

6.2 Honeybee colony disorder in crop areas: the role of pesticides and viruses

Noa Simon-Delso^{1,2}, Gilles San Martin³, Etienne Bruneau¹, Laure-Anne Minsart¹, Coralie Mouret¹, Louis Hautier³

¹ Beekeeping Research and Information Centre (CARI), Place Croix du Sud 4, 1348 Louvain la Neuve (Belgium); simon@cari.be, (Corresponding author)

² Environmental Sciences, Copernicus Institute, Utrecht University, Heidelberglaan 2, 3584 CS, Utrecht, The Netherlands

³ Walloon Agricultural Research Centre, Life Sciences Department, Plant Protection and Ecotoxicology Unit, Rue de Liroux, 2, B-5030 Gembloux, Belgium

Abstract

As in many other locations in the world, honeybee colony losses and disorders have increased in Belgium. Some of the symptoms observed rest unspecific and their causes remain unknown. The present study aims to determine the role of both pesticide exposure and virus load on the appraisal of unexplained honeybee colony disorders in field conditions.

From July 2011 to May 2012, 330 colonies were monitored. Honeybees, wax, bee bread and honey samples were collected. Morbidity and mortality information provided by beekeepers, colony clinical visits and availability of analytical matrix were used to form 2 groups: healthy colonies and colonies with disorders (n=29, n=25, respectively). Disorders included: (1) dead colonies or colonies in which part of the colony appeared dead, or had disappeared; (2) weak colonies; (3) queen loss; (4) problems linked to brood and not related to any known disease. Five common viruses and 99 pesticides (41 fungicides, 39 insecticides and synergist, 14 herbicides, 5 acaricides and metabolites) were quantified in the samples.

The main symptoms observed in the group with disorders are linked to brood and queens. The viruses most frequently found are Black Queen Cell Virus, Sac Brood Virus, Deformed Wing Virus. No significant difference in virus load was observed between the two groups. Three acaricides, 5 insecticides and 13 fungicides were detected in the analysed samples. A significant correlation was found between the presence of fungicide residues and honeybee colony disorders. A significant positive link could also be established between the observation of disorder and the abundance of crop surface around the beehive. According to our results, the role of fungicides as a potential stressor for honeybee colonies should be further studied, either by their direct and/or indirect impacts on bees and bee colonies.

Keywords: *Apis mellifera*; honeybee colony disorders; fungicides; pesticides; virus; mortality; queen failure; crop area; landscape