(4-5-90) File - ~~129009~~ 121011

MRID No. 410302-06

DATA EVALUATION RECORD

1. **CHEMICAL:** Clethodim. Shaughnessey Number: Not available.

2. **TEST MATERIAL:** RE-45601 Technical (Select); (E,E)-(±)-2-[1-[((3-chloro-2-propenyl)oxy)imino]propyl]-5-[2-(ethylthio)propyl]-3-hydroxy-2-cyclohexen-1-one; Lot No. SX-1688; 83.3% purity; an amber liquid.

3. **STUDY TYPE:** Avian Reproduction Study.
Species Tested: Bobwhite quail (Colinus virginianus).

4. **CITATION:** Beavers, J.B. 1988. RE-45601 Technical: A One-Generation Reproduction Study with the Bobwhite (Colinus virginianus). Prepared by Wildlife International Ltd., Easton, Maryland. Laboratory Project No. 162-183. Submitted by Chevron Chemical Company, Richmond, California. Chevron Project No. S-2836. MRID Number: 410302-06.

5. **REVIEWED BY:**

Michael L. Whitten, M.S.
Wildlife Toxicologist
KBN Engineering and
Applied Sciences, Inc.

Signature:

Date:

6. **APPROVED BY:**

Prapimpan Kosalwat, Ph.D.
Staff Toxicologist
KBN Engineering and
Applied Sciences, Inc.

Signature:

Date:

R.C. Cotter 4/05/90

Henry T. Craven, M.S.
Supervisor, EEB/HED
USEPA

Signature: Henry T. Craven 4/05/90

Date:

at 833 ppm

7. **CONCLUSIONS:** Mean measured concentrations of RE-45601 Technical at 100, 250, and 833 ppm as test material had no effects upon egg shell thickness in adult bobwhite quail during the 22-week exposure period. The NOEC was 250 ppm, based upon reduced embryo viability and 14-day-old survivors of eggs set. The study is scientifically sound but does not fulfill the requirements for an avian reproductive test, since a high rate of adult mortality was not adequately explained. The high rate of mortality in adults and chicks (due to incubator failure) contributes to a level of variation high enough to prevent statistical accuracy.

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Michael L. Whitten, M.S.
Wildlife Toxicologist
KBN Engineering and
Applied Sciences, Inc.

Signature: Michael L Whitten
Date: 2-16-90

6. **APPROVED BY:**

Prapimpan Kosalwat, Ph.D.
Staff Toxicologist
KBN Engineering and
Applied Sciences, Inc.

Signature: P. Kosalwat
Date: 2-18-90

Henry T. Craven, M.S.
Supervisor, EEB/HED
USEPA

Signature:
Date:

7. **CONCLUSIONS:** Nominal dietary concentrations of RE-45601 Technical at 120, 300, and 1000 ppm as test material had no effects upon behavior, food consumption or body weight in adult bobwhite quail during the 22-week exposure period. The NOEC was 300 ppm, based upon reduced embryo viability and 14-day-old survivors of eggs set. The study is scientifically sound but does not fulfill the requirements for an avian reproductive test, since a high rate of adult mortality was not adequately explained.

8. **RECOMMENDATIONS:** N/A

39/ns V

8. **RECOMMENDATIONS:** N/A

9. **BACKGROUND:**

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

11. **MATERIALS AND METHODS:**

A. **Test Animals:** The birds used in the test were pen-reared, unmated bobwhite quail and were purchased from Sand Prairie Quail Farm, Maquoketa, Iowa. All birds were acclimated to the facilities for 9 weeks prior to initiation of the test. Birds that did not appear healthy at test initiation were discarded. The birds were 25 weeks of age at test initiation.

B. **Dose/Diet Preparation/Food Consumption:** Test diets were prepared by mixing RE-45601 Technical into a pre-mix which was used for weekly preparation of the final diet. Control diet and three test concentrations (120, 300, and 1000 ppm) were prepared weekly. Portions of the freshly prepared diet were presented to the birds on Friday of each week, and the remainder was stored frozen. On Monday of each week, diets in all treatment groups were replaced with fresh frozen diet. On Wednesday of each week, diets in the 120-ppm group were again replaced with fresh frozen diet. When necessary, additional feed was prepared. Dietary concentrations were not adjusted for purity of the test substance. The control diet contained an amount of the carrier (corn oil) and solvent (acetone) equal to that in the treated diets.

Adults were fed a game bird ration formulated for breeding birds. All offspring received a game bird ration formulated for young growing birds. The test substance was not mixed into the diet of the offspring. Food and water were supplied *ad libitum* during acclimation and during the test. Samples of the control diet and each of the test diets were taken weekly after mixing, and immediately after removal from the freezer, and used for analysis of the active ingredient.

Food consumption in each pen was determined once each week throughout the study.

C. **Design:** The birds were randomly distributed into four groups as follows:

RE-45601 Technical Nominal Concentration	Number of Pens	Birds Per Pen Males	Females
Control (0 ppm)	16	1	1
120 ppm	16	1	1
300 ppm	16	1	1
1000 ppm	16	1	1

"Treatment levels were based upon known toxicity data and consultation with the client." Adult birds were identified by individual leg bands. The primary phases of the study and their approximate durations were as follows:

1. Acclimation - 9 weeks.
2. Pre-photostimulation - 7 weeks.
3. Pre-egg laying (with photostimulation) - 3 weeks.
4. Egg laying - 12 weeks.
5. Post-adult sacrifice (final incubation, hatching, 14-day offspring rearing period) - 6 weeks.

