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UMR1438

Characterization and Surveillance of Pesticide Resistance (CASPER)

Management

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Research topics

- Genetic basis of resistance
- Evolutionary cost of resistance
- Evolutionary response to an agronomic landscape

Key figures

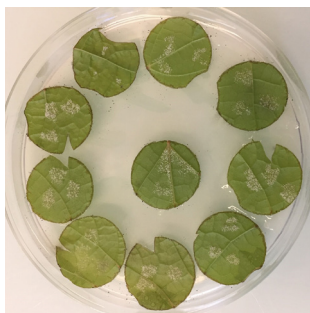
- 5 researchers
- 4 engineers and technicians
- 1 administrative officer

Keywords

- Plant protection products
- Resistance
- Monitoring
- Crop pests

Mission and objectives

The "Characterisation and Surveillance of Pesticide Resistance" (CASPER) group studies crop pests' resistance to plant protection products (PPP), commonly known as pesticides. The CASPER group belongs to a laboratory of the French Agency for Food, Environmental and Occupational Health & Safety (ANSES). It is also a platform shared by ANSES and INRAE for analysis and research into PPP resistance. This theme is tackled both from a practical point of view, through the unit's annual participation in the national PPP resistance monitoring plan, and from a more fundamental point of view, by conducting or collaborating on research projects. We work on a wide range of pest species, mainly plant pathogenic fungi and plant-parasitic insects.



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Our main objectives are:

- To develop methods and tools for monitoring the emergence and spatial and temporal evolution of resistance to plant protection products;
- To gain a better understanding of the evolution of resistance phenomena in order to develop strategies or methods for managing resistance to plant protection products in the future.

The unit's work mainly involves:

- Carrying out biological tests on plant pests, in particular phytopathogenic fungi and insects;
- The use of molecular biology tools to detect resistant bio-aggressors once the causal mutations have been characterized;
- The development of new tools and methods for characterizing, detecting and monitoring PPP resistance in populations of crop pests.



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Research

The group's research activities focus on 3 main areas. (i) characterizing pest resistance mechanisms; (ii) studying the costs associated with the evolution of resistance; and (iii) exploring the spatial and temporal distribution of resistance in agronomic landscapes. In a context of reducing the use of PPPs for sustainable agriculture, it is essential to gain a better understanding of the factors that favour the emergence, dispersion and growth of PPP resistance. Each of these areas is strategic in terms of monitoring resistance and developing strategies to fight against the evolution of these resistances in order to maintain the effectiveness of PPPs in the field.

Most of the experiments carried out by the CASPER joint research unit (UMR) are conducted in the laboratory. Working in a controlled environment makes it possible to accurately assess and quantify the levels of resistance of crop pests to the active substances or PPPs under study. The biological models used for the research are mainly the green peach aphid (*Myzus persicae*), the invasive fruit fly *Drosophila suzukii*, the grapevine downy mildew pathogen (*Plasmopara viticola*) and the plant pathogenic fungus *Cercospora beticola*, responsible for cercosporiosis in beetroot.

Collaboration and expertise

National

We collaborate with many research units in France (IGEPP, CEFE, LBBE). One of the unit's key collaborative efforts is with the members of the R4P network (Research and Reflection Ring on Pesticide Resistance) among whom are the INRAE units BIOGER (Paris-Saclay), Agroecology (Dijon), PSH (Avignon), SAVE (Bordeaux) and ISA (Sophia Antipolis). We are also one of the major partners of DGAL (Direction générale de l'alimentation) in running the national plan for the monitoring of resistance to PPPs, as part of the Biological Monitoring of France project. The unit is an important contributor to this plan and is involved in both organizing and executing it. Members of the group also regularly act as experts on national working groups (for example the Phytopharmacovigilance working group).

International

The CASPER UMR is developing collaborations with recognized international partners (Aarhus University, University of Exeter, USDA). Members of the unit are also involved in international groups of experts (for example "EPPO Expert Working Group on Resistance to Plant Protection Products" from the European and Mediterranean Organization for Plant Protection).

Scientific facilities

The CASPER group is equipped to carry out a wide range of biological and molecular biology tests. The group has 3 climatic chambers and 8 climatic cabinets. It has a Potter-Burgener tower, a piece of equipment that enables it to imitate the spraying of products in the field in the laboratory. The unit also has access to state of the art molecular biology equipment.

Teaching

The group is involved in teaching activities through regular supervision of undergraduate, Master's and PhD students. It is also involved in organizing workshops for agricultural professionals on the subject of resistance to plant protection products.



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