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KENMERK CGM/170131-01

ONDERWERP Advies import en verwerking gg-maïs MON89034 x 1507 x NK603 x DAS-40278-9

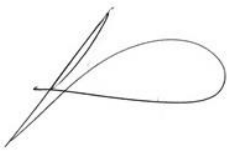
Geachte mevrouw Dijksma,

Naar aanleiding van een adviesvraag betreffende de vergunningaanvraag voor de import en verwerking van genetisch gemodificeerde maïs MON89034x1507xNK603xDAS-40278-9 (EFSA/GMO/NL/2013/112), ingediend door Dow AgroSciences LLC, deelt de COGEM u het volgende mee.

Samenvatting:
De COGEM is gevraagd te adviseren over de mogelijke milieurisico's van import en verwerking van de genetisch gemodificeerde (gg-) maïslijn MON89034x1507xNK603x DAS-40278-9. In deze lijn komen de genen *pat*, *aad-1*, *cp4 epsps* en *cp4 epsps L214P* tot expressie, waardoor het gewas tolerant is voor bepaalde herbiciden. Ook komen de *cry1F*, *cry1A.105* en *cry2Ab2* genen tot expressie in deze lijn, waardoor het gewas resistent is tegen bepaalde plaaginsecten die behoren tot de vlinderachtigen.
De maïslijn MON89034x1507xNK603xDAS-40278-9 is tot stand gekomen door kruisingen met vier gg-ouderlijnen. De COGEM heeft eerder positief geadviseerd over import en verwerking van alle vier de gg-ouderlijnen.
Verwildering van maïsplanten is in Nederland nooit waargenomen. Daarnaast worden maïsplanten uit gemorst zaad (ook wel opslagplanten genoemd) hier nauwelijks aangetroffen. Bovendien zijn er in Nederland geen wilde verwanten van maïs aanwezig, waardoor de ingebrachte sequenties zich niet naar andere soorten kunnen verspreiden.
De moleculaire karakterisering van MON89034x1507xNK603xDAS-40278-9 voldoet aan de eisen van de COGEM. Er zijn geen redenen om aan te nemen dat expressie van de ingebrachte genen ervoor zorgt dat deze gg-maïslijn zou kunnen verwilderen.
Gezien het bovenstaande acht de COGEM de milieurisico's van de import en verwerking van de gg-maïslijn MON89034x1507xNK603xDAS-40278-9, en mogelijke sub-combinaties hiervan, verwaarloosbaar klein.
Omdat een voedselveiligheidsbeoordeling door andere instanties wordt uitgevoerd, heeft de COGEM bij deze vergunningaanvraag de risico's van incidentele consumptie niet beoordeeld.

De door de COGEM gehanteerde overwegingen en het hieruit voortvloeiende advies treft u hierbij aan als bijlage.

Hoogachtend,



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Voorzitter COGEM

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Import and processing of genetically modified maize MON89034x1507xNK603xDAS-40278-9

COGEM advice CGM/170131-01

- The present application (EFSA/GMO/NL/2013/112) concerns the authorisation for import and processing for use in feed and food of genetically modified (GM) maize MON89034x1507xNK603xDAS-40278-9;
- Maize MON89034x1507xNK603xDAS-40278-9 expresses the *cry1A.105, cry2Ab2* and *cry1F* genes conferring resistance to certain lepidopteran insects, and the *pat, cp4 epsps, cp4 epsps L214P* and *aad-1* genes conferring tolerance to glyphosate, glufosinate-ammonium, and certain 'aryloxyphenoxypropionate' (AOPP) containing herbicides and auxin acting herbicides;
- COGEM advised positively on the import and processing of the parental lines MON89034, 1507, NK603 and DAS-40278-9 in 2009 (MON89034), 2003 (1507 and NK603) and 2011 (DAS-40278-9);
- In the Netherlands, feral maize populations have never been observed and the appearance of volunteers is rare;
- In the Netherlands, wild relatives of maize have never been observed and hybridisation of maize with other species is therefore not possible;
- The molecular characterisation of maize MON89034x1507xNK603xDAS-40278-9 meets the criteria of COGEM;
- There are no reasons to assume that the introduced traits will allow GM maize MON89034x1507xNK603xDAS-40278-9 to survive in the Dutch environment;
- There are no indications that the introduced traits altered the fitness of maize MON89034x1507xNK603xDAS-40278-9;
- The updated molecular characterisation does not give any indication of a potential environmental risk;
- COGEM is of the opinion that import and processing of maize MON89034x1507x NK603xDAS-40278-9, or potential subcombinations in segregating progeny, poses a negligible risk to the environment in the Netherlands;
- COGEM abstains from giving advice on the potential risks of incidental consumption since a food/feed assessment is carried out by other organisations.

