https://doi.org/10.29321/MAJ.10.A02109

Madras Agric. J. 75 (5-6) : 189-195 May-June, 1988

STABILITY ANALYSIS IN SHORT DURATION VARIETIES OF RICE (*Oryza sativa* L.)

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Ten short duration varieties of rice (*Oryza sativa* L.) evaluated under three environments showed genotype-environment interaction for days to 50 per cent flowering, plant height, number of ear-bearing tillers, panicle length, number of filled grains per ear, spikelet fertility, harvest index and plot yield. Although both the components of genotype-environment interaction namely, linear and non-linear, contributed to the total genotype-environment interaction, preponderance of linear component was there. It was found that IR 50 was the widely adapted genotype over environments. Co 41 faired well under low yield environment and the genotypes ADT 36 and ACM 2 faired well under high yield environment.

Rice (*Oryza sativa* L.) is grown under diverse eco-geographic regions in tropical and sub-tropical countries. Breeding for wide adaptability over a range of agro-climatic conditions is an important objective in most cereal improvement programmes. Varieties vary greatly in their phenotypic response to a range of environments. Some crop varieties are able to perform well in a wide range of environments while others need specific environments to express their genetic potential.

MATERIALS AND METHODS

The experiment was carried out at the Agricultural College and Research Institute, Madurai. The experiment consisted of the study of the ten short duration rice genotypes such as ADT 31, ADT 36, Co 37, IET 4786, IR 50, Co 33, TKM 9, Co 41, ACM 2 and ACM 3 in three different dates of sowing during the first crop season (Kharif) to impose the environmental effects. The crop was raised in the months of June, July and August with timely plantings. The following months were the three environments :

E1 : 1984, June sowing

E2 : 1984, July sowing

E3 : 1984, August sowing.

The crop was raised in a randomized block design with three replications. Observations were recorded on days to 50 per cent flowering, plant height, panicle length, number of ear-bearing tillers, number of filled grains per ear, spikelet-fertility, harvest index and plot yield. Statistical analysis was carried out using the analytical approach of Eberhart and Russell (1966).

RESULTS AND DISCUSSION

Pooled analysis of variance for stability parameters for eight traits in rice is presented in Table 1. It was evident that the mean squares due to genotype, environment and environment+(genotype x environment) were significant for all the traits. The genotypes interacted significantly with the

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environments. These results were in conformity with the earlier reports of Chaudhari *et al.* (1979) and Desai (1983) The mean squares due to genotype x environment interaction (linear) were significant for plant height and harvest index and it showed that although both the components of genotype-environment interaction contributed to the total genotype-environment interaction, the preponderance of linear component was there. Hence, the mean performance of varieties could be predicted across the environments. This result was in accord with the findings of Borthakur *et al* (1979), Yadava and Prakash Kumar (1979) and Sain Dass *et al.* (1985).

Estimation of stability parameters for eight traits was presented in Table 2. A variety is said to be a stable one, if it has regression coefficient equal or close to one (b=1) and it has low deviation (S²di) from the regression coefficient (Maurya and Singh, 1977). It was evident from the table that no variety was stable for the expression of eight quantitative traits over environments. The trait-wise analysis showed that some genotypes were stable in respect of either one or the other trait.

It was considered that the genotype having high mean value was the best performer, the bi' value equal to 1.00 was the most responsive genotype and the least $S^{-2}di$ value was the most stable genotype (Table 3)

The study also revealed that for plot yield, IR 50 was the most widely adopted genotype as it yielded above average in all the environments and 'bi' value was close or equal to one. The genotype Co 41 faired well under adverse or low yield envlronment (E3), whereas it performed poorly in the favourable or high-yield environment (E2) as it recorded moderate mean yield and the 'bi' value was much lower than unity or close to zero ($b > 1$ or $=0$). ADT 36 and ACM 2 faired well in favourable environment (E2) and faired poorly in adverse environment (E3) since they recorded moderate to high mean yields and the bi' value was greater than one($b > 1$). These results are in conformity with the earlier reports of Das Gupta *et al.* (1980).

