



Quality control of biostimulant inoculum

Carolin Schneider, December 13, 2017

PPPHE 2017

Efficacy and risks of „biorationals“ in organic and integrated
pest management - acceptable?

Example: Mycorrhiza

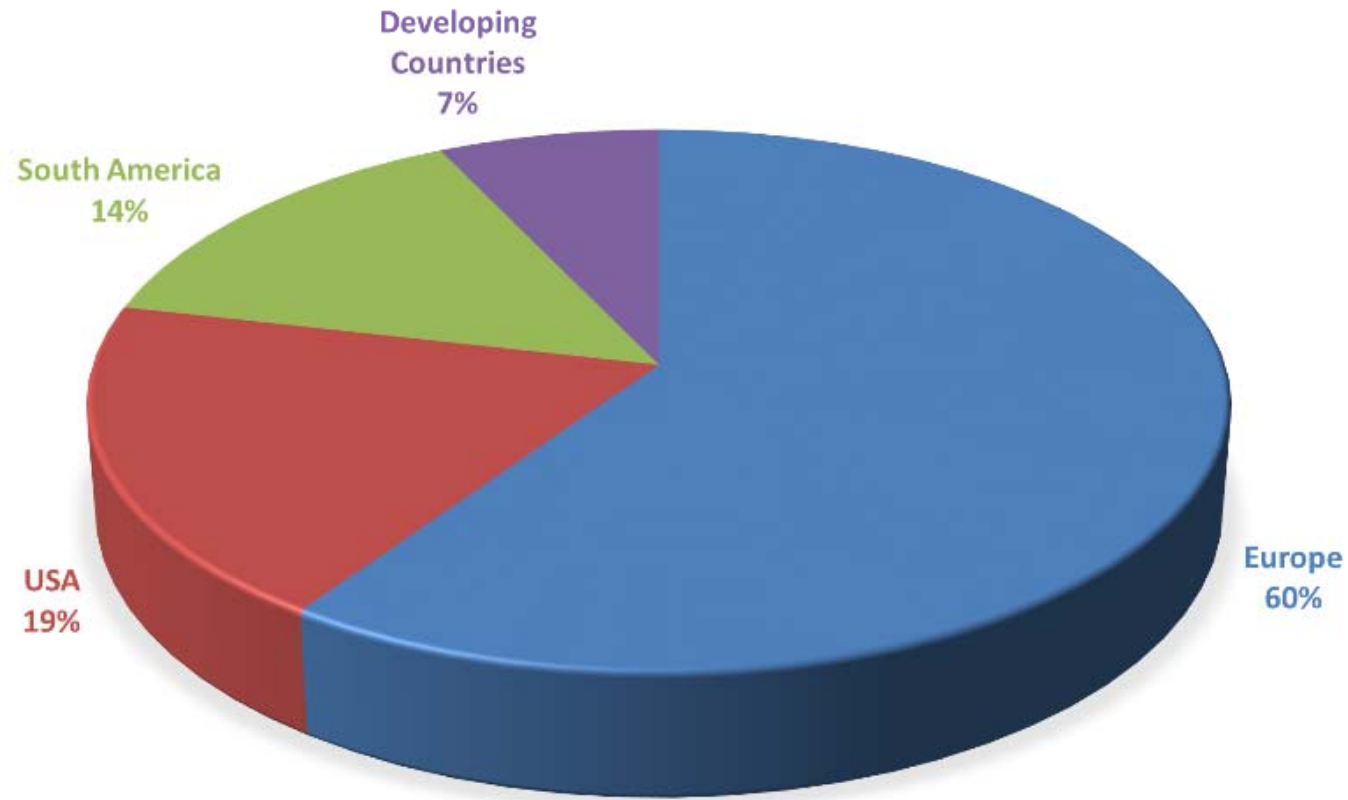


Mycorrhizal products are still a niche market. But the number of companies dealing with mycorrhizal products (producing and/or retailing) **increases** in Europe:

Number of companies (Arato, Inoq 2017)

2003	2014	2017
9	25	66

Worldwide distribution of mycorrhiza companies





Mycorrhizal products are sold as, i.e.

