DATA EVALUATION RECORD

1. **CHEMICAL:** Naled. Shaughnessey No. 034401.

2. **TEST MATERIAL:** ^{14}C-Naled; Lot No. 2675-010; CAS No. 300-76-5; 1.017 mCi; 35.01 mCi/mmole specific activity; radiopurity of 97.3%; a clear liquid.

3. **STUDY TYPE:** 72-4. Freshwater Invertebrate Life-Cycle Test. Species Tested: *Daphnia magna*.

4. **CITATION:** Putt, A.E. 1993. Naled - The Chronic Toxicity to *Daphnia magna* Under Flow-Through Conditions. Report No. 93-5-4781. Study conducted by Springborn Laboratories, Inc., Wareham, MA. Submitted by Valent U.S.A. Corporation, Walnut Creek, CA. EPA MRID No. 429088-01.

5. **REVIEWED BY:**

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Date: 10 January 1994

6. **APPROVED BY:**

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7. **CONCLUSIONS:** This study is scientifically sound and meets the requirements for a life-cycle study using the freshwater invertebrate, *Daphnia magna*. Based on mean measured concentrations and effects of Naled on daphnid length, the MATC of Naled for *Daphnia magna* was >~~45~~ 98 and <~~98~~ 180 ng ai/l (geometric mean MATC = ~~66~~ 130 ng ai/l).

8. **RECOMMENDATIONS:**

9. **BACKGROUND:**

10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

24.5

11. MATERIALS AND METHODS:

A. Test Animals: *Daphnia magna* were obtained from in-house cultures which were maintained at 20 ±2°C under a photoperiod of 16 hours of light. The daphnids were fed a combination of green alga (*Ankistrodesmus falcatus*) and trout food suspension daily.

B. Test System: The test system was an intermittent-flow proportional diluter with a 50% dilution factor. Test vessels were 2-l glass battery jars. Each jar drained through a 3 x 8-cm notch at the upper edge. Each notch was screen-covered and located 13 cm from the bottom of the test vessel. The volume of test solutions was maintained at 1.8 l. The diluter delivered test solutions to each vessel at a rate of 6 volume additions per day providing a 90% solution replacement time of 9 hours.

Sixteen hours of light at an intensity of 35-55 footcandles were provided each day. Test temperature was maintained at approximately 20 ±1°C using a water bath.

The dilution (culture) water was fortified well water and had a pH of 7.9-8.3, a specific conductivity of 400-600 µmhos/cm, and a total hardness and alkalinity of 160-180 and 110-130 mg/l as $CaCO_3$, respectively.

A primary stock solution was prepared by dissolving the test material in methylene chloride. "This solution was applied to three TLC plates in an 8-cm band across the plates. The plates were eluted in a preconditioned TLC chamber containing 100 ml of chloroform:methanol (95:5). The zones containing Naled were scraped from the plates, combined and extracted several times with methylene chloride. The solvent was removed under a stream of nitrogen and diluted to 50 ml with acetone." A diluter stock solution (25.3 µg ai/ml) was prepared every 11 days by diluting 12.39 ml of the primary stock solution with acetone to a final volume of 25 ml.

C. Dosage: Twenty-one-day, flow-through test. Based on the results of preliminary testing, five nominal test concentrations (27, 54, 110, 220, and 430 ng ai/l) were selected for this study. In addition, a solvent control and a dilution water control were included. The solvent control solution contained the maximum amount of solvent (17 µl/l) present in any test solution.

D. **Design:** Ten daphnids (≤24 hours old) were impartially selected and distributed to each of four replicate exposure vessels per treatment (i.e., 40 daphnids per treatment). The daphnids were fed 2.0 ml of trout food (5 mg/ml), 3.0 ml of algal suspension (*Ankistrodesmus falcatus;* 4 x 10^7 cells/ml), and 0.5 ml of Selco® food supplement (0.6 mg/ml) at least twice daily. Test vessels were brushed at least twice a week to remove algal growth and the solutions filtered through a fine-mesh net.

Adult survival was determined on days 1, 2, 4, 7, 10, 12, 14, 17, 19, and 21. Offspring production was noted on day 7 and three times weekly thereafter. The offspring were discarded after counting. At test termination, total body length (to the nearest 0.05 mm) and dry weight (to the nearest 0.01 mg) of all surviving adults were recorded.

Dissolved oxygen concentration (DO) was measured every weekday in one replicate vessel of each treatment. Temperature was measured daily in one replicate vessel of each treatment, and continuously throughout the test period in one replicate of the 430 ng ai/l nominal concentration. Total hardness, alkalinity, specific conductivity, and pH were measured weekly in one replicate of each treatment. Temperature, DO, and pH were also measured once a week in all replicate vessels of each treatment.

Water samples were collected from the midpoint of two replicates of each treatment on test days 0, 7, 14, and 21. These samples were analyzed using liquid scintillation counting (LSC). In addition, samples from the highest test concentration were collected on the same days and analyzed for Naled and Dimethyl 2,2-Dichlorovinyl Phosphate (DDVP, a photolytic degradate of Naled) using gas chromatography (GC).

E. **Statistics:** The responses of the dilution water control and solvent control animals for each endpoint were compared using a Student's t-test. The tests demonstrated significant differences in reproduction and total length between the dilution water control and the solvent control data. Therefore, the responses of the exposure groups for these parameters were compared to those of the solvent control data. Survival and dry weight were compared to the pooled control data.

Survival, reproduction, and growth data were tested for normality and homogeneity of variance (Shapiro-Wilks and Bartlett's tests, respectively). William's Test was used to assess exposure-level effects of these parameters. Analyses were performed using the mean organism response in each replicate vessel. Survival data were arcsine square-root transformed before analysis. All statistical conclusions were made at 95% level of certainty except for Shapiro-Wilks and Bartletts' tests which were at 99% level of certainty.

The 21-day EC_{50} was calculated using the moving average angle analysis, probit analysis, or nonlinear interpolation.

