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# EMERGREEN: Greenhouses Platform for Studying Emerging Plant Diseases

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## PRESENTATION

The EMERGREEN platform (EMERging plants pathogens in GREENhouses and labs) was established in 2023 from the desire of INRAE's scientific departments to create a high-tech tool dedicated to regulated phytopathogenic agents and their vectors. This platform is located on the INRAE Nouvelle-Aquitaine Bordeaux campus in Villenave d'Ornon, France.

The experiments conducted at EMERGREEN aim to:

- Anticipate the emergence of diseases caused by quarantine phytopathogens:
  - Exploration of the biology of QOs (Quarantine Organism): life cycle, pathogenicity, life history traits, vectors, and hosts
  - Study of QOs' tolerance to environmental conditions such as temperature, humidity, and ultraviolet radiation
  - Analysis of QOs' adaptive potential, implementation of experimental evolution approaches
- Improve detection and surveillance methods:
  - Study of QOs' genetic diversity
  - Development of early detection methods for emerging disease outbreaks
- Propose actionable levers:
  - Development of risk management strategies considering various environmental, biological, and socio-economic factors
  - Study of host resistance to QOs
  - Study of the effectiveness of antagonists and potential auxiliaries for biological regulation of QOs and control the spread of diseases

## PLATFORM OFFER

EMERGREEN is dedicated to studies on emerging plant diseases characterized by complex interactions among a host plant, a quarantine or regulated pathogen, its potential vectors, and the environment and meets the needs of the national and international academic scientific community and industrial stakeholders. Manipulating these phytopathogenic agents (listed on the QO list) requires authorization from government services, and EMERGREEN's experience in applying for accreditation and monitoring compliance with the handling of quarantine organisms (record keeping, audits, etc.) enables us to meet the needs of the scientific community for quarantine organism manipulation and preparation of accreditation dossiers. EMERGREEN also offers support services for project management, provision of scientific equipment in confined facilities, and support for experimental activities such as phenotyping of pathogen-plant host-vector interactions, contributing to ongoing research projects.

## CONFINED FACILITIES

The EMERGREEN platform comprises three biosafety level 2 and 3 modules, all organized to meet biosafety requirements. Currently, EMERGREEN hosts:

- 1) a 180 m<sup>2</sup> biosafety level 2 "Vection" module, including a leafhopper (*Euscelidius variegatus*) rearing unit, a hatching unit for the natural vector of grapevine flavescence dorée phytoplasma (*Scaphoideus titanus*), and a phytoplasma collection maintained on periwinkle (*Catharanthus roseus*) for acquisition/transmission studies by insect vectors.

2) a 265 m<sup>2</sup> "High Containment" module, including 148 m<sup>2</sup> of biosafety level 3 greenhouse, with activities such as a virus collection on *Prunus*, the study of plant virus etiology, and the transmission/acquisition of grapevine yellows phytoplasma with the natural vector.

3) a 420 m<sup>2</sup> "Insect-Free" module of biosafety level 2, including laboratories, technical rooms and 132 m<sup>2</sup> of greenhouse, for the study of pine diseases (agreement pending).

Funding from the Nouvelle Aquitaine Region and INRAE has been obtained for the construction of biosafety level 2 and 3 greenhouses and laboratories (each approximately 400m<sup>2</sup>) to support EMERGREEN's future ambitions. This project aims to increase experimentation capacity, offer operational flexibility, and achieve high energy performance.

EMERGREEN, through its agents' involvement, is represented in numerous scientific and technological networks, which serve as strong means of access to technological innovations within the EMERGREEN platform's scope of expertise. The skills and know-how of the platform's agents, as well as the privileged link with users, are sources of continuous improvement of research equipment. Additionally, the platform is positioned within strategic frameworks such as INRAE 2030, contributing to scientific advancements and addressing key challenges in the field.

At the academic level, the EMERGREEN platform benefits from the scientific environment of INRAE, Bordeaux University, Bordeaux Sciences Agro, and the CNRS.

Thus, meeting the needs of the scientific community to progress in the identification and characterization of quarantine organisms (prioritized or non-prioritized), to elucidate their life cycle, and to find management strategies in changing agricultural and forest landscapes, the platform is involved in 14 regional, national, and international projects in these first two years, where its expertise is recognized and valued.

