TEXT SEARCHABLE DOCUMENT 2009

Data Evaluation Report on the Acute Toxicity of 2,4-D Dimethylamine Salt to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number N/A **EPA MRID Number 471060-02**

Data Requirement:

PMRA Data Code:	9.8.4 (TGAI) or 9.8.6 (EP)
EPA DP Barcode:	D345223
OECD Data Point:	IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)
EPA Guideline:	OPPTS 850.4250 (123-1b)

Test material: 2,4 D Dimethylamine Salt **Purity:** 39.28% (acid equivalence)
Common name: 2,4- DMA Salt
Chemical name: IUPAC: Not Reported
CAS name: Not Reported
CAS No.: 2008391
Synonyms: Gordon's Amine 4000 2,4-D Weed Killer

Primary Reviewer: John Marton **Signature:**
Staff Scientist, Cambridge Environmental, Inc. **Date:** 02/08/08

Secondary Reviewer: Teri S. Myers **Signature:**
Senior Scientist, Cambridge Environmental, Inc. **Date:** 02/26/08

Primary Reviewer: Anita Ullagaddi **Date:** 3/10/09
EPA/OPP/EFED/ERB1

Secondary Reviewer(s): Christine Hartless **Date:** 3/10/09
EPA/OPP/EFED/ERB1 3-10-09

Reference/Submission No.: {.....}

Company Code	{.....}	[For PMRA]
Active Code	{.....}	[For PMRA]
Use Site Category:	{.....}	[For PMRA]
EPA PC Code	030019	

Date Evaluation Completed: 03/10/09

CITATION: Porch, John R., H.O. Krueger and K.H. Martin. 2006. 2,4-D Dimethylamine Salt: A Toxicity Test to Determine the Effects of the Test Substance on the Vegetative Vigor of Ten Species of Plants Grown Under Greenhouse Conditions. Unpublished study performed by Wildlife International, Ltd., Easton, Maryland. Laboratory report number 467-112. Study submitted to Industry Task Force II on 2,4-D Research Data, c/o McKenna Long & Aldridge, LLP, Washington, DC. Study completed April 11, 2006.

DISCLAIMER: This document provides guidance for EPA and PMRA reviewers on how to complete a data evaluation record after reviewing a scientific study concerning the acute toxicity of a pesticide to terrestrial vascular plants. It is not intended to prescribe conditions to any external party for conducting this study nor to establish absolute criteria regarding the assessment of whether the study is scientifically sound and whether the study satisfies any applicable data requirements. Reviewers are expected to review and to determine for each study, on a case-by-case basis, whether it is scientifically sound and provides sufficient information to satisfy applicable data requirements. Studies that fail to meet any of the conditions may be accepted, if appropriate; similarly, studies that meet all of the conditions may be rejected, if appropriate. In sum, the reviewer is to take into account the totality of factors related to the test methodology and results in determining the acceptability of the study.

2083537

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Turnip % survival, Day 21; lbs ae/A
File: 6002ps Transform: NO TRANSFORMATION

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	neg control	100.000	100.000	147.000
2	0.0015	100.000	100.000	147.000
3	0.0067	100.000	100.000	147.000
4	0.0264	100.000	100.000	147.000
5	0.0996	63.333	63.333	57.000
6	0.390	3.333	3.333	21.000

Calculated H Value = 14.000 Critical H Value Table = 11.070
Since Calc H > Crit H REJECT Ho:All groups are equal.

Turnip % survival, Day 21; lbs ae/A
File: 6002ps Transform: NO TRANSFORMATION

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0 0 0 0 0 0 / 6 5 3 4 1 2
6	0.390	3.333	3.333	\
5	0.0996	63.333	63.333	. \
3	0.0067	100.000	100.000	* * \
4	0.0264	100.000	100.000	* * . \
1	neg control	100.000	100.000	* * . . \
2	0.0015	100.000	100.000	* * . . . \

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,6) = 2.936 SE = 5.092

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.044	0.030	0.065	0.083	0.68
EC10	0.055	0.039	0.077	0.072	0.71
EC25	0.081	0.062	0.10	0.056	0.77
EC50	0.12	0.10	0.15	0.042	0.82

Slope = 3.67 Std.Err. = 0.432

Goodness of fit: p = 1.0 based on DF= 3.0 30.

Data Evaluation Report on the Acute Toxicity of 2,4-D Dimethylamine Salt to Terrestrial Vascular Plants: Vegetative Vigor

PMRA Submission Number N/A **EPA MRID Number 471060-02**

Dicot

EC_{05}/IC_{05}: <0.0017 (0.00051) lbs ae/A 95% C.I.: N/A (0.00014-0.0019)
EC_{25}/IC_{25}: 0.0038 lbs ae/A 95% C.I.: 0.0016-0.0089 lbs ae/A
EC_{50}/IC_{50}: 0.015 lbs ae/A 95% C.I.: 0.0084-0.027 lbs ae/A
NOAEC: 0.0017 lbs ae/A
Slope: 1.12
Std err: 0.128
Most sensitive dicot: Lettuce
Most sensitive parameter: Dry Weight

This toxicity study is classified as Acceptable for a Tier II terrestrial plant vegetative vigor toxicity study.

Table 1. Summary of most sensitive parameters by species (lbs ae/A).

Species	Endpoint	NOAEC	EC_{05}	EC_{25}	EC_{50}
Corn	Dry Weight	0.136	0.087	0.77	>2.07 (3.5)
Onion	Dry Weight	0.135	0.034	0.14	0.37
Ryegrass	Dry Weight	2.07	1.0	>2.07 (6.1)	>2.07 (21)
Wheat	Dry Weight	0.133	0.32	1.1	>2.03 (2.7)
Cabbage	Dry Weight	0.0981	0.079	0.18	0.31
Lettuce	Dry Weight	0.0017	<0.0017 (0.00051)	0.0038	0.015
Radish	Dry Weight	0.0016	<0.0016 (0.0012)	0.012	>0.0266 (0.059)
Soybean	Dry Weight	0.0072	0.0093	0.039	>0.0998 (0.11)
Tomato	Dry Weight	0.0016	0.0018	0.0074	0.020
Turnip	Dry Weight	0.0015	<0.0015 (0.00077)	0.011	0.065

I. MATERIALS AND METHODS:

GUIDELINE FOLLOWED: This study was conducted following guidelines outlined in U.S. Environmental Protection Agency Series 850- Ecological Effects Test Guidelines OPPTS Number 850.4150 and 850.4250. The following deviations from OPPTS 850.4250 were noted:

1. The historical % germination and storage conditions of the test seeds were not reported.
2. The geographic location, depth of collection, cation exchange capacity and moisture content of the test soil were not reported.

These deviations do not impact the acceptability of the study.

COMPLIANCE: Signed and dated No Data Confidentiality, GLP and Quality Assurance statements were provided. This study was conducted in compliance with EPA Good Laboratory Practice Standards, 40 CFR 160; OECD Principles of Good Laboratory Practices (ENV/MC/CHEM (98) 17); and Japan MAFF (11 NohSan, Notification No. 6283, Agricultural Production Bureau) with the following exception: Periodic analyses of well water and soil for potential contaminants were performed using a certified laboratory and

Critical F value = 2.76 (0.05,4,25)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Turnip plant height (cm), Day 21; lbs ae/a
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DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	neg control	20.067	20.067		
2	0.0015	19.167	19.167	1.184	
3	0.0067	20.200	20.200	-0.175	
4	0.0264	19.200	19.200	1.140	
5	0.0996	20.300	20.300	-0.307	

Dunnett table value = 2.28 (1 Tailed Value, P=0.05, df=24,4)

Turnip plant height (cm), Day 21; lbs ae/a
File: 6002ph 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	neg control	6			
2	0.0015	6	1.733	8.6	0.900
3	0.0067	6	1.733	8.6	-0.133
4	0.0264	6	1.733	8.6	0.867
5	0.0996	6	1.733	8.6	-0.233

Turnip plant height (cm), Day 21; lbs ae/a
File: 6002ph Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	20.067	20.067	19.617
2	0.0015	6	19.167	19.167	19.617
3	0.0067	6	20.200	20.200	19.700
4	0.0264	6	19.200	19.200	19.700
5	0.0996	6	20.300	20.300	20.300

Turnip plant height (cm), Day 21; lbs ae/a
File: 6002ph Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

and tomato seeds were obtained from The Meyer Seed Co., Baltimore, MD.
Prior seed treatment/sterilization: None
Historical % germination of seed: Not Reported
Seed storage, if any: Not Reported

B. STUDY DESIGN:

1. Experimental Conditions

a. Limit test: N/A; this test was conducted under Tier II conditions.

b. Range-finding study: No range-finding data were provided.

c. Definitive Study

Table 3: Experimental Parameters - Vegetative Vigor

Parameters	Vegetative Vigor	
	Details	Remarks *Criteria*
Duration of the test	21 Days	*Recommended test duration is 14-21 days.*
Number of seeds/plants replicate	Five plants per replicate	*Five plants per replicate are recommended.*
Number of plants retained after thinning	No thinning was reported	
Number of replicates Control: Adjuvant control: Treated:	6 N/A 6	*Four replicates per dose are recommended*
Test concentrations (mg ai/kg soil and g ai/ha) Nominal: Measured:	Monocots: 0 (negative control), 0.008, 0.0313, 0.125, 0.5 and 2.0 lbs ae/A Dicots: 0 (negative control), 0.0016, 0.0063, 0.025, 0.1 and 0.4 lbs ae/A See Reviewer's Comments	*Five test concentrations should be used with a dose range of 2X or 3X progression*
Method and interval of	Samples were collected from the spray	

s = 2.400
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0010	9.5E-05	0.011	0.50	0.093
EC10	0.0030	0.00048	0.019	0.39	0.16
EC25	0.019	0.0066	0.053	0.22	0.35
EC50	0.14	0.069	0.29	0.15	0.49

Slope = 0.767 Std.Err. = 0.190

Goodness of fit: p = 0.44 based on DF= 2.0 25.

6002PF : Turnip fresh weight (g), Day 21; lbs ae/a

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	20.1	20.2	-0.0812	100.	0.00
0.00150	6.00	19.4	18.9	0.542	93.5	6.46
0.00670	6.00	16.1	17.0	-0.947	84.6	15.4
0.0264	6.00	15.0	14.4	0.641	71.3	28.7
0.0996	6.00	10.9	11.0	-0.158	54.8	45.2

!!!Warning: EC5 not bracketed by doses evaluated.

