



Mercator Research Program | Call 5

Improving disease resistance of pea through selection at the plant-soil interface

Background

Soil-borne diseases in legumes are one of the most severe problems in protein production. They cause severe damage and can lead up to total yield loss, especially in pea (*Pisum sativum* L.). The lack of adequate resistance in current pea varieties impedes pea cultivation worldwide. Sustainable solutions are needed, particularly for organic farmers who rely on this ecologically important nitrogen-fixing legume in crop rotations.

Objective

The overall goal is to improve the resistance of pea against soil-borne diseases to allow higher frequencies of grain legumes in organic and sustainable production systems. Investigating the potential role of root exudates in the inhibition or attraction of plant pathogen complexes as well as beneficial microbes will elucidate the physiological basis of disease resistance of pea genotypes.

Research Approach

- Development of a high-throughput screening system for resistance against soil-borne pathogen complexes and application of it to screen genetic resources of international origin as well as European pea breeding material
- Genome-wide association mapping, quantitative real-time PCR and HPTLC technology to unravel resistance mechanisms at the plant-soil interface
- On-farm experiments to verify resistance mechanisms in the field
- Survey among farmers to determine incentives needed to cultivate grain legumes

Relevance and Expected Outcomes

A better understanding of the plant resistance mechanisms will aid in the development of screening tools for breeders to select genotypes resistant to soil-borne diseases taking account of the complex plant-soil interface. Breeding pea varieties with high resilience against soil-borne pathogens is a precondition for obtaining high and stable protein yields and is therefore crucial for the acceptance of new varieties by farmers. Resistant pea varieties will help to reduce the cultivation break of legumes in general as pea pathogens also affect other important legumes. Ultimately, outcomes of this project will be transferable to other legume cultivation systems.

Food System Challenges Addressed

Sustainable protein production, resistance mechanisms, resilience, plant breeding.

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Principal Investigator Prof. Bruno Studer,
Molecular Plant Breeding

Co-Investigators Dr. Pierre Hohmann, Dr. Monika Messmer, FiBL

PhD Student Lukas Wille

Partners Prof. Gertrud Morlock, Giessen University; Agata Leska, GZPK

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