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Screening of Provitamin A Maize Inbred Lines for Drought Tolerance Using Morpho-Pysiological and Biochemical Traits

Aleck Kondwakwenda, Julia Sibiya

University of KwaZulu-Natal, School of Agricultural, Earth & Environmental Science (SAEES) - Plant Breeding, South Africa

Abstract

The potential role of maize (*Zea mays* L.) in combating food insecurity in sub-Saharan Africa (SSA) is indisputable given the wide production and consumption in this region. However, its role in curbing nutrition insecurity is questionable due to lack of key micronutrients such as vitamin A. This has been deemed to be contributory to high prevalence of 'hidden hunger' related conditions such as vitamin A deficiency (VAD) in this region. On the other hand, maize production in this region is constantly under threat from recurrent and episodic droughts. Development of drought tolerant biofortified maize could be a solution to food and nutrition insecurity in this region. Drought tolerance being a complex trait requires integrated approaches of selecting candidate genotypes. In this study, with the objective of selecting drought tolerant candidate inbred lines, 46 provitamin A maize inbred lines and 4 drought tolerant checks were screened under optimum and drought conditions in the greenhouse and field for drought tolerance using grain yield, anthesis silking interval (ASI), number of ears per plant (EPP), plant height, stomatal conductance, leaf senescence, chlorophyll content, leaf rolling and proline content. Analysis of variance, Pearson's correlation coefficient, principal component analysis and drought tolerant index were computed. There were significant differences ($p \leq 0.001$, 0.01, 0.05) among the genotypes' performances under both optimum and drought conditions. Some inbred lines that had high grain yield under both optimum and drought conditions scored moderately high to high values for yield components such as number of ears per plant, kernel weight and shelling percentage under drought conditions. Moderately high to high proline content was observed and was positively correlated to grain yield under drought stress. Under drought, the first two principal components were most influential contributing 59.22% of the total variation in which ASI and EPP had higher loadings followed by proline content and grain yield. Seven lines were earmarked as drought tolerant with twenty-four lines being moderately drought tolerant. These results suggest that proline content might be considered as one of the biochemical traits that can be used in screening maize for drought tolerance.

Keywords: Biofortification, drought, inbred line, maize, provitamin A

Contact Address: Aleck Kondwakwenda, University of KwaZulu-Natal, School of Agricultural, Earth & Environmental Science (SAEES) - Plant Breeding, 55 Mills Circles, 3102 Pitermaritzburg, South Africa, e-mail: alekondwa@gmail.com