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GEAC's Approval for GM-Mustard

Why in news?

The Genetic Engineering Appraisal Committee (GEAC) has again cleared the proposal for commercial cultivation of genetically modified (GM) mustard.

What is the case with GM mustard?

A crop which has a gene artificially inserted into it from another species to give some desired properties (pest resistant, herbicide tolerant, etc.) is known as GM crop.

- The GEAC had earlier [cleared the proposal in 2017](#) but the Union Ministry of Environment, Forest and Climate Change had vetoed it.
- The Ministry suggested GEAC to hold more studies on the GM crop.
- The Supreme Court also stayed the clearance saying public opinion should be sought on the issue.
- Recently, GEAC recommended the environmental release of **transgenic hybrid mustard DMH-11 (Dhara Mustard Hybrid-11) for seed production** and conduct of field demonstration studies with respect to its effects.
- This is the **first GM food crop** that India has permitted for commercial release.
- After 2006 when the Centre permitted the commercial release of **Bollgard II cotton (Bt-Cotton)**, this is the first crop that has overcome regulatory and political hurdles to be allowed for release.
- Though attempts were made to introduce field trials of GM brinjal, it met with stiff resistance.

What is the need for GM 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 the parents.

- **Difficulty in hybridisation** - The process of hybridisation is difficult in mustard, as the plants are largely **self-pollinating**.

- The limitation in the scope for developing hybrids in turn affects the production of superior offsprings.
- **Rising edible oil import bill** - The country produces only 8.5-9 million tonnes of edible oil annually, while importing 14-14.5 million tonnes during the fiscal year 2022.

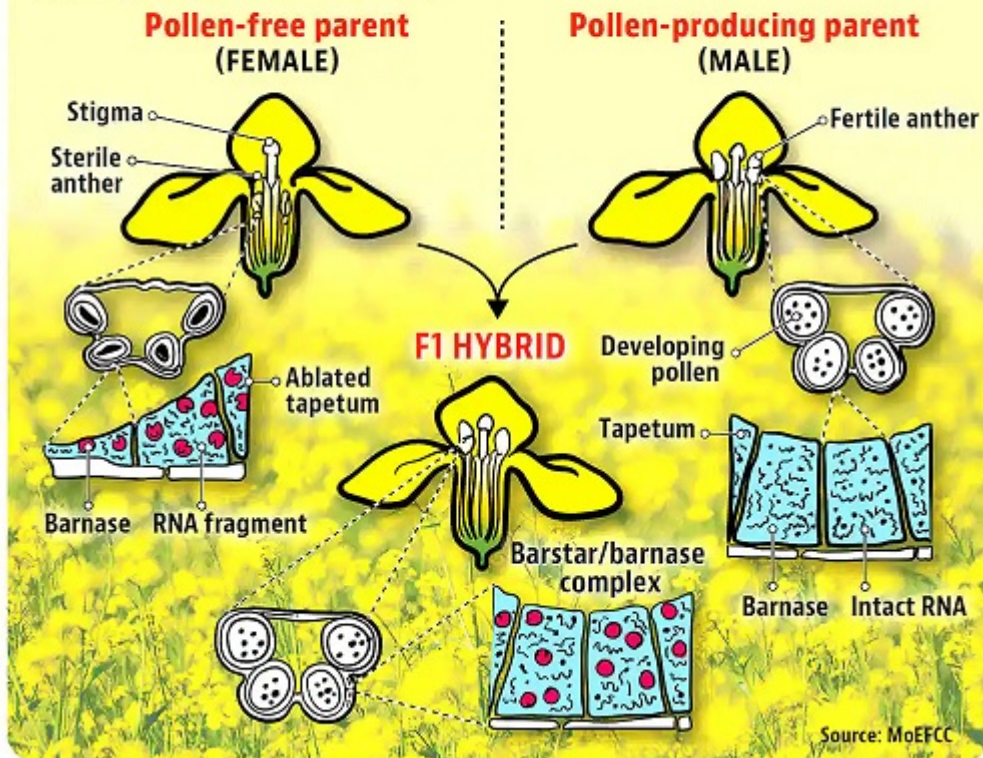
How is GM mustard produced?

