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).

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.

