Section A7.5.1.1 Inhibition to microbial activity (terrestrial)

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			Official use only
		1 REFERENCE	
1.1	**Reference**	a) J.P.E. Anderson, 1991, Influence of the Commercial Product ®Euparen WG 50 on the Soil Respiration after Amendment with Glucose, Bayer AG, Institute for Environmental Biology, Monheim, Germany, Report No. AJO/91490, unpublished, 1991-02-25. b) J.P.E. Anderson, 1991, Influence of the Commercial Product ®Euparen WG 50 on the Microbial Mineralization of Carbon in Soils, Bayer AG, Institute for Environmental Biology, Monheim, Germany, Report No. AJO/91690, unpublished, 1991-03-11. c) J.P.E. Anderson, 1991, Influence of the Commercial Product ®Euparen WG 50 on Nitrogen Mineralization in Soil, Bayer AG, Institute for Environmental Biology, Monheim, Germany, Report No. AJO/91590, unpublished, 1991-03-18.	
1.2	**Data protection**	Yes	
1.2.1	Data owner	Bayer Crop Science AG	
1.2.2	Companies with letter of access	Bayer Chemicals AG	
1.2.3	Criteria for data protection	Data submitted to the MS after 13 May 2000 on existing a.s. for the purpose of its entry into Annex I/IA	
		2 GUIDELINES AND QUALITY ASSURANCE	
2.1	**Guideline study**	Yes, all studies were carried out according to the Guidelines for the Official Testing of Plant Protectants, Part VI, Influence on the activity of the Soil Microflora, BBA Braunschweig, Germany, March 1990.	
2.2	**GLP**	Yes	
2.3	**Deviations**	No	
		3 MATERIALS AND METHODS	
3.1	**Test material**	dichlofluanid formulation: Euparen WG 50	
3.1.1	Lot/Batch number	[redacted]	
3.1.2	Specification	[redacted] dichlofluanid, water dispersible granule	X
3.1.3	Purity	[redacted] dichlofluanid	
3.1.4	Composition of Product	[redacted] dichlofluanid	X
3.1.5	Further relevant properties	-	
3.1.6	Method of analysis	a) For CO_2 in the respiration test: The quantities of CO_2 were measured after absorption in NaOH and following titration (Gas analyzer: Wösthoff Co., Bochum, Germany) b) The CO_2 released from the soil was drawn through 40 ml 0.5 M	

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		NaOH by means of CO_2-free air at a rate of 60 ml/min. The lye was replaced weekly and the amount of bound CO_2 was determined by titration with 0.1 M HCl from pH 8.3 to pH 3.8. An automatic titrator with sample changer was used for these analyses. c) For the determination of the nitrification: Three photometric methods were used to measure ammonium (colour complex at 660 nm), nitrate plus nitrite (after nitrate reduction and formation of an azo dyestuff at 540 nm) and nitrite (also at 540 nm). Determination with Technicon Autoanalyzer II.	
3.2	**Reference substance**	No	X
3.2.1	Method of analysis for reference substance	-	
3.3	**Testing procedure**		
3.3.1	Soil sample / inoculum / test organism	See table A7_5_1_1-1	X
3.3.2	Test system	See table A7_5_1_1-2	
3.3.3	Application of TS	See table A7_5_1_1-3	
3.3.4	Test conditions	See table A7_5_1_1-4	
3.3.5	Test parameter	a) Respiration Test: Inhibition of microbial carbon transformation b) Mineralisation Test: Inhibition of microbial mineralisation of lucerne-grass-green-meal c) Nitrification Test: Inhibition of nitrification of ammonia	
3.3.6	Analytical parameter	a) Respiration Test: CO_2 measurement b) Mineralisation Test: CO_2 measurement c) Nitrification Test: Ammonia and nitrate (including nitrite) measurement	
3.3.7	Duration of the test	a) Respiration Test: 91 days b) Mineralisation Test: 91 days c) Nitrification Test: 91 days	
3.3.8	Sampling	See table A7_5_1_1-3	
3.3.9	Monitoring of TS concentration	No	
3.3.10	Controls	Carrier (quartz sand) control	
3.3.11	Statistics	a) Averages and standard deviations of the 3 soil samples per evaluation day were calculated; b) Averages and standard deviations of the 3 soil samples per evaluation day were calculated; c) Averages and standard deviations of the 3 soil samples per evaluation day were calculated; t-Test with 5% probability level	

