ENHANCING THE MINERAL CONCENTRATION OF WHEAT THROUGH PLANT BREEDING

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More than half of the world's population suffers micronutrient undernourishment. The main sources of minerals (iron, and zinc) for low-income rural and urban populations are staple foods of plant origin that often contain low levels or low bioavailability of these micronutrients. Biofortification aims to develop micronutrient-enhanced crop varieties through conventional plant breeding. HarvestPlus, the CGIAR's biofortification initiative, seeks to breed and disseminate crop varieties with enhanced micronutrient content that can better the nutrition of the hard-to-reach (by fortification or supplementation programs) rural and urban poor in targeted countries/regions. In attempting to enhance micronutrient levels in wheat through conventional plant breeding, it is important to consider the following; 1) identify genetic resources with high levels of the targeted micronutrients, preferably in the best agronomic background available; among the best donor parents for high Zn identified so far are Triticum spelta, and landraces from China and Spain. 2) consider the heritability of the targeted traits, 3) explore the availability of high throughput screening techniques for zinc and iron, promising results are being observed with the use of colorimetric techniques and the use of near infrared technology; 4) when screening germplasm it is essential to grow them under intermediate to high levels of available Zn, since under low soil Zn availability often there is no discrimination among genotypes in Zn grain concentration; 5) map areas with low soil Zn variation, this can be done with the use of systematic checks together with geostatistics or with the application of Zinc sulfate fertilizer. Soil Zn homogeneous areas allow better conditions for the identification of genetic differences for grain Zn concentration; and 6) gain a better understanding of genotype by environment interactions. Biofortified wheat varieties must have the trait combinations which trigger adoption such as high yield potential, disease resistance (stem, leaf and yellow rust), and consumer acceptability. When defining breeding strategies and target micronutrient levels (10 for Zn and 22 ppm for Fe above the average genotype in a representative area of the target countries), researchers need to consider the desired micronutrient increment, food intake, retention and bioavailability as they relate to food processing, promoters, and inhibitors. Preliminary results suggest a high correlation between grain protein concentration and micronutrients, suggesting that selecting for high grain protein may a viable way of screening for biofortified crops. The main target areas are India and Pakistan Finally, ex ante studies that quantify the burden of micronutrient deficiency and the potential of biofortification to achieve a significant improvement in human micronutrient status in the deficient target population are needed to determine whether a biofortification program is cost-effective.

Keywords: Zinc, iron, protein, *Triticum spelta*, bioavailability, landraces.