MON87701Soybean

Organisation: Reconsider ekonomisk förening
City: Tomelilla
Country: Sweden
Type: Individual
Public: Yes

---

a. Assessment:
3. Environmental risk assessment

There is a risk with planting GMO seeds. You've considered the risk, evaluated it and drawn a conclusion, but I don't find the conclusion responsible at all. As long as there is a potential risk with GMO:s, we don't need them. We have a large enough food supply in the world already, the major problem we should face is distributing them accurately. So please avoid GMO:s to the greatest possible extent.

---

5. Others

If accepting GMO crops is a mistake, of which we cannot be certain, it is a mistake that cannot be undone. It would be utterly irresponsible to let this GMO crop be distributed in the EU, as well as in any other place on this planet.

Organisation: Reconsider ekonomisk förening
City: Tomelilla
Country: Sweden
Type: Individual
Public: Yes

---

a. Assessment:
3. Environmental risk assessment

There is a risk with planting GMO seeds. You've considered the risk, evaluated it and drawn a conclusion, but I don't find the conclusion responsible at all. As long as there is a potential risk with GMO:s, we don't need them. We have a large enough food supply in the world already, the major problem we should face is distributing them accurately. So please avoid GMO:s to the greatest possible extent.

5. Others

If accepting GMO crops is a mistake, of which we cannot be certain, it is a mistake that cannot be undone. It would be utterly irresponsible to let this GMO crop be distributed in the EU, as well as in any other place on this planet.

6. Labelling proposal

Please make sure the fact that this product is genetically modified is noticed very easily by the consumer.

Organisation: Board for Gene Technology
City: Helsinki
Country: Finland
Type: Regulatory body
Public: Yes

a. Assessment:
3. Environmental risk assessment

The Finnish Board for Gene Technology is delighted to note that the EFSA scientific opinion recommends appropriate management systems for restricting soybean seeds from entering cultivation as well as - within general surveillance - introduction of management systems for active monitoring of feral soybean plants in areas where soybean spillage and plant establishment are likely to occur.

Organisation: Testbiotech
City: München
Country: Germany
Type: Non Profit Organisation
Public: Yes

a. Assessment:
Comparative analysis (for compositional analysis and agronomic traits and GM

phenotype)

Since these soybeans cannot be regarded as being substantially equivalent, even EFSA´s own guidance requires a comprehensive risk assessment (EFSA 2011). This risk assessment described by EFSA as an alternative to its standard comparative risk assessment, has neither been defined by EFSA nor was it explicitly applied in this case.

According to experts from member states, the content of the additional proteins produced in the plant are highly variable. This may indicate genetic instability and result in unexpected reactions to specific environmental conditions. Several investigations show that genetically engineered plants can exhibit unexpected reactions under stress conditions (see for example: Matthews et al., 2005). This can also impact the Bt content in the plants (Then& Lorch, 2008). But functional stability of the transgene under various defined environmental conditions was not shown. Genetic stability was only considered in the context of the hereditary of the gene constructs to following generations.

In comparison with its conventional counterparts, many significant differences in the compositional analysis were found. References were made to unspecific and questionable 'historical' data from industry unrelated to the actual field trials, e.g. the ILSI database. Since it is not sufficiently clear under which specific conditions these additional historical data were generated, this kind of comparison inevitably contains major uncertainties.

Despite the fact that the plants´ own gene regulation is affected by the transgene and a higher Vitamin E content in the genetically engineered plants has been confirmed, no detailed investigations of the plants metabolism were requested, no systematic investigation under various defined environmental conditions was conducted to determine interactions between the genome and the environment.

In agronomic parameters, several significant differences were identified in comparison to the control plants. Most differences were not consistent over all field trials. The reason for this might be that these differences only emerge under particular environmental conditions. Significant differences in agronomic performances should have been investigated in relation to interactions between the genome and the environment under defined environmental conditions. But there was no systematic investigation of changes in composition and agronomic performance under various defined environmental conditions.

Matthews D, Jones H, Gans P, Coates St & Smith LMJ (2005) Toxic secondary metabolite production in genetically modified potatoes in response to stress. Journal of Agricultural and Food Chemistry, 10.1021/jf050589r.

