035001

8-31-87

DATA EVALUATION REPORT

1. Chemical: Dimethoate

2. Test Material: Dimethoate (DIM; test compound 82/326)
96.75% purity

3. Study Type: Avian Reproduction on the Bobwhite Quail

Species Tested: Colinus virginianus

4. Study ID: Munk, R. (1986) One-Generation Reproduction Study with Dimethoate on the Bobwhite Quail (Colinus virginianus) after Administration in the Diet; Project No. 71W326/8256. Unpublished study prepared by BASF AG. 314 pages. TRID No. 470255-017, MRID No. 00162777.

5. Reviewed By: Candy Brassard
EEB/HED
Signature: Candy Brassard
Date: 8/3/87

6. Approved By: Douglas J. Urban
Head, Review Section III
EEB/HED
Signature: Douglas J. Urban
Date: 8/3/87

7. Conclusions:

Based on the data submitted, dimethoate is expected to cause reproductive impairment for the number of eggs laid, eggs set, viable embryos, and live embryos at a level of $\geq$ 30 mg/kg in the diet. The NOEL was determined to be 6 mg/kg. The NOEL for number of eggs cracked and number of normal hatchlings is $\geq$ 30 mg/kg. This study is classified as "supplemental." The study appears to be scientifially sound; however, there are data discrepancies that cause concerns.

8. Recommendations:

The study author/company should report the following:

- Why were the chicks so cadaverous that postmortem examinations could not be performed?

- A more detailed explanation is needed why dinitro-o-toluamide (DOT) was administered in the feed to the chicks up to production week 6. If the birds were healthy, why was the DOT needed?

See section 14 of this report for additional concerns.

9. Background:

This study is submitted in response to data requirements in the Registration Standard.

10. Discussion of Individual Test: N/A

11. Materials and Methods:

a. Test Animals - The bobwhite quail were obtained from the Heinrich Linnenschmidt, Quail Breeding, Am Nonenplatz 40, D-4840 Rheda-Wiedenbruch, FRG. The birds (about 5 months old) were approaching their first breeding season and were kept for a 2-week acclimation period.

The birds were weighed individually and were allocated to the test groups by a randomization plan on the basis of their body weights closely following the subprogram "RANPER." The birds were fed "Club" turkey starter and water ad libitum.

b. Test Systems - The adult birds were housed in stainless steel wire mesh cages (0.59 x 0.45 x 0.26 m; floor area about 0.26 m^2) with sloping wire mesh floors and egg catchers. The birds were transferred into clean cages every 2 weeks throughout the study. Temperature was 22 ± 3 °C and the relative humidity ranged from 50 to 80 percent. The lighting regime, with 160 Lux in the top cages and 16 Lux at the level of the lowest cages, was as follows:

Week of Test		Hours of Light	Hours of Dark
-2 to 0	Settling-in	7	17
1 to 8	Feeding period	7	17
9 and 10	before egg	9	15
11	laying	12	12
12 and 13		14	10
14 to 28	Egg-laying period	17	7

The chicks were housed in Makrolon® four containers (55 x 33 x 20 cm; floor area 1815 cm^2) with stainless steel wire mesh lids and infrared lamps above cages. The containers were bedded with wooden chips for the chicks in the initial 4 weeks of the egg-production

period. The bedding was changed to cellulose because the chicks started eating the wood chips. The temperature was about 25 °C and humidity 50 percent. Temperature in containers directly under the lamps was 40 to 45 °C; the chicks could choose their optimum temperature.

The chicks were fed the same as the adults, and in addition, were fed 100 mg of coccidiostatic DOT in the feed until June 12, 1985. The chicks also received, as a prophylactic treatment, 300 mg Tiamutin/L in the drinking water ad libitum.

The chicks hatched from egg-production week 6 were treated with Tiamutin (300 mg/L) for only 2 days after hatch. Beginning with the chicks of egg-production week 7, the chicks were treated exclusively with only 125 mg Tiamutin/L drinking water for the initial 3 days after hatch.

c. Dose - A control and two treatment levels, 6 mg/kg and 30 mg/kg, which was mixed weekly into a final diet.

d. Study Design - Each pen held 1 male and 2 females, with a total of 15 pens per treatment level.

Body weights were measured at day 0 and weeks 2, 4, 6, and 8 of the pre-egg-production period and at the end of the test.

Feed consumption was measured twice a week. The total feed consumption/pen/day was determined and the mean/pen/week was calculated and recorded.

e. Egg Collection - The total number of eggs/week/replicate was recorded daily from the onset of egg laying throughout the 15-week egg-production period.

f. Egg Weights - Eggs were weighed individually at 7-day intervals, and the replicate mean weight and numbers of eggs weighed were recorded.

g. Egg Quality - Eggs were checked for cracks, abnormalities, and breakages at 7-day intervals.

h. Eggshell Thickness - Eggs were measured for thickness at weeks 1, 3, 5, 7, 9, 11, 13, and 15 of the egg-production period.

