

S406678
SUBMISSION #

129011
SHAUGHNESSY NO.

REVIEW NO.

EEB REVIEW

DATE: IN 11-26-91

DATE: OUT 3-29-93

FILE OR ID NO. MRID 420410-01

PETITION OR EXP. NO. _____

DATE OF SUBMISSION 10-28-91

DATE RECEIVED BY EFED 11-26-91

RD REQUESTED COMPLETION DATE 5-5-92

EEB ESTIMATED COMPLETION DATE 03-15-93

RD ACTION CODE/TYPE OF REVIEW Data Evaluation Record

Fish Early Life-Stage --

Fathead Minnow

TYPE OF PRODUCT(S) : I,D,H,F,N,R,S Fungicide

DATA ACCESSION NO(S). _____

PRODUCT MANAGER (NO.) Cynthia Giles-Parker

PRODUCT NAME(S) Fenbuconazole, RH7592, Fenethanil, Indar, RH-
57,592

COMPANY NAME Rohm and Haas

SUBMISSION PURPOSE Meet EEB Study requirements

SHAUGHNESSY NO.	CHEMICAL & FORMULATION(S)	% A.I.
<u>129011</u>	<u>Fenbuconazole</u>	<u>98.3</u>
_____	<u>Inert</u>	<u>1.7</u>

DATA EVALUATION RECORD

1. **CHEMICAL:** RH-7592. Shaughnessey No. 129011.
2. **TEST MATERIAL:** RH-7592 Technical; Lot No. BPP-3-1786R; 96.7% active ingredient; a white powder.
3. **STUDY TYPE:** 72-4. Freshwater Fish Early Life-Stage Toxicity Test. Species Tested: Fathead Minnow (*Pimephales promelas*).
4. **CITATION:** Sword, M.C. and J.L. Stratton. 1991. Early Life-Stage Toxicity of RH-7592 Technical to Fathead Minnow (*Pimephales promelas*) Under Flow-Through Conditions. ABC Report No. 39266. Rohm and Haas Report No. 91RC-0007. Study conducted by Analytical Bio-Chemistry Laboratories, Inc., Columbia, MO. Submitted by Rohm and Haas, Spring House, PA. EPA MRID No. 420410-01.

5. **REVIEWED BY:**

Rosemary Graham Mora, M.S.
Associate Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature:

Date:

Rosemary Graham Mora
12/3/92

6. **APPROVED BY:**

Louis M. Rifici, M.S.
Associate Scientist
KBN Engineering and
Applied Sciences, Inc.

Signature:

Date:

Louis M. Rifici
12/4/92

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

Signature:

Date:

Reginald Hiscorn 3/22/93
Henry T. Craven 4/24/93

7. **CONCLUSIONS:** This study is scientifically sound and fulfills the guideline requirements for an early life-stage test using freshwater fish. Based on mean measured concentrations and the results, the MATC for *Pimephales promelas* exposed to RH-7592 Technical was >0.082 and <0.16 mg a.i./l (geometric MATC of 0.11 mg a.i./l).
8. **RECOMMENDATIONS:**
9. **BACKGROUND:**

✓

10. DISCUSSION OF INDIVIDUAL TESTS: N/A.11. MATERIALS AND METHODS:

- A. Test Animals: Newly fertilized eggs (<24 hours post-fertilization) of the fathead minnow (*Pimephales promelas*) were obtained from the spawning culture at the testing facility.
- B. Test System: The test system was a 2-l proportional diluter which intermittently delivered test solutions to replicate test chambers. Duplicate glass aquaria were divided into two replicate chambers, each measuring 15.8 x 30.4 cm with a water depth of 24.4 cm, yielding a 12-liter chamber volume. All chamber drains were covered with stainless steel screen. The diluter delivered an average of 90 l of solution per day to each replicate chamber resulting in 7.5 volume replacements per day. The test solutions were allowed to flow through the test system for an 18-hour equilibration period before test initiation.

Embryo incubation cups were glass jars (9-cm diameter) with Nitex screen bottoms. One cup was suspended in each test chamber. A rocker arm apparatus was used to gently oscillate the incubation cups in the test chambers.

Sixteen hours of light at an intensity of 99.1 ± 7.8 footcandles at the water surface were provided each day. Test temperature was maintained by a water bath.

The dilution water was a mixture of untreated and treated (reverse osmosis) well water. The water had a pH of 8.1-8.4, a specific conductivity of 350-440 $\mu\text{mhos/cm}$, and a hardness and alkalinity of 170-178 and 190-198 mg/l as CaCO_3 , respectively.

Stock solutions (4.0 mg a.i./ml) were prepared by dissolving the appropriate amount of whole test material in acetone.

- C. Dosage: Thirty-five-day, flow-through test. Nominal test concentrations selected based on results of a previous definitive study were 0.006, 0.013, 0.025, 0.05, 0.1, 0.2, and 0.4 mg a.i./l. A dilution water control and solvent control were also included. The solvent control contained an acetone concentration of 0.10 ml/l which corresponds to the highest acetone concentration used in exposure levels 1-7.

- D. **Design:** Four replicates of each treatment and control were included in the test. Duplicate test aquaria per concentration were arranged in two rows on one tier using a random number table to assign specific test concentrations, providing a nested experimental design.

Embryos were impartially selected and distributed to the incubation cups by twos until each cup contained 20 eggs. Hatching was 100% complete on test day 6 at which time the fry were released into their respective chambers. Biomass loading was 0.037 g/l/day at test termination.

Initial feeding on study day 4 consisted of rotifers. Starting on study day 5, larvae were fed live brine shrimp nauplii and rotifers. Beginning on day 21, a commercial dry food was added to the diet. Frequency of feeding along with quantity and food size were adjusted during the study on the basis of average fish size. Feeding was discontinued 24 hours prior to test termination. The aquaria were cleaned as needed.

Behavior, appearance, and survival of embryos and larvae were observed and recorded daily. Dead individuals were removed at each observation. At test termination (study day 35), the larvae were counted and standard length and wet weight of each individual were measured.

Dissolved oxygen concentration (DO), pH, conductivity, hardness, alkalinity, and temperature were measured on days 0, 7, 14, 21, 28, and 35. Temperature, DO, pH, and conductivity were also measured on day 1. Temperature and DO were measured in two of four replicates (alternating weekly). Total hardness and alkalinity, pH, and specific conductance were measured in one replicate of the control, lowest and highest test concentrations containing live fish. Temperature was also measured continuously throughout the test period.

Water samples were collected from each test concentration for the determination of RH-7592 Technical using gas-liquid chromatography. These samples were collected on test days 0, 1, 7, 14, 21, 28, and 35.

- E. **Statistics:** Statistical analyses were based on a $p \leq 0.05$ level of significance. T-tests and Fisher's Exact tests demonstrated no significant difference

between the dilution water control data and solvent control data. Therefore, the pooled control data were used to assess the response of the treatment groups. Shapiro-Wilk normality test statistics were computed within each test concentration to assess departures from normality. When the data suggested departures from normality, the data were examined for indications of central tendency. If the variability between replicates within aquaria was not significant or there was no strong evidence of biological significance, then the aquaria within concentrations and replicate within aquaria error sources were combined.

Egg hatchability and survival data were analyzed using frequency analysis comparing the pooled control responses to each exposure level. Analysis of variance (ANOVA) procedure for nested design experiments, coupled with Dunnett's one-tailed multiple comparison procedure, was used to analyze the growth data.

12. **REPORTED RESULTS:** Mean measured concentrations were 0.0097, 0.013, 0.02, 0.047, 0.082, 0.16, and 0.33 mg a.i./l (Table 2, attached). These values ranged from 80 to 162% of nominal concentrations. Test material was detected in the solvent control solution on days 0 and 1 but was not found on day 5 or at any other time during the test.

