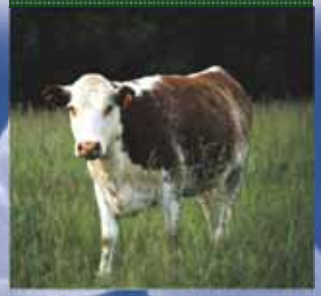
Efficacy of Prestop® against soil borne and foliar pathogens on European crops

Core business : Production of micro-organisms

Bakker's yeast and products

Biers

Animal Care (health/nutrition)



Wine

Human Care (health/nutrition)

Distilled alcools and ethanol

Plant Care (health/nutrition)

Bio-ingredients

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Plant Care Unit : Ithec and Verdera

Biological plant protection products and biofertilizer for agriculture, horticulture and forestry

Verdera

Biological plant protection products for horticulture

Prestop

based on *Gliocladium catenulatum*
strain 1446

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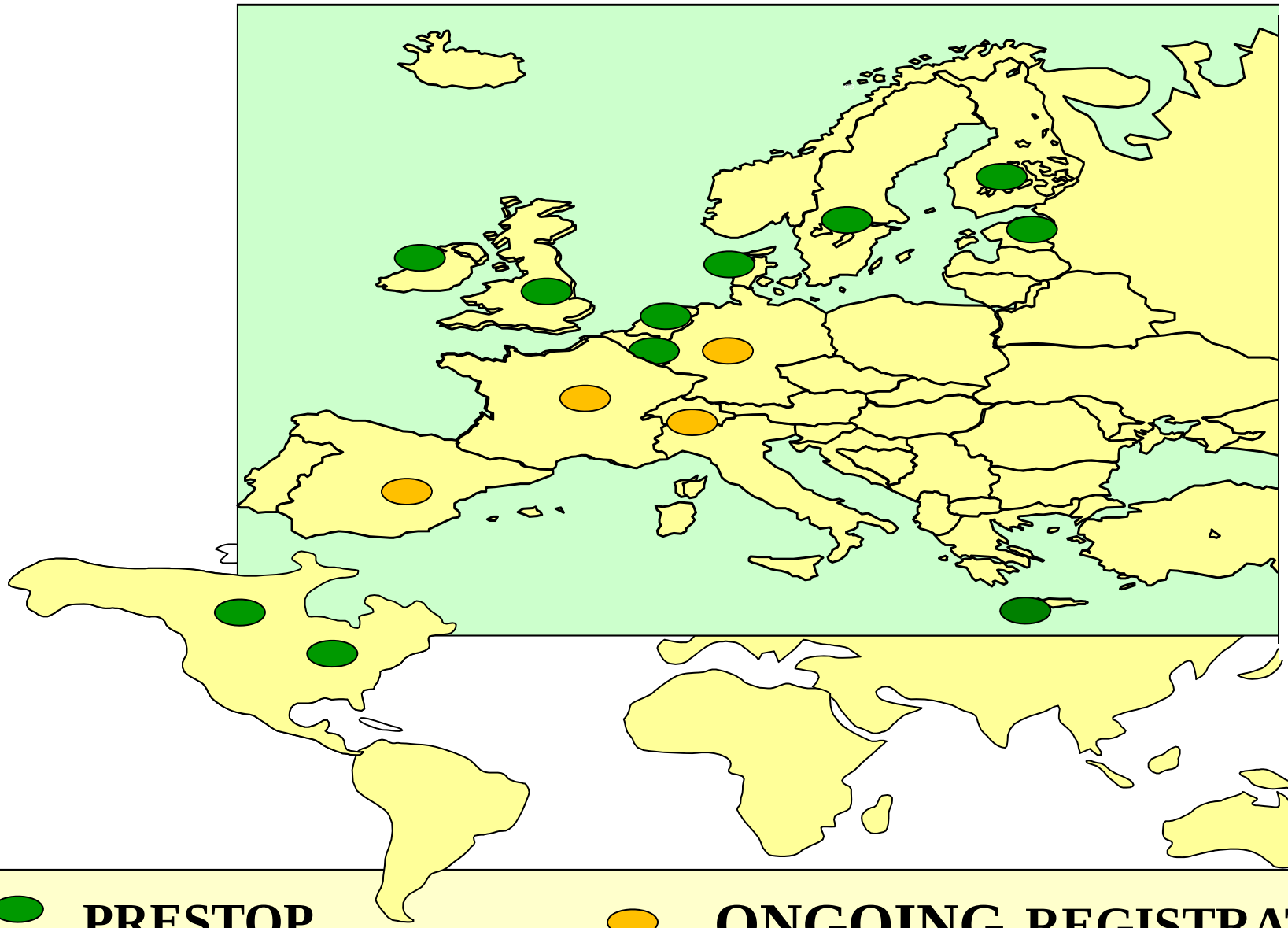
Current Registrations of Prestop