All the remaining eggs were placed in brooders and were candled on days 11 and 18 of the incubation period for evaluation of infertilities and early and late embryonic deaths. (See Attachment A for definition.)

i. Hatchlings - All chicks that hatched were reared until they were 14 days old. Mortalities, body weights (day 1 and 14), and number of 14-day survivors were recorded. Postmortem examination was performed only on chicks that died during the 14-day observation period. No postmortem examination was carried out at termination.

j. Statistics - The statistical analysis was done with the SAS procedures ANOVA and TABLE for the parametric analysis of variance and Dunnett test and with the SAS procedure NPAR/WAY for the Kruskal-Wallis and the Wilcoxon rank statistics.

Statistical analysis was carried out on the following parameters:

- Adult feed consumption;
- Adult body weight;
- Number of eggs laid and proportion damaged;
- Egg weight;
- Eggshell thickness;
- Number of infertilities, embryonic mortalities, and hatching;
- Number of 14-day-old surviving chicks; and
- Chick body weight at hatching and 14 days later.

12. Reported Results:

The following compound-related effects were seen in the high-dose group (30 mg/kg):

- Slight reduction in the feed consumption during the egg-production period;

- Slight reduction in the body weight gain in the males and also suggested in the females;

- Marked reduction in egg production;

- Marginal reduction in eggshell thickness;

- Marginal reduction in the fertility rate of the eggs;

- Slight reduction in the chicks surviving at 14 days as a percentage of chicks hatched;

- Marginal reduction in the body weights of the chicks at hatching; and

- As a result of lower egg production and the fertility rate of the eggs, the absolute number of offspring (hatched chicks) was roughly one third lower compared with the control and the low-dose group.

See Attachment B for a summary of egg production and chick data.

13. Study Authors' Conclusions/QA Measures:

> The low dose (6 mg/kg) is a safe "No Observable Effect Level" (NOEL).
>
> The Quality Assurance unit inspected the study, audited the final report, and reported findings to the study director and to management.

The study was inspected eight times from November 9, 1984 to July 29, 1986.

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

The following discrepancies were noted in the study:

a. Test Procedures - Tiamutin was given to the adults twice for 10 days with interruption of 12 days (treatment November 15 to 24 and December 7 to 16, 1984). Five days later the adaptation period was started. Tiamutin is a form of vitamin B (Quang Bui, Toxicology Branch, HED, July 1987).

- Until week 6 of egg-production, the feed contained coccidiostatic DOT. Tiamutin was also administered via the drinking water continuously until egg-production week 6. After egg-production week 6, chicks were only treated for 2 days after hatch with Tiamutin. Chicks hatched from egg-production (EP) week 7 were treated with Tiamutin for initial 3 days. The company should clarify why the adult birds and the chicks (until week 6 of EP) were given DOT if the birds were healthy.

- The raw data for postmortem examinations for the chicks reported that most of the chicks were cadaverous and could not be examined (page 58 of report). In addition, diarrhea and dysentery were reported. The company should explain why a postmortem was not performed on the chick immediately instead of waiting until the condition of the chick made it impossible to discern cause of death.

- The deformities seen (page 53 in study) should have been listed out as far as number and types.

- The photoperiod consisted of 160 Lux in the top cages

and about 16 Lux at the level of the lowest cages; warm fluorescent lamps were used. EEB recommends an illumination of 6 foot candles (approximately 60 Lux) at the bird level.

- The Quality Assurance statement should have included a statement concerning whether the study was performed according to EPA Good Laboratory Practices.

- The percent eggs cracked for the control (3.2 percent) is high.

- The percent viable embryos (of percent eggs set) is 70.5 percent, which is low.

- The postmortem findings, in particular the status of reproductive organs, should be reported in measurements of weights, not in measurements of various types of legumes. Since EEB does not require this parameter to be measured, the results will not be used to evaluate the study.

- The study author should have reported if the chicks showed any adverse effects to the wood chips in the initial 4-week period.

- A withdrawal period of 3 weeks should have been added to the test phase. This pesticide showed reduced reproduction; therefore, continued observations should have been made on egg production, fertility, hatchability, and hatching survival.

b. Statistical Results - The following parameters were evaluated using an ANOVA program and Duncans Multiple Range test: eggs laid, eggs cracked, eggs set, viable embryos, live embryos, normal hatchlings, and eggshell thickness.