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

Turnip plant height (cm), Day 21; lbs ae/a
File: 6002ph Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	0	12	6	11	1

Calculated Chi-Square goodness of fit test statistic = 10.1403
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Turnip plant height (cm), Day 21; lbs ae/a
File: 6002ph Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 43.347

W = 0.947

Parameters	**Vegetative Vigor**	
	Details	**Remarks** ***Criteria***
% silt % clay pH: % organic carbon CEC Moisture at 1/3 atm (%)	29% 21% 7.4 1.7% (organic matter) Not Reported Not Reported	*EPA prefers soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter. Glass beads, rock wool, and 100% acid washed sand are not preferred..* *OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.*
Details of nutrient medium, if used	N/A; a nutrient medium was not used	
Watering regime and schedules Water source/type: Volume applied: Interval of application: Method of application:	 Well water Predetermined amount (not specified) As needed Sub-irrigation	 *EPA prefers that under foliage watering or bottom watering be utilized for vegetative vigor studies so that the chemical is not washed out of the soil during the test.*
Any pest control method/fertilization, if used	A slow-release fertilizer was added to provide nutrients essential for plant growth.	
Test conditions Temperature:	Onion and Turnip: 17.79-33.86°C	

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File: 6002pf        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =    4.24
Closest, conservative, Table H statistic =   33.0   (alpha = 0.01)

Used for Table H ==>     R (# groups) =   5,    df (# reps-1) =        5
Actual values    ==>     R (# groups) =   5,    df (# avg reps-1) =   5.00

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Turnip fresh weight (g), Day 21; lbs ae/a
File: 6002pf        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =    2.75
Table Chi-square value =   13.28   (alpha = 0.01)
Table Chi-square value =    9.49   (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   4
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Turnip fresh weight (g), Day 21; lbs ae/a
File: 6002pf        Transform: NO TRANSFORMATION

                                ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              4            329.488           82.372          14.298

Within (Error)      25            144.029            5.761
-----------------------------------------------------------------------------
Total               29            473.517
-----------------------------------------------------------------------------

  Critical F value =   2.76   (0.05,4,25)
  Since  F > Critical F  REJECT  Ho:All groups equal


Turnip fresh weight (g), Day 21; lbs ae/a
File: 6002pf        Transform: NO TRANSFORMATION
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Parameters	Vegetative Vigor	
	Details	Remarks
	observation of the seedlings. Plant weight was estimated by measuring the mean shoot fresh and dry weights of each replicate. Seedling heights were measured with a ruler to the nearest whole centimeter from the surface of the soil to either the tip of the tallest leaf (ryegrass, turnip, onion, wheat, corn, radish, cabbage and lettuce) or the tip of the apical meristem (soybean and tomato). All surviving seedlings were clipped, weighed as fresh weight, dried in an oven and then re-weighed to determine dry weight.	
Observation intervals	Plant height and phytotoxicity were determined on Days 7, 14 and 21. Survival, fresh weight and dry weight were determined on Day 21.	
Other observations, if any	None Reported	
Were raw data included?	Yes	
Phytotoxicity rating system, if used	0, no effect; 10-30 slight effect (10- barely noticeable, 20- not apparently detrimental, 30- effect more pronounced); 40-60, moderate effect (40- moderate, recovery possible, 50-more lasting effect and recovery doubtful, 60- lasting effect and recovery doubtful); 70-90 severe effect (70- heavy injury w/ loss of leaves, 80- plant nearly destroyed w/ few surviving leaves, 90-occasional surviving leaves); 100, complete effect	Rating scale adapted from: Frans, Robert E and Ronald E. Talbert. 1977. Design of Field Experiments and the Measurement and Analysis of Plant Responses. Pages 15-23 in B. Truelove, ed. Research Methods in Weed Science. Southern Weed Science Society, Auburn University, Alabama.

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

4	0.0264	2.368	2.368	5.415	*
5	0.0996	1.677	1.677	8.271	*

Dunnett table value = 2.28 (1 Tailed Value, P=0.05, df=24,4)

Turnip dry weight (g), Day 21; lbs ae/A
File: 6002pd 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	neg control	6			
2	0.0015	6	0.552	15.0	-0.027
3	0.0067	6	0.552	15.0	0.828
4	0.0264	6	0.552	15.0	1.312
5	0.0996	6	0.552	15.0	2.003

Turnip dry weight (g), Day 21; lbs ae/A
File: 6002pd Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	3.680	3.680	3.693
2	0.0015	6	3.707	3.707	3.693
3	0.0067	6	2.852	2.852	2.852
4	0.0264	6	2.368	2.368	2.368
5	0.0996	6	1.677	1.677	1.677

Turnip dry weight (g), Day 21; lbs ae/A
File: 6002pd 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
neg control	3.693				
0.0015	3.693	0.055		1.71	k= 1, v=25
0.0067	2.852	3.418	*	1.79	k= 2, v=25
0.0264	2.368	5.413	*	1.82	k= 3, v=25
0.0996	1.677	8.267	*	1.83	k= 4, v=25

s = 0.420
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.00077	0.00013	0.0045	0.37	0.17

Table 5: Reported effect of 2,4 DMA Salt on Vegetative Vigor

Species	Results summary for dry weight (lbs ae/A)								
	g*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	r^2
Corn	2.79-4.58	0.50	0.1977	0.0042-0.03586	0.4883	0.3168-1.5212	>2.0	N/A	N.R.
Onion	0.04-0.25	0.125	0.0951	0-0.1709	0.2316	0.0679-0.2747	0.3823	0.2950-0.4181	N.R.
Ryegrass	0.271-0.337	2.0	N.R.	N.R.	>2.0	N/A	>2.0	N/A	N.R.
Wheat	0.513-0.934	0.125	0.0075	0.0029-0.2143	1.0091	0.6926-1.2406	>2.0	N/A	N.R.
Cabbage	1.28-3.56	0.1	0.0698	0.0366-0.1091	0.1921	0.1593-0.2428	0.3306	0.2747-0.3826	N.R.
Lettuce	0.28-2.85	0.0016	0.0032	0.0006-0.0079	0.0096	0.0049-0.0128	0.0178	0.0142-0.0201	N.R.
Radish	0.57-0.88	0.0016	0.0027	0.0008-0.0036	0.0110	0.0050-0.0217	>0.025	N/A	N.R.
Soybean	1.89-4.99	0.025	0.0083	0-0.0168	0.0438	0.0132-0.0607	0.1438	0.0647-0.2538	N.R.
Tomato	0.53-3.63	0.0016	0.0019	0.0001-0.0036	0.0073	0.0045-0.0126	0.0206	0.0160-0.0262	N.R.
Turnip	1.23-3.71	0.0016	0.0026	0-0.0038	0.0095	0.0035-0.0190	0.0815	0.0527-0.1045	N.R.

* range provided represents the range of the treatment means
NR- Not reported

Goodness of fit: p = 0.98 based on DF= 3.0 30.

6002TS : Tomato % survival, Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	100.	98.9	1.15	100.	0.00
0.00160	6.00	100.	98.9	1.15	100.	2.88e-14
0.00720	6.00	96.7	98.9	-2.19	100.	3.06e-05
0.0266	6.00	96.7	96.8	-0.0981	97.9	2.11
0.0998	6.00	16.7	16.7	0.00738	16.9	83.1
0.411	6.00	0.00	0.00156	-0.00156	0.00158	100.

Turnip dry weight (g), Day 21; lbs ae/A
File: 6002pd Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

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INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	2	5	16	6	1

Calculated Chi-Square goodness of fit test statistic = 3.2283
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Turnip dry weight (g), Day 21; lbs ae/A
File: 6002pd Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 4.404

W = 0.965

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Turnip dry weight (g), Day 21; lbs ae/A
File: 6002pd Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 7.66
Closest, conservative, Table H statistic = 33.0 (alpha = 0.01)

Table 5b: Reported effect of 2,4 DMA Salt on Vegetative Vigor

Species	Results summary for plant height (lbs ae/A)								
	cm*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	r^2
Corn	94.1-110.5	0.5	N.R.	N.R.	>2.0	N/A	>2.0	N/A	N.R.
Onion	15.7-32.6	0.125	0.0751	0-0.1480	0.3432	0.2290-0.4296	1.8055	1.0815-2.0279	N.R.
Ryegrass	19.9-22.2	2.0	N.R.	N.R.	>2.0	N/A	>2.0	N/A	N.R.
Wheat	49.8-58.6	0.5	N.R.	N.R.	>2.0	N/A	>2.0	N/A	N.R.
Cabbage	12.2-22.6	0.1	0.1334	0.0996-0.1551	0.2670	0.2235-0.3673	>0.4	N/A	N.R.
Lettuce	3.1-17.8	0.0063	0.0081	0.0051-0.0087	0.0153	0.0126-0.0181	0.0243	0.0202-0.0571	N.R.
Radish	16.1-21.4	0.0016	N.R.	N.R.	>0.025	N/A	>0.025	N/A	N.R.
Soybean	37.0-73.7	0.025	0.0263	0.0083-0.0426	0.0798	0.0611-0.0992	>0.4	N/A	N.R
Tomato	16.1-48.8	0.0063	0.0075	0.0033-0.0091	0.0168	0.0143-0.0195	0.0495	0.0236-0.0668	N.R.
Turnip	16.0-20.3	0.1	N.R.	N.R.	>0.4	N/A	>0.4	N/A	N.R.

* range provided represents the range of the treatment means
NR- Not reported

6002TH : Tomato plant height (cm), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	43.7	47.3	-3.57	100.	0.00
0.00160	6.00	48.8	46.5	2.36	98.3	1.74
0.00720	6.00	45.2	41.5	3.67	87.8	12.2
0.0266	6.00	26.6	29.9	-3.40	63.3	36.7
0.0998	4.00	16.1	14.7	1.41	31.1	68.9

Tomato % survival, Day 21; lbs ae/A
File: 6002ts Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	2	2	31	0	1

Calculated Chi-Square goodness of fit test statistic = 36.4128
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

Tomato % survival, Day 21; lbs ae/A
File: 6002ts Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 1800.000

W = 0.672

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

Tomato % survival, Day 21; lbs ae/A
File: 6002ts Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
Bartletts test for homogeneity of variance

Plant Injury Index*											
Control	Corn	Onion	Ryegrass	Wheat	Cabbage	Lettuce	Radish	Soybean	Tomato	Turnip	Adj. Control
0-14	0-74	0-62	0-22	0-6	0-94	0-94	0-100	0-100	0-100	0-100	N/A

Values represent the range of replicate means. 0, no effect; 10-30 slight effect (10- barely noticeable, 20- not apparently detrimental, 30- effect more pronounced); 40-60, moderate effect (40-moderate, recovery possible, 50-more lasting effect and recovery doubtful, 60- lasting effect and recovery doubtful); 70-90 severe effect (70- heavy injury w/ loss of leaves, 80- plant nearly destroyed w/ few surviving leaves, 90-occasional surviving leaves); 100, complete effect. Rating scale adapted from: Frans, Robert E and Ronald E. Talbert. 1977. Design of Field Experiments and the Measurement and Analysis of Plant Responses. Pages 15-23 in B. Truelove, ed. Research Methods in Weed Science. Southern Weed Science Society, Auburn University, Alabama