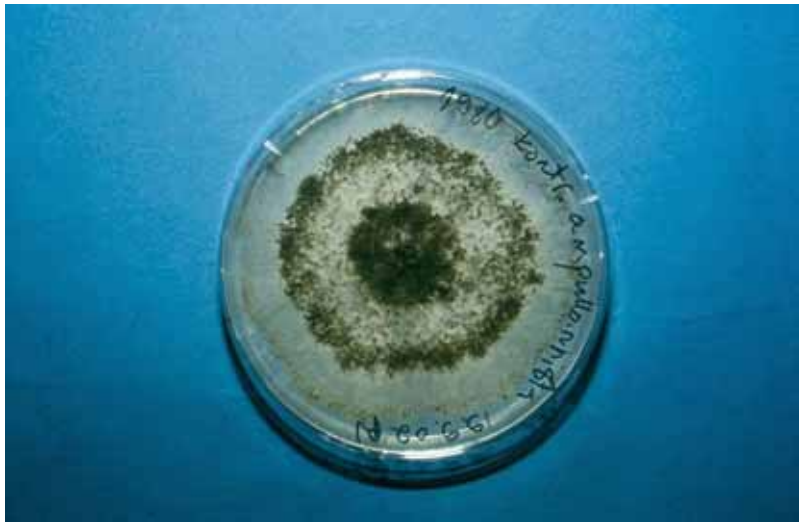
PRESTOP

ONGOING REGISTRATION

US and European approval (EPA and Annex 1)

Ecological characteristics of strain J1446

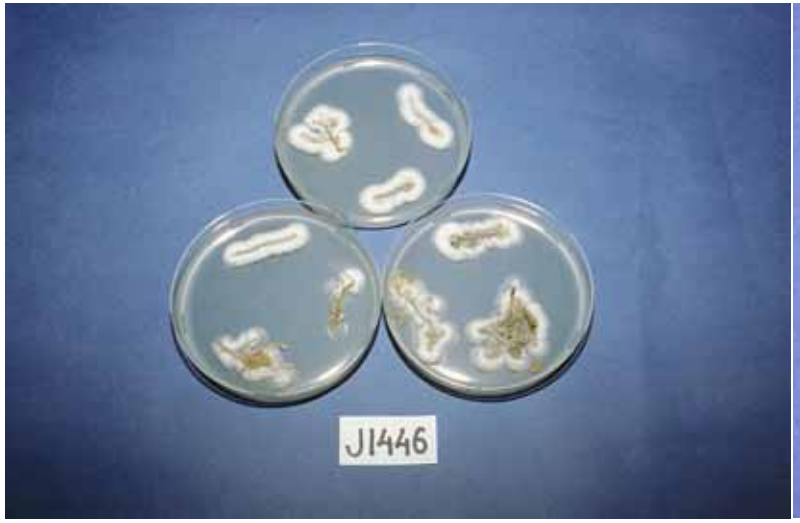
- Isolated from Finnish field soil within a Nordic project on biocontrol of seed-borne pathogens of cereals 1989-93
- Biological activities : between 6 and 30°C
- Able to survive below 6°C and above 30 °C
- Not harmfull to beneficial insects, nematodes or pollinators