D. Pen Facilities: Adult birds were housed indoors in pens constructed of wire grid and sheeting. Pens measured approximately 30 cm x 51 cm. The pens had sloping floors which resulted in a ceiling height ranging from 21 to 26 cm. The average temperature in the adult study room was 20.2°C ± 3.0°C (SD) with an average relative humidity of 42%.

The photoperiod during the first 7 weeks of the study was 8 hours of light per day. The photoperiod was increased to 17 hours of light per day during Week 8, and was maintained at that length until sacrifice of adult birds. The birds received approximately 130 lux of illumination throughout the study.

E. Adult Observations/Gross Pathology: All adult birds were observed at least once daily throughout the study for signs of toxicity or abnormal behavior. All birds that died during the study were necropsied. At study termination, all surviving birds were sacrificed and necropsied. Adult birds were weighed at test initiation, at the end of weeks 2, 4, 6, 8, and at study termination.

F. Eggs/Eggshell Thickness: Eggs were collected daily from all pens, marked according to pen of origin, and fumigated to prevent pathogen contamination. The eggs were then stored at 10.5°C ± 1.4°C (SD) and 75% relative

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humidity until incubated. Eggs were removed from the storage room weekly and candled. Cracked or abnormal eggs were discarded. All eggs that were not cracked, abnormal or used for egg shell thickness measurements were placed in an incubator at 37.4°C ± 0.1°C (SD) and 56% relative humidity. Eggs were candled again on day 11 of incubation to determine embryo viability and on day 21 to determine embryo survival. All eggs were turned automatically while in the incubator and placed in a hatcher on incubation day 21. Temperature in the hatcher was 37.1°C ± 0.8°C (SD) with a relative humidity of 73%.

Weekly throughout the egg laying period, one egg was collected, when available, from each of the odd numbered pens during the odd numbered weeks, and from each of the even numbered pens during the even numbered weeks. These eggs were used for egg shell thickness measurements. The average thickness of the dried shell plus membrane was determined by measuring (to the nearest 0.005 mm) five points around the waist of the egg using a micrometer.

G. **Hatchlings**: All hatchlings and unhatched eggs were removed from the hatcher on day 25 or 26 of incubation. The average body weight of the hatchlings by pen was then determined. Hatchlings were leg-banded for identification by pen of origin and then placed in brooding pens until 14 days of age. Each brooding pen measured 72 cm x 90 cm x 23 cm high, and was constructed of galvanized wire mesh and sheeting. Brooder temperatures were maintained at approximately 38°C. The photoperiod was maintained at 16 hours of light per day. Hatchlings were fed untreated diet. At 14 days of age, the average body weight by parental pen of all survivors was determined.

H. **Statistics**: Upon completion of the study, Dunnett's method was used to determine statistically significant differences between the control group and each of the treatment groups. Sample units were the individual pens within each experimental group. Percentage data were examined using Dunnett's method following arcsine transformation. The pens in which mortality occurred were not used in statistical comparisons of the data.

Each of the following parameters was analyzed statistically:

Adult Body Weight
Adult Feed Consumption
Eggs Laid of Maximum Laid
Eggs Cracked of Eggs Laid
Viable Embryos of Eggs Set
Live 3-Week Embryos of Viable Embryos
Hatchlings of 3-Week Embryos
Hatchlings of Eggs Set
Offspring's Body Weight
Hatchlings of Maximum Set
14-Day Old Survivors of Maximum Set
14-Day Old Survivors of Eggs Set
14-Day Old Survivors of of Hatchlings
Egg Shell Thickness

12. **REPORTED RESULTS**

A. **Diet Analysis**: The test material was analyzed by Chevron's Analytical Services Laboratory. The results of the analysis were presented as an addendum report (MRID # 410302-06, Vol. 2 of 2). Since the diet formulation, test chemical, and dose levels were the same as in a simultaneous study using mallards (MRID No. 410302-05), and since the same diet preparations were administered in both studies, a single series of chemical analyses were conducted for both studies. The mean measured concentrations for freshly prepared diets were 87.5%, 90.4%, and 94.5% of the nominal concentrations (adjusted for active ingredient) of 100, 250, and 833 ppm, respectively.

B. **Mortality and Behavioral Reactions**: "There were no treatment related mortalities during the study. However, incidental mortalities occurred in the control group and all treatment groups. In all instances, mortalities appeared to be related to either head or foot lesions, resulting from cannibalism or self-inflicted injury. Birds from this particular lot (hatch) seemed prone to flushing and injuring themselves." The deaths of three females were recorded in the control group, and occurred during weeks 4 and 9. Six females died in the 120-ppm group, during weeks 10, 12, 13, and 16. Three females and one male died during weeks 9, 13, 17, and 22 in the 300-ppm group. Six females and one male died in the 1000-ppm group, during weeks 12, 13, and 15.

No overt signs of toxicity were observed at any concentration.

All birds that died during the study and all survivors were necropsied. All lesions observed were considered to be unrelated to treatment. Results of the necropsies are reported in Appendix IV (attached).

