UNIVERSITEIT GENT

FACULTY OF BIOSCIENCE ENGINEERING

Potential of biostimulants as a novel tool for biofortification

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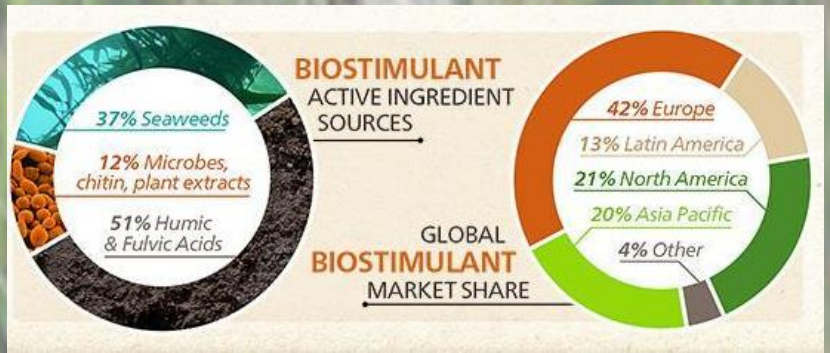
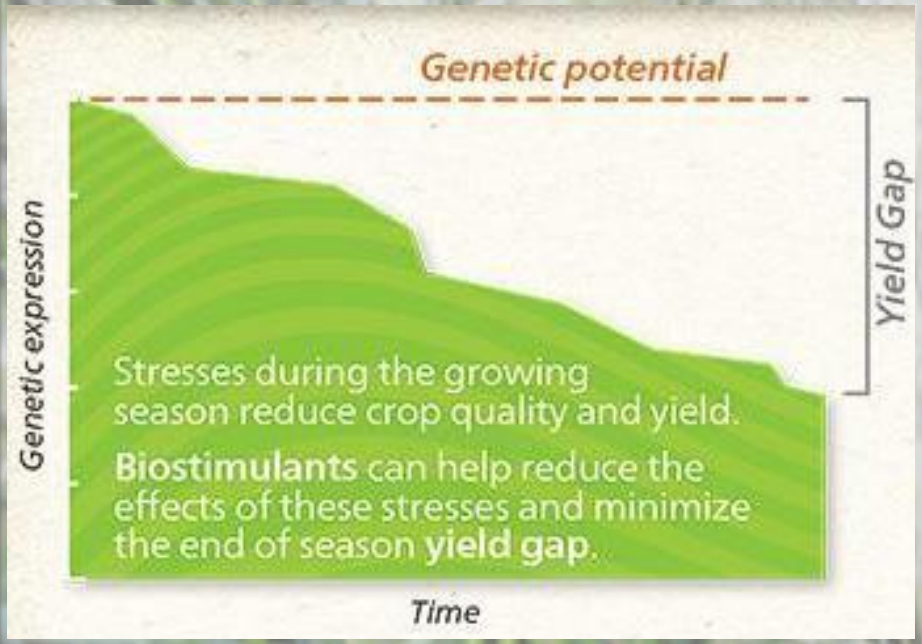
Biostimulants

- **What ?**
  - Agricultural biostimulants include diverse formulations of compounds, substances and micro-organisms that are applied to plant or soil to improve crop vigour, yields, quality and tolerance to abiotic stress.
  - Some examples:
    - Seaweed extracts and botanicals
    - Humic and fulvic acids
    - Benefecial fungi and bacteria (growth promoting organisms)
    - Chitosan and other biopolymers
    - …
  - Market:



