DATA EVALUATION RECORD
FRESHWATER FISH EARLY LIFE-STAGE TEST
GUIDELINE 72-4

1. **CHEMICAL:** s-Metolachlor PC Code No.: 108800

2. **TEST MATERIAL:** CGA-77102 technical Purity: 98.6%

3. **CITATION:** **Author**: J.V. Sousa
   Title: S-Metolachlor (CGA-77102): Early Life-Stage Toxicity Test with Fathead Minnow (*Pimephales promelas*)
   Study Completion Date: November 30, 1999
   Laboratory: Springborn Laboratories, Inc., Wareham, MA
   Sponsor: Novartis Crop Protection, Inc., Greensboro, NC
   Laboratory Report ID: 1781.6576
   MRID No.: 449959-03
   DP Barcode: D262736

4. **REVIEWED BY:** Mark Mossler, M.S., Environmental Scientist,
   Golder Associates Inc.
   Signature: **Date:** 5/2/00

   APPROVED BY: Pim Kosalwat, Ph.D., Senior Scientist,
   Golder Associates Inc.
   Signature: **Date:**

5. **APPROVED BY:** Brian Montague, Fisheries Biologist
   ERB I Environmental Fate and Effects Division
   Signature: **Date:** May 15, 2000

6. **CONCLUSIONS:** This study is scientifically sound and fulfills the guideline requirements for a fish early life-stage toxicity test. The most sensitive parameter measured was dry weight of larval fish.

   NOEC: 30 ppb ai **LOEC:** 56 ppb ai **Growth effected :** 56 ppb

7. **ADEQUACY OF THE STUDY:**
   A. Classification: Core
   B. Rationale: N/A
   C. Repairability: N/A

8. GUIDELINE DEVIATIONS:

1. Only two replicates were utilized; four are recommended.

2. Laboratory has failed to provide sufficient raw data to determine how long D.O and pH variations occurred. The DO concentration fell below 75% of saturation in all groups at some time during the test and as low as 63% in in the 130 ppb test group. Controls fell to 67% saturation at one point. Mean average values for all test groups were above 75%, however. pH varies over one unit during the study. No explanations for either variance were offered.

9. MATERIALS AND METHODS:

A. Biological System:

Guideline Criteria	Reported Information
Species: A freshwater or saltwater fish species.	Fathead minnow (*Pimephales promelas*)
Source: Commercial fishery, wild, or brood stock.	In-house culture
Age at beginning of test: Embryos 2 to 24 hours old.	≤24 hours old
Replicates: Minimum of 20 embryos per replicate cup, 4 replicates per concentration. Minimum of 30 fish per treatment for posthatch exposure.	60 embryos/incubation cup, 1 cup/chamber, 2 replicate chambers/level (120 total embryos/level) Thinned to 40 fish/chamber, 2 replicate chambers/level
Posthatch: % of embryos that produce live fry must be ≥ 50% in each control; % hatch in any control embryo cup must be no more than 1.6 times that in another control cup.	85% control survival at hatch 1.1 times

Guideline Criteria	Reported Information
Feeding: Fish should be fed at least twice daily. Fish should not be fed for at least 24 hr prior to termination.	Fish were fed with live brine shrimp nauplii three times daily *ad libitum* beginning on Day 5 (Day 0 post-hatch). Food was withheld 24 hours before study termination.
Counts: At a minimum, live fish should be counted 11, 18, 25, and 32 days after hatching.	Embryos were counted daily and larvae were counted twice weekly.
Controls: Avg. survival at end of test must be ≥80%. Survival in any control chamber must not be <70%.	Terminal survival averaged 93% in the dilution water control group. Survival in each control replicate was ≥85%.

