

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Data Requirement: PMRA Data Code:
EPA DP Barcode: D351572
OECD Data Point:
EPA Guideline: OPPTS 850.4100 and 850.4225 (123-1a)

Test material: Dimethyl disulfide **Purity:** 99.6%
Common name:
Chemical name: IUPAC: Not reported
CAS name: Not reported
CAS No.: Not reported
Synonyms: DMDS

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Date: {.....} *03/30/2010*

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CITATION: Porch, J.R., and H.O. Krueger. 2008. Dimethyl Disulfide: A Toxicity Test to Determine the Effects of the Test Substance on Seedling Emergence of Ten Species of Plants. Unpublished study performed by Wildlife International, Ltd., Easton, Maryland. Laboratory Project No.: 524-102. Study submitted by Arkema, Inc., Philadelphia, PA. Study completed March 17, 2008.

DISCLAIMER: This document provides guidance for EPA and PMRA reviewers on how to complete a data evaluation record after reviewing a scientific study concerning the acute toxicity of a pesticide to terrestrial vascular plants. It is not intended to prescribe conditions to any external party for conducting this study nor to establish absolute criteria regarding the assessment of whether the study is scientifically sound and whether the study satisfies any applicable data requirements. Reviewers are expected to review and to determine for each study, on a case-by-case basis, whether it is scientifically sound and provides sufficient information to satisfy applicable data requirements. Studies that fail to meet any of the conditions may be accepted, if appropriate; similarly, studies that meet all of the conditions may be rejected, if appropriate. In sum, the reviewer is to take into account the totality of



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factors related to the test methodology and results in determining the acceptability of the study.

EXECUTIVE SUMMARY:

The effect of Dimethyl disulfide applied as a gas on the seedling emergence of monocot (onion, *Allium cepa*; oat, *Avena sativa*; ryegrass, *Lolium perenne*; and corn, *Zea mays*) and dicot (sugarbeet, *Beta vulgaris*; cabbage, *Brassica oleracea*; cucumber, *Cucumis sativa*; soybean, *Glycine max*; lettuce, *Lactuca sativa*; and tomato, *Lycopersicon esculentum*) crops was studied at varying nominal application rates. All species were treated with nominal application rates of 0 (negative control), 37.5, 75, 150, 300, and 600 lbs a.i./A. The application rates were not analytically verified. Because DMDS is applied as a gas, the application rate also needs to be reported as a volume. Herbivory of seeds and plants and irrigation problems confounded the results for some species, particularly cucumber. Results for cucumber were not reliable and, so, are not considered in the reviewer's verification of the results.

The growth medium used in the seedling emergence test was natural soil, classified as a sandy loam, with an approximate organic matter content of 1.3%. On Day 21 the surviving plants per pot were recorded and cut at soil level for measuring the plant height and dry weight.

Dry weight and plant height was significantly affected in onion, ryegrass, sugarbeet, soybean, lettuce, and tomato. The percent inhibition in seedling emergence in the treated species as compared to the negative control ranged from 12 to 23%.

Statistics are reported based on lb/A. The most sensitive monocot, based on dry weight, was ryegrass with NOAEC and EC₂₅ values of 75 and 290 lbs ai/A, respectively. The EC₂₅ for ryegrass should be interpreted with caution because it was not associated with a reliable 95% confidence interval. The most sensitive dicot, based on dry weight, was sugarbeet, with NOAEC and EC₂₅ values of 75 and 91 lbs ai/A, respectively.

The maximum phytotoxicity rating across all replicates and all crops on Day 21 was 100%, with means ranging from 0 to 55%, indicating that there dose-response related effects with respect to this endpoint.

Maximum Labeled Rate: 600 lbs ai/A

Results Synopsis

Monocot

EC₀₅/IC₀₅: <37.5 lbs ai/A 95% C.I.: Not reliable

EC₂₅/IC₂₅: 290 lbs ai/A 95% C.I.: Not reliable

EC₅₀/IC₅₀: >600 lbs ai/A 95% C.I.: N/A

NOAEC: 75 lbs ai/A

Slope: 0.734

Std err: 0.572

Most sensitive monocot: Ryegrass

Most sensitive parameter: Dry weight

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Dicot

EC₀₅/IC₀₅: 27 lbs ai/A 95% C.I.: 4.0-180 lbs ai/A
 EC₂₅/IC₂₅: 91 lbs ai/A 95% C.I.: 29-290 lbs ai/A
 EC₅₀/IC₅₀: 210 lbs ai/A 95% C.I.: 110-440 lbs ai/A
 NOAEC: 75 lbs ai/A
 Slope: 1.82
 Std err: 0.573
 Most sensitive dicot: Sugarbeet
 Most sensitive parameter: Dry Weight

This toxicity study is classified as supplemental and does not satisfy the guideline requirement for a Tier 2 terrestrial plant seedling emergence toxicity study.

Table 1. Summary of most sensitive parameters by species (lbs ai/A).

Species	Endpoint	NOAEC	EC ₀₅	EC ₂₅	EC ₅₀
Onion	Dry weight	150	<37.5	330	>600
Oat	Dry weight	600	<37.5	>600	>600
Ryegrass	Dry weight	75	<37.5	290	>600
Corn	Survival	600	<37.5	>600	>600
Sugarbeet	Dry weight	75	27	91	210
Cabbage	None	600	>600	>600	>600
Cucumber	ND	ND	ND	ND	ND
Soybean	Survival	300	310	530	>600
Lettuce	Dry weight	150	32	160	500
Tomato	Dry weight	300	180	400	>600

ND- Not Determined

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: This study was conducted following guidelines outlined in US EPA Series 850 – Ecological Effects Test Guidelines OPPTS Number 850.4225. The following deviations from OPPTS 850.4100 and 850.4225 were noted:

1. The historical % germination and storage of the seeds were not reported.
2. The moisture (% at 1/3 atm) of the soil was not reported.
3. All species were tested under similar environmental conditions instead of separating the warm-loving species from the cold-loving species.
4. The active ingredient was used to test the toxicity, rather than the recommended typical end-use product.
5. The effects of dimethyl disulfide on cucumber endpoints are unclear because of substantial herbivore damage to these seeds and plants, resulting in fewer than two replicates in at least one treatment level. The study author presents results for cucumber endpoints using both damaged and undamaged replicates and determines that toxicity estimates calculated excluding damaged replicates show this species to be one of the more sensitive dicots. The reviewer could not confidently verify these results because of the confounding factors.

These deviations do impact the acceptability of the study.

COMPLIANCE: Signed and dated No Data Confidentiality, GLP and Quality Assurance statements were provided. This study was conducted in compliance with the requirements of 40 CFR Part 160, OECD Principles, and Japan MAFF

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with the exception of periodic analyses of well water and soil for contaminants.

A. MATERIALS:

1. Test Material	Dimethyl disulfide
Description:	Liquid
Lot No./Batch No. :	05.03.06 (Batch Number)
Purity:	99.6%
Stability of compound under test conditions:	Samples were not analyzed for dimethyl disulfide due to its administration as neat material. <i>(OECD recommends chemical stability in water and light)</i>
Storage conditions of test chemicals:	Stored at ambient room temperature.

Table 2. Physical/chemical properties of Dimethyl disulfide.

Parameter	Values	Comments
Water solubility at 20EC	Not Reported	
Vapor pressure	Not Reported	
UV absorption	Not Reported	
pKa	Not Reported	
Kow	Not Reported	

2. Test organism:

Monocotyledonous species: Corn (*Zea mays*; Family Poaceae, Mandan Bride), Onion (*Allium cepa*, Family Liliaceae, WI 301), Ryegrass (*Lolium perenne*, Family Poaceae, Manhattan 4) and Oat (*Avena sativa*, Family Poaceae, Armor); *EPA recommends four monocots in two families, including corn.*

Dicotyledonous species: Cabbage (*Brassica oleracea*, Family Brassicaceae, Late Flat Dutch), Lettuce (*Lactuca sativa*, Family Asteraceae, Summertime), Soybean (*Glycine max*, Family Fabaceae, Williams 82), Sugarbeet (*Beta vulgaris*, Family Chenopodiaceae, none given), Tomato (*Lycopersicon esculentum*, Family Solanaceae, Rutgers) and Cucumber (*Cucumis sativa*, Family Cucurbitaceae, Straight Eight); *EPA recommends six dicots in four families, including soybean and a root crop.*

OECD recommends a minimum of three species selected for testing, at least one from each of the following categories: Category 1: ryegrass, rice, oat, wheat, and sorghum; Category 2: mustard, rape, radish, turnip, and Chinese cabbage; Category 3: vetch, mung bean, red clover, fenugreek, lettuce, and cress.

Seed source: Onion obtained from Wannamaker Seeds, St. Matthews, SC; oat obtained from Wilken Seed

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Grains, Inc., Pontiac, IL; ryegrass, cabbage, cucumber, and tomato obtained from The Meyer Seed Co., Baltimore, MD; corn obtained from Johnny's Selected Seeds, Winslow, ME; sugarbeet obtained from BetaSeed Inc., Shakopee, MN; soybean obtained from Missouri Foundation Seeds, Columbia, MO; and lettuce obtained from Territorial Seed Co., Cottage Grove, OR.

Prior seed treatment/sterilization: Seeds were not treated with fungicides, insecticides, or repellents prior to test initiation.

Historical % germination of seed: Not Reported

Seed storage, if any: Not Reported

B. STUDY DESIGN:

1. Experimental Conditions

- a. Limit test: N/A; this was a Tier II test.
- b. Range-finding study: A range-finding study was not conducted.
- c. Definitive Study

Table 3: Experimental Parameters - Seedling Emergence.

Parameters	Seedling Emergence	
	Details	Remarks
		<i>Criteria</i>
Duration of the test	21 Days	<p><i>Recommended test duration is 14-21 days.</i></p> <p><i>OECD recommends that the test be terminated no sooner than 14 days after 50 percent of the control seedlings have emerged</i></p>
Number of seeds/plants/species/replicate	All species were comprised of 10 seeds per replicate. Each replicate had a single pot, with 10 seeds per pot.	<p><i>Ten seeds per replicate should be used.</i></p> <p><i>OECD recommends a minimum of five seeds planted in each replicate within 24 hours of incorporation of the test substance. All seeds of each species for each test should be of the same size class. The seed should not be imbibed.</i></p>
Number of replicates Control:	4	

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Parameters	Seedling Emergence	
	Details	Remarks
	Criteria	
Formulation control: Treated:	N/A 4	<i>Four replicates per dose should be used.</i> <i>OECD recommends a minimum of four replicates per treatment</i>
<u>Test concentrations (lb ai/A or g ai/ha)</u> Nominal: Measured:	0 (negative control), 37.5, 75.0, 150, 300, and 600 lbs a.i./A Measured application rates could not be determined because analytical verification was not performed.	 <i>Five test concentrations should be used with a dose range of 2X or 3X progression</i> <i>OECD recommends three concentrations, preferably with application rates equivalent to 0.0 (control), 1.0, 10.0 and 100 mg substance per kg of oven-dried soil.</i>
<u>Method and interval of analytical verification</u>	Not performed due to use of neat test substance.	
LOQ: LOD:	N/A N/A	
Adjuvant (type, percentage, if used)	N/A	
<u>Test container (pot)</u> Size/Volume Material: (glass/polystyrene)	<u>All species:</u> 16 cm (diameter) x 12 cm (tall) Plastic	All pots contained drainage holes along the bottom. <i>Non-porous containers should be used.</i> <i>OECD recommends that non-porous plastic or glazed pot be used.</i>
Growth facility	Greenhouse; after initial 48-hour exposure period, treatment groups were taken out of the greenhouse, removed from treatment bags, and placed in subirrigation trays on greenhouse benches.	
Method/depth of seeding	Ryegrass, onion, tomato, cabbage, sugarbeet and lettuce planted at <i>ca.</i> 6 mm depth; corn, cucumber, soybean, and oat were planted at 20 mm.	

