

# Wildflowers availability not a land-use type affects commercial bumblebee foraging on the strawberry.

Anna Bontsutsnaja<sup>1</sup>, Matti Pisman<sup>2</sup>, Reet Karise<sup>1</sup>, Marika Mänd<sup>1</sup>, Guy Smagghe<sup>2</sup>



[anna.bontsutsnaja@emu.ee](mailto:anna.bontsutsnaja@emu.ee)

<sup>1</sup>Estonian University of Life Sciences, Kreutzwaldi 1, 51014 Tartu, Estonia,

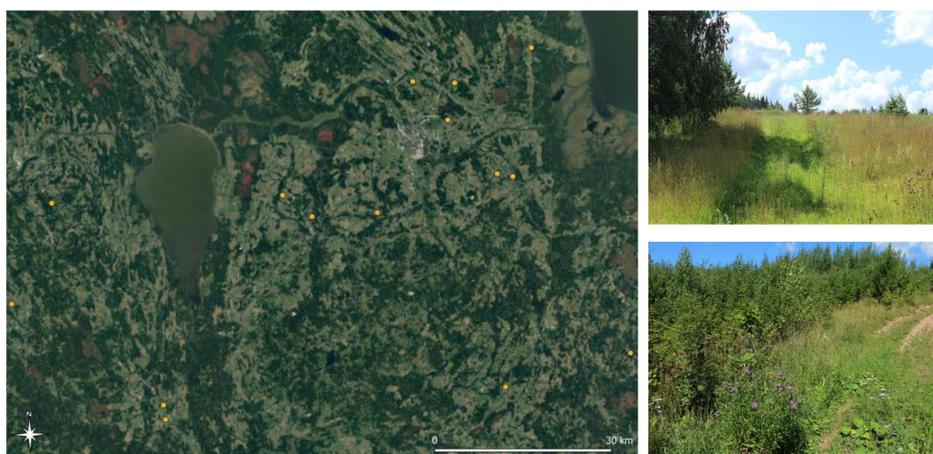
<sup>2</sup>Ghent University, Faculty of Bioscience Engineering, Coupure Links 653, 9000 Gent, Belgium

## INTRODUCTION

Managed bumble bees can be used to increase crop yield quality and quantity in areas where wild pollinators are insufficient. The success of introduced pollinators is highly dependent on the surrounding environment, competition with other pollinators, food source relevance, and foraging behaviour.

## AIM

To describe impact of surrounding land-use type with different plant communities on bumble bee food preferences among strawberry production fields.



**Figure 1.** Map of study sites (1:50 000) and pictures of semi-natural areas within the study area. Author: E.Kuningas.

## METHODOLOGY

- 15 strawberry fields in the south of Estonia
  - 2 commercial bumble bee (*Biobest*®) hives per side
- The percentage of land-use types surrounding strawberry fields were calculated at different spatial scales (100, 200, 400, 600, 800 and 1000m). Values at 1km radius, as common bumble bee foraging range, provided to describe study areas: arable land (24.0 – 75.9%), woodland (10.1 – 68.7%) and grassland (2.4 – 17.6%). Corbicular pollen was collected from bumble bee foragers as they entered the nest across two sampling days during the strawberry flowering period of 2017. Afterwards pollen origin was determined by light microscope to the lowest possible taxonomic level.

**Table 1.** Plant species that were identified by light microscope, roughly divided by habitat. Only plant species of >3% abundance were presented.

Plant group	% ± SE	Habitat
<i>Lupinus</i>	11.43 ± 1.51	Grasslands, areas with high human impact
<i>Caragana</i>	11.15 ± 1.48	Hedgerows, areas with high human impact
<i>Lamium album</i>	10.48 ± 1.37	Forest and field edges, grasslands
<i>Rosaceae</i>	8.83 ± 1.29	Grasslands, areas with high human impact
<i>Brassicaceae</i>	6.38 ± 1.15	Field edges, grasslands
<i>Chelidonium majus</i>	5.53 ± 1.04	Forest and field edges, grasslands
<i>Trifolium</i>	5.03 ± 0.49	Grasslands
<i>Brassica napus</i>	4.78 ± 0.96	Arable land
<i>Vicia cracca</i>	4.72 ± 0.94	Forest and field edges, grasslands
<i>Fabaceae</i>	4.30 ± 0.89	Forest and field edges, grasslands
<i>Apiaceae</i>	3.20 ± 0.71	Forest and field edges, grasslands

