

Biostimulating bacterial inoculants
to bridge imbalances of intensive
agricultural production systems



***where Nature
leads Innovation***



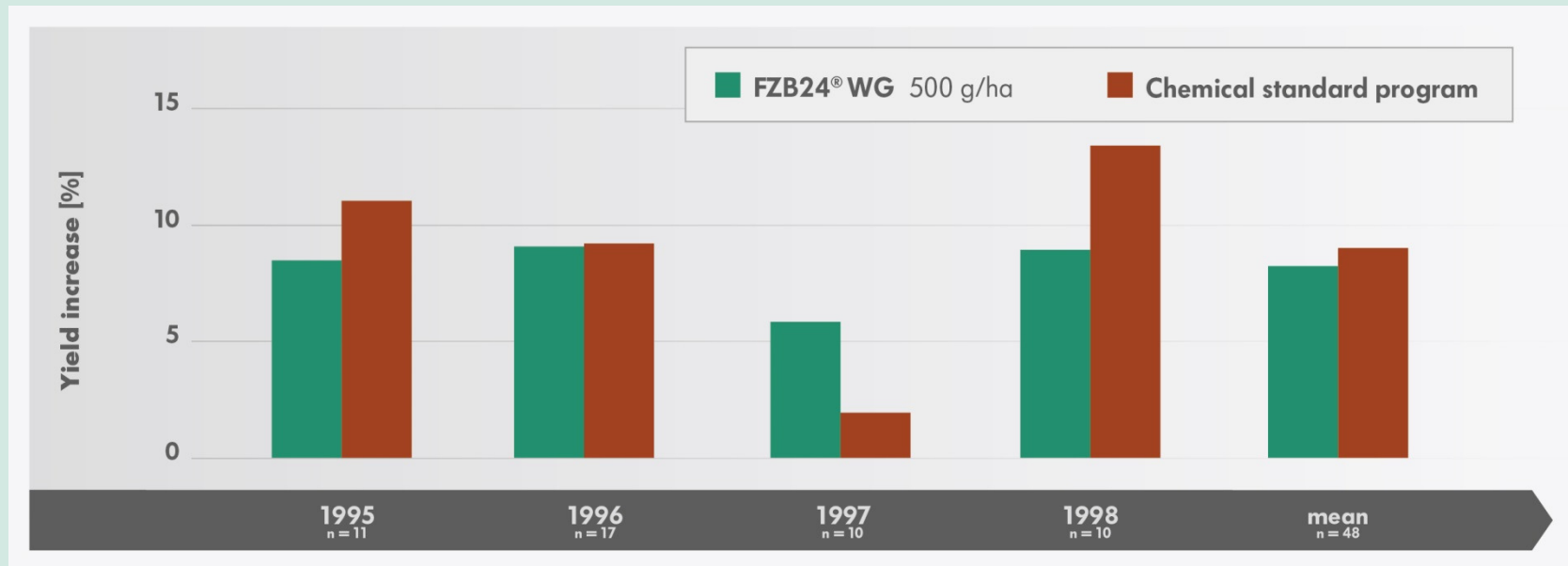
Partnerships in Biocontrol, Biostimulants
& Microbiome Congress: Europe
Rotterdam, 15.05.2018
Simon Fleischli-Zantkuijl