***Gliocladium catenulatum* J1446**

Ecological characteristics of strain J1446

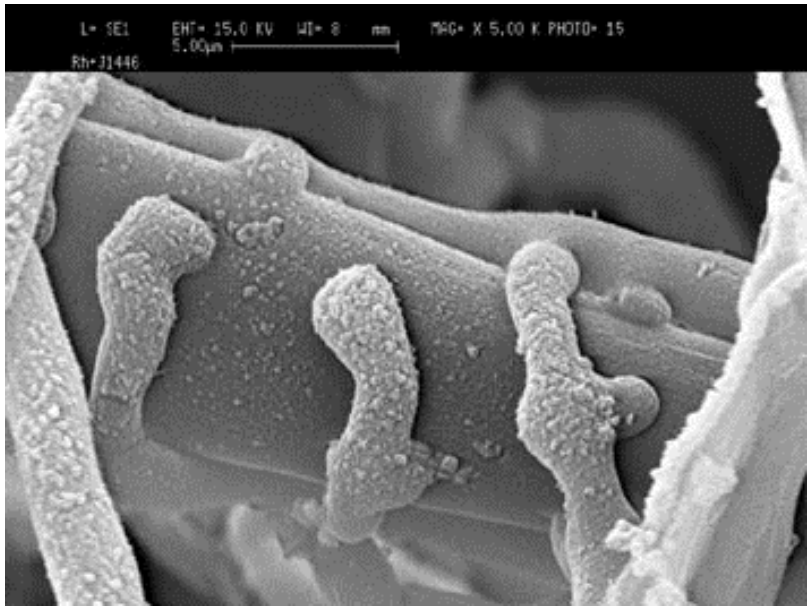
Gliocladium catenulatum J1446 is able to colonize leaf and root surface



G. catenulatum growing on water agar, isolated from cucumber roots.

G. catenulatum growing on potato dextrose agar, isolated from pelargonium leaves.

Modes of action of *G. catenulatum* J1446



Various modes of action are involved

- Hyperparasitism seems to play an important role :
  - Detection of enzyme activities
  - Observation of mycelium interaction
- Competition for nutrients and space
  - Colonization of root and foliar surfaces
- Antibiosis not shown

Weak probability of development of pathogen resistance

The compatibility between *Gliocladium catenulatum* and chemical pesticides

In vitro

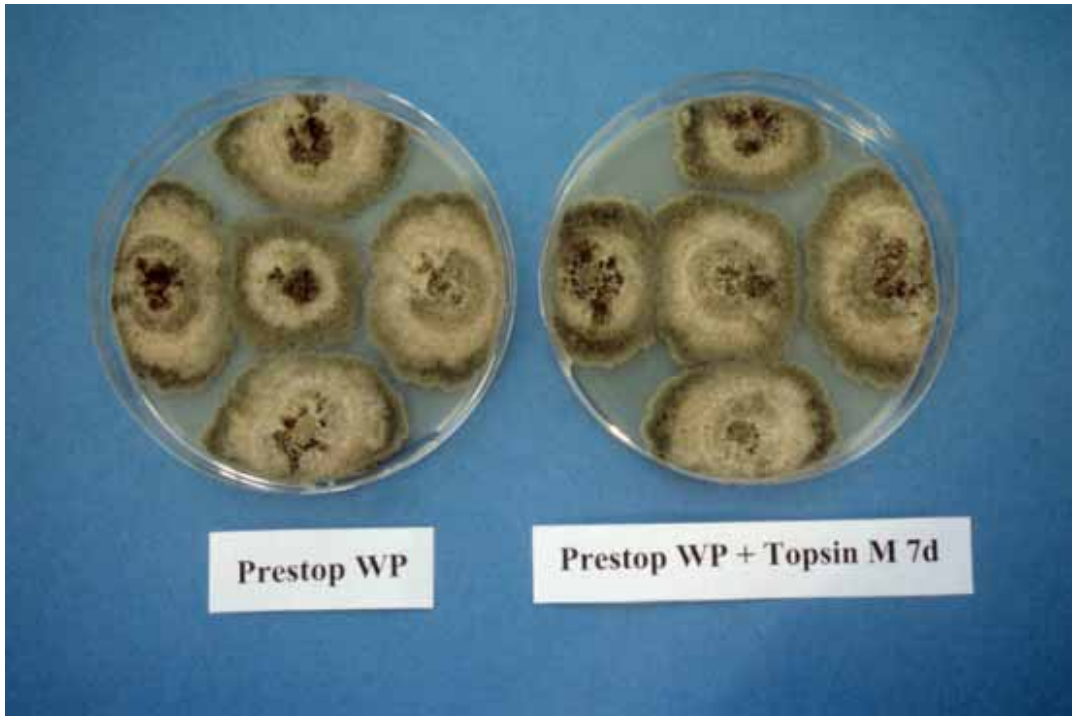
Teldor
(fenhexamid)

Switch 62.5 WG
(cyprodinil and fludioxonil)

