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Genotype x environment interaction and stability of farmer preferred traits of cassava varieties adapted to the tropical climatic conditions of western Kenya

Vincent Were Woyengo

Kenya Agricultural Research Institute, Kenya

Abstract

The presence of genotype x environment interaction (GEI) dictates variety evaluation and selection strategy. In order to initiate an effective cassava breeding, a study was conducted to determine the influence of GEI on farmer preferred traits and identify stable cassava varieties. Tens (six landraces and four improved) cassava varieties were evaluated in six (three on-farm and three on-station) environments using 5 x 2 α-lattice design. Genotype and environment mean squares were significant for all traits evaluated indicating significant genotypic and environmental differences. Genotype and environment interaction mean squares were significant for all traits evaluated except plant height and number of storage roots per plant indicating the presence GEI effects. The significant GEI effect for all farmer preferred traits evaluated except plant height and number of storage roots indicate varieties need to be evaluated in several environments in order to select the stable varieties. All the four stability analysis methods used in the study show that no single variety was stable for all the farmer preferred traits evaluated. However, all landraces except Nambukaya had at least one of the stability parameters significant for all farmer preferred traits evaluated except internode length. Improved varieties had most of the stability parameters insignificant for all traits evaluated except internode length. These imply landraces were generally more stable as compared to improved varieties except for internode length. The improved varieties and on-station environments fell in the same quadrant of the AMMI biplot for storage roots yields implying they are specifically adapted to on-station environments. This means probably during breeding, the improved varieties was evaluated on-station and selection was mainly based on storage roots yields. The presence of GEI among the farmer preferred traits necessitates variety selection based on multi-environment evaluation and stability. The evaluation environment should not only be on-station but also on-farm where variety stability across divergent climatic, soil conditions and cultural practices are captured.

Keywords: Genotype x environment interaction (GEI), Farmer preferred traits, Stability, Variety performance