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		was used to evaluate significant differences between treated and untreated soil samples in nitrogen mineralization.	
		4 RESULTS	
4.1	**Range finding test**	Not performed	
4.1.1	Concentration	n.a.	
4.1.2	Effect data	n.a.	
4.2	**Results test substance**		
4.2.1	Initial concentrations of test substance	In all studies: 0, 6.7 and 67 mg Euparen 50 WG/kg dry weight soil. These application rates were equivalent to 5 and 50 kg Euparen WG 50/ha which is equivalent to the recommended agricultural field dose and a 10-fold overdose (calculated according a method given by German BBA)	X
4.2.2	Actual concentrations of test substance	Since the soil was not extracted and analyzed, values given for the active ingredients are nominal	X
4.2.3	Growth curves	n.a.	
4.2.4	Cell concentration data	n.a.	
4.2.5	Concentration/ response curve	n.a.	
4.2.6	Effect data	The data show, that the product did not cause a change in soil pH. a) Respiration Test: See table A7_5_1_1-5. During the 91-day experiments, 6.7 mg Euparen WG 50/kg dry wt soil had no meaningful influence on respiration after adding glucose (3000 mg/kg dry wt soil) to loamy sand and loamy silt. In contrast to this, a 10-fold overdose (67 mg Euparen WG 50/kg dry wt soil) caused a reduction in the amount of glucose degraded. When applied as recommended under practical conditions, Euparen WG 50 will not influence carbon turnover in soil. b) Mineralisation Test: See table A7_5_1_1-6. During the 91-day experiments, 6.7 mg and also 67 mg Euparen WG 50/kg dry wt soil had no influence on the mineralisation of lucerne-grass-green-meal in a loamy sand and loamy silt. When applied as recommended under practical conditions, Euparen WG 50 will not affect carbon transformations in soil. c) Nitrification Test: See table A7_5_1_1-7. During the 91-day experiments, 6.7 mg Euparen WG 50/kg dry wt soil had no influence on nitrogen mineralisation in loamy sand and loamy silt. In contrast to this, a 10-fold overdose (67 mg Euparen WG 50/kg dry wt soil) induced a temporary inhibition and, subsequently, a temporary stimulation of nitrogen mineralisation in both soils. After 91 days, there were no differences between treated and untreated soils. When applied as recommended under practical conditions, Euparen WG 50 will not affect nitrogen mineralisation in soil.	
4.2.7	Other observed effects	-	

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4.3	**Results of controls**	See table A7_5_1_1-5 (Respiration Test), table A7_5_1_1-6 (Mineralisation Test) and table A7_5_1_1-7 (Nitrification Test).	
4.4	**Test with reference substance**	No reference substance investigated.	
4.4.1	Concentrations	-	
4.4.2	Results	-	
		5 APPLICANT'S SUMMARY AND CONCLUSION	
5.1	**Materials and methods**	The influence of Euparen WG 50 (a.i.: 50.9% dichlofluanid) on the soil carbon turnover and transformation on and soil nitrification was investigated. Used concentrations: 0, 6.7 and 67 mg Euparen WG 50/kg dry weight soil; these application rates were equivalent to 5 and 50 kg Euparen WG 50/ha which is equivalent to the recommended agricultural field dose and a 10-fold overdose (calculated according a method given by German BBA). All studies were carried out according to the Guidelines for the Official Testing of Plant Protectants, Part VI, Influence on the activity of the Soil Microflora, BBA Braunschweig, Germany, March 1990.	
5.2	**Results and discussion**	The data show, that the product did not cause a change in soil pH. a) **Respiration Test:** See table A7_5_1_1-5. During the 91-day experiments, 6.7 mg Euparen WG 50/kg dry wt soil had no meaningful influence on respiration after adding glucose (3000 mg/kg dry wt soil) to loamy sand and loamy silt. In contrast to this, a 10-fold overdose (67 mg Euparen WG 50/kg dry wt soil) caused a reduction in the amount of glucose degraded. When applied as recommended under practical conditions, Euparen WG 50 will not influence carbon turnover in soil. b) **Mineralisation Test:** See table A7_5_1_1-6. During the 91-day experiments, 6.7 mg and also 67 mg Euparen WG 50/kg dry wt soil had no influence on the mineralisation of lucerne-grass-green-meal in a loamy sand and loamy silt. When applied as recommended under practical conditions, Euparen WG 50 will not affect carbon transformations in soil. c) **Nitrification Test:** See table A7_5_1_1-7. During the 91-day experiments, 6.7 mg Euparen WG 50/kg dry wt soil had no influence on nitrogen mineralisation in loamy sand and loamy silt. In contrast to this, a 10-fold overdose (67 mg Euparen WG 50/kg dry wt soil) induced a temporary inhibition and, subsequently, a temporary stimulation of nitrogen mineralisation in both soils. After 91 days, there were no differences between treated and untreated soils. When applied as recommended under practical conditions, Euparen WG 50 will not affect nitrogen mineralisation in soil.	X
5.2.1	NOEC	n.a.	
5.2.2	EC_{10}	n.a.	
5.2.3	EC_{50}	n.a.	
5.3	**Conclusion**	When applied as recommended under practical conditions, Euparen WG	X

