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Biology of plant pathogenic fungi: from genomes to agroecosystems (BIOGER)

Direction

Sabine Fillinger, director
Jessica Soyer, deputy director

Quelques chiffres

- 22 researchers and engineers
- 10 doctoral and post-doctoral students
- 23 technicians et administrative
- 210 m² greenhouse
- 300 m² of growth chambers, including 220 m² in level 3 containment

Mission et objectives

The BIOGER research unit is the French reference center for research into fungal diseases of field crops (wheat, rapeseed) and vines. BIOGER develops multi-disciplinary (genomics, molecular biology and biochemistry, cell biology, genetics, population genetics, evolution, epidemiology, modeling, phenotyping, diagnostics and taxonomy) and multi-scale (from gene to landscape) approaches to diseases of major



Pictures: © INRAE, F. Surlent, R. O'Connell

Our study models are pathogens responsible for economically important fungal diseases of wheat, rapeseed and other crops: wheat rusts (*Puccinia striiformis* and *Puccinia triticina*), rapeseed collar necrosis (*Leptosphaeria maculans*), wheat septoria (*Zymoseptoria tritici*), gray mold (*Botrytis cinerea*) of many cultivated and wild plants, and crucifer anthracnose (*Colletotricum* spp.).

The work of BIOGER and our collaborators has helped elevate these fungal species to model status for certain aspects of their genomic, biological, ecological and/or adaptive traits.

Our research generates scientific knowledge that is both fundamental, *through* the generation of new concepts with generic scope, and operational, enabling us to meet the expectations of society and various agricultural sectors for effective, sustainable management of fungal diseases of field crops.



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Microorganisms, Health &
Environment

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Plant Science, Diversity,
Health & Biotechnology

T

Agroecosystems &
Environment

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Digital Sciences &
Systems Modelling

Topics

Research

Our research work is organized into three interdependent transversal areas:

- **Mechanistic** understanding of **biotic interactions within the diseased plant ecosystem**. We characterize the molecular determinants of plant-fungus interactions, their regulation and the plant signals involved. Our research also includes the study of disease-associated microbiota.
- Deciphering **the mechanisms and dynamics** of plant pathogenic fungi's **adaptation** to varietal resistance, plants, fungicides and the environment at different scales. These studies are made possible by our large (heritage) fungal collections and associated phenotypic data.
- Development, evaluation and transfer of **sustainable fungal disease management strategies**. We analyze different disease management strategies involving the use of resistant varieties and/or fungicides. We evaluate them in terms of efficacy, sustainability and related socio-economic constraints, through statistical analysis of field data, modeling and experimental evolution under laboratory conditions.

In each of these areas, UMR BIOGER produces academic knowledge, generates new concepts and opens up new scientific fronts in fungal plant pathology, providing the basis for integrated fungal disease management based on current agro-ecology concepts.

This new knowledge is transferred to our socio-economic partners, who appropriate it for sustainable management of field crop diseases, minimizing the use of pesticides while maintaining crop quality and yields.

Collaborations

UMR BIOGER maintains active academic collaborations on a national and international scale with INRAE, CNRS, CIRAD and university laboratories. At regional level, BIOGER is part of the EUR Saclay-Plant-Sciences (SPS), which brings together all the laboratories in the Paris region involved in plant research. On an international scale, we are developing collaborations with numerous teams in Europe, the USA, Australia and North Africa.

BIOGER maintains close links with various French and international technical institutes, notably Arvalis, Terres Inovia and the International Maize and Wheat Improvement Center (CIMMYT), through collaborative projects and co-supervised theses.

Our research activity also includes collaborative projects and co-supervised theses with private or industrial partners (seed groups, crop protection industry).

Teaching

The BIOGER research unit is affiliated with the "Biosphera" and, to a lesser extent, "Life Science & health" Graduate schools of the Université Paris-Saclay. BIOGER lecturers and researchers contribute to the teaching of plant pathology and crop protection at AgroParisTech, ENSAIA, LaSalle Beauvais, as well as in the "Sciences du Végétal" Master's program at Université Paris-Saclay.



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