The sublethal effects (spinal curvature, fish on bottom of chamber, erratic swimming, and abnormal coloration) noted did not appear to be toxicant related. Hatching success and larval survival were not significantly affected at any test concentration when compared to the pooled control data (Table 7, attached). Five embryos in replicate C of the 0.05 mg a.i./l nominal concentration were found to be enclosed in a fungal clump; these eggs were discarded and were not included in statistical analysis. Standard length was significantly reduced at the highest test concentration (0.33 mg a.i./l) and wet weight was significantly reduced at the two highest test concentrations (0.16 and 0.33 mg a.i./l) when compared to the pooled control data (Table 8, attached).

During the study, pH was 8.1-8.4, specific conductance was 350-440 μ mhos/cm, and total hardness and alkalinity were 170-178 and 190-198 mg/l as CaCO_3 , respectively. The DO ranged from 6.3 to 8.8 mg/l. The temperature range was 23.9-25.3°C based on weekly measurements and 22.5-27.0°C based on continuous measurements.

23.9-25.3°C based on weekly measurements and 22.5-27.0°C based on continuous measurements.

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

"Based on egg hatchability, fry survival and growth data for this 29-day post-hatch fathead minnow early life stage study, the Maximum Acceptable Toxicant Concentration (MATC) for RH-7592 Technical was estimated to be 0.11 mg a.i./l with limits of 0.082 and 0.16 mg a.i./l."

A GLP compliance statement was included in the report indicating that the study was conducted in accordance with EPA Good Laboratory Practice Regulations (40 CFR, Part 160). A quality assurance statement was also included.

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

- A. Test Procedure:** The test procedure is generally in accordance with the SEP guidelines, except for the following deviations:

The light intensity used during the test was 1067 ±84 lux (reported as 99.1 ±7.8 footcandles); the SEP recommends a light intensity of 400-800 lux.

The report did not indicate the use of 15- to 30-minute dawn/dusk simulation periods as recommended.

The number of male and female fish used to produce the test embryos was not reported; the SEP recommends at least 3 males and 3 females.

Embryos were "impartially" selected and distributed; the SEP requires random selection.

B. Statistical Analysis:

Growth data were individually measured; however, the authors statistically analyzed these data using a one-way ANOVA and the replicate means. When replicate mean values are used, the variation that exists within each replicate is ignored. Individual measurements of growth should have been analyzed using a two-way ANOVA design.

The reviewer analyzed the growth data (both weight and length) using both Duncan's Multiple Range Test and Bonferroni (Dunn) T-tests (printouts attached). The results from the individual wet weight data indicate a significant reduction in weight in the treatment groups

0.16 and 0.33 mg/L. In addition, there was a significant difference in length between control groups and 0.33 mg/L treatment group. These results were the same as those presented by the study author.

Survival and hatchability data were analyzed using Toxstat® (Version 3.3). The hatchability data (arcsine square-root transformed) failed to meet the assumptions of homogeneity of variance due to zero variance at one level. Therefore, a non-parametric test (Kruskal-Wallis test) was used to determine treatment effects (printouts, attached). The results showed no significant difference in hatchability in the treatment levels when compared to the solvent control. The survival data did meet the assumptions of homogeneity of variance and normality, therefore, these data were analyzed using a one-way ANOVA coupled with Dunnett's comparison test (printouts, attached). The reviewer's results were the same as those presented by the authors.

- C. Discussion/Results: This study is scientifically sound and meets the requirements for an early life-stage toxicity test using freshwater fish. Based on the results, the MATC for *Pimephales promelas* exposed to RH-7592 Technical was >0.082 and <0.16 mg a.i./l mean measured concentrations (geometric mean MATC of 0.11 mg a.i./l).

D. Adequacy of the Study:

- (1) Classification: Core.
- (2) Rationale:
- (3) Repairability:

15. COMPLETION OF ONE-LINER: Yes, November 24, 1992.

RIN 3477-95

EEB FENBUCONAZOLE REVIEW

Page is not included in this copy.

Pages 8 through 12 are not included.

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.
- ☒ 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.

OBS	TRT	WT	LGTH	SAS
1	1	0.309	20.4818	13:19 Tuesday, March 30, 1993 1
2	1	0.211	20.2338	
3	1	0.148	22.1856	
4	1	0.174	22.2370	
5	1	0.188	22.1856	
6	1	0.162	21.2695	
7	1	0.251	19.9733	
8	1	0.199	20.7425	
9	1	0.144	17.6904	
10	1	0.097	16.9312	
11	1	0.169	19.9774	
12	1	0.218	21.0219	
13	1	0.095	25.5967	
14	1	0.179	22.5072	
15	1	0.175	23.0040	
16	1	0.224	20.3582	
17	1	0.159	22.2814	
OBS	TRT	WT	LGTH	SAS
18	1	0.099	17.0132	13:19 Tuesday, March 30, 1993 2
19	1	0.196	18.1402	
20	1	0.191	18.3725	
21	1	0.196	18.7220	
22	1	0.079	19.9733	
23	1	0.175	16.6653	
24	1	0.192	20.5705	
25	1	0.185	20.8239	
26	1	0.219	21.7841	
27	1	0.178	21.8945	
28	1	0.161	20.6216	
29	1	0.111	17.0915	
30	1	0.146	19.3891	
31	1	0.171	19.7648	
32	1	0.082	16.5459	
33	1	0.132	21.1367	
34	1	0.170	19.6016	
OBS	TRT	WT	LGTH	SAS
35	1	0.271	21.7633	13:19 Tuesday, March 30, 1993 3
36	1	0.086	24.0469	
37	1	0.128	20.3868	
38	1	0.148	20.2881	
39	1	0.149	22.5690	
40	1	0.201	22.7731	
41	1	0.083	13.7417	
42	1	0.062	20.2338	
43	1	0.165	22.1415	
44	1	0.101	20.7366	
45	1	0.182	21.2668	
46	1	0.141	17.0574	
47	1	0.143	20.6341	
48	1	0.201	18.4222	
49	1	0.101	20.3689	
50	1	0.099	18.3690	
51	1	0.163	16.1444	
SAS			13:19 Tuesday, March 30, 1993 4	

52	1	0.196	21.0153	
53	1	0.251	17.4690	
54	1	0.053	20.6565	
55	1	0.225	22.6573	
56	1	0.166	23.1275	
57	1	0.164	20.5591	
58	1	0.122	19.8865	
59	1	0.125	19.6062	
60	1	0.231	20.0421	
61	1	0.204	20.6721	
62	1	0.192	20.1404	
63	1	0.250	21.8490	
64	1	0.117	17.5954	
65	1	0.178	23.3392	
66	1	0.218	21.0503	
67	1	0.138	22.2686	
68	1	0.151	21.9111	
OBS	TRT	WT	LGTH	SAS
69	1	0.147	19.7251	13:19 Tuesday, March 30, 1993 5
70	1	0.172	20.6341	
71	1	0.129	22.6530	
72	1	0.139	24.1107	
73	1	0.176	24.8085	
74	1	0.088	19.8278	
75	1	0.207	23.0293	
76	1	0.185	17.4662	
77	1	0.216	24.3146	
78	1	0.177	23.0693	
79	1	0.063	19.2164	
80	1	0.110	22.4824	
81	1	0.098	16.0318	
82	1	0.272	22.0066	
83	1	0.230	21.0661	
84	1	0.226	19.7288	
85	1	0.253	20.2310	
OBS	TRT	WT	LGTH	SAS
86	1	0.189	22.9162	13:19 Tuesday, March 30, 1993 6
87	1	0.262	19.3042	
88	1	0.104	18.2789	
89	1	0.129	19.2202	
90	1	0.115	19.7448	
91	1	0.129	18.3632	
92	1	0.154	24.4417	
93	1	0.138	17.4953	
94	1	0.157	21.7599	
95	1	0.117	22.7144	
96	1	0.155	17.9032	
97	1	0.329	25.4890	
98	1	0.104	19.8522	
99	1	0.148	21.1317	
100	1	0.144	18.1790	
101	1	0.239	21.3818	
102	1	0.172	18.3196	
OBS	TRT	WT	LGTH	SAS
103	1	0.168	23.1883	13:19 Tuesday, March 30, 1993 7