B. Physical System:

Guideline Criteria	Reported Information
Test Water: 1) May be natural (well or spring) or reconstituted water. 2) Water should be sterilized with UV radiation and screened for contaminants. 3) Hardness of 40-200 mg/L as $CaCO_3$, pH of 7.2-7.6	1) Aerated well water 2) The water was screened for contaminants. 3) Hardness of 38-44 mg/L as $CaCO_3$, pH of 6.7-7.8
Test Temperature: Depends upon test species; should not deviate by more than 2°C from appropriate temperature. For fathead minnow, 25°C is recommended.	24-27°C
Photoperiod: Recommend 16L/8D.	16-hour light/8-hour dark

Guideline Criteria	Reported Information
Dosing Apparatus: Intermittent flow proportional diluters or continuous flow serial diluters should be used. A minimum of 5 toxicant concentrations with a dilution factor not greater than 0.5 and controls should be used.	Intermittent-flow proportional diluter Control and six toxicant concentrations with a dilution factor of 0.5
Toxicant Mixing: 1) Mixing chamber is recommended but not required; 2) Aeration should not be used for mixing; 3) It must be demonstrated that the test solution is completely mixed before intro. into the test system; 4) Flow splitting accuracy must be within 10%.	1) Mixing chambers were used. 2) No aeration of exposure solutions. 3) Mixing confirmed by analysis. 4) Flow splitting accuracy verified prior to test initiation by chemical analysis.
Test Vessels: All glass or glass with stainless steel frame.	19.5-liter glass aquaria maintained with a test volume of approximately 15 liters
Embryo Cups: 120 mL glass jars with bottoms replaced with 40 mesh stainless steel or nylon screen.	Glass jars (50-mm diameter) with 40-mesh Nitex® screen bottoms (gently rocked until hatching was complete)
Flow Rate: Flow rates to larval cups should provide 90% replacement in 8-12 hours and must maintain DO ≥75% of saturation and maintain the toxicant level.	Approximately 6.6 volume additions/24 hours DO and chemical concentrations confirmed by analysis
Aeration: Dilution water should be aerated to insure DO concentration at or near 100% saturation. Test tanks and embryo cups should not be aerated.	DO was ≥63% of saturation throughout the duration of the test

C. **Chemical System:**

Guideline Criteria	Reported Information
Concentrations: Minimum of 5 concentrations and a control, all replicated, plus solvent control if appropriate. - Toxicant conc. must be measured in one tank at each toxicant level every week. - One concentration must adversely affect a life stage and one concentration must not affect any life stage.	- Negative control, 31, 63, 130, 250, 500, and 1000 μg ai/L. - Test solutions were analyzed on Days 0, 5, 7, 14, 21, 28, and test termination (Day 35). - The NOEC and LOEC were both determined.
Other Variables: DO must be measured at each conc. at least once a week.	DO was measured daily in each replicate.
Solvents: Should not exceed 0.1 mL/L in a flow-through system. Following solvents are acceptable: dimethylformamide, triethylene glycol, methanol, acetone, ethanol.	Solvent: none Conc.: N/A

Comments: Analytical results were obtained with solid-phase extraction coupled with HPLC-UV detection. The procedural recovery and highest LOQ were reported as 102% and 3.1 ppb ai, respectively. Mean measured concentrations ranged from 84 to 96% of nominal.

10. **REPORTED RESULTS:**

Guideline Criteria	Reported Information
Data Endpoints must include: - Number of embryos hatched; - Time to hatch; - Mortality of embryos, larvae, and juveniles; - Time to swim-up (if appropriate); - Measurement of growth; - Incidence of pathological or histological effects; - Observations of other effects or clinical signs.	Data include: - Number (survival) of embryos hatched; - 30-day post-hatch survival; - 30-day post-hatch length; - 30-day post-hatch wet and dry weight; - Clinical observations
Raw data included? (Y/N)	Yes

Effects Data

Toxicant Concentration (μg ai/L)		Mean % Hatch	30-day Post-hatch % Survival	Total Length (mm)	Wet Weight (mg)	Dry Weight (mg)
Nom.	Measured (RSD)					
Con.	<LOQ (N/A)	85	93	33.4	399	101
31	30 (9)	90	95	33.1	396	99.1
63	56 (9)	88	99	32.9	375	94.4
130	110 (7)	89	100	32.9	373	93.6
250	220 (4)	87	95	32.7	355	90.7
500	450 (4)	85	96	32.2	343	86.4
1000	870 (6)	85	98	31.6	334	83.4

Toxicity Observations: No sublethal signs of toxicity were reported.

Statistical Results: Percentage data were arcsine transformed prior to analyses. The MATC was reported to be 41 ppb ai.