C. Adult Body Weight and Food Consumption: No significant differences in body weights between the control and any treatment group were noted at any body weight interval.

"Due to excessive wastage by some birds, feed consumption was variable between pens. There was no apparent treatment related effect upon feed consumption among birds at any concentration tested." When compared to the control group, at 120 ppm there were significant decreases in food consumption during weeks 1 and 22, and significant increases during weeks 4 and 12. At 300 ppm, there was a significant decrease in food consumption during week 16. These differences were considered to be unrelated to treatment. There were no significant differences between the control and 1000-ppm group during the study. Mean feed consumption and levels of significance are shown in Table 2 (attached).

D. Reproduction: When compared to the control group, there were no significant differences in reproductive parameters at any concentration tested. "While not statistically significant, at the 1000 ppm concentration there appeared to be a slight treatment related reduction in the percentage of viable embryos of eggs set"(Tables 3 & 3A, attached). The effect upon viability was also reflected in the numbers of hatchlings and 14-day survivors expressed as percentages of eggs set.

"A brooder failure during rearing of hatchlings from the fifth set of eggs resulted in incidental mortalities of offspring. One other incidental mortality, a hatchling euthanized because of a broken leg, also occurred during the course of the study. There were 44 incidental mortalities from the control group, 25 from the 120 ppm treatment group and 32 incidental mortalities from the 300 ppm treatment group. Incidental mortalities were not utilized when computing the percentage of 14 day old survivors of hatchlings or of eggs set."

E. Egg Shell Thickness: When compared to the control group, there were no significant differences in egg shell thickness at any concentration.

1

F. Offspring Body Weight: There were no significant differences between the control and any treatment group in body weights of offspring at hatching or at 14 days of age.

13. STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:

"Dietary concentrations of RE-45601 Technical at 120, 300, or 1000 ppm did not result in treatment related mortality, overt signs of toxicity, or effects upon body weight or feed consumption among adult bobwhite during the 22 week exposure period. No treatment related effects upon reproductive performance were noted at 120 or 300 ppm. While not statistically significant, there appeared to be a slight reduction in the percentage of viable embryos of eggs set at the 1000 ppm concentration. The no-observed-effect concentration for bobwhite in this study was 300 ppm."

The report stated that study was conducted in conformance with Good Laboratory Practice regulations. The data were inspected and the final report signed by Quality Assurance representatives of Chevron Chemical Company and Wildlife International, Ltd.

14. Reviewer's Discussion and Interpretation of the Study:

A. Test Procedures: The test procedures were in accordance with the SEP and Subdivision E guidelines except for the following deviations:

Eggs were stored at a temperature of approximately 11°C and a relative humidity of approximately 75%; 16°C and 65% are recommended.

Eggs were candled on day 21 to determine embryo survival; day 18 is recommended.

Observations on food palatability were not reported.

Behavioral observations of offspring were not reported.

B. Statistical Analysis: Statistical procedures differed from recommended methods. Specifically, there is no basis for transforming the number of eggs laid and the number of hatchlings to percentile values of the maximum number of eggs laid or set in any test group.

Analyses of reproductive parameters were verified (attached) and found to match those reported by the author, except in the ratio of 14-day-old survivors/eggs

set. The analysis of this parameter, using the author's "adjusted" data (see below) indicated that the 1000-ppm group was significantly ($p = 0.042$) lower than the control group, contrary to the author's conclusion of no significant difference.

C. Discussion/Results: The reduced food consumption does not appear to be related to treatment.
Using SAS egg shell thickness data were evaluated. No significant differences from the controls were found at any treatment level.

The observed mortality among adult bobwhites is of concern. Twenty birds (2 males, 18 females) died during the study. The author stated that all mortalities appeared to be related to either head or foot lesions that resulted from cannibalism or injury, and further stated that birds from this particular lot (hatch) seemed prone to flushing and injuring themselves. This explanation, however, does not adequately explain why 18 of 20 mortalities were females.

The necropsy reports (Appendix IV, attached) of the 20 mortalities appear to be incomplete. The pathological observations of birds that died during the study do not include categories for the ovaries, egg yolk peritonitis, or liver. It is unclear whether these categories are included under the broad category of "internal" on page 2 of Appendix IV. Since the effects of toxic chemicals are often seen in the liver and reproductive tract, the absence of these categories seems odd. The inclusion of categories for egg yolk peritonitis and regressing ovary in birds which were sacrificed at study termination, while excluding the same categories for birds that died during the study is also peculiar.

The deaths of 101 hatchlings due to a brooder malfunction are also of concern. The author's exclusion of these mortalities from the analyses of 14 day survivors/eggs set and 14 day survivors/hatchlings is not acceptable statistical procedure. The absence of survival data associated with these hatchlings, combined with the absence of data from 20 other pens due to adult mortalities, seriously reduces the sample size available for analyses of these two parameters.

Mortality in 14 day old birds across all pens was 31%; and 19% in the controls. The total number of pens at the study conclusion were reduced from 16 to 12; a level considered unacceptable by ASTM standards. Mortalities were as follows:

Treatment	Mortalities
control	3
120 ppm	6
300 ppm	4
1000 ppm	7

Brooder failure occurred resulting in the death of 101 chicks as follows:

Treatment	Mortalities
control	44
120 ppm	25
300 ppm	32

A consideration of the problems discussed above generates serious doubts about the validity of the test. It is unclear whether the adult mortalities were due to the test chemical, poor husbandry, random error, or a combination of these factors. This, combined with unclear necropsy results and a large number of incidental mortalities of hatchlings, prevents a satisfactory risk assessment of the test substance. The study, therefore, while scientifically sound in its design, does not fullfill the requirements for an avian reproductive test.

