Electronic Journal of Plant Breeding, 6(4): 992-995 (Dec- 2015)

ISSN 0975-928X

Research Article

Assessment of stability performance in scented rice genotypes under transplanted condition of south-eastern plain zone of Rajasthan

N.R. Koli , R K. Bagri , B.L.Kumhar , Chandra Prakash, R.K. Mahawar[5] and S.S. Punia
Agricultural Research Station (MPUA&T), Ummedganj, Kota -324001
E-mail: nanag70@yahoo.co.in

(Received: 29th Jan 2015; Accepted: 17th Jul 2015)

Abstract
An experiment was conducted during *kharif* 2007 to 2009 to assess the stability performance of seven genotypes of scented rice (*Oryza sativa* L.) for grain yield and its component characters. Genotypic and G x E interaction variances were found to be significant for all the characters studied. Both linear and non-linear components of G x E interaction were also found significant. Estimates of stability parameters as general mean (X), regression coefficient (bi) and deviation from regression (S^2di) showed that, genotype IET 19491 was found stable for grain yield and number of panicles/m^2, Pusa basmati-1 was found stable for plant height (cm) and days to 50% maturity.

Key words
Genotype x environment interaction, Regression coefficient, stability parameters, rice.

Introduction

The assessment of stability of a genotype under different environments is useful for recommending cultivars for known conditions of cultivation. The stability of varieties over wide range of environments with high yield potential is desirable. It has always been emphasized by breeders as base before releasing an ideal variety for commercial cultivation (Singh and Shukla, 2001). It helps in understanding the varietal adaptation to environmental changes and use of adaptable varieties is important for stabilizing the crop production over season and region. It is therefore necessary to evaluate large number of genotype over the years either for their direct commercial exploitation or for utilization in further breeding programme. Since the information on the stability of scented rice genotype are lacking, a study was planned to evaluate and screen out the most stable and high yielding genotypes over environments.

Materials and methods

The experimental material consisted of seven genotypes (including two checks varieties *viz.* Pusa basmati -1 & Taraori) which were grown under transplanted conditions in randomized block design with three replications during three crop seasons of *kharif* 2007, 2008 & 2009 at Agricultural Research Station ,Ummedganj, Kota . Each plot consisted of rows spaced 20 cm apart with a plant to plant distance of 10 cm. The cultural practices were followed as per the recommended package. Observations were recorded on days to 50 % flowering, days to 50 % maturity and grain yield (q./ha) on the plot basis. Data on plant height (cm) and numbers of panicles / m^2 were recorded on ten randomly selected plants in each replication .The pooled weather data for three different crop seasons are presented in Figures 1, 2 & 3 for temperature, relative humidity and rainfall, respectively. The stability parameters of different genotypes were computed as per the model of Eberhert and Russell (1966).

Results and discussion

Pooled analysis of variance showed highly significant mean sum of squares for genotypes and environments for all the characters studied, indicating the presence of substantial variation among the genotypes over environments (Table 1). Significant mean squares due to genotype x environment (G x E) interaction indicated that the genotypes under different environments behaved differently for the expression of characters of interest. It means a particular variety may not exhibit the same phenotypic performance under different environments or different varieties may respond differently to a specific environment. Both linear and non-linear components of G x E interactions were also found significant for all the characters studied showing the importance of both linear (predictable) and non-linear (unpredictable) components in the expression of the traits. Significant pooled deviation (non-linear component) suggested that the performance of different genotypes fluctuated considerably in respect to their stability for respective characters. Thus both predictable and unpredictable components contributed significantly to differences in stability among genotypes. These results are in agreement to those reported by Nayak (2008), Kulkarni and Gangaram (1998) and Shadakshari (2001) in rice and Ram *et. al*. (2009) in mung bean.

Eberhart and Russel (1966) proposed that the stability of a genotype depends on three parameters namely, genotypic mean (X), regression or linear response (bi) and deviation from the linearity (S^2di). According to this model, an ideally stable genotype is one that conforms high mean value (>gi), unit regression or linear response (bi=1) and no deviation from the linearity ($S^2di = 0$). The estimates of mean performance (x), regression coefficient (bi) and deviation from regression (S^2di) are presented in Table 2. Considering the stability of a genotype, the three parameters *viz*, grand mean over the environments (x), unit regression coefficient (bi=1) and squared deviation from the regression ($S^2di = 0$) were considered stable in performance.

