

M2 INTERNSHIP SUBJECT 6 months

Behavior of a *Fusarium* spp. synthetic community under abiotic and biotic perturbations

CONTEXT:

Fusarium spp. are the causal agents of Fusarium head blight (FHB), one of the most devastating fungal diseases of cereal crops. In addition to yield losses, some of these fungal species are responsible for grain contamination with mycotoxins which are a major health and food safety concern. The FHB disease is the outcome of complex interactions between a mixture of *Fusarium* species coexisting at the same time in a shared niche, all along the fungal life cycle. The issue of such interactions is driven by environmental conditions and could not be predictable according to the behavior of each species considered solely. You will join the TeamTox project (ANR-22-CE20-0003) which aims to develop a holistic approach based on the study of a *Fusarium* spp. synthetic community (called Meta-*Fusarium* spp) considered as a whole. Understanding the behavior of such Meta-*Fusarium* spp. under abiotic and biotic perturbations is essential to develop innovative strategies to manage FHB disease.

OBJECTIVES :

The aim of this internship subject is to study the behavior of the Meta-*Fusarium* spp under abiotic and biotic perturbations. First, we will study the effect of a range of temperature, likely to be encountered by the Meta-*Fusarium* during its life cycle (from near 0°C to 25°C). Second, we will evaluate the role of the *F. graminearum* intra-species diversity on the Meta-*Fusarium* spp. dynamic.

METHODS :

Task 1. Effect of temperature on the dynamic of the Meta *Fusarium* spp.

The Meta *Fusarium* is a synthetic community composed of seven fungal isolates, one from each of the seven predominant FHB species. The inoculum consisted of a mix of equal number of conidia per species. This inoculum will be submitted to various modalities of temperature (0°C, 5°C, 10°C, 15°C, 25°C) before inoculation in liquid media at 25°C. Growth, toxin production will be quantified, and the composition of the Meta-*Fusarium* will be determined either by qPCR or metabarcoding methods. The student will carry out the *in vitro* experiments, and the subsequent molecular and biochemical analyses. He/She will perform statistical analyses (descriptive statistics, anova ...).

Task 2. Effect of the genotype of *F. graminearum* on the Meta *Fusarium* spp

Approximately one hundred of *F. graminearum* strains are available in the MycSA collection. As many Meta *Fusarium* spp. have been generated in a previous experiment (100 *F. graminearum* strains facing the same *Fusarium* spp. mixture). The student will carry out the subsequent molecular analyses. The composition of each Meta *Fusarium* will be determined by metabarcoding. He/She will perform bioinformatic (metabarcoding) and statistical analyses

PREREQUISITES :

Skills in microbiology, molecular biology, bioinformatics, statistics

REFERENCES

Xu, X. et al (2007) Effects of fungal interactions among *Fusarium* head blight pathogens on disease development and mycotoxin accumulation. *International Journal of Food Microbiology*, 119, 67–71. doi.org/10.1016/j.ijfoodmicro.2007.07.027.

Siou, D et al.(2015) Interactions between head blight pathogens: consequences for disease development and toxin production in wheat spikes. Applied and Environmental Microbiology 81, 957–965, doi:10.1128/AEM.02879-14.

Wagacha, J.M. et al. (2012). Interactions of Fusarium species during prepenetration development. Fungal Biology, 116, 836–847, doi:10.1016/j.funbio.2012.05.001.

KEYWORDS (5) :

filamentous fungi, biotic interaction, synthetic community, pathobiome, metabarcoding

NAMES OF THE SUPERVISORS:

Marie Foulongne-Oriol (Scientist).

NAME and ADDRESS OF THE TEAM/LABORATORY :



MycSA Mycologie et Sécurité des Aliments, INRAE Bordeaux Nouvelle Aquitaine

71, avenue Edouard Bourlax – CS 20032 .

33882 Villenave d'ornon cedex

www.inrae.fr, www6.bordeaux-aquitaine.inrae.fr/mycsa/

TEL : +33 5 57 12 26 35

E-MAIL : marie.foulongne-oriol@inrae.fr