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Biofortified Sweet Potato: The Guardian of Our Nutritive Status

*Ananya Mishra and Nityamanjari Mishra
Department of Vegetable Science, College of Agriculture, Odisha University of Agriculture & Technology (O.U.A.T.), Bhubaneswar-751003, Odisha, India
*Corresponding Author's email: ananyamishravegetable604@gmail.com

Shakarkand or sweet potato (*Ipomoea batatas* (L.) Lam.), is a resilient and incredibly bio-efficient crop. In many tropical and subtropical regions of the world, it is primarily grown for its meaty, edible and nutrient-dense roots. In the majority of both developed and developing nations, it is regarded as a basic or staple food, animal feed and raw material for numerous industrial products. After wheat, rice, maize, potatoes, barley and cassava, it ranks as the seventh most significant food crop worldwide (Prakash *et al.*, 2018). Minerals and vitamins are necessary for metabolism and growth. Since micronutrient malnutrition affects the majority of people worldwide, it is the primary driver behind the increase in sweet potato production. A long-term, low-cost way to address population's micronutrient deficiencies and thereby lower malnutrition and enhance public health is through biofortification. The process of increasing the vitamin and mineral density of food crops through traditional plant breeding, agronomic techniques and contemporary biotechnology is known as biofortification (Bouis and Saltzman, 2017). Although sweet potatoes are grown and eaten in eastern India, they are typically white-fleshed, which lacks the nutritional value of orange and purple fleshed fleshed varieties. Increased availability of orange and purple fleshed varieties high in beta-carotene and anthocyanin respectively is necessary in these areas. Biofortified sweet potato genotypes with higher yields may enhance the socio-economic circumstances and nutritional status of the farming community, according to recent studies.

Methods of Biofortification

Although there are numerous methods for biofortification, the most common ones are agronomic and genetic biofortification. When genetic diversity is present in the primary, secondary or tertiary gene pool of the desired crop in a usable form, biofortification through breeding has been accomplished in crops and specific traits.

(1)Agronomic Strategies: Agronomic methods of biofortification necessitate the physical application of fertilizer, which momentarily enhances the nutritional and health status of crops. One of the essential soil nutrients, nitrogen is involved in a variety of plant physiological and biochemical processes. According to Constantin *et al.* (1984), applying nitrogen fertilizer to sweet potatoes causes a significant increase in their carotenoid content.

(2)Breeding Strategies: Biofortification has historically been accomplished through conventional breeding. The targeted crops' vitamin and mineral content can be increased by employing genetic variations and various breeding techniques. To create plants with desired traits, donor and recipient lines are crossed over a number of generations with desired agronomic traits in conventional plant breeding.

(3)Transgenic Strategies: A transgenic approach may be a viable substitute for the development of biofortified crops with desired nutrient and agronomic traits in a crop where target traits do not naturally occur at the necessary level in the gene bank (Bouis and Saltzman, 2017). Transgenic sweet potatoes that accumulate higher carotenoid contents were reported by Kim *et al.*, (2013). They found that compared to white fleshed sweet potato lines, the transgenic sweet potato had ten times higher levels of β carotene and total carotenoids.


Advancements in Biofortification

ICAR-Central Tuber Crop Research Institute has released several beta-carotene rich sweet potato varieties like Bhu Sona, Bhu Kanti, Bhu Ja, Gouri, Kamala Sundari and Co-5 in India out of which Bhu Sona has maximum carotene content (14.0 mg/100 g). The same institution has also developed another biofortified variety called 'Bhu Krishna' which is an anthocyanin rich variety of purple flesh sweet potato found in the country. The tuber of this variety contains a high amount of anthocyanin (85-90 mg/100 g). The International Potato Centre (CIP) has also developed protocols of breeding for enhancement of quality traits, such as β-carotene, iron and zinc. Carotene-rich orange flesh sweet potato varieties have been developed and released by HarvestPlus and the International Potato Centre (CIP) at the global level also. Three varieties *viz.*, Twatasha, Kokota and Chiwoko are released in Uganda and six varieties *viz.*, Ejumula, Kakamega, Vita, Kabode, Naspot 12O and Naspot 13O have been released in Zambia. In India, pickles have also been made from orange-fleshed varieties. Gulab jamun can also be made with its flour by combining it with milk powder and refined wheat flour. Sweet potatoes with orange flesh are also used to make ice cream.

Future Scope for Research

The production of sweet potatoes those have been biofortified ought to be significantly expanded as it truly plays the role of a guardian to our nutritive status. Pigments like beta-carotene is the precursor of Vit. A, highly essential for infants and pregnant women. Antioxidants like anthocyanin is anti- cancerous and useful for the body. Iron and Zinc being micronutrients also help the body in several physiological developments. Raising farmers' understanding and awareness of the value of foods high in nutrients and guaranteeing a supply of high-quality planting material can boost output and productivity. Knowledge on proper crop management techniques, the use of chemical pesticides and fertilizers and a decrease in post-harvest handling should be disseminated to them. Value addition to the produce and augmentation of earning through those processed products should be encouraged. Lastly, in order to increase food production and nutritional security, policymakers ought to prioritise agriculture.

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