The genotype IET 19441, IET 19783 and IET 19784 had significant regression coefficient (bi) for grain yield (qt./ha.), indicating that the regression accounted for G x E interactions for these genotypes. Non linear components (S^2di) were found significant for 5 genotypes, indicating the genotypes are sensitive and unpredictable to environmental changes. Among the tested genotypes, IET 19491 had high grain yield (38.38 q./ha) as compared to general mean (37.41q /ha) over the environments, along with non significant deviation from regression (S^2di) and high regression coefficient value (bi >1), suggesting that the genotype is stable and responsive to favourable environment. Similar results were also reported by Shadakshari *et. al.* (2001) and Kulkarni (2000). Whereas, genotype IET 19783 and IET 19784 possessed significant value for regression coefficient (bi) and deviation from regression (S^2di) indicating the presence of high magnitude of G x E interaction. Similar results were reported by Madhusudhana *et. al.* (2003) in rabi sorghum.

For number of panicles/m^2, three genotypes namely, IET 19491, IET 19492 and Pusa basmati-1 recorded high mean value with non–significant bi value, but their performance was unpredictable due to significant deviation from regression (S^2di). On the other hand, the deviation from regression was significant for all the genotypes, suggesting the preponderance of non-linear components of variation. So their performance over environments would be unpredictable. Similar results were reported by Kulkarni and Gangaran (1998) in rice.

All the genotypes were linearly predictable in terms of plant height and days to 50% maturity because of non-significant deviation from regression (S^2di). The genotype Pusa basmati-1 was found to be stable with high general mean (X), non significant bi (bi=1) and S^2di value ($S^2di=0$). Similar results were reported by Shadaksheri *et. al*. (2001) in upland rice. For days to 50% flowering, all genotypes showed significant deviation from regression (S^2di), indicating that their performance over environment would be unpredictable.

The present study brought out the fact that advantage of genotype may not only be in the area of increased yield but also for the greater stability in production across the environments. Among the tested genotypes, IET 19491 for grain yield and Pusa basmati-1 for plant height and days to 50% maturity were found stable. These genotypes may be considered for cultivation under transplanting conditions of South-Eastern Plain Zone of Rajasthan for getting higher yield.

References

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

Kulkarni N and Gangaram 1998. Genetic changes and phenotypic stability in mutant rice variety "Sambha Mahsuri". *Oryza*. **25**: 322-324.

Kulkarni N. 2000. G x E interaction in rice. *Oryza* **37** : 72-73.

Madhusudhana R, Umakanth A V, Swarnlata Kaur. and Rana B S. 2003. Stability analysis for grain yield in *rabi* sorghum [*Sorghum bicolar* (l), Moench]. *Indian J. Genet. 63(3):* 255-256.

Nayak A R 2008. Stability of quality characters in scented rice. *Indian J. Agric. Res*. **24(2)**: 102-106

Shadakshari Y G, Chandrappa H M, Kulkarni R S and Shashidher H .E. 2001. Genotypic X Environment interaction in low land rice genotypes of hill zone of Karnataka. *Indian J. Genet*. **64(4)**: 350-352.

Singh S P and Shukla S 2001. Stability parameters for opium and seed yield in opium poppy (*Papaver somniferum* L.). *Indian J. Agril. Sci*.**71**:313-315.

Ram B, Tikka S B S and Mahla H R 2009. Stability of seed yield and quality characters in black gram. *Indian J. Agric. Sci*. **79 (8)**: 654-657.

Electronic Journal of Plant Breeding, 6(4): 992-995 (Dec- 2015)

ISSN 0975-928X

Table 1. Pooled analysis of variance (mean squares) for phenotypic stability for different traits of scented rice genotypes in transplanted condition of South –Eastern Humid Plain Zone of Rajasthan.

