



SC Verdict on GM Mustard Approval

For Prelims: [Genetically Modified \(GM\) crops](#), [Herbicide Resistance](#), [Bt cotton](#), [Genetic Engineering Appraisal Committee \(GEAC\)](#), [Dhara Mustard Hybrid-11 \(DMH-11\)](#), [‘Early Heera-2’ mustard](#), [Bacillus amyloliquefaciens](#).

For Mains: Significance of Genetically Modified Crops Challenges and Mitigation.

[Source: TH](#)

Recently, the [Supreme Court \(SC\)](#) delivered a split verdict on the validity of the Centre’s decision to grant conditional approval for the environmental release of [Genetically Modified \(GM\) mustard crops](#). Now, the case will be referred to a **Supreme Court’s three-judge Bench**.

- **Genetically Modified (GM) Crops** are **genetically engineered crops** that undergo gene alteration and modification.

What are the Key Highlights of SC Verdict on GM Mustard?

- **Reason Behind Split Judgement:**
 - **Justice Nagarathna** criticised the GEAC for clearing the project without relying on any **indigenous studies** on the crop’s effect in India and its possible environmental ramifications and **only foreign research studies** were considered while making the recommendation.
 - **In contrast, Justice Karol upheld** the GEAC’s clearance for GM mustard’s commercial release
 - However, **both judges concurred on certain points** raised during the arguments.
 - They acknowledged that judicial review of decisions made by the GEAC was permissible and emphasised the need for the Centre to consider implementing a **national policy**.
- **Directive for National Policy:**
 - The judges asked the Union Ministry of Environment and Forest to formulate such a policy, along with rules, within four months.
 - This policy should cover **research, cultivation, trade, and commerce**, and be developed in consultation with stakeholders including agriculture experts, **biotechnologists, state governments, and farmer representatives**.
- **GEAC's Role:**
 - The [Genetic Engineering Appraisal Committee \(GEAC\)](#) approved the environmental release of the **transgenic mustard hybrid Dhara Mustard Hybrid-11 (DMH-11)** in October 2022.

What is GM Mustard?

- **About:**
 - **Dhara Mustard Hybrid-11 (DMH-11)** was developed in India by hybridising the Indian

- mustard variety '[Varuna](#)' and '[Early Heera-2](#)' (**Eastern European variety**).
- It contains two alien genes ('barnase' and 'barstar') isolated from a soil bacterium called [Bacillus amyloliquefaciens](#) that enable breeding of high-yielding commercial mustard hybrids.
- It is approved by the **Genetic Engineering Appraisal Committee (GEAC)** for cultivation.
- **Characteristics:**
 - It is classified as a **Herbicide Tolerant (HT)** mustard variety and it is **engineered to withstand specific herbicides**, which can aid in **weed control and enhance crop yield**.
- **Significance:**
 - **Mustard Contribution in Oil Production and Imports:** Despite producing 116.5 lakh tonnes of edible oils in **2021-22, India imported 141.93 lakh tonnes**, highlighting a significant gap and there is a projected demand of **34 million tonnes by 2025-26**.
 - Mustard plays a pivotal role, constituting **40% of India's total edible oil** production.
 - **Potential Yield Enhancement Of GM Mustard:** **GM Mustard demonstrates a yield increase of approximately 28% compared to the national standard and surpasses zonal benchmarks by around 37%, indicating superior performance in specific agricultural regions.**
 - Its varieties like **DMH-11 have the capability to substantially increase yields to 3-3.5 tonnes** per hectare.
 - **Improved Input Efficiency:** GM mustard can optimise resource utilisation by requiring **less water, fertilisers, and pesticides compared to traditional varieties**. This efficiency is crucial for sustainable agriculture practices and mitigating environmental impact.
 - **Reduced Price Volatility:** Enhanced production through GM mustard can stabilise edible oil prices in the domestic market, benefiting consumers and ensuring food security.

What are Genetically Modified (GM) Crops?

- **GM crops** are plants whose **genes are artificially modified**, usually by **inserting genetic material from another organism**, in order to give it new properties, such as increased yield, tolerance to a **herbicide, resistance** to disease or **drought**, or improved nutritional value.
 - Earlier, India approved the commercial cultivation of **only one GM crop, Bt cotton**, but [Genetic Engineering Appraisal Committee \(GEAC\)](#) has recommended GM Mustard for commercial use.
- **Challenges Faced by BT Cotton (only Commercially cultivable GM Crop in India):**
 - **Insect Resistance:** The primary challenge with BT cotton has been the emergence of **insect resistance to the Bt toxin**. Overreliance on a single mode of pest control has accelerated this process.
 - **Secondary Pest Outbreaks:** While **effectively controlling bollworms**, BT cotton has led to **increased populations of sucking pests like aphids and whiteflies, necessitating additional pesticide applications**.
 - **Environmental Impact:** Concerns about the impact of Bt cotton **on non-target organisms, such as beneficial insects**, have been raised.
 - **Economic Implications:** Despite initial yield gains, the long-term economic benefits of BT cotton have been debated, with **some studies indicating diminishing returns**.

