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The risk to nature of GM maize

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Introduction

In the European Union only one genetically modified (GM) crop is authorised for cultivation – Monsanto's Mon810 maize – authorised in 1998. Genetically modified crops are unwanted and unnecessary, and in 2016, Mon810 maize was cultivated on less than one per cent of arable land in the European Union.

Regardless, the European Commission is tabling two new GM maize varieties for cultivation in the European Union – Pioneer's 1507 and Syngenta's Bt11 – as well as the reauthorisation request for Mon810.

Despite over 10 years of scientific and political debate, the safety checks on these three GM maize strains still lack key data on how nature could be impacted – especially butterflies and moths who may consume the toxic pollen from the GM maize. This briefing outlines the main arguments against the three varieties of genetically modified maize.

Political opposition to genetically modified crops

The two GM maize types have caused controversy amongst national governments since the applications for cultivation were first lodged in 2006. In 2009 the EU Commissioner in charge proposed to withdraw the maize but failed to get the backing of all his fellow Commissioners.

In a reaction to an EU court ruling (Case T-164/10), the Commission attempted to authorise the maize 1507 again in February 2014. Nineteen governments opposed it; only 5 supported the decision, while the others abstained. In addition, the European Parliament demanded its rejection.

Since then, the EU has agreed on the so called 'opt-out proposal' that gives governments new tools to ban the cultivation of GM crops on their territories. In a clear political signal, 17 countries, and 4 regions in 2 other countries, banned the cultivation of various GM maize types in autumn 2015.¹

Undemocratic decisions

The European Commission has consistently failed since 1998 to get support for GM crop authorisations from EU governments and has approved GM foods and feeds against the majority of opposing member states. Commission President Juncker considers this undemocratic and wants to resolve the voting procedure in 2017.

Plunge into herbicide tolerant GM crops

The two new GM maize are tolerant to a highly toxic herbicide, called glufosinate. This herbicide is known to harm the reproductive system of humans and animals. Under EU

¹ http://ec.europa.eu/food/plant/gmo/authorisation/cultivation/geographical_scope_en.htm

pesticide law it should be phased out, but the pesticide giant Bayer is currently attempting to keep it on the EU market.

Experience from North and South America clearly shows that herbicide-tolerant GM crops cause widespread harm to the environment, and lead to an increase in the use of herbicides. The European Commission has suggested that writing on seed packaging that maize should not be sprayed with glufosinate will limit the damage done, rather than proposing any robust control or monitoring of its actual use. This is clearly insufficient and dangerous.

Impacts on nature still unknown

National governments requested a better assessment on the potential harm caused by GM maize Bt11 and 1507 in 2006. The GM maize produces toxins in the plants aimed at destroying a maize pest (corn borer) but the toxins can also harm various other species.

The European Food Safety Authority, EFSA, was repeatedly asked to investigate the impacts of the maize varieties on biodiversity. Instead of assessing the impact on other organisms, EFSA only focused on one group of non-target organisms.²³ Within this group they focused on a mathematical model of possible effects on groups of butterflies and moths.⁴ This very narrow focus makes it impossible to guarantee it will not have an impact on other non-target organisms.

In their most recent opinion EFSA limited their scope even further: only assessing impacts on butterflies and moths in protected areas, ignoring the impact on the wider agricultural landscape.

Despite these significant gaps in analysis and data, EFSA still concluded that the crops are safe to grow in Europe's fields but that there was a potential risk for nature. The EFSA opinion (2011) states that 1507 and its Cry1F toxin forms a risk for at least some butterfly and moth species⁵ and that there is a lack of knowledge concerning which of these species are at risk and where they are in an agricultural landscape.⁶ This gap has not been filled since 2011.

However, instead of concluding that 1507 was not safe, EFSA suggested conducting further studies *after* authorisation for commercial cultivation.⁷

Empirical and long-term evidence dismissed

² Bonny, S. (2015). Genetically Modified Herbicide-Tolerant Crops, Weeds, and Herbicides: Overview and Impact. Environmental management, 1-18. <http://link.springer.com/article/10.1007/s00267-015-0589-7>

³ Arthropods consist of invertebrates with an exoskeleton and a segmented body, e.g. insects, crustacea, spiders.

⁴ In the EFSA 2012 opinion on GM maize 1507 this restriction remains. EFSA identified four additional studies: three on arthropods as well as one a symbiotic mycorrhizal fungi.

