3.5 Effects of a neonicotinoid seed treatment in winter oilseed rape (active substance clothianidin) on colony development, longevity, and development of hypopharyngeal glands of honey bees (*Apis mellifera* L.) in field, semi-field and cage tests.

Eva Blum[1, 2], Ingrid Illies[1], Stephan Härtel[1, 2], Jens Pistorius[3]

[1] Bavarian State Institute for Viniculture and Horticulture, Department of Honey Bee Research & Beekeeping, 97209 Veitshöchheim, Germany
[2] Department of Animal Ecology & Tropical Biology, University of Würzburg, 97074 Würzburg, Germany
[3] Julius Kühn-Institute (JKI) Federal Research Centre for Cultivated Plants, Institute for Crop Protection in Field Crops & Grassland, 38104 Braunschweig, Germany

Abstract

Currently the impact of neonicotinoids on bees is under fierce discussion in the European Union. The neonicotinoid clothianidin is a systemic pesticide used as seed treatment in winter oilseed rape (OSR). On the EU level it was concluded that there is still some uncertainty about an environmental risk for pollinators of this systemic treatment due to lack of data on residues in nectar and pollen.

The work presented here is part of a large-scale project, coordinated by Julius Kühn-Institute. In this study honey bee colonies were observed in field and semi-field tests during rape flowering. In the field test four colonies were placed adjacent to a treated OSR field (seed treatment with Elado®, 10g clothianidin/kg seed) and to a control field (without insecticide seed treatment). For the semi-field test four tents (40m^2) per treatment (control, Elado®, Modesto® - 5g clothianidin/kg seed) were equipped with a honey bee colony, two bumble bee colonies (*Bombus terrestris* L.) and three nesting sites for solitary bees populated with cocoons of the red mason bee (*Osmia bicornis* L.). The flight activity of all bee species was daily recorded.

The mortality of honey bees was monitored by using dead bee traps. Colony development was estimated according to the Liebefeld method in order to estimate lethal and sub-lethal effects of the treatments and the study design (field vs. semi-field). In addition, twenty newly emerged bees from control and treatment colonies (field and semi-field) were taken from the combs and caged to investigate the longevity of bees raised under the described test conditions. Four cages per treatment were observed for six weeks and mortality was recorded daily. At the same time 50 newly emerged bees were captured, marked and release into the colony. After four days at least ten marked bees were re-captured, immediately frozen and the volume of hypopharyngeal glands of each bee was measured.

All colonies of the semi-field test needed additional feeding to survive the study. The field colonies were able to storage honey but there were differences between treatment and control group in the mortality of bees collected from the dead bee traps at this study site. Comparing the longevity of bees caged from the control colonies we found differences between the semi-field colonies and field colonies.