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The Nutritional Antidote toward Future Prospects: Biofortification

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SUMMARY

The enhancement of nutritional qualities and quantities in food is the necessity in current and future generations. Such value addition process is known as biofortification. There are various techniques to fortify the food to overcome the problem of hunger and off course malnutrition such as molecular breeding, mutation breeding, genetic engineering etc. Now-a-days our agriculture sector is focusing on uplifting the productivity and nutritional quantity of agronomical and horticultural plants exclusively, to fight against the above-mentioned circles.

INTRODUCTION

Biofortification is the process of growing the crops by improving its nutritional content through the methods of conventional and biotechnological approaches. This is the one-time investment process as it provides cost- effective, long term and sustainable approach in tackling the present situation. Once the fortified crops are developed, then their will not be any sort of addition of fortified supplements in food during processing to overcome the problem of malnutrition and hunger. The current nutrition deficiency in our country are: iron, zinc, folic acid, vitamin A and so on. There are three main approaches to develop the biofortified crops or plants namely Conventional breeding, transgenic and agronomic (involves crop breeding, used of biotechnology and fertilizers strategies respectively.). In India, biofortification process is carried by selective breeding. The crops are classified under these approaches:

1.Conventional, biotechnical and agronomic approaches: Rice, Wheat, Maize, Sorghum, Tomato, Potato, Common bean, Sweet potato.
2.Transgenic and breeding approaches: Cauliflower, Banana and Cassava.
3.Transgenic and agronomic approaches: Mustard, Barley, Soybean, Carrot, Canola etc.

The practical utilization of breeding approach is more as compared to transgenic, though it has certain limitations like it takes long time to achieve desirable results, no guarantee of any particular gene combination will work out after maximum crosses generated. Therefore, when there is less or no genetic variation in nutrient content of crops, then transgenic approach is the best option to develop the biofortified crops as it is accessible to use unlimited gene pool to transfer genes and to study the expression of desirable genes from one plant to another. When a particular micronutrient is completely absent or does not form naturally then, the only feasible approach we can use i.e. transgenic approach though it has less practical utilization. Transgenic crops containing high micronutrient level hold a potential to reduce micronutrient malnutrition among the people, especially poor people in developing countries.

Need for Optimizing Biofortified Food

- To increase the productivity, quality of nutritional levels to fight against malnutrition population in the world.
- To reduce the morbidity rates (frequency of increasing the disease in a population due to lack of nutrition) and mortality rates.
- To overcome the problem of malnutrition in the hidden population.
- Will be more beneficial for farmers to utilize the superior biofortified varieties as these varieties will not only provide high yielding facility but will be a power box containing high nutrients level.

Some Biofortified Crops by Traditional Breeding Technique.

1.Pearl Millet:

- High-yielding and high-iron hybrid ICMH 1201 being commercialized by a seed company since 2014; adopted by 25,000 farmers, mostly in Maharashtra and Rajasthan.

- High iron (71 mg/kg), early-maturing, open pollinated pearl millet variety Dhanashakti commercialized in India; being adopted by >35,000 farmers.

2.Sorghum:

- ICRISAT-bred biofortified sorghum line ICSR 14001: 50% higher iron and zinc than base level out yielded all other entries in the state multilocation trials in Maharashtra state.

3.Wheat (WB 02):

Released and notified in 2017 for Punjab, Haryana, Delhi, Rajasthan (excluding Kota and Udaipur division) etc. It is rich in zinc (42.0 ppm) and iron (40.0 ppm).

- Pusa Tejas (HI 8759)- high protein (12%), iron (42.1 ppm) and zinc (42.8 ppm) content. It is suitable for making *chapatti* (Indian bread), various food products etc. This biofortified variety has been developed by ICAR-Indian Agricultural Research Institute (IARI), Regional Station, Indore, Madhya Pradesh.

4.Transgenic Rice:

Golden Rice was an important breakthrough in this direction as it has an effective source of provitamin A (beta-carotene) with a significant potential to reduce disease burden by expressing genes encoding *PSY* and carotene desaturase. Phytoene, has been enhanced up to 23-fold by targeting gene encoding carotene desaturase. increase folate content up to 150-fold by overexpressing genes encoding *Arabidopsis* GTP-cyclohydrolase I (GTPCHI) and aminodeoxychorismate synthase.

5.Transgenic Wheat:

Vitamin A- maize *psy1* gene encoding phytoene synthase, bacterial *crtI. Use of* particle bombardment method enhanced the level of *vitamin A by* 4.96 µg/g DW. Fe content- *soybean ferritin* gene, total increase in level of Fe was 40 µg/g (in leaves tissues).

6.Transgenic maize:

Vitamin A- bacterial *crtB* and *crtI and psy1* (maize)gene was used *to enhance the level of vitamin A by* 9.8 µg/g DW and 59.32 µg/g DW respectively.

CONCLUSION

The frequently lacking of nutrients now-a-days is increasing like a forest fire. Hence, there must be the application of or use of biofortified crops constantly in our agricultural section so that one could able to fulfil the levels of nutrition within themselves. However, the co-ordination of molecular breeders, scientists, plant breeders is required to build the pillars of biofortified crops in the developed and developing population of the world.

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