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Parameters	Seedling Emergence	
	Details	Remarks
		Criteria
<u>Test material application</u> Application time including the plant growth stage Number of application Application interval Method of application	Test material was applied on Day 0 to injection containers. Each species was treated once N/A; single application Test material was injected into dosing containers that were placed in bags along with the replicate pots containing the planted seeds. The bags were sealed for 48 hours so that the test substance could volatilize.	
<u>Details of soil used</u> Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: % organic carbon CEC Moisture at 1/3 atm (%)	Representative of a sandy loam soil Not Reported 75% 11% 14% Not reported. 1.3% organic matter Not reported. Not Reported	Soil mixes containing sandy loam, loam, or clay loam soil with no greater than 2% organic matter are preferable. Glass beads, rock wool, and 100% acid washed sand are not preferred. OECD prefers the soil to be sieved (0.5 cm) to remove coarse fragments. Carbon content should not exceed 1.5% (3% organic matter). Fine particles (under 20um) makeup should be between 10 and 20%. The recommended pH is between 5.0 and 7.5.
Details of nutrient medium, if used	N/A; a nutrient medium was not used	
<u>Watering regime and schedules</u> Water source/type: Volume applied: Interval of application: Method of application:	Well water from the greenhouse facility. Not reported. Intermittent; every 2 to 6 days. Sub-irrigation trays filled to a pre-determined depth.	Following application, pots were top watered to initiate a continuous water column. Once this column was created, capillary action was used to water the soil. EPA prefers that bottom watering be utilized for seedling emergence studies so that the chemical is not leached out of the soil during the test.
Any pest control	None	

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Parameters	Seedling Emergence	
	Details	Remarks
	Criteria	
method/fertilization, if used		
<u>Test conditions</u> Temperature: 8.49-29.64°C Photoperiod: 16L:8D Light intensity and quality: 1.3-16.9 moles photosynthetically active radiation. Natural light supplemented by artificial light. Relative humidity: 13.83-74.70%		EPA prefers that the cold vs warm loving plants be tested in two separate groups to optimize plant growth. OECD prefers that the temperature, humidity and light conditions be suitable for maintaining normal growth of each species for the test period.
<u>Reference chemical (if used)</u> Name: N/A Concentrations: N/A		A reference chemical was not used.
Other parameters, if any	None	

2. Observations:

Table 4: Observation Parameters - Seedling Emergence.

Parameters	Seedling Emergence	
	Details	Remarks
Parameters measured (e.g., number of germinated seeds, emerged seedlings, plant height, dry weight or other endpoints)	-Emergence -Survival -Dry weight -Plant height	
Measurement technique for each parameter	Emergence and survival were assessed visually. Dry weight was determined by clipping seedlings at soil level, drying the shoots of all living seedlings in an oven, and then weighing. The total dry weights of the shoots within each replicate were measured and then divided by the	

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	number weighed. Height was measured to the nearest whole centimeter from the soil surface to the tip of the tallest leaf or apical meristem.	
Observation intervals	Emergence was assessed 7, 14 and 21 days after application. Height, survival, plant height, and dry weight were determined at test termination.	
Other observations, if any	None	
Were raw data included?	Replicate data were provided	
Phytotoxicity rating system, if used	0%- No injury/effect; 10-30%- slight plant effect (effects barely noticeable to not obviously detrimental; 40-60%- moderate effect involving the whole plant (recovery possible to doubtful); 70-90%- severe effect with recovery not possible (loss of some leaves to only a few surviving leaves); 100%- complete plant effect (death of plant)	

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

1. Seedling Emergence:

Negative control emergence ranged from 60% to 100% for all species tested and treatment group emergence ranged from 58% to 100%.

Percent survival in the negative control ranged from 97% to 100% while treatment group survival ranged from 80% to 100%.

The study author's results indicated that the level of inhibition in plant height across all plant treatments was low in half the treatments, with the exclusion of sugarbeet, cucumber, soybean, lettuce, and tomato. Sugarbeet exhibited the largest inhibition of plant height of up to 53%, and there was a clear dose-response relationship.

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The level of inhibition in dry weight across all treatments was moderate to high (up to 73%) with the exception of cabbage, corn, and oat suggesting that there were adverse effects on dry weight.

There was severe damage in the cucumber treatments due to mice which resulted in elimination of numbers of replicates across every concentration. The study authors reported that based on dry weight, the most sensitive dicot was cucumber, with reported NOAEC and EC25 values of 37.5 and 91.2 lbs a.i./A, respectively. Based on dry weight, the most sensitive monocot was ryegrass, with reported NOAEC and EC25 values of 75.0 and 286 lbs a.i./A.

The study authors used a standard phytotoxicity rating system. There were limited, scattered cases of necrosis, leaf curl, unshed seed coat, wilting and chlorosis across all species and concentrations.

B. REPORTED STATISTICS:

The study author analyzed phytotoxicity, survival, emergence, plant height and dry weight based on lb/A. Mean emergence, survival, dry weight, and height of the control and treatment groups were compared using a Dunnett's t-test, using the DUNNETT option of the GLM procedure of SAS. Data were evaluated using Dunnett's test to determine the NOEAC and LOAEC. The determination of effect concentrations and their confidence limits was performed using the non-linear regression analysis of Bruce and Versteeg when reductions in test endpoints among one or more treatment groups were 25% or more relative to control means. Analyses were conducted using the NLIN procedure of SAS version 8. Nominal application rates (lbs ai/A) were used for all analyses.

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Table 5: Reported effect of Dimethyl disulfide on Seedling Emergence

Species	Results summary for height (lbs ai/A)									
	cm*	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	Std. Err.
Onion	7.6-10.0	150	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Oat	37.3-39.7	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Ryegrass	11.5-13.5	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Corn	42.7-47.3	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Sugarbeet	5.8-12.6	75	N.R.	N.R.	157	N.R.	448	N.R.	N.R.	N.R.
Cabbage	9.7-11.4	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Cucumber ¹	7.9-10.6	150	N.R.	N.R.	471	N.R.	>600	N/A	N.R.	N.R.
Soybean	12.6-18.5	300	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Lettuce	6.1-8.7	75	N.R.	N.R.	432	N.R.	>600	N/A	N.R.	N.R.
Tomato	6.2-8.1	150	N.R.	N.R.	473	N.R.	>600	N/A	N.R.	N.R.

* range provided represents the range of the treatment means

N/A- Not Applicable

N.R.- Not Reported

¹ Only undisturbed replicates were evaluated.

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Table 5a: Reported effect of Dimethyl disulfide on Seedling Emergence

Species	Results summary for dry weight (lbs ai/A)									
	g*	NOAFC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	Std. Err.
Onion	0.00554-0.00887	150	N.R.	N/A	334	N.R.	>600	N/A	N.R.	N.R.
Oat	0.129-0.159	600	N.R.	N/A	>600	N/A	>600	N/A	N.R.	N.R.
Ryegrass	8.98-14.83	75	N.R.	N/A	286	N.R.	>600	N/A	N.R.	N.R.
Corn	0.291-0.330	600	N.R.	N/A	>600	N/A	>600	N/A	N.R.	N.R.
Sugarbeet	0.0207-0.0910	75	N.R.	N/A	91.8	N.R.	215	N.R.	N.R.	N.R.
Cabbage	87.5-112.7	600	N.R.	N/A	>600	N/A	>600	N/A	N.R.	N.R.
Cucumber ¹	0.144-0.234	37.5	N.R.	N/A	91.2	N.R.	>600	N/A	N.R.	N.R.
Soybean	0.216-0.292	600	N.R.	N/A	>600	N/A	>600	N/A	N.R.	N.R.
Lettuce	20.4-44.4	75	N.R.	N/A	161	N.R.	498	N.R.	N.R.	N.R.
Tomato	26.4-52.4	150	N.R.	N/A	401	N.R.	>600	N/A	N.R.	N.R.

* range provided represents the range of the treatment means

N/A- Not Applicable

N.R.- Not Reported

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Table 5b: Reported effect of Dimethyl disulfide on Seedling Emergence

Species	Results summary for survival (lbs ai/A)									
	%*	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	Std. Err.
Onion	91-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Oat	98-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Ryegrass	100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Corn	91-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Sugarbeet	88-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Cabbage	97-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Cucumber	N/A	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Soybean	80-98	300	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Lettuce	97-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.
Tomato	97-100	600	N.R.	N.R.	>600	N/A	>600	N/A	N.R.	N.R.

* range provided represents the range of the treatment means

N/A- Not Applicable

N.R.- Not Reported

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Day 7 Emergence										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
80 (10-100)	44 (25-70)	96 (90-100)	71 (60-88)	83 (68-95)	47 (30-70)	72 (55-87)	49 (0-100)	67 (40-85)	78 (63-95)	21 (0-38)

* provide the mean and range

Day 14 Emergence										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
89 (60-100)	75 (68-80)	96 (90-100)	93 (88-98)	88 (78-95)	65 (58-73)	78 (73-87)	93 (75-100)	77 (40-93)	88 (78-98)	83 (73-90)

Day 21 Emergence										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
89 (60-100)	77 (70-83)	97 (90-100)	94 (88-98)	88 (78-95)	67 (58-75)	78 (73-87)	93 (75-100)	85 (70-93)	88 (78-98)	85 (73-93)

Plant Injury Index										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
0-100	0-100	0-100	0-20	0-100	0-100	0-100	0-100	0-100	0-100	0-100

0%- No injury/effect; 10-30%- slight plant effect (effects barely noticeable to not obviously detrimental); 40-60%- moderate effect involving the whole plant (recovery possible to doubtful); 70-90%- severe effect with recovery not possible (loss of some leaves to only a few surviving leaves); 100%- complete plant effect (death of plant)

C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

Statistical Method(s): Any species exhibiting an inhibition of $\geq 5\%$ in dry weight, plant height, or % survival relative to the negative control was analyzed; toxicity values for all other species and endpoints were determined visually. All analyses were conducted using the negative control only. The reviewer then tested each appropriate data set for normality using the Chi-square and Shapiro-Wilks tests and for homogeneity of variance using the Hartley and Bartlett's tests. All data sets with the exclusion of corn survival met these assumptions of ANOVA; therefore, the NOAEC values were determined using the parametric Dunnett's and Williams' tests via Toxstat statistical software. In the case of corn survival, the Steel's and Krusal-Wallis tests were used to determine the NOAEC. The reviewer then attempted to determine the EC_x values, confidence intervals and probit slopes using the probit analysis via Nuthatch statistical software. All analyses were conducted using the nominal application rates in lbs a.i./A.

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Table 6: Reported effect of Dimethyl disulfide on Seedling Emergence

Species	Results summary for dry weight (lbs ai/A)									
	g*	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	Std. Err.
Onion	0.00554-0.00887	150	<37.5	NR	330	59-1900	>600	N/A	0.719	0.434
Oat	0.129-0.159	600	<37.5	NR	>600	N/A	>600	N/A	0.315	0.427
Ryegrass	8.98-14.83	75	<37.5	NR	290	NR	>600	N/A	0.734	0.572
Corn	0.291-0.330	600	240	NR	>600	N/A	>600	N/A	0.785	1.02
Sugarbeet	0.0207-0.0910	75	27	4.0-180	91	29-290	210	110-440	1.82	0.573
Cabbage	87.5-112.7	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Cucumber ¹	0.144-0.234	ND	ND	N/A	ND	N/A	ND	N/A	N/A	N/A
Soybean	0.216-0.292	300	130	NR	>600	N/A	>600	N/A	1.28	0.937
Lettuce	20.4-44.4	150	32	2.8-360	160	49-540	500	260-990	1.38	0.546
Tomato	26.4-52.4	300	180	42-790	400	220-720	>600	N/A	2.83	1.70

* range provided represents the range of the treatment means

NR-Not reliable; range fell outside the tested concentrations.

