Advice Import & processing MON87427×MON94804×MON89034×MIR162×NK603

COGEM advice CGM/251205-01

COGEM has been requested to evaluate the environmental risks associated with the authorisation for import, processing and food and feed use of genetically modified (GM) maize MON87427 × MON94804 × MON89034 × MIR162 × NK603 and its subcombinations (GMFF-2025-34987), as submitted by Bayer Agriculture B.V. on behalf of Bayer CropScience LP.

GM maize MON87427 × MON94804 × MON89034 × MIR162 × NK603 was produced by crossing the five GM parental maize lines using conventional breeding methods and expresses multiple introduced genes (Table 1). The GM maize expresses two copies of the cp4 epsps genes, derived from NK603 and MON87427, as well as one copy of the cp4 epsps L214P gene derived from NK603, all of which confer tolerance to glyphosate-containing herbicides. The cp4 epsps and cp4 epsps L214P genes differ by one amino acid at position 214 and are functionally equivalent. The GM maize expresses a GA20ox_SUP suppression cassette, derived from MON94804, which down-regulates the expression of the ZmGA20ox3 and ZmGA20ox5 genes and results in reduced levels of the plant hormone gibberellic acid/gibberellin. Consequently, MON87427 × MON94804 × MON89034 × MIR162 × NK603 has a reduced plant height. Furthermore, the GM maize expresses the transgenes *cry1A.105* and *cry2Ab2* derived from MON 89034 and the gene *vip3Aa20* derived from MIR162, which confer resistance against certain lepidopteran pests. In addition, GM maize MON87427 × MON94804 × MON89034 × MIR162 × NK603 contains the *pmi* derived from MIR162, which was used as a selectable marker during the development of MIR162.

Table 1. Description of the introduced genes and traits

Introduced genes/cassettes	Encoded proteins	Regulatory elements	Traits
cp4 epsps (MON87427)	The 5-enolpyruvylshikimate-3-phosphate synthase (EPSPS) enzyme originating from *Agrobacterium tumefaciens* strain CP4[1,2]	Enhanced *35S* (*e35S*) promoter from Cauliflower mosaic virus (CaMV) and nopaline synthase (*nos*) terminator from *A. tumefaciens*	Tolerance to glyphosate containing herbicides
GA20ox_SUP suppression cassette (MON94804)	Two inverted repeats derived from the maize coding sequences of gibberellin 20-oxidase homolog 3 and 5 (GA20ox3 and -5), flanked by three Osa-miR1425 fragments from *Oryza sativa*	Promoter and leader from the Rice tungro bacilliform virus (RTBV),[3] intron and flanking exon sequence from the *hsp70* gene from *Zea mays*[3] and synthetic 3' untranslated region (UTR) (GST43) based on multiple 3'UTR sequences from *Z. mays*	Reduced gibberellic acid/ gibberellin levels in the stem and reduced overall plant height[4]
cry1A.105 (MON89034)	The Cry1A.105 protein is a chimeric protein with domains from different Cry1 proteins from *Bacillus thuringiensis* subsp. *kumamotoensis*[5]	Enhanced *35S* (*e35S*) promoter from CaMV and T-Hsp17 terminator from *Triticum aestivum*	Resistance to certain lepidopteran insects
cry2Ab2 (MON89034)	Variant of the Cry2Ab2 protein from *B. thuringiensis* subsp. *kurstaki*[5]	35S promoter from *Figwort mosaic virus* (FMV) and *nos* terminator from *A. tumefaciens*	Resistance to certain lepidopteran insects
vip3Aa20 (MIR162)	Variant of a native vegetative insecticidal protein (Vip) class A, subclass a, (Vip3Aa20) originating from *B. thuringiensis* strain AB88[6]	Polyubiquitin promoter and intron (Zm*Ubi*Int) from *Z. mays* and *35S* terminator from CaMV	Resistance to certain lepidopteran insects
pmi, also known as *manA* (MIR162)	Phosphomannose isomerase (PMI) enzyme derived from *Escherichia coli* K12[7]	Polyubiquitin promoter and intron (Zm*Ubi*Int) from *Z. mays* and nopaline synthase (*nos*) terminator from *A. tumefaciens*	Enables transformed plant cells to use mannose as a sole carbon source

