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Bio fortification: A new approach for combating malnutrition

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Abstract
Bio fortified foods is a new public health approach to solve the problem of micronutrient malnutrition especially in women and preschool children in India. Bio fortification requires a multi-disciplinary research and strategies to support the farmers and ultimate distribution of seeds. It is the development of micronutrient dense staple because staple foods predominate in the diets of the poor and reaches to low income households and delivering naturally fortified foods to people with limited access to commercially fortified foods. The bio fortified crop system is quite sustainable and has a direct linkage with the human health and nutritional problems.

Keywords: bio fortification, staple food crops, nutrients, food fortification and supplementation

Introduction

Bio-fortification is an emerging new approach to address micronutrient malnutrition based on the fact that is essentially a food problem. Bio-fortification is the development of nutrient dense staple crops using the best conventional breeding practices and modern biotechnology without sacrificing agronomic performance and important consumer preferred traits by increasing their nutritional value from the seed on. Conventional crop breeding increase nutrient levels without reducing yields. Extra nutrients in crops even after processing and cooking improve micronutrient status.

Bio-fortification helps directly in improving the micronutrients found on a crop during production and eliminates the need for a public distribution system and no additional nutritional intervention is required for better nutrition for poverty stricken population.

Bio-fortification is breeding crops with increased levels of vitamins, minerals or higher protein with healthier crops. It can be performed through genetic engineering or conventional selective breeding. It differs from ordinary fortification as the main emphasis on making plant foods more nutritious when plants are growing rather than having nutrients added to food while they are being processed.

It can be easily reachable to mass population especially who suffer from malnutrition and rarely have an access to commercially fortified food. It is an upcoming strategy for dealing the deficiencies of micronutrients in the developing countries. Our diets mainly comprise of staple foods like rice wheat and maize which are low in certain micronutrients and they could not afford fruits, vegetables and milk or meat products. It is fairy cost effective technique than supplementation which is comparatively costly and requires continued financing and trained health professionals in supplementary feeding programs run through ICDS (Integrated Child Development Schemes) by the government in the country.

Supplementation refers to the provision of relatively large doses of micronutrients usually in the form of pills, capsules widely used in the supplementation programme of infants, children, pregnant and lactating women it is a long sustainable approach for providing large population in developing countries with at least a part of their micronutrient requirements.

Billions of people suffer from micronutrient malnutrition also known as hidden hunger leading to chronic deficiencies and health problems of blindness, anaemia, stunting growth and mental problems, low working capacity learning disabilities and even premature death. Most of Indian diets are based on cereals and other starchy foods lacking sufficient quantities of essential minerals and vitamins like iodine, zinc iron and vitamin A and often suffer from micronutrient malnutrition.

Food fortification implies to the addition of one or more micronutrients to processed food and helps in reducing goitre incidence with iodised salt. The most common micronutrient deficiencies are iron and zinc with a billion people affecting worldwide with anaemia followed by vitamin A deficiency says report of World health organization.

Harvest plus is an alliance for bio-fortification that leads the efforts to develop, utilize and scale such crops across the world. Harvest plus focusses on three micronutrients that are most limited in the diets of poor-vitamin A, zinc and iron and breed these into key staple crops. In India the focus is on six crops viz. pearl millet(iron), wheat(zinc), sorghum (iron), rice (zinc), cowpea (iron) and lentils (iron and zinc).

After a decade of testing the first iron rich pearl millet named *Dhana Shakti* was released in 2012 in Maharashtra and in

2013 across India. *Dhan Shakti* can provide children 100 % of the Recommended Dietary Allowances (RDA) of iron by consuming 100 gram. Studies have shown that iron deficient women can absorb twice the amount of iron from this variety when compared to non-fortified grain. In fact consumption of 200grams of *DhanaShakti* everyday can provide women with more than 80% of their daily iron needs. Currently bio fortified pearl millet; rice and wheat are available to the farmers in the country.

As a part of the agriculture ministry Food Security Mission, ICAR (Indian Council of Agricultural Research) has been developing strains including infusing varieties of rice, cauliflower and vegetables with carotene, pro-vitamin A rich Golden Rice and protein rich potato, pro-vitamin and iron rich banana and pro-vitamin A rich orange cauliflower. Bio-fortified strains of crops like rice, maize, wheat and pearl millet and vegetables developed will be used to study the health parameters over a period of time. The Women and Child Development ministry will study if the crops can be used in nutrition schemes to curb the problem of malnutrition.

When eaten regularly these micronutrient rich foods work to contribute to body stores of micronutrients thereby reducing hidden hunger of malnourished population Crops will no longer be bred for volume but for vitamins and minerals. Bio-fortified crops have medical properties and are good for infants, pregnant and nursing mothers.

A sustainable, long term bio fortification strategy will be to provide staple food crops enriched with essential micronutrients and other nutrients to fulfil all the physiological needs of the poor. Value added food products to be developed so as to improve the status of food and nutritional security for malnourished. Various nutrition education programs needs to be planned to educate the masses on nutritional benefits of these new varieties and encourage farmers to grow and eat these bio-fortified food from traditional staples.

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