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28th Nordic-Baltic Apicultural Research Symposium,
the Nordic-Baltic Bee-Council and Estonian Beekeepers Winter days
4. – 6. February 2011
Dorpat Hotel, Soola 6, Tartu, Estonia

Using honey bees to disseminate the biocontrol agent *Gliocladium catenulatum* J1446 to strawberries for *Botrytis cinerea* control

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There is a need for more environmentally friendly plant protection methods, since the intensification of agriculture and the increasing use of agrochemicals have led to resistance problems in botrytis control for many strawberry growers.

An alternative to chemical spraying is to use bees as entomovectors to carry the biological control agents onto the flowers during their foraging flight. First experiments to study the efficiency of the forenamed biocontrol method in strawberry grey mould control were successfully conducted in Finland, using the biofungicide Prestop Mix, which is a preparation of the parasitic fungus *Gliocladium catenulatum*.

In 2010, a similar experiment was conducted in Estonia, to study if using bees in dispersing the Prestop Mix preparation would be also efficient in our local conditions, where the landscape is more heterogeneous and the strawberry pollen and nectar is not very attractive for honey bees. The study was carried out in two strawberry plantations in Tartu County, in five experimental areas. The strawberry varieties were `Sonata` and `Polka`. Honey bee hives were placed at the edge of strawberry fields; to each hive we attached a special dispenser containing the Prestop Mix preparation. Exiting the hive the bees walked through the Prestop Mix powder, which sticks on the legs and body hair of the bees. Searching for pollen and nectar honey bees visit hundreds of flowers every day and carry the Prestop Mix preparation to the strawberry flowers.

We compared the bee-disseminated biocontrol with untreated control, the control field plots were covered with exclusion cages and to other plots bees had fee access. The proportion of healthy and botrytis infected berries were evaluated.

Our results show that treating the strawberry plants with the bee-dispersed Prestop Mix significantly reduced the proportion of infected berries compared with the control; we also found that the efficiency of the treatment depended of the strawberry variety.

Since there is little data on the safety of Prestop Mix to the physiology of bees, we conducted laboratory experiments with commercially produced bumble bees. The test bumble bees were fed for three weeks with a mix of pollen, sugar solution and the Prestop Mix preparation, whereas the control bumble bees were fed with pollen and sugar solution only. An infrared gas analyser was used to measure the metabolic rate by recording the amount of CO_2 release (VCO_2 ml h^{-1}). Preliminary results of laboratory tests show that dusting the bees with Prestop Mix powder lowered somewhat the metabolic rate of the treated bumble bees, whereas feeding the bees with the biopreparation had no effect on the metabolic rate of treated bumble bees compared with the control.