C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

Statistical Methods: The reviewer analyzed fresh weight, dry weight, plant height and survival for any species exhibiting an inhibition of ≥5% relative to the negative control; the reviewer visually determined the toxicity values for those species that did not exhibit inhibitions of ≥5% relative to the negative control. Prior to determining the toxicity values, each data set was analyzed for normality using the Chi-square and Shapiro-Wilks tests and for homogeneity of variance using the Hartley and Bartlett's tests. If the data met these assumptions of ANOVA, the NOAEC value was determined using the parametric Dunnett's Test (or Bonferroni's Test) and Williams' Test via Toxstat statistical software. If the data did not meet these assumptions, the NOAEC value was determined using the non-parametric Kruskal-Wallis test in conjunction with the direct observation of the dose-response data. The reviewer determined the ECx values, 95% confidence intervals and probit slopes using the probit analysis via Nuthatch statistical software. All analyses were conducted using the measured application rates.

```
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Tomato plant height (cm), Day 21; lbs ae/A
File: 6002th        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =    2.03
Table Chi-square value =   13.28  (alpha = 0.01)
Table Chi-square value =    9.49  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   4.60
Used for Chi-square table value ==>   df (#groups-1) =   4
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Tomato plant height (cm), Day 21; lbs ae/A
File: 6002th        Transform: NO TRANSFORMATION

                              ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              4            3904.969          976.242         84.094

Within (Error)      23             266.997           11.609
-----------------------------------------------------------------------------
Total               27            4171.967
-----------------------------------------------------------------------------

  Critical F value =   2.80  (0.05,4,23)
  Since  F > Critical F  REJECT  Ho:All groups equal


Tomato plant height (cm), Day 21; lbs ae/A
File: 6002th        Transform: NO TRANSFORMATION

      BONFERRONI T-TEST   -   TABLE 1 OF 2            Ho:Control<Treatment
-----------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN
GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS    T STAT  SIG
----- --------------------     -----------    ------------------  ------  ---
  1            neg control      43.733             43.733
  2                 0.0016      48.833             48.833          -2.593
  3                 0.0072      45.183             45.183          -0.737
  4                 0.0266      26.550             26.550           8.735  *
  5                 0.0998      16.125             16.125          12.553  *
-----------------------------------------------------------------------------
Bonferroni T table value =  2.40     (1 Tailed Value, P=0.05,  df=23,4)


Tomato plant height (cm), Day 21; lbs ae/A
```

Table 6a: Reported effect of 2,4 DMA Salt on Vegetative Vigor

Species	Results summary for fresh weight (lbs ae/A)									
	g*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Corn	21.7-39.6	0.136	0.046	0.0084-0.25	0.51	0.24-1.1	>2.07	N/A	0.930	0.205
Onion	0.43-3.47	0.135	0.037	0.012-0.11	0.13	0.065-0.27	0.32	0.20-0.51	1.74	0.296
Ryegrass	1.28-1.59	2.07	0.50	0.0017-140	>2.07	N/A	>2.07	N/A	1.11	2.04
Wheat	3.64-6.48	0.500	0.45	0.14-1.5	1.3	0.85-2.0	>2.03	N/A	2.12	0.833
Cabbage	8.3-27.2	0.0981	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Lettuce	0.8-32.6	0.0017	<0.0017	N/A	0.0047	0.0022-0.010	0.012	0.0071-0.021	1.64	0.230
Radish	5.47-8.79	0.0016	<0.0016	N/A	0.0095	0.0023-0.039	>0.0266	N/A	0.944	0.455
Soybean	9.2-20.2	0.0266	0.021	0.0058-0.079	0.066	0.042-0.10	>0.0998	N/A	1.98	0.803
Tomato	2.3-27.1	0.0072	0.0056	0.0035-0.0089	0.014	0.011-0.019	0.027	0.022-0.033	2.41	0.239
Turnip	10.3-20.1	0.0015	<0.0015	N/A	0.019	0.0066-0.053	0.14	0.069-0.29	0.767	0.190

* range provided represents the range of the treatment means
ND- Not Determined

1	neg control	6			
2	0.0016	6	3.988	14.7	0.223
3	0.0072	6	3.988	14.7	2.910
4	0.0266	6	3.988	14.7	13.252
5	0.0998	4	4.459	16.5	24.787

Tomato fresh weight (g), Day 21; lbs ae/A
File: 6002tf Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	27.050	27.050	27.050
2	0.0016	6	26.827	26.827	26.827
3	0.0072	6	24.140	24.140	24.140
4	0.0266	6	13.798	13.798	13.798
5	0.0998	4	2.263	2.263	2.263

Tomato fresh weight (g), Day 21; lbs ae/A
File: 6002tf 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
neg control	27.050				
0.0016	26.827	0.134		1.72	k= 1, v=23
0.0072	24.140	1.750		1.80	k= 2, v=23
0.0266	13.798	7.968	*	1.83	k= 3, v=23
0.0998	2.263	13.330	*	1.84	k= 4, v=23

s = 2.881
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0056	0.0035	0.0089	0.098	0.63
EC10	0.0079	0.0053	0.012	0.084	0.67
EC25	0.014	0.011	0.019	0.062	0.75
EC50	0.027	0.022	0.033	0.041	0.82

Slope = 2.41 Std.Err. = 0.239

Goodness of fit: p = 0.91 based on DF= 2.0 23.

6002TF : Tomato fresh weight (g), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change

Table 6c: Reported effect of 2,4 DMA Salt on Seedling Emergence

Species	Results summary for survival (lbs ae/A)									
	%*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Corn	93-100	2.07	N.D.	N.D.	>2.07	N/A	>2.07	N/A	N.D.	N.D.
Onion	40-100	0.489	0.41	0.081-2.1	1.2	0.68-2.2	>1.99	N/A	2.05	1.03
Ryegrass	97-100	2.07	>2.07	N/A	>2.07	N/A	>2.07	N/A	N/A	N/A
Wheat	100	2.03	>2.03	N/A	>2.03	N/A	>2.03	N/A	N/A	N/A
Cabbage	70-100	0.0981	N.D.	N.D.	N.D.	N.D.	>0.405	N/A	N.D.	N.D.
Lettuce	67-100	0.0074	<0.0017	N/A	0.072	0.012-0.44	>0.405	N/A	0.486	0.167
Radish	0-100	0.0072	0.016	$4.7x10^{-10}$-$5.6x10^{+5}$	0.021	$3.0x10^{-6}$-140	0.024	0.0013-0.44	9.14	157
Soybean	3-100	0.0998	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.	N.D.
Tomato	0-100	0.0266	0.032	0.011-0.087	0.048	0.026-0.092	0.065	0.044-0.096	5.21	2.23
Turnip	3-100	0.0264	0.044	0.030-0.065	0.081	0.062-0.10	0.12	0.10-0.15	3.67	0.432

* range provided represents the range of the treatment means
ND- Not Determined

```
Tomato fresh weight (g), Day 21; lbs ae/A
File: 6002tf        Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies
-----------------------------------------------------------------------------

INTERVAL      <-1.5      -1.5 to <-0.5      -0.5 to 0.5      >0.5 to 1.5      >1.5

EXPECTED      1.876          6.776             10.696           6.776         1.876
OBSERVED      3              5                 13               6             1

-----------------------------------------------------------------------------
Calculated Chi-Square goodness of fit test statistic =   2.1332
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.


Tomato fresh weight (g), Day 21; lbs ae/A
File: 6002tf        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-----------------------------------------------------------------------------

D =  190.868

W =    0.932

Critical W (P = 0.05) (n = 28) = 0.924
Critical W (P = 0.01) (n = 28) = 0.896
-----------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


Tomato fresh weight (g), Day 21; lbs ae/A
File: 6002tf        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   13.36
Closest, conservative, Table H statistic =   33.0   (alpha = 0.01)

Used for Table H ==>     R (# groups) =   5,    df (# reps-1) =        5
Actual values    ==>     R (# groups) =   5,    df (# avg reps-1) =    4.60
                                                (average df used)

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Tomato fresh weight (g), Day 21; lbs ae/A
File: 6002tf        Transform: NO TRANSFORMATION
```

0.135, 0.489 and 1.99 lbs ae/A. Lettuce and cabbage were treated with measured application rates of 0 (negative control), 0.0017, 0.0074, 0.0266, 0.0981 and 0.405 lbs ae/A. Wheat was treated with measured application rates of 0 (negative control), 0.0085, 0.0330, 0.133, 0.500 and 2.03 lbs ae/A. Corn and ryegrass were treated with measured application rates of 0 (negative control), 0.0082, 0.0387, 0.136, 0.505 and 2.07 lbs ae/A. Radish, soybean and tomato were treated with nominal application rates of 0 (negative control), 0.0016, 0.0072, 0.0266, 0.0998 and 0.411 lbs ae/A.

Complete mortality was observed at the two highest treatment levels for radish; therefore, these two levels were excluded from the analyses for dry weight, fresh weight and plant height. Complete mortality was also observed at the highest treatment level for tomato; this level was therefore excluded from all analyses.

Only one replicate contained surviving plants at the highest treatment level for turnip and soybean. Therefore, this level was excluded from growth endpoint analyses for these species.

Soybean survival was 100% in the control and 0.0016-0.0998 lbs ae/A treatment groups and 3% in the 0.411 lbs ae/A treatment group. Because there were not three or more distinct isotone means, the reviewer was unable to determine ECx values for this endpoint.

Inhibitions in cabbage fresh weight, plant height and survival were only observed at the highest treatment level and inhibitions at this level were 66, 30 and 42% for fresh weight, plant height and survival, respectively. Due to the lack of three or more distinct isotone means for these parameters, the reviewer was unable to determine ECx values despite that inhibitions were >25% for all parameters. Therefore, dry weight was identified as the most sensitive parameter for cabbage.

The in-life portion of the definitive vegetative vigor test was conducted from April 12 to May 3, 2005 for onion and turnip; from April 14 to May 5, 2005 for lettuce and cabbage; from April 22 to May 13, 2005 for wheat; and from July 22 to August 12, 2005 for corn, ryegrass, radish, soybean and tomato.

F. CONCLUSIONS:

The study is classified as Acceptable. The most sensitive monocot was onion, based on dry weight, with NOAEC, EC_{05} and EC_{25} values of 0.135, 0.034 and 0.14 lbs ae/A, respectively. The most sensitive dicot was lettuce, based on dry weight, with NOAEC, EC_{05} and EC_{25} values of 0.0017, <0.0017 (0.00051) and 0.0038 lbs ae/A, respectively.

Most sensitive monocot and EC_{25}: Onion (Dry Weight), 0.14 lbs ae/A
Most sensitive dicot and EC_{25}: Lettuce (Dry Weight), 0.0038 lbs ae/A

III. REFERENCES:

U.S. Environmental Protection Agency. 1996. Series 850- Ecological Effects Test Guidelines (*draft*), OPPTS Number 850.4150: Terrestrial Plant Toxicity, Tier I (Vegetative Vigor).

U.S. Environmental Protection Agency. 1996. Series 850- Ecological Effects Test Guidelines (*draft*), OPPTS Number 850.4250: Terrestrial Plant Toxicity, Tier II (Vegetative Vigor).

Frans, Robert E. and Ronald E. Talbert. 1977. Design of Field Experiments and the Measurement and Analysis of Plant Responses. Pages 15-23 in B. Truelove, ed. Research Methods in Weed Science. Southern Weed Science Society, Auburn University, Alabama.

