Trinity College Dublin
Coláiste na Tríonóide, Baile Átha Cliath
The University of Dublin

Endophytes in horticulture: a novel plant health approach

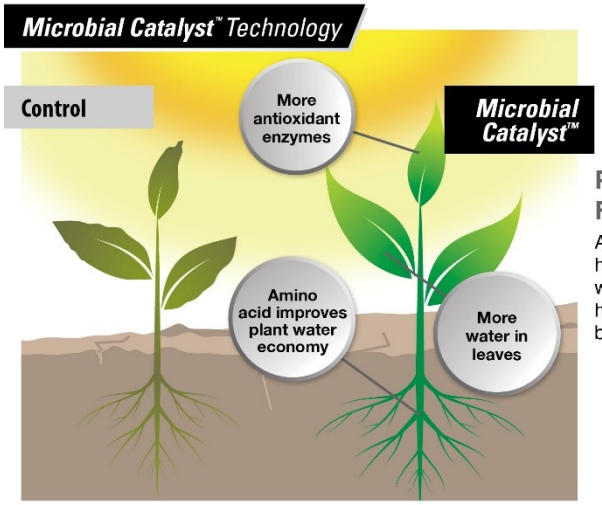
Dr. Brian R. Murphy RSci, MRSB, MIBioII
Research Professor TCD
Chief Technology Officer
e-Seed Crop Technology Solutions Ltd.

Email: murphb16@tcd.ie

Presentation to Nursery/Ornamentals group Teagasc, July 22nd 2020

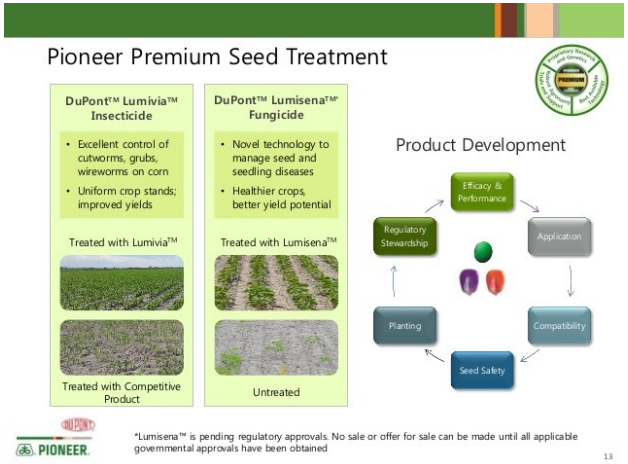
Microbes as biological treatments

A fast growing area of research and application



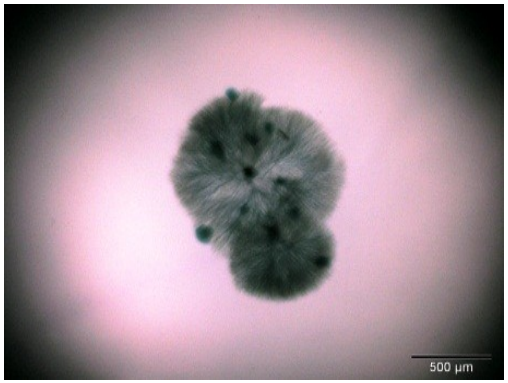
Protect Your Crops From Drought

Almost every growing season has a dry spell. Crops treated with **Generate®** are typically healthier, more efficient and better able to resist stress.

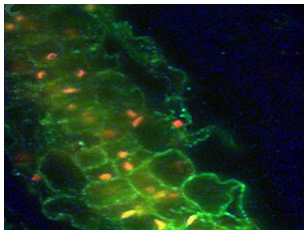


The Microbiome/Endophyte Solution

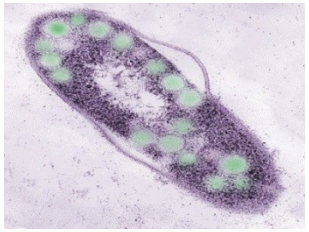
‘Endo’ + ‘phyte’ = ‘Inside’ + ‘plant’



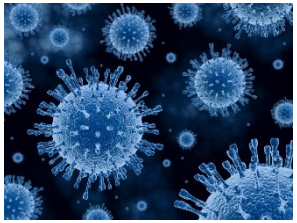
Fungi



Bacteria



Unicellular eukaryotes



Viruses?

