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Data Evaluation Report on the Acute Toxicity of AE 0317309 03 EC23 A8 to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number 2006-2447 **EPA MRID Number 468019-36**

Data Requirement:	PMRA Data Code:	9.8.4 (TGAI) or 9.8.6 (EP)
	EPA DP Barcode:	D328639
	OECD Data Point:	IIA 8.12 (TGAI) and IIIA 10.8.1.1 (EP)
	EPA Guideline:	123-1a

Test material: AE 0317309 03 EC23 A8 **Purity:** 3.45% wt/wt
Common name: AE 0317309 (Pyrasulfotole)
Chemical name: IUPAC: 5-hydroxy-1,3-dimethylpyrazol-4-yl(2-mesyl-4-trifluoromethylphenyl)methanone
CAS name: Not reported
CAS No.: Not reported
Synonyms: Not reported

Primary Reviewer: John Marton **Signature:**
Staff Scientist, Cambridge Environmental Inc. **Date:** 5/12/06

Secondary Reviewer: Teri S. Myers **Signature:**
Senior Scientist, Cambridge Environmental Inc. **Date:** 5/24/06

Primary Reviewer: Melissa Panger **Date:** 9/29/06
EPA

Secondary Reviewer: J.D. Whall (Officer No. 1268) **Date:** 11/17/06
PMRA

Reference/Submission No.: {.....}

Company Code	BCZ
Active Code	PSA
Use Site Category:	13, 14
EPA PC Code	000692

Date Evaluation Completed: 12-01-2006

CITATION: Pallet, K. and H. Gosch. 2006. Non-target terrestrial plants: Seedling emergence and seedling growth test (Tier 2); AE 0.317309+Mefenpyr di-ethyl+Bromoxynil (Code: AE 0317309 03 EC23 A8). Unpublished study performed by Bayer CropScience GmbH Ecotoxicology, Frankfurt am Main, Germany. Laboratory report number SE 05/001. Study sponsored by Bayer CropScience GmbH Ecotoxicology, Frankfurt am Main, Germany. Study completed on January 24, 2006.

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

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US EPA ARCHIVE DOCUMENT

Data Evaluation Report on the Acute Toxicity of AE 0317309 03 EC23 A8 to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number 2006-2447 **EPA MRID Number 468019-36**

EXECUTIVE SUMMARY:

The effect of AE 0317309 03 EC23 A8 (formulation containing the active ingredients AE 0317309 [pyrasulfotole] at 37.5 g a.i./L plus bromoxynil at 210 g a.i./L) on the seedling emergence of monocot (barley, *Hordeum vulgare*; corn, *Zea mays*; oat, *Avena sativa*; onion, *Allium cepa*; and ryegrass, *Lolium perenne*) and dicot (cucumber, *Cucumis sativus*; oilseed rape, *Brassica napus*; soybean, *Glycine max*; sugar beet, *Beta vulgaris*; sunflower, *Helianthus annuus L.*; tomato, *Lycopersicon esculentum*) crops was studied at varying nominal application rates. AE 0317309 03 EC23 A8 is proposed for use on selected cereal crops at a one time application rate of up to 1 L product/ha (or, 37.5 g a.i./ha pyrasulfotole) in the US, or 0.83 L product/ha (or, 31.1 g. a.i./ha pyrasulfotole) in Canada (note: all rates in this report expressed as a.i. refer to levels of pyrasulfotole). Barley was tested as a back-up for onion and since onion did not meet the validity criteria (only 42% emergence), no further endpoints were analyzed; therefore, endpoints were analyzed for barley and reported by the study authors. Mean-measured application rates for oat were 0 (negative control), 0.0036, 0.0072, 0.014 and 0.029 lbs ai/A (or, 0, 4.0, 8.1, 15.7 and 32.5 g a.i./ha). Mean-measured application rates for corn were 0 (negative control), 0.0018, 0.0036, 0.0072, 0.014 and 0.029 lbs ai/A (or, 0, 2.0, 4.0, 8.1, 15.7 and 32.5 g a.i./ha). Mean-measured application rates for ryegrass, barley and soybean were 0 (negative control), 0.0009, 0.0018, 0.0036, 0.0072, 0.014 and 0.029 lbs ai/A (or, 0, 1.0, 2.0, 4.0, 8.1, 15.7 and 32.5 g a.i./ha). Mean-measured application rates for cucumber and soybean were 0 (negative control), 0.00022, 0.00045, 0.0009, 0.0018, 0.0036 and 0.0072 lbs ai/A (or, 0, 0.25, 0.50, 1.0, 2.0, 4.0 and 8.1 g a.i./ha). Mean-measured application rates for sugar beet were 0 (negative control), 0.000059, 0.00011, 0.00022, 0.00045, 0.00090, 0.0018, 0.0036 and 0.0072 lbs ai/A (or, 0, 0.066, 0.11, 0.25, 0.50, 1.0, 2.0, 4.0 and 8.1 g a.i./ha). Mean-measured application rates for tomato were 0 (negative control), 0.00011, 0.00022, 0.00045, 0.00090, 0.0018 and 0.0036 lbs ai/A (or, 0, 0.11, 0.25, 0.50, 1.0, 2.0 and 4.0 g a.i./ha). Mean-measured application rates for oilseed rape were 0 (negative control), 0.000059, 0.00011, 0.00022, 0.00045, 0.00090 and 0.0018 lbs ai/A (or, 0, 0.066, 0.11, 0.25, 0.50, 1.0 and 2.0 g a.i./ha). The growth medium used in the seedling emergence test was natural soil classified as a silty loam with a pH of 7.4 and an organic carbon content of 1.19%. On Day 21 the surviving plants per pot were recorded and cut at soil level for measuring the plant height and dry weight.

Biomass was significantly affected in cucumber, soybean, sugar beet and tomato; plant height was significantly affected in cucumber, sugar beet and tomato; and survival was significantly affected in sugar beet. No monocot species exhibited a significant reduction in biomass, plant height or survival at any treatment level. The % inhibition in seedling emergence in the treated species as compared to the control ranged from -21 to 22%. The most sensitive dicot species, based on dry weight, was tomato with an EC_{25} of 0.00025 lbs ai/A (or, 0.28 g a.i./ha) and a NOAEC of 0.00022 lbs ai/A (or, 0.25 g a.i./ha).

The following phytotoxic effects were noted: chlorosis, bleaching, necrosis, stunting, leaf deformation, wilting and growth suppression.

Maximum Labeled Rate: Not reported

Results Synopsis

Monocot

EC_{05}/IC_{05}: N/A 95% C.I.:
EC_{25}/IC_{25}: N/A 95% C.I.:
EC_{50}/IC_{50}: N/A 95% C.I.:
NOAEC: N/A
Slope: N/A
Std err: N/A
Most sensitive monocot: None
Most sensitive parameter: None

US EPA ARCHIVE DOCUMENT

Data Evaluation Report on the Acute Toxicity of AE 0317309 03 EC23 A8 to Terrestrial Vascular Plants: Seedling Emergence

PMRA Submission Number 2006-2447 **EPA MRID Number 468019-36**

Dicot

EC_{05}/IC_{05}: 0.0000036 lbs ai/A (0.0040 g a.i./ha) 95% C.I.: 0.0000000094 – 0.0014 lbs ai/A ($1.1\ e^{-05}$ – 1.6 g a.i./ha)
EC_{25}/IC_{25}: 0.00025 lbs ai/A (0.28 g a.i./ha) 95% C.I.: 1.9^{E-05}-0.0035 lbs ai/A (0.021 – 3.9 g a.i./ha)
EC_{50}/IC_{50}: >0.0036 lbs ai/A (>4.0 g a.i./ha) 95% C.I.: N/A
NOAEC: 0.00022 lbs ai/A (0.25 g a.i./ha)
Slope: 0.526
Std err: 0.231
Most sensitive dicot: Tomato
Most sensitive parameter: Dry Weight

This toxicity study is classified as **ACCEPTABLE** and satisfies the guideline requirement for a Tier II terrestrial plant seedling emergence toxicity study.

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

Species	Endpoint	NOAEC	EC_{05}	EC_{25}	EC_{50}
Barley	None	0.029	>0.029	>0.029	>0.029
Corn	Dry Weight	0.029	ND	>0.029	>0.029
Oat	Dry Weight	0.014	ND	>0.029	>0.029
Ryegrass	All	0.029	ND	>0.029	>0.029
Cucumber	Dry Weight	0.0009	0.00016	0.0014	0.0060
Oilseed Rape	Dry Weight & Plant Height	0.0018	ND	>0.0018	>0.0018
Soybean	Dry Weight	0.0072	0.0024	0.020	>0.029
Sugar beet	Dry Weight	0.0018	0.0012	0.0025	>0.0036
Sunflower	Plant Height & Survival	0.0072	ND	>0.0072	>0.0072
Tomato	Dry Weight	0.00022	0.0000036	0.00025	>0.0036

ND- Not determined

Table 1b. Summary of most sensitive parameters by species (g a.i./ha).

Species	Endpoint	NOAEC	EC_{05}	EC_{25}	EC_{50}
Barley	None	32.5	>32.5	>32.5	>32.5
Corn	Dry Weight	32.5	ND	>32.5	>32.5
Oat	Dry Weight	15.7	ND	>32.5	>32.5
Ryegrass	All	32.5	ND	>32.5	>32.5
Cucumber	Dry Weight	1.0	0.18	1.6	6.7
Oilseed Rape	Dry Weight & Plant Height	2.0	ND	>2.0	>2.0
Soybean	Dry Weight	8.1	2.7	22.4	>32.5
Sugar beet	Dry Weight	2.0	1.3	2.8	>4.0
Sunflower	Plant Height & Survival	8.1	ND	>8.1	>8.1
Tomato	Dry Weight	0.25	0.0040	0.28	>4.0

ND- Not determined

I. MATERIALS AND METHODS

GUIDELINE FOLLOWED: The study followed guidelines outlined in US EPA Pesticide Assessment Guidelines, Sub-division J, Hazard Evaluation, Non-Target Plants , PB83-

153940, EPA540/9-82-020, Series 123, Tier 2 of Non-Target Area Testing and OECD, Guideline for the testing of chemicals, Guideline 208, Terrestrial (Non-Target) Plant Test, 208 A, Seedling Emergence and Seedling Growth Test and 208 B, Vegetative Vigor test. The following deviations were noted:

1. The maximum label rate of the test material was not reported.
2. The physiochemical properties of the test material were not reported.
3. The LOQ and LOD were not reported.
4. The geographic location, depth of collection, CEC and moisture at 1/3 atm were not reported.
5. All species were tested under the same environmental conditions instead of testing cold-preferring species separately from warm-preferring species.
6. While test containers were bottom-watered for the duration of the study, pots were initially top watered to establish the water column in the soil and to facilitate germination (prior to being treated). It is unclear if loss of test material occurred at this initial watering and what impact this may have had on seed exposure to the test material.
7. The daily range in temperature (11 to 39 °C) and humidity (20 to 98%) were outside those recommended by EPA (*i.e.*, 20 to 25 °C and 70 to 90%, respectively)

The deviations had no impact on the acceptability of the study.

COMPLIANCE: Signed and dated No Data Confidentiality, GLP and Quality Assurance statements were provided. This study was performed in compliance with the Principles of Good Laboratory Practice, Annex 1 to Chemicals Act of Federal Republic of Germany in the current version [Grundätze der Guten Laborpraxis (GLP), Anhang 1 zum Chemikaliengesetz der Bundesrepublik Deutschland in der aktuellen Fassung] based on the OECD Principles of Good Laboratory Practice as revised in 1997 and adopted November 26th, 1997 by decision of the OECD Council [C(97)186/Final].

A. MATERIALS:

1. Test Material AE 0317309 03 EC23 A8

Description: Amber Liquid

Lot No./Batch No. : 04KLE001P059

Purity: 3.45% wt/wt

Stability of compound under test conditions: Samples of the spray solution (identical stock solution) were collected at Day 0 and analyzed for AE 0317309. The recovery was 78.8-91.% of nominal. *(OECD recommends chemical stability in water and light)*

Storage conditions of test chemicals: Stored under ambient conditions.

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Table 2. Physical/chemical properties of AE 0317309 03 EC23 A8.

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: Barley (*Hordeum vulgare*, Family Poaceae, Baroness), Corn (*Zea mays*, Family Poaceae, Lorenzo), Oat (*Avena sativa*, Family Poaceae, Flämings Nova), Onion (*Allium cepa*, Family Liliaceae, Braunschweiger Blutrote) and Ryegrass (*Lolium perenne*, Family Poaceae, Deutsches Weidegras); *EPA recommends four monocots in two families, including corn.*

Dicotyledonous species: Cucumber (*Cucumis sativus*, Family Curcubitaceae, Delikatess), Oilseed rape (*Brassica napus*, Family Brassicaceae, Liratop), Soybean (*Glycine max*, Family Fabaceae, Trail), Sugar beet (*Beta vulgaris*, Family Chenopodiaceae, Achat), Sunflower (*Helianthus annuus L.*, Family Asteraceae, Big Smile) and Tomato (*Lycopersicon esculentum*, Family Solanaceae, Balkonstar); *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: Seeds were supplied from commercial sources via Bayer CropScience GmbH, Horticulture, H872, 65926 Frankfurt am Main.
Prior seed treatment/sterilization: None
Historical % germination of seed: 77.5-100% (based on control seedlings)
Seed storage, if any: Seeds were stored in plastic boxes in the refrigerator

B. STUDY DESIGN:

1. Experimental Conditions

a. Limit test: A limit test was not conducted.

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

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		Criteria
Duration of the test	21 Days	*Recommended test duration is 14-21 days.* *OECD recommends that the test be terminated no sooner than 14 days after 50 percent of the control seedlings have emerged*
Number of seeds/plants/species/ replicate	5 seeds/pot 8 pots/replicate	*Ten seeds per replicate should be used.* *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.*
<u>Number of replicates</u> Control: Adjuvant control: Treated:	 8 N/A 8	An adjuvant control was not used. There were a total of 40 seeds per treatment level. *Four replicates per dose should be used.* *OECD recommends a minimum of four replicates per treatment*

US EPA ARCHIVE DOCUMENT

Parameters	Seedling Emergence	
	Details	**Remarks** *Criteria*
Test concentrations (lb ai/A or g ai/ha) Nominal: Measured:	Oat: 0 (negative control), 0.0041, 0.0083, 0.017 and 0.033 lbs ai/A Corn: 0 (negative control), 0.0021, 0.0041, 0.0083, 0.017 and 0.033 lbs ai/A Onion, Ryegrass, Barley and Soybean: 0 (negative control), 0.0010, 0.0021, 0.0041, 0.0083, 0.017 and 0.033 lbs ai/A Cucumber and Sunflower: 0 (negative control), 0.00026, 0.00052, 0.0010, 0.0021, 0.0041 and 0.0083 lbs ai/A Sugar beet: 0 (negative control), 0.000070, 0.00013, 0.00026, 0.00052, 0.0010, 0.0021, 0.0041 and 0.0083 lbs ai/A Tomato: 0 (negative control), 0.00013, 0.00026, 0.00052, 0.0010, 0.0021 and 0.0041 lbs ai/A Oilseed rape: 0 (negative control), 0.000070, 0.00013, 0.00026, 0.00052, 0.0010 and 0.0021 lbs ai/A See Reviewer's Comments	*Five test concentrations should be used with a dose range of 2X or 3X progression* *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.*
Method and interval of analytical verification LOQ: LOD:	Samples were analyzed on Day 0 using HPLC Not reported Not reported	
Adjuvant (type, percentage, if used)	N/A; an adjuvant was not used	

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Parameters	Seedling Emergence	
	Details	**Remarks** ***Criteria***
Test container (pot) Size/Volume Material: (glass/polystyrene)	 10 cm in diameter Plastic	Pots were commercial plastic flower pots (10 cm in diameter). *Non-porous containers should be used.* *OECD recommends that non-porous plastic or glazed pot be used.*
Growth facility	On-site greenhouse	
Method/depth of seeding	Depth varied with size of seed, i.e. a 5 mm diameter seed was covered with 5 mm of soil, a 3 mm diameter seed with 3 mm of soil. etc	
Test material application Application time including the plant growth stage Number of application Application interval Method of application	 Test material was applied on Day 0 to pre-emerged seeds. 1 N/A; single application Laboratory Track Sprayer	
Details of soil used Geographic location Depth of soil collection Soil texture % sand % silt % clay pH: % organic carbon CEC Moisture at 1/3 atm (%)	 Not reported Not reported Silty loam 14.2% 65.1% 20.7% 7.4 1.19% Not reported Not reported	Soil was supplied locally and was steam pasteurized before use. *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.*

Parameters	Seedling Emergence	
	Details	**Remarks** *Criteria*
Details of nutrient medium, if used	N/A; a nutrient medium was not used	
Watering regime and schedules Water source/type: Volume applied: Interval of application: Method of application:	 Local tap water Not reported Checked daily Bottom watering	Pots were initially top watered to establish the water column in the soil and to facilitate germination. After that, water was provided via bottom watering as needed in order to have an optimal water supply for plant growth. *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 method/fertilization, if used	Soil was sterilized via 120 degrees of vapor for about 30 minutes. 2.4 g/L of granular fertilizer (Blaukorn) was added to the soil prior to sowing.	No pest control was reported.
Test conditions Temperature: Photoperiod: Light intensity and quality: Relative humidity:	 11-39°C 16L:8D 10000-20000 20-98%	Minor deviations in temperature occurred for short periods of time when the temperature reached as high as 39°C and as low as 11°C. *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.*
Reference chemical (if used) Name: Concentrations:	 N/A 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	Emergence, growth stage, survival, phytotoxicity,	

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Parameters	Seedling Emergence	
	Details	**Remarks**
seedlings, plant height, dry weight or other endpoints)	shoot length and dry weight.	
Measurement technique for each parameter	Emergence, growth stage and survival were determined by visual observation. Plant length was determined by measuring the total shoot height (i.e. longest leaf) to the nearest 0.1 cm. Dry weight was determined using a balance and weight to the nearest 0.001 g. Phytotoxicity was determined using a numerical rating system.	
Observation intervals	Emergence, survival and phytotoxicity were determined weekly. Dry weight, plant height and growth stage were determined at test termination (Day 21).	
Other observations, if any	None reported	
Were raw data included?	Yes	
Phytotoxicity rating system, if used	Phytotoxicity was described using a percentage, which reflected the extent of the symptom. 0%- no injury or effect; 10-20%- slight symptoms throughout the whole plant or more moderate symptoms on a small area; 30-40%- moderate symptoms throughout the whole plant or severe symptoms on a limited area; 50-60%- severe symptoms throughout the whole plant with younger or newly developed leaves growing	Any plant considered dead was not rated for phytotoxicity.

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Parameters	Seedling Emergence	
	Details	**Remarks**
	normally; 70-80%- total plant symptoms with the plant showing poor vigor; 90%- moribund or dying plant	

II. RESULTS and DISCUSSION:

A. INHIBITORY EFFECTS:

1. Seedling Emergence:

No monocot species exhibited any significant reductions relative to the negative control for any endpoint analyzed (dry weight, plant height and survival). Dry weight was significantly reduced for cucumber, soybean, sugar beet and tomato. The response of dry weight to the test material was clearly dose-dependent for cucumber and soybean. For sugar beet, reductions in dry weight, relative to the negative control, were only observed at the 0.0021 and 0.0041 lbs ai/A treatment levels, reductions of 15 and 37%, respectively, were observed. A 93% reduction in mortality was observed at the highest treatment level (0.0083 lbs ai/A) making calculations unreasonable. Positive growth was observed in all other treatment levels (0.000070-0.0010 lbs ai/A), relative to the negative control. Percent reductions of tomato dry weight were 21, 7, 29, 47, 49 and 36% at the nominal 0.00013, 0.00026, 0.00052, 0.0010, 0.0021 and 0.0041 lbs ai/A treatment levels, respectively. There was definitely a negative response associated with the application of the test material; however, the response was non-linear.

Sugar beet, sunflower and tomato were the only species in which a significant reduction in plant height, relative to each species' respective negative control, was observed. Of these three species, sugar beet was the only one where a reduction of >25% was observed. A 93% reduction in mortality was observed at the highest treatment level (0.0083 lbs ai/A) making calculations unreasonable. At the highest treatment level containing survivors (0.0041 lbs ai/A), a reduction in plant height of 28% was observed. The response was non-linear and was not apparently dose-dependent in that all other treatment levels exhibited reductions of -15-8%, relative to the negative control.

Sugar beet was the only species in which survival was significantly reduced relative to the negative control. Percent reductions were 0, 0, 0, 0, 3, 9, 42 and 93% at the nominal 0.000070, 0.00013, 0.00026, 0.00052, 0.0010, 0.0021, 0.0041 and 0.0083 lbs ai/A treatment levels, respectively, when compared to the negative control.

Control emergence ranged from 77.5-100% and emergence at the treatment levels ranged from 60-100%; however, mean emergence was 77-99% for all species. No species exhibited a significant reduction in emergence relative to each species' negative control.

No monocot species exhibited a reduction of >25% for any of the endpoints analyzed; therefore, a most sensitive monocot could be identified. The most sensitive dicot, based on dry weight, was tomato with NOAEC and EC_{25} values of 0.00052 and 0.000363 lbs ai/A, respectively.

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No phytotoxic effects were observed in the control plants for any of the species. Cucumber and sugar beet were the only species which exhibited phytotoxic symptoms. Effects included chlorosis, bleaching, necrosis, stunting, leaf deformation, wilting and growth suppression. Phytotoxicity was described using a percentage, which reflected the extent of the symptom. 0%- no injury or effect; 10-20%- slight symptoms throughout the whole plant or more moderate symptoms on a small area; 30-40%- moderate symptoms throughout the whole plant or severe symptoms on a limited area; 50-60%- severe symptoms throughout the whole plant with younger or newly developed leaves growing normally; 70-80%- total plant symptoms with the plant showing poor vigor; 90%- moribund or dying plant.

B. REPORTED STATISTICS:

The data from all treatment levels was compared to each species' respective negative control. Mortality and dry weight were compared using the ToxRat software for statistical analysis (version 2.09). Plant height was also analyzed by comparing treatment data to the control data; however, the statistical software used was not reported..

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Table 5: Reported effect of AE 0317309 03 EC23 A8 on Seedling Emergence

Species	Results summary for biomass (lbs ai/A)									
	g*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Barley	0.311-0.353	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Corn	0.687-0.792	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Oat	0.154-0.178	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Ryegrass	0.049-0.061	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Cucumber	0.188-0.371	0.0010	NR	NR	0.00178	0.00066-0.00290	0.00673	0.00416-0.0200	NR	NR
Oilseed Rape	0.404-0.505	0.0021	NR	NR	>0.0021	N/A	>0.0021	N/A	NR	NR
Soybean	0.176-0.268	0.017	NR	NR	0.0200	0.0139-0.0317	>0.033	N/A	NR	NR
Sugar beet	0.052-0.106	0.0041	NR	NR	0.00304	0.00251-0.00350	0.00538	0.00452-0.00776	NR	NR
Sunflower	0.211-0.287	0.0083	NR	NR	>0.0083	N/A	>0.0083	N/A	NR	NR
Tomato	0.021-0.042	0.00052	NR	NR	0.000363	ND	0.00502	ND	NR	NR

* range provided represents the range of the treatment means
N/A- Not applicable
ND- Not determined
NR- Not reported

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Table 5a: Reported effect of AE 0317309 03 EC23 A8 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
Barley	44.244-47.256	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Corn	59.425-64.200	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Oat	40.769-43.050	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Ryegrass	21.763-25.015	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Cucumber	6.131-8.069	0.0083	NR	NR	>0.0083	N/A	>0.0083	N/A	NR	NR
Oilseed Rape	16.408-19.344	0.0021	NR	NR	>0.0021	N/A	>0.0021	N/A	NR	NR
Soybean	10.800-11.475	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Sugar beet	6.452-10.379	0.0021	NR	NR	0.00383	0.00343-0.00432	0.00611	0.00515-0.00884	NR	NR
Sunflower	8.488-10.619	0.0021	NR	NR	>0.0083	N/A	>0.0083	N/A	NR	NR
Tomato	3.052-4.238	0.00052	NR	NR	>0.0041	N/A	>0.0041	N/A	NR	NR

* range provided represents the range of the treatment means
N/A- Not applicable
ND- Not determined
NR- Not reported

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Table 5b: Reported effect of AE 0317309 03 EC23 A8 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
Barley	100	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Corn	100	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Oat	100	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Ryegrass	94-100	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Cucumber	100	0.0083	NR	NR	>0.0083	N/A	>0.0083	N/A	NR	NR
Oilseed Rape	85-100	0.0021	NR	NR	>0.0021	N/A	>0.0021	N/A	NR	NR
Soybean	97-100	0.033	NR	NR	>0.033	N/A	>0.033	N/A	NR	NR
Sugar beet	8-100	0.0021	NR	NR	0.00261	0.00215-0.00310	0.00429	0.00356-0.00521	NR	NR
Sunflower	91-100	0.0083	NR	NR	>0.0083	N/A	>0.0083	N/A	NR	NR
Tomato	96-100	0.0041	NR	NR	>0.0041	N/A	>0.0041	N/A	NR	NR

* range provided represents the range of the treatment means
N/A- Not applicable
ND- Not determined
NR- Not reported

Day 21 Emergence*											
Control	Barley	Corn	Oat	Ryegrass	Cucumber	Oilseed Rape	Soybean	Sugar beet	Sunflower	Tomato	Adjuvant control
87.8 (77.5-100)	96 (93-98)	99 (98-100)	95 (93-98)	90 (78-100)	82 (62.5-92.5)	88 (83-93)	93 (83-100)	81 (60-93)	95 (90-100)	77 (65-93)	N/A

* provide the mean (and range)
The mean and range reported for each species do not include the control values as these were already captured in the "Control" mean (and range) values.

Plant Injury Index*											
Control	Barley	Corn	Oat	Ryegrass	Cucumber	Oilseed rape	Soybean	Sugar beet	Sunflower	Tomato	Adjuvant control
0%	0%	0%	0%	0%	0-23%	0%	0%	0-90%	0%	0%	N/A

*0%- no injury or effect; 10-20%- slight symptoms throughout the whole plant or more moderate symptoms on a small area; 30-40%- moderate symptoms throughout the whole plant or severe symptoms on a limited area; 50-60%- severe symptoms throughout the whole plant with younger or newly developed leaves growing normally; 70-80%- total plant symptoms with the plant showing poor vigor; 90%- moribund or dying plant

C. VERIFICATION OF STATISTICAL RESULTS BY THE REVIEWER:

Statistical Method(s): Replicate data for dry weight, plant height and percent survival were first tested for the assumptions of ANOVA (normality and homogeneity) for any species exhibited a ≥5% reduction relative to the negative control. If these assumptions were met, the NOAEC values were determined by comparing the treatment data against the negative control data using the parametric Dunnetts Test (or Bonferonni's T-Test for unequal replicates) and William's Test. If the assumptions of ANOVA were not met, the NOAEC values were determined by comparing the treatment data against the negative control data using the non-parametric Kruskal-Wallis test. All NOAEC values were determined using Toxstat statistical software. Phytotoxicity was not reported as this is not a quantitative endpoint. The ECx values (with corresponding 95% C.I.) and probit slopes (when applicable) were determined using Nuthatch statistical software. When the % reduction was <5, <25 or <50%, the respective ECx values were determined visually. When 100% mortality was observed in the highest treatment level, these data were excluded from the analyses. All toxicity values were determined using the mean-measured application rates.

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Table 6: Reported effect of AE 0317309 03 EC23 A8 on Seedling Emergence

Species	Results summary for biomass (lbs ai/A)									
	g*	NOAEC	EC_{05}	95%CI	EC_{25}	95%CI	EC_{50}	95%CI	slope	std err
Barley	0.311-0.353	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Corn	0.687-0.792	0.029	ND	ND	>0.029	N/A	>0.029	N/A	ND	ND
Oat	0.154-0.178	0.029	ND	ND	>0.029	N/A	>0.029	N/A	ND	ND
Ryegrass	0.049-0.061	0.029	ND	ND	>0.029	N/A	>0.029	N/A	ND	ND
Cucumber	0.188-0.371	0.0009	<0.00022	N/A	0.0014	0.00044-0.0041	0.0060	0.0032-0.011	1.05	0.308
Oilseed Rape	0.404-0.505	0.0018	ND	ND	>0.0018	N/A	>0.0018	N/A	N/A	N/A
Soybean	0.176-0.268	0.0072	0.0024	0.00022-0.026	0.020	0.0088-0.043	>0.029	N/A	1.07	0.493
Sugar beet	0.052-0.106	0.0018	0.0012	0.00036-0.0044	0.0025	0.0015-0.0041	>0.0036	N/A	3.18	1.95
Sunflower	0.211-0.287	0.0072	>0.0072	N/A	>0.0072	N/A	>0.0072	N/A	0.0458	0.334
Tomato	0.021-0.042	0.00022	<0.00011	N/A	0.00025	1.9^{E-05}-0.0035	>0.0036	N/A	0.526	0.231

* range provided represents the range of the treatment means
N/A- Not applicable
ND- Not determined
NR- Not reported

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Table 6a: Reported effect of AE 0317309 03 EC23 A8 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
Barley	44.244-47.256	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Corn	59.425-64.200	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Oat	40.769-43.050	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Ryegrass	21.763-25.015	0.029	ND	ND	>0.029	N/A	>0.029	N/A	ND	ND
Cucumber	6.131-8.069	0.0036	0.00059	$1.6E^{-05}$-0.022	>0.0072	N/A	>0.0072	N/A	0.776	0.509
Oilseed Rape	16.408-19.344	0.0018	ND	ND	>0.0018	N/A	>0.0018	N/A	N/A	N/A
Soybean	10.800-11.475	0.029	ND	ND	>0.029	N/A	>0.029	N/A	ND	ND
Sugar beet	6.452-10.379	0.0018	0.0017	0.00072-0.0039	0.0032	0.0025-0.0041	>0.0036	N/A	3.39	1.87
Sunflower	8.488-10.619	0.0072	ND	ND	>0.0072	N/A	>0.0072	N/A	ND	ND
Tomato	3.052-4.238	0.00045	<0.00011	N/A	>0.0036	N/A	>0.0036	N/A	0.525	0.353

* range provided represents the range of the treatment means
N/A- Not applicable
ND- Not determined
NR- Not reported

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Table 6b: Reported effect of AE 0317309 03 EC23 A8 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
Barley	100	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Corn	100	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Oat	100	0.029	>0.029	N/A	>0.014	N/A	>0.029	N/A	N/A	N/A
Ryegrass	94-100	0.029	ND	ND	>0.029	N/A	>0.029	N/A	ND	ND
Cucumber	100	0.0072	>0.0072	N/A	>0.0072	N/A	>0.0072	N/A	N/A	N/A
Oilseed Rape	85-100	0.0018	>0.0018	N/A	>0.0018	N/A	>0.0018	N/A	N/A	N/A
Soybean	97-100	0.029	>0.029	N/A	>0.029	N/A	>0.029	N/A	N/A	N/A
Sugar beet	8-100	0.0018	0.0019	0.0015-0.0025	0.0029	0.0025-0.0034	0.0039	0.0035-0.0044	5.38	0.627
Sunflower	91-100	0.0072	ND	ND	>0.0072	N/A	>0.0072	N/A	ND	ND
Tomato	96-100	0.0036	>0.0036	N/A	>0.0036	N/A	>0.0036	N/A	N/A	N/A

* range provided represents the range of the treatment means
N/A- Not applicable
ND- Not determined
NR- Not reported

Day 21 Emergence*											
Control	Barley	Corn	Oat	Ryegrass	Cucumber	Oilseed Rape	Soybean	Sugar beet	Sunflower	Tomato	Adjuvant control
87.8 (77.5-100)	96 (93-98)	99 (98-100)	95 (93-98)	90 (78-100)	82 (62.5-92.5)	88 (83-93)	93 (83-100)	81 (60-93)	95 (90-100)	77 (65-93)	N/A

* provide the mean (and range)
The mean and range reported for each species do not include the control values as these were already capture in the "Control" mean (and range) values.

Plant Injury Index*											
Control	Barley	Corn	Oat	Ryegrass	Cucumber	Oilseed rape	Soybean	Sugar beet	Sunflower	Tomato	Adjuvant control
0%	0%	0%	0%	0%	0-23%	0%	0%	0-90%	0%	0%	N/A

*0%- no injury or effect; 10-20%- slight symptoms throughout the whole plant or more moderate symptoms on a small area; 30-40%- moderate symptoms throughout the whole plant or severe symptoms on a limited area; 50-60%- severe symptoms throughout the whole plant with younger or newly developed leaves growing normally; 70-80%- total plant symptoms with the plant showing poor vigor; 90%- moribund or dying plant

Monocot

EC_{05}/IC_{05}: N/A 95% C.I.:
EC_{25}/IC_{25}: N/A 95% C.I.:
EC_{50}/IC_{50}: N/A 95% C.I.:
NOAEC: N/A
Slope: N/A
Std err: N/A
Most sensitive monocot: None
Most sensitive parameter: None

Dicot

EC_{05}/IC_{05}: 0.0000036 lbs ai/A (0.0040 g a.i./ha) 95% C.I.: 0.0000000094 – 0.0014 lbs ai/A ($1.1\ e^{-05}$ – 1.6 g a.i./ha)
EC_{25}/IC_{25}: 0.00025 lbs ai/A (0.28 g a.i./ha) 95% C.I.: 1.9^{E-05}-0.0035 lbs ai/A (0.021 – 3.9 g a.i./ha)
EC_{50}/IC_{50}: >0.0036 lbs ai/A (>4.0 g a.i./ha) 95% C.I.: N/A
NOAEC: 0.00022 lbs ai/A (0.25 g a.i./ha)
Slope: 0.526
Std err: 0.231
Most sensitive dicot: Tomato
Most sensitive parameter: Dry Weight

D. STUDY DEFICIENCIES:

There were no study deficiencies.

E. REVIEWERS' COMMENTS:

The reviewers' conclusions were identical to the study authors', in that tomato dry weight was the most sensitive endpoint. The reviewers' toxicity values were slightly lower than the study authors', presumably because they were based on the mean-measured application rates, whereas the study authors' results are based on the nominal application rates. Therefore, the reviewers' results are reported in the Executive Summary and Conclusions sections of this DER.

Percent reductions in biomass were ≤10% relative to the negative control for corn, oat, ryegrass and oilseed rape. Reductions in plant height were ≤9% relative to the negative control for ryegrass, oilseed rape and soybean. Percent reductions in percent survival were ≤6% relative to the negative control for ryegrass and sunflower. However, due to the non-linear response of the data, EC_{05} values for these species and endpoints could not be determined.

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Sunflower exhibited biomass reductions of 10, 13, 9, 13, 26 and 3%, relative to the negative control, and plant height reductions of 9, 13, 11, 10, 20 and 4%, relative to the negative control, at the mean-measured 0.00022, 0.00045, 0.0009, 0.0018, 0.0036 and 0.0072 lbs ai/A, respectively. Because the dose-response was non-linear and did not appear to be dose dependent, the reviewer's analysis yielded NOAEC values of 0.0072 lbs ai/A for both endpoints, the highest application rate. The calculated EC_{05}, EC_{25} and EC_{50} values for biomass were all >0.0072 lbs ai/A. The EC_{25} and EC_{50} values for plant height were also >0.0072 lbs ai/A; an EC_{05} value could not be determined for sunflower plant height.

Mortality was 93% at the highest application rate for sugar beet (0.0072 lbs ai/A). Due to the high mortality, this level was not included in the analyses for dry weight and plant height. Reductions in dry weight and plant height did not exceed 50% for the other treatment levels that were included in the analyses; therefore, the reviewer determined that EC_{50} values for dry weight and plant height were greater than the next highest application rate (0.0036 lbs ai/A). The reviewer visually determined the NOAEC value for sugar beet percent survival to be 0.0018 lbs ai/A, due to the ≤9% reductions in survival at the mean-measured 0.000059-0.0018 lbs ai/A treatment levels and the observed 42 and 93% reductions at the mean-measured 0.0036 and 0.0072 lbs ai/A, respectively, relative to the negative control.

All species were tested under the same environmental conditions instead of testing cold-preferring species separately from warm-preferring species. The less-than-optimal environmental conditions could have had a synergistic effect with the test material, potentially confounding the observed results which are attributed entirely to the exposure of the test material.

The mean-measured application rates were determined by the reviewer based on the mean recoveries of the ten stock solutions representative of the ten application rates. The reviewer determined the mean recovery for each stock solution and multiplied this value by the nominal application rate to derive the mean-measured application rate.

Mean-measured application rates for oat were 0 (negative control), 0.0036, 0.0072, 0.014 and 0.029 lbs ai/A (or, 0, 4.0, 8.1, 15.7 and 32.5 g a.i./ha). Mean-measured application rates for corn were 0 (negative control), 0.0018, 0.0036, 0.0072, 0.014 and 0.029 lbs ai/A (or, 0, 2.0, 4.0, 8.1, 15.7 and 32.5 g a.i./ha). Mean-measured application rates for ryegrass, barley and soybean were 0 (negative control), 0.0009, 0.0018, 0.0036, 0.0072, 0.014 and 0.029 lbs ai/A (or, 0, 1.0, 2.0, 4.0, 8.1, 15.7 and 32.5 g a.i./ha). Mean-measured application rates for cucumber and soybean were 0 (negative control), 0.00022, 0.00045, 0.0009, 0.0018, 0.0036 and 0.0072 lbs ai/A (or, 0, 0.25, 0.50, 1.0, 2.0, 4.0 and 8.1 g a.i./ha). Mean-measured application rates for sugar beet were 0 (negative control), 0.000059, 0.00011, 0.00022, 0.00045, 0.00090, 0.0018, 0.0036 and 0.0072 lbs ai/A (or, 0, 0.066, 0.11, 0.25, 0.50, 1.0, 2.0, 4.0 and 8.1 g a.i./ha). Mean-measured application rates for tomato were 0 (negative control), 0.00011, 0.00022, 0.00045, 0.00090, 0.0018 and 0.0036 lbs ai/A (or, 0, 0.11, 0.25, 0.50, 1.0, 2.0 and 4.0 g a.i./ha). Mean-measured application rates for oilseed rape were 0 (negative control), 0.000059, 0.00011, 0.00022, 0.00045, 0.00090 and 0.0018 lbs ai/A (or, 0, 0.066, 0.11, 0.25, 0.50, 1.0 and 2.0 g a.i./ha).

Onion was originally one of the monocots tested; however, due to only 42% emergence, no further endpoints were analyzed and barley was used in place of onion.

The study authors reported that oilseed rape was repeated several times and failed to meet the validity criteria of the study. The raw data for oilseed rape represent the final test with oilseed rape as the validity criteria were met.

Percent emergence was only 77.5% for the control plants of sugar beet. Survival was 100% and therefore the reviewers did not feel that the low emergence negatively impacted the scientific validity of the study.

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No monocot species exhibited any significant reductions in dry weight, plant height or survival, relative to the negative control. However, non-significant reductions of ≥5% were observed although EC_{05} values could not be determined. Therefore, in Table 1 (Summary of Most Sensitive Parameters by Species) the reviewers reported which endpoint(s) for each monocot exhibited non-significant reductions of ≥5%, represented by "ND" in the EC_{05} column.

The test material, AE 0317309 03 EC23 A8, was a formulation containing the active ingredients AE 0317309 (pyrasulfotole, purity of 3.45% w/w), AE F107892 (mefenpyr-diethyl, purity of 0.85% w/w) and AE F025943 (bromoxynil, purity of 18.94% w/w). The reviewers corrected all nominal application rates for the purity of AE 0317309 and converted theses rates into lbs ai/A and g ai/ha.

The dates of experimental work for the definitive seedling emergence test were February 01 to November 01, 2005.

There appears to be an error in the reporting of treatment levels for oats in the original study report. Biomass and shoot length endpoints are reported in the appendices as ranging from 0.063 to 0.5 L product/ha, whereas the stated treatment levels ranged from 0.125 to 1.0 L/ha. Therefore, the final NOEC and LOEC values for oat should be 1.0 L product/ha (32.5 g a.i./ha or, 0.029 lbs a.i./a) and >1.0 L product/ha, respectively.

In verifying the EC_{25} for tomato biomass endpoint, the secondary reviewer determined an EC_{25} of 0.0004 lbs a.i./a, or 0.45 g a.i./ha using the ICp approach (Norberg-King 1993). However, the model failed to produce 95% CIs, therefore the reviewer agrees with the estimate of 0.00022 lbs a.i./a, or 0.25 g a.i./ha provided by the EPA.

F. CONCLUSIONS:

The study is **ACCEPTABLE**. No monocot species exhibited any significant reductions in any endpoint analyzed relative to each species' negative control. The most sensitive dicot was tomato, based on dry weight, with NOAEC and EC_{25} values of 0.00022 (or, 0.25 g a.i./ha) and 0.00025 lbs ai/A (or, 0.28 g a.i./ha), respectively.

Most sensitive monocot and EC_{25}: N/A; No monocot species exhibited significant reductions in any endpoints analyzed
Most sensitive dicot and EC_{25}: Tomato (Dry Weight), 0.00025 lbs ai/A (or, 0.28 g a.i./ha).

III. REFERENCES:

BBA (Mai 2000): EPPO Standard PP 1/135 (2), Phytotoxicity Assessment.

BBCH-Monograph. Growth stages of Mono- and Dicotyledonous Plants, Federal Biological Research Centre for Agriculture and Forestry, 1997.

Chemikaliengesetz der Bundesrepublik Deutschland (ChemG), Anhang 1. in der Fassung der Bekanntmachung vom 20.03.2002 (BGBI. I S. 2090).

Holst, R.W. and Ellwanger, T.C. 1982. Pesticide Assessment Guidelines, Sub-division J, Hazard Evaluation: Non Target Plants, PB83-153940; EPA540/9-82-020; Series 123; Tier 2 of Non-target Area Testing; §123-1, US EPA, Washington, DC.

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Norberg-King, T. 1993. National Effluent Toxicity Assessment Center Technical Report 03-93. A linear interpolation method for sublethal toxicity: The inhibition concentration (ICp) approach. Version 2.0. Environmental Protection Agency, Environmental Research Laboratory – Duluth, MN 55804.

OECD (Draft Document July 2000): Guideline for the testing of chemicals, Proposal for updating Guideline 208 "Terrestrial (Non-Target) Plant Test: 208A: Seedling Emergence and Seedling Growth Test. 208B: Vegetative Vigor Test."

THE OECD PRINCIPLES OF GOOD LABORATORY PRACTICE, adopted by Council on 26th November 1997 [C(97)186/Final]. Environmental Directorate, Organization for Economic Co-operation and Development, Paris 1998.

Ratte. M. ToxRat Professional 2.09: ToxRat Solutions GmbH, Naheweg 15, 52477 Alsdorf.

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APPENDIX I. OUTPUT OF REVIEWER'S STATISTICAL VERIFICATION:

Corn dry weight (g), lbs ai/A; Day 21
File: 1936cw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	5	0.048	0.010	0.476
Within (Error)	42	0.884	0.021	
Total	47	0.932		

Critical F value = 2.45 (0.05,5,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Corn dry weight (g), lbs ai/A; Day 21
File: 1936cw 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	0.734	0.734		
2	0.0018	0.743	0.743	-0.131	
3	0.0036	0.718	0.718	0.221	
4	0.0072	0.723	0.723	0.148	
5	0.014	0.687	0.687	0.649	
6	0.029	0.792	0.792	-0.799	

Dunnett table value = 2.31 (1 Tailed Value, P=0.05, df=40,5)

Corn dry weight (g), lbs ai/A; Day 21
File: 1936cw 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	8			
2	0.0018	8	0.167	22.8	-0.009
3	0.0036	8	0.167	22.8	0.016
4	0.0072	8	0.167	22.8	0.011
5	0.014	8	0.167	22.8	0.047
6	0.029	8	0.167	22.8	-0.058

Corn dry weight (g), lbs ai/A; Day 21
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WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

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GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.734	0.734	0.721
2	0.0018	8	0.743	0.743	0.721
3	0.0036	8	0.718	0.718	0.721
4	0.0072	8	0.723	0.723	0.721
5	0.014	8	0.687	0.687	0.721
6	0.029	8	0.792	0.792	0.792

Corn dry weight (g), lbs ai/A; Day 21
File: 1936cw 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	0.721				
0.0018	0.721	0.177		1.68	k= 1, v=42
0.0036	0.721	0.177		1.76	k= 2, v=42
0.0072	0.721	0.177		1.79	k= 3, v=42
0.014	0.721	0.177		1.80	k= 4, v=42
0.029	0.792	0.798		1.80	k= 5, v=42

s = 0.145
Note: df used for table values are approximate when v > 20.

Oat dry weight (g), lbs ai/A; Day 21
File: 1936ow Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	4	0.0034	0.0008	0.889
Within (Error)	35	0.0307	0.0009	
Total	39	0.0340		

Critical F value = 2.69 (0.05,4,30)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Oat dry weight (g), lbs ai/A; Day 21
File: 1936ow 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	0.170	0.170		
2	0.0018	0.154	0.154	1.058	
3	0.0036	0.168	0.168	0.125	
4	0.0072	0.178	0.178	-0.550	

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5	0.014	0.155	0.155	0.983

Dunnett table value = 2.25 (1 Tailed Value, P=0.05, df=30,4)

Oat dry weight (g), lbs ai/A; Day 21
File: 1936ow 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	8			
2	0.0018	8	0.034	19.9	0.016
3	0.0036	8	0.034	19.9	0.002
4	0.0072	8	0.034	19.9	-0.008
5	0.014	8	0.034	19.9	0.015

Oat dry weight (g), lbs ai/A; Day 21
File: 1936ow Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.170	0.170	0.170
2	0.0018	8	0.154	0.154	0.167
3	0.0036	8	0.168	0.168	0.167
4	0.0072	8	0.178	0.178	0.167
5	0.014	8	0.155	0.155	0.155

Oat dry weight (g), lbs ai/A; Day 21
File: 1936ow 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	0.170				
0.0018	0.167	0.213		1.69	k= 1, v=35
0.0036	0.167	0.213		1.77	k= 2, v=35
0.0072	0.167	0.213		1.79	k= 3, v=35
0.014	0.155	0.994		1.80	k= 4, v=35

s = 0.030
Note: df used for table values are approximate when v > 20.

Ryegrass dry weight (g), lbs ai/A; Day 21
File: 1936gw Transform: NO TRANSFORMATION

ANOVA TABLE

US EPA ARCHIVE DOCUMENT

SOURCE	DF	SS	MS	F
Between	6	0.0009	0.0001	0.333
Within (Error)	49	0.0162	0.0003	
Total	55	0.0171		

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Ryegrass dry weight (g), lbs ai/A; Day 21
File: 1936gw 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	0.054	0.054		
2	0.0009	0.057	0.057	-0.419	
3	0.0018	0.061	0.061	-0.779	
4	0.0036	0.055	0.055	-0.130	
5	0.0072	0.049	0.049	0.577	
6	0.014	0.051	0.051	0.375	
7	0.029	0.058	0.058	-0.505	

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Ryegrass dry weight (g), lbs ai/A; Day 21
File: 1936gw 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	8			
2	0.0009	8	0.021	38.2	-0.004
3	0.0018	8	0.021	38.2	-0.007
4	0.0036	8	0.021	38.2	-0.001
5	0.0072	8	0.021	38.2	0.005
6	0.014	8	0.021	38.2	0.003
7	0.029	8	0.021	38.2	-0.004

Ryegrass dry weight (g), lbs ai/A; Day 21
File: 1936gw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.054	0.054	0.054
2	0.0009	8	0.057	0.057	0.054

US EPA ARCHIVE DOCUMENT

3	0.0018	8	0.061	0.061	0.054
4	0.0036	8	0.055	0.055	0.054
5	0.0072	8	0.049	0.049	0.054
6	0.014	8	0.051	0.051	0.054
7	0.029	8	0.058	0.058	0.058

Ryegrass dry weight (g), lbs ai/A; Day 21
File: 1936gw 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	0.054				
0.0009	0.054	0.072		1.68	k= 1, v=49
0.0018	0.054	0.072		1.76	k= 2, v=49
0.0036	0.054	0.072		1.79	k= 3, v=49
0.0072	0.054	0.072		1.80	k= 4, v=49
0.014	0.054	0.072		1.80	k= 5, v=49
0.029	0.058	0.482		1.81	k= 6, v=49

s = 0.018
Note: df used for table values are approximate when v > 20.

Ryegrass plant height (cm), lbs ai/A; Day 21
File: 1936gh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	65.861	10.977	0.892
Within (Error)	49	603.002	12.306	
Total	55	668.862		

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Ryegrass plant height (cm), lbs ai/A; Day 21
File: 1936gh 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	24.015	24.015		
2	0.0009	22.806	22.806	0.689	
3	0.0018	23.656	23.656	0.204	
4	0.0036	24.888	24.888	-0.498	
5	0.0072	22.973	22.973	0.594	
6	0.014	21.763	21.763	1.284	
7	0.029	25.015	25.015	-0.570	

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Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Ryegrass plant height (cm), lbs ai/A; Day 21
File: 1936gh 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	8			
2	0.0009	8	4.157	17.3	1.208
3	0.0018	8	4.157	17.3	0.358
4	0.0036	8	4.157	17.3	-0.873
5	0.0072	8	4.157	17.3	1.042
6	0.014	8	4.157	17.3	2.252
7	0.029	8	4.157	17.3	-1.000

Ryegrass plant height (cm), lbs ai/A; Day 21
File: 1936gh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	24.015	24.015	23.350
2	0.0009	8	22.806	22.806	23.350
3	0.0018	8	23.656	23.656	23.350
4	0.0036	8	24.888	24.888	23.350
5	0.0072	8	22.973	22.973	23.350
6	0.014	8	21.763	21.763	23.350
7	0.029	8	25.015	25.015	25.015

Ryegrass plant height (cm), lbs ai/A; Day 21
File: 1936gh 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	23.350				
0.0009	23.350	0.379		1.68	k= 1, v=49
0.0018	23.350	0.379		1.76	k= 2, v=49
0.0036	23.350	0.379		1.79	k= 3, v=49
0.0072	23.350	0.379		1.80	k= 4, v=49
0.014	23.350	0.379		1.80	k= 5, v=49
0.029	25.015	0.570		1.81	k= 6, v=49

s = 3.508
Note: df used for table values are approximate when v > 20.

Cucumber dry weight (g), lbs ai/A; Day 21

US EPA ARCHIVE DOCUMENT

File: 1936uw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	0.268	0.045	7.500
Within (Error)	49	0.279	0.006	
Total	55	0.547		

Critical F value = 2.34 (0.05,6,40)
Since F > Critical F REJECT Ho:All groups equal

Cucumber dry weight (g), lbs ai/A; Day 21
File: 1936uw 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	0.371	0.371		
2	0.00022	0.361	0.361	0.245	
3	0.00045	0.320	0.320	1.297	
4	0.0009	0.312	0.312	1.507	
5	0.0018	0.281	0.281	2.317	
6	0.0036	0.188	0.188	4.712	*
7	0.0072	0.190	0.190	4.670	*

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Cucumber dry weight (g), lbs ai/A; Day 21
File: 1936uw 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	8			
2	0.00022	8	0.092	24.8	0.009
3	0.00045	8	0.092	24.8	0.050
4	0.0009	8	0.092	24.8	0.058
5	0.0018	8	0.092	24.8	0.090
6	0.0036	8	0.092	24.8	0.182
7	0.0072	8	0.092	24.8	0.181

Cucumber dry weight (g), lbs ai/A; Day 21
File: 1936uw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

US EPA ARCHIVE DOCUMENT

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.371	0.371	0.371
2	0.00022	8	0.361	0.361	0.361
3	0.00045	8	0.320	0.320	0.320
4	0.0009	8	0.312	0.312	0.312
5	0.0018	8	0.281	0.281	0.281
6	0.0036	8	0.188	0.188	0.189
7	0.0072	8	0.190	0.190	0.189

Cucumber dry weight (g), lbs ai/A; Day 21
File: 1936uw 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	0.371				
0.00022	0.361	0.252		1.68	k= 1, v=49
0.00045	0.320	1.332		1.76	k= 2, v=49
0.0009	0.312	1.548		1.79	k= 3, v=49
0.0018	0.281	2.380	*	1.80	k= 4, v=49
0.0036	0.189	4.817	*	1.80	k= 5, v=49
0.0072	0.189	4.817	*	1.81	k= 6, v=49

s = 0.075
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.00016	1.7E-05	0.0015	0.49	0.10
EC10	0.00036	5.8E-05	0.0022	0.39	0.16
EC25	0.0014	0.00044	0.0041	0.24	0.33
EC50	0.0060	0.0032	0.011	0.14	0.53

Slope = 1.05 Std.Err. = 0.308

Goodness of fit: p = 0.57 based on DF= 4.0 49.

1936UW : Cucumber dry weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	0.371	0.376	-0.00543	100.	0.00
0.000220	8.00	0.361	0.351	0.0102	93.3	6.69
0.000450	8.00	0.320	0.331	-0.0105	88.0	12.0
0.000900	8.00	0.312	0.303	0.00963	80.5	19.5
0.00180	8.00	0.281	0.266	0.0152	70.7	29.3
0.00360	8.00	0.188	0.222	-0.0339	59.0	41.0
0.00720	8.00	0.190	0.175	0.0147	46.6	53.4

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

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Cucumber plant height (cm), lbs ai/A; Day 21
File: 1936uh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	22.100	3.683	2.111
Within (Error)	49	85.516	1.745	
Total	55	107.616		

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Cucumber plant height (cm), lbs ai/A; Day 21
File: 1936uh 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	7.563	7.563		
2	0.00022	8.069	8.069	-0.766	
3	0.00045	7.425	7.425	0.208	
4	0.0009	6.613	6.613	1.438	
5	0.0018	7.229	7.229	0.505	
6	0.0036	6.539	6.539	1.549	
7	0.0072	6.131	6.131	2.167	

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Cucumber plant height (cm), lbs ai/A; Day 21
File: 1936uh 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	8			
2	0.00022	8	1.565	20.7	-0.506
3	0.00045	8	1.565	20.7	0.138
4	0.0009	8	1.565	20.7	0.950
5	0.0018	8	1.565	20.7	0.333
6	0.0036	8	1.565	20.7	1.023
7	0.0072	8	1.565	20.7	1.431

Cucumber plant height (cm), lbs ai/A; Day 21
File: 1936uh Transform: NO TRANSFORMATION

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WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	7.563	7.563	7.816
2	0.00022	8	8.069	8.069	7.816
3	0.00045	8	7.425	7.425	7.425
4	0.0009	8	6.613	6.613	6.921
5	0.0018	8	7.229	7.229	6.921
6	0.0036	8	6.539	6.539	6.539
7	0.0072	8	6.131	6.131	6.131

Cucumber plant height (cm), lbs ai/A; Day 21
File: 1936uh 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	7.816				
0.00022	7.816	0.383		1.68	k= 1, v=49
0.00045	7.425	0.208		1.76	k= 2, v=49
0.0009	6.921	0.971		1.79	k= 3, v=49
0.0018	6.921	0.971		1.80	k= 4, v=49
0.0036	6.539	1.549		1.80	k= 5, v=49
0.0072	6.131	2.167	*	1.81	k= 6, v=49

s = 1.321
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.00059	1.6E-05	0.022	0.78	0.027
EC10	0.0017	0.00017	0.018	0.51	0.097
EC25	0.011	0.0027	0.041	0.29	0.26
EC50	0.078	0.0029	2.1	0.72	0.037

Slope = 0.776 Std.Err. = 0.509

Goodness of fit: p = 0.52 based on DF= 4.0 49.

1936UH : Cucumber plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	7.56	7.74	-0.175	100.	0.00
0.000220	8.00	8.07	7.55	0.516	97.6	2.39
0.000450	8.00	7.43	7.42	0.00515	95.9	4.11
0.000900	8.00	6.61	7.23	-0.613	93.4	6.62
0.00180	8.00	7.23	6.95	0.280	89.8	10.2
0.00360	8.00	6.54	6.58	-0.0390	85.0	15.0
0.00720	8.00	6.13	6.11	0.0248	78.9	21.1

US EPA ARCHIVE DOCUMENT

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

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

Oilseed rape dry weight (g), lbs ai/A; Day 21
File: 1936dw 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	0.449	0.449	207.000
2	0.000059	0.506	0.506	287.000
3	0.00011	0.465	0.465	216.000
4	0.00022	0.436	0.436	187.000
5	0.00045	0.404	0.404	195.500
6	0.0009	0.485	0.485	239.000
7	0.0018	0.456	0.456	264.500

Calculated H Value = 3.870 Critical H Value Table = 12.590
Since Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.

Oilseed rape dry weight (g), lbs ai/A; Day 21
File: 1936dw 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 0 5 4 1 7 3 6 2
5	0.00045	0.404	0.404	\
4	0.00022	0.436	0.436	. \
1	neg control	0.449	0.449	. . \
7	0.0018	0.456	0.456	. . . \
3	0.00011	0.465	0.465	. . . . \
6	0.0009	0.485	0.485	. . . . . \
2	0.000059	0.506	0.506	. . . . . \

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,7) = 3.038 SE = 8.153

Oilseed rape plant height (cm), lbs ai/A; Day 21
File: 1936dh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	42.030	7.005	0.639
Within (Error)	49	536.981	10.959	
Total	55	579.011		

US EPA ARCHIVE DOCUMENT

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Oilseed rape plant height (cm), lbs ai/A; Day 21
File: 1936dh 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	17.685	17.685		
2	0.000059	19.344	19.344	-1.002	
3	0.00011	18.623	18.623	-0.566	
4	0.00022	18.300	18.300	-0.371	
5	0.00045	16.408	16.408	0.771	
6	0.0009	18.106	18.106	-0.254	
7	0.0018	17.427	17.427	0.156	

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Oilseed rape plant height (cm), lbs ai/A; Day 21
File: 1936dh 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	8			
2	0.000059	8	3.923	22.2	-1.658
3	0.00011	8	3.923	22.2	-0.938
4	0.00022	8	3.923	22.2	-0.615
5	0.00045	8	3.923	22.2	1.277
6	0.0009	8	3.923	22.2	-0.421
7	0.0018	8	3.923	22.2	0.258

Oilseed rape plant height (cm), lbs ai/A; Day 21
File: 1936dh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	17.685	17.685	18.551
2	0.000059	8	19.344	19.344	18.551
3	0.00011	8	18.623	18.623	18.551
4	0.00022	8	18.300	18.300	18.300
5	0.00045	8	16.408	16.408	17.314
6	0.0009	8	18.106	18.106	17.314
7	0.0018	8	17.427	17.427	17.314

US EPA ARCHIVE DOCUMENT

Oilseed rape plant height (cm), lbs ai/A; Day 21
File: 1936dh 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	18.551				
0.000059	18.551	0.523		1.68	k= 1, v=49
0.00011	18.551	0.523		1.76	k= 2, v=49
0.00022	18.300	0.371		1.79	k= 3, v=49
0.00045	17.314	0.224		1.80	k= 4, v=49
0.0009	17.314	0.224		1.80	k= 5, v=49
0.0018	17.314	0.224		1.81	k= 6, v=49

s = 3.310
Note: df used for table values are approximate when v > 20.

Soybean dry weight (g), lbs ai/A; Day 21
File: 1936sw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	0.044	0.007	3.500
Within (Error)	49	0.116	0.002	
Total	55	0.160		

Critical F value = 2.34 (0.05,6,40)
Since F > Critical F REJECT Ho:All groups equal

Soybean dry weight (g), lbs ai/A; Day 21
File: 1936sw 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	0.0009	0.249	0.249	0.822	
3	0.0018	0.254	0.254	0.626	
4	0.0036	0.234	0.234	1.526	
5	0.0072	0.232	0.232	1.599	
6	0.014	0.216	0.216	2.331	
7	0.029	0.176	0.176	4.120	*

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Soybean dry weight (g), lbs ai/A; Day 21
File: 1936sw Transform: NO TRANSFORMATION

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

US EPA ARCHIVE DOCUMENT

GROUP	IDENTIFICATION	NUM OF REPS	Minimum Sig Diff (IN ORIG. UNITS)	% of CONTROL	DIFFERENCE FROM CONTROL
1	neg control	8			
2	0.0009	8	0.053	19.8	0.018
3	0.0018	8	0.053	19.8	0.014
4	0.0036	8	0.053	19.8	0.034
5	0.0072	8	0.053	19.8	0.036
6	0.014	8	0.053	19.8	0.052
7	0.029	8	0.053	19.8	0.092

Soybean dry weight (g), lbs ai/A; Day 21
File: 1936sw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.268	0.268	0.268
2	0.0009	8	0.249	0.249	0.252
3	0.0018	8	0.254	0.254	0.252
4	0.0036	8	0.234	0.234	0.234
5	0.0072	8	0.232	0.232	0.232
6	0.014	8	0.216	0.216	0.216
7	0.029	8	0.176	0.176	0.176

Soybean dry weight (g), lbs ai/A; Day 21
File: 1936sw 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	0.268				
0.0009	0.252	0.666		1.68	k= 1, v=49
0.0018	0.252	0.666		1.76	k= 2, v=49
0.0036	0.234	1.405		1.79	k= 3, v=49
0.0072	0.232	1.472		1.80	k= 4, v=49
0.014	0.216	2.146	*	1.80	k= 5, v=49
0.029	0.176	3.793	*	1.81	k= 6, v=49

s = 0.049
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0024	0.00022	0.026	0.52	0.091
EC10	0.0053	0.00094	0.029	0.37	0.18
EC25	0.020	0.0088	0.043	0.17	0.45
EC50	0.084	0.024	0.29	0.27	0.29

Slope = 1.07 Std.Err. = 0.493

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Goodness of fit: p = 0.92 based on DF= 4.0 49.

1936SW : Soybean dry weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	0.268	0.261	0.00643	100.	0.00
0.000900	8.00	0.249	0.257	-0.00726	98.2	1.79
0.00180	8.00	0.254	0.251	0.00229	96.2	3.77
0.00360	8.00	0.234	0.242	-0.00874	92.7	7.25
0.00720	8.00	0.232	0.228	0.00410	87.2	12.8
0.0140	8.00	0.216	0.208	0.00751	79.6	20.4
0.0290	8.00	0.176	0.180	-0.00432	68.9	31.1

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

Soybean plant height (cm), lbs ai/A; Day 21
File: 1936sh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	3.516	0.586	0.360
Within (Error)	49	79.783	1.628	
Total	55	83.299		

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Soybean plant height (cm), lbs ai/A; Day 21
File: 1936sh 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	11.394	11.394		
2	0.0009	10.838	10.838	0.872	
3	0.0018	11.475	11.475	-0.127	
4	0.0036	10.800	10.800	0.931	
5	0.0072	11.004	11.004	0.611	
6	0.014	11.110	11.110	0.444	
7	0.029	11.331	11.331	0.098	

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Soybean plant height (cm), lbs ai/A; Day 21
File: 1936sh Transform: NO TRANSFORMATION

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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	8			
2	0.0009	8	1.512	13.3	0.556
3	0.0018	8	1.512	13.3	-0.081
4	0.0036	8	1.512	13.3	0.594
5	0.0072	8	1.512	13.3	0.390
6	0.014	8	1.512	13.3	0.283
7	0.029	8	1.512	13.3	0.063

Soybean plant height (cm), lbs ai/A; Day 21
File: 1936sh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	11.394	11.394	11.394
2	0.0009	8	10.838	10.838	11.156
3	0.0018	8	11.475	11.475	11.156
4	0.0036	8	10.800	10.800	11.061
5	0.0072	8	11.004	11.004	11.061
6	0.014	8	11.110	11.110	11.061
7	0.029	8	11.331	11.331	11.061

Soybean plant height (cm), lbs ai/A; Day 21
File: 1936sh 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	11.394				
0.0009	11.156	0.372		1.68	k= 1, v=49
0.0018	11.156	0.372		1.76	k= 2, v=49
0.0036	11.061	0.521		1.79	k= 3, v=49
0.0072	11.061	0.521		1.80	k= 4, v=49
0.014	11.061	0.521		1.80	k= 5, v=49
0.029	11.061	0.521		1.81	k= 6, v=49

s = 1.276
Note: df used for table values are approximate when v > 20.

Sugar beet dry weight (g), lbs ai/A; Day 21
File: 1936bw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F

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Between	7	0.0142	0.0020	2.500
Within (Error)	55	0.0430	0.0008	
Total	62	0.0572		

Critical F value = 2.25 (0.05,7,40)
Since F > Critical F REJECT Ho:All groups equal

Sugar beet dry weight (g), lbs ai/A; Day 21
File: 1936bw 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	0.083	0.083		
2	0.000059	0.097	0.097	-1.016	
3	0.00011	0.086	0.086	-0.230	
4	0.00022	0.083	0.083	-0.053	
5	0.00045	0.078	0.078	0.336	
6	0.0009	0.106	0.106	-1.653	
7	0.0018	0.070	0.070	0.893	
8	0.0036	0.052	0.052	2.103	

Bonferroni T table value = 2.54 (1 Tailed Value, P=0.05, df=50,7)

Sugar beet dry weight (g), lbs ai/A; Day 21
File: 1936bw 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	8			
2	0.000059	8	0.036	43.5	-0.014
3	0.00011	8	0.036	43.5	-0.003
4	0.00022	8	0.036	43.5	-0.001
5	0.00045	8	0.036	43.5	0.005
6	0.0009	8	0.036	43.5	-0.023
7	0.0018	8	0.036	43.5	0.013
8	0.0036	7	0.037	45.1	0.031

Sugar beet dry weight (g), lbs ai/A; Day 21
File: 1936bw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.083	0.083	0.090
2	0.000059	8	0.097	0.097	0.090

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3	0.00011	8	0.086	0.086	0.088
4	0.00022	8	0.083	0.083	0.088
5	0.00045	8	0.078	0.078	0.088
6	0.0009	8	0.106	0.106	0.088
7	0.0018	8	0.070	0.070	0.070
8	0.0036	7	0.052	0.052	0.052

Sugar beet dry weight (g), lbs ai/A; Day 21
File: 1936bw 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	0.090				
0.000059	0.090	0.515		1.68	k= 1, v=55
0.00011	0.088	0.405		1.76	k= 2, v=55
0.00022	0.088	0.405		1.79	k= 3, v=55
0.00045	0.088	0.405		1.80	k= 4, v=55
0.0009	0.088	0.405		1.80	k= 5, v=55
0.0018	0.070	0.904		1.81	k= 6, v=55
0.0036	0.052	2.130	*	1.81	k= 7, v=55

s = 0.028
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0012	0.00036	0.0044	0.27	0.29
EC10	0.0016	0.00063	0.0042	0.21	0.39
EC25	0.0025	0.0015	0.0041	0.11	0.61
EC50	0.0041	0.0026	0.0064	0.096	0.64

Slope = 3.18 Std.Err. = 1.95

Goodness of fit: p = 0.30 based on DF= 5.0 55.

1936BW : Sugar beet dry weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	0.0825	0.0880	-0.00549	100.	0.00
5.90e-05	8.00	0.0969	0.0880	0.00888	100.	2.40e-07
0.000110	8.00	0.0857	0.0880	-0.00224	100.	2.95e-05
0.000220	8.00	0.0832	0.0880	-0.00474	100.	0.00269
0.000450	8.00	0.0777	0.0879	-0.0101	99.9	0.114
0.000900	8.00	0.106	0.0864	0.0195	98.2	1.81
0.00180	8.00	0.0699	0.0768	-0.00691	87.3	12.7
0.00360	7.00	0.0517	0.0504	0.00135	57.2	42.8

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

Sugar beet plant height (cm), lbs ai/A; Day 21

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File: 1936bh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	7	65.718	9.388	3.770
Within (Error)	55	136.944	2.490	
Total	62	202.662		

Critical F value = 2.25 (0.05,7,40)
Since F > Critical F REJECT Ho:All groups equal

Sugar beet plant height (cm), lbs ai/A; Day 21
File: 1936bh 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	9.006	9.006		
2	0.000059	9.581	9.581	-0.729	
3	0.00011	8.773	8.773	0.296	
4	0.00022	8.673	8.673	0.423	
5	0.00045	8.892	8.892	0.145	
6	0.0009	10.379	10.379	-1.740	
7	0.0018	8.330	8.330	0.857	
8	0.0036	6.452	6.452	3.127	*

Bonferroni T table value = 2.54 (1 Tailed Value, P=0.05, df=50,7)

Sugar beet plant height (cm), lbs ai/A; Day 21
File: 1936bh 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	8			
2	0.000059	8	2.003	22.2	-0.575
3	0.00011	8	2.003	22.2	0.233
4	0.00022	8	2.003	22.2	0.333
5	0.00045	8	2.003	22.2	0.115
6	0.0009	8	2.003	22.2	-1.373
7	0.0018	8	2.003	22.2	0.676
8	0.0036	7	2.074	23.0	2.554

Sugar beet plant height (cm), lbs ai/A; Day 21
File: 1936bh Transform: NO TRANSFORMATION

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WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	9.006	9.006	9.294
2	0.000059	8	9.581	9.581	9.294
3	0.00011	8	8.773	8.773	9.179
4	0.00022	8	8.673	8.673	9.179
5	0.00045	8	8.892	8.892	9.179
6	0.0009	8	10.379	10.379	9.179
7	0.0018	8	8.330	8.330	8.330
8	0.0036	7	6.452	6.452	6.452

Sugar beet plant height (cm), lbs ai/A; Day 21
File: 1936bh 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	9.294				
0.000059	9.294	0.364		1.68	k= 1, v=55
0.00011	9.179	0.219		1.76	k= 2, v=55
0.00022	9.179	0.219		1.79	k= 3, v=55
0.00045	9.179	0.219		1.80	k= 4, v=55
0.0009	9.179	0.219		1.80	k= 5, v=55
0.0018	8.330	0.857		1.81	k= 6, v=55
0.0036	6.452	3.127	*	1.81	k= 7, v=55

s = 1.578
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0017	0.00072	0.0039	0.18	0.43
EC10	0.0021	0.0012	0.0038	0.13	0.56
EC25	0.0032	0.0025	0.0041	0.053	0.78
EC50	0.0051	0.0031	0.0083	0.11	0.61

Slope = 3.39 Std.Err. = 1.87

Goodness of fit: p = 0.25 based on DF= 5.0 55.

1936BH : Sugar beet plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	9.01	9.18	-0.178	100.	0.00
5.90e-05	8.00	9.58	9.18	0.397	100.	2.51e-09
0.000110	8.00	8.77	9.18	-0.411	100.	7.87e-07
0.000220	8.00	8.67	9.18	-0.511	100.	0.000180
0.000450	8.00	8.89	9.18	-0.291	100.	0.0172

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0.000900	8.00	10.4	9.14	1.24	99.5	0.525
0.00180	8.00	8.33	8.62	-0.285	93.8	6.19
0.00360	7.00	6.45	6.41	0.0423	69.8	30.2

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

Sugar beet % survival, lbs ai/A; Day 21
File: 1936bs 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	100.000	100.000	360.000
2	0.000059	100.000	100.000	360.000
3	0.00011	100.000	100.000	360.000
4	0.00022	100.000	100.000	360.000
5	0.00045	100.000	100.000	360.000
6	0.0009	96.875	96.875	331.000
7	0.0018	90.625	90.625	325.000
8	0.0036	58.375	58.375	130.500
9	0.0072	7.500	7.500	41.500

Calculated H Value = -65.625 Critical H Value Table = 15.510
Since Calc H < Crit H FAIL TO REJECT Ho:All groups are equal.

Sugar beet % survival, lbs ai/A; Day 21
File: 1936bs 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 0 0 0 0 9 8 7 6 5 1 2 3 4
9	0.0072	7.500	7.500	\
8	0.0036	58.375	58.375	. \
7	0.0018	90.625	90.625	* . \
6	0.0009	96.875	96.875	* . . \
5	0.00045	100.000	100.000	* . . . \
1	neg control	100.000	100.000	* . . . . \
2	0.000059	100.000	100.000	* . . . . . \
3	0.00011	100.000	100.000	* . . . . . . \
4	0.00022	100.000	100.000	* . . . . \

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,9) = 3.197 SE = 10.877

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	0.0019	0.0015	0.0025	0.053	0.78
EC10	0.0023	0.0018	0.0028	0.046	0.81
EC25	0.0029	0.0025	0.0034	0.034	0.85
EC50	0.0039	0.0035	0.0044	0.024	0.90

Slope = 5.38 Std.Err. = 0.627

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Goodness of fit: p = 0.99 based on DF= 6.0 63.

1936BS : Sugar beet % survival, lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	100.	98.8	1.16	100.	0.00
5.90e-05	8.00	100.	98.8	1.16	100.	2.88e-14
0.000110	8.00	100.	98.8	1.16	100.	2.88e-14
0.000220	8.00	100.	98.8	1.16	100.	8.69e-10
0.000450	8.00	100.	98.8	1.16	100.	2.15e-05
0.000900	8.00	96.9	98.8	-1.93	100.	0.0294
0.00180	8.00	90.6	95.4	-4.80	96.5	3.45
0.00360	8.00	58.4	57.2	1.13	57.9	42.1
0.00720	8.00	7.50	7.71	-0.205	7.80	92.2

Sunflower dry weight (g), lbs ai/A; Day 21
File: 1936fw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	0.028	0.005	1.000
Within (Error)	49	0.242	0.005	
Total	55	0.271		

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Sunflower dry weight (g), lbs ai/A; Day 21
File: 1936fw 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	0.287	0.287		
2	0.00022	0.259	0.259	0.806	
3	0.00045	0.249	0.249	1.068	
4	0.0009	0.262	0.262	0.714	
5	0.0018	0.251	0.251	1.029	
6	0.0036	0.212	0.212	2.143	
7	0.0072	0.277	0.277	0.283	

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Sunflower dry weight (g), lbs ai/A; Day 21
File: 1936fw Transform: NO TRANSFORMATION

US EPA ARCHIVE DOCUMENT

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	8			
2	0.00022	8	0.084	29.2	0.028
3	0.00045	8	0.084	29.2	0.038
4	0.0009	8	0.084	29.2	0.025
5	0.0018	8	0.084	29.2	0.036
6	0.0036	8	0.084	29.2	0.076
7	0.0072	8	0.084	29.2	0.010

Sunflower dry weight (g), lbs ai/A; Day 21
File: 1936fw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.287	0.287	0.287
2	0.00022	8	0.259	0.259	0.259
3	0.00045	8	0.249	0.249	0.256
4	0.0009	8	0.262	0.262	0.256
5	0.0018	8	0.251	0.251	0.251
6	0.0036	8	0.212	0.212	0.244
7	0.0072	8	0.277	0.277	0.244

Sunflower dry weight (g), lbs ai/A; Day 21
File: 1936fw 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	0.287				
0.00022	0.259	0.810		1.68	k= 1, v=49
0.00045	0.256	0.895		1.76	k= 2, v=49
0.0009	0.256	0.895		1.79	k= 3, v=49
0.0018	0.251	1.034		1.80	k= 4, v=49
0.0036	0.244	1.219		1.80	k= 5, v=49
0.0072	0.244	1.219		1.81	k= 6, v=49

s = 0.070
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	2.5E-14	7.0E-174	9.1E+145	80.	2.8E-160
EC10	2.2E-06	1.5E-52	3.2E+40	23.	6.9E-47
EC25	4.1E+07	2.1E-146	8.0E+160	76.	5.1E-154
EC50	2.2E+22	2.2E-308	+INF	1.8E+02	0.0

US EPA ARCHIVE DOCUMENT

Slope = 0.0458 Std.Err. = 0.334

Goodness of fit: p = 0.42 based on DF= 4.0 49.

1936FW : Sunflower dry weight (g), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	0.287	0.287	-3.04e-05	100.	0.00
0.000220	8.00	0.259	0.254	0.00508	88.3	11.7
0.000450	8.00	0.250	0.253	-0.00336	88.0	12.0
0.000900	8.00	0.262	0.252	0.00994	87.7	12.3
0.00180	8.00	0.251	0.251	-0.000375	87.5	12.5
0.00360	8.00	0.211	0.250	-0.0389	87.2	12.8
0.00720	8.00	0.277	0.250	0.0277	86.9	13.1

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

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

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

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

Sunflower plant height (cm), lbs ai/A; Day 21
File: 1936fh Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	22.249	3.708	1.202
Within (Error)	49	151.148	3.085	
Total	55	173.397		

Critical F value = 2.34 (0.05,6,40)
Since F < Critical F FAIL TO REJECT Ho:All groups equal

Sunflower plant height (cm), lbs ai/A; Day 21
File: 1936fh 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	10.619	10.619		
2	0.00022	9.715	9.715	1.030	
3	0.00045	9.200	9.200	1.616	
4	0.0009	9.475	9.475	1.302	
5	0.0018	9.575	9.575	1.188	
6	0.0036	8.488	8.488	2.427	*

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7	0.0072	10.163	10.163	0.520

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Sunflower plant height (cm), lbs ai/A; Day 21
File: 1936fh 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	8			
2	0.00022	8	2.081	19.6	0.904
3	0.00045	8	2.081	19.6	1.419
4	0.0009	8	2.081	19.6	1.144
5	0.0018	8	2.081	19.6	1.044
6	0.0036	8	2.081	19.6	2.131
7	0.0072	8	2.081	19.6	0.456

Sunflower plant height (cm), lbs ai/A; Day 21
File: 1936fh Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	10.619	10.619	10.619
2	0.00022	8	9.715	9.715	9.715
3	0.00045	8	9.200	9.200	9.417
4	0.0009	8	9.475	9.475	9.417
5	0.0018	8	9.575	9.575	9.417
6	0.0036	8	8.488	8.488	9.325
7	0.0072	8	10.163	10.163	9.325

Sunflower plant height (cm), lbs ai/A; Day 21
File: 1936fh 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	10.619				
0.00022	9.715	1.030		1.68	k= 1, v=49
0.00045	9.417	1.369		1.76	k= 2, v=49
0.0009	9.417	1.369		1.79	k= 3, v=49
0.0018	9.417	1.369		1.80	k= 4, v=49
0.0036	9.325	1.473		1.80	k= 5, v=49
0.0072	9.325	1.473		1.81	k= 6, v=49

s = 1.756
Note: df used for table values are approximate when v > 20.

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Sunflower % survival, lbs ai/A; Day 21
File: 1936fs 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	97.500	97.500	233.500
2	0.00022	90.625	90.625	198.500
3	0.00045	97.500	97.500	233.500
4	0.0009	100.000	100.000	260.000
5	0.0018	100.000	100.000	260.000
6	0.0036	97.500	97.500	233.500
7	0.0072	91.875	91.875	177.000

Calculated H Value = 85.895 Critical H Value Table = 12.590
Since Calc H > Crit H REJECT Ho:All groups are equal.

Sunflower % survival, lbs ai/A; Day 21
File: 1936fs Transform: NO TRANSFORMATION

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

GROUP	IDENTIFICATION	TRANSFORMED MEAN	ORIGINAL MEAN	GROUP 0 2	0 7	0 1	0 6	0 3	0 4	0 5
2	0.00022	90.625	90.625	\						
7	0.0072	91.875	91.875	.	\					
1	neg control	97.500	97.500	.	.	\				
6	0.0036	97.500	97.500	.	.	.	\			
3	0.00045	97.500	97.500	.	.	.	.	\		
4	0.0009	100.000	100.000	.	.	.	.	.	\	
5	0.0018	100.000	100.000	.	.	.	.	.	.	\

* = significant difference (p=0.05) . = no significant difference
Table q value (0.05,7) = 3.038 SE = 8.616

Tomato dry weight (g), lbs ai/A; day 21
File: 1936tw Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	0.0030	0.0005	5.000
Within (Error)	49	0.0057	0.0001	
Total	55	0.0087		

Critical F value = 2.34 (0.05,6,40)
Since F > Critical F REJECT Ho:All groups equal

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Tomato dry weight (g), lbs ai/A; day 21
File: 1936tw 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	0.042	0.042		
2	0.00011	0.033	0.033	1.800	
3	0.00022	0.039	0.039	0.600	
4	0.00045	0.030	0.030	2.400	*
5	0.0009	0.022	0.022	3.950	*
6	0.0018	0.021	0.021	4.150	*
7	0.0036	0.027	0.027	3.025	*

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Tomato dry weight (g), lbs ai/A; day 21
File: 1936tw 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	8			
2	0.00011	8	0.012	28.2	0.009
3	0.00022	8	0.012	28.2	0.003
4	0.00045	8	0.012	28.2	0.012
5	0.0009	8	0.012	28.2	0.020
6	0.0018	8	0.012	28.2	0.021
7	0.0036	8	0.012	28.2	0.015

Tomato dry weight (g), lbs ai/A; day 21
File: 1936tw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	0.042	0.042	0.042
2	0.00011	8	0.033	0.033	0.036
3	0.00022	8	0.039	0.039	0.036
4	0.00045	8	0.030	0.030	0.030
5	0.0009	8	0.022	0.022	0.023
6	0.0018	8	0.021	0.021	0.023
7	0.0036	8	0.027	0.027	0.023

Tomato dry weight (g), lbs ai/A; day 21
File: 1936tw Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 2 OF 2

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IDENTIFICATION	ISOTONIZED MEAN	CALC. WILLIAMS	SIG P=.05	TABLE WILLIAMS	DEGREES OF FREEDOM
neg control	0.042				
0.00011	0.036	1.095		1.68	k= 1, v=49
0.00022	0.036	1.095		1.76	k= 2, v=49
0.00045	0.030	2.191	*	1.79	k= 3, v=49
0.0009	0.023	3.385	*	1.80	k= 4, v=49
0.0018	0.023	3.385	*	1.80	k= 5, v=49
0.0036	0.023	3.385	*	1.81	k= 6, v=49

s = 0.011
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	3.6E-06	9.4E-09	0.0014	1.3	0.0026
EC10	1.8E-05	1.7E-07	0.0019	1.0	0.0097
EC25	0.00025	1.9E-05	0.0035	0.57	0.073
EC50	0.0049	0.00077	0.031	0.40	0.16

Slope = 0.526 Std.Err. = 0.231

Goodness of fit: p = 0.080 based on DF= 4.0 49.

1936TW : Tomato dry weight (g), lbs ai/A; day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	0.0420	0.0425	-0.000512	100.	0.00
0.000110	8.00	0.0330	0.0343	-0.00130	80.7	19.3
0.000220	8.00	0.0390	0.0323	0.00667	76.1	23.9
0.000450	8.00	0.0300	0.0301	-5.64e-05	70.7	29.3
0.000900	8.00	0.0222	0.0276	-0.00540	65.0	35.0
0.00180	8.00	0.0212	0.0251	-0.00384	59.0	41.0
0.00360	8.00	0.0269	0.0224	0.00444	52.8	47.2

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

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

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

Tomato plant height (cm), lbs ai/A; Day 21
File: 1936th Transform: NO TRANSFORMATION

ANOVA TABLE

SOURCE	DF	SS	MS	F
Between	6	9.953	1.659	2.860
Within (Error)	49	28.402	0.580	
Total	55	38.355		

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```
  Critical F value =   2.34  (0.05,6,40)
  Since  F > Critical F  REJECT  Ho:All groups equal
```

Tomato plant height (cm), lbs ai/A; Day 21
File: 1936th 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	4.031	4.031		
2	0.00011	3.667	3.667	0.957	
3	0.00022	4.238	4.238	-0.542	
4	0.00045	3.773	3.773	0.679	
5	0.0009	3.052	3.052	2.572	*
6	0.0018	3.060	3.060	2.550	*
7	0.0036	3.438	3.438	1.559	

Dunnett table value = 2.37 (1 Tailed Value, P=0.05, df=40,6)

Tomato plant height (cm), lbs ai/A; Day 21
File: 1936th 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	8			
2	0.00011	8	0.902	22.4	0.364
3	0.00022	8	0.902	22.4	-0.206
4	0.00045	8	0.902	22.4	0.258
5	0.0009	8	0.902	22.4	0.979
6	0.0018	8	0.902	22.4	0.971
7	0.0036	8	0.902	22.4	0.594

Tomato plant height (cm), lbs ai/A; Day 21
File: 1936th Transform: NO TRANSFORMATION

WILLIAMS TEST (Isotonic regression model) TABLE 1 OF 2

GROUP	IDENTIFICATION	N	ORIGINAL MEAN	TRANSFORMED MEAN	ISOTONIZED MEAN
1	neg control	8	4.031	4.031	4.031
2	0.00011	8	3.667	3.667	3.952
3	0.00022	8	4.238	4.238	3.952
4	0.00045	8	3.773	3.773	3.773
5	0.0009	8	3.052	3.052	3.183
6	0.0018	8	3.060	3.060	3.183
7	0.0036	8	3.438	3.438	3.183

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Tomato plant height (cm), lbs ai/A; Day 21
File: 1936th 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	4.031				
0.00011	3.952	0.208		1.68	k= 1, v=49
0.00022	3.952	0.208		1.76	k= 2, v=49
0.00045	3.773	0.679		1.79	k= 3, v=49
0.0009	3.183	2.228	*	1.80	k= 4, v=49
0.0018	3.183	2.228	*	1.80	k= 5, v=49
0.0036	3.183	2.228	*	1.81	k= 6, v=49

s = 0.761
Note: df used for table values are approximate when v > 20.

Estimates of EC%

Parameter	Estimate	95% Bounds Lower	95% Bounds Upper	Std.Err.	Lower Bound /Estimate
EC5	6.9E-05	2.1E-07	0.022	1.3	0.0031
EC10	0.00034	7.1E-06	0.016	0.84	0.021
EC25	0.0049	0.00054	0.044	0.48	0.11
EC50	0.094	0.00071	12.	1.1	0.0075

Slope = 0.525 Std.Err. = 0.353

Goodness of fit: p = 0.079 based on DF= 4.0 49.

1936TH : Tomato plant height (cm), lbs ai/A; Day 21

Observed vs. Predicted Treatment Group Means

Dose	#Reps.	Obs. Mean	Pred. Mean	Obs. -Pred.	Pred. %Control	%Change
0.00	8.00	4.03	4.08	-0.0533	100.	0.00
0.000110	8.00	3.67	3.83	-0.164	93.8	6.21
0.000220	8.00	4.24	3.74	0.495	91.6	8.38
0.000450	8.00	3.77	3.63	0.145	88.8	11.2
0.000900	8.00	3.05	3.49	-0.441	85.5	14.5
0.00180	8.00	3.06	3.33	-0.273	81.6	18.4
0.00360	8.00	3.44	3.15	0.287	77.1	22.9

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

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

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

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Barley Dry Weight (g)

	Negative Control	0.0009	0.0018	0.0036
Rep 1	0.354	0.269	0.315	0.305
Rep 2	0.289	0.320	0.332	0.370
Rep 3	0.234	0.371	0.304	0.236
Rep 4	0.275	0.390	0.279	0.290
Rep 5	0.358	0.381	0.326	0.337
Rep 6	0.252	0.360	0.309	0.394
Rep 7	0.408	0.298	0.413	0.282
Rep 8	0.354	0.432	0.498	0.277
Mean	*0.316*	*0.353*	*0.347*	*0.311*
% Reduction	*N/A*	*-12*	*-10*	*1*

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0.0072	**0.014**	**0.029**
0.334	0.415	0.239
0.326	0.238	0.423
0.299	0.351	0.370
0.240	0.425	0.296
0.328	0.357	0.332
0.353	0.295	0.306
0.378	0.255	0.376
0.297	0.301	0.395
0.319	*0.330*	*0.342*
-1	*-4*	*-8*

Conversion of Study Authors' Toxicity Values

Cucumber	L product/ha	g ai/ha	lbs ai/A
EC25	0.054	2.025	0.00178
Lower 95% C.I.	0.020	0.75	0.00066
Upper 95% C.I.	0.088	3.3	0.00290
EC50	0.204	7.65	0.00673
Lower 95% C.I.	0.126	4.725	0.00416
Upper 95% C.I.	0.605	22.6875	0.01997
Soybean			
EC25	0.607	22.7625	0.02003
Lower 95% C.I.	0.421	15.7875	0.01389
Upper 95% C.I.	0.961	36.0375	0.03171
Sugar beet			
EC25	0.092	3.45	0.00304
Lower 95% C.I.	0.076	2.85	0.00251
Upper 95% C.I.	0.106	3.975	0.00350
EC50	0.163	6.1125	0.00538
Lower 95% C.I.	0.137	5.1375	0.00452
Upper 95% C.I.	0.235	8.8125	0.00776
Tomato			
EC25	0.011	0.4125	0.000363
Lower 95% C.I.	ND	ND	ND
Upper 95% C.I.	ND	ND	ND
EC50	0.152	5.7	0.00502
Lower 95% C.I.	ND	ND	ND
Upper 95% C.I.	ND	ND	ND

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Corn Dry Weight (g)

	Negative Control	**0.0018**	**0.0036**	**0.0072**	**0.014**
Rep 1	0.655	0.508	0.724	0.634	0.734
Rep 2	0.812	0.690	0.592	0.583	0.663
Rep 3	0.738	0.765	0.625	0.487	0.709
Rep 4	0.360	0.900	0.707	0.605	0.812
Rep 5	1.020	0.628	0.769	0.869	0.490
Rep 6	0.883	0.916	0.788	0.856	0.526
Rep 7	0.624	0.890	0.694	0.897	0.907
Rep 8	0.778	0.649	0.843	0.853	0.653
Mean	*0.734*	*0.743*	*0.718*	*0.723*	*0.687*
% Reduction	*N/A*	*-1*	*2*	*1*	*6*

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0.029
1.000
0.605
0.796
0.799
0.725
0.790
0.742
0.876
0.792
-8

Corn Dry Weight (g)

	Negative Control	**0.0018**	**0.0036**	**0.0072**	**0.014**
Rep 1	0.655	0.508	0.724	0.634	0.734
Rep 2	0.812	0.690	0.592	0.583	0.663
Rep 3	0.738	0.765	0.625	0.487	0.709
Rep 4	0.360	0.900	0.707	0.605	0.812
Rep 5	1.020	0.628	0.769	0.869	0.490
Rep 6	0.883	0.916	0.788	0.856	0.526
Rep 7	0.624	0.890	0.694	0.897	0.907
Rep 8	0.778	0.649	0.843	0.853	0.653
Mean	*0.734*	*0.743*	*0.718*	*0.723*	*0.687*
% Reduction	*N/A*	*-1*	*2*	*1*	*6*

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0.029
1.000
0.605
0.796
0.799
0.725
0.790
0.742
0.876
0.792
-8

Corn dry weight (g), lbs ai/A; Day 21
6
8
8
8
8
8
8
neg control
0.655
0.812
0.738
0.360
1.020
0.883
0.624
0.778
0.0018
0.508
0.690
0.765
0.900
0.628
0.916
0.890
0.649
0.0036
0.724
0.592
0.625
0.707
0.769
0.788
0.694
0.843
0.0072
0.634
0.583
0.487
0.605
0.869
0.856
0.897
0.853
0.014
0.734
0.663
0.709
0.812
0.490
0.526
0.907
0.653
0.029
1.000
0.605
0.796

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0.799
0.725
0.790
0.742
0.876

11.8
9
11.5
11.5
11.5
9.6
9.333
0.0018
5.333
7.775
8
9.2
10
8.333
11
7
0.0036
6
8
3.667
6
4
10
7.5

Sugar beet dry weight (g), lbs ai/A; Day 21
8
8
8
8
8
8
8
8
7
neg control
0.105
0.080
0.098
0.088
0.068
0.079
0.075
0.067
0.000059
0.050
0.080
0.098
0.126
0.073
0.158
0.118
0.072
0.00011
0.082
0.089
0.072
0.075
0.053
0.076
0.140
0.099
0.00022
0.097
0.133
0.082
0.110
0.061
0.046
0.083
0.054
0.00045
0.069
0.112
0.058
0.080
0.103
0.056
0.056
0.088
0.0009
0.082

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0.128
0.078
0.145
0.139
0.117
0.070
0.088
0.0018
0.041
0.062
0.052
0.091
0.105
0.063
0.122
0.023
0.0036
0.052
0.064
0.020
0.047
0.016
0.1
0.063

Sugar beet % survival, lbs ai/A; Day 21
9
8
8
8
8
8
8
8
8
8
neg control
100
100
100
100
100
100
100
100
0.000059
100
100
100
100
100
100
100
100
0.00011
100
100
100
100
100
100
100
100
0.00022
100
100
100
100
100
100
100
100
0.00045
100
100
100
100
100
100
100
100
0.0009

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100
100
100
100
100
100
100
75
0.0018
100
100
100
100
100
100
100
25
0.0036
67
75
75
100
0
50
33
67
0.0072
0
20
20
0
0
20
0
0

Sugar beet Dry Weight (g)

	Negative Control	**0.000059**	**0.00011**	**0.00022**
Rep 1	0.105	0.050	0.082	0.097
Rep 2	0.080	0.080	0.089	0.133
Rep 3	0.098	0.098	0.072	0.082
Rep 4	0.088	0.126	0.075	0.110
Rep 5	0.068	0.073	0.053	0.061
Rep 6	0.079	0.158	0.076	0.046
Rep 7	0.075	0.118	0.140	0.083
Rep 8	0.067	0.072	0.099	0.054
Mean	*0.083*	*0.097*	*0.086*	*0.083*
% Reduction	*N/A*	*-17*	*-4*	*-1*

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0.00045	**0.0009**	**0.0018**	**0.0036**	**0.0072**
0.069	0.082	0.041	0.052	
0.112	0.128	0.062	0.064	
0.058	0.078	0.052	0.020	
0.080	0.145	0.091	0.047	
0.103	0.139	0.105	0.016	
0.056	0.117	0.063	0.100	
0.056	0.070	0.122	0.063	
0.088	0.088	0.023		
0.078	*0.106*	*0.070*	*0.052*	*#DIV/0!*
5	*-28*	*15*	*37*	*#DIV/0!*

Soybean plant height (cm), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
11.6
9.6
11.6
11.6
11.4
10.75
12
12.6
0.0009
12
11.6
8.8
10
10.75
9.4
12.75
11.4
0.0018
12.8
9
13
12.6
11
10.6
12
10.8
0.0036
10.6
11.2
9.8
9
12.4
12.6
12
8.8
0.0072
10.667
9.667
8.8
10.5
12
12.2
11.4
12.8
0.014
10
9

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10.333
12.75
11
12.4
11.4
12
0.029
12.4
11.4
10.8
12
9.2
12.6
11.25
11

Soybean dry weight (g), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
0.250
0.204
0.252
0.264
0.284
0.246
0.312
0.330
0.0009
0.254
0.263
0.172
0.248
0.295
0.196
0.299
0.268
0.0018
0.303
0.125
0.269
0.291
0.185
0.267
0.286
0.304
0.0036
0.250
0.250
0.174
0.210
0.298
0.281
0.206
0.200
0.0072
0.204
0.128
0.218
0.202
0.292
0.241
0.286
0.285
0.014
0.163
0.2

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0.205
0.224
0.217
0.335
0.182
0.199
0.029
0.225
0.183
0.197
0.155
0.140
0.202
0.173
0.130

Soybean Shoot Length (cm)

	Negative Control	**0.0009**	**0.0018**
Rep 1	11.600	12.000	12.800
Rep 2	9.600	11.600	9.000
Rep 3	11.600	8.800	13.000
Rep 4	11.600	10.000	12.600
Rep 5	11.400	10.750	11.000
Rep 6	10.750	9.400	10.600
Rep 7	12.000	12.750	12.000
Rep 8	12.600	11.400	10.800
Mean	*11.394*	*10.838*	*11.475*
% Reduction	*N/A*	*5*	*-1*

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0.0036	**0.0072**	**0.014**	**0.029**
10.600	10.667	10.000	12.400
11.200	9.667	9.000	11.400
9.800	8.800	10.333	10.800
9.000	10.500	12.750	12.000
12.400	12.000	11.000	9.200
12.600	12.200	12.400	12.600
12.000	11.400	11.400	11.250
8.800	12.800	12.000	11.000
10.800	*11.004*	*11.110*	*11.331*
5	*3*	*2*	*1*

Ryegrass plant height (cm), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
17.667
25.4
27.25
27
25
20.8
23
26
0.0009
20.6
25.4
18.8
22.8
21.8
28.2
23.6
21.25
0.0018
23.8
23.4
26.2
23.6
17.6
24.4
23
27.250
0.0036
23.8
24
29.8
26.2
29.5
25.333
24.8
15.667
0.0072
23.4
29.25
24.4
21.750
16.5
20.4
24.333
23.75
0.014
25.5
13.75

US EPA ARCHIVE DOCUMENT

23.5
26
24.6
18.75
23
19
0.029
26
26.25
26.2
24.4
18.667
24.8
26
27.8

Ryegrass dry weight (g), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
0.026
0.048
0.082
0.077
0.051
0.047
0.063
0.036
0.0009
0.058
0.054
0.038
0.054
0.057
0.072
0.051
0.075
0.0018
0.046
0.074
0.065
0.062
0.040
0.076
0.058
0.063
0.0036
0.082
0.067
0.065
0.062
0.051
0.053
0.049
0.010
0.0072
0.038
0.070
0.063
0.034
0.030
0.051
0.072
0.032
0.014
0.060
0.008

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0.062
0.091
0.064
0.037
0.048
0.034
0.029
0.057
0.077
0.078
0.049
0.028
0.065
0.065
0.046

Ryegrass Dry Weight (g)

	Negative Control	**0.0009**	**0.0018**	**0.0036**
Rep 1	0.026	0.058	0.046	0.082
Rep 2	0.048	0.054	0.074	0.067
Rep 3	0.082	0.038	0.065	0.065
Rep 4	0.077	0.054	0.062	0.062
Rep 5	0.051	0.057	0.040	0.051
Rep 6	0.047	0.072	0.076	0.053
Rep 7	0.063	0.051	0.058	0.049
Rep 8	0.036	0.075	0.069	0.010
Mean	*0.054*	*0.057*	*0.061*	*0.055*
% Reduction	*N/A*	*-7*	*-14*	*-2*

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0.0072	**0.014**	**0.029**
0.038	0.060	0.057
0.070	0.008	0.077
0.063	0.062	0.078
0.034	0.091	0.049
0.030	0.064	0.028
0.051	0.037	0.065
0.072	0.048	0.065
0.032	0.034	0.046
0.049	*0.051*	*0.058*
9	*6*	*-8*

Oilseed rape plant height (cm), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
18.25
16
20.6
19.8
15.25
17.25
16
18.333
0.000059
22
14.75
14
20.5
19.5
21.5
22
20.5
0.00011
18
19.4
19.25
18.6
19.4
19.6
21.4
13.333
0.00022
17.667
21.333
18
20
21.2
17
11.2
20
0.00045
9.667
14
11.5
17.2
21
19
19.4
19.5
0.0009
16
17.6

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15.75
20
17
20.25
20
18.25
0.0018
20.2
19.75
21
16.4
19.5
5.4
19.5
17.667

Oilseed rape dry weight (g), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
0.554
0.327
0.519
0.456
0.351
0.463
0.362
0.556
0.000059
0.563
0.392
0.516
0.494
0.623
0.518
0.508
0.431
0.00011
0.472
0.449
0.463
0.482
0.468
0.478
0.509
0.395
0.00022
0.404
0.653
0.503
0.365
0.511
0.431
0.273
0.348
0.00045
0.216
0.3
0.145
0.404
0.574
0.481
0.499
0.616
0.0009
0.463
0.403

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0.399
0.536
0.424
0.612
0.610
0.436
0.0018
0.478
0.613
0.516
0.472
0.405
0.059
0.577
0.527

Oilseed rape Dry Weight (g)

	Negative Control	**0.000059**	**0.00011**	**0.00022**
Rep 1	0.554	0.563	0.472	0.404
Rep 2	0.327	0.392	0.449	0.653
Rep 3	0.519	0.516	0.463	0.503
Rep 4	0.456	0.494	0.482	0.365
Rep 5	0.351	0.623	0.468	0.511
Rep 6	0.463	0.518	0.478	0.431
Rep 7	0.362	0.508	0.509	0.273
Rep 8	0.556	0.431	0.395	0.348
Mean	*0.449*	*0.506*	*0.465*	*0.436*
% Reduction	*N/A*	*-13*	*-4*	*3*

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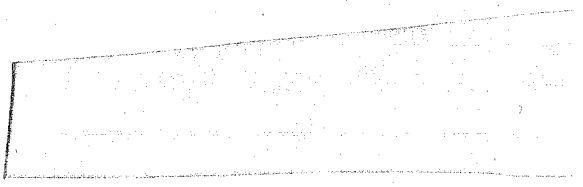
0.00045	**0.0009**	**0.0018**
0.216	0.463	0.478
0.300	0.403	0.613
0.145	0.399	0.516
0.404	0.536	0.472
0.574	0.424	0.405
0.481	0.612	0.059
0.499	0.610	0.577
0.616	0.436	0.527
0.404	*0.485*	*0.456*
10	*-8*	*-2*



Oat Dry Weight (g)

	Negative Control	**0.0018**	**0.0036**	**0.0072**	**0.014**
Rep 1	0.199	0.145	0.132	0.203	0.119
Rep 2	0.186	0.199	0.174	0.167	0.117
Rep 3	0.181	0.172	0.151	0.136	0.113
Rep 4	0.167	0.123	0.228	0.207	0.182
Rep 5	0.178	0.155	0.125	0.168	0.179
Rep 6	0.174	0.182	0.171	0.185	0.208
Rep 7	0.157	0.139	0.169	0.162	0.158
Rep 8	0.117	0.117	0.194	0.197	0.165
Mean	*0.170*	*0.154*	*0.168*	*0.178*	*0.155*
% Reduction	*N/A*	*9*	*1*	*-5*	*9*

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Oat dry weight (g), lbs ai/A; Day 21
5
8
8
8
8
8
neg control
0.199
0.186
0.181
0.167
0.178
0.174
0.157
0.117
0.0018
0.145
0.199
0.172
0.123
0.155
0.182
0.139
0.117
0.0036
0.132
0.174
0.151
0.228
0.125
0.171
0.169
0.194
0.0072
0.203
0.167
0.136
0.207
0.168
0.185
0.162
0.197
0.014
0.119
0.117
0.113
0.182
0.179
0.208
0.158
0.165

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Nominal Application Rates

L product/ha	g ai/ha	
Negative Control	Negative Control	x 0.0022 lb/g
0.002	0.08	x 0.0022 lb/g
0.004	0.15	x 0.0022 lb/g
0.008	0.29	x 0.0022 lb/g
0.016	0.59	x 0.0022 lb/g
0.032	1.17	x 0.0022 lb/g
0.063	2.34	x 0.0022 lb/g
0.125	4.69	x 0.0022 lb/g
0.25	9.38	x 0.0022 lb/g
0.5	18.75	x 0.0022 lb/g
1	37.5	x 0.0022 lb/g

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		lbs ai/A
0	x 0.4 ha/A	**0**
0.000176	x 0.4 ha/A	**0.000070**
0.00033	x 0.4 ha/A	**0.00013**
0.00064	x 0.4 ha/A	**0.00026**
0.00130	x 0.4 ha/A	**0.00052**
0.0026	x 0.4 ha/A	**0.0010**
0.0051	x 0.4 ha/A	**0.0021**
0.0103	x 0.4 ha/A	**0.0041**
0.021	x 0.4 ha/A	**0.0083**
0.041	x 0.4 ha/A	**0.017**
0.0825	x 0.4 ha/A	**0.033**

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Nominal Application Rates

Stock Solution #	10	9	8	7	6	5
L product/ha	0.002	0.004	0.008	0.016	0.032	0.063
g ai/ha	0.08	0.15	0.29	0.59	1.17	2.34
lbs ai/A	**0.000070**	**0.00013**	**0.00026**	**0.00052**	**0.0010**	**0.0021**
% Recovery		87.4	89.5	91.0	90.4	90.5
% Recovery		87.4	88.0	89.2	88.9	90.2
% Recovery	85.8	87.7	88.0	87.9	88.5	88.7
% Recovery	86.0	88.2	88.9	87.9	88.1	87.8
% Recovery	86.4	87.9	88.4	89.0	89.0	87.8
% Recovery	84.7	85.9	86.9	86.1	86.5	84.7
% Recovery	78.8	81.0	82.3	82.3	81.7	82.4
Mean Recovery	*84.3*	*86.5*	*87.4*	*87.6*	*87.6*	*87.4*
Mean-Measured Application Rates (lbs ai/A)	**0.000059**	**0.00011**	**0.00022**	**0.00045**	**0.00090**	**0.0018**

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4	3	2	1
0.125	0.25	0.5	1
4.69	9.38	18.75	37.5
0.0041	**0.0083**	**0.017**	**0.033**
91.2	91.1	90.3	89.5
90.2	90.4	90.4	90.5
88.6	88.0	88.8	88.9
88.4	88.8	87.3	87.2
86.8	85.8	85.9	85.0
84.7	84.5	83.9	84.5
81.5	82.9		
87.3	*87.4*	*87.8*	*87.6*
0.0036	**0.0072**	**0.014**	**0.029**

Cucumber plant height (cm), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
8.5
6
9
7.8
8.5
5.5
6.2
9
0.00022
7.25
9.4
7.5
10.75
8.2
8.2
8
5.25
0.00045
7
8.6
8.2
6.6
7.8
7.5
6.2
7.5
0.0009
7.2
8.2
6.75
7.25
5.333
6.5
5.667
6
0.0018
8.4
8.6
8.2
5
6.333
7.2
7.6
6.5
0.0036
8.333
6.4

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5
5.75
7.333
5.5
6
8
0.0072
3.5
5
8.8
5
5.4
7.4
7.75
6.2

Cucumber dry weight (g), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
0.453
0.346
0.511
0.328
0.395
0.281
0.282
0.370
0.00022
0.365
0.331
0.428
0.479
0.347
0.329
0.383
0.228
0.00045
0.355
0.394
0.348
0.285
0.309
0.249
0.289
0.335
0.0009
0.323
0.341
0.211
0.326
0.293
0.270
0.306
0.429
0.0018
0.310
0.414
0.273
0.188
0.250
0.277
0.252
0.284
0.0036
0.240
0.133

US EPA ARCHIVE DOCUMENT

0.205
0.148
0.331
0.237
0.198
0.014
0.0072
0.062
0.134
0.336
0.112
0.125
0.232
0.270
0.248

Cucumber Dry Weight (g)

	Negative Control	**0.00022**	**0.00045**	**0.0009**
Rep 1	0.453	0.365	0.355	0.323
Rep 2	0.346	0.331	0.394	0.341
Rep 3	0.511	0.428	0.348	0.211
Rep 4	0.328	0.479	0.285	0.326
Rep 5	0.395	0.347	0.309	0.293
Rep 6	0.281	0.329	0.249	0.270
Rep 7	0.282	0.383	0.289	0.306
Rep 8	0.370	0.228	0.335	0.429
Mean	*0.371*	*0.361*	*0.321*	*0.312*
% Reduction	*N/A*	*3*	*14*	*16*

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0.0018	**0.0036**	**0.0072**
0.310	0.240	0.062
0.414	0.133	0.134
0.273	0.205	0.336
0.188	0.148	0.112
0.250	0.331	0.125
0.277	0.237	0.232
0.252	0.198	0.270
0.284	0.014	0.248
0.281	*0.188*	*0.190*
24	*49*	*49*

Tomato Dry Weight (g)

	Negative Control	**0.00011**	**0.00022**	**0.00045**
Rep 1	0.027	0.044	0.042	0.024
Rep 2	0.051	0.016	0.035	0.020
Rep 3	0.053	0.033	0.037	0.025
Rep 4	0.038	0.020	0.030	0.047
Rep 5	0.038	0.054	0.032	0.035
Rep 6	0.050	0.051	0.050	0.033
Rep 7	0.017	0.024	0.048	0.017
Rep 8	0.062	0.022	0.038	0.039
Mean	*0.042*	*0.033*	*0.039*	*0.030*
% Reduction	*N/A*	*21*	*7*	*29*

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0.0009	**0.0018**	**0.0036**
0.022	0.010	0.025
0.039	0.027	0.032
0.002	0.018	0.018
0.019	0.033	0.020
0.029	0.020	0.029
0.025	0.027	0.033
0.028	0.018	0.024
0.014	0.017	0.034
0.022	*0.021*	*0.027*
47	*49*	*36*

Tomato dry weight (g), lbs ai/A; day 21
7
8
8
8
8
8
8
8
neg control
0.027
0.051
0.053
0.038
0.038
0.050
0.017
0.062
0.00011
0.044
0.016
0.033
0.020
0.054
0.051
0.024
0.022
0.00022
0.042
0.035
0.037
0.030
0.032
0.050
0.048
0.038
0.00045
0.024
0.020
0.025
0.047
0.035
0.033
0.017
0.039
0.0009
0.022
0.039
0.002
0.019
0.029
0.025
0.028
0.014
0.0018
0.010
0.027

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Tomato plant height (cm), lbs ai/A; Day 21
7
8
8
8
8
8
8
8
neg control
3.75
4
4.5
3.75
3.6
4.4
3.25
5
0.00011
4
3.2
3.667
2.667
5
4.8
3
3
0.00022
5
4
3.8
4
3.8
4.25
4.25
4.8
0.00045
3
2.333
3.5
4.4
4.2
4.25
3.5
5
0.0009
2.333
3.333
1.5
2.75
4
3.5
4
3
0.0018
2.75
2.333

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```
3
4.4
3.25
3.5
3.25
2
0.0036
3
4.333
2.5
2.5
3.
3.667
3.5
5
```