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To the Minister of
Infrastructure and Water Management
Mrs S. van Veldhoven-van der Meer
P.O. Box 20901
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DATE	06 February 2018
REFERENCE	CGM/180206-01
SUBJECT	Advisory letter on 'The importance of maize and oilseed rape field margins for Lepidoptera'

Dear Minister,

Many of the genetically modified (GM) agricultural crops cultivated worldwide are insect-resistant. These crops, including maize, contain Bt toxins which are toxic to certain pest insects.[1]

Environmental risk assessments are part of applications for the cultivation of insect-resistant GM maize lines and must include the potential adverse effects of the crop on other organisms than the pest organisms (non-target organisms), such as Lepidoptera (butterflies and moths).[2] The caterpillars of lepidopteran species that occur in maize field margins may be exposed to Bt toxins during the flowering period of maize via the deposition of GM pollen. If any of these species are susceptible to the Bt toxin concerned, this could lead to a decline in the size of lepidopteran populations.

With a view to possible future permit applications and to improving the risk assessment, COGEM has made an inventory of the occurrence of lepidopteran species in maize fields and field margins in the Netherlands. Based on the results in the attached research report,[3] COGEM concludes that lepidopteran species in the Netherlands occupy a broad habitat range and that these species do not depend for their survival solely on maize fields and field margins, where they could be exposed to Bt toxins. However, given the endangered status of lepidopteran species in the Netherlands, every increase in existing pressures could lead to a more rapid decline of lepidopteran populations.

The results of the study and the insights they give are important for improving the environmental risk assessment. COGEM points out that any future decision about the

authorisation of a Bt crop should ideally include a comparison of the effects of the use of conventional and alternative methods of pest control on lepidopteran populations.

Background

Applications to cultivate GM crops that produce a Bt toxin must be accompanied by an assessment of the potential effects on non-target organisms based on laboratory experiments (on several representative species) and field trials.[2] In addition, the European Food Safety Authority (EFSA) uses a theoretical mathematical model to prescribe risk mitigation measures. In its mathematical model, the EFSA assumes the existence of a lepidopteran that is highly susceptible to the Bt toxin and that this species depends for its survival on the field margins around the maize field or on weed species in the maize field. The model also assumes that the food resources (the host plants) of the caterpillars of this species are found mainly in the fields or field margins where maize is grown.

Based on this mathematical model, the EFSA recommends maintaining an isolation distance from protected areas and planting conventional maize border rows around the Bt-maize field if the area of insect-resistant GM maize exceeds a certain percentage.[4,5,6] These recommendations have also been included in draft decisions by the European Commission on the authorisation (or renewal of the authorisation) for placing on the market for cultivation of three insect-resistant GM maize lines.[7,8,9]

However, it is not clear whether or not there are any lepidopteran species in the Netherlands whose habitat is restricted to maize fields or field margins. This was the reason for COGEM to commission a study by Dutch Butterfly Conservation (*De Vlinderstichting*). The results of the study are described in the attached research report, *The importance of maize and oilseed rape field margins for Lepidoptera* (CGM 2017-03).

Research results

The researchers carried out a literature study and used information on field margin vegetation and field data (distribution data of lepidopteran species) to investigate the potential occurrence in the Netherlands of lepidopteran species (butterflies and macro-moths) which are dependent for their survival on maize field margins (up to 30 m from the field). The researchers identified 19 butterfly species and 28 macro-moth species which occur in and around maize fields and whose caterpillars may be exposed to Bt toxins via deposition of GM pollen during the flowering period of maize or by eating GM plants. However, the habitats of lepidopteran species present in the Netherlands are not restricted to maize fields and field margins. There are no species for which more than 50% of its distribution or population occur in maize fields and field margins. The researchers therefore conclude that lepidopteran species in the Netherlands do not largely (>50%) depend for their survival on maize fields and field margins, where they could potentially be exposed to Bt toxins.

Further, the study revealed that the Red List species Dusky Large Blue (*Phengaris nausithous*) is the butterfly species most dependent on maize field margins. There is just a single population of this species in the Netherlands. It occurs in an area where much maize is cultivated and 38% of the records of this species are from maize field margins.

COGEM advice

The data from the research report show that the lepidopteran species in the Netherlands have a broad habitat range that is not restricted to maize fields and field margins. This means that the food resources (host plants) for the caterpillars of these species also occur outside maize fields and field margins. The lepidopteran species present in the Netherlands, therefore, do not depend for their survival on maize fields and field margins.

Although maize fields and field margins make up just a fraction of the habitat of lepidopteran species, lepidoptera populations are indeed susceptible to potential deterioration in the habitat quality of maize fields and field margins because lepidopteran species in the Netherlands are under pressure and many are threatened with extinction. Exposure to Bt toxins could lead to an accelerated decline of these populations. However, COGEM also notes that exposure to Bt toxins can only be damaging to lepidopteran species that are sensitive to the toxins concerned.