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OBS	104	1	0.113	21.5732
	105	1	0.263	20.2290
	106	1	0.154	20.3645
	107	1	0.173	23.7199
	108	1	0.153	22.2991
	109	1	0.146	19.7386
	110	1	0.155	22.4824
	111	1	0.055	20.7460
	112	1	0.086	19.9989
	113	1	0.224	16.3674
	114	1	0.192	14.2010
	115	1	0.107	19.1337
	116	1	0.145	21.1367
	117	1	0.112	23.0854
	118	1	0.186	22.4337
	119	1	0.109	18.5775

OBS	120	1	0.046	22.1535
	121	1	0.206	19.3519
	122	1	0.123	21.5371
	123	1	0.162	20.5386
	124	1	0.183	17.8175
	125	1	0.188	18.2877
	126	1	0.170	18.0257
	127	1	0.193	14.1216
	128	1	0.138	21.7152
	129	1	0.109	20.7378
	130	1	0.224	18.6770
	131	1	0.202	21.8816
	132	1	0.131	17.7123
	133	1	0.095	21.1631
	134	1	0.226	22.1590
	135	1	0.176	22.3958
	136	1	0.163	21.6451

OBS	137	1	0.196	21.9535
	138	1	0.140	19.9535
	139	1	0.213	18.3474
	140	1	0.201	22.4337
	141	1	0.206	20.3550
	142	1	0.208	19.5839
	143	1	0.137	21.3723
	144	1	0.216	19.4308
	145	1	0.161	19.5979
	146	1	0.191	22.7358
	147	1	0.106	22.5176
	148	1	0.161	22.6959
	149	1	0.164	20.4217
	150	1	0.151	20.6482
	151	1	0.111	17.2550
	152	1	0.152	19.3268
	153	3	0.141	21.3909

OBS	158	3	0.216	22.9289
	159	3	0.231	21.8904
	160	3	0.202	22.0594
	161	3	0.215	14.1936
	162	3	0.177	16.3551
	163	3	0.203	19.6363
	164	3	0.218	21.4815
	165	3	0.173	22.3937
	166	3	0.173	20.6200
	167	3	0.158	20.3609
	168	3	0.181	22.6802
	169	3	0.218	22.6752
	170	3	0.160	23.3614

OBS	171	3	0.101	24.4732
	172	3	0.132	15.5391
	173	3	0.109	22.1371
	174	3	0.075	23.4854
	175	3	0.255	19.8494
	176	3	0.213	22.1652
	177	3	0.270	17.9488
	178	3	0.177	19.5454
	179	3	0.121	14.7371
	180	3	0.108	24.8153
	181	3	0.057	18.6088
	182	3	0.107	21.4826
	183	3	0.138	18.7630
	184	3	0.172	19.8233
	185	3	0.128	23.6588
	186	3	0.187	18.3632
	187	3	0.248	21.2158

OBS	188	3	0.229	20.2673
	189	3	0.142	14.8930
	190	3	0.166	22.0286
	191	3	0.057	21.6507
	192	3	0.177	20.1605
	193	3	0.129	20.6094
	194	3	0.195	23.3219
	195	3	0.178	23.2538
	196	3	0.209	15.8689
	197	3	0.111	19.8400
	198	3	0.181	21.8871
	199	3	0.180	18.7289
	200	3	0.102	18.5098
	201	3	0.169	20.4830
	202	3	0.058	21.5401
	203	3	0.067	18.4503
	204	3	0.134	15.1665

OBS	205	3	0.165	18.5949
	206	3	0.115	21.3738
	207	3	0.214	22.1605
	208	3	0.113	19.7448
	209	3	0.120	14.5166
	210	3	0.173	16.2916
	211	3	0.163	20.3609

212	3	0.120	23.4575
213	3	0.219	16.4940
214	3	0.149	22.0382
215	3	0.065	19.9632
216	3	0.058	22.5690
217	3	0.170	22.1331
218	3	0.206	18.7832
219	3	0.176	21.3822
220	3	0.193	22.1415
221	3	0.175	20.7425

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OBS	TRT	WT	LGTH
222	3	0.067	20.6216
223	3	0.150	19.2046
224	3	0.134	21.6451
225	3	0.172	21.4287
226	4	0.195	23.5845
227	4	0.213	19.4657
228	4	0.083	21.2638
229	4	0.225	18.1188
230	4	0.146	22.3296
231	4	0.149	23.6899
232	4	0.155	19.6906
233	4	0.148	21.8845
234	4	0.219	20.9799
235	4	0.166	19.9875
236	4	0.091	22.6445
237	4	0.165	22.5664
238	4	0.178	21.0373

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OBS	TRT	WT	LGTH
239	4	0.138	20.2673
240	4	0.133	22.6320
241	4	0.122	17.3056
242	4	0.214	20.1408
243	4	0.100	20.0134
244	4	0.161	16.6323
245	4	0.182	21.9181
246	4	0.207	18.0382
247	4	0.171	20.7678
248	4	0.204	17.4360
249	4	0.051	22.9279
250	4	0.133	19.8106
251	4	0.176	22.6734
252	4	0.104	23.2792
253	4	0.142	20.6917
254	4	0.121	14.9759
255	4	0.187	21.5010

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266	4	0.164	21.3723
267	4	0.152	21.1600
268	4	0.171	23.1275
269	4	0.203	19.4125
270	4	0.139	23.3832
271	4	0.187	22.6620
272	4	0.134	21.5056

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OBS	TRT	WT	LGTH
273	4	0.210	16.5879
274	4	0.175	23.3486
275	4	0.080	20.1905
276	4	0.076	16.4114
277	4	0.238	18.8091
278	4	0.192	21.4456
279	4	0.118	21.8812
280	4	0.131	24.6750
281	4	0.194	20.7678
282	4	0.206	21.3738
283	4	0.069	23.9166
284	4	0.175	19.6016
285	4	0.200	20.3995
286	4	0.123	21.7674
287	4	0.202	22.4543
288	4	0.161	23.2663
289	4	0.082	17.4360

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OBS	TRT	WT	LGTH
290	4	0.110	20.2605
291	4	0.258	23.7169
292	4	0.134	16.2060
293	4	0.151	19.3920
294	4	0.240	23.8017
295	4	0.080	16.8618
296	4	0.158	22.1590
297	4	0.230	18.1188
298	4	0.159	20.8638
299	4	0.153	21.5180
300	4	0.224	24.6484
301	5	0.178	21.1929
302	5	0.124	19.6136
303	5	0.179	21.2096
304	5	0.212	25.2036
305	5	0.158	24.4761
306	5	0.175	21.1653

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OBS	TRT	WT	LGTH
307	5	0.162	20.9598
308	5	0.271	22.9430
309	5	0.087	23.0949
310	5	0.130	19.7189
311	5	0.117	17.8148
312	5	0.137	17.4360
313	5	0.162	20.5705
314	5	0.170	20.6972
315	5	0.169	16.8656
316	5	0.092	19.4786
317	5	0.076	21.4815
318	5	0.120	20.0639
319	5	0.230	21.9830

