

## Supporting plant health through microbial communities: the apple fruit case



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## Biocontrol agents & postharvest disease ?

*Pichia anomala* (strain K) & *Candida oleophila* (strain O)



*Jijakli and Lepoint, Phytopathology, 1998*  
*Grevesse et al., Phytopathology, 2003*  
*Friel et al., Yeast, 2006*  
*Friel et al., Molecular plant-microbe interaction, 2007*  
*Massart et al., Phytopathology, 2007*  
*Massart and Jijakli, Journal of Microbiological Methods, 2007*  
*Kwasibonski et al., Plos One, 2014*

*Rachid Lahlali et al., Eur J Plant Pathol, 2008*  
*Rachid Lahlali et al., J. of Food Microbiology, 2008*  
*R. Lahlali & MH Jijakli, Biological Control, 51, 2009*  
*Lahlali, R. et al., Plant Disease, 2011*  
*Lahlali, R. et al., Plant Pathology, 2011*  
*Jijakli, H., & Lahlali, R. Acta Horticulturae, 2016*

# Introduction

## The biocontrol agent


## Biocontrol agents efficacy ?





## Biocontrol agents & postharvest disease ?

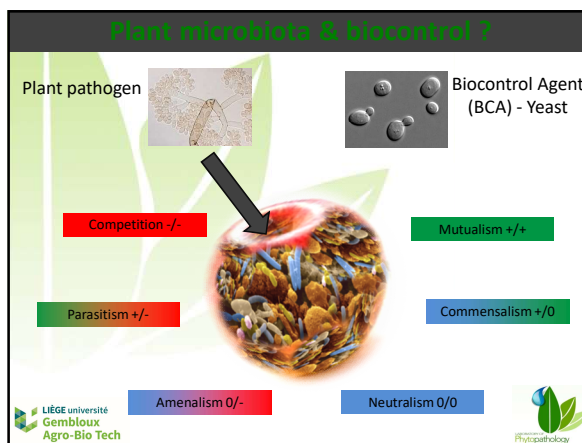
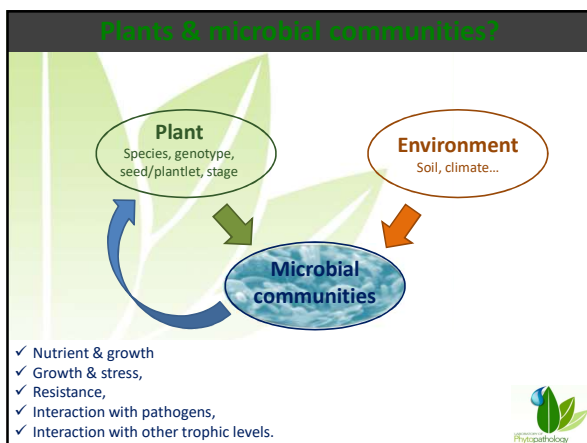
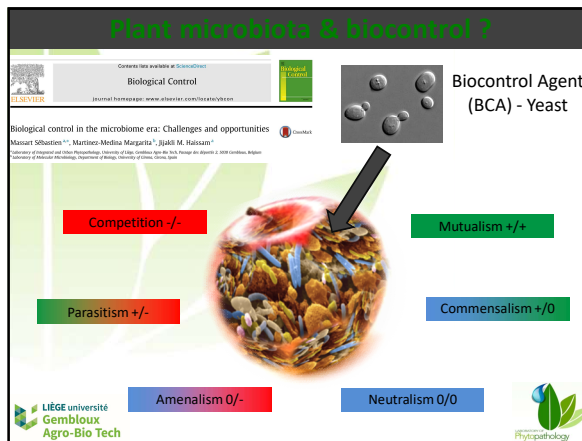
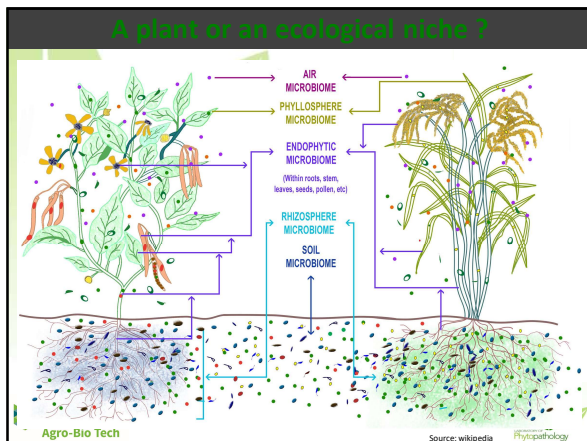
- Losses of 15-25% after harvest
- Major fungal diseases :
  - Wound parasites
    - *Botrytis cinerea*
    - *Penicillium expansum*
  - Latent infections
    - *Gloeosporides* sp.