Where Nature leads Innovation



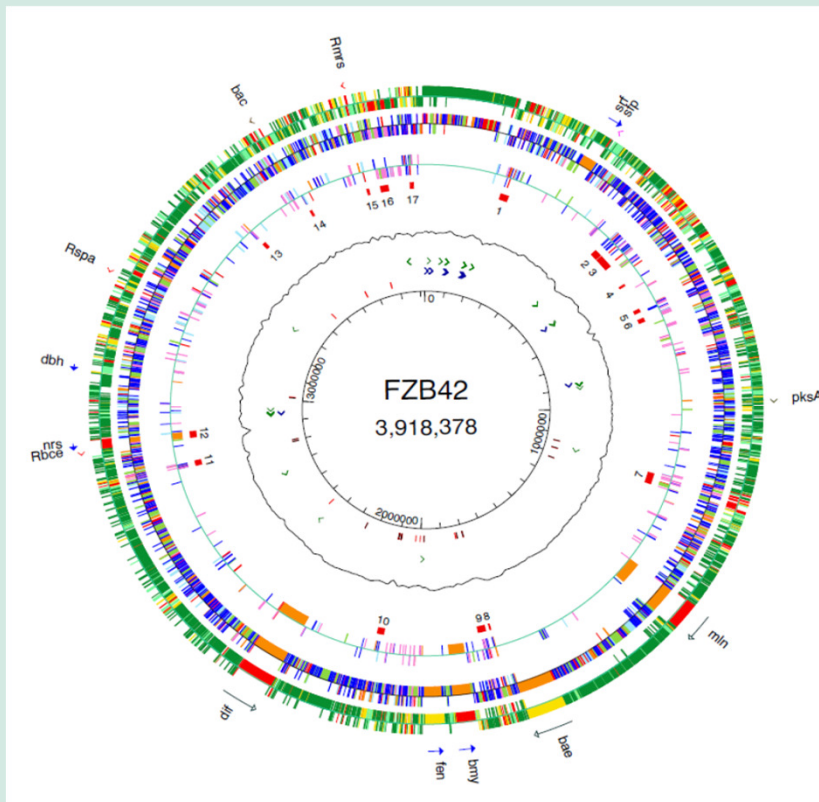
Bacillus on potatoes

Intensive evaluation period 1995 - 1998



(ABiTEP, 1995 -1998)

Bacillus amyloliquefaciens FZB42



A very well studied microorganism

nature
biotechnology

Comparative analysis of the complete genome sequence of the plant growth-promoting bacterium *Bacillus amyloliquefaciens* FZB42

ABiTEP – The innovator



ABiTEP GmbH

- **Company for AgroBioTechnic Development and Production**
 - Established in 2005
- **Expert for Bacillus fermentation and Biotechnology**
- **R&D oriented company with 30+ years experience with agricultural bacteria products**
- **Quality oriented**
 - GMP+B2 / ISO 9001:2015 certified (food grade)



Andermatt Biocontrol – matching partner

- 30 years of experience in biocontrol
- Family- and employee-owned (~150FTE)
- World leader in baculovirus production
- Global distribution network
- Focus on quality and innovation

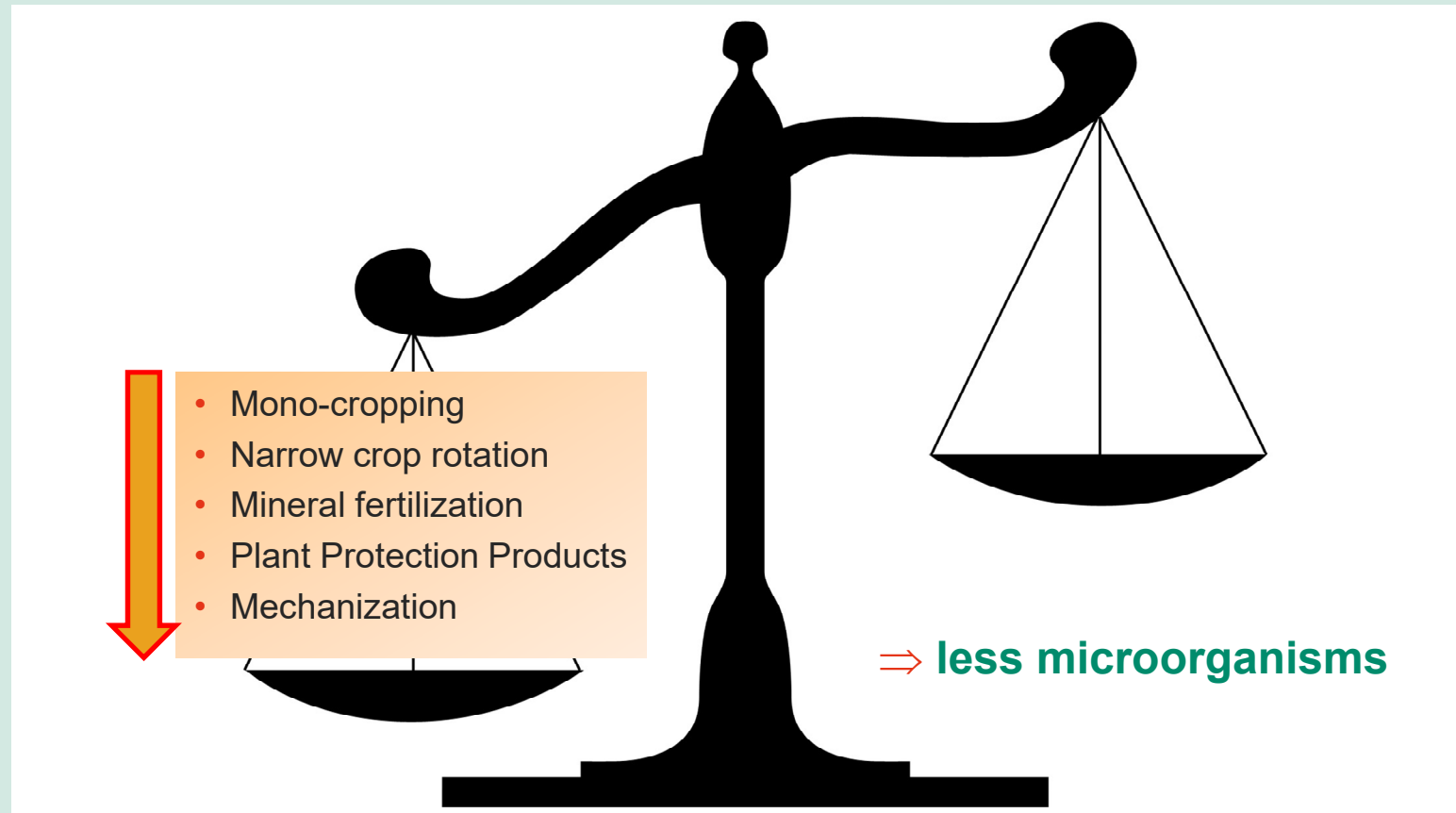
We aim to provide good biological alternatives, to replace chemical pesticides - for the production of safe food in a healthy environment!