12. **REPORTED RESULTS:** Mean measured concentrations were 29, 45, 98, 180, and 360 ng ai/l, with an average coefficient of variation of 11% (Table 2, attached). Although the mean measured concentration of Naled in the highest test concentration determined by GC analysis was 31% less than that determined by LSC, "it was established that the measurements were in general agreement and that the exposure system was appropriate to maintain sufficient quantities of parent Naled to elicit a concentration-response by the test organisms." Based on the results of GC analysis, no measurable levels of DDVP were present in the highest test concentration and stock solution.

The survival and reproductive rates for control groups exceeded the minimum EPA guideline requirements of 70% survival and 40 offspring/female. Survival was statistically reduced at the two highest test concentrations when compared to that of the pooled control (Table 5, attached). These treatments were not included in growth or reproduction analysis. The cumulative number of offspring per female at 180 and 360 ng ai/l was statistically reduced when compared to that of the solvent control data (Table 7, attached).

Mean total body length and mean dry weight of daphnids at concentrations $\leq$98 ng ai/l were not statistically reduced compared to those of control data (Table 9, attached). The 21-day EC_{50} for immobilization was 130 ng ai/l with a 95% confidence interval of 98-180 ng ai/l.

During the study, the test solutions had a pH of 8.2-8.4, a specific conductivity of 500 μmhos/cm, a DO of 7.8-9.0 mg/l, and a total hardness and alkalinity of 160-176 and 110-120 mg/l as $CaCO_3$, respectively. The average daily temperature

ranged from 19 to 20°C and the continuous temperature was 18-21°C.

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:** The NOEC and LOEC for this study were 98 and 180 ng ai/l, respectively, based on the adverse effect observed on survival of *Daphnia magna*. The MATC was >98 and <180 ng ai/l (geometric mean MATC = 130 ng ai/l).

Quality assurance and GLP compliance statements were included in the report indicating that the data and report prepared for this study were produced and compiled in accordance with all pertinent EPA Good Laboratory Practice Regulations (40 CFR Part 160) except in the case of stability, characterization and verification of test substance identity. In addition, routine water and food contaminant analyses were not conducted in accordance with GLP procedures.

14. **REVIEWER'S DISCUSSION AND INTERPRETATION OF STUDY RESULTS:**

A. **Test Procedure:** An SEP for *Daphnia* chronic flow-through studies is not available at this time, thus the SEP for the *Daphnia magna* 21-day static-renewal test was used as general guidance. Study weaknesses were as follows:

Contamination was indicated in both the dilution water control and the solvent control on test day 14 at concentrations of 3.1-3.8 ng ai/l. The author attributed the day-14 contamination to contaminated glassware during the chemical analysis. The control solutions were sampled again on day 18 and results of analysis demonstrated concentrations to be <1.7 ng ai/l.

The author evaluated the effects of the test material on reproduction using average number of young produced per female. Since reproduction was not measured daily and each replicate contained more than one female, the appropriate endpoint is the number of young per female reproductive day, rather than number of young per female.

The length and weight data were individually measured; however, the data for these parameters were statistically analyzed using the mean value of each replicate. When mean values are used, the variation that exists within each replicate is ignored.

Individual measurements of length and weight should have been used.

B. **Statistical Analysis:** Survival data (arcsine square-root transformed) did not meet the assumptions of homogeneity of variance (Hartley test), therefore, Steels Many-One Rank test was used to analyze the data (page 5 of printout, attached). The results were the same as those of the author.

The reviewer calculated the number of young per female reproductive day (Table 8, attached). These data were analyzed using Williams' test, since the data met the assumptions of normality and homogeneity of variance (page 11 of printout, attached).

A two-way ANOVA with Bonferroni's comparison test was performed on each growth endpoint (pages 15 and 16 of printout, attached). Weight was not significantly reduced at any test level when compared to the solvent control or the dilution water control. Length was significantly reduced at 29 and 98 ng ai/l when compared to the solvent control. Length was not significantly reduced at any test level when compared to the dilution water control. The significant reduction in length at 29 ng ai/l was probably a result of biological variation and not treatment related since length at 45 ng ai/l was not significantly different from that of the solvent control.

C. **Discussion/Results:** Although control contamination was indicated in samples collected on day 14 at levels 3.1-3.8 ng ai/l, samples collected on day 18 demonstrated concentrations <1.7 ng ai/l. Since levels of control contamination were near the level of detection (1.9 ng ai/l) and control samples collected on day 18 showed no signs of contamination, the level of contamination detected is not likely to have had an effect on the results of the study.

This study is scientifically sound and meets the requirements for a life-cycle study using the freshwater invertebrate, *Daphnia magna*. Based on mean measured concentrations and effects of Naled on daphnid length, the MATC of Naled for *Daphnia magna* was >45 and <98 ng ai/l (geometric mean MATC = 66 ng ai/l).

D. **Adequacy of the Study:**

(1) Classification: Core.

(2) Rationale: N/A.

(3) Repairability: N/A.

15. COMPLETION OF ONE-LINER: Yes; 21 December 1993.

Table 2. Concentrations of ^{14}C-Naled equivalents measured in replicate exposure solutions by liquid scintillation counting (LSC) during the 21-day chronic test with daphnids (*Daphnia magna*).

Nominal Concentration (ng A.I./L)	Measured Concentration (ng A.I./L)[a]				
	Day 0[b]	Day 7[b]	Day 14[b]	Day 21[b]	Mean (SD)[c]
Control	<1.9	<1.9	3.1[d]	<1.9	NA[e]
	<1.9	<1.9	3.6	<1.9	
Solvent Control	< 1.9	<1.9	3.8	<1.9	NA
	< 1.9	<1.9	3.2	<1.9	
27	31	31	32	22	29(4.1)
	33	31	30	24	
54	55	46	45	36	45(6.4)
	50	48	45	37	
110	110	150	92	70	98(26)
	110	92	94	72	
220	200	220	180	140	180(26)
	210	180	180	150	
430	390	390	310	300	360(47)
	440	390	330	330	
QC #1[f]	21.2	22.0	20.6	23.7	
	(25.5)[g]	(25.5)	(25.5)	(25.5)	
QC #2	130	219	112	141	
	(153)	(255)	(153)	(153)	
QC #3	208	250	128	221	
	(255)	(306)	(255)[h]	(255)	

a Measured concentrations have been corrected for average QC recovery at the request of the Study Sponsor.

b Samples taken on days 0 and 14 were removed from replicates A and B and samples taken on days 7 and 21 were removed from replicates C and D.

c Mean measured concentrations are presented with standard deviations in parentheses and were calculated using actual (unrounded) analytical results and not with the rounded (two significant figures) values presented in this table.

d Naled contamination in the controls was attributed to contaminated glassware during the analysis portion of the procedure and not representative of the actual exposure concentration. Analysis on day 18 established analytical results < 1.7 ng A.I./L in the control solutions.

e NA = Not applicable

f QC = Quality Control sample

g Nominal fortified concentration for each QC sample is presented in parentheses.

h Percent recovery is outside the standard acceptable range established by this laboratory (i.e., ± 3 standard deviations from the mean recovery established during the method validation/recovery study, Appendix V). Not included in calculation of mean recovery for QC samples.

