



EU GREEN DEAL

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#EUGREENWEEK
30 MAY – 5 JUNE 2022

DISTAL



ALMA MATER STUDIORUM
UNIVERSITÀ DI BOLOGNA
DIPARTIMENTO DI SCIENZE E TECNOLOGIE
AGRO-ALIMENTARI

STAAA PhD OPEN DAY

Dipartimenti di Eccellenza 2018-2022
DISTAL The Nexus Approach for Sustainability in Agriculture,
Food, Energy & Water

June 1st, 2022

Bio-formulates as a promising control strategy against different *Fusarium* pathogens with intent to reduce food mycotoxins contamination

PhD candidate: **Eleonora Cappelletti**

Cycle: **36°**

(supervisor: Antonio Prodi; co-supervisors: *Claudio Ratti*)

**NEXT
GEN
EU**

The problems of fungal pathogens on durum wheat



Durum wheat

Italy is the main producer and consumer of this cereal

Durum wheat is subject to the attack of **numerous microorganisms** responsible for different diseases, that cause both **quantitative** and **qualitative** damages

Main pathogens

Fusarium culmorum,
F. graminearum and
F. pseudograminarum are the main responsible of FCR/FFR/FHB, but not only *Fusarium* species are involved (*Microdochium* spp.)



Grain contamination

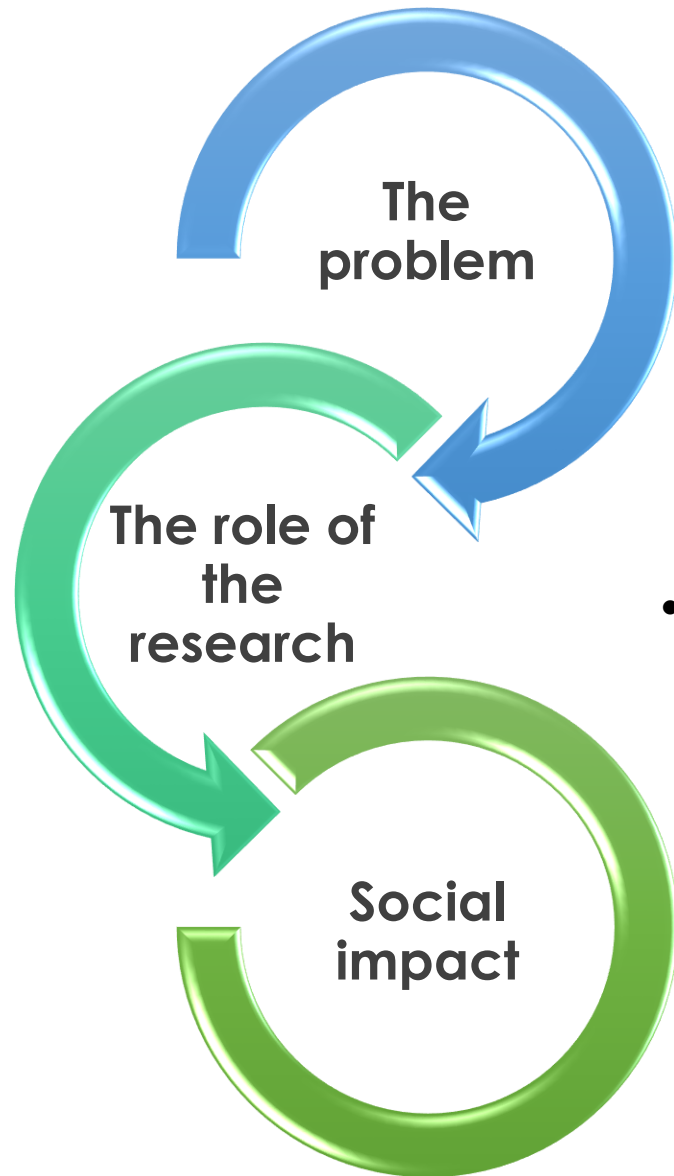
Increasing in samples coming from **organic cereal farming**



