prophyta

Biologischer Pflanzenschutz GmbH

What is needed to make microbial biocontrol agents commercially successful?

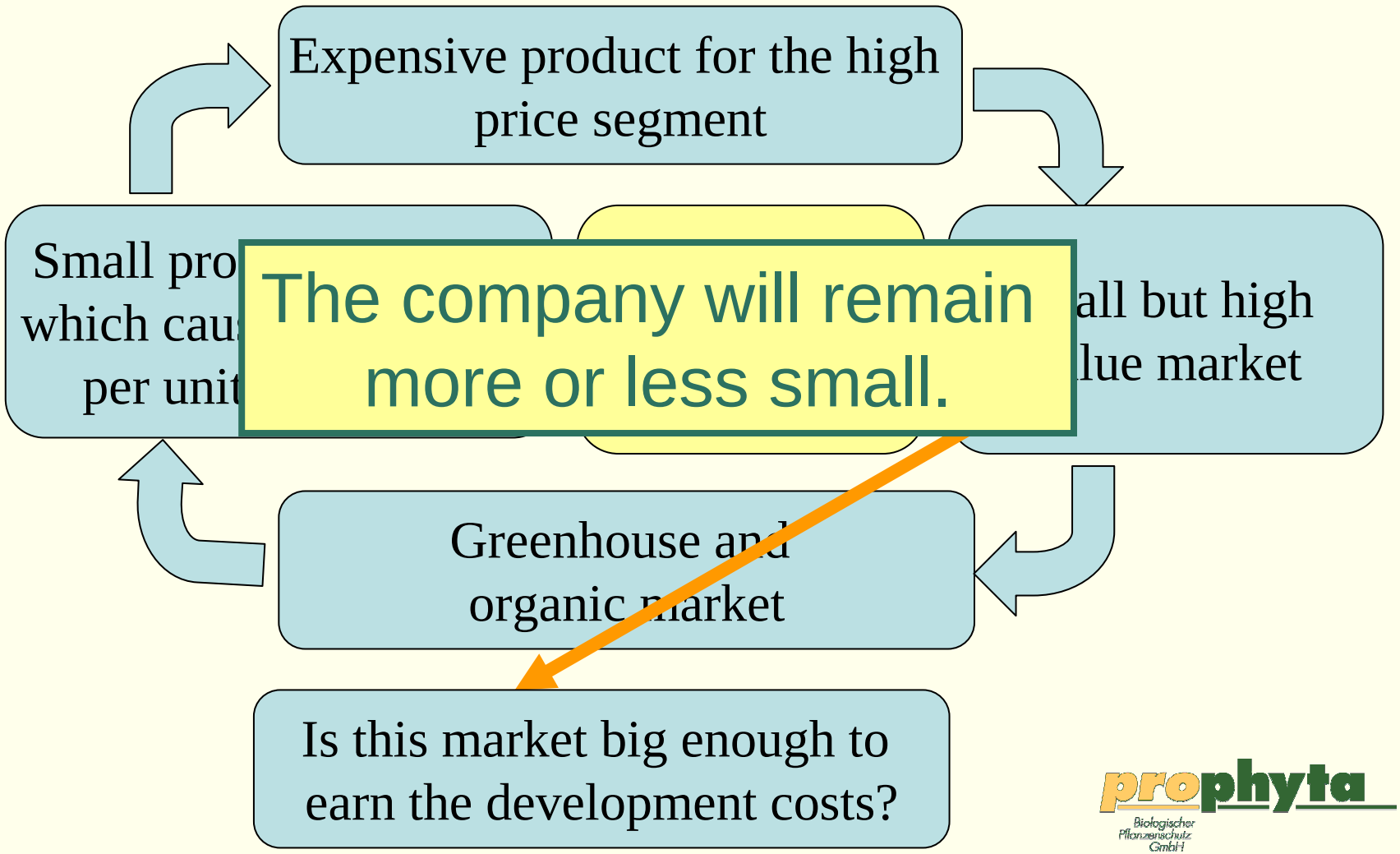
Peter Lüth

Introduction

- Founded in 1992
- 31 Employees
- 2 own registered products (4 formulations) plus contract production of another 3 products
- 4 further products in development
- Distribution into 31 countries