Then C. & Lorch A., 2008, A simple question in a complex environment: How much Bt toxin do genetically engineered MON810 maize plants actually produce?: in Breckling B, Reuter H, Verhoeven R (eds) (2008) Implications of GM-Crop Cultivation at Large Spatial Scales., Theorie in der Ökologie 14. Frankfurt, Peter Lang, http://www.gmls.eu/index.php?contact=ja

---

b. Food Safety Assessment:
Toxicology

Since these soybeans cannot be regarded as being substantially equivalent, EFSA´s guidance requires a comprehensive risk assessment (EFSA 2011). This risk assessment described by

EFSA as an alternative to its standard comparative risk assessment, has neither been defined by EFSA nor was it explicitly applied in this case.

For some reason, the level of Vitamin E is enhanced unintentionally in this soy when compared to the level in the control plants. Despite these findings, EFSA 2011, states that "No indication was found in the molecular analysis and in the comparative compositional, phenotypic and agronomic analysis that the genetic modification of soybean MON 87701 resulted in any unintended changes." This statement simply is wrong.

The mode of action of Bt toxins is not fully understood. It is a matter of controversial debate (Pigott & Ellar, 2007). Strict selectivity of the Bt toxins is not shown by empirical evidence, but deduced from modes of action described previously. More recent research shows that there are mechanisms that might cause toxicity in other species and even in mammals (Soberon et al., 2009). Thus, risks for human health cannot be excluded by assumptions or considerations, but only by empirical testing before market authorisation. In this case no detailed investigations were performed to show that Cry1Ac is inactive on mammalian cells (as single compound and in combination).

Cry1Ac is also a Bt toxin known for its synergistic effects with other Bt toxins (Sharma et al., 2010). Further synergistic effects between Cry1Ac and other Bt toxins such as Cry2Ab2 and Cry1F are discussed in and Lee et al. (1996), Chakrabarti et al (1998) and Khasdan et al (2007). Synergistic interactivity between Cry2Ab2 and Cry1Ac has also been discussed in Stewart et al. (2001). Synergistic effects can become highly problematic for non-target organisms. Interactivity of the toxins or the toxins in combination with environmental toxins, bacteria, plant enzymes or pesticides can cause higher than expected toxicity and lower selectivity (Then, 2010). These effects can impact human health as well as ecosystems. The plants will go into feed and might, therefore, be mixed with other genetically engineered plants. Tests need to be carried out to determine potential accumulative or combinatorial effects. But no assessment of combinatorial effects with other genetically engineered plants used in food and feed were requested, despite the fact that Cry1Ac is known for potential synergies with other Bt toxins. No tests were performed to determine potential combinatorial or accumulated effects of the toxins nor of any other factors as other toxic compounds, bacteria, plant enzymes (trypsin inhibitors) and pesticides in mammals.

Soybeans produce large amounts of protease inhibitors (trypsin inhibitors) that can strongly enhance the toxicity of Bt toxins (Pardo-Lopez et al., 2009). Even the presence of very low levels of protease inhibitors can multiply the insecticidal activity of Cry toxins. The extent to which the trypsin inhibitors will be destroyed by heat processing depends on the method used. This was not considered by EFSA.

Feeding studies were repeated because they revealed significant effects in rats. The effects were not reproduced in the second feeding trial, but there were other significant effects. Further, higher mortality and other significant findings were shown in feeding trials with poultry fed with the genetically engineered soy. Despite these findings, no long-term and more detailed studies were conducted. Potential risks for human health are supported in a report by Gallagher (2010) dealing with kidney problems and immune reactions observed in feeding studies with genetically engineered eggplant, which also express a modified Cry1Ac protein. No investigations were conducted to assess the impact of a permanent ingestion of these plants on the intestinal microbial composition in human and animals. There have been no feeding studies over the whole lifetime of animals and none including following generations. No endocrinological studies were performed to investigate potential impacts on

the reproductive system, despite the fact that soy is producing hormonal active substances that might have been changed unintentionally.

All in all, this product has a wide range of risks and a high level of uncertainty concerning its safety. The risks are likely be higher for non-processed soybeans, such as sprouts which can be expected to have the full level of Bt toxin, allergenic active proteins and trypsin inhibitors. The risks might be lower in soybeans that are heat processed, because heat should reduce the content of Cry1Ac and the activity of the trypsin inhibitors. However, the effects of the different methods used for processing were not investigated.

