



FIGHT AGAINST HIDDEN HUNGER IN INDIA BY HARVESTPLUS

Ravi Kumar*¹, Arvind Kumar², Pukh Raj¹ and Nidhi Jain³

¹Research scholar, Department of Plant Breeding and Genetics,

²Research scholar, Department of Plant Physiology,

SKN College of Agriculture, SKNAU, Jobner

³Nidhi Jain, Assistant Professor, Tanta University, Sriganaganagar

Email of corresponding author - bishnoiravi@gmail.com

Introduction: HarvestPlus is part of the *Consultative Group on International Agricultural Research* (CGIAR) Programme on Agriculture for Nutrition and Health (A4NH), which helps realize the potential of agricultural development to deliver gender-equitable health and nutritional benefits to the poor. It aims at improving nutrition and public health by developing and promoting biofortified food crops that are rich in vitamins and minerals and is also providing global leadership on biofortification evidence and technology.

Vitamins and minerals are micronutrients that are essential for children's overall development (to grow, learn, and build healthy immune systems). One in three people in the world suffers from a hidden hunger caused by a lack of micronutrients (such as vitamin A, zinc, and iron) in their diets. Adults are also affected by hidden hunger and can lead to repeated bouts of illness and weakened ability to work, as well as increase the risk of women dying during childbirth. A diverse diet that includes a variety of fruits, vegetables, or animal products usually provides enough micronutrients. However, millions of people, mostly in poorer countries, rely upon staple foods such as rice or maize that fill up their stomachs but do not have sufficient micronutrients. Foods that are more nutritious are often too expensive or simply unavailable. Now, through a strategy called biofortification, HarvestPlus and its partners are breeding and disseminating nutrient-rich varieties of the staple food crops that poor people eat every day. Ensuring that these crops reach rural areas and improve nutrition requires a clear roadmap and a multidisciplinary approach.

HarvestPlus focuses on three micronutrients (Iron, Zinc and Vitamin A), seven crops (Rice, Wheat, Maize, Pearl Millet, Beans, Cassava and Orange Sweet Potato) and eight countries (Rwanda, Uganda, Nigeria, Zambia, the Democratic Republic of Congo, India, Bangladesh, and Pakistan). **Iron** deficiency during childhood and adolescence impairs mental development and learning capacity. In adults, it reduces the ability to do physical labor. Severe anemia increases the risk of women dying in childbirth. **Zinc** is involved in more body functions than any other mineral. Zinc's role includes acting as a necessary component of more than 200 enzyme systems, normal growth and development, the maintenance of body tissues, sexual function, vision, and the immune system. Zinc is essential for survival, and zinc deficiency has serious consequences for health, particularly during childhood when zinc requirements are increased. In addition, zinc deficiency also causes stunting. Randomized controlled trials showed that zinc supplementation can reduce the severity of morbidity from a number of common childhood infections, including diarrhea, pneumonia, and possibly malaria, by one-third. **Vitamin A** is essential for good vision and cell differentiation. Deficiency results in growth retardation, damage to mucous membrane

tracts, reproductive disorders, eye damage and ultimately blindness. Children with vitamin A deficiency are often deficient in multiple micronutrients and are likely to be anemic, have impaired growth, and be at increased risk of severe morbidity from common childhood infections such as diarrheal diseases and measles. Pregnant women with vitamin A deficiency may be at increased risk of mortality. The 2016 World Food Prize was awarded to Howarth Bouis, founding director of HarvestPlus, along with three colleagues from the International Potato Center- Maria Andrade, Jan Low, and Robert Mwangi, demonstrating biofortification's acceptance as an impactful and scalable approach to tackle micronutrient deficiency.

HarvestPlus supports the National Agricultural Research System in India to breed, test, and release biofortified pearl millet, rice and wheat developed through partnership with the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) and the International Maize and Wheat Improvement Center (CIMMYT). HarvestPlus is working in India mainly on wheat, rice and pearl millet by improving their nutritional value through conventional plant breeding methods because wheat & rice are the most important food grains of the country and pearl millet is one of the staple foods in arid and semi-arid regions of India. Pearl millet is biofortified for Iron whereas wheat and rice for Zinc.

Zinc-Biofortified Wheat: Wheat is the second most consumed cereal in Asia, after rice, but is grown worldwide. HarvestPlus bred wheat varieties through collaboration with Banaras Hindu University, Varanasi, {BHU-3, BHU-6 (Chitra)} and Indian Institute of Wheat and Barley Research & Punjab Agricultural University (WB-02 & HPBW-01) for higher Zn content.



Zinc Shakti (Chitra)

*Pedigree: CROC1 /AE.SQUARROSA(210)//INQALAB 91*2/KUKUNA/3/ PBW343*2/KUKUNA*

Extra-early with +14 ppm Zn (40% increase) grown by farmers in North-Eastern Plain Zones of India



WB02 and HPBW-01

*Pedigree: T.DICOCCON,CI9309/ AE.SQUARROSA (409)//MU-TUS/3/2*MUTUS*

Two sister lines with +7 ppm Zn released in 2017 for North-Western Plain Zones of India

Iron Pearl Millet: Pearl millet is one of the most important food staples of poorer populations in the drylands of India. ICTP 8203-Fe-10-2 (Dhanashakti) and ICMH 1201 (Shakti-1201) varieties of pearl millet are developed by HarvestPlus working with ICRISAT, Hyderabad which are higher in Iron content.



Zinc Rice: Rice is the staple food of India. HarvestPlus is working on rice fortification in terms of Zn mineral.

References

- Anonymous, 2016. Annual Report. The CGIAR Research Program on Agriculture for Nutrition and Health (A4NH).
- Anonymous, 2016. Annual Report. The HarvestPlus.
<http://www.harvestplus.org/>.