

## Biofortified Millet: A solution to Malnutrition

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### Introduction

Millets and other cereals are becoming more and more popular in a society where health and wellbeing have taken the top spot as a way of life. Every nutritionist and dietician attests to millets' extraordinary advantages for human health. Millets, which include pearl millet (Bajra), finger millet (Ragi), foxtail millet (Kakum/Kangni), proso millet, barnyard millet, kodo millet, and little millet, are frequently referred to as "small seeded grasses" (Sama). Given their abundance of proteins, dietary fibres, iron, zinc, calcium, phosphorus, potassium, vitamin B, and vital amino acids, millets are nutritionally superior to wheat and rice. Pearl millet accounts for 95% of all production among the millets. As the main threats to a healthy and tranquil life have grown since the start of the twenty-first century, humanity has seen the growth of terrorism, economic inflation, and climate change. But just a small percentage of people are aware of an even worse issue called "hidden hunger" that is always present. Micronutrient, protein, vitamin, and other dietary necessary element deficiencies affect almost 50% of the world's population. An incredible 2 billion people worldwide suffer from anaemia, which is mostly brought on by a lack of iron in their diet, according to figures from the World Health Organization (WHO). The technique of biofortification involves either genetic alteration utilising contemporary biotechnology or the finest conventional breeding procedures to create food crops that are rich in micronutrients. Millets can be biofortified using one of two methods: either increasing the nutrient accumulation in milled grains or lowering the antinutrients to boost the bioavailability of minerals. The presence of antinutrients including phytic acid, polyphenols, and tannins limits the biofortification of millets. To reduce these antinutrients, methods like RNA interference and genome editing must be used.

Instead than manually adding nutrients to the food as it is being processed, this method of fortification concentrates on enhancing the nutrient profile of the food crop as it

grows and matures. By adding foreign genes from the wild crop of the same species or from other species that code for the increased production of particular nutrients or disease resistance, one can alter the genetic make-up of a crop, making it more nutrient-rich and of higher quality. To generate a crop rich in a range of nutrients, it is also possible to stack various genes that code for various nutrients. Millets, together with grains, are the main sources of energy throughout Asia, Africa, and the semi-arid tropical regions. Millets have great nutritional value since their grains are rich in important amino acids, minerals, and vitamins, as well as proteins. Harvest Plus Group released conventionally grown high iron pearl millet in India to combat iron deficiency after realising the significance of millet biofortification. For easier use in baby foods, the molecular basis of the waxy starch in foxtail millet, proso millet, and barnyard millet has been discovered. Transcriptomics has discovered several calcium sensor genes involved in calcium absorption, translocation, and accumulation in finger millet, while transgenic expression of zinc transporters led to the creation of high grain zinc.

The first iron-biofortified crop cultivar to be formally introduced in India is Dhanshakti. It is a part of the Nutri-Farm/ Pilot Program that the Indian government established. Dhanshakti is a commercially available, early-maturing, open-pollinated, high iron (71 mg/kg), pearl millet variety in India that has been embraced by more than 35,000 farmers.

This year, JSLPS and the Harvest Plus organisation came to an understanding about the distribution of AHB-1200 (Bio-fortified Millet Seeds with High Iron) and HHB299 (Bio-fortified millet seeds with High Iron & Zinc). ICRISAT has clinically bio-fortified these seeds (a leading international research institute for rural development). Comparing these seeds to conventional and hybrid pearl millet seeds reveals that they are more nutrient-dense. Iron, zinc, and provitamin A are all included in Bio Fortified Seed. The elimination of malnutrition, underweight, and obesity depends on this nutrition.