OBS	320	0.206	23.1016
	321	0.128	18.7470
	322	0.119	16.8205
	323	0.217	22.6573

SAS 13:19 Tuesday, March 30, 1993 20

OBS	324	0.120	23.4868
	325	0.101	23.2123
	326	0.130	16.9217
	327	0.107	20.6753
	328	0.098	20.6847
	329	0.149	21.5196
	330	0.123	21.7000
	331	0.107	19.5929
	332	0.192	18.4744
	333	0.145	18.4902
	334	0.169	20.5339
	335	0.197	19.3456
	336	0.113	19.4437
	337	0.169	17.3448
	338	0.167	20.1018
	339	0.065	19.3109
	340	0.044	23.4333

SAS 13:19 Tuesday, March 30, 1993 21

OBS	341	0.125	14.7181
	342	0.206	18.8280
	343	0.069	20.4818
	344	0.264	23.4333
	345	0.095	22.0216
	346	0.101	24.3326
	347	0.101	17.8216
	348	0.200	19.3042
	349	0.219	22.4031
	350	0.173	23.6636
	351	0.197	15.9188
	352	0.132	22.7802
	353	0.201	17.8193
	354	0.093	16.4104
	355	0.077	21.8782
	356	0.171	23.0303
	357	0.147	21.5010

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OBS	358	0.195	19.9875
	359	0.127	19.2349
	360	0.076	22.7144
	361	0.111	21.1837
	362	0.240	21.2908
	363	0.175	23.1285
	364	0.200	21.3253
	365	0.276	23.6584
	366	0.192	21.3424
	367	0.164	19.3251
	368	0.155	21.8827
	369	0.153	19.1607
	370	0.139	24.6156
	371	0.194	17.5558
	372	0.095	18.1523
	373	0.227	22.1553

OBS	374	0.173	20.2182
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OBS	375	0.116	16.5694
	376	0.216	23.2580
	377	0.106	15.2749
	378	0.057	20.8343
	379	0.182	23.2426
	380	0.235	19.1121
	381	0.217	24.1982
	382	0.191	23.0075
	383	0.198	22.2308
	384	0.105	22.9342
	385	0.172	18.5892
	386	0.109	22.0084
	387	0.181	17.4662
	388	0.158	20.1580
	389	0.145	17.0640
	390	0.184	23.3028
	391	0.115	21.5010

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OBS	392	0.076	21.7573
	393	0.119	20.8948
	394	0.134	18.4744
	395	0.212	19.4844
	396	0.100	22.4712
	397	0.156	17.0708
	398	0.152	24.3066
	399	0.153	23.1275
	400	0.141	21.1600
	401	0.178	21.3557
	402	0.253	22.9046
	403	0.180	21.7543
	404	0.207	22.2071
	405	0.252	19.1654
	406	0.070	23.9481
	407	0.170	22.7358
	408	0.192	20.3713

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OBS	409	0.108	21.4818
	410	0.129	15.9528
	411	0.068	15.7075
	412	0.202	19.8147
	413	0.148	19.7288
	414	0.193	18.5932
	415	0.138	22.9003
	416	0.158	19.1121
	417	0.234	22.0099
	418	0.176	18.0490
	419	0.207	23.1816
	420	0.171	22.6180
	421	0.102	19.0068
	422	0.184	23.1327
	423	0.240	20.7655
	424	0.225	23.5597
	425	0.101	23.6721

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OBS	TRT	WT	LGTH	SAS
426	6	0.159	21.5210	13:19 Tuesday, March 30, 1993 27
427	6	0.142	21.8965	
428	6	0.112	19.6939	
429	6	0.138	18.1746	
430	6	0.084	20.6565	
431	6	0.147	17.6960	
432	6	0.171	14.8903	
433	6	0.162	22.5176	
434	6	0.149	17.4694	
435	6	0.167	20.2274	
436	6	0.246	23.9575	
437	6	0.154	20.5169	
438	6	0.095	19.0782	
439	6	0.124	19.9498	
440	6	0.136	21.0030	
441	6	0.221	20.8650	
442	6	0.135	21.0580	
SAS 13:19 Tuesday, March 30, 1993 27				
OBS	TRT	WT	LGTH	
443	6	0.222	24.0654	
444	6	0.138	19.5056	
445	6	0.076	19.7185	
446	6	0.088	19.9389	
447	6	0.055	20.2386	
448	6	0.140	17.0318	
449	7	0.181	19.2096	
450	7	0.155	19.6597	
451	7	0.239	19.8461	
452	7	0.183	21.6282	
453	7	0.169	20.8623	
454	7	0.106	23.3028	
455	7	0.174	21.6271	
456	7	0.174	19.6507	
457	7	0.134	18.6990	
458	7	0.210	20.9103	
459	7	0.160	22.4409	
SAS 13:19 Tuesday, March 30, 1993 28				
OBS	TRT	WT	LGTH	
460	7	0.158	22.7130	
461	7	0.211	18.2457	
462	7	0.138	22.0040	
463	7	0.214	23.3392	
464	7	0.203	21.4815	
465	7	0.152	23.6561	
466	7	0.094	20.8623	
467	7	0.084	22.0007	
468	7	0.160	21.6361	
469	7	0.156	21.1194	
470	7	0.083	21.4751	
471	7	0.192	19.8347	
472	7	0.213	23.2663	
473	7	0.150	17.9488	
474	7	0.152	22.0594	
475	7	0.102	21.7614	
476	7	0.112	20.2530	
SAS 13:19 Tuesday, March 30, 1993 29				

477	7	0.111	20.2274	13:19 Tuesday, March 30, 1993 30
478	7	0.138	22.0143	
479	7	0.162	22.7144	
480	7	0.180	18.3196	
481	7	0.165	18.8233	
482	7	0.134	24.4907	
483	7	0.202	23.6790	
484	7	0.216	17.9122	
485	7	0.263	17.6212	
486	7	0.030	22.0319	
487	7	0.121	17.8470	
488	7	0.176	20.7378	
489	7	0.140	13.0742	
490	7	0.237	19.5917	
491	7	0.134	20.4881	
492	7	0.141	20.3800	
493	7	0.184	23.7114	
SAS 13:19 Tuesday, March 30, 1993 30				
OBS	TRT	WT	LGTH	
494	7	0.163	19.2303	
495	7	0.090	21.0461	
496	7	0.089	21.5119	
497	7	0.151	20.5591	
498	7	0.128	19.9161	
499	7	0.185	19.9125	
500	7	0.145	20.7460	
501	7	0.149	22.8993	
502	7	0.141	19.8791	
503	7	0.119	17.4402	
504	7	0.147	19.7873	
505	7	0.106	20.7503	
506	7	0.121	19.1620	
507	7	0.212	21.1489	
508	7	0.219	20.0748	
509	7	0.110	23.3403	
510	7	0.151	16.9202	
SAS 13:19 Tuesday, March 30, 1993 31				
OBS	TRT	WT	LGTH	
511	7	0.200	24.4182	
512	7	0.122	17.2175	
513	7	0.149	16.6687	
514	7	0.126	22.8515	
515	7	0.134	19.9774	
516	7	0.081	22.1360	
517	7	0.141	19.0421	
518	7	0.203	19.9875	
519	7	0.073	23.5116	
520	7	0.071	18.8563	
521	7	0.104	20.5988	
522	7	0.102	18.8632	
523	7	0.240	17.4953	
524	7	0.071	18.7047	
525	8	0.114	23.3375	
526	8	0.202	21.0348	
527	8	0.124	19.8787	
SAS 13:19 Tuesday, March 30, 1993 32				
OBS	TRT	WT	LGTH	
528	8	0.133	17.7123	
529	8	0.140	18.9518	
530	8	0.167	19.7201	