SAS Institute, Inc. 1999. SAS Proprietary Software Version 8, Cary, NC, SAS Institute, Inc.

```
Average df used in calculation  ==>   df (avg n - 1) =   4.60
Used for Chi-square table value ==>   df (#groups-1) =   4
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Tomato dry weight (g), Day 21; lbs ae/A
File: 6002td        Transform: NO TRANSFORMATION

                                ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              4              35.376            8.844          68.031

Within (Error)      23               2.999            0.130
-----------------------------------------------------------------------------
Total               27              38.375
-----------------------------------------------------------------------------

  Critical F value =   2.80  (0.05,4,23)
  Since  F > Critical F  REJECT  Ho:All groups equal


Tomato dry weight (g), Day 21; lbs ae/A
File: 6002td        Transform: NO TRANSFORMATION

      BONFERRONI T-TEST   -   TABLE 1 OF 2            Ho:Control<Treatment
-----------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN
GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS    T STAT  SIG
----- --------------------     -----------    ------------------  ------  ---
  1            neg control       3.623              3.623
  2                 0.0016       3.492              3.492           0.633
  3                 0.0072       2.787              2.787           4.019  *
  4                 0.0266       1.515              1.515          10.128  *
  5                 0.0998       0.525              0.525          13.313  *
-----------------------------------------------------------------------------
Bonferroni T table value =  2.40     (1 Tailed Value, P=0.05,  df=23,4)


Tomato dry weight (g), Day 21; lbs ae/A
File: 6002td        Transform: NO TRANSFORMATION

      BONFERRONI T-TEST   -   TABLE 2 OF 2            Ho:Control<Treatment
-----------------------------------------------------------------------------
                               NUM OF   Minimum Sig Diff  % of     DIFFERENCE
GROUP    IDENTIFICATION        REPS     (IN ORIG. UNITS)  CONTROL  FROM CONTROL
----- --------------------    -------   ----------------  -------  ------------
  1            neg control      6
  2                 0.0016      6             0.499         13.8        0.132
  3                 0.0072      6             0.499         13.8        0.837
  4                 0.0266      6             0.499         13.8        2.108
  5                 0.0998      4             0.558         15.4        3.098
-----------------------------------------------------------------------------
```

APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Corn dry weight (g), Day 21; lbs ae/A
File: 6002cd Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	1	11	14	7	3

Calculated Chi-Square goodness of fit test statistic = 1.9117
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Corn dry weight (g), Day 21; lbs ae/A
File: 6002cd Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 20.666

W = 0.851

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

Corn dry weight (g), Day 21; lbs ae/A
File: 6002cd Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 19.48
Closest, conservative, Table H statistic = 38.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 5
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 5.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

```
Soybean % survival, Day 21; lbs ae/A
File: 6002ss        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
Bartletts test for homogeneity of variance
-------------------------------------------------------------------------------

These two tests can not be performed because at least one group has
zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

-------------------------------------------------------------------------------

Soybean % survival, Day 21; lbs ae/A
File: 6002ss        Transform: NO TRANSFORMATION

              KRUSKAL-WALLIS ANOVA BY RANKS  -  TABLE 1 OF 2
-------------------------------------------------------------------------------
                                TRANSFORMED   MEAN CALCULATED IN      RANK
GROUP    IDENTIFICATION           MEAN         ORIGINAL UNITS         SUM
----- --------------------     -----------   ------------------   -----------
  1            neg control      100.000            100.000          129.000
  2                 0.0016      100.000            100.000          129.000
  3                 0.0072      100.000            100.000          129.000
  4                 0.0266      100.000            100.000          129.000
  5                 0.0998      100.000            100.000          129.000
  6                  0.411        3.333              3.333           21.000
-------------------------------------------------------------------------------

  Calculated H Value =   6.001          Critical H Value Table =  11.070
  Since  Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.


Soybean % survival, Day 21; lbs ae/A
File: 6002ss        Transform: NO TRANSFORMATION

 DUNNS MULTIPLE COMPARISON -  KRUSKAL-WALLIS  -  TABLE 2 OF 2
-------------------------------------------------------------------------------
                                                      GROUP
                       TRANSFORMED  ORIGINAL   0 0 0 0 0 0
GROUP  IDENTIFICATION    MEAN        MEAN     6 2 3 4 5 1
----- --------------- -----------  ---------  - - - - - -
  6             0.411       3.333      3.333  \
  2            0.0016     100.000    100.000  * \
  3            0.0072     100.000    100.000  * . \
  4            0.0266     100.000    100.000  * . . \
  5            0.0998     100.000    100.000  * . . . \
  1       neg control     100.000    100.000  * . . . . \
-------------------------------------------------------------------------------

* = significant difference (p=0.05)            . = no significant difference
Table q value (0.05,6) =   2.936              SE =    3.937

Tomato dry weight (g), Day 21; lbs ae/A
File: 6002td        Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies
-------------------------------------------------------------------------------

INTERVAL     <-1.5     -1.5 to <-0.5     -0.5 to 0.5     >0.5 to 1.5     >1.5
```

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	6			
2	0.0082	6	1.117	25.1	-0.033
3	0.0387	6	1.117	25.1	-0.097
4	0.136	6	1.117	25.1	-0.125
5	0.505	6	1.117	25.1	1.102
6	2.07	6	1.117	25.1	1.658

Corn dry weight (g), Day 21; lbs ae/A
File: 6002cd Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	4.450	4.450	4.514
2	0.0082	6	4.483	4.483	4.514
3	0.0387	6	4.547	4.547	4.514
4	0.136	6	4.575	4.575	4.514
5	0.505	6	3.348	3.348	3.348
6	2.07	6	2.792	2.792	2.792

Corn dry weight (g), Day 21; lbs ae/A
File: 6002cd 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
neg control	4.514				
0.0082	4.514	0.133		1.70	k= 1, v=30
0.0387	4.514	0.133		1.78	k= 2, v=30
0.136	4.514	0.133		1.80	k= 3, v=30
0.505	3.348	2.299	*	1.81	k= 4, v=30
2.07	2.792	3.461	*	1.82	k= 5, v=30

s = 0.830
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.087	0.0049	1.5	0.61	0.057
EC10	0.20	0.022	1.7	0.46	0.11
EC25	0.77	0.25	2.4	0.24	0.33
EC50	3.5	1.3	9.6	0.22	0.36

Slope = 1.02 Std.Err. = 0.455

Goodness of fit: p = 0.59 based on DF= 3.0 30.

Soybean plant height (cm), Day 21; lbs ae/A
File: 6002sh 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	neg control	6			
2	0.0016	6	9.333	14.4	-2.567
3	0.0072	6	9.333	14.4	-8.733
4	0.0266	6	9.333	14.4	-0.667
5	0.0998	6	9.333	14.4	18.600

Soybean plant height (cm), Day 21; lbs ae/A
File: 6002sh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	64.933	64.933	68.700
2	0.0016	6	67.500	67.500	68.700
3	0.0072	6	73.667	73.667	68.700
4	0.0266	6	65.600	65.600	65.600
5	0.0998	6	46.333	46.333	46.333

Soybean plant height (cm), Day 21; lbs ae/A
File: 6002sh 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
neg control	68.700				
0.0016	68.700	0.920		1.71	k= 1, v=25
0.0072	68.700	0.920		1.79	k= 2, v=25
0.0266	65.600	0.163		1.82	k= 3, v=25
0.0998	46.333	4.544	*	1.83	k= 4, v=25

s = 7.090
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.030	0.0093	0.099	0.25	0.31
EC10	0.044	0.019	0.10	0.18	0.43
EC25	0.080	0.058	0.11	0.069	0.72
EC50	0.16	0.097	0.26	0.10	0.61

Slope = 2.30 Std.Err. = 1.08

```
Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =       5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =   5.00
---------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Corn fresh weight (g), Day 21; lbs ae/A
File: 6002cf        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
---------------------------------------------------------------------------

Calculated B statistic =    4.23
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   5
---------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Corn fresh weight (g), Day 21; lbs ae/A
File: 6002cf        Transform: NO TRANSFORMATION

                                ANOVA TABLE
---------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
---------------------------------------------------------------------------
Between              5            1515.536          303.107         14.574

Within (Error)      30             623.929           20.798
---------------------------------------------------------------------------
Total               35            2139.465
---------------------------------------------------------------------------

  Critical F value =   2.53  (0.05,5,30)
  Since  F > Critical F  REJECT  Ho:All groups equal


Corn fresh weight (g), Day 21; lbs ae/A
File: 6002cf        Transform: NO TRANSFORMATION

      DUNNETTS TEST   -   TABLE 1 OF 2            Ho:Control<Treatment
---------------------------------------------------------------------------
                                  TRANSFORMED    MEAN CALCULATED IN
GROUP    IDENTIFICATION             MEAN          ORIGINAL UNITS    T STAT  SIG
----- --------------------       -----------    ------------------  ------  ---
  1            neg control        38.657             38.657
  2                 0.0082        39.573             39.573          -0.348
```

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	19.0	19.5	-0.478	100.	0.00
0.00160	6.00	19.3	19.5	-0.222	100.	0.00522
0.00720	6.00	20.2	19.4	0.838	99.5	0.488
0.0266	6.00	17.9	18.1	-0.158	92.8	7.24
0.0998	6.00	12.2	12.2	0.0191	62.5	37.5

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

Soybean plant height (cm), Day 21; lbs ae/A
File: 6002sh Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	2	8	10	9	1

Calculated Chi-Square goodness of fit test statistic = 1.1860
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Soybean plant height (cm), Day 21; lbs ae/A
File: 6002sh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 1256.700

W = 0.947

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Soybean plant height (cm), Day 21; lbs ae/A
File: 6002sh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 4.74
Closest, conservative, Table H statistic = 33.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 5, df (# reps-1) = 5
Actual values ==> R (# groups) = 5, df (# avg reps-1) = 5.00

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.046	0.0084	0.25	0.36	0.18
EC10	0.11	0.030	0.42	0.28	0.27
EC25	0.51	0.24	1.1	0.16	0.48
EC50	2.7	1.6	4.5	0.11	0.60

Slope = 0.930 Std.Err. = 0.205

Goodness of fit: p = 0.86 based on DF= 3.0 30.

6002CF : Corn fresh weight (g), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	38.7	39.6	-0.912	100.	0.00
0.00820	6.00	39.6	39.2	0.386	99.0	0.965
0.0387	6.00	39.0	37.9	1.19	95.7	4.33
0.136	6.00	34.6	35.1	-0.476	88.6	11.4
0.505	6.00	29.3	29.7	-0.386	75.1	24.9
2.07	6.00	21.7	21.5	0.194	54.2	45.8

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

Corn plant height (cm), Day 21; lbs ae/A
File: 6002ch Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	1	10	13	10	2

Calculated Chi-Square goodness of fit test statistic = 1.3189
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Corn plant height (cm), Day 21; lbs ae/A
File: 6002ch Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 930.735

W = 0.975

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912

```
Soybean fresh weight (g), Day 21; lbs ae/A
File: 6002sf        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =    7.32
Table Chi-square value =   13.28  (alpha = 0.01)
Table Chi-square value =    9.49  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   4
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Soybean fresh weight (g), Day 21; lbs ae/A
File: 6002sf        Transform: NO TRANSFORMATION

                              ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              4            245.386           61.347          8.388

Within (Error)      25            182.838            7.314
-----------------------------------------------------------------------------
Total               29            428.224
-----------------------------------------------------------------------------

  Critical F value =   2.76  (0.05,4,25)
  Since  F > Critical F  REJECT  Ho:All groups equal


Soybean fresh weight (g), Day 21; lbs ae/A
File: 6002sf        Transform: NO TRANSFORMATION

      DUNNETTS TEST   -   TABLE 1 OF 2            Ho:Control<Treatment
-----------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN
GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS    T STAT  SIG
----- --------------------     ----------     ------------------  ------  ---
  1            neg control      19.023             19.023
  2                 0.0016      19.278             19.278          -0.163
  3                 0.0072      20.243             20.243          -0.781
  4                 0.0266      17.932             17.932           0.699
  5                 0.0998      12.210             12.210           4.364   *
-----------------------------------------------------------------------------
Dunnett table value =  2.28     (1 Tailed Value, P=0.05,  df=24,4)


Soybean fresh weight (g), Day 21; lbs ae/A
File: 6002sf        Transform: NO TRANSFORMATION

      DUNNETTS TEST   -   TABLE 2 OF 2            Ho:Control<Treatment
-----------------------------------------------------------------------------
                          NUM OF   Minimum Sig Diff  % of      DIFFERENCE
```

