Genetics & physiology of the modulation of pathogen resistance by an abiotic factor

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Team
Resistance and adaptation

Direction
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Keywords
Clubroot
Nitrogen
Quantitative resistance

Social-economic context

The use of resistant plant varieties is a major component of integrated strategies for plant disease control, in a perspective of low input agriculture development.

Scientific context

In the field, plants are often exposed to diverse environmental stresses, and resistant cultivars identified for a single stress may not be relevant under various environmental conditions. Recent evidences suggest that plants have the ability to cope with simultaneous biotic and abiotic stresses through exhibition of tailored responses which cannot be understood by directly extrapolating the results from individual stress studies where each stress is applied independently. The available evidences indicate that simultaneous occurrence of biotic and abiotic stresses can cause either a negative or positive effect on plants depending on the stress and pathogen under study.

Objectives

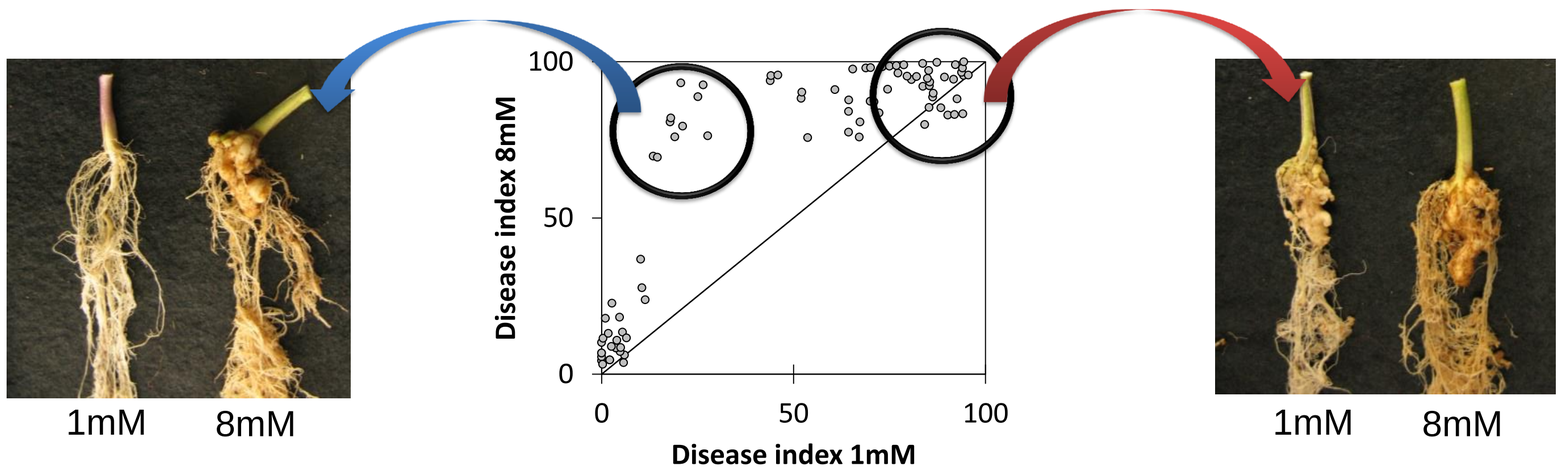
The aim of this study is to understand the impact of nitrogen constraint on the modulation of the *Brassica napus* response to clubroot, caused by *Plasmodiophora brassicae*. The questions raised in my PhD work are:

1° How effects of QTL involved in plant resistance to clubroot are modulated by nitrogen supply?

2° What are the mechanisms involved in the modulation of resistance to *P. brassicae* under nitrogen limitation?

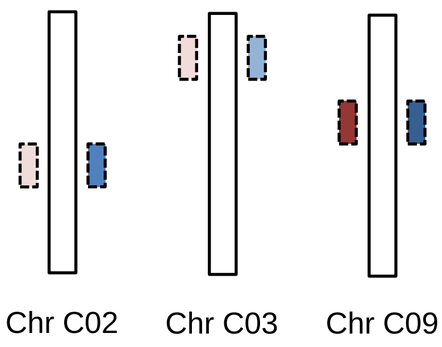
Results

Identification of genotypes with low N-triggered clubroot resistance



- Comparison of clubroot symptoms at 1mM and 8mM in a set of segregating population of genotype derived from a cross between Darmor-bzh and Yudal.

Genetic analysis highlights that low-N enhances C02-QTL effect



- QTL of resistance to *P. brassicae*, eH isolate, were detected both under low (N1) and standard (N8) nitrogen input at chromosomes C02, C03 and C09. However, the effect of C02-QTL is highly improved under nitrogen constraint compared to control condition (8mM in red and 1mM in blue, the more the color is intense, the more the effect of QTL is important).

Perspectives

To understand the mechanisms involved in this modulated response, the transcriptome and metabolome of the genotype Yudal, susceptible under 8mM and resistant under 1mM, will compare to that of the genotype HD018, susceptible in both conditions.