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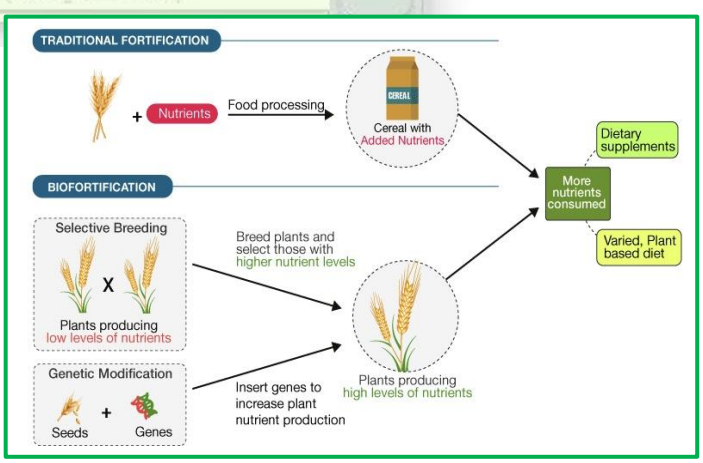
Biofortification of Crops for Reducing Micronutrient Deficiency

(*Narendra Deshwal[1], Ankita Yadav[2], Govinda[3] and Hitesh Jangir[4])
[1]Ph.D. Scholar, Department of Genetics and Plant breeding, SKRAU, Bikaner (334006)
[2]Ph.D. Scholar, Department of Entomology, SKRAU, Bikaner (334006)
[3]Research Scholar, Department of Soil Science, RBS College, Bichpuri (283105)
[4]Research Scholar, Department of Entomology, SKNAU, Jobner, Jaipur (303329)
*Corresponding Author's email: ndeshwal93@gmail.com

Biofortification is a strategy to enhance the nutritional content of crops by increasing the levels of essential vitamins, minerals, and other nutrients in their edible parts. The primary goal of biofortification is to address micronutrient deficiencies, also known as hidden hunger, in populations that rely heavily on staple crops with low nutritional value. This approach aims to improve public health by increasing access to essential nutrients through the regular diet. Biofortified crops are typically enriched with essential nutrients such as vitamin A, iron, zinc, vitamin C, and folate. The choice of nutrient depends on the prevalent deficiencies in a particular region.

Methodology

1. **Selective breeding:** - Using this method, plant breeders search seed or germplasm bank for existing varieties of crops which are naturally high in nutrients. They then crossbreed these high-nutrient varieties with high-yielding varieties of crops, to provide a seed with high yields and increased nutritional value. Crops must be bred with sufficient amounts of nutrients to have a measurable positive impact on human health. As such, they must be developed with the involvement of nutritionists who study whether the consumers of the improved crop can absorb the extra nutrients, and the extent to which storage, processing, and cooking of the crops affect their available nutrient levels. Bread wheat with high grain iron and zinc has been developed through radiation breeding.
2. **Genetic modification:** - Golden rice is an example of a GM crop developed for its nutritional value. The latest version of golden rice contains genes from a common soil bacterium *Erwinia* and maize, and contains increased levels of beta-carotene which can be converted by the body into vitamin A. Golden rice is being developed as a potential new way to address vitamin A deficiency.
3. **Seed priming:** - It is possible to "prime" seeds before sowing by bombarding them with iron oxide nanoparticle. This method would trigger more iron acquisition in the wheat plants and thus increase the nutritive value of the grains.



List of biofortified crops

S.No.	Crops	varieties
1	Rice	1. CR Dhan 310 (protein rich variety) **2.** DRR Dhan 45 (zinc rich variety)
2	Wheat:	1. WB 02 (zinc & iron rich variety) 2. HPBW 01 (iron & zinc rich variety)
3	Maize:	1. Pusa Vivek QPM9 Improved (provitamin-A, lysine & tryptophan rich hybrid) 2. Pusa HM4 Improved (lysine & tryptophan rich hybrid)
4	Pearlmillet:-	1. ICTP 8203 (Dhanshakti)-iron & zinc rich variety 2. HHB 299 (iron & zinc rich hybrid) 3. AHB 1200 (iron rich hybrid) 4. RHB 233, RHB 234, HHB 311, AHB 1269 (Identified in 2018)
5	Mustard	1. Pusa Mustard 30 (low erucic acid variety) 2. Pusa Double Zero Mustard 31 (low erucic acid & low glucosinolate variety)
6	Cauliflower:	1. Pusa Beta Kesari 1 (β-carotene rich variety)
7	Sweet potato	1. Bhu Sona (β-carotene rich variety) 2. Bhu Krishna (anthocyanin rich variety)

Challenges

1. Acceptance: Some people are hesitant about consuming biofortified crops, especially genetically modified ones, due to concerns about safety and ethics.
2. Cultural Preferences: Changing dietary habits and cultural preferences can be a challenge.
3. Regulatory and Environmental Concerns: Genetically modified biofortified crops may face regulatory hurdles, and there can be environmental implications.

References

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