Corn plant height (cm), Day 21; lbs ae/A
File: 6002ch 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	neg control	101.933	101.933		
2	0.0082	105.833	105.833	-1.213	
3	0.0387	110.333	110.333	-2.612	
4	0.136	106.733	106.733	-1.493	
5	0.505	104.917	104.917	-0.928	
6	2.07	94.067	94.067	2.446	*

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Corn plant height (cm), Day 21; lbs ae/A
File: 6002ch 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	neg control	6			
2	0.0082	6	7.493	7.4	-3.900
3	0.0387	6	7.493	7.4	-8.400
4	0.136	6	7.493	7.4	-4.800
5	0.505	6	7.493	7.4	-2.983
6	2.07	6	7.493	7.4	7.867

Corn plant height (cm), Day 21; lbs ae/A
File: 6002ch Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	101.933	101.933	106.208
2	0.0082	6	105.833	105.833	106.208
3	0.0387	6	110.333	110.333	106.208
4	0.136	6	106.733	106.733	106.208
5	0.505	6	104.917	104.917	104.917
6	2.07	6	94.067	94.067	94.067

Corn plant height (cm), Day 21; lbs ae/A
File: 6002ch Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

Soybean dry weight (g), Day 21; lbs ae/A
File: 6002sd Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	4.933	4.933	4.962
2	0.0016	6	4.990	4.990	4.962
3	0.0072	6	4.787	4.787	4.787
4	0.0266	6	4.102	4.102	4.102
5	0.0998	6	2.582	2.582	2.582

Soybean dry weight (g), Day 21; lbs ae/A
File: 6002sd 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
neg control	4.962				
0.0016	4.962	0.079		1.71	k= 1, v=25
0.0072	4.787	0.408		1.79	k= 2, v=25
0.0266	4.102	2.312	*	1.82	k= 3, v=25
0.0998	2.582	6.538	*	1.83	k= 4, v=25

s = 0.623
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0093	0.0029	0.030	0.25	0.31
EC10	0.016	0.0064	0.040	0.19	0.40
EC25	0.039	0.024	0.066	0.11	0.60
EC50	0.11	0.078	0.15	0.068	0.73

Slope = 1.55 Std.Err. = 0.370

Goodness of fit: p = 0.98 based on DF= 2.0 25.

6002SD : Soybean dry weight (g), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	4.93	4.96	-0.0313	100.	0.00
0.00160	6.00	4.99	4.95	0.0370	99.8	0.234
0.00720	6.00	4.79	4.79	-0.00622	96.5	3.46
0.0266	6.00	4.10	4.10	0.000428	82.6	17.4
0.0998	6.00	2.58	2.58	0.000116	52.0	48.0

```
Warning -  The two homogeneity tests are sensitive to non-normal data and
           should not be performed.


Corn % survival, Day 21; lbs ae/A
File: 6002cs        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-------------------------------------------------------------------------------

D = 1866.667

W =    0.590

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912
-------------------------------------------------------------------------------

Data FAIL normality test. Try another transformation.

Warning -  The two homogeneity tests are sensitive to non-normal data and
           should not be performed.


Corn % survival, Day 21; lbs ae/A
File: 6002cs        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
Bartletts test for homogeneity of variance
-------------------------------------------------------------------------------

These two tests can not be performed because at least one group has
zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

-------------------------------------------------------------------------------

Corn % survival, Day 21; lbs ae/A
File: 6002cs        Transform: NO TRANSFORMATION

              KRUSKAL-WALLIS ANOVA BY RANKS  -  TABLE 1 OF 2
-------------------------------------------------------------------------------
                                TRANSFORMED   MEAN CALCULATED IN      RANK
GROUP    IDENTIFICATION           MEAN         ORIGINAL UNITS         SUM
----- --------------------    -----------   ------------------   -----------
  1            neg control     100.000            100.000          120.000
  2                 0.0082     100.000            100.000          120.000
  3                 0.0387     100.000            100.000          120.000
  4                  0.136     100.000            100.000          120.000
  5                  0.505      93.333             93.333           85.000
  6                   2.07      93.333             93.333          101.000
-------------------------------------------------------------------------------

  Calculated H Value =  -2.917          Critical H Value Table =  11.070
  Since  Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.


Corn % survival, Day 21; lbs ae/A
```

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.010	7.260	11.460	7.260	2.010
OBSERVED	1	8	11	8	2

Calculated Chi-Square goodness of fit test statistic = 0.6769
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Soybean dry weight (g), Day 21; lbs ae/A
File: 6002sd Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 9.703

W = 0.965

Critical W (P = 0.05) (n = 30) = 0.927
Critical W (P = 0.01) (n = 30) = 0.900

Data PASS normality test at P=0.01 level. Continue analysis.

Soybean dry weight (g), Day 21; lbs ae/A
File: 6002sd Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 4.42
Closest, conservative, Table H statistic = 33.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 5, df (# reps-1) = 5
Actual values ==> R (# groups) = 5, df (# avg reps-1) = 5.00

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal but do not differ greatly, the Hartley test may still be used as an approximate test (average df are used).

Soybean dry weight (g), Day 21; lbs ae/A
File: 6002sd Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance

Calculated B statistic = 4.13
Table Chi-square value = 13.28 (alpha = 0.01)

```
Calculated H statistic (max Var/min Var) =   15.16
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =        5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =    4.83
                                                (average df used)

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Onion dry weight (mg), Day 21; lbs ae/A
File: 6002nd        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   12.88
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   4.83
Used for Chi-square table value ==>   df (#groups-1) =   5
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Onion dry weight (mg), Day 21; lbs ae/A
File: 6002nd        Transform: NO TRANSFORMATION

                                ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE            DF              SS                MS              F
-----------------------------------------------------------------------------
Between            5          229933.810        45986.762        20.618

Within (Error)    29           64683.333         2230.460
-----------------------------------------------------------------------------
Total             34          294617.143
-----------------------------------------------------------------------------

  Critical F value =   2.55  (0.05,5,29)
  Since  F > Critical F  REJECT  Ho:All groups equal


Onion dry weight (mg), Day 21; lbs ae/A
File: 6002nd        Transform: NO TRANSFORMATION

      BONFERRONI T-TEST   -   TABLE 1 OF 2            Ho:Control<Treatment
-----------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN
GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS    T STAT  SIG
```

EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	1	3	31	0	1

Calculated Chi-Square goodness of fit test statistic = 35.7430
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

Radish % survival, Day 21; lbs ae/A
File: 6002rs Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 3066.667

W = 0.554

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

Radish % survival, Day 21; lbs ae/A
File: 6002rs Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
Bartletts test for homogeneity of variance

These two tests can not be performed because at least one group has zero variance.

Data FAIL to meet homogeneity of variance assumption.
Additional transformations are useless.

Radish % survival, Day 21; lbs ae/A
File: 6002rs Transform: NO TRANSFORMATION

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	neg control	100.000	100.000	168.000
2	0.0016	100.000	100.000	168.000
3	0.0072	96.667	96.667	158.500

s = 47.228
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.034	0.0098	0.12	0.27	0.29
EC10	0.058	0.020	0.17	0.23	0.34
EC25	0.14	0.065	0.30	0.16	0.46
EC50	0.37	0.23	0.61	0.11	0.61

Slope = 1.59 Std.Err. = 0.286

!!!Poor fit: p = 0.033 based on DF= 3.0 29.

6002ND : Onion dry weight (mg), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	223.	243.	-19.6	100.	0.00
0.00810	6.00	247.	242.	4.79	99.6	0.418
0.0335	6.00	235.	231.	3.90	95.1	4.85
0.135	6.00	217.	184.	32.6	75.8	24.2
0.489	6.00	73.3	103.	-30.0	42.5	57.5
1.99	5.00	40.0	30.1	9.88	12.4	87.6

Onion fresh weight (g), Day 21; lbs ae/A
File: 6002nf Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.345	8.470	13.370	8.470	2.345
OBSERVED	1	10	14	9	1

Calculated Chi-Square goodness of fit test statistic = 1.8821
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Onion fresh weight (g), Day 21; lbs ae/A
File: 6002nf Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 12.375

W = 0.982

Critical W (P = 0.05) (n = 35) = 0.934
Critical W (P = 0.01) (n = 35) = 0.910

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

Radish plant height (cm), Day 21; lbs ae/A
File: 6002rh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	3	110.540	36.847	16.420
Within (Error)	20	44.873	2.244	
Total	23	155.413		

Critical F value = 3.10 (0.05,3,20)
Since F > Critical F REJECT Ho:All groups equal

Radish plant height (cm), Day 21; lbs ae/A
File: 6002rh 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	neg control	21.367	21.367		
2	0.0016	21.267	21.267	0.116	
3	0.0072	18.767	18.767	3.006	*
4	0.0266	16.133	16.133	6.051	*

Dunnett table value = 2.19 (1 Tailed Value, P=0.05, df=20,3)

Radish plant height (cm), Day 21; lbs ae/A
File: 6002rh 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	neg control	6			
2	0.0016	6	1.894	8.9	0.100
3	0.0072	6	1.894	8.9	2.600
4	0.0266	6	1.894	8.9	5.233

Radish plant height (cm), Day 21; lbs ae/A
File: 6002rh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

Critical F value = 2.55 (0.05,5,29)
Since F > Critical F REJECT Ho:All groups equal

Onion fresh weight (g), Day 21; lbs ae/A
File: 6002nf 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	neg control	3.238	3.238		
2	0.0081	3.470	3.470	-0.614	
3	0.0335	3.352	3.352	-0.300	
4	0.135	3.068	3.068	0.451	
5	0.489	0.895	0.895	6.211	*
6	1.99	0.428	0.428	7.102	*

Bonferroni T table value = 2.46 (1 Tailed Value, P=0.05, df=29,5)

Onion fresh weight (g), Day 21; lbs ae/A
File: 6002nf 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	neg control	6			
2	0.0081	6	0.929	28.7	-0.232
3	0.0335	6	0.929	28.7	-0.113
4	0.135	6	0.929	28.7	0.170
5	0.489	6	0.929	28.7	2.343
6	1.99	5	0.975	30.1	2.810

Onion fresh weight (g), Day 21; lbs ae/A
File: 6002nf Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	3.238	3.238	3.354
2	0.0081	6	3.470	3.470	3.354
3	0.0335	6	3.352	3.352	3.352
4	0.135	6	3.068	3.068	3.068
5	0.489	6	0.895	0.895	0.895
6	1.99	5	0.428	0.428	0.428

Onion fresh weight (g), Day 21; lbs ae/A
File: 6002nf Transform: NO TRANSFORMATION

2	0.0016	6	8.590	8.590	8.590
3	0.0072	6	6.645	6.645	6.645
4	0.0266	6	5.467	5.467	5.467

Radish fresh weight (g), Day 21; lbs ae/A
File: 6002rf 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
neg control	8.787				
0.0016	8.590	0.220		1.72	k= 1, v=20
0.0072	6.645	2.396	*	1.81	k= 2, v=20
0.0266	5.467	3.714	*	1.83	k= 3, v=20

s = 1.548
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.00090	2.7E-05	0.030	0.73	0.030
EC10	0.0022	0.00015	0.031	0.56	0.070
EC25	0.0095	0.0023	0.039	0.29	0.24
EC50	0.049	0.015	0.17	0.26	0.29

Slope = 0.944 Std.Err. = 0.455

Goodness of fit: p = 0.44 based on DF= 1.0 20.