D. **Adequacy of the Study:**

(1) **Classification:** Supplemental.

(2) **Rationale:** The high mortality of adults and chicks plus unclear necropsy results, prevent a determination of whether the deaths were related to treatment.

(3) **Repairability:** The study can be upgraded only if the registrant can show that the adult mortalities were not treatment-related.

15. **COMPLETION OF ONE-LINER:** Yes; February 15, 1990.

CLETHODIM

Page _____ is not included in this copy.

Pages 11 through 16 are not included in this copy.

The material not included contains the following type of information:

_____ Identity of product inert ingredients.

_____ Identity of product impurities.

_____ Description of the product manufacturing process.

_____ Description of quality control procedures.

_____ Identity of the source of product ingredients.

_____ Sales or other commercial/financial information.

_____ A draft product label.

_____ The product confidential statement of formula.

_____ Information about a pending registration action.

X FIFRA registration data.

_____ The document is a duplicate of page(s) _____.

_____ The document is not responsive to the request.

The information not included is generally considered confidential by product registrants. If you have any questions, please contact the individual who prepared the response to your request.

Clethodim: Bob-white Quail

TREATMENT LEVEL 0

		EL	EC	ES	VE	LE21	HAT	TWOWK
CASE	1	81	0	74	67	67	62	54
CASE	2	34	0	30	21	21	20	19
CASE	3	48	0	43	43	43	35	26
CASE	4	56	0	50	41	41	38	31
CASE	5	41	1	36	36	36	30	26
CASE	6	71	1	65	63	63	60	47
CASE	7	63	4	53	47	47	44	38
CASE	8	38	1	33	27	27	25	22
CASE	9	59	0	54	53	53	48	42
CASE	10	34	0	31	31	31	25	24
CASE	11	38	0	34	34	33	31	28
CASE	12	49	0	45	39	38	37	27
		612	7	548	502	500	455	384

TREATMENT LEVEL 120

CASE	13	39	0	35	29	29	26	23
CASE	14	46	0	42	38	37	30	26
CASE	15	69	0	62	61	58	52	43
CASE	16	52	0	46	37	37	27	20
CASE	17	6	0	5	5	5	5	4
CASE	18	73	0	65	63	63	62	54
CASE	19	15	0	12	12	12	10	8
CASE	20	68	0	62	59	59	51	47
CASE	21	55	2	46	32	32	31	22
CASE	22	34	0	31	28	27	25	24
		457	2	406	364	359	319	271

TREATMENT LEVEL 300

CASE	23	61	0	54	38	38	25	22
CASE	24	22	0	18	16	16	13	11
CASE	25	32	0	29	26	26	23	21
CASE	26	28	0	24	24	24	23	15
CASE	27	80	0	73	66	65	57	49
CASE	28	67	0	61	36	36	31	25
CASE	29	59	7	48	35	35	30	20
CASE	30	62	2	54	53	53	51	46
CASE	31	44	1	37	30	30	27	19
CASE	32	5	0	4	1	1	1	1
CASE	33	35	2	29	26	26	24	21
CASE	34	54	0	50	49	47	39	35
		549	12	481	400	397	344	285

TREATMENT LEVEL 1000

CASE	35	57	0	52	46	46	44	40
CASE	36	55	0	50	49	49	44	32
CASE	37	69	0	63	7	7	6	6
CASE	38	55	0	49	10	10	8	8
CASE	39	47	0	41	39	38	32	30
CASE	40	51	2	43	33	33	31	29
CASE	41	57	0	51	51	51	45	42
CASE	42	28	1	22	14	14	14	12
CASE	43	70	0	64	62	62	58	55
		489	3	435	311	310	282	254

ANOVA on SQR(Eggs Laid)

DEP VAR: SEL N: 43 MULTIPLE R: .229 SQUARED MULTIPLE R: .053

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	5.158	3	1.719	0.722	0.545
ERROR	92.846	39	2.381		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	1.837	1	1.837	0.772	0.385
ERROR	92.846	39	2.381		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	1.805	1	1.805	0.758	0.389
ERROR	92.846	39	2.381		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.323	1	0.323	0.136	0.714
ERROR	92.846	39	2.381		

ANOVA on SQR(Eggs Cracked)

DEP VAR: SEC N: 43 MULTIPLE R: .230 SQUARED MULTIPLE R: .053

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	0.978	3	0.326	0.723	0.544
ERROR	17.576	39	0.451		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.413	1	0.413	0.917	0.344
ERROR	17.576	39	0.451		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.091	1	0.091	0.201	0.656
ERROR	17.576	39	0.451		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.113	1	0.113	0.251	0.619
ERROR	17.576	39	0.451		

ANOVA on SQR(Eggs Set)

