

Increasing Iron and Zinc Concentration in Wheat Through Biofortification

Thomas Call, Aichatou Djibo Waziri

Biofortification

Biofortification is the process of increasing the nutritional content of crops above the norm. Our study focuses on identifying wheat cultivars that contain iron (Fe) and zinc (Zn) concentrations that meet the standard for biofortification.

Background

Zn and Fe are essential nutrients for our bodies. Their absence can cause many major health concerns such as:

- Compromised immune system
- Child development/maturity impairment
- Dizziness, fatigue, high heart rate, etc.

Zn deficiency is most common in developing countries where nearly 50% of food consumed is from wheat products which are naturally Zn deficient (Cakmak, 2008). This study will determine which local cultivars contain the standard level of Zn (38 ppm) and Fe (60 ppm) so people can use the cultivars with adequate levels of Zn and Fe content.

Acknowledgments: Dr. Kimberly Campbell's team
References: 1. Cakmak, I. (2007). Enrichment of cereal grains with zinc: Agronomic or genetic biofortification? *Plant and Soil*, 302(1-2), 1-17. <https://doi.org/10.1007/s11104-007-9366-3> 2. Ortiz-Monasterio, J. I., Palacios-Rojas, N., Meng, E. C., Pixley, K., Trethowan, R., & Peña, R. J. (2007). Enhancing the mineral and vitamin content of wheat and maize through plant breeding. *Journal of Cereal Science*, 46(3), 293-307. 3. Stein, A. J., Nestel, P., Meenakshi, J., Qaim, M., Sachdev, H. P. S., & Blutta, Z. A. (2007). Plant breeding to control zinc deficiency in India: how cost-effective is biofortification? *Public Health Nutrition*, 10(5), 492-501.

Question: Can we find local cultivars that contain iron and zinc concentrations that meet the standard for biofortification?

Hypothesis: We will find local cultivars that contain iron and zinc concentrations that meet the standard for biofortification.

Materials & Methods



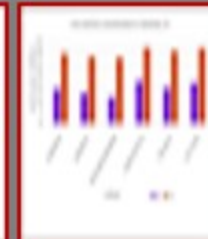
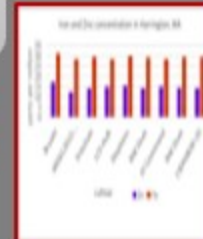
Mix of cultivars planted at Genesee, ID and Harrington, WA (done before me)

Harvested by hand, threshed, cleaned, mineral measurement with EDXRF (with help)

Data analyzed in Excel and mineral content calculated (with help)

Results

Across locations it can be noted that the concentration of Fe is significantly higher than that of Zn. The average concentration of mineral nutrients across the different types of plant is similar in both locations with 30 ppm and 15 ppm for Fe and Zn, respectively. Unfortunately, the concentrations of both types of nutrients are below the target for human consumption (figure 1, figure 2).



Conclusion

Biofortification is a powerful approach which ensures that many people can consume the nutrients they need day-to-day through their staple foods. (Cakmak, 2012), (Ortiz-Monasterio, 2007), and (Stein, 2007) are just a few successful biofortification studies. Through traditional plant breeding, we can achieve that goal. The process is at its early stages in this project, and we have not yet identified the plants with the desired characteristics. However, we are confident that future experiments that will involve the consideration of the soil nutrient content itself and the screening of additional types of plants will get us closer to our goal.