SCIENTIFIC OPINION

Applications (references EFSA-GMO-NL-2005-22, EFSA-GMO-RX-NK603) for the placing on the market of the genetically modified glyphosate tolerant maize NK603 for cultivation, food and feed uses, import and processing and for renewal of the authorisation of maize NK603 as existing products, both under Regulation (EC) No 1829/2003 from Monsanto[1]

Scientific Opinion of the Panel on Genetically Modified Organisms

(Questions No EFSA-Q-2005-249, No EFSA-Q-2008-075)

Adopted on 27 May 2009

PANEL MEMBERS[*]

Hans Christer Andersson, Salvatore Arpaia, Detlef Bartsch, Josep Casacuberta, Howard Davies, Patrick du Jardin, Lieve Herman, Niels Hendriksen, Sirpa Kärenlampi, Jozsef Kiss, Gijs Kleter, Ilona Kryspin-Sørensen, Harry Kuiper, Ingolf Nes, Nickolas Panopoulos, Joe Perry, Annette Pöting, Joachim Schiemann, Willem Seinen, Jeremy Sweet and Jean-Michel Wal.

SUMMARY

This document provides a scientific opinion of the Panel on Genetically Modified Organisms (GMO Panel) of the European Food Safety Authority (EFSA) on two applications (References EFSA-GMO-NL-2005-22 and EFSA-GMO-RX-NK603) submitted by Monsanto under Regulation (EC) No 1829/2003 for (1) the placing on the market of the genetically modified (GM) glyphosate tolerant maize NK603 for cultivation, food and feed uses and import and processing, as well as for (2) the renewal of the authorisation of existing products produced from GM maize NK603 (Unique Identifier MON-ØØ6Ø3-6).

The scope of these two applications covers:

- cultivation, food and feed uses and import and processing (Reference EFSA-GMO-NL-2005-22);

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- the continued marketing of existing food additives and feed (feed materials and feed additives) produced from maize NK603 which were lawfully placed on the market in the Community before the date of entry into force of Regulation (EC) No 1829/2003 (Reference EFSA-GMO-RX-NK603). After the date of entry into force of Regulation (EC) No 1829/2003, these products were notified to the European Commission according to Articles 8 and 20 of that Regulation and included in the Community Register of genetically modified food and feed[2].

Maize NK603 has been developed for tolerance to glyphosate (also refer to as GMHT crop) by the introduction, via particle gun acceleration, of a gene coding for 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) from *Agrobacterium* sp. strain CP4 (CP4 EPSPS).

In delivering its scientific opinion, the EFSA GMO Panel considered the applications EFSA-GMO-NL-2005-22 and EFSA-GMO-RX-NK603, additional information supplied by the applicant, the scientific comments submitted by Member States and the report of the Spanish Competent Authority and its Biosafety Commission.

The EFSA GMO Panel assessed maize NK603 with reference to the intended uses and appropriate principles described in the guidance document of the EFSA GMO Panel for the risk assessment of GM plants and derived food and feed. The scientific assessment included molecular characterisation of the inserted DNA and expression of target proteins. A comparative analysis of agronomic traits and composition was undertaken, and the safety of the new protein and the whole food/feed were evaluated with respect to potential toxicity, allergenicity and nutritional quality. An assessment of environmental impacts and the post-market environmental monitoring plan were undertaken.

Data for molecular characterisation established that the insert is a single complete copy of the plasmid vector fragment used (PV-ZMGT32L) and that there is no detectable presence of plasmid DNA from outside of this fragment. Appropriate analyses of the integration site, including sequence determination of the inserted DNA and flanking regions and bioinformatic analysis, have been performed. Bioinformatic analysis of junction regions demonstrated the absence of any potential new ORFs coding for known toxins or allergens. The expression of the new proteins (CP4 EPSPS and CP4 EPSPS L214P) produced by the genetic modification has been sufficiently analysed and the stability of the genetic modification has been demonstrated over several generations. Variations in protein levels were observed in field trials but given the fact that the CP4 EPSPS proteins are demonstrated to be safe, this does not raise any safety concern. The EFSA GMO Panel is therefore of the opinion that the molecular data provided are sufficient and do not raise a safety concern.

Based on the results of compositional analysis of grain and forage material of maize NK603 collected at field trials from a representative range of environments and seasons, the EFSA GMO Panel concludes that maize NK603 is compositionally equivalent to conventional maize, except for the presence of the CP4 EPSPS proteins. In addition, field trials did not show changes in phenotypic characteristics and agronomic performance except for the introduced trait.

