Comparsion between the algae grow inhibition test (DIN 38412) and the toxicity determination with a bbe Cuvette-Fluorometer

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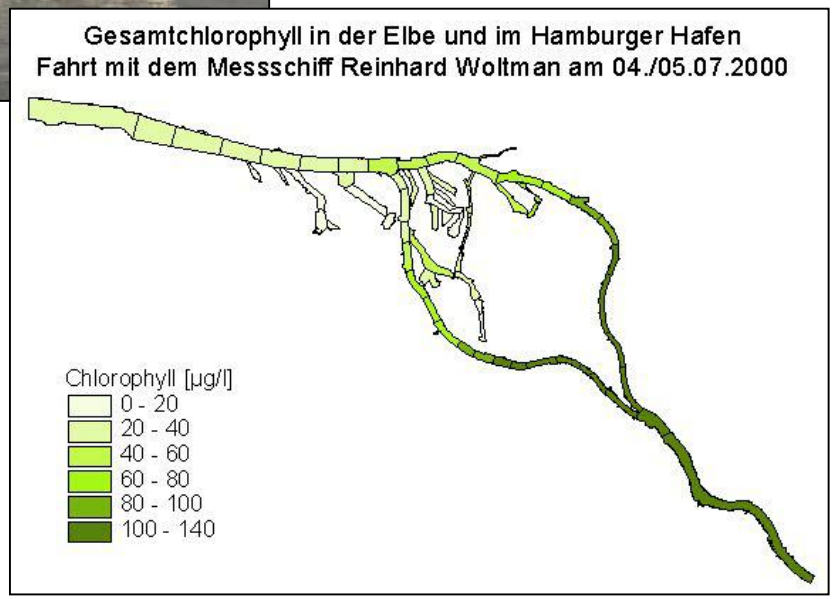
Hamburg

Chlorophyll Measurment with the bbe Cuvette Fluorometer in Hamburg



bbe Cuvette Fluorometer

Scope of works:

- Measurement of the concentration of several algae clases
- Measurement of the total algae concentration
- Measurement of algae activity (Genty)

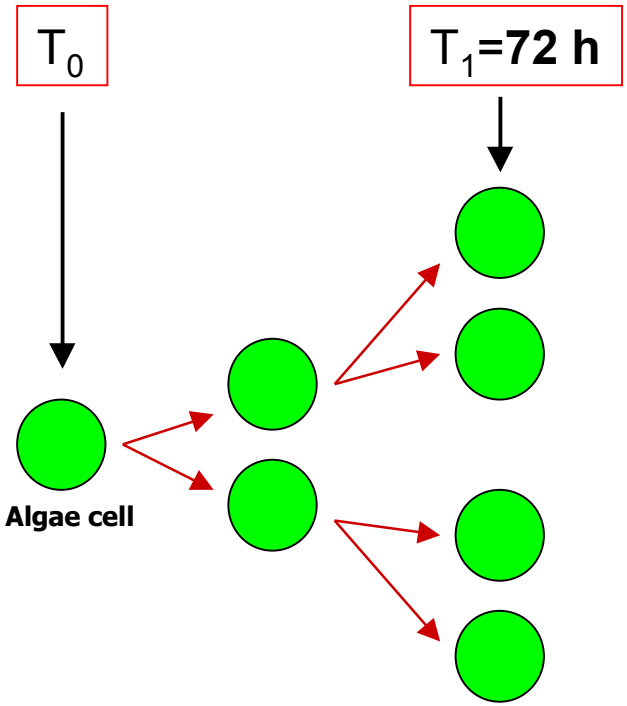
Aim of the Preliminary Test

Questions:

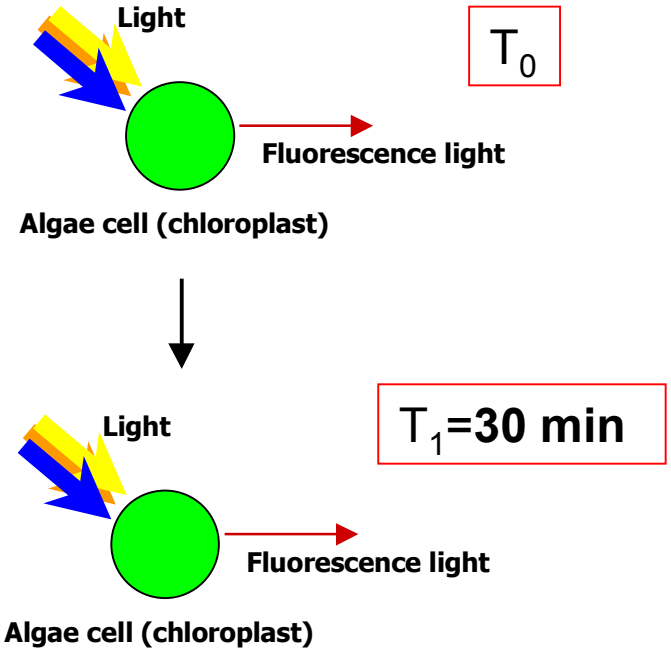
- Is it possible to carry out toxicity tests with the bbe Cuvette Fluorometer reliably?
- How comparable are the test results with findings from the growth inhibition test (DIN 38412)?
- Is the use of the bbe test as a fast and mobile test possible and an addition to the algae growth inhibition test?

Comparsion Between the Toxicity Tests

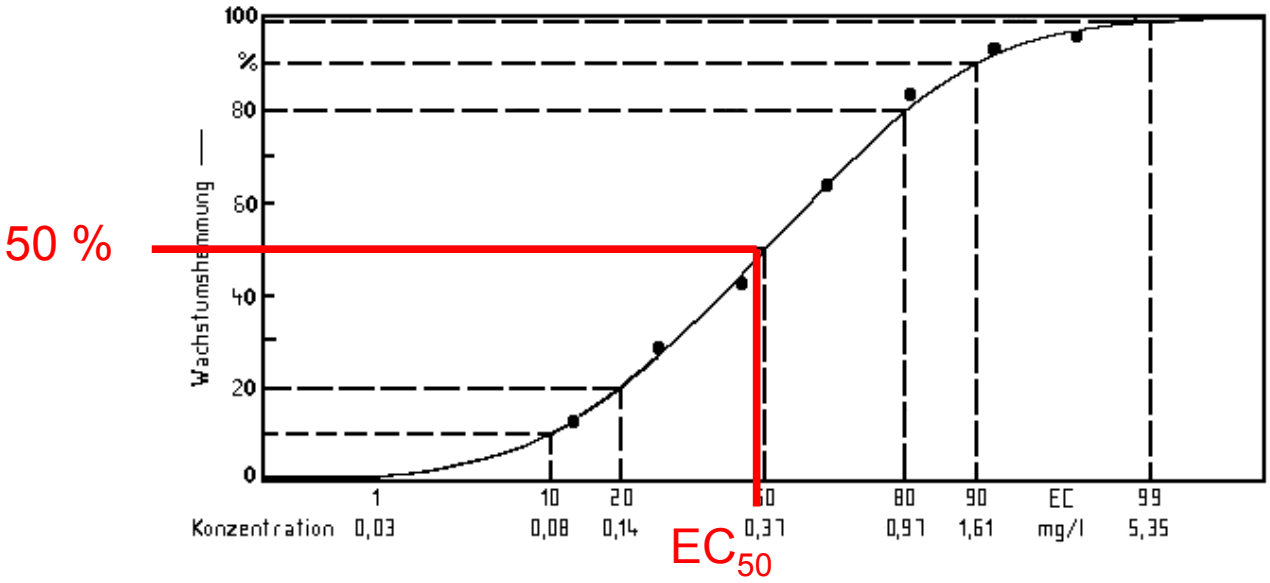
proliferation determination with the growth inhibition test (DIN 38 412)



activity determination with the bbe flourometer



Relationship Between Effect and Concentration



Beispiel für eine Konzentrations-Wirkungsbeziehung, angepaßt an eine Normalverteilung für die Wachstumshemmung

EC_{50}: Statistically derived concentration of a substance in an environmental medium expected to produce a certain effect in 50% of test organisms in a given population under a defined set of conditions.