The compatibility between *Gliocladium catenulatum* and chemical pesticides

In vivo

Full compatibility with Topsin M (tiophanate-methyl) on cucumber when sprayed at the same day



Compatibility between *Gliocladium catenulatum* and fungicides

Active ingredient	Examples of commercial name	Interval (days)
Azoxystrobin	Amistar	2
Benomyl	Benlate	4
Boscalid et krésoxim-méthyl	Collis	0
Bitertanol	Baycor	2
Carboxin	Cadan, Oxalin, Vitavax	4
Fenhexamide	Teldor	0
Fludioxonil-cyprodinil	Switch	4
Guazatine	Panoctine	2
Hymexazol		7
Imazalil	Fungaflor	2
Iprodione	Chipco Green 75WG / Rovral	4
Krézoxym-méthyl	Stroby, Candit	0
Mancozep	Dithane, Mancozeb	4
Mépanipyrim	Frupica	0
Métalaxyl-M		0
Myclobutanil	Systhane 24 EC	0
Penconazole	Topenco , Topas 100 EC	1
Phosétyl-aluminium	Aliette	0
Prochloraz	Sportak 45 HF	7
Procymidone	Fortress 500	0
Propamocarp Hydrochloride	Previcur® Energy, Previcur N®	0
Propiconazole + prochloraz	Basso	7
Pyraclostrobin+boscalid	Signum	2
Pyriméthanil	Scala	1
Sulfur		0*
Thiophanate méthyl	Topsin M	2
Toclofosmethyl	Rizolex	2
Thiram	Thirame, TMTC, TMTD	4
Triadiméfon	Amiral, Baylaton	0
Triadiménol	Baytan	2
Triforine	Funginex	2
Trifloxystrobin +propiconazole	Stratego	4
Triflumizole		0
Vinclozolin	Ronilan	4

Compatibility between *Gliocladium catenulatum* and insecticides

Active ingredients	Days
Bacillus thuringiensis	0
Beauveria bassiana	0
Buprofezin	0
Cypermethrin	2
Deltamethrin	0
Diazinon	0
Fenbutatin oxide	2
Malathion	0
Metharizium anisopliae	0
Mevinphos	0
Permethrin	2
Pirimicarb	0
Pyrethrins	0

USES in CONVENTIONAL, IPM and ORGANIC CROPS

1. **Treatments of substrates against *Pythium, Phytophtora, Rhizoctonia, Fusarium***

2. **Treatments of vegetable, ornamental and aromatic plants, against *Pythium, Phytophthora, Rhizoctonia et Fusarium***

3. **Treatments against black rot of cucumbers (*Didymella*)**

4. **Treatments against grey mould caused by *Botrytis* on tomatoes, green pepper, cucumbers, strawberries, and ornamental plants**

Biological activity of *Gliocladium catenulatum* strain J1446 with Prestop® formulation

Foliar diseases

Prestop® on tomatoes against *Botrytis cinerea*

- In the Netherlands and Belgium, annual crop losses in spring and autumn (up to 25%)
- Airborne spores always available
- Growth conditions:
  - high moisture (> 87%)
  - weak plant tissues (pruning wounds)

Trial in 2008 : Prestop® on tomatoes against *Botrytis* (spraying on stems)

- Protocol :
  - Tomato crop – 25 weeks old
  - The rate of Prestop® was 100 g suspension per 1000 plants (20ml per stem) per application
  - Three times replicated (wk 42, 44, 46)
  - Pruning wounds preventively treated by spraying the stems and then inoculated with *Botrytis* spore suspension
  - Treated wound covered during 48 hours
  - Lesion development on wound