Introduced genes/cassettes	Encoded proteins	Regulatory elements	Traits
cp4 epsps (NK603)	The EPSPS enzyme originating from *A. tumefaciens* strain CP4[1,2]	*Ract1* promoter from *O. sativa* and *nos* terminator from *A. tumefaciens*	Tolerance to glyphosate containing herbicides
cp4 epsps L214P (NK603)	The EPSPS L214P enzyme originating from *A. tumefaciens* strain CP4[1,2], functionally equivalent to the EPSPS enzyme	*E35S* promoter from CaMV and *nos* terminator from *A. tumefaciens*	Tolerance to glyphosate containing herbicides

COGEM has previously advised positively on the cultivation and import of NK603[8,9,10] and MON89034[11,12], and on import and processing of the parental lines MON87427,[13,14] MON94804,[15] and MIR162.[16,17] COGEM also advised positively on the import and processing of many stacked events containing these parental lines,[e.g. 18,19,20,21,22,23,24,25,26,27,28,29,30,31,32,33,34,35,36,37,38,39,40,41,42,43,44,45,46,47,48,49] as well as the cultivation of several stacked events containing one or more of the involved parental lines.[50,51,52,53,54] The parental lines NK603, MON89034, MON87427, MON94804, and MIR162 have all been authorised for import and processing for use in food and feed in the European Union.[55,56,57,58,59]

Maize (*Zea mays*) is a highly domesticated crop that is cultivated globally. Maize is wind pollinated.[60,61] Insect pollination of maize is highly limited but cannot be excluded.[62] Maize is very sensitive to weed competition.[63] During the long process of domestication, maize has lost the ability to persist in the wild.[61] After ripening, the seeds (the kernels) adhere to the cob and do not scatter naturally.[62,64] Consequently, seed dispersal is severely hampered.

Maize does not tolerate prolonged cold and frost, and requires warm conditions to grow.[62,65,66] In cultivation areas with warm climatic conditions, volunteers – maize not deliberately planted – can be present the year following maize cultivation due to spilled cobs or kernels. However, these volunteers are usually killed by common mechanical pre-planting soil preparation practices.[62] In the Netherlands the appearance of volunteers is rare, although maize plants occasionally have been observed outside agricultural fields.[65,67] Any volunteers emerging will be killed by frost at the onset of winter.[65] COGEM is not aware of any reports of feral maize populations in the Netherlands.[65] Hybridisation of GM maize with species other than teosinte – the wild relative of maize – cannot occur. However, as teosinte is absent in maize fields and nature in the Netherlands,[65] hybridisation of GM maize with teosinte will not occur in the Netherlands.

The bio-informatic analysis of each of the inserted elements and its 3' and 5' junctions with the genome of GM maize MON87427 × MON94804 × MON89034 × MIR162 × NK603 were updated, using up-to-date databases of allergens, toxins, and other biologically active proteins to assess protein sequence similarities. No indications for potential environmental risks were identified.

The applicant analysed the phenotypic and agronomic characteristics of MON87427 × MON94804 × MON89034 × MIR162 × NK603 and reported that most characteristics of the GM maize did not differ from the non-GM near-isogenic control line, and is equivalent to the reference varieties, taking natural variation into account.

There are no indications that the introduced traits in MON87427 × MON94804 × MON89034 × MIR162 × NK603 will allow the GM maize to survive in the Dutch environment. A post-market environmental monitoring (PMEM) plan is provided in the application.

COGEM is of the opinion that the market authorisation for import and processing of GM maize of MON87427 × MON94804 × MON89034 × MIR162 × NK603 and its subcombinations poses a negligible risk to the Dutch environment. COGEM abstains from giving advice on the potential risks of incidental consumption, as a food/feed assessment is carried out by other organisations.

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