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		50 will not influence carbon turnover, carbon transformations and nitrogen mineralisation in soil.
5.3.1	Reliability	Reliability indicator: 2
5.3.2	Deficiencies	Yes; Information incomplete about the composition of Euparen WG 50

Evaluation by Competent Authorities	
	Use separate "evaluation boxes" to provide transparency as to the comments and views submitted
	EVALUATION BY RAPPORTEUR MEMBER STATE
Date	28/01/05
Materials and Methods	Accept applicant's version noting the following minor deviations: **3.1.2** Test material is dichlofluanid formulation Euparen WG 50, the purity is only [redacted] dichlofluanid **3.1.4** The information given about the composition of Euparen WG 50 is incomplete, this is identified as a deficiency by the applicant in 5.3.2 **3.2** No reference substance was used **3.3.1** The depth of sampling and cation exchange capacity were not reported
Results and discussion	Accept applicant's version with the following minor deviations: **4.2.1** The test concentrations represent the product Euparen WG 50 ([redacted] purity). The concentrations refer to mg/l of Eurapen WG 50 which only contains [redacted] dichlofluanid, although the applicant has recalculated the concentrations to represent mg/a.i./l in Doc II-A 4.2.3.3: 6.7 mg/l Euparen WG 50 is equivalent to 3.41 mg/ai/l and 67 mg/l Euparen WG 50 is equivalent to 34.1 mg/ai/l. **4.2.2** No concentrations were measured The respiration test with glucose has been done as a further test for the carbon mineralisation test. To remove the relative difference between the soil sample with the high level of toxicant and the control, where the sample with the high level of toxicant gains extra substrate in the form of dead microbial matter. The respiration with glucose study shows that in the presence of an excess of substrate the function of the soil microbes is impaired by the presence of the toxicant.
Conclusion	Accept applicant's version with the following comment: **5.2** and **5.3** Summary refers to when Euparen 50 WG is applied under practical conditions there will be no effects, this is not revelant to this submission.
Reliability	Reliability = 2
Acceptability	Acceptable

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Remarks	All endpoints and data presented in the summary and tables have been checked against the original summary and are correct.
	COMMENTS FROM ...
Date	*Give date of comments submitted*
Materials and Methods	*Discuss additional relevant discrepancies referring to the (sub)heading numbers and to applicant's summary and conclusion.* *Discuss if deviating from view of rapporteur member state*
Results and discussion	*Discuss if deviating from view of rapporteur member state*
Conclusion	*Discuss if deviating from view of rapporteur member state*
Reliability	*Discuss if deviating from view of rapporteur member state*
Acceptability	*Discuss if deviating from view of rapporteur member state*
Remarks	

Table A7_5_1_1-1: Properties of soil samples

Criteria	Details	
Nature	Loamy sand	Loamy silt
Sampling site:	Soil sample from Germany	Soil sample from Germany
Geographical reference on the sampling site	Laacherhof experimental farm of Bayer AG, Monheim, Plot F	Laacherhof experimental farm of Bayer AG, Monheim, Plot Hohenseh 4 a
Data on the history of the site	Plant protection chemicals have not been used on the field since 1981; grass was planted in 1987, summer wheat in 1988, winter rye in 1988/89 and winter barley in 1989/90.	Plant protection chemicals have not been used on the field since 1981; 19851986/87 winter barley, 1987/88 oat, 1988 winter barley, spring 1989 perennial ryegrass.
Use pattern	Agricultural soil	Agricultural soil
Depth of sampling [cm]	Not reported	Not reported
Sand / Silt / Clay content [% dry wt]	69.1 / 22.4 / 8.5 (loamy sand)	5.4 / 82.5 / 12.1 (loamy silt)
pH (1 M KCl)	4.42-4.60	6.25-6.29
Organic carbon content [% dry wt]	0.84	1.75
Nitrogen content [% dry wt]	0.08	0.18
Cation exchange capacity [meq/100 g dry wt soil]	Not reported	Not reported
Initial microbial biomass [mg microbial C/kg dry wt soil]	155	597
Reference of methods	J.P.E. Anderson, 1982, Soil Respiration, in: Page, A.L. et al. (eds.): Methods of Soil Analysis, Part 2 (Chemical and Microbiological Methods), Agronomy Monograph 9, 2nd ed., Madison, USA, pp. 831-871	
Collection / storage of samples	The soils were sampled from the field, passed through a sieve (2 mm) and stored until used, as described in ISO/DIS 1036-6 (1992)	
Preparation of inoculum for exposure	n.a.	
Pretreatment	n.a.	

