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Abiotic Stresses Tolerance and Nutrients Contents in Groundnut, Pearl Millet and Sorghum Mini Core Collections for Food and Nutrition Security

F. Hamidou[1], H.Y. Bissala[1], M.S. Awel[1] and H.D. Upadhyaya[2]
[1]International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Sahelian Center, BP 12404, Niamey, NIGER
[2]International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Patancheru, Greater Hyderabad 502 324, AP, INDIA
f.hamidou@cgiar.org

Food and nutrition security still require new sources of tolerance to major abiotic stresses and high nutritional quality. Groundnut, pearl millet and sorghum mini core collections are representing diversity of global collections but few studies investigated the nutrients contents and the tolerance to low phosphorus (LP) and drought stress (WS). Under lysimetre and pots conditions, subsets of these mini core collections were used to assess genotypic variation in nutrients contents and identify new sources of tolerance to WS and LP. In a randomized completely block design with 5 replications, water regimes and phosphorus treatments were imposed. Agromorphological and nutrients contents parameters were investigated. ANOVA were performed to assess the genotype and treatments effects. WS decreased the transpiration efficiency (47%), yield and its components (68%) in groundnut. Combined WS-LP reduced pods weight (83%). ICG3312, ICG81, ICG13395 and ICG467 revealed tolerant to WS/LP. In Pearl millet, LP decreased 100 seeds weight (14%), panicle and shoot biomass weight (25%), the booting date delayed except on IP1060, IP5869, IP9000, IP17532 and IP17775. WS-LP decreased total biomass (35%) while LP reduced total N(4.5%), P(20%), K(23%), Fe(25%) and Zn(3%). IP17532, IP 5153 and IP 5581 revealed highest Fe content (524mgkg^{-1}). In sorghum, LP delayed the booting date, decreased biomass (32%) and WS-LP reduced biomass (74%). ISS2151, ISS705 and ISS862 revealed tolerant to WS-LP. LP decreased total N(11%), P(32%), K(13%), Fe(13%) and Zn(11%). IS1412, IS311 and IS376 showed high Fe content (515mgKg^{-1}). Selected genotypes and traits might be useful in crops improvement for more adaptation and productivity.

Keywords: Mini core collections, Drought stress tolerance, Low phosphorus, Nutrients contents, Crop improvement

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Exploiting Genetic Diversity for Adaptation and Mitigation of Climate Change: A Case of Finger Millet in East Africa

E.O. Manyasa[1], P. Tongoona[2], P. Shanahan[2], S.M. Githiri[3], H. Ojulong[1] and A. Rathore[4]
[1]International Crops Research Institute for Semi-Arid Tropics (ICRISAT)-Nairobi, KENYA
[2]University of KwaZulu Natal, Pietermaritzburg, SOUTH AFRICA
[3]omo Kenyatta University of Agriculture and Technology, KENYA
[4]International Crops Research Institute for Semi-Arid Tropics (ICRISAT)-Patancheru, INDIA
e.manyasa@Cgiar.Org

With the reality of global climate change there is a need to exploit the variation in the germplasm in order to develop genotypes adapted to these changes. This requires breeding and selection of crops at strategically selected locations along a rainfall/temperature gradient to enable farmers select desired cultivars. Eighty one finger millet germplasm lines from East Africa were evaluated in eight environments spread across Kenya, Tanzania and Uganda for adaptation, grain yield stability using the additive main effects and multiplicative interaction (AMMI) ANOVA and Genotype and Genotype x Environment (GGE) models and blast reaction under artificial and natural inoculation. Lanet 2012 long rains, Serere 2012 long rains and Miwaleni 2012 long rains were found to be the most discriminating environments for the low temperature, sub-humid mid-altitude and dry lowland areas, respectively. Alupe 2012 long rains was the ideal environment for blast selection. Seven genotypes were identified for yield stability across the eight environments whereas nine genotypes had specific adaptation. Nine genotypes were identified with resistance to three blast types. However, one and two genotypes had high resistance only to leaf and neck blast, respectively. Two resistant and 12 moderately resistant genotypes to blast attained the highest grain yields and had varied maturity, plant heights and grain colour. This will provide farmers the opportunity to select genotypes appropriate to their target agro-ecologies with desired end-uses. The East African finger millet germplasm has high potential as a source of climate smart high yielding and blast resistant genotypes for direct production and/or breeding.

Keywords: Genetic Diversity, Finger Millet, GGE, Yield Stability