Research reveals new dimension in environmental risk posed by genetically engineered plants

Glyphosate resistant plants show a surprisingly high potential for uncontrolled environmental spread
Friday, 6 April 2018

Research from China has revealed a new dimension in environmental risk posed by genetically engineered plants: additionally inserted genes can enhance the potential for uncontrolled spread into the environment. There is now evidence to show that this is the case for glyphosate resistant plants. Where there is gene flow from the plants into the natural populations, the offspring will have increased fitness and can spread their transgenic DNA more effectively than assumed. Surprisingly, it was found that this risk to the environment is solely dependent on the additionally inserted gene, and not on the application of glyphosate. The effect can be enhanced by specific stressors such as drought and heat.

Glyphosate-resistant genetically engineered plants have been grown commercially for more than 20 years and are the most commonly grown genetically engineered plants worldwide. Nevertheless, their high potential for uncontrolled spread has so far not been investigated in detail in any official risk assessment.

There are some previous findings showing enhanced fitness of transgenic plants. Especially genetically engineered oilseed rape and rice have several times succeeded in introgressing natural populations. Contrary to expectations, the resulting transgenic offspring very often persisted in the environment and continued to propagate. Testbiotech has highlighted these findings numerous times.

Despite this previous evidence, the European Food Safety Authority (EFSA) and the biotech-industry have always maintained that the newly introduced gene would not render increased fitness to the plants if they were not sprayed with glyphosate. Now, the Chinese researchers have clearly shown that even in a glyphosate-free environment higher fitness does occur. They are demanding that further studies should be conducted, including the hybrid descendants of transgenic crops, to thoroughly assess the ecological impact.

According to the research from China, the additional enzyme (EPSPS) produced in the plants not only makes the plants resistant to glyphosate, it also interferes with plant metabolism for growth and fecundity. As a consequence, plant offspring can produce more seeds and be more resistant to environmental stressors such as drought and heat. The Chinese researchers stated that the potential cause of the observed effects could be a higher production of the hormone auxin in the transgenic plants. This plant hormone plays a key role in growth, fecundity and adaptation to environmental stressors.

Interestingly, environmental stressors such as heat and drought have been found to enhance the potential for uncontrolled spread. This finding strengthens one of the core demands that Testbiotech has been making for several years. In many comments filed to EFSA, Testbiotech insisted that genetically engineered plants should be examined in regard to their reaction to environmental stress factors, such as those triggered by global climate change. So far, EFSA has consistently denied the need for in-depth investigation to explore these risks.

“Even after 20 years of large-scale cultivation of transgenic plants, there are still significant unknowns regarding environmental risks. We must now take much stronger precautionary measures to prevent uncontrolled spread,” Christoph Then says for Testbiotech. “Genetically engineered organisms that cannot be controlled in their spatio-temporal dimension cannot be allowed for release.”

There are further aspects that can become extremely relevant for weed control. Several weedy species naturally inherit genes that can produce the EPSPS enzyme. However, the activity of these genes is normally too weak to protect the weeds against glyphosate. Nevertheless, several weedy species have been able to adapt to the spraying of glyphosate: it is known that some species can enhance activity of the relevant genes increase the overall activity of their EPSPS enzymes. This is regarded as an epigenetic process of adaptation that can be passed on to following generations. Consequently, these weeds become resistant to glyphosate. From the new research it has to be assumed that in this way the weeds additionally acquire a higher biological fitness. This means that the large-scale cultivation of genetically engineered plants can cause the emergence of super weeds which can spread faster than ever before in the fields. A more recent study from the US shows that these concerns are indeed relevant. In any case, many agricultural areas where cultivation of genetically engineered plants takes place are already widely impacted by these herbicide resistant weeds.

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Further information: Article published by Chinese researchers [2]
Article published by US researchers [3]
Testbiotech report on the uncontrolled spread of transgenic plants in the environment [4]

Attachment	Size
new environmental risks of GE plants.pdf [5]	165.4 KB

Source
URL:https://www.testbiotech.org/en/press-release/research-reveals-new-dimension-environmental-risk-posed-genetically-engineered-plants

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