Impact of the agro-ecological infrastructures on the biological control of *Dysaphis plantaginea* and *Cydia pomonella* in French cider apple orchards

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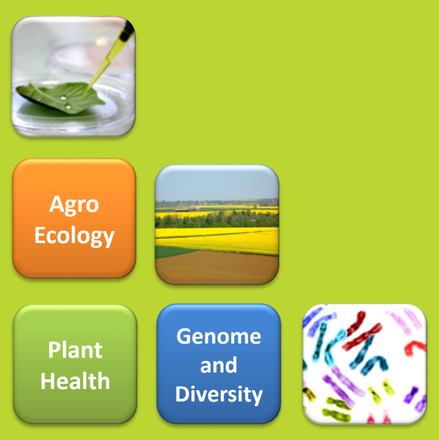

Social-economic context

Reducing the use of chemical products in cider apple orchard is currently an important concern. Fruits are transformed and farmers are not under strong pressure to provide a perfect visual quality of their production. Consequently, the potential to developp more environmentally friendly practices based on agroecological approaches is high.

Scientific context

Crops protection faces new environmental, economic and societal issues. The successful development of agroecological practices requires a global handling of all bioagressor populations and elucidation of the ecological processes determining their dynamics. This includes, among others, the study of the interactions between plants, pest and natural enemies (NE) in order to improve the biological control of pests.

Objectives

The Institut Français des Productions cidricoles (IFPC) is carrying out a study to develop and test new low inputs systems of cider apple orchard management relying on changes in farmers' practices to improve the biological control of two major pests: the rosy apple aphid (*Dysaphis plantaginea*) and the codling moth (*Cydia pomonella*). These pests can cause important economical damages. The aim of this study is to assess the feasibility of developing new agroecological practices by comparing in producer partners' orchards two systems of production: PROD systems where ordinary producer partners practices are applied (integrated pest management or biological control) and ECO systems in which agronomic innovations are tested including the setting up of agro-ecological infrastructures (AEI) and the reduction of use of pesticides.

The first step of this thesis is to understand which community of natural enemies that significantly reduce the populations of the rosy apple aphid (RAA) and of the codling moth. Then, statistical analyses are carried out to assess the influence the NE abundance and whether the setting up of AEI (for example hedgerow or flowers strips) could boost them in the orchards. Ultimately, this project is expected to provide farmers with some recommendations to improve their farming strategies.

Results

The preliminary results showed that syrphids' larvae and ladybirds are the most abundant natural enemies (NE) in the rosy apple aphid (RAA) colonies and that their presence is concomitant to the presence of this pest. Thus there seems to be the most efficient NE to control the populations of RAA in the cider apple orchards in Northern France.

These NE were found more abundant in ECO system than in PROD system. It can be due to the farming practices but also to the AEI set up in the ECO system. For instance, flower strips can provide them with nectar, pollen and alternative preys. The localization of these AEI seems to play a key role: the flower strips set up in the alley of the trees seem to increase the number of syrphids in the RAA colony more than when they are located around the orchards.

Some particular farming practices have also been showed to influence the control of RAA by NE. For instance, the kaolin treatment seems to disturb the efficiency of NE by modifying their feeding behavior.

The study of the predation by Carabids on *Cydia pomonella* is in progress.

Perspectives

Hence, a global and integrated management of orchards is necessary to improve the biological control of RAA. The setting up of AEI appears to favor the natural enemies community and thus to reduce the pest abundance. Further analyses are needed and are in progress to confirm these first results.