

PERSPECTIVES ON ENHANCING VALUE OF AGRONOMIC BIOFORTIFICATION IN MAIZE

Augustine R.* and D. Kalyanasundaram

*Department of Agronomy, Faculty of Agriculture, Annamalai University,
Chidambaram, Tamilnadu, India*

Email: augustinerajendran@gmail.com

Received-07.07.2020, Revised-28.07.2020

Abstract: Most of the health components based foods are boosted by the application of mineral nutrients. Farmers fertilize the crop for optimum to higher yields which has become essential, since post green revolution. In addition to higher yield, plant nutrition also affects other human nutritional needs like proteins, oils, vitamins and minerals. Trace elements necessary to human nutrition can be optimized by applying micronutrients to food crops. Some nutrients have their own restrictions to various factors like temperature, climate, time of applications, crop adaptability, etc., and few micronutrients are beneficial and play a significant role in food nutrition making easier access in the plant edible parts by its applications. It is important to note that foliar application of Zn and Fe at the later crop stage (mid booting stage or early milking stage) is found to be effective than early applications. When compared to related interventions like supplementation and fortification, biofortification was found to be significantly cost effective in applications to crop and creates value for human nutrition.

Keywords: Iron (Fe), Zinc (Zn), Micronutrients, Supplementation, Fortification, Bio fortification

REFERENCES

- Cakmak, I.** (2008). Enrichment of cereal grains with zinc: Agronomic or genetic biofortification? *Plant and Soil*, 302: 1-17.
- Cakmak, I., Pfeiffer, W.H. and McLaugherty, Y B.** (2010). Biofortification of durum wheat with zinc and iron. *Cereal Chemistry*, 87: 10-20.
- Connorton, J.M., Jones, E.R., Rodriguez-Ramiro, I., Fairweather-Tait, S., Uauy, C. and Balk, J.** (2017). Wheat vacuolar iron transporter TaVIT2 transports Fe and Mn and is effective for biofortification. *Plant Physiology*, 174: 2434-2444.
- Dahiya, S., Chaudhary, D., Jaiwal, R., Dhankher, O., Singh, R.** (2008). Elemental biofortification of crop plants. In: Jaiswal P, Singh R, Dhankar OP (eds) *Plant membrane and vacuolar transporters*. CABI International, Wallingford/Cambridge, pp. 345-371.
- Dhaliwal, S.S., Sadana, U.S., Khurana, M.P.S., Dhadli, H.S. and Manchanda, J.S.,** (2010). Enrichment of rice grains through ferti-fortification. *Indian Journal of Fertilizer*, 6 (7): 28-35.
- Fang, Y., Wang, L., Xin, Z., Zhao, L., An, X. and Hu, Q.** (2008). Effect of foliar application of zinc, selenium, and iron fertilizers on nutrients concentration and yield of rice grain in China. *Journal of Agriculture Food and Chemistry*, 6(56): 2079-84. doi:10.1021/jf800150z
- Frossard, E., Bucher, M., Machler, F., Mozafar, A. and Hurrell, F.** (2000). Potential for increasing the content and bioavailability of Fe, Zn and Ca in plants for human nutrition. *Journal of the Science of Food and Agriculture*, 80: 861-879.
- Gannon, B., Kaliwile, C., Arscott, S. A., Schmaelzle, S., Chileshe, J., Kalungwana, N., Mosonda, M., Pixley, K., Masi, C. and Tanumihardjo S. A.** (2014). Biofortified orange maize is as efficacious as a vitamin A supplement in Zambian children even in the presence of high liver reserves of vitamin A: a community based randomized placebo-controlled trial. *American Journal of Clinical Nutrition*, DOI:10.3945/ajcn.114.087379.
- Graham, R.D., R.M. Welch, and H.E. Bouis** (2001). Addressing micronutrient malnutrition through enhancing the nutritional quality of staple foods: Principle, perspectives and knowledge gaps. *Advances in Agronomy*, 70:77-142.
- He, W., Shohag, M.J., Wei, Y., Feng, Y. and Yang, X.** (2013). Iron concentration, bioavailability, and nutritional quality of polished rice affected by different forms of foliar iron fertilizer. *Food Chemistry*, 141(4):4122-6. Doi: 10.1016/j.foodchem.2013.07.005
- Lal, R.** (2009). Soil degradation as a reason for inadequate human nutrition. *Food Security*, 1: 45-57.
- Meenakshi, J., Johnson, N., Manyong, V., Degroote, H., Javelosa, J., Yanggen, D., Naher, F., Gonzalez, C., Garcia, J. and Meng, E.** (2010). How cost-effective is biofortification in combating micronutrient malnutrition? An ex ante assessment, *World Development*, 38 (1): 64-75.
- Pfeiffer, W.H. and McClafferty, B.** (2007). HarvestPlus: Breeding crops for better nutrition. *Crop Science*, 47: S88-105.
- Raut, N., Sitaula, B. K. and Bajracharya, R. M.** (2010). Agricultural intensification: linking with livelihood improvement and environmental degradation in mid-hills of Nepal. *Journal of Agriculture and Environmental Sciences*, 11: 83-94.
- Shetty, P.** (2009). Incorporating nutritional considerations when addressing food insecurity. *Food Security*, 1: 431-40.

*Corresponding Author

- Stein, A., Sachdev, H. and Qaim, M.** (2006). Potential impact and cost-effectiveness of Golden Rice. *Nature Biotechnology*, 24:1200-1201.
- Tanumihardjo, S. A., Anderson, C., Kaufner-Horwitz, M., Bode, L., Emenaker, N. J., Haqq, A. M., Satia, J. A., Silver H. and Stadler D. D.** (2007). Poverty, obesity and malnutrition: an international perspective recognizing the paradox. *Journal of the American Dietetic Association*, 107: 1966-1972.
- White, P.J. and Broad LeY, M.R.** (2011). Physiological limits to zinc biofortification of edible crops. *Frontier Plant Science*, 2: 80.
- Wiedenhoeft, A.C.** (2006). *Plant nutrition*. Chelsea House Publishers, USA.
- Yuan, L., Wu, L., Yang, C. and Quin, L.V.** (2013). Effects of iron and zinc foliar applications on rice plants and their grain accumulation and grain nutritional quality. *Journal of the Science of Food and Agriculture*, 93(2):254–61. doi:10.1002/jsfa.5749
- Zhu, C., Naqvi, S., Gomez-Galera, S., Pelacho, AM., Capell, T. and Christou, P.** (2007). Transgenic strategies for the nutritional enhancement of plants. *Trends in Plant Science*, 12:548–55
- Zhou, C.Q., Zhang, Y.Q., Rashid, A., Ram, H., Savasli, E. and Arisoy, R.Z.** (2012). Biofortification of wheat with zinc through zinc fertilization in seven countries. *Plant and Soil*, 361: 119–130.