World Academy of Science, Engineering and Technology
International Journal of Agricultural and Biosystems Engineering
Vol:18, No:01, 2024

Variation in Total Iron and Zinc Concentration, Protein Quality, and Quantity of Maize Hybrids Grown under Abiotic Stress and Optimal Conditions

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Abstract : Maize is one of the most important staple food crops for most low-income households in the Sub-Saharan (SSA). Combined heat and drought stress is the major production threats that reduce the yield potential of biofortified maize and restrain various macro and micronutrient deficiencies highly prevalent in low-income people who rely solely on maize-based diets, SSA. This problem can be alleviated by crossing the biofortified inbred lines with different nutritional attributes, Fe, Zn, Protein, and Provitamin A, and developing agronomically superior and stable multi-nutrient maize of various genetic backgrounds. This aimed to understand the correlation between biofortified inbred lines per se and hybrid performance under combined heat and drought stress conditions (CSC). The experiment was conducted at CIMMYT, Zimbabwe, using α-lattice design with three replications. The hybrid effect was highly significant for zein fractions (α-, β-, γ- and δ-zein) zinc, (Zn), and iron (Fe) provitamin A, phytic acid, and grain yield. Under CSC, Fe, Zn concentration, provitamin A in grain and grain yield of hybrids were significantly decreased, however, the zein fraction content and phytic acid content increases in grain were increased under CSC. The phenotypic correlation between grain yield with Zn, Fe concentration, and Provitamin A in grain was strongly positive and higher under CSC than in well-watered conditions. The present investigation confirmed that under CSC, Fe, and Zn-enhanced hybrids could be forecasted to a certain scope based on the performance of and scientifically selected for desirable grain yield and related traits with CSC tolerance during hybrid development programs. In conclusion, the development of high-yielding and micronutrient-dense maize variety is possible under CSC, which could reduce the highly prevalent micronutrient in SSA.

Keywords : drought, Fe, heat, maize, protein, zein fractions, Zn
Conference Title : ICAPSB 2024 : International Conference on Agronomy, Plant Science and Breeding
Conference Location : New York, United States
Conference Dates : January 29-30, 2024