Table A7_5_1_1-2: Test system for soil respiration / nitrification tests

Criteria	Details
Culturing apparatus	a) Respiration Test: after mixing soil samples equivalent to 750 g dry wt soil were poured into 1000 ml preserving jars with glass lids (without rubber rings). b) Mineralisation Test: after mixing soil samples equivalent to 100 g dry wt soil were poured into 500 ml brown glass bottles with screw cup aeration system. c) Nitrification Test: treated soil samples (weight not given) were poured into 500 ml brown glass bottles with screw cup aeration system.
Number of vessels / concentration	3
Aeration device	No
Measuring equipment	No
Test performed in closed vessels	No

Table A7_5_1_1-3: Application of test substance and sampling

Criteria	Details
Application procedure	Addition of pre-mixtures in a carrier and mixing the carrier with native soil
Carrier	Quartz sand
Concentration of liquid carrier [% v/v]	No liquid carrier
Liquid carrier control	n.a.
Sampling procedure	a) Respiration Test: Moist samples (equivalent to 25 g dry wt. soil) were taken from each treatment on day 0 (within 3 hours after treatment), and after 14, 28, 41 or 42, 56, 70 and 91 days of incubation. The samples were mixed with glucose, poured into plastic cylinders and connected to the gas analyzer. b) Mineralisation Test: The lye (1 M NaOH) containers in the incubation bottles were sampled and replaced weekly (day 0, 7, 14, 21, 28, 42, 56, 70 and 91). c) Nitrification Test: Immediately after treatment and after 7, 13 or 14, 21, 28, 42, 56 or 57, 70 and 91 days, the soil in each jar was mixed with a spatula and a moist sample (equivalent to 10 g dry wt. soil) was extracted with 50 ml 1 M KCl; after filtration the extracts were analyzed on an autoanalyser.

Table A7_5_1_1-4: Test conditions

Criteria	Details
Organic (inorganic) substrate	a) Respiration Test: addition of 3000 mg glucose/kg dry wt. soil, to induce a maximum respiration rate in soil b) Mineralisation Test: Addition of 5000 mg lucerne grass-green meal/kg dry wt. soil, to induce a maximum respiration rate in soil c) Nitrification Test: addition of 5000 mg lucerne grass-green meal/kg dry wt. soil, to stimulate nitrogen stimulation in soil
Incubation temperature	20 ± 2 °C
Soil moisture	45-48% of the water holding capacity
Method of soil incubation	Bulk
Aeration	No

Table A7_5_1_1-5A: Respiration in a loamy sand soil 14 after treatment with Euparen WG 50 and addition of glucose (3000 mg/kg dry wt soil)

Hours after addition of Glucose	0 mg Euparen WG 50/kg[1] (quartz sand only)	6.7 mg Euparen WG 50/kg	67 mg Euparen WG 50/kg[1]
	mg carbon dioxide/hour/kg dry wt soil (average ± standard deviation)		
2	5.66 ± 1.17	5.35 ± 0.58	2.48 ± 0.25
3	5.56 ± 1.06	5.35 ± 0.57	2.54 ± 0.42
4	5.66 ± 1.06	5.49 ± 0.41	2.50 ± 0.30
5	5.70 ± 1.09	5.66 ± 0.51	2.56 ± 0.18
6	6.00 ± 1.13	5.58 ± 0.56	2.54 ± 0.23
7	6.06 ± 0.93	6.04 ± 0.39	2.63 ± 0.17
8	6.57 ± 0.91	6.08 ± 0.53	2.58 ± 0.31
9	6.64 ± 1.03	6.38 ± 0.41	2.78 ± 0.10
10	7.24 ± 0.85	7.02 ± 0.28	2.84 ± 0.07
11	7.80 ± 0.80	7.19 ± 0.47	2.79 ± 0.19
12	8.15 ± 1.14	7.93 ± 0.30	3.06 ± 0.12
13	8.97 ± 0.72	8.93 ± 0.16	3.09 ± 0.11
Sum	80.00	76.99	32.38
% of Control	100.0	96.2	40.5

