

bio-ferm GmbH

bio-ferm is part of the ERBER Group

postharvest product for Citrus

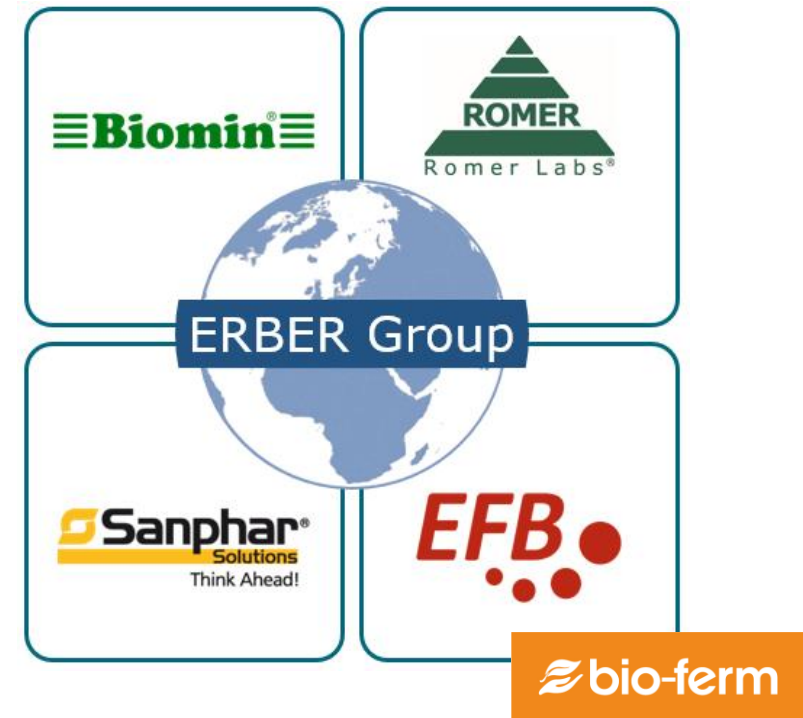
bio-ferm is part of the Austrian family-owned

ERBER Group

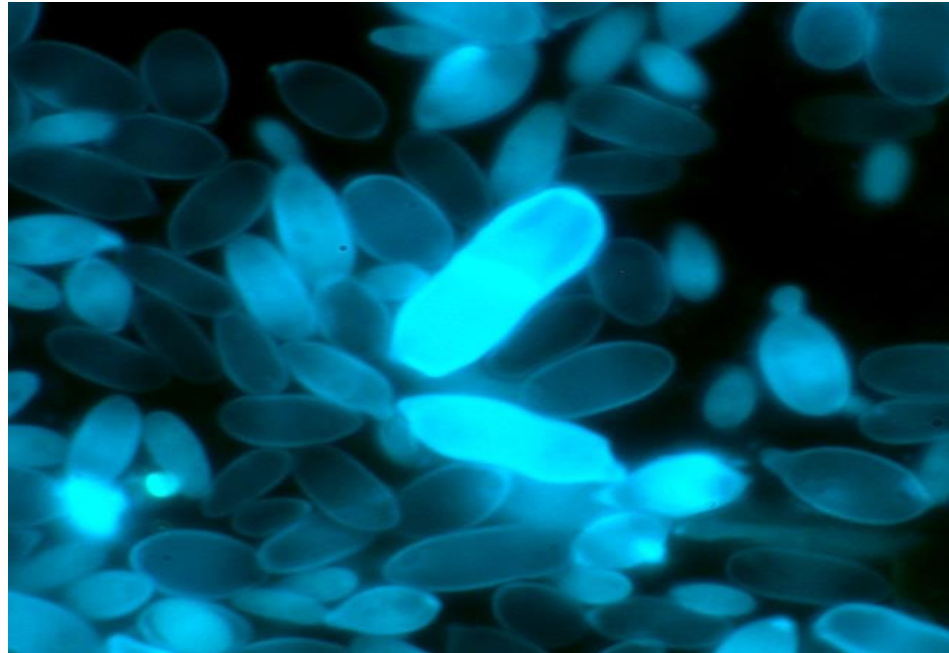
- more than 50 branches
- active in almost 100 countries worldwide
- more than 1.600 employees
- turnover > 300 Mio EUR