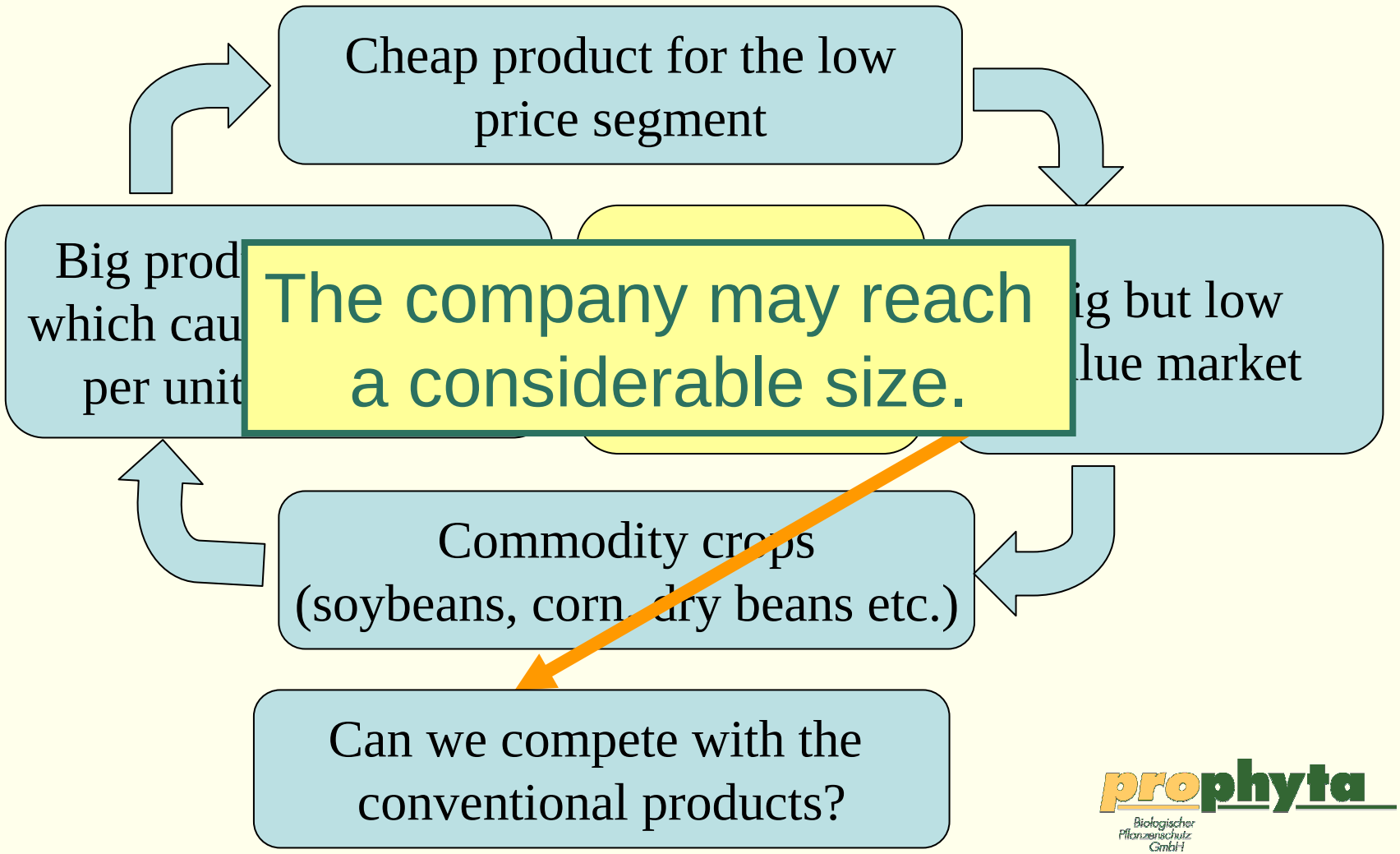
prophyta
Biologischer Pflanzenschutz GmbH