1 = dry wt soil / average from three samples

Table A7_5_1_1-5B: Respiration in a loamy silt soil 14 after treatment with Euparen WG 50 and addition of glucose (3000 mg/kg dry wt soil)

Hours after addition of Glucose	0 mg Euparen WG 50/kg[1] (quartz sand only)	6.7 mg Euparen WG 50/kg	67 mg Euparen WG 50/kg[1]
	mg carbon dioxide/hour/kg dry wt soil (average ± standard deviation)		
2	28.47 ± 2.45	27.93 ± 1.58	23.78 ± 0.54
3	28.50 ± 0.48	28.13 ± 0.47	22.60 ± 0.25
4	29.85 ± 0.55	26.93 ± 1.84	23.52 ± 1.41
5	29.05 ± 0.53	28.73 ± 0.33	23.62 ± 0.40
6	30.53 ± 0.30	30.84 ± 0.47	24.43 ± 0.31
7	33.03 ± 0.89	33.01 ± 0.73	25.70 ± 0.50
8	36.87 ± 0.29	36.67 ± 0.41	27.46 ± 1.12
9	41.42 ± 0.18	40.10 ± 0.34	30.94 ± 1.95
10	46.10 ± 0.61	46.48 ± 0.95	35.75 ± 1.25
11	54.12 ± 0.47	55.79 ± 0.70	41.64 ± 1.53
12	66.37 ± 0.95	65.17 ± 0.34	49.93 ± 3.25
13	77.44 ± 1.97	75.81 ± 1.62	62.56 ± 2.67
Sum	501.75	495.60	391.93
% of Control	100.0	98.8	78.1

1 = dry wt soil / average from three samples

Table A7_5_1_1-6: Influence of Euparen WG 50 on the microbial mineralisation of lucerne-grass-green-meal in a loamy sand and a loamy silt soil

Days after Treatment	0 mg Euparen WG 50/kg[1] (quartz sand only)	6.7 mg Euparen WG 50/kg	67 mg Euparen WG 50/kg[1]
	mg carbon dioxide/100 g dry wt soil (average ± standard deviation)		
	LOAMY SAND SOIL		
7	227.8 ± 3.9	219.6 ± 15.5	208.3 ± 11.3
14	55.7 ± 3.8	67.1 ± 6.6	74.0 ± 3.4
21	25.3 ± 1.3	28.9 ± 1.2	36.4 ± 1.4
28	18.2 ± 1.6	19.7 ± 2.2	21.8 ± 1.2
42	22.9 ± 3.4	23.0 ± 2.8	26.7 ± 1.7
56	16.7 ± 4.8	14.5 ± 3.6	16.7 ± 2.7
71	11.6 ± 2.5	11.4 ± 1.8	14.5 ± 1.1
91	14.4 ± 0.9	14.2 ± 3.4	13.9 ± 1.2
	LOAMY SILT SOIL		
7	231.3 ± 4.8	230.9 ± 4.8	218.0 ± 6.5
14	73.7 ± 3.8	75.4 ± 1.1	85.5 ± 3.3
21	43.9 ± 1.3	44.0 ± 0.0	44.2 ± 0.6
28	37.0 ± 1.6	34.6 ± 2.6	34.6 ± 1.9
42	52.8 ± 3.4	55.8 ± 5.7	48.2 ± 0.6
56	39.5 ± 6.3	43.0 ± 6.3	40.0 ± 2.6
70	31.7 ± 3.7	31.5 ± 3.0	29.4 ± 2.3
91	37.4 ± 3.3	41.2 ± 5.1	35.0 ± 0.9

1 = dry wt soil / average from three samples

Table A7_5_1_1-7A: Nitrogen mineralization in a loamy sand soil after treatment with Euparen WG 50 and addition of lucerne-grass-green meal (5000 mg/kg dry wt soil)

