# GM Mustard curry awaits its spices!

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**New Delhi:** Post October 5th, 2016 when the process of assessment of food and environmental safety for release of genetically modified Mustard (*Brassica juncea*) got completed, all eyes are on the union government's next move on the issue. Earlier the Union Environment Ministry on 5th September, had put the document prepared by the sub-committee of Genetic Engineering Appraisal Committee (GEAC) on its website for comments by stakeholders and general public for a period of 30 days.

The process was rolled out as a response to the application of Centre for Genetic Manipulation of Crop Plants (CGMCP), University of Delhi for the approval of environmental release of GM Mustard hybrid, DMH-11 and use of parental events (Varuna bn 3.6 and EH-2 modbs 2.99) for the

development of new generation hybrids.

**Biosafety concerns taken care of?**

The 4000+ pages biosafety dossier of GM mustard packed in VII volumes generated over a period of more than 15 years reaffirm the scientific scrutiny, safety and supremacy of Indian regulatory system in assessing biosafety of GM crops in India, say the experts. During the public comments period as announced by Environment Minister on 7th October, around 759 comments were submitted by experts familiar with the subject of agriculture and crop improvement including the visits of dozens of researchers, students and farmers to ministry demonstrate the public participation and participatory engagement in the process of the commercial approval of GM mustard in India.

As per Dr Shivendra Bajaj, Executive Director, Association of Biotechnology Led Enterprises, Agriculture Focus Group (ABLE-AG) said, “We have been importing and consuming oil derived from GM Canola and Soybean for the several years, so what is the point of opposing GM Mustard? The sub-committee on GM Mustard has evaluated all bio-safety data and found GM Mustard safe. This safety assessment report also includes impact on non-target organism and beneficial insects and there is no difference between conventional and GM Mustard. So there is all reason to grow GM Mustard and reduce dependency on oil imports.”

Excerpts from the bio-safety docket on GM Mustard placed in the public domain by the Ministry highlights: ‘Expression of the introduced proteins, encoded by the barnase and barstar genes, is controlled by a tapetum-specific promoter and no expression is detected in the pollen. As a consequence, the exposure of the pollinating insects to these proteins is likely to be negligible.’

Dr Deepak Pental, Professor of Genetics, Delhi University South Campus, who is also the developer of GM Mustard said, “We have carried out all the necessary studies with respect to bio-safety of the GM Mustard hybrid DMH-11 and its parental lines. The report submitted by us to the MoEF clearly highlights all the safety assessment data. The issues being raised are to stop the use of genetic engineering technologies for improving crop productivity in the country. Creating fears on scientific developments amongst farmers and common man is unethical and not in the interest of development and prosperity”.

Dr Shanthu Shantharam, noted Biotechnology Regulatory affairs expert & bio-safety risk assessment specialist, currently Professor, University of Maryland (Eastern Shore) and formerly with the United States Department of Agriculture (USDA) said, “It seems the beekeepers have been put up as a front by the anti-GM activists in a desperate attempt to derail approvals for GM mustard.  This tactic has been played out by such groups in both Europe and to some extent in the US as well.  There is no scientific evidence to even remotely suggest that honey bees are affected by any GM crop, much less by GM mustard.”

**Honey bee sting on GM Mustard fails**

On September 26, 2016, the Confederation of Bee Keeping Industry organized a press conference in the village Hafizpur in Yamuna Nagar district of Haryana to appraise the media of the concerns and objections of the honey industry with regards to GM mustard. It alleged that the GM Mustard would be a threat to the bee population and cause losses to famers.

The ABLE-AG called the claim completely baseless and added that it is also surprising that this is

being raised for the first time since the introduction of Bt Cotton in India. “It is important to note that Bt Cotton has been grown in Indian since 2002, in China since 1997 and in the US since 1995. Today GM crops are grown extensively across South Asia (including Bt Brinjal in Bangladesh). To date there is no scientific basis much less a study that highlights any adverse effect of a GM crop on honey bee populations in the south Asia region.”

Dr Vibha Gupta, Principal Scientist of Delhi University South Campus who is directly involved in the GM mustard project informed that “In GM mustard, hybrid DMH-11 is fully fertile with pollen viability similar to the parental line Varuna and has fully developed nectaries. In the BRL-I and BRL-II trials honey bees were observed to visit transgenic lines and hybrid DMH-11 as well as their visit to their non- GM comparators”

“GM mustard does not contain any insecticide that will kill honeybees visiting its flowers, nor enhances use of sprayable insecticides.  On the contrary, GM mustard with its hybrid vigor will help in increasing more visits of honey bees and consequently of their population. It is this simple logic that we all know and this Confederation needs to learn”, said Dr Govind Gujar, Ex-Head, Division of Entomology, Indian Agricultural Research Institute (IARI), New Delhi.