Table 5. Cumulative mean percent survival of parental daphnids (*Daphnia magna*) during the 21-day chronic exposure to Naled.

Mean Measured Concentration (ng A.I./L)	Mean Cumulative Percent Survival (SD)[a]				
	Day 1	Day 2	Day 4	Day 7	Day 10
Control	100(0)	100(0)	98(5)	98(5)	98(5)
Solvent Control	100(0)	100(0)	100(0)	100(0)	98(5)
Pooled Control	100(0)	100(0)	99(4)	99(4)	98(5)
29	100(0)	100(0)	98(5)	98(5)	98(5)
45	100(0)	100(0)	100(0)	100(0)	100(0)
98	100(0)	100(0)	100(0)	100(0)	100(0)
180	100(0)	100(0)	98(5)	98(5)	98(5)
360	100(0)	100(0)	100(0)	70(32)	0(0)

[a] SD = standard deviation.

Table 5. Continued. Cumulative mean percent survival of parental daphnids (*Daphnia magna*) during the 21-day chronic exposure to Naled.

Mean Measured Concentration (ng A.I./L)	Mean Cumulative Percent Survival (SD)[a]				
	Day 12	Day 14	Day 17	Day 19	Day 21
Control	98(5)	98(5)	93(10)	93(10)	93(10)
Solvent Control	93(10)	90(14)	88(19)	88(19)	88(19)
Pooled Control	95(8)	94(11)	90(14)	90(14)	90(14)
29	85(10)	83(15)	65(29)	58(38)	58(38)[c]
45	100(0)	98(5)	98(5)	98(5)	98(5)
98	98(5)	98(5)	98(5)	98(5)	98(5)
180	75(17)	75(17)	43(26)	3(5)	0(0)[b]
360	0(0)	0(0)	0(0)	0(0)	0(0)[b]

[a] SD = standard deviation.
[b] Significantly different from the pooled control organisms.
[c] Although survival among organisms exposed to the 27 ng A.I./L treatment level is reduced compared to survival of pooled control organisms, it was not statistically significant. Survival at this treatment level is not considered to be toxicant-related, but due to biological variability among daphnids.

Table 7. Cumulative number of offspring produced per female daphnid (*Daphnia magna*) during the 21-day chronic exposure to Naled.

Mean Measured Concentration (ng A.I./L)	Mean Cumulative Number of Offspring/Female						
Day:	7	10	12	14	17	19	21
Control	0(0)	12(2)	23(4)	37(4)	65(5)	109(7)	119(8)
Solvent Control	0(0)	9(3)	38(5)	41(4)	75(5)	122(9)	162(12)
29	0(0)	12(1)	33(9)	36(11)	60(13)	92(21)	106(40)
45	0(0)	10(1)	34(4)	38(6)	70(7)	113(11)	151(24)
98	0(0)	9(1)	33(3)	39(3)	72(3)	112(8)	142(4)
180	0(0)	1(1)	21(2)	25(6)	56(10)	81(9)	81(9)[a]
360	0(0)	1(1)	1(1)	1(1)	1(1)	1(1)	1(1)[a]

[a] Data excluded from statistical analysis due to a significant effect on daphnid survival at this treatment level.

Table 8. Total number of offspring alive and total number of offspring immobilized at each observation interval after first brood release during the 21-day chronic exposure of daphnids (*Daphnia magna*) to Naled.

