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STUDIES ON GENETIC VATIABILITY IN MEDIUM DURATION RICE (*ORYZA SATIVA* L.) FOR YIELD AND YIELD COMPONENT TRAITS OVER SIX SEASONS UNDER COASTAL ECO-SYSTEM

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Abstract

Twenty six genotypes of medium duration rice were evaluated for ten yield and yield component traits over six seasons under the coastal eco-system. The GCