

1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptafluoro-

Terrestrial Plants Toxicity, Seedling Emergence

according to
OECD Guideline 208 (Draft July 2000)

Sponsor

Telomer Research Project
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Laboratory Project ID

Project-No. 020719CK
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Report

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
Terrestrial Plants Toxicity, Seedling Emergence
acc. to OECD Guideline 208 (Draft July 2000)

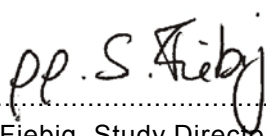
Project-No. 020719CK
Study-No. TNC84113

Statement of GLP Compliance

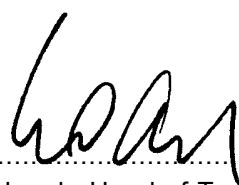
Title	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro- Terrestrial Plant Toxicity, Seedling Emergence
Guideline	OECD 208 (Draft document, July, 2000), Terrestrial (Non-Target) Plant Test, (Part A) Seedling Emergence
Test Item	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro- (Batch number: P00/001)
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Deviations of GLP Regulations	None

We declare that this study was conducted and reported in compliance with the actual OECD principles of Good Laboratory Practice and the national GLP regulations as specified in the law in force, except deviations mentioned above.

2003-05-02
(Date)


.....
(Silke Fiebig, Study Director)

2003-05-02
(Date)


.....
(Dr. Udo Noack, Head of Testing Facility)

Statement of the Quality Assurance Unit

Title	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro- Terrestrial Plant Toxicity, Seedling Emergence
Guideline	OECD 208 (Draft document, July, 2000), Terrestrial (Non- Taget) Plant Test, (Part A) Seedling Emergence
Test Item	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro- (Batch number: P00/001)
Study Director	Silke Fiebig

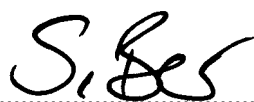
The study was verified as follows:

inspection	dates	date of report
study plan	2002-11-13	2002-11-13
study based	2002-11-21	2002-11-21
report	2003-02-19 2003-02-20 2003-02-21 2003-04-09 2003-04-11 2003-04-29	2003-02-20 2003-02-20 2003-02-21 2003-04-10 2003-04-11 2003-04-29

The reported results accurately and completely reflect the raw data of the study. Also methods, procedures, and observations are accurately and completely described in the report.

The accordance of the study with its study plan and the principles of Good Laboratory Practice is guaranteed.

2003-05-02

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Gudrun Möhrmann-Kalabokidis

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
Terrestrial Plants Toxicity, Seedling Emergence
acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
Study-No. TNC84113

Personnel Involved

Study Director:	Silke Fiebig (Engineer, Biotechnologist)
Technical Staff:	Kirsten McVean Petra Makus Simone Pioch Barbara Wienker
Quality Assurance Unit:	Gudrun Möhrmann-Kalabokidis (Biologist)
Deputy:	Susanne Becker (Biologist)
Director of the Testing Facility:	Dr. Udo Noack (Biologist)

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1 Summary

The phytotoxicity of the test item 1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro- (batch number P00/001) to three terrestrial plant species was determined in a seedling emergence test over a period of 21 days, from November 21, 2002 to February 07, 2003 (for detailed test periods see test conditions) according to OECD 208 Draft document, July 2000 at the DR.U.NOACK-LABORATORIUM FÜR ANGEWANDTE BIOLOGIE, Sarstedt, Germany.

The test was conducted with the nominal concentrations

10.0 - 32.0 - 100 - 320 - 1000 soil dry weight (DW) (oats and soybean)
6.25 - 12.5 - 25.0 - 50.0 - 100 mg/kg soil dry weight (DW) (rape)

selected on the basis of a preliminary phytotoxicity test.

To reach a sorption equilibrium the application of the test medium was performed 24 h before the seeds were sown.

Test systems were one monocotyledon (oats (Gramineae)) and two dicotyledons (rape (Brassicaceae) and soybean (Leguminosae)). The test containers were bottom watered with nutrient solution as needed.

A solvent control without test item (quartz sand only spiked with *tert.*-buthyl-methyl-ether) was tested under the same conditions as the test groups. To exclude effects of the solvent *tert.*-buthyl-methyl-ether a second control without solvent was tested. The solvent *tert.*-buthyl-methyl-ether caused no inhibitory effects in shoot height, biomass growth, and rate of emergence. No statistically significant differences were found between the control and the solvent control.

For rape, enhanced growth was observed for the solvent control relative to the control. This promotion was not significant for this study.

Therefore for calculations the replicates of the control and solvent control were summarized in a pooled control group.

The toxic effects of the test item were determined on day 7, 14 and 21 by visual observations (number of emerged seedlings, phytotoxic effects and number of dead plants) and on day 21 by shoot height and shoot fresh weight determination.

Shoot height, fresh weight and number of emerged seedlings were checked for statistically significant differences relative to the controls and the NOEC, the EC₂₅- and EC₅₀-values were calculated (Table 1-3).

Table 1: **Shoot Height: NOEC, EC₂₅ and EC₅₀ Values with Confidence Range (p)**

Species	NOEC* [mg/kg DW]	EC ₂₅ [mg/kg DW]	p = 95% [mg/kg DW]	EC ₅₀ [mg/kg DW]	p = 95% [mg/kg DW]
oats	1000	> 1000	–	> 1000	–
rape	50.0	80.2	65.6 - 97.9	> 100	–
soybean	1000	> 1000	–	> 1000	–

Table 2: **Fresh Weight: NOEC, EC₂₅ and EC₅₀ Values with Confidence Range (p)**

Species	NOEC* [mg/kg DW]	EC ₂₅ [mg/kg DW]	p = 95% [mg/kg DW]	EC ₅₀ [mg/kg DW]	p = 95% [mg/kg DW]
oats	1000	> 1000	–	> 1000	–
rape	25.0	51.7	44.0 - 60.8	73.7	62.6 - 86.7
soybean	320	> 1000	–	> 1000	–

Table 3: **Number of Emerged Seedlings: NOEC, EC₂₅ and EC₅₀ Values with Confidence Range (p)**

Species	NOEC* [mg/kg DW]	EC ₂₅ [mg/kg DW]	p = 95% [mg/kg DW]	EC ₅₀ [mg/kg DW]	p = 95% [mg/kg DW]
oats	1000	> 1000	–	> 1000	–
rape	100	> 100	–	> 100	–
soybean	1000	> 1000	–	> 1000	–

– not determinable

* The highest tested concentration of the test item at which no statistically significant effect is observed relative to control

2 Characterisation Data of the Test Item

TEST ITEM	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
Batch Number	P00/001
CAS RN	678-39-7
Chemical characterization	3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluorodecane-1-ol (EINECS)
Purity	C8-perfluoroalkylethanol: 99.8 % (a/a), sum perfluoroalkylethanol 99.9 % (a/a)
Appearance	Yellowish solid wax
Water solubility	134 µg/L at 12 degree C, Std 29 µg/L, n=8 (DuPont, 2002) 137 µg/L at 25 degree C, Std 53 µg/L, n=17 (DuPont, 2002)
Stability in water	Stable at test conditions
Density	Ca. 1.7 g/cm ³

Expiry date	Unlimited if stored under the recommended conditions.
Recommended storage	Room temperature (20 °C), protected from moisture.
Storage at testing facility	Room temperature, protected from moisture and light.
Retention	At least 1 g has been retained.
Identification parameter at testing facility	Name, batch number and colour.

The test item and the information concerning the test item were provided by the sponsor.

3 Method

GUIDELINE

OECD 208 (Draft document, July 2000), Terrestrial (Non-Target) Plants Testing, (Part A) Seedling Emergence

TYPE AND PURPOSE OF THE STUDY

Determination of toxic effects of soil incorporated chemicals on the emergence of seedlings and the early stages of growth of three terrestrial plant species.

Principle of the test

The test item was incorporated into the soil in which the seeds were sown. During the test period the number of seedlings emerged were counted every 7 days. The seedlings also were observed for visual phytotoxic symptoms. After 21 days the plants were harvested and shoot height and shoot fresh weight were measured.

TEST SYSTEMS

Three plant species of different families were tested:

Monocotyledonae:

Avena sativa (oats)¹, Flämingsstern

Gramineae

Dicotyledonae:

Glycine max (soybean)², Jutro

Leguminosae

Brassica napus (rape)³, Pollen

Brassicaceae

Reason for the selection of the test systems

The species are recommended species according to the test guideline.

Origin

¹ LOCHOW PETKUS GMBH, Postfach 1197, D-29296 Bergen

² SÜDWESTSAAT Gbr., Im Rheinfeld 1-13, D-76437 Rastatt

³ GRÖTZNER PFLANZENZUCHT GMBH & CO. KG, Margaretenhof 23, D-22397 Hamburg

Storage

The seeds were stored at the test facility at room temperature (20 ± 5 °C) and protected from light and moisture until use.

TEST ITEM	1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
Pretreatment	The test item was heated to 50 °C, weighed out, dissolved in <i>tert.</i> -methyl-buthyl-ether and mixed with quartz sand. After the solvent had volatilised out of the quartz sand, the quartz sand was mixed with test soil to provide the test treatments.
Test concentration	Oats, soybean: 1000 - 320 - 100 - 32 - 10 mg/kg soil dry weight (DW) (factor $\sqrt{10}$) Rape: 100 - 50 - 25 - 12.5 - 6.25 mg/kg soil dry weight (DW) (factor 2)
Vehicle	Max. 1 % Quartz sand
Solvent	<i>tert.</i> -methyl-buthyl-ether
Stock solutions for oats study	The soil test concentrations of 10 - 100 mg/kg DW were made using two freshly prepared stock solutions dissolved in <i>tert.</i> -methyl-butyl-ether having test concentrations of 25 and 10 g/L. Appropriate stock solution volumes were mixed with quartz sand and finally with the soil to give specified soil concentrations (see table below). The test concentrations 320 and 1000 mg/kg DW were prepared by adding directly weighed quantities of the test item to measured quantity of solvent (<i>tert.</i> -methyl-butyl-ether) (see table below). The volume of stock solution mixed with quartz sand is given below.

Soil test concentration [mg/kg DW]	Amount of DW soil [kg]	Amount of quartz sand (1 %) [g]	Conc. of Test Item Stock solution [g/L]	Stock solution volume* [mL]	Direct weighing		Stock solution volume prepared [mL]	Solvent [mL]
					nominal [g]	actual [g]		
1000	10.5	105.2	-	-	10.521	10.5213	-	35
320	10.5	105.2	-	-	3.367	3.3671	-	20
100	15.8 ¹⁾	157.8	25	63.1	2.5	2.4996	100	-
32	10.5	105.2	25	13.6	-	-	-	-
10	10.5	105.2	10	11.0	0.5	0.5003	50	-

* Volume of stock solution (*tert.*-methyl-butyl-ether) mixed with quartz sand

DW = dry weight

Conc. = concentration

¹⁾ = larger amount of DW soil prepared because rape tested additionally

Stock solutions
 for soybean study

The soil test concentrations of 10 - 100 mg/kg DW were made using two freshly prepared stock solutions dissolved in *tert.*-methyl-butyl-ether having test concentrations of 50 and 5 g/L. Appropriate stock solution volumes for the concentrations 32 and 100 mg/kg DW were mixed with quartz sand and finally with the soil to give specified soil concentrations (see table below). The test concentrations 320 and 1000 mg/kg DW were prepared by adding directly weighed quantities of the test item to measured quantity of solvent (*tert.*-methyl-butyl-ether) (see table below).

The stock solution for the concentration 10 mg/kg DW was prepared by 1:10 dilution of the stock solution 50 g/L (see table below).

The volume of stock solution mixed with quartz sand is given below.

Soil test concentration [mg/kg DW]	Amount of DW soil [kg]	Amount of quartz sand (1 %) [g]	Conc. of Test Item Stock solution [g/L]	Stock solution volume* [mL]	Direct weighing		Stock solution volume prepared [mL]	Solvent [mL]
					nominal [g]	actual [g]		
1000	5.2	51.9	-	-	5.186	5.1863	-	30
320	5.2	51.9	-	-	1.659	1.6591	-	25
100	5.2	51.9	50	10.4	2.5	2.4998	50	-
32	5.2	51.9	50	3.4	-	-	-	-
10	5.2	51.9	5	10.0	-	-	-	-

* Volume of stock solution (*tert.*-methyl-butyl-ether) mixed with quartz sand

DW = dry weight

Conc. = concentration

Stock solutions
 for rape study

A stock solution for 1-Decanol,3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro- for soil concentrations 10 - 1000 mg/kg DW (57.8 g/L; nominal: 2.89 g, actual: 2.8901 g dissolved in 50 mL of *tert.*-methyl-butyl-ether) was freshly prepared.

The soil test concentrations 6.25 - 50 mg/kg DW were prepared by 1:2 dilution of the stock solution with a final volume of 50 mL each. 10 mL of the appropriate stock solution was mixed with quartz sand.

Soil test concentration	Amount of DW soil	Amount of quartz sand (1 %)	Stock solution volume*	Conc. of Test Item Stock solution
[mg/kg DW]	[kg]	[g]	[mL]	[g/L]
100	5.8	57.8	10	57.8
50	5.8	57.8	10	28.9
25	5.8	57.8	10	14.5
12.5	5.8	57.8	10	7.2
6.25	5.8	57.8	10	3.6

* Volume of stock solution (*tert.*-methyl-butyl-ether) mixed with quartz sand
 DW = dry weight
 Conc. = concentration

REFERENCE ITEM

No reference item is recommended for this test according to the test guideline.

CONTROL

8 replicates applied with quartz sand.

SOLVENT CONTROL

8 replicates applied with quartz sand and *tert.*-methyl-buthyl-ether.

Amount solvent added per treatment:

oats: 63.1 mL

soybean: 30 mL

rape: 10 mL

TEST CONDITIONS

Duration

A: oats

Incorporation of the quartz sand into the soil: 2002-11-21

Sowing of the seeds: 2002-11-22

Completion date: 2002-12-13

B: soybean

Incorporation of the quartz sand into the soil: 2002-11-28

Sowing of the seeds: 2002-11-29

Completion date: 2002-12-20

	C: rape Incorporation of the quartz sand into the soil: 2003-01-16 Sowing of the seeds: 2003-01-17 Completion date: 2003-02-07
Number of replicates	8 replicates per dose level, solvent control and control were tested in a randomized block design.
Number of seeds	5 seeds were sown per replicate.
Test medium	$\frac{2}{3}$ certified LUFA soil No. 2.2 and $\frac{1}{3}$ quartz sand (Non-GLP data) Overall carbon content: 1.31 % Certified LUFA soil No. 2.2 (batch-no. Sp 223302 / 224602) (Non-GLP data) Soil type: loamy sand (DIN) Grain size: ≤ 2 mm Carbon content: 2.3 ± 0.2 % pH value 5.6 ± 0.4 The soil has been stored at the test facility at green house conditions until use. Origin: LANDWIRTSCHAFTLICHE UNTERSUCHUNGS- UND FORSCHUNGSANSTALT SPEYER (LUFA), Obere Langgasse 40, D-67346 Speyer.
Test container	Plastic containers (standard flower pots) with a diameter of 12 cm were used.
Sowing	Test containers were filled with 700 g treated soil each (see below) and seeding holes were made with a seeding pistil. One seed was placed in every hole and covered with soil. During cultivation the test containers were bottom watered and fertilized as necessary.
Application	The control, solvent control and test item were applied once at the beginning of the study.
Application technique	To reach a sorption equilibrium the test item was incorporated into the soil 24 h prior to test start. The concentrations of the test item are expressed in terms of the dry weight of the soil.

The test item was weighed out and dissolved in *tert.*-buthyl-methyl-ether to produce a number of stock solutions. A specified amount of the appropriate test item stock solution was mixed with quartz sand. After the solvent had volatilised out of the quartz sand, the treated quartz sand was mixed with the soil. The soil was mixed carefully with a hand-mixer (KRUPS) to insure a homogeneous distribution of the test item in the soil. The amount of quartz sand added was the same for each test concentration (1 %).

After 24 h the treated soil was placed in the test container and the seeds were sown (see above).

ENVIRONMENTAL CONDITIONS

	Temperature [°C]	Relative humidity [%]	Photoperiod [h]	Illumination [lx]
nominal	20 ± 10	> 60	16	> 3500
Oats	16 - 24	68 - 100	16	3600 ± 1100
Soybean	16 - 24	70 - 100	16	5300 ± 1400
Rape	17 - 26	74 - 100	16	3400 ± 1100

Source of light

Special-fluorescent tube FLUORA (Art.-No. 25414925)
 Special-fluorescent tube DAYLIGHT (Art.-No. 25414922)
 Origin: HOKLATHERM GMBH, Postfach 206, D-26687 Apen

Watering / Fertilisation

Bottom watering of the test containers with nutrient solution as necessary.

Nutrient solution

Flory 9 hydro (0.5 ‰)
 Origin: GÄRTNEREIBEDARF ASPERG E.G., Niederlassung Hannover, Ringstrasse 7, D-30457 Hannover

Nutrient	Concentration [mg/L]
Ammonium nitrogen	50
Nitrate nitrogen	100
P ₂ O ₅	70
Potassium oxide	220
Magnesium oxide	60
Boron	0.3
Iron (Chelate)	1.2
Copper	0.02
Manganese	0.5
Molybdenum	0.05
Zinc	0.1

**TYPE AND FREQUENCY
OF MEASUREMENTS AND
OBSERVATIONS**

The room temperature and relative humidity were recorded continuously throughout the test with a thermohygrograph.

During the observation period the replicates were observed every 7 days for number of emerged seedlings, number of dead plants and visual phytotoxic effects.

Observations included all variations, either inhibitory or stimulatory, between the treated replicates and the pooled controls. Such variations were phytotoxic symptoms (e.g. chlorosis, necrosis, wilting), formative effects and growth and development rates.

At the end of the study the number of emerged seedlings, number of dead plants and phytotoxic effects were determined and shoot height and shoot fresh weight were measured.

TEST DESCRIPTION

A preliminary NON-GLP test was performed with 3 soil concentrations (10 - 100 - 1000 mg/kg DW), and additionally for rape a single concentration of 1 mg/kg DW was tested. Based on the results of the preliminary test, the main study was performed with five concentrations from 10 to 1000 mg/kg DW with a factor of $\sqrt{10}$ (oats and soybean) and from 6.25 to 100 mg/kg DW with a factor of 2 (rape).

Day -1:

The test medium was heated to 50 °C, weighed out, dissolved in *tert.*-buthyl-methyl-ether and mixed with quartz sand. After the solvent had volatilised out of the quartz sand (ca. 1 h), the treated quartz sand was mixed with the soil.

Start (day 0):

The treated soil was placed in the test containers and the seeds were sown.

Every working day:

Test containers were bottom watered and fertilised as needed.

Day 7, 14, 21:

The plants were observed for number of emerged seedlings, visual phytotoxic effects and number of dead plants.

Test end:

Final shoot heights and fresh weight measurements were done.

STATISTICS AND CALCULATIONS

NOEC of biomass/
be emerged seedlings

One Way Analysis of Variance (ANOVA) and DUNNETT'S Test were carried out for the determination of statistically significant differences compared to pooled control replicates. When running a One Way Analysis of Variance a Normality Test and an Equal Variance Test were done first. P-values for both Normality and Equal Variance Test are 0.05. The α -value for ANOVA and DUNNETT'S Test (acceptable probability of incorrectly concluding that there is a difference) is $\alpha=0.05$.

No statistically significant differences were found between the control and the solvent control.

Therefore for calculations the replicates of the control and solvent control were summarized in a pooled control group.

All dead plants were measured and weighed and included in calculations if possible according to the guideline.

EC-values and confidence
Interval of growth

Calculations were carried out via probit analysis. Probit values were taken from WEBER (1986). Confidence intervals were calculated according to a standard procedure (BREITIG & TÜMPLING 1982).

Software

SigmaPlot (windows) rel. 6.0 (2000), SPSS INCORPORATION
 SigmaStat (windows) rel. 2.03 (1997), SPSS INCORPORATION
 Excel rel. 9.0 (2000), MICROSOFT CORPORATION

VALIDITY CRITERIA

The following validity criteria must be found in the control replicates:

- a minimum of 65 % emergence
- the mean seedling growth should not exhibit visible phytotoxic effects
- the mean survival of the plants is at least 90 % at the end of the test

DEVIATIONS FROM THE GUIDELINE

None

Report

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
Terrestrial Plants Toxicity, Seedling Emergence
acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
Study-No. TNC84113

**DEVIATIONS FROM
THE STUDY PLAN**

None

REPORTING

The final report is issued as paper copy (5 originals) and an electronic record (1 original).

ARCHIVING

The following was retained in the archive of the test facility for the period as specified in the operative national GLP regulations:

- all raw data
- study plan (Original 1 of 2)
- final report paper copy (Original 1 of 5)
- all records performed by the quality assurance programme including master schedules
- sample of test item

Microfilms will be retained in a safe-deposit by Volksbank Sarstedt, D-31157 Sarstedt.

4 Results

No statistically significant differences were found between the control and the solvent control.

Therefore for calculations the replicates of the control and solvent control were summarized in a pooled control group.

4.1 Visual Phytotoxicity

The plants were observed on day 7, 14 and 21 for visual phytotoxic effects, number of dead plants and emerged seedlings. Observations are given in Table 19 - 21 (day 7), Table 22 - 24 (day 14) and Table 25 - 27 (day 21). Number of emerged seedlings is given in Table 10 - 12 (day 7), 13 - 15 (day 14) and 16 - 18 (day 21). Phytotoxic effects and rate of emergence after 21 days are given in Table 4 - 6.

Table 4: **Oats: Phytotoxic Effects and Rate of Emergence after 21 Days**

Conc. [mg/kg DW]	Phytotoxic effects	Phytotoxic effects								Rate of Emergence [%]
		Replicate								
		1	2	3	4	5	6	7	8	
Pooled control	—	-	-	-	-	-	-	-	-	88
		-	-	-	-	-	-	-	-	
10	—	-	-	-	-	-	-	-	-	88
32	—	-	-	-	-	-	-	-	-	90
100	—	-	-	-	-	-	-	-	-	85
320	—	-	-	-	-	-	-	-	-	68
1000	—	-	-	-	-	-	-	-	-	78

Conc. = Concentration

- = not occurred

Table 5: Rape: Phytotoxic Effects and Rate of Emergence after 21 Days

Conc. [mg/kg DW]	Phytotoxic effects*	Phytotoxic effects								Rate of Emergence [%]
		Replicate								
		1	2	3	4	5	6	7	8	
Pooled control	–	-	-	-	-	-	-	-	-	99
		-	-	-	-	-	-	-	-	
6.25	–	-	-	-	-	-	-	-	-	95
12.5	(E)	-	-	-	-	-	-	-	1	98
25	–	-	-	-	-	-	-	-	-	95
50	–	-	-	-	-	-	-	-	-	95
100	(2.1)	++	++	+	++	++	+	+	++	98

Table 6: Soybean: Phytotoxic Effects and Rate of Emergence after 21 Days

Conc. [mg/kg DW]	Phytotoxic effects*	Phytotoxic effects								Rate of Emergence [%]
		Replicate								
		1	2	3	4	5	6	7	8	
Pooled control	(E)	-	-	-	-	1	1	-	-	93
		-	-	-	-	-	-	-	-	
10	(E)	-	-	-	1	-	-	-	-	93
32	(E)	-	-	-	-	1	-	-	-	85
100	–	-	-	-	-	-	-	-	-	90
320	–	-	-	-	-	-	-	-	-	95
1000	–	-	-	-	-	-	-	-	-	80

Conc. = Concentration

* The numbers in brackets correspond to the observations as follows:

(2.1) : Decrease in length

(E) : Dead plant

– = not occurred

+/- = slight effect

+ = medium effect

++ = strong effect

4.2 Shoot Height

The shoot height was determined on day 21.

Test item related statistically significant inhibition (marked with *) of the shoot heights was found at the concentration 100 mg/kg DW for rape (Figure 2).

No test item related inhibition was determined in the tested concentration range of 10 - 1000 mg/kg DW for the plant species oats and soybean (Figure 1, 3).

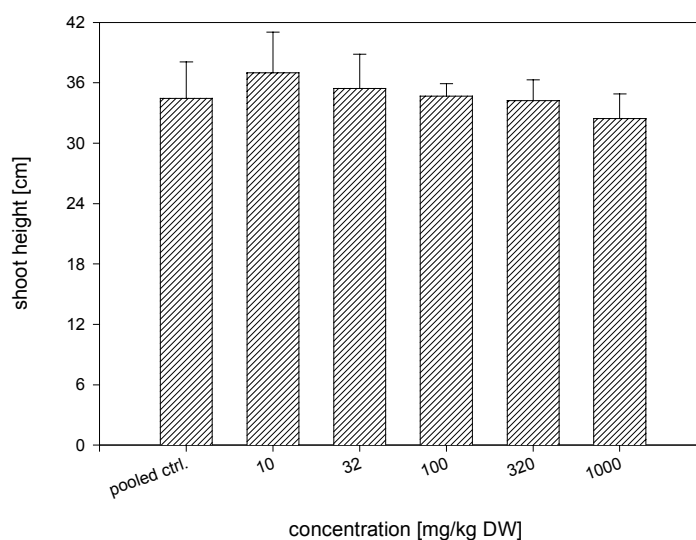


Figure 1: **Oats**: Shoot Height after 21 Days (Mean $\pm$ SD) in Relation to the Test Item Concentration in Soil

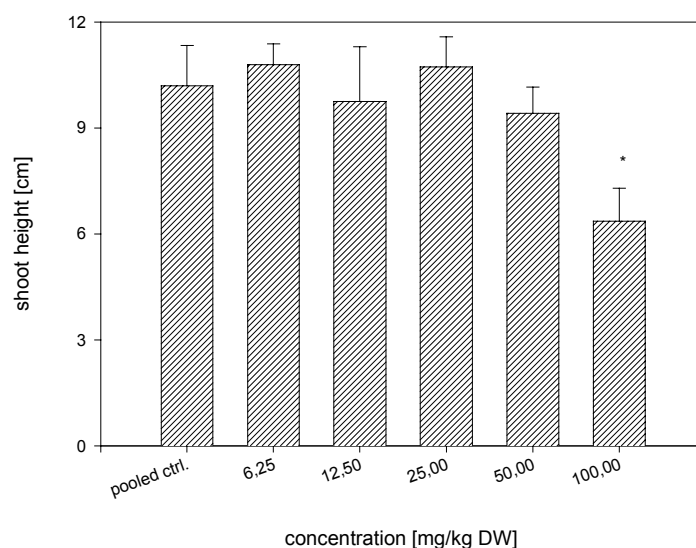


Figure 2: **Rape**: Shoot Height after 21 Days (Mean $\pm$ SD) in Relation to the Test Item Concentration in Soil

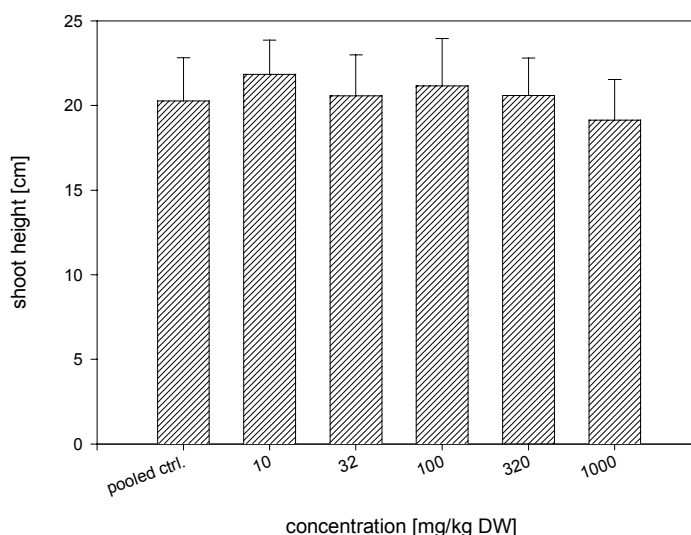


Figure 3: **Soybean:** Shoot Height after 21 Days (Mean $\pm$ SD) in Relation to the Test Item Concentration in Soil

4.3 Fresh Weight (Biomass)

The biomass was determined as fresh weight on day 21.

Test item related statistically significant inhibition (marked with *) of the fresh weight was found at concentrations ≥ 50 mg/kg DW for rape and at the concentration 1000 mg/kg DW for soybean (Figure 5, 6).

No test item related statistically significant inhibition of the fresh weight was determined in the tested concentration range 10 - 1000 mg/kg DW for the plant species oats (Figure 4).

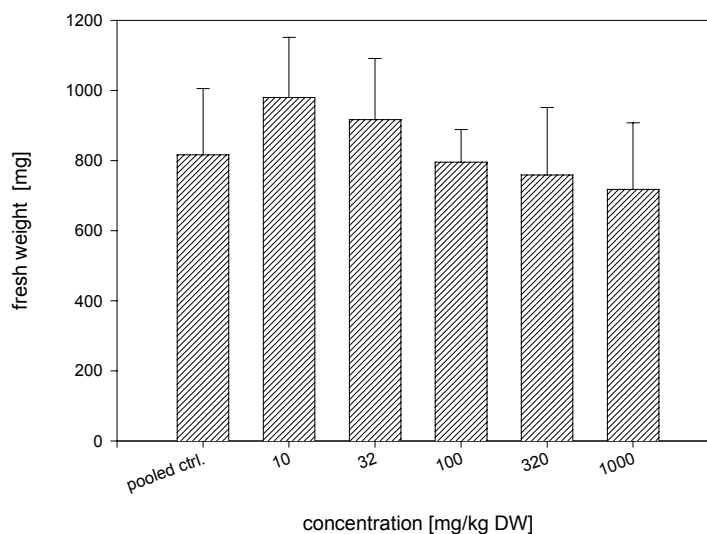


Figure 4: **Oats:** Fresh Weight after 21 Days (Mean $\pm$ SD) in Relation to the Test Item Concentration in Soil

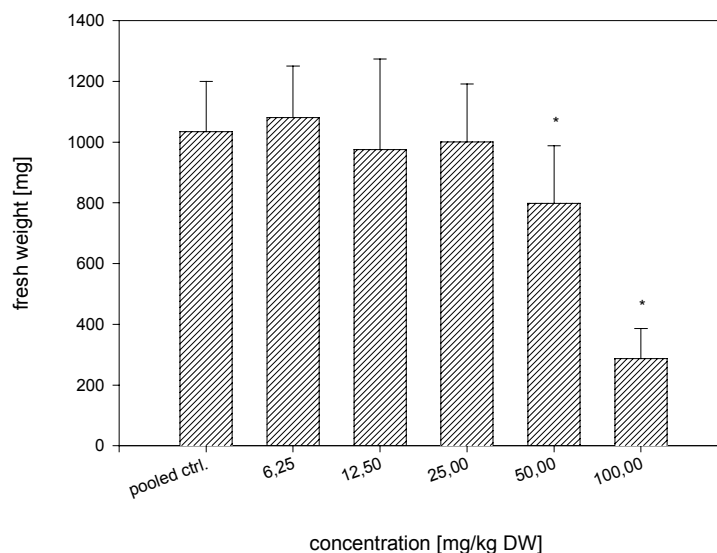


Figure 5: **Rape:** Fresh Weight after 21 Days (Mean $\pm$ SD) in Relation to the Test Item Concentration in Soil

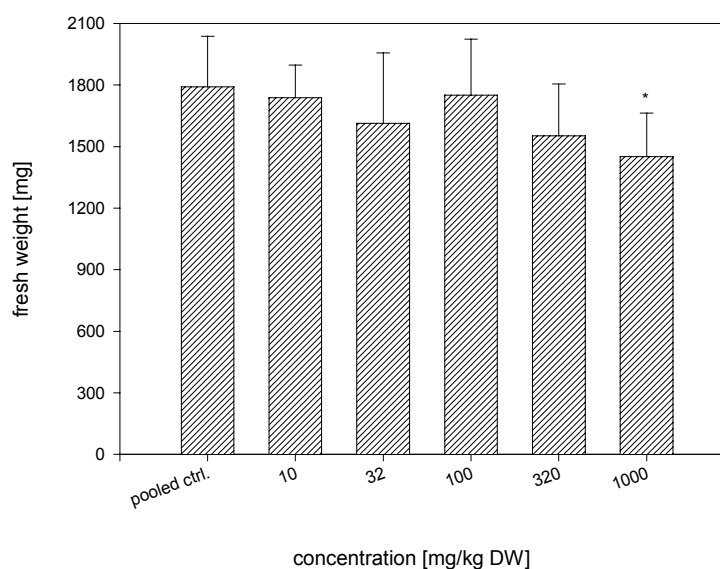


Figure 6: **Soybean:** Fresh Weight after 21 Days (Mean $\pm$ SD) in Relation to the Test Item Concentration in Soil

4.4 Emerged Seedlings

No statistically significant decrease was found for the plant species oats and soybean at the concentration range 10 - 1000 mg/kg DW and for the plant species rape at the concentration range 6.25 - 100 mg/kg DW (Figure 7 - 9).

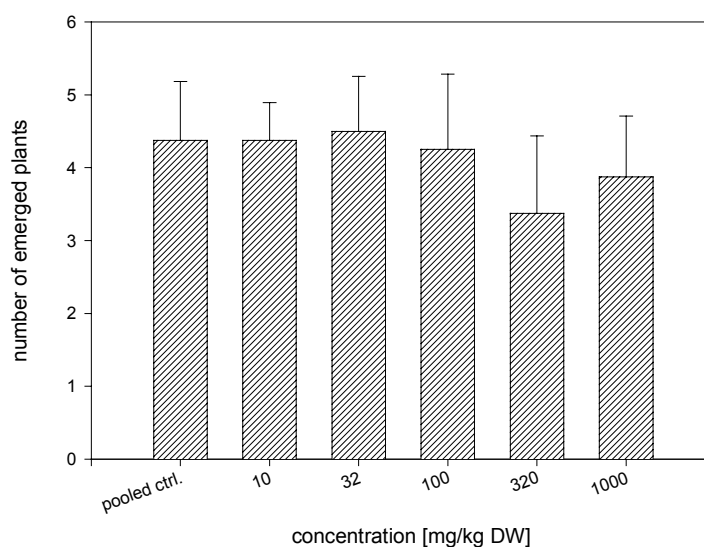


Figure 7: **Oats**: Emerged Seedlings after 21 Days (Mean ± SD) in Relation to the Test Item Concentration in Soil

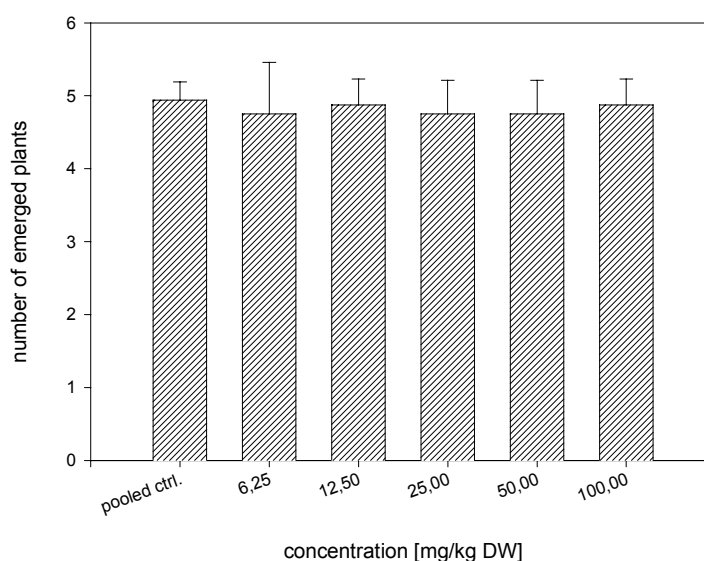


Figure 8: **Rape**: Emerged Seedlings after 21 Days (Mean ± SD) in Relation to the Test Item Concentration in Soil

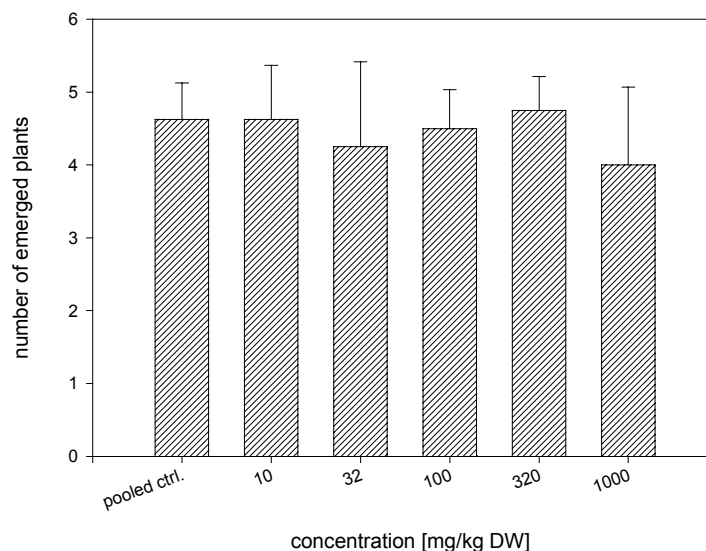


Figure 9: **Soybean: Emerged Seedlings after 21 Days (Mean ± SD) in Relation to the Test Item Concentration in Soil**

4.5 Effect Levels

4.5.1 Inhibition of Shoot Height, Fresh Weight and Number of Emerged Seedlings

The tabulated results represent rounded results calculated on the exact raw data.

Table 7: **Inhibition of Shoot Height**

Concentration [mg/kg DW]	Shoot height [cm]				Concentration [mg/kg DW]	Shoot height [cm]	
	Oats	Inhib. [%]	Soy- bean	Inhib. [%]		Rape	Inhib. [%]
Pooled control	34.4	-	20.2	-	pooled control	10.2	-
10	37.0	-8	21.8	-8	6.25	10.8	-6
32	35.4	-3	20.6	-2	12.5	9.8	4
100	34.7	-1	21.2	-5	25	10.7	-5
320	34.2	0	20.6	-2	50	9.4	8
1000	32.4	6	19.1	6	100	6.4*	37

Inhib. = Inhibition

negative values = enhanced growth

* Significantly different, $P < 0.05$, ANOVA $\alpha = 0.05$

Table 8: **Inhibition of Fresh Weight**

Concentration [mg/kg DW]	Fresh weight [mg]				Concentration [mg/kg DW]	Fresh weight [mg]	
	Oats	Inhib. [%]	Soy- bean	Inhib. [%]		Rape	Inhib. [%]
Pooled control	816	-	1792	-	pooled control	1035	-
10	979	-20	1737	3	6.25	1081	-4
32	917	-12	1614	10	12.5	975	6
100	795	3	1750	2	25	1001	3
320	759	7	1553	13	50	798*	23
1000	718	12	1452	19*	100	287*	72

Table 9: **Inhibition of Emerged Seedlings**

Concentration [mg/kg DW]	Emerged seedlings [%]				Concentration [mg/kg DW]	Emerged seedlings [%]	
	Oats	Inhib. [%]	Soy- bean	Inhib. [%]		Rape	Inhib. [%]
Pooled control	88	-	93	-	pooled control	99	-
10	88	0	93	0	6.25	95	4
32	90	-2	85	9	12.5	98	1
100	85	3	90	3	25	95	4
320	68	23	95	-2	50	95	4
1000	78	11	80	14	100	98	1

Inhib. = Inhibition

negative values = enhanced growth

* Significantly different, $P < 0.05$, ANOVA $\alpha = 0.05$

4.5.2 EC_{25} , EC_{50} and NOEC Values

EC_{25} and EC_{50} values with confidence range of shoot height, fresh weight and emerged seedlings were calculated out of percentage inhibition. Results were presented in Table 1-3.

NOEC values were calculated using One Way Analysis of Variance (ANOVA) and DUNNETT's test. Results were also presented in Table 1-3.

5 Graphs

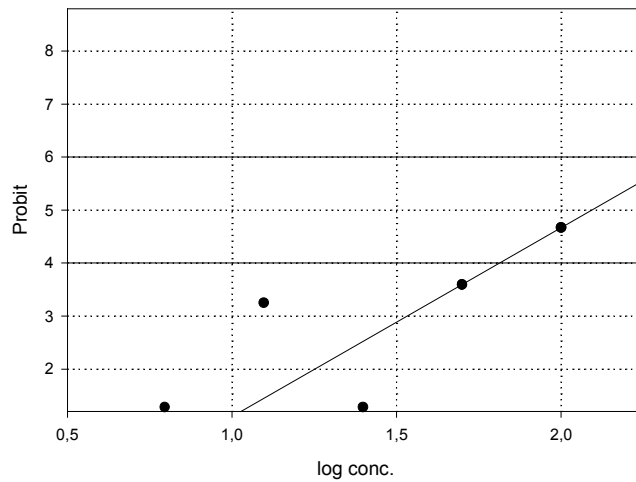


Figure 10: **Rape:** Shoot Height after 21 d

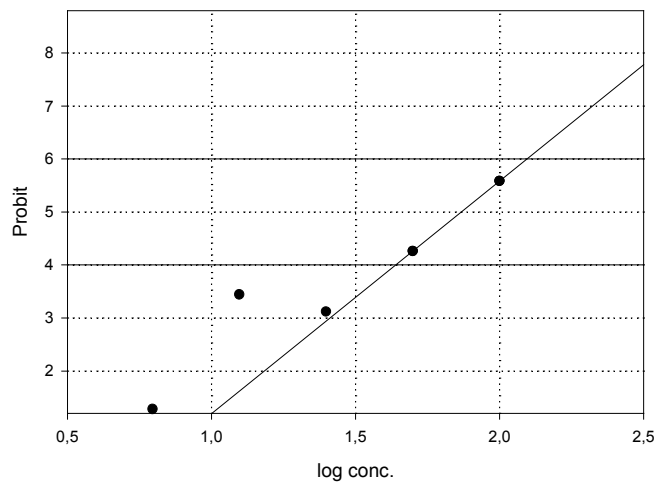


Figure 11: **Rape:** Fresh Weight after 21 d

6 Conclusions

After 21 days no test item related phytotoxic effects were observed for the plant species oats and soybean at the tested concentration range 10 - 1000 mg/kg DW.

For rape decrease in length was observed at the concentration 100 mg/kg DW as medium to strong effect.

For details see Table 25 - 27.

The **EC₅₀-value for shoot height** was not calculable in the tested concentration range for the tested plant species because no test item related inhibition occurred.

The EC₅₀- values for shoot height were > 100 mg/kg DW for rape and > 1000 mg/kg DW for oats and soybean, respectively (Table 1).

Significant differences in comparison to the control were determined at the concentration 100 mg/kg for rape.

The **EC₅₀- values for fresh weight** was determined for the plant species rape at 73.7 mg/kg DW (Table 2).

The EC₅₀- values for fresh weight were > 1000 mg/kg DW for oats and soybean (Table 2).

Significant differences in comparison to the control were determined at the concentration 50 and 100 mg/kg for rape and at the concentration 1000 mg/kg for soybean.

The **EC₅₀- value for seedling emergence** was not calculable in the tested concentration range for the tested plant species.

The EC₅₀- values for seedling emergence were > 100 mg/kg DW for rape and > 1000 mg/kg DW for oats and soybean, respectively (Table 3).

7 Validity Criteria

The control treatment validity criteria according to the test guideline were fulfilled:

- a minimum of 65 % emergence
- the mean seedling growth exhibited no visible phytotoxic effects
- the mean survival of the plants was at least 90 % at the end of the test

8 Literature

- (1) BREITIG & TÜMPLING (1982): Methoden der Wasseruntersuchungen Bd.II, VEB GUSTAV FISCHER VERLAG, Jena.
- (2) DuPont, Determination of physio-chemical parameters of Perfluorooctylethanol, CAS No. 678-39-7, Unpublished results, Update Feb. 15, 2002
- (3) FÜLL C., JUNG S. UND C. SCHULTE (1999): Prüfanforderungen des Umweltbundesamtes zur Bewertung der Auswirkungen von Pflanzenschutzmitteln auf terrestrische Pflanzen. UWSF - Z. Umweltchem. Ökotox. 11 (3) 145-149
- (4) OECD 208 (draft document, July, 2000), Terrestrial (Non-Target) Plant Testing, Part A Seedling Emergence Test
- (5) WEBER. E.: Grundriß der biologischen Statistik, 9. Auflage (1986).

9 Biological Data

9.1 Observation Parameter

- (2) Disturbance of growth
 - (2.1) Decrease in length
 - (2.2) Promoted growth
- (3) Alteration of form and appearance (deformation)
 - (3.1) Curling / twisting / sticking or other deformation of the leafs
 - (3.2) Change of appearance
 - (3.3) Shoot deformations
 - (3.4) Wilting
- (4) Discolouration of the leafs
 - (4.1) Lighter green
 - (4.2) darker green
 - (4.3) Chlorosis
 - (4.3.1) spots
 - (4.3.2) marginal
 - (4.3.3) of the veins
 - (4.3.4) between the veins
 - (4.4) Loss of colour or discolouration
- (5) Alteration of the leaf cells
 - (5.1) Necrosis
 - (5.1.1) spots
 - (5.1.2) marginal
 - (5.1.3) apical
 - (5.1.4) between the veins
 - (5.1.5) of the whole leaf
- (E) Dead plant

Assessment of the effects:

- = no effects observed
- +/- = slight effects
- + = medium effects
- ++ = strong effects

9.2 Emerged Seedlings on Day 7

Table 10: **Oats: Emerged Seedlings on Day 7**

Concentration [mg/kg DW]	Emergence [%]	Emerged seedlings							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	85	5	4	5	4	3	4	3	4
		5	5	4	5	3	5	4	5
10	83	5	5	4	4	5	3	4	3
32	90	5	5	4	5	3	4	5	5
100	85	5	3	5	3	3	5	5	5
320	65	4	3	4	4	2	1	5	3
1000	70	3	4	3	3	3	2	5	5

Table 11: **Rape: Emerged Seedlings on Day 7**

Concentration [mg/kg DW]	Emergence [%]	Emerged seedlings							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	96	5	4	5	5	5	5	5	5
		5	5	5	5	5	5	3	5
6.25	93	5	3	4	5	5	5	5	5
12.5	95	5	5	5	5	5	4	5	4
25	95	5	5	5	4	5	4	5	5
50	95	4	5	5	5	5	4	5	5
100	95	5	5	5	5	4	5	5	4

Table 12: Soybean: Emerged Seedlings on Day 7

Concentration [mg/kg DW]	Emergence [%]	Emerged seedlings							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	83	4	3	5	5	4	5	5	4
		3	4	3	3	5	5	4	4
10	83	5	4	5	4	4	1	5	5
32	80	2	5	4	3	5	5	4	4
100	83	4	5	4	5	4	3	4	4
320	90	5	3	4	5	5	5	5	4
1000	78	4	3	2	5	4	5	5	3

9.3 Emerged Seedlings on Day 14

Table 13: Oats: Emerged Seedlings on Day 14

Concentration [mg/kg DW]	Emergence [%]	Emerged seedlings							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	85	5	4	5	4	3	4	3	4
		5	5	4	5	3	5	4	5
10	88	5	5	4	4	5	4	4	4
32	90	5	5	4	5	3	4	5	5
100	85	5	3	5	3	3	5	5	5
320	68	4	3	4	4	2	2	5	3
1000	78	4	4	3	4	3	3	5	5

Table 14: Rape: Emerged Seedlings on Day 14

Concentration [mg/kg DW]	Emergence [%]	Emerged seedlings							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	98	5	5	5	5	5	5	5	5
		5	5	5	5	5	5	3	5
6.25	95	5	3	5	5	5	5	5	5
12.5	98	5	5	5	5	5	4	5	5
25	95	5	5	5	4	5	4	5	5
50	95	4	5	5	5	5	4	5	5
100	98	5	5	5	5	5	5	5	4

Table 15: Soybean: Emerged Seedlings on Day 14

Concentration [mg/kg DW]	Emergence [%]	Emerged seedlings							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	91	4	4	5	5	5	5	5	4
		4	5	4	5	5	5	4	4
10	93	5	4	5	5	5	3	5	5
32	85	2	5	4	3	5	5	5	5
100	90	5	5	4	5	5	4	4	4
320	95	5	4	4	5	5	5	5	5
1000	80	4	4	2	5	4	5	5	3

9.4 Emerged Seedlings on Day 21

Table 16: Oats: Emerged Seedlings on Day 21

Concentration [mg/kg DW]	Emergence [%]	Sig. Dif. §	Emerged seedlings							
			Replicate							
			1	2	3	4	5	6	7	8
Pooled control	88	–	5	4	5	4	3	4	3	4
			5	5	5	5	3	5	5	5
10	88	No	5	5	4	4	5	4	4	4
32	90	No	5	5	4	5	3	4	5	5
100	85	No	5	3	5	3	3	5	5	5
320	68	No	4	3	4	4	2	2	5	3
1000	78	No	4	4	3	4	3	3	5	5

Table 17: Rape: Emerged Seedlings on Day 21

Concentration [mg/kg DW]	Emergence [%]	Sig. Dif. §	Emerged seedlings							
			Replicate							
			1	2	3	4	5	6	7	8
Pooled control	99	–	5	5	5	5	5	5	5	5
			5	5	5	5	5	5	4	5
6.25	95	No	5	3	5	5	5	5	5	5
12.5	98	No	5	5	5	5	5	4	5	5
25	95	No	5	5	5	4	5	4	5	5
50	95	No	4	5	5	5	5	4	5	5
100	98	No	5	5	5	5	5	5	5	4

§ Significantly different, ANOVA, $\alpha = 0.05$

Table 18: **Soybean: Emerged Seedlings on Day 21**

Concentration [mg/kg DW]	Emergence [%]	Sig. Dif. §	Emerged seedlings							
			Replicate							
			1	2	3	4	5	6	7	8
Pooled control	93	–	4	4	5	5	5	5	5	4
			4	5	4	5	5	5	5	4
10	93	No	5	4	5	5	5	3	5	5
32	85	No	2	5	4	3	5	5	5	5
100	90	No	5	5	4	5	5	4	4	4
320	95	No	5	4	4	5	5	5	5	5
1000	80	No	4	4	2	5	4	5	5	3

§ Significantly different, ANOVA, $\alpha = 0.05$

9.5 Visual Phytotoxicity on Day 7

Table 19: **Oats: Visual Observations and Number of Dead Plants on Day 7**

Concentration [mg/kg DW]	Phytotoxic effects	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	–	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
10	–	-	-	-	-	-	-	-	-
32	–	-	-	-	-	-	-	-	-
100	–	-	-	-	-	-	-	-	-
320	–	-	-	-	-	-	-	-	-
1000	–	-	-	-	-	-	-	-	-

- = not occurred

Table 20: Rape: Visual Observations and Number of Dead Plants on Day 7

Concentration [mg/kg DW]	Phytotoxic effects	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	—	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
6.25	—	-	-	-	-	-	-	-	-
12.5	—	-	-	-	-	-	-	-	-
25	—	-	-	-	-	-	-	-	-
50	—	-	-	-	-	-	-	-	-
100	—	-	-	-	-	-	-	-	-

Table 21: Soybean: Visual Observations and Number of Dead Plants on Day 7

Concentration [mg/kg DW]	Phytotoxic effects	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	—	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
10	—	-	-	-	-	-	-	-	-
32	—	-	-	-	-	-	-	-	-
100	—	-	-	-	-	-	-	-	-
320	—	-	-	-	-	-	-	-	-
1000	—	-	-	-	-	-	-	-	-

- = not occurred

9.6 Visual Phytotoxicity on Day 14

Table 22: Oats: Visual Observations and Number of Dead Plants on Day 14

Concentration [mg/kg DW]	Phytotoxic effects	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	—	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
10	—	-	-	-	-	-	-	-	-
32	—	-	-	-	-	-	-	-	-
100	—	-	-	-	-	-	-	-	-
320	—	-	-	-	-	-	-	-	-
1000	—	-	-	-	-	-	-	-	-

Table 23: Rape: Visual Observations and Number of Dead Plants on Day day 14

Concentration [mg/kg DW]	Phytotoxic effects	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	—	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
6.25	—	-	-	-	-	-	-	-	-
12.5	—	-	-	-	-	-	-	-	-
25	—	-	-	-	-	-	-	-	-
50	—	-	-	-	-	-	-	-	-
100	—	-	-	-	-	-	-	-	-

- = not occurred

Table 24: Soybean: Visual Observations and Number of Dead Plants on Day 14

Concentration [mg/kg DW]	Phytotoxic effects*	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	(E)	-	-	-	-	1	1	-	-
		-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
32	(E)	-	-	-	-	1	-	-	-
100	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-

9.7 Visual Phytotoxicity on Day 21

Table 25: Oats: Visual Observations and Number of Dead Plants on Day 21

Concentration [mg/kg DW]	Phytotoxic effects	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	-	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
10	-	-	-	-	-	-	-	-	-
32	-	-	-	-	-	-	-	-	-
100	-	-	-	-	-	-	-	-	-
320	-	-	-	-	-	-	-	-	-
1000	-	-	-	-	-	-	-	-	-

* The numbers in brackets correspond to the observations as follows:

(E) : Dead plants

- = not occurred

Table 26: Rape: Visual Observations and Number of Dead Plants on Day 21

Concentration [mg/kg DW]	Phytotoxic effects*	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	–	-	-	-	-	-	-	-	-
		-	-	-	-	-	-	-	-
6.25	–	-	-	-	-	-	-	-	-
12.5	(E)	-	-	-	-	-	-	-	1
25	–	-	-	-	-	-	-	-	-
50	–	-	-	-	-	-	-	-	-
100	(2.1)	++	++	+	++	++	+	+	++

Table 27: Soybean: Visual Observations and Number of Dead Plants on Day 21

Concentration [mg/kg DW]	Phytotoxic effects*	Phytotoxic effects							
		Replicate							
		1	2	3	4	5	6	7	8
Pooled control	(E)	-	-	-	-	1	1	-	-
		-	-	-	-	-	-	-	-
10	(E)	-	-	-	1	-	-	-	-
32	(E)	-	-	-	-	1	-	-	-
100	–	-	-	-	-	-	-	-	-
320	–	-	-	-	-	-	-	-	-
1000	–	-	-	-	-	-	-	-	-

* The numbers in brackets correspond to the observations as follows:

(2.1) : Decrease in length

(E) : Dead plant

- = not occurred

+/- = slight effect

+ = medium effect

++ = strong effect

9.8 Shoot Height

Statistical analysis was carried out using ANOVA and DUNNETT's Method if applicable (ANOVA $\alpha = 0.05$). Multiple Comparisons vs. Control Group were done.
 Results see table 28 - 33.

Table 28 : Oats: Shoot Height [cm] Pooled Control, 10 and 32 mg/kg DW

Repl.	Pooled control				Concentration [mg/kg DW]			
	Control		Solvent control		10		32	
	Height [cm]	Mean ± SD	Height [cm]	Mean ± SD	Height [cm]	Mean ± SD	Height [cm]	Mean ± SD
1	4.9	31.2 ± 14.9	37.4	36.1 ± 3.4	42.9	38.7 ± 2.6	3.4	29.8 ± 14.9
	40.6		37.0		38.6		35.6	
	37.5		38.4		36.7		38.8	
	38.4		37.7		39.1		38.0	
	34.8		30.2		36.3		33.4	
2	38.7	36.9 ± 3.0	38.5	37.7 ± 2.8	37.8	39.0 ± 2.7	35.1	35.7 ± 1.4
	36.2		41.3		43.0		37.7	
	32.9		36.0		40.4		36.6	
	39.7		38.7		36.8		34.5	
	-		33.9		36.8		34.5	
3	37.0	39.6 ± 4.5	37.5	30.5 ± 15.4	38.3	38.4 ± 0.9	35.5	34.8 ± 2.1
	39.8		39.8		37.4		33.4	
	33.6		39.0		39.6		32.7	
	43.6		32.6		38.4		37.4	
	44.2		3.4		-		-	
4	42.2	37.8 ± 3.3	38.4	34.8 ± 2.2	48.7	44.4 ± 4.1	41.8	41.1 ± 4.1
	35.6		33.6		46.7		43.6	
	34.8		35.4		39.5		41.5	
	38.4		33.4		42.6		34.1	
	-		33.3		-		44.4	
5	37.7	34.7 ± 3.1	37.8	37.5 ± 3.3	33.8	36.7 ± 3.8	33.7	37.1 ± 3.7
	31.5		40.6		32.6		36.7	
	35.0		34.1		39.0		41.0	
	-		-		41.9		-	
	-		-		36.0		-	
6	32.5	35.1 ± 1.8	36.1	37.0 ± 2.2	9.3	32.5 ± 15.8	34.3	37.8 ± 4.1
	35.3		37.1		35.8		36.1	
	36.0		39.4		41.3		37.1	
	36.4		38.6		43.5		43.6	
	-		33.9		-		-	
7	36.1	35.1 ± 1.1	3.6	27.9 ± 14.0	16.7	33.2 ± 11.2	36.3	34.2 ± 2.7
	35.4		29.8		38.1		34.1	
	33.9		32.0		41.6		29.6	
	-		37.9		36.2		35.9	
	-		36.3		-		35.0	
8	29.9	27.5 ± 8.6	32.0	31.9 ± 2.9	7.3	32.9 ± 17.2	39.7	33.0 ± 8.1
	37.9		32.6		38.4		34.9	
	17.4		27.0		43.3		32.9	
	24.7		33.5		42.4		38.1	
	-		34.6		-		19.3	
Mean ± SD	34.5 ± 3.6				37.0 ± 4.1		35.4 ± 3.4	
Sig. Dif. P< 0.05	-				No		No	

- not emerged

Sig. Dif. = Significantly different

Table 29 : Oats: Shoot Height [cm] 100, 320 and 1000 mg/kg DW

Repl.	Concentration [mg/kg DW]					
	Height [cm]	100 Mean ± SD	Height [cm]	320 Mean ± SD	Height [cm]	1000 Mean ± SD
1	34.0 36.3 32.5 30.0 34.4	33.4 ± 2.4	31.4 32.0 28.8 37.9 -	32.5 ± 3.8	34.9 25.9 35.3 32.2 -	32.1 ± 4.3
2	42.8 29.3 38.2 - -	36.8 ± 6.9	35.1 32.2 33.2 - -	33.5 ± 1.5	38.0 36.7 35.9 30.6 -	35.3 ± 3.3
3	35.8 35.2 36.9 30.9 39.9	35.7 ± 3.3	36.0 37.0 39.2 34.3 -	36.6 ± 2.0	39.2 32.7 33.7 - -	35.2 ± 3.5
4	35.1 33.1 35.6 - -	34.6 ± 1.3	31.4 33.1 33.3 33.3 -	32.8 ± 0.9	27.4 38.1 26.9 34.8 -	31.8 ± 5.5
5	32.7 34.8 38.2 - -	35.2 ± 2.8	37.1 36.7 - - --	36.9 ± 0.3	35.9 31.8 17.9 - -	28.5 ± 9.4
6	34.3 33.0 36.0 32.0 35.0	34.1 ± 1.6	26.4 35.7 - - -	31.1 ± 6.6	33.6 27.6 29.3 - -	30.2 ± 3.1
7	36.6 36.1 25.6 37.3 29.1	32.9 ± 5.3	37.9 30.0 35.1 36.3 37.4	35.3 ± 3.2	35.7 39.8 29.4 35.7 32.9	34.7 ± 3.9
8	38.6 34.1 39.6 33.9 26.7	34.6 ± 5.1	35.4 34.0 36.0 - -	35.1 ± 1.0	32.8 19.2 35.2 37.0 33.6	31.6 ± 7.1
Mean ± SD	34.7 ± 1.3		34.2 ± 2.1		32.4 ± 2.5	
Sig. Dif. P< 0.05	No		No		No	

- not emerged

Sig. Dif. = Significantly different

Table 30 : Rape: Shoot Height [cm] Pooled Control, 6.25 and 12.5 mg/kg DW

Repl.	Pooled control				Concentration [mg/kg DW]			
	Control		Solvent control		6.25		12.5	
	Height [cm]	Mean $\pm$ SD	Height [cm]	Mean $\pm$ SD	Height [cm]	Mean $\pm$ SD	Height [cm]	Mean $\pm$ SD
1	11.5 8.7 9.9 5.7 9.4	9.0 $\pm$ 2.1	10.8 8.9 10.4 10.7 11.3	10.4 $\pm$ 0.9	11.6 12.0 11.3 11.4 10.7	11.4 $\pm$ 0.5	10.7 10.8 9.6 10.2 10.3	10.3 $\pm$ 0.5
2	9.4 9.3 11.2 9.5 2.5	8.4 $\pm$ 3.4	12.0 9.4 12.2 12.1 10.7	11.3 $\pm$ 1.2	11.6 11.9 9.2 - -	10.9 $\pm$ 1.5	11.6 13.4 10.9 11.1 12.3	11.9 $\pm$ 1.0
3	13.5 10.8 10.2 10.9 9.1	10.9 $\pm$ 1.6	10.3 13.3 11.6 9.7 10.0	11.0 $\pm$ 1.5	9.7 11.9 12.4 3.9 11.2	9.8 $\pm$ 3.5	9.7 11.8 9.8 8.9 10.5	10.1 $\pm$ 1.1
4	11.3 9.2 9.1 10.0 10.8	10.1 $\pm$ 1.0	13.2 12.9 12.6 10.4 11.8	12.2 $\pm$ 1.1	11.3 11.0 11.1 11.6 10.8	11.2 $\pm$ 0.3	7.4 11.1 9.8 9.7 9.8	9.6 $\pm$ 1.3
5	10.3 10.9 8.1 10.9 4.7	9.0 $\pm$ 2.7	11.2 11.5 11.1 13.1 11.1	11.6 $\pm$ 0.9	14.1 10.6 11.0 11.6 9.3	11.3 $\pm$ 1.8	8.9 9.0 10.1 8.9 10.8	9.5 $\pm$ 0.9
6	8.6 7.6 8.5 9.5 8.6	8.6 $\pm$ 0.7	10.8 10.8 11.1 10.9 8.4	10.4 $\pm$ 1.1	11.7 11.4 9.2 10.5 10.5	10.7 $\pm$ 1.0	8.4 11.2 8.7 9.4 -	9.4 $\pm$ 1.3
7	10.5 9.4 9.2 10.1 11.1	10.1 $\pm$ 0.8	11.9 13.0 10.5 3.4 -	9.7 $\pm$ 4.3	11.7 10.2 10.8 11.2 11.2	11.0 $\pm$ 0.6	10.9 10.6 10.8 11.1 10.2	10.7 $\pm$ 0.3
8	8.3 9.3 9.9 7.8 10.5	9.2 $\pm$ 1.1	11.2 11.5 11.6 10.5 11.2	11.2 $\pm$ 0.4	11.3 7.8 10.2 10.6 10.1	10.0 $\pm$ 1.3	2.5 9.1 5.4 8.2 7.4	6.5 $\pm$ 2.6
Mean $\pm$ SD	10.2 $\pm$ 1.1				10.8 $\pm$ 0.6		9.8 $\pm$ 1.5	
Sig. Dif. P < 0.05	-				No		No	

- not emerged

Sig. Dif. = Significantly different

Table 31 : Rape: Shoot Height [cm] 25, 50 and 100 mg/kg DW

Repl.	Concentration [mg/kg DW]					
	Height [cm]	25 Mean $\pm$ SD	Height [cm]	50 Mean $\pm$ SD	Height [cm]	100 Mean $\pm$ SD
1	10.3	9.2 $\pm$ 2.9	10.8	9.3 $\pm$ 1.3	5.1	5.8 $\pm$ 1.2
	5.2		7.6		6.3	
	11.0		9.6		7.5	
	12.4		9.3		4.5	
	7.3		-		5.5	
2	11.4	12.0 $\pm$ 1.2	10.8	9.7 $\pm$ 2.0	8.1	5.5 $\pm$ 2.1
	12.6		11.0		3.2	
	10.1		7.0		5.5	
	12.8		11.5		7.1	
	12.9		8.0		3.7	
3	11.0	10.3 $\pm$ 0.6	8.7	10.3 $\pm$ 0.9	7.4	7.1 $\pm$ 1.8
	10.7		10.9		4.7	
	9.8		11.1		9.4	
	9.5		10.5		8.1	
	10.3		10.3		6.1	
4	11.3	11.5 $\pm$ 0.5	8.3	8.1 $\pm$ 1.1	3.8	5.0 $\pm$ 0.9
	11.3		7.4		4.9	
	11.0		8.8		5.5	
	12.2		9.3		6.1	
	-		6.5		4.9	
5	11.5	10.7 $\pm$ 0.5	11.7	10.0 $\pm$ 1.1	8.7	7.0 $\pm$ 1.8
	10.2		9.2		6.8	
	10.6		10.3		7.2	
	10.8		9.0		8.3	
	10.6		10.0		4.1	
6	12.0	11.1 $\pm$ 0.8	8.5	10.0 $\pm$ 1.3	7.9	6.1 $\pm$ 1.5
	11.4		11.0		5.0	
	10.9		11.1		5.7	
	10.0		9.3		7.5	
	-		-		4.4	
7	9.3	10.3 $\pm$ 0.8	10.0	8.7 $\pm$ 1.8	8.7	7.8 $\pm$ 1.1
	10.4		9.4		6.3	
	9.8		9.2		7.2	
	10.8		5.5		8.9	
	11.2		9.5		7.7	
8	11.5	10.7 $\pm$ 1.2	10.2	9.2 $\pm$ 1.9	6.6	6.6 $\pm$ 1.0
	12.4		8.7		6.6	
	10.3		10.3		7.7	
	9.5		10.8		5.3	
	9.9		6.1		-	
Mean $\pm$ SD		10.7 $\pm$ 0.8		9.4 $\pm$ 0.7		6.4 $\pm$ 0.9
Sig. Dif. P < 0.05		No		No		Yes

- not emerged

Sig. Dif. = Significantly different

Table 32 : **Soybean: Shoot Height [cm] Pooled Control, 10 and 32 mg/kg DW**

Repl.	Pooled control				Concentration [mg/kg DW]			
	Control		Solvent control		10		32	
	Height [cm]	Mean ± SD	Height [cm]	Mean ± SD	Height [cm]	Mean ± SD	Height [cm]	Mean ± SD
1	20.6	21.3 ± 1.7	22.3	21.2 ± 3.5	12.0	19.7 ± 4.8	16.8	19.1 ± 3.2
	19.2		25.6		23.8		21.3	
	22.1		18.8		20.9		-	
	23.2		18.0		18.5		-	
	-		-		23.1		-	
2	18.7	18.9 ± 4.4	23.5	23.2 ± 1.3	21.5	20.7 ± 1.7	16.9	20.1 ± 3.8
	21.6		23.1		18.1		15.1	
	22.5		24.7		21.4		22.0	
	12.7		23.7		21.6		23.8	
	-		21.1		-		22.6	
3	19.5	21.4 ± 3.5	22.7	16.0 ± 7.8	25.2	22.1 ± 4.7	22.2	21.9 ± 1.1
	21.2		8.7		15.5		20.3	
	24.1		9.8		27.0		22.0	
	25.5		22.7		23.4		22.9	
	16.7		-		19.2		-	
4	4.0	15.4 ± 10.2	4.5	17.4 ± 9.2	23.0	24.9 ± 2.1	24.5	23.4 ± 1.2
	4.5		11.1		23.5		22.2	
	22.8		24.4		25.6		23.5	
	23.8		25.2		27.5		-	
	21.7		21.9		*		-	
5	12.0	20.8 ± 5.9	8.5	19.4 ± 6.3	25.9	23.3 ± 2.7	3.2	15.6 ± 11.5
	24.0		21.7		24.4		2.9	
	22.7		23.1		18.8		25.5	
	24.5		19.7		23.9		24.2	
	*		23.8		23.4		22.4	
6	25.8	24.2 ± 1.2	22.7	18.6 ± 8.7	16.1	18.7 ± 4.0	20.6	22.1 ± 1.7
	24.3		3.2		16.7		22.3	
	23.1		22.1		23.3		23.3	
	23.6		23.9		-		20.1	
	*		21.1		-		24.0	
7	24.4	23.6 ± 0.8	24.0	20.9 ± 4.6	17.9	22.7 ± 2.9	24.4	21.9 ± 4.6
	23.6		23.0		22.6		24.6	
	23.9		22.3		24.3		23.5	
	23.8		22.2		23.4		23.3	
	22.3		12.8		25.3		13.7	
8	6.2	20.1 ± 9.3	23.7	21.9 ± 4.0	21.4	22.6 ± 1.8	21.8	20.5 ± 5.2
	23.6		23.9		24.7		11.9	
	25.3		24.2		21.6		20.1	
	25.1		15.9		24.2		23.6	
	-		-		20.9		25.2	
Mean ± SD	20.3 ± 2.5				21.8 ± 2.0		20.6 ± 2.4	
Sig. Dif. P< 0.05	-				No		No	

* not determinable, plant decomposed

- not emerged

Sig. Dif. = Significantly different

Table 33 : **Soybean: Shoot Height [cm] 100, 320 and 1000 mg/kg DW**

Repl.	Concentration [mg/kg DW]					
	Height [cm]	100 Mean ± SD	Height [cm]	320 Mean ± SD	Height [cm]	1000 Mean ± SD
1	3.9 25.6 23.1 22.7 23.2	19.7 ± 8.9	22.0 24.6 22.2 23.7 21.1	22.7 ± 1.4	18.4 20.3 11.5 21.5 -	17.9 ± 4.5
2	7.7 23.8 20.9 22.5 22.1	19.4 ± 6.6	19.8 20.4 20.3 22.4 -	20.7 ± 1.1	16.7 22.1 15.4 21.1 -	18.8 ± 3.3
3	23.1 21.9 21.1 23.4 -	22.4 ± 1.1	17.0 7.4 22.2 18.7 -	16.3 ± 6.3	22.8 21.4 - - -	22.1 ± 1.0
4	25.5 23.4 24.4 24.7 25.5	24.7 ± 0.9	21.3 20.1 23.9 15.0 23.1	20.7 ± 3.5	21.0 21.6 19.3 19.5 11.8	18.6 ± 3.9
5	24.4 24.0 16.2 20.8 22.8	21.6 ± 3.3	21.9 20.7 23.9 26.2 23.7	23.3 ± 2.1	22.0 19.2 19.0 22.1 -	20.6 ± 1.7
6	10.0 15.1 13.1 25.0 -	15.8 ± 6.5	4.1 24.0 22.0 20.3 23.7	18.8 ± 8.4	21.8 10.9 21.9 19.6 17.0	18.2 ± 4.6
7	20.4 22.8 22.6 23.0 -	22.2 ± 1.2	21.5 23.3 17.8 22.7 22.9	21.6 ± 2.2	23.9 18.8 22.8 22.6 22.1	22.0 ± 1.9
8	23.2 22.6 24.5 23.6 -	23.5 ± 0.8	18.9 22.8 23.3 18.4 19.5	20.6 ± 2.3	2.6 21.0 20.7 - -	14.8 ± 10.5
Mean ± SD	21.2 ± 2.8		20.6 ± 2.2		19.1 ± 2.4	
Sig. Dif. P< 0.05	No		No		No	

