The impact of Cry3Bb1 toxin on selected target and non-target arthropods

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With regard to the spread of western corn rootworm (WCR, Diabrotica virgifera virgifera) the cultivation of GM maize resistant to this pest due to the presence of bacterial toxin Cry3Bb1 is considered in the Czech Republic. Possible environmental impact of GM maize MON 88017, was followed with a non-GM isogenic cultivar, non-GM cultivar treated with the insecticide Dursban 10G (a. i. chlorpyrifos) and two reference cultivars KIPOUS and PR38N86. Each treatment was planted on five 0.5 ha plots (25 plots in total) on 14 ha field trial in 2009-2011.

The diversity and the abundance of predators (hoverflies, lady birds, pirate bugs) and parasitoids (ichneumons, braconids), plant dwelling insect (thrips, aphids) and epigeic arthropods (spiders, ground and rove beetles) were monitored during whole vegetation period.

Multivariate analysis (RDA) and analysis of variance did not reveal any significant impact of GM maize (verified expression of Cry3Bb1 with ELISA) on either species composition or abundance of the non-target arthropods during the period of three years of study. The slight effect of insecticide treatment, currently used in Czech Republic for WCR control, was evident in decrease of abundance or diversity of epigeic arthropods but mainly not significantly.

Bt maize expressing Cry3Bb1 provides considerable but not full protection against WCR. To improve the effect of coleopteran-specific Cry3 toxins several recombinant proteins with N-/C-terminal and binding domain modifications were prepared and examined in a laboratory bioassays. The preliminary results did not indicate any differences between natural and modified Cry proteins tested on the last instar larvae however experiments with neonates are still ongoing.

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