

GENOTYPE X ENVIRONMENT INTERACTION AND STABILITY ANALYSIS FOR PROMISING MUNG BEAN (*VIGNA RADIATA* (L.) WILCZEK) LINES *

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INTRODUCTION

Mung bean (*Vigna radiata* (L.) Wilczek) is a self-pollinated legume crop. It is an important tropical and sub tropical crop that can be cultivated in different types of soil conditions. In Sri Lanka, mung bean is cultivated mainly in the Dry and the Intermediate zones, during both *Yala* and *Maha* seasons. In 2013, the extent, production and national average yield of mung bean were 14,741 ha, 11,509 mt and 1.02 mt/ha, respectively. Annual imports of mung bean seeds to Sri Lanka in 2013 was 7,912 mt (Agstat, 2013).

Even though improved varieties have contributed to increase the mung bean productivity and production in the island, the most mung bean producing areas have realized only about half of the potential yield. This yield gap is considered as a production constraint. In order to increase production, selection of comparatively more stable mung bean varieties across all cultivated areas is also important. A challenging issue for plant breeders is the significant variety x environment interaction. It plays a major role in developing improved stable varieties. The objective of the present study was to determine the phenotypic stability of grain yield in different promising mung bean lines using different univariate stability parameters models and to evaluate the degree of associations among them.

* See "Tropical Agriculturist" Volume 163 for details.

MATERIALS AND METHODS

Two promising breeding lines, namely, ANKG 42 and ANKG 49 and three exotic lines, namely Eoul, Dayeon, J-41 with two standard check varieties, namely MI 6 and Ari were planted in a randomized complete block design with three replications at five locations during two seasons. Trial in each environment was maintained as per the recommendations of the Department of Agriculture. A combined analysis of variance over environments was performed on the data set partitioning the total variance into components representing environment (E), genotype (G) and ExG interaction. Nine stability parameters (S^2 - Environmental variance, CV - Coefficient of Variance, W_i^2 - Wricke's ecovalence, σ_i^2 - Shukla's stability variance, θ_i - Plaited & Person's mean variance component, S_i^2 - Abeysiriwardena's deviation method, b_i - Finlay & Wilkison's regression coefficient, δ_i^2 - Eberhart & Russell's (1966) deviation parameters, β_i - Perkins & Jink's regression coefficient) were evaluated.

RESULTS AND DISCUSSION

In general, 72% of the total sum of squares (variations) was attributed to environmental effect. Environments used in the study were different from each other and the prerequisite to have diverse environments in a variety stability test has been fulfilled. The environmental means ranged from 0.697 t/ha to 2.113 t/ha. The yield range revealed differences across environments as measured by location X season combinations. Stability parameters of the variance component methods indicated that Dahyon was the most stable line across environments. The principle component analysis (PCA) on correlation matrix was performed to understand the associations among different stability parameters. Two principal components were plotted against each other. The first two PCs explained 87.5% (56.4% & 31.3% by PC1 and PC2, respectively). According to the PCA, nine parameters grouped in to four classes. Two parameters W^2 and S_i^2 are included in class 1. The parameters σ_i^2 and θ_i are in class 2. S^2 , CV and δ_i^2 methods are grouped in class 3 and class 4 consisted parameter b_i and β_i .

According to the results of stability analysis of this study W_i^2 and S_i^2 are strongly correlated. Parameters σ_i^2 and θ_i also correlated each other. The Four parameters classified in to class 1 and 2 follow the dynamic or agronomic concept. Environmental variance (S^2), Coefficient of Variation (CV %) and Eberhart and Russell regression parameters (δ_i^2) are in class 3 (C3). Selection based on these procedures, caused high yielding varieties to be introduced as stable varieties. If selection of stable varieties is based on these methods, a poorly adopted varieties with less general adaptability but good specific adaptability may be discarded (Fikere *et al.*, 2009). However, the PC2 axis distinguishes the parameters in class 3 that indicates the strong association with promising yield and parameters in class 1 which do not gives rise promising yields. Stable varieties based on classes 1 and 2 are suitable for unfavourable environments. The two stability parameters Finlay and Wilkionson's regression coefficient (b_i) and Perkins and Jink Regression coefficient (β_i) do not show any positive relationship with other stability parameters and were grouped as a distinct class C4.

Both yield and stability of performance should be considered simultaneously to exploit the beneficial effect of EG interactions and to make variety or line selection more precise and refined. Several stability parameters (EV , CV , W_i^2 , σ_i^2 , θ_i , S_i^2 , b_i , δ_i^2 and β_i) used in present study quantified genotype stability of mung bean. Two stability parameter belong to C1 (W^2 and S_i^2) quantified genotype with respect to stability, thus highly appropriate to select more stable varieties. Promising line Dahyon can be recommended as the most stable line with regard to stability to be tested in farmers' field.

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