* not determinable, plant decomposed

- not emerged

Sig. Dif. = Significantly different

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
 Terrestrial Plants Toxicity, Seedling Emergence
 acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
 Study-No. TNC84113

9.9 Fresh Weight (Biomass) Day 21

Table 34: Oats: Fresh Weight on Day 21

Conc. [mg/kg DW]	Repl. No.	Number of plants per replicate*	Fresh weight mean value per replicate [mg]	Fresh weight mean value ± SD [mg]	Signif. Diff.	Conc. [mg/kg DW]	Number of plants per replicate*	Fresh weight mean value per replicate [mg]	Fresh weight mean value ± SD [mg]	Signif. Diff.
100	Control	1	765			100	5	628		
		2	1017				3	896		
		3	1092				5	901		
		4	1086				3	815		
		5	783				3	798		
		6	907				5	702		
		7	823				5	843	795	
		8	509				5	780	± 93	No
	Solvent control	1	926			320	4	614		
		2	748				3	828		
		3	834				4	886		
		4	787				4	572		
		5	747				2	1134		
		6	1002				2	601		
		7	572	817			5	630	759	
		8	465	± 189	–		3	804	± 193	No
10		1	1057			1000	4	576		
		2	831				4	790		
		3	980				3	1071		
		4	1318				4	787		
		5	1001				3	530		
		6	850				3	517		
		7	766	979			5	837	718	
		8	1030	± 172	No		5	633	± 190	No
32		1	795							
		2	858							
		3	879							
		4	1256							
		5	985							
		6	1054							
		7	757	917						
		8	749	± 174	No					

* number of plants per replicate included in calculations

Conc. = Concentration

SD = Standard deviation

Signif. Diff. = Significantly different, ANOVA, $\alpha = 0.05$.

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
 Terrestrial Plants Toxicity, Seedling Emergence
 acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
 Study-No. TNC84113

Table 35: Rape: Fresh Weight on Day 21

Conc. [mg/kg DW]	Repl. No.	Number of plants per replicate*	Fresh weight mean value per replicate [mg]	Fresh weight mean value ± SD [mg]	Signif. Diff.	Conc. [mg/kg DW]	Number of plants per replicate*	Fresh weight mean value per replicate [mg]	Fresh weight mean value ± SD [mg]	Signif. Diff.
Pooled control	Control	1	871			25	5	885		
		2	830				5	1227		
		3	1160				5	857		
		4	1118				4	1184		
		5	995				5	907		
		6	863				4	1016		
		7	1339				5	715	1001	
		8	848				5	1213	± 191	No
	Solvent control	1	918			50	4	768		
		2	1287				5	950		
		3	1103				5	834		
		4	1052				5	459		
		5	1202				5	829		
		6	817				4	1096		
		7	1081	1035			5	655	798	
		8	1071	± 166	–		5	796	± 189	Yes
6.25	1	5	1254			100	5	154		
	2	3	1259				5	292		
	3	5	1036				5	461		
	4	5	1232				5	208		
	5	5	1142				5	280		
	6	5	826				5	275		
	7	5	1022	1081			5	394	287	
	8	5	878	± 169	No		4	228	± 100	Yes
12.5	1	5	965							
	2	5	1414							
	3	5	1031							
	4	5	765							
	5	5	1030							
	6	4	950							
	7	5	1232	975						
	8	5	416	± 298	No					

* number of plants per replicate included in calculations

Conc. = Concentration

SD = Standard deviation

Signif. Diff. = Significantly different, ANOVA, $\alpha = 0.05$.

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
 Terrestrial Plants Toxicity, Seedling Emergence
 acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
 Study-No. TNC84113

Table 36: Soybean: Fresh Weight on Day 21

Conc. [mg/kg DW]	Repl. No.	Number of plants per replicate*	Fresh weight mean value per replicate [mg]	Fresh weight mean value ± SD [mg]	Signif. Diff.	Conc. [mg/kg DW]	Number of plants per replicate*	Fresh weight mean value per replicate [mg]	Fresh weight mean value ± SD [mg]	Signif. Diff.
Pooled control	Control	1	4	1755		100	5	1616		
		2	4	1657			5	1433		
		3	5	1701			4	1921		
		4	5	1477			5	1715		
		5	5	1393			5	1720		
		6	5	1743			4	1433		
		7	5	2003			4	1910	1750	
		8	4	1988			4	2251	± 274	No
	Solvent control	1	4	1856		320	5	1656		
		2	5	2359			4	1477		
		3	4	1441			4	1252		
		4	5	1833			5	1435		
		5	5	1747			5	2075		
		6	5	1728			5	1493		
		7	5	1952	1792		5	1671	1553	
		8	4	2032	± 246		5	1368	± 252	No
10	1	5	1792		No	1000	4	1146		
	2	4	1496				4	1502		
	3	5	1838				2	1755		
	4	5	1765				5	1492		
	5	5	1703				4	1624		
	6	3	1556				5	1293		
	7	5	1745	1737			5	1579	1452	
	8	5	2004	± 159			3	1225	± 211	Yes
32	1	2	1414		No					
	2	5	1290							
	3	4	1332							
	4	3	2174							
	5	5	1234							
	6	5	1811							
	7	5	1908	1614						
	8	5	1746	± 343						

* number of plants per replicate included in calculations

Conc. = Concentration

SD = Standard deviation

Signif. Diff. = Significantly different, ANOVA, $\alpha = 0.05$.

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
Terrestrial Plants Toxicity, Seedling Emergence
acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
Study-No. TNC84113

10 Certificate of Test Item Analysis

Clariant GmbH, Werk Gendorf
CQG / Qualitätsmanagement
D-84504 Burgkirchen
Fax: ++49 8679 / 2676



Inspection certificate
according to EN10204-3.1B

Date: 13.11.2001
Page: 1 / 1

Our Consignment
Material : 1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,
10-heptadecafluoro
Material-no. : 104705
Batch No. : P00/091

On the batch, of which the consignment is a part, the following values
were determined. They conform to the agreed product specification.

Inspection characteristic / -methodSpecification		Result
Sum Perfluoroalkylethanol Capillary GC	>= 97,5	99,3%[a/a]
Sum Perfluoroalkylethanol Capillary GC	>= 98,0	99,9%[a/a]
Sum Perfluoroalkylbutanol Capillary GC	<=1,0	< 0,1%[a/a]
Sum Perfluoroalkylethene Capillary GC	<=0,5	< 0,1%[a/a]
Water content Karl Fischer DIN 51777	<=0,2	< 0,1%
N-Methylpyrrolidone content Capillary GC	<=0,2	< 0,1%

The above particulars do not release the customer from the obligation to
carry out an
inspection of goods received.

Ms. Baumgärtner - Worksinspector

This report is not to be signed

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1-Decanol, 3,3,4,4,5,5,6,6,7,7,8,8,9,9,10,10,10-heptadecafluoro-
 Terrestrial Plants Toxicity, Seedling Emergence
 acc. to OECD Guideline 208 (Draft July 2000)

Project-No. 020719CK
 Study-No. TNC84113

11 GLP Certificate of DR.U.NOACK-LABORATORIUM



Niedersächsisches
Umweltministerium

Gute Laborpraxis/Good Laboratory Practice

GLP-Bescheinigung/Statement of GLP Compliance

(gemäß/according to § 19 b Abs.1 Chemikaliengesetz)

Eine GLP-Inspektion zur Überwachung der Einhaltung der GLP-Grundsätze gemäß Chemikaliengesetz bzw. Richtlinie 88/320/EG wurde durchgeführt in:

Assessment of conformity with GLP according to Chemikaliengesetz and Directive 88/320/EEC at:

☒ Prüfeinrichtung / Test facility

☐ Prüfstandort / Test site

Dr. U. NOACK LABORATORIUM
 für angewandte Biologie
 Käthe-Paulus-Str. 1
 D-31157 Sarstedt

Dr. U. NOACK LABORATORY
 of applied biology
 Käthe-Paulus-Str. 1
 D-31157 Sarstedt

(Unverwechselbare Bezeichnung und Adresse/Unequivocal name and address)

Prüfungen nach Kategorien/Areas of Expertise

(gemäß/according ChemVwV-GLP Nr. 5.3/OECD guidance)

- 1 - Prüfungen zur Bestimmung der physikalisch-chemischen Eigenschaften und Gehaltsbestimmungen
- 3 - Prüfungen zur Bestimmung der erbgutverändernden Eigenschaften (in vitro und in vivo)
- 4 - Umwelttoxikologische Prüfungen zu Auswirkungen auf aquatische und terrestrische Organismen
- 5 - Prüfungen zum Verhalten im Boden, im Wasser und in der Luft, Prüfungen zur Bioakkumulation und zur Metabolisierung
- 6 - Prüfungen zur Bestimmung von Rückständen
- 7 - Prüfungen zur Bestimmung der Auswirkungen auf Mesokosmen und natürliche Ökosysteme

Datum der Inspektion / Date of Inspection
 (Tag.Monat.Jahr / day.month.year)

25. - 27. Juni 2001 / June 25th - 27th, 2001

29. August und 21. September 2001 / August 29th and September 21st, 2001

Die genannte Prüfeinrichtung/Der genannte Prüfstandort befindet sich im nationalen GLP-Überwachungsverfahren und wird regelmäßig auf Einhaltung der GLP-Grundsätze überwacht.

The above mentioned test facility / test site is included in the national GLP Compliance Programme and is inspected on a regular basis.

Auf der Grundlage des Inspektionsberichtes wird hiermit bestätigt, dass in dieser Prüfeinrichtung/diesem Prüfstandort die oben genannten Prüfungen unter Einhaltung der GLP-Grundsätze durchgeführt werden können.

Based on the inspection report it can be confirmed, that this test facility / test site is able to conduct the aforementioned studies in compliance with the Principles of GLP.

Niedersächsisches Umweltministerium
 Referat 33
 Archivstraße 2
 30169 Hannover



11. März 2002
 Im Auftrage

Dr. Braedt

Michael Braedt