Prophyta's market approach



prophyta
Biologischer Pflanzenschutz GmbH

Prophyta's market approach



prophyta
Biologischer Pflanzenschutz GmbH

Searching for solution

- Fungi available in international culture collections and collections of universities, research institutes and companies
- Fungal isolates mentioned in scientific papers, presentations and other publications
- Fungal isolates already used in biological pesticides but not properly produced or formulated → license

Prophyta is not screening new isolates itself.

prophyta
Biologischer Pflanzenschutz GmbH

Criteria

- The market must be big enough to earn the development and registration costs back and to make a good profit.
- The product must work as good as a comparable chemical pesticide.
- The product shouldn‘t be more expensive than a chemical pesticide.
- The product should be applicable as easily as a chemical pesticide using the same equipment.

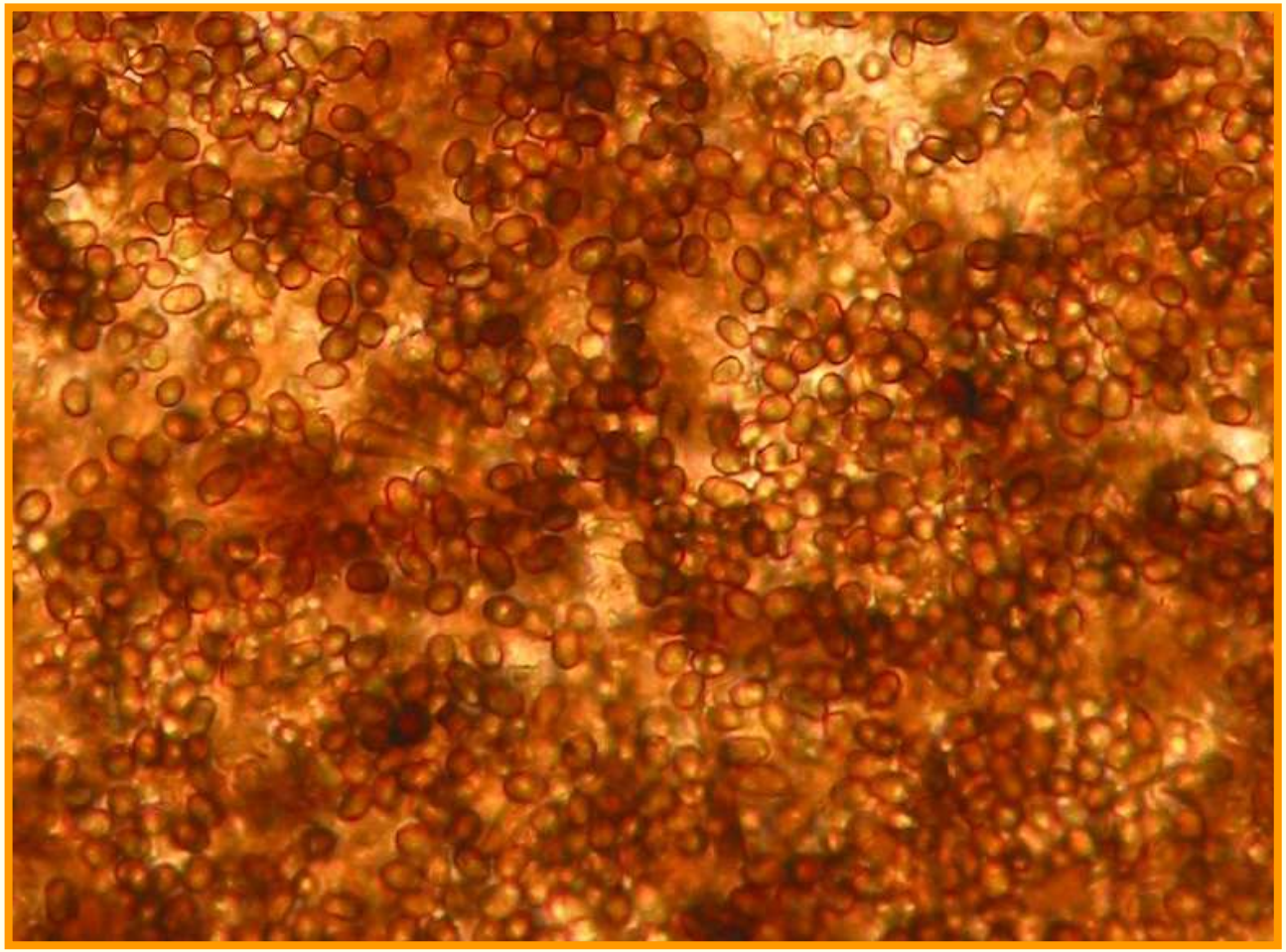
prophyta
Biologischer Pflanzenschutz GmbH