1. Introduction

The present application (EFSA/GMO/NL/2013/112), filed by Dow AgroScience LLC, concerns import and processing of genetically modified (GM) maize MON89034x1507xNK603xDAS-40278-9, for use in feed and food.

Maize MON89034x1507xNK603xDAS-40278-9 is produced by conventional crossbreeding of four GM parental maize lines. The stacked line contains the *cry1A.105*, *cry2Ab2* and *cry1F* genes conferring resistance to certain lepidopteran insects. This maize line also contains the genes *pat*, *cp4 epsps*, *cp4 epspsL214P*, and *aad-1*, conferring tolerance to certain glyphosate, glufosinate-ammonium, and 'aryloxyphenoxypropionate' (AOPP) containing herbicides and certain auxin acting herbicides.

Parental lines MON89034[1], 1507[2,3] and NK603[4], have been authorized for import and processing for use in food and feed in the European Union since 2004 (NK603), 2006 (1507) and 2009 (MON89034). [5] In 2016, EFSA issued a positive opinion on the import and processing of maize line DAS-40278-9[6]. Several stacked lines have also been authorized for import and processing for use in food and feed in the European Union.[7,8,9]

2. Previous COGEM advice

COGEM has previously advised on the import and processing of the parental lines MON89034[10,11], 1507[12,13], NK603[14] and DAS-40278-9[15*], and combinations thereof (MON89034xNK603[16,17], MON89034x1507xNK603[18], and 1507xNK603[19]). The environmental risks of import and processing of the parental and above-mentioned stacked maize lines were considered negligible.[11,12,13,14,15,17, 18,19]

3. Environmental risk assessment

MON89034x1507xNK603xDAS-40278-9 maize contains four inserts. These inserts and the traits they encode may segregate in the progeny of the GM maize line. As a result, the imported kernels (seeds) of this GM maize line may possess all traits that are present in MON89034x1507xNK603xDAS-40278-9 or a combination thereof. Potential risks of MON89034x1507xNK603xDAS-40278-9 maize kernels, and segregates containing subcombinations of this stacked line, are assessed as part of the environmental risk assessment.

3.1 Aspects of the wild-type crop

Maize (*Zea mays*) is a member of the grass family *Poaceae*. Maize is a highly domesticated crop originating from Central America, but nowadays it is cultivated globally. Maize is predominantly wind pollinated.[20,21] Maize has both male and female flowers that are spatially separated. Female flowers are not attractive to insect pollinators, because they do not produce nectar. As insects do not visit the female flowers, insect pollination of maize is limited. [22]

In the Netherlands, no wild relatives of maize are present and hybridisation with other species cannot occur. Maize requires warm conditions in order to grow and does not tolerate prolonged cold and frost.[22,23] After ripening, the kernels remain on the cob and do not shatter naturally.[22,24] In cultivation areas with warmer climatic conditions, the appearance of volunteers can occur the year following maize cultivation due to spilled cobs or kernels. However, these volunteers are usually

[*] In the 2011 COGEM advice, the maize line DAS-40278-9 was incorrectly named DAS-40728-9.

killed by common mechanical pre-planting soil preparation practices.[22] In the Netherlands, the appearance of volunteers is very rare to absent.[25]

Maize is very sensitive to weed competition.[26] During the long process of domestication, maize has lost the ability to survive in the wild.[21] Establishment of maize plants in the wild has never been observed in the Netherlands and COGEM is not aware of any reports of feral maize populations elsewhere in Europe.

Conclusion: In the Netherlands, feral maize populations do not occur and hybridisation of maize with other species is not possible.