## CONCLUSIONS

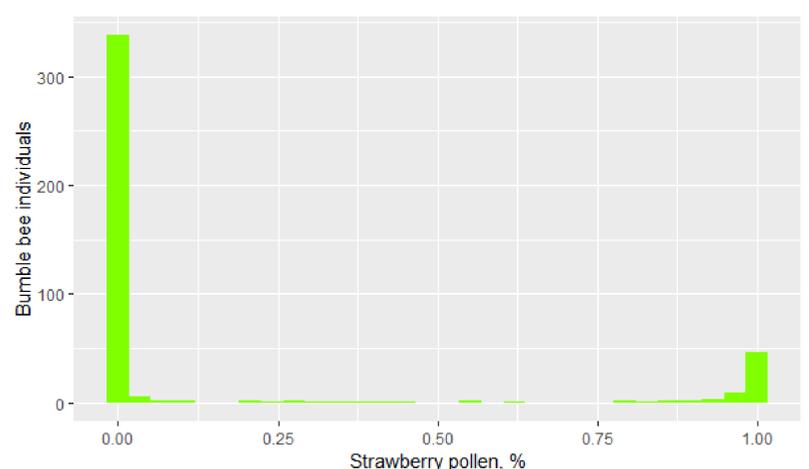
Regardless of land-use type or strawberry field size, only a few bumble bee individuals foraged on strawberry, preferring wildflowers, which mostly originated from grasslands.

## RESULTS AND DISCUSSION

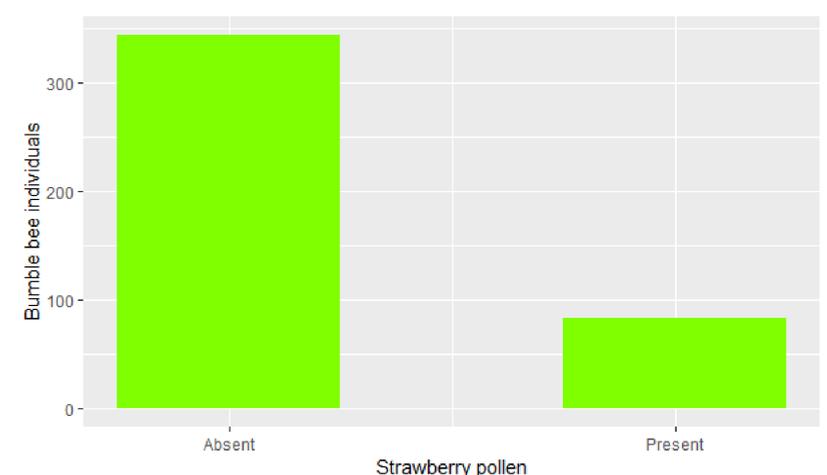
- Pollen loads on average contained only 16.4 ± 1.7% strawberry pollen (Fig.2), but the bumble bee individuals foraged on strawberry mostly stayed on strawberry (Fig.3).
- Proportion of the different land-use types at any spatial scale did not significantly affect bumble bee foraging rate on strawberry (exception: grasslands).
- A majority of wild plants found in bumble bee corbicular pollen originated from grasslands (Tab.1).
- Strawberry field size did not affect bumble bee foraging rate on strawberry ( $z = 0.69$ ,  $p = 0.43$ ).

## FUTHER DIRECTIONS

- **Pollen DNA meta-barcoding:** for more specific information about foraging plant diversity;
- How does plant species diversity affect bumble bee nest size/weight, and is it related to land-use type?
- How do semi-natural area patchiness and distance from strawberry fields affect bumble bee foraging preferences?



**Figure 2.** Strawberry pollen concentration in pollen loads collected by individual bumble bee forager.



**Figure 3.** Absence or presence of strawberry pollen in pollen loads collected by individual bumble bee forager.

## ACKNOWLEDGEMENTS

This study was supported by the Estonian Ministry of Education and Research project IUT36-2

