

## DATA EVALUATION RECORD

1. **CHEMICAL:** Acetochlor  
Shaughnessey No. 121601.
2. **TEST MATERIAL:** Acetochlor technical; 2-chloro-N-ethoxymethyl-6'-ethylacet-o-toluidide; sample identification 11691-36-01; 89.7% w/w active ingredient; a brown liquid.
3. **STUDY TYPE:** Fish Early Life-Stage Toxicity Test. Species Tested: fathead minnow (*Pimephales promelas*).
4. **CITATION:** Tapp, J.F., J.E. Caunter, and R.D. Stanley. 1989. Acetochlor: Determination of Chronic Toxicity to Fathead Minnow (*Pimephales promelas*) Embryos and Larvae. Report No. BL/B/3669. Prepared by ICI PLC, Brixham Laboratory, Brixham, Devon, UK. Submitted by ICI Americas, Inc. EPA MRID No. 415920-11.
5. **REVIEWED BY:**  
  
Louis M. Rifici, M.S.  
Associate Scientist  
KBN Engineering and  
Applied Sciences, Inc.  
  
Signature: *Louis M. Rifici*  
Date: *10/4/91*
6. **APPROVED BY:**  
  
Pim Kosalwat, Ph.D.  
Senior Scientist  
KBN Engineering and  
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Signature: *P. Kosalwat*  
Date: *10/4/91*  
  
Henry T. Craven, M.S.  
Supervisor, EEB/EFED  
USEPA  
  
Signature: *William B. Robert 10/19/93*  
Date: *H.T. Craven 12/2/93*
7. **CONCLUSIONS:** This study is scientifically sound and meets the requirements for an early life-stage toxicity test using fathead minnows. After 36 days of exposure, the MATC of Acetochlor technical for fathead minnows, based upon the most sensitive biological parameter (fish survival) was >450 and <797  $\mu\text{g/l}$  mean measured concentrations (geometric mean MATC = 599  $\mu\text{g/l}$ ).
8. **RECOMMENDATIONS:** N/A.
9. **BACKGROUND:**
10. **DISCUSSION OF INDIVIDUAL TESTS:** N/A.

**11. MATERIALS AND METHODS:**

- A. **Test Animals:** Fathead minnow embryos (*Pimephales promelas*) were obtained from brood stock cultured at ICI Group Environmental Laboratory, Brixham. The fish were fed a diet of Promin® with occasional supplements. Embryos (<24 hours old) from 5 spawning females were pooled in a dish filled with dilution water before distribution to the egg incubation cups.
- B. **Test System:** A flow-through test system, designed to deliver five nominal concentrations of test material, a dilution water control, and a solvent control, was employed in this study. Each glass test vessel (30 X 21 X 20 cm) maintained a constant solution volume of 9.2 l with solution depth of 15 cm. Embryo incubation cups were constructed from glass tubing (length of 8 cm, outer diameter of 5 cm) with nylon screen (0.47 mm mesh) cemented to the bottom. The embryo cups were suspended in the test vessels and oscillated 2.5 cm at a rate of 2 oscillations/minute. The test temperature was 25 ±1°C. The photoperiod was 16 hours of light and 8 hours of darkness.

Stock solutions were prepared for each concentration by adding the appropriate amount of test material to dimethylformamide (DMF) in 500 ml glass jars and stirred for 60 seconds. The jars were placed on magnetic stirrers and were continuously stirred during the test. The stock jars were replenished weekly.

The stock solution was delivered to each mixing chamber via a peristaltic pump. Dilution water was supplied from an aerated, temperature-controlled tank to each mixing chamber at a nominal rate of 300 ml/minute. The mixing chambers were fitted with magnetic stirrers to ensure adequate mixing. These chambers were also devised to split the flow to each of the two duplicate test vessels. The flow rates of the stocks and of the dilution water were measured on day 0 and thereafter three times per week. Each replicate tank received test solution at a rate of 8 volume replacements/day. The test solutions were not aerated during the study.

The dilution water was tap water supplied from a reservoir (retention time of 24 hours). This supply was dechlorinated with sodium thiosulfate, carbon-filtered, UV-sterilized and filtered (1 µm) before delivery to the laboratory. A characterization of the water was given in Table 13 (attached).

- C. **Dosage:** Thirty-six-day, embryo-larval, flow-through toxicity test. Five nominal test concentrations (50, 100, 200, 400, and 800  $\mu\text{g/l}$ ) were selected for this study. A dilution water control and a solvent control (33  $\mu\text{l DMF/l}$ ) were also used. The test concentrations were based on the total product.
- D. **Design:** Sets of five eggs were randomly selected, observed for viability, and placed in incubating cups by random assignment. Twenty embryos were distributed to each incubation cup (2 cups/test vessel, 2 test vessels/treatment, 80 embryos/test level). The incubation cups containing the eggs were treated with malachite green (60 mg/l for 15 seconds), and rinsed with dilution water at 25°C. Dead embryos were counted and removed daily. Once most of the eggs had hatched (day 4), 15 larvae were randomly selected from each incubation cup (30/replicate) and released into the test vessels. "In four cases, the B replicates of the 400, 200, and 50  $\mu\text{g/l}$  nominal exposure concentrations, and the A replicate of the dilution water control, the release of larvae to the test chambers was delayed by one day." Once hatching was complete, the number of live, dead and deformed larvae in each vessel was recorded, and the percentage of embryos that hatched was calculated. The "hatch day" was determined to be the day on which the greatest number of larvae were hatched (exposure day 4).