Endpoint	Method	NOEC (µg ai/L)	LOEC (µg ai/L)
Survival @ Hatch	unspecified	870	N/A
Terminal Survival	unspecified	870	N/A
Length	Williams' test	110	220
Wet Weight	Williams' test	30	56
Dry Weight	Williams' test	30	56

11. **REVIEWER'S STATISTICAL RESULTS:** Since treatment survival means were equal to or greater than control means, these data were not analyzed. Growth data were analyzed as specified.

Endpoint	Method	NOEC (ppb ai)	LOEC (ppb ai)
Length	Dunnett's test	110	220
Wet Weight	"	56	110
Dry Weight	"	30	56

12. **REVIEWER'S COMMENTS:** This study is scientifically sound and fulfills the guideline requirements for a fish early life-stage toxicity test using the fathead minnow. Based on mean measured concentrations, the LOEC and NOEC for fathead minnows exposed to s-metolachlor were 56 and 30 ppb ai, respectively (geometric mean MATC = 41 ppb ai). This study is classified as **Core**.

Analysis Variable : DRYWT

TRT=1 REP=1 ≈ Control

N	Mean	Std Dev	Minimum	Maximum
34	0.1039941	0.0173017	0.0665000	0.1480000

TRT=1 REP=2

N	Mean	Std Dev	Minimum	Maximum
40	0.0991800	0.0211390	0.0533000	0.1390000

TRT=2 REP=1 ≈ 30 ppb ai

N	Mean	Std Dev	Minimum	Maximum
38	0.0983132	0.0237567	0.0397000	0.1424000

TRT=2 REP=2

N	Mean	Std Dev	Minimum	Maximum
38	0.0998500	0.0150962	0.0690000	0.1310000

TRT=3 REP=1 ≈ 56 ppb ai

N	Mean	Std Dev	Minimum	Maximum
40	0.0959450	0.0174793	0.0644000	0.1434000

TRT=3 REP=2

N	Mean	Std Dev	Minimum	Maximum
39	0.0927205	0.0185146	0.0593000	0.1317000

TRT=4 REP=1 ≈ 110 ppb ai

N	Mean	Std Dev	Minimum	Maximum
40	0.0927475	0.0180855	0.0497000	0.1254000

TRT=4 REP=2

N	Mean	Std Dev	Minimum	Maximum
40	0.0945375	0.0174309	0.0620000	0.1314000

Analysis Variable : DRYWT

TRT=5 REP=1 ≈ 220 ppb ai

N	Mean	Std Dev	Minimum	Maximum
40	0.0914550	0.0180726	0.0588000	0.1371000

TRT=5 REP=2

N	Mean	Std Dev	Minimum	Maximum
36	0.0898222	0.0155769	0.0617000	0.1236000

TRT=6 REP=1 ≈ 450 ppb ai

N	Mean	Std Dev	Minimum	Maximum
39	0.0873026	0.0189973	0.0356000	0.1213000

TRT=6 REP=2

N	Mean	Std Dev	Minimum	Maximum
38	0.0854658	0.0151610	0.0577000	0.1336000

TRT=7 REP=1 ≈ 870 ppb ai

N	Mean	Std Dev	Minimum	Maximum
38	0.0827947	0.0167391	0.0550000	0.1371000

TRT=7 REP=2

N	Mean	Std Dev	Minimum	Maximum
39	0.0838923	0.0195815	0.0307000	0.1278000

General Linear Models Procedure
Class Level Information

Class	Levels	Values
TRT	7	1 2 3 4 5 6 7
REP	2	1 2

Number of observations in data set = 539

s-metolachlor: Fathead Minnow Early Life Stage
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General Linear Models Procedure

Dependent Variable: DRYWT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.0190717	0.0031786	9.64	0.0001
Error	532	0.1754335	0.0003298		
Corrected Total	538	0.1945052			

R-Square	C.V.	Root MSE	DRYWT Mean
0.098052	19.59899	0.0182	0.0927

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	6	0.0190717	0.0031786	9.64	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	6	0.0190717	0.0031786	9.64	0.0001

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General Linear Models Procedure
Least Squares Means

TRT	DRYWT LSMEAN	LSMEAN Number
1	0.10139189	1
2	0.09908158	2
3	0.09435316	3
4	0.09364250	4
5	0.09068158	5
6	0.08639610	6
7	0.08335065	7