DEP VAR: SES N: 43 MULTIPLE R: .235 SQUARED MULTIPLE R: .055

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	5.175	3	1.725	0.757	0.525
ERROR	88.831	39	2.278		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	1.858	1	1.858	0.816	0.372
ERROR	88.831	39	2.278		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.163	1	2.163	0.950	0.336
ERROR	88.831	39	2.278		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.211	1	0.211	0.093	0.762
ERROR	88.831	39	2.278		

ANOVA on SQR(Viable Embryos)

DEP VAR: SVE N: 43 MULTIPLE R: .219 SQUARED MULTIPLE R: .048

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	5.529	3	1.843	0.658	0.583
ERROR	109.286	39	2.802		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.069	1	2.069	0.738	0.395
ERROR	109.286	39	2.802		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	4.666	1	4.666	1.665	0.205
ERROR	109.286	39	2.802		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	3.240	1	3.240	1.156	0.289
ERROR	109.286	39	2.802		

ANOVA on SQR(21-day Live Embryos)

DEP VAR: SLE21 N: 43 MULTIPLE R: .222 SQUARED MULTIPLE R: .049

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	5.565	3	1.855	0.671	0.575
ERROR	107.857	39	2.766		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.228	1	2.228	0.805	0.375
ERROR	107.857	39	2.766		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	4.701	1	4.701	1.700	0.200
ERROR	107.857	39	2.766		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	3.200	1	3.200	1.157	0.289
ERROR	107.857	39	2.766		

ANOVA on SQR(Hatched)

DEP VAR: SHAT N: 43 MULTIPLE R: .242 SQUARED MULTIPLE R: .059

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	6.193	3	2.064	0.811	0.495
ERROR	99.263	39	2.545		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.488	1	2.488	0.977	0.329
ERROR	99.263	39	2.545		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	5.595	1	5.595	2.198	0.146
ERROR	99.263	39	2.545		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.946	1	2.946	1.157	0.289
ERROR	99.263	39	2.545		

ANOVA on SQR(Two week Survivors)

DEP VAR: STWOWK N: 43 MULTIPLE R: .248 SQUARED MULTIPLE R: .061

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	5.658	3	1.886	0.849	0.476
ERROR	86.631	39	2.221		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.185	1	2.185	0.984	0.327
ERROR	86.631	39	2.221		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	5.488	1	5.488	2.471	0.124
ERROR	86.631	39	2.221		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	1.466	1	1.466	0.660	0.421
ERROR	86.631	39	2.221		

ANOVA on EC/EL

DEP VAR: RESP1 N: 43 MULTIPLE R: .229 SQUARED MULTIPLE R: .053

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	63.540	3	21.180	0.723	0.544
ERROR	1142.844	39	29.304		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	26.658	1	26.658	0.910	0.346
ERROR	1142.844	39	29.304		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	7.325	1	7.325	0.250	0.620
ERROR	1142.844	39	29.304		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	3.553	1	3.553	0.121	0.730
ERROR	1142.844	39	29.304		

ANOVA on VE/ES

DEP VAR: RESP2 N: 43 MULTIPLE R: .350 SQUARED MULTIPLE R: .122

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	1456.721	3	485.574	1.810	0.161
ERROR	10461.916	39	268.254		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	15.155	1	15.155	0.056	0.813
ERROR	10461.916	39	268.254		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	603.956	1	603.956	2.251	0.142
ERROR	10461.916	39	268.254		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	1074.942	1	1074.942	4.007	0.052
ERROR	10461.916	39	268.254		

ANOVA on LE21/VE

DEP VAR: RESP3 N: 43 MULTIPLE R: .208 SQUARED MULTIPLE R: .043

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	29.073	3	9.691	0.586	0.628
ERROR	644.444	39	16.524		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	16.001	1	16.001	0.968	0.331
ERROR	644.444	39	16.524		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.005	1	0.005	0.000	0.986
ERROR	644.444	39	16.524		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	1.652	1	1.652	0.100	0.754
ERROR	644.444	39	16.524		

ANOVA on HAT/LE21

DEP VAR: RESP4 N: 43 MULTIPLE R: .113 SQUARED MULTIPLE R: .013

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	32.159	3	10.720	0.169	0.916
ERROR	2468.789	39	63.302		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.560	1	0.560	0.009	0.926
ERROR	2468.789	39	63.302		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	22.827	1	22.827	0.361	0.552
ERROR	2468.789	39	63.302		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.129	1	0.129	0.002	0.964
ERROR	2468.789	39	63.302		

ANOVA on TWOWK/HAT → 2-WEEK-OLD SURVIVORS/EGGS HATCHED

EGGS HATCHED NOT ADJUSTED FOR BROODER MALFUNCTION; SEE TEXT, PARAGRAPHS 12.D. AND 14.C.

DEP VAR: RESP5 N: 43 MULTIPLE R: .396 SQUARED MULTIPLE R: .157

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	486.072	3	162.024	2.419	0.081
ERROR	2612.253	39	66.981		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	8.086	1	8.086	0.121	0.730
ERROR	2612.253	39	66.981		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	2.652	1	2.652	0.040	0.843
ERROR	2612.253	39	66.981		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	297.210	1	297.210	4.437	0.042
ERROR	2612.253	39	66.981		

ANOVA on HAT/ES

DEP VAR: RESP6 N: 43 MULTIPLE R: .333 SQUARED MULTIPLE R: .111

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	854.210	3	284.737	1.622	0.200
ERROR	6848.307	39	175.598		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	0.303	1	0.303	0.002	0.967
ERROR	6848.307	39	175.598		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	335.121	1	335.121	1.908	0.175
ERROR	6848.307	39	175.598		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	567.385	1	567.385	3.231	0.080
ERROR	6848.307	39	175.598		

ANOVA on TWOWK/ES ⇒ TWO-WEEK-OLD SURVIVORS OF EGGS SET

EGGS SET NOT ADJUSTED FOR BROODER MALFUNCTION; SEE PARAGRAPHS 12.D. AND 14.C.

