Trophic resource exploitation and movements of an aphid parasitoid in cereal-legume intercrops

Martin Luquet

Funding

PROGRAILIVE project

FEADER PEI-AGRI, Conseil Régional de Bretagne

•

2016-2019

UMR IGEPP

Institute for Genetics, Environment and Plant Protection

Inra - Agrocampus Ouest -Université de Rennes 1

Team name

Ecology and Genetics of Insects

Direction

Dr. Sylvia Anton

Dr. Bruno Jaloux

Pr. Anne-Marie Cortesero

Partners

European Union

Régions Bretagne & Pays-de-la-Loire

UNION EUROPÉENNE
UNANIEZH EUROPA

Région BRETAGNE

L'Europe s'engage en Bretagne / Avec le Fonds européen agricole pour le développement rural : l'Europe investit dans les zones rurales

UNION EUROPÉENNE

Région PAYS de la LOIRE

CE PROJET EST COFINANCÉ PAR LE FONDS EUROPÉEN AGRICOLE POUR LE DÉVELOPPEMENT RURAL. L'EUROPE INVESTIT DANS LES ZONES RURALES

Keywords

Parasitoid,
insect olfaction,
foraging strategies,
biological control,
intercrops

Agro ecology

Plant health

Genome and diversity

Social-economic context

Protein crops are legumes which could constitute an economically and environmentally sustainable alternative to soy importation for European countries, concerning livestock feeding. However, pest pressure could be an obstacle to securing yields. In a context of pesticide-use reduction, it is therefore needed to develop agro-ecological pest management solutions.

Scientific context

Parasitoids use hosts for reproduction and food sources such as nectar. In crops, food and/or alternative hosts are often limited to the borders, which leads to parasitoid daily commuting and their accumulation at the field interface (Fig.1 *A*,*B*).

Resource diversification through intercropping can result in higher parasitoid attraction and retention (Fig.2), leading to better biological control.

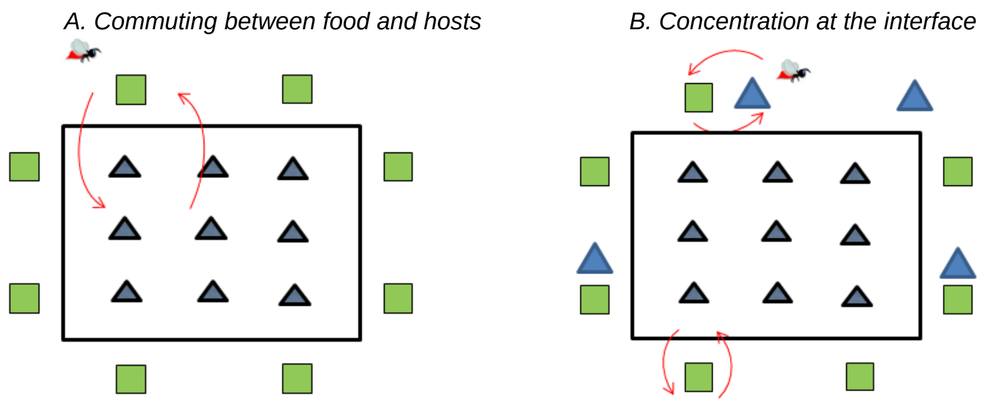

Fig.1 : parasitoid movements and resource exploitation in single crops

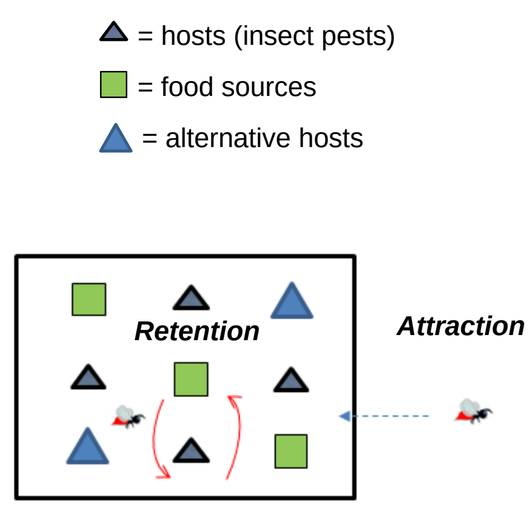

Fig.2 : parasitoid movements and resource exploitation in intercrops

Objectives

Aphidius ervi parasitizes both *Acyrthosiphon pisum*, a major legume aphid, and *Sitobion avenae*, the grain aphid. It can also feed on faba bean extrafloral nectar.

This PhD will consist in seeing how resource combination can affect *A. ervi* at several levels, using various methods, to address the following questions:

- **Odour perception & behavioural responses** *(olfactometry, electroantennography)*

a) Does nutritional state influence parasitoid odour perception ?

b) Can environmental heterogeneity modulate parasitoid odour learning ?

- **Movements and foraging strategies** *(isotopic enrichment approaches)*

c) How does resource diversification affect parasitoid movements in the field ?

- **Biological control** *(field surveys)*

d) Can intercropping increase aphid biological control ?

One additional question will be to see if environmental variability can explain the lack of host specialisation for *A. ervi*.

Perspectives

This PhD work will both allow understanding the ecological processes underlying parasitoid behaviour and resource exploitation, and help to see if intercropping could be an interesting way to secure future protein crop production in the West of France.

INRA SCIENCE & IMPACT — AGRO CAMPUS OUEST — UNIVERSITÉ DE RENNES 1