Endophytes benefit crops

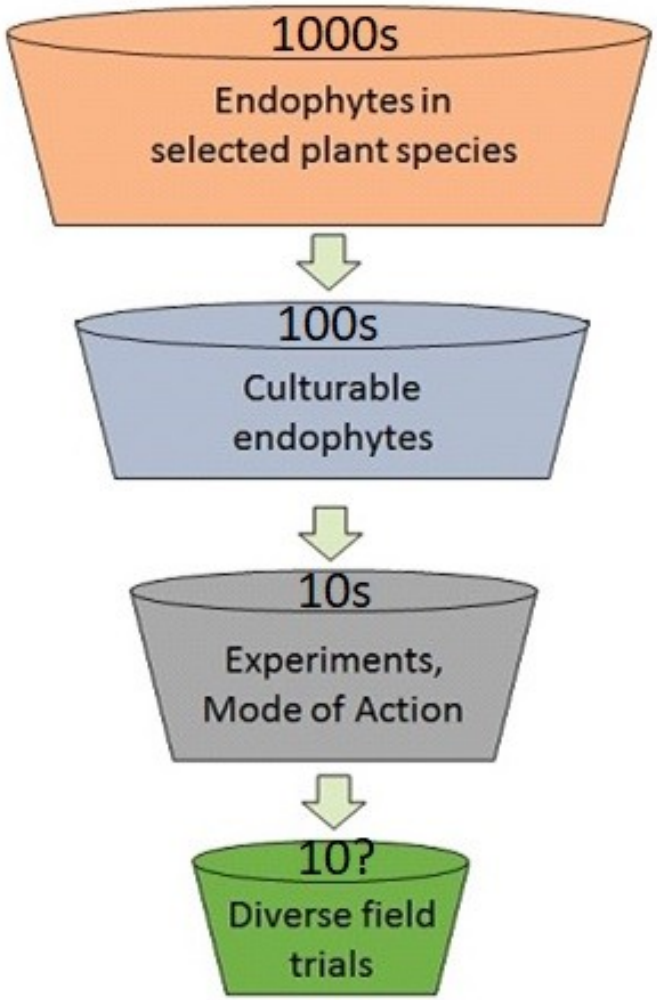
- Biotic stress
- Abiotic stress

- Yield increase
- Environment

Image credits: iiaiblog.com, 12.000.scripts.mit.edu, www.hedgeco.net en.wikipedia.org

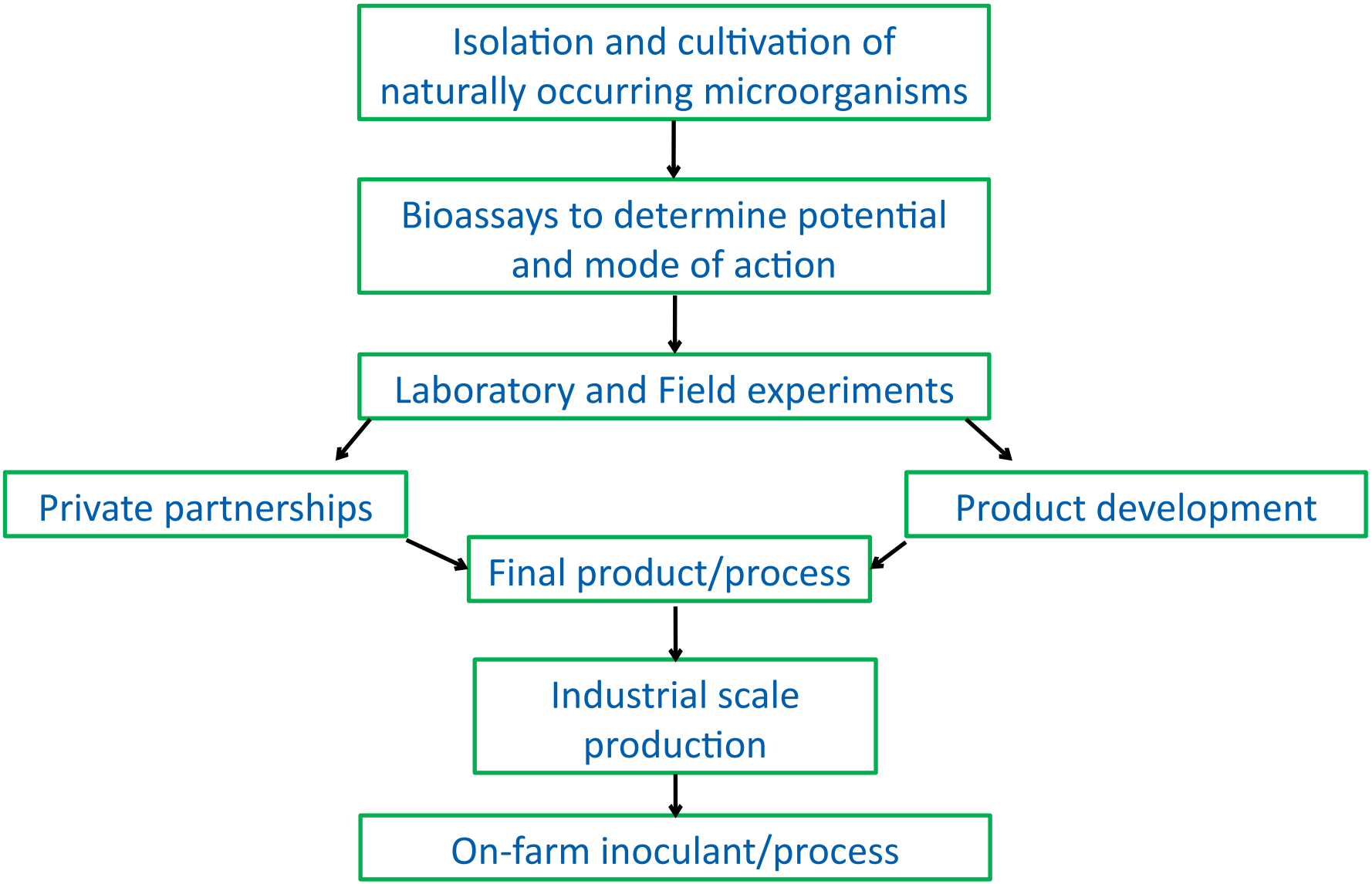
How do we select endophytes?