The results were as follows:

Eggs laid = NOEL = $\leq$ 6 mg/kg
LOEL = $\geq$ 30 mg/kg
MATC = $\geq$ 6 mg/kg $\leq$ 30 mg/kg

Eggs cracked = NOEL = $\leq$ 30 mg/kg

Eggs set = NOEL = $\leq$ 6 mg/kg
LOEL = $\geq$ 30 mg/kg
MATC = $\geq$ 6 mg/kg $\leq$ 30 mg/kg

Viable embryos = NOEL = $\leq$ 6 mg/kg
LOEL = $\geq$ 30 mg/kg
MATC = $\geq$ 6 mg/kg $\leq$ 30 mg/kg

Live embryos = NOEL = $\leq$ 6 mg/kg
LOEL = $\geq$ 30 mg/kg
MATC = $\geq$ 6 mg/kg $\leq$ 30 mg/kg

Normal hatchlings = NOEL = $\geq$ 30 mg/kg.

Eggshell thickness NOEL = $\leq$ 6 mg/kg
LOEL = $\geq$ 30 mg/kg.

EEB analyzed the results of the reproductive effects. See Table A.

c. Discussion/Results - The dosage of 6 mg/kg is lower than what is expected for the birds to be exposed to. The Dimethoate Registration Standard indicated residue levels as high as 1250 ppm (based on maximum application rate of 10 lb ai/A). However, EEB accepts the level at which these birds were tested, since, if the birds were actually tested at higher levels, a NOEL may not have been obtained.

The company should indicate why most of the chicks were cadaverous and could not have autopsies performed on them.

In addition, the company should report why both the adults and the chicks were administered DOT in the feed if they were healthy.

d. Adequacy of Study

1) Classification - Supplemental for 96.75% technical dimethoate.

2) Rationale - This study appears to be scientifically sound; however, the discrepancies (in Rationale section 3) detract from the study.

3) Repairability - Repairability pending postmortem information on the chicks and a more detailed explanation with regard to the use of DOT.

Table A. Analysis of Reproductive Effects

	Control	Concentrations in the Diet 6 mg/kg	30 mg/kg
Eggs Laid/Hen	59.3	66.6	44.9
Eggs Cracked/Hen No.	1.92	1.3	1.66
Percent of Eggs Laid	3.2	1.9	3.66
Eggs Set Per Hen	53	59.3	39.8
Viable Embryos/Hen	37.39	39.53	24.87
Percent of Eggs Laid	63.0	59.4	55.4
Percent of Eggs Set	70.5	66.7	62.48
Live 18-Day Embryos/Hen	37.07	39.4	24.76
Percent of Viable Embryos	99.1	99.6	99.6
Hatchlings/Hen	20.25	22.63	14.53
Percent of Eggs Laid	34.2	34.0	32.4
Percent of Eggs Set	38.2	38.2	36.5
Percent of Viable Embryos	54.2	57.2	58.4
Percent of 18-Day Embryos	54.5	57.4	58.7
14-Day Survivors/Hen	15.79	16.16	9.36
14-Day Survivors of Normal Hatchlings Percent	77.9	71.4	64.5
Average Hatchweight (g)	6.7	6.4	6.4
Average 14-Day-Old Survivors' Weight (g)	19.9	19.8	19.7
Adult Body Weight (g/bird)			
Females	214.9	214.4	206.3
Males	194.4	196.3	191.4
Adult Body Weight Percent increase compared with Day 0			
Females	+24.3	+24.7	+20.3
Males	+8.9	+11.9	+10.0
Mean Eggshell Thickness	0.21	0.21	0.20
Mean Egg Weight	10.1	9.96	9.86
Average Feed Consumption			
Pre-egg-production Period	12.4	12.7	12.7
Egg-Production Period	20.0	20.3	18.3
Mean Total	16.5	16.8	15.7

Attachment A

BASF
Toxikologie

Project No.: 72W326/82

5.3. Fertility, embryonic development and hatching

5.3.1. Infertile eggs

Recording of infertile eggs; infertile eggs are defined as being "clear" on day 14 candling.

5.3.2. Early embryonic deaths

These are mortalities before full differentation of the embryo and are recorded on day 14 candling.

5.3.3. Late embryonic deaths

These are mortalities recorded at day 21 candling when the embryo is fully differentiated.

5.3.4. Chicks "dead in shell"

Recorded at hatching chicks "dead in shell" are considered to have been fully formed and viable.

5.3.5. Number of chicks hatched

The number of chicks hatched was recorded.

5.3.6. Abnormalities

Any abnormalities in chicks hatched were recorded.

5.4. F_1 chicks

All chicks hatched alive were reared until they were 14 days old. The following parameters were recorded:

5.4.1. Mortalities and toxic signs

Daily (incomplete recording for chicks from egg-laying weeks 2 and 3)

5.4.2. Body weights

Individual body weights were recorded within a period of 24 hours after hatching and on day 14.

5.4.3. Number of 14-day survivors

The number of 14-day survivors was recorded.

5.4.4. Post-mortem examination

All chicks which died during the 14-day observation period were examined macroscopically for gross-pathological abnormalities.

No post-mortem examination was carried out at termination.