New “OLD” problem

Presence of **mycotoxins** in wheat grains

NEXUS focus: Sustainability in Agriculture and Food



- Mycotoxins in food are carcinogenic and toxic secondary metabolites for humans/animals
- **Reduction of** the use of **chemical pesticides** in agriculture
- **No alternatives to chemicals to date**
- Finding effective **alternative strategies** (non-chemical)
- **Eco-friendly** solutions are essential to prevent the health risk of consumers due to the consumption of contaminated food products and/or derivatives

How to deal with these diseases

✓ Good AGRONOMIC PRACTICES

✓ Use of HEALTHY SEEDS

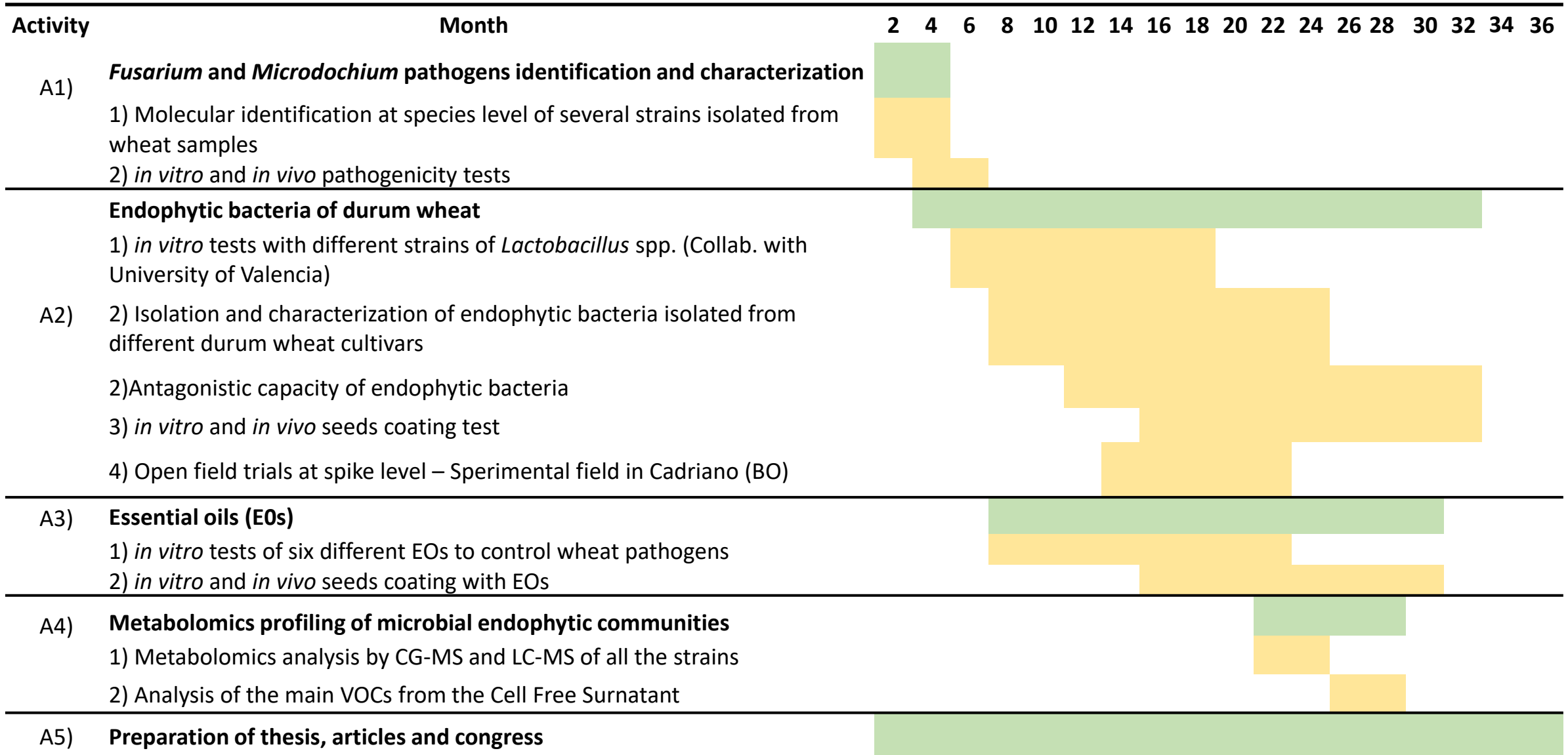
✓ Use of LESS SUSCEPTIBLE VARIETIES

✓ Use of COATED SEEDS