SOV.	DF	Mean squares				
		Grain yield (q/ha)	No. panicles/m^2	Plant height (cm.)	Days to 50% flowering	Days to 50% maturity
Genotype (G)	6	175.941**	3706.397**	719.941**	34.126**	147.211**
Environment (E)	2	62.220**	9355.444**	4.063*	11.476**	21.730**
G x E	12	57.023**	1092.778**	43.100**	15.976**	207.878**
Envi. (Linear)	1	41.480**	6236.963**	2.708*	7.650**	14.486**
G x E (Linear)	6	17.106**	653.496**	28.733**	9.913**	136.166**
Pooled deviation	7	17.922**	64.304**	8.72**	0.632**	2.073**
Pooled Error	42	0.189	7.930	0.188	0.040**	4.666**

** Significant at P= 0.01, *Significant at P=0.05

Table 2. Stability parameters of promising scented rice genotypes in transplanted condition of South –Eastern Humid plain Zone of Rajasthan.

Genotype	Grain yield (q/ha)			No. panicles/m2			Plant height (cm)			Days to 50% flowering			Days to 50% maturity		
	Mean	bi	$S^{-2}d$	Mean	bi	$S^{-2}d$	Mean	bi	$S^{-2}d$	Mean	bi	$S^{-2}d$	Mean	bi	$S^{-2}d$
IET-No. 19441	39.96	2.37**	-2.77	285.66	1.66*	-48.82**	107.72	12.68**	0.00	100.77	-2.51**	-60.15**	135.11	-1.61	-0.22
IET-No. 19491	38.38	-1.28	1.727	302.88	0.84	-110.98**	92.22	0.87	0.00	107.55	-2.10	-65.32**	139.22	-0.95	0.49
IET-No. 19492	33.16	1.38	26.311**	371.88	0.89	-110.62**	92.66	3.93	0.00	96.66	0.39	-62.99**	137.66	-4.25**	-0.13
IET-No. 19783	38.64	2.38**	74.040**	305.11	2.00**	168.47**	95.88	-12.25**	0.01	98.00	-1.12	-65.25**	134.44	1.81*	-0.54
IET-No. 19784	42.94	2.39**	5.457**	313.00	1.73*	-59.79**	96.11	8.31	-0.00	99.33	-2.45**	-63.57**	133.77	3.36**	0.74
Pusa Basmati-1	38.94	0.09	3.190*	316.55	-0.27	-69.71**	100.55	0.87	-0.08	101.77	-4.30**	-62.28**	135.22	0.83	-0.48
Taraori	29.84	-0.89	91.725**	265.00	0.14	-95.54**	116.77	-7.43	0.00	95.33	19.10**	-63.19**	134.88	5.02**	0.57
Mean	37.41			294.30			100.22			99.22			135.76		
SE (Mean)	2.99			4.00			1.47			0.719			0.397		
SE(bi)		0.714			0.009			7.63			0.69			0.727	