The technology

Substrate covered with the conidia of Beauveria basiana

prophyta
Biologischer Pflanzenschutz GmbH

The technology



Pure conidia suspension

The technology

Fluidized bed drying of the conidia

prophyta
Biologischer Pflanzenschutz GmbH

The technology

- Active ingredient: Coniothyrium minitans
- Water dispersible granule
- Carrier: Glucose
- 1 x 10^9 living conidia per gram product
- Rate: 0.5 – 4 kg per hectare
- Shelf life: 12 months at +4 ℃ and 2 years at –18 ℃
- Applicable to control: Sclerotinia spp. on canola, sunflower, lettuce, beans, carrots and other crops
- The product is manufactured on a pure biological basis.

The price of the product

The price of the product must be competitive toward the price of a conventional pesticide.

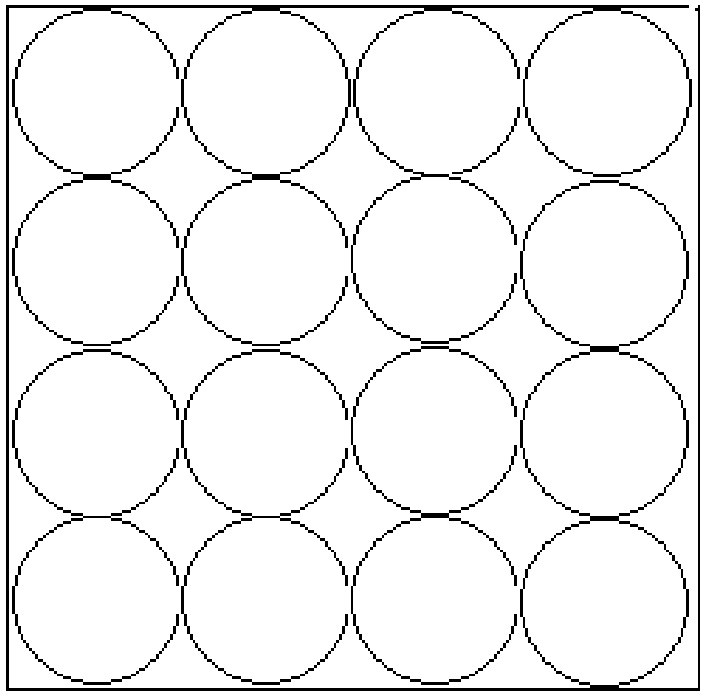
But, how to reach this goal?

What must we know?