531	8	0.125	23.2792
532	8	0.111	16.9241
533	8	0.093	21.5086
534	8	0.131	20.8774
535	8	0.073	19.8604
536	8	0.163	19.7902
537	8	0.127	19.0166
538	8	0.137	21.5010
539	8	0.155	16.4153
540	8	0.067	20.2386
541	8	0.082	16.8618
542	8	0.069	18.3191
543	8	0.174	16.0201
544	8	0.130	18.9620

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OBS	TRT	WT	LGTH
545	8	0.088	21.8827
546	8	0.126	17.5761
547	8	0.129	18.9825
548	8	0.087	19.9320
549	8	0.149	19.6115
550	8	0.088	19.1654
551	8	0.140	19.9940
552	8	0.126	22.3937
553	8	0.121	18.2789
554	8	0.186	19.5665
555	8	0.211	19.0862
556	8	0.115	20.4881
557	8	0.106	22.8848
558	8	0.189	18.7047
559	8	0.111	19.8474
560	8	0.098	17.2175
561	8	0.110	18.9706

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OBS	TRT	WT	LGTH
562	8	0.169	20.8343
563	8	0.162	17.3649
564	8	0.091	21.0072
565	8	0.120	19.4187
566	8	0.163	18.7077
567	8	0.220	20.1343
568	8	0.148	19.4923
569	8	0.164	24.0775
570	8	0.152	21.3196
571	8	0.114	20.7460
572	8	0.143	20.3741
573	8	0.117	19.2235
574	8	0.083	20.4854
575	8	0.147	19.4857
576	8	0.126	20.2418
577	8	0.073	17.1930
578	8	0.105	19.0510

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585	8	0.128	19.8604
586	8	0.080	21.8167
587	8	0.092	21.4317
588	8	0.090	19.1121
589	8	0.171	16.3437
590	8	0.107	21.8871
591	8	0.117	17.3928
592	8	0.200	21.7335
593	8	0.110	20.8883
594	8	0.118	17.5913
595	8	0.181	18.4678

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OBS	TRT	WT	LGTH
596	8	0.111	21.1653
597	8	0.167	18.4534
598	8	0.180	15.2665
599	8	0.059	17.0318
600	8	0.102	18.2612
601	9	0.088	18.7405
602	9	0.088	16.6687
603	9	0.082	16.8051
604	9	0.067	17.6322
605	9	0.107	17.3262
606	9	0.095	18.2137
607	9	0.063	14.9283
608	9	0.098	16.5425
609	9	0.153	19.7595
610	9	0.086	20.1905
611	9	0.125	17.7857
612	9	0.081	18.0136

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OBS	TRT	WT	LGTH
613	9	0.094	22.0143
614	9	0.107	16.9432
615	9	0.090	20.1199
616	9	0.137	17.5724
617	9	0.068	16.3808
618	9	0.177	14.0756
619	9	0.106	15.2474
620	9	0.128	15.9933
621	9	0.136	21.8827
622	9	0.186	16.6789
623	9	0.075	19.1620
624	9	0.137	20.6584
625	9	0.081	15.6559
626	9	0.179	19.3970
627	9	0.074	18.5805
628	9	0.080	15.3188
629	9	0.048	19.1248

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OBS	TRT	WT	LGTH
630	9	0.138	16.5503
631	9	0.071	15.0793
632	9	0.099	21.5311
633	9	0.062	17.8475
634	9	0.068	17.4662
635	9	0.093	15.8577
636	9	0.073	16.4148
637	9	0.117	16.1464
638	9	0.065	14.2329

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OBS	TRT	WT	LGTH
639	9	0.101	18.6973
640	9	0.061	18.6713
641	9	0.150	17.2043
642	9	0.116	19.5917
643	9	0.080	15.5835
644	9	0.082	17.9897
645	9	0.084	18.3355
646	9	0.179	19.3970

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OBS	TRT	WT	LGTH
647	9	0.096	15.1387
648	9	0.129	16.4267
649	9	0.204	16.4252
650	9	0.071	21.7599
651	9	0.084	17.5563
652	9	0.070	16.8814
653	9	0.148	22.4121
654	9	0.058	20.7397
655	9	0.102	15.2659
656	9	0.085	16.7327
657	9	0.081	17.8271
658	9	0.101	17.5471
659	9	0.156	20.4561
660	9	0.138	16.7732
661	9	0.101	16.7138
662	9	0.060	19.3310
663	9	0.072	19.5205

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OBS	TRT	WT	LGTH
664	9	0.108	17.0986
665	9	0.118	16.0615
666	9	0.089	15.5251
667	9	0.138	20.2530
668	9	0.114	17.3019
669	9	0.075	18.7163
670	9	0.139	18.8112
671	9	0.161	18.7979
672	9	0.110	18.5513
673	9	0.106	18.2643
674	9	0.111	19.0068
675	9	0.068	21.0003
676	9	0.060	16.8507
677	9	0.118	18.9377
678	9	0.115	18.1094

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General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	8	1 3 4 5 6 7 8 9

Number of observations in data set = 678

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General Linear Models Procedure

Dependent Variable: WT	DF	Sum of Squares	Mean Square	F Value	Pr > F
Source					
Model	7	0.23253822	0.03321975	14.43	0.0001
Error	670	1.54272048	0.00230257		
Corrected Total	677	1.77525870			

R-Square	C.V.	Root MSE	WT Mean
0.130988	32.39814	0.047985	0.14811062

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General Linear Models Procedure

Dependent Variable: WT	DF	Type I SS	Mean Square	F Value	Pr > F
Source					
TRT	7	0.23253822	0.03321975	14.43	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	0.23253822	0.03321975	14.43	0.0001

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General Linear Models Procedure

Duncan's Multiple Range Test for variable: WT

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

Alpha= 0.05 df= 670 MSE= 0.002303

WARNING: Cell sizes are not equal.

Harmonic Mean of cell sizes= 80.10687

Number of Means 2 3 4 5 6 7 8

Critical Range .0151 .0158 .0163 .0167 .0170 .0173 .0175

Means with the same letter are not significantly different.

General Linear Models Procedure

Duncan Grouping	Mean	N	TRT
A	0.16338	152	1
A	0.15771	75	4
A	0.15689	70	6
A	0.15630	73	3
A	0.15214	78	5
A	0.15047	76	7

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B 0.13208 75 8
C 0.10325 79 9

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General Linear Models Procedure

Bonferroni (Dunn) T tests for variable: WT

NOTE: This test controls the type I experimentwise error rate but generally has a higher type II error rate than Tukey's for all pairwise comparisons.

Alpha= 0.05 Confidence= 0.95 df= 670 MSE= 0.002303
Critical Value of T= 3.13632

Comparisons significant at the 0.05 level are indicated by '***'.