** Significant at P= 0.01, *Significant at P=0.05

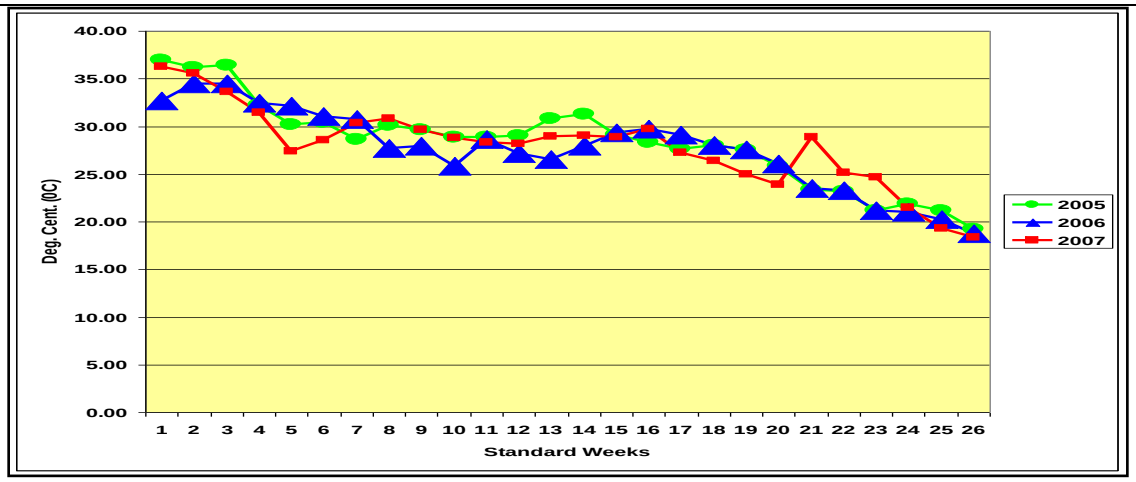

Figure 1. Average temperature across three environments

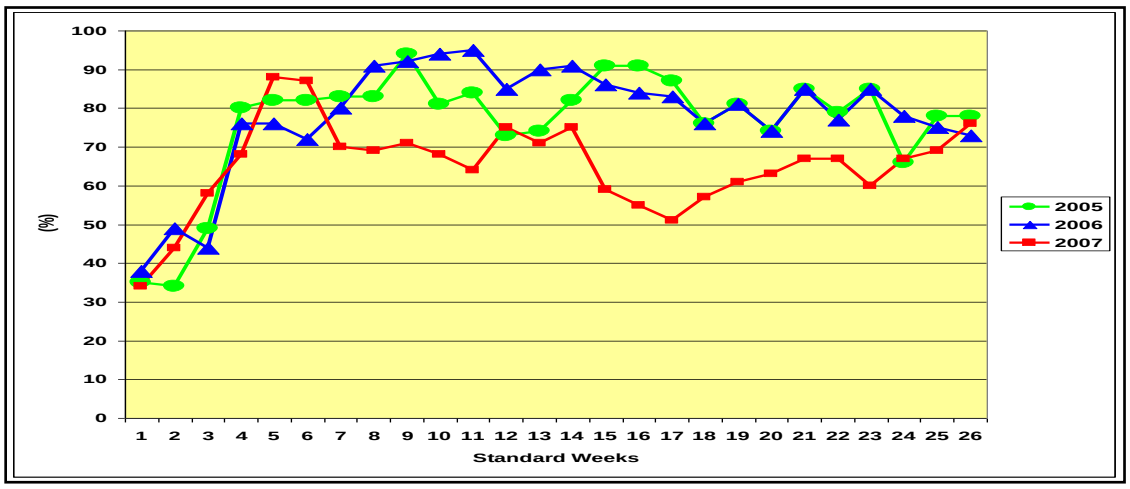

Figure 2. Relative humidity (%) across three environments

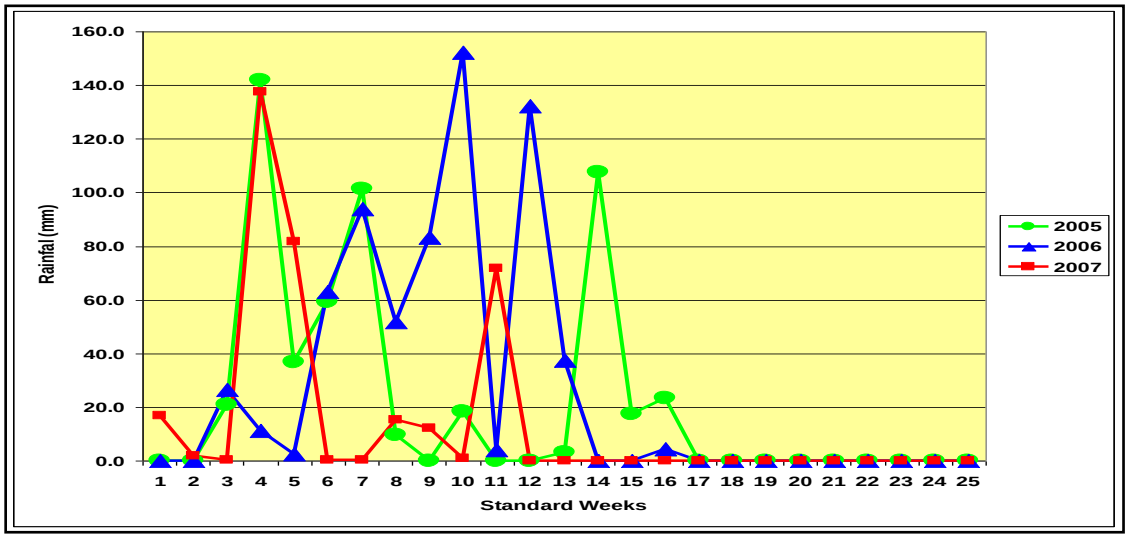

Figure 3. Average rainfall across three environments