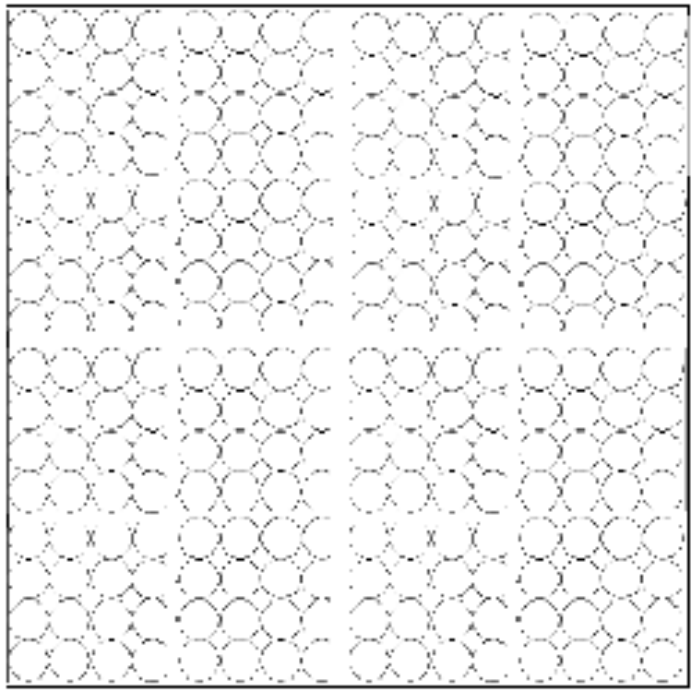
- Price of the competitive product (EUR/ha)
- Costs of the production of one batch
- Number of cfu per batch (maybe one fermenter run)
- CFU needed to treat one hectare effectively

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product



20 µm



5 µm

The influence of the conidia size

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Maximum spore yield per fermenter

	maximum content in 1 ml	maximum content in 600000 ml
Conidia diameter 20 µm	**1.25×10^{8}**	**7.5×10^{13}**
Conidia diameter 5 µm	**8.0×10^{9}**	**4.8×10^{15}**

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Expenditure to be covered by one fermenter run (an example)

- produ
  - sta
  - ma
  - re
  - de
- mark
- resea
- overh
- profit

Costs caused by the registration are not considered!!!

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Impact of the duration of the fermentation

- 30 days EUR 6000
- 20 days EUR 4500
- 10 days EUR 3000

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Impact of the use of the production capacity

- 100 % EUR 6000
- 50 % EUR 9000
- 25 % EUR 13500

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Calculation of the Ex Works Price

End user price: EUR 50.00 per ha

margin for the retailer: 25 %	→	EUR 41.25
margin for the distributor: 45 %	→	EUR 22.00

The producer cannot expect to get more than EUR 22.00 per ha for the product.

Is this profitable??????

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Calculation based on

- costs of EUR 6000 per batch (fermenter run)
- earnings per hectare: EUR 22.00 → we need 273 ha to make the process profitable

Area (ha) to be treated with the cfu of 1 batch (1 fermenter)

	Number of cfu needed per hectare					
Conidia per batch	2.5×10^{12}	1.0×10^{12}	5.0×10^{11}	2.5×10^{11}	1.0×10^{11}	5.0×10^{10}
1.0×10^{15}	**400 ha** (EUR 8800)	**1000 ha** (EUR 22000)	**2000 ha** (EUR 44000)	**4000 ha** (EUR 88000)	**10000 ha** (EUR 220000)	**20000 ha** (EUR 440000)
5.0×10^{14}	**200 ha** (EUR 4400)	**500 ha** (EUR 11000)	**1000 ha** (EUR 22000)	**2000 ha** (EUR 44000)	**5000 ha** (EUR 110000)	**10000 ha** (EUR 220000)
1.0×10^{14}	**40 ha** (EUR 880)	**100 ha** (EUR 2200)	**200 ha** (EUR 4400)	**400 ha** (EUR 8800)	**1000 ha** (EUR 22000)	**2000 ha** (EUR 44000)
5.0×10^{13}	**20 ha** (EUR 440)	**50 ha** (EUR 880)	**100 ha** (EUR 2200)	**200 ha** (EUR 4400)	**500 ha** (EUR 11000)	**1000 ha** (EUR 22000)
1.0×10^{13}	**4 ha** (EUR 88)	**10 ha** (EUR 220)	**20 ha** (EUR 440)	**40 ha** (EUR 880)	**100 ha** (EUR 2200)	**200 ha** (EUR 4400)