After release into the chambers until day 5 post-hatch, the fish were fed powdered Pruteen® (suspended in water) once daily and supplemented with live rotifers. On days 4 and 5, feedings were also supplemented with brine shrimp (24 hours old). From day 6 to 15 post-hatch, larvae were fed live newly hatched brine shrimp 2-3 times daily on weekdays and twice daily on weekend days and holidays. From day 16 post-hatch onwards, the brine shrimp used were 72 hours old and had been sustained on Pruteen®. From day 21 post-hatch, one of the daily brine shrimp feedings was replaced with a commercial fish food. Fish were not fed during the 24 hours preceding test termination.

Observations of larval mortality and developmental abnormalities were recorded daily. At test termination, the individual lengths and weights of all surviving fish were recorded.

Dissolved oxygen concentration (DO), pH, and temperature were measured on day 0 and twice weekly in each test vessel. Temperature was also measured continuously in one control chamber. Hardness and conductivity of the laboratory water supply were measured daily.

Acetochlor concentrations were analyzed using gas chromatography on samples taken on days -6, -3, 0, 1, 2, 3, 4, 8, 11, 14, 20, 21, 26, 28, 33, and 35. Initially (days -6 to 3), samples were taken from each replicate for analysis. From day 4 until test termination, samples were taken from alternate replicates to ensure that each vessel was sampled at least once per week. "No correction has been made for the purity of the test material."

- E. **Statistics:** The percent hatch and survival data were analyzed using contingency table tests. For the length and weight data, differences between the responses of the solvent and dilution water control were evaluated using Student's t test. The control data were pooled and the data analyzed using a one-way ANOVA. Dunnett's was used to compare treatment means to control means. Treatment data were also compared to the dilution water and solvent controls individually.

12. **REPORTED RESULTS:** The mean measured concentrations were 63, 108, 225, 450, and 797  $\mu\text{g/l}$  and ranged from 100 to 126% of nominal values (Table 2, attached). Measured concentrations were fairly consistent between sampling days.

The percent hatchability in the individual replicates was 82.5-100%, and was not significantly affected by the concentration of the test material (Table 2, attached). Larval survival at 797  $\mu\text{g/l}$  was significantly lower than that of the pooled control (Table 2, attached). Survival for individual replicates ranged from 73.3 to 100%, based on the number of larvae released on day 4.

Length and weight of the surviving larvae were not significantly different from those of the dilution water control (Table 2, attached). The relative standard deviations (RSD) for the control growth data ranged from 8.3 to 32.5%. Physical abnormalities were noted in only one surviving larvae at test termination (replicate A of the dilution water control).

Based on the survival data, the maximum acceptable toxicant concentration (MATC) limits were 450 and 797  $\mu\text{g/l}$  mean measured concentrations (geometric mean MATC = 599  $\mu\text{g/l}$ ).

During the study, the pH was 7.0-7.7 and the temperature was 23.6-25.8°C. The levels of dissolved oxygen concentrations ranged from 4.8 to 8.0 mg/l. The light intensity, based on single measurements at the surface of the solutions, was 1060-1150 lux. The hardness, alkalinity, and conductivity of the test solutions are given in Table 13 (attached).

13. **STUDY AUTHOR'S CONCLUSIONS/QUALITY ASSURANCE MEASURES:**  
No conclusions, other than those mentioned above, were reported.

A GLP compliance statement was included in the report indicating that the study was conducted in accordance with USEPA GLP Regulations. The report also included a quality assurance statement which was signed by a representative of the laboratory's quality assurance unit.

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

- A. **Test Procedure:** The test procedure follows the intent of the SEP and ASTM (1987) guidelines, except for the following deviations:

Measured concentrations on days 0-2 in replicate A and B of the 50  $\mu\text{g/l}$  (nominal) test solution were more than 30% greater than the time-weighted average (TWA) concentrations for the replicates (58.9 and 56.6  $\mu\text{g/l}$ , respectively). ASTM states that a test is unacceptable if the measured concentration of test material in any treatment was more than 30% higher than the TWA concentration for more than 5% of the duration of the test.

Only two true replicates were employed in this study; the SEP recommends four replicates be used.

Measurable quantities of several pesticides were present in the two dry foods used (Table 14, attached). Several heavy metals were found in measurable quantities in one of the dry foods and the brine shrimp cysts used for feeding.

The embryos were treated with malachite green after they had been distributed to the incubation cups.

The report states that temperature was measured continuously in one replicate, however the results were not given in the report.

Dechlorinated water was used as dilution water. ASTM does not recommend using dechlorinated water, however, the free residual and combined residual chlorine of the dilution water was measured daily and no chlorine was detected during the test.

