Earthworms decompose GM maize

**Pest-resistant genetically modified** (GM) maize makes up an increasing proportion of maize grown commercially in the EU. A new study shows that earthworms may help break down the toxins produced by GM maize.

**GM maize (Bt-maize)** plants are engineered to produce “cry” proteins that are toxic to the European corn borer, a major insect pest responsible for corn crop losses. Recent studies have shown that planting Bt-maize can increase yields and grain quality, as well as profitability. However, there is concern that cry toxins may have an impact on other species besides the corn borer. It is therefore essential to understand the fate of these toxins in soil.

As widespread soil-dwelling species, earthworms are important indicators of soil quality. Their burrowing and feeding activities may also have an impact on any toxins released into the soil. However, until now it has been unclear exactly how earthworms affect cry toxin levels – whether they stabilise or reduce concentrations. New research shows that earthworms may in fact help to enhance the decline of cry toxins in soils planted with GM maize.

The researchers studied two species of earthworm, *Lumbricus terrestris* (the ‘common earthworm’ or ‘night crawler’), and, *Aporrectodea caliginosa*, (the ‘grey worm’). These were added to soils to which GM plant matter (leaves and roots) had been added. Five weeks after leaves were added to the soil concentrations of the toxin, Cry1Ab, were at least 4 per cent lower in soils containing earthworms compared with soils without earthworms. Where earthworms were fed on roots instead of leaves, they reduced concentrations of the toxin by at least 3 per cent.

According to the researchers, earthworms may help microorganisms in the soil decompose plant matter containing the toxin, by releasing compounds that enhance microbial activity. There were some differences to be found between the impacts of the two species of worm, however, which may be due to their different eating habits. The *A. caliginosa* proportionally ingests more soil than the *L. terrestris* which in turn increases concentrations of clay material. Clay can help stabilise levels of the Cry1AB toxin in the soil. While this could increase its effects on the corn borer, it also raises the possibility that the Cry1Ab could be available to other, non-target, organisms for a longer time period. Further research is needed to explore the effects of soil type and worm activity on the persistence of toxins in the soil.

Such studies may provide insights into how soils should be managed where Bt-maize is cultivated and will become more important to agricultural practice in the EU as commercial cultivation of GM crops continues to rise. In 2007, the area covered by GM maize in the EU rose by more than three quarters, from 62,000 hectares to 110,000, with Spain producing a quarter of all its maize from genetically modified crops.


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