UR, Wageningen, Nederland, Autumn 2008

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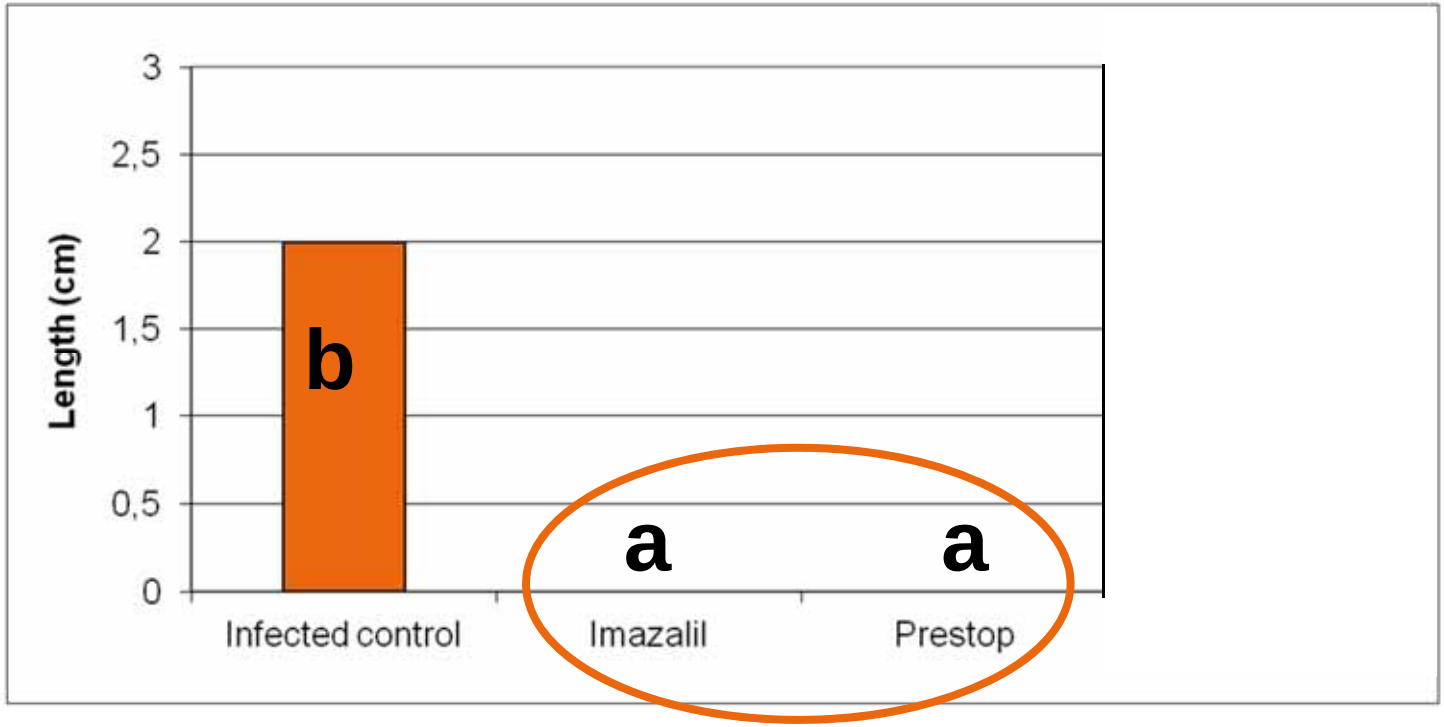
Trial in 2008 : Prestop® on tomatoes against *Botrytis* (spraying on stems)

