

Import of genetically modified maize 59122 x 1507

COGEM advice CGM/070911-02

Summary

*This notification concerns the import and processing of the genetically modified maize line 59122 x 1507 for use in feed and food. Cultivation is not part of the application. The hybrid maize line harbors two copies of the pat gene and three cry genes; cry34Ab1, cry35Ab1 and cry1F. The pat gene confers tolerance to herbicides containing glufosinate-ammonium. The cry34Ab1 and cry35Ab1 genes induce resistance to certain coleopteran insects such as the corn rootworm (*Diabrotica virgifera*) while cry1F provides the plant with a resistance trait to certain lepidopteran insects such as the European corn borer (*Ostrinia nubilalis*).*

Previously, COGEM advised positively on the import of maize lines 59122 and 1507. COGEM has also given a positive advice on the cultivation of maize line 1507.

In the Netherlands, no wild relatives of maize are present and establishment of maize plants in the wild has never been observed. There are no reasons to assume that the inserted traits will increase the potential of the maize line to establish feral populations. In addition, the appearance of volunteers is very rare under Dutch conditions.

COGEM is of the opinion that interactions between the products of the inserted genes are not to be expected. The applicant has sufficiently proven that no toxic or allergenic products are formed as a result of the modification of maize line 59122 x 1507. Based on these considerations, COGEM is of the opinion that the import of maize line 59122 x 1507 poses a negligible risk to human health and the environment.

Introduction

The scope of the present notification by Mycogen Seeds, c/o Dow AgroSciences and Pioneer Hi-Bred International, Inc. concerns the import and processing of the hybrid maize line 59122 x 1507 for use in feed and food.

The maize line is produced by traditional crossing of maize lines 59122 and 1507. Maize line 59122 expresses the *pat* gene conferring tolerance to glufosinate-ammonium containing herbicides and the two *cry* genes *cry34Ab1* and *cry35Ab1* conferring resistance to certain coleopteran insects such as the corn rootworm (*Diabrotica virgifera*). Maize line 1507 expresses a *pat* gene as well, plus a *cry1F* gene which provides the plant with a resistance trait to some lepidopteran insects such as the European corn borer (*Ostrinia nubilalis*).

Previous COGEM advices

In 2003 and 2005 respectively, COGEM advised positively on the import of maize lines 59122 and 1507 (1, 2). COGEM has also given a positive advice on the cultivation of maize line 1507 (3).

Aspects of the crop

Maize (*Zea mays L.*) is a member of the grass family *Poaceae*. Maize is being cultivated as an agricultural crop, originating from Central America. Although insect pollination can not be completely excluded, maize is predominantly wind pollinated (4, 5). According to literature, pollen viability varies between 30 minutes and 9 days (5, 6, 7). In Europe, no wild relatives of maize are present and, therefore, hybridization with other species cannot occur.

The appearance of volunteers is very rare under Dutch conditions. Grains exhibit no germination dormancy, resulting in a short persistence under Northern European climate conditions. Generally, only few seeds remain on the field after harvesting of fodder maize (4). Establishment of maize plants in the wild has never been observed in the Netherlands.

Molecular characterization

The genetically modified maize line 59122 x 1507 was produced by crossing the two parental maize lines 59122 and 1507. The molecular characterization of these parental lines will be briefly discussed. A more detailed description of the inserted genes and the pest insects can be found in previous COGEM advices on the single parental maize lines (1,2).

Properties of the introduced genes conferring herbicide tolerance

Maize line 59122 as well as maize line 1507 are genetically modified by the introduction of a *pat* gene, encoding for the enzyme phosphinothricin acetyltransferase protein (PAT). Expression of PAT confers tolerance to glufosinate-ammonium herbicides (8).

The active ingredient in glufosinate-ammonium herbicide is L-phosphinothricin (L-PPT), which binds to glutamine synthetase in plants. The detoxification of excess ammonia is thereby prevented, leading to plant death. Maize line 59122 and 1507 express the *pat* gene which catalyses the conversion of L-PPT to an inactive form, which does not bind glutamine synthetase. The application of glufosinate-ammonium herbicides to maize line 59122 and 1507 will therefore be ineffective since ammonia is detoxified (9).

Properties of the introduced genes conferring insect resistance

Maize line 59122 was genetically modified with the *cry34Ab1* and the *cry35Ab1* gene derived from *B. thuringiensis* (subsp. *kumamotoensis*). These genes act together to control certain coleopteran insect pests, among others the larvae of the Western corn rootworm (*Diabrotica virgifera virgifera*), Northern corn rootworm (*Diabrotica barberi*) and the Southern corn rootworm (*Diabrotica undecimpunctata howardi*). The genes *cry34Ab1* and *cry35Ab1* have a synergistic effect. The *cry34Ab1* gene confers an average resistance for the corn rootworm, while *cry35Ab1* alone confers no resistance at all. Expression of both genes in the same plant however, results in a maximum resistance against the corn rootworm. The Cry34Ab1 and Cry35Ab1 proteins produced are δ -endotoxins which selectively bind to receptors located in the midgut of susceptible insects (10). After this binding to receptors, the gut is perforated, enabling enterobacteria from the midgut to enter the body, causing the insect to die from poisoning within 48 to 120 hours (11).

Maize line 1507 expresses cry gene *cry1F*. *Cry1F* encodes another δ -endotoxin, which is lethal to insects of the lepidopteran order, including larvae of the European corn borer (*Ostrinia nubilalis*) and the pink borer (*Sesamia cretica*). Cry1F has the same physical effect on the insects as Cry34Ab1 and Cry35Ab1.

Molecular analysis

Previously, the molecular aspects of parental maize line 59122 as well as 1507 have been positively assessed (1, 2). COGEM is of the opinion that the molecular analysis of the three parental maize lines 59122 and 1507 was sufficient and it is unlikely that toxic or allergenic products are formed as a consequence of the modifications.

Advice

The present application concerns the commercial import and processing of maize line 59122 x 1507 for the use in food and feed. Maize line 59122 x 1507 expresses the genes *pat*, *cry34Ab*, *cry35Ab1* and *cry1F*, providing the plant with a herbicide tolerance trait as well as resistance to certain coleopteran and lepidopteran insects, respectively. In the past, COGEM advised positively on the import of maize lines with these traits and hybrid maize lines with a combination of these traits.

There are no wild relatives of maize in the Netherlands and the appearance of volunteers is very rare under Dutch conditions. Furthermore, there are no reasons to assume that the traits inserted will increase the now absent potential of the maize line to run wild.

In the opinion of COGEM, the molecular analysis for 59122 x 1507 is adequate. In addition, maize line 1507 is already commercially grown and consumed from 2001 on in the U.S.A and several other countries without any reports of adverse effects.

In view of these considerations, COGEM is of the opinion that the proposed import and processing of maize line 59122 x 1507 poses a negligible risk to human health and the environment.

References

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