TESTBIOTECH Background 18 - 12 - 2018

Testbiotech comment on 'Assessment of genetically modified soybean MON 89788 for renewal of authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO-RX-011)' by company Monsanto

Testbiotech e. V.
Institute for Independent Impact Assessment in Biotechnology

Christoph Then & Andreas Bauer-Panskus

Introduction

Ten years after soybean MON89788, which is resistant to glyphosate (EFSA 2018a), was first authorised for import into the EU, the EFSA GMO Panel assessed an application for renewal of authorisation. The EFSA re-assessment completely ignores the fact that there has been a considerable increase in problems with herbicide resistant weeds over the last ten years; and that the number of sprayings and the amount of sprayed complementary herbicide is now higher than it was then. Therefore, new data are needed before any decision is made on the safety of the GE soybean.

1. Molecular characterisation

EFSA should have requested data that takes into account the increased number of times that glyphosate is sprayed because of problems with herbicide resistant weeds (see, for example, Benbrook, 2016). A higher number of applications of glyphosate will not only lead to a higher burden of residues in the harvest, but may also influence the expression of the transgenes or other genome activities in the plants. The changes in plant gene activity might also be caused by interference in the metabolism of the plant hormone auxin (Fang et al., 2018).

This aspect, which is the most relevant in regard to the re-assessment of this event, was completely ignored by EFSA. EFSA should have requested that Monsanto submit data from field trials sprayed with the highest dosage of the complementary herbicides that can be tolerated by the plants, also including repeated spraying. The material derived from those plants should have also been assessed using Omics techniques to investigate changes in the gene activity of the transgene and in the natural genome of the plants.

2. Comparative analysis (for compositional analysis and agronomic traits and GM phenotype)

There have been huge changes in the last ten years in the way that glyphosate-resistant plants are cultivated. Therefore, new field trials should have been requested from the applicant. Due to the changes in weed populations, it has to be expected that these plants can and will be exposed to higher and repeated dosages of glyphosate. Higher applications of glyphosate will not only lead to a higher burden of residues in the harvest, but may also influence plant composition and agronomic characteristics. The changes in plant gene activity might also be caused by interference in the metabolism of the plant hormone auxin (Fang et al., 2018).

This aspect, which is the most relevant in regard to this specific event, was completely ignored in the risk re-assessment. The issues of practical conditions prevalent in large scale cultivation and increasing weed occurrence were left aside.

EFSA should have requested that Monsanto submit data from field trials sprayed with the highest dosage of the complementary herbicides that can be tolerated by the plants, also including repeated spraying. The material derived from those plants should have been assessed using Omics techniques to investigate changes in plant composition and agronomic characteristics.

Further, data representing more extreme environmental conditions, such as those caused by climate change, would have been necessary.

New field trials are also necessary since new standards for conducting the trials and assessment of the data are now requested in the EU (see Regulation 503/2013).

Toxicology

Both the EU pesticide regulation and the GMO regulation require a high level of protection for health and the environment. Thus, in regard to herbicide-resistant plants, specific assessment of residues from spraying with complementary herbicides must be considered to be a prerequisite for granting authorisation. In assessing the safety of the products derived from the soybeans, the assessments made by the Pesticide Panel in 2015 (EFSA 2015) and 2018 (EFSA 2018b) have to be taken into account. They state that:

> *«In the framework of the renewal, representative uses were proposed for conventional crops only and residue trials on glyphosate tolerant GM crops were not provided."* (EFSA 2015)
>
> *"For genetically modified crops, data were sufficient to derive MRL for sweet corn (EPSPS modification) and cotton seed (EPSPS modification), noting that MRLs should be tentative pending on the submission of confirmatory methods for enforcement of AMPA and N-acetyl-glyphosate. For sugar beet roots, maize and soybeans (EPSPS modification), soybeans (GAT modification) and rapeseeds (GOX modification), the available data were insufficient to derive MRLs and risk assessment values."* (EFSA 2018b)

The conclusion that has to be taken from these EFSA reports (2015 and 2018 b) is that the existing data are not sufficient to conclude on the overall safety of the soybeans for import.

Further, while the GMO panel considers the assessment of the toxicity of the residues from spraying to be outside its remit, it is the duty of the GMO panel to consider and assess the specific metabolism in the plants and the specific metabolites that might occur in the plants after application of the complementary herbicides. These residues might show a specific pattern or accumulation that only occurs in this specific event. The pesticide panel can only assess the toxicity of these metabolites, if the GMO panel request specific data on metabolism and metabolites, also considering the various formulas, mixtures and combination of the complementary herbicides. So even if it is the case that the pesticide panel only has to assess the toxicity of these metabolites, it is the duty of the GMO panel to request these specific data that are needed to conclude on the safety of the plants.

