

# *Bombus terrestris* as an entomovector to suppress *Botrytis cinerea* in open field strawberry



**Marika Mänd  
Reet Karise**



Estonian University of Life Sciences  
Kreutzwaldi 1a, 51014, Tartu, Estonia

## Introduction

Strawberry (*Fragaria x ananassa*) is a fruit crop grown worldwide, but diseases such as the grey mould *Botrytis cinerea* frequently limit its yield. Most of grey mould infection on the fruits is initiated during the flowering period. Use of foraging bees as disseminators of microbial control agents (MCAs) to flowers is known as entomovector technology. Many researchers have shown that bumble bees can efficiently vector MCAs; however, most studies have been conducted in greenhouse conditions.

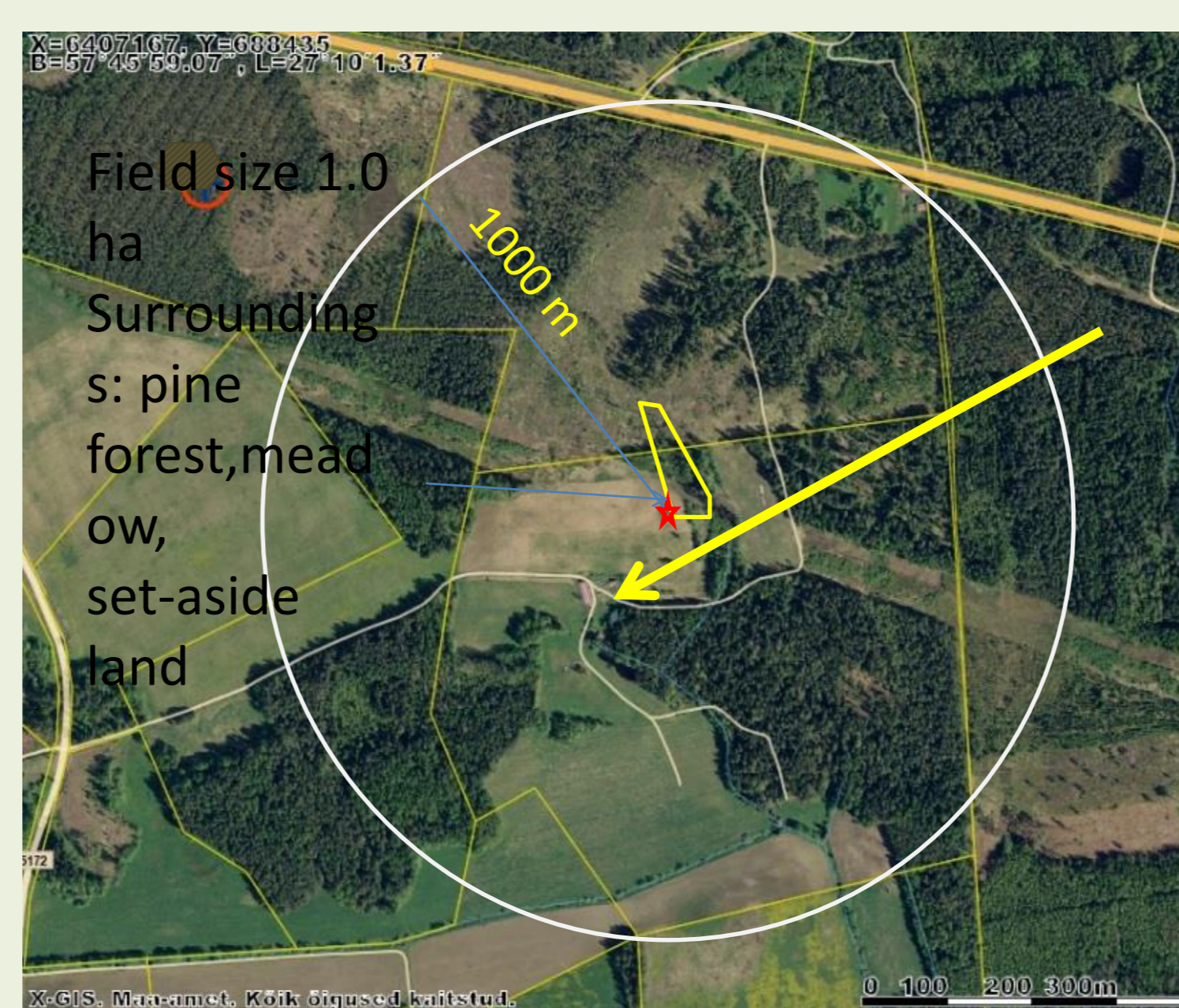


**The aim** of this study was to investigate to what extent the bumble bee *Bombus terrestris* visits strawberry flowers and whether it can suppress *Botrytis* in field conditions where many competing plant species are flowering simultaneously.

