

US EPA ARCHIVE DOCUMENT

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>

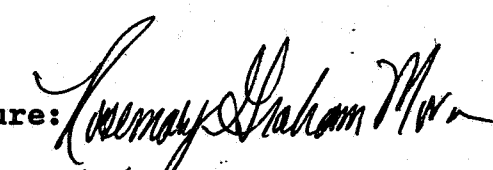
DATA EVALUATION RECORD

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:



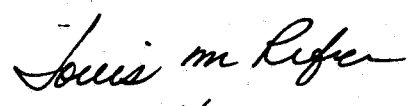
Date:

12/3/92

6. **APPROVED BY:**

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

Signature:

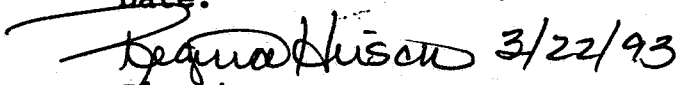


Date:

12/4/92

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

Signature:



Date:

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 2-1 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 CaCO₃, 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
1	1	0.309	20.4818
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
18	1	0.099	17.0132
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
35	1	0.271	21.7633
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

OBS	TRT	WT	LGTH
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
69	1	0.147	19.7251
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	26.3146
78	1	0.177	25.0693
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
86	1	0.189	22.9162
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	21.1517
100	1	0.144	18.1790
101	1	0.239	21.3818
102	1	0.172	18.3196

13

OBS	TRT	SAS	WT	LGTH
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	TRT	SAS	WT	LGTH
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	TRT	SAS	WT	LGTH
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	TRT	SAS	WT	LGTH
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	TRT	SAS	WT	LGTH
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	TRT	SAS	WT	LGTH
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	TRT	SAS	WT	LGTH
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	

Handwritten mark resembling a stylized '4' or 'h'.

OBS	TRT	WT	LGTH
212	3	0.120	23.4575
213	3	0.219	16.4940
214	3	0.149	22.0782
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

SAS 13:19 Tuesday, March 30, 1993 14

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	3	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

SAS 13:19 Tuesday, March 30, 1993 15

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	20.4917
254	4	0.121	14.9759
255	4	0.187	21.5010

SAS 13:19 Tuesday, March 30, 1993 16

OBS	TRT	WT	LGTH
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

SAS 13:19 Tuesday, March 30, 1993 17

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

SAS 13:19 Tuesday, March 30, 1993 18

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

SAS 13:19 Tuesday, March 30, 1993 19

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

5

OBS	320	0.206	23.1016
SAS	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	19.5929
	331	0.107	18.4744
	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	374	0.173	20.2182
SAS	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

SAS 13:19 Tuesday, March 30, 1993 24

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

SAS 13:19 Tuesday, March 30, 1993 25

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

SAS 13:19 Tuesday, March 30, 1993 26

26

OBS	TRT	WT	LGTH
426	6	0.159	21.5210
427	6	0.142	21.8945
428	6	0.112	19.6939
429	6	0.138	18.1746
430	6	0.084	20.6565
431	6	0.147	17.6940
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	20.9623
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

OBS	TRT	WT	LGTH
477	7	0.111	20.2274
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



OBS	TRT	WT	LGTH	SAS
531	8	0.125	23.2792	13:19 Tuesday, March 30, 1993 33
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	

OBS	TRT	WT	LGTH	SAS
545	8	0.088	21.8827	13:19 Tuesday, March 30, 1993 34
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	

OBS	TRT	WT	LGTH	SAS
562	8	0.169	20.8343	13:19 Tuesday, March 30, 1993 35
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	

OBS	TRT	WT	LGTH	SAS
585	8	0.128	19.8604	13:19 Tuesday, March 30, 1993 36
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	

OBS	TRT	WT	LGTH	SAS
596	8	0.111	21.1653	13:19 Tuesday, March 30, 1993 37
597	8	0.167	18.4534	
598	8	0.180	15.2665	
599	8	0.039	17.0318	
600	8	0.102	18.2612	
601	9	0.082	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	

OBS	TRT	WT	LGTH	SAS
613	9	0.094	22.0143	13:19 Tuesday, March 30, 1993 38
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	

18

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	15.5833
644	9	0.082	17.9897
645	9	0.084	18.3355
646	9	0.179	19.3970

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

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	17.5019
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

SAS 13:19 Tuesday, March 30, 1993 41

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

SAS 13:19 Tuesday, March 30, 1993 42

General Linear Models Procedure

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

R-Square 0.130988 C.V. 0.047985 Root MSE 0.14811062

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	7	0.23253822	0.03321975	14.43	0.0001
Source	DF	Type III SS <th>Mean Square</th> <th>F Value</th> <th>Pr > F</th>	Mean Square	F Value	Pr > F
TRT	7	0.23253822	0.03321975	14.43	0.0001

SAS 13:19 Tuesday, March 30, 1993 44

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.

