

STABILITY OF NEW RICE GENOTYPES FOR GRAIN YIELD

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Abstract: The yield potential and grain yield stability of three medium duration rice cultures were studied over six cropping seasons at the Regional Agricultural Research Station, Pattambi. Cul-8770 and Cul-8772 had shown stable high yield potential over the seasons. These two cultures recorded high mean yield and lesser deviation from regression. BR-51-46-1 with its lower mean yield and higher deviation from regression, is not suited for general cultivation, especially during kharif season. The added advantage of Cul-8770 and Cul-8772 is the good straw yield and red bold grains which are highly preferred in Kerala. All these attributes make Cul-8770 and Cul-8772 suited for release as varieties for general cultivation.

Key words: Rice breeding, yield stability, new rice cultures.

INTRODUCTION

Environmental parameters significantly influence the yield expression of genotypes causing considerable variations in yield in fluctuating environments. High yield potential combined with stability is therefore highly desirable for the genotypes recommended for general cultivation. The parameters of stability and adaptability were applied in rice by Maurya and Singh (1977) and Sarma *et al.* (1982) for comparing different varieties to ascertain their usefulness over a wide range of environments. The present investigation was aimed to test the stability of advanced rice cultures under different environments to determine their suitability for release as varieties.

MATERIALS AND METHODS

The yield performance of three medium duration rice cultures evolved at the Regional Agricultural Research Station, Pattambi was compared with two popular varieties of Kerala viz., Pavizham and Bharathy to test their stability for grain yield. The cultures tested were Cul-8770, Cul-8772 and BR-51-46-1. Of this, Cul-8770 (BR-51 x Cul-23332-2) and Cul-8772 (Jyothi x BR-51-46-1) are having long bold grains with red kernel colour. BR-51-46-1 (IR-20 x IR-5) has long slender white kernelled grains. The experiment was laid out

in randomised block design with four replications, during six cropping seasons, each season considering as one environment and as such there were six environments (1) E₁ - Kharif 1987 (2) E₂ - Kharif 1989 (3) E₃ - Kharif 1990 (4) E₄ - Rabi 1989 (5) E₅ - Rabi 1990 and (6) E₆ - Rabi 1991. All the genotypes received cultivation practices recommended by the Kerala Agricultural University (KAU, 1989). The mean grain yields of the genotypes were subjected to pooled analysis of variance for stability over six environments. The pooled analysis revealed the presence of significant genotypes x environment interaction. The data were therefore further analysed for assessing the relative genotypic stability using the model suggested by Eberhart and Russell (1966).

RESULTS AND DISCUSSION

The mean performance of the genotypes in terms of grain and straw yield in the two cropping seasons of Kerala is presented in Table 1. The grain yield data clearly indicated the higher grain and straw yield performance of Cul-8770 and Cul-8772 in both the seasons. Cul-8770 had recorded an average grain yield of 4337 kg ha⁻¹ whereas Cul-8772 had recorded a grain yield of 5027 kg ha⁻¹. Grain yield of other culture viz. BR-51-46-1 was 4245 kg ha⁻¹. The yield potential of Cul-8772 during rabi season was much

Table 1. Mean yield performance of new cultures in different cropping seasons of Kerala, kg ha⁻¹

Genotypes	Grain			Straw		
	Kharif	Rabi	Pooled mean	Kharif	Rabi	Pooled mean
Cul-8770	4849	4624	4737	5150	5518	5334
Cul-8772	4735	5317	5027	5920	5777	5840
BR-51-46-1	3855	4642	4245	6210	4502	5356
Pavizham	4085	4583	4204	5000	3633	4310
Bharathy	4682	4589	4765	4670	4675	4673
CD (0.05)	775	NS	576	-	-	385

promising compared to other genotypes. It is a highly desirous character in view of the failure of many of the existing high yielding genotypes to yield well during rabi season. The data on straw yield of genotypes further supported the above inferences. Farmers only prefer varieties with good straw yield potential during rabi season. Cul-8772 with its straw yield as high as 5840 kg ha⁻¹ will definitely get ready acceptance by farmers.