Attachment B

BASF XI
Abteilung Toxikologie
Department of Toxicology

Project No.: 71W326/8256

Rabbit reproduction data 12

Summary of egg production and chick data

Group	0	1	2
Treatment (mg/kg)	0 (control)	6	30
No. of eggs laid	1742	1999	1347
No. of cracked and broken eggs	55	39	50
Mean egg weight (g)	10.1	10.1	10.0
Mean egg shell thickness (mm)	0.21	0.21	0.20
No. of eggs incubated	1551	1798	1194
No. of fertile eggs	1159	1256	778
No. of infertile eggs	392	542	416
No. of early embryonic mortalities	53	70	30
No. of late embryonic mortalities	11	4	5
No. of total embryonic deaths	64	74	35
No. of "dead in shell"	490	503	307
No. of chicks hatched	605	679	436
No. of chicks surviving at 14 days	458	485	281
Mean body weight of chicks at hatching (g)	6.7	6.4	6.4
Mean body weight of chicks 14 days after hatching (g)	19.8	19.8	19.7

Summary of egg production and chick data expressed as percentages

Group	0	1	2
Treatment (mg/kg)	0 (control)	6	30
Cracked and broken eggs as a % of total laid	3.2	2.0	3.7
Fertile eggs as a % of total incubated	74.7	69.9	65.2
Infertile eggs as a % of total incubated	25.3	30.1	34.8
Early embryonic mortalities as a % of fertile eggs	4.6	5.6	3.9
Late embryonic mortalities as a % of fertile eggs	0.9	0.3	0.6
% of total embryonic deaths of fertile eggs	5.5	5.9	4.5
"Dead in shell" as a % of fertile eggs	42.3	40.0	39.5
Hatchability (chicks hatched as a % of fertile eggs)	52.2	54.1	56.0
Chicks surviving at 14 days as a % chicks hatched	75.7	71.4	64.4

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EDI

Job 2139

Dimethoate - avian reproduction — ANOVA (BigBird)
parameters per pen / NOT per BIRD.

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1

SAS 8:31 FRIDAY, JULY 17, 1987 1

OBS	TRT	EL	EC	ES	EE	LE	NH
1	A	92	0	81	80	80	40
2	A	140	3	126	81	80	50
3	A	156	4	139	50	48	12
4	A	145	7	127	74	74	30
5	A	133	6	118	114	114	65
6	A	120	1	107	74	73	31
7	A	147	6	128	111	110	65
8	A	108	15	83	79	79	54
9	A	105	3	97	85	84	51
10	A	72	0	66	48	48	33
11	A	86	0	78	66	65	37
12	A	115	3	105	75	73	32
13	A	125	0	117	77	77	38
14	A	124	0	112	47	47	31
* 15	B	160	1	145	137	136	96
16	B	124	2	112	95	95	63
17	B	123	0	114	79	79	46
18	B	143	2	131	89	89	47
19	B	114	2	105	74	74	51
20	B	118	0	106	90	90	58
21	B	121	12	99	52	52	28
22	B	141	0	129	87	87	35
23	B	132	3	119	1	1	0
24	B	91	1	84	34	33	21
25	B	147	2	132	96	96	56
26	B	147	3	132	108	107	54
27	B	157	8	135	72	72	27
28	B	120	1	108	86	85	52
29	B	161	2	147	86	86	45
30	C	96	1	88	80	80	57
31	C	115	2	105	93	93	50
32	C	133	5	119	54	54	31
33	C	101	3	91	88	88	44
34	C	36	1	34	28	28	18
35	C	101	2	91	2	2	1
36	C	101	2	93	91	89	52
37	C	82	3	71	54	54	31
38	C	80	0	74	34	33	16
39	C	92	0	86	25	25	20
40	C	58	18	33	13	12	3
41	C	61	3	53	45	45	30
42	C	95	2	83	56	55	24
43	C	102	2	92	59	59	41
44	C	94	6	81	26	26	18

* The 15th pen (rep 4/5) was NOT included in ANOVA - due to 1 mortality 1 in pen.

1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 2

12

P
THIS LINE IS COMPRESSED [illegible] PER INCH.
IS THIS ACCEPTABLE?
1111111111111111111111111111[illegible]11111111111111111111111111
P
THIS LINE IS COMPRESSED AT 17 CHARACTERS PER INCH.
IS THIS ACCEPTABLE?
11111111111111111111111111111111111111111111111111111111111111111111

Eggshell Thickness

fetch 8428 clr
? l 'n.c.
NOTE: COPYRIGHT (C) 1984,1986 SAS INSTITUTE INC., CARY, N.C. 27511, U.S.A.
CARY, N.C. 27511-8000
' 1228/1
INVALID COMMAND
? l 228/1
CARY, N.C. 27511-8000

1 SAS 17:52 TUESDAY, JULY 21, 1987 1

OBS	TRT	RESP1	RESP2	RESP3	RESP4	RESP5	RESP6	RESP7	RESP8	RESP9	RESP10	RESP11	RESP12	RESP13	RESP14	RESP15	RESP16	RESP17	RESP18	RESP19	RESP20
1	A	0.21	0.21	0.22	0.21	0.20	0.19	0.21	0.22	0.20	0.21	0.20	0.21	0.22	0.22	0.22	.	.	.	.	.
2	B	0.21	0.21	0.21	0.19	0.21	0.22	0.20	0.21	0.19	0.22	0.21	0.22	0.20	0.21	0.23	.	.	.	.	.
3	C	0.21	0.20	0.22	0.21	0.14	0.20	0.21	0.19	0.20	0.20	0.18	0.18	0.21	0.21	0.19	.	.	.	.	.

