

Encadrement :

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Nature du financement de la gratification : acquis x prévu (bourse de mobilité a demander par l'étudiant)

Titre du stage :

The role of **cyanogenic glucosides** in the **genetic structure of the bean beetle, *Zabrotes subfasciatus*, and its larval parasitoids, *Stenocorse bruchivora*.**

Résumé:

Background :

Many plants contain chemical compounds which function, in part, to deter insect herbivory. The lima bean plant, *Phaseolus lunatus*, contains cyanogenic compounds in both the leaves and the beans and these compounds are known to be toxic to herbivores (Balhorn et al. 2005). Furthermore, these compounds affect herbivore behavior and development (Balhorn et al 2011). Previous studies in our group have shown that variation in the herbivore's host plant influence not only genetic structure of the herbivore (Alvarez et al. 2007), but also that of its associated parasitoids (Aebi et al. 2004, Campan et al. 2005). However the extent to which plant allelochemicals, such as cyanogenic compounds, present in the seeds may play a role in these processes is not known. Students joining this project will participate in one or more aspects of the project with the research team. Multiple positions are available for interested students.

Objectifs :

1. Wild seeds of lima bean plants collected from different populations in Mexico will be analyzed and characterized for their content of cyanogenic compounds.
2. Bruchids and parasitoids will be exposed to seeds from the previous populations varying in their content of cyanogenic compounds and their performance will be determined.
3. The genetic structure of the bruchid beetles emerging from the seeds of these different populations will be determined.

Méthodes :

For these experiments we will use seeds of Lima beans previously collected in the field in Mexico. Performance experiments will include setting up mating pairs of beetles in cups with beans and measuring egg number, development time, mass, and sex ratios. Parasitoid wasps will also be allowed to parasitize some of the beetle-infested beans and development time, mass, sex ratios, and adult longevity will be measured. Cyanogenic glucosides in the bean will be analyzed using an extraction and separation technique, liquid chromatography, and mass spectroscopy. Finally for genetic analysis DNA will be extracted from beetle samples and genetic structure will be quantified using microsatellite markers and PCR techniques.

Références bibliographiques :

Aebi, A., T. Shani, R.D.J. Butcher, N. Alvarez, A.M. Risterucci and **B. Benrey**. Isolation and characterization of polymorphic microsatellite markers in *Zabrotes subfasciatus* Boheman (Coleoptera: Bruchidae). Molecular Ecology Notes 4: 752-754.

Alvarez, N., M. Hossart-McKey, G. Restoux, A. Delgado-Salinas and **B. Benrey** (2007). Anthropogenic effects on population genetics of phytophagous insects associated with domestic plants. *Evolution* 6 : 2614-2622.

Balhorn, D.J., R. Lieberei and J.U. Ganzhorn (2005). Plant cyanogenesis of *Phaseolus lunatus* and its relevance for herbivore plant interaction: the importance of quantitative data. *Journal of Ecology* 31:1445-1473.

Balhorn, D.J., S. Kautz, M. Jensen, I. Schmitt, M. Heil, and A.D. Hegeman (2011). Genetic and environmental interactions determine plant defences against herbivores. *Journal of Ecology* 99:313-326.

Campan, E.D.M., A. Callejas, M. Rahier, and **B. Benrey** (2005). Interpopulation variation in a larval parasitoid of Bruchids, *Stenocorse bruchivora* (Hymenoptera : Braconidae) : Host plant effects. *Environ. Entomol.* 34(2) : 457-465. :

Techniques mises en œuvre :

Insect ecology : performance experiments

- **Chemical analysis** : liquid chromatography, mass spectroscopy
- **Molecular analysis** : PCR, microsatellites

Compétences particulières exigées :

An **interest in** research involving plant-insect and **tri-trophic interactions**.

Strong organization skills and ability to follow detailed directions (in English).

Neuchâtel is located in French-speaking Switzerland, however the lab includes a diverse array of researchers from different countries. The common language for communication is English, therefore we expect the applicant to have **strong English skills**.

Liste complète des sujets de stage de M2 sur le site de la filière bop : <http://www.u-bourgogne.fr/BOPdijon/>