Report of activities in 2017. **15/02/2018**

Title: Chrysopidae family and flower strips as habitat management practices for the control of cabbage insect pests

Department of Plant Protection Biology, SLU, Alnarp. *By Belén Cotes and Mario Porcel*

1. Chrysopidae populations in cabbage crops and impact of floral sources in their assemblages.

1.1. Field experiments in 2017

Three commercial brassica crops in different locations in Scania (Knästorp, Veberöd and Kåseberga) were used as experimental fields during 2017. Two different treatments were established in all the three fields: (1) flower strips adjacent to cabbage fields and (2) a control treatment without flower strips. The flowering plant mixture used in the flower strips was comprised by six different plant species listed in Table 1. The seeds of these six plant species were sown by hand following the spatial structure represented in Figure 1.

Table 1: List of flowering species used in flower strips

Swedish name	English name	Species name / Cultivar
Honungsört	Lacy phacelia	*Phacelia tanacetifolia* (var Boratus, ekologisk frö)
Bovete	Buckwheat	*Fagopyrum esculentum* (ekologiskt frö)
Koriander	Coriander	*Coriandrum sativum* (Var: Marino) (ekologiskt frö)
Gurkört	Starflower	*Borago officinalis* Gurkört (ekologiskt frö)
Solros	Sunflower	*Helianthus annuus* Velvet Queen ekologiskt frö
Fänkål	Fennel	*Foeniculum vulgare* (var. Orion F.1 ekologiskt frö)

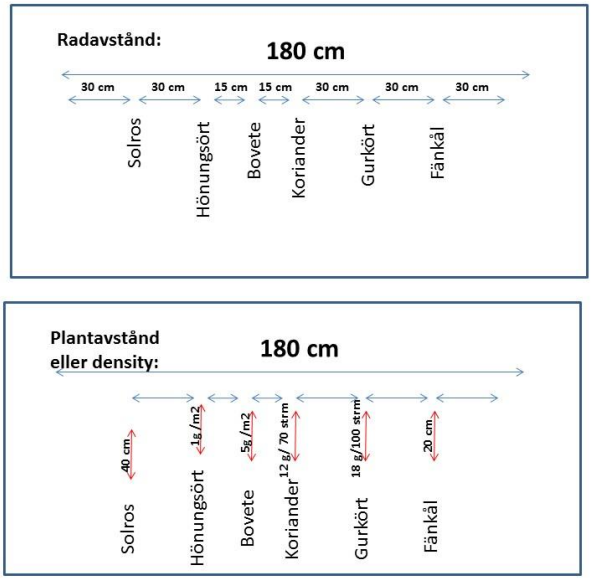

Figure 1: Distance between plants within and between rows of flower strips

The seeds were produced under organic conditions (Lindbloms Frö, Sweden). Sowing was carried out in each strip at the same time, but the timing between different strips within farm and in the different farms was adapted to the growers planting schedules (all of them sowed brassica varieties during the summer season). All plants had a good blooming rate during the sampling period (Figure 2), except for sunflower and fennel (Figure 3).