- bio-ferm is working on the international product registration and marketing of innovative biotechnological plant protection products.
- Mode of action: Microorganisms isolated from nature act as antagonists and prevent the infection by pathogens

- The advantages of our products are obvious:
 - no chemical residues
 - no resistances
 - non-GMO production
 - registered for IP and organic growing systems



Aureobasidium pullulans, DSM 14940 and DSM 14941



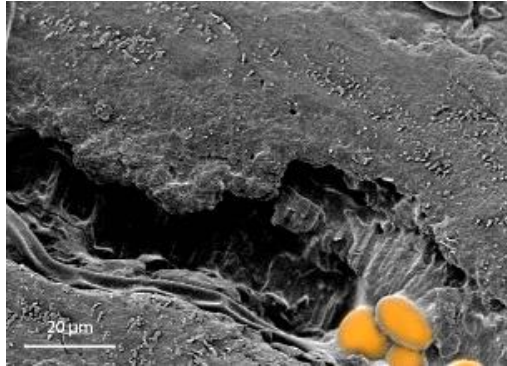
***Aureobasidium pullulans* DSM14940 and DSM14941**

- two strains as active substances in all bio-ferm products

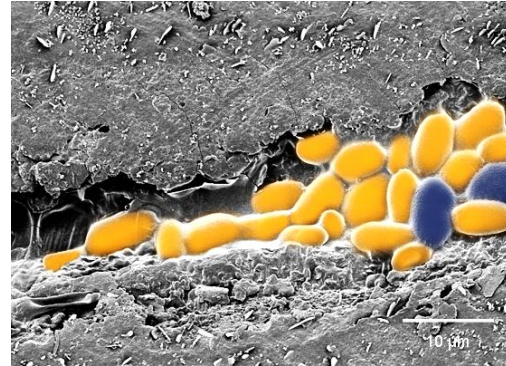
Ascomycete, asexual, yeast-like reproducing cells (blastospores)



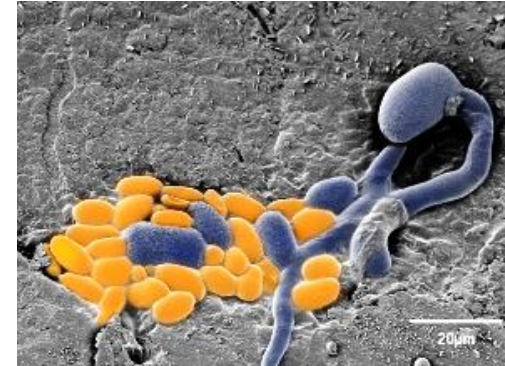
Mode of Action: Antagonism – competition for space and nutrients



1. Micro scratches on the fruit surface represent natural entrances for the pathogen. The scratches are colonized by *Aureobasidium pullulans* immediately after application of Botector® . (Picture: Mendgen).



2. Due to the high proliferation rate of *Aureobasidium pullulans* the pathogen cannot infect the plant . (Picture: Mendgen).

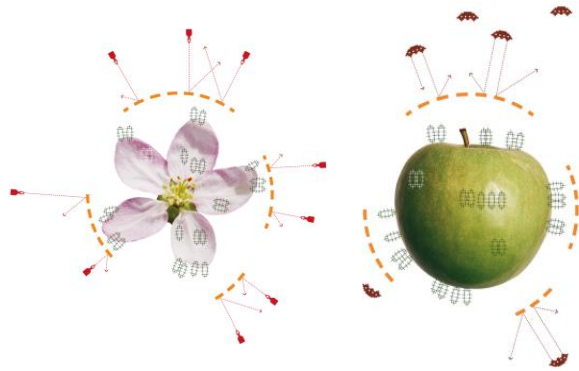


3. The micro scratch is completely colonized with *Aureobasidium pullulans*. Botector® acts as a natural shield which protects grape bunches from infection with *Botrytis cinerea* (Picture: Mendgen).