Pipeline of discovery for particular cultivars



Bioprospecting: The First Step

Discovery and Screening



The entire planet as a microbial resource

- Forests
- Soils
- Atmosphere
- Oceans
- Deserts
- Savannas
- Fresh water
- Polar regions
- Etc……

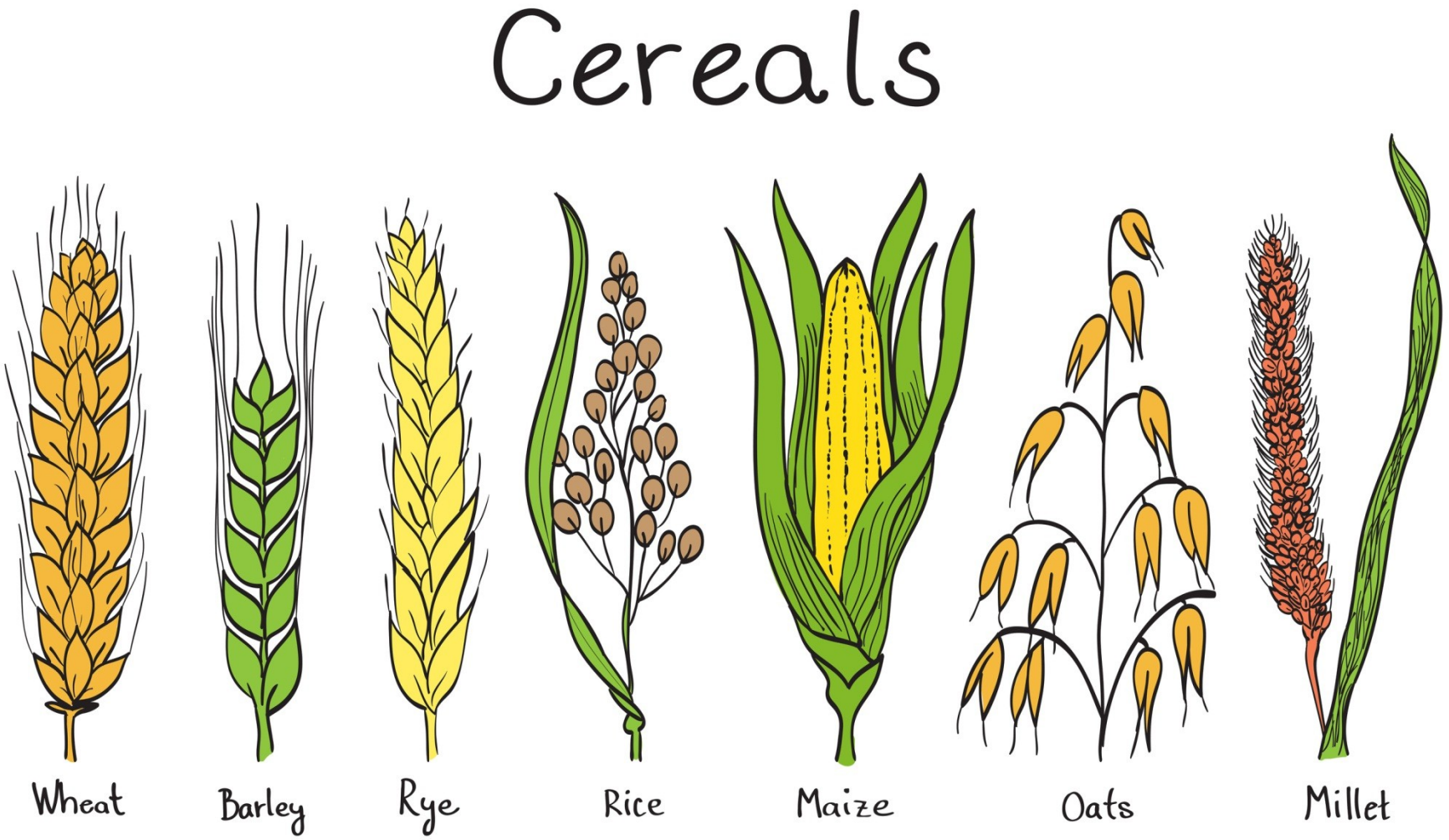
kaiserscience.wordpress.com

The Principle Behind Agricultural Applications

Ecological Restoration?

