

The importance of insect pollination for field bean yield

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The field bean (*Vicia faba*) is an important break crop that fixates atmospheric nitrogen, thereby providing nitrogen to the crop rotation and improving the soil structure. Field beans have a high yield and protein content, and a protein composition that fits several livestock species. In Sweden, field beans have substituted peas, which together with increasing demand for organic meat have increased the area of organically cropped field beans. Yield in field beans is enhanced by insect pollination and can be severely reduced by insect pests. Knowledge about benefits, management, and underpinning ecology of ecosystem services such as pollination and biological control of insect pests is needed for sustainable, effective and economically viable field bean cultivation.

We set out to test if:

- Adding managed honey bees increases the yield of field beans.
- Cultivation of annual flower strips that provide pollen and nectar resources before and during field bean bloom, increases the presence of wild pollinators and natural enemies, thereby increasing the yield of field bean fields.
- High densities of pollinating insects reduce the occurrence of pests in field beans.

Originally, field work was planned for 2017, but due to parental leaves in the team, fieldwork was postponed until 2018. PhD-student Chloë Raderschall then joined the team for this experiment. Also, flower strips were planned to be sown in the autumn of 2017, but this was made impossible due to adverse weather. We instead established spring sown flower strips in 2018 in 9 locations across Skåne. To 4 of these we added a minimum of 10 honey bee hives per field. We also had 8 control fields without a flower strip, adding honey bee hives to 4 of these.

The crossed experimental design allowed us to examine how adding honey bees and/or flower strips affected: yield and yield components, pests attack of aphids (*Aphis fabae*) and beanbeetles (*Bruchus rufinamus*), pest control and pollination, as well as population densities of wild pollinating and predatory and parasitic insects during flowering. Due to an extremely warm and dry spring in 2018, the establishment of the flower strips was somewhat uneven. For the same reason the field beans had a very early and brief flowering period. Despite this, we managed to sample most of the variables mentioned above. Due to a dry summer with high temperatures, yield levels were low. The yet many samples from the field season of 2018 are now being processed in the laboratory.

In addition to the measurements in the crop, we are following up these surveys in the spring of 2019 with a estimation of the number of bumble bee queens found at each site where we surveyed a field bean crop in 2018. This will tell us whether the honey bee and flower strip treatments have had any effect on the wild bumble bee populations.

We further wish to test whether autumn sown flower strips affect yield, by providing early bloom to support ecosystem services and beneficial insects in field beans. We will therefore, at the end of the summer 2019, establish flower strips in 8-9 sites, selecting yet another 8-9 sites as controls. These field bean fields will be surveyed in the summer of 2020.



Field site with flower strip and bee hives in 2018 (Photo: Oskar Rennstam-Rubbmark)