India is the 4th largest contributor of oilseeds in the world and rapeseed and mustard contributes about 28.6% of total oilseeds production.

- GM mustard is developed by the Centre for Genetic Manipulation of Crop Plants (CGMCP) in Delhi University.
- The scientists have deployed the **barnase-barstar GM technology** to develop DMH-11, containing two alien genes isolated from a soil bacterium called ***Bacillus amyloliquefaciens***.
- The barnase gene 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 the 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.
- DMH-11 was developed by crossing the Indian mustard variety 'Varuna' (barnase line) with an East European 'Early Heera-2' mutant (barstar).

The science behind DMH-11

To create Dhara Mustard Hybrid-11, the team improvised on a 1990s breeding innovation pioneered in Belgium called the barnase/barster male sterility technique. It works on the principle of removing male fertility in one parent and restoring it in the offspring



What are the pros and cons of DMH-11?

Pros of DMH-11

- **Yield** - 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).
- **New traits** - New traits relating to resistance against disease, etc. can be incorporated.
- **Indigenous** - Since the seeds are indigenously developed, the patent remains with government unlike cotton where it is with corporates.
- **Import bill** - Mustard oil production from this variety of crop will save a lot on foreign exchange exchequer.
- **Transfer to humans**- So far, there is no evidence suggesting that the transgenes could be transferred to humans or animals through consumption of GE food.

Cons of DMH-11

- **Free pricing of technology** -The Centre fixing a cap on the royalty to be paid for the technology discourages companies involved in developing the new technologies from sharing them with Indian firms.
- **Effect on honey bees** - There is a concern over GM mustard threatening or undermining the population of honey bees.

- **Use of chemicals** - It increases the use of toxic herbicides.
- **Corporates** - It is a Trojan horse to clear the doorway for powerful companies like Monsanto.
- **Entering the wild population** - Concerns include the capability of the GE Plant to escape and potentially introduce the engineered genes into wild populations.

What does the GEAC decision mean?

- **GM mustard clearance** - By permitting environmental release, the GEAC has allowed the commercial release of GM mustard.
- The Centre for Genetic Manipulation of Crops, University of Delhi has to grant permission for the commercial release.
- State governments will have a role in the commercial release of GM variety.
- The Indian Council of Agricultural Research (ICAR) will be the authorised agency to accord necessary permissions for the development of any other mustard hybrids.
- All hybrids released using this technology shall also be regulated under **Seed Act 1966**.
- GEAC nod is not the final approval for commercial release but a step forward.
- The approval is valid for the next 4 years.
- **Other clearances** - The GEAC asked Review Committee on Genetic Manipulation (RCGM) to permit to permit field trials of genetically-engineered potato, banana and rubber.

References

1. [The Indian Express | Understanding GM mustard](#)
2. [The Hindu | GEAC approves commercial cultivation of GM mustard](#)
3. [The Hindu Businessline | GEAC clears GM mustard](#)
4. [Business Standard | GEAC clears environmental release of GM mustard](#)
5. [Britannica | Mustard](#)

Quick facts

Mustard

- **Family** - Brassicaceae
- **Types**
 - White or Yellow mustard (*Sinapis alba*) - Mediterranean origin
 - Brown or Indian mustard (*Brassica juncea*) - Himalayan origin
- The seeds contain about 30-40% vegetable oil, a slightly smaller proportion of protein, and a strong enzyme called myrosin.
- **Rajasthan** is the **largest producing** state in the country.
- Other mustard cultivating states- Gujarat, Uttar Pradesh, West Bengal, Haryana, Punjab, Madhya Pradesh.

Genetic engineering appraisal committee (GEAC)

- It is established under **Ministry of Environment, Forests and Climate Change**.
- It is the apex body for approval of activities involving large scale use of hazardous microorganisms and recombinants.
- It is responsible for approval of proposals relating to release of genetically engineered organisms and products including experimental field trials.



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