

### **3.12 Comparative chronic toxicity of three neonicotinoids on New Zealand packaged honey bees**

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#### **Abstract**

Thiamethoxam, clothianidin, and imidacloprid are the most commonly used neonicotinoid insecticides on the Canadian prairies. There is widespread contamination of nectar and pollen with neonicotinoids, at concentrations which are sublethal for honey bees (*Apis mellifera* Linnaeus). We compared the effects of chronic, sublethal exposure to the three most commonly used neonicotinoids on honey bee colonies established from New Zealand packaged bees using colony weight gain, brood area, and population size as measures of colony performance. From May 7 to July 29, 2016 (12 weeks), sixty-eight colonies received weekly feedings of sugar syrup and pollen patties containing 0, 20 (median environmental dose), or 80 (high environmental dose) nM of one of three neonicotinoids (thiamethoxam, clothianidin, and imidacloprid). Colonies were weighed at three week intervals. There was a significant negative effect ( $P < 0.01$ ) on colony weight gain (honey production) after 9 and 12 weeks of exposure to 80 nM neonicotinoids and on cluster size ( $P < 0.05$ ) after 12 weeks. A significant effect of neonicotinoid exposure was not observed for brood area or number of adult bees, but these analyses lacked adequate ( $>80\%$ ) statistical power due to marked variation within treatment groups. Thus, continued reliance on colony-level parameters such as brood area and population size for pesticide risk assessment may not be the most sensitive method to detect sublethal effects of neonicotinoids on honey bees.

#### **Reference**

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<http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0190517>

### **3.13 Tank mixtures of insecticides and fungicides, adjuvants, additives, fertilizers and their effects on honey bees after contact exposure in a spray chamber**

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#### **Abstract**

In agriculture honey bees may be exposed to multiple pesticides. In contrast to single applications of plant protection products (PPP), the effects of tank mixtures of two or more PPP on honey bees are not routinely assessed in the risk assessment of plant protection products. However, tank mixes are often common practice by farmers. Mixtures of practically non-toxic substances can lead to synergistic increase of toxic effects on honey bees, observed for the first time in 19921 in combinations of pyrethroids and azole fungicides. 2004 Iwasa et al. already reported that ergosterol-biosynthesis-inhibiting (EBI) fungicides strongly increase the toxicity of neonicotinoids in laboratory for the contact exposure route. Furthermore, in agricultural practice additives, adjuvants and fertilizers may be added to the spray solution. For these additives usually no informations on potential side effects on bees are available when mixed with plant protection products. Therefore, it is considered necessary to investigate possible additive or synergistic impacts and evaluate potentially critical combinations to ensure protection of bees. Here, we investigated the effects on bees of combinations of insecticides, fungicides and fertilizers under controlled laboratory conditions. A spray chamber was used to evaluate effects following contact exposure by typical field application rates. Subsequently, mortality and behaviour of bees were monitored for at least 48 h following the OECD acute contact toxicity test 2143. Dependencies of synergistic effects and the time intervals between the applications of the mixing partners were evaluated.