6002RF : Radish fresh weight (g), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	8.79	8.92	-0.134	100.	0.00
0.00160	6.00	8.59	8.21	0.381	92.0	7.98
0.00720	6.00	6.64	7.00	-0.360	78.5	21.5
0.0266	6.00	5.47	5.36	0.112	60.0	40.0

!!!Warning: EC5 not bracketed by doses evaluated.

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

Radish plant height (cm), Day 21; lbs ae/A
File: 6002rh Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	1.608	5.808	9.168	5.808	1.608

```
Onion plant height (cm), Day 21; lbs ae/A
File: 6002nh        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-------------------------------------------------------------------------------

D =  160.512

W =    0.968

Critical W (P = 0.05) (n = 35) = 0.934
Critical W (P = 0.01) (n = 35) = 0.910
-------------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


Onion plant height (cm), Day 21; lbs ae/A
File: 6002nh        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-------------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   10.41
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =        5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =    4.83
                                                (average df used)

-------------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Onion plant height (cm), Day 21; lbs ae/A
File: 6002nh        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-------------------------------------------------------------------------------

Calculated B statistic =    5.32
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   4.83
Used for Chi-square table value ==>   df (#groups-1) =   5
-------------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Onion plant height (cm), Day 21; lbs ae/A
File: 6002nh        Transform: NO TRANSFORMATION
```

```
Data PASS normality test. Continue analysis.


Radish fresh weight (g), Day 21; lbs ae/A
File: 6002rf        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-------------------------------------------------------------------------------

D =   47.937

W =    0.969

Critical W (P = 0.05) (n = 24) = 0.916
Critical W (P = 0.01) (n = 24) = 0.884
-------------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


Radish fresh weight (g), Day 21; lbs ae/A
File: 6002rf        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-------------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   11.07
Closest, conservative, Table H statistic =   28.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   4,    df (# reps-1) =       5
Actual values    ==>     R (# groups) =   4,    df (# avg reps-1) =   5.00

-------------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Radish fresh weight (g), Day 21; lbs ae/A
File: 6002rf        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-------------------------------------------------------------------------------

Calculated B statistic =    6.07
Table Chi-square value =   11.34  (alpha = 0.01)
Table Chi-square value =    7.81  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   3
-------------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).
```

2	0.0081	6	32.367	32.367	32.367
3	0.0335	6	32.233	32.233	32.233
4	0.135	6	29.600	29.600	29.600
5	0.489	6	20.800	20.800	20.800
6	1.99	5	15.660	15.660	15.660

Onion plant height (cm), Day 21; lbs ae/A
File: 6002nh 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
neg control	32.633				
0.0081	32.367	0.196		1.70	k= 1, v=29
0.0335	32.233	0.294		1.78	k= 2, v=29
0.135	29.600	2.233	*	1.81	k= 3, v=29
0.489	20.800	8.712	*	1.82	k= 4, v=29
1.99	15.660	11.915	*	1.83	k= 5, v=29

s = 2.353
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.032	0.011	0.093	0.23	0.35
EC10	0.075	0.032	0.17	0.18	0.43
EC25	0.31	0.19	0.51	0.11	0.60
EC50	1.5	1.1	2.0	0.064	0.74

Slope = 0.986 Std.Err. = 0.130

Goodness of fit: p = 0.067 based on DF= 3.0 29.

6002NH : Onion plant height (cm), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	32.6	33.2	-0.538	100.	0.00
0.00810	6.00	32.4	32.7	-0.383	98.7	1.27
0.0335	6.00	32.2	31.5	0.782	94.8	5.19
0.135	6.00	29.6	28.1	1.45	84.9	15.1
0.489	6.00	20.8	22.7	-1.89	68.4	31.6
1.99	5.00	15.7	15.0	0.689	45.1	54.9

Onion % survival, Day 21; lbs ae/A
File: 6002ns Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5

SOURCE	DF	SS	MS	F
Between	3	0.401	0.134	7.444
Within (Error)	20	0.352	0.018	
Total	23	0.753		

Critical F value = 3.10 (0.05,3,20)
Since F > Critical F REJECT Ho:All groups equal

Radish dry weight (g), Day 21; lbs ae/A
File: 6002rd 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	neg control	0.877	0.877		
2	0.0016	0.878	0.878	-0.022	
3	0.0072	0.688	0.688	2.431	*
4	0.0266	0.575	0.575	3.894	*

Dunnett table value = 2.19 (1 Tailed Value, P=0.05, df=20,3)

Radish dry weight (g), Day 21; lbs ae/A
File: 6002rd 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	neg control	6			
2	0.0016	6	0.170	19.4	-0.002
3	0.0072	6	0.170	19.4	0.188
4	0.0266	6	0.170	19.4	0.302

Radish dry weight (g), Day 21; lbs ae/A
File: 6002rd Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	0.877	0.877	0.878
2	0.0016	6	0.878	0.878	0.878
3	0.0072	6	0.688	0.688	0.688
4	0.0266	6	0.575	0.575	0.575

5	0.489	93.333	93.333	99.000
6	1.99	60.000	60.000	39.000

Calculated H Value = 4.648 Critical H Value Table = 11.070
Since Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.

Onion % survival, Day 21; lbs ae/A
File: 6002ns Transform: NO TRANSFORMATION

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0 0 0 0 0 0 6 5 3 4 1 2
6	1.99	60.000	60.000	\
5	0.489	93.333	93.333	. \
3	0.0335	100.000	100.000	* . \
4	0.135	100.000	100.000	* . . \
1	neg control	100.000	100.000	* . . . \
2	0.0081	100.000	100.000	* . . . . \

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,6) = 2.936 SE = 4.198

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.41	0.081	2.1	0.35	0.20
EC10	0.62	0.18	2.1	0.26	0.29
EC25	1.2	0.68	2.2	0.13	0.55
EC50	2.6	1.6	4.3	0.10	0.61

Slope = 2.05 Std.Err. = 1.03

Goodness of fit: p = 1.0 based on DF= 3.0 30.

6002NS : Onion % survival, Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	100.	100.	-0.0925	100.	0.00
0.00810	6.00	100.	100.	-0.0924	100.	1.37e-05
0.0335	6.00	100.	100.	-0.0872	100.	0.00522
0.135	6.00	100.	99.7	0.320	99.6	0.412
0.489	6.00	93.3	93.4	-0.0535	93.3	6.70
1.99	6.00	60.0	60.0	0.00551	59.9	40.1

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

Ryegrass dry weight (g), Day 21; lbs ae/A
File: 6002gd Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

```
  5            0.0981      66.667      66.667  \
  6             0.405      70.000      70.000  . \
  4            0.0266      76.667      76.667  . . \
  1       neg control     100.000     100.000  * . . \
  2            0.0017     100.000     100.000  * . . . \
  3            0.0074     100.000     100.000  * . . . . \
-----------------------------------------------------------------------

* = significant difference (p=0.05)            . = no significant difference
Table q value (0.05,6) =   2.936              SE =    5.385

Estimates of EC%
-----------------------------------------------------------------------
Parameter   Estimate     95% Bounds        Std.Err.  Lower Bound
                        Lower     Upper               /Estimate
EC5          0.00072   7.5E-06    0.070      0.98      0.010
EC10          0.0040   0.00013     0.13      0.74      0.032
EC25           0.072     0.012     0.44      0.39       0.16
EC50             1.8      0.29      11.      0.38       0.16

         Slope =    0.486  Std.Err. =    0.167


!!!Poor fit: p =     0.038  based on DF=       3.0       30.
-----------------------------------------------------------------------
6002LS : Lettuce % survival, Day 21; lbs ae/a
-----------------------------------------------------------------------
Observed vs. Predicted Treatment Group Means
-----------------------------------------------------------------------
     Dose      #Reps.      Obs.      Pred.      Obs.      Pred.    %Change
                           Mean      Mean     -Pred.   %Control

     0.00       6.00      100.      103.     -3.38      100.       0.00
  0.00170       6.00      100.      96.0      4.02      92.8       7.15
  0.00740       6.00      100.      90.5      9.47      87.6       12.4
   0.0266       6.00      76.7      83.9     -7.24      81.2       18.8
   0.0981       6.00      66.7      75.3     -8.65      72.9       27.1
    0.405       6.00      70.0      64.2      5.77      62.1       37.9

!!!Warning: EC5 not bracketed by doses evaluated.

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

Radish dry weight (g), Day 21; lbs ae/A
File: 6002rd        Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies
-----------------------------------------------------------------------

INTERVAL     <-1.5     -1.5 to <-0.5     -0.5 to 0.5     >0.5 to 1.5     >1.5

EXPECTED     1.608         5.808             9.168           5.808        1.608
OBSERVED     0             7                 9               6            2

-----------------------------------------------------------------------
Calculated Chi-Square goodness of fit test statistic =   1.9576
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.
```

```
Table Chi-square value =   15.09   (alpha = 0.01)
Table Chi-square value =   11.07   (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   5
--------------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Ryegrass dry weight (g), Day 21; lbs ae/A
File: 6002gd        Transform: NO TRANSFORMATION

                                ANOVA TABLE
--------------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
--------------------------------------------------------------------------------
Between              5              0.015            0.003           0.750

Within (Error)      30              0.118            0.004
--------------------------------------------------------------------------------
Total               35              0.133
--------------------------------------------------------------------------------

  Critical F value =   2.53  (0.05,5,30)
  Since  F < Critical F  FAIL TO REJECT  Ho:All groups equal


Ryegrass dry weight (g), Day 21; lbs ae/A
File: 6002gd        Transform: NO TRANSFORMATION

      DUNNETTS TEST   -   TABLE 1 OF 2            Ho:Control<Treatment
--------------------------------------------------------------------------------
                                TRANSFORMED    MEAN CALCULATED IN
GROUP    IDENTIFICATION           MEAN          ORIGINAL UNITS     T STAT  SIG
----- --------------------     -----------    ------------------   ------  ---
  1            neg control       0.286              0.286
  2                 0.0082       0.293              0.293           -0.196
  3                 0.0387       0.337              0.337           -1.401
  4                  0.136       0.292              0.292           -0.151
  5                  0.505       0.298              0.298           -0.324
  6                   2.07       0.272              0.272            0.402
--------------------------------------------------------------------------------
Dunnett table value =  2.33     (1 Tailed Value, P=0.05,  df=30,5)


Ryegrass dry weight (g), Day 21; lbs ae/A
File: 6002gd        Transform: NO TRANSFORMATION

      DUNNETTS TEST   -   TABLE 2 OF 2            Ho:Control<Treatment
--------------------------------------------------------------------------------
                                NUM OF   Minimum Sig Diff  % of      DIFFERENCE
GROUP    IDENTIFICATION          REPS    (IN ORIG. UNITS)  CONTROL   FROM CONTROL
----- --------------------     -------  ----------------  -------   ------------
  1            neg control        6
  2                 0.0082        6            0.085        29.7        -0.007
  3                 0.0387        6            0.085        29.7        -0.051
  4                  0.136        6            0.085        29.7        -0.006
```

```
        neg control     16.953
             0.0017     16.953     1.113              1.70       k= 1, v=29
             0.0074     16.953     1.061              1.78       k= 2, v=29
             0.0266      8.167     9.923      *       1.81       k= 3, v=29
             0.0981      4.833    14.110      *       1.82       k= 4, v=29
              0.405      3.100    16.287      *       1.83       k= 5, v=29
-----------------------------------------------------------------------------
s =    1.379
Note: df used for table values are approximate when v > 20.

Estimates of EC%
-----------------------------------------------------------------------
Parameter   Estimate     95% Bounds        Std.Err.  Lower Bound
                        Lower     Upper               /Estimate
EC5          0.0011   0.00030    0.0041      0.28       0.27
EC10         0.0024   0.00079    0.0074      0.24       0.33
EC25         0.0088    0.0039     0.020      0.17       0.44
EC50          0.037     0.022     0.063      0.11       0.59

        Slope =     1.08  Std.Err. =    0.131


!!!Poor fit: p < 0.001 based on DF=     3.00     29.0
-----------------------------------------------------------------------
6002LH : Lettuce plant height (cm), Day 21; lbs ae/A
-----------------------------------------------------------------------
Observed vs. Predicted Treatment Group Means
-----------------------------------------------------------------------
     Dose      #Reps.      Obs.      Pred.      Obs.      Pred.    %Change
                           Mean      Mean     -Pred.   %Control

     0.00       6.00      16.1       17.8     -1.78      100.      0.00
  0.00170       6.00      17.8       16.5      1.31      92.6      7.40
  0.00740       5.00      17.0       13.8      3.12      77.6      22.4
   0.0266       6.00      8.17       10.1     -1.88      56.3      43.7
   0.0981       6.00      4.83       5.81    -0.979      32.6      67.4
    0.405       6.00      3.10       2.36     0.739      13.2      86.8

!!!Warning: EC5 not bracketed by doses evaluated.

Lettuce % survival, Day 21; lbs ae/a
File: 6002ls        Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies
-------------------------------------------------------------------------------

INTERVAL      <-1.5      -1.5 to <-0.5      -0.5 to 0.5      >0.5 to 1.5      >1.5
              ------     -------------      -----------      -----------      ----

EXPECTED      2.412          8.712              13.752           8.712        2.412
OBSERVED      0              8                  23               5            0

-------------------------------------------------------------------------------
Calculated Chi-Square goodness of fit test statistic =  12.6829
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.


Lettuce % survival, Day 21; lbs ae/a
File: 6002ls        Transform: NO TRANSFORMATION
```