1 SAS 17:52 TUESDAY, JULY 21, 1987 2

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C

NUMBER OF OBSERVATIONS IN DATA SET = 60

NOTE: ALL DEPENDE[illegible] CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES. HOWEVER, ONLY 45 [illegible] BE USED IN THIS ANALYSIS.

1 SAS 17:52 TUESDAY, JULY 21, 1987 3

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	0.00169333	0.00084667	4.32	0.0196	0.170699	6.8160
ERROR	42	0.00822667	0.00019587		ROOT MSE		RESP MEAN
CORRECTED TOTAL	44	0.00992000			0.01399546		0.20533333

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	0.00169333	4.32	0.0196	2	0.00169333	4.32	0.0196

1 SAS 17:52 TUESDAY, JULY 21, 1987 4

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=42 MSE=2.0E-04

NUMBER OF MEANS 2 3

Job 3139

Dimethoate - avian reproduction — ANOVA (Big Bird)
parameter per pen / NOT per BIRD.

/1 1 403/1
403. 1

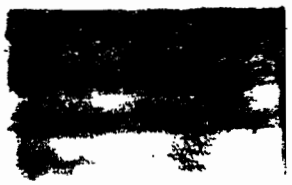
SAS 8:31 FRIDAY, JULY 17, 1987 1

OBS	TRT	EL	EC	ES	VE	LE	NH
1	A	92	6	31	66	66	40
2	A	140	3	126	81	80	50
3	A	156	4	139	50	48	12
4	A	145	7	127	74	74	30
5	A	133	6	118	114	114	63
6	A	120	1	107	74	73	31
7	A	147	6	128	111	110	65
8	A	108	15	83	79	79	54
9	A	105	3	97	85	84	51
10	A	72	0	66	48	48	33
11	A	86	0	78	66	65	37
12	A	115	3	105	75	73	32
13	A	125	0	117	77	77	38
14	A	124	0	112	47	47	31
15	B	160	1	145	137	136	96
16	B	124	2	112	95	95	63
17	B	123	0	114	79	79	46
18	B	143	2	131	89	89	47
19	B	114	2	105	74	74	51
20	B	118	0	106	90	90	58
21	B	121	12	99	52	52	28
22	B	141	0	129	87	87	35
23	B	132	3	119	1	1	0
24	B	91	1	84	34	33	21
25	B	147	2	132	96	96	56
26	B	147	3	132	108	107	54
27	B	157	8	135	72	72	27
28	B	120	1	108	86	85	52
29	B	161	2	147	86	86	45
30	C	96	1	88	80	80	57
31	C	115	2	105	93	93	50
32	C	133	5	119	54	54	31
33	C	101	3	91	88	88	44
34	C	36	1	34	28	28	18
35	C	101	2	91	2	2	1
36	C	101	2	93	91	89	52
37	C	82	3	71	54	54	31
38	C	80	0	74	34	33	16
39	C	92	0	86	25	25	20
40	C	58	18	33	13	12	3
41	C	61	3	53	45	45	30
42	C	95	2	83	56	55	24
43	C	102	2	92	59	59	41
44	C	94	4	81	26	26	18

* The 15th pen (rep 4/5) was NOT included in ANOVA - due to 1 mortality in pen.

1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 2

14



GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 3

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	14722.86147186	7361.43073593	14.11	0.0001	0.407769	20.6466
ERROR	41	21383.04761905	521.53774681		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	36105.90909091			22.83720094		111.95454545

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	14722.86147186	14.11	0.0001	2	14722.86147186	14.11	0.0001

1 1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 4

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=41 MSE=521.538

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	17.0411	17.9153

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	133.267	15	B
A			
A	119.143	14	A
B	89.860	15	C

Mean per BIRD
66.63
59.71
44.9

1 2. ANALYSIS OF EE DATA 8:31 FRIDAY, JULY 17, 1987 5

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 2. ANALYSIS OF EC DATA 8:31 FRIDAY, JULY 17, 1987

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	11.60238095	5.80119048	0.38	0.6890	0.018042	120.3cc
ERROR	41	632.64761905	15.43042973		ROOT MSE		RESP MEA
CORRECTED TOTAL	43	644.25000000			3.92815857		3.250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR
TRT	2	11.60238095	0.38	0.6890	2	11.60238095	0.38	0.68

