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Biofortification: A way To Meet India's Nutritional Challenge

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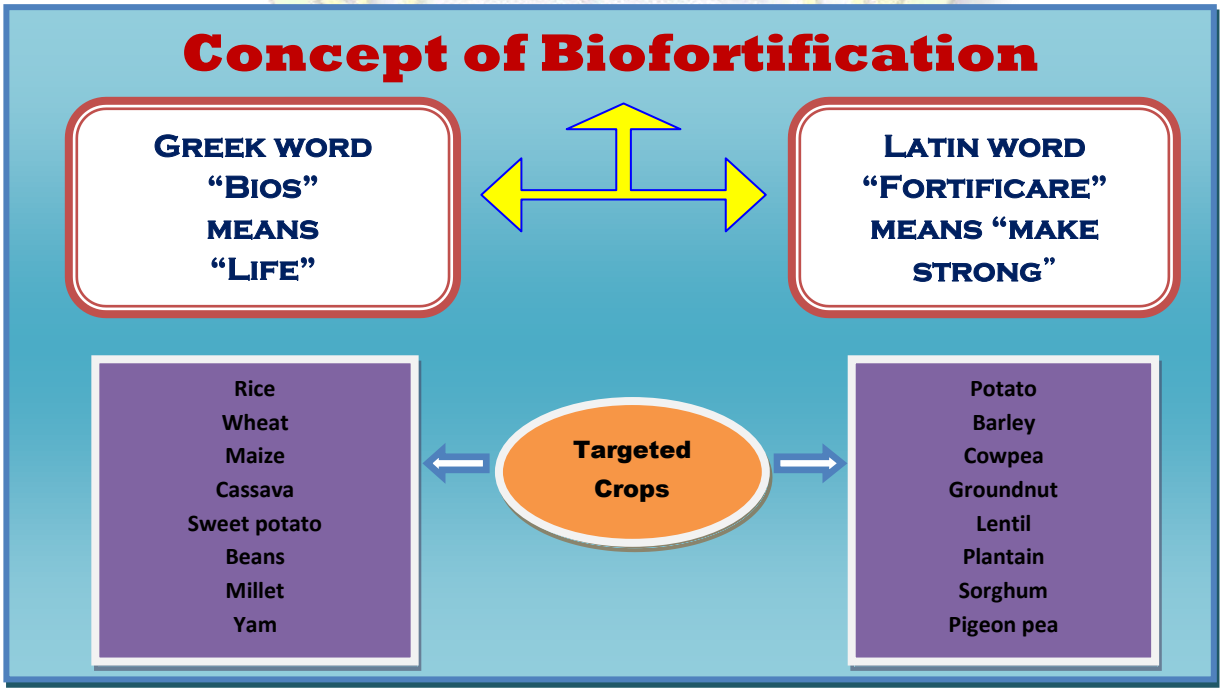
India's hunger problem was the focus of the Green Revolution and related initiatives and high agronomic yields rather than nutritional quality have been the focus of modern plant breeding from the beginning. However, due to increased food grain production brought forth by the Green Revolution, the nation is now largely self-sufficient. Despite having "enough to eat," many people may not eat enough to meet their nutritional needs. As a result, there is a problem with hidden hunger. It is known as "hidden hunger" when micronutrients like zinc and iron are lacking. Hence, right now the focus is on improving the nutritious composition of the diet. To ensure that people are eating enough food with sufficient caloric value, the government has put in place a number of programmes and policies. It is feasible to halt covert hunger or malnutrition with biofortification. Biofortication is different from food fortification, which aims to increase the nutritional content of food crops while they are being processed. By raising the concentration of vitamins and minerals in a crop, either naturally through plant breeding, artificially through agronomic approaches, or artificially through biotechnology, the nutritional value of food crops can be increased. However, only selective breeding is used for biofortification in India. To create biofortified varieties of food crops with high levels of micronutrients in addition to other desirable qualities, food crops are crossed with varieties with other desirable traits from the target areas (such as viral resistance, drought tolerance, high yielding, and flavour). In India, the emphasis is on pearl millet (iron), wheat (zinc), sorghum (iron), rice (zinc), cowpeas (iron), and lentils (iron and zinc).



Improvements in The Following are Sought by Biofortification:

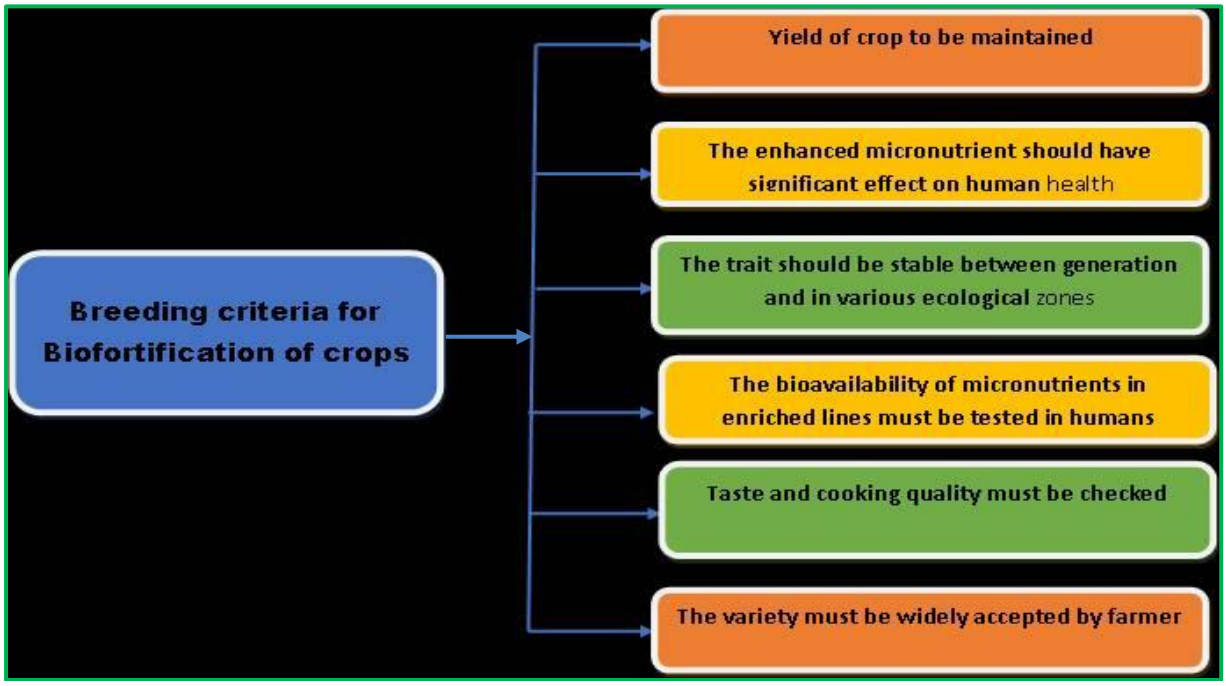
1. Proteins' quantity and quality
2. Oil's composition and quality
3. Vitamin content
4. Micronutrient and mineral content

Key Processes or Procedures for Biofortifying Crops

Agronomic methods: In order to boost the amount of micronutrients in plants growing in soil that is deficient in certain micronutrients or minerals, fertilisers must be applied.

Standard plant breeding: This entails using conventional breeding techniques to create enough genetic variation for crops to have the desired characteristic, such as a high content of any micronutrient. In order to produce a plant with a high nutrient content as well as other advantageous features, it needs crossing varieties over many generations. In India, biofortified crops are only produced using this technology.

Genetic alteration or engineering: This is introducing DNA into an organism's genome to add new or unusual traits, such as disease resistance.



Purpose of Biofortification

Crops that have been bio fortified are intended to be more nutrient-dense. Numerous individuals who live below the poverty level are either illiterate enough to not understand the value of micronutrients or do not have access to a varied diet. This group of people can benefit from bio fortification. The only method for supplying vital micronutrients to crops is bio fortification. It has a significant impact on how people eat and maintain their general health. A long-lasting method that breeders utilise to produce crops with increased nutrition is bio fortification.

Biofortification's Advantageous Effects

- Bio fortification makes it feasible to improve people's overall health.
- Crop yields are more resilient to pests, diseases, and other environmental stresses.
- It offers an environmentally friendly, food-based, low-dose alternative to iron supplementation.

- Farmers as well as the neediest people in society who are unable to purchase dietary supplements may benefit from it.
- The technique is quite cost-effective because it can be simply reproduced and scaled up.
- Instead of introducing GM crops, which have implementation issues, it is preferable to introduce bio fortified, non-genetically modified crops.
- Bio fortification can be utilised in countries like India that have serious nutritional problems as a long-term, cost-effective solution to this problem.

Characteristics of Biofortification

Bio fortification aims to increase food security, productivity, and reduce mortality and morbidity rates linked to micronutrient deficiencies. In order to address widespread vitamin A, iron, and zinc deficiencies, which are most common in low-income countries, bio fortification was primarily developed as a food-based method. It has the potential to be sustainable because planting material can frequently be saved, recycled, and distributed to other farmers. The rural poor are the main target of bio fortification since they depend heavily on locally produced staple foods for nutrition and frequently do not have access to commercially processed fortified foods because of cost or market issues. Once initial development and dissemination are finished, it is anticipated that the ongoing costs of maintaining bio fortified crop production would be low.

Challenges

The final mile reach of fortified foods and the lack of consumer acceptance resulting from colour modifications (such as golden rice) continue to be major obstacles for bio fortification in India. Another hurdle in India is its adoption of farmers and the cost associated with the process. Though bio fortification can be accomplished without genetic alteration, the process is slower than that of genetic modification. Moreover, lack of a successful seed and rural extension system for propagation and distribution of new kinds also serves as one of the major challenges.