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Genotype × Environment Interaction Studies in Mungbean (*Vigna radiata* L. Wilczek)

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A B S T R A C T

Twelve genotypes of mungbean were evaluated for three different sowing dates at Mahatma Phule Krishi Vidyapeeth, Rahuri. The data on seed yield were subjected to genotype × environment interaction analysis to identify high yielding stable mungbean genotype. Significant G × E interaction depicted differential performance of the genotypes over environments. Based on stability analysis, it was concluded that the genotypes, Utkarsha and Vaibhav were found to be high yielders, stable performers with below average response to environments which can be recommended for favourable environments. The genotypes, NUL-0605 and Igatpuri Local were found to be high yielders, stable performers with above average response to environments which can be recommended for poor environments.

Introduction

Mungbean *(Vigna radiata* L. Wilczek), an important short duration pulse crop extensively grown in India under varying soil types and climatic conditions. The climate change can cause unpredictable drought and heat stress. So it is necessary to have stable genotypes. The genotype × environment interaction studies are as important as crop improvement. In any breeding programme, it is necessary to screen and identify phenotypically stable genotypes which could perform more or less uniform in different environments. Thus, breeding for climate or environment resilient varieties is crucial (Allard and Bradshaw, 1964). Significant achievement in crop production may be possible by breeding varieties for their stability for yield and yield components (Singh *et al.*, 2009). The phenotype of an individual is determined by G × E interaction. The phenotypic response to change in environment is not same for all the genotypes.

Mungbean being a short duration crop, succumbs very much to the changing environments. Hence, it is necessary to study the performance of Mungbean genotypes sown on different dates along with its stability.

Materials and Methods

Twelve genotypes of mungbean were evaluated in Randomized block design with three replications during *kharif* 2018, at Post Graduate Institute Research Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri, Maharashtra, India.

The data on each environment was analysed. Further, the data on seed yield per plant (g) was subjected to pooled analysis and found significant G × E interaction. Hence, this data was subjected to stability analysis as proposed by Eberhart and Russell (1966).

Results and Discussion

G × E interactions have major importance to plant breeders in developing improved varieties. Low levels of interactions are useful for some characters so as to maximize stable performance over a number of environments.

The interactions of genetic and non-genetic factors on phenotypic expression is called G × E interaction which is widely present and substantially contributes to the non-realization of expected gain from selection (Comstock and Moll, 1963).

Stable genotypes are particularly of great importance in India, where greengram is grown as a risk under varied environmental conditions. G × E interaction certainly plays an important role in the evaluation and execution of breeding programmes.

Allard and Bradshaw (1964) have critically reviewed this phenomenon and brought out its implications in applied plant breeding. Thus, G × E interaction is important in the expression of quantitative characters, which are controlled by polygenic systems and largely influenced by environmental fluctuations.

In the present investigation, 12 genotypes of mungbean were subjected to pooled analysis of variance (Table 1).

Pooled analysis of variance over three different environments showed that genotypes differed significantly when tested against G × E interaction, pooled deviation and pooled error indicating the presence of substantial amount of variability in the material.

Variance due to G × E interaction was found significant for all traits including seed yield per plant when tested against pooled error. This indicated differential response of genotypes in expression of characters to varying environments.

The earlier workers, Imrie and Butler (1982), Pathak *et al.*,(1990), Gupta *et al.*, (1991), Naidu and Satyanarayana (1991a), Patil and Narkhede (1992), Renganayaki (1995), Kalpande *et al.*, (1996), Khairnar (1998), Raje and Rao (2004), Swamy and Reddy (2004), Abbas *et al.*, (2008), Singh *et al.*, (2009), Patel *et al.*, (2009), Akhtar *et al.*, (2010), Nath (2012), Arunkumar and Konda (2014), Kyaw*et al.*, (2018) also observed significant differences among the genotypes, environments and G × E interaction.

Partitioning of G × E interaction showed that G × E (linear) effect was significant for all the characters including seed yield per plant when tested against pooled error, indicating the predictability of the performance of genotypes over environments.

Both linear and non-linear components of G × E interactions were significant indicating that genotypes responded linearly to environmental changes in respect of these characters.

Table.1 ANOVA for stability analysis of seed yield per plant in mungbean

Source of variation	df	Mean sum of square
Genotype	11	2.27*
Environment	2	37.11*
G × E	22	0.19*
E + G × E	24	3.27*
Environment (linear)	1	74.22*
G× E (linear)	11	0.26*
Pooled deviation	12	0.11*
Pooled error	66	0.02*

*Significant at P = 0.05

Table.2 Estimates of stability parameters for seed yield in mungbean

Sr. No.	Genotypes	Mean seed yield	b_i	S^2d_i
1	**Utkarsha**	6.82	**1.03****	**-0.03ns**
2	**NUL-0605**	6.76	**0.89****	**-0.02ns**
3	**Vaibhav**	7.02	**1.18***	**0.02ns**
4	Mangaon Kolhapur	5.53	1.01	0.04ns
5	BM-2004	6.47	0.95	0.16*
6	Naval	6.43	0.68*	0.10*
7	Burli Yellow	3.99	1.13*	-0.01ns
8	**Igatpuri Local**	6.63	**0.81****	**-0.03ns**
9	BM-2002-1	7.29	1.02	0.10*
10	Panache Kurhe	6.07	1.46*	0.13*
11	Mamurabad Local	5.78	0.78	0.56**
12	AKM-9910	6.16	1.07	-0.01ns

*, ** = Significant at 5 and 1% level of significance, respectively

Environment (linear) effect was significant for seed yield per plant when tested against pooled deviation and pooled error. Nath (2012) also reported significant environment (linear) effect for majority of traits in mungbean.