EC_{50}- Values from Safety Data Sheets

Bayer CropScience
SICHERHEITSDATENBLATT nach EG-Richtlinie 2001/58/EG

AZUR
Version 3 / D
102000005790

1/9
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Druckdatum: 28.01.2005

1. STOFF-/ZUBEREITUNGS- UND FIRMENBEZEICHNUNG

Produktinformation

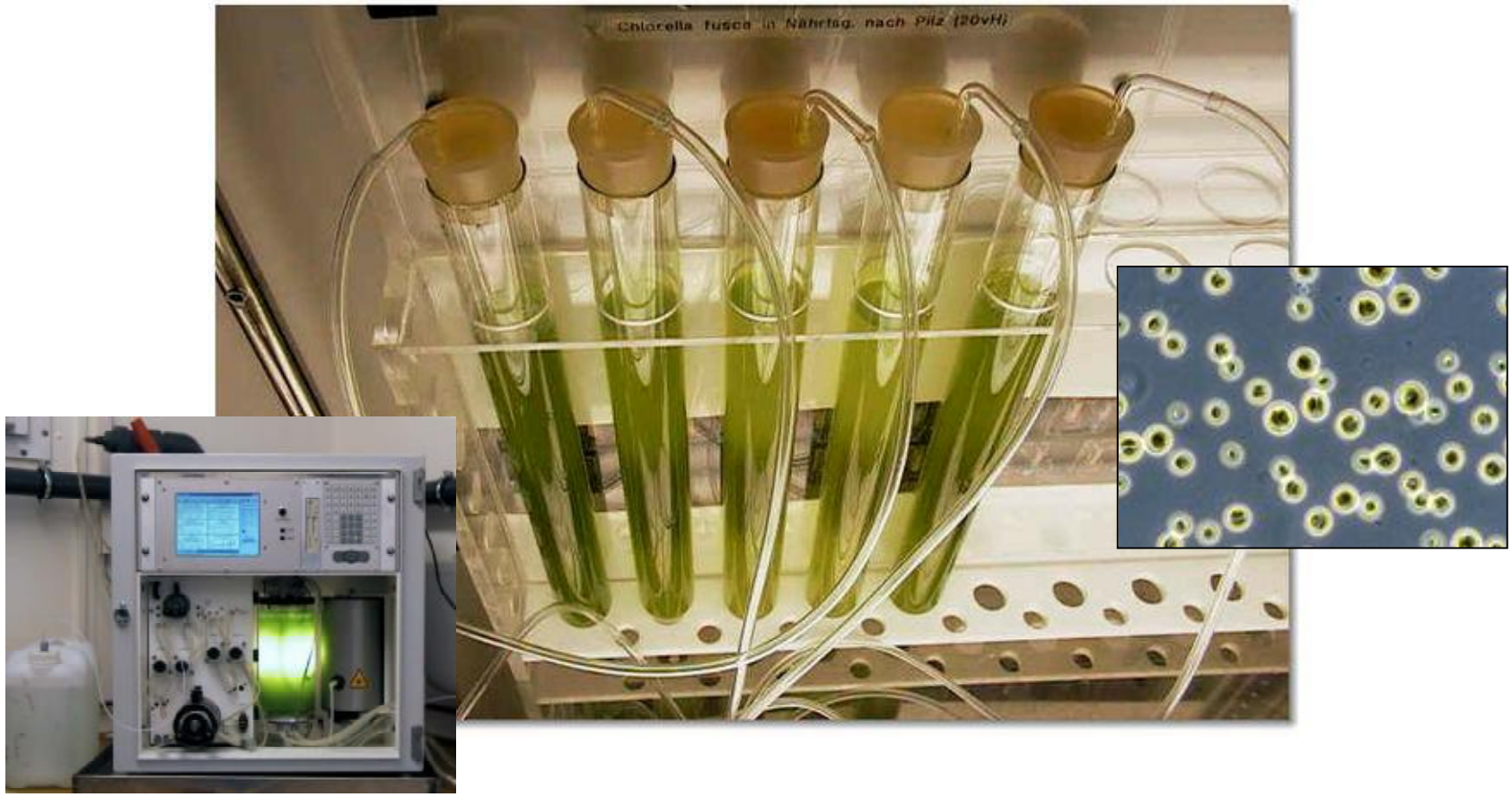
Handelsname	AZUR
Produktcode (UVP)	06328210
Produktcode	AE F016410 43 SC45 A7
Spezifikation	34081
Verwendung	Herbizid
Firma	Bayer CropScience AG Alfred-Nobel-Straße 50 40789 Monheim Deutschland
Telefon	
Telefax	
Auskunftsgebender Bereich	
Notrufnummer	
Vertrieb	

