Data Evaluation Report on the Chronic Toxicity of XDE-638 to Freshwater invertebrates - Daphnia sp.
PMRA Submission Number EPA MRID Number 45831026

Data Requirement:

PMRA DATA CODE	
EPA DP Barcode	D288160
OECD Data Point	
EPA MRID	45831026
EPA Guideline	§72-4b

Test material: XDE-638 **Purity:** 97.5%
Common name: Penoxsulam
Chemical name: IUPAC: Not reported
CAS name: 2-(2,2-Difluoroethoxy)-N-(5,8-dimethoxy[1,2,4]triazolo[1,5-C]pyrimidin-2-yl)-6-(trifluoromethyl)benzenesulfonamide
CAS No.: Not reported
Synonyms: None specified

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{EPA/OECD/PMRA}
Date:

Reference/Submission No.:

Company Code:
Active Code:
EPA PC Code: ~~109031~~ 119031

Date Evaluation Completed:

CITATION: Kirk, H.D., *et. al.* 2000. XDE-638: 21-Day Chronic Toxicity Test with the Daphnid, *Daphnia magna* Straus. Unpublished study performed by Toxicology & Environmental Research and Consulting, The Dow Chemical Company, Midland, MI. Laboratory Study No. 001018. Study submitted by Dow AgroSciences LLC, Indianapolis, IN. Study initiated May 11, 2000 and completed October 27, 2000.

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EXECUTIVE SUMMARY:

The 21-day chronic toxicity of XDE-638 (penoxsulam) to *Daphnia magna* was studied under static renewal conditions. Daphnids were exposed to XDE-638 at nominal concentrations of 0 (negative control), 0.041, 0.123, 0.37, 1.11, 3.33, and 10 ppm. Mean-measured concentrations were <0.01(LOQ, control), 0.040, 0.111, 0.376, 0.942, 2.95, and 9.76 ppm a.i.

By Day 21, mortality was 10% in the dilution water control, 0% in the 0.040 and 0.111 ppm a.i. test groups, 30% in the 0.376 and 0.942 ppm a.i. test groups, and 10% in the 2.95 and 9.76 ppm a.i. test groups. The 21-day LC_{50} was >9.76 ppm a.i. Immobility was observed in 10% of daphnids in the 0.942 and 2.95 ppm a.i. treatment groups; no other sub-lethal effects were observed. The 21-day EC_{50} was >9.76 ppm a.i.

No treatment-related effects were observed on the day of first eggs observed, the day to first brood release, the total number of offspring produced, the number of offspring per adult, or terminal lengths. However, a statistically-significant reduction in the number of live offspring produced was observed at the 9.76 ppm a.i. level compared to the control group (922 versus 1395). Based on the number of live offspring (the only endpoint affected), the NOAEC, LOAEC, and MATC values were 2.95, 9.76, and 5.37 ppm a.i., respectively.

This study is scientifically sound, fulfills the guideline requirements for an aquatic invertebrate life cycle test with *Daphnia magna* (§ 72-4b), and is classified CORE.

Results Synopsis:

Test Organism Age (eg. 1st instar): <24 hours old
Test Type (Flow through, Static, Static Renewal): Static renewal.

Mortality
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Immobility
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Total No. Young
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Total No. Live Young
NOAEC: 2.95 ppm a.i.
LOAEC: 9.76 ppm a.i.

Length
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Day to First Eggs & Day to First Brood
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Endpoints Affected: Total number of live young

I. MATERIALS AND METHODS

GUIDELINES FOLLOWED: The study protocol was based on procedures outlined in the U.S. EPA Pesticide Assessment Guidelines, Series §72-4 (1982), and the U.S. EPA Standard Evaluation Procedure *Daphnia magna* Life Cycle (21-Day Renewal) Chronic Toxicity Test (1987). Deviations from guideline §72-4b include:

1. The storage conditions of the test material were not reported.

2. The pretest health (including mortality) of the parental stock was not specified. In addition, an isolated 21-day acclimation period was not performed.