The conductivity, alkalinity, and hardness of at least one test concentration were not reported. The SEP recommends these parameters be collected for the control and at least one concentration.

The light intensity (1060-1150 lux) employed in this study was higher than recommended (400-800 lux).

The report did not mention the percentage of eggs fertilized out of the group used to initiate this study. The SEP recommends that eggs used in the study be obtained from a group of eggs of which 70% is fertilized.

The report does not indicate whether weight data were measurements of dry or wet weight.

- B. **Statistical Analysis:** The reviewer used one-way ANOVA (Toxstat Version 3.3) and Dunnett's test to analyze the percent hatch and larval survival data. The percent hatch in the exposure concentrations were not significantly different from the solvent control (attached printouts 1 and 2). Larval survival at 797  $\mu\text{g/l}$  mean measured concentration was significantly lower than that of the solvent control (attached printouts 3 and 4). The reviewer used two-way ANOVA (Crunch Version 3) and Bonferroni's t-test to compare the length and weight data of the concentrations and the solvent control. There was no significant difference between the exposure and control data (printouts 5 and 6, attached). The results of these analyses were the same as those of the authors.
- C. **Discussion/Results:** The variability in measured concentrations at 63  $\mu\text{g/l}$  was significant. Based on ASTM requirements, this study is not considered acceptable. However, significant variability was observed only at 63  $\mu\text{g/l}$  and no biological effects were seen at this level or the next three higher concentrations. Therefore, the reviewer does not

consider the variation in measured concentration at this level as a factor which would detract from the validity of the MATC or cause the test to be classified as "invalid".

The study is scientifically sound and meets the requirements for an embryo-larval early life-stage toxicity test. After 36 days of exposure, the MATC of Acetochlor technical for fathead minnows was >450 and <797  $\mu\text{g/l}$  mean measured concentrations (geometric mean MATC = 599  $\mu\text{g/l}$ ), based upon the most sensitive biological parameter, fish survival.

D. Adequacy of the Study:

(1) Classification: Core.

(2) Rationale: N/A.

(3) Repairability: N/A.

15. COMPLETION OF ONE-LINER: Yes, 9/20/91.

REFERENCE:

ASTM. 1987. Proposed New Standard Guide for Conducting Early Life-Stage Toxicity Tests with Fish. Draft No. 12.

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ACETOCHLOR

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Pages 8 through 11 are not included.

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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.
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Printout 1

acetochlor, 415920-11, percent hatch (survival)  
File: a:41592011.hat Transform: ARC SINE(SQUARE ROOT(Y))  
TRANSFORM: NO TRANSFORM NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE
1	solvent control	1	0.9270
1	solvent control	2	0.9510
2	50	1	0.8950
2	50	2	0.9510
3	100	1	0.8720
3	100	2	0.9470
4	200	1	1.0000
4	200	2	0.9750
5	400	1	0.8250
5	400	2	0.8970
6	800	1	0.9510
6	800	2	0.8460

Shapiro Wilks test for normality

D = 0.041

W = 0.919

Critical W (P = 0.05) (n = 12) = 0.859

Critical W (P = 0.01) (n = 12) = 0.805

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

Bartlett's test for homogeneity of variance

Calculated B statistic = 1.21

Table Chi-square value = 15.09 (alpha = 0.01)

Table Chi-square value = 11.07 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 1.00

Used for Chi-square table value ==> df (#groups-1) = 5

Data PASS homogeneity test at 0.01 level. Continue analysis.

Permtout 2

acetochlor, 415920-11, percent hatch (survival)  
 File: a:41592011.hat Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.076	0.015	2.232
Within (Error)	6	0.041	0.007	
Total	11	0.117		

Critical F value = 4.39 (0.05,5,6)  
 Since  $F < \text{Critical } F$  FAIL TO REJECT  $H_0$ : All groups equal

acetochlor, 415920-11, percent hatch (survival)  
 File: a:41592011.hat Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 1 OF 2  $H_0$ : Control < Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	solvent control	1.322	0.939		
2	50	1.294	0.923	0.342	
3	100	1.272	0.910	0.615	
4	200	1.452	0.988	-1.570	
5	400	1.192	0.861	1.586	
6	800	1.258	0.899	0.787	

Dunnett table value = 2.83 (1 Tailed Value,  $P=0.05$ ,  $df=6,5$ )

acetochlor, 415920-11, percent hatch (survival)  
 File: a:41592011.hat Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST - TABLE 2 OF 2  $H_0$ : Control < Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	solvent control	2			
2	50	2	0.154	16.4	0.016
3	100	2	0.154	16.4	0.029
4	200	2	0.154	16.4	-0.048
5	400	2	0.154	16.4	0.078
6	800	2	0.154	16.4	0.041

### Printout 3

TITLE: 415920-11, acetochlor, larval survival  
FILE: A:\41592011.SUR  
TRANSFORM: NO TRANSFORM  
NUMBER OF GROUPS: 6

