

Genetically Engineered Crops and It's Regulation in India

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Introduction

Plant genetic engineering methods were developed over 30 years ago, and since then, genetically modified (GM) crops or transgenic crops have become commercially available and widely adopted in many countries. In these plants, one or more genes coding for desirable traits have been inserted. Genetic engineering allows for direct gene transfer across species boundaries, some traits that were previously difficult or impossible to breed can now be developed with relative ease. The first-generation GM crops have improved traits like Herbicide-resistant crops (soybeans and maize, Pest resistance (Cotton and corn). Second-generation GM crops involve enhanced quality traits, such as higher nutrient content (ISAAA, 2019). "Golden Rice," one of the very first GM crops, is biofortified to address vitamin A deficiency. Among the various concerns related to GM crops, following are highlighted.

Biosafety concerns

There is a need of biosafety in GE research and development activities, an international multilateral agreement on biosafety "the Cartagena Protocol on Biosafety (CPB)" has been adopted by 167 parties, including 165 United Nations countries, Niue, and the European Union. The Protocol entered into force on 11 September 2003, and its main objectives are:

- 1. To set up the procedures for safe trans-boundary movement of living modified organisms
- 2. Harmonize principles and methodology for risk assessment and establish a mechanism for information sharing through the Biosafety Clearing House (BCH).

The major biosafety concerns fall into these categories (Kumar, 2014):

1. Bio-safety of human and animal health

- Risk of toxicity, due to the nature of the product or the changes in the metabolism and the composition of the organisms resulting from gene transfer.
- Newer proteins in transgenic crops from the organisms, which have not been consumed as foods, sometimes has the risk of these proteins becoming allergens.
- Genes used for antibiotic resistance as selectable markers have also raised concerns regarding the transfer of such genes to microorganisms and thereby aggravate the health problems due to antibiotic resistance in the disease-causing organisms.

2. Ecological concerns

• Gene flow due to cross pollination for the traits involving resistance can result in development of tolerant or resistant weeds that are difficult to eradicate.

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- GM crops could lead to erosion of biodiversity and pollute gene pools of endangered plant species.
- Genetic erosion has occurred as the farmers have replaces the use of traditional varieties with monocultures.

3. Environmental concerns

Effect of transgenic plants on population dynamics of target and non-target pests, secondary pest problems, insect sensitivity, evolution of new insect biotypes, environmental influence on gene expression, development of resistance in insect population, development of resistance to herbicide

Regulatory Mechanisms in India

Biosafety regulations cover assessment of risks and the policies and procedures adopted to ensure environmentally safe applications of biotechnology. The regulatory framework for transgenic crops in India consists of the following rules and guidelines.

a) Rules and policies (Rules, 1989 under Environment Protection Act, 1986, Seed Policy, 2002)

b) Guidelines (Recombinant DNA guidelines, 1990, Guidelines for research in transgenic crops, 1998)

The two main agencies identified for implementation of the rules are the Ministry of Environment, Forests and Climate Change and the Department of Biotechnology, Government of India. The rules have also defined competent authorities and the composition of such authorities for handling of various aspects of the rules. There are six competent authorities as per the rules.

- 1. Recombinant DNA Advisory Committee (RDAC)
- 2. Review Committee on Genetic Manipulation (RCGM)
- 3. Genetic Engineering Approval Committee (GEAC)
- 4. Institutional Biosafety Committees (IBSC)
- 5. State Biosafety Coordination Committees (SBCC)
- 6. District Level Committees (DLC).

Out of these, the three agencies that are involved in approval of new transgenic crops are:

- IBSC set-up at each institution for monitoring institute level research in genetically modified organisms.
- RCGM set-up at DBT to monitor ongoing research activities in GMOs and small-scale field trials.
- GEAC set-up in the Ministry of Environment, Forests and Climate Change to authorize large-scale trials and environmental release of genetically modified organisms.
- The Recombinant DNA Advisory Committee (RDAC) constituted by DBT takes note of developments in biotechnology at national and international level and prepares suitable recommendations.

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- The State Biotechnology Coordination Committees (SBCCs) set up in each state where research and application of GMOs are contemplated, coordinate the activities related to GMOs in the state with the central ministry.
- SBCCs have monitoring functions and to take punitive action in case of violations.
- District Level Committees (DLCs) are constituted at district level to monitor the safety regulations in installations engaged in the use of GMOs in research and application.

Conclusion

Adoption of GM crops by concerning the above-mentioned points can be helpful in attaining higher yield, lesser consumption of pesticides, thus ultimately helpful in achieving higher profits.

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