N/A- Not Applicable

N.D.- Not Determined

In the oat treatments, Replicate D from the Negative Control was dropped due to a problem with the irrigation tube, and Replicate B from the 37.5 lb/A treatment was dropped due to damage during handling.

¹Cucumber could not be analyzed due to lack of replicate data resulting from widespread mice damage.

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Table 6a: Reported effect of Dimethyl disulfide on Seedling Emergence

Species	Results summary for height (lbs ai/A)									
	cm*	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	Std. Err.
Onion	7.6-10.0	150	<37.5	NR	>600	N/A	>600	N/A	0.387	0.471
Oat ¹	37.3-39.7	600	320	NR	>600	N/A	>600	N/A	0.513	0.529
Ryegrass	11.5-13.5	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Corn	42.7-47.3	600	310	72-1300	>600	N/A	>600	N/A	1.09	0.890
Sugarbeet	5.8-12.6	75	35	9.6-130	160	82-300	450	310-640	1.48	0.322
Cabbage ²	9.7-11.4	600	N.D.	N/A	N.D.	N/A	N.D.	N/A	N/A	N/A
Cucumber ³	7.9-10.6	N.D.	N.D.	N.D.	N.D.	N/A	N.D.	N/A	N/A	N/A
Soybean	12.6-18.5	300	240	110-550	610	470-780	>600	N/A	2.44	1.03
Lettuce	6.1-8.7	75	28	1.9-410	430	170-1100	>600	N/A	0.815	0.323
Tomato	6.2-8.1	150	<37.5	NR	480	130-1800	>600	N/A	0.705	0.349

* range provided represents the range of the treatment means

NR-Not reliable; range fell outside the tested concentrations.

N/A- Not Applicable

N.D.- Not Determined

1 In the oat treatments, Replicate D from the Negative Control was dropped due to a problem with the irrigation tube.

2 Cabbage didn't fit probit analysis; NOAEC and EC25 values had to be visually determined.

3 Cucumber could not be analyzed due to lack of replicate data resulting from widespread mice damage.

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Table 6b: Reported effect of Dimethyl disulfide on Seedling Emergence

Species	Results summary for survival (lbs ai/A)									
	%*	NOAEC	EC ₀₅	95%CI	EC ₂₅	95%CI	EC ₅₀	95%CI	Slope	Std. Err.
Onion	91-100	600	51	NR	>600	N/A	>600	N/A	0.501	0.712
Oat	98-100	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Ryegrass	100	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Corn	91-100	600	<37.5	NR	>600	N/A	>600	N/A	0.571	0.394
Sugarbeet	88-100	75	130	NR	580	180-1900	>600	N/A	1.51	1.73
Cabbage	97-100	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Cucumber ¹	95-100	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Soybean	80-98	300	310	110-870	530	390-700	760	500-1100	4.30	3.18
Lettuce	97-100	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A
Tomato	97-100	600	>600	N/A	>600	N/A	>600	N/A	N/A	N/A

* range provided represents the range of the treatment means

NR-Not reliable; range fell outside the tested concentrations.

N/A- Not Applicable

N.D.- Not Determined

¹ Cucumber replicates at each treatment level were damaged by mice. Study authors provided data for all replicates, and performed statistics on all replicates and on just undamaged replicates. The reviewer was unable to perform statistics, so NOAEC and EC25 values were visually determined.

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Day 7 Emergence										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
80 (10-100)	44 (25-70)	96 (90-100)	71 (60-88)	83 (68-95)	47 (30-70)	72 (55-87)	49 (0-100)	67 (40-85)	78 (63-95)	21 (0-38)

Day 14 Emergence										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
89 (60-100)	75 (68-80)	96 (90-100)	93 (88-98)	88 (78-95)	65 (58-73)	78 (73-87)	93 (75-100)	77 (40-93)	88 (78-98)	83 (73-90)

Day 21 Emergence										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
89 (60-100)	77 (70-83)	97 (90-100)	94 (88-98)	88 (78-95)	67 (58-75)	78 (73-87)	93 (75-100)	85 (70-93)	88 (78-98)	85 (73-93)

Plant Injury Index										
Control	Onion	Oat	Ryegrass	Corn	Sugarbeet	Cabbage	Cucumber	Soybean	Lettuce	Tomato
0-100	0-100	0-100	0-20	0-100	0-100	0-100	0-100	0-100	0-100	0-100

0%- No injury/effect; 10-30%- slight plant effect (effects barely noticeable to not obviously detrimental); 40-60%- moderate effect involving the whole plant (recovery possible to doubtful); 70-90%- severe effect with recovery not possible (loss of some leaves to only a few surviving leaves); 100%- complete plant effect (death of plant)

Monocot

EC₀₅/IC₀₅: <37.5 lbs ai/A 95% C.I.: Not reliable

EC₂₅/IC₂₅: 290 lbs ai/A 95% C.I.: Not reliable

EC₅₀/IC₅₀: >600 lbs ai/A 95% C.I.: N/A

NOAEC: 75 lbs ai/A

Slope: 0.734

Std err: 0.572

Most sensitive monocot: Ryegrass

Most sensitive parameter: Dry weight

Dicot

EC₀₅/IC₀₅: 27 lbs ai/A 95% C.I.: 4.0-180 lbs ai/A

EC₂₅/IC₂₅: 91 lbs ai/A 95% C.I.: 29-290 lbs ai/A

EC₅₀/IC₅₀: 210 lbs ai/A 95% C.I.: 110-440 lbs ai/A

NOAEC: 75 lbs ai/A

Slope: 1.82

Std err: 0.573

Most sensitive dicot: Sugarbeet

Most sensitive parameter: Dry Weight

D. STUDY DEFICIENCIES:

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Herbivory (presumably by mice), resulting in seed and plant damage interfered with the ability to determine effects of treatment on cucumber, which may have been one of the most sensitive dicot species. While the study authors analyzed results for data including and excluding damaged plants, the reviewer did not believe that the results obtained from these analyses were reliable and suggests retesting this species, taking care to prevent the introduction of potentially confounding factors.

E. REVIEWER'S COMMENTS:

The results are based on the nominal test concentrations, because the application rates were not analytically verified.

The study authors did not report the confidence intervals or slopes for the results of statistical analyses. Therefore, the reviewer's results are reported in the Executive Summary and Conclusions sections of this DER using nominal test concentrations.

In the case of cabbage height, inhibitions were >5%, but the reviewer was unable to determine the EC₀₅ value due to the lack of three or more distinct isotone means. Therefore, the reviewer reported "N.D." in the respective tables. In situations where inhibitions of ≥5% were determined, but the NOAEC value was the highest nominal application rate, the reviewer indicated that the given endpoint exhibited no sensitivity.

Cucumber replicates suffered severe damage due to mice. The study authors reported data and statistics for all replicates, and for just the undamaged replicates. The reviewer used data for the undamaged replicates only, but was unable to generate statistics due to the lack of replicates. According to the statistics generated by the study authors, cucumber was the most sensitive dicot, but this could not be verified by the reviewer. Further, it is possible that the damage from the mice affected all of the replicates, not just the ones that appeared to be damaged.

The physiochemical properties of the test material were not reported.

In the oat treatments, Replicate D from the Negative Control was dropped due to a problem with the irrigation tube, and Replicate B from the 37.5 lb/A treatment was dropped due to damage during handling procedure.

The NOAEC for ryegrass dry weight and sugarbeet survival were determined visually by determination of the highest application rate with a % inhibition of <10% relative to the negative control.

F. CONCLUSIONS:

The study is classified as supplemental. The most sensitive monocot, based on dry weight, was ryegrass with NOAEC and EC₂₅ values of 75 and 290 lbs ai/A, respectively. The most sensitive dicot, based on dry weight, was sugarbeet, with NOAEC and EC₂₅ values of 75 and 91 lbs ai/A, respectively.

Most sensitive monocot and EC₂₅: Ryegrass (Dry weight), 290 lbs ai/A

Most sensitive dicot and EC₂₅: Sugarbeet (Dry weight), 91 lbs ai/A

III. REFERENCES:

U.S. Environmental Protection Agency. 1996. Series 850- Ecological Effects Test Guidelines (draft), OPPTS Number 850.4225: Terrestrial Plant Toxicity, Tier II (Seedling Emergence).

Frans, Robert E. and Ronald E. Talbert. 1977. Design of Field Experiments and the Measurement and Analysis of Plant Responses. Pages 15-23 in B. Truelove, ed. Research Methods in Weed Science. Southern Weed Science

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Society, Auburn University, Alabama.

SAS Institute, Inc. 1999. SAS Proprietary Software Version 8, Cary, NC, SAS Institute, Inc.

Bruce, Robert D. and Donald J. Versteeg. 1992. A Statistical Procedure for Modeling Continuous Toxicity Data. *Environmental Toxicology and Chemistry*. 11: 1485-1494.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
File: 1001cah 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	1.541	5.566	8.786	5.566	1.541
OBSERVED	0	7	7	9	0

Calculated Chi-Square goodness of fit test statistic = 5.9331
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
File: 1001cah Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 37.982

W = 0.973

Critical W (P = 0.05) (n = 23) = 0.914

Critical W (P = 0.01) (n = 23) = 0.881

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

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
File: 1001cah Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 10.71
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 2.83
(average df used)

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).

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Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
 File: 1001cah Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

 Calculated B statistic = 5.43
 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) = 2.83
 Used for Chi-square table value ==> df (#groups-1) = 5

 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).

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
 File: 1001cah Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	9.115	1.823	0.816
Within (Error)	17	37.982	2.234	
Total	22	47.097		

Critical F value = 2.81 (0.05,5,17)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
 File: 1001cah Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Neg control	10.600	10.600		
2	37.5	10.433	10.433	0.146	
3	75	11.425	11.425	-0.781	
4	150	10.875	10.875	-0.260	
5	300	9.700	9.700	0.852	
6	600	9.700	9.700	0.852	

 Bonferroni T table value = 2.57 (1 Tailed Value, P=0.05, df=17,5)

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
 File: 1001cah Transform: NO TRANSFORMATION

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BONFERRONI T-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	Neg control	4			
2	37.5	3	2.930	27.6	0.167
3	75	4	2.713	25.6	-0.825
4	150	4	2.713	25.6	-0.275
5	300	4	2.713	25.6	0.900
6	600	4	2.713	25.6	0.900

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
File: 1001cah Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	4	10.600	10.600	10.860
2	37.5	3	10.433	10.433	10.860
3	75	4	11.425	11.425	10.860
4	150	4	10.875	10.875	10.860
5	300	4	9.700	9.700	9.700
6	600	4	9.700	9.700	9.700

Dimethyl disulfide & Cabbage Height (cm) lbs ai/A
File: 1001cah Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	10.860				
37.5	10.860	0.228		1.74	k= 1, v=17
75	10.860	0.246		1.82	k= 2, v=17
150	10.860	0.246		1.85	k= 3, v=17
300	9.700	0.852		1.87	k= 4, v=17
600	9.700	0.852		1.87	k= 5, v=17

s = 1.495

Note: df used for table values are approximate when v > 20.

1001CAH : Dimethyl disulfide & Cabbage Height (cm) lbs ai/A

Williams Test

[One-Sided Test for Decrease, alpha = 0.050000]

Dose	Isotone Means	T-bar	P-value	Significance
0	10.9	.		
37.5	10.9	-0.2277		N.S.

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75	10.9	-0.246	N.S.
150	10.9	-0.246	N.S.
300	9.7	0.8515	N.S.
600	9.7	0.8515	N.S.

"*"=Significant; "N.S."=Not Significant.

!!!Failure #3: Data not suitable for probit model fit.

Criterion is 3 or more distinct isotone means.

Dimethyl disulfide & Corn Height (cm) lbs ai/A
File: 1001ch 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	11	5	8	0

Calculated Chi-Square goodness of fit test statistic = 10.5795
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Corn Height (cm) lbs ai/A
File: 1001ch Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 143.660

W = 0.962

Critical W (P = 0.05) (n = 24) = 0.916
Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Corn Height (cm) lbs ai/A
File: 1001ch Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 17.87
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 3.00

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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).

Dimethyl disulfide & Corn Height (cm) lbs ai/A
File: 1001ch Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 9.29
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) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Corn Height (cm) lbs ai/A
File: 1001ch Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	61.453	12.291	1.540
Within (Error)	18	143.660	7.981	
Total	23	205.113		

Critical F value = 2.77 (0.05,5,18)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Corn Height (cm) lbs ai/A
File: 1001ch 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	Neg Control	45.975	45.975		
2	37.5	47.275	47.275	-0.651	
3	75	46.950	46.950	-0.488	
4	150	45.375	45.375	0.300	
5	300	44.000	44.000	0.989	
6	600	42.725	42.725	1.627	

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Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Corn Height (cm) lbs ai/A
 File: 1001ch 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	Neg Control	4			
2	37.5	4	4.814	10.5	-1.300
3	75	4	4.814	10.5	-0.975
4	150	4	4.814	10.5	0.600
5	300	4	4.814	10.5	1.975
6	600	4	4.814	10.5	3.250

Dimethyl disulfide & Corn Height (cm) lbs ai/A
 File: 1001ch Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	45.975	45.975	46.733
2	37.5	4	47.275	47.275	46.733
3	75	4	46.950	46.950	46.733
4	150	4	45.375	45.375	45.375
5	300	4	44.000	44.000	44.000
6	600	4	42.725	42.725	42.725

Dimethyl disulfide & Corn Height (cm) lbs ai/A
 File: 1001ch Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	46.733				
37.5	46.733	0.380		1.73	k= 1, v=18
75	46.733	0.380		1.82	k= 2, v=18
150	45.375	0.300		1.85	k= 3, v=18
300	44.000	0.989		1.86	k= 4, v=18
600	42.725	1.627		1.87	k= 5, v=18

s = 2.825

Note: df used for table values are approximate when v > 20.

Estimates of EC%

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Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	3.1E+02	72.	1.3E+03	0.31	0.23
EC10	6.7E+02	2.8E+02	1.6E+03	0.18	0.42
EC25	2.4E+03	2.1E+02	2.7E+04	0.51	0.089
EC50	9.9E+03	86.	1.1E+06	0.99	0.0087

Slope = 1.09 Std.Err. = 0.890

Goodness of fit: p = 0.82 based on DF= 3.0 18.

 1001CH : Dimethyl disulfide & Corn Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	46.0	46.8	-0.792	100.	0.00
37.5	4.00	47.3	46.6	0.697	99.6	0.403
75.0	4.00	46.9	46.3	0.659	99.0	1.02
150.	4.00	45.4	45.7	-0.303	97.7	2.33
300.	4.00	44.0	44.5	-0.504	95.2	4.84
600.	4.00	42.7	42.5	0.241	90.8	9.16

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
 File: 1001lh 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	8	9	7	0

 Calculated Chi-Square goodness of fit test statistic = 4.2910
 Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
 File: 1001lh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 7.955

W = 0.976

Critical W (P = 0.05) (n = 24) = 0.916

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
File: 1001lh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 17.24
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
File: 1001lh Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 4.49
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) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
File: 1001lh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	24.023	4.805	10.871
Within (Error)	18	7.955	0.442	
Total	23	31.978		

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Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
 File: 1001lh 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	Neg control	8.300	8.300		
2	37.5	8.675	8.675	-0.798	
3	75	8.275	8.275	0.053	
4	150	6.650	6.650	3.510	*
5	300	6.100	6.100	4.680	*
6	600	6.650	6.650	3.510	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
 File: 1001lh 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	Neg control	4			
2	37.5	4	1.133	13.7	-0.375
3	75	4	1.133	13.7	0.025
4	150	4	1.133	13.7	1.650
5	300	4	1.133	13.7	2.200
6	600	4	1.133	13.7	1.650

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
 File: 1001lh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	4	8.300	8.300	8.488
2	37.5	4	8.675	8.675	8.488
3	75	4	8.275	8.275	8.275
4	150	4	6.650	6.650	6.650
5	300	4	6.100	6.100	6.375
6	600	4	6.650	6.650	6.375

Dimethyl disulfide & Lettuce Height (cm) lbs ai/A
 File: 1001lh Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	8.488				
37.5	8.488	0.399		1.73	k= 1, v=18
75	8.275	0.053		1.82	k= 2, v=18
150	6.650	3.510	*	1.85	k= 3, v=18
300	6.375	4.095	*	1.86	k= 4, v=18
600	6.375	4.095	*	1.87	k= 5, v=18

s = 0.665

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	28.	1.9	4.1E+02	0.56	0.068
EC10	78.	12.	5.2E+02	0.40	0.15
EC25	4.3E+02	1.7E+02	1.1E+03	0.20	0.39
EC50	2.9E+03	5.9E+02	1.4E+04	0.33	0.20

Slope = 0.815 Std.Err. = 0.323

!!!Poor fit: p = 0.0046 based on DF= 3.0 18.

1001LH : Dimethyl disulfide & Lettuce Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	8.30	8.60	-0.298	100.	0.00
37.5	4.00	8.68	8.07	0.609	93.8	6.18
75.0	4.00	8.27	7.76	0.518	90.2	9.78
150.	4.00	6.65	7.33	-0.683	85.3	14.7
300.	4.00	6.10	6.79	-0.686	78.9	21.1
600.	4.00	6.65	6.12	0.530	71.2	28.8

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh 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	1.541	5.566	8.786	5.566	1.541
OBSERVED	0	9	7	7	0

Calculated Chi-Square goodness of fit test statistic = 5.9331

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 85.555

W = 0.947

Critical W (P = 0.05) (n = 23) = 0.914

Critical W (P = 0.01) (n = 23) = 0.881

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

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 14.13

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==>	R (# groups) =	6,	df (# reps-1) =	3
Actual values ==>	R (# groups) =	6,	df (# avg reps-1) =	2.83
			(average df used)	

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).

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 7.04

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) = 2.83

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

Data PASS homogeneity test at 0.01 level. Continue analysis.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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NOTE: If groups have unequal replicate sizes the average replicate size is used to calculate the B statistic (see above).

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	22.411	4.482	0.891
Within (Error)	17	85.555	5.033	
Total	22	107.966		

Critical F value = 2.81 (0.05,5,17)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Neg control	39.800	39.800		
2	37.5	39.700	39.700	0.058	
3	75	39.650	39.650	0.088	
4	150	38.150	38.150	0.963	
5	300	37.325	37.325	1.444	
6	600	37.925	37.925	1.094	

Bonferroni T table value = 2.57 (1 Tailed Value, P=0.05, df=17,5)

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

BONFERRONI T-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	Neg control	3			
2	37.5	4	4.398	11.1	0.100
3	75	4	4.398	11.1	0.150
4	150	4	4.398	11.1	1.650
5	300	4	4.398	11.1	2.475
6	600	4	4.398	11.1	1.875

Dimethyl disulfide & Oat Height (cm) lbs ai/A
File: 1001oh Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	3	39.800	39.800	39.800
2	37.5	4	39.700	39.700	39.700
3	75	4	39.650	39.650	39.650
4	150	4	38.150	38.150	38.150
5	300	4	37.325	37.325	37.625
6	600	4	37.925	37.925	37.625

Dimethyl disulfide & Oat Height (cm) lbs ai/A
 File: 1001oh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	39.800				
37.5	39.700	0.058		1.74	k= 1, v=17
75	39.650	0.088		1.82	k= 2, v=17
150	38.150	0.963		1.85	k= 3, v=17
300	37.625	1.269		1.87	k= 4, v=17
600	37.625	1.269		1.87	k= 5, v=17

s = 2.243

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	3.2E+02	14.	7.4E+03	0.65	0.044
EC10	1.6E+03	76.	3.6E+04	0.64	0.046
EC25	2.5E+04	8.6	7.4E+07	1.7	0.00034
EC50	5.2E+05	0.32	8.5E+11	3.0	6.1E-07

Slope = 0.513 Std.Err. = 0.529

Goodness of fit: p = 0.73 based on DF= 3.0 17.

1001OH : Dimethyl disulfide & Oat Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	3.00	39.8	40.0	-0.240	100.	0.00
37.5	4.00	39.7	39.4	0.335	98.3	1.69
75.0	4.00	39.7	39.1	0.590	97.6	2.45
150.	4.00	38.2	38.6	-0.497	96.5	3.48
300.	4.00	37.3	38.1	-0.776	95.2	4.84
600.	4.00	37.9	37.4	0.529	93.4	6.60

!!!Warning: EC10 not bracketed by doses evaluated.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Onion Height (cm) lbs ai/A
File: 1001onh 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	10	4	10	0

Calculated Chi-Square goodness of fit test statistic = 12.1805
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Onion Height (cm) lbs ai/A
File: 1001onh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 12.365

W = 0.974

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Onion Height (cm) lbs ai/A
File: 1001onh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 40.06
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, 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).

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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Dimethyl disulfide & Onion Height (cm) lbs ai/A
 File: 100lonh Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

 Calculated B statistic = 8.11
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

 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).

Dimethyl disulfide & Onion Height (cm) lbs ai/A
 File: 100lonh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	15.953	3.191	4.645
Within (Error)	18	12.365	0.687	
Total	23	28.318		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Onion Height (cm) lbs ai/A
 File: 100lonh 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	Neg control	9.275	9.275		
2	37.5	8.025	8.025	2.133	
3	75	10.025	10.025	-1.280	
4	150	8.275	8.275	1.706	
5	300	7.575	7.575	2.901	*
6	600	8.475	8.475	1.365	

 Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Onion Height (cm) lbs ai/A

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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File: 1001onh 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	Neg control	4			
2	37.5	4	1.412	15.2	1.250
3	75	4	1.412	15.2	-0.750
4	150	4	1.412	15.2	1.000
5	300	4	1.412	15.2	1.700
6	600	4	1.412	15.2	0.800

Dimethyl disulfide & Onion Height (cm) lbs ai/A
File: 1001onh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	4	9.275	9.275	9.275
2	37.5	4	8.025	8.025	9.025
3	75	4	10.025	10.025	9.025
4	150	4	8.275	8.275	8.275
5	300	4	7.575	7.575	8.025
6	600	4	8.475	8.475	8.025

Dimethyl disulfide & Onion Height (cm) lbs ai/A
File: 1001onh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	9.275				
37.5	9.025	0.427		1.73	k= 1, v=18
75	9.025	0.427		1.82	k= 2, v=18
150	8.275	1.706		1.85	k= 3, v=18
300	8.025	2.133	*	1.86	k= 4, v=18
600	8.025	2.133	*	1.87	k= 5, v=18

s = 0.829

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	33.	0.0097	1.1E+05	1.7	0.00030
EC10	2.8E+02	3.2	2.5E+04	0.94	0.011
EC25	1.1E+04	1.6	7.0E+07	1.8	0.00015
EC50	5.8E+05	0.0062	5.5E+13	3.8	1.1E-08

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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Slope = 0.387 Std.Err. = 0.471

!!!Poor fit: p = 0.0041 based on DF= 3.0 18.

