

The “good” weeds or how to give value to the local flora

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Abstract

Plant species other than crop are usually seen as weeds. Even though they can compete with crop for water and nutrients, they can also provide important services such as soil protection from erosion and promotion of natural enemies and pollinators. For this reason, it is essential that both farmers and fruit advisers are aware of which plant species are the most useful for enhancing biological control. In this context, we produced a plant guide that shows 1) lists of plants to promote specific groups of natural enemies and alternative preys/hosts, 2) lists of plants to enhance the guild of natural enemies according to specific groups of pests, and 3) factsheets of the most suitable plants for the promotion of natural enemies. In order to get local information, we sampled trees, shrubs and herbaceous plants present in semi-natural and natural habitats, as well as in margins of farms, orchards and roads of the fruit-growing area of Lleida, Catalonia (NE-Spain). Overall we captured more than 26,300 arthropods that were classified to family level and into three large groups: predators, parasitoids and alternative preys/hosts. We built up a database that associates each type of pest with its natural enemies (information from local literature) and the arthropods present in the sampled plant species. The analysis of this database allowed us to elaborate several lists of plants that harbour natural enemies of pests, as well as alternative preys/hosts. This guide can be accessed at: http://www.irta.cat/wp-content/uploads/2019/10/LLIBRE_guia_enemics_naturals.pdf.

Keywords: Ecological infrastructures, predators, parasitoids, pests, biological control.

Introduction

The growing demand for organic food and the low price that farmers receive from conventional fruits is boosting organic farming. However, agronomical practices on organic farms are often based on input substitution rather than on promoting the self-regulation of the agroecosystem. For this reason, it is essential that farmers are aware of the strategies that harness ecosystem services such as pollination and conservation biological control, among others. Therefore, knowledge on the presence and phenology of natural enemies in each area, as well as their nutritional requirements (preys/hosts and/or pollen) are crucial when trying to improve biological control of pests. In this context, we produced a plant guide to help farmers to develop more sustainable organic agroecosystems by promoting natural enemies. The guide is structured in three sections. The first one shows basic information about the biological cycle and food habits of the main natural enemies of pests. In section two, we explain the methodology used during the samplings and the criteria used to identify the most suitable plants to promote each natural enemy. The results of our work are displayed in the last section as: 1) lists of plants to promote specific groups of natural enemies and alternative preys/hosts, 2) lists of plants to enhance the guild of natural enemies according to specific groups of pests, and 3) factsheets of the most suitable plants for the promotion of natural enemies.

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Material and Methods

The samplings were carried out in the fruit-growing area of Lleida, Catalonia (NE-Spain) on trees, shrubs and herbaceous plants present in semi-natural and natural habitats, as well as in margins of farms, orchards and roads. From 2010 to 2012, trees and shrubs were sampled by beating and herbaceous plants were sampled with an insect suction sampler. In addition, a specific sampling for hoverflies was conducted from 2015 to 2016 using a butterfly net. In order to know the plants visited by hoverflies, the pollen grains that were adhered to their body were collected and identified to genus level. The individuals were identified to family level and classified into three large groups: predators, parasitoids and alternative prey/hosts. Each plant species was sampled at least three times per season.

Three types of analysis were carried out to 1) determine the distribution of natural enemies and alternative preys/hosts per season, 2) identify which plant species were preferred by each group of natural enemies and alternative preys/hosts per season and 3) classify plants according to the type of pest to be controlled. In order to classify plants according to the type of pest to be controlled, a literature review was carried out to associate each type of pest with its natural enemies. The sources of information consulted were, in most of the cases, studies carried out in Catalonia in order to reflect as accurately as possible the trophic relationships between pests and natural enemies present in our area.

With respect to factsheets, we elaborated 76 descriptions of the most suitable plants for the promotion of natural enemies. Each factsheet shows botanic and agronomic information of the plant species, two colour photographs, a summary of the natural enemies associated to them, and which type of pests could be predated or parasitized by those natural enemies.

Results

We sampled 25 tree and shrub species (361 beating samples) and 88 herbaceous plants species (1,098 suction samples). The number of captured arthropods was 26,358 (12.3% predators, 5.5% parasitoids, 32.9% alternative hosts/preys and the rest of the individuals were arthropods that did not belong to any of these three categories). Regarding predatory hoverflies, a total of 342 individuals were captured.

Overall, the trees and shrubs that showed the higher abundance of natural enemies were *Euonymus japonicus*, *Laurus nobilis*, *Punica granatum*, *Robinia pseudoacacia* and *Tilia platyphyllos*. With regard to herbaceous plants, species that belong to Asteraceae and Brassicaceae families were the most visited by natural enemies.

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