0.00	6.00	0.286	0.303	-0.0165	100.	0.00
0.00820	6.00	0.293	0.303	-0.00937	100.	0.000807
0.0387	6.00	0.337	0.303	0.0347	100.	0.0272
0.136	6.00	0.292	0.302	-0.0102	99.7	0.284
0.505	6.00	0.298	0.296	0.00150	97.9	2.05
2.07	6.00	0.272	0.272	-0.000117	89.7	10.3

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

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

Ryegrass fresh weight (g), Day 21; lbs ae/A
File: 6002gf Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	1	12	14	6	3

Calculated Chi-Square goodness of fit test statistic = 3.0596
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Ryegrass fresh weight (g), Day 21; lbs ae/A
File: 6002gf Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 6.626

W = 0.898

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912

Data FAIL normality test. Try another transformation.

Warning - The two homogeneity tests are sensitive to non-normal data and should not be performed.

Ryegrass fresh weight (g), Day 21; lbs ae/A
File: 6002gf Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 10.44
Closest, conservative, Table H statistic = 38.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 5
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 5.00

```
Lettuce plant height (cm), Day 21; lbs ae/A
File: 60021h        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   30.56
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =        5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =    4.83
                                                (average df used)

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Lettuce plant height (cm), Day 21; lbs ae/A
File: 60021h        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   18.54
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   4.83
Used for Chi-square table value ==>   df (#groups-1) =   5
-----------------------------------------------------------------------------

Data FAIL homogeneity test at 0.01 level. Try another transformation.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Lettuce plant height (cm), Day 21; lbs ae/A
File: 60021h        Transform: NO TRANSFORMATION

                                ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              5            1262.594          252.519         132.765

Within (Error)      29              55.145            1.902
-----------------------------------------------------------------------------
Total               34            1317.739
-----------------------------------------------------------------------------

  Critical F value =   2.55  (0.05,5,29)
  Since  F > Critical F  REJECT  Ho:All groups equal
```

6	2.07	1.275	1.275	0.718

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Ryegrass fresh weight (g), Day 21; lbs ae/A
File: 6002gf 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	neg control	6			
2	0.0082	6	0.632	43.0	-0.115
3	0.0387	6	0.632	43.0	-0.117
4	0.136	6	0.632	43.0	-0.002
5	0.505	6	0.632	43.0	-0.005
6	2.07	6	0.632	43.0	0.195

Ryegrass fresh weight (g), Day 21; lbs ae/A
File: 6002gf Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	1.470	1.470	1.547
2	0.0082	6	1.585	1.585	1.547
3	0.0387	6	1.587	1.587	1.547
4	0.136	6	1.472	1.472	1.473
5	0.505	6	1.475	1.475	1.473
6	2.07	6	1.275	1.275	1.275

Ryegrass fresh weight (g), Day 21; lbs ae/A
File: 6002gf 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
neg control	1.547				
0.0082	1.547	0.285		1.70	k= 1, v=30
0.0387	1.547	0.285		1.78	k= 2, v=30
0.136	1.473	0.012		1.80	k= 3, v=30
0.505	1.473	0.012		1.81	k= 4, v=30
2.07	1.275	0.719		1.82	k= 5, v=30

s = 0.470
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds	Std.Err.	Lower Bound

File: 60021f Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance

```
Calculated B statistic =   21.56
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   4.83
Used for Chi-square table value ==>   df (#groups-1) =   5
```

Data FAIL homogeneity test at 0.01 level. Try another transformation.

NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

Lettuce fresh weight (g), Day 21; lbs ae/A
File: 60021f Transform: NO TRANSFORMATION

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	neg control	32.205	32.205	168.000
2	0.0017	32.558	32.558	171.000
3	0.0074	29.136	29.136	120.000
4	0.0266	5.648	5.648	85.500
5	0.0981	2.363	2.363	59.000
6	0.405	0.810	0.810	26.500

Calculated H Value = 28.879 Critical H Value Table = 11.070
Since Calc H > Crit H REJECT Ho:All groups are equal.

Lettuce fresh weight (g), Day 21; lbs ae/A
File: 60021f Transform: NO TRANSFORMATION

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0 0 0 0 0 0 / 6 5 4 3 1 2
6	0.405	0.810	0.810	\
5	0.0981	2.363	2.363	. \
4	0.0266	5.648	5.648	. . \
3	0.0074	29.136	29.136	* . . \
1	neg control	32.205	32.205	* * . . \
2	0.0017	32.558	32.558	* * . . . \

```
* = significant difference (p=0.05)          . = no significant difference
Table q value (0.05,6) =   2.936          Unequal reps - multiple SE values
```

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate

```
Data PASS normality test at P=0.01 level. Continue analysis.


Wheat dry weight (g), Day 21; lbs ae/A
File: 6002wd        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   24.90
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =       5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =   5.00

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Wheat dry weight (g), Day 21; lbs ae/A
File: 6002wd        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   11.35
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>  df (avg n - 1) =   5.00
Used for Chi-square table value ==>  df (#groups-1) =   5
-----------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Wheat dry weight (g), Day 21; lbs ae/A
File: 6002wd        Transform: NO TRANSFORMATION

                              ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              5              0.665             0.133          13.300

Within (Error)      30              0.299             0.010
-----------------------------------------------------------------------------
Total               35              0.964
-----------------------------------------------------------------------------

  Critical F value =   2.53  (0.05,5,30)
  Since  F > Critical F  REJECT  Ho:All groups equal
```

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	2.838	2.838	2.846
2	0.0017	6	2.853	2.853	2.846
3	0.0074	5	2.422	2.422	2.422
4	0.0266	6	0.798	0.798	0.798
5	0.0981	6	0.488	0.488	0.488
6	0.405	6	0.277	0.277	0.277

Lettuce dry weight (g), Day 21; lbs ae/A
File: 6002ld 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
neg control	2.846				
0.0017	2.846	0.051		1.70	k= 1, v=29
0.0074	2.422	2.690	*	1.78	k= 2, v=29
0.0266	0.798	13.826	*	1.81	k= 3, v=29
0.0981	0.488	15.927	*	1.82	k= 4, v=29
0.405	0.277	17.362	*	1.83	k= 5, v=29

s = 0.256
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.00051	0.00014	0.0019	0.27	0.28
EC10	0.0011	0.00035	0.0033	0.24	0.33
EC25	0.0038	0.0016	0.0089	0.18	0.42
EC50	0.015	0.0084	0.027	0.13	0.56

Slope = 1.12 Std.Err. = 0.128

!!!Poor fit: p < 0.001 based on DF= 3.00 29.0

6002LD : Lettuce dry weight (g), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	2.84	3.08	-0.237	100.	0.00
0.00170	6.00	2.85	2.63	0.221	85.6	14.4
0.00740	5.00	2.42	1.96	0.466	63.6	36.4
0.0266	6.00	0.798	1.21	-0.408	39.2	60.8
0.0981	6.00	0.488	0.560	-0.0716	18.2	81.8
0.405	6.00	0.277	0.170	0.107	5.52	94.5

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC10 not bracketed by doses evaluated.

IDENTIFICATION	MEAN	WILLIAMS	P=.05	WILLIAMS	FREEDOM
neg control	0.933				
0.0085	0.885	0.839		1.70	k= 1, v=30
0.0330	0.838	1.663		1.78	k= 2, v=30
0.133	0.838	1.663		1.80	k= 3, v=30
0.500	0.797	2.372	*	1.81	k= 4, v=30
2.03	0.513	7.289	*	1.82	k= 5, v=30

s = 0.100
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.32	0.11	0.92	0.22	0.35
EC10	0.52	0.24	1.1	0.17	0.46
EC25	1.1	0.76	1.7	0.085	0.67
EC50	2.7	1.9	3.7	0.069	0.72

Slope = 1.79 Std.Err. = 0.497

Goodness of fit: p = 0.27 based on DF= 3.0 30.