Mean Measured Concentration (ng A.I./L)		Number of Offspring Alive (# Offspring Immobilized)								No Repro. Days	No. Young per Repro. Day
	Day:	7	10	12	14	17	19	21	Total		
Control[a]	A	0(0)	102(0)	98(0)	140(0)	304(0)	479(0)	137(0)	1260(0)	120	10.5
	B	0(0)	121(0)	121(0)	114(0)	294(0)	388(0)	82(0)	1120(0)	120	9.3
	C	0(0)	148(0)	129(0)	152(0)	288(0)	358(0)	66(0)	1141(0)	110	10.4
	D	0(0)	90(0)	79(0)	136(0)	232(0)	397(0)	73(0)	1007(0)	108	9.3
	Total	0(0)	461(0)	427(0)	542(0)	1118(0)	1622(0)	358(0)	4528(0)		
Solvent[b] Control	A	0(0)	49(0)	355(0)	1(0)	346(0)	449(0)	396(0)	1596(0)	120	13.3
	B	0(0)	76(0)	283(0)	28(0)	292(0)	401(0)	428(0)	1508(0)	110	13.7
	C	0(0)	127(0)	276(0)	31(0)	296(0)	524(0)	323(0)	1577(0)	120	13.1
	D	0(0)	104(0)	197(0)	24(0)	262(0)	243(0)	207(0)	1037(0)	85	12.2
	Total	0(0)	356(0)	1111(0)	84(0)	1196(0)	1617(0)	1345(0)	5718(0)		
29[b]	A	0(0)	123(0)	204(0)	34(0)	118(0)	137(0)	0(0)	616(0)	82	7.5
	B	0(0)	99(0)	94(0)	0(0)	258(0)	286(0)	131(0)	868(0)	108	8.0
	C	0(0)	122(0)	298(0)	38(0)	98(0)	62(0)	2(0)	620(0)	66	9.4
	D	0(0)	121(0)	243(0)	20(0)	341(0)	433(0)	369(0)	1527(0)	110	13.9
	Total	0(0)	465(0)	839(0)	92(0)	815(0)	918(0)	502(0)	3631(0)		
45[b]	A	0(0)	97(0)	176(0)	19(0)	283(0)	393(0)	167(0)	1135(0)	112	10.1
	B	0(0)	103(0)	243(0)	81(0)	364(0)	504(0)	517(0)	1812(0)	120	15.1
	C	0(0)	88(0)	256(0)	49(0)	298(0)	358(0)	370(0)	1419(0)	120	11.8
	D	0(0)	85(0)	291(0)	31(0)	311(0)	393(0)	450(0)	1561(0)	120	13.0
	Total	0(0)	373(0)	966(0)	180(0)	1256(0)	1648(0)	1504(0)	5927(0)		
98[b]	A	0(0)	95(0)	244(0)	23(0)	309(0)	467(0)	302(0)	1440(0)	120	12.0
	B	0(0)	89(0)	281(0)	56(0)	289(0)	403(0)	228(0)	1346(0)	110	12.2
	C	0(0)	104(0)	197(0)	85(0)	318(0)	423(0)	244(0)	1371(0)	120	11.4
	D	0(0)	78(0)	221(0)	68(0)	364(0)	291(0)	383(0)	1405(0)	120	11.7
	Total	0(0)	366(0)	943(0)	232(0)	1280(0)	1584(0)	1157(0)	5562(0)		
180[b]	A	0(0)	0(0)	207(0)	3(0)	224(0)	166(0)	-	600(0)	77	7.8
	B	0(0)	4(0)	179(0)	12(0)	221(0)	177(0)	-	593(0)	74	8.0
	C	0(0)	24(0)	211(0)	9(0)	197(0)	55(0)	0(0)	496(0)	52	9.5
	D	0(0)	21(0)	171(0)	93(0)	252(0)	42(0)	-	579(0)	62	9.3
	Total	0(0)	49(0)	768(0)	117(0)	894(0)	440(0)	0(0)	2268(0)		
360[a]	A	0(0)	0(7)	0(0)	0(0)	-	-	-	0(7)		
	B	0(0)	4(0)	0(0)	0(0)	-	-	-	4(0)		
	C	0(0)	2(0)	0(0)	0(0)	-	-	-	2(0)		
	D	0(0)	19(0)	0(0)	0(0)	-	-	-	19(0)		
	Total	0(0)	25(7)	0(0)	0(0)	-	-	-	25(7)		

[a] First brood release was observed on test day 9.
[b] First brood release was observed on test day 8.

Table 9. Mean lengths and dry weights of parental daphnids at termination of the 21-day chronic toxicity test exposing daphnids (*Daphnia magna*) to Naled.

Mean Measured Concentration (ng A.I./L)	Mean[a] Length (mm)	Mean[a] Dry Weight (mg)
Control	4.6(0.1)	1.06(0.17)
Solvent Control	4.9(0.2)	1.05(0.09)
Pooled Control	NA[b]	1.05(0.14)
29	4.6(0.3)	0.97(0.18)
45	4.8(0.2)	1.04(0.15)
98	4.8(0.3)	1.04(0.21)
180	--[c]	--[c]
360	--[c]	--[c]

[a] Mean lengths and weights are presented with the standard deviation in parentheses.
[b] NA - not applicable. Control data could not be pooled.
[c] Data was excluded from statistical analysis due to prior 100% mortality and a significant effect on daphnid survival at this treatment level.

Naled: Survival of Exposed D.magna
File: e:\aquadata\42908801.sur Transform: ARC SINE(SQUARE ROOT(Y))

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	5	15	4	0

Calculated Chi-Square goodness of fit test statistic = 7.6011
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Naled: Survival of Exposed D.magna
File: e:\aquadata\42908801.sur Transform: ARC SINE(SQUARE ROOT(Y))

Shapiro Wilks test for normality

D = 0.760

W = 0.865

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

Data FAIL normality test. Try another transformation.

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

Naled: Survival of Exposed D.magna
File: e:\aquadata\42908801.sur Transform: ARC SINE(SQUARE ROOT(Y))

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.

TITLE: Naled: Survival of Exposed D.magna
FILE: e:\aquadata\42908801.sur
TRANSFORM: ARC SINE(SQUARE ROOT(Y)) NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Solvent Control	1	1.0000	1.4120
1	Solvent Control	2	0.9000	1.2490
1	Solvent Control	3	1.0000	1.4120
1	Solvent Control	4	0.6000	0.8861
2	29 ng ai/l	1	0.3000	0.5796
2	29 ng ai/l	2	0.9000	1.2490
2	29 ng ai/l	3	0.2000	0.4636
2	29 ng ai/l	4	0.9000	1.2490
3	45 ng ai/l	1	0.9000	1.2490
3	45 ng ai/l	2	1.0000	1.4120
3	45 ng ai/l	3	1.0000	1.4120
3	45 ng ai/l	4	1.0000	1.4120
4	98 ng ai/l	1	1.0000	1.4120
4	98 ng ai/l	2	0.9000	1.2490
4	98 ng ai/l	3	1.0000	1.4120
4	98 ng ai/l	4	1.0000	1.4120
5	180 ng ai/l	1	0.0000	0.1588
5	180 ng ai/l	2	0.0000	0.1588
5	180 ng ai/l	3	0.0000	0.1588
5	180 ng ai/l	4	0.0000	0.1588
6	360 ng ai/l	1	0.0000	0.1588
6	360 ng ai/l	2	0.0000	0.1588
6	360 ng ai/l	3	0.0000	0.1588
6	360 ng ai/l	4	0.0000	0.1588

Naled: Survival of Exposed D.magna
File: e:\aquadata\42908801.sur Transform: ARC SINE(SQUARE ROOT(Y))

STEELS MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	Solvent Control	1.240				
2	29 ng ai/l	0.885	13.00	10.00	4.00	
3	45 ng ai/l	1.371	20.50	10.00	4.00	
4	98 ng ai/l	1.371	20.50	10.00	4.00	
5	180 ng ai/l	0.159	10.00	10.00	4.00	*
6	360 ng ai/l	0.159	10.00	10.00	4.00	*

Critical values use k = 5, are 1 tailed, and alpha = 0.05

Naled: No.Young per Reproductive Day of Exposed D.magna
File: e:\aquadata\42908801.rep 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	8	9	7	0

Calculated Chi-Square goodness of fit test statistic = 4.2910
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Naled: No.Young per Reproductive Day of Exposed D.magna
File: e:\aquadata\42908801.rep Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 47.749

W = 0.917

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.