GRP	IDENTIFICATION	REP	VALUE
1	solvent control	1	0.9330
1	solvent control	2	0.9670
2	50	1	0.9670
2	50	2	0.9000
3	100	1	0.9330
3	100	2	1.0000
4	200	1	0.8330
4	200	2	0.9000
5	400	1	0.9670
5	400	2	1.0000
6	800	1	0.8000
6	800	2	0.7330

Shapiro Wilks test for normality

D = 0.040

W = 0.884

Critical W (P = 0.05) (n = 12) = 0.859

Critical W (P = 0.01) (n = 12) = 0.805

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

Bartlett's test for homogeneity of variance

Calculated B statistic = 0.76

Table Chi-square value = 15.09 (alpha = 0.01)

Table Chi-square value = 11.07 (alpha = 0.05)

Average df used in calculation ==> df (avg n - 1) = 1.00

Used for Chi-square table value ==> df (#groups-1) = 5

Data PASS homogeneity test at 0.01 level. Continue analysis.

Peratont 4

415920-11, acetochlor, larval survival

File: a:41592011.sur

Transform: ARC SINE(SQUARE ROOT(Y))

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.187	0.037	5.667
Within (Error)	6	0.040	0.007	
Total	11	0.226		

Critical F value = 4.39 (0.05,5,6)

Since  $F > \text{Critical } F$  REJECT  $H_0$ :All groups equal

415920-11, acetochlor, larval survival

File: a:41592011.sur

Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST

TABLE 1 OF 2

$H_0$ :Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	solvent control	1.349	0.950		
2	50	1.319	0.934	0.369	
3	100	1.394	0.967	-0.562	
4	200	1.199	0.867	1.836	
5	400	1.434	0.984	-1.049	
6	800	1.067	0.767	3.462	*

Dunnett table value = 2.83 (1 Tailed Value,  $P=0.05$ ,  $df=6,5$ )

415920-11, acetochlor, larval survival

File: a:41592011.sur

Transform: ARC SINE(SQUARE ROOT(Y))

DUNNETTS TEST

TABLE 2 OF 2

$H_0$ :Control<Treatment

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	solvent control	2			
2	50	2	0.142	15.0	0.016
3	100	2	0.142	15.0	-0.017
4	200	2	0.142	15.0	0.083
5	400	2	0.142	15.0	-0.034
6	800	2	0.142	15.0	0.183

Fmax for testing homogeneity of between subjects variances: 3.36  
 Number of variances= 12 df per variance= 26.  
 Analysis of Variance Dependent variable: WEIGHT

Source	df	SS (H)	MSS	F	P
Between Subjects	327	334911.4400			
C (CONC)	5	13238.7041	2647.7407	2.613	0.0245
R (REP)	1	574.5014	574.5014	0.567	0.4520
CR	5	934.8092	186.9618	0.185	0.9686
Subj w Groups	316	320163.4400	1013.1754		

Printout 5

415920-11  
Weight.

Raw data in appendix to this  
DER

Analysis of Variance

File: acetowc

Date: 09-19-1991

FILTER: None

Post-hoc tests for factor C (CONC)

Level	Mean	Level	Mean
1	115.484 ✓	6	118.487 ✓
2	118.638 ✓		
3	126.793 ✓		
4	132.815 ✓		
5	115.615 ✓		

1 = Solvent control  
 2 = 63 µg/L  
 3 = 108  
 4 = 225  
 5 = 450  
 6 = 797

Comparison	Bon- ferroni
1 < 2	
1 < 3	
1 < 4	0.0723
1 < 5	
1 < 6	
2 < 3	
2 < 4	
2 > 5	
2 > 6	
3 < 4	
3 > 5	
3 > 6	
4 > 5	0.0719
4 > 6	
5 < 6	

.....

Fmax for testing homogeneity of between subjects variances: 3.28

Number of variances= 12 df per variance= 26.

.....

Analysis of Variance Dependent variable: LENGTH

Source	df	SS (H)	MSS	F	P
Between Subjects	327	1060.6472			
C (CONC)	5	27.3623	5.4725	1.692	0.1348
R (REP)	1	8.2302	8.2302	2.545	0.1116
CR	5	3.2247	0.6449	0.199	0.9629
Subj w Groups	316	1021.8300	3.2336		

Printout 6

415920-11

Length

Raw data in appendix to  
this DER

Analysis of Variance

File: acetocop

Date: 09-19-1991

FILTER: None

Post-hoc tests for factor C (CONC)

Level	Mean	Level	Mean
1	19.656 ✓	6	19.413 ✓
2	19.705 ✓		
3	20.103 ✓		
4	20.315 ✓		
5	19.773 ✓		

Comparison	Bon- ferroni
1 < 2	1 = Solvent control
1 < 3	2 = 63 Mg/L
1 < 4	3 = 108
1 < 5	4 = 225
1 > 6	5 = 450
2 < 3	6 = 797
2 < 4	7 =
2 < 5	
2 > 6	
3 < 4	
3 > 5	
3 > 6	
4 > 5	
4 > 6	
5 > 6	

