

National Academy of Agricultural Sciences

DATE: 04-10-2016

Government of India

Ministry of Environment, Forest & Climate Change (MOEF&CC)

CS-III Division, New Delhi-110003

mustard.mef@gov.in



Dr. S. Ayyappan
President

Reference: Note dated September 5, 2016, issued by the MOEF&CC, inviting comments on the proposal for authorisation of environmental release of genetically engineered mustard (*Brassica juncea*) hybrid DMH-11 and use of parental events (Varuna bn 3.6 and EH-2 modbs 2.99) for development of new generation hybrids

Recommendations of the NATIONAL ACADEMY OF AGRICULTUREAL SCIENCES, New Delhi

1. **The document, prepared by the sub-committee** constituted by the GEAC, on food safety, environmental safety, compliance etc., for the environmental release of GE Mustard (*Brassica juncea*) hybrid DMH-11 and use of the parental events (Varuna bn3.6 and EH2 modbs 2.99) for development of new generation hybrids, was studied in detail by the National Academy of Agricultural Sciences (NAAS). The Academy also studied the full biosafety dossier submitted by the applicants, and **is in agreement with the observations of the sub-committee in the document** circulated by the MOEF&CC.
2. **The applicants**, Centre for Genetic Manipulation of Crop Plants (CGMCP), University of Delhi South Campus, New Delhi have used a **novel approach to develop hybrid lines** of mustard (*Brassica juncea*), by developing transgenic parental lines.
3. The applicants have generated **sound scientific data** on molecular characterization, Biosafety assessment of food, feed and environment, and agronomic performance of GE Mustard Hybrid DMH-11 and its parental lines.
4. As desired by the MOEF&CC, **Specific comments on the prescribed form are attached**, for kind consideration.
5. **To allay the general public concerns**, the Academy would also like to highlight the following points:
 - a. **Herbicide is used in the process** only in hybrid production plot to retain only the male sterile lines, carrying the barnase gene, in the plot for successful hybrid production.
 - b. The normal **activity of bees is not affected**.
 - c. GE Mustard provides yield advantage. After commercialization it will compete with other hybrids and varieties available in the market. Its **further success can be judged only after commercialization**.
 - d. **The barnase, barstar and bar genes are in use for hybrid seed production** in rapeseed (a crop closely related to mustard) in Australia, Canada, China, EU, Japan, Korea, Mexico, South Africa and USA for over two decades with no adverse effect on environment or human and animal health. Canola oil from Canada is imported by India in large quantities.
6. Considering, that GE Mustard Hybrid DMH-11 has (a) satisfactorily met all the biosafety parameters, (b) it provides 20 – 30% yield advantage showing hybrid vigour, and (c) the urgent need to increase edible oil production in the country, **the Academy strongly recommends commercial release of GE Mustard Hybrid DMH-11 and its parental lines.**

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Dr. S. Ayyappan
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FORM

**For comments on the document on
“Assessment of Food and Environmental Safety (AFES)”**

**On The Proposal for Authorisation Of
Environmental Release of Genetically Engineered Mustard (*Brassica Juncea*)
Hybrid DMH-11 and use of Parental Events (Varuna Bn3.6 And EH2 Modbs2.99)
For Development of New Generation Hybrids**

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2. Brief Comments on AFES on GE Mustard

Chapter	Section	Comments# (Please mention Page/line no./table/fig no/ for each comments)
CHAPTER 4	Molecular Characterization of GE Mustard Hybrid DMH-11 and Its Parental Lines	The developers have very well characterized the GE Mustard DMH-11 and its parental lines , as evidenced by the molecular characterization data presented in the attached assessment of food and environmental safety. Molecular characterization on pages 35-55, clearly shows stable integration of transgenes and their inheritability through several generations.
CHAPTER 5	Biosafety Assessment : Food And Feed For GE	The three transgenes - Bar, Barnase and Barstar- used in developing GE Mustard are well known genes of commonly occurring bacteria. The proteins coded by the transgenes are expressed at very low or negligible levels; none of the three proteins were found to be toxic or allergenic, as very well explained in pages 62-73.

		Compositional and nutritional assessment (Tables 5.1 to 5.3) found no unintended effect in the overall composition of GE plants. Assessment of the cyto-toxicity related observations of Barnase on pages 70 and 71 is very satisfying.
	Hybrid Dmh-11 and The Parental Lines	
CHAPTER 6	Biosafety Assessment: Environment Safety Assessment Studies for GE Hybrid DMH-11 and the Parental Lines	Environmental safety assessment has shown (pages 75-80) that GE Mustard does not have any weediness potential. Data (pages 82-88; Fig. 6.2) with reference to gene flow clearly show no interspecies crossability of GE Mustard with related <i>Brassica</i> spp. However, intra-species gene flow could occur but it will not have survival advantage. Moreover, the barnase carrying pollen have been shown to be sterile thus being unable to pollinate any neighbouring population. No difference was found on microbes, pests and diseases in the fields growing GE and non-GE mustard (pages 89-96). GE mustard showed no reduction in bee activity as the nectarines are not affected. Foraging activity was similar in GE and non-GE mustard (Table 6.2). The comparisons and similarities of the bee visits and behaviour do not indicate any associated environmental risk. There is over two decades history of safe use of the three transgenes in rapeseed (a sister crop of oilseed mustard, in nine countries, including Australia, Canada, China and the US.
CHAPTER 7	Evaluation Of Agronomic Parameters For GE Hybrid DMH-11 and The Parental Lines	All the agronomic features (Table 7.1) were consistent including in their variant expressions in different locations. DMH-11 provided 20 to 30% yield advantage in BRL I and II trials at different locations (Tables 7.2, 7.3 and 7.4).
Miscellaneous	Recommendation	Considering that the GE Mustard is biosafe, based on the results of biosafety tests performed in the best laboratories of the country, which showed that the GE mustard has nil/ negligible toxicity, allergenicity or weediness potential, negligible gene flow

		potential and no alteration in nutrient composition (Table 8.1), while it provides 20 to 30 % yield advantage. Considering the overall assessment of food and environmental safety in which no adverse affects were found, and yield advantage, environmental release of GE mustard for commercialization is strongly recommended.
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Be very brief in your comment(s) and relevant to chapter to facilitate further analysis.

Send your comments by email (only) to: mustard.mef@gov.in by mentioning “Comments on RARM document on GE Mustard” in the subject matter. Last date to receive comments is 05.10.2016.