Results

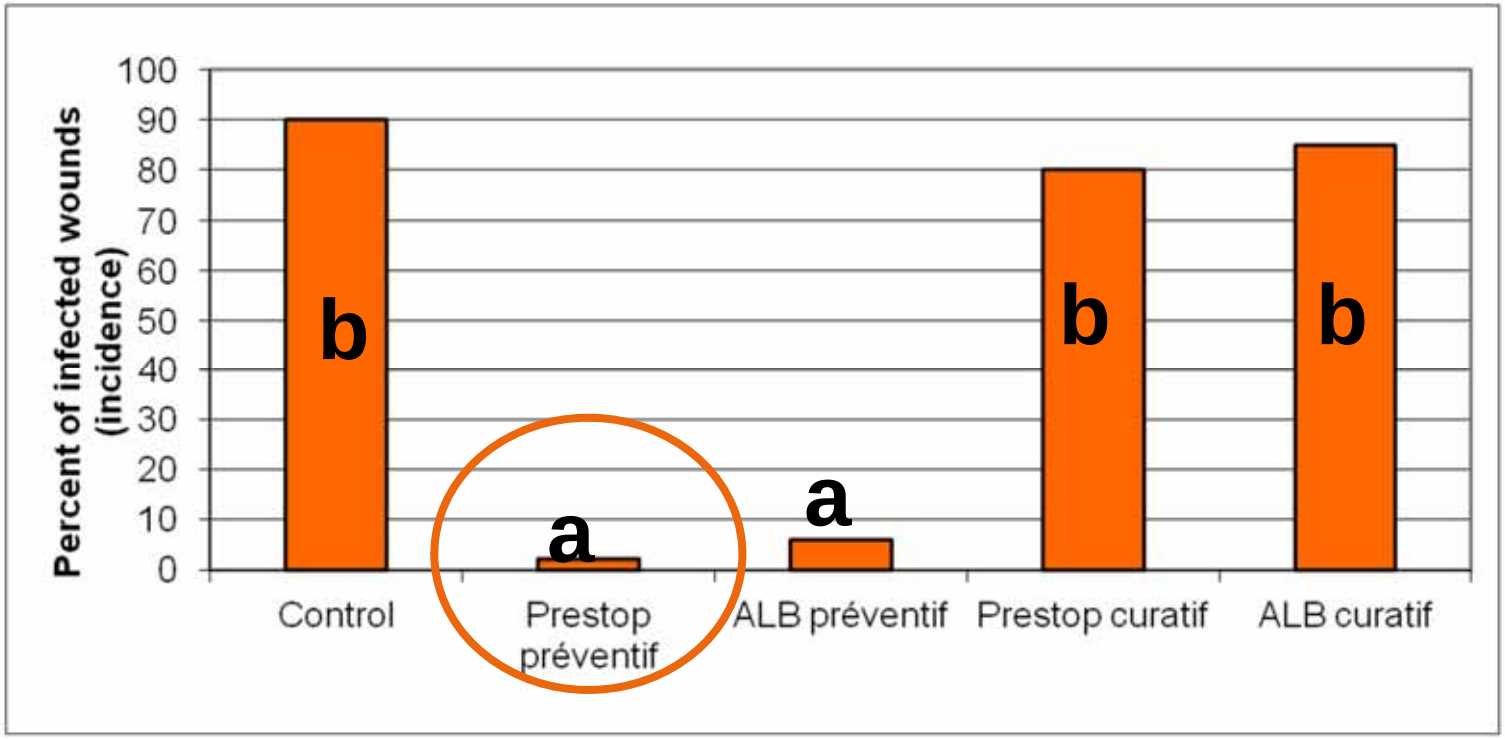


Preventive application of Prestop = Total protection like chemical treatement

UR, Wageningen, Nederland, Autumn 2008

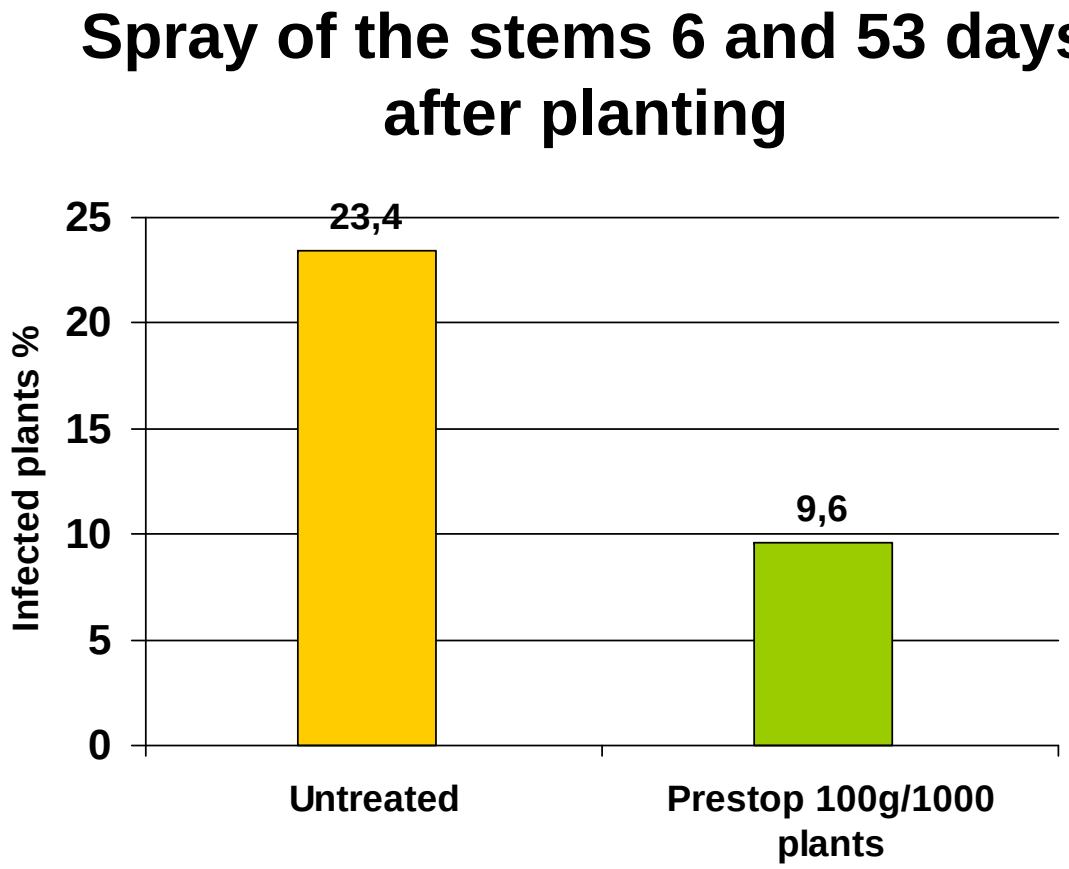
Trial in 2011 : Prestop® on tomatoes against *Botrytis* (spraying on wounds)

