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A BIOMETRICAL APPROACH TO EXPRESS STABILITY OF RICE SEED AND SEEDLING VIGOUR OVER VARIABLE TEMPERATURES

R. N. SHARMA, S. M. SHARMA, O. P. KASHYAP, P. K. JOSHI AND N. SHUKLA

Department of Plant Breeding & Genetics, I.G. Agricultural University Raipur 492012

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ABSTRACT

Rice varieties with high dry weight of seedlings perform better under a wide range of temperatures. Such genotypes also have higher stability of germination count as well as speed.

Key words: Rice, seedling vigour, stability, temperature response

Knowledge of genotype x environment interaction for seed and seedling vigour in rice is of utmost importance to determine stable rice varieties for seed and seedling vigour under different temperature regimes in the laboratory. The present investigation has been undertaken to determine the differential response of rice varieties for seed and seedling vigour and to determine the stable genotypes under fluctuating temperature conditions.

The experimental material consisted of 49 rice genotypes. The experiment was carried out during 1989 under laboratory conditions at 20, 25, 30, 35 and 40°C to record seed and seedling vigour of each variety on the basis of ten competitive seedlings in two replicates. Seed and seedling vigour was estimated for the parameters; germination percentage, speed of germination, first count (3-day germination count), seedling growth rate, seedling height on 14th day and seedling dry weight. Stability parameters were calculated as per model given by [1].

The pooled analysis of variance revealed that treatment differences were highly significant for all the characters and also the genotype x environment interactions except for seedling dry weight. It indicated that seedling dry weight remains constant under varying temperature conditions perhaps because of equilibrium maintained due to considerable

Table 1. Genetic parameters of stable rice genotypes

Genotypes	Germination			Speed of germination			First count		
	$\bar{X}$	bi	S^2_{di}	$\bar{X}$	bi	S^2_{di}	$\bar{X}$	bi	S^2_{di}
IR 36	75.3	1.02	18.1	13.9	1.26	1.22	48.1	0.75	6.3
IR 50	70.4	1.23	36.9	14.0	1.09	1.00	51.5	0.54	22.1
IR 5	77.3	0.98	10.8	14.4	1.01	0.69	40.5	0.61	27.0
Cauvery	70.4	0.99	78.6	12.0	1.21	2.95	55.4	1.24	9.3
Purva	79.2	0.89	29.4	15.2	0.95	1.47	65.9	1.30	36.5
IET 9799	64.6	1.48	21.0	13.8	0.85	1.11	39.0	1.40	15.5
IET 8675	68.0	1.15	89.3	14.4	0.86	0.54	38.8	0.33	4.5
IET 8707	73.3	0.93	27.9	13.9	1.06	0.40	57.9	1.12	18.5
IET 8886	72.4	0.99	11.2	14.0	1.18	1.49	54.8	1.42	19.3
IET 9793	68.2	0.75	30.1	13.8	0.75	0.99	45.6	0.57	152.1
IET 9976	72.3	0.58	4.5	14.0	1.07	0.46	62.0	0.89	2.0
IET 9978	79.9	1.08	38.7	14.2	0.87	0.87	55.9	1.01	21.8
IET 11678	72.0	0.98	10.5	14.4	1.01	0.67	62.1	1.45	40.7
IET 11730	67.3	0.98	21.1	13.9	1.23	1.42	42.2	0.64	39.5
R 309-28	65.4	0.84	12.1	12.6	0.88	0.09	55.2	1.17	49.4
UPR 10-3-8	63.6	0.89	43.7	12.4	0.72	0.07	55.4	2.03	79.0
Genotype	Seedling ht. on 14th day			Seedling growth rate			Seedling dry weight		
	$\bar{X}$	bi	S^2_{di}	$\bar{X}$	bi	S^2_{di}	$\bar{X}$	bi	S^2_{di}
IR 36	10.6	0.91	6.1	2.6	0.81	1.28	3.6	1.17	0.1
IR 60	11.9	1.17	2.6	3.2	1.16	1.11	3.8	0.66	0.2
IR 64	12.9	1.21	3.4	3.1	1.11	0.16	4.1	0.75	4.8
Rasi	10.2	0.88	5.9	2.9	0.99	1.01	3.6	0.10	0.1
Akashi	8.4	0.63	4.1	2.4	0.78	1.20	3.6	0.99	0.1
IET 9978	13.4	1.39	0.1	3.5	1.07	1.32	3.7	0.94	0.1
IET 8681	11.0	0.93	0.7	2.9	1.18	0.59	2.8	0.58	0.1
IET 8886	12.8	1.11	0.1	3.4	0.95	0.65	3.2	1.06	0.02
IET 9984	12.5	1.05	0.5	3.7	1.40	0.30	3.5	0.99	0.16
RP1442-2-2-3	9.8	0.75	1.3	2.9	0.91	4.53	3.2	0.64	0.01
RP1843-213-5-1	10.8	0.78	0.7	3.2	0.71	3.95	3.2	0.71	0.03

corresponding variation in germination, first count and seedling height at 14th day under different temperature conditions. It was found that varieties, Rasi, IR 54, IR 64, Akashi, IR 60, IET 9984, IET 9297, had high mean values and regression coefficient near unity for at least two vigour parameters. The experimental findings are in agreement with the earlier observations of [2, 3].

It may, therefore, be concluded that these varieties having high seedling dry weight have in built genetic potential to perform better under varying temperatures. These varieties are already under large scale cultivation and have proved their utility. The other popular varieties which have not been rated stable are IR 50, IR 36, IR 58, Ratna, Cauvery, Anupma and Purva. This may be because of their low vigour high sensitivity to ambient temperature.

It was worth noting that stable varieties for seedling dry weight were also having high stability either for germination percentage or for speed of germination. Variety IR 54 showed stable performance with respect to all the seed/seedling vigour parameters under varying temperature conditions.

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