The **organic seed coating** technique with **EOs** or **endophytic bacteria (or consortia)** may represent a reliable and safe microbial based strategy able to control soil-borne pathogens.

Gantt diagram



● COMPLETED

● ON GOING

● TO BE DONE

The importance of collaboration with experts

At UNIBO – DISTAL

Agro-environmental Microbiology laboratory of DISTAL (Prof. Diana Di Gioia)

The lab is providing us a great support concerning:

- The isolation of microorganisms from different agricultural niches;
- The characterization of the isolated bacteria strains;
- Their application to combat targeted pathogens in plants.

During my period abroad

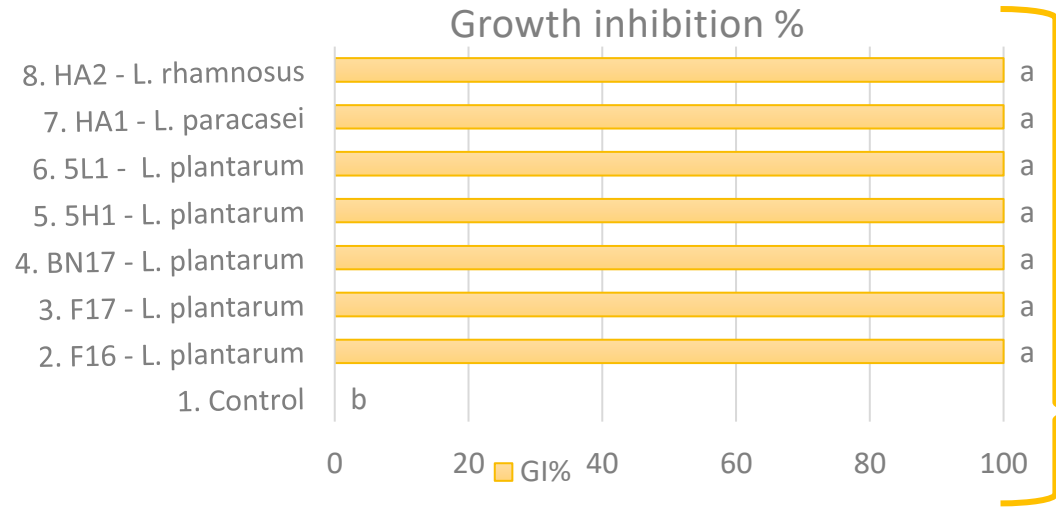
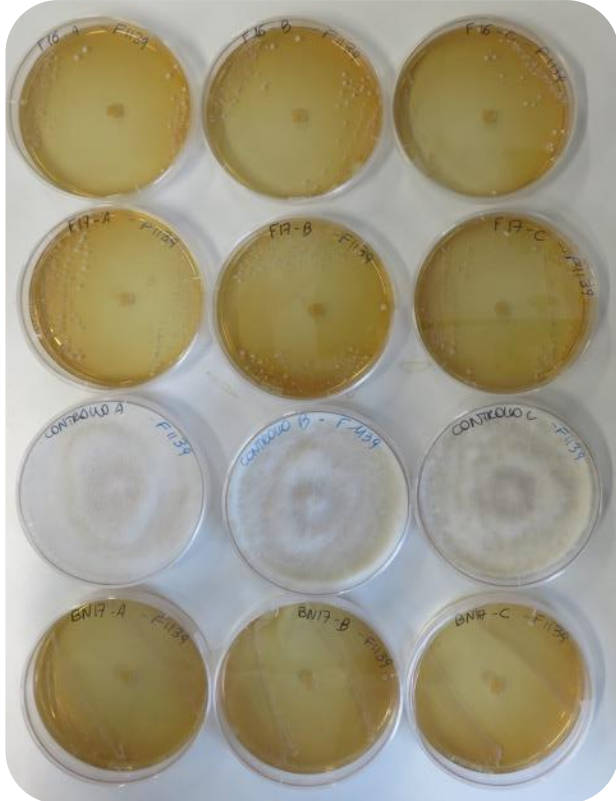
University of Pharmacy of Valencia (Prof. Giuseppe Meca)

