
VI. Session - Biocontrol methodology using bees

Pesticide sprays compromise pollination and biocontrol services on strawberry

Heikki Hokkanen, Ingeborg Menzler-Hokkanen, Aino-Maija Mustalahti

Department of Agricultural Sciences, University of Helsinki, Box 27, FIN-00014 Helsinki, Finland

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During the past five years we have developed a successful and reliable method of protecting strawberry and raspberry cultivations from grey mould (*Botrytis cinerea*) attacks, by using honey-bee disseminated biocontrol with the commercial antagonist *Gliocladium catenulatum* (Prestop Mix). This has allowed growers to fully abandon grey mould fungicide sprays and increase their marketable berry yields. Some growers still prefer to use, in addition to the bee-vectored biocontrol, chemical fungicides, and many more are spraying against insect pests at the time of flowering. The pesticide sprays may decrease the efficiency of the pollination and biocontrol services, provided by our 'entomovector technology'.

In our second study year (2007) we assessed in detail the honeybee foraging patterns on strawberry, primarily to determine whether adequate flower visitation was taking place in the target area (strawberry and raspberry cultivations) for effective biocontrol of the grey mould. Flower visits by pollinators - including honeybees from the hives for entomovectoring - were monitored on five farms throughout the flowering season and at different times of the day. Periods of observation lasted in one spot usually 20 or 30 minutes, and at each spot about 10-15 flowers were observed at one time. In total over 11 hours of observations were made, including 445 individual flowers.

At the beginning of flowering, an average of 1.5 honeybee visits per flower in one hour were counted, throughout the day (an average of about 10 honeybee visits/flower/day). This rose to about 3 or 4 visits/flower/hour at the end of the flowering season, despite abundant appearance of competing flowers. However, at the critical times in the middle of flowering honeybee visitation rates on strawberry flowers declined, being lowest at 0.5 visits/flower/hour about two weeks after onset of flowering. This coincided with the peak spraying of fungicides and insecticides on those farms, which were using both the bee-disseminated biocontrol and chemical pesticides. On several farms, 2-3 sprays were carried out within 5 days, and we observed clear decline in pollinator visitation after the sprays. After some days, the visitation rates started to increase again. Practically no honeybee visits occurred during the day following insecticide sprays, presumably because of a repellent effect of the insecticide.

We believe that pesticide use on strawberries severely compromises the efficacy of bee-disseminated biocontrol, and the associated pollination services. Although combining the biocontrol and pesticides produces the highest level of grey mould control, the marketable strawberry yields were highest in our study from treatments where only the bee-vectored biocontrol was used, indicating that pesticide sprays were not necessary, and likely were harmful to the efficacy of the bees in providing optimum pollination and biocontrol on the crop.