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Aureobasidium pullulans
an effective Yeast for biocontrol

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history

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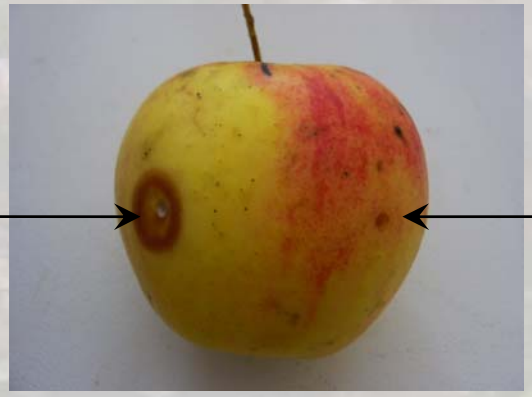
LS Phytopathologie, University of Konstanz

- approx. 500 microorganisms were screened for efficiency against apple decay

(Schiewe und Mendgen 1992; Falconi 1993; Schiewe 1993; Falconi und Mendgen 1994)

pathogen



test strain + pathogen

Botrytis cinerea
Penicillium expansum
Monilia fructigena
Pezicula sp. (Gloeoaporium)

field trials

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IP-orchard

Golden Delicious

Treatment: 5, 3, 1 weeks before harvest

Yeast $1x10^7$ /ml ; bacteria $1x10^8$ /ml

CF10	**Aureobasidium pullulans**
CF40	**Aureobasidium pullulans**
Cf35	Rhodutorula glutinis
HG77	Bacillus sp.
AG704	Bacillus sp.
M1	CF10, CF40, CF35
M2	CF10, HG77,AG704

Leibinger, W., B. Breuker, M. Hahn und K. Mendgen (1997). Phytopathology 97: 1103-1110.

TABLE 2. Diseased apples and infections per apple after 6 months of cold storage[t]

Treatment	1993/1994 Diseased apples[u] (%)	1993/1994 Infections per apple[v]	1994/1995 Diseased apples[u] (%)	1994/1995 Infections per apple[v]
Control	5.6 a[w]	0.142 a	9.9 a	0.176 a
Euparen[x]	2.6 b	0.034 b	6.1 b	0.081 b
Mixture M1[y]	3.1 b	0.041 b	6.2 b	0.101 b
Mixture M2[z]	3.5 b	0.051 b	7.4 ab	0.106 b

[t] Apples were incubated in cold storage and evaluated regularly for disease symptoms for up to 6 months. Most infections were caused by *Pezicula* spp., *Penicillium* spp., and *Monilinia fructigena*.
[u] Values are expressed as percentage of diseased apples in each treatment.
[v] Values are expressed as the average number of infections per apple in each treatment.
[w] Statistical comparisons were made only within the same column. Values with the same letter are not significantly different ($\alpha = 0.05$).
[x] Dichlofluanid.
[y] Mixture M1 = *Aureobasidium pullulans* strains CF10 and CF40 and *Rhodotorula glutinis* strain CF35.
[z] Mixture M2 = *Bacillus subtilis* strains AG704 and HG77 and *Aureobasidium pullulans* strain CF10.

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development of biocontrol agents

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- production procedure
- formulation
- field trials
- registration

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Boni-Protect®

Pfanzenstärkungsmittel (LS 005320)

- **Ingredients**
  5x 10^9 cfu/g *Aureobasidium pullulans* on a carrier
- **Application rate**
  0.5 kg/ha*m crown height (0,1%)
- **Timing**
  Treatments are recommended 1, 3 and 5 weeks before harvest.

  Replacement of the last treatments with chemical fungicides

=> Reduction of chemical residues on the fruits

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field experiments

cultivar Cox-Orange

Treatment	2002	2003	2004	2005
Boni-Protect **Boni-Protect +** Düngal-Ca	07.08. 19.08. 05.09. -	30.07. 11.08. 25.09. -	10.08. 23.08. 07.09.	17.08. 01.09. 09.09.
Chemical Standard	05.08. Du Pont Benomyl	26.07. Flint, Düngal-Calcium 15.08. Flint, Düngal Calcium	05.08. Malvin 17.08. Flint, Düngal-Calcium 28.08. Euparen, Düngal-Calcium	08.08. Merpan 80 WG 28.08. Euparen, Düngal-Calcium
Harvest	11.09.	09.09.	14.09.	19.09.
Rating	27.11.	20.11.	22.11.	01.12.