⁵ EFSA opinion February 2012, page 2; "*reductions in populations of certain highly sensitive non-target lepidopteran species where high proportions of their populations are exposed over successive years to high levels of maize 1507 pollen deposited on their host-plants. In situations where highly sensitive non-target Lepidoptera populations might be at risk, the EFSA GMO Panel recommends that mitigation measures are adopted to reduce exposure.*" <http://www.efsa.europa.eu/en/efsajournal/doc/2429.pdf>

⁶ EFSA opinion February 2012, p. 2; "*Nevertheless, the EFSA GMO Panel concludes that there is a risk to certain highly sensitive non-target Lepidopteran species where high proportions of their populations are exposed over successive years to high levels of maize 1507 pollen deposited on their host-plants.*" <http://www.efsa.europa.eu/en/efsajournal/doc/2429.pdf>

⁷ Furthermore, there are few datasets available for estimating the sensitivity for most assessed Bt-maize events, and for only a very limited number of mainly pest species." (Source EFSA 2015, p. 11); <https://oda.hio.no/jspui/bitstream/10642/3196/1/1309832.pdf>

EFSA has updated its scientific opinion five times since 2010 in reaction to several new scientific publications. However, they have continually failed to accept conflicting safety evidence to their original model, despite research clearly showing the impacts on non-target insects could be much higher (Holst et al, 2013).

In 2014 a group of scientists published empirical data about pollen dispersal over 10 years on 215 sites.⁸ They concluded that in reality pollen flies long distances – in the order of kilometres – thus substantially challenging the EFSA model, which assumes a maximum of 30 metres. EFSA dismissed this highly relevant evidence. They applied an elicitation process based on judgements, discussions and estimates to lower the long-term pollen measurements by 97%, thus defending their earlier theoretical model and conclusion that it would be safe to cultivate the GM maize.⁹ In an interesting turn of phrase, they called the reduction of 97 % an “uncertainty analysis”.

Thus EFSA have played down evidence-based findings that challenge their previous assessments and failed dramatically to improve their theoretical model.

Lack of market for GM seed

Most biotech companies withdrew their applications for planting GM crops in the EU some years ago. In the few countries with GM cultivation, such as Spain and Portugal, US agencies¹⁰ have reported that cultivation dropped by 19 per cent in 2015. More and more European farmers are losing interest in cultivating GM maize.

GM maize can only be used as feed. Food retailers have phased out the use of GM raw materials in their products.

Conclusion:

Despite 10 years of scientific and political debate, the safety checks on these three GM maize strains are incomplete – and the full impacts on nature unknown. Even the scientific processes used by EFSA have been called into question, and conflicting evidence rejected. EFSA’s decision to support authorisation of the crops first, and study the impacts after, undermines the core European precautionary principle. All this for genetically modified crops that are unwanted, politically controversial, and rejected by farmers and the wider public.

On the basis of the EU’s precautionary principle, the three GM maize crops should therefore not be authorised.

⁸ Hofmann F, Otto m and Wosniok W, 2014. Maize pollen deposition in relation to the distance from the nearest pollen source under common cultivation – Results of 10 years of monitoring (2001–2010). Environmental Sciences Europe, 2014, 26:24. doi:10.1186/s12302-014-0024-3, <https://enveurope.springeropen.com/articles/10.1186/s12302-014-0024-3>

⁹ *Through an elicitation process, these 11 sources of uncertainty were discussed by the experts of the standing working group of the EFSA GMO Panel on ERA; these experts estimated the direction and magnitude of the impacts of these sources of uncertainty on the exposure level. The experts considered that 8 out of the 11 uncertainties were of major relevance and therefore should be accounted for in the calculations of the Perry et al. (2010, 2011, 2012, 2013) Bt-related mortality model in order to reflect a more realistic level of exposure to Bt-maize pollen (see Section 3.3.2). ... Based on their judgement and the available information, the experts attributed values to the means for each source of uncertainty through a structured discussion process. The value of a multiplicative factor, used to reduce exposure, was then derived from the median values of the individual scores of the uncertainty factors that affect exposure identified during this elicitation process. The estimated exposure was then reduced using this multiplicative factor in order to estimate the larval mortality of Lepidoptera (Section 3.5) under different exposure scenarios (Section 3.4).* <https://oda.hio.no/jspui/bitstream/10642/3196/1/1309832.pdf>

¹⁰ http://gain.fas.usda.gov/Recent%20GAIN%20Publications/Agricultural%20Biotechnology%20Annual_Paris_EU-28_7-23-2015.pdf

Prepared by Mute Schimpf, edited by Adrian Bebb | Samuel Fleet, January 2017



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