  Source: wikipedia

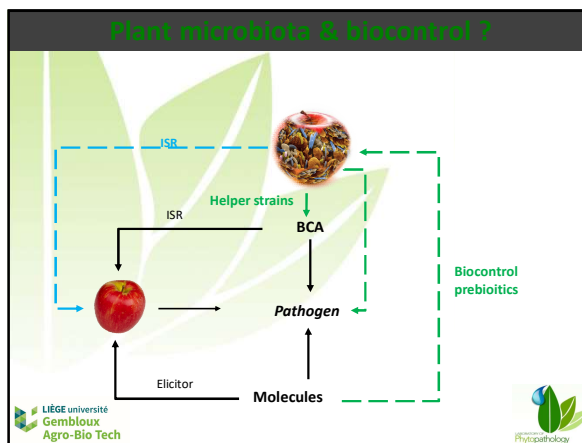
# Introduction

## The Plant



# Introduction


## The Plant, Its microbiome & The BCA

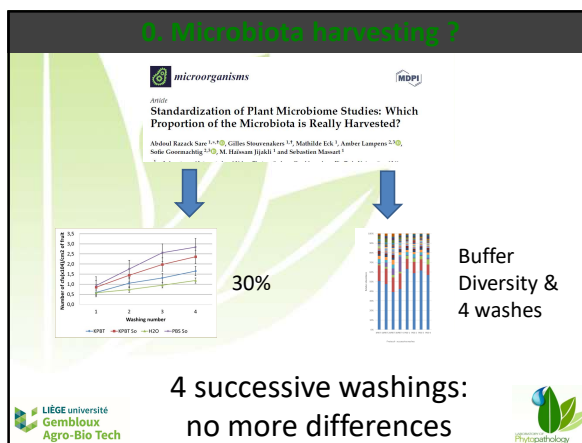


# Objectives

### 0. Microbiota harvesting ?

Buffer	Technic use	Purpose	Reference
Malt extract + glucose + antibiotic	Culture of fruit slice shaken at 100rpm (3-10 days)	Plating	(Vadkertová, Molnárová, Vránová, & Slávková, 2012)
sterile deionized water	Two washes (by dipping)	Biological assay	(Wilson, Wisniewski, Drobny, & Chalutz, 1993)
phosphate buffer, pH 6.5	Use of 2 <sup>nd</sup> wash; 30s sonication + 100rpm shaking for 10 min (the first washing with no sonication is thrown)	Plating	(Fan and Tian 2001)
phosphate buffer, pH 6.5	Use of 2 <sup>nd</sup> wash; 10 min sonication + 150 rpm shaking for 10 min (the first wash with no sonication is thrown)	Plating	(Villas, Usall, Teixido, & Sanchez, 1998)
sterile water	100rpm shaking for 10 min	Plating	(Qin, Tian, & Xu, 2004)
double deionized water (DDI)	2 min mixing the sample + 1min sonication on each side	454-amplicon sequencing	(Glenn, Bassett, & Dowd, 2015)
ionized sterile water	5 min sonication	Amplicon sequencing	(Ottosen, A.R., White, J.R, Skaltsas, D.N., Newell, M.J., Walsh, 2009)
phosphate buffer, pH=7	Fruit dissection + shaking for 20 min at 150 rpm+ 10 min sonication	Plating	(Teixido, Usall, Gutierrez, & Villas, 1998)
phosphate buffer, pH=6.5	Rinsing by shaking at 120 rpm for 20 min	Plating	(Lahiri, Misra, De Clercq, Serhini, & Bjakki, 2008)
Water and Phosphate buffer, pH 6.5	Rinsing first time in water; and once with sonication bath with phosphate buffer	Plating	(Manso and Nunes 2011)
no buffer	Wiping the fruit surface with moistened cotton swab	Amplicon sequencing	(Shen, Nie, Li, et al., 2018)(Shen, Nie, Dong, et al., 2018)
phosphate buffer, pH 6.8	Rinsing by shaking at 120 rpm for 2 hours	Amplicon sequencing	

