Insecticides and curcubitacins: Compatibility of Invite EC™ with insecticides with different modes of action

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Introduction
Management options to control the western corn rootworm (WCR) are also targeting the adult beetles. The development of resistance in the US renewed the interest in combinations of insecticides with semi-synthetic compounds. Curcubitacins evoke a compulsive feeding behaviour of adult WCR, allowing a reduction of the field application rate. But the use of a single active ingredient (i.e. cabaryl) can lead to the development of resistance within few years.

The aim of the study was to evaluate (i) the possibility to combine curcubitacins (Invite EC™) with insecticides of different modes of action (ii) the influence of biological factors on the attractiveness of the bitter compounds and (iii) the development of resistance to curcubitacins.

Methods
Leaf dipping bioassays: (i) to compare the toxicity of pure insecticides and insecticide-Invite-mixtures (Fig. 1)
Cellulose membrane bioassays: (ii) to identify the influence of age, sex and pre-contact to the number of beetles arrested and the membrane area consumed (Fig. 2); (iii) to identify the development of resistance to insecticides by using beetles collected in Austrian maize fields before and after an insecticide-Invite application.

Results
(i) For none of the insecticides the addition of Invite cause an increased efficacy of 90%. Most suitable products to be mixed with Invite are Avaunt and Biscaya (Fig. 3). The biggest difference between the treatments with or without Invite occur after 5 h exposure. For Karate Zeon, Reldan22, and Spinosad, the addition of Invite cause no effect after 48 h.
(ii) The attractiveness of Invite is influenced by all biological factors tested, i.e. Invite is most attractive to young males without a pre-contact (Fig. 4).
(iii) Invite is more attractive to beetles collected before than the beetles collected after application (Fig. 5).

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