

Testbiotech Overview: Genetically engineered plants soon to be authorised for cultivation in the EU

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Crop	Event	Company	Trait	EFSA Opinion	Description
Maize	TC1507	Pioneer / Agro DowScience	glufosinate tolerance Bt (Cry1F)	03/03/05 and 25/10/12 (6/11/12)	<ul style="list-style-type: none"> • This crop is a dinosaur amongst genetically engineered plants (like MON810 and Bt11) and was developed around twenty years ago. • The genetic transformation process has unintended effects; numerous additional gene fragments can be found in the genome. • A 90- day feeding study in rats showed significant differences compared to the control group. • The content of the toxin in pollen is very high compared to other genetically engineered plants. • There are nearly no data regarding effects on non-target organisms, especially <i>Lepidoptera</i> species. • Since this crop is resistant to glufosinate, there might be more of an inducement to spray the crop with a herbicide that is suspected of having severe effects on health and which is likely to be banned in the EU in 2017. • This plant is used to produce SmartStax, a genetically engineered maize producing six insecticidal toxins and resistant to two herbicides. Market authorisation of this maize might also pave the way for cultivation of SmartStax.
Maize	Bt11	Syngenta	glufosinate tolerance Bt (Cry1Ab)	19/05/05 and 11/12/12	<ul style="list-style-type: none"> • This crop is a dinosaur amongst genetically engineered plants (like MON810 and NK603) and was developed around twenty years ago. • Risks associated with these plants were never fully investigated. For example, the mode of action of the insecticidal proteins is not fully understood, thus unintended effects in non-target organisms cannot be excluded.

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					<ul style="list-style-type: none"> • Adoption of pest insects to Cry1Ab in large-scale cultivation has been seen in several regions. • Immunological reactions to Bt proteins indicate health risks. • Since this crop is resistant to glufosinate, there might be an inducement to spray the crop with a herbicide that is suspected of having severe effects on health and which is likely to be banned in the EU in 2017. •
Maize	NK603	Monsanto	glufosinate tolerance	11/06/09	<ul style="list-style-type: none"> • This crop is a dinosaur amongst genetically engineered plants (like MON810 and Bt11) and was developed around twenty years ago. • The genetic transformation process caused unintended effects, numerous additional gene fragments such as additional gene sequences from chloroplasts can be found in the genome. • The stop signal of the gene construct does not work properly, so the additionally inserted genes produce unintended products from 'fusion genes' from the plant's neighbouring DNA sequences. They show no similarity with any known protein. • A 90-day feeding study with rats showed several significant findings concerning blood parameters. A two-year study concluded severe health risks. • According to EFSA, the cultivation of glyphosate resistant plants can cause “(1) a reduction in farmland biodiversity, (2) changes in botanical diversity due to weed shifts, with the selection of weed communities mostly composed of tolerant species, and (3) the selection of glyphosate resistant weeds. The potential harmful effects could occur at the level of arable weeds, farmland biodiversity, food webs and the ecological functions they provide.”
Maize	MON810 (Renewal)	Monsanto	Bt (Cry1Ab)	30/06/09 11/12/12	<ul style="list-style-type: none"> • This crop is a dinosaur amongst genetically engineered plants (like Bt11 and NK603) and was developed around twenty years ago. • Risks associated with these plants were never fully investigated. For example, the mode of action of the insecticidal proteins is not fully understood, thus unintended effects in non-target organisms cannot be excluded. • Adoption of pest insects to Cry1Ab in large-scale cultivation has been seen in several regions.

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Maize	MON88017	Monsanto	glyphosate tolerance Bt (Cry3Bb1)	10/11/11	<ul style="list-style-type: none"> Immunological reactions to Bt proteins indicate health risks. This is one of Monsanto's attempts to fight the rootworm, which is known to cause considerable damage in maize. However, several studies have shown that incomplete control of rootworm in MON88017 is responsible for the emergence of resistant populations in parts of the US Corn Belt. A laboratory study even shows fitness advantages for rootworms with resistant alleles. There are significant unintended changes in the composition of components (such as Vitamin B1, fatty acids, amino acids, zinc and lignin) and significant unexpected differences in phenotype (such as height, seedling vigour and yield) in comparison to plants derived from conventional breeding. There are several publications showing effects on non-target beetles. According to EFSA, the cultivation of glyphosate resistant plants can cause “(1) a reduction in farmland biodiversity, (2) changes in botanical diversity due to weed shifts, with the selection of weed communities mostly composed of tolerant species, and (3) the selection of glyphosate resistant weeds. The potential harmful effects could occur at the level of arable weeds, farmland biodiversity, food webs and the ecological functions they provide.” This plant is used to produce SmartStax, a genetically engineered maize producing six insecticidal toxins and resistant to two herbicides. Market authorisation of this maize might also pave the way for cultivation of SmartStax.
Maize	GA21	Syngenta	glyphosate tolerance	16/12/11	<ul style="list-style-type: none"> This is Syngenta's version of a 'Roundup Ready' maize, it is a dinosaur amongst genetically engineered plants (like MON810 and NK603) and was developed around twenty years ago. There are several technical deficiencies such as multiple copies of the transgene cassette in the genome of the plants due to the transformation method, thus it is likely that unintended effects in the plants will occur. For example, the level of carotenoids is different compared to those from conventionally bred plants. Animal feeding studies revealed many significant findings, which should have been investigated further. According to EFSA, the cultivation of glyphosate resistant plants can cause “(1) a reduction in farmland biodiversity, (2) changes in botanical diversity due to weed shifts, with the selection of weed communities mostly composed of tolerant species,

