STAGE DE RECHERCHE M2 ECOLOGIE EVOLUTION GENOMIQUE
Rentrée 2020

Sensory mechanisms underlying host plant choice in the pea aphid complex

Master 2 Internship at Institut Agro (formerly Agrocampus Ouest) Angers
Dates (flexible): January-June 2021

Research Unit: IGEPP, (Institute of Genetics, Environment and Plant Protection), UMR 1349 INRA-Agrocampus Ouest-Université Rennes 1, Ecology and Genetics of Insects team https://www6.rennes.inrae.fr/igepp/Equipes-de-recherche/Ecologie-et-Genetique-des-Insectes

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Project description:
Plant specialization is a very common phenomenon in herbivorous insects and olfaction often plays a major role in host plant choice, even though other senses can be involved. We have recently tried to evaluate which sensory cues are involved in host plant selection in well- characterized host races of the pea aphid *Acyrthosiphon pisum.* This pest aphid forms a complex of plant-specialized populations (also referred to as biotypes), each feeding specifically on one or a few legume (Fabaceae) species. Whereas olfactory cues do not seem to play an important role in host choice for wingless aphids, according to our preliminary experiments, they might be more important in winged aphids, which have a larger number of olfactory organs on their antennae. The recent identification of key volatiles and the ratio of emissions of different compounds from two legume plant species, pea and dyer's broom, each of which having their own specialized biotype of the pea aphid, will allow us now to investigate their role in host plant selection in addition to using whole plants as volatile sources. In the framework of the ANR project MECADAPT, we propose to investigate antennal detection of the volatile compounds, identified by our collaboration partner at the Max Planck Institute for Chemical Ecology emitted from pea and dyer's broom, using electroantennogram (EAG) recordings on winged morphs of a pea- and a dyer's broom-adapted aphid clones. In parallel, the student will investigate the attractive- or repulsiveness of single compounds and blends of compounds as well as of volatile bouquets of entire plants to the same aphid clones in behavioural bioassays, using a 4-way olfactometer. These two methods will allow to test whether specialized aphids respond to host and non-host plant volatiles, and if so, use them to select their specific host plant. This internship will allow the student to acquire knowledge in different aspects of insect sensory ecology and to learn behavioural and electrophysiological approaches, as well as to model and use appropriate statistics.

Related publications of the team:

Ben-Ari M, Outreman Y, Denis G, Le Gallic JF, Inbar M, Simon JC (2019). Differences in escape behavior between pea aphid biotypes reflect their host plants' palatability to mammalian herbivores. Basic and Applied Ecology, 34,108-117.

Peccoud J, Ollivier A, Plantegenest M, Simon JC (2009). A continuum of genetic divergence from sympatric host races to species in the pea aphid complex. Proc Natl Acad Sci U S A., 106,7495-7500.

Luquet M, Tritto O, Cortesero AM, Jaloux B, Anton S (2019). Early Olfactory Environment Influences Antennal Sensitivity and Choice of the Host-Plant Complex in a Parasitoid Wasp. Insects, 10(5):127– 13.

Sochard C, Le Floch M, Anton S, Outreman Y, Simon JC (2020) Limited influence of gain and loss of symbionts on host plant selection in specialized pea aphid genotypes. Entomologia Generalis, Accepted.

Qualification: We look for a highly motivated student with a background in behavioural ecology or neuroethology and a strong interest in sensory ecology.
Please send a CV and letter of motivation to the supervisors.