Ökotoxische Wirkungen

Fischtoxizität	LC50 (Regenbogenforelle (Oncorhynchus mykiss)) 17 mg/l Expositionszeit: 96 h Test wurde mit einer ähnlichen Formulierung durchgeführt.
Daphnientoxizität	EC50 (Wasserfloh (Daphnia magna)) 23 mg/l Expositionszeit: 48 h Test wurde mit einer ähnlichen Formulierung durchgeführt.
Algentoxizität	EC50 (Scenedesmus subspicatus) 49 µg/l Expositionszeit: 72 h Test wurde mit einer ähnlichen Formulierung durchgeführt.

algae growth inhibition test (DIN 38 412)

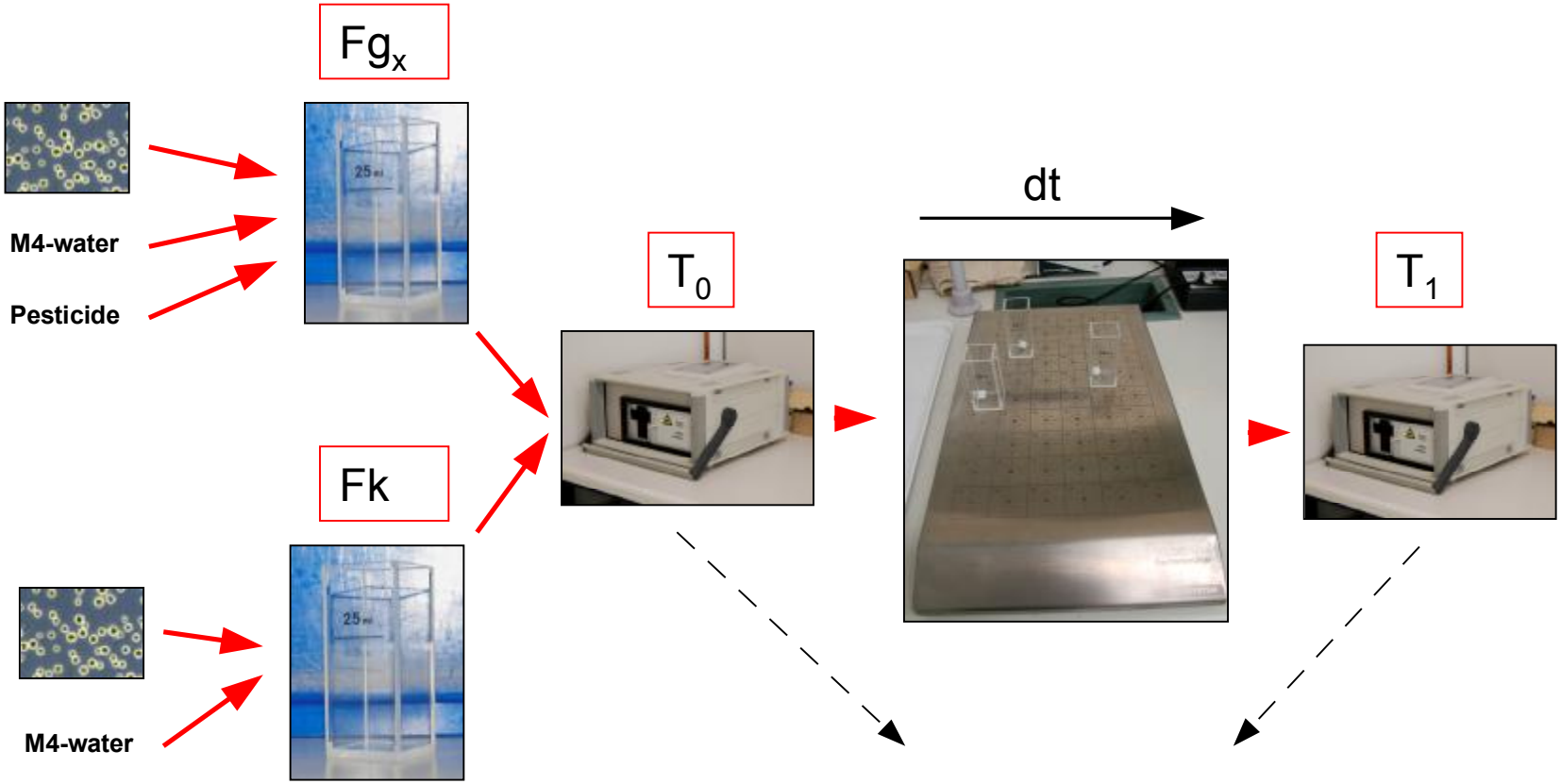
Test Organism: Chlorella Vulgaris (green algae)