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General Linear Models Procedure

Simultaneous
Lower Confidence Limit
Difference Between Means
Upper Confidence Limit

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
1 - 4	-0.01557	0.00567	0.02691
1 - 6	-0.01525	0.00649	0.02823
1 - 3	-0.01436	0.00707	0.02850
1 - 5	-0.00973	0.01123	0.03220
1 - 7	-0.00824	0.01290	0.03404
1 - 8	-0.01006	0.03130	0.05253
1 - 9	0.03925	0.06012	0.08100
4 - 1	-0.02691	-0.00567	0.01557
4 - 6	-0.02419	0.00082	0.02583
4 - 3	-0.02334	0.00141	0.02615

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General Linear Models Procedure

Simultaneous
Lower Confidence Limit
Difference Between Means
Upper Confidence Limit

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
4 - 5	-0.01877	0.00557	0.02990
4 - 7	-0.01726	0.00723	0.03173
4 - 8	0.00105	0.02563	0.05020
4 - 9	0.03019	0.05445	0.07872
6 - 1	-0.02823	-0.00649	0.01525
6 - 4	-0.02583	-0.00082	0.02419
6 - 3	-0.02459	0.00058	0.02576
6 - 5	-0.02003	0.00474	0.02952
6 - 7	-0.01852	0.00641	0.03134
6 - 8	-0.00021	0.02481	0.04982

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General Linear Models Procedure

Simultaneous
Lower Confidence Limit
Difference Between Means
Upper Confidence Limit

Limit Means Limit
Comparison

TRT Comparison	Limit	Means	Limit
6 - 9	0.02893	0.05363	0.07834
3 - 1	-0.02850	-0.00707	0.01436
3 - 4	-0.02615	-0.00141	0.02334
3 - 6	-0.02576	-0.00058	0.02459
3 - 5	-0.02035	0.00416	0.02867
3 - 7	-0.01884	0.00583	0.03049
3 - 8	-0.00052	0.02422	0.04897
3 - 9	0.02862	0.05305	0.07748
5 - 1	-0.03220	-0.01123	0.00973

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General Linear Models Procedure

Simultaneous
Lower Confidence Limit
Difference Between Means
Upper Confidence Limit

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
5 - 4	-0.02990	-0.00557	0.01877
5 - 6	-0.02952	-0.00474	0.02003
5 - 3	-0.02867	-0.00416	0.02035
5 - 7	-0.02259	0.00167	0.02592
5 - 8	-0.00428	0.02006	0.04440
5 - 9	0.02487	0.04889	0.07291
7 - 1	-0.03404	-0.01290	0.00824
7 - 4	-0.03173	-0.00723	0.01726
7 - 6	-0.03134	-0.00641	0.01852
7 - 3	-0.03049	-0.00583	0.01884

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General Linear Models Procedure

Simultaneous
Lower Confidence Limit
Difference Between Means
Upper Confidence Limit

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
7 - 5	-0.02592	-0.00167	0.02259
7 - 8	-0.00610	0.01839	0.04289
7 - 9	0.02304	0.04722	0.07140
8 - 1	-0.05253	-0.03130	-0.01006
8 - 4	-0.05020	-0.02563	-0.00105
8 - 6	-0.04982	-0.02481	0.00021
8 - 3	-0.04897	-0.02422	0.00052
8 - 5	-0.04440	-0.02006	0.00428
8 - 7	-0.04289	-0.01839	0.00610
8 - 9	0.00456	0.02883	0.05309

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General Linear Models Procedure

Simultaneous
Lower Confidence Limit
Difference Between Means
Upper Confidence Limit

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
9 - 1	-0.08100	-0.06012	-0.03925
9 - 4	-0.07872	-0.05445	-0.03019
9 - 6	-0.07834	-0.05363	-0.02893
9 - 3	-0.07748	-0.05305	-0.02862

R

9	-5	-0.07291	-0.04889	-0.02487	***
9	-7	-0.07140	-0.04722	-0.02304	***
9	-8	-0.05309	-0.02883	-0.00456	***

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General Linear Models Procedure

Dunnnett's T tests for variable: WT

NOTE: This tests controls the type I experimentwise error for comparisons of all treatments against a control.

Alpha= 0.05 Confidence= 0.95 df= 670 MSE= 0.002303
Critical Value of Dunnnett's T= 2.662

Comparisons significant at the 0.05 level are indicated by '***'.

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General Linear Models Procedure

Comparison	Simultaneous		Simultaneous	
	Lower Confidence Limit	Difference Between Means	Upper Confidence Limit	
TRT	-0.02370	-0.00567	0.01236	
4	-0.02494	-0.00649	0.01196	
6	-0.02527	-0.00707	0.01112	
3	-0.02903	-0.01123	0.00656	
5	-0.03085	-0.01290	0.00505	
7	-0.04932	-0.03130	0.01327	***
8	-0.07784	-0.06012	-0.04240	***
9	-	-	-	***

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General Linear Models Procedure

Class Level Information

Class	Levels	Values
TRT	8	1 3 4 5 6 7 8 9

Number of observations in data set = 678

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General Linear Models Procedure

Dependent Variable: LGTH

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	7	505.0861381	72.1551626	14.72	0.0001
Error	670	3283.7237442	4.9010802		
Corrected Total	677	3788.8098823			

R-Square C.V. Root MSE LGTH Mean

0.133310	11.00016	2.213838	20.1255044
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General Linear Models Procedure

Dependent Variable: LGTH

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	7	505.0861381	72.1551626	14.72	0.0001
Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	505.0861381	72.1551626	14.72	0.0001

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General Linear Models Procedure

Duncan's Multiple Range Test for variable: LGTH

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

Alpha= 0.05 df= 670 MSE= 4.90108
WARNING: Cell sizes are not equal.
Harmonic Mean of cell sizes= 80.10687

Number of Means 2 3 4 5 6 7 8
Critical Range 0.695 0.731 0.754 0.771 0.786 0.798 0.807
Means with the same letter are not significantly different.

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General Linear Models Procedure

Duncan Grouping

Mean	N	TRT
20.703	75	4
20.699	70	6
20.524	76	7
20.520	78	5
20.436	152	1
20.404	73	3
19.656	75	8
17.887	79	9

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General Linear Models Procedure

Bonferroni (Dunn) T tests for variable: LGTH

NOTE: This test controls the type I experimentwise error rate but

Alpha = 0.05 Confidence = 0.95 df = 670 MSE = 4.90108
Critical Value of T = 3.13632

Comparisons significant at the 0.05 level are indicated by '***'.

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General Linear Models Procedure

Comparison	TRT	Simultaneous		Difference Between Means	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
6 - 4	-6	-1.150	0.004	0.004	1.158	1.309
6 - 7	-7	-0.951	0.179	0.183	1.309	1.306
6 - 5	-5	-0.940	0.183	0.267	1.247	1.440
4 - 1	-1	-0.713	0.267	0.299	2.181	3.936
4 - 3	-3	-0.843	0.299	1.047	2.181	3.936
4 - 8	-8	-0.086	1.047	2.816	***	***
4 - 9	-9	1.697	2.816	***	***	***
6 - 4	-4	-1.158	-0.004	-0.004	1.150	1.326
6 - 7	-7	-0.975	0.176	0.179	1.326	1.322
6 - 5	-5	-0.964	0.179	0.179	1.322	1.322

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General Linear Models Procedure

Comparison	TRT	Simultaneous		Difference Between Means	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
6 - 1	-1	-0.740	0.263	0.263	1.266	1.437
6 - 3	-3	-0.866	0.295	1.044	2.198	3.952
6 - 8	-8	-0.110	1.044	2.813	***	***
6 - 9	-9	1.673	2.813	***	***	***
7 - 4	-4	-1.309	-0.179	-0.179	0.951	0.975
7 - 6	-6	-1.326	-0.176	0.004	1.123	1.063
7 - 5	-5	-1.116	0.004	0.088	1.258	1.998
7 - 1	-1	-0.888	0.088	0.120	1.998	1.998
7 - 3	-3	-1.018	0.120	0.868	1.998	1.998
7 - 8	-8	-0.262	0.868	***	***	***

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General Linear Models Procedure