Metabolomics profiling of microbial endophytic communities isolated from durum wheat cultivars susceptible to FCR and FHB.

Fundamental in order to know all the secondary metabolites and volatile compounds produced by the different analyzed strains

Some of the obtained results

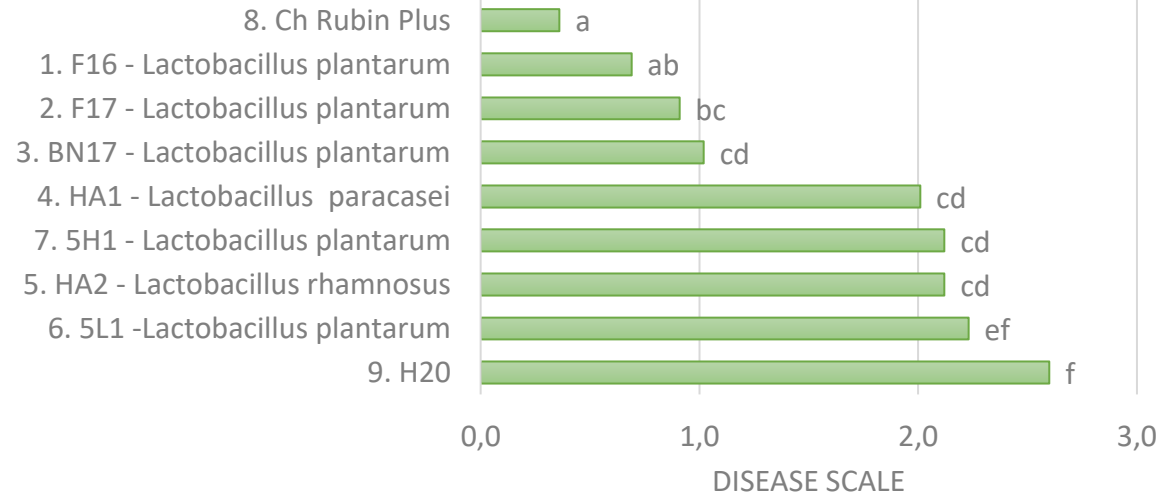
Dual culture assay



F401, F1126, P484	<i>Fusarium culmorum</i>
F566	<i>Fusarium graminearum</i>
F1139	<i>Fusarium pseudograminearum</i>
M875, M876	<i>Microdochium nivale var. nivale</i>
M877	<i>Microdochium nivale var. nivale</i>

Completely inhibited

Seed coating with *Lactobacillus* spp. and Polyvinil Alcool



Today we are working on...

1°

Finding the most effective coating technique for *in vivo* seed coating with bacteria/EOs

2°

Isolation of new endophytic bacteria from durum wheat plants

3°

FHB trial with *Lactobacillus* spp. in open field 2021/2022 → Cadriano



The expected results of my PhD are...



...to identify a defense strategy "respectful of the environment" through the use of a **biological coating**.



... to find an effective and stable formulation based on **microorganisms, substances produced by them** and/or **EOs**, in order to reduce the use of phytosanitary products of synthesis in the field and be able to reduce the risk of mycotoxin contamination in food.