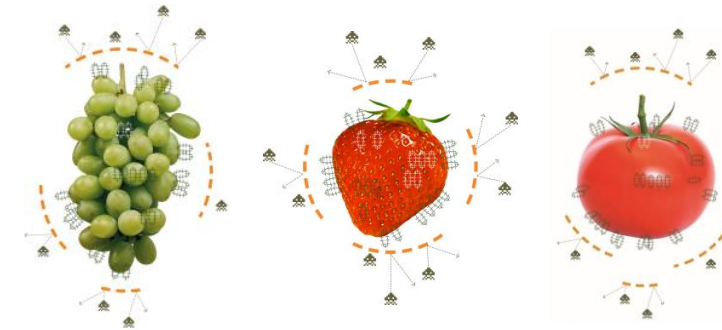
- *Aureobasidium pullulans*
- pathogen

Two Plant Protection Products for preharvest application (PHI 0):

Blossom Protect™
Fire blight, storage diseases



Botector®
Botrytis



Plant Protection Product Registration:

- EU Annex I inclusion 2014 (AT, DE, SI, HU, SK, HU, PL, IT, ES, PT, GR, FR, BE, NL, LU)
- USA, Turkey, Israel, Morocco, Tunesia, Australia, Switzerland, Canada
- Pending: Chile, New Zealand, UK

postharvest diseases in citrus

Penicillium italicum

blue mold



Penicillium digitatum

green mold



Geotrichum candidum

sour rot



- Infections via wounds during harvest, storage and processing in packinghouses
- Control by postharvest fungicides (imazalil, pyrimethanil, fludioxinil)
 - => residues
 - => fungicide resistance

Aureoshield, bio-ferm postharvest product

Biotechnological fungicide for control of postharvest diseases in citrus

- Water dispersible granule (WG)
- Active ingredients: 1×10^{10} CFU/g *Aureobasidium pullulans* strain DSM 14940
 1×10^{10} CFU/g *Aureobasidium pullulans* strain DSM 14941

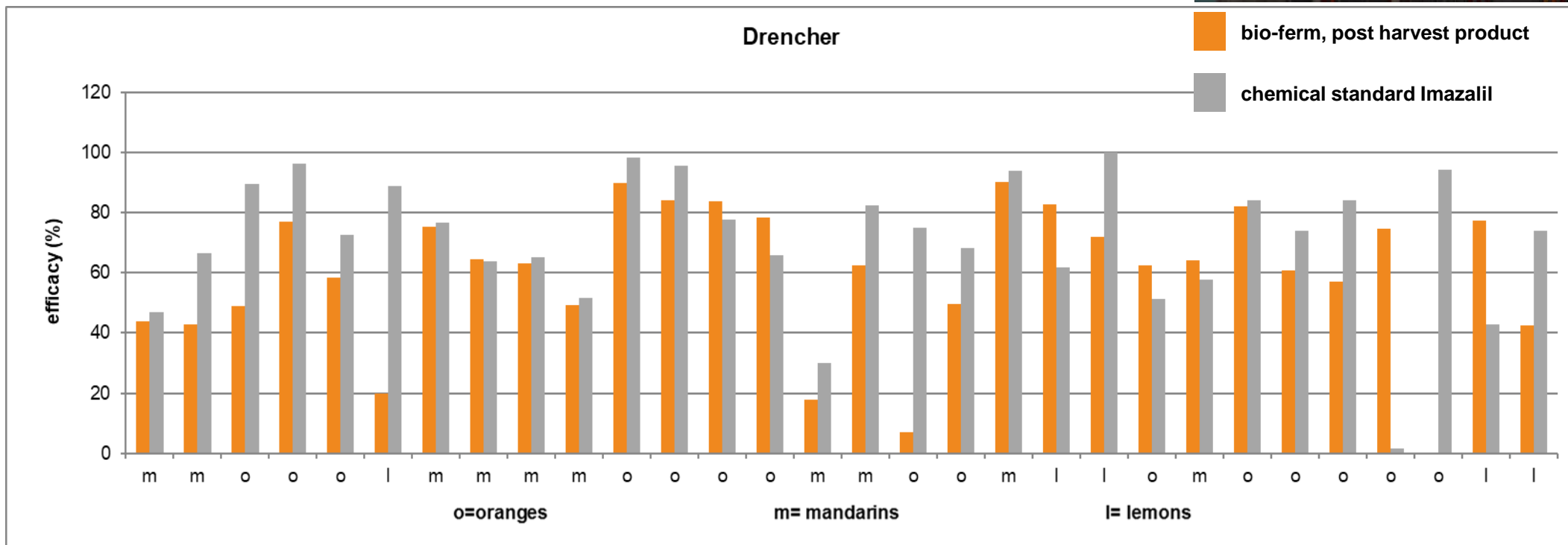
Crop to be treated	Citrus: lemon, mandarine, orange, grapefruit
Disease to be controlled	Postharvest fungi (Penicillium spp.; Geotrichum)
Application rate	2g/L
Application timing	Postharvest treatment
Max. number of treatments	2 (by drenching and spraying)