Comparison	TRT	Simultaneous		Difference Between Means	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
7 - 9	-9	1.521	2.637	3.753	***	***
5 - 4	-4	-1.306	-0.183	0.940	0.940	0.964
5 - 6	-6	-1.322	-0.179	0.004	1.116	1.051
5 - 7	-7	-1.123	0.004	0.084	1.247	1.988
5 - 1	-1	-0.883	0.084	0.116	1.988	1.988
5 - 3	-3	-1.015	0.116	0.865	1.988	1.988
5 - 8	-8	-0.258	0.865	2.633	***	***
5 - 9	-9	1.525	2.633	***	***	***

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General Linear Models Procedure

Comparison	TRT	Simultaneous		Difference Between Means	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
1 - 4	-4	-1.247	-0.267	0.713	0.713	0.883
1 - 6	-6	-1.063	-0.088	0.088	0.883	0.883
1 - 7	-7	-1.051	-0.084	0.084	1.021	1.021
1 - 5	-5	-0.957	0.032	0.780	1.760	1.760
1 - 8	-8	-0.199	0.780	2.549	3.512	3.512
1 - 9	-9	1.586	2.549	***	***	***
3 - 4	-4	-1.440	-0.299	0.843	0.843	0.866
3 - 6	-6	-1.457	-0.295	0.295	1.018	1.018
3 - 7	-7	-1.258	-0.120	0.116	1.015	1.015
3 - 5	-5	-1.247	-0.116	***	***	***

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General Linear Models Procedure

Comparison	TRT	Simultaneous		Difference Between Means	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
3 - 1	-1	-1.021	-0.032	0.957	0.957	0.957
3 - 8	-8	-0.393	0.749	1.890	3.645	3.645
3 - 9	-9	1.390	2.517	***	***	***
8 - 4	-4	-2.181	-1.047	0.086	0.086	0.110
8 - 6	-6	-2.198	-1.044	0.262	0.262	0.262
8 - 7	-7	-1.998	-0.865	0.258	0.258	0.258
8 - 5	-5	-1.988	-0.865	0.199	0.199	0.199
8 - 1	-1	-1.760	0.199	0.393	0.393	0.393
8 - 3	-3	-1.890	0.393	1.769	2.888	2.888
8 - 9	-9	0.649	1.769	***	***	***

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General Linear Models Procedure

Comparison	TRT	Simultaneous		Difference Between Means	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
4 - 4	-4	-3.936	-2.816	-1.697	***	***
4 - 6	-6	-3.952	-2.813	-1.673	***	***
4 - 7	-7	-3.753	-2.637	-1.521	***	***
4 - 5	-5	-3.742	-2.633	-1.525	***	***
4 - 1	-1	-3.512	-2.549	-1.386	***	***
4 - 3	-3	-3.645	-2.517	-1.390	***	***
4 - 8	-8	-2.888	-1.769	-0.649	***	***

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General Linear Models Procedure

Dunnett's T tests for variable: LGTH

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NOTE: This tests controls the type I experimentwise error for comparisons of all treatments against a control.

Alpha= 0.05 Confidence= 0.95 df= 670 MSE= 4.90108
Critical Value of Dunnett's t= 2.662

Comparisons significant at the 0.05 level are indicated by ***.

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General Linear Models Procedure

TRT Comparison	Simultaneous		Difference Between Means	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit		Lower Confidence Limit	Upper Confidence Limit
4 - 1	-0.565	1.099	0.267	-0.565	1.099
6 - 1	-0.588	1.115	0.263	-0.588	1.115
7 - 1	-0.740	0.916	0.088	-0.740	0.916
5 - 1	-0.737	0.905	0.084	-0.737	0.905
3 - 1	-0.871	0.807	-0.032	-0.871	0.807
8 - 1	-1.612	0.051	-0.780	-1.612	0.051
9 - 1	-3.367	-1.732	-2.549	-3.367	-1.732

RH-7592: Survival of Exposed FHM Larvae
File: 42041001.sur Transform: NO TRANSFORMATION

Chi-square test for normality: actual and expected frequencies

INTERVAL	<-1.5	-1.5 to <-0.5	-0.5 to 0.5	>0.5 to 1.5	>1.5
EXPECTED	2.412	8.712	13.752	8.712	2.412
OBSERVED	0	11	18	7	0

Calculated Chi-Square goodness of fit test statistic = 7.0735

Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

.RH-7592: Survival of Exposed FHM Larvae
File: 42041001.sur Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 0.045

W = 0.958

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

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

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

RH-7592: Survival of Exposed FHM Larvae

File: 42041001.sur

Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 6.67

Closest, conservative, Table H statistic = 281.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 9, df (# reps-1) = 3

Actual values ==> R (# groups) = 9, 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).

RH-7592: Survival of Exposed FHM Larvae
File: 42041001.sur Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 5.69
Table Chi-square value = 20.09 (alpha = 0.01)
Table Chi-square value = 15.51 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 8

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: RH-7592: Survival of Exposed FHM Larvae

FILE: 42041001.sur

TRANSFORM: NO TRANSFORMATION

NUMBER OF GROUPS: 9

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Solvent Control	1	1.0000	1.0000
1	Solvent Control	2	0.9000	0.9000
1	Solvent Control	3	0.9500	0.9500
1	Solvent Control	4	0.9500	0.9500
2	Control	1	0.9500	0.9500
2	Control	2	0.9000	0.9000
2	Control	3	1.0000	1.0000
2	Control	4	0.9500	0.9500
3	0.0097 mg ai/l	1	0.8500	0.8500
3	0.0097 mg ai/l	2	0.9500	0.9500
3	0.0097 mg ai/l	3	1.0000	1.0000
3	0.0097 mg ai/l	4	0.9000	0.9000
4	0.0.013 mg ai/l	1	0.9500	0.9500
4	0.0.013 mg ai/l	2	0.9500	0.9500
4	0.0.013 mg ai/l	3	0.9000	0.9000
4	0.0.013 mg ai/l	4	0.9500	0.9500
5	0.02 mg ai/l	1	0.9500	0.9500
5	0.02 mg ai/l	2	1.0000	1.0000
5	0.02 mg ai/l	3	0.9500	0.9500
5	0.02 mg ai/l	4	1.0000	1.0000
6	0.047 mg ai/l	1	0.9500	0.9500
6	0.047 mg ai/l	2	0.9000	0.9000
6	0.047 mg ai/l	3	0.8700	0.8700
6	0.047 mg ai/l	4	1.0000	1.0000
7	0.082 mg ai/l	1	0.9000	0.9000
7	0.082 mg ai/l	2	0.9500	0.9500
7	0.082 mg ai/l	3	0.9500	0.9500
7	0.082 mg ai/l	4	1.0000	1.0000
8	0.016 mg ai/l	1	0.9500	0.9500
8	0.016 mg ai/l	2	0.9500	0.9500
8	0.016 mg ai/l	3	0.9000	0.9000
8	0.016 mg ai/l	4	0.9500	0.9500
9	0.33 mg ai/l	1	1.0000	1.0000
9	0.33 mg ai/l	2	0.9500	0.9500
9	0.33 mg ai/l	3	1.0000	1.0000
9	0.33 mg ai/l	4	1.0000	1.0000

RH-7592: Survival of Exposed FHM Larvae

File: 42041001.sur

Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	8	0.013	0.002	0.999
Within (Error)	27	0.045	0.002	
Total	35	0.059		

Critical F value = 2.31 (0.05,8,27)