DEP VAR: RESP7 N: 43 MULTIPLE R: .300 SQUARED MULTIPLE R: .090

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	453.497	3	151.166	1.288	0.292
ERROR	4576.062	39	117.335		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	13.210	1	13.210	0.113	0.739
ERROR	4576.062	39	117.335		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	322.103	1	322.103	2.745	0.106
ERROR	4576.062	39	117.335		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	237.333	1	237.333	2.023	0.163
ERROR	4576.062	39	117.335		

TWO-WEEK SURVIVORS OF EGGS HATCHED

ANOVA on TWOWK/HAT

DEP VAR: RESP5 N: 43 MULTIPLE R: .191 SQUARED MULTIPLE R: .036

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	108.400	3	36.133	0.492	0.690
ERROR	2866.858	39	73.509		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT
TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	79.797	1	79.797	1.086	0.304
ERROR	2866.858	39	73.509		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT
TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	65.802	1	65.802	0.895	0.350
ERROR	2866.858	39	73.509		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT
TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	6.745	1	6.745	0.092	0.764
ERROR	2866.858	39	73.509		

THE ABOVE ANALYSES WERE CONDUCTED USING DATA ADJUSTED FOR BROODER MALFUNCTION (SEE PARAGRAPHS 12.D. AND 14.C.)

14 DAY SURVIVORS / EGGS SET

ANOVA on TWOWK/ES

DEP VAR: RESP7 N: 43 MULTIPLE R: .360 SQUARED MULTIPLE R: .129

ANALYSIS OF VARIANCE

SOURCE	SUM-OF-SQUARES	DF	MEAN-SQUARE	F-RATIO	P
TRT	757.806	3	252.602	1.931	0.141
ERROR	5102.426	39	130.831		

Post-hoc contrast of treatment 1 with control.

TEST FOR EFFECT CALLED:
TRT
TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	55.742	1	55.742	0.426	0.518
ERROR	5102.426	39	130.831		

Post-hoc contrast of treatment 2 with control.

TEST FOR EFFECT CALLED:
TRT

TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	436.307	1	436.307	3.335	0.075
ERROR	5102.426	39	130.831		

Post-hoc contrast of treatment 3 with control.

TEST FOR EFFECT CALLED:
TRT
TEST OF HYPOTHESIS

SOURCE	SS	DF	MS	F	P
HYPOTHESIS	576.418	1	576.418	4.406	0.042
ERROR	5102.426	39	130.831		

THE ABOVE ANALYSES WERE CONDUCTED USING DATA ADJUSTED FOR BROODER MALFUNCTION (SEE PARAGRAPHS 12.D. AND 14.C.)

Shaughnessey No. NOT AVAILABLE Chemical Name clethodim Chemical Class _____ Page 1 of 1

Study/Species/Lab/ Succession	Chemical % Active	Results					Reviewer/ Date	Valid Stat
Avian		Group	*Nominal Dose(ppm)	Effected/Parameters	Mort.(%)	%Chg Inh.		
Species: Bobwhite quail (Colinus virginianus)	83.3%	Control	0	NONE	9%	N/A		
		Treatment I	120	NONE	19%		M.L. WHITTEN	
Lab: Wildlife International		Treatment II	300	NONE	12.5%		2-15-90	
		Treatment III	1000	EMBRYO VIABILITY 14 DAY SURVIVORS/EGGS SET	22%		INVALID	
MRID No. 410302-06		Study Duration: 22 WEEKS						
		Comments: * ~~NOMINAL~~ Mean measured DOSES OF ACTIVE INGREDIENT: 0, 100, 250, 833 ppm						

Field Study (Simulated/Actual)
Species: _____
Lab: _____
Acc. _____

Group	Rate(ai/a)	Treatment Interval	Total # Treatments	Mor.(%)
Control				
Treatment I				
Treatment II				
Treatment III				

Crop/Site: _____ Study Duration: _____
Comments:

Chronic fish,
Species _____
Lab: _____
Acc. _____

Concentrations Tested (pp__)= _____
MATC = >____ <____ pp__. Effected Parameter = _____
Contr. Mort.(%)= _____ Sol. Contr. Mort.(%)= _____
Comments:

Chronic invertebrate
Species _____
Lab _____
Acc. _____

Concentrations Tested (pp__)= _____
MATC =>____ <____ pp__. Effected Parameter(s) _____
Contr. Mort.(%)= _____ Sol. Contr. Mort.(%)= _____
Comments:

SAS - Methodin - Egg shell Thickness

From pgs. 76, 77, 78, 79.
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41030206