- Mode of action: preventive antagonist (competition for space and nutrients)
- Product suitable for organic farming according to REG n° 834/2007
- Classification according to the Fungicide Resistance Action Committee (FRAC): FRAC Code: NC.

Registered PPP in USA,
ES, FR, pending: IT

packinghouse trials 2012-2016

Application in Drencher



Drencher

Viability of *A. pullulans* in the drencher



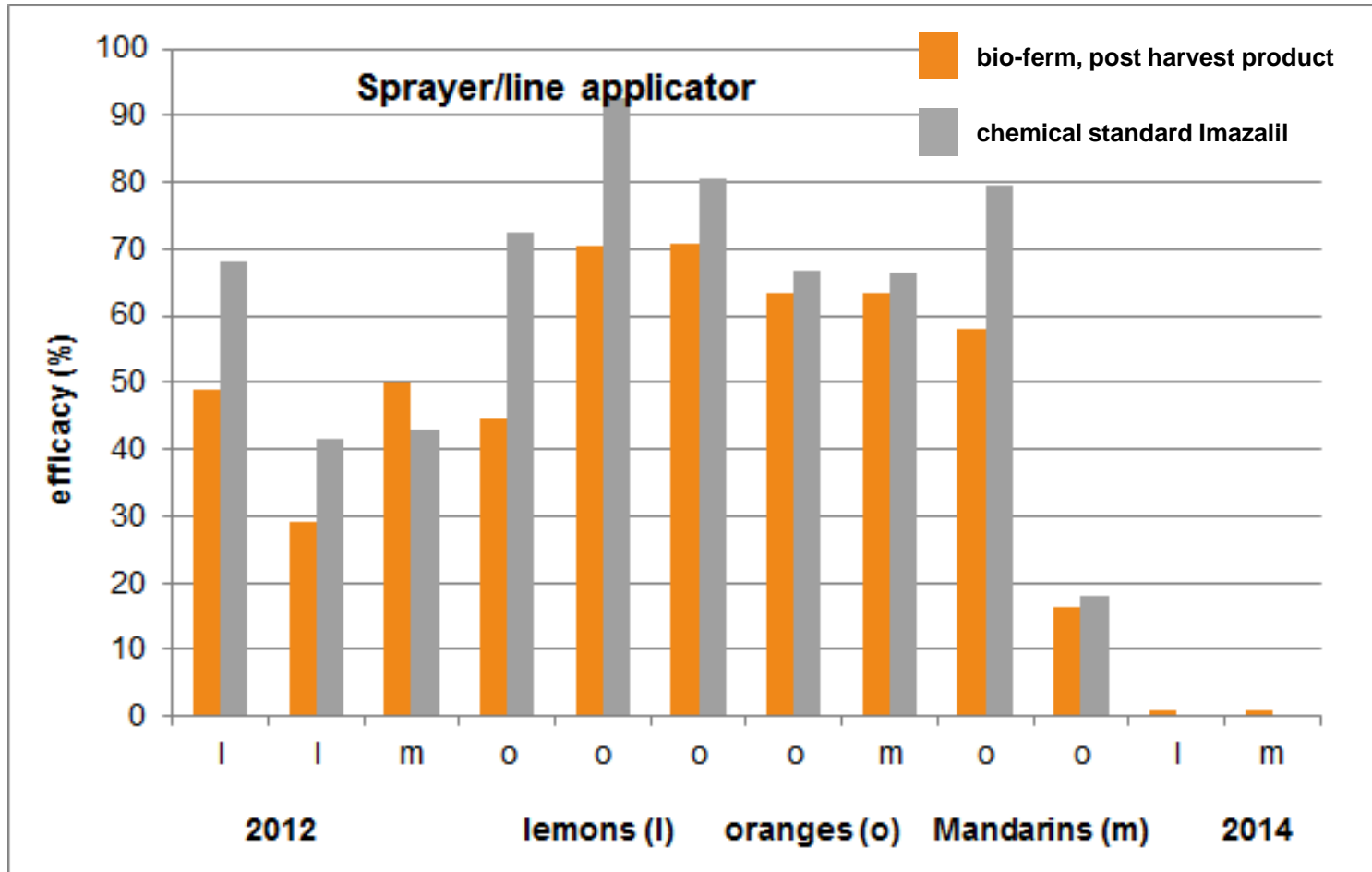
Drencher 2g/L	Temperature	Stirring	max. time suspension can be used [h]
	8 °C	+	72
8 °C	-	48	
20 °C	+	33	
20 °C	-	33	
27 ± 1 °C	+	9	
27 ± 1 °C	-	4	
35 °C	+	4	
35 °C	-	1	