**Are swadeshi sentiments misplaced?**

The Swadeshi Jagran Manch that is the part of the current government’s ideological fountainhead, Rashtriya Swayam Sewak Sangh has fiercely opposed any green signal to the GM Mustard. Recently it had invited the anti-GM scientist such as Dr Gilles-Eric Seralini along with various other critics on a single platform to oppose the technology. The move backfired due to the allegations on the past background of the scientist who was specifically invited to talk on GM Mustard developed in India.

“This move is to misguide general public in India,” mentioned the South Asia Biotechnology Centre, “Some groups fundamentally opposed to genetic modification technologies, breaking their ideological differences (both left and right wings), seemed to have found a common ground to oppose this indigenous scientific endeavor, relying heavily on an imported anti-GM scientist such as Gilles-Eric Seralini, a controversial French scientist, to misguide the general public in India.”

“It is grossly unethical for Dr Seralini to have accepted the invitation from SJM to visit India and criticize the internal domestic matter related to indigenous scientific endeavor. It is ironic that SJM is relying on a controversial videshi scientist known for his anti-biotech crusade to derail a “Make-in-India” product developed by Delhi University. SJM is utterly confused with their core mission and agricultural agenda” alluded Dr C D Mayee, the President of the SABC.

Echoing above sentiments, Prof Marc Van Montagu, a world renowned Belgian scientist credited with the discovery of recombinant DNA technology and the recipient of the World Food Prize in 2013 stated “it is a disgrace for science and humanity and a deep shame that Dr Seralini still makes such statements after his publications on tumors in rats was retracted. The GM technology is safe and used in Canola (Canadian mustard) in Canada since more than 20 years.”

It is worth noting that the French Gilles-Eric Seralini and New Zealand’s Lou Gallagher had a major misadventure in influencing government’s decision on Bt brinjal in 2010. Then, Seralini and Gallagher aligned with Greenpeace and anti-GM lobbyists, to successfully brand Bt brinjal “unsafe” resulting in the moratorium on Bt brinjal imposed in Feb 2010. Notably, Bt brinjal is successfully

grown by farmers and eaten by consumers in Bangladesh since 2014.

While the scientific experts vouch for GM Mustard pointing towards need to provide farmers with a facilitating environment, the top ministers in the previous governments as well as the current dispensation too have reiterated the need for modern technologies to improve their crop productivity in the larger interest of the Indian economy.  The internal brainstorming by top policymakers has highlighted GM as one of the pillars to support the goal set by Mr Narendra Modi to double their income by 2022.

The scientific reasoning on Bt Cotton couldn't weigh much on the then environment minister's decision despite the former Prime Minister's favorable statements. However, the mood seems to be different this time. The presence of a decisive Prime Minister who has time again praised modern technologies, has bolstered the GM Mustard's chances. Unless of course the politics takes over.

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**Countering myths on barnase-barstar technology and GE mustard hybrid DMH-11.**

- **Non terminator technology and male sterility trait in Mustard**: The system of male sterility in one of the parents is a fundamental necessity for efficient hybrid seed production irrespective of use of methodologies such as the cytoplasmic male sterility (CMS) or the barnase-barstar system. Efforts should be made to ensure that the general public should not be confused with the system of male sterility induced by the barnase-barstar technology with the GURT or terminator technology.
- **Efficient hybridization an increasing Mustard yield:** The barnase-barstar system provides opportunity to produce fully fertile hybrids with enhanced yield levels, reduce hybrid seed production cost and increased farmers' income.1
- **Mustard Crossability:** The issue of crossability of GE mustard with the conventional mustard or wild relatives has been overstated and exaggerated to stall the commercial cultivation of this powerful hybridization technology.
- **Herbicide tolerance in Mustard:** The herbicide tolerance is not a prime target for the barnase-barstar GE mustard hybrid DMH-11. However, all efforts should be directed to develop mustard seeds tolerant to popular herbicides including glyphosate and glufosinate to allow farmers to increase mustard productivity and production in India.
- **IPRs on GM Mustard:** None of the patents on barnase-barstar system were ever filed by developers in India. Global patents on barnase-barstar genes have already expired. Notably, the patents of the modification of the barnase-barstar technology in mustard developed by Delhi University South Campus were filed in India and other countries such as USA and Canada, are held jointly by the National Dairy Development Board (NDDB) and Delhi University.