415920-11

Appendix

## Fish Weight Rawdata

Data Listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs. CONC REP WEIGHT

1	1	1	166.00
2	1	1	145.60
3	1	1	83.80
4	1	1	71.50
5	1	1	112.30
6	1	1	111.20
7	1	1	164.00
8	1	1	108.20
9	1	1	124.60
10	1	1	106.20
11	1	1	129.60
12	1	1	69.70
13	1	1	157.80
14	1	1	107.90
15	1	1	119.20
16	1	1	122.40
17	1	1	88.90
18	1	1	86.00
19	1	1	81.70
20	1	1	98.50
21	1	1	111.10
22	1	1	30.50
23	1	1	87.90
24	1	1	146.40
25	1	1	131.80
26	1	1	133.10
27	1	1	99.70
28	1	1	101.60
29	1	1	89.30
30	1	2	123.30
31	1	2	110.90
32	1	2	102.60
33	1	2	107.90
34	1	2	97.70
35	1	2	160.80
36	1	2	124.40
37	1	2	130.30
38	1	2	118.90
39	1	2	132.60
40	1	2	95.20
41	1	2	132.40
42	1	2	131.30
43	1	2	119.40
44	1	2	183.00
45	1	2	140.00
46	1	2	70.40
47	1	2	82.40
48	1	2	160.90
49	1	2	85.70
50	1	2	58.20
51	1	2	117.40
52	1	2	164.50
53	1	2	42.20
54	1	2	137.40
55	1	2	174.70

1 = control

2 = solvent control

3 = 63 µg/L

4 = 108 µg/L

5 = 225 µg/L

6 = 450 µg/L

7 = 797 µg/L

Data listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs.	CONC	REP	WEIGHT
56	1	2	117.40
57	2	1	144.90
58	2	1	106.80
59	2	1	97.30
60	2	1	134.90
61	2	1	72.30
62	2	1	84.60
63	2	1	123.20
64	2	1	129.50
65	2	1	138.30
66	2	1	111.20
67	2	1	155.20
68	2	1	131.60
69	2	1	105.50
70	2	1	156.30
71	2	1	112.60
72	2	1	100.00
73	2	1	126.20
74	2	1	126.90
75	2	1	89.50
76	2	1	126.50
77	2	1	140.00
78	2	1	142.60
79	2	1	40.40
80	2	1	159.00
81	2	1	103.50
82	2	1	133.70
83	2	1	126.10
84	2	1	96.00
85	2	2	105.40
86	2	2	132.10
87	2	2	117.60
88	2	2	105.20
89	2	2	119.20
90	2	2	119.60
91	2	2	120.50
92	2	2	133.10
93	2	2	131.00
94	2	2	99.50
95	2	2	123.00
96	2	2	150.70
97	2	2	102.50
98	2	2	105.70
99	2	2	111.90
100	2	2	119.20
101	2	2	155.50
102	2	2	150.50
103	2	2	18.30
104	2	2	149.50
105	2	2	35.90
106	2	2	98.50
107	2	2	116.90
108	2	2	148.70
109	2	2	145.70
110	2	2	167.50



Data listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs.	CONC	REP	WEIGHT
111	2	2	49.70
112	2	2	91.90
113	2	2	43.20
114	3	1	149.10
115	3	1	97.50
116	3	1	120.50
117	3	1	76.10
118	3	1	60.10
119	3	1	117.70
120	3	1	90.20
121	3	1	151.50
122	3	1	156.20
123	3	1	113.80
124	3	1	139.90
125	3	1	112.50
126	3	1	80.80
127	3	1	75.90
128	3	1	177.20
129	3	1	139.20
130	3	1	126.90
131	3	1	31.00
132	3	1	128.80
133	3	1	149.80
134	3	1	106.80
135	3	1	108.60
136	3	1	128.00
137	3	1	165.60
138	3	1	178.00
139	3	1	122.40
140	3	1	168.70
141	3	1	118.60
142	3	1	120.30
143	3	2	113.40
144	3	2	121.40
145	3	2	129.20
146	3	2	91.00
147	3	2	174.90
148	3	2	119.70
149	3	2	138.40
150	3	2	70.60
151	3	2	126.10
152	3	2	87.10
153	3	2	96.70
154	3	2	103.00
155	3	2	141.90
156	3	2	128.70
157	3	2	104.50
158	3	2	121.40
159	3	2	126.80
160	3	2	75.60
161	3	2	117.60
162	3	2	145.70
163	3	2	127.90
164	3	2	87.50
165	3	2	141.20