OUTPUT
Command ===>

SAS 12:26 Tuesday, April 3, 1990 1

OBS		TRT	WK7 EL	WK8 EC	WK9 ES	WK10 VE	WK11 LE	WK6 NH
1		a	0.230	0.212	0.201	0.197	0.217	0.219
2		a	0.246	0.233	0.225	0.234	0.236	0.220
3	0 ppm	a	0.180	0.200	0.232	0.208	0.226	0.225
4		a	0.226	0.200	0.204	0.225	0.212	0.202
5		a	0.205	0.235	0.208	0.214	0.207	0.215
6		a	0.216	0.229	0.220	0.192	0.231	0.198
7		b	0.203	0.226	0.195	0.205	0.206	0.221
8		b	0.209	0.221	0.208	0.219	0.207	0.229
9	120 ppm	b	0.205	0.220	0.203	0.215	0.202	0.205
10		b	0.198	0.203	0.191	0.215	0.195	0.198
11		b	0.229	.	0.224	0.199	0.194	0.203
12		c	0.192	0.227	0.205	0.209	0.218	0.220
13		c	0.201	0.236	0.213	0.206	0.202	0.239
14	300 ppm	c	0.234	0.198	0.244	0.246	0.245	0.248
15		c	0.205	0.198	0.207	0.189	0.219	0.197
16		c	0.218	0.224	0.221	0.215	0.176	0.222

ZOOM R

OUTPUT
Command ===>

SAS 12:26 Tuesday, April 3, 1990
2

OBS		TRT	EL	EC	ES	VE	LE	NH
17	300 ppm	c	.	0.235	.	0.229	0.208	0.214
18		d	0.219	0.212	0.217	0.210	0.213	0.218
19	1000 ppm	d	0.214	0.226	0.203	0.212	0.220	0.230
20		d	0.215	0.240	0.214	0.230	0.215	0.243
21		d	0.234	.	0.225	.	0.227	.
22		d	0.234	.	0.229	.	0.230	.
23		d	0.190	.	0.205	.	0.187	.

ZOOM RI

OUTPUT
Command ===>

1. ANALYSIS OF EL DATA 3
****
12:26 Tuesday, April 3, 1990

35

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d

Number of observations in data set = 23

NOTE: Due to missing values, only 22 observations can be used in this analysis.

ZOOM RI

OUTPUT
Command ===>

1. ANALYSIS OF EL DATA 4
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	F Value	Pr > F
Model	3	0.00035490	0.38	0.7669
Error	18	0.00556897		
Corrected Total	21	0.00592386		

R-Square	C.V.	RESP Mean
0.059910	8.228085	0.21377273

ZOOM RI

OUTPUT
Command ===>

1. ANALYSIS OF EL DATA 5
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Type I SS	F Value	Pr > F
TRT	3	0.00035490	0.38	0.7669

Source	DF	Type III SS	F Value	Pr > F
TRT	3	0.00035490	0.38	0.7669

ZOOM RI

OUTPUT
Command ===>

1. ANALYSIS OF EL DATA 6
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 18 MSE= 0.000309
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 5.454545

Number of Means	2	3	4
Critical Range	.0223	.0235	.0242

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

1. ANALYSIS OF EL DATA 7
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.2177	6	d
A			
A	0.2172	6	a
A			
A	0.2100	5	c
A			
A	0.2088	5	b

NO Sign. Diff.

37

ZOOM RI

OUTPUT
Command ===>

2. ANALYSIS OF EC DATA 8
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d

Number of observations in data set = 23

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

ZOOM RI

OUTPUT
Command ===>

2. ANALYSIS OF EC DATA 9
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	F Value	Pr > F
Model	3	0.00015252	0.22	0.8835
Error	15	0.00352517		
Corrected Total	18	0.00367768		

R-Square	C.V.	RESP Mean
0.041471	6.976560	0.21973684

ZOOM RI

OUTPUT
Command ===>

2. ANALYSIS OF EC DATA 10
****

12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Type I SS	F Value	Pr > F
TRT	3	0.00015252	0.22	0.8835

Source	DF	Type III SS	F Value	Pr > F
TRT	3	0.00015252	0.22	0.8835

ZOOM RI

OUTPUT
Command ===>

2. ANALYSIS OF EC DATA 11
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 15 MSE= 0.000235
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 4.363636

Number of Means	2	3	4
Critical Range	.0221	.0232	.0239

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

2. ANALYSIS OF EC DATA 12
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.2260	3	d
A			

No Sign. diff

A	0.2197	6	c
A			
A	0.2182	6	a
A			
A	0.2175	4	b

ZOOM RI

OUTPUT
Command ===>

3. ANALYSIS OF ES DATA 13
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d

Number of observations in data set = 23

NOTE: Due to missing values, only 22 observations can be used in this analysis.

ZOOM RI

OUTPUT
Command ===>

3. ANALYSIS OF ES DATA 14
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	F Value	Pr > F
Model	3	0.00057079	1.15	0.3577
Error	18	0.00299030		
Corrected Total	21	0.00356109		

R-Square	C.V.	RESP Mean

0.160285 6.040887 0.21336364

ZOOM RI

OUTPUT
Command ===>

3. ANALYSIS OF ES DATA 15
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Type I SS	F Value	Pr > F
TRT	3	0.00057079	1.15	0.3577

Source	DF	Type III SS	F Value	Pr > F
TRT	3	0.00057079	1.15	0.3577

ZOOM RI

OUTPUT
Command ===>

3. ANALYSIS OF ES DATA 16
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 18 MSE= 0.000166
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 5.454545

Number of Means	2	3	4
Critical Range	.0164	.0172	.0178

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.21800	5	c
A			
A	0.21550	6	d
A			
A	0.21500	6	a
A			
A	0.20420	5	b

NO Sign. diff.