1001ONH : Dimethyl disulfide & Onion Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. - Pred.	Pred. %Control	%Change
0.00	4.00	9.28	9.27	0.00844	100.	0.00
37.5	4.00	8.03	8.78	-0.756	94.8	5.24
75.0	4.00	10.0	8.65	1.37	93.4	6.61
150.	4.00	8.28	8.50	-0.228	91.8	8.24
300.	4.00	7.58	8.33	-0.750	89.8	10.2
600.	4.00	8.47	8.12	0.356	87.6	12.4

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
File: 1001rh 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	9	9	6	0

Calculated Chi-Square goodness of fit test statistic = 4.9797
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
File: 1001rh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 54.142

W = 0.961

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
 File: 1001rh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 3.75
 Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
 File: 1001rh Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 1.49
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
 File: 1001rh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	17.777	3.555	1.182
Within (Error)	18	54.142	3.008	
Total	23	71.920		

Critical F value = 2.77 (0.05,5,18)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
File: 1001rh 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	Neg Control	13.600	13.600		
2	37.5	13.450	13.450	0.122	
3	75	13.425	13.425	0.143	
4	150	11.750	11.750	1.509	
5	300	11.525	11.525	1.692	
6	600	12.175	12.175	1.162	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
File: 1001rh 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	Neg Control	4			
2	37.5	4	2.956	21.7	0.150
3	75	4	2.956	21.7	0.175
4	150	4	2.956	21.7	1.850
5	300	4	2.956	21.7	2.075
6	600	4	2.956	21.7	1.425

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
File: 1001rh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	13.600	13.600	13.600
2	37.5	4	13.450	13.450	13.450
3	75	4	13.425	13.425	13.425
4	150	4	11.750	11.750	11.817
5	300	4	11.525	11.525	11.817
6	600	4	12.175	12.175	11.817

Dimethyl disulfide & Ryegrass Height (cm) lbs ai/A
File: 1001rh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM

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	Neg Control	13.600			
	37.5	13.450	0.122	1.73	k= 1, v=18
	75	13.425	0.143	1.82	k= 2, v=18
	150	11.817	1.454	1.85	k= 3, v=18
	300	11.817	1.454	1.86	k= 4, v=18
	600	11.817	1.454	1.87	k= 5, v=18

s = 1.734

Note: df used for table values are approximate when v > 20.

!!!Failure#1: near-singular matrix, model possibly unsuitable.

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A

File: 1001sbh 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	10	6	8	0

Calculated Chi-Square goodness of fit test statistic = 8.1636

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A

File: 1001sbh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 35.242

W = 0.952

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A

File: 1001sbh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 9.05

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, df (# avg reps-1) = 3.00

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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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).

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A
 File: 1001sbh Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 5.36
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A
 File: 1001sbh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	164.687	32.937	16.822
Within (Error)	18	35.242	1.958	
Total	23	199.930		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A
 File: 1001sbh 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	Neg Control	12.300	12.300		
2	37.5	12.600	12.600	-0.303	
3	75	11.775	11.775	0.531	
4	150	9.325	9.325	3.007	*
5	300	7.200	7.200	5.154	*

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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6 600 5.775 5.775 6.595 *

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A
File: 1001sbh 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	Neg Control	4			
2	37.5	4	2.385	19.4	-0.300
3	75	4	2.385	19.4	0.525
4	150	4	2.385	19.4	2.975
5	300	4	2.385	19.4	5.100
6	600	4	2.385	19.4	6.525

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A
File: 1001sbh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	12.300	12.300	12.450
2	37.5	4	12.600	12.600	12.450
3	75	4	11.775	11.775	11.775
4	150	4	9.325	9.325	9.325
5	300	4	7.200	7.200	7.200
6	600	4	5.775	5.775	5.775

Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A
File: 1001sbh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	12.450				
37.5	12.450	0.152		1.73	k= 1, v=18
75	11.775	0.531		1.82	k= 2, v=18
150	9.325	3.007	*	1.85	k= 3, v=18
300	7.200	5.155	*	1.86	k= 4, v=18
600	5.775	6.595	*	1.87	k= 5, v=18

s = 1.399

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	35.	9.6	1.3E+02	0.27	0.28
EC10	61.	22.	1.7E+02	0.22	0.35
EC25	1.6E+02	82.	3.0E+02	0.14	0.52
EC50	4.5E+02	3.1E+02	6.4E+02	0.075	0.70

Slope = 1.48 Std.Err. = 0.322

Goodness of fit: p = 0.50 based on DF= 3.0 18.

 1001SBH : Dimethyl disulfide & Sugarbeet Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	12.3	12.8	-0.499	100.	0.00
37.5	4.00	12.6	12.1	0.510	94.5	5.54
75.0	4.00	11.8	11.2	0.577	87.5	12.5
150.	4.00	9.32	9.72	-0.396	75.9	24.1
300.	4.00	7.20	7.71	-0.510	60.2	39.8
600.	4.00	5.77	5.46	0.318	42.6	57.4

!!!Warning: EC5 not bracketed by doses evaluated.

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	10	7	7	0

 Calculated Chi-Square goodness of fit test statistic = 6.9989

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 16.775

W = 0.976

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 6.46
 Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 3.63
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	75.703	15.141	16.246
Within (Error)	18	16.775	0.932	
Total	23	92.478		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh 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	Neg control	16.850	16.850		
2	37.5	15.500	15.500	1.978	
3	75	18.525	18.525	-2.454	
4	150	15.550	15.550	1.904	
5	300	15.725	15.725	1.648	
6	600	12.600	12.600	6.226	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh 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	Neg control	4			
2	37.5	4	1.645	9.8	1.350
3	75	4	1.645	9.8	-1.675
4	150	4	1.645	9.8	1.300
5	300	4	1.645	9.8	1.125
6	600	4	1.645	9.8	4.250

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	4	16.850	16.850	16.958
2	37.5	4	15.500	15.500	16.958
3	75	4	18.525	18.525	16.958
4	150	4	15.550	15.550	15.638
5	300	4	15.725	15.725	15.638
6	600	4	12.600	12.600	12.600

Dimethyl disulfide & Soybean Height (cm) lbs ai/A
 File: 1001sh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

ISOTONIZED	CALC.	SIG	TABLE	DEGREES OF
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

IDENTIFICATION	MEAN	WILLIAMS	P=.05	WILLIAMS	FREEDOM
Neg control	16.958				
37.5	16.958	0.159		1.73	k= 1, v=18
75	16.958	0.159		1.82	k= 2, v=18
150	15.638	1.776		1.85	k= 3, v=18
300	15.638	1.776		1.86	k= 4, v=18
600	12.600	6.226	*	1.87	k= 5, v=18

s = 0.965

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	2.4E+02	1.1E+02	5.5E+02	0.17	0.45
EC10	3.4E+02	2.0E+02	5.8E+02	0.11	0.59
EC25	6.1E+02	4.7E+02	7.8E+02	0.053	0.78
EC50	1.2E+03	6.0E+02	2.2E+03	0.13	0.52

Slope = 2.44 Std.Err. = 1.03

!!!Poor fit: p = 0.0018 based on DF= 3.0 18.

1001SH : Dimethyl disulfide & Soybean Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	16.9	16.7	0.113	100.	0.00
37.5	4.00	15.5	16.7	-1.23	100.	0.0140
75.0	4.00	18.5	16.7	1.82	99.8	0.188
150.	4.00	15.5	16.5	-0.931	98.5	1.53
300.	4.00	15.7	15.5	0.274	92.3	7.68
600.	4.00	12.6	12.6	-0.0399	75.5	24.5

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Tomato Height (cm) lbs ai/A

File: 1001th 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	7	9	8	0

Calculated Chi-Square goodness of fit test statistic = 4.2910

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

Data PASS normality test. Continue analysis.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
File: 1001th Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 19.802

W = 0.972

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
File: 1001th Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 15.88
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
File: 1001th Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 6.45
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) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Tomato Height (cm) lbs ai/A

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

File: 1001th Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	14.824	2.965	2.695
Within (Error)	18	19.803	1.100	
Total	23	34.626		

Critical F value = 2.77 (0.05,5,18)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
 File: 1001th 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	Neg Control	8.375	8.375		
2	37.5	8.150	8.150	0.303	
3	75	7.125	7.125	1.685	
4	150	7.350	7.350	1.382	
5	300	6.500	6.500	2.528	*
6	600	6.225	6.225	2.899	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
 File: 1001th 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	Neg Control	4			
2	37.5	4	1.787	21.3	0.225
3	75	4	1.787	21.3	1.250
4	150	4	1.787	21.3	1.025
5	300	4	1.787	21.3	1.875
6	600	4	1.787	21.3	2.150

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
 File: 1001th Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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1	Neg Control	4	8.375	8.375	8.375
2	37.5	4	8.150	8.150	8.150
3	75	4	7.125	7.125	7.238
4	150	4	7.350	7.350	7.238
5	300	4	6.500	6.500	6.500
6	600	4	6.225	6.225	6.225

Dimethyl disulfide & Tomato Height (cm) lbs ai/A
 File: 1001th Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	8.375				
37.5	8.150	0.303		1.73	k= 1, v=18
75	7.238	1.534		1.82	k= 2, v=18
150	7.238	1.534		1.85	k= 3, v=18
300	6.500	2.528	*	1.86	k= 4, v=18
600	6.225	2.899	*	1.87	k= 5, v=18

s = 1.049

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	20.	0.51	7.9E+02	0.77	0.025
EC10	66.	5.1	8.6E+02	0.54	0.077
EC25	4.8E+02	1.3E+02	1.8E+03	0.27	0.27
EC50	4.3E+03	3.7E+02	5.0E+04	0.51	0.086

Slope = 0.705 Std.Err. = 0.349

Goodness of fit: p = 0.73 based on DF= 3.0 18.

1001TH : Dimethyl disulfide & Tomato Height (cm) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	8.38	8.42	-0.0495	100.	0.00
37.5	4.00	8.15	7.81	0.339	92.7	7.28
75.0	4.00	7.13	7.52	-0.399	89.3	10.7
150.	4.00	7.35	7.15	0.200	84.9	15.1
300.	4.00	6.50	6.68	-0.184	79.3	20.7
600.	4.00	6.22	6.13	0.0935	72.8	27.2

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A

File: 1001cw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	9	7	8	0

Calculated Chi-Square goodness of fit test statistic = 6.3102

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A

File: 1001cw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 0.018

W = 0.957

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A

File: 1001cw Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 15.81

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3

Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A

File: 1001cw Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Bartlett's test for homogeneity of variance

Calculated B statistic = 8.55
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A
 File: 1001cw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.0038	0.0008	0.800
Within (Error)	18	0.0184	0.0010	
Total	23	0.0222		

Critical F value = 2.77 (0.05,5,18)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A
 File: 1001cw 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	Neg Control	0.312	0.312		
2	37.5	0.330	0.330	-0.816	
3	75	0.308	0.308	0.179	
4	150	0.299	0.299	0.570	
5	300	0.298	0.298	0.626	
6	600	0.291	0.291	0.917	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A
 File: 1001cw 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
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Group	Identification	N	Original Mean	Transformed Mean	Isotonized Mean
1	Neg Control	4			
2	37.5	4	0.054	17.3	-0.018
3	75	4	0.054	17.3	0.004
4	150	4	0.054	17.3	0.013
5	300	4	0.054	17.3	0.014
6	600	4	0.054	17.3	0.021

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A
 File: 1001cw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	0.312	0.312	0.321
2	37.5	4	0.330	0.330	0.321
3	75	4	0.308	0.308	0.308
4	150	4	0.299	0.299	0.299
5	300	4	0.298	0.298	0.298
6	600	4	0.291	0.291	0.291

Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A
 File: 1001cw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	0.321				
37.5	0.321	0.404		1.73	k= 1, v=18
75	0.308	0.177		1.82	k= 2, v=18
150	0.299	0.565		1.85	k= 3, v=18
300	0.298	0.620		1.86	k= 4, v=18
600	0.291	0.908		1.87	k= 5, v=18

s = 0.032

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	2.4E+02	7.5	7.5E+03	0.72	0.032
EC10	6.9E+02	85.	5.6E+03	0.44	0.12
EC25	4.1E+03	19.	8.6E+05	1.1	0.0047
EC50	3.0E+04	0.84	1.0E+09	2.2	2.8E-05

Slope = 0.785 Std.Err. = 1.02

Goodness of fit: p = 0.72 based on DF= 3.0 18.