1 2. ANALYSIS OF EC DATA 8:31 FRIDAY, JULY 17, 1987

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=41 MSE=15.4304

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	2.93119	3.08156

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	3.857	14	A
A			
A	3.333	15	C
A			
A	2.600	15	B

1 3. ANALYSIS OF ES DATA 8:31 FRIDAY, JULY 17, 1987

GENERAL LINEAR MODELS PROCEDURE

Eggshell Thickness

```
P
THIS LINE IS COMPRESSED AT 17 [illegible] INCH.
IS THIS ACCEPTABLE?
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIII[illegible]IIIIIIIIIIIIIIIIIIIIIIIIIIII
P
THIS LINE IS COMPRESSED AT 17 CHARACTERS PER INCH.
IS THIS ACCEPTABLE?
IIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIIII
fetch 8428 clr
> l n.c.
 171.     NOTE: COPYRIGHT (C) 1984,1986 SAS INSTITUTE INC., CARY, N.C. 27511, U.S.A.
 228.           CARY, N.C. 27511-8000
> l 228/1
INVALID COMMAND
> l 228/1
 228.           CARY, N.C. 27511-8000
 229.     1                                        SAS                  17:52 TUESDAY, JULY 21, 1987   1
 230.
 231.                                                    R    R    R    R    R    R    R R R R R
 232.            R    R    R    R    R    R    R    R    R    E    E    E    E    E    E    E E E E E
 233.            E    E    E    E    E    E    E    E    E    S    S    S    S    S    S    S S S S S
 234.     O  T   S    S    S    S    S    S    S    S    S    P    P    P    P    P    P    P P P P P
 235.     B  R   P    P    P    P    P    P    P    P    P    1    1    1    1    1    1    1 1 1 . 2
 236.     S  T   1    2    3    4    5    6    7    8    9    0    1    2    3    4    5    6 7 8 9 0
 237.
 238.     1  A 0.21 0.21 0.22 0.21 0.20 0.19 0.21 0.22 0.20 0.21 0.20 0.21 0.22 0.22 0.22 . . . . .
 239.     2  B 0.21 0.21 0.21 0.19 0.21 0.22 0.20 0.21 0.19 0.22 0.21 0.22 0.20 0.21 0.23 . . . . .
 240.     3  C 0.21 0.20 0.22 0.21 0.14 0.20 0.21 0.19 0.20 0.20 0.18 0.18 0.21 0.21 0.19 . . . . .
 241.     1                                        SAS                  17:52 TUESDAY, JULY 21, 1987   2
 242.
 243.                               GENERAL LINEAR MODELS PROCEDURE
 244.
 245.                                 CLASS LEVEL INFORMATION
 246.
 247.                                CLASS     LEVELS    VALUES
 248.
 249.                                TRT          3      A B C
 250.
 251.
 252.                          NUMBER OF OBSERVATIONS IN DATA SET = 60
 253.
 254.
 255.     NOTE: ALL DEPENDENT [illegible] CONSISTENT WITH RESPECT TO THE PRESENCE OR ABSENCE OF MISSING VALUES. HOWEVER,
 256.          ONLY     45 [illegible] BE USED IN THIS ANALYSIS.
 257.     1                                        SAS                  17:52 TUESDAY, JULY 21, 1987   3
 258.
 259.                               GENERAL LINEAR MODELS PROCEDURE
 260.
 261.     DEPENDENT VARIABLE: RESP
 262.
 263.     SOURCE              DF    SUM OF SQUARES      MEAN SQUARE     F VALUE      PR > F      R-SQUARE        C.V.
 264.
 265.     MODEL                2        0.00169333       0.00084667        4.32      0.0196      0.170699      [illegible]160
 266.
 267.     ERROR               42        0.00822667       0.00019587                  ROOT MSE                 RESP MEAN
 268.
 269.     CORRECTED TOTAL     44        0.00992000                                0.01399546                0.20533333
 270.
 271.
 272.     [illegible]         DF       TYPE I SS   F VALUE   PR > F    DF      TYPE III SS    F VALUE    PR > F
 273.
 274.     TRT                  2      0.00169333      4.32   0.0196     2       0.00169333      4.32    [illegible]
 275.     1                                        SAS                  17:52 TUESDAY, JULY 21, 1987   4
 276.
 277.                               GENERAL LINEAR MODELS PROCEDURE




 278.
 279.                     DUNCAN'S MULTIPLE RANGE TEST FOR VARIABLE: RESP
 280.                     NOTE: THIS TEST CONTROLS THE TYPE I COMPARISONWISE ERROR RATE,
 281.                           NOT THE EXPERIMENTWISE ERROR RATE
 282.
 283.                                 ALPHA=0.05  DF=42  MSE=2.0E-04
 284.
 285.                              NUMBER OF MEANS        2       3
```

Job 2139

Dimethoate - avian reproduction — ANOVA (BigBird)
parameter per pen / NOT PER BIRD.

