Oilseed rape MS8, RF3 and MS8 x RF3

Organisation: Testbiotech
Country: Germany
Type: Non Profit Organisation

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a. Assessment:
Molecular characterisation

As recent publications show, the new metabolism introduced into the plants by inserting the bar gene is not as yet fully understood. Apparently, it causes unintended products to be produced in the plants that can trigger effects on health (Christ et al., 2017). EFSA did not know about this publication whilst it was considering the application.

It is evident that the gene products and their expression rate emerging from the insertion of the additional gene constructs now have to be assessed in much more detail.

Christ, B., Weng, J. K., Guyer, L., Hochstrasser, R., Francisco, R., Hörtensteiner, S., & Aubry, S. (2017). Non-specific activities of the major herbicide-resistance gene BAR. Nature plants, 1. https://www.nature.com/articles/s41477-017-0061-1

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

A publication cited by Member State experts shows alterations in the antioxidant activity system of oilseed rape MS8 x RF3 compared with their non-transgenic control (Xu et al., 2011). Alterations in antioxidant enzyme activity were associated with alterations in phenolics and unsaturated fatty acids.

However, these findings were rejected by EFSA for the reason that “antioxidant enzyme activity does not belong to standard spectrum of compositional parameters as recommended by OECD”. This seems to be a purely formalistic argument and not acceptable.

Also in the light of the publications by Lantz (2013) and Christ et al (2017), EFSA should have required further studies e.g. Omics studies (proteomics, transcriptomics, metabolomics) to assist the compositional analysis and the assessment of the phenotypical changes. Investigations of changes in content of miRNA which can be taken up at from the gut and render biological effects across border of life domains. Exposing the plants to a wide range of defined biotic or abiotic stressors to assess the true range of possible changes in the plants´ composition.

Christ, B., Weng, J. K., Guyer, L., Hochstrasser, R., Francisco, R., Hörtensteiner, S., & Aubry, S. (2017). Non-specific activities of the major herbicide-resistance gene BAR. Nature plants, 1. https://www.nature.com/articles/s41477-017-0061-1

Lantz, S.R. (2013) Atypical organophosphorus toxicology of the herbicides glufosinate and ethephon. Berkeley, University of California. Doctor of Philosophy in Molecular Toxicology: 62. https://escholarship.org/uc/item/7mr2s4s4

Xu, W., Guo, F., Zhou, X., Shang, Y., Yuan, Y., Zhang, F., Huang, K. (2011) Unintended effects were investigated in antioxidant activity between genetically modified organisms and their nontransgenic control. African Journal of Biotechnology, 10, 9272-9279. https://www.ajol.info/index.php/ajb/article/view/95666

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b. Food Safety Assessment:
Toxicology

Thus far, no feeding study with the whole food and feed derived from oilseed rape MS8, RF3 and MS8×RF3 has been conducted. This is surprising because since 2014, 90-day feeding studies are requested (Commission Implementing Regulation (EU) No 503/2013). In our opinion, these requirements have to be imposed for applications for authorisation renewal if such studies are still missing at the stage of the application.

Safety issues regarding the bar gene are also presented in a new scientific publication that was published only days after the EFSA opinion on oilseed rape MS8, RF3 and MS8×RF3. Christ et al. (2017) describe unintended effects caused by the usage of herbicide resistance gene bar. According to the study, the bar gene as used in genetically engineered plants seems to produce two new enzymes, acetyl-aminoadipate and acetyl-tryptophan. These findings came as a surprise as the bar gene has been used in transgenic plants for decades without any indication that it may interfere with plant metabolism. According to the authors, acetyl-tryptophan is a naturally occurring metabolite in different plant species. However, acetyl-aminoadipate has never been reported as a plant metabolite before.

As this specific paper contains new scientific information, EFSA should reassess its opinion regarding oilseed rape MS8, RF3 and MS8×RF3. Further, all other genetically engineered plants containing the bar gene and already authorised in the EU should also be reassessed.

In addition, the risk manager has to make sure that the gaps between GMO regulation and pesticide regulations are closed. From a scientific and regulatory point of view, there is no justification for carrying out an assessment of herbicide-resistant genetically engineered plants for health risks and leaving out the residues from spraying with complementary herbicides. Health risk assessment cannot be reduced to what is required under Regulation 396/ 2005 (Pesticide Regulation) since this assessment does not take the specific pattern of exposure and relevant cumulative effects into account; this can also concern specific issues that are clearly related to GMO risk assessment, such as gene expression, plant composition and phenotypical characteristics.

In this context, open questions regarding the food/feed safety of oilseed rape MS8, RF3 and MS8×RF3 were addressed by Member State experts. Experts cited uncertainties with respect to the toxicological evaluation of the metabolite N-acetyl-glufosinate (N-Ac-GLF), which is produced in GM oilseed rape Ms8xRf3 due to the expression of the PAT protein (bar gene). Experts cited a publication by Lantz (2013) indicating potential toxic effects on humans by N-Ac-GLF and asked for an evaluation of the toxicity of N-Ac-GLF before extension of commercial use of this GMO. However, this was rejected by EFSA ("N-Acetyl-glufosinate is a plant protection product metabolite and therefore the comment is outside the remit of the GMO Panel").

We are not aware that these risks were investigated elsewhere. Therefore, the renewal process has to be stopped until a conclusion can be drawn on the open questions associated with the application of the complementary herbicide.

