Communication between plants and honey bees more complex

Molecules acting on gene regulation are exchanged across species' borders

18 August 2021 / A new scientific publication shows that honey bees can take up specific RNA molecules produced by plants via their gut, and that these molecules could interfere with gene regulation in the pollinators. The research looked at so-called miRNAs produced in the pollen of sunflowers and Sidr (*Ziziphus spina-christi*). The miRNA was found inside intestinal cells and could influence several gene functions that are, for example, linked to exploratory behaviour and development of the larvae. The research demonstrates that communication between plants and honey bees is more complex than previously thought.

As the researchers conclude: „*In summary, these results provide evidence of cross-species regulation function of miRNA between honeybee and flowering host plants, extending our understanding of the molecular interactions between plants and animals.*" For the first time it has been shown that honey bees take up larger amounts of plant miRNA in their intestines. Other previous research has shown that miRNA fed by honey bees to their larvae can impact caste development. Therefore, it seems likely that miRNA from sunflowers and Sidr can impact gene regulation in bees.

The miRNA (microRNA) molecules are fundamentally different to mRNA (messengerRNA) used in the corona vaccines. The mRNA in the vaccines is meant to produce proteins, whereas the miRNAs are meant to interfere with gene regulation. That is why they are called ‚non coding' RNA (ncRNA). Plants and animals produce miRNAs for their own gene regulation, but also can take up or exude the molecules via roots or their intestines. These processes enable, amongst others, the exchange of information with microorganisms associated with plants and animals, and can also be part of their defence mechanisms.

As such, the 'RNA-code' acts beyond species' borders and may play a significant role in the co-evolution of plants and animals. For example, the time at which the plants flower and the development of the pollinators could by synchronized in this way. The effects of miRNA were first discovered in nematodes and have meanwhile also been seen in humans. Several ongoing research projects are exploring potential medical applications.

The ncRNAs are also used to combat insects: Bayer is currently selling genetically engineered maize which produces additional nsRNA. In this case it is a ‚short intefering' RNA (siRNA). The molecules are meant to interfere with gene regulation in pest insects feeding on the roots, and thus reduce infestation. Several companies are also working on sprays containing ncRNA that are intended for use as pesticides in the fields.

However, the mechanisms are complex and risk assessment not conclusive. This has also been shown in work done by the European Food Safety Authority (EFSA). Similarly to genetically engineered maize, no final conclusions can be drawn on whether, or to which extent, the artificial RNA is taken up from feeding and which adverse effects this may have.

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Further information: The recent publication [2]
Further publication on miRNA effects in honey bees [3]
Review of some miRNA research [4]

Testbiotech on the risk assessment of GE maize producing insecticidal miRNA [5]

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