Naled: No.Young per Reproductive Day of Exposed D.magna
File: e:\aquadata\42908801.rep Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 69.28
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==>	R (# groups) =	6,	df (# reps-1) =		3
Actual values ==>	R (# groups) =	6,	df (# avg reps-1) =		3.00

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).

Naled: No.Young per Reproductive Day of Exposed D.magna
File: e:\aquadata\42908801.rep Transform: NO TRANSFORMATION

Bartletts test for homogeneity of variance

Calculated B statistic = 13.19
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) = 3.00
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).

TITLE: Naled: No.Young per Reproductive Day of Exposed D.magna
FILE: e:\aquadata\42908801.rep
TRANSFORM: NO TRANSFORMATION NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Solvent Control	1	13.3000	13.3000
1	Solvent Control	2	13.7000	13.7000
1	Solvent Control	3	13.1000	13.1000
1	Solvent Control	4	12.2000	12.2000
2	29 ng ai/l	1	7.5000	7.5000
2	29 ng ai/l	2	8.0000	8.0000
2	29 ng ai/l	3	9.4000	9.4000
2	29 ng ai/l	4	13.9000	13.9000
3	45 ng ai/l	1	10.1000	10.1000
3	45 ng ai/l	2	15.1000	15.1000
3	45 ng ai/l	3	11.8000	11.8000
3	45 ng ai/l	4	13.0000	13.0000
4	98 ng ai/l	1	12.0000	12.0000
4	98 ng ai/l	2	12.2000	12.2000
4	98 ng ai/l	3	11.4000	11.4000
4	98 ng ai/l	4	11.7000	11.7000
5	180 ng ai/l	1	7.8000	7.8000
5	180 ng ai/l	2	8.0000	8.0000
5	180 ng ai/l	3	9.5000	9.5000
5	180 ng ai/l	4	9.3000	9.3000
6	360 ng ai/l	1	0.7000	0.7000
6	360 ng ai/l	2	0.4000	0.4000
6	360 ng ai/l	3	0.6700	0.6700
6	360 ng ai/l	4	3.2000	3.2000

Naled: No.Young per Reproductive Day of Exposed D.magna
File: e:\aquadata\42908801.rep Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Solvent Control	4	13.075	13.075	13.075
2	29 ng ai/l	4	9.700	9.700	11.342
3	45 ng ai/l	4	12.500	12.500	11.342
4	98 ng ai/l	4	11.825	11.825	11.342
5	180 ng ai/l	4	8.650	8.650	8.650
6	360 ng ai/l	4	1.243	1.243	1.243

Naled: No.Young per Reproductive Day of Exposed D.magna
File: e:\aquadata\42908801.rep 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
Solvent Control	13.075				
29 ng ai/l	11.342	1.505		1.73	k= 1, v=18
45 ng ai/l	11.342	1.505		1.82	k= 2, v=18
98 ng ai/l	11.342	1.505		1.85	k= 3, v=18
180 ng ai/l	8.650	3.842	*	1.86	k= 4, v=18
360 ng ai/l	1.243	10.274	*	1.87	k= 5, v=18

s = 1.629
Note: df used for table values are approximate when v > 20.

TRT 1 = Solvent CONTROL
TRT 2 = Dilution Water Control
TRT 3 = 29 ng ai/l
TRT 4 = 45 ng ai/l
TRT 5 = 98 ng ai/l
TRT 6 = 180 ng ai/l
TRT 7 = 360 ng ai/l

		TRT	REP	LENGTH	WEIGHT
CASE	1	1.0000	1.0000	4.9000	1.0600
CASE	2	1.0000	1.0000	5.1000	1.0500
CASE	3	1.0000	1.0000	4.9000	1.0700
CASE	4	1.0000	1.0000	4.8000	1.0400
CASE	5	1.0000	1.0000	5.0500	1.1000
CASE	6	1.0000	1.0000	5.1000	1.1100
CASE	7	1.0000	1.0000	4.7500	1.1400
CASE	8	1.0000	1.0000	5.1500	1.0800
CASE	9	1.0000	1.0000	5.0000	1.0900
CASE	10	1.0000	2.0000	4.7000	0.9700
CASE	11	1.0000	2.0000	5.1000	1.0500
CASE	12	1.0000	2.0000	4.7500	1.0800
CASE	13	1.0000	2.0000	4.8500	0.9600
CASE	14	1.0000	2.0000	4.8500	0.8300
CASE	15	1.0000	2.0000	5.0000	0.8500
CASE	16	1.0000	2.0000	4.9000	0.9900
CASE	17	1.0000	2.0000	4.9000	1.0800
CASE	18	1.0000	2.0000	4.7500	1.0800
CASE	19	1.0000	3.0000	4.8500	1.1200
CASE	20	1.0000	3.0000	5.1000	1.0200
CASE	21	1.0000	3.0000	4.9500	0.9300
CASE	22	1.0000	3.0000	4.9500	1.0300
CASE	23	1.0000	3.0000	5.0000	1.0000
CASE	24	1.0000	3.0000	5.0000	1.0400
CASE	25	1.0000	3.0000	5.0000	0.8800
CASE	26	1.0000	3.0000	4.6500	1.2600
CASE	27	1.0000	3.0000	5.0000	1.1000
CASE	28	1.0000	3.0000	5.1000	1.1400
CASE	29	1.0000	4.0000	5.0000	1.1100
CASE	30	1.0000	4.0000	5.2500	1.1700
CASE	31	1.0000	4.0000	4.9000	1.2200
CASE	32	1.0000	4.0000	4.7500	1.0500
CASE	33	1.0000	4.0000	4.6500	0.9700
CASE	34	1.0000	4.0000	5.0000	0.9900
CASE	35	2.0000	1.0000	4.6500	0.8900
CASE	36	2.0000	1.0000	4.8000	0.9800
CASE	37	2.0000	1.0000	4.5000	0.7900
CASE	38	2.0000	1.0000	4.6500	1.1500
CASE	39	2.0000	1.0000	4.5500	1.0000
CASE	40	2.0000	1.0000	4.6000	1.0800
CASE	41	2.0000	1.0000	4.4000	0.8000
CASE	42	2.0000	1.0000	4.5000	1.0300
CASE	43	2.0000	1.0000	4.2500	1.0800
CASE	44	2.0000	1.0000	4.6000	0.9400
CASE	45	2.0000	2.0000	4.6000	1.2900
CASE	46	2.0000	2.0000	4.8000	1.3100
CASE	47	2.0000	2.0000	4.8500	1.2900
CASE	48	2.0000	2.0000	4.7500	1.2600
CASE	49	2.0000	2.0000	4.7500	0.9500
CASE	50	2.0000	2.0000	4.7500	1.2500
CASE	51	2.0000	2.0000	4.6000	1.2200
CASE	52	2.0000	2.0000	4.5000	0.9700
CASE	53	2.0000	2.0000	4.6000	0.8300
CASE	54	2.0000	2.0000	4.6000	1.2300
CASE	55	2.0000	3.0000	4.5000	1.0500
CASE	56	2.0000	3.0000	4.5000	1.0700
CASE	57	2.0000	3.0000	4.5500	0.7500