Christ, B., Weng, J. K., Guyer, L., Hochstrasser, R., Francisco, R., Hörtensteiner, S., & Aubry, S. (2017). Non-specific activities of the major herbicide-resistance gene BAR. Nature plants, 1. https://www.nature.com/articles/s41477-017-0061-1

Lantz, S.R. (2013) Atypical organophosphorus toxicology of the herbicides glufosinate and ethephon. Berkeley, University of California. Doctor of Philosophy in Molecular Toxicology: 62. https://escholarship.org/uc/item/7mr2s4s4

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3. Environmental risk assessment

Europe is the centre of origin and genetic diversity for the group of Brassica plants to which oilseed rape belongs. Thus, there are several wild relatives that can interbreed with Brassicus napus. Oilseed rape (Brassica napus) can spread via pollen and seeds. Further, the seed remains viable in the soil for more than ten years (Lutman et al., 2003). Consequently, oilseed rape has a high potential for establishing volunteer plants even many years after the first sowing.

Testbiotech strongly insists that findings presented in other public consultations regarding genetically engineered oilseed rape should be addressed by the EU Commission and EFSA (see, for example, Then, & Bauer-Panskus, 2017). This is especially important in the case of a publication by Banks (2014) on the persistence of oilseed rape.

Banks (2014), a researcher who led the first long-term study over a period of 11 years on feral oilseed rape populations, comes to the conclusion that feral oilseed rape populations "can persist and flower outside the range of cropped oilseed rape plants. It has become part of the native weed and wildflower community, but to date has had no major ecological impact. The long term demographic changes in feral oilseed rape that were found in the 11 year study could not have been predicted from the initial early years when there were few populations or from prior estimates of risk carried out at small spatial scales."

Banks, G. (2014) Feral oilseed rape populations within a Scottish landscape: implications for GM coexistence and environmental risk assessment (Doctoral dissertation, University of Dundee). http://ethos.bl.uk/OrderDetails.do?uin=uk.bl.ethos.613607?

Lutman, P.J.W., Freeman, S.E., Pekrun, C. (2003) The long-term persistence of seeds of oilseed rape (Brassica napus) in arable fields. The Journal of Agricultural Science, 141(2): 231-240.

Then, C. & Bauer-Panskus, A. (2017) Testbiotech comment on EFSA GMO Panel Scientific Opinion on application EFSAGMO- NL-2013-119 for authorisation of genetically modified glufosinate-ammonium and glyphosate-tolerant oilseed rape MON 88302 x MS8 x RF3 and subcombinations. https://www.testbiotech.org/node/1996

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4. Conclusions and recommendations

The import of viable whole kernels of oilseed rape MS8, RF3 and MS8×RF3 cannot be allowed. The opinion of EFSA has to be rejected due to major flaws and substantial gaps. New evidence shows that the opinion of EFSA is not conclusive.

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5. Others

EFSA agrees with the notifier that no targeted case-specific monitoring of the uncontrolled spread of the transgenic and related gene flow is necessary if import is allowed. It would be up to the notifier and other members of the industry lobby organisation, EuropaBio, to oversee the import and report potential unanticipated adverse effects.

Several experts from EU Member States (EFSA, 2017b) voiced concern regarding this approach. They believe there is a need for much more targeted case-specific monitoring of factual gene flow. Thus, case-specific monitoring should be run in regions where oilseed rape MS8, RF3 and MS8×RF3 will be transported, stored, packaged, processed or used. In case of substantial losses and spread of oilseed rape MS8, RF3 and MS8×RF3 oilseed rape, all receiving environments need to be monitored.

Recently, including in Europe, studies on feral oilseed rape stemming from imports were conducted in the vicinity of "hot spots", such as oil mills and along transportation roads. Fertile genetically engineered oilseed rape was found in Switzerland (Hecht et al., 2012, Schoenenberger & D'Andrea, 2012, Schulze et al., 2014). In Germany, large amounts of feral oilseed rape were found in the vicinity of oils mills and seed processing industries at the harbours along the river Rhine (Franzaring et al., 2016). Only one of the plants proved to be transgenic. Nevertheless, the findings indicate an urgent need for monitoring efforts.

In the light of the potential environmental risks, the monitoring plan as presented cannot be accepted.

Franzaring, J., Wedlich, K., Fangmeier, A., Eckert, S., Zipperle, J., Krah-Jentgens, I., ... & Züghart, W. (2016). Exploratory study on the presence of GM oilseed rape near German oil mills. Environmental Science and Pollution Research, 23(22), 23300-23307.

Hecht, M., Oehen, B., Schulze, J., Brodmann, P., Bagutti, C. (2013) Detection of feral GT73 transgenic oilseed rape (Brassica napus) along railway lines on entry routes to oilseed factories in Switzerland. Environmental Science and Pollution Research, 21(2): 1455-1465.

Schoenenberger, N., & D'Andrea, L. (2012) Surveying the occurrence of subspontaneous glyphosate-tolerant genetically engineered Brassica napus L.(Brassicaceae) along Swiss railways. Environmental Sciences Europe, 24(1): 1-8. http://link.springer.com/article/10.1186/2190-4715-24-23

Schulze, J., Frauenknecht, T., Brodmann, P., Bagutti, C. (2014) Unexpected Diversity of Feral Genetically Modified Oilseed Rape (Brassica napus L.) Despite a Cultivation and Import Ban in Switzerland. PLoS ONE 9(12): e114477. http://journals.plos.org/plosone/article?id=10.1371/journal.pone.0114477