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GGE Biplot Analysis of Genotype X Environment Interaction of Cold Tolerant Green Super Rice Genotypes in Ethiopia

Abebaw Dessie*

Fogera National rice research and Training Center, Ethiopian Institute of Agricultural Research Center, Ethiopia

The experiment was conducted in Fogera and Shire-Maitsebrifrom 2016-2018 main cropping seasons with the major objectives of high yielding, cold tolerant, disease resistance and early maturing GSR rice varieties for the high altitude of lowland production system. A total of 15 GSR genotypes including two checks were used in the study. The trial was laid out in randomized complete block design with three replications with plot size of 7.5 m^2. The combined analysis of variance revealed significant difference on grain yield, days to maturity, days to heading, panicle length, filled grain per panicle, plant height and thousand grains weight ($P \leq 0.01$). Three genotypes (G2, G6 and G4) showed significant difference than the standard checks on grain yield and gave grain yield advantage of 32.6 %, 27.9 % and 22.3 %, respectively. The genotype main effect plus genotype x environment interaction (GE) biplots were used to analyse and visualize pattern of the interaction component. The first two principal components (PC1 and PC2) of the GGE explained 79.34 % with PC1= 54.09 % and PC2=25.25 % of GGE sum of squares, respectively. Genotypes, G2 (Yungeng 31) and G6 (KB-2) combined both high stability performance and high mean grain yield across the test environments and characterized as an ideal genotypes and proposed for national variety release. The present study revealed that significant differences among genotypes and environments for grain yield and related agronomic traits suggesting differential response of genotypes to varied environments. Mean grain yield and stability performance over environments of each genotype is explored by using AEC methods. These methods showed that G2 (Yungeng 31)followed by G6 (KB-2)had high mean grain yield as well as high stability out of the fifteen tested genotypes. These two genotypes are proposed for national variety release. The experiment revealed the importance of cold tolerance, high yield and diseases resistance in the evaluation of genotypes. Cold tolerance varieties allow rice producers to use high elevation areas for rice production. The proposed two varieties are crucial to boost production and productivity in high elevation of rain fed low land rice production system of Ethiopia. Authors are gratefully acknowledged BILL & MELINDA GATES foundation through GSR project for financial support and CAAS (Chines Agricultural Academic Science) for the germplasm resources. The authors highly appreciate and acknowledge the efforts made by rice research team Fogera National Rice Research and Training Center and Shire-Maitsebri Agricultural Research Center for field management and data collection during the execution of field trial. Authors are also indebted to Ethiopian Institute of Agricultural Research for providing administrative assistance during the work.

***Corresponding author:** Abebaw Dessie, Assistant Professor, Fogera National rice research and Training Center, Ethiopian Institute of Agricultural Research Center, Ethiopia Tel: 251937352948; Email: dessieabebaw7@gmail.com

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