CASE	58	2.0000	3.0000	4.7000	0.9000
CASE	59	2.0000	3.0000	4.5500	1.2300
CASE	60	2.0000	3.0000	4.5000	0.8000
CASE	61	2.0000	3.0000	4.5500	0.9500
CASE	62	2.0000	3.0000	4.8000	1.0100
CASE	63	2.0000	4.0000	4.7500	1.3600
CASE	64	2.0000	4.0000	4.5500	0.8600
CASE	65	2.0000	4.0000	4.5500	0.9800
CASE	66	2.0000	4.0000	4.5000	0.9200
CASE	67	2.0000	4.0000	4.4000	1.2100
CASE	68	2.0000	4.0000	4.3500	1.1800
CASE	69	2.0000	4.0000	4.5000	1.2000
CASE	70	2.0000	4.0000	4.5000	1.2300
CASE	71	2.0000	4.0000	4.3500	1.2000
CASE	72	3.0000	1.0000	4.4500	1.1100
CASE	73	3.0000	1.0000	4.5000	0.9000
CASE	74	3.0000	1.0000	4.3000	0.8200
CASE	75	3.0000	2.0000	4.5500	1.2400
CASE	76	3.0000	2.0000	4.5000	0.9700
CASE	77	3.0000	2.0000	4.5000	1.2100
CASE	78	3.0000	2.0000	4.5500	0.7800
CASE	79	3.0000	2.0000	4.7500	0.9200
CASE	80	3.0000	2.0000	4.4000	1.2200
CASE	81	3.0000	2.0000	4.5000	0.5600
CASE	82	3.0000	2.0000	4.7500	0.8600
CASE	83	3.0000	2.0000	4.2500	1.2100
CASE	84	3.0000	3.0000	4.2500	0.9300
CASE	85	3.0000	3.0000	4.2500	1.1100
CASE	86	3.0000	4.0000	4.7500	0.7400
CASE	87	3.0000	4.0000	5.0000	1.0100
CASE	88	3.0000	4.0000	4.9000	0.9600
CASE	89	3.0000	4.0000	4.9000	0.9000
CASE	90	3.0000	4.0000	4.8000	1.1100
CASE	91	3.0000	4.0000	5.0000	0.9800
CASE	92	3.0000	4.0000	4.7500	0.7100
CASE	93	3.0000	4.0000	4.9000	1.0200
CASE	94	3.0000	4.0000	4.9000	0.9600
CASE	95	4.0000	1.0000	4.8000	0.9800
CASE	96	4.0000	1.0000	4.9000	1.1900
CASE	97	4.0000	1.0000	4.5000	1.1300
CASE	98	4.0000	1.0000	4.5500	0.9300
CASE	99	4.0000	1.0000	4.6000	0.9400
CASE	100	4.0000	1.0000	4.6000	0.9000
CASE	101	4.0000	1.0000	4.6000	1.1300
CASE	102	4.0000	1.0000	4.7500	1.3200
CASE	103	4.0000	1.0000	4.6500	1.0800
CASE	104	4.0000	2.0000	4.8000	1.3400
CASE	105	4.0000	2.0000	4.8000	1.2000
CASE	106	4.0000	2.0000	4.8000	0.9800
CASE	107	4.0000	2.0000	4.6500	1.0100
CASE	108	4.0000	2.0000	4.8500	1.0500
CASE	109	4.0000	2.0000	5.0000	1.1300
CASE	110	4.0000	2.0000	5.0000	1.1200
CASE	111	4.0000	2.0000	4.9500	1.0600
CASE	112	4.0000	2.0000	4.7500	1.1000
CASE	113	4.0000	2.0000	4.6500	0.4400
CASE	114	4.0000	3.0000	5.0000	0.9300
CASE	115	4.0000	3.0000	4.8000	0.9500
CASE	116	4.0000	3.0000	4.8500	1.0500
CASE	117	4.0000	3.0000	5.1500	1.1100
CASE	118	4.0000	3.0000	5.0500	1.1200
CASE	119	4.0000	3.0000	5.0500	1.0700
CASE	120	4.0000	3.0000	5.0000	0.9600
CASE	121	4.0000	3.0000	4.6500	0.9400
CASE	122	4.0000	3.0000	5.0000	1.1900
CASE	123	4.0000	3.0000	5.0000	1.0800
CASE	124	4.0000	4.0000	5.0000	0.9700
CASE	125	4.0000	4.0000	4.8000	1.1200