Results



IWT, Belgium, 2011

Prestop in the control of gummy stem blight of cucumber (*Didymella/Mycosphaerella*)



Trials in 2011 and 2012 : Low volume spraying of Prestop® in foliar treatment of tomatoes

- LV-spraying (fine fog) was used in a commercial tomato cultivation in Holland
- The pressure was 6 bars and the solution was pumped through a filter-nozzle combination

- An excellent colonization of *Gliocladium* in the foliage was observed after LV-spraying:
  - *Gliocladium* index (0-3) in larger leaves: average **2.8**
  - *Gliocladium* index (0-3) in smaller leaves: average **2.8**

- No observation of *Botrytis* (*in vitro* and in the greenhouse)

Tomato producers, Nederland, 2011 and 2012

Novel applications on grapevine

- Trials in 2010 and 2011 in Austria by Kwisda
  - 2010 : test at 5 kg
  - 2011 : test at 1 kg and 2 kg with or without copper

1.	Untreated Check			
2.	Switch WG cyprodinil 375 g/kg +fludioxonil 250 g/kg	1	kg/ha	BCD
3.	Frupica Opti WG mepanipyrim 500, g/kg	0,8	kg/ha	BCD
4.	PRESTOP	1	kg/ha	BCD
5.	PRESTOP	2	kg/ha	BCD
6.	PRESTOP + Cu^{++}	1	kg/ha	BCD
7.	**PRESTOP**	**1**	**kg/ha**	**ABCD**

A … mid flowering BBCH 65-67
B … Berries beginning to touch, BBCH 77 (36 and 22 DA-A)
C … Begin of ripening, BBCH 79- 81 (15 and 33 DA-B)
D … Softening of berries, BBCH 85 (31 and 8 DA-C)
Water volume: 500 and 1000 L/ha.

