EEC Council Directive 88/320/EEC of 9 June 1988.

OECD. 2000. OECD Guideline for Testing of Chemicals. *Lemna* sp. Growth Inhibition Test. Proposed Guideline #221.Revised Draft, October 2000.

Sokal, R.R. and F.J. Rohlf. 1981. *Biometry.* 2nd Edition. W.H. Freeman and Co. New York, NY. 859 pp.

U.S. EPA. 1982. *Pesticide Assessment Guidelines, Subdivision J, Hazard Evaluation: Nontarget Plants.* EPA 540/9-82-020, 27 October 1982. U.S. EPA, Washington, D.C.

U.S. EPA. Federal Insecticide, Fungicide and Rodenticide Act (FIFRA); Good Laboratory Practice Standards; Final Rule (40 CFR, Part 160). Federal Register, 48 (230); 34052-34074. U.S. Environmental Protection Agency, Washington, DC.

Weber, C.I., W.H. Peltier, T.J. Norberg-King, W.B. Horning II, F.A. Kessier, J.R. Menkedick, T.W. Neiheisel, P.A. Lewis, D.J. Kiemm, Q.H. Pickering, E.L. Robinson, J.M. Lazorchak, L.J. Wymer and R.W. Freyberg (eds.). 1989. Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms. 2nd ed. EPA/600/4/89/001. Environmental Monitoring Systems Laboratory, U.S. Environmental Protection Agency, Cincinatti, OH.

Williams, D.A. 1971. A test for differences between treatment means when several dose levels are compared with a zero dose control. *Biometrics* 27: 103-117.

Williams, D.A. 1972. A comparison of several dose levels with a zero control. *Biometrics* 28: 519-531.

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL RESULTS:

frond production

File: 1105f Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	36949.810	6158.302	4.374
Within (Error)	14	19712.000	1408.000	
Total	20	56661.810		

Critical F value = 2.85 (0.05,6,14)
Since F > Critical F REJECT Ho:All groups equal

frond production
File: 1105f Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	solvent control	797.333	797.333		
2	0.10	657.000	657.000	4.580	*
3	0.27	776.000	776.000	0.696	
4	0.68	725.000	725.000	2.361	
5	1.7	725.000	725.000	2.361	
6	4.2	750.333	750.333	1.534	
7	6.2	719.667	719.667	2.535	*

Dunnett table value = 2.53 (1 Tailed Value, P=0.05, df=14,6)

frond production
File: 1105f Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	solvent control	3			
2	0.10	3	77.513	9.7	140.333
3	0.27	3	77.513	9.7	21.333

4	0.68	3	77.513	9.7	72.333
5	1.7	3	77.513	9.7	72.333
6	4.2	3	77.513	9.7	47.000
7	6.2	3	77.513	9.7	77.667

frond production
File: 1105f Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	solvent control	3	797.333	797.333	797.333
2	0.10	3	657.000	657.000	726.667
3	0.27	3	776.000	776.000	726.667
4	0.68	3	725.000	725.000	726.667
5	1.7	3	725.000	725.000	726.667
6	4.2	3	750.333	750.333	726.667
7	6.2	3	719.667	719.667	719.667

frond production
File: 1105f Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG	TABLE P=.05 WILLIAMS	DEGREES OF FREEDOM
solvent control	797.333				
0.10	726.667	2.307	*	1.76	k= 1, v=14
0.27	726.667	2.307	*	1.85	k= 2, v=14
0.68	726.667	2.307	*	1.88	k= 3, v=14
1.7	726.667	2.307	*	1.89	k= 4, v=14
4.2	726.667	2.307	*	1.90	k= 5, v=14
6.2	719.667	2.535	*	1.91	k= 6, v=14

s = 37.523
Note: df used for table values are approximate when v > 20.