3. The pH range of the dilution water (6.5-7.6) was less than recommended (7.6-8.0).

4. The study design differed from EPA guidance: in this static renewal study, 1 daphnid per test chamber was maintained, with ten replicate chambers per concentration (total of 10 daphnids/concentration). EPA guidance recommends 22 daphnids/level for static renewal studies, where seven test chambers should contain one daphnid each (to collect data on survival, growth, and reproduction), and three test chambers should contain five daphnids each (to collect data on survival only).

These deviations did not affect the acceptability or the validity of the study.

COMPLIANCE: Signed and dated GLP, Quality Assurance, and Data Confidentiality statements were provided. This study was conducted in accordance with U.S. EPA, OECD, and EC GLP standards (p. 3).

A. MATERIALS:

1. Test Material XDE-638 (penoxsulam)

Description: Pink, solid powder

Lot No. : ND05167938

Purity: 97.5%

Stability: The stability of XDE-638 was assessed

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in dilution water fortified at nominal concentrations of 0.1 and 100 ppm and stored at 20 ± 2°C for up to 24 days (p. 12). Recoveries were 94.9-113% of initial values for the 0.1 ppm solutions and 94.1-102% of initial values for the 100 ppm solutions (Table 3, p. 27).

Storage conditions of test chemical: Not reported.

OECD requires water solubility, stability in water and light, pK_a, P_{ow}, and vapor pressure of the test compound. Stability was reported above. Other OECD requirements were not reported.

2. Test organism:

Species: *Daphnia magna*

Age of the parental stock: <24 hours old

Source: In-house laboratory cultures.

B. STUDY DESIGN:

1. Experimental Conditions

a. Range-finding Study: Concentrations selected for use in the definitive study were based upon the results of a 48-hour acute toxicity study (MRID 45831012; EC_{50} >100 ppm) and a 21-day static renewal range-finding study. The 21-day study was conducted with 10 daphnids/level at nominal concentrations of 0 (negative control), 0.1, 1, 10, and 100 ppm (p. 15). After 21 days, mortality was 0, 30, 10, 50, and 30% in the 0, 0.1, 1, 10, and 100 ppm treatment groups, respectively. The average number of young per adult were 210, 175, 159, 114, and 99 in the 0, 0.1, 1, 10, and 100 ppm treatment groups, respectively.

b. Definitive Study:

Table 1. Experimental Parameters

Parameter	Details	Remarks
		Criteria
Parental acclimation:		The day before

Parameter	Details	Remarks / Criteria
Period: Conditions (same as test or not): Feeding: Health: (any mortality observed)	Continuous Same as test *Daphnia* cultures were fed 4 times/week with mixed diet of *Selenastrum capricornutum* Printz (algae) and yeast-ceraphyll-trout chow mixture (YCT). Not reported	instars were needed for testing, stock tanks with daphnids >14 days old, which had at least four broods, were removed from the incubator. Instars were removed and discarded, and the adults were placed back into the incubator. At the start of the definitive test, the procedure was repeated to cull <24-hour old instars for use.
Test condition: Static renewal/flow through: Type of dilution system- for flow through method. Renewal rate for static renewal	Static Renewal N/A At least 3 times per week (Monday, Wednesday, and Friday).	*For flow-through study: consistent flow rate of 5-10 vol/24 hours, meter systems calibrated before study and checked twice daily during test period.*
Aeration, if any	No aeration during the study.	*Dilution water should be aerated to insure DO concentration at or near 100% saturation. Test tanks should not be aerated.*
Duration of the test	21 days	*EPA requires 21 days for static renewal*
Test vessel Material: (glass/stainless steel)	Borosilicate vessels (covered with a watch glass)	