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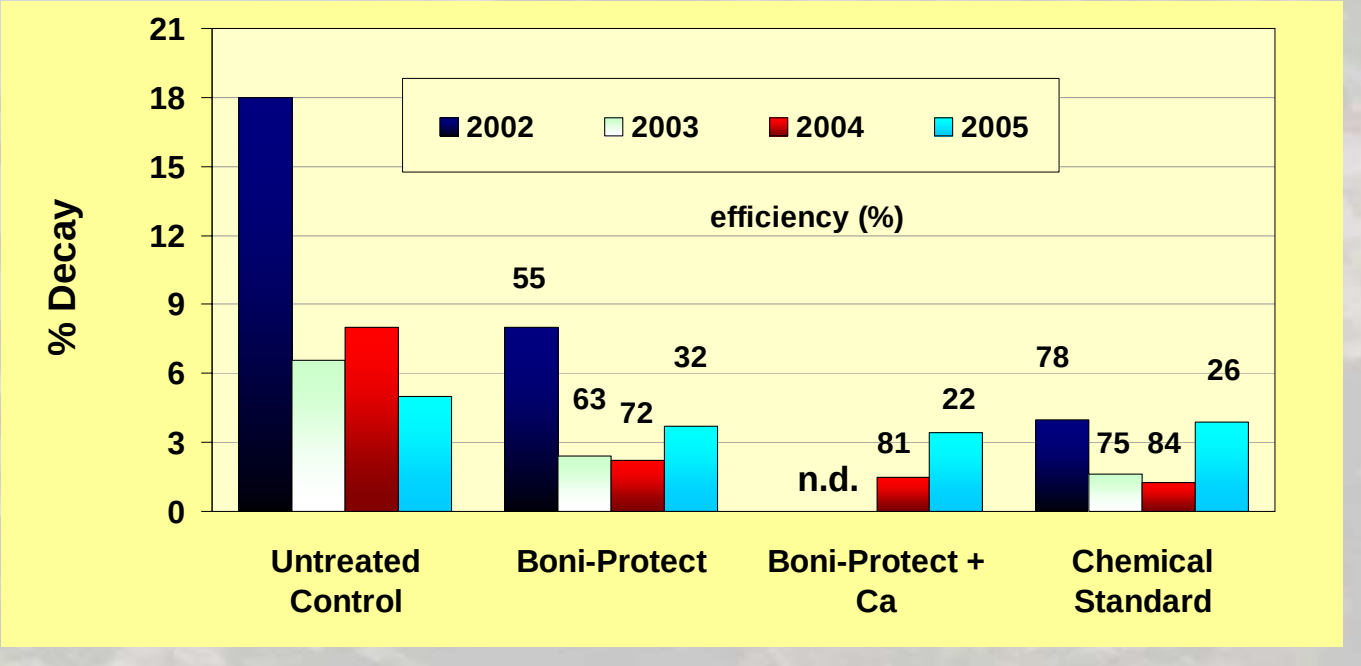
field experiments



Mögel, G., and S. Kunz. 2006. Vier Jahre Praxisversuche mit dem Hefepräparat Boni-Protect. *Obstbau* 31 (9):468-470.

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fire blight

in vivo test system

1x10^6/ml *E. amylovora*

test preparation

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Blossom-Protect

Pfanzenstärkungsmittel (LS 006158)

- **Ingredients**

  Component A: buffer substances to maintain a low pH

  Component B: 5x 10^9 cfu/g *Aureobasidium pullulans*

- **Application rate**

  6.0 kg/ha*m crown height (1.2 %)

- **Timing**

  - Treatments are recommended when 10%, 40%, 70% or 90% of the blossoms are open
  - 1 day before conditions for fire blight infections will be fulfilled

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fire blight field experiments

Germany 2002-2006: (EPPO guide line PP1/ 166 (3))

	Symptom reduction [%]
Blossom-Protect	76 % ± 11 (6 field trials)
Antibiotic (Streptomycinsulphate)	82 % ± 8 (10 field trials)
Compared agent (*Bacillus subtilis*)	51 % ± 9 (7 field trials)

Fried, A. (2002), Obstbau, 27, 551-555
Fried, A., et al. (2004), Obstbau, 29, 161-164
Kunz, S., et al. (2004), Oekoobstbau, 2-7
Scheer, C., et al. (2005), Obstbau, 30, 122-127;

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in the development

Boni-Protect® forte

- strawberries
  - ➢ higher yield, longer shelf life
- plums
  - ➢ higher yield, longer shelf life
- sour cherries
  - ➢ reduction of brown rot blossom blight incidence

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Aureobasidium pullulans

- Boni-Protect®
  - postharvest diseases of apple
- Blossom-Protect
  - fire blight
- Boni-Protect® forte
  - *B. cinerea* in strawberries and brown rot (*Monilia sp*.) in stone fruits

Distributors:
Biofa AG; D-72525 Münsingen
Bioferm GmbH; A-3430 Tulln
Andermatt biocontrol AG: CH-6146 Grossdietwil

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thank you

- Prof. Mendgen, University of Konstanz
- G. Mögel, M. Schwarz, M. Hinze, A. Weiß

partly funded by
MlR Baden-Württemberg (0288E; 0288F)
BMBF (FKZ: 0311785;0313194 A)
AIF (KA 0027001 ARF 1)