Mean seed yield and stability parameters are presented in Table 2. According to Eberhart and Russell (1966), a stable genotype should be with high yield, non-significant squared deviation from regression and average response to the environment. Four genotypes *viz*. Utkarsha, NUL-0605, Vaibhav and Igatpuri Local recorded non-significant S^2di and hence considered as stable genotypes. Among four genotypes, Utkarsha and Vaibhav recorded non-significant S^2di and bi>1 and hence considered as below average responsive genotypes and suitable for favourable environments. Two genotypes, NUL-0605 and Igatpuri Local recorded non-significant S^2di and bi<1 hence considered as above average responsive genotypes and suitable for poor or stress environments

Based on the foregoing discussion, it can be concluded that the genotypes, Utkarsha and Vaibhav found to be high yielder, stable performer with below average response to environments. Hence, these genotypes can be recommended to highly favourable environments only and genotypes NUL-0605 and Igatpuri Local found to be high yielder, stable performer with above average response to environments. Hence, these genotypes can be recommended to poor or stress environments

References

Abbas, G., Babar, M. A., Shah, T. M., and Haq, M. A., (2008). Stability analysis for seed yield in mungean. *J. Agric. Res.* 46(3): 223-228.

Akhtar, L. H., Muhammad, K., Muhammad, A., Tariq, A. (2010). Stability analysis for grain yield in mungbean (*Vigna radiata* L. Wilczek) grown in different agro-climatic regions. *Emir. J. Food Agric.* 22(6): 490-497.

Allard, R. W. and A. D. Bradshaw (1964). Implications of genotype x environment interaction in applied plant breeding. *Crop Sci.* 4: 503-508.

Arunkumar, B. and C. R. Konda (2014). Genotype and environment interaction and stability analysis for seed yield in yellow mungbean (*Vigna radiata* L.) *J. Appl. & Nat. Sci.* 6(2): 782-785.

Eberhart, S. A. and W. L. Rusell (1966). Stability parameters for comparing varieties.*Crop Sci.*6: 36-40.

Gupta, R. K., Y. S. Tomer, K. R. Battan and V. R. Singh (1991). Stability analysis in mungbean. *Indian J. agric. Res.* 25(3): 154-160.

Imrie, B. C. and Butler, K. L. (1982). An analysis of variability and genotype x environment interaction in mungbean [*Vigna radiata* (L.) Wilczek] in South Eastern Queensland. *Aust. J. agric. Res.* 33: 523-530.

Kalpande, H. V., J. G. Patil and R. B. Deshmukh (1996). Stability analysis for seed yield and its components in greengram. *J. Soils and Crops*. 6(2): 173-176.

Khairnar, M. N. (1998). Variability and stability for yield and its components in Mungbean. M.Sc. (Agri.) thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra (India).

Kyaw, S. W., Kyi, W., Than, D. M., Nyo, M. H. and Tun, S. (2018). Genotype by environment interaction and stability analysis of seed yield, agronomic characters in mungbean (*Vigna radiata* L. Wilczek) genotypes. *Int. J. Adv. Res*. 6(3), 926-934.

Naidu, N. V. and A. Satyanarayana (1991a). Association between mean performance and stability parameters in greengram. Indian J. agric. Sci. 61(6): 420-421.

Nath, A. (2012). Stability analysis in Mungbean. M.Sc (Agri.) thesis submitted to Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar, Maharashtra, India.

Patel, J. D., Naik M. R., Chaudhari S. B., Vaghela K. O., Kodappully V. C. (2009). Stability analysis for seed yieldin green gram (*Vigna radiata* L. Wilczek). *Agricultural Science Digest*. 29: 36-38.

Pathak, A. R., P. P. Zaveri, J. A. Patel, H. R. Kher and R. M. Shan (1990). Stability analysis in mungbean. *Indian J. Pulses Res*. 3: 13-18.

Patil, H. S. and B. N. Narkhede (1992). Stability analysis for plant height, days to flower and days to maturity in greengram. *Indian J. agric. Res.* 26(3): 115-119.

Raje, R. S. and Rao, S. K. (2004). Stability analysis in mungbean. *Legume Res*. 27(1): 11-18.

Renganayaki, K. (1995). Phenotypic stability in mungbean.*Madras Agric. J.* 82(6, 7, 8): 425-427.

Singh, S. K., Singh, I. P., Singh, B. B., Singh,

O. (2009). Stability analysis in mungbean (*Vigna radiata* L.). *Legume Res*. 32(2): 108- 112.

Swamy, A. A. and G. Reddy (2004). Stability analysis of yield in mungbean. *Legume Res*. 27(2): 107-110.

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