Green: profitable

Red: not profitable

prophyta
Biologischer Pflanzenschutz GmbH

The price of the product

Calculation based on

- costs of EUR 6000 per batch (fermenter run)
- earnings per hectare: EUR **30.00** → we need 200 ha to make the process profitable

Area (ha) to be treated with the cfu of 1 batch (1 fermenter)

	Number of cfu needed per hectare					
Conidia per batch	2.5×10^{12}	1.0×10^{12}	5.0×10^{11}	2.5×10^{11}	1.0×10^{11}	5.0×10^{10}
1.0×10^{15}	**400 ha** (EUR 12000)	**1000 ha** (EUR 30000)	**2000 ha** (EUR 60000)	**4000 ha** (EUR 120000)	**10000 ha** (EUR 300000)	**20000 ha** (EUR 600000)
5.0×10^{14}	**200 ha** (EUR 6000)	**500 ha** (EUR 15000)	**1000 ha** (EUR 30000)	**2000 ha** (EUR 60000)	**5000 ha** (EUR 150000)	**10000 ha** (EUR 300000)
1.0×10^{14}	**40 ha** (EUR 1200)	**100 ha** (EUR 3000)	**200 ha** (EUR 6000)	**400 ha** (EUR 12000)	**1000 ha** (EUR 30000)	**2000 ha** (EUR 60000)
5.0×10^{13}	**20 ha** (EUR 600)	**50 ha** (EUR 1500)	**100 ha** (EUR 3000)	**200 ha** (EUR 6000)	**500 ha** (EUR 15000)	**1000 ha** (EUR 30000)
1.0×10^{13}	**4 ha** (EUR 120)	**10 ha** (EUR 300)	**20 ha** (EUR 600)	**40 ha** (EUR 1200)	**100 ha** (EUR 3000)	**200 ha** (EUR 6000)

Green: profitable

Red: not profitable

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

If the BCAs get distributed into the conventional market they must be:

- as effective as the chemical products
- as applicable as the chemical products
- as cheap as the chemical products

Nevertheless, we will never be able to sell as much as the chemical industry.

Biocontrol companies have an additional problem:
The reputation of our products is not good.

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

Reasons for the bad reputation

- unauthorised product (snake oils) in the market
- insufficient technical support
- wrong expectation of the users
- market power of the chemical competitors
- insufficient shelf life

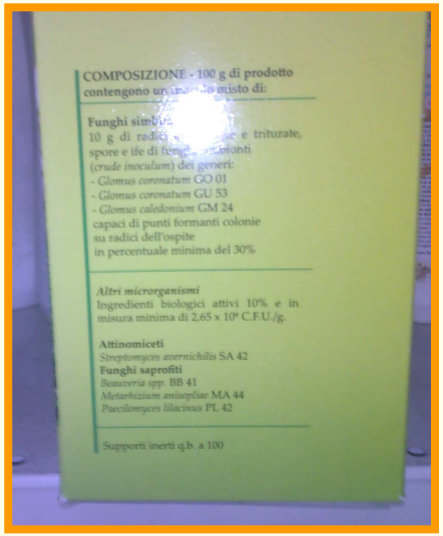
prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

This is a big problem for example in Italy.

