Biocontrol in aquaponic systems: Toward a better characterization of microbiota properties

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1. Plant pathogens in aquaponic systems
Aquaponics → greenhouse conditions
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* Ideal conditions for plant growth
* But also ideal for the development of many diseases
* Compromises have to be made between
  * Optimum conditions for economic productivity
  * Conditions for diseases and pests prevention
Aquaponics
→ hydroponic diseases

* Theoretically less susceptible to soil-borne pathogens

* Zoosporic oomycetes are frequently detected
  * Pythium spp. and Phytophtora spp.

* Fusarium spp., Rhizoctonia spp., Alternaria spp., Sclerotinia spp., powdery mildews, Botrytis spp., etc.
Aquaponics

\[ \rightarrow \] hydroponic diseases

* Crown and root rots on basil
Aquaponics

→ hydroponic diseases

* Botrytis cinerea on basil
2. How to manage plant pathogens in aquaponic system?
Pests control in aquaponics

* Plant pathogens
  → Difficult to manage

* No pesticides or biopesticides especially developed for aquaponics
  * Fish health
  * Antagonist agents not adapted to aquaponic conditions

* Inadvisable use of disinfecting agents
  * For fish health
  * For beneficial bacteria
Diseases control in aquaponics

* Resistant varieties
* Preventive measures
* Good agricultural practices
* Greenhouse conditions management

“All pathogens go through a cycle with similar events.”
3. What about biological control?
3 observations

1. Good plant yields with less nutrients compared to hydroponics
   * Biostimulants?

2. Aquaponic systems appears more resistant to diseases that affect standard hydroponics
   * Antagonist agents?
   * Plant elicitation?
   * Sustaining plant growth under biotic and/or abiotic stress?
3. Microbiota in recirculated aquaculture and hydroponic systems are already characterized

→ Not yet in aquaponics!
4. My PhD thesis
Characterization and biocontrol properties of the microbiota associated with an aquaponic system
1. Characterization of the rhizosphere microbiota
   * Taxonomy
   * Roles and properties
   → 16s rDNA sequencing and shotgun sequencing

2. Quantify the aquaponic plants resistance to diseases

* Underlying questions:
  * Optimal conditions, microbiota evolution, isolation, characterization of an antagonist agent, etc.
Overview of preliminary results:

- Rhizosphere microbiota collecting for DNA extraction
  → Protocol development

**Microorganisms concentration in CFU/g of root**

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Thank you for your attention

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