In addition, as mentioned, higher applications of glyphosate will not only lead to a higher burden of residues in the harvest, but may also influence the expression of the transgenes or other genome activities in the plants. The changes in plant gene activity might also be caused by interference in the metabolism of the plant hormone auxin (Fang et al., 2018). These changes can have a serious impact on health since soybeans are known to produce many bioactive compounds such as allergens and oestrogens.

There are further relevant issues: for example, the potential impact on the intestinal microbiome also has to be considered. Such effects might be caused by the residues from spraying since glyphosate has been shown to have negative effects on the composition of the intestinal flora of

cattle (Reuter et al., 2007) and poultry (Shehata et al., 2013). New research also shows an increase in resistance to antibiotics due to selective pressure caused by exposure to glyphosate (Kurenbach et al. 2018). In general, antibiotic effects and other adverse health effects might occur from exposure to a diet containing these plants (see also EFSA, 2018c); these were not assessed under pesticide regulation.

As a result, the toxicological assessment carried out by EFSA is not acceptable.

Allergenicity
No data were presented to show that plant composition is unchanged in regard to allergenic potential.

As mentioned, higher applications of glyphosate will not only lead to a higher burden of residues in the harvest, but may also influence the expression of the transgenes or other genome activities in the plants. The changes in plant gene activity might also be caused by interference in the metabolism of the plant hormone auxin (Fang et al., 2018). These changes can have serious impacts on health since soybeans are known to produce many allergens.

Consequently, the assessment in regard to allergenicity cannot be regarded as conclusive.

Others
According to Regulation (EU) No 503/2013, the applicant has to ensure that post-market monitoring (PMM) is developed to collect reliable information on the detection of indications showing whether any (adverse) effects on health may be related to GM food or feed consumption (see also EFSA, 2018c). Thus, the monitoring report should at very least contain detailed information on:

i) actual volumes of the GE soybean imported into the EU,
ii) the ports and silos where shipments of the GE soybean were unloaded,
iii) the processing plants where the GE soybean was transferred to,
iv) the amount of the GE soybean used on farms for feed, and
v) transport routes of the GE soybean.

Environmental monitoring should be run in regions where viable kernels of the GE soybean are transported, stored, packaged, processed or used for food/feed. In case of losses and spread of the GE soybean, all receiving environments need to be monitored.

Furthermore, environmental exposure through organic waste material, by-products, sewage or faeces containing the GE soybean during or after the production process, and during or after human or animal consumption should be part of the monitoring procedure (see also EFSA, 2018c).

Conclusions and recommendations
The EFSA risk assessment cannot be accepted.

References
Benbrook, C.M., 2016. Trends in glyphosate herbicide use in the United States and globally. Environ. Sci. Eur. 28, 3. https://doi.org/10.1186/s12302-016-0070-0

EFSA (2018a) GMO Panel (EFSA Panel on genetically modified organisms), Scientific Opinion on the assessment of genetically modified soybean MON 89788 for renewal of authorisation under Regulation (EC) No 1829/2003 (application EFSA-GMO-RX-011). EFSA Journal 2018;16(11):5468, 11 pp. https://doi.org/10.2903/j.efsa.2018.5468

EFSA (2018b). Reasoned Opinion on the review of the existing maximum residue levels for glyphosate according to Article 12 of Regulation (EC) No 396/2005. EFSA Journal 2018;16(5):5263, 230 pp. https://doi.org/10.2903/j.efsa.2018.5263)

EFSA GMO Panel (2018c) Comments from the experts of Member States on the scientific opinion on the assessment of genetically engineered soybean MON 89788 (application EFSA-GMO-RX-011). Accessed via the register of EFSA, http://registerofquestions.efsa.europa.eu/roqFrontend/login?0

EFSA, (2015). Conclusion on the peer review of the pesticide risk assessment of the active substance glyphosate. EFSA J. 13, 4302. https://doi.org/10.2903/j.efsa.2015.4302

Fang, J., Nan, P., Gu, Z., Ge, X., Feng, Y.-Q., Lu, B.-R., 2018. Overexpressing Exogenous 5-Enolpyruvylshikimate-3-Phosphate Synthase (EPSPS) Genes Increases Fecundity and Auxin Content of Transgenic Arabidopsis Plants. Front. Plant Sci. 9. https://doi.org/10.3389/fpls.2018.00233

Kurenbach B., Hill A.M., Godsoe W., van Hamelsveld S., and HeinemannJ.A. (2018) Agrichemicals and antibiotics in combination increase antibiotic resistance evolution, PeerJ, DOI10.7717/peerj.5801, https://peerj.com/articles/5801/

Reuter T., Alexander T.W., Martinez T.F., McAllister T.A. (2007) The effect of glyphosate on digestion and horizontal gene transfer during in vitro ruminal fermentation of genetically modified canola. J Sci Food Agric 87:2837–2843

Shehata A.A., Schrödl W., Aldin A.A., Hafez H.M., Krüger M. (2012) The effect of glyphosate on potential pathogens and beneficial members of poultry microbiota in vitro. Curr Microbiol 6(4):350–358