1001CW : Dimethyl disulfide & Corn Dry Weight (g) lbs ai/A

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. - Pred.	Pred. %Control	%Change
0.00	4.00	0.312	0.318	-0.00610	100.	0.00
37.5	4.00	0.330	0.314	0.0158	98.9	1.15
75.0	4.00	0.308	0.311	-0.00349	97.9	2.08
150.	4.00	0.299	0.306	-0.00747	96.4	3.58
300.	4.00	0.298	0.299	-0.00142	94.1	5.88
600.	4.00	0.291	0.289	0.00262	90.8	9.19

!!!Warning: EC10 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
 File: 1001lw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	10	8	6	0

Calculated Chi-Square goodness of fit test statistic = 6.3968
 Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
 File: 1001lw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 1080.630

W = 0.933

Critical W (P = 0.05) (n = 24) = 0.916
 Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
 File: 1001lw Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 101.43

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
 File: 1001lw Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

 Calculated B statistic = 14.22
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

 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).

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
 File: 1001lw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	1769.070	353.814	5.893
Within (Error)	18	1080.630	60.035	
Total	23	2849.700		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
 File: 1001lw Transform: NO TRANSFORMATION

DUNNETTS TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

1	Neg Control	35.425	35.425	
2	37.5	44.375	44.375	-1.634
3	75	36.175	36.175	-0.137
4	150	26.750	26.750	1.583
5	300	21.625	21.625	2.519 *
6	600	20.450	20.450	2.733 *

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
File: 1001lw 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	Neg Control	4			
2	37.5	4	13.204	37.3	-8.950
3	75	4	13.204	37.3	-0.750
4	150	4	13.204	37.3	8.675
5	300	4	13.204	37.3	13.800
6	600	4	13.204	37.3	14.975

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
File: 1001lw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	35.425	35.425	39.900
2	37.5	4	44.375	44.375	39.900
3	75	4	36.175	36.175	36.175
4	150	4	26.750	26.750	26.750
5	300	4	21.625	21.625	21.625
6	600	4	20.450	20.450	20.450

Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A
File: 1001lw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	39.900				
37.5	39.900	0.817		1.73	k= 1, v=18
75	36.175	0.137		1.82	k= 2, v=18
150	26.750	1.583		1.85	k= 3, v=18
300	21.625	2.519	*	1.86	k= 4, v=18
600	20.450	2.733	*	1.87	k= 5, v=18

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

s = 7.748

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	32.	2.8	3.6E+02	0.51	0.089
EC10	59.	8.4	4.1E+02	0.41	0.14
EC25	1.6E+02	49.	5.4E+02	0.25	0.30
EC50	5.0E+02	2.6E+02	9.9E+02	0.14	0.51

Slope = 1.38 Std.Err. = 0.546

Goodness of fit: p = 0.11 based on DF= 3.0 18.

1001LW : Dimethyl disulfide & Lettuce Dry Weight (g) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	35.4	39.7	-4.30	100.	0.00
37.5	4.00	44.4	37.3	7.06	93.9	6.06
75.0	4.00	36.2	34.6	1.54	87.2	12.8
150.	4.00	26.8	30.4	-3.63	76.5	23.5
300.	4.00	21.6	24.7	-3.04	62.1	37.9
600.	4.00	20.5	18.2	2.26	45.8	54.2

!!!Warning: EC5 not bracketed by doses evaluated.

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
File: 1001onw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	9	8	7	0

Calculated Chi-Square goodness of fit test statistic = 5.3637
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
File: 1001onw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 33.592

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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W = 0.951

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001ow Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 10.49

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3

Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001ow Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 6.60

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) = 3.00

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

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).

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001ow Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	33.535	6.707	3.594
Within (Error)	18	33.592	1.866	

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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Total 23 67.126

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001onw 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	Neg Control	8.855	8.855		
2	37.5	8.168	8.168	0.712	
3	75	8.870	8.870	-0.016	
4	150	7.150	7.150	1.765	
5	300	5.543	5.543	3.429	*
6	600	6.938	6.938	1.985	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001onw 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	Neg Control	4			
2	37.5	4	2.328	26.3	0.687
3	75	4	2.328	26.3	-0.015
4	150	4	2.328	26.3	1.705
5	300	4	2.328	26.3	3.312
6	600	4	2.328	26.3	1.917

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001onw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	8.855	8.855	8.855
2	37.5	4	8.168	8.168	8.519
3	75	4	8.870	8.870	8.519
4	150	4	7.150	7.150	7.150
5	300	4	5.543	5.543	6.240
6	600	4	6.938	6.938	6.240

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A
 File: 1001onw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	8.855				
37.5	8.519	0.348		1.73	k= 1, v=18
75	8.519	0.348		1.82	k= 2, v=18
150	7.150	1.765		1.85	k= 3, v=18
300	6.240	2.707	*	1.86	k= 4, v=18
600	6.240	2.707	*	1.87	k= 5, v=18

s = 1.366

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	15.	0.12	1.8E+03	1.0	0.0081
EC10	48.	1.5	1.5E+03	0.72	0.031
EC25	3.3E+02	59.	1.9E+03	0.36	0.18
EC50	2.9E+03	2.1E+02	4.1E+04	0.55	0.071

Slope = 0.719 Std.Err. = 0.434

Goodness of fit: p = 0.077 based on DF= 3.0 18.

1001ONW : Dimethyl disulfide & Onion Dry Weight (g) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	8.86	9.00	-0.146	100.	0.00
37.5	4.00	8.17	8.21	-0.0474	91.3	8.73
75.0	4.00	8.87	7.86	1.01	87.3	12.7
150.	4.00	7.15	7.40	-0.253	82.2	17.8
300.	4.00	5.54	6.85	-1.30	76.1	23.9
600.	4.00	6.94	6.20	0.738	68.9	31.1

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Oat Dry Weight lbs ai/A
 File: 1001ow 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	1.474	5.324	8.404	5.324	1.474
OBSERVED	0	7	8	7	0

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Calculated Chi-Square goodness of fit test statistic = 4.0226
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Oat Dry Weight lbs ai/A
File: 1001ow Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 0.006

W = 0.961

Critical W (P = 0.05) (n = 22) = 0.911

Critical W (P = 0.01) (n = 22) = 0.878

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

Dimethyl disulfide & Oat Dry Weight lbs ai/A
File: 1001ow Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 6.15
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 2.67
(average df used)

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).

Dimethyl disulfide & Oat Dry Weight lbs ai/A
File: 1001ow Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 2.31
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) = 2.67
Used for Chi-square table value ==> df (#groups-1) = 5

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

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).

Dimethyl disulfide & Oat Dry Weight lbs ai/A
File: 1001ow Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.0025	0.0005	1.250
Within (Error)	16	0.0056	0.0004	
Total	21	0.0081		

Critical F value = 2.85 (0.05,5,16)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Oat Dry Weight lbs ai/A
File: 1001ow Transform: NO TRANSFORMATION

BONFERRONI T-TEST - TABLE 1 OF 2 Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	T STAT	SIG
1	Neg control	0.154	0.154		
2	37.5	0.159	0.159	-0.265	
3	75	0.139	0.139	0.971	
4	150	0.131	0.131	1.528	
5	300	0.129	0.129	1.675	
6	600	0.143	0.143	0.775	

Bonferroni T table value = 2.58 (1 Tailed Value, P=0.05, df=16,5)

Dimethyl disulfide & Oat Dry Weight lbs ai/A
File: 1001ow Transform: NO TRANSFORMATION

BONFERRONI T-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	Neg control	3			
2	37.5	3	0.042	27.3	-0.004
3	75	4	0.039	25.6	0.015
4	150	4	0.039	25.6	0.023
5	300	4	0.039	25.6	0.026
6	600	4	0.039	25.6	0.012

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Oat Dry Weight lbs ai/A
 File: 1001ow Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	3	0.154	0.154	0.157
2	37.5	3	0.159	0.159	0.157
3	75	4	0.139	0.139	0.139
4	150	4	0.131	0.131	0.134
5	300	4	0.129	0.129	0.134
6	600	4	0.143	0.143	0.134

Dimethyl disulfide & Oat Dry Weight lbs ai/A
 File: 1001ow Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	0.157				
37.5	0.157	0.142		1.75	k= 1, v=16
75	0.139	1.038		1.83	k= 2, v=16
150	0.134	1.417		1.86	k= 3, v=16
300	0.134	1.417		1.87	k= 4, v=16
600	0.134	1.417		1.88	k= 5, v=16

s = 0.019

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound
		Lower	Upper		/Estimate
EC5	9.4	3.7E-05	2.4E+06	2.6	3.9E-06
EC10	1.3E+02	0.18	1.0E+05	1.4	0.0013
EC25	1.1E+04	0.30	4.2E+08	2.2	2.7E-05
EC50	1.6E+06	8.8E-05	2.8E+16	4.9	5.7E-11

Slope = 0.315 Std.Err. = 0.427

Goodness of fit: p = 0.26 based on DF= 3.0 16.

1001OW : Dimethyl disulfide & Oat Dry Weight lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	3.00	0.154	0.155	-0.00115	100.	0.00
37.5	3.00	0.159	0.144	0.0145	92.7	7.27
75.0	4.00	0.140	0.142	-0.00250	91.3	8.67

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A EPA MRID Number 47381001

150.	4.00	0.131	0.140	-0.00852	89.7	10.3
300.	4.00	0.129	0.137	-0.00797	87.9	12.1
600.	4.00	0.143	0.134	0.00891	85.9	14.1

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	7	11	6	0

Calculated Chi-Square goodness of fit test statistic = 3.8331

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 166.712

W = 0.976

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 8.85

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3

Actual values ==> R (# groups) = 6, df (# avg reps-1) = 3.00

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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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).

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 4.10
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) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	93.383	18.677	2.017
Within (Error)	18	166.712	9.262	
Total	23	260.095		

Critical F value = 2.77 (0.05,5,18)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw 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	Neg Control	13.525	13.525		
2	37.5	14.833	14.833	-0.608	
3	75	11.830	11.830	0.788	
4	150	10.417	10.417	1.444	
5	300	8.978	8.978	2.113	
6	600	10.638	10.638	1.342	

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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Dunnnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw 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	Neg Control	4			
2	37.5	4	5.186	38.3	-1.307
3	75	4	5.186	38.3	1.695
4	150	4	5.186	38.3	3.108
5	300	4	5.186	38.3	4.548
6	600	4	5.186	38.3	2.887

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	13.525	13.525	14.179
2	37.5	4	14.833	14.833	14.179
3	75	4	11.830	11.830	11.830
4	150	4	10.417	10.417	10.417
5	300	4	8.978	8.978	9.808
6	600	4	10.638	10.638	9.808

Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A
File: 1001rw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	14.179				
37.5	14.179	0.304		1.73	k= 1, v=18
75	11.830	0.788		1.82	k= 2, v=18
150	10.417	1.444		1.85	k= 3, v=18
300	9.808	1.728		1.86	k= 4, v=18
600	9.808	1.728		1.87	k= 5, v=18

s = 3.043

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	Upper	Std.Err.	Lower Bound /Estimate
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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EC5	14.	0.024	7.7E+03	1.3	0.0018
EC10	43.	0.42	4.4E+03	0.97	0.0098
EC25	2.9E+02	28.	3.0E+03	0.49	0.097
EC50	2.4E+03	99.	5.7E+04	0.66	0.042

Slope = 0.734 Std.Err. = 0.572

Goodness of fit: p = 0.30 based on DF= 3.0 18.