Restoring lost beneficial associations with microbes

Great potential for cereal crops



imgkid.com

Endophyte research at Trinity College Dublin

Focused on agricultural crops

Supplementary research at TCD

Biofortification

Bioremediation

Other applications using endophytes

- tissue culture
- biomass/biofuel production
- medicinal products

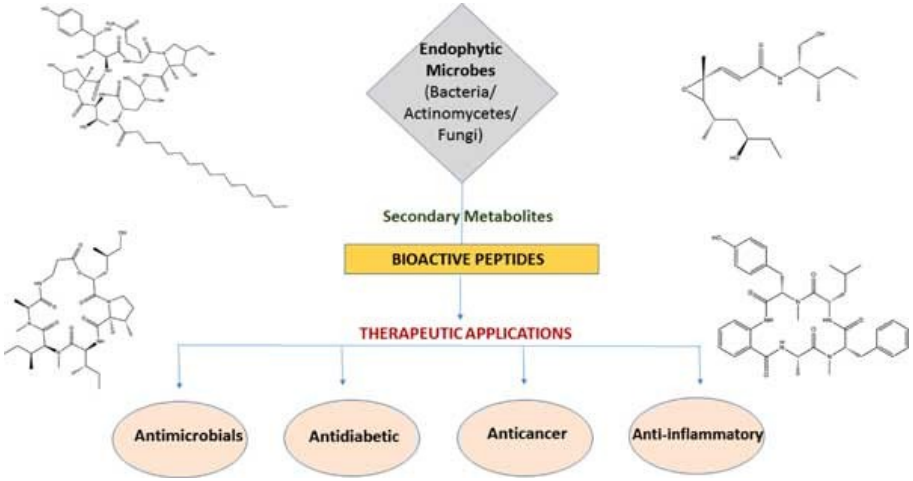
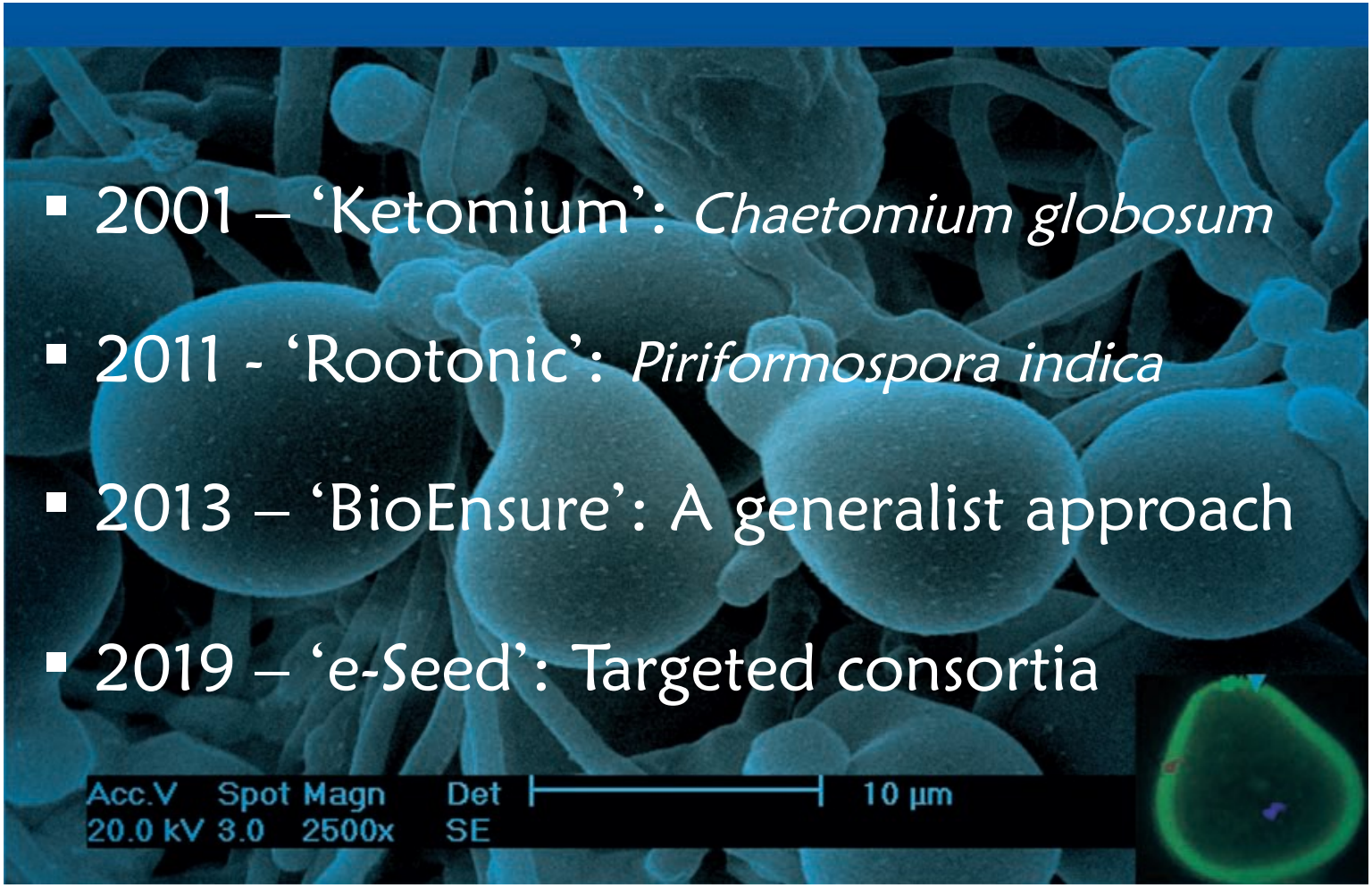


Image credits: plantscienceconference.alliedacademies.com, jgi.doe.gov, currentproteinpeptidescience.com

Commercial endophyte products



- 2001 – 'Ketomium': *Chaetomium globosum*
- 2011 - 'Rootonic': *Piriformospora indica*
- 2013 – 'BioEnsure': A generalist approach
- 2019 – 'e-Seed': Targeted consortia

From Concept to Commerce

e-Seed Crop Technology Solutions Limited

Providing microbial based solutions to agriculture

Launched 2019

e-Seed Crop Technology Solutions Limited

Providing microbial based solutions to agriculture

- e-Seed develops and commercialises microbial solutions for agriculture
- These microbes can replace or reduce chemical inputs in agriculture systems
- Unique discovery platform to isolate microorganisms from within plant tissue
-
- Focus on endophyte recovery from wild relatives of crop species
- Endophyte isolates are fully tested in controlled environments
- Multiple benefits for crop species, especially cereals

e-Seed provides a comprehensive set of benefits to farmers

- e-Seed increases barley yield by up to 25% (Mean 10%*)
- e-Seed enhances crop stress resistance
- e-Seed can reduce fertiliser costs by half
- e-Seed reduces emission of greenhouse gasses
- e-Seed provides an alternative to chemicals
- e-Seed is more sustainable and environmentally friendly

* Based on 3 year multi-site field trials with multiple barley cultivars

Expanding the scope to address horticulture

e-Seed technology can be adapted for ANY plant species

- Potential to develop the same technology for all plant species
- Targeted species specific application
- Better results for plants grown under cover?