The first step in applying for consent to cultivate GM crops, such as maize, is to carry out laboratory experiments to obtain information for use in assessing the possible risks to non-target organisms.[2] These laboratory experiments test various non-target organisms to determine whether or not they are adversely affected by the Bt toxin present in the GM crop. As there are numerous types of non-target organisms that may be present on a crop, it is impossible to study the possible effects on every non-target organism that could be exposed to the GM crop. The non-target organisms to be investigated must be as representative as possible of the non-target organisms that may be exposed to the GM crop in the field.

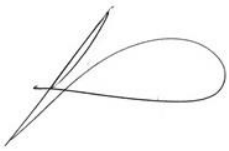
In the report the researchers make recommendations on three butterfly species that can serve as model species in laboratory experiments for assessing risks to non-target lepidopteran species. The researchers consider these species to be suitable candidates because of their widespread European occurrence in arable field margins, their rapid life cycle and the considerable experience that has been gained with laboratory rearing of these species. All things considered, COGEM maintains that the three species – the Queen of Spain Fritillary (*Issoria lathonia*), the Wall Brown (*Lasiommata megera*) and the Swallowtail (*Papilio machaon*) – are the most suitable for use as representative species in laboratory experiments.[A] COGEM advises the Minister for Infrastructure and Water Management to put this forward to the EFSA so that its guidelines may be amended accordingly.

[A] The Dusky Large Blue (*Phengaris nausithous*) mentioned earlier has a complex life cycle which makes it unsuitable for use in laboratory experiments.

COGEM has some reservations concerning EFSA's theoretical mathematical model.
First, there seems to be an inconsistency between imposing isolation distances based on model calculations for a theoretical sensitive species and carrying out laboratory experiments to investigate potential adverse effects on non-target organisms. Imposing isolation distances based on the outcome of the mathematical model renders laboratory studies on the susceptibility of non-target lepidopteran species redundant.
Further, COGEM observes that imposing isolation distances from protected habitats fails to address the fact that populations of most lepidopteran species occur both in and outside protected habitats. Imposing isolation distances around protected habitats is therefore not an effective measure.
Given the above, COGEM has a strong preference for experimental and observational studies to assess the potential risks to non-target lepidopteran species rather than imposing isolation distances based on a theoretical mathematical model.

Just one insect-resistant GM maize line (MON810) has been authorised for placing on the European market for cultivation. The pest insects against which the Bt toxin in this maize line and related lines is active do not occur in the Netherlands. No GM maize is currently cultivated in the Netherlands, but this situation may change in the future. Should an application be made in the future for the cultivation of insect-resistant GM crops, COGEM notes that it is important to also consider the effects of the use of insecticides to control the pest insects. Until now no adverse effects of GM crops on lepidopteran species have been demonstrated, whereas such effects have been shown for insecticides.

Yours sincerely,



Professor Sybe Schaap
Chair of COGEM

c.c. H.P. de Wijs, Head of the GMO Office
J.K.B.H. Kwisthout, Ministry of Infrastructure and Water Management

1. COGEM (2017). Assessment of risks to non-target organisms of the cultivation of GM crops that express one or more Bt toxins. COGEM report CGM/170907-01
2. Non-target organisms: all organisms in the field with the exception of the pest insect against which the introduced trait in the GM crop is directed.
3. Wallis de Vries MF, van Deijk J & van Alebeek F (2017). The importance of maize and oilseed rape field margins for Lepidoptera. COGEM research report CGM 2017-03
4. EFSA (2011). Statement supplementing the evaluation of the environmental risk assessment and risk management recommendations on insect resistant genetically modified maize Bt11 for cultivation. EFSA Journal 9 (12): 2478
5. EFSA (2011). Scientific Opinion updating the evaluation of the environmental risk assessment and risk management recommendations on maize 1507 for cultivation. EFSA Journal 9 (11): 2429
6. EFSA (2015). Updating risk management recommendations to limit exposure of non-target Lepidoptera of conservation concern in protected habitats to Bt-maize pollen. EFSA Journal 13 (7): 4127
7. European Commission. Commission implementing decision of XXX concerning the placing on the market for cultivation of genetically modified maize 1507 (DAS-Ø15Ø7-1) seeds. http://ec.europa.eu/transparency/regcomitology/index.cfm?do=search.documentdetail&Dos_ID=14171&DS_ID=46172&Version=7 (accessed: 1 December 2017)
8. European Commission. Comitology register. Commission implementing decision of XXX concerning the placing on the market for cultivation of genetically modified maize Bt11 (SYN-BTØ11-1) seeds. http://ec.europa.eu/transparency/regcomitology/index.cfm?do=search.documentdetail&dos_id=0&ds_id=46173&version=7 (accessed: 1 December 2017)
9. European Commission. Commission implementing regulation (EU) …/… of XXX renewing the authorisation for the placing on the market for cultivation of genetically modified maize MON 810 (MON-ØØ81Ø-6) seeds. http://ec.europa.eu/transparency/regcomitology/index.cfm?do=search.documentdetail&Dos_ID=14171&DS_ID=46170&Version=7&CLX=en (accessed: 1 December 2017)