ECx

!!!Failure#1: near-singular matrix, model possibly unsuitable.

growth rate

File: 1105g Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	0.0015	0.0003	3.000
Within (Error)	17	0.0025	0.0001	
Total	23	0.0041		

Critical F value = 2.70 (0.05,6,17)
Since F > Critical F REJECT Ho:All groups equal

growth rate
File: 1105g Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	GRPS 1&2 POOLED	0.438	0.438		
2	0.10	0.417	0.417	3.064	*
3	0.27	0.430	0.430	1.179	
4	0.68	0.420	0.420	2.593	
5	1.7	0.423	0.423	2.121	
6	4.2	0.437	0.437	0.236	
7	6.2	0.433	0.433	0.707	

Bonferroni T table value = 2.65 (1 Tailed Value, P=0.05, df=17,6)

growth rate
File: 1105g Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	GRPS 1&2 POOLED	6			
2	0.10	3	0.019	4.3	0.022
3	0.27	3	0.019	4.3	0.008
4	0.68	3	0.019	4.3	0.018
5	1.7	3	0.019	4.3	0.015

6	4.2	3	0.019	4.3	0.002
7	6.2	3	0.019	4.3	0.005

growth rate
File: 1105g Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	GRPS 1&2 POOLED	6	0.438	0.438	0.438
2	0.10	3	0.417	0.417	0.427
3	0.27	3	0.430	0.430	0.427
4	0.68	3	0.420	0.420	0.427
5	1.7	3	0.423	0.423	0.427
6	4.2	3	0.437	0.437	0.427
7	6.2	3	0.433	0.433	0.427

growth rate
File: 1105g 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
GRPS 1&2 POOLED	0.438				
0.10	0.427	1.347		1.74	k= 1, v=17
0.27	0.427	1.347		1.82	k= 2, v=17
0.68	0.427	1.347		1.85	k= 3, v=17
1.7	0.427	1.347		1.87	k= 4, v=17
4.2	0.427	1.347		1.87	k= 5, v=17
6.2	0.427	1.347		1.88	k= 6, v=17

s = 0.012
Note: df used for table values are approximate when v > 20.

ECx

!!!Failure #3: Data not suitable for probit model fit.

Criterion is 3 or more distinct isotone means.

dry weight
File: 1105d Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	2856.312	476.052	1.106
Within (Error)	17	7317.662	430.451	
Total	23	10173.973		

Critical F value = 2.70 (0.05,6,17)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

dry weight
File: 1105d Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	GRPS 1&2 POOLED	121.550	121.550		
2	0.10	90.200	90.200	2.137	
3	0.27	108.700	108.700	0.876	
4	0.68	109.767	109.767	0.803	
5	1.7	115.467	115.467	0.415	
6	4.2	121.633	121.633	-0.006	
7	6.2	98.467	98.467	1.573	

Bonferroni T table value = 2.65 (1 Tailed Value, P=0.05, df=17,6)

dry weight
File: 1105d Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 2 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	GRPS 1&2 POOLED	6			
2	0.10	3	38.950	32.0	31.350
3	0.27	3	38.950	32.0	12.850
4	0.68	3	38.950	32.0	11.783
5	1.7	3	38.950	32.0	6.083
6	4.2	3	38.950	32.0	-0.083

7	6.2	3	38.950	32.0	23.083

dry weight
File: 1105d Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	GRPS 1&2 POOLED	6	121.550	121.550	121.550
2	0.10	3	90.200	90.200	109.153
3	0.27	3	108.700	108.700	109.153
4	0.68	3	109.767	109.767	109.153
5	1.7	3	115.467	115.467	109.153
6	4.2	3	121.633	121.633	109.153
7	6.2	3	98.467	98.467	98.467

dry weight
File: 1105d 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
GRPS 1&2 POOLED	121.550				
0.10	109.153	0.845		1.74	k= 1, v=17
0.27	109.153	0.845		1.82	k= 2, v=17
0.68	109.153	0.845		1.85	k= 3, v=17
1.7	109.153	0.845		1.87	k= 4, v=17
4.2	109.153	0.845		1.87	k= 5, v=17
6.2	98.467	1.573		1.88	k= 6, v=17

s = 20.747
Note: df used for table values are approximate when v > 20.

ECx

!!!Failure#1: near-singular matrix, model possibly unsuitable.