Intensive agricultural production systems



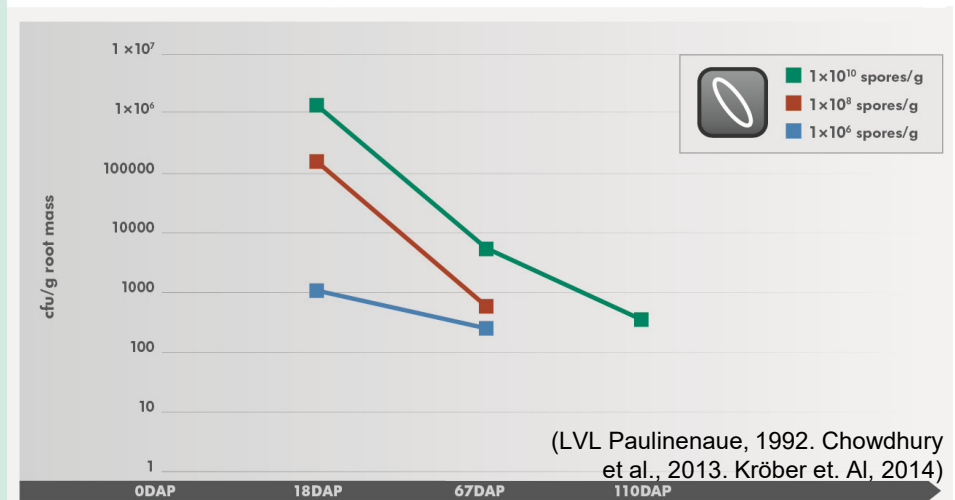
Soil health and intensive agriculture



Temporary shift of the natural equilibrium

Shifting the balance for desired properties:

- **Efficacy:**
 - Root colonization
 - Auxin & Enzyme production
- **Efficiency**
 - Ease of handling
 - Liquid Formulation
 - Compatibility with PPP
 - Logistic flexibility



RhizoVital® biostimulating bacterial inoculants

RhizoVital 42: Bacillus amyloliquefaciens FZB42

RhizoVital C5: Bacillus atrophaeus ABi05

RhizoVital P45: Bacillus amyloliquefaciens FZB45

- $>2.5 \times 10^{10}$ spores per ml
- Easy to store (room temp. 2 years)
- Excellent miscibility with PP-inputs and fertilisers



