

Pollen of current generation genetically modified crops is not harmful to bees

Gent - 4 February 2013, At least one third of all crops are pollinated by insects, with honeybees accounting for up to 80 % of the work. Therefore, bees are correctly considered to be the most important pollinators in agriculture. However, a decline in bee populations has been noted all over the world. The Greens/EFA group has sounded a warning and launched a campaign "Give bees a chance: no GMOs, no pesticides". Scientific studies have shown that certain pesticides from the group of neonicotinoids can be harmful for bees. However, it is objectionable that the Greens/EFA group has linked genetically modified (GMO) crops to the current bee problems. There is no sensible argument to indicate that GMO crops are harmful to bees.

So how does the confusion arise that GMO crops are harmful to apiculture?

The current generation of genetically modified plants was developed and marketed by a number of multinationals. Long before the introduction of the GMO technology, many of these companies were founded on the development of pesticides. Although pesticides are needed to secure food productivity and although they are probably not the main reason for the declining bee populations, it is reported that some neonicotinoids have sublethal effects on honey bees and bumblebees. In lab and field-like circumstances neonicotinoids can decrease foraging behaviour of bees, decrease their state of health, induce problems with orientation and decrease production of queen bees (Schneider *et al.* 2012; Whitehorn *et al.* 2012; Gil *et al.* 2012). However, these pesticides have nothing to do with the GMO technology or the current generation of GMO crops, they are merely produced by companies that also develop GMO crops. This is an unfortunate coincidence and only demonstrates that multinationals are active at many different levels in the agro-industry.

Beekeepers in the United States have seen their bee populations declining and have incorrectly blamed the introduction of GMO crops as one of the possible causes. However, a similar general deterioration and abnormally high mortality in honeybees has been noted in Northern Europe (e.g. Belgium). Yet there are no commercially farmed GMO crops in Belgium and surrounding countries. Therefore, the GMO crops cannot be the cause of the deterioration in bee populations in this case. This is a good example of how myths are formed that give GMO crops a bad reputation.

What are GMO crops and which GMOs are cultivated in Europe?

There are 2 very important aspects when discussing GMOs: the application, in other words, which genetic information has been added to the crop and the GMO technology itself. The GMO technology allows us to introduce one or more desirable characteristics into a specific plant in a more targeted manner. If the genetic information of a plant was compared to a software package, then the GMO technique could be compared to upgrading the software: the genetic code for a certain characteristics is added.

The cultivation of GMOs in Europe is very limited. GMO corn (insect-resistant corn MON810) is only cultivated in Spain, Portugal, the Czech Republic, Romania and Slovakia, whilst the Amflora potato was cultivated in Sweden and Germany until 2011.

The insect-resistant corn MON810 that is cultivated in Europe produces a protein obtained from the soil bacterium *Bacillus thuringiensis* (Bt), more specifically the Cry1Ab protein. This Bt protein is only effective against certain insects and its use as a spray is permitted in organic agriculture. If Bt is sprayed, then Bt-sensitive insects that do not eat the plant are also killed. By allowing the crops to produce Bt themselves, only the insects that eat the crop are killed. The Bt protein is also produced in the pollen and therefore bees will come into contact with it. However, the Bt mechanism of action is absent in bees, so there is no sensible argument in favor of assuming that Bt crops are harmful to apiculture. Indeed, various studies in the lab and the field have demonstrated that - in comparison to conventional pollen - the pollen from Bt crops has no effect on the weight of the bees, the orientation, the quantity of pollen collected, the activity of the pollen collectors, the health of the colony and the weight and development of the brood (Rose *et al.* 2007; Duan *et al.* 2008; Hendriksma *et al.* 2011).

Regarding the Amflora potato, it has an altered starch composition and it is only used for industrial applications (paper industry), not for consumption. The cultivation of the Amflora potato is not harmful to pollinators since the altered starch composition of the potato tuber has no effect on the



quality of the pollen and nectar. Moreover honeybees are not attracted to potatoes, as the flowers do not produce nectar.

Apiculture and GMO technology hand-in-hand

Bt crops have been cultivated for more than 15 years in America and Asia and it has been concluded that the crops require far less spraying per season (Brookes and Barfoot 2012), which is beneficial for the environment and insect biodiversity. In India for example, the use of insecticides has decreased drastically as a result of the cultivation of Bt cotton (James 2011). The local beekeepers therefore confidently place their bee colonies in Bt cotton fields. These beekeepers produce normal quantities of honey, receive a good market price and have - to date - not reported any negative effects of Bt cotton on their bee populations (Dhillon *et al.* 2011).

A large study that performed measurements over a period of 20 years at 36 different locations in China demonstrated that Bt fields showed an increase in ladybugs, green lacewings and spiders (Lu *et al.* 2012). The investigators attributed this increase entirely to the reduced use of broad-spectrum insecticides. In addition, these useful insects are natural enemies of plague insects, which results in natural control of plagues. Furthermore, it was noted that these useful insects also spread to surrounding areas, where they keep plague insects in neighbouring non-biotech crops under control and reduced the need to spray there too. In other words: the Bt technology does not have to contradict organic agriculture at all. On the contrary, biotechnology can offer important support to a form of agriculture that uses fewer chemical insecticides and is more focused on biological pest control. This can only benefit bee activity and development.

References

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