6002WD : Wheat dry weight (g), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	0.933	0.876	0.0570	100.	0.00
0.00850	6.00	0.885	0.876	0.00864	100.	0.000385
0.0330	6.00	0.817	0.876	-0.0594	100.	0.0314
0.133	6.00	0.858	0.868	-0.00949	99.0	0.974
0.500	6.00	0.797	0.793	0.00403	90.4	9.55
2.03	6.00	0.513	0.514	-0.000706	58.7	41.3

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

Wheat fresh weight (g), Day 21; lbs ae/A
File: 6002wf Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	1	12	14	5	4

Calculated Chi-Square goodness of fit test statistic = 4.6991
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Wheat fresh weight (g), Day 21; lbs ae/A

```
Data PASS normality test. Continue analysis.


Lettuce dry weight (g), Day 21; lbs ae/A
File: 6002ld        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-------------------------------------------------------------------------------

D =    1.894

W =    0.987

Critical W (P = 0.05) (n = 35) = 0.934
Critical W (P = 0.01) (n = 35) = 0.910
-------------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


Lettuce dry weight (g), Day 21; lbs ae/A
File: 6002ld         Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-------------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   22.23
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =        5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =    4.83
                                                (average df used)

-------------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Lettuce dry weight (g), Day 21; lbs ae/A
File: 6002ld        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-------------------------------------------------------------------------------

Calculated B statistic =    9.49
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   4.83
Used for Chi-square table value ==>   df (#groups-1) =   5
-------------------------------------------------------------------------------

Data PASS homogeneity test at 0.01 level. Continue analysis.

NOTE: If groups have unequal replicate sizes the average replicate size is
```

SOURCE	DF	SS	MS	F
Between	5	30.372	6.074	9.974
Within (Error)	30	18.265	0.609	
Total	35	48.638		

Critical F value = 2.53 (0.05,5,30)
Since F > Critical F REJECT Ho:All groups equal

Wheat fresh weight (g), Day 21; lbs ae/A
File: 6002wf 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	neg control	6.482	6.482		
2	0.0085	6.250	6.250	0.514	
3	0.0330	5.540	5.540	2.090	
4	0.133	5.768	5.768	1.583	
5	0.500	5.698	5.698	1.739	
6	2.03	3.643	3.643	6.300	*

Dunnett table value = 2.33 (1 Tailed Value, P=0.05, df=30,5)

Wheat fresh weight (g), Day 21; lbs ae/A
File: 6002wf 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	neg control	6			
2	0.0085	6	1.050	16.2	0.232
3	0.0330	6	1.050	16.2	0.942
4	0.133	6	1.050	16.2	0.713
5	0.500	6	1.050	16.2	0.783
6	2.03	6	1.050	16.2	2.838

Wheat fresh weight (g), Day 21; lbs ae/A
File: 6002wf Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	6.482	6.482	6.482
2	0.0085	6	6.250	6.250	6.250
3	0.0330	6	5.540	5.540	5.669

```
------------------- ---------- ---------- ----- ---------- ------------
        neg control     22.113
             0.0017     22.113     0.719             1.70      k= 1, v=30
             0.0074     22.113     0.719             1.78      k= 2, v=30
             0.0266     22.113     0.719             1.80      k= 3, v=30
             0.0981     22.113     0.719             1.81      k= 4, v=30
              0.405     12.183     6.103       *     1.82      k= 5, v=30
-------------------------------------------------------------------------
s =    2.521
Note: df used for table values are approximate when v > 20.

Cabbage % survival, Day 21; lbs ae/A
File: 6002bs        Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies
-------------------------------------------------------------------------

INTERVAL     <-1.5     -1.5 to <-0.5     -0.5 to 0.5     >0.5 to 1.5     >1.5

EXPECTED     2.412         8.712            13.752          8.712        2.412
OBSERVED     0             1                33              2            0

-------------------------------------------------------------------------
Calculated Chi-Square goodness of fit test statistic =  43.7624
Table Chi-Square value (alpha = 0.01) = 13.277

Data FAIL normality test. Try another transformation.

Warning -  The two homogeneity tests are sensitive to non-normal data and
           should not be performed.


Cabbage % survival, Day 21; lbs ae/A
File: 6002bs        Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-------------------------------------------------------------------------

D = 3000.000

W =    0.539

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912
-------------------------------------------------------------------------

Data FAIL normality test. Try another transformation.

Warning -  The two homogeneity tests are sensitive to non-normal data and
           should not be performed.


Cabbage % survival, Day 21; lbs ae/A
File: 6002bs        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
Bartletts test for homogeneity of variance
-------------------------------------------------------------------------

These two tests can not be performed because at least one group has
```

```
EXPECTED     2.412          8.712          13.752          8.712      2.412
OBSERVED     4              5              17              9          1

-----------------------------------------------------------------------------
Calculated Chi-Square goodness of fit test statistic =   4.2303
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.


Wheat plant height (cm), Day 21; lbs ae/A
File: 6002wh       Transform: NO TRANSFORMATION

Shapiro Wilks test for normality
-----------------------------------------------------------------------------

D =  153.280

W =    0.967

Critical W (P = 0.05) (n = 36) = 0.935
Critical W (P = 0.01) (n = 36) = 0.912
-----------------------------------------------------------------------------

Data PASS normality test at P=0.01 level. Continue analysis.


Wheat plant height (cm), Day 21; lbs ae/A
File: 6002wh        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =    6.06
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =       5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =   5.00

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Wheat plant height (cm), Day 21; lbs ae/A
File: 6002wh       Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =    4.02
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
```

```
Data PASS normality test at P=0.01 level. Continue analysis.


Cabbage plant height (cm), Day 21; lbs ae/A
File: 6002bh        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   30.77
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =       5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =   5.00

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Cabbage plant height (cm), Day 21; lbs ae/A
File: 6002bh        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   17.96
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   5
-----------------------------------------------------------------------------

Data FAIL homogeneity test at 0.01 level. Try another transformation.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).
Cabbage plant height (cm), Day 21; lbs ae/A
File: 6002bh        Transform: NO TRANSFORMATION

                              ANOVA TABLE
-----------------------------------------------------------------------------

SOURCE              DF              SS                MS              F
-----------------------------------------------------------------------------
Between              5             502.019          100.404         15.797

Within (Error)      30             190.688            6.356
-----------------------------------------------------------------------------
Total               35             692.708
-----------------------------------------------------------------------------

  Critical F value =   2.53  (0.05,5,30)
  Since  F > Critical F  REJECT  Ho:All groups equal
```

Wheat plant height (cm), Day 21; lbs ae/A
File: 6002wh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	6	58.567	58.567	58.567
2	0.0085	6	56.967	56.967	57.656
3	0.0330	6	57.467	57.467	57.656
4	0.133	6	58.533	58.533	57.656
5	0.500	6	56.433	56.433	56.433
6	2.03	6	49.833	49.833	49.833

Wheat plant height (cm), Day 21; lbs ae/A
File: 6002wh 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
neg control	58.567				
0.0085	57.656	0.698		1.70	k= 1, v=30
0.0330	57.656	0.698		1.78	k= 2, v=30
0.133	57.656	0.698		1.80	k= 3, v=30
0.500	56.433	1.635		1.81	k= 4, v=30
2.03	49.833	6.692	*	1.82	k= 5, v=30

s = 2.260
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
EC5	0.87	0.45	1.7	0.14	0.51
EC10	1.5	1.1	2.1	0.068	0.73
EC25	3.8	2.3	6.2	0.11	0.60
EC50	10.	3.1	35.	0.26	0.29

Slope = 1.53 Std.Err. = 0.554

Goodness of fit: p = 0.50 based on DF= 3.0 30.

6002WH : Wheat plant height (cm), Day 21; lbs ae/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	6.00	58.6	57.9	0.691	100.	0.00
0.00850	6.00	57.0	57.9	-0.909	100.	0.000122
0.0330	6.00	57.5	57.9	-0.405	100.	0.00685
0.133	6.00	58.5	57.8	0.769	99.8	0.193

```
Critical W (P = 0.01) (n = 36) = 0.912
-----------------------------------------------------------------------------

Data FAIL normality test. Try another transformation.

Warning -  The two homogeneity tests are sensitive to non-normal data and
           should not be performed.


Cabbage fresh weight (g), Day 21; lbs ae/A
File: 6002bf        Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated H statistic (max Var/min Var) =   33.10
Closest, conservative, Table H statistic =   38.0  (alpha = 0.01)

Used for Table H ==>     R (# groups) =   6,    df (# reps-1) =       5
Actual values    ==>     R (# groups) =   6,    df (# avg reps-1) =   5.00

-----------------------------------------------------------------------------

Data PASS homogeneity test. Continue analysis.

NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Cabbage fresh weight (g), Day 21; lbs ae/A
File: 6002bf        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   24.49
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   5
-----------------------------------------------------------------------------

Data FAIL homogeneity test at 0.01 level. Try another transformation.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Cabbage fresh weight (g), Day 21; lbs ae/A
File: 6002bf        Transform: NO TRANSFORMATION

              KRUSKAL-WALLIS ANOVA BY RANKS  -  TABLE 1 OF 2
-----------------------------------------------------------------------------
                                TRANSFORMED   MEAN CALCULATED IN      RANK
GROUP    IDENTIFICATION           MEAN         ORIGINAL UNITS         SUM
----- -------------------      ----------   ------------------   ----------
  1            neg control      24.093            24.093           91.000
  2                 0.0017      24.720            24.720          101.500
  3                 0.0074      27.133            27.133          152.500
  4                 0.0266      27.203            27.203          149.000
```

```
NOTE: This test requires equal replicate sizes. If they are unequal
      but do not differ greatly, the Hartley test may still be used
      as an approximate test (average df are used).


Cabbage dry weight (g), Day 21; lbs ae/A
File: 6002bd        Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance
-----------------------------------------------------------------------------

Calculated B statistic =   15.55
Table Chi-square value =   15.09  (alpha = 0.01)
Table Chi-square value =   11.07  (alpha = 0.05)

Average df used in calculation  ==>   df (avg n - 1) =   5.00
Used for Chi-square table value ==>   df (#groups-1) =   5
-----------------------------------------------------------------------------

Data FAIL homogeneity test at 0.01 level. Try another transformation.

NOTE: If groups have unequal replicate sizes the average replicate size is
      used to calculate the B statistic (see above).

Cabbage dry weight (g), Day 21; lbs ae/A
File: 6002bd        Transform: NO TRANSFORMATION

              KRUSKAL-WALLIS ANOVA BY RANKS  -  TABLE 1 OF 2
-----------------------------------------------------------------------------
                                TRANSFORMED   MEAN CALCULATED IN      RANK
GROUP    IDENTIFICATION           MEAN         ORIGINAL UNITS         SUM
----- -------------------      ----------   -----------------    ----------
  1          neg control         3.130             3.130            93.000
  2               0.0017         3.463             3.463           155.000
  3               0.0074         3.560             3.560           164.000
  4               0.0266         3.468             3.468           142.500
  5               0.0981         3.120             3.120            87.500
  6                0.405         1.275             1.275            24.000
-----------------------------------------------------------------------------

  Calculated H Value =  21.261        Critical H Value Table =  11.070
  Since  Calc H > Crit H  REJECT Ho:All groups are equal.


Cabbage dry weight (g), Day 21; lbs ae/A
File: 6002bd        Transform: NO TRANSFORMATION

 DUNNS MULTIPLE COMPARISON -  KRUSKAL-WALLIS  -  TABLE 2 OF 2
-----------------------------------------------------------------------------
                                                    GROUP
                        TRANSFORMED  ORIGINAL   0 0 0 0 0 0
GROUP  IDENTIFICATION     MEAN        MEAN     6 5 1 2 4 3
----- --------------- ----------  ---------   - - - - - -
  6            0.405       1.275       1.275   \
  5           0.0981       3.120       3.120   . \
  1       neg control      3.130       3.130   . . \
  2           0.0017       3.463       3.463   * . . \
  4           0.0266       3.468       3.468   * . . . \
  3           0.0074       3.560       3.560   * . . . . \
-----------------------------------------------------------------------------
```