- unauthorised product (snake oils) in the market

Unregistered microbial products:



Streptomyces avernichilis
Beauveria spp.
Metarhizium anisopliae
Paecilomyces lilacinus

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

Micosat	DP-10	TAB	VO12	LEN
Mycorrhiza	Gloumus coronatum GO-01 Gloumus coronatum GU-53 Gloumus caledoium GM-24	Gloumus coronatum GO-01 Gloumus coronatum GU-53 Gloumus caledoium GM-24 Gloumus intraradices GB-67 Gloumus intraradices GG-31 Gloumus mosseae GP-11 Gloumus mosseae GC-11 Gloumus viscosum GC-41	Gloumus coronatum GO-01 Gloumus coronatum GU-53 Gloumus caledoium GM-24	Gloumus coronatum GO-01 Gloumus coronatum GU-53 Gloumus caledonium GM-24 Gloumus intraradices GB-67 Gloumus intraradices GG-31 Gloumus mosseae GP-11 Gloumus mosseae GC-11 Gloumus viscosum GC-41
Aandeel mycorrhiza per 100 gram product	20gram (vermalen wortels met mycorrhiza sporen en mycelium)	10gram (vermalen wortels met mycorrhiza sporen en mycelium)	10gram (vermalen wortels met mycorrhiza sporen en mycelium)	
Bacterien	Bacillus subtilis SR-62 Agrobacterium radiobacter AB-39	Bacillus subtilis BA 41 Pseudomonas spp. SN 02 Pseudomonas spp. PM 46 Pseudomonas borealis PA 37	Pseudomonas spp. PM 46	Bacillus subtilis BA 41
Actinomyceten	Streptomyces spp SA 55	Streptomyces spp SB 19		Streptomyces spp SB 19
Schimmels	Trichoderma harzianum TH 01	Trichoderma harzianum TH 01 Trichoderma viride TV 03	Ulocladium spp. UO 18	Beauveria spp BB-41 Paecilomyces lilacinus PL-42
Gisten		Pichia pastoris PP 59	Pichia pastoris PP 59	
Aandeel microben per 100gram product	30 gram met minimaal $5x10^8$ CFU/g	10 gram met minimaal 2,65 x 10^9 CFU/g	10 gram met minimaal 2,65 x 10^8 CFU/g	10 gram met minimaal 5,2 x 10^6 CFU/g

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

“TC+Stim” is does not declare the ingredients being according to analysis 2008:

- ***C. minitans, strain CON/M/91-08*: 4.3 x 10^7 cfu/g**
- ***T. harzianum*: 4.7 x 10^7 cfu/g**
- **bacterial contamination very high: 2.3 x 10^8 cfu/g**