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Parameter	Details	Remarks Criteria
Size: growth/reproduction test: survival test: Fill volume: growth/reproduction test: survival test:	250 mL same 150 mL same	*1. Material: Glass, No. 316 stainless steel, or perfluorocarbon plastics* *2. Size: 250 mL with 200 mL fill volume is preferred; 100 mL with 80 mL fill volume is acceptable.* *OECD requires parent animals be maintained individually, one per vessel, with 50 - 100 mL of medium in each vessel.*
Source of dilution water	The dilution water was pumped to the laboratory from the upper Saginaw Bay of Lake Huron. The water was filtered (sand and carbon), pH-adjusted, and UV-irradiated. The hardness was adjusted to approximately 170 mg/L as $CaCO_3$, then the water was autoclaved for 30 minutes and aerated for 24 hours prior to use.	*Unpolluted well or spring that has been tested for contaminants, or appropriate reconstituted water (see ASTM for details).*
Water parameters: Hardness pH Dissolved oxygen Temperature Total Organic Carbon (TOC) Particulate matter Metals Pesticides Chlorine	166-170 mg $CaCO_3$/L 6.5-7.6 7.4-9.0 mg/L (≥83%) 18.5-20.9°C 1500 ng/mL <1000 ng/mL (<LOD, total suspended solids) See Table 1, p. 25 Not detected; Table 2, p. 26 3-5 ppb	The pH range was less than recommended. Results from inorganic and organic analysis of the dilution water are provided in Tables 1 and 2, pp. 25-26. ***Hardness and pH*** *EPA requires hardness of 160 to 180 mg/L as $CaCO_3$ and pH between 7.6 and 8.0. pH must not deviate by more than one unit for more than 48 hours. OECD requires hardness of >140 mg/L as $CaCO_3$ and pH between 6 and 9. pH should not vary more than 1.5 units in any one test.* ***Dissolved Oxygen*** *Renewal: must not drop below 50% for more than 48 hours.* *Flow-through: ≥ 60% through out test.* ***Temperature*** *EPA requires 20 ± 2 °C; must not deviate from 20 °C by more than 5 °C*

Parameter	Details	Remarks Criteria
		for more than 48 hours. OECD requires range of 18 - 22 °C; should not vary more than ± 2 °C. *OECD requires total organic carbon <2 mg/L.*
Number of organisms: For growth and reproduction: For survival test:	10 daphnids/test level 10 replicate chambers with 1 daphnid per replicate (Not differentiated; same test chambers as above)	Did not follow recommended test design. *EPA requires 22 daphnids/level; 7 test chambers should contain 1 daphnid each, and 3 test chambers should contain 5 daphnids each.* *OECD requires minimum of 10 daphnids held individually for static tests. For flow-through tests, 40 animals divided into 4 groups of 10 animals at each test concentration.*
Application rates: nominal: measured:	0 (negative control), 0.041, 0.123, 0.37, 1.11, 3.33, and 10 ppm <0.01 (LOQ, control), 0.04, 0.111, 0.376, 0.942, 2.95, and 9.76 ppm a.i.	Mean-measured concentrations were based on bulk dose solutions and individual test vessels (Table 4, pp. 28-29). Recoveries were 84.9 to 102% of nominal. *EPA requires control(s) and at least 5 test concentrations; dilution factor not greater than 50%* *OECD requires at least 5 test concentrations in a geometric series with a separation factor not exceeding 3.2.*
Solvent (type, percentage, if used)	N/A	 *EPA requires: solvent to exceed 0.5 ml/L for static tests or 0.1 ml/L for flow-through tests. Acceptable solvents are dimethylformamide, triethylene glycol, methanol, acetone and ethanol.* *OECD requires ≤ 0.1 ml/L*
Lighting	16:8 hour light/dark cycle with a half-hour transition period	Intensity averaged 2050 ± 244 lux. *EPA/OECD requires: 16 hours light, 8 hours dark.*
Feeding	The daphnids were fed 800 µL	