CASE	126	4.0000	4.0000	5.0000	0.9900
CASE	127	4.0000	4.0000	4.7500	0.8300
CASE	128	4.0000	4.0000	5.0500	1.0100
CASE	129	4.0000	4.0000	5.0000	1.1200
CASE	130	4.0000	4.0000	5.0000	1.0100
CASE	131	4.0000	4.0000	5.0000	1.0200
CASE	132	4.0000	4.0000	4.8500	0.8300
CASE	133	4.0000	4.0000	4.7000	1.0600
CASE	134	5.0000	1.0000	4.3500	0.7400
CASE	135	5.0000	1.0000	4.6000	0.8200
CASE	136	5.0000	1.0000	4.5000	0.8000
CASE	137	5.0000	1.0000	4.6000	0.8500
CASE	138	5.0000	1.0000	4.1000	0.9900
CASE	139	5.0000	1.0000	4.6000	0.5900
CASE	140	5.0000	1.0000	4.6000	0.8700
CASE	141	5.0000	1.0000	4.7500	0.6800
CASE	142	5.0000	1.0000	4.0000	0.6500
CASE	143	5.0000	1.0000	4.0000	0.6500
CASE	144	5.0000	2.0000	4.8500	1.0300
CASE	145	5.0000	2.0000	4.7500	0.9700
CASE	146	5.0000	2.0000	5.1000	1.0900
CASE	147	5.0000	2.0000	4.6000	1.2600
CASE	148	5.0000	2.0000	5.0000	1.0200
CASE	149	5.0000	2.0000	5.0000	1.0000
CASE	150	5.0000	2.0000	4.9500	1.2300
CASE	151	5.0000	2.0000	5.0500	1.0600
CASE	152	5.0000	2.0000	5.0000	1.1300
CASE	153	5.0000	3.0000	4.9500	1.0600
CASE	154	5.0000	3.0000	5.0000	1.3600
CASE	155	5.0000	3.0000	4.7500	1.1900
CASE	156	5.0000	3.0000	4.8500	1.5000
CASE	157	5.0000	3.0000	4.9000	1.1000
CASE	158	5.0000	3.0000	4.7500	1.3400
CASE	159	5.0000	3.0000	5.0000	1.2800
CASE	160	5.0000	3.0000	5.0000	1.0600
CASE	161	5.0000	3.0000	5.0000	1.0500
CASE	162	5.0000	3.0000	4.8000	1.1000
CASE	163	5.0000	4.0000	4.9000	1.2800
CASE	164	5.0000	4.0000	4.7500	1.0000
CASE	165	5.0000	4.0000	4.8500	1.0700
CASE	166	5.0000	4.0000	4.8500	1.0500
CASE	167	5.0000	4.0000	5.0000	1.1100
CASE	168	5.0000	4.0000	4.7500	1.0600
CASE	169	5.0000	4.0000	4.7500	1.3800
CASE	170	5.0000	4.0000	4.7500	1.1100
CASE	171	5.0000	4.0000	5.0000	1.1400
CASE	172	5.0000	4.0000	5.0000	1.0600

ANOVA on Weights
LEVELS ENCOUNTERED DURING PROCESSING ARE:
TRT

1.0000	2.0000	3.0000	4.0000	5.0000

REP

1.0000	2.0000	3.0000	4.0000

DEP VAR: WEIGHT N: 172 MULTIPLE R: 0.591 SQUARED MULTIPLE R: 0.349

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	0.0855	4	0.0214	1.0561	0.3804
REP	0.2035	3	0.0678	3.3514	0.0207
TRT*REP	1.1825	12	0.0985	4.8684	0.0000
ERROR	3.0766	152	0.0202		

DURBIN-WATSON D STATISTIC 2.133
FIRST ORDER AUTOCORRELATION -.067

Post-hoc pairwise comparison of weight/Bonferroni.
USING LEAST SQUARES MEANS.
POST HOC TEST OF WEIGHT

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	0.0059	0.0000			
3	-0.0787	-0.0846	0.0000		
4	-0.0153	-0.0213	0.0634	0.0000	
5	-0.0063	-0.0122	0.0724	0.0090	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	1.0000	1.0000			
3	0.7702	0.5329	1.0000		
4	1.0000	1.0000	1.0000	1.0000	
5	1.0000	1.0000	0.9490	1.0000	1.0000

ANOVA on Lengths
LEVELS ENCOUNTERED DURING PROCESSING ARE:

TRT

1.0000	2.0000	3.0000	4.0000	5.0000

REP

1.0000	2.0000	3.0000	4.0000

DEP VAR: LENGTH N: 172 MULTIPLE R: 0.817 SQUARED MULTIPLE R: 0.667

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	3.3208	4	0.8302	39.1878	0.0000
REP	0.8942	3	0.2981	14.0697	0.0000
TRT*REP	2.3860	12	0.1988	9.3852	0.0000
ERROR	3.2202	152	0.0212		

DURBIN-WATSON D STATISTIC 2.010
FIRST ORDER AUTOCORRELATION -.009

Post-hoc pairwise comparison of length/Bonferroni.
USING LEAST SQUARES MEANS.

POST HOC TEST OF LENGTH

MATRIX OF PAIRWISE MEAN DIFFERENCES:

	1	2	3	4	5
1	0.0000				
2	-0.3545	0.0000			
3	-0.4129	-0.0584	0.0000		
4	-0.0919	0.2626	0.3210	0.0000	
5	-0.1579	0.1966	0.2550	-0.0660	0.0000

BONFERRONI ADJUSTMENT.
MATRIX OF PAIRWISE COMPARISON PROBABILITIES:

	1	2	3	4	5
1	1.0000				
2	0.0000	1.0000			
3	0.0000	1.0000	1.0000		
4	0.0857	0.0000	0.0000	1.0000	
5	0.0001	0.0000	0.0000	0.4734	1.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000

TOTAL OBSERVATIONS: 34

	WEIGHT	LENGTH
N OF CASES	34	34
MINIMUM	0.8300	4.6500
MAXIMUM	1.2600	5.2500
MEAN	1.0488	4.9324
STANDARD DEV	0.0938	0.1487

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000

TOTAL OBSERVATIONS: 37

	WEIGHT	LENGTH
N OF CASES	37	37
MINIMUM	0.7500	4.2500
MAXIMUM	1.3600	4.8500
MEAN	1.0605	4.5784
STANDARD DEV	0.1724	0.1397

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000

TOTAL OBSERVATIONS: 23

	WEIGHT	LENGTH
N OF CASES	23	23
MINIMUM	0.5600	4.2500
MAXIMUM	1.2400	5.0000
MEAN	0.9665	4.6261
STANDARD DEV	0.1767	0.2486

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000

TOTAL OBSERVATIONS: 39

	WEIGHT	LENGTH
N OF CASES	39	39
MINIMUM	0.4400	4.5000
MAXIMUM	1.3400	5.1500
MEAN	1.0356	4.8436
STANDARD DEV	0.1492	0.1698

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000

TOTAL OBSERVATIONS: 39

	WEIGHT	LENGTH
N OF CASES	39	39
MINIMUM	0.5900	4.0000
MAXIMUM	1.5000	5.1000
MEAN	1.0444	4.7692
STANDARD DEV	0.2109	0.2750

SUMMARY STATISTICS FOR WEIGHT

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 21.1909 DF= 4 PROBABILITY = 0.0003