Execution of the Test

Test organism:	Chlorrella vulgaris
Herbicides:	Isoproturon Atrazin Diuron Terbuthylazin
Test water:	M4
Incubation time:	3 min and 30 min
Test repetition:	not less than 3 times

Execution of the Test



$$Hf = \frac{Genty_{Fk} - Genty_{Fg}}{Genty_{Fk}} * 100$$

Measurment Results (Terbuthylazin)

Probe	Konzentration Isoproturon [µg/l]	Algenkonzentration vor Zugabe von Isoproturon [µg/l]	T0 genty (dt=3 min)	T1genty (dt=30 min)
Fg1	1	100,7	56,78%	53,32%
Fg2	10	108,6	45,71%	38,91%
Fg3	50	107,4	16,17%	14,86%
Fg4	100	108,0	10,19%	10,01%
Fk	0	101,6	56,36%	55,86%

$$Hf = \frac{Genty_{Fk} - Genty_{Fg}}{Genty_{Fk}} * 100$$

Measurment Results (Terbuthylazin)

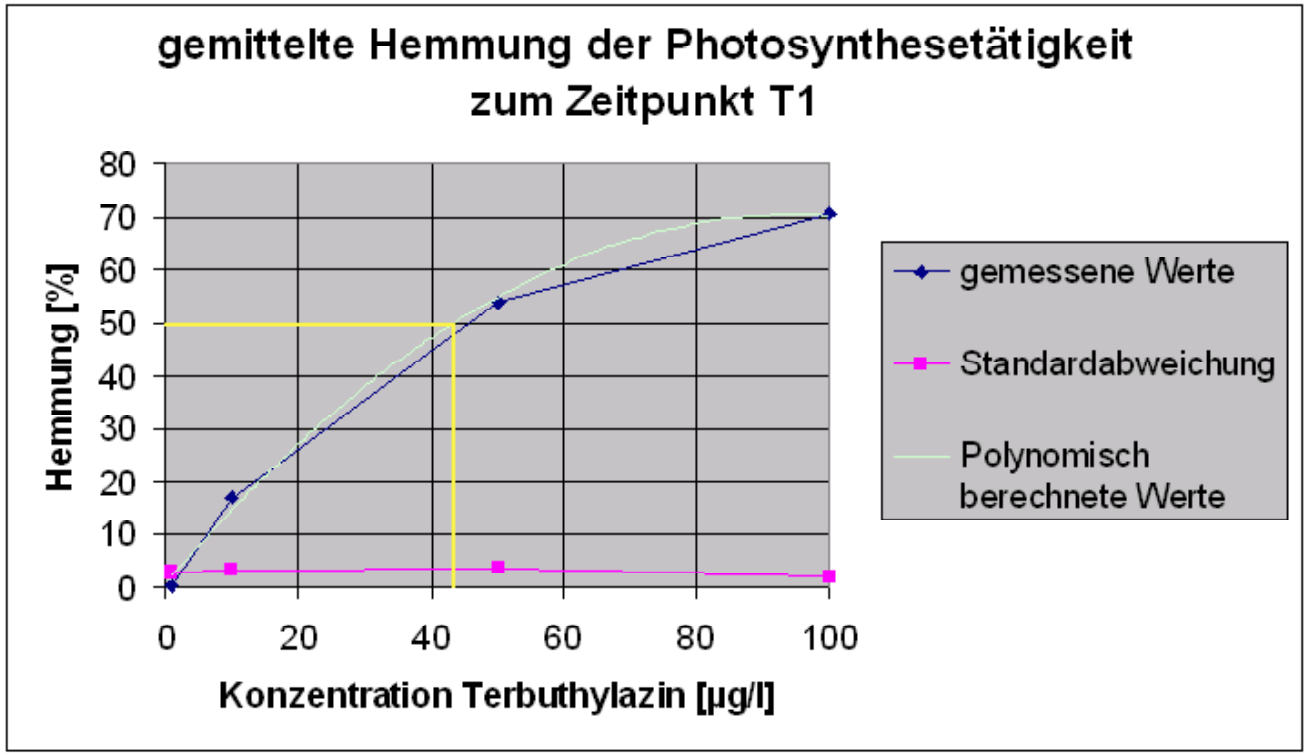
T_0		
Probe	**Konzentration Isoproturon in µg/l**	**Hf in %**
Fg1	1	-0,75
Fg2	10	18,9
Fg3	50	71,31
Fg4	100	81,92
Hf= Hemmwirkung auf die Photosynthese-tätigkeit in %, ausgedrückt als Minderung der Chlorophyllfluoreszenz		

T_1		
Probe	**Konzentration Isoproturon in µg/l**	**Hf in %**
Fg1	1	4,55
Fg2	10	30,34
Fg3	50	73,4
Fg4	100	82,08
Hf= Hemmwirkung auf die Photosynthese-tätigkeit in %, ausgedrückt als Minderung der Chlorophyllfluoreszenz		

T_0 = 3 min

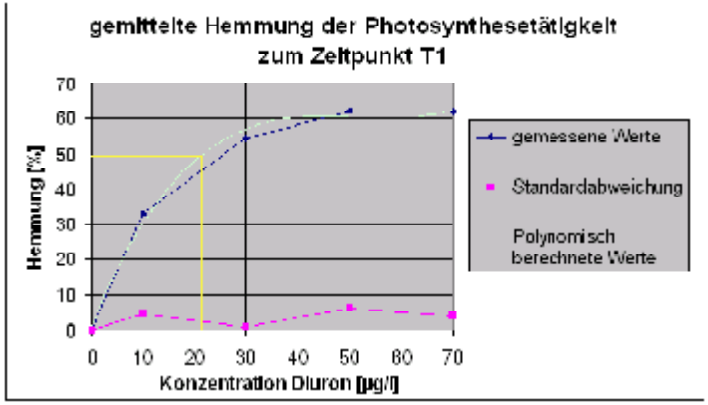
T_1 = 30 min

Measurment Results (Terbuthylazin)