Figure 2: View of a flower strip next to a cabbage field in Knästorp

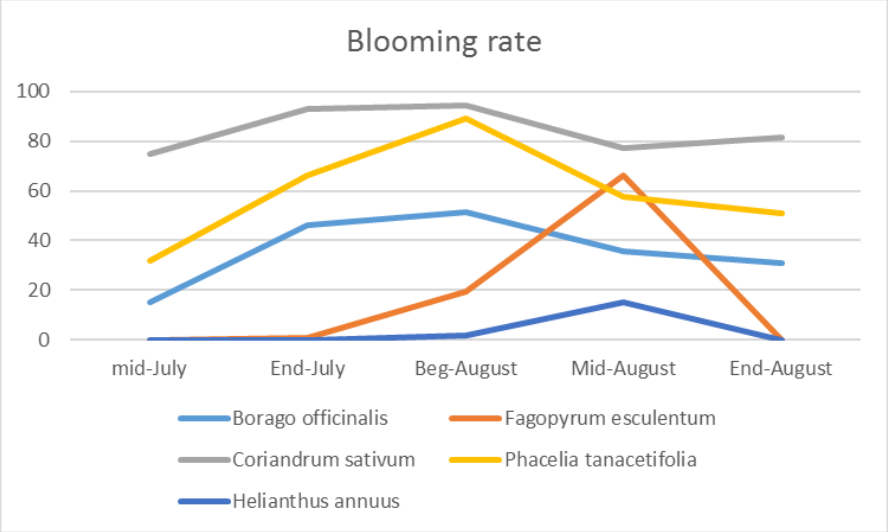

Figure 3: Blooming rate for five of the blooming plants in flower strips

On a weekly basis, from June to September 2017, arthropods were aspirated from the flower strips (alternating mornings and afternoons to increase the variety of species with different daily habits) for 40s using a Stihl® SH 85C suction sampler. Specimens were immediately frozen at -20°C transported to the laboratory. Larvae and adults of Chrysopidae were identified at species level in the case of adults (some of the species from the

C. carnea complex will be identified by M. Porcel) and will be identified at genus level for larvae in the coming year.

A total number of 54 adults and 15 larvae belonging to the Chrysopidae family were captured in the flower strips. Out of the adult specimens, 90.74% belonged to *Chyrsoperla carnea s.l.*, 7.41% to *Chrysopa commata* and only 1.85% to *Chrysopa pallens.*

Furthermore, brassica plants in rows with and without flower strips were visually inspected at each sampling occasion. Pests and natural enemies were recorded in a datasheet (data not presented here) and larvae of the Chrysopidae family were collected and frozen for PCR analysis.

1.2. Laboratory experiments in 2017

A laboratory bioassay was performed with adults of *C. carnea* reared from larvae provided by Koppert BV (Berkel en Rodenrijs, The Netherlands) and fresh plant material obtained from the flower strips. Newly emerged adults were individually released after 24 h in cages containing two flowering plants combined in six dual-choice bioassays (Lacy phacelia, buckwheat, coriander and starflower). The adults were left feeding on the flowers for 24 h. Pollen gut content will help to identify whether in a dual choice situation *C. canea* adults prefer to feed from one type of plant or another.

1.3. Laboratory experiments in 2018

Once adults of the Chyrsopidae family from experiments in *sections 1.1* and *1.2* have been sorted by species level, the abdomen of the females will be dissected in order to examine their pollen preferences during 2018.

2. Chrysopidae populations in cabbage crops and impact of flowering sources in their assemblages.

2.1 Semifield experiment in 2017

Newly moulted second instar larvae were released on canopies of white cabbage plants and left feeding on natural field populations of pests for 48 h. Each cabbage bearing five *C. carnea* larvae was covered with a net bag from BugDorm (Megaview Science Co., Ltd., Taiwan). Then, cabbage plants were cut and brought to the laboratory to recapture the released larvae, which were immediately frozen for future PCR analysis.

2.2 Calibratory feeding experiments in 2017

Before PCR analysis, time-series trials were carried out in laboratory with *C. carnea* specimens from our insect culture. Newly moulted second instar larvae starved for six sequences between 0 and 24 hours. After every sequential time of starvation, larvae were left feeding for 30 min on one of the pests of interest (cabbage aphid and diamondback moth). Specimens of diamondback moth were provided from the culture at the University of Copenhagen and cabbage aphids were collected from brassica fields. Specimens were immediately frozen at -80°C.

2.3 Field collection of larvae in 2018

All the Chrysopidae larvae recorded by visual observation in the experiment described in *section 1.1* were captured and included in the collection that will be used to identify the type of prey consumed by chrysopid larvae. Field-collected lacewing larvae, target prey (cabbage aphid and diamondback moth), and relevant non-target prey collected in 2017 will be used for these experiments. In addition, specimens will be captured during 2018 in order to count with a sufficient number of individuals for DNA extraction.

2.4 DNA analysis in 2019

DNA analysis of all larvae (field and semifield collections) will be carried out at the Institute of Agrifood Research and Technology, Barcelona, Catalonia, Spain in 2019.