➔ **the name T C is giving a hidden indication**

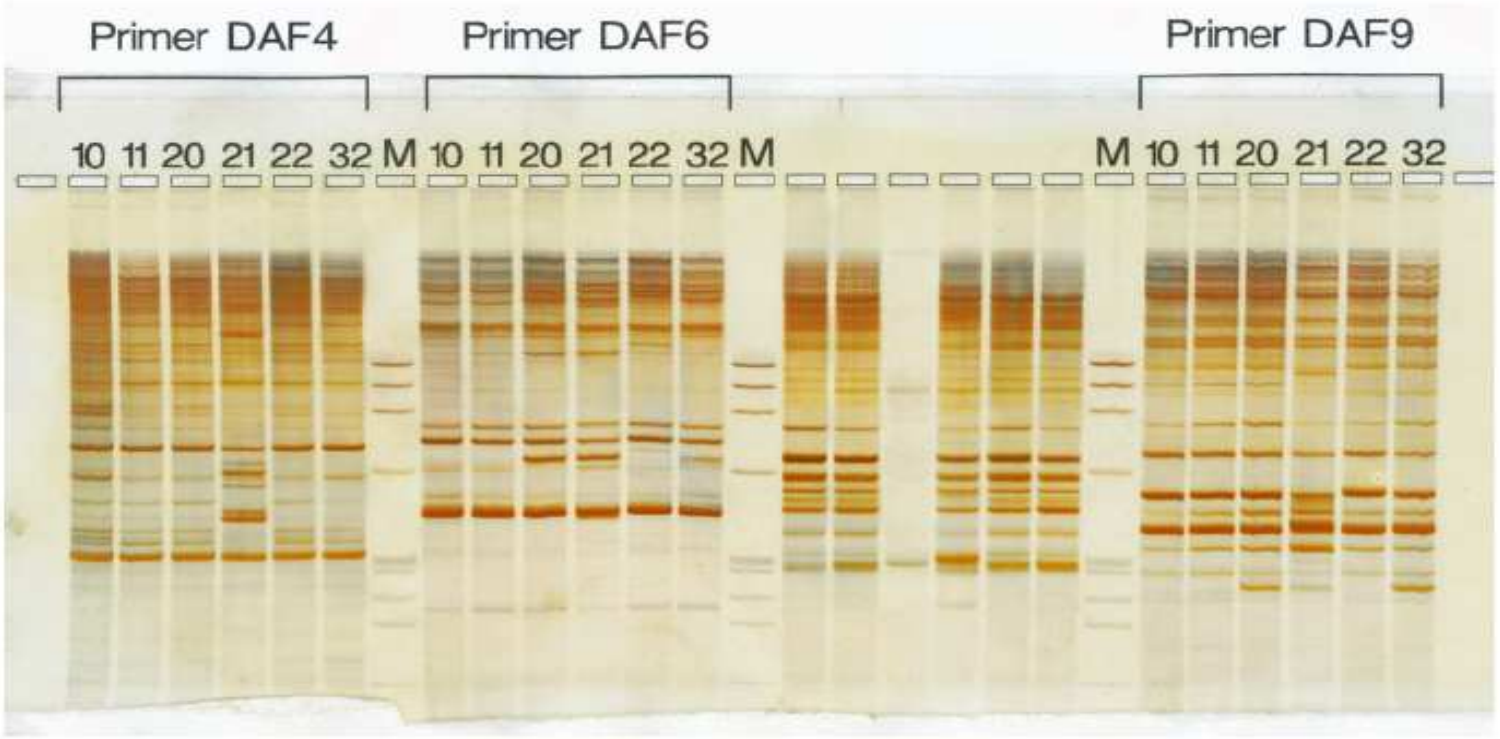
- 4 lawlessness's:

1. **Placing on the market without registration**
2. **Intentional wrong labelling**
3. **In fact concentration is never suitable for the purpose**
4. **Patent fraud**

prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

The PROPHYTA strain CON/M/91-08 was found in the product



prophyta
Biologischer Pflanzenschutz GmbH

Improvement of the reputation of our products

Aims

The principle objectives are:

1. To associate all companies, organisations and individuals involved with the development and the use of biocontrol activities.
2. To act as spokesman for the industry in relations with national and international institutions, policy makers, media and the public.
3. To set up a forum in order to exchange views between IBMA members and to discuss issues of common interest. As a result of this exchange of views, position papers are published and brought to the attention of parties concerned.
4. To set up and implement ethical professional rules.
5. To ensure product quality standards required by the market.
6. To contribute to a broader and more intensive use of biological crop protection, animal health and public hygiene.
7. To offer training and information in order to improve skills of member company staff at their request, and consequently to improve their business performance.
8. To offer the opportunity of conducting joint projects satisfying the needs of IBMA members.
9. To ensure transfer of information between all interested parties.

prophyta
Biologischer Pflanzenschutz GmbH

Formulation

The criteria of an optimum formulation are:

- shelf life of 2 years at 20 ℃ (or higher)
- rate less than 2 kg or litre per hectare
- if possible liquid
- good dissolvability in water (no clocking of the nozzles)
- good dispersion of the cfu on the leaves or in the soil

prophyta
Biologischer Pflanzenschutz GmbH

Thank you for your attention!

prophyta
Biologischer Pflanzenschutz GmbH