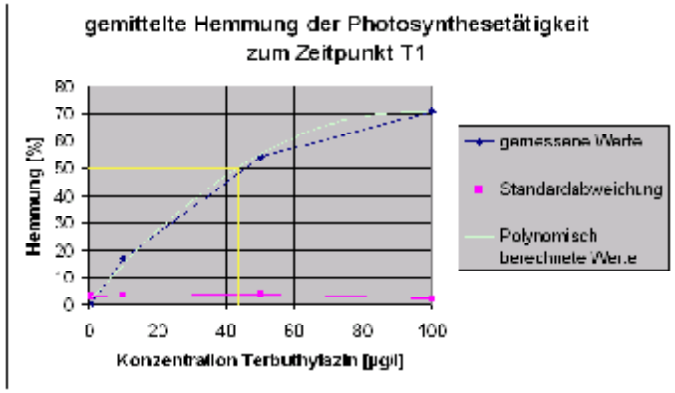


EC_{50}= 43 µg/l

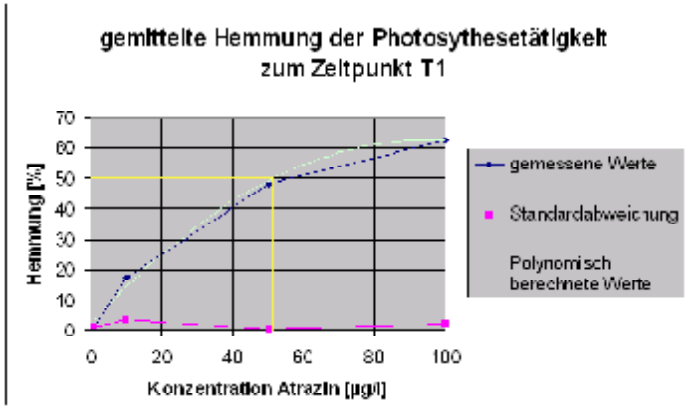
Measurment Results



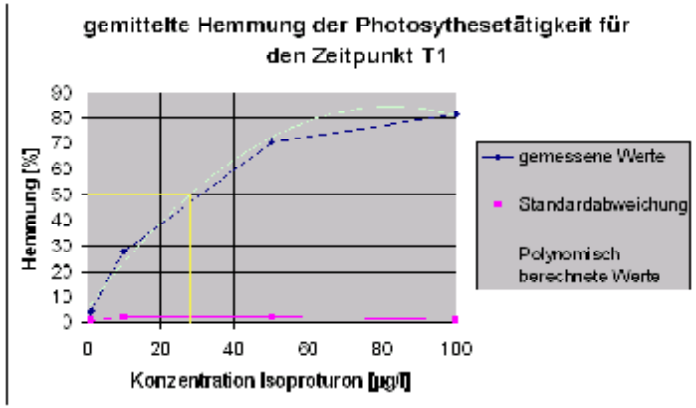
EC_{50}= 22 µg/l



EC_{50}= 43 µg/l



EC_{50}= 51 µg/l



EC_{50}= 28 µg/l

Results

Herbizid	gemessener EC_{50}-Wert	Sicherheitsdatenblätter	
		EC_{50}-Wert	Zeitspanne der Testdurchführung
Isoproturon	0,028 mg/l	0,0227 mg/l[1]	72 Stunden
Atrazin	0,051 mg/l	0,0290 mg/l[2]	72 Stunden
Terbuthylazin	0,043 mg/l	0,0160 mg/l[3]	72 Stunden
Diuron	0,030 mg/l	0,0220 mg/l[4]	48 Stunden

[1] http://www.raiffeisen.com/SDB
[2] http://www.syngenta-agro.ch
[3] http://www.raiffeisen.com/SDB
[4] http://prod-images.raiffeisen.com/Raiffeisen/SDB