Biological activity of Bacillus

- Colonises the root zone
- Stimulates root growth and root formation (more fine roots)
- Plant growth stimulation through released auxine-like compounds
- Enhances nutrient mobilisation: biofertilising effects through the activity of different enzymes
- Increases tolerance to unfavourable conditions like abiotic stresses

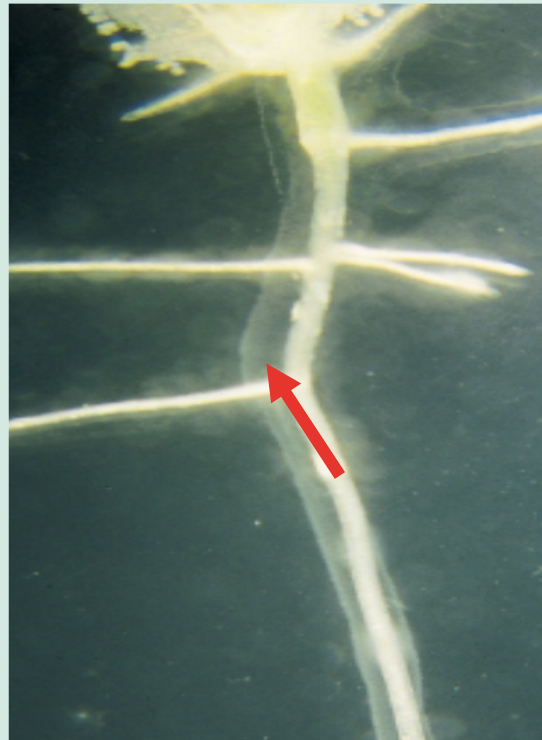


Efficient Colonisation of Plant Roots

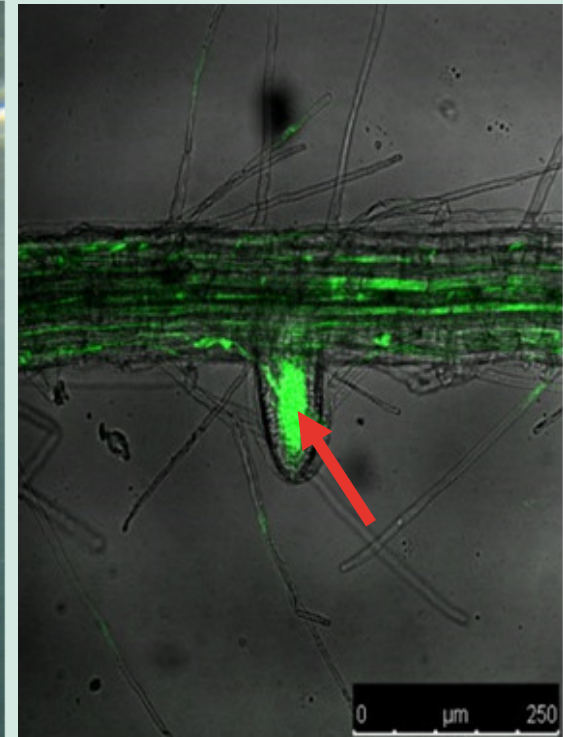
Bacillus amyloliquefaciens



(Zimmermann, HUB)



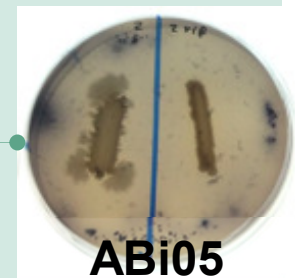
(Thomzik, Bayer)



(Dietel, ABiTEP)

Auxin and Enzyme production

- **Indol acetic acid:** plant hormone
- **Phytase:** mobilizing organic P
- **Siderophore:** mobilizing Fe^{3+}
- **Protease:** break-down of proteins to amino acids
- **Cellulase:** break-down of cellulose
- **Xylanase:** break-down of hemi-cellulose
- **B-Glucanase:** break-down of glucane