Biostimulant

- **What can we expect? Myths or reality?**

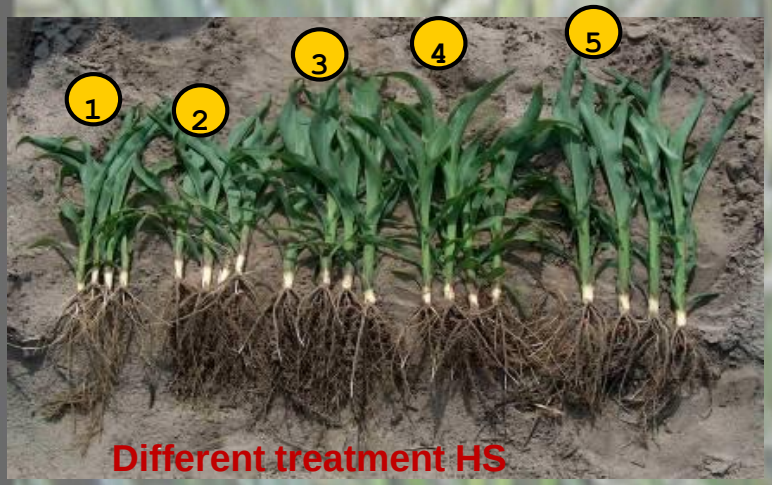


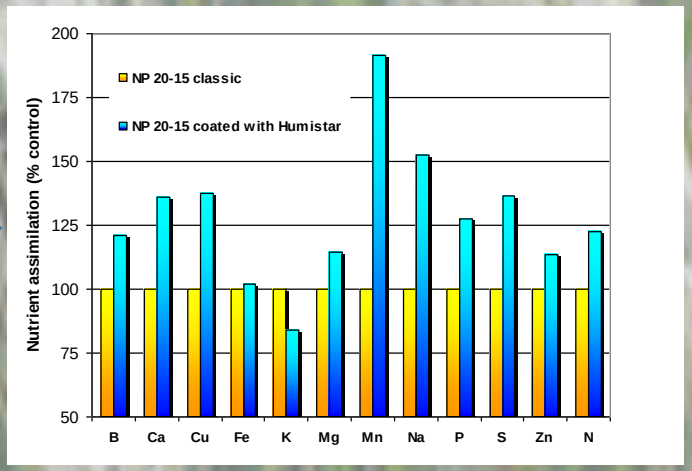
- **Biostimulants interfere in different ways with plant metabolisms:**
  - Root formation: Humic acids
  - Transfer nutrient to plants: AMF
  - Stomatal closure via ABA-dependent mechanisms: chitosan
  - Up and down regulation of hormone linked genes: seaweed extract
  - Interaction with expression of transporter genes: Humic acids
  - Enhancing availability of nutrients: PGPR
  - …