## Material and Methods

- ❖ The study was conducted in 2012 in two strawberry fields (Figure 1). Bumble bee (*Bombus terrestris*) hives (three per ha) were placed near strawberry fields.
- ❖ To each hive a special dispenser was attached containing the biofungicide Prestop-Mix, based on the parasitic fungus *Gliocladium catenulatum*, which prevents the growth of many plant pathogenic fungi.
- ❖ Two treatments were established: bee-delivered Prestop-Mix treatment and untreated control. Healthy and *Botrytis*-infected berries were counted.
- ❖ Pollen pellets from returning forager bumble bees (N=30) were gathered and identified. 0

**Study site 1** (no flowering cultures)



**Study site 2** (many flowering cultures)

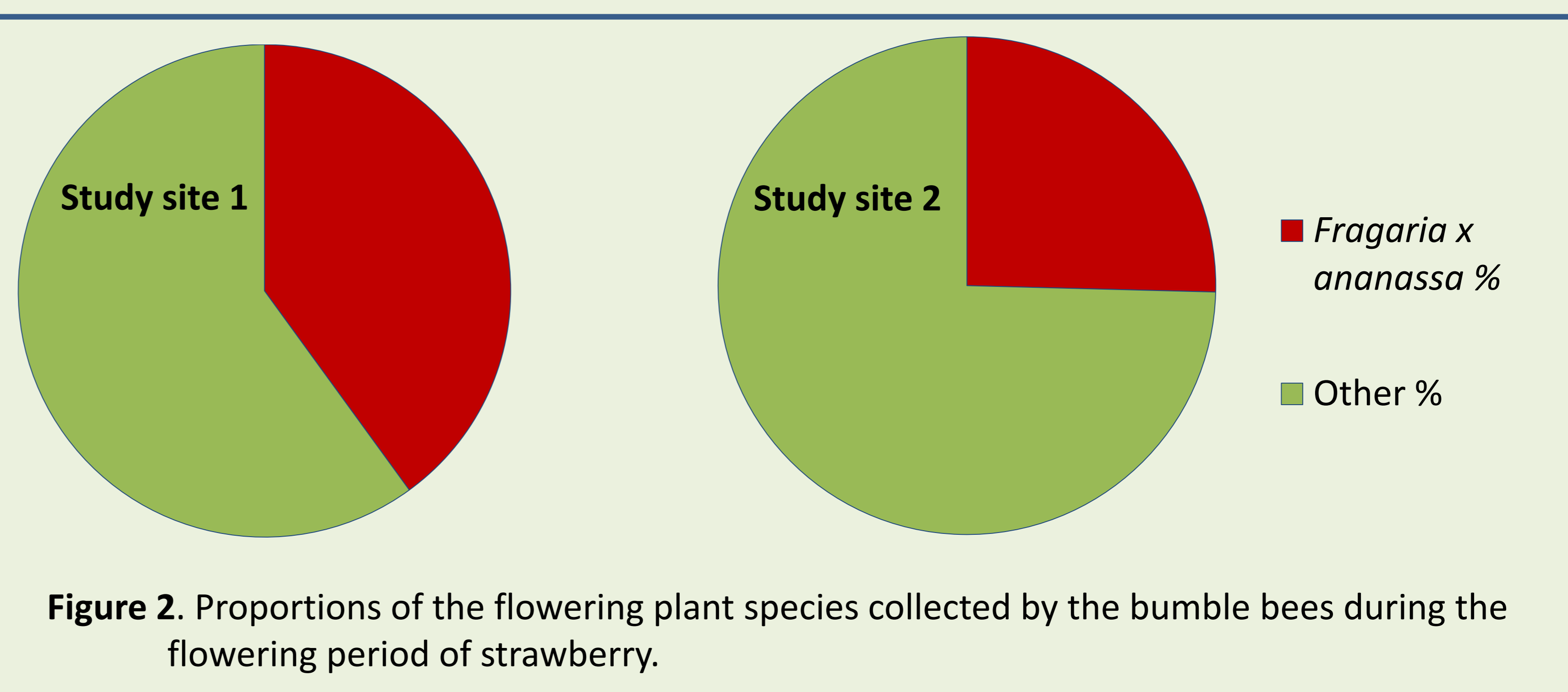


Field size 2.0 ha  
Surroundings: orchards, lupine, grape, currant

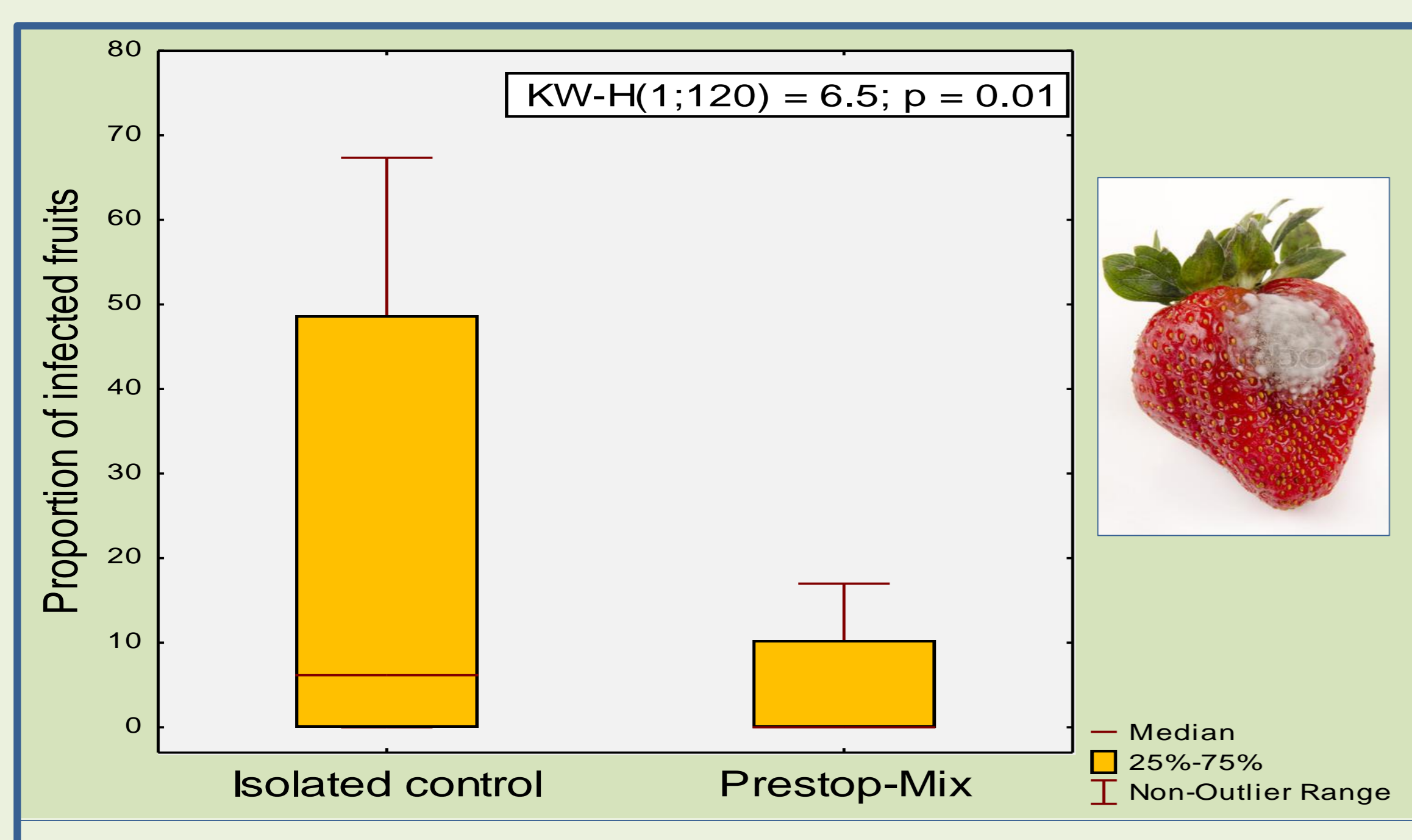
**Figure 1.** Landscape around the strawberry fields.

## Results and Discussion

- ❖ The study showed that the corbicular pollen gathered by the bumble bees contained 25-40% of strawberry pollen (Figure 2) and 1/3 of the foragers visited mostly or only strawberry during a foraging trip.
- ❖ The other dominantly-collected plant species were white dead-nettle (*Lamium album*), apple (*Malus domestica*), *Artctostaphylos uva-ursi*, *Rosa sp* and *Ranunculus linqua*.
- ❖ The rate of strawberry infection by grey mould decreased from 18% on the isolated control plots to 6% on the plots visited by bumble bees (Figure 3).



**Figure 2.** Proportions of the flowering plant species collected by the bumble bees during the flowering period of strawberry.



**Figure 3.** The rate of infected strawberries on the isolated control plots and on the plots visited by the bumble bees.

## Conclusion

This study provides strong evidence that bumble bees can vector a MCA to reduce significantly *B. cinerea* incidence not only in greenhouse strawberries but also in open field conditions where the landscape is heterogeneous with many competing flowers.