NOTES AND COMMENTS

Bt transgenic maize pollen and the silent poisoning of the hive.

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Maize or cotton pollen from Bt transgenic plants has been shown not to harm Coleopterans (ladybirds) and Hymenopterans (honeybees and bumblebees), even when they are exposed to large amounts of the anti-lepidopteran Bt maize or cotton pollen (Malone and Pham-Dèlègue, 2001; Hanley *et al*., 2003). Hanley *et. al*. (2003) suggested that the Bt pollen could be used to control moths in beehives and recommended its use as a bio-pesticide. We disagree that transgenic Bt pollen will not harm honeybees and it may be useful as a hive bio-pesticide and that it is good if honeybees collect it.

The foraging range of the honeybee may reach 12 km in length; it may encompass a circle with 6 km radius centred on the beehive, much more than previously supposed (Beekman and Ratnieks, 2000). So, a single colony can effectively collect pollen and nectar from an area which surpasses 113 km^2.

Maize is not a source of nectar for the honeybee, nor is its pollen considered to be an important source of protein for them. The crude protein of maize pollen is about 15%, so, it can be considered to be a food of medium quality for bees (Sommerville, 2001). However, maize pollen is frequently collected by bees in summer, particularly in some places (Louveaux and Albisetti, 1963). We found, during a three years' trial, that in the village of 'Cesar', in Northwest Portugal, in some weeks of summer, an average of 17% of the total pollen collected by honeybee colonies was maize pollen, even though this crop is not sown extensively in that region. During 2003, some colonies collected, during the maize pollination period, up to 0,435 kg of maize pollen. So, it is not surprising that in hives located in places where the maize crop is sown in large areas, along with the lack of other sources, the maize pollen may reach 90% of dietary pollen during some consecutive weeks (Louveaux and Albisetti, 1963). The importance of maize pollen for insects can be crucial, as it may be one of the last sources of pollen before wintertime. It will thus be stored for a long period. As bees are not affected even when they ingest large quantities of Bt transgenic pollen, we will never see its direct effects in this insect. But problems, may arise, and not only from the risk of insect-mediated hybridisation with wild plants.

In healthy honeybee colonies, for example, two species of moth, *Achroia grisella* and *Galeria mellonella*, can usually be found living in symbiosis. In commercial beekeeper literature they are cited as pests of stored combs. This was the point of view of Hanley *et. al*. (2003), but it is very doubtful whether they really cause an economical impact, as super honey combs are never infested.

The moths can be considered beneficial insects. In nature, they feed on beeswax that is either too old and contaminated to be reused by the bees, or that has been abandoned after the death of the bee colony. Thus they clean the nest of old wax, particularly when it contains brood or pollen, which, once abandoned, may become (and it really does), a potential focus for the dispersal of bacterial and viral diseases (Melathopoulos *et al*., 2004). This process affects not only honeybees and wild bees but also other insects that invade abandoned nests. The moths do not eat the wax; they ingest it to absorb the remains of the brood, the faeces, cocoons and stored pollen.

As honeybees do not distinguish conventional maize or cotton pollen from transgenic pollen, this pollen may be stored in hives, sometimes 10 km away from the transgenic field and transgenic Bt pollen can cause 100% mortality of moth larvae.

This fact can have an effect on the lepidopteran fauna associated with the honeybee colony. The increase and fast spread of transgenic crops, may thus lead in the future, to the appearance of new environmental problems, just as other apparently non-harmful pesticides of the past affected non-target insects far away from fields.

Fortunately, the wax moth species shall probably never be at risk, but we should not be worried only about protected species, but with the entire environmental balance, as they are of crucial importance to honeybees and wild bees.

Once Bt maize or cotton pollen is stored in wild colonies after their death, combs will most likely remain unrecycled as long

as the stored pollen maintains its toxicity. Consequently, combs will remain as a potential source of disease for a longer time. So, if we disturb the role of the moth in nature in its cleaning and recycling tasks of the hives' wax (and that of some other wild pollinators) around Bt transgenic fields, we may be opening doors to new problems in the future.

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