Biostimulants enhance root formation and nutrient uptake

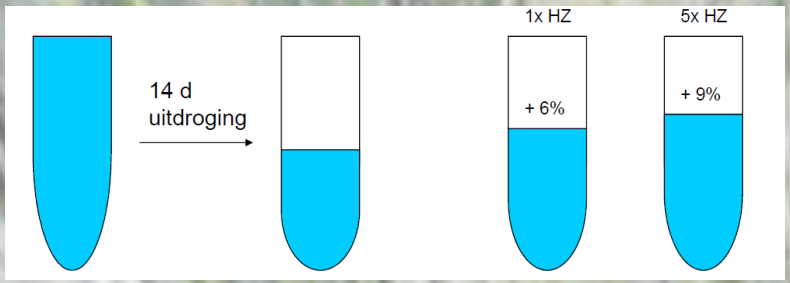
- **Concentrated humic substances**

Root formation seed treatment triticale



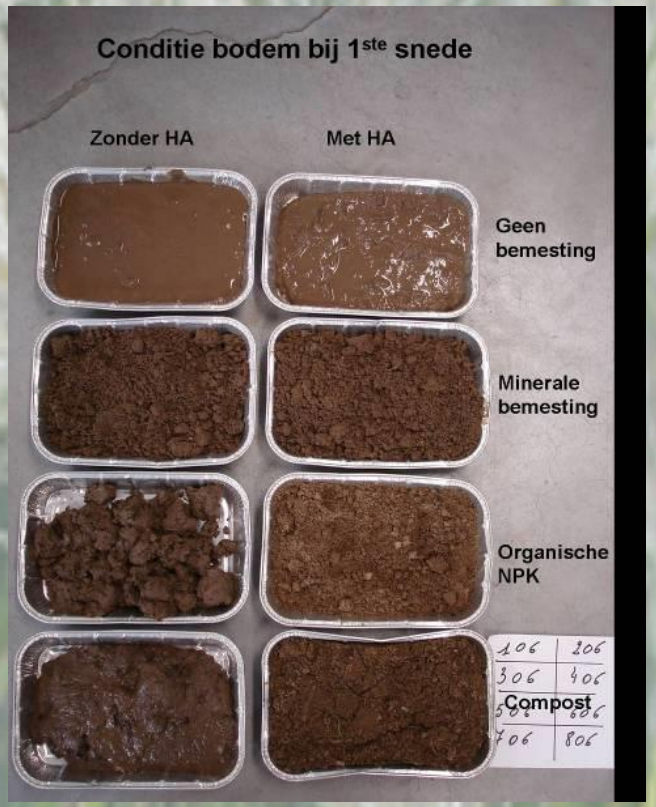


Humic acids and soil characteristics



Water holding capacity

Treatment	CEC (cmolc/kg)
No humic substances	5.20 a
1 x Humifirst 12/3	5.15 a
5x Humifirst 12/3	5.50 a
1x Humifirst 8/8	5.38 a

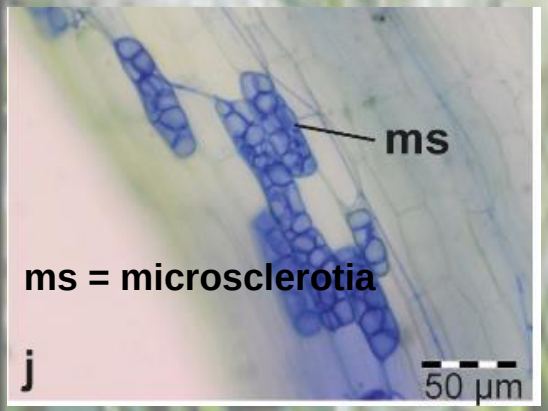


Soil aggregates

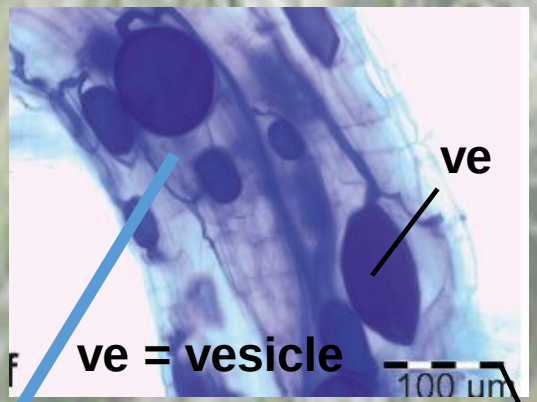
Growth promoting organisms: effective tool ?

Fungi from 3 different phyla could be observed after our survey in Central Africa

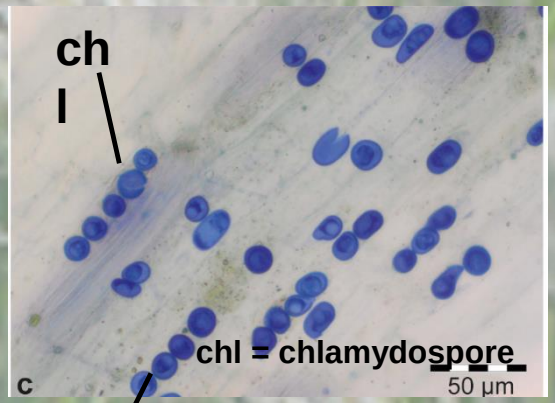
Dark septate endophytes DSE (Ascomycota)