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1 : Analysis of variance for stability parameters for eight traits in rice

ce	Days to 50 percent for flowering				Plant height			Number of earbearing tillers			Panic	
	d.f.	M.S.	F (Pooled; error mean Squares	F (Pooled; deviation mean Squares	M.S.	P (Pooled; error mean Squares	P (Pooled; deviation mean Squares	M S.	F (Pooled; error mean Squares	F (Pooled; devitation meen Squares	M.S.	(Pc led; err me Sq res
type (c)	9	18.360	78.462**	4.920*	408.215	154.803**	23.818**	3.273	11.902**	1.391	1.522	13.
ionment+ type X ionment)	10	5.911	24.833**	1.557	62.854	23.835**	3.667*	8 624	31.360**	3 665**	1.638	14.
ionment ar)	1	31.489	134.563**	8.438	437.975	166.088**	25.554**	138.340	503.055**	58.793**	11.816	102.
type X ZX ionment ar)	9	5.268	22.512**	1.412	71.968	27.292**	4.199*	1.179	4.287**	0.501	1.632	14.
ed ation -linear)	10	3.732	15.949**	–	17.139	6.499**	—	2.353	8.556**	—	0.626	5.4
led r	54	0.234	—	—	2.637	—	—	0.275	—	—	0.115	—
-linear- ar ratio		1:1.41			1:4.20			1:0.50			1:2.61	

gnificant at 5 percent level; ** Significant at 1 percent level.

	Number of filled graine per ear			Spikelet fertility (per cent)			Harvest-Index			Plot yield (kg)		
^2di	Mean	bi	$S^{-2}di$	Mean (Per cent)	bi	$S^{-2}di$	Mean	bi	$S^{-2}di$	Mean	bi	$S^{-2}d_i$
245	86.32	-2.532	389.528*	90.07	1.864	3 246	0.214	0.227	-0.0013	2.18	0.854°	-0.012
069	89.49	-2 317°	4.660	87.54	0.354	12.085*	0.260	1.681°	-0.0006*	2.73	1.546	0.135*
068	87 52	0.030	102 781*	89.12	0.836°	-1.404	0.239	1.081	-0.0006	2 16	1.144	0.008
028	84.32	1.112	120.530*	86.36	0.452	19.966*	0.206	-0.016°	-0.0001	2.08	0.907	0.354*
347*	90.02	0.178	495.279*	90.06	1.366°	-1.363	0.308	2.942°	-0.0004	2.73	1.284	0.054*
300	76.42	2.638	167.401*	88.29	2.086	13.567*	0.257	0.126°	-0.0006	1.94	1.054	0.598*
309*	82.22	0.402	60.747*	90.22	0.237*	-1.132	0.326	1.203	-0.0022	3.48	0.392	0.321*
086	94.11	5.862°	56 843*	87 20	0.008	2.095	0.259	-1.409°	-0.0003	2.30	0.228	0.279*
114*	72.22	1 016	84 932*	85.67	1.287°	-1.405	0.222	1.888	0.0044*	2.16	1.505°	0.021
069	74.57	3.611	60.201*	88.20	1.510	13.425*	0.218	2.277	0.0018	2.14	1.085	1.145*
	83.72	1.000	—	88.27	1.000	—	0.249	1.000	—	2 39	1.000	—
	2.39	2.898	—	0.70	0.838	—	0.014	0.667	—	0.07	0.474	—

Table 3 : List of the best performer, the most responsive and the most stable genotypes for different traits.

Traits	The best performer	The most responsive	The most stable
Days to 50 per cent flowering	CO 37 and ACM 2	CO 33	CO 37
Plant height	CO 41	ACM 2	CO 41
Number of earbearing tillers	ACM 3	IR 50	IR 50
Panicle length	CO 41	ACM 2	IET 4786
Number of filled grains per ear	CO 41	ACM 2	ADT 36
Spikelet-fertility	TKM 9	ACM 3	TKM 9
Harvest-index	TKM 9	CO 37	IET 4786
Plot yield	TKM 9	CO 33	CO 37

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