Spraying/line application



packinghouse trials

Sprayer/line applicator



Compatibility

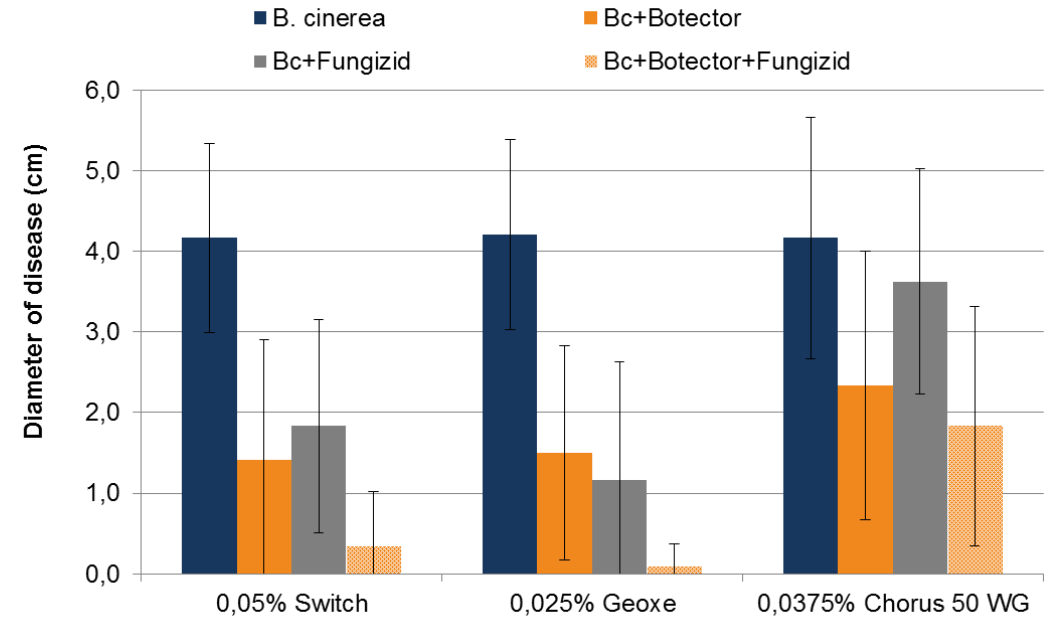
- Laboratory Test:
 - Mixing formulated *A. pullulans* with the recommended dose of the product and 4 fold dose.
 - Incubation for 2 hrs stirring the suspension at room temp.
 - Determination of the colony forming units (cfu) after dilution plating

- [Compatibility List](#) - 315 preparations
 - 155 fungicides
 - 37 insecticides/acaricides
 - 5 bactericides
 - 11 growth regulators
 - 27 additives/wetting agents/ sticker
 - 48 fertilizers
 - 32 plant strengtheners

Synergistic response

Aureobasidium pullulans (Botector) against *Botrytis cinerea* Bc97

Bc97, multiresistant to Strobilurin, Boscalid, Cyprodinil, Fluopyram and reduced sensitivity to Fludioxinil



ANOVA; Tukey Multiple Comparison Test	A	BC	B	C	A	B	BC	C	A	B	AB	B
Efficacy (%)		66	56	92		64	72	98		44	13	56
Synergistic response				1.1				1.1				1.1

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Thank you for your attention

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Leaving foodprints