Data listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs.	CONC	REP	WEIGHT
166	3	2	130.30
167	3	2	127.80
168	3	2	98.60
169	3	2	85.00
170	4	1	128.30
171	4	1	163.90
172	4	1	79.80
173	4	1	93.90
174	4	1	160.40
175	4	1	73.20
176	4	1	161.40
177	4	1	102.30
178	4	1	94.70
179	4	1	160.40
180	4	1	169.60
181	4	1	113.90
182	4	1	161.90
183	4	1	89.50
184	4	1	145.00
185	4	1	71.70
186	4	1	125.90
187	4	1	133.50
188	4	1	145.40
189	4	1	100.90
190	4	1	117.40
191	4	1	138.40
192	4	1	126.00
193	4	1	175.10
194	4	1	121.10
195	4	1	184.40
196	4	1	142.30
197	4	1	108.00
198	4	2	90.00
199	4	2	89.80
200	4	2	86.40
201	4	2	129.30
202	4	2	136.30
203	4	2	174.90
204	4	2	149.70
205	4	2	132.00
206	4	2	70.50
207	4	2	65.80
208	4	2	207.00
209	4	2	110.90
210	4	2	153.00
211	4	2	168.20
212	4	2	136.00
213	4	2	155.60
214	4	2	160.30
215	4	2	73.80
216	4	2	145.10
217	4	2	148.70
218	4	2	181.30
219	4	2	135.70
220	4	2	125.10

Data listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs.	CONC	REP	WEIGHT
221	4	2	116.50
222	4	2	99.40
223	4	2	104.60
224	4	2	122.00
225	4	2	57.20
226	4	2	113.10
227	4	2	127.50
228	5	1	162.50
229	5	1	114.20
230	5	1	89.00
231	5	1	89.00
232	5	1	27.70
233	5	1	116.70
234	5	1	161.60
235	5	1	158.70
236	5	1	202.30
237	5	1	111.20
238	5	1	146.20
239	5	1	155.00
240	5	1	173.10
241	5	1	127.40
242	5	1	113.80
243	5	1	89.90
244	5	1	180.40
245	5	1	117.90
246	5	1	125.90
247	5	1	183.20
248	5	1	150.90
249	5	1	179.00
250	5	1	140.80
251	5	1	130.00
252	5	1	141.80
253	5	2	114.50
254	5	2	188.90
255	5	2	156.20
256	5	2	106.40
257	5	2	89.40
258	5	2	125.00
259	5	2	135.80
260	5	2	80.80
261	5	2	152.10
262	5	2	171.20
263	5	2	127.00
264	5	2	207.00
265	5	2	110.10
266	5	2	87.50
267	5	2	94.10
268	5	2	120.80
269	5	2	124.10
270	5	2	144.20
271	5	2	107.50
272	5	2	90.90
273	5	2	179.20
274	5	2	135.30
275	5	2	118.20

Data listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs.	CONC	REP	WEIGHT
276	5	2	205.30
277	5	2	135.50
278	5	2	96.10
279	5	2	115.10
280	6	1	116.80
281	6	1	136.90
282	6	1	107.80
283	6	1	93.80
284	6	1	124.50
285	6	1	101.60
286	6	1	139.30
287	6	1	106.20
288	6	1	92.20
289	6	1	136.00
290	6	1	107.00
291	6	1	119.00
292	6	1	104.60
293	6	1	97.00
294	6	1	76.00
295	6	1	79.40
296	6	1	126.40
297	6	1	155.00
298	6	1	118.10
299	6	1	111.90
300	6	1	79.90
301	6	1	149.80
302	6	1	118.20
303	6	1	108.20
304	6	1	125.50
305	6	1	123.60
306	6	1	141.30
307	6	1	83.80
308	6	1	117.10
309	6	2	63.00
310	6	2	115.50
311	6	2	180.10
312	6	2	121.60
313	6	2	86.30
314	6	2	97.90
315	6	2	134.30
316	6	2	128.10
317	6	2	129.60
318	6	2	113.60
319	6	2	119.80
320	6	2	80.40
321	6	2	108.10
322	6	2	151.10
323	6	2	96.10
324	6	2	138.50
325	6	2	151.60
326	6	2	117.30
327	6	2	86.00
328	6	2	89.70
329	6	2	143.00
330	6	2	106.00

Data listing

File: acetow

Date: 09-19-1991

FILTER: None

Obs.	CONC	REP	WEIGHT
331	6	2	141.00
332	6	2	148.20
333	6	2	80.90
334	6	2	109.80
335	6	2	136.50
336	6	2	94.20
337	6	2	95.50
338	6	2	160.70
339	7	1	108.60
340	7	1	99.00
341	7	1	118.20
342	7	1	102.30
343	7	1	149.30
344	7	1	85.90
345	7	1	98.50
346	7	1	87.00
347	7	1	151.60
348	7	1	163.00
349	7	1	165.30
350	7	1	104.70
351	7	1	142.80
352	7	1	130.90
353	7	1	110.50
354	7	1	116.00
355	7	1	170.30
356	7	1	91.60
357	7	1	73.90
358	7	1	136.60
359	7	1	116.20
360	7	1	116.30
361	7	1	102.20
362	7	1	117.70
363	7	2	135.50
364	7	2	150.20
365	7	2	166.60
366	7	2	104.50
367	7	2	187.90
368	7	2	134.10
369	7	2	146.80
370	7	2	83.20
371	7	2	23.60
372	7	2	93.20
373	7	2	106.60
374	7	2	110.90
375	7	2	90.70
376	7	2	134.90
377	7	2	104.50
378	7	2	155.60
379	7	2	138.40
380	7	2	89.30
381	7	2	147.60
382	7	2	80.40
383	7	2	91.50
384	7	2	116.00