ZOOM RI

OUTPUT
Command ===>

12:26 Tuesday, April 3, 1990

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d

Number of observations in data set = 23

NOTE: Due to missing values, only 20 observations can be used in this analysis.

ZOOM RI

OUTPUT
Command ===>

12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

42

Source	DF	Sum of Squares	F Value	Pr > F
Model	3	0.00013442	0.19	0.9013
Error	16	0.00376253		
Corrected Total	19	0.00389695		

R-Square	C.V.	RESP Mean
0.034493	7.184293	0.21345000

ZOOM RI

OUTPUT
Command ===>

4. ANALYSIS OF VE DATA 20
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Type I SS	F Value	Pr > F
TRT	3	0.00013442	0.19	0.9013

Source	DF	Type III SS	F Value	Pr > F
TRT	3	0.00013442	0.19	0.9013

ZOOM RI

OUTPUT
Command ===>

4. ANALYSIS OF VE DATA 21
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 16 MSE= 0.000235
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 4.615385

Number of Means 2 3 4

Critical Range .0214 .0224 .0231

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

4. ANALYSIS OF VE DATA 21
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 16 MSE= 0.000235
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 4.615385

Number of Means 2 3 4
Critical Range .0214 .0224 .0231

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

4. ANALYSIS OF VE DATA 22
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.2173	3	d
A			
A	0.2157	6	c
A			
A	0.2117	6	a
A			
A	0.2106	5	b

No Sign. Diff.

ZOOM RI

OUTPUT

Command ===>

5. ANALYSIS OF LE DATA 23
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d

Number of observations in data set = 23

ZOOM RI

OUTPUT
Command ===>

5. ANALYSIS OF LE DATA 24
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Sum of Squares	F Value	Pr > F
Model	3	0.00122547	1.70	0.1999
Error	19	0.00455297		
Corrected Total	22	0.00577843		

R-Square	C.V.	RESP Mean
0.212076	7.276509	0.21273913

ZOOM RI

OUTPUT
Command ===>

5. ANALYSIS OF LE DATA 25
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Type I SS	F Value	Pr > F
TRT	3	0.00122547	1.70	0.1999

Source	DF	Type III SS	F Value	Pr > F
TRT	3	0.00122547	1.70	0.1999

ZOOM RI

OUTPUT
Command ===>

5. ANALYSIS OF LE DATA 26
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 19 MSE= 0.00024
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 5.714286

Number of Means	2	3	4
Critical Range	.0191	.0201	.0208

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

5. ANALYSIS OF LE DATA 27
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.22150	6	a
A			
A	0.21533	6	d
A			
A	0.21133	6	c
A			

No significant difference

```
A           0.20080      5  b
```

ZOOM RI

OUTPUT
Command ===>

```
                    6. ANALYSIS OF NH DATA                          28
                       ********************
                                    12:26 Tuesday, April 3, 1990

                General Linear Models Procedure
                    Class Level Information

                  Class     Levels    Values

                  TRT            4    a b c d


             Number of observations in data set = 23

NOTE: Due to missing values, only 20 observations can be used in
      this analysis.
```

ZOOM RI

OUTPUT
Command ===>

```
                    6. ANALYSIS OF NH DATA                          29
                       ********************
                                    12:26 Tuesday, April 3, 1990

                General Linear Models Procedure

Dependent Variable: RESP

Source                   DF     Sum of Squares    F Value     Pr > F

Model                     3         0.00099657       1.64     0.2187

Error                    16         0.00323163

Corrected Total          19         0.00422820

                  R-Square               C.V.           RESP Mean

                  0.235695           6.510245          0.21830000
```

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ZOOM RI

OUTPUT
Command ===>

6. ANALYSIS OF NH DATA 30
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Dependent Variable: RESP

Source	DF	Type I SS	F Value	Pr > F
TRT	3	0.00099657	1.64	0.2187

Source	DF	Type III SS	F Value	Pr > F
TRT	3	0.00099657	1.64	0.2187

ZOOM RI

OUTPUT
Command ===>

6. ANALYSIS OF NH DATA 31
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan's Multiple Range Test for variable: RESP

NOTE: This test controls the type I comparisonwise error rate, not the experimentwise error rate

Alpha= 0.05 df= 16 MSE= 0.000202
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 4.615385

Number of Means	2	3	4
Critical Range	.0198	.0208	.0214

Means with the same letter are not significantly different.

ZOOM RI

OUTPUT
Command ===>

6. ANALYSIS OF NH DATA 32
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.23033	3	d
A			
A	0.22333	6	c
A			
A	0.21317	6	a
A			
A	0.21120	5	b

No significant difference

ZOOM RI

OUTPUT
Command ===>

7. ANALYSIS OF ES/EL DATA 33
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d

Number of observations in data set = 23

NOTE: Due to missing values, only 22 observations can be used in this analysis.

ZOOM RI

OUTPUT
Command ===>

7. ANALYSIS OF ES/EL DATA 33
****
12:26 Tuesday, April 3, 1990

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	4	a b c d