- Propagule powder/carrier
- Spores bound to carrier
- Pure *in vitro* spores
- Mix with organic fertilizer, seed, etc.

European IPM regulation under major revision



- Fertilizer act EC 2003/2003 and Plant Protection Act 1107/2009 are under revision
- Revised fertilizer act sets standards for (microbial) plant biostimulants for the first time
- The difference between biostimulation and plant protection is defined by *Mode of Action* of the organism:

Plant Biostimulant

Plant Protection Product

against

Abiotic stress (Fertilizer Act)

Biotic stress (Plant Protection Act)

Future definitions in draft fertilizer act, Annex I, *Product Function Categories (PFC):*



6 Plant biostimulant: stimulating plant nutrition processes independently of the product's nutrient content with the sole aim of improving one or more of the following characteristics of the plant: (a) nutrient use efficiency; (b) tolerance to abiotic stress; (c) quality traits.

6(A) Microbial plant biostimulant: A microbial plant biostimulant shall consist of a micro-organism or a consortium of micro-organisms referred to in *Component Material Category (CMC) 7* of Annex II.

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Challenge: positive list



Annex II, CMC 7: Micro-organisms

"A EU fertilising product belonging to PFC 6(A) may contain micro-organisms, including dead or empty-cell micro-organisms and non-harmful residual elements of the media on which they were produced, which have undergone no other processing than drying or freeze-drying and are listed below:

Mycorrhizal fungi, *Rhizobium* spp., *Azospirillum* spp. *Azotobacter* spp."

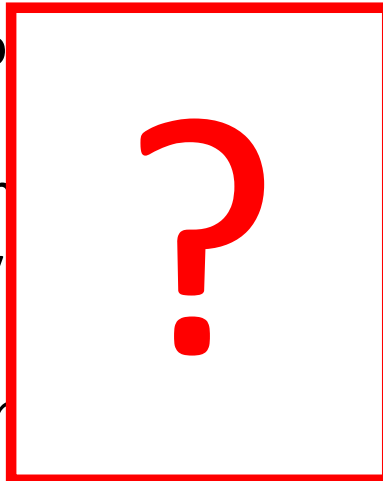
What about other species or genera? What will be the process to list new genotypes?

Challenge: positive list



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Challenge: double function



- if double function: plant protection product
- claim decides, not biology?

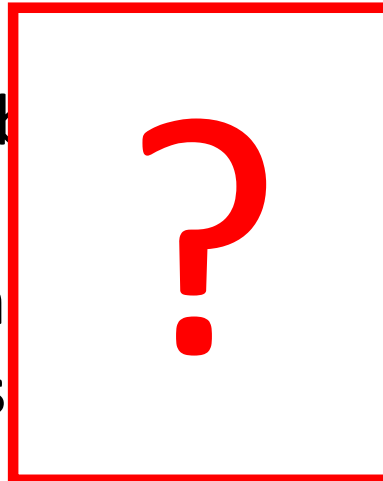
What will happen when plant protection function of a biostimulant is published, but not claimed?

Challenge: double function



- if double function: ...ion product
- claim decides, not ...

**What will happen when
biostimulant is published
protection function of a
claimed?**



Challenge: conformity assessment



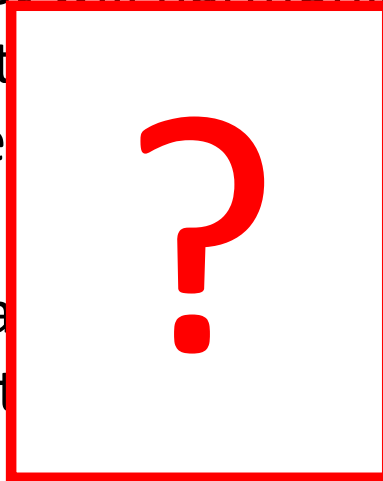
- The new EU Fertilizer Act will harmonize regulation and registration in EU countries. At present, the legal regulation of biostimulation is organised on national level, often with high regulatory burden through national laws.
- In future, a conformity assessment will ease market entry EU wide and promote a single market.