415920-11

Appendix

## Fish length Raw data

Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
1	1	1	22.80
2	1	1	21.50
3	1	1	18.40
4	1	1	17.00
5	1	1	19.60
6	1	1	18.50
7	1	1	23.40
8	1	1	20.30
9	1	1	19.80
10	1	1	19.40
11	1	1	20.40
12	1	1	16.90
13	1	1	21.50
14	1	1	19.50
15	1	1	20.70
16	1	1	18.80
17	1	1	17.70
18	1	1	17.40
19	1	1	17.30
20	1	1	19.40
21	1	1	17.60
22	1	1	10.40
23	1	1	17.80
24	1	1	21.60
25	1	1	20.90
26	1	1	20.70
27	1	1	18.60
28	1	1	17.80
29	1	1	17.40
30	1	2	18.90
31	1	2	19.60
32	1	2	19.00
33	1	2	19.50
34	1	2	19.50
35	1	2	22.60
36	1	2	20.40
37	1	2	21.20
38	1	2	20.10
39	1	2	20.40
40	1	2	18.60
41	1	2	20.40
42	1	2	20.00
43	1	2	19.60
44	1	2	21.90
45	1	2	20.90
46	1	2	17.80
47	1	2	17.60
48	1	2	22.40
49	1	2	17.40
50	1	2	16.30
51	1	2	19.20
52	1	2	22.20
53	1	2	15.10
54	1	2	20.50
55	1	2	23.30

1 = Control

2 = Solvent control

3 = 63 mg/L

4 = 108 mg/L

5 = 225 mg/L

6 = 40450 mg/L

7 = 797 mg/L

Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
56	1	2	19.20
57	2	1	22.40
58	2	1	19.00
59	2	1	19.10
60	2	1	20.60
61	2	1	17.40
62	2	1	18.30
63	2	1	19.60
64	2	1	20.70
65	2	1	20.80
66	2	1	20.60
67	2	1	20.90
68	2	1	21.40
69	2	1	19.80
70	2	1	20.50
71	2	1	20.20
72	2	1	19.70
73	2	1	20.40
74	2	1	21.10
75	2	1	18.10
76	2	1	21.40
77	2	1	21.40
78	2	1	21.50
79	2	1	14.40
80	2	1	21.50
81	2	1	19.20
82	2	1	19.70
83	2	1	21.10
84	2	1	17.80
85	2	2	19.40
86	2	2	20.50
87	2	2	20.50
88	2	2	20.00
89	2	2	20.30
90	2	2	20.50
91	2	2	19.70
92	2	2	20.30
93	2	2	19.20
94	2	2	18.80
95	2	2	20.90
96	2	2	21.70
97	2	2	19.50
98	2	2	18.90
99	2	2	19.50
100	2	2	20.40
101	2	2	21.70
102	2	2	21.60
103	2	2	12.00
104	2	2	20.50
105	2	2	14.10
106	2	2	18.10
107	2	2	19.50
108	2	2	21.60
109	2	2	21.50
110	2	2	22.40

Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
111	2	2	15.60
112	2	2	17.60
113	2	2	15.50
114	3	1	22.40
115	3	1	19.10
116	3	1	20.50
117	3	1	17.30
118	3	1	15.80
119	3	1	19.40
120	3	1	17.50
121	3	1	20.90
122	3	1	22.20
123	3	1	19.40
124	3	1	20.30
125	3	1	19.30
126	3	1	17.50
127	3	1	17.50
128	3	1	22.40
129	3	1	20.70
130	3	1	21.00
131	3	1	14.00
132	3	1	20.50
133	3	1	21.40
134	3	1	20.20
135	3	1	19.30
136	3	1	21.30
137	3	1	21.30
138	3	1	23.50
139	3	1	20.40
140	3	1	22.40
141	3	1	20.40
142	3	1	19.70
143	3	2	19.50
144	3	2	19.40
145	3	2	20.70
146	3	2	18.50
147	3	2	21.40
148	3	2	19.50
149	3	2	20.80
150	3	2	16.70
151	3	2	20.80
152	3	2	18.60
153	3	2	18.80
154	3	2	19.40
155	3	2	21.50
156	3	2	21.00
157	3	2	17.90
158	3	2	19.60
159	3	2	20.50
160	3	2	16.50
161	3	2	18.40
162	3	2	20.50
163	3	2	20.00
164	3	2	18.20
165	3	2	21.20



Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
166	3	2	19.60
167	3	2	20.40
168	3	2	19.20
169	3	2	17.30
170	4	1	21.40
171	4	1	22.20
172	4	1	17.80
173	4	1	18.80
174	4	1	21.70
175	4	1	17.20
176	4	1	21.90
177	4	1	18.50
178	4	1	18.90
179	4	1	22.20
180	4	1	21.50
181	4	1	20.00
182	4	1	22.20
183	4	1	19.30
184	4	1	20.10
185	4	1	17.50
186	4	1	20.30
187	4	1	20.60
188	4	1	20.70
189	4	1	19.50
190	4	1	20.50
191	4	1	21.50
192	4	1	19.20
193	4	1	22.40
194	4	1	18.60
195	4	1	23.60
196	4	1	20.50
197	4	1	19.70
198	4	2	19.40
199	4	2	18.80
200	4	2	18.10
201	4	2	20.10
202	4	2	20.50
203	4	2	23.00
204	4	2	21.40
205	4	2	20.70
206	4	2	17.80
207	4	2	16.70
208	4	2	22.40
209	4	2	18.30
210	4	2	20.60
211	4	2	21.60
212	4	2	21.50
213	4	2	21.10
214	4	2	21.70
215	4	2	17.40
216	4	2	21.50
217	4	2	22.20
218	4	2	21.80
219	4	2	20.30
220	4	2	19.50

Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
221	4	2	19.70
222	4	2	17.40
223	4	2	19.40
224	4	2	18.60
225	4	2	16.30
226	4	2	19.40
227	4	2	20.50
228	5	1	21.60
229	5	1	19.70
230	5	1	18.50
231	5	1	18.40
232	5	1	13.40
233	5	1	20.60
234	5	1	21.90
235	5	1	21.80
236	5	1	23.80
237	5	1	18.70
238	5	1	20.60
239	5	1	21.90
240	5	1	22.30
241	5	1	20.50
242	5	1	19.50
243	5	1	18.50
244	5	1	22.40
245	5	1	18.70
246	5	1	19.60
247	5	1	22.60
248	5	1	21.60
249	5	1	23.50
250	5	1	20.60
251	5	1	20.50
252	5	1	20.50
253	5	2	19.20
254	5	2	22.40
255	5	2	20.30
256	5	2	19.60
257	5	2	19.60
258	5	2	19.60
259	5	2	20.50
260	5	2	17.80
261	5	2	21.50
262	5	2	21.70
263	5	2	19.40
264	5	2	23.60
265	5	2	18.40
266	5	2	17.50
267	5	2	18.50
268	5	2	20.20
269	5	2	20.50
270	5	2	21.40
271	5	2	18.60
272	5	2	19.30
273	5	2	21.50
274	5	2	21.50
275	5	2	19.40

Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
276	5	2	23.00
277	5	2	20.90
278	5	2	19.00
279	5	2	19.80
280	6	1	19.70
281	6	1	21.70
282	6	1	19.90
283	6	1	18.30
284	6	1	19.70
285	6	1	19.00
286	6	1	20.90
287	6	1	20.10
288	6	1	18.90
289	6	1	20.50
290	6	1	18.80
291	6	1	20.40
292	6	1	19.50
293	6	1	19.50
294	6	1	16.10
295	6	1	18.30
296	6	1	20.60
297	6	1	20.20
298	6	1	19.10
299	6	1	19.40
300	6	1	18.30
301	6	1	23.20
302	6	1	20.50
303	6	1	19.50
304	6	1	19.60
305	6	1	21.00
306	6	1	21.40
307	6	1	18.20
308	6	1	20.40
309	6	2	16.50
310	6	2	19.30
311	6	2	23.00
312	6	2	20.80
313	6	2	18.40
314	6	2	18.30
315	6	2	21.00
316	6	2	20.80
317	6	2	21.90
318	6	2	18.50
319	6	2	19.60
320	6	2	17.80
321	6	2	20.00
322	6	2	21.70
323	6	2	19.80
324	6	2	22.40
325	6	2	20.00
326	6	2	19.90
327	6	2	18.60
328	6	2	17.80
329	6	2	21.40
330	6	2	19.40

Data listing

File: acetol

Date: 09-18-1991

FILTER: None

Obs.	CONC	REP	LENGTH
331	6	2	21.60
332	6	2	20.50
333	6	2	17.70
334	6	2	17.60
335	6	2	20.70
336	6	2	18.50
337	6	2	18.50
338	6	2	21.90
339	7	1	19.00
340	7	1	17.70
341	7	1	19.50
342	7	1	19.40
343	7	1	21.80
344	7	1	17.10
345	7	1	19.20
346	7	1	18.10
347	7	1	22.40
348	7	1	20.70
349	7	1	21.70
350	7	1	18.10
351	7	1	20.20
352	7	1	20.50
353	7	1	19.10
354	7	1	18.90
355	7	1	21.50
356	7	1	19.50
357	7	1	17.50
358	7	1	20.40
359	7	1	19.50
360	7	1	19.50
361	7	1	18.00
362	7	1	19.70
363	7	2	19.50
364	7	2	21.00
365	7	2	21.70
366	7	2	17.90
367	7	2	21.70
368	7	2	21.00
369	7	2	20.30
370	7	2	17.70
371	7	2	12.20
372	7	2	18.80
373	7	2	19.40
374	7	2	19.30
375	7	2	17.70
376	7	2	21.40
377	7	2	17.70
378	7	2	21.70
379	7	2	20.80
380	7	2	17.20
381	7	2	20.60
382	7	2	17.90
383	7	2	18.70
384	7	2	19.80