Pr > |T| HO: LSMEAN(i)=LSMEAN(j)

i/j	1	2	3	4	5	6	7
1	.	0.4363	0.0169	0.0084	0.0003	0.0001	0.0001
2	0.4363	.	0.1057	0.0620	0.0045	0.0001	0.0001
3	0.0169	0.1057	.	0.8052	0.2088	0.0064	0.0002
4	0.0084	0.0620	0.8052	.	0.3092	0.0127	0.0004
5	0.0003	0.0045	0.2088	0.3092	.	0.1450	0.0128
6	0.0001	0.0001	0.0064	0.0127	0.1450	.	0.2985
7	0.0001	0.0001	0.0002	0.0004	0.0128	0.2985	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

s-metolachlor: Fathead Minnow Early Life Stage
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General Linear Models Procedure

Bonferroni (Dunn) T tests for variable: DRYWT

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= 532 MSE= 0.00033
Critical Value of T= 3.05274

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

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
1 - 2	-0.006743	0.002310	0.011364	
1 - 3	-0.001930	0.007039	0.016007	
1 - 4	-0.001192	0.007749	0.016690	
1 - 5	0.001657	0.010710	0.019764	***
1 - 6	0.005971	0.014996	0.024020	***
1 - 7	0.009017	0.018041	0.027066	***
2 - 1	-0.011364	-0.002310	0.006743	
2 - 3	-0.004179	0.004728	0.013636	
2 - 4	-0.003441	0.005439	0.014319	
2 - 5	-0.000593	0.008400	0.017393	
2 - 6	0.003722	0.012685	0.021649	***
2 - 7	0.006767	0.015731	0.024695	***
3 - 1	-0.016007	-0.007039	0.001930	
3 - 2	-0.013636	-0.004728	0.004179	
3 - 4	-0.008082	0.000711	0.009504	
3 - 5	-0.005236	0.003672	0.012579	
3 - 6	-0.000921	0.007957	0.016835	
3 - 7	0.002125	0.011003	0.019880	***
4 - 1	-0.016690	-0.007749	0.001192	
4 - 2	-0.014319	-0.005439	0.003441	
4 - 3	-0.009504	-0.000711	0.008082	
4 - 5	-0.005919	0.002961	0.011841	
4 - 6	-0.001604	0.007246	0.016097	
4 - 7	0.001442	0.010292	0.019142	***
5 - 1	-0.019764	-0.010710	-0.001657	***
5 - 2	-0.017393	-0.008400	0.000593	
5 - 3	-0.012579	-0.003672	0.005236	
5 - 4	-0.011841	-0.002961	0.005919	
5 - 6	-0.004678	0.004285	0.013249	
5 - 7	-0.001633	0.007331	0.016295	
6 - 1	-0.024020	-0.014996	-0.005971	***
6 - 2	-0.021649	-0.012685	-0.003722	***
6 - 3	-0.016835	-0.007957	0.000921	
6 - 4	-0.016097	-0.007246	0.001604	
6 - 5	-0.013249	-0.004285	0.004678	
6 - 7	-0.005889	0.003045	0.011980	
7 - 1	-0.027066	-0.018041	-0.009017	***
7 - 2	-0.024695	-0.015731	-0.006767	***
7 - 3	-0.019880	-0.011003	-0.002125	***
7 - 4	-0.019142	-0.010292	-0.001442	***
7 - 5	-0.016295	-0.007331	0.001633	

s-metolachlor: Fathead Minnow Early Life Stage
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General Linear Models Procedure

TRT	Simultaneous Lower Confidence	Difference Between	Simultaneous Upper Confidence

Comparison	Lower Limit	Means	Upper Limit
7 - 6	-0.011980	-0.003045	0.005889

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General Linear Models Procedure

Dunnett's One-tailed T tests for variable: DRYWT

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

Alpha= 0.05 Confidence= 0.95 df= 532 MSE= 0.00033
Critical Value of Dunnett's T= 2.294

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

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
2 - 1	-0.009113	-0.002310	0.004492	
3 - 1	-0.013777	-0.007039	-0.000301	***
4 - 1	-0.014467	-0.007749	-0.001032	***
5 - 1	-0.017513	-0.010710	-0.003908	***
6 - 1	-0.021776	-0.014996	-0.008215	***
7 - 1	-0.024822	-0.018041	-0.011261	***