 1001RW : Dimethyl disulfide & Ryegrass Dry Weight (g) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. - Pred.	Pred. %Control	%Change
0.00	4.00	13.5	14.1	-0.532	100.	0.00
37.5	4.00	14.8	12.7	2.08	90.7	9.31
75.0	4.00	11.8	12.2	-0.323	86.5	13.5
150.	4.00	10.4	11.4	-0.977	81.1	18.9
300.	4.00	8.98	10.5	-1.50	74.5	25.5
600.	4.00	10.6	9.41	1.23	66.9	33.1

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A

File: 1001sbw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	9	7	8	0

 Calculated Chi-Square goodness of fit test statistic = 6.3102

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A

File: 1001sbw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 6261.590

W = 0.966

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
File: 1001sbw Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 10.16
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
File: 1001sbw Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 3.95
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) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
File: 1001sbw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE DF SS MS F

Between 5 15138.955 3027.791 8.704
Within (Error) 18 6261.590 347.866

Total 23 21400.545

Critical F value = 2.77 (0.05,5,18)
Since F > Critical F REJECT Ho:All groups equal

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
 File: 1001sbw 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	Neg Control	76.675	76.675		
2	37.5	90.975	90.975	-1.084	
3	75	67.650	67.650	0.684	
4	150	47.975	47.975	2.176	
5	300	29.825	29.825	3.552	*
6	600	20.650	20.650	4.248	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
 File: 1001sbw 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	Neg Control	4			
2	37.5	4	31.784	41.5	-14.300
3	75	4	31.784	41.5	9.025
4	150	4	31.784	41.5	28.700
5	300	4	31.784	41.5	46.850
6	600	4	31.784	41.5	56.025

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
 File: 1001sbw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	76.675	76.675	83.825
2	37.5	4	90.975	90.975	83.825
3	75	4	67.650	67.650	67.650
4	150	4	47.975	47.975	47.975
5	300	4	29.825	29.825	29.825
6	600	4	20.650	20.650	20.650

Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A
 File: 1001sbw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

ISOTONIZED	CALC.	SIG	TABLE	DEGREES OF
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

IDENTIFICATION	MEAN	WILLIAMS	P=.05	WILLIAMS	FREEDOM
Neg Control	83.825				
37.5	83.825	0.542		1.73	k= 1, v=18
75	67.650	0.684		1.82	k= 2, v=18
150	47.975	2.176	*	1.85	k= 3, v=18
300	29.825	3.552	*	1.86	k= 4, v=18
600	20.650	4.248	*	1.87	k= 5, v=18

s = 18.651

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	27.	4.0	1.8E+02	0.40	0.15
EC10	42.	8.4	2.1E+02	0.34	0.20
EC25	91.	29.	2.9E+02	0.24	0.32
EC50	2.1E+02	1.1E+02	4.4E+02	0.15	0.49

Slope = 1.82 Std.Err. = 0.573

Goodness of fit: p = 0.57 based on DF= 3.0 18.

1001SBW : Dimethyl disulfide & Sugarbeet Dry Weight (g) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	76.7	84.9	-8.26	100.	0.00
37.5	4.00	91.0	77.8	13.2	91.6	8.40
75.0	4.00	67.7	67.7	-0.0472	79.7	20.3
150.	4.00	48.0	52.0	-3.98	61.2	38.8
300.	4.00	29.8	33.6	-3.82	39.6	60.4
600.	4.00	20.6	17.7	2.92	20.9	79.1

!!!Warning: EC5 not bracketed by doses evaluated.

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A

File: 1001sw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	8	8	8	0

Calculated Chi-Square goodness of fit test statistic = 5.0194

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

Data PASS normality test. Continue analysis.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
File: 1001sw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 0.024

W = 0.941

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
File: 1001sw Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 13.47

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3

Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
File: 1001sw Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 7.91

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) = 3.00

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

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).

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
File: 1001sw Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.015	0.003	3.000
Within (Error)	18	0.024	0.001	
Total	23	0.038		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
 File: 1001sw 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	Neg control	0.268	0.268		
2	37.5	0.269	0.269	-0.022	
3	75	0.292	0.292	-1.073	
4	150	0.239	0.239	1.286	
5	300	0.242	0.242	1.174	
6	600	0.216	0.216	2.337	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
 File: 1001sw 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	Neg control	4			
2	37.5	4	0.054	20.1	-0.000
3	75	4	0.054	20.1	-0.024
4	150	4	0.054	20.1	0.029
5	300	4	0.054	20.1	0.026
6	600	4	0.054	20.1	0.052

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
 File: 1001sw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number	N/A	EPA MRID Number 47381001				
1	Neg control	4	0.268	0.268	0.276	
2	37.5	4	0.269	0.269	0.276	
3	75	4	0.292	0.292	0.276	
4	150	4	0.239	0.239	0.241	
5	300	4	0.242	0.242	0.241	
6	600	4	0.216	0.216	0.216	

Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A
 File: 1001sw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	0.276				
37.5	0.276	0.319		1.73	k= 1, v=18
75	0.276	0.319		1.82	k= 2, v=18
150	0.241	1.075		1.85	k= 3, v=18
300	0.241	1.075		1.86	k= 4, v=18
600	0.216	2.042	*	1.87	k= 5, v=18

s = 0.036

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	1.3E+02	9.8	1.6E+03	0.53	0.078
EC10	2.4E+02	47.	1.2E+03	0.34	0.19
EC25	7.2E+02	2.9E+02	1.8E+03	0.19	0.41
EC50	2.4E+03	2.5E+02	2.3E+04	0.47	0.10

Slope = 1.28 Std.Err. = 0.937

Goodness of fit: p = 0.41 based on DF= 3.0 18.

1001SW : Dimethyl disulfide & Soybean Dry Weight (g) lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	0.268	0.274	-0.00636	100.	0.00
37.5	4.00	0.268	0.272	-0.00304	99.0	1.03
75.0	4.00	0.292	0.267	0.0250	97.3	2.68
150.	4.00	0.239	0.258	-0.0183	93.9	6.12
300.	4.00	0.242	0.241	0.00119	87.7	12.3
600.	4.00	0.216	0.214	0.00163	78.0	22.0

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

File: 1001tw 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	7	9	8	0

Calculated Chi-Square goodness of fit test statistic = 4.2910
 Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 1707.212

W = 0.959

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 19.05
 Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Calculated B statistic = 9.31
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	1684.417	336.883	3.552
Within (Error)	18	1707.212	94.845	
Total	23	3391.630		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw 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	Neg Control	44.850	44.850		
2	37.5	44.800	44.800	0.007	
3	75	38.875	38.875	0.868	
4	150	52.375	52.375	-1.093	
5	300	34.100	34.100	1.561	
6	600	26.375	26.375	2.683	*

Dunnnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw 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
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Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A EPA MRID Number 47381001

1	Neg Control	4			
2	37.5	4	16.596	37.0	0.050
3	75	4	16.596	37.0	5.975
4	150	4	16.596	37.0	-7.525
5	300	4	16.596	37.0	10.750
6	600	4	16.596	37.0	18.475

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	44.850	44.850	45.225
2	37.5	4	44.800	44.800	45.225
3	75	4	38.875	38.875	45.225
4	150	4	52.375	52.375	45.225
5	300	4	34.100	34.100	34.100
6	600	4	26.375	26.375	26.375

Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A
 File: 1001tw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	45.225				
37.5	45.225	0.054		1.73	k= 1, v=18
75	45.225	0.054		1.82	k= 2, v=18
150	45.225	0.054		1.85	k= 3, v=18
300	34.100	1.561		1.86	k= 4, v=18
600	26.375	2.683	*	1.87	k= 5, v=18

s = 9.739

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	1.8E+02	42.	7.9E+02	0.31	0.23
EC10	2.4E+02	80.	7.5E+02	0.23	0.33
EC25	4.0E+02	2.2E+02	7.2E+02	0.12	0.56
EC50	6.9E+02	4.3E+02	1.1E+03	0.10	0.62

Slope = 2.83 Std.Err. = 1.70

Goodness of fit: p = 0.19 based on DF= 3.0 18.

1001TW : Dimethyl disulfide & Tomato Dry Weight (g) lbs ai/A

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. - Pred.	Pred. %Control	%Change
0.00	4.00	44.8	44.8	0.0460	100.	0.00
37.5	4.00	44.8	44.8	0.00356	100.	0.0168
75.0	4.00	38.9	44.7	-5.79	99.7	0.313
150.	4.00	52.4	43.5	8.91	97.0	2.99
300.	4.00	34.1	38.0	-3.92	84.9	15.1
600.	4.00	26.4	25.6	0.803	57.1	42.9

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Corn 21-day Survival lbs a.i./A
File: 1001cs 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	5	16	3	0

Calculated Chi-Square goodness of fit test statistic = 9.7772
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Corn 21-day Survival lbs a.i./A
File: 1001cs Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 29.500

W = 0.912

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Corn 21-day Survival lbs a.i./A
File: 1001cs Transform: NO TRANSFORMATION

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 Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Data FAIL to meet homogeneity of variance assumption.
 Additional transformations are useless.

Dimethyl disulfide & Corn 21-day Survival lbs a.i./A
 File: 1001cs Transform: NO TRANSFORMATION

STEELS MANY-ONE RANK TEST - Ho:Control<Treatment

GROUP	IDENTIFICATION	TRANSFORMED MEAN	RANK SUM	CRIT. VALUE	df	SIG
1	Neg Control	10.000				
2	37.5	8.500	10.00	10.00	4.00	*
3	75	9.500	16.00	10.00	4.00	
4	150	9.000	12.00	10.00	4.00	
5	300	7.750	12.00	10.00	4.00	
6	600	7.750	12.00	10.00	4.00	

Critical values use k = 5, are 1 tailed, and alpha = 0.05

Dimethyl disulfide & Corn 21-day Survival lbs a.i./A
 File: 1001cs Transform: NO TRANSFORMATION

KRUSKAL-WALLIS ANOVA BY RANKS - TABLE 1 OF 2

GROUP	IDENTIFICATION	TRANSFORMED MEAN	MEAN CALCULATED IN ORIGINAL UNITS	RANK SUM
1	Neg Control	10.000	10.000	78.000
2	37.5	8.500	8.500	39.500
3	75	9.500	9.500	65.500
4	150	9.000	9.000	50.500
5	300	7.750	7.750	34.500
6	600	7.750	7.750	32.000

Calculated H Value = 9.331 Critical H Value Table = 11.070
 Since Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.

Dimethyl disulfide & Corn 21-day Survival lbs a.i./A
 File: 1001cs Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP					
				0	0	0	0	0	0
				5	6	2	4	3	1
5	300	7.750	7.750	\					
6	600	7.750	7.750	. \					
2	37.5	8.500	8.500	. . \					
4	150	9.000	9.000	. . . \					
3	75	9.500	9.500 \					
1	Neg Control	10.000	10.000 \					

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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* = significant difference (p=0.05)

. = no significant difference

Table q value (0.05,6) = 2.936

SE = 4.771

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	17.	0.075	3.7E+03	1.1	0.0045
EC10	72.	2.1	2.5E+03	0.74	0.029
EC25	8.4E+02	97.	7.2E+03	0.45	0.12
EC50	1.3E+04	88.	1.8E+06	1.0	0.0070

Slope = 0.571 Std.Err. = 0.394

Goodness of fit: p = 0.47 based on DF= 3.0 18.

1001CS : Dimethyl disulfide & Corn 21-day Survival lbs a.i./A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	10.0	9.93	0.0704	100.	0.00
37.5	4.00	8.50	9.19	-0.691	92.6	7.44
75.0	4.00	9.50	8.92	0.580	89.8	10.2
150.	4.00	9.00	8.58	0.417	86.4	13.6
300.	4.00	7.75	8.18	-0.426	82.3	17.7
600.	4.00	7.75	7.70	0.0508	77.5	22.5

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Interpreted as Dose = 0

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A

File: 1001ls 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	5	14	5	0

Calculated Chi-Square goodness of fit test statistic = 5.9875

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A

File: 1001ls Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Shapiro Wilks test for normality

D = 15.750

W = 0.927

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A

File: 10011s Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 9.00

Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3

Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A

File: 10011s Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 6.62

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) = 3.00

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

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).

