

## BIOTECHNOLOGY FOR SUSTAINABLE DEVELOPMENT IN PLANTS

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### ABSTRACT

*Emerging biotechnologies based on new scientific discoveries, offer novel approaches for striking a balance between developmental needs and environmental conservation. Biotechnology contributes a significant role to fulfill the desired nutritional requirement of blasting population of the world. Various biotechnology techniques and strategies are being useful for sustainable development in plants like de -novo domestication, genome editing, transgenic, RNA interference, odm, transgrafting etc. Modern advances in agricultural application of modern biotechnology show a significant potential of agricultural biotechnology to contribute to sustainable gain in agriculture productivity enhancing food security in developing countries.*

**Keywords:** *Biotechnology, De-Novo Domestication, Genome Editing, Transgenic, ODM, Trans-grafting.*

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### Introduction

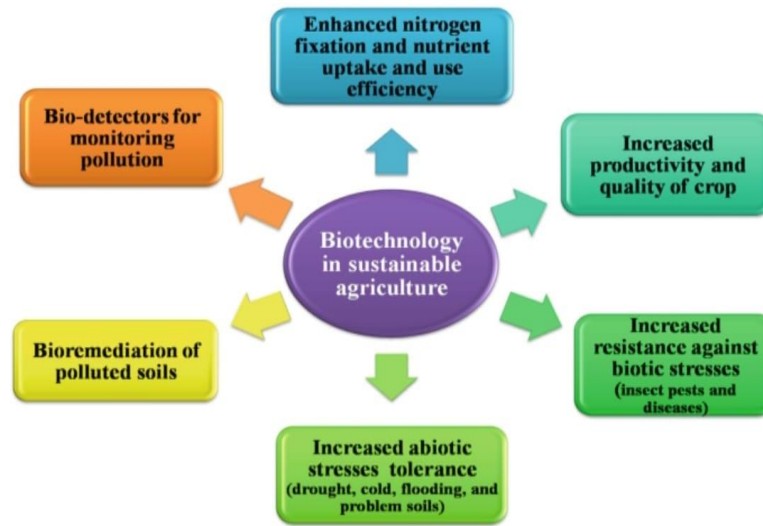
On 10th of November, every year celebrated as “International science day” and this year the day was celebrated with the theme of “Basic sciences for sustainable development”. This shows that the major need of today’s time is sustainable development. The concept of sustainable development is based on the conviction that it should be possible to increase the basic standard of living of the world’s growing population, without unnecessarily depleting our finite natural resources and further degrading the environment in which we live. The developmental approaches such as genome editing, genetic engineering have paved the way for precise and faster genetic modification of plants. Biotechnology includes any technique that uses living organism or parts of organism to make or modify products to improve plant or microorganism for specific use. The world population has increased approximately 8 fold since 1800 to almost 8 billion in 2019. By 2030 the world population is expected to grow 8.1 billion at a rate of over 75 million people per year. WRI reports on creating a sustainable food future estimates that we need about 70% more food in 2050 than we have today in order to feed 9.6 billion world population. Biotechnology is significant tool for agricultural sustainability.

**Role of Biotechnology:** Biotechnology helps in-

- Different products
- Reducing costs
- Improving crop nutrient efficiency
- Improving photosynthesis rate of C3 plants via transgenic approach
- Developing disease resistance ability in plants.
- Developing Stress management (biotic and abiotic) in plants

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### Emerging trends using for sustainable development in Plants

After analyzed the various researches, articles and research papers we find out few emerging trends, techniques of biotechnology which have significant role for sustainable development in plants. These trends are listed below:

#### Techniques Used for Sustainable Development

| # | Technology  | Unique feature  | Products  | Traits   |
|---|---|---|---|--|
| 1 | De-novo domestication (Transformation and genome) | Set new genetic background. Starts from selecting the elite foundation materials from wild/ semi wild plant species in nature to follows by the rapid introduction of domestication related traits into them by genetic & breeding tools. | Oryza alta (allotetraploid), Tomato, Ground Cheery.                             | Large biomass, Genome buffering, Heteroisis, Rapid adaptation to climate change.                               |
| 2 | Cisgenesis and intra genesis                      | Transfer of gene into T-DNA with native promoter and terminator sequence or regulatory region from sexually compatible gene pool  | Apple (Malus domestica)   | Resistance to apple scap (Venturia - inaequalis) Fungal Resistance.  |
| 3 | RNA interference                                  | Complex of molecular mechanism, which have the main function of gene expression, inhibition or suppression activated by presence of DS DNA.   | Prunus(plum) domestica, other woody fruit species, Papaya, Apple.               | Virus (Pathogen) Resistance  |
| 4 | Trans grafting                                    | To autonomous genotype selected individually for their rooting ability and fruiting characteristics and grafted together in order to combined their superior traits in the scion and root stock.  | Sweetcheery (Prinis avium), Grapewine (Vitis vinifera), Apple (Malus domestica) | Resistance to PNRSV (ring spoturus) to control Pierce's disease. Control of scion vigor & reduce Plant height. |
| 5 | ODM (Oligonucleotide directed mutagenesis)        | Gene editing technique. Introduce new mutation in the plants genome by replacing one or few base pair   | Maize, Rice, Wheat, Tobacco.  | Herbicide tolerance. Desired specific changes in the plant genome is required.                                 |

**Conclusion**

These biotechnological techniques are significant tools for plant breeders. They make possible to create desirable crop cultivars in past and more efficient ways to meet the demand for improved crops to support sustainable agriculture productivity.

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