SAS 8:31 FRIDAY, JULY 17, 1987 1

OBS	TRT	EL	EC	ES	VE	LE	NH
1	A	72	0	31	66	66	40
2	A	140	7	126	81	90	50
3	A	156	4	139	50	48	12
4	A	145	7	127	74	74	30
5	A	133	0	118	114	114	63
6	A	120	1	107	74	73	31
7	A	147	0	128	111	110	65
8	A	108	15	83	79	79	54
9	A	105	3	97	85	84	51
10	A	72	2	66	48	48	33
11	A	86	0	78	66	65	37
12	A	115	3	105	75	73	32
13	A	125	0	117	77	77	38
14	A	124	0	112	47	47	31
* 15	B	160	1	145	137	136	96
16	B	124	2	112	95	95	63
17	B	123	0	114	79	79	46
18	B	143	2	131	89	89	47
19	B	114	2	105	74	74	51
20	B	118	0	106	90	90	58
21	B	121	12	99	52	52	28
22	B	141	0	129	87	87	35
23	B	132	3	119	1	1	0
24	B	91	1	84	34	33	21
25	B	147	2	132	96	96	56
26	B	147	3	132	108	107	54
27	B	157	8	135	72	72	27
28	B	120	1	108	86	85	52
29	B	161	2	147	86	86	45
30	C	96	1	88	80	80	57
31	C	115	2	105	93	93	50
32	C	133	5	119	54	54	31
33	C	101	3	91	88	88	44
34	C	36	1	34	28	28	18
35	C	101	2	91	2	2	1
36	C	101	2	93	91	89	52
37	C	82	3	71	54	54	31
38	C	80	0	74	34	33	16
39	C	92	0	86	25	25	20
40	C	58	18	33	13	12	3
41	C	61	3	53	45	45	30
42	C	95	2	83	56	55	24
43	C	102	2	92	59	59	41
44	C	94	6	81	26	26	18

* The 15th pen (rep 4/5) was not included in ANOVA - due to 1 mortality 1 in pen.

1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 2

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 3

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	14722.86147186	7361.43073593	14.11	0.0001	0.407769	20.4466
ERROR	41	21383.047o1905	521.53774681		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	36105.90909091			22.83720094		113.95454545

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	14722.86147186	14.11	0.0001	2	14722.86147186	14.11	0.0001

1 1. ANALYSIS OF EL DATA 8:31 FRIDAY, JULY 17, 1987 4

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=41 MSE=521.538

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

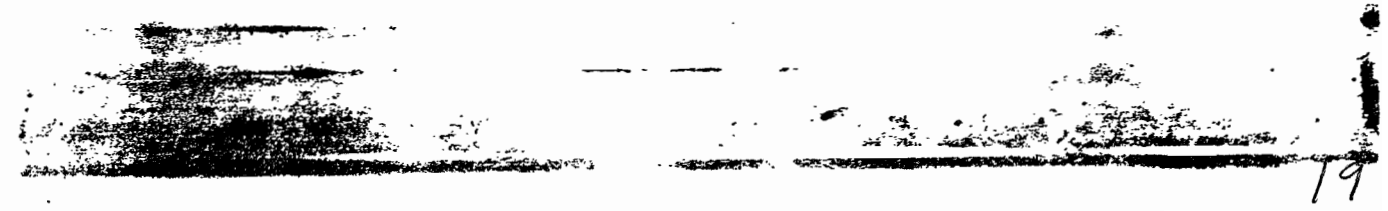
NUMBER OF MEANS	2	3
CRITICAL RANGE	17.0411	17.9153

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	133.267	15	B
A			
B	119.143	14	A
B	89.800	15	C

Mean per BIRD
66.63
59.71
44.9

1 2. ANALYSIS OF EC DATA 8:31 FRIDAY, JULY 17, 1987 5



CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 2. ANALYSIS OF EC DATA 8:31 FRIDAY, JULY 17, 1987

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	11.60238095	5.80119048	0.38	0.6890	0.018069	120.86[illegible]
ERROR	41	632.64761905	15.43042973		ROOT MSE		RESP MEA
CORRECTED TOTAL	43	644.25000000			3.92815857		3.250000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR
TRT	2	11.60238095	0.38	0.6890	2	11.60238095	0.38	0.68

1 2. ANALYSIS OF EC DATA 8:31 FRIDAY, JULY 17, 1987

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=41 MSE=15.4304

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	2.93119	3.08156

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	3.857	14	A
A			
A	3.333	15	C
A			
A	2.600	15	B

1 3. ANALYSIS OF ES DATA 8:31 FRIDAY, JULY 17, 1987

GENERAL LINEAR MODELS PROCEDURE

[redacted]

