Centre de Biologie pour la Gestion des Populations
Campus International de Baillarguet
755 avenue du Campus Agropolis - CS 30016
34988 Montferrier-sur-Lez - France
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https://www6.montpellier.inrae.fr/cbgp

Title : Influence of the Microbiome on the Invasive Success of a Global Pest

Context : Invasive insects pose a significant threat to global agriculture, causing substantial economic losses and major ecological disruptions. Among these insects, Lepidoptera are outstanding since they encompass a diversity of species known for their ability to adapt quickly to new environments. In particular, they may develop resistance to pest control methods such as insecticides on short time scales. It is therefore imperative to better understand how resistance develops in order to mitigate the impacts of these pests. Insects have developed a wide variety of relationships with micro-organisms. Phytophagous insects in particular often depend on their digestive microbiota to acquire certain essential nutrients. The composition of the digestive bacterial community may vary, sometimes on very short time scales, in response to a new environment or host, situations often encountered during biological invasions. Relevant for this project, gut symbionts have often been reported as providing resistance against pest control techniques, and insecticides in particular.

This PhD project will focuss on *Spodoptera frugiperda,* a native American Lepidoptera that is extremely polyphagous and causes serious damage to food crops such as maize, rice or sorghum. In Africa, it is the most damaging invader causing important food security risks. The biology of the species and its invasion pattern show several singularities that make it a particularly relevant model to assess insect capability to rapidly develop resistance to control methods. In *S. frugiperda*, the composition of the microbiome may vary depending on the host plant, or even the host genotype on which the larvae develop. However, whether microbial symbionts in this species play a role in its invasion success, and in its resistance against insecticides is poorly elucidated. The *S. frugiperda* model will therefore be used to study the role of the digestive microbiome in the invasion success of the species. Specifically, this PhD aims to test whether microbiome modulations alter reciprocal interactions between the composition and diversity of the digestive microbiome and resistance to abiotic environmental stresses such as temperature extremes and exposure to insecticides like the Bt toxin. Fieldwork to sample insects in in Kenya where this species has shown resistance to Bt toxins is likely.

The PhD will be supervised by Marion Javal (marion.javal@ird.fr; https://mjaval.wixsite.com/marionjaval) and Enric Frago (enric.frago@cirad.fr; https://sites.google.com/site/enricfrago/) and will involve collaboration with other labs (DGIMI, France ; ICIPE, Kenya). Do not hesitate to contact us if you need any extra information.

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Host institute: The PhD project will be based at CBGP (Centre for the Management and Biology of Populations) in Montpellier. This institute offers an international, dynamic and friendly scientific environment (https://umr-cbgp.fr/).

Requirements: This position requires a Master degree in biology or equivalent. The candidate should have a strong interest in experimental biology, eco-physiology and entomology, as well as an interest in plant-insect interaction systems.
We are looking for someone with good writing skills and statistical analyses using R, independent, motivated and keen on working in a multidisciplinary team. All geographic origins, orientations and identities welcome.

How to apply: please send an email to marion.javal@ird.fr and enric.frago@cirad.fr with a CV and a motivation letter (in English or French) including in the subject of the email « Candidature PhD Spodoptera ».

Application deadline: 18th April 2024

Starting date of the PhD project: 1st December 2024 at the latest.

Details of the selection process: once the documents are received we will acknowledge receipt. We will perform interviews the week following the application deadline.
The funding of the thesis is then subject to selection by the funding institute (IRD).