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	0.1416	4	0.0354	1.2902	0.2759
WITHIN GROUPS	4.5826	167	0.0274		

SUMMARY STATISTICS FOR LENGTH

BARTLETT TEST FOR HOMOGENEITY OF GROUP VARIANCES

CHI-SQUARE = 25.7504 DF= 4 PROBABILITY = 0.0000

ANALYSIS OF VARIANCE

SOURCE	SUM OF SQUARES	DF	MEAN SQUARE	F	PROBABILITY
BETWEEN GROUPS	2.9182	4	0.7295	18.0215	0.0000
WITHIN GROUPS	6.7604	167	0.0405		

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 1.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	1.0400	4.7500
MAXIMUM	1.1400	5.1500
MEAN	1.0822	4.9722
STANDARD DEV	0.0315	0.1417

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 2.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	0.8300	4.7000
MAXIMUM	1.0800	5.1000
MEAN	0.9878	4.8667
STANDARD DEV	0.0964	0.1275

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 3.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.8800	4.6500
MAXIMUM	1.2600	5.1000
MEAN	1.0520	4.9600
STANDARD DEV	0.1089	0.1308

THE FOLLOWING RESULTS ARE FOR:
TRT = 1.0000
REP = 4.0000

TOTAL OBSERVATIONS: 6

	WEIGHT	LENGTH
N OF CASES	6	6
MINIMUM	0.9700	4.6500
MAXIMUM	1.2200	5.2500
MEAN	1.0850	4.9250
STANDARD DEV	0.0995	0.2115

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 1.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.7900	4.2500
MAXIMUM	1.1500	4.8000
MEAN	0.9740	4.5500
STANDARD DEV	0.1200	0.1509

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 2.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.8300	4.5000
MAXIMUM	1.3100	4.8500
MEAN	1.1600	4.6800
STANDARD DEV	0.1738	0.1135

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 3.0000

TOTAL OBSERVATIONS: 8

	WEIGHT	LENGTH
N OF CASES	8	8
MINIMUM	0.7500	4.5000
MAXIMUM	1.2300	4.8000
MEAN	0.9700	4.5813
STANDARD DEV	0.1550	0.1100

THE FOLLOWING RESULTS ARE FOR:
TRT = 2.0000
REP = 4.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	0.8600	4.3500
MAXIMUM	1.3600	4.7500
MEAN	1.1267	4.4944
STANDARD DEV	0.1662	0.1236

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 1.0000

TOTAL OBSERVATIONS: 3

	WEIGHT	LENGTH
N OF CASES	3	3
MINIMUM	0.8200	4.3000
MAXIMUM	1.1100	4.5000
MEAN	0.9433	4.4167
STANDARD DEV	0.1498	0.1041

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 2.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	0.5600	4.2500
MAXIMUM	1.2400	4.7500
MEAN	0.9967	4.5278
STANDARD DEV	0.2406	0.1563

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 3.0000

TOTAL OBSERVATIONS: 2

	WEIGHT	LENGTH
N OF CASES	2	2
MINIMUM	0.9300	4.2500
MAXIMUM	1.1100	4.2500
MEAN	1.0200	4.2500
STANDARD DEV	0.1273	0.0000

THE FOLLOWING RESULTS ARE FOR:
TRT = 3.0000
REP = 4.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	0.7100	4.7500
MAXIMUM	1.1100	5.0000
MEAN	0.9322	4.8778
STANDARD DEV	0.1307	0.0939

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 1.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	0.9000	4.5000
MAXIMUM	1.3200	4.9000
MEAN	1.0667	4.6611
STANDARD DEV	0.1404	0.1294

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 2.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.4400	4.6500
MAXIMUM	1.3400	5.0000
MEAN	1.0430	4.8250
STANDARD DEV	0.2354	0.1275

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 3.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.9300	4.6500
MAXIMUM	1.1900	5.1500
MEAN	1.0400	4.9550
STANDARD DEV	0.0901	0.1462

THE FOLLOWING RESULTS ARE FOR:
TRT = 4.0000
REP = 4.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.8300	4.7000
MAXIMUM	1.1200	5.0500
MEAN	0.9960	4.9150
STANDARD DEV	0.1009	0.1270

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 1.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	0.5900	4.0000
MAXIMUM	0.9900	4.7500
MEAN	0.7640	4.4100
STANDARD DEV	0.1238	0.2797

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 2.0000

TOTAL OBSERVATIONS: 9

	WEIGHT	LENGTH
N OF CASES	9	9
MINIMUM	0.9700	4.6000
MAXIMUM	1.2600	5.1000
MEAN	1.0878	4.9222
STANDARD DEV	0.1012	0.1603

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 3.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	1.0500	4.7500
MAXIMUM	1.5000	5.0000
MEAN	1.2040	4.9000
STANDARD DEV	0.1575	0.1054

THE FOLLOWING RESULTS ARE FOR:
TRT = 5.0000
REP = 4.0000

TOTAL OBSERVATIONS: 10

	WEIGHT	LENGTH
N OF CASES	10	10
MINIMUM	1.0000	4.7500
MAXIMUM	1.3800	5.0000
MEAN	1.1260	4.8600
STANDARD DEV	0.1166	0.1101

KOLMOGOROV-SMIRNOV ONE SAMPLE TEST USING STANDARD NORMAL DISTRIBUTION

VARIABLE	N-OF-CASES	MAXDIF	PROBABILITY (2-TAIL)
LENGTH	172.0000	1.0000	0.0000
WEIGHT	172.0000	0.7297	0.0000