Days after Treatment	0 mg Euparen WG 50/kg[1] (quartz sand only)		6.7 mg Euparen WG 50/kg		67 mg Euparen WG 50/kg[1]	
	mg nitrogen/kg dry wt soil (average ± standard deviation)					
	ammonium	nitrate	ammonium	nitrate	ammonium	nitrate
0	3.07 ± 0.35	11.66 ± 0.67	2.86 ± 0.04	10.91 ± 0.03	2.93 ± 0.18	11.06 ± 0.34
7	2.06 ± 0.38	2.36 ± 0.16	3.89 ± 0.73 (t)	1.51 ± 0.15 (t)	10.25 ± 0.38 (t)	1.07 ± 0.07 (t)
14	1.11 ± 0.04	11.72 ± 0.37	2.02 ± 0.38	13.30 ± 0.30 (t)	19.55 ± 1.13 (t)	3.07 ± 0.21 (t)
21	1.70 ± 0.51	19.09 ± 1.01	1.56 ± 0.49	22.77 ± 0.44 (t)	16.58 ± 0.86 (t)	12.37 ± 0.43 (t)
28	1.56 ± 0.27	23.66 ± 0.80	1.50 ± 0.28	29.47 ± 0.09 (t)	8.53 ± 1.92 (t)	28.22 ± 1.06 (t)
42	1.17 ± 0.07	32.09 ± 0.33	1.24 ± 0.10	37.72 ± 0.62 (t)	2.27 ± 0.44	40.10 ± 0.98 (t)
57	0.60 ± 0.02	39.98 ± 2.59	0.52 ± 0.06	49.23 ± 2.50 (t)	1.35 ± 0.25 (t)	53.71 ± 3.83 (t)
70	0.99 ± 0.08	47.01 ± 2.12	0.99 ± 0.01	53.69 ± 3.20 (t)	1.75 ± 0.16 (t)	56.97 ± 4.23 (t)
91	1.22 ± 0.32	63.06 ± 6.12	1.21 ± 0.17	63.49 ± 7.93	1.57 ± 0.14	69.82 ± 5.66 (t)

1 = dry wt soil / average from three samples
(t) = significant difference between treated and untreated soil samples (t-Test with 5 % probability level)

Table A7_5_1_1-7B: Nitrogen mineralization in a loamy silt soil after treatment with Euparen WG 50 and addition of lucerne-grass-green meal (5000 mg/kg dry wt soil)

Days after Treatment	0 mg Euparen WG 50/kg[1] (quartz sand only)		6.7 mg Euparen WG 50/kg		67 mg Euparen WG 50/kg[1]	
	mg nitrogen/kg dry wt soil (average ± standard deviation)					
	ammonium	nitrate	ammonium	nitrate	ammonium	nitrate
0	4.16 ± 0.17	12.69 ± 0.12	4.07 ± 0.01	12.55 ± 0.21	4.20 ± 0.07	12.77 ± 0.01
7	1.78 ± 0.15	5.98 ± 0.40	1.70 ± 0.06	6.28 ± 0.50	8.93 ± 1.21 (t)	9.13 ± 0.17 (t)
13	1.79 ± 0.30	7.73 ± 0.84	1.50 ± 0.21	8.42 ± 0.96	8.75 ± 2.16 (t)	14.40 ± 1.35 (t)
21	1.56 ± 0.26	13.08 ± 0.86	1.45 ± 0.29	15.16 ± 0.83 (t)	1.39 ± 0.08	28.29 ± 0.21 (t)
28	1.53 ± 0.43	18.64 ± 0.66	1.75 ± 0.46	20.63 ± 1.01 (t)	1.94 ± 0.63	35.98 ± 0.91 (t)
42	1.84 ± 0.30	18.81 ± 0.95	2.00 ± 0.01	20.38 ± 0.42	1.61 ± 0.26	29.49 ± 0.27 (t)
56	1.27 ± 0.22	42.65 ± 0.68	1.15 ± 0.02	43.12 ± 1.19	1.56 ± 0.08	54.36 ± 1.17 (t)
70	1.43 ± 0.26	51.09 ± 1.06	1.32 ± 0.24	49.60 ± 2.90	1.39 ± 0.33	57.86 ± 1.15 (t)
91	0.88 ± 0.42	62.91 ± 3.17	0.88 ± 0.35	59.70 ± 4.00	1.08 ± 0.39	66.64 ± 2.26

1 = dry wt soil / average from three samples
(t) = significant difference between treated and untreated soil samples (t-Test with 5% probability level)