Since $F < \text{Critical } F$ FAIL TO REJECT H_0 : All groups equal

RH-7592: Survival of Exposed FHM Larvae

File: 42041001.sur

Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Solvent Control	0.950	0.950		
2	Control	0.950	0.950	-0.000	
3	0.0097 mg ai/l	0.925	0.925	0.862	
4	0.0.013 mg ai/l	0.938	0.938	0.431	
5	0.02 mg ai/l	0.975	0.975	-0.862	
6	0.047 mg ai/l	0.930	0.930	0.690	
7	0.082 mg ai/l	0.950	0.950	0.000	
8	0.016 mg ai/l	0.938	0.938	0.431	
9	0.33 mg ai/l	0.988	0.988	-1.293	

Dunnett table value = 2.53 (1 Tailed Value, P=0.05, df=24,8)

RH-7592: Survival of Exposed FHM Larvae

File: 42041001.sur

Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 2 OF 2

Ho:Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	Solvent Control	4			
2	Control	4	0.073	7.7	-0.000
3	0.0097 mg ai/l	4	0.073	7.7	0.025
4	0.0.013 mg ai/l	4	0.073	7.7	0.012
5	0.02 mg ai/l	4	0.073	7.7	-0.025
6	0.047 mg ai/l	4	0.073	7.7	0.020
7	0.082 mg ai/l	4	0.073	7.7	0.000
8	0.016 mg ai/l	4	0.073	7.7	0.012
9	0.33 mg ai/l	4	0.073	7.7	-0.038

RH-7592: Hatchability of Exposed FHM Embryos

File: 42041001.hat

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	2.412	8.712	13.752	8.712	2.412
OBSERVED	0	9	22	5	0

Calculated Chi-Square goodness of fit test statistic = 11.3620

Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

RH-7592: Hatchability of Exposed FHM Embryos

File: 42041001.hat

Transform: ARC SINE(SQUARE ROOT(Y))

Hartley test for homogeneity of variance

Bartlett's 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: RH-7592: Hatchability of Exposed FHM Embryos

FILE: 42041001.hat

TRANSFORM: ARC SINE(SQUARE ROOT(Y))

NUMBER OF GROUPS: 9

GRP	IDENTIFICATION	REP	VALUE	TRANS VALUE
1	Solvent Control	1	1.0000	1.4588
1	Solvent Control	2	0.9500	1.3453
1	Solvent Control	3	1.0000	1.4588
1	Solvent Control	4	0.9500	1.3453
2	Control	1	1.0000	1.4588
2	Control	2	0.9500	1.3453
2	Control	3	1.0000	1.4588
2	Control	4	1.0000	1.4588
3	0.0097 mg ai/l	1	0.9000	1.2490
3	0.0097 mg ai/l	2	1.0000	1.4588
3	0.0097 mg ai/l	3	1.0000	1.4588
3	0.0097 mg ai/l	4	1.0000	1.4588
4	0.0.013 mg ai/l	1	1.0000	1.4588
4	0.0.013 mg ai/l	2	0.9500	1.3453
4	0.0.013 mg ai/l	3	1.0000	1.4588
4	0.0.013 mg ai/l	4	1.0000	1.4588
5	0.02 mg ai/l	1	1.0000	1.4588
5	0.02 mg ai/l	2	1.0000	1.4588
5	0.02 mg ai/l	3	1.0000	1.4588
5	0.02 mg ai/l	4	1.0000	1.4588
6	0.047 mg ai/l	1	1.0000	1.4588
6	0.047 mg ai/l	2	0.9500	1.3453
6	0.047 mg ai/l	3	1.0000	1.4588
6	0.047 mg ai/l	4	1.0000	1.4588
7	0.082 mg ai/l	1	0.9500	1.3453
7	0.082 mg ai/l	2	0.9500	1.3453
7	0.082 mg ai/l	3	1.0000	1.4588
7	0.082 mg ai/l	4	1.0000	1.4588
8	0.016 mg ai/l	1	0.9500	1.3453
8	0.016 mg ai/l	2	0.9500	1.3453
8	0.016 mg ai/l	3	0.9500	1.3453
8	0.016 mg ai/l	4	1.0000	1.4588
9	0.33 mg ai/l	1	1.0000	1.4588
9	0.33 mg ai/l	2	0.9500	1.3453
9	0.33 mg ai/l	3	1.0000	1.4588
9	0.33 mg ai/l	4	1.0000	1.4588

RH-7592: Hatchability of Exposed FHM Embryos

File: 42041001.hat

Transform: ARC SINE(SQUARE ROOT(Y))

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2 (p=0.05)

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	Solvent Control	1.402	0.975	63.000
2	Control	1.430	0.988	80.500
3	0.0097 mg ai/l	1.406	0.975	74.500
4	0.0.013 mg ai/l	1.430	0.988	80.500
5	0.02 mg ai/l	1.459	1.000	98.000
6	0.047 mg ai/l	1.430	0.988	80.500
7	0.082 mg ai/l	1.402	0.975	63.000
8	0.016 mg ai/l	1.374	0.962	45.500
9	0.33 mg ai/l	1.430	0.988	80.500

Calculated H Value = 5.998

Critical H Value Table = 15.510

Since Calc H < Crit H FAIL TO REJECT Ho: All groups are equal.

RH-7592: Hatchability of Exposed FHM Embryos

File: 42041001.hat

Transform: ARC SINE(SQUARE ROOT(Y))

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2 (p=0.05)

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP									
				0	0	0	0	0	0	0	0	0	0
				8	7	1	3	6	4	2	9	5	
8	0.016 mg ai/l	1.374	0.962	\									
7	0.082 mg ai/l	1.402	0.975	.	\								
1	Solvent Control	1.402	0.975	.	.	\							
3	0.0097 mg ai/l	1.406	0.975	.	.	.	\						
6	0.047 mg ai/l	1.430	0.988	.	.	.	.	\					
4	0.0.013 mg ai/l	1.430	0.988	.	.	.	.	.	\				
2	Control	1.430	0.988	.	.	.	.	.	.	\			
9	0.33 mg ai/l	1.430	0.988	.	.	.	.	.	.	.	\		
5	0.02 mg ai/l	1.459	1.000	.	.	.	.	.	.	.	.	\	

* = significant difference (p=0.05)

Table q value (0.05,9) = 3.197

. = no significant difference

SE = 6.124

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DATABASE ENTRY FORM
FOR ACUTE OR CHRONIC TOXICITY STUDIES

1. Chemical RH-7592 Shaughnessy 129011
2. Common Name Of Organism Tested Fathead Minnow
3. Scientific Name Pimephales promelas
4. Age Of Organisms <24 hours
5. Guideline No. 72-4
6. Type Of Dosing Method (Circle One) Or Study
1. Oral 2. Dietary 3. Reproduction 4. Static
5. Static Renewal 6. Flowthrough 7. Acute Contact
8. Other _____
7. % AI Of Test Substance 96.7%
8. Study Duration (Hrs Or Days) 35 days
9. Dose Type (Circle One) A. LD50 B. LC50 C. EC50 D. MATC
10. Toxicity Level A. mg/kg B. ppm C. mg/l D. µg/l E. ng/l
F. µg/bee G. Other _____
11. 95% C.L.s NA LC₅₀ = NA
12. Curve Slope NA
13. NOEL 0.082 mg ai/l LOEL = 0.16 mg ai/l
14. Study Date (YEAR) 1991
15. Study Review Date (YEAR) 1992
16. Category (Circle One) CORE SUPPLEMENTAL INVALID
17. MRID or Accession Number 420410-01
18. Laboratory Analytical Bio-Chemistry Laboratories, INC.
19. Reviewer Rosemary Graham Mora
20. For Reproductive Studies (avian or aquatic) Indicate Which Parameter Affected At What Toxicity Level.
Eggs Laid _____ % Cracked _____ % Viable _____
% Live Embryos _____ % Eggs hatched _____ 14D Survivors _____
Growth Effectuated at _____ Other Effects _____