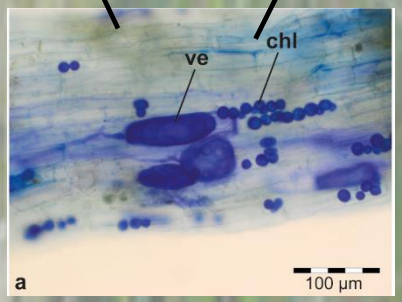
Arbuscular mycorrhizal fungi AMF (Glomeromycota)



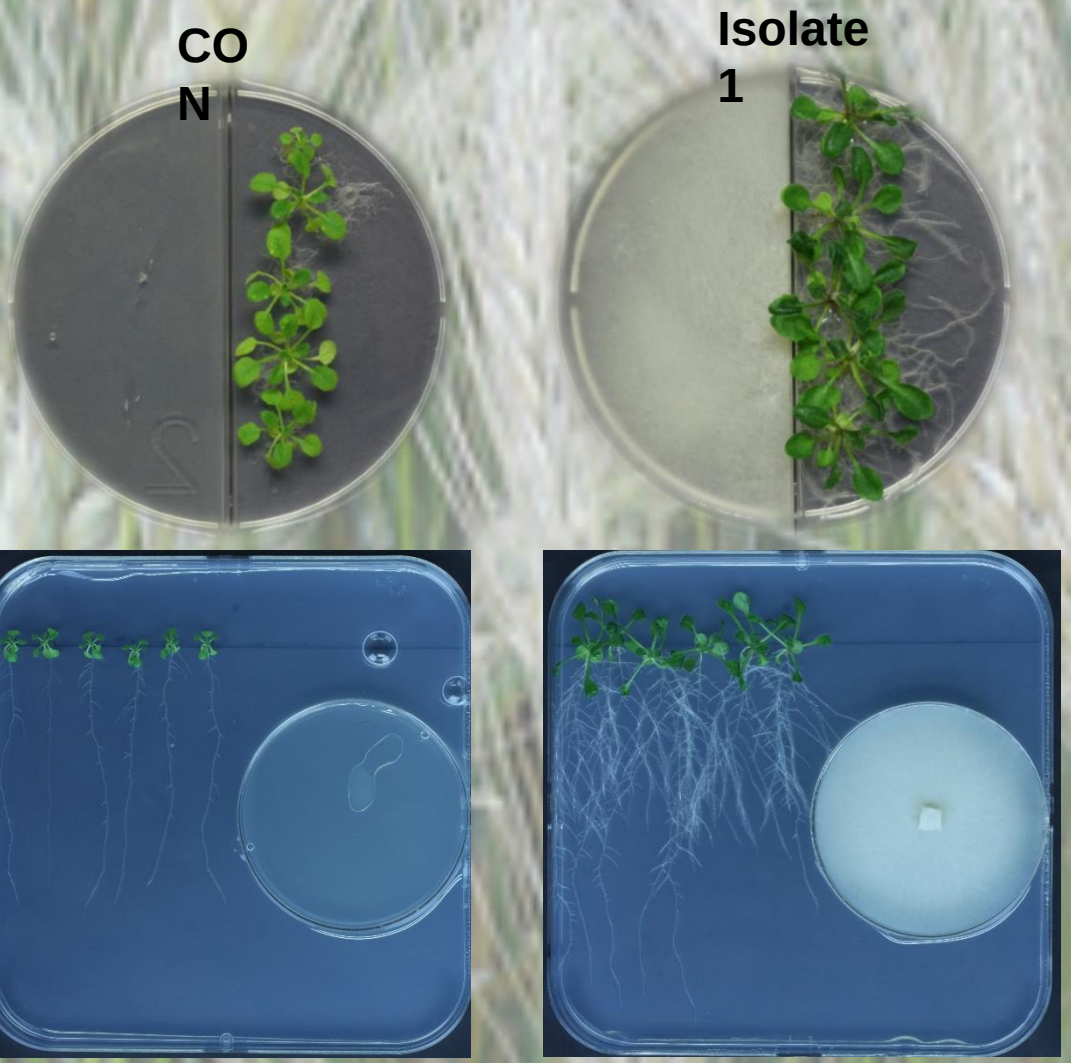
Basidiomycota



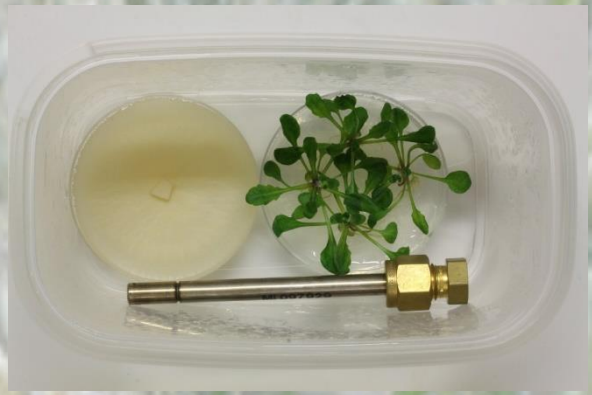
Sample a trap	Sample b trap	Sample c tra	Sample field
Archaeospora trappei	Glomus aurantium	Paraglo brasilianum	Acaulospora delicata
Diversispora spurca	Paraglomus brasilianum		Acaulospora mellea
Glomus aurantium	Paraglomus uncultured		Ambispora uncultured
Glomus eburneum			Archaeospora uncultured
			Scutellospora gilmorei
			Scutellospora heterogama
			Scutellospora uncultured