Results

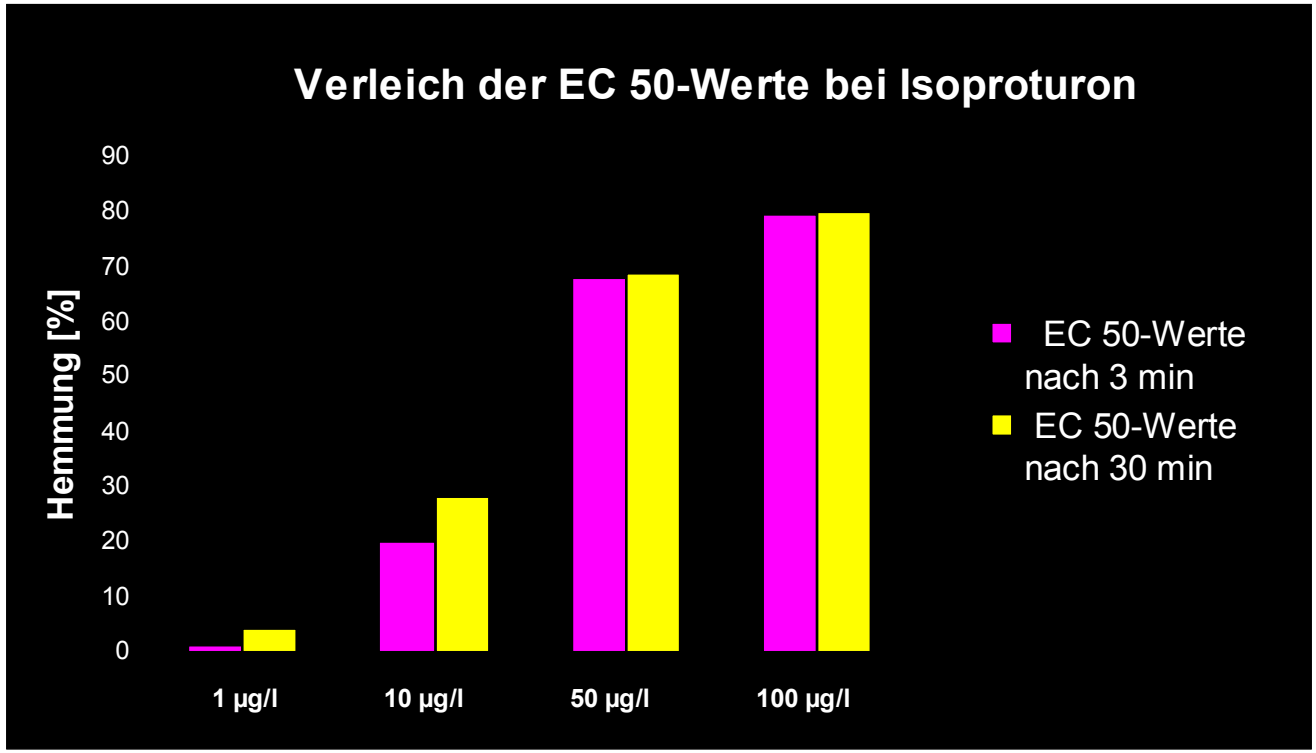
- The results from our tests are in the same dimension as the EC_{50} values from the algae growth inhibition test researched from the safety data sheets.
- Thus the first functional test was positive
- The test results were always well reproducible
- At first glance, the fluorecence method seems to be a bit more insensitive than the growth inhibition method.

  One reason could be the use of two different algae species. It is known that the ***Scenedesmus subspicatus*** reacts more sensitively to toxic substances than ***Chlorella vulgaris.***

Forecast for Next Tests in Hamburg

- More herbicides will be tested
- The influence of the inhibition time should be analysed. Up to now only 30 minutes is used →
- A growth inhibition test will be checked in parallel to the bbe test
- The next tests will be carried out by using *Scenedesmus subspicatus*
- The influence of the temperature on the measurement has to be analysed
- What is the influence of the light emission during the exposure to the measurment results?

What is the Optimal Incubation Time?



Thank you for your attention!

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