This is not a host plant : Decrypting the plant mechanisms of recognition and acceptance by a phytophagous insect

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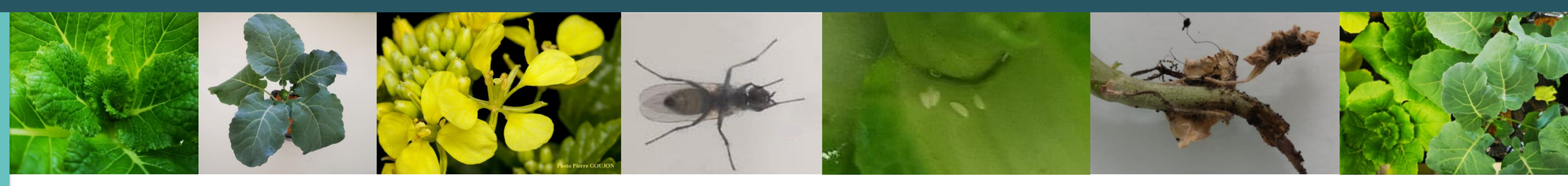

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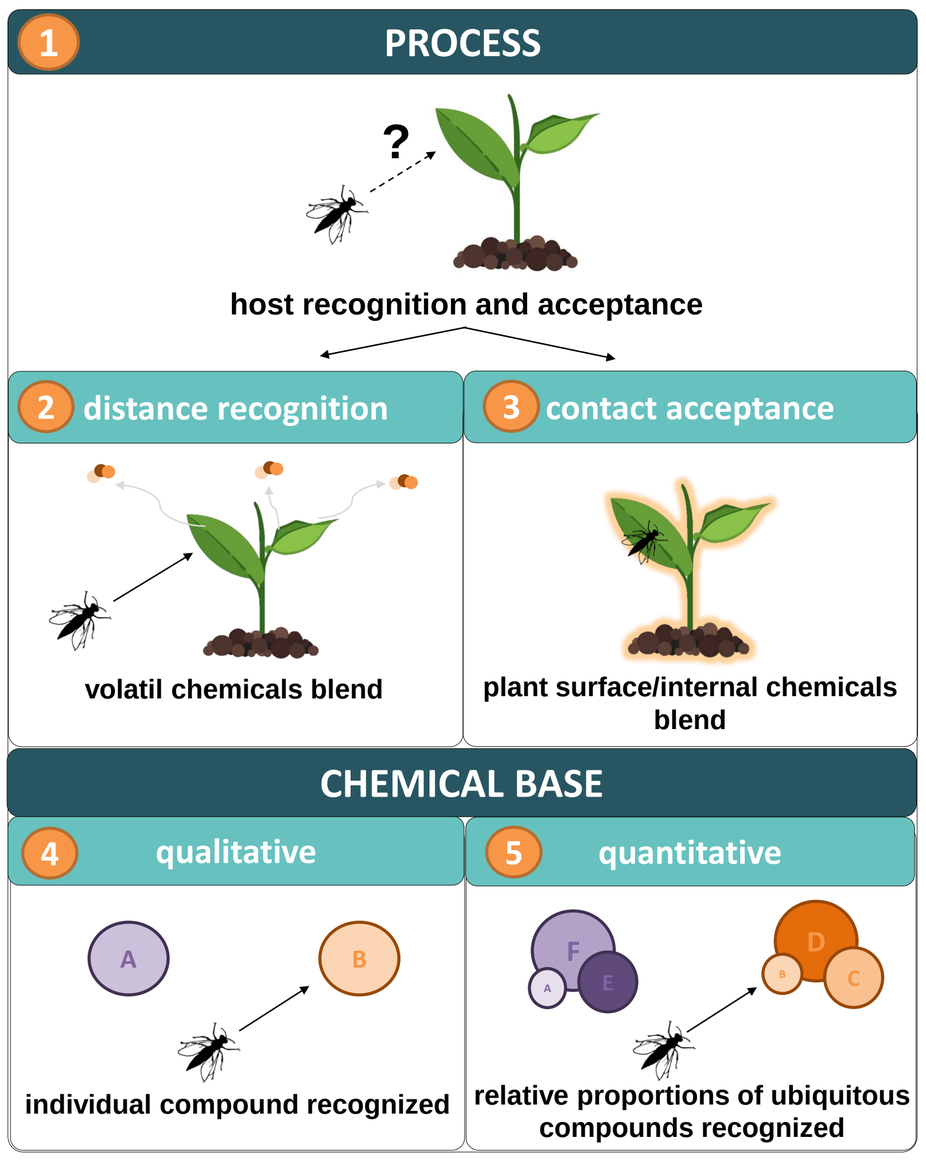
Scientific context

Among one million described species of insects, 500,000 are phytophagous. Since phytophagous insects exploit plants, they should therefore be able to recognize the signals emitted by them (1). These signals are mostly volatile chemicals (distance recognition) (2) and plant surface/internal chemicals (contact acceptance) (3).

Among phytophagous insects, 90 % are specialist, *i.e.* they exploit a limited host plant range. Many specialists even have preferences within this limited host range. This specialization is necessarily associated with abilities to detect and recognize signals emitted by plants of the exploited host range. Host recognition and acceptance can be a qualitative process (4) (based on the presence of specific compounds) and/or a quantitative process (5) (based on blends of ubiquitous compounds in specific proportions). The study of this quantitative aspect remains difficult since blends of chemicals produced and emitted by plants are usually composed of dozens to thousands compounds.



Objectives

The cabbage root fly (*Delia radicum)* is a Diptera whose females are specialist. Those females lay eggs only on plants of the Brassicaceae family and they even have preferences within this family. Previous studies showed interspecific differences in quality for the fly between cabbage (*Brassica oleracea*), Chinese cabbage (*B. rapa* ssp. *pekinensins*) and the white mustard (*Sinapis alba*), as well as intraspecific differences in Chinese cabbage and the white mustard. The processes of host recognition and acceptance are suspected to be at the origin of these differences. However, little is known about chemical signals that are responsible for this fine-scale variations. The objective of this PhD is both to characterize the chemical signals involved in the recognition and the acceptance of these three host plant species, and to decipher the relative contribution of qualitative and quantitative processes. This study will take place at three steps of the plant-insect interaction:

i. adult distance recognition (olfactometry)
ii. adult contact acceptance (oviposition test)
iii. larval contact acceptance (feeding test)

Perspectives

This PhD will allow to better understand the mechanisms underlying host recognition and preferences in specialist phytophagous insects. In particular, it will be one of the first studies that fully integrate the quantitative aspect in the study of host recognition and acceptance in specialist phytophagous insects.