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Parameter	Details	Remarks Criteria
	of *Navicula pelliculosa* and 800 µL of YCT per 150 mL of test solution on renewal days, and an additional 500 µL of *Nitzschia frustulum* was provided on non-renewal days.	
Stability of chemical in the test system	The stability of XDE-638 was assessed in dilution water fortified at nominal concentrations of 0.1 and 100 ppm and stored at 20 ± 2°C for up to 24 days (p. 12). Recoveries were 94.9-113% of initial values for the 0.1 ppm solutions and 94.1-102% of initial values for the 100 ppm solutions (Table 3, p. 27).	
Recovery of chemical: Frequency of measurement: LOD: LOQ:	82.7-102% of nominal Samples analyzed on Days 2, 18, and 21. Not reported 0.01 ppm a.i.	Based on individual test vessel solutions (Table 4, pp. 28-29).
Other parameters, if any	N/A	
Positive control {if used, indicate the chemical and concentrations}	N/A	

2. **Observations:**

Table 2: Observations

Criteria	Details	Remarks *Criteria*
Data end points measured (list)	- Number of dead or immobilized adult daphnids - Time to first eggs and time to first brood release - No. of live and dead offspring born per treatment group. - Mean progeny per adult - Body length	*EPA requires:* *- Survival of first-generation daphnids,* *- Number of young produced per female,* *- Dry weight (recommended) and length (required)* of each first generation daphnid alive at the end of the test,* *- Observations of other effects or clinical signs.* **current requirement until the Agency provides specific guidance indicating otherwise (Pesticide Rejection Rate Analysis, p. 132).*
Observation intervals	Mortality was observed daily recorded on Days 1, 2, 4, 7, 14, and 21. Offspring production was observed daily and recorded 3 times/week (Mondays, Wednesdays, and Fridays). Body length was determined at test termination.	
Were raw data included?	Yes	
Other observations, if any	N/A	

II. RESULTS AND DISCUSSION

A. MORTALITY AND SUB-LETHAL EFFECTS:

By Day 21, mortality was 10% in the dilution water control, 0% in the 0.040 and 0.111 ppm a.i. test groups, 30% in the 0.376 and 0.942 ppm a.i. test groups, and 10% in the 2.95 and 9.76 ppm a.i. test groups (Table 7, p. 32). The 21-day LC_{50} was >9.76 ppm a.i.

Immobility was observed in 10% of daphnids in the 0.942 and 2.95 ppm a.i. treatment groups. The 21-day EC_{50} was >9.76 ppm a.i.

Table 1: Effect of XDE-638 on Survival and Immobilization of *Daphnia sp.*

Treatment, ppm a.i. Measured (and Nominal) Concentrations	Mortality		Immobility	
	No.	%	No.	%
Dilution water control	1	10	0	0
0.040 (0.041)	0	0	0	0
0.111 (0.123)	0	0	0	0
0.376 (0.37)	3	30	0	0
0.942 (1.11)	3	30	1	10
2.95 (3.33)	1	10	1	10
9.76 (10)	1	10	0	0
NOAEC, ppm a.i.	ND		ND	
LOAEC, ppm a.i.	ND		ND	
LC_{50}/EC_{50} (95% C.I.), ppm a.i.	>9.76		>9.76	

ND - Not determined.

B. EFFECT ON REPRODUCTION AND GROWTH:

No treatment-related effects on the total number of offspring produced, the number of offspring per adult, or terminal lengths were observed at any treatment level (Table 7, p. 32). However, a statistically-significant reduction in the number of live offspring produced was observed at the 9.76 ppm a.i. level compared to the control group (922 versus 1395).

Based on the number of live offspring (the only endpoint affected), the NOAEC, LOAEC, and MATC values were 2.95, 9.76, and 5.37 ppm a.i., respectively.