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TRT=1 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	34	33.7602941	1.5036329	30.7500000	36.9300000
WETWT	34	0.4059324	0.0697514	0.2589000	0.6105000

TRT=1 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	40	33.1587500	2.1802202	27.4700000	37.1200000
WETWT	40	0.3938950	0.0825637	0.2321000	0.5637000

TRT=2 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	38	32.9515789	2.2604610	24.8500000	38.0600000
WETWT	38	0.3930947	0.0933836	0.1704000	0.5581000

TRT=2 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	38	33.3326316	1.5384806	29.2100000	36.1100000
WETWT	38	0.3979079	0.0572332	0.2950000	0.5092000

TRT=3 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	40	33.0795000	1.6560580	30.0100000	37.3800000
WETWT	40	0.3861775	0.0707072	0.2784000	0.5892000

TRT=3 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	39	32.7710256	1.7650403	29.9400000	36.4200000
WETWT	39	0.3640179	0.0715672	0.2309000	0.5298000

TRT=4 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	40	32.7175000	1.5988710	28.8000000	36.1400000
WETWT	40	0.3664200	0.0689325	0.2057000	0.5268000

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TRT=4 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	40	33.0032500	1.6841560	29.2500000	36.2500000
WETWT	40	0.3792350	0.0699848	0.2512000	0.5204000

TRT=5 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	40	32.7687500	1.6389524	30.3100000	37.1600000
WETWT	40	0.3574850	0.0694876	0.2375000	0.5372000

TRT=5 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	36	32.5452778	1.6104382	29.7200000	35.4700000
WETWT	36	0.3523611	0.0585792	0.2336000	0.4783000

TRT=6 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	39	32.4005128	2.0322802	26.3700000	36.4700000
WETWT	39	0.3491436	0.0731162	0.1464000	0.4859000

TRT=6 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	38	32.0415789	1.6322320	27.8500000	35.2600000
WETWT	38	0.3363526	0.0595983	0.2178000	0.5200000

TRT=7 REP=1

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	38	31.2518421	1.8904666	27.3200000	37.5100000
WETWT	38	0.3299158	0.0646102	0.2251000	0.5374000

TRT=7 REP=2

Variable	N	Mean	Std Dev	Minimum	Maximum
LEN	40	31.9212500	2.2029900	24.8600000	35.5500000
WETWT	40	0.3377950	0.0772791	0.1238000	0.4919000

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General Linear Models Procedure
Class Level Information

Class	Levels	Values

TRT	7	1 2 3 4 5 6 7
REP	2	1 2

Number of observations in data set = 540

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General Linear Models Procedure

Dependent Variable: LEN

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	173.70810	28.95135	8.72	0.0001
Error	533	1769.92622	3.32069		
Corrected Total	539	1943.63432			

R-Square	C.V.	Root MSE	LEN Mean
0.089373	5.574892	1.8223	32.687

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	6	173.70810	28.95135	8.72	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	6	173.70810	28.95135	8.72	0.0001

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General Linear Models Procedure

Dependent Variable: WETWT

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	6	0.2883937	0.0480656	9.53	0.0001
Error	533	2.6875007	0.0050422		
Corrected Total	539	2.9758944			

R-Square	C.V.	Root MSE	WETWT Mean
0.096910	19.31557	0.0710	0.3676

Source	DF	Type I SS	Mean Square	F Value	Pr > F
TRT	6	0.2883937	0.0480656	9.53	0.0001

Source	DF	Type III SS	Mean Square	F Value	Pr > F
TRT	6	0.2883937	0.0480656	9.53	0.0001

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General Linear Models Procedure

Least Squares Means

TRT	LEN LSMEAN	LSMEAN Number
1	33.4351351	1
2	33.1421053	2
3	32.9272152	3
4	32.8603750	4
5	32.6628947	5
6	32.2233766	6
7	31.5951282	7

Pr > |T| HO: LSMEAN(i)=LSMEAN(j)

i/j	1	2	3	4	5	6	7
1	.	0.3253	0.0855	0.0510	0.0097	0.0001	0.0001
2	0.3253	.	0.4633	0.3349	0.1056	0.0019	0.0001
3	0.0855	0.4633	.	0.8172	0.3671	0.0162	0.0001
4	0.0510	0.3349	0.8172	.	0.4990	0.0290	0.0001
5	0.0097	0.1056	0.3671	0.4990	.	0.1364	0.0003
6	0.0001	0.0019	0.0162	0.0290	0.1364	.	0.0323
7	0.0001	0.0001	0.0001	0.0001	0.0003	0.0323	.