3.2 Molecular characterisation

Previously, COGEM evaluated the molecular characterisation of each parental line and considered them adequate.[11,12,13,14,15]

For each parental line, the applicant updated the molecular characterisation and the bioinformatic analyses. According to the applicant, no endogenous genes were disrupted at the insertion site or in the genomic DNA flanking the insertion site, and no biologically meaningful protein sequence similarities with allergens or toxic proteins were detected in these analyses. The molecular characterisation was conducted according to the criteria previously laid down by COGEM.[27]

The applicant states that for parental line 1507 a significant amino acid alignment was found with the Mas1 protein (agropine synthesis reductase) from *Agrobacterium.* According to the applicant, the alignment was limited to half of the Mas1 protein. If expressed, the protein would therefore be incomplete and unlikely to be active. In view of this, and the long history of safe use of maize 1507, COGEM is of the opinion that this finding does not affect the outcome of the environmental risk assessment.

Conclusion: The molecular characterisation of maize MON89034x1507xNK603xDAS-40278-9 is adequate and no indications for potential environmental risks were identified.

3.3 Description of the introduced genes and traits

Introduced genes	**Encoded proteins**	**Traits**
cp4 epsps (two copies)	The 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) enzyme originating from *Agrobacterium tumefaciens* strain CP4[14]	Tolerance to glyphosate containing herbicides, because of a decreased binding affinity for glyphosate
cp4 epsps L214P	A variant of the EPSPS enzyme from *A. tumefaciens* strain CP4[14]	Tolerance to glyphosate containing herbicides, because of a decreased binding affinity for glyphosate
pat	Phosphinothricin N-acetyltransferase (PAT) enzyme originating from *Streptomyces viridochromogenes* strain Tü 494[12,13]	Tolerance to glufosinate-ammonium containing herbicides

aad-1	Aryloxyalkanoate dioxygenase (AAD-1) enzyme originating from *Sphingobium herbicidovorans*[15]	This enzyme can cleave several synthetic auxins, and certain 'aryloxyphenoxy-propionate' (AOPP) herbicides, resulting in a tolerance to several synthetic auxin acting herbicides like 2,4-dichlorophenoxoxyacetic acid' (2,4-D) and to AOPP containing herbicides
cry1A.105	The Cry1A.105 protein is a chimeric protein with domains from different Cry1 proteins from *Bacillus thuringiensis*.[10,11]	Resistance to certain lepidopteran insects
cry2Ab2	Variant of the Cry2Aa protein from *B. thuringiensis* subsp. *kurstaki*[10,11]	Resistance to certain lepidopteran insects
cry1F	The Cry1F protein originating from *B. thuringiensis* subsp. *aizawa*[12,13]	Resistance to certain lepidopteran insects
For a detailed description of the traits see references.		

3.4 Phenotypic and agronomic characteristics

Previously, COGEM evaluated the phenotypic and agronomic characteristics of each parental line of MON89034x1507xNK603xDAS-40278-9, and found no deviations influencing the outcome of the environmental risk assessment.[10,15,28,29]

The applicant analysed the phenotypic and agronomic characteristics of MON89034x1507x NK603xDAS-40278-9. The introduced traits do not give reason to assume that the parental lines have an altered survivability compared to conventional maize. The applicant noted a difference in plant height between the stacked line and the isoline and a likely difference between the stacked line and reference varieties. However, this is just one of many characteristics that determine plant fitness. Therefore, COGEM is of the opinion that there are no indications to assume that the introduced traits in MON89034x1507x NK603xDAS-40278-9 allow maize to survive or establish in the Dutch environment.

Conclusion: MON89034x1507xNK603xDAS-40278-9 does not have an increased potential for the establishment of feral populations in the Netherlands.

4. Food/feed assessment

This application is submitted under Regulation (EC) 1829/2003, therefore a food/feed assessment is carried out by EFSA and national organisations involved in the assessment of food safety. In the Netherlands, RIKILT carries out a food and/or feed assessment for Regulation (EC) 1829/2003 applications. The outcome of the assessment by other organisations (EFSA, RIKILT) was not known when this advice was completed.

5. Post-market environmental monitoring (PMEM)

The applicant supplied a new general surveillance plan as part of the PMEM. COGEM has published several recommendations for further improvement of the general surveillance (GS) plan[30,31] but considers the current GS plan adequate for import and processing of maize MON89034x1507xNK603xDAS-40278-9.

6. Overall conclusion

COGEM is of the opinion that import and processing of maize MON89034x1507x NK603xDAS-40278-9, and potential subcombinations in segregating progeny, poses a negligible risk to the environment in the Netherlands. COGEM abstains from giving advice on the potential risks of incidental consumption since other organisations carry out a food/feed assessment.

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