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

SAS 13:19 Tuesday, March 30, 1993 45

General Linear Models Procedure

61

Comparison	B	0.13208	75	8
	C	0.10325	79	9

SAS 13:19 Tuesday, March 30, 1993 46
 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 '****'.

SAS 13:19 Tuesday, March 30, 1993 47

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 4	-0.01557	0.02691
1 - 6	-0.01525	0.02823
1 - 3	-0.01436	0.02850
1 - 5	-0.00973	0.03220
1 - 7	-0.00824	0.03404
1 - 8	-0.01006	0.03253
1 - 9	0.03925	0.08100

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 1	-0.02691	0.01557
1 - 6	-0.02419	0.02583
1 - 3	-0.02334	0.02615

SAS 13:19 Tuesday, March 30, 1993 48

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 5	-0.01877	0.02990
1 - 7	-0.01726	0.03173
1 - 8	-0.00105	0.05020
1 - 9	0.03019	0.07872
1 - 1	-0.02823	0.01525
1 - 4	-0.02583	0.02419
1 - 3	-0.02459	0.02576
1 - 5	-0.02003	0.00474
1 - 7	-0.01852	0.00641
1 - 8	-0.00021	0.02481

SAS 13:19 Tuesday, March 30, 1993 49

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 1	-0.08100	0.06012
1 - 4	-0.07872	0.05445
1 - 6	-0.07834	0.02893
1 - 3	-0.07748	0.05305

Comparison	Limit	Means	Limit
6 - 9	0.02893	0.05363	0.07834

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

SAS 13:19 Tuesday, March 30, 1993 50

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 4	-0.02990	0.00557
1 - 6	-0.02952	0.00474
1 - 3	-0.02867	0.00416
1 - 7	-0.02259	0.00167
1 - 8	-0.00428	0.02006
1 - 9	0.02487	0.04889
1 - 1	-0.03404	-0.01290
1 - 4	-0.03173	-0.00723
1 - 6	-0.03134	-0.00641
1 - 3	-0.03049	-0.00583

SAS 13:19 Tuesday, March 30, 1993 51

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 5	-0.02592	0.00167
1 - 8	-0.00610	0.01839
1 - 9	0.02304	0.04722
1 - 1	-0.05253	-0.03130
1 - 4	-0.05020	-0.02563
1 - 6	-0.04982	-0.02481
1 - 3	-0.04897	-0.02422
1 - 5	-0.04440	-0.02006
1 - 7	-0.04289	-0.01839
1 - 9	0.00456	0.02883

SAS 13:19 Tuesday, March 30, 1993 52

General Linear Models Procedure

Comparison	Simultaneous	
	Lower Confidence Limit	Upper Confidence Limit
TRT		
1 - 1	-0.08100	0.06012
1 - 4	-0.07872	0.05445
1 - 6	-0.07834	0.02893
1 - 3	-0.07748	0.05305

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

SAS 13:19 Tuesday, March 30, 1993 53

General Linear Models Procedure

Dunnett's T tests for variable: LGTH

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 Dunnett's T= 2.662

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

SAS 13:19 Tuesday, March 30, 1993 54

General Linear Models Procedure

Simultaneous

TRT Comparison	Lower Confidence Limit		Difference Between Means	Upper Confidence Limit	
	Limit	Limit		Limit	Limit
4 - 1	-0.02370	-0.00567	0.01236	0.01196	0.01196
6 - 1	-0.02494	-0.00649	0.01196	0.01112	0.00656
3 - 1	-0.02527	-0.00707	0.01112	0.00656	0.00505
5 - 1	-0.02903	-0.01123	0.00656	0.00505	0.00505
7 - 1	-0.03085	-0.01290	0.00505	0.01327	0.01327
8 - 1	-0.04932	-0.03130	0.01327	0.04240	0.04240
9 - 1	-0.07784	-0.06012	0.04240	0.04240	0.04240

SAS 13:19 Tuesday, March 30, 1993 55

General Linear Models Procedure

Class Level Information

Number of observations in data set = 678

SAS 13:19 Tuesday, March 30, 1993 56

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

SAS 13:19 Tuesday, March 30, 1993 57

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

SAS 13:19 Tuesday, March 30, 1993 58

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.