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A

File: 10011s Transform: NO TRANSFORMATION

ANOVA TABLE

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

SOURCE	DF	SS	MS	F
Between	5	12.875	2.575	2.943
Within (Error)	18	15.750	0.875	
Total	23	28.625		

Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A
 File: 1001ls 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	Neg Control	9.750	9.750		
2	37.5	8.750	8.750	1.512	
3	75	9.750	9.750	0.000	
4	150	7.750	7.750	3.024	*
5	300	8.250	8.250	2.268	
6	600	9.000	9.000	1.134	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A
 File: 1001ls 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	Neg Control	4			
2	37.5	4	1.594	16.3	1.000
3	75	4	1.594	16.3	0.000
4	150	4	1.594	16.3	2.000
5	300	4	1.594	16.3	1.500
6	600	4	1.594	16.3	0.750

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A
 File: 1001ls Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	9.750	9.750	9.750
2	37.5	4	8.750	8.750	9.250
3	75	4	9.750	9.750	9.250
4	150	4	7.750	7.750	8.333

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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5	300	4	8.250	8.250	8.333
6	600	4	9.000	9.000	8.333

Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A
 File: 1001ls Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	9.750				
37.5	9.250	0.756		1.73	k= 1, v=18
75	9.250	0.756		1.82	k= 2, v=18
150	8.333	2.142	*	1.85	k= 3, v=18
300	8.333	2.142	*	1.86	k= 4, v=18
600	8.333	2.142	*	1.87	k= 5, v=18

s = 0.935

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	0.38	6.9E-14	2.1E+12	6.1	1.8E-13
EC10	79.	0.0020	3.2E+06	2.2	2.5E-05
EC25	5.8E+05	9.8E-10	3.4E+20	7.1	1.7E-15
EC50	1.2E+10	2.1E-23	6.5E+42	16.	1.8E-33

Slope = 0.157 Std.Err. = 0.321

!!!Poor fit: p = 0.040 based on DF= 3.0 18.

1001LS : Dimethyl disulfide & Lettuce 21-day Survival lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	9.75	9.76	-0.00665	100.	0.00
37.5	4.00	8.75	8.86	-0.115	90.9	9.14
75.0	4.00	9.75	8.79	0.963	90.1	9.94
150.	4.00	7.75	8.70	-0.954	89.2	10.8
300.	4.00	8.25	8.62	-0.366	88.3	11.7
600.	4.00	9.00	8.52	0.477	87.4	12.6

!!!Warning: EC5 not bracketed by doses evaluated.

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	6	13	5	0

Calculated Chi-Square goodness of fit test statistic = 4.9364
 Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 32.500

W = 0.946

Critical W (P = 0.05) (n = 24) = 0.916
 Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 4.38
 Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Calculated B statistic = 2.61
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

 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).

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	5.500	1.100	0.609
Within (Error)	18	32.500	1.806	
Total	23	38.000		

Critical F value = 2.77 (0.05,5,18)
 Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os 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	Neg Control	8.000	8.000		
2	37.5	8.250	8.250	-0.263	
3	75	7.250	7.250	0.789	
4	150	7.000	7.000	1.052	
5	300	7.500	7.500	0.526	
6	600	7.000	7.000	1.052	

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os 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	Neg Control	4			
2	37.5	4	2.290	28.6	-0.250

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A			EPA MRID Number 47381001		
3	75	4	2.290	28.6	0.750
4	150	4	2.290	28.6	1.000
5	300	4	2.290	28.6	0.500
6	600	4	2.290	28.6	1.000

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	8.000	8.000	8.125
2	37.5	4	8.250	8.250	8.125
3	75	4	7.250	7.250	7.250
4	150	4	7.000	7.000	7.250
5	300	4	7.500	7.500	7.250
6	600	4	7.000	7.000	7.000

Dimethyl disulfide & Onion 21-day Survival lbs ai/A
 File: 1001os Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	8.125				
37.5	8.125	0.132		1.73	k= 1, v=18
75	7.250	0.789		1.82	k= 2, v=18
150	7.250	0.789		1.85	k= 3, v=18
300	7.250	0.789		1.86	k= 4, v=18
600	7.000	1.052		1.87	k= 5, v=18

s = 1.344

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	51.	0.013	2.1E+05	1.7	0.00025
EC10	2.7E+02	2.4	3.1E+04	0.99	0.0087
EC25	4.4E+03	2.9	6.7E+06	1.5	0.00066
EC50	9.8E+04	0.014	6.7E+11	3.3	1.5E-07

Slope = 0.501 Std.Err. = 0.712

Goodness of fit: p = 0.69 based on DF= 3.0 18.

1001OS : Dimethyl disulfide & Onion 21-day Survival lbs ai/A

Observed vs. Predicted Treatment Group Means

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

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Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	8.00	8.06	-0.0630	100.	0.00
37.5	4.00	8.25	7.71	0.537	95.7	4.34
75.0	4.00	7.25	7.59	-0.336	94.1	5.91
150.	4.00	7.00	7.43	-0.425	92.1	7.91
300.	4.00	7.50	7.23	0.274	89.6	10.4
600.	4.00	7.00	6.99	0.0141	86.6	13.4

!!!Warning: EC25 not bracketed by doses evaluated.

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	7	10	7	0

Calculated Chi-Square goodness of fit test statistic = 3.7808
Table Chi-Square value (alpha = 0.01) = 13.277

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 57.750

W = 0.951

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

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

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 10.37
Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
Actual values ==> R (# groups) = 6, df (# avg reps-1) = 3.00

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

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).

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 3.86
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) = 3.00
Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	11.875	2.375	0.740
Within (Error)	18	57.750	3.208	
Total	23	69.625		

Critical F value = 2.77 (0.05,5,18)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb 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	Neg control	7.000	7.000		
2	37.5	7.000	7.000	0.000	
3	75	6.750	6.750	0.197	
4	150	6.000	6.000	0.790	

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

5	300	6.500	6.500	0.395
6	600	5.000	5.000	1.579

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb 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	Neg control	4			
2	37.5	4	3.052	43.6	0.000
3	75	4	3.052	43.6	0.250
4	150	4	3.052	43.6	1.000
5	300	4	3.052	43.6	0.500
6	600	4	3.052	43.6	2.000

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg control	4	7.000	7.000	7.000
2	37.5	4	7.000	7.000	7.000
3	75	4	6.750	6.750	6.750
4	150	4	6.000	6.000	6.250
5	300	4	6.500	6.500	6.250
6	600	4	5.000	5.000	5.000

Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A
File: 1001sb Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg control	7.000				
37.5	7.000	0.000		1.73	k= 1, v=18
75	6.750	0.197		1.82	k= 2, v=18
150	6.250	0.592		1.85	k= 3, v=18
300	6.250	0.592		1.86	k= 4, v=18
600	5.000	1.579		1.87	k= 5, v=18

s = 1.791

Note: df used for table values are approximate when v > 20.

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	1.3E+02	3.0	5.7E+03	0.79	0.023
EC10	2.3E+02	18.	2.9E+03	0.53	0.078
EC25	5.8E+02	1.8E+02	1.9E+03	0.25	0.31
EC50	1.6E+03	1.1E+02	2.4E+04	0.56	0.069

Slope = 1.51 Std.Err. = 1.73

Goodness of fit: p = 0.87 based on DF= 3.0 18.

1001SBS : Dimethyl disulfide & Sugarbeet 21-day Survival lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	7.00	6.93	0.0681	100.	0.00
37.5	4.00	7.00	6.88	0.116	99.3	0.686
75.0	4.00	6.75	6.78	-0.0282	97.8	2.22
150.	4.00	6.00	6.52	-0.518	94.0	5.98
300.	4.00	6.50	6.00	0.504	86.5	13.5
600.	4.00	5.00	5.14	-0.142	74.2	25.8

!!!Warning: EC50 not bracketed by doses evaluated.

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A

File: 1001ss 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	1.608	5.808	9.168	5.808	1.608
OBSERVED	0	7	12	5	0

Calculated Chi-Square goodness of fit test statistic = 4.4479

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

Data PASS normality test. Continue analysis.

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A

File: 1001ss Transform: NO TRANSFORMATION

Shapiro Wilks test for normality

D = 29.000

W = 0.950

Critical W (P = 0.05) (n = 24) = 0.916

Critical W (P = 0.01) (n = 24) = 0.884

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

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

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss Transform: NO TRANSFORMATION

Hartley test for homogeneity of variance

Calculated H statistic (max Var/min Var) = 19.67
 Closest, conservative, Table H statistic = 184.0 (alpha = 0.01)

Used for Table H ==> R (# groups) = 6, df (# reps-1) = 3
 Actual values ==> R (# groups) = 6, 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).

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss Transform: NO TRANSFORMATION

Bartlett's test for homogeneity of variance

Calculated B statistic = 8.75
 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) = 3.00
 Used for Chi-square table value ==> df (#groups-1) = 5

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).

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	28.833	5.767	3.580
Within (Error)	18	29.000	1.611	
Total	23	57.833		

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Critical F value = 2.77 (0.05,5,18)
 Since F > Critical F REJECT Ho:All groups equal

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss 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	Neg Control	8.750	8.750		
2	37.5	9.000	9.000	-0.279	
3	75	8.000	8.000	0.836	
4	150	8.750	8.750	0.000	
5	300	8.250	8.250	0.557	
6	600	5.750	5.750	3.343	*

Dunnett table value = 2.41 (1 Tailed Value, P=0.05, df=18,5)

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss 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	Neg Control	4			
2	37.5	4	2.163	24.7	-0.250
3	75	4	2.163	24.7	0.750
4	150	4	2.163	24.7	0.000
5	300	4	2.163	24.7	0.500
6	600	4	2.163	24.7	3.000

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	Neg Control	4	8.750	8.750	8.875
2	37.5	4	9.000	9.000	8.875
3	75	4	8.000	8.000	8.375
4	150	4	8.750	8.750	8.375
5	300	4	8.250	8.250	8.250
6	600	4	5.750	5.750	5.750

Dimethyl disulfide & Soybean 21-day Survival lbs ai/A
 File: 1001ss Transform: NO TRANSFORMATION

Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number N/A

EPA MRID Number 47381001

WILLIAMS TEST (Isotonic regression model)			TABLE 2 OF 2		
IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
Neg Control	8.875				
37.5	8.875	0.139		1.73	k= 1, v=18
75	8.375	0.418		1.82	k= 2, v=18
150	8.375	0.418		1.85	k= 3, v=18
300	8.250	0.557		1.86	k= 4, v=18
600	5.750	3.343	*	1.87	k= 5, v=18

s = 1.269

Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds		Std.Err.	Lower Bound /Estimate
		Lower	Upper		
EC5	3.1E+02	1.1E+02	8.7E+02	0.21	0.36
EC10	3.8E+02	1.8E+02	7.9E+02	0.15	0.48
EC25	5.3E+02	3.9E+02	7.0E+02	0.061	0.75
EC50	7.6E+02	5.0E+02	1.1E+03	0.087	0.66

Slope = 4.30 Std.Err. = 3.18

Goodness of fit: p = 0.77 based on DF= 3.0 18.

1001SS : Dimethyl disulfide & Soybean 21-day Survival lbs ai/A

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	4.00	8.75	8.63	0.125	100.	0.00
37.5	4.00	9.00	8.63	0.375	100.	1.00e-06
75.0	4.00	8.00	8.63	-0.625	100.	0.000792
150.	4.00	8.75	8.61	0.136	99.9	0.126
300.	4.00	8.25	8.26	-0.0112	95.8	4.22
600.	4.00	5.75	5.75	0.00114	66.7	33.3

!!!Warning: EC50 not bracketed by doses evaluated.

**Data Evaluation Report on the Acute Toxicity of Dimethyl Disulfide to Terrestrial
Vascular Plants: Seedling Emergence**

PMRA Submission Number N/A

EPA MRID Number 47381001