Genetically Modified Crops

About

- Genetic modification of plants involves **adding a specific stretch of DNA into the plant's genome**, giving it new or different characteristics
- Also called **Transgenic crops**

Global Cultivation

- Top 5 GM growing countries - **USA, Brazil, Argentina, India and Canada**
- Major GM Crops - **Soybean, maize, cotton and canola**

Concerns

- Manipulation of GM Seed Cost
- Seeds don't create viable offsprings
- Insect-resistant plants harm non-targeted species too
- Intermixing violates natural plants' intrinsic values



Objective

- Increase yield
- Increase tolerance to herbicides
- Improve nutritional value
- Provide resistance to disease/drought

GM Crops in India

- **Bt cotton** - **only one GM crop approved**, (90% of India's total cotton acreage) (resistance against pink bollworm)
- **Ht Bt cotton** - resistance against **glyphosate** (herbicide)
- **DMH-11 mustard** - **recommended for commercial use** (high yield)
- **Golden rice** - probably the best variety of GM rice (**Vitamin A**)

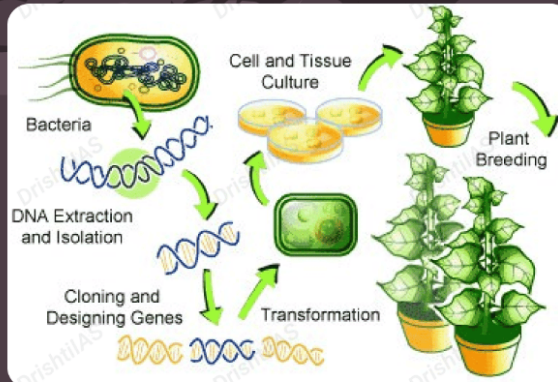
GM Crop Regulation

• Statutory Provision:

- Rules for Manufacture, Use, Import, Export and Storage of Hazardous Microorganisms (HM) Genetically Engineered Organisms or Cells, 1989 under the Environment Protection Act (1986).

• Statutory Bodies:

- **Genetic Engineering Appraisal Committee (GEAC)** (under MoEF&CC) - **administers commercial release** of GMC
- Recombinant DNA Advisory Committee (RDAC)
- Institutional Biosafety Committee (IBSC)
- Review Committee on Genetic Manipulation (RCGM)
- State Biotechnology Coordination Committee (SBCC)



Cartagena Protocol on Biosafety (2000)

- It seeks to protect biological diversity from the potential risks posed by **Living Modified Organisms** resulting from **modern biotechnology**.
- **India is a signatory** to this protocol.

What is the Genetic Engineering Appraisal Committee (GEAC)?

- The **GEAC**, under the Ministry of Environment (MoEF&CC), is **responsible for the appraisal of activities** involving large-scale use of hazardous microorganisms and recombinants in research and industrial production from an environmental angle.
- The committee is also **responsible for the appraisal of proposals** relating to the **release of genetically engineered (GE)** organisms and products into the environment including experimental field trials.
- GEAC is chaired by the Special Secretary/**Additional Secretary of MoEF&CC** and co-chaired by a representative from the **Department of Biotechnology (DBT)**.
 - Presently, **it has 24 members** and meets every month to review the applications in the areas indicated above.

What are the Concerns Associated with GM Mustard?

- **Biodiversity Concern: Potential effects on honeybees due to altered flowering and pollen production.**
 - Its altered genes could potentially affect other beneficial such as **insects, soil microbes, and wildlife**, and unintended harm to beneficial insect populations can disrupt **ecological balances** essential for agriculture.
- **Food Security and Health Concerns: Monoculture cropping facilitated by GM varieties** could increase vulnerability to crop diseases and climate change impacts, threatening long-term food security.
 - Potential for **creating novel proteins with unknown impacts on human health**, as the genes used in GM mustard are not part of the human diet.
- **Ethical Considerations:** There are ethical concerns surrounding the commodification of genetic resources like **self-terminating seed** and **exclusive patent regime** are the implications for agricultural sovereignty.
 - The introduction of GM mustard raises questions about **equitable access to technologies and the rights of farmers** to save and exchange seeds.
- **Regulatory Challenges:** Ensuring compliance with stringent **bio-safety protocols** and monitoring **long-term environmental impacts** requires robust institutional capacity and infrastructure and regulatory challenges.

Way Forward

- **Biodiversity Mitigation: Conducting extensive research to understand the ecological impacts of GM mustard on non-target organisms and Implementing adaptive management strategies.**
- **Food Safety and Human Health:** Risk assessment of the allergenicity and toxicity of novel proteins introduced into the crop. Investing in long-term studies to monitor the impacts of GM mustard on food security, including its effects on crop diseases.
 - **For Example**, the successful adoption of **Bt cotton in India**.
- **Ethical Considerations: Equitable access to GM technologies, including the rights to save and exchange seeds to farmers. Implementing policies that protect traditional farming practices and promoting farmer autonomy in decision-making.**

- **Capacity Building:** Strengthening institutional capacity through training regulators, enhancing laboratory facilities for testing GM crops, and improving data collection and analysis capabilities.
 - Establishing transparent regulatory frameworks that incorporate public consultation and stakeholder engagement.

Read more: [Herbicide Tolerant \(HT\) Bt Cotton](#), [BT Cotton in India - Problems and Solutions](#)

Drishti Mains Question:

Q. Genetically Modified (GM) Mustard crops hold potential benefits for agricultural productivity but also present significant challenges. Discuss the major challenges associated with the adoption of GM mustard crops in India. What measures can be taken to mitigate these challenges?

UPSC Civil Services Examination Previous Year Question (PYQ)

Prelims

Q1. Other than resistance to pests, what are the prospects for which genetically engineered plants have been created? (2012)

1. To enable them to withstand drought
2. To increase the nutritive value of the produce
3. To enable them to grow and do photosynthesis in spaceships and space stations
4. To increase their shelf life

Select the correct answer using the codes given below:

- (a) 1 and 2 only
- (b) 3 and 4 only
- (c) 1, 2 and 4 only
- (d) 1, 2, 3 and 4

Ans: (c)

Mains:

Q. What are the present challenges before crop diversification? How do emerging technologies provide an opportunity for crop diversification? **(2021)**

Q. What are the research and developmental achievements in applied biotechnology? How will these achievements help to uplift the poorer sections of the society? **(2021)**