How is conformity assessment proceeded?

Challenge: conformity assessment



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How is conformity assessment proceeded?

Challenge: thresholds



**Thresholds for
anorganic
contaminants**

**Cadmium (Cd), Hexavalent chromium (Cr VI), Lead (Pb),
Mercury (Hg), Nickel (Ni), Arsenic (As), Copper (Cu) and Zinc
(Zn)**

**Thresholds for
pathogenic
microorganisms**

Salmonella spp., *Escherichia coli*, *Listeria monocytogenes*, *Vibrio*
spp., *Shigella* spp., *Staphylococcus aureus*, *Enterococcaceae*.
Anaerobic plate count unless the microbial biostimulant is an
aerobic bacterium, yeast and mould count unless the microbial
biostimulant is a fungus




Thresholds:

- f.e. phosphorus (P), lead (Pb), copper (Cu), magnesium (Mg), nickel (Ni) and calcium (Ca) are often "high" in mycorrhizal inoculum as a result of the production method
- But dosage is low, f.e. 100 mg inoculum/L substrate

Risk assessment:

- f.e. lead (Pb), mercury (Hg), arsenic (As) should be below threshold
- pathogenic microorganisms below threshold

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Challenge: Identification and concentration



Additional requirements for Microbial plant biostimulants

all intentionally added **microorganisms shall be indicated.**

Where the microorganism has several strains, the intentionally added **strains shall be indicated.**

Their concentration shall be expressed as the **number of active units per volume or weight**, or in any other manner that is relevant to the micro-organism, e.g. colony forming units per gram (cfu/g).


Identification + Concentration



- Strain = Species (easy)? Mycorrhiza isolate?
- Mycorrhiza propagules: never cfu! spores + vesicles?
Propagule viability? **Biotest (MPN)?**
- Viability after storage? Shelf life?
- no strong correlation between propagules and colonization potential...

Identification + Concentration



- Species (easy)? Strain
- Mycorrhiza propagule  spores + vesicles?
Propagule viability? B...)?
- Viability after storage
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Science-based:



MiRA, Microbe-induced resistance to agricultural pests. Marie Skłodowska-Curie Actions Innovative Training Network (ITN), 2017-2021

MycoSign, Novel plant biostimulants: Joint action of signal molecules & mycorrhiza for sustainable agriculture. EU Eurostars, 2017- 2019

MycoTom, Einsatz arbuskulärer Mykorrhizapilze als Bodenhilfsstoff zur Produktion qualitativ hochwertiger Tomaten im Gewächshaus, KMU-innovativ, 2017-2020

MICROMETABOLITE, Research Training Network on the microbial enhancement of bioactive secondary metabolite production in plants, Marie Skłodowska-Curie Actions Innovative Training Network (ITN). 2017-2021

INTERFUTURE, From microbial interactions to new-concept biopesticides and biofertilizers. Marie Skłodowska-Curie Actions Innovative Training Network (ITN), 2016-2020

BestPass, Boosting plant-Endophyte STability, compatibility and Performance Across ScaleS, Marie Skłodowska-Curie Actions Innovative Training Network (ITN), 2015-2019

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PhD-position available,
deadline 14.1.2018, see
www.inoq.de

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Summary:

- definition of biostimulants and differentiation to plant protection products
- positive list: producers propose criteria-based evaluation and harmonized standards
- thresholds = safety criteria
- strain identification and microorganism concentration

Timeline for developing a European regulation recognizing biostimulants:



Ravensberg 2017, IBMA, EBIC

Thank you for your attention!