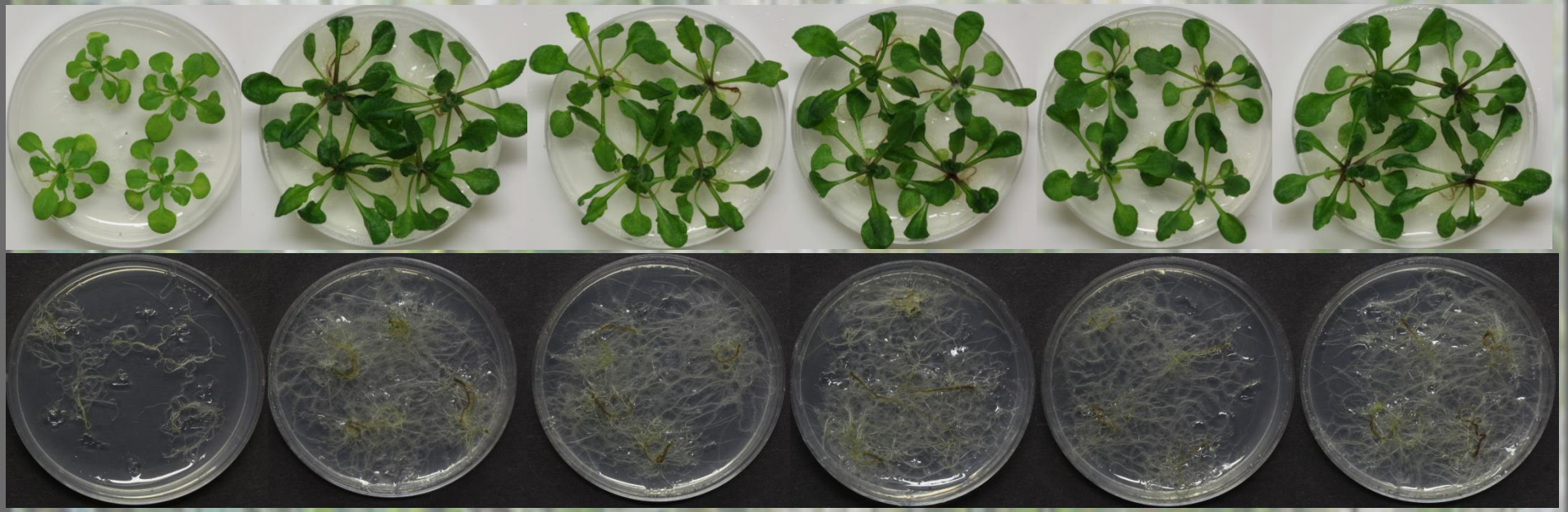


Effect of Basidiomycetes species



Effect of Basidiomycetes species

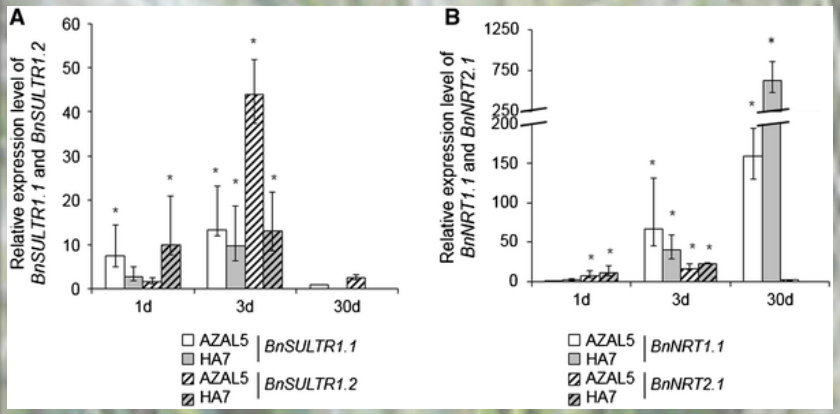


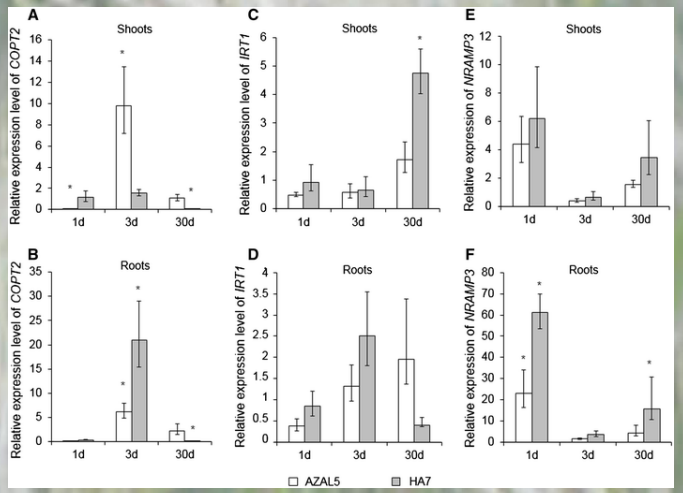


CONTROL 1 12 30 34 PW

Biostimulants and gene expression of transporter genes

- Effects of Humic substances and seaweed extracts (Billard et al., 2014)





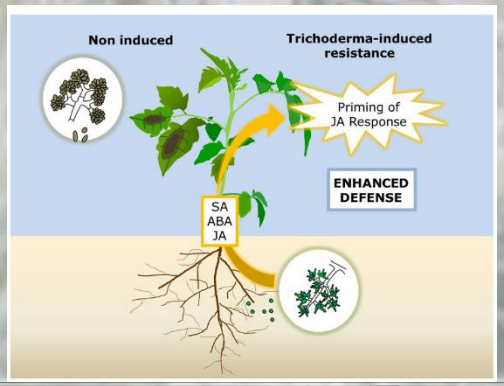
AZAL: seaweed
HA7: Humic acids
BnSultri.1 transporter genes of sulfate
BnSultri.2
BnNRT1.1 Transporter genes of Nitrate
BnNRT2.1

AZAL: seaweed
HA7: Humic acids
COPT2 transporter gene of Cu
IRT1 transporter gene of Fe
NRAMP3 Transporter gene of Zn

CropFit: a multidisciplinair consortium

Screening & identification

Mode of action & characterisation



Proof of concept in the field

Natural Resources → Biostimulant → Biological activity → Identification and characterization → Proof of concept → Commercial development

Fundamental research — **Applied research**


THANK
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