CLASS LEVELS VALUES

TRT 3 A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 3. ANALYSIS OF ES DATA 8:31 FRIDAY, JULY 17, 1987 9

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	12535.39393939	6267.69696970	13.68	0.0001	0.396201	21.1428
ERROR	41	18787.33333333	458.22764228		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	31322.72727273			21.40625241		101.2727273

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	12535.39393939	13.68	0.0001	2	12535.39393939	13.68	0.0001

1 3. ANALYSIS OF ES DATA 8:31 FRIDAY, JULY 17, 1987 10

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=41 MSE=458.228

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	15.9734	16.7927

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	119.867	15	B
A			
A	106.000	14	A
B	79.600	15	C

1 4. ANALYSIS OF VE DATA 8:31 FRIDAY, JULY 17, 1987 11

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS LEVELS VALUES

TRT 3 A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 4. ANALYSIS OF VE DATA 8:31 FRIDAY, JULY 17, 1987 12

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	7411.22619048	3705.61309524	4.90	0.0123	0.193040	40.5739
ERROR	41	30981.02380952	755.63472706		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	38392.25000000			27.48881094		67.7500000

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	7411.22619048	4.90	0.0123	2	7411.22619048	4.90	0.0123

1 4. ANALYSIS OF VE DATA 8:31 FRIDAY, JULY 17, 1987 13

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

TRT 3 A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 4. ANALYSIS OF VE DATA 8:31 FRIDAY, JULY 17, 19[illegible] 12

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	[illegible]
MODEL	2	7411.22619048	3705.61309524	4.90	0.0123	0.[illegible]	[illegible]
ERROR	41	30981.02380952	755.63473[illegible]		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	38392.25000000			27.48881[illegible]		[illegible]

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	7411.22619048	4.90	0.0123	2	7411.22619048	4.90	0.0123

1 4. ANALYSIS OF VE DATA 8:31 FRIDAY, JULY 17, 19[illegible] 13

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=41 MSE=755.635

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	20.5122	21.5644

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	79.07	15	B
A			
A	74.79	14	A
B	49.87	15	C

1 5. ANALYSIS OF LE DATA 8:31 FRIDAY, JULY 17, 19[illegible] 14

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 5. ANALYSIS OF LE DATA 8:31 FRIDAY, JULY 17, 1987 15

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	7374.03874459	3687.01937229	4.90	0.0123	0.192968	40.7273
ERROR	41	30839.84761905	752.19140534		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	38213.88636364			27.42610810		[illegible]

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	7374.03874459	4.90	0.0123	2	7374.03874459	4.90	0.0123

1 5. ANALYSIS OF LE DATA 8:31 FRIDAY, JULY 17, 1987 16

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=41 MSE=752.191

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	20.4654	21.5152

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	78.80	15	B
A			
A	74.14	14	A
B	49.53	15	C

1 6. ANALYSIS OF NH DATA 8:31 FRIDAY, JULY 17, 1987 17

********* 744. GENERAL

SS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C

NUMBER OF OBSERVATIONS IN DATA SET = 44

THIS LINE IS COMPRESSED AT 17 CHARACTERS PER INCH.
IS THIS ACCEPTABLE?

NUMBER OF OBSERVATIONS IN DATA SET = 44

1 6. ANALYSIS OF NH DATA 8:31 FRIDAY, JULY 17, 1987 18

GENERAL LINEAR MODELS PROCEDURE

DEPENDENT VARIABLE: RESP

SOURCE	DF	SUM OF SQUARES	MEAN SQUARE	F VALUE	PR > F	R-SQUARE	C.V.
MODEL	2	2074.36060606	1037.18030303	3.14	0.0539	.132787	47.5513
ERROR	41	13547.36666667	330.42357724		ROOT MSE		RESP MEAN
CORRECTED TOTAL	43	15621.72727273			18.17755697		38.22727273

SOURCE	DF	TYPE I SS	F VALUE	PR > F	DF	TYPE III SS	F VALUE	PR > F
TRT	2	2074.36060606	3.14	0.0539	2	2074.36060606	3.14	0.0539

1 6. ANALYSIS OF NH DATA 8:31 FRIDAY, JULY 17, 1987 19

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=41 MSE=330.424

WARNING: CELL SIZES ARE NOT EQUAL.
HARMONIC MEAN OF CELL SIZES=14.6512

NUMBER OF MEANS	2	3
CRITICAL RANGE	13.5641	14.2599

MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

DUNCAN GROUPING	MEAN	N	TRT
A	45.267	15	B
A			
B A	40.500	14	A
B	29.067	15	C

1 7. ANALYSIS OF ES/EC DATA 8:31 FRIDAY, JULY 17, 1987 20

GENERAL LINEAR MODELS PROCEDURE

CLASS LEVEL INFORMATION

CLASS	LEVELS	VALUES
TRT	3	A B C