TRT	WETWT LSMEAN	LSMEAN Number
1	0.39942568	1
2	0.39550132	2
3	0.37523797	3
4	0.37282750	4
5	0.35505789	5
6	0.34283117	6
7	0.33395641	7

Pr > |T| HO: LSMEAN(i)=LSMEAN(j)

i/j	1	2	3	4	5	6	7
1	.	0.7352	0.0357	0.0206	0.0001	0.0001	0.0001
2	0.7352	.	0.0763	0.0467	0.0005	0.0001	0.0001
3	0.0357	0.0763	.	0.8306	0.0775	0.0045	0.0003
4	0.0206	0.0467	0.8306	.	0.1188	0.0084	0.0006
5	0.0001	0.0005	0.0775	0.1188	.	0.2874	0.0658
6	0.0001	0.0001	0.0045	0.0084	0.2874	.	0.4369
7	0.0001	0.0001	0.0003	0.0006	0.0658	0.4369	.

NOTE: To ensure overall protection level, only probabilities associated with pre-planned comparisons should be used.

s-metolachlor: Fathead Minnow Early Life Stage
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General Linear Models Procedure

Bonferroni (Dunn) T tests for variable: LEN

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= 533 MSE= 3.320687
Critical Value of T= 3.05272

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

Simultaneous Lower	Difference	Simultaneous Upper

TRT Comparison		Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
1	- 2	-0.6155	0.2930	1.2015	
1	- 3	-0.3920	0.5079	1.4079	
1	- 4	-0.3225	0.5748	1.4720	
1	- 5	-0.1363	0.7722	1.6807	
1	- 6	0.3062	1.2118	2.1173	***
1	- 7	0.9373	1.8400	2.7427	***
2	- 1	-1.2015	-0.2930	0.6155	
2	- 3	-0.6789	0.2149	1.1087	
2	- 4	-0.6093	0.2817	1.1728	
2	- 5	-0.4232	0.4792	1.3816	
2	- 6	0.0192	0.9187	1.8182	***
2	- 7	0.6504	1.5470	2.4436	***
3	- 1	-1.4079	-0.5079	0.3920	
3	- 2	-1.1087	-0.2149	0.6789	
3	- 4	-0.8155	0.0668	0.9492	
3	- 5	-0.6295	0.2643	1.1581	
3	- 6	-0.1870	0.7038	1.5947	
3	- 7	0.4441	1.3321	2.2200	***
4	- 1	-1.4720	-0.5748	0.3225	
4	- 2	-1.1728	-0.2817	0.6093	
4	- 3	-0.9492	-0.0668	0.8155	
4	- 5	-0.6936	0.1975	1.0885	
4	- 6	-0.2511	0.6370	1.5251	
4	- 7	0.3801	1.2652	2.1504	***
5	- 1	-1.6807	-0.7722	0.1363	
5	- 2	-1.3816	-0.4792	0.4232	
5	- 3	-1.1581	-0.2643	0.6295	
5	- 4	-1.0885	-0.1975	0.6936	
5	- 6	-0.4600	0.4395	1.3390	
5	- 7	0.1712	1.0678	1.9644	***
6	- 1	-2.1173	-1.2118	-0.3062	***
6	- 2	-1.8182	-0.9187	-0.0192	***
6	- 3	-1.5947	-0.7038	0.1870	
6	- 4	-1.5251	-0.6370	0.2511	
6	- 5	-1.3390	-0.4395	0.4600	
6	- 7	-0.2654	0.6282	1.5219	
7	- 1	-2.7427	-1.8400	-0.9373	***
7	- 2	-2.4436	-1.5470	-0.6504	***
7	- 3	-2.2200	-1.3321	-0.4441	***
7	- 4	-2.1504	-1.2652	-0.3801	***
7	- 5	-1.9644	-1.0678	-0.1712	***

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General Linear Models Procedure

TRT Comparison		Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit
7	- 6	-1.5219	-0.6282	0.2654

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General Linear Models Procedure