Table 2: Effect of XDE-638 on Reproduction and Growth of *Daphnia sp.*

Treatment, ppm a.i. Measured (and Nominal) Concentrations	Total Number Offspring	Total Number of Live Offspring	Mean No. Young per Adult	Day to 1st Eggs	Day of 1st Brood Release	Length (mm)
Dilution water control	1395	1395	139.5	5	8	4.48 ± 0.23
0.040 (0.041)	1302	1302	130.2	5	8	4.17 ± 0.46
0.111 (0.123)	1452	1452	145.2	6	8	4.40 ± 0.22
0.376 (0.37)	1269	1269	126.9	5	8	4.31 ± 0.20
0.942 (1.11)	1313	1313	131.3	6	8	4.24 ± 0.21
2.95 (3.33)	1304	1304	130.4	5	8	4.20 ± 0.22
9.76 (10)	1144	922*	114.4	5	8	4.39 ± 0.08
NOAEC, ppm a.i.	9.76	2.95	9.76	ND	ND	9.76
LOAEC, ppm a.i.	>9.76	9.76	>9.76	ND	ND	>9.76
MATC, ppm a.i.	>9.76	5.37	>9.76	ND	ND	>9.76

* Significantly different ($\alpha = 0.05$) from control.
ND - Not determined.

C. REPORTED STATISTICS:

Mortality and immobilization data were not analyzed because less than 50% mortality/immobilization occurred during the test.

Endpoints that were analyzed statistically included the total number of progeny per dose, the total number of live progeny per dose, the mean progeny per adult, and the terminal length. Data (transformed if necessary for normalizing) were test for normality using the Shapiro-Wilk's test, and for homogeneity of variance using Bartlett's test. If the data satisfied these tests, then the one-tailed Dunnett's test was used to determined differences between the treatment groups and the control group. Data that did not satisfy these tests were analyzed by either a Steel's Many-one Rank Test (equal number of replicates), or a Kruskal-Wallis test followed by the Wilcoxon procedure (unequal replicates). The NOAEC was defined as the highest dose group that is not significantly different from the control. The MATC was calculated as the geometric mean of the NOAEC and LOAEC. Mean-measured values were used in all estimations.

D. VERIFICATION OF STATISTICAL RESULTS:

Mortality, immobilization, total number of young, total number of live young, and length were analyzed statistically. Reproduction and growth data did not satisfy the assumptions of ANOVA (i.e., normal distribution and variance homogeneity); the NOAEC and LOAEC for these endpoints were determined using the non-parametric Kruskal-Wallis test, followed by Dunn's multiple comparison (if required). The NOAEC and LOAEC for mortality and immobility were determined using Fisher's Exact Test. These analyses were conducted using TOXSTAT statistical software. The NOAEC and LOAEC for day to first eggs and day to first

brood could be visually determined.

Results synopsis
Mortality
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Immobility
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Total No. Young
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Total No. Live Young
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Length
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Day to First Eggs & Day to First Brood
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Endpoints Affected: None

E. STUDY DEFICIENCIES:

There were no significant deviations from U.S. EPA guideline §72-4b that affected the validity or acceptability of this study. Although the study design differed from recommended guidance, all objectives of a chronic daphnid study were met. Until the Agency provides specific guidance on the terminal growth measurements, the length measurement is considered adequate in fulfilling guideline requirements.

F. REVIEWER'S COMMENTS:

The reviewer's conclusions differed from those of the study authors. The reviewer's analysis revealed that no endpoint was sensitive to treatment with XDE-638. The study authors' analysis detected a significant reduction in the total number of live progeny at the highest treatment level. Because the study authors' conclusions were more conservative than the reviewer's, they are reported in the Executive Summary and Conclusions sections.

The study authors reported that although the spread of concentrations used in the definitive study was outside of the range suggested by the U.S. EPA, that this deviation was required in an attempt to achieve a NOAEC (p. 15).

There were no observations of ephippia produced by any of the organisms (p. 20).

G. CONCLUSIONS:

The study is scientifically sound and fulfills the guideline requirements for an aquatic invertebrate life cycle test with the *Daphnia magna* (§72-4b). This study is classified as CORE. The only endpoint affected was the total number of live offspring, at the highest concentration tested of 9.76 ppm a.i..