[2] http://ec.europa.eu/food/dyna/gm_register/gm_register_auth.cfm?pr_id=11

There were no adverse effects in a 90-day feeding study on rats with NK603 maize grain. Feeding studies on broiler chickens, Angus-continental cross steers, Holstein dairy cows, growing-finishing pigs, and rats provided evidence of nutritional equivalence of maize NK603 to conventional maize. In addition, there is no evidence that the overall allergenicity of the whole plant is changed. The EFSA GMO Panel is of the opinion that maize NK603 is as safe as conventional maize. Maize NK603 and derived products are unlikely to have any adverse effect on human and animal health in the context of the intended uses.

The Spanish Competent Authority and its Biosafety Commission provided to EFSA its opinion on the environmental risk assessment in line with Articles 6.3 (e) and 18.3 (e) of Regulation (EC) No 1829/2003. The Spanish Competent Authority and its Biosafety Commission conclude that "*according to the current state of scientific knowledge and after examining the existing information and data provided by the Monsanto Company, the Spanish Commission on Biosafety could give a favourable opinion to the commercialisation in the E.U. of maize NK603 if proposals and conditions established in the ERA report are implemented*".

The EFSA GMO Panel considers that maize NK603 has no altered survival, multiplication or dissemination characteristics and interacts with other organisms as conventional maize. The likelihood of unintended environmental effects due to the establishment and spread of maize NK603 will be no different from that of traditionally bred maize. The EFSA GMO Panel considers that the potential environmental impacts of the specific cultivation, management and harvesting techniques of maize NK603 are indirect effects entirely associated with the use of the complimentary herbicide regimes. Thus the EFSA GMO Panel concludes that maize NK603 plants are unlikely to cause any direct adverse effects, but that potential adverse environmental effects of the cultivation of maize NK603 associated with the use of the complimentary glyphosate herbicide have been identified. This conclusion is in line with the conclusions of the Spanish Competent Authority and its Biosafety Commission.

The EFSA GMO Panel recommends that the potential adverse effects of the glyphosate should be evaluated for the specific use on maize NK603 during the national registration by Member States under the pesticide Directive 91/414/EEC. In addition, the EFSA GMO Panel recommends that the occurrence of weed resistance and appropriate management strategies should be addressed as part of the registration of glyphosate under Directive 91/414/EEC. In line with its interplay working document (EFSA, 2008) and the requirements of Directive 2001/18/EC (EC, 2001), the EFSA GMO Panel also recommends glyphosate use on maize NK603 in regimes that have similar or reduced environmental impacts compared with conventional maize cultivation. The Spanish Competent Authority and its Biosafety Commission propose that monitoring should be conducted under Directive 2001/18/EC and recommend to "*consider deeper studies on the following potential adverse effects: the potential indirect effects on non-target organisms due to the weed management, the development of weed resistance to glyphosate and the evolution of the flora associated to management of the cultivation of NK603 maize and their potential impacts on biodiversity*". However, the EFSA GMO Panel is of the opinion that an alternative option would be the use of herbicide management measures in conjunction with the monitoring for weed resistance evolution under Directive 91/414/EEC (as proposed by the Spanish Competent Authority and its Biosafety Commission) and general surveillance of maize NK603 under Directive 2001/18/EC to detect unanticipated adverse effects.

The EFSA GMO Panel agrees with the general methods and approaches of the general surveillance plan, but advises the applicant to describe in more detail how information will be collected that could be used to assess whether the intended uses of maize NK603 and its specific management are having unanticipated adverse environmental effects.

In conclusion, the EFSA GMO Panel considers that the information available for maize NK603 addresses the scientific comments raised by Member States and that maize NK603 is as safe as its conventional counterpart with respect to potential direct effects on human and animal health and the environment. However, the EFSA GMO Panel concludes that the cultivation management of maize NK603 could have adverse effects on the environment in the context of its intended uses. The EFSA GMO Panel therefore recommends managing the use of glyphosate on maize NK603 in regimes that have similar or reduced environmental impacts compared with conventional maize cultivation.

Key words: GMO, maize (*Zea mays*), NK603, herbicide tolerant, glyphosate, cultivation, food and feed uses, food safety, feed safety, human and animal health, environment, Regulation (EC) No 1829/2003, Directive 2001/18/EC, renewal, existing products