ABiTEP, 2017

Effect on early plant development

Bacillus atrophaeus ABi05



Effect on early plant development

Bacillus amyloliquefaciens FZB45



RhizoVital® 42 biostimulating bacterial inoculants

RhizoVital 42: Bacillus amyloliquefaciens FZB42

RhizoVital C5: Bacillus atrophaeus ABi05

RhizoVital P45: Bacillus amyloliquefaciens FZB45

- $>2.5 \times 10^{10}$ spores per ml
- Easy to store (room temp. 2 years)
- Excellent miscibility with PP-inputs and fertilisers
- The field proven standard

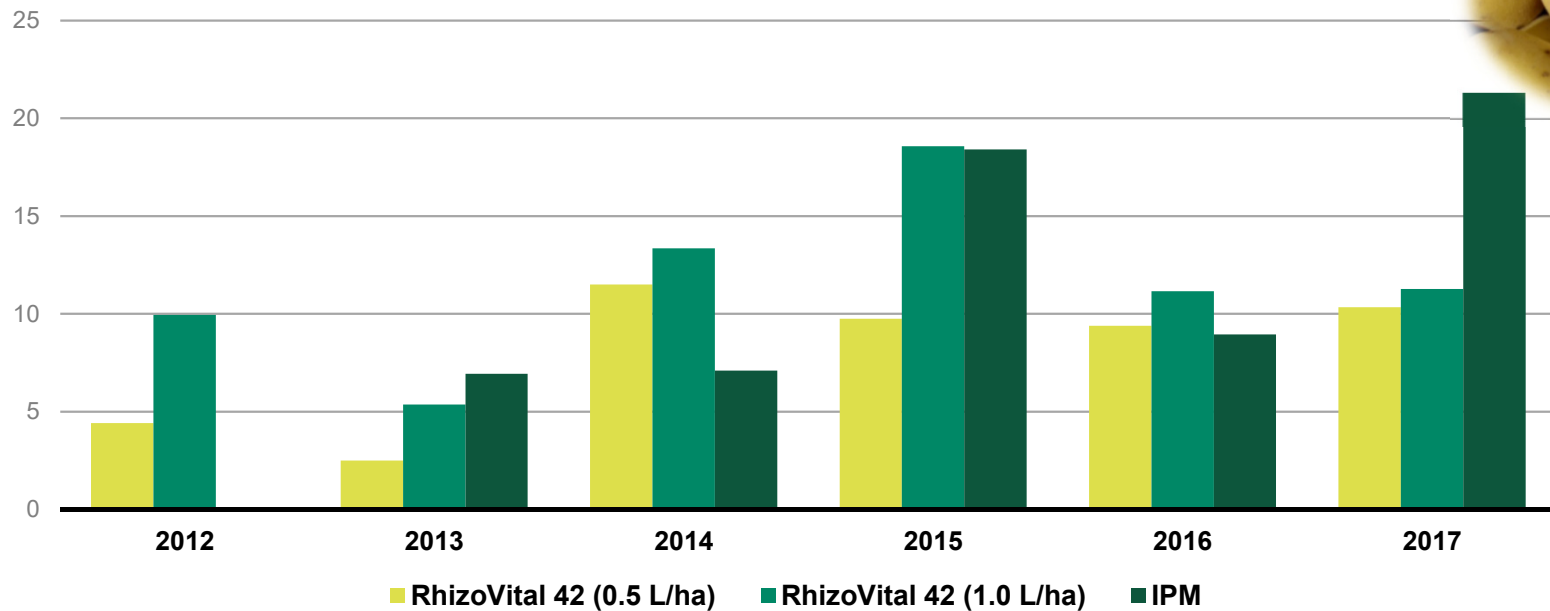


RhizoVital[®] 42 on potato

Effect on yield

% Yield increase on potato

 0 DAP



Yield level control: 2017: 43.7 t/ha; 2016: 59.8 t/ha; 2015: 32.3 t/ha; 2014: 32.4 t/ha; 2013: 32.9 t/ha; 2012: 31.9 t/ha

Variety: 2015-2017: Gala; 2012-2014: Verdi

agro nord, Germany,
2012-2017

RhizoVital® C5 biostimulating bacterial inoculants

RhizoVital 42: Bacillus amyloliquefaciens FZB42

RhizoVital C5: Bacillus atrophaeus ABi05

RhizoVital P45: Bacillus amyloliquefaciens FZB45

- $>2.5 \times 10^{10}$ spores per ml
- Easy to store (room temp. 2 years)
- Excellent miscibility with PP-inputs and fertilisers
- Increased cold tolerance



