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GENOTYPE x ENVIRONMENT INTERACTION AND STABILITY OF PRE-RELEASE CULTURES AND VARIETIES OF RICE

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Abstract: Stability analysis conducted using the data collected from nine genotypes of rice evaluated during 1983, 84, 85, 87 and 88 kharif seasons at the College of Agriculture, Vellayani revealed that all the nine genotypes were stable for height of the plant. With regard to tillers per plant, Cul.126 (Remya) and Pavizhom were stable. The genotypes Karthika, Asha, Pavizhom, Cul.25331 and Cul.126 (Remya) were stable for sheath blight disease, while Karlhika, Cul.25331, Cul.126 (Remya) and Cul.4 (Aarathy) were stable for sheath rot disease. Regarding the grain yield, Karlhika and Cul.4 (Aarathy) can be considered as stable genotypes, since they had higher yield than grand mean along with average response and non-significant deviation from regression.

INTRODUCTION

Genotype x environment interaction (g x e) encountered in yield trials is a challenge to plant breeders. The study of g x e interaction in its biometrical aspect is very relevant to the production problem in agriculture in general, and in particular to plant breeding (Breese, 1969). The relative performance of different genotypes gets altered in different environments due to the presence of g x e interaction. A knowledge on the interaction and stability is essential in breeding varieties for general adaptations, particularly in a crop- like rice, which is grown in diverse agro-climatic conditions. Ruschel (1977) suggested that plant breeders have the choice of either selecting genotypes of restricted adaptability for defined ecological conditions or searching for genotypes with wider adaptability capable of sustaining production in spite of wide variation in environments. Therefore, an attempt has been made in this study for identifying stable genotypes of rice by stability analysis.

MATERIALS AND METHODS

Nine entries including pre-release cultures and varieties of rice were evaluated during 1983, 84, 85, 87 and 88 kharif seasons in a randomised block design with three replications under the National Agricultural Research Project, College of Agriculture, Vellayani. The data on height of the plant, tillers per plant, sheath blight and sheath rot disease scores were recorded from a random sample of five plants in each plot. The grain yield per plot was also recorded. The data collected were subjected to environment-wise analysis and pooled analysis for partitioning the total variability into variance due to genotype, environment and g x e interaction. In cases where g x e interaction was found to be significant, the analysis of variance was proceeded further to estimate stability parameters, following Eberhart and Russell (1966).

RESULTS AND DISCUSSION

The analysis of variance for stability in respect of five characters (Table 1) revealed significant difference between genotypes for height of the plant and grain yield only. The linear component of interaction was significant in sheath blight and sheath rot disease scores, while the non-linear component was significant for tillers per plant and grain yield, indicating the contribution of non-linear component to the interaction effect in respect of tillers per plant and grain yield.

Table 1. Analysis of variance for five characters in rice

Source	Df	Mean square				
		Height of the plant	Tillers per plant	Sheath blight score (1 to 9)	Sheath rot score (1 to 9)	Grain yield
Genotypes	8	1181.70**	2.41	0.42	0.34	542.42*
Environments + (g x e)	36	57.10	7.87	1.18	1.35	1329.23
Environments (linear)	1	1787.40	236.84	32.25	39.40	41529.02
Genotypes x environments (linear)	8	5.30	1.08	0.70**	0.66**	110.10
Pooled deviation	27	8.42	1.41**	0.17	0.15	201.60*
Pooled error	90	10.44	0.43	0.14	0.15	119.60

* Significant at 5 per cent level

** Significant at 1 per cent level

According to Eberhart and Russell (1966), a desired variety should have high mean than grand mean, unit regression coefficient (b = 1) and least mean square deviation from linear regression ($S^2d = 0$). Later, Breese (1969) and Paroda *et al.* (1973) stated that regression coefficient is a measure of response to varying environments and the mean square deviation from linear regression is a true measure of stability, the genotypes with the least deviation being the most stable and vice versa.

The mean (X), regression coefficient (bi) and mean square deviation from regression (S^2di) for five characters are presented in Table 2. All the nine genotypes were stable for height of the plants, since they had average response and nonsignificant mean square deviation from regression. With regard to tillers per plant, all the genotypes had average response, but the deviations from regression were significant in Jaya, Karthika, Asha, Cul.169 and Cul.4 (Aarathy), suggesting the unpredictability of the performance of these genotypes in different years. The genotypes Pavizhom and Cul.126 (Remya) having more number of tillers than grand mean along with average response and non-significant deviation from regression were stable in respect of tillers per plant.

The genotypes Karthika, Asha, Pavizhom, Cul.25331 and Cul.126 (Remya) recorded low sheath blight scores than grand mean, average response and non-significant deviation from regression indicating their stability. Regarding sheath rot disease Karthika, Cul.25331, Cul.4 (Aarathy) and Cul.126 (Remya) recorded low disease scores, average response and non-significant mean square deviation from regression indicating their

Table 2. Mean, regression coefficient and mean square deviations from regression of five characters in rice

Sl. No.	Variety	Height of the plant (cm)	bi	S^2di	Tillers per plant	bi	S^2di	Sheath blight score (1 to 9)	bi	S^2di	Sheath rot score (1 to 9)	bi	S^2di	Grain yield (t/ha)	bi	S^2di
1	Jaya	83.18	1.03	0.132	5.85	0.76	7.71"	0.646	0.44*	2.55	1.38	1.51**	0.47	2.18	1.16	0.176
2	Karthika	86.23	0.99	0.303	6.35	1.05	4.32**	0.904	1.38	0.19	1.08	0.96	0.08	2.44	1.05	0.941
3	Asha	81.16	0.98	0.362	5.99	0.97	5.10**	0.618	0.61	0.45	1.03	0.55*	2.42	2.20	0.95	0.686
4	Pavizhom	84.37	0.94	0.467	7.31	1.45	2.19	0.906	1.07	0.26	1.16	0.41**	0.95	2.21	0.95	2.701
5	Cul.25331	128.12	1.11	2.092	5.89	0.86	1.67	0.700	0.58	0.46	0.94	1.04	2.06	1.91	0.89	0.332
6	Cul.25337	75.93	1.26	0.667	5.52	1.02	0.03	1.362	1.60**	0.87	1.68	1.61**	1.52	1.89	1.13	1.206
7	Cul.169	82.32	0.99	1.672	7.05	0.81	5.15**	1.346	1.10	0.03	1.16	1.04	0.77	2.76	1.19	3.847*
8	Cul.4 (Aarathy)	84.51	1.04	0.982	7.53	1.13	3.35*	1.296	1.55*	3.59*	0.78	0.97	0.13	2.82	0.69	1.060
9	Cul.126 (Remya)	85.98	0.64	0.576	6.85	0.95	0.298	0.772	0.67	1.13	1.11	0.89	0.77	2.58	0.98	4.223**
Grand mean		87.98	-	-	6.46	-	-	0.950	-	-	1.15	-	-	2.33	-	-

* Significant at 5 per cent level ** Significant at 1 per cent level bi = Regression coefficient S"di = Deviation from regression

stability. All the genotypes had average response for grain yield. The Cul.169 and Cul.126 (Remya) had significant mean square deviation from regression indicating that the performances of these genotypes were unpredictable in different years. Among the nine genotypes Karthika and Cul.4 (Aarathy) which recorded higher mean grain yield than grand mean along with average response and nonsignificant deviation from regression can be considered as stable genotypes suitable for cultivation during kharif season.

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