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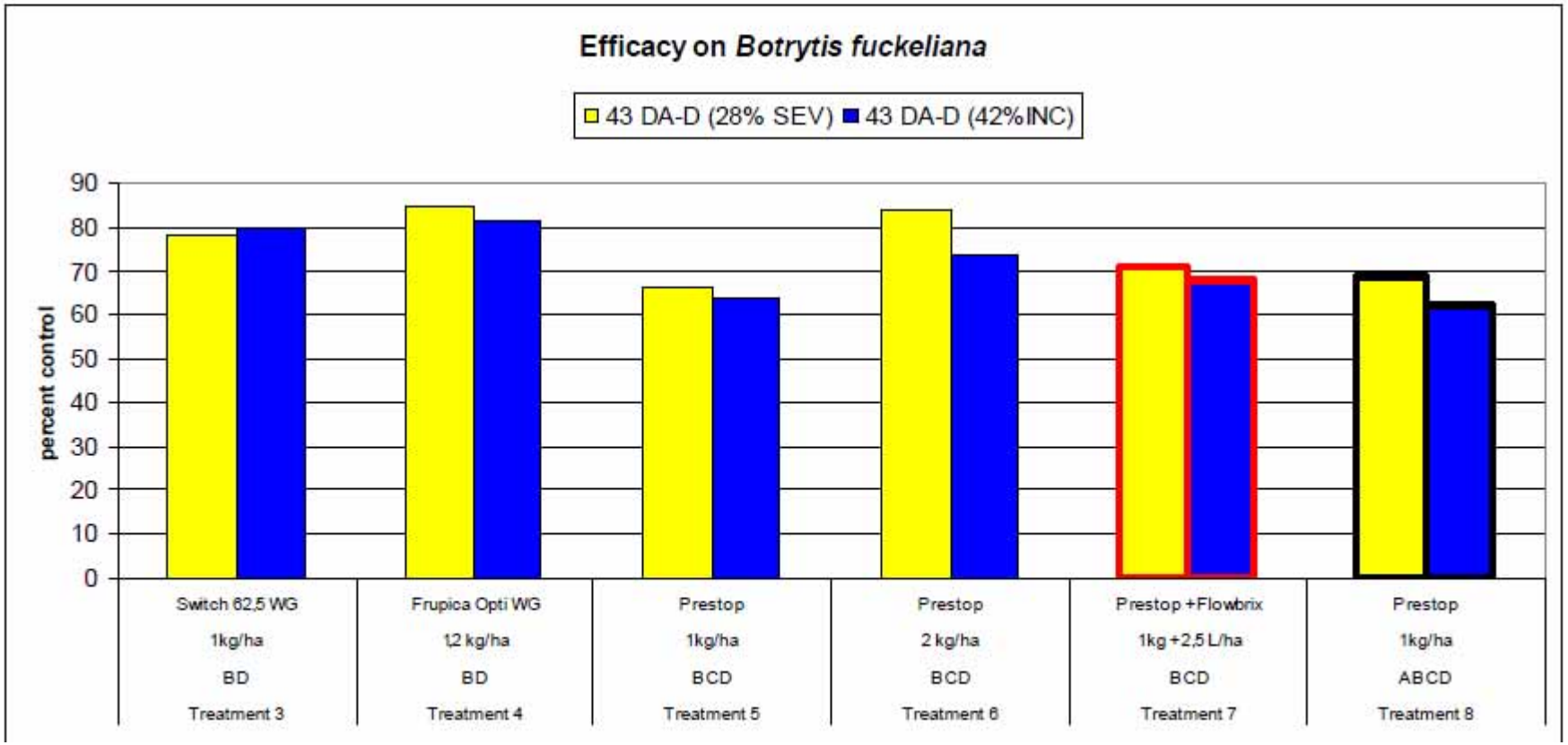
Control of grapevine grey mould : 1st site

Trial Location: Styria/AT
Variety: Zweigelt

Kwisda experiment

Application	A	B	C	D
Date	15.06.2011	07.07.2010	09.08.2011	17.08.2011
BBCH	67	77	81	85
Frupica		x	x	x
Switch		x	x	x
PRESTOP	(x)	x	x	x



Control of grapevine grey mould : 2nd site

Kwisda experiment :
Similar results with Zweigelt variety in Lower Austria

Biological activity of *Gliocladium catenulatum* strain J1446 with Prestop® formulation

Root diseases

Pythium, Phytophtora,
Rhizoctonia, Fusarium

Prestop® in the control of root diseases on sweet pepper, applied via drip irrigation

Trial 15/01

Prestop in the control of damping off (*Pythium* and *Rhizoctonia*), 6 weeks after sowing

Control

Prestop by drenching 10g/m²

Prestop® spraying on *Pelargonium* infected by *Phytophtora*

Peat

Phytophthora

Phytophthora + Prestop WP

Potting soil

Phytophthora

Phytophthora + Prestop WP

Methods of applications

- Application methods for root and foliar diseases :
  - Spraying of the growing medium →

  - Incorporation in the liquid solution for hydroponic cultures and drip irrigation

  - Spraying with standard equipement at normal and low volume (LV-spraying system)
  - Spray the pruning wounds with a small hand-sprayer against *Botrytis* on tomatoes

Conclusions:
Gliocladium catenulatum strain J1446 as a biocontrol agent

- Strain J1446 controls several root diseases as well as foliar pathogens on vegetable, fruit, ornemental and aromatic plants

- Strain J1446 is compatible with many other plant care products
- Prestop is registrated in American and European countries
- Prestop is widely used in greenhouse and more and more in field
- Formulation is adapted to standard and alternative systems of application

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Thank you for your attention