RhizoVital® C5 – Selected for early growth

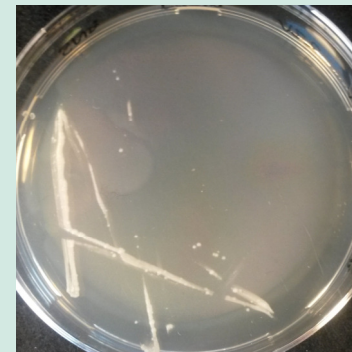
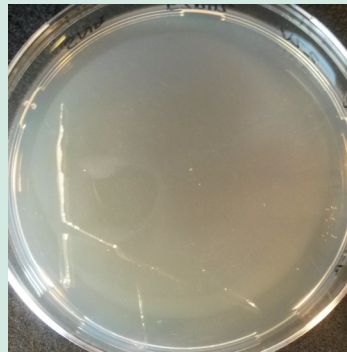
Incubation time at 12°C

3 days

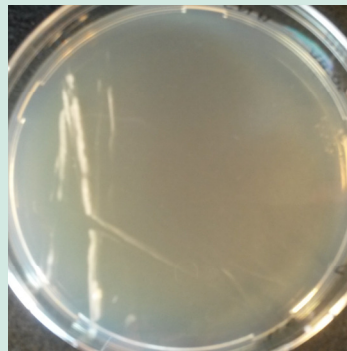
7 days

14 days

Bacillus amyloliquefaciens



Bacillus atrophaeus
ABi05



ABiTEP, 2018

RhizoVital® C5 – Selected for early growth

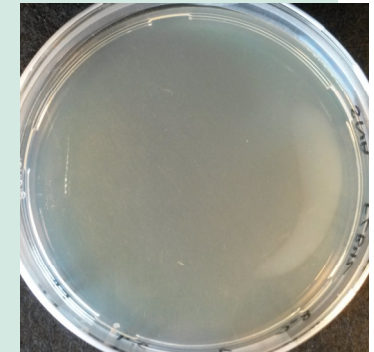
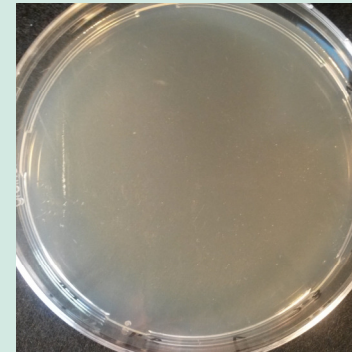
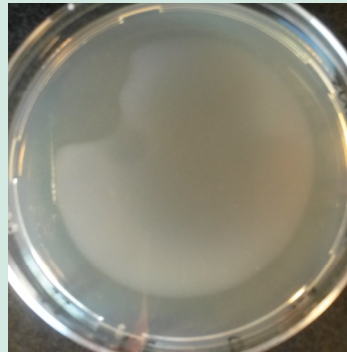
Incubation time at 8°C

3 days

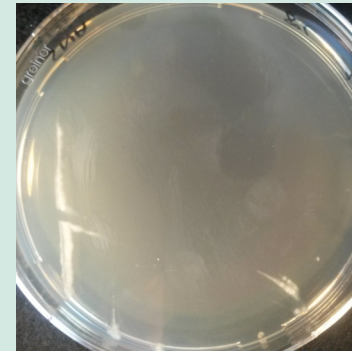
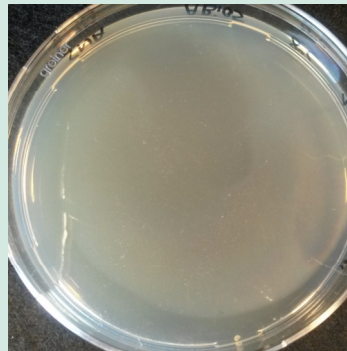
7 days