Bonferroni (Dunn) T tests for variable: WETWT

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= 533 MSE= 0.005042
Critical Value of T= 3.05272

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

TRT Comparison		Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
1	- 2	-0.03148	0.00392	0.03933	
1	- 3	-0.01088	0.02419	0.05926	
1	- 4	-0.00836	0.02660	0.06156	
1	- 5	0.00897	0.04437	0.07977	***
1	- 6	0.02131	0.05659	0.09188	***
1	- 7	0.03029	0.06547	0.10065	***
2	- 1	-0.03933	-0.00392	0.03148	
2	- 3	-0.01457	0.02026	0.05509	
2	- 4	-0.01205	0.02267	0.05740	
2	- 5	0.00528	0.04044	0.07561	***
2	- 6	0.01762	0.05267	0.08772	***
2	- 7	0.02661	0.06154	0.09648	***
3	- 1	-0.05926	-0.02419	0.01088	
3	- 2	-0.05509	-0.02026	0.01457	
3	- 4	-0.03197	0.00241	0.03679	
3	- 5	-0.01465	0.02018	0.05501	
3	- 6	-0.00231	0.03241	0.06712	
3	- 7	0.00668	0.04128	0.07588	***
4	- 1	-0.06156	-0.02660	0.00836	
4	- 2	-0.05740	-0.02267	0.01205	
4	- 3	-0.03679	-0.00241	0.03197	
4	- 5	-0.01695	0.01777	0.05249	
4	- 6	-0.00461	0.03000	0.06460	
4	- 7	0.00438	0.03887	0.07336	***
5	- 1	-0.07977	-0.04437	-0.00897	***
5	- 2	-0.07561	-0.04044	-0.00528	***
5	- 3	-0.05501	-0.02018	0.01465	
5	- 4	-0.05249	-0.01777	0.01695	
5	- 6	-0.02282	0.01223	0.04728	
5	- 7	-0.01384	0.02110	0.05604	
6	- 1	-0.09188	-0.05659	-0.02131	***
6	- 2	-0.08772	-0.05267	-0.01762	***
6	- 3	-0.06712	-0.03241	0.00231	
6	- 4	-0.06460	-0.03000	0.00461	
6	- 5	-0.04728	-0.01223	0.02282	
6	- 7	-0.02595	0.00887	0.04370	
7	- 1	-0.10065	-0.06547	-0.03029	***
7	- 2	-0.09648	-0.06154	-0.02661	***
7	- 3	-0.07588	-0.04128	-0.00668	***
7	- 4	-0.07336	-0.03887	-0.00438	***
7	- 5	-0.05604	-0.02110	0.01384	

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General Linear Models Procedure

Simultaneous Lower	Difference	Simultaneous Upper

TRT Comparison	Confidence Limit	Between Means	Confidence Limit
7 - 6	-0.04370	-0.00887	0.02595

s-metolachlor: Fathead Minnow Early Life Stage
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General Linear Models Procedure

Dunnett's One-tailed T tests for variable: LEN

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

Alpha= 0.05 Confidence= 0.95 df= 533 MSE= 3.320687
Critical Value of Dunnett's T= 2.293

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

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
2 - 1	-0.9756	-0.2930	0.3895	
3 - 1	-1.1840	-0.5079	0.1682	
4 - 1	-1.2488	-0.5748	0.0993	
5 - 1	-1.4548	-0.7722	-0.0897	***
6 - 1	-1.8921	-1.2118	-0.5314	***
7 - 1	-2.5182	-1.8400	-1.1618	***

s-metolachlor: Fathead Minnow Early Life Stage
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General Linear Models Procedure

Dunnett's One-tailed T tests for variable: WETWT

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

Alpha= 0.05 Confidence= 0.95 df= 533 MSE= 0.005042
Critical Value of Dunnett's T= 2.293

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

TRT Comparison	Simultaneous Lower Confidence Limit	Difference Between Means	Simultaneous Upper Confidence Limit	
2 - 1	-0.03052	-0.00392	0.02267	
3 - 1	-0.05053	-0.02419	0.00216	
4 - 1	-0.05286	-0.02660	-0.00033	***
5 - 1	-0.07096	-0.04437	-0.01777	***
6 - 1	-0.08311	-0.05659	-0.03008	***
7 - 1	-0.09190	-0.06547	-0.03904	***