

## Bt Brinjal

Bt Brinjal is a transgenic brinjal created by inserting a gene cry1Ac from the soil bacterium *Bacillus thuringiensis* into Brinjal. This genetically modified brinjal gives resistance against insects such as the Brinjal Fruit and Shoot Borer (*Leucinodes orbonalis*). Bt Brinjal was developed by Maharashtra Hybrid Seeds Company (Mahyco).

### Development of Bt Brinjals

- Bt Brinjal is the first Genetically Modified food crop in India that has reached the approval stage for commercialization.
- Bt Brinjal has been developed by inserting a gene cry1Ac from a soil bacterium called *Bacillus thuringiensis* through an *Agrobacterium*-mediated gene transfer.
- It is a genetically modified brinjal developed by the Maharashtra Hybrid Seed Company Ltd. (Mahyco), a leading Indian seed company.
- For the development of the Bt brinjal, Mahyco obtained the license for using the cry1Ac gene. The gene is present in the brinjal throughout its life cycle.
- Once a fruit and shoot borer larva feed on Bt brinjal plants, it injects the cry1Ac protein along with the plant tissue. It reacts with the alkaline in the insect gut, binding it to specific receptor proteins present in the membrane. It disrupts the insect's digestive process, causing paralysis and eventually the death of the larvae.

### Controversy about Bt Brinjal

- Bt Brinjal has generated much debate in India. The promoters say that Bt Brinjal will be beneficial to small farmers because it is insect resistant, increases yields, is more cost-effective and will have a minimal environmental impact.
- On the other hand, concerns about Bt Brinjal relate to its possible adverse impact on human health and biosafety, livelihoods and biodiversity.

### Commercial History of Bt Brinjals in India

The agreement to develop Bt brinjal was decided in 2005 between Mahyco and two agricultural universities - the University of Agricultural Sciences and Tamil Nadu Agricultural University

A committee set up in 2006 found that the Bt brinjal was safe and equivalent to its non-Bt counterpart, but it also concluded that more studies were needed to examine the benefits it would bring with regard to pest management and pesticide reduction. It recommended that large-scale trials be carried out. In 2009, a second committee felt that tests have been adequately carried out and concluded that Bt brinjals could be viable for commercial use.

The Genetic Engineering Appraisal Committee (GEAC) cleared BT brinjal for commercial use in India on 14 October 2009. When concerns were raised by farmers, scientists and NGOs, the Central Government announced in February 2009 that it needed more time to test how safe the BT Brinjal was before approving it for commercial use.

In 2010, it was announced that the government would be putting a 10-year moratorium on the commercialization of Bt brinjals, citing that a thorough field test must be carried out before it can be used by farmers.

## Benefits of Bt Brinjal

The arguments made in favour of Bt Brinjal are as follows:

### Environmental Impacts

- Brinjal cultivation involves the usage of huge amounts of pesticides. 60% of plant protection cost is for controlling fruit and shoot borers.
- Small and marginal farmers use 25-80 sprays of pesticides in Brinjal cultivation.
- Bt brinjal would reduce pesticide usage in cultivation by 80%.

### Biodiversity

- Bt brinjal does not exhibit any different agronomic or morphological traits compared to non-Bt brinjal that may give it a competitive advantage over other species in the ecosystem.

### Human Health and Biosafety

- Bt brinjal has been found to be safe for human consumption and safe for the environment.
- Human health concerns due to pesticide use can be reduced with this transgenic brinjal and its in-built resistance to pests.

- The Cry1Ac endo-toxin is a protein that breaks down when cooked. It is active only in an alkaline medium, and since humans consume brinjal only when cooked, it will not interfere with digestion. Additionally, as the stomach is acidic, the digestive process will not be affected by the introduction of the Cry1Ac toxin. The toxin breaks down into common amino acids in the digestive system, which are part of the normal diet and are neither toxic nor allergic. The Cry1Ac endo-toxin would only damage the fruit and shoot borer gut which is alkaline.

## Livelihoods and Economic Benefits

- Bt brinjal increases marketable yields, thus resulting in higher incomes for farmers.
- During trials, average shoot and fruit damage in Bt brinjal hybrids was found to be less than in non-Bt brinjal hybrid counterparts.
- Farmers will be able to continue to save and re-use their seeds for the hybrids varieties.

## Concerns about Bt Brinjal

Like in the case of other Genetically Modified Crops in India, several concerns were raised about Bt Brinjal by scientists, farmers and environmental activists. They are as follows:

**Environmental Impact:** The use of pest-resistant Bt Brinjal may lead to the extinction of species considered important for farm ecology.

**Bt Brinjals can become costly:** Companies that own Bt Brinjal seeds can charge a high price for their procurement, as it is predicted that its high yield and increased shelf life will fuel demand. If that is the case, it might lead to a scenario where small and marginal farmers can ill afford Bt brinjal seeds.

**Concerns regarding Nutrition:** Scientists are of the opinion that Bt brinjal poses a serious health risk, as its resistance to antibiotics can make medicines ineffective. There also might be adverse effects of forming allergens and other anti-nutritious in foods.

M.S Swaminathan, the father of India's Green Revolution, had asked for an independent study on the long-term toxicity of Bt Brinjal before approving it for commercial use

## Recent Developments regarding Bt Brinjal in India

Following the end of the moratorium on Bt Brinjals, the Government of India in 2020 approved for trials to be carried out regarding the commercial viability of the product. The trials will kick-start in Madhya Pradesh, Karnataka, Bihar, Chhattisgarh, Jharkhand, Tamil Nadu, Odisha and West Bengal from 2020 and continue until 2023.

## Frequently Asked Questions on Bt Brinjal

### Q 1. What is Bt Brinjal and who developed it?

Ans. Bt brinjal is a genetically engineered variety of eggplant and has been under rigorous evaluation for its human and environmental safety. The Bt Brinjal was developed by the Maharashtra Hybrid Seeds Company (Mahyco).

### Q 2. What is the benefit of Bt Brinjal crops?

Ans. Bt Brinjal crops will be useful for generating higher yields for farmers if used appropriately. When used in conjunction with good farming practices, Bt brinjal crops will produce more undamaged fruit than non-bioengineered brinjal crops.