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Soybean	MON40-3-2	Monsanto	glyphosate tolerance	21/06/12	<ul style="list-style-type: none"> • This crop is a dinosaur amongst genetically engineered plants (like MON810 and Btt11) and was developed around twenty years ago. It was a Monsanto blockbuster in the US and Argentina, and led to the spraying of millions of tons of glyphosate. Meanwhile around 50% of US soybean farmers are reporting problems with weeds adapted to glyphosate. • According to EFSA, the cultivation of glyphosate resistant plants can cause “(1) a reduction in farmland biodiversity, (2) changes in botanical diversity due to weed shifts, with the selection of weed communities mostly composed of tolerant species, and (3) the selection of glyphosate resistant weeds. The potential harmful effects could occur at the level of arable weeds, farmland biodiversity, food webs and the ecological functions they provide.”
Maize	DAS 59122	Pioneer HiBred /Mycogen Seeds	glufosinate tolerance Bt (Cry 35Ab1, Cry34Ab1)	26/03/13	<ul style="list-style-type: none"> • This event could be named “TwinTox Maize”. DAS 59122 produces two insecticidal proteins that are active against the larvae of corn rootworms (<i>Diabrotica</i> spp.). Neither of them alone can kill an insect, but in synergy they can. This maize is an example of the combinatorial effects of Bt toxins that cannot be predicted from the effects of its single components. These kind of synergies are very well known in Bt toxins and can even affect non-target organisms, they have hardly been investigated at all. In this case, selectivity is highly questionable: The proteins showed effects not only as expected in <i>Coleoptera</i> but also in <i>Lepidoptera</i>. • Since this crop is resistant to glufosinate, there might be more of an inducement to spray the crop with a herbicide that is suspected of having severe effects on health and which is likely be banned in the EU in 2017. • This plant is a used to produce SmartStax, a genetically engineered maize producing six insecticidal toxins and resistant to two herbicides. Market authorisation of this maize might also pave the way for cultivation of SmartStax.

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Maize	MON89034	Monsanto	Bt (Cry2Ab2, Cry1A.105)	Close to final opinion	<ul style="list-style-type: none"> This event could be named “SynthiTox-Maize” because it produces a synthetic insecticidal protein (Cry1A.105). There is no native form of this combined protein. According to Monsanto’s patent application on the toxin, it is much more toxic than the natural Bt toxins – however the risk assessment is based on the assumption that safety can be concluded by comparison with the native Bt toxins used before. In comparison to its conventional counterparts, many significant differences in compositional analysis were observed in field trials in the US. A 90-day feeding study with rats showed significant differences compared to the control group. Especially female animals showed several complications in their kidneys. The immunological impact of the toxin was not assessed in detail despite the fact that Cry1Ac toxins are known to be a potent immune active substance. This plant is used to produce SmartStax, a genetically engineered maize producing six insecticidal toxins and resistant to two herbicides. Market authorisation of this maize might also pave the way for cultivation of SmartStax.
Maize	MON89034 x MON88017	Monsanto	glyphosate tolerance Bt (Cry2Ab2, Cry1A.105, Cry3Bb1)	Close to final opinion	<ul style="list-style-type: none"> This maize could be named “SynthiStax Maize”. It combines the risks of synthetic insecticidal proteins with the spraying of glyphosate. Nevertheless, the combinatorial effects between the residues from spraying with the Bt toxins were not investigated. No feeding studies to investigate health effects were performed. This stacked event is used to produce SmartStax, a genetically engineered maize producing six insecticidal toxins and resistant to two herbicides. Market authorisation of this maize might also pave the way for cultivation of SmartStax.
Maize	NK603 x MON810	Monsanto	glyphosate tolerance Bt (Cry1Ab1)	Close to final opinion	<ul style="list-style-type: none"> This maize could be called a “Dinosaur Stack”. It combines the risks of insecticidal proteins with the spraying of glyphosate. Nevertheless, the combinatorial effects between the residues from spraying with the Bt toxins were not investigated.
Maize	TC1507 x NK603	Pioneer Hi-Bred	Glufosinate/ glyphosate tolerance Bt (Cry1F)	Close to final opinion	<ul style="list-style-type: none"> This maize could be called a “Dinosaur Stack”. It combines the risks of insecticidal proteins with the spraying of glyphosate. Nevertheless, the combinatorial effects between the residues from spraying with the Bt toxins were not investigated.