14 days

Bacillus amyloliquefaciens



Bacillus atrophaeus
ABi05



ABiTEP, 2018

RhizoVital® P45 biostimulating bacterial inoculants

RhizoVital 42: Bacillus amyloliquefaciens FZB42

RhizoVital C5: Bacillus atrophaeus ABi05

RhizoVital P45: Bacillus amyloliquefaciens FZB45

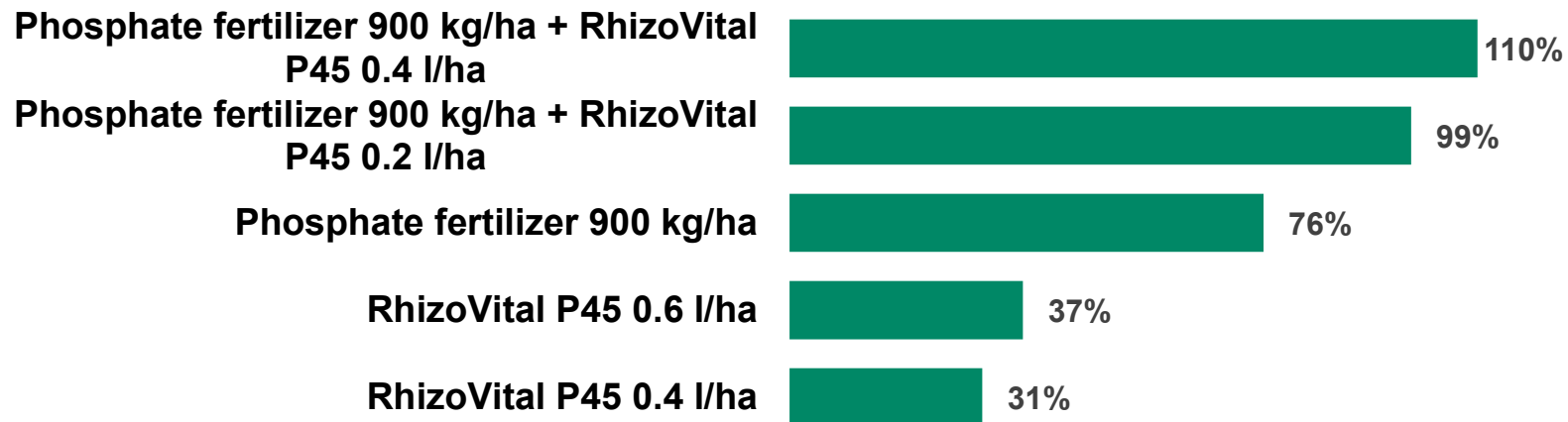
- $>2.5 \times 10^{10}$ spores per ml
- Easy to store (room temp. 2 years)
- Excellent miscibility with PP-inputs and fertilisers
- Increased phosphorous mobilization



RhizoVital® P45 – Selected for P-mobilization

- ~2,5-fold higher Phytase production by *Bacillus amyloliquefaciens* FZB45 (Ramirez & Kloepper, 2010)

% Yield increase on tomato. Mean of 3 trials. Brazil



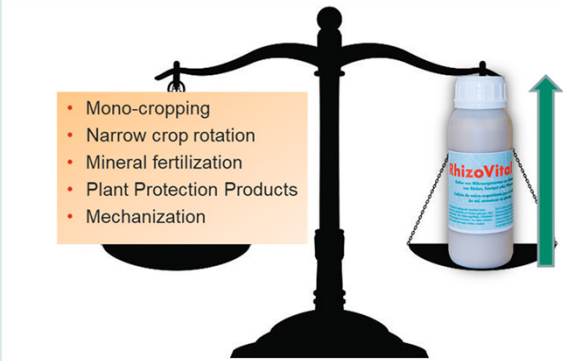
Universidade Estadual de Ponta Grossa, Brazil, 2017.

Conclusions from our experience

RhizoVital®

- Increases root growth and offers a larger and vigorous root system
- Helps crops to cope with unfavorable environmental situations
- Reduces risks in crop production (insurance)
- Increases profit and marketable yield
- Easy to handle and integrate in existing production systems



- 
- Mono-cropping
 - Narrow crop rotation
 - Mineral fertilization
 - Plant Protection Products
 - Mechanization



**Many thanks to Dr. Helmut Junge
and Dr. Kristin Dietel from ABiTEP
GmbH for the good collaboration!**

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**where Nature
leads Innovation**





***Thank you for
your attention!***



Andermatt
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YEARS **B**