Results synopsis
Mortality
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Immobility
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Total No. Young
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Total No. Live Young
NOAEC: 2.95 ppm a.i.
LOAEC: 9.76 ppm a.i.

Length
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Day to First Eggs & Day to First Brood
NOAEC: 9.76 ppm a.i.
LOAEC: >9.76 ppm a.i.

Endpoints Affected: Total number of live young

III. REFERENCES:

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APPENDIX 1. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Mortality

SUMMARY OF FISHERS EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	10	1	
1	0.040 mg/L	10	0	
2	0.111 mg/L	10	0	
3	0.376 mg/L	10	3	
4	0.942 mg/	10	3	
5	2.95 mg/L	10	1	
6	9.76 mg/L	10	1	

Immobility

SUMMARY OF FISHERS EXACT TESTS

GROUP	IDENTIFICATION	NUMBER EXPOSED	NUMBER DEAD	SIG (P=.05)
	CONTROL	10	0	
1	0.040 mg/L	10	0	
2	0.111 mg/L	10	0	
3	0.376 mg/L	10	0	
4	0.942 mg/L	10	0	
5	2.95 mg/L	10	1	
6	9.76 mg/L	10	0	

total young

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KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	control	139.500	139.500	377.500
2	0.040	130.200	130.200	351.000
3	0.111	145.200	145.200	432.500
4	0.376	126.900	126.900	362.500
5	0.942	131.300	131.300	411.500
6	2.95	130.400	130.400	313.500
7	9.76	114.400	114.400	236.500

Calculated H Value = 6.316 Critical H Value Table = 12.590

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

total young

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DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0000000 7426513
7	9.76	114.400	114.400	\
4	0.376	126.900	126.900	. \
2	0.040	130.200	130.200	.. \
6	2.95	130.400	130.400	... \
5	0.942	131.300	131.300	.... \
1	control	139.500	139.500	..... \
3	0.111	145.200	145.200	..... \

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,7) = 3.038 SE = 9.097

live young
File: 1026ly Transform: NO TRANSFORMATION

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	control	139.500	139.500	389.500
2	0.040	130.200	130.200	367.000
3	0.111	145.200	145.200	441.500
4	0.376	126.900	126.900	374.500
5	0.942	131.300	131.300	418.500
6	2.95	130.400	130.400	332.500
7	9.76	92.200	92.200	161.500

Calculated H Value = 12.650 Critical H Value Table = 12.590
Since Calc H > Crit H REJECT Ho:All groups are equal.

live young
File: 1026ly Transform: NO TRANSFORMATION

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0000000 7426513
7	9.76	92.200	92.200	\
4	0.376	126.900	126.900	. \
2	0.040	130.200	130.200	.. \
6	2.95	130.400	130.400	... \
5	0.942	131.300	131.300	.... \
1	control	139.500	139.500	..... \
3	0.111	145.200	145.200	* ..... \

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* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,7) = 3.038 SE = 9.097

length
File: 1026l Transform: NO TRANSFORMATION

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	control	4.478	4.478	386.000
2	0.04	4.170	4.170	253.000
3	0.111	4.400	4.400	362.500
4	0.376	4.314	4.314	205.500
5	0.942	4.243	4.243	161.500
6	2.95	4.200	4.200	184.500
7	9.76	4.388	4.388	277.000

Calculated H Value = 15.606 Critical H Value Table = 12.590
Since Calc H > Crit H REJECT Ho:All groups are equal.

length
File: 1026l Transform: NO TRANSFORMATION

DUNNS MULTIPLE COMPARISON - KRUSKAL-WALLIS - TABLE 2 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0000000 2654731
2	0.04	4.170	4.170	\
6	2.95	4.200	4.200	. \
5	0.942	4.243	4.243	.. \
4	0.376	4.314	4.314	... \
7	9.76	4.388	4.388	.... \
3	0.111	4.400	4.400	..... \
1	control	4.478	4.478	..... \

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,7) = 3.038 Unequal reps - multiple SE values

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