

GEAC cleared GM Mustard

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In news- The Genetic Engineering Appraisal Committee (GEAC) has recommended the “environmental release” of the transgenic hybrid mustard DMH-11 for seed production and conduct of field demonstration studies with respect to its effects, if any, on honey bees and other pollinating insects.

The hybrid mustard-

- **Hybridisation involves crossing two genetically dissimilar plant varieties** that can even be from the same species.
- The first-generation (F1) offspring from such crosses tend to have higher yields than what either parent can individually give.
- Such hybridisation isn't easy in mustard, as its flowers have both female (pistil) and male (stamen) reproductive organs, making the plants largely self-pollinating.
- Since the eggs of one plant cannot be fertilised by the pollen grains from another, it limits the scope for developing hybrids – unlike in cotton, maize or tomato, where this can be done through simple emasculation or physical removal of anthers.
- **By genetic modification (GM). Scientists at Delhi University's Centre for Genetic Manipulation of Crop Plants (CGMCP) have developed the hybrid mustard DMH-11 containing two alien genes** isolated from a soil bacterium called **Bacillus amyloliquefaciens**.
- The first gene ('barnase') codes for a protein that impairs pollen production and renders the plant into which it is incorporated male-sterile.
- This plant is then crossed with a fertile parental

line containing, in turn, the second 'barstar' gene that blocks the action of the barnase gene.

- **The resultant F1 progeny is both high-yielding and also capable of producing seed/ grain, thanks to the barstar gene in the second fertile line.**
- **The CGMCP scientists have deployed the barnase-barstar GM technology** to create what they say is a robust and viable hybridisation system in mustard.
- This system was used to develop **DMH-11** by crossing a popular **Indian mustard variety 'Varuna'** (the barnase line) **with an East European 'Early Heera-2' mutant (barstar).**
- **DMH-11 is claimed to have shown an average 28% yield increase over Varuna** in contained field trials carried out by the Indian Council of Agricultural Research (ICAR).

What has GEAC now done?

- GEAC that functions under the Union Environment Ministry is a body responsible for appraisal of proposals relating to the "release" of GM organisms and products (ordinarily considered hazardous) into the environment.
- In this case, **it has recommended the environmental release of DMH-11 "for its seed production and testing, prior to commercial release".**
- In other words, **it has given the green signal for commercial cultivation by farmers**, with production of seed material being the first step.
- GEAC has **also recommended the environmental release of DMH-11's parental lines** (carrying the barnase and barstar genes) for them to be used to develop new hybrids. Such hybrids could give even higher yields than DMH-11.
- Mustard varieties in India have a narrow genetic base. The barnase-barstar system enables breeding

of hybrids from a wider range of mustards, including those of East European origin such as 'Heera' and 'Donskaja'.

- Considering the application of the Centre for Genetic Manipulation of Crop Plants, the GEAC also set certain conditions for the clearance. It includes that the approval is for a limited period of four years and is renewable for two years at a time based on compliance report.
- The recommendation will now again go for the approval of the Environment Ministry. Though the GEAC had cleared the proposal in 2017, the Ministry had vetoed it and suggested that the GEAC hold more studies on the GM crop.
- **India has until date approved GM breeding technology only in cotton. Previous attempts at commercial release of GM brinjal were foiled by environmental activists.**

Further

reading:

<https://journalsofindia.com/genetic-engineering-appraisal-committee-geac/>