Gallagher, L., 2010, Bt Brinjal Event EE1The Scope and Adequacy of the GEAC Toxicological Risk Assessment, Review of Oral Toxicity Studies in Rats, http://www.testbiotech.de/node/444

Khasdan, V., Sapojnik, M., Zaritsky, A., Horowitz, A.R., Boussiba, S., Rippa, M., Manasherob, R. and Ben-Dov, E. (2007) Larvicidal activities against agricultural pests of transgenic Escherichia coli expressing combinations od four genes from Bacillus thuringiensis. Arch Microbiol 188, 643– 653.

Lee M.K., Curtiss A., Alcantara E., Dean D.H., 1996, Synergistic Effect of the Bacillus thuringiensis Toxins CryIAa and CryIAc on the Gypsy Moth, Lymantria dispar: Applied and Environmental Microbiology 62 (2): 583-586

Pardo-López, L., Muñoz-Garay,C., Porta, H., Rodríguez-Almazán,C., Soberón M., Bravo A., 2009, Strategies to improve the insecticidal activity of Cry toxins from Bacillus thuringiensis, Peptides, 30(3): 589–595. doi:10.1016/j.peptides.2008.07.027.

Pigott, C.R. & Ellar, D.J., 2007, Role of Receptors in Bacillus thuringiensis Crystal Toxin Activity: Microbiol Mol Biol Rev 71 (2): 255–281

Sharma P, Nain V, Lakhanpaul S, Kumar P.A., 2010, Synergistic activity between Bacillus thuringiensis Cry1Ab and Cry1Ac toxins against maize stem borer (Chilo partellus Swinhoe). Lett Appl Microbiol, 51(1):42-47

Stewart, S.D., Adamczyk, J.J., Knighten K.S., Davis, F.M., Impact of Bt cottons expressing one or two insecticidal proteins of Bacillus thuringiensis Berliner on growth and survival of noctuid (Lepidoptera) larvae, 2001, J. Econ, Entomol, 94 (3): 752-760

Soberón, A., Gill, S.S., Bravo A., 2009, Signaling versus punching hole: How do Bacillus thuringiensis toxins kill insect midgut cells? Cell. Mol. Life Sci. 66 (2009) 1337 – 1349

Then, C., 2010, Risk assessment of toxins derived from Bacillus thuringiensis-synergism, efficacy, and selectivity. Environ Sci Pollut Res Int; 17(3):791-7

Allergenicity

Insect-killing Soy MON87701 is engineered to produce insecticidal protein Cry1Ac. This is a Bt toxin which is known to enhance immune reactions (Vázquez Padrón et al., 1999 and 2000). Soy is one of the most potent allergenic food plants, consequently, from a

precautionary perspective,this protein should be avoided in plants with a high allergic potential.

The significant findings in blood samples from individuals with a known allergy to soybeans, should have triggered more investigations with a much larger number of blood samples. Instead EFSA (2011b) stated in response to concerns of member states: “The EFSA GMO Panel requested the applicant to comment on the observed differences (…) between the (…) MON 87701 and the control, in particular, when more spots can be seen with MON 87701 (…) and to identify (…) the spots corresponding to the known major soybean allergens. The applicant gave general comments that did not raise concern.”

Vázquez Padrón R.I., Moreno Fierros L., Neri Bazán L., de la Riva G.A., López Revilla R., 1999, Intragastric and intraperitoneal administration of Cry1Ac protoxin from Bacillus thuringiensis induces systemic and mucosal antibody responses in mice. Life Sciences 64(21):1897 1912.

Vásquez Padrón R.I., Gonzáles Cabrera J., Garcia Tovar C., Neri Bazan L., Lopéz Revilla R., Hernández M., Morena Fierra L, de la Riva G.A., 2000, Cry1Ac Protoxin from Bacillus thuringiensis sp. kurstaki HD73 binds to surface proteins in the mouse small intestine. Biochem and Biophys Research Comm 271:54 58.

Others

No empirical investigation of the actual persistence of the Bt toxins and their potential accumulation in the environment.

No investigation conducted for DNA traces in animal tissue after feeding.

No plan for surveillance as required by European regulation was made available that would allow identification of particular health impacts that might be related to the use of these genetically engineered plants in food and feed.

The protocols used for conducting the measurements of the Bt toxins have not been fully published or evaluated by independent laboratories. As a result, independent institutions can hardly monitor the actual content of Bt concentration in the plants during cultivation or in food and feed products.

4. Conclusions and recommendations

The opinion of EFSA should not be adopted.

The application should be rejected for precautionary reasons. Genetically engineered plants with a high potential of allergenicity (such as soybean) should not be authorised if they produce additional proteins that are known to stimulate immune reactions.