- ### Identify beneficial plant microbiota
1. Harvest contrasted microbial communities
  2. Characterization of microbe composition
  3. Microbiota biocontrol properties
  4. New BCA
- 



# Results


### 1. Microbiota biobanking

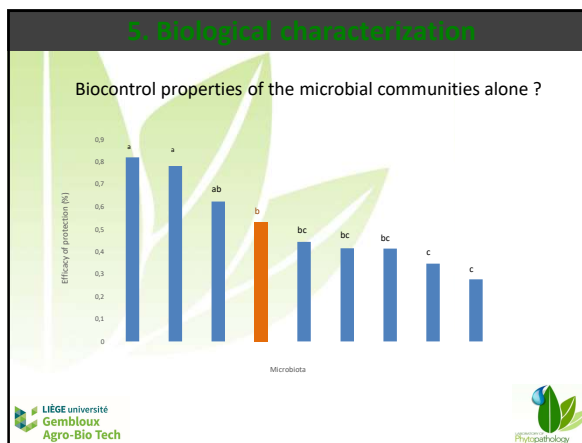
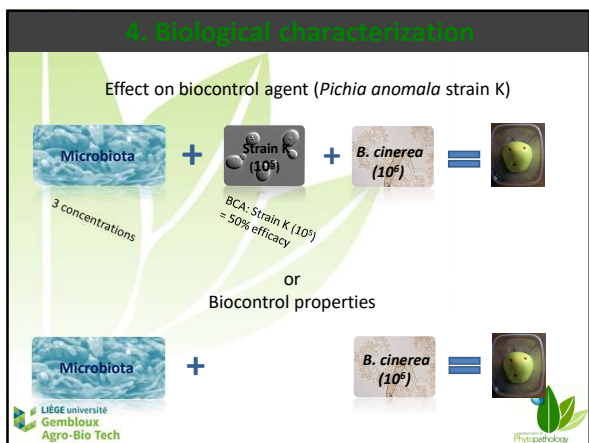
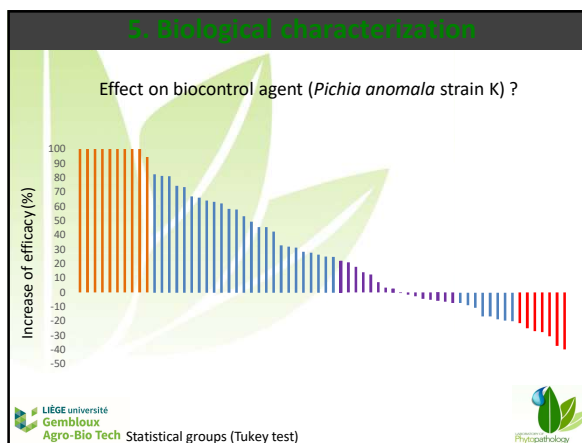
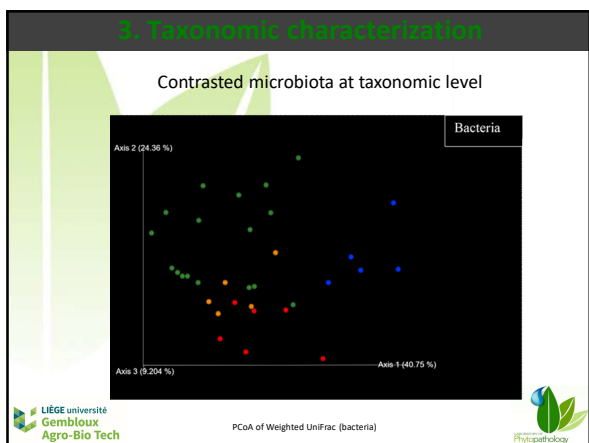
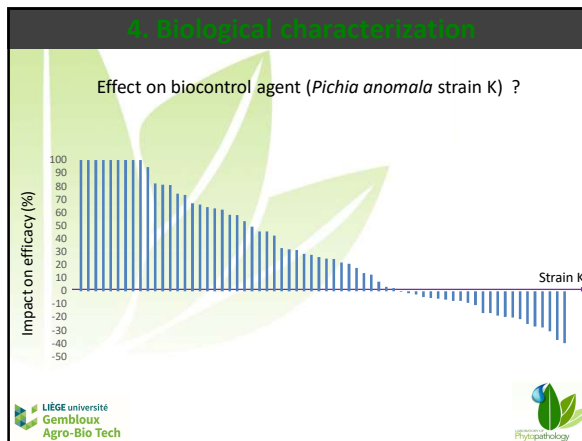
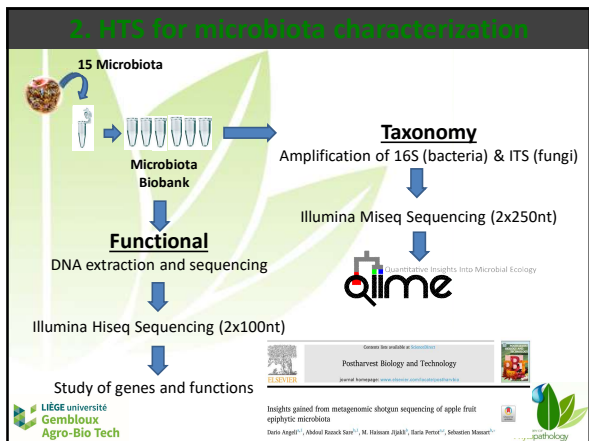
Microbiota

