



Genetically Modified Mustard

For Prelims: [Genetically Modified \(GM\) crops](#), [Herbicide](#), [Resistance](#), [Drought](#), [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 in achieving Sustainable Development Goal 2: Zero Hunger.

Source: TH

Why in News?

Recently, the Government of India told the Supreme Court that [Genetically Modified \(GM\) crops](#) such as **mustard** will make quality edible oil cheaper for the common man and benefit national interest by reducing foreign dependency.

- The Genetic Engineering Appraisal Committee (GEAC) has approved the environmental release of Dhara Mustard Hybrid-11 (DMH-11), a genetically-engineered variant of mustard.
- If approved for commercial cultivation it would be the first genetically modified food crop available to Indian farmers.

India's Demand for Edible oil

- The total edible oil demand of India was **24.6 million tonnes (2020-21)** with domestic availability of **11.1 million tonnes (2020-21)**.
- In **2020-21**, 13.45 million tonnes (**54%**) of the total edible oil demand was met through import worth about **₹1,15,000 crore**, which included **palm oil (57%)**, **soybean oil (22%)**, **sunflower oil (15%)** and small quantity of canola quality mustard oil.
- In **2022-23**, **155.33 lakh tonnes (55.76%)** of the total edible oil demand was met through import.
- India is the **biggest importer** of palm oil, which makes up **40%** of its vegetable oil consumption.
- India meets half of its annual need for **8.3 MT of palm oil** from **Indonesia**.
- In 2021, India unveiled the [National Mission on Edible Oil-Oil Palm](#) to boost India's domestic palm oil production.

What are Genetically Modified (GM) Crops?

- [GM crops](#) are derived from 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.

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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**)



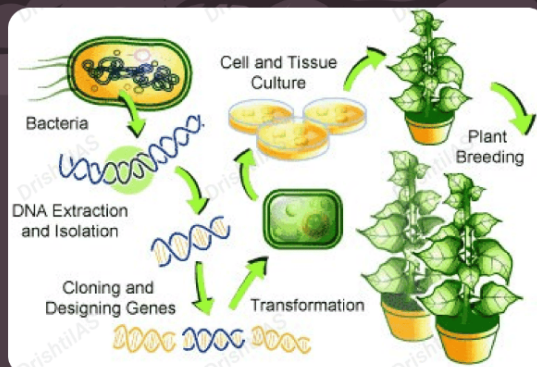
GM Crop Regulation

• 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 GM Mustard?

- **Dhara Mustard Hybrid-11 (DMH-11)** is an indigenously developed transgenic mustard. It is a genetically modified variant of **Herbicide Tolerant (HT) mustard**.
- **DMH-11** is a result of a cross between **Indian mustard** variety '**Varuna**' and **East European 'Early Heera-2' mustard**.
- 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.
- **DMH-11** has shown approximately **28%** more yield than the national check and **37 %** more than the zonal checks and its use has been claimed and approved by the **GEAC**.
 - "Bar gene" maintains the genetic purity of hybrid seed.

What is the Genetic Engineering Appraisal Committee (GEAC)?

- The **Genetic Engineering Appraisal Committee (GEAC)** functions in the **Ministry of Environment, Forest and Climate Change (MoEF&CC)**.
- It is responsible for **appraisal of activities involving large scale use of hazardous microorganisms** and recombinants in research and industrial production from the environmental angle.
- The committee is also **responsible for appraisal of proposals relating to 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.

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)

- Genetically modified crops (GM crops or biotech crops) are plants used in agriculture, the DNA of which has been modified using genetic engineering methods. In most cases, the aim is to introduce a new trait to the plant which does not occur naturally in the species. Examples of traits in food crops include resistance to certain pests, diseases, environmental conditions, reduction of spoilage, resistance to chemical treatments (e.g., resistance to a herbicide), or improving the nutrient profile of the crop.
- Some potential applications of GM crop technology are:
 - Nutritional enhancement - Higher vitamin content, more healthful fatty acid profiles, Hence, 2 is correct.

- Stress Tolerance - Tolerance to high and low temperatures, salinity, and drought, Hence, 1 is correct.
- There is no such prospect that enables GM crops to grow and do photosynthesis in spaceships and space stations. Hence, 3 is not correct.
- Scientists have been able to create certain genetically modified crops which stay fresh for a month longer than usual. Hence, 4 is correct. Therefore, option (c) is the correct answer.

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)**

Q. How is science interwoven deeply with our lives? What are the striking changes in agriculture triggered off by science-based technologies? **(2020)**

Q. How was India benefited from the contributions of Sir M. Visvesvaraya and Dr. M.S. Swaminathan in the fields of water engineering and agricultural science respectively? **(2019)**

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