The mean grain yield data over different environments were subjected to pooled analysis and the data are presented in Table 2. The results showed significant differences among the genotypes and environments indicating that the genotypes showed differential reaction in different years. There was significant genotype x environment interaction indicating that the performance of the varieties was not uniform in different environments. This showed that there were differences among varieties with regard to their relative stability in adapting to specific environments. Linear component of environmental effect was also found to be significant.

The linear regression analysis facilitates identification of genotypes

having wider adaptability over a range of environments. According to Eberhart and Russell (1966), a genotype with high mean yield, unit regression coefficient ($b_i = 1$) and least deviation from regression ($s^2_{di} = 0$) is considered as an ideal, widely

Table 2. Pooled analysis of variance for stability of grain yield

Source	Df	Mean squares
Genotypes	4	76561* ⁺⁺
Environments	5	6021608 ^{**++}
Genotype x environment	20	228643 ^{**}
Pooled error	72	83406
Environment (linear)	1	30108048 ^{**++}
Pooled deviation	20	216525 ^{**}

* Tested against pooled error

+ Tested against pooled deviation

adapted and stable genotype. The stability parameters of the genotypes are presented in Table 3. The data clearly revealed the stable high yield potential of Cul-8770 and Cul-8772. These two cultures recorded mean grain yields higher than population mean yields (4.6 t ha⁻¹), unit regression

coefficient and lesser deviation from regression compared to the other culture tested namely BR-51-46-1. Pavizham showed highest stability over different environments but with less mean yield than population mean. This indicated the possibility of utilizing this variety in rice breeding programmes for transferring the stability attribute. Bharathy had shown high deviation values indicating a lower stability in fluctuating environments. This variety is ideal for cultivation under most favourable environments. BR-51-46-1 had lower mean yield and higher deviation from regression indicating less suitability for general cultivation, especially during kharif season.

Table 3. Estimates of stability parameters for grain yield in rice genotypes

Genotypes	Overall mean yield (kg ha ⁻¹)	bi	s ² di
Cul-8770	4737	1.05	167513
Cul-8772	5027	0.93	137767
BR-51-46-1	4245	0.90	387624
Pavizham	4204	0.97	77426
Bharathy	4765	1.15	208036
Population mean	4596		
S.E.	208.0	0.189	

Table 4. Performance of Cul-8770 and Cul-8772 in farm trials in different districts of Kerala

Genotype	Palakkad (Kharif '90-'91)	Trichur (Puncha '91-'92)	Ernakulam (Kharif '91-'92)	Wynad (Kharif '90-'91)	Overall mean
Cul-8770	4541	5437	4762	4400	4785
Cul-8772	5020	5528	4498	4900	4987
Local check	4471	5551	4111	4450	4646

*Mean of three trials

In order to test the stability of Cul-8770 and Cul-8772 over different agro-ecological situations, farm trials were conducted in different districts of Kerala. At each location the cultures were raised in fanners fields in an area of 0.02 ha each, along with a popular HYV of medium duration. In each district three trials were conducted and the results of these trials are presented in Table 4. The cultures are able to perform well in the different agro-climatic regions of the state. Besides, these two cultures had also shown good yield performance and stress tolerance over a wide range of environments throughout the country (AICRIP, 1991). And hence it can be concluded that Cul-8770 and Cul-8772 are high yielders with wider adaptability and yield stability and are ideal for general cultivation and varietal release in Kerala.

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REFERENCES

- AICRIP, 1991. Annual Progress Report for Kharif. Vol.1. All India Co-ordinated Rice Improvement Programme, ICAR, New Delhi
- KAU, 1989. *Package of Practices Recommendations* Kerala Agricultural University, Trichur
- Eberhart, S.A. and Russell, W.A. 1966. Stability parameters for comparing varieties. *Crop Sci.* 6: 36-40
- Maurya, D.M. and Singh, D.P. 1977. Stability in rice. *Indian J. Genet. Plant Breed.* 31 : 21-25
- Sarma, N.K., Baruah, R.K.S.M., Sarma, K.C. and Datta, D. 1982. Stability parameters for grain yield in rice. *Oryza* 19 : 177-178