Microbiota Biobank

Phytosanitary treatments	Cultivars
Conservation orchard (Never treated, 35 years old)	9
Light organic	3
Organic	3
Conventional	

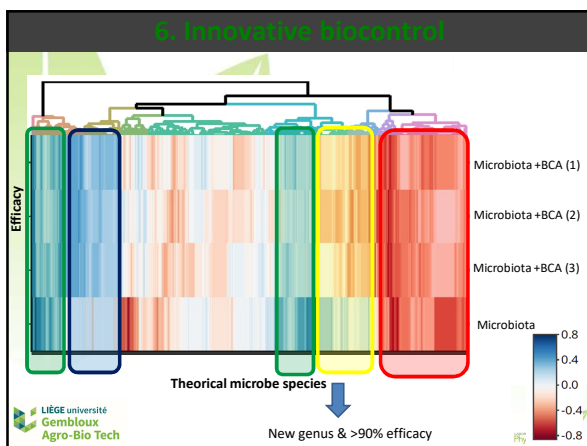
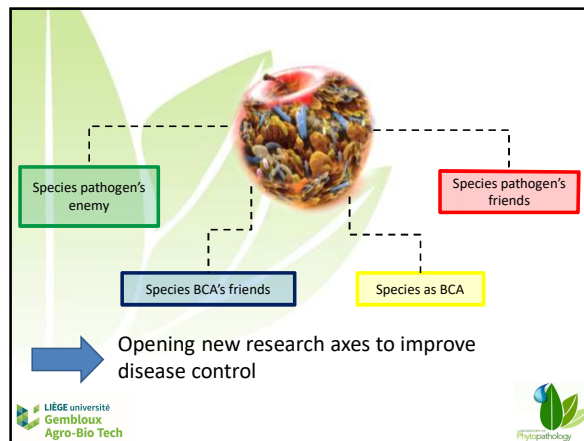
= 15 contrasted microbiota from Belgium





**6. Innovative biocontrol**

Clustering taxonomical characterization and biocontrol properties ?



**Research perspective**

- 1) Coping diversity = which niche level ?
- 2) Standardisation / harmonisation !
- 3) From catalogue to functional links !

**Conclusions**

Thanks to **fnr's**  
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& thank you for your attention

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