SAS 13:19 Tuesday, March 30, 1993 59

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

SAS 13:19 Tuesday, March 30, 1993 60

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 '****'.

SAS 13:19 Tuesday, March 30, 1993 61
 General Linear Models Procedure

Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
6	-6	-1.150	1.158
4	-7	-0.951	1.309
4	-5	-0.940	1.306
4	-1	-0.713	1.247
4	-3	-0.843	1.440
4	-8	-0.086	2.181
4	-9	1.697	3.936

General Linear Models Procedure			
Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
6	-4	-1.158	1.150
6	-7	-0.975	1.326
6	-5	-0.964	1.322

SAS 13:19 Tuesday, March 30, 1993 62
 General Linear Models Procedure

Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
6	-1	-0.740	1.265
6	-3	-0.866	1.457
6	-8	-0.110	2.198
6	-9	1.673	3.952

General Linear Models Procedure			
Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
7	-4	-1.309	0.951
7	-6	-1.326	0.975
7	-5	-1.116	1.123
7	-1	-0.888	1.063
7	-3	-1.018	1.258
7	-8	-0.262	1.998

SAS 13:19 Tuesday, March 30, 1993 63
 General Linear Models Procedure

Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
7	-9	1.521	3.753

General Linear Models Procedure			
Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
5	-4	-1.306	0.940
5	-6	-1.322	0.964
5	-7	-1.123	1.116
5	-1	-0.883	1.051
5	-3	-1.015	1.247
5	-8	-0.258	1.988
5	-9	1.525	3.742

SAS 13:19 Tuesday, March 30, 1993 64

General Linear Models Procedure

Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
1	-4	-1.247	0.713

General Linear Models Procedure			
Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
1	-6	-1.266	0.740
1	-7	-1.063	0.888
1	-5	-1.051	0.883
1	-3	-0.957	1.021
1	-8	-0.199	0.780
1	-9	1.586	3.512

General Linear Models Procedure			
Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
3	-4	-1.440	0.843
3	-6	-1.457	0.866
3	-7	-1.258	1.018
3	-5	-1.247	1.015

SAS 13:19 Tuesday, March 30, 1993 65
 General Linear Models Procedure

Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
3	-1	-1.021	0.957
3	-8	-0.393	1.890
3	-9	1.390	3.645

General Linear Models Procedure			
Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
8	-4	-2.181	0.086
8	-6	-2.198	0.110
8	-7	-1.998	0.262
8	-5	-1.988	0.258
8	-1	-1.760	0.199
8	-3	-1.890	0.393
8	-9	0.649	2.888

SAS 13:19 Tuesday, March 30, 1993 66
 General Linear Models Procedure

Comparison	TRT	Simultaneous	
		Lower Confidence Limit	Upper Confidence Limit
9	-4	-3.936	-1.697
9	-6	-3.952	-1.673
9	-7	-3.753	-1.521
9	-5	-3.742	-1.525
9	-1	-3.512	-1.386
9	-3	-3.645	-1.390
9	-8	-2.888	-0.649

SAS 13:19 Tuesday, March 30, 1993 67
 General Linear Models Procedure

Dunnnett's T tests for variable: LGTH

22

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 '***'.

SAS 13:19 Tuesday, March 30, 1993 68

General Linear Models Procedure

Comparison	TRI	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	1.099	
6	-1	-0.588	1.115	0.263	1.115	
7	-1	-0.740	0.916	0.088	0.916	
5	-1	-0.737	0.905	0.084	0.905	
3	-1	-0.871	0.807	-0.032	0.807	
8	-1	-1.612	0.051	-0.780	0.051	***
9	-1	-3.367	-1.732	-2.549	-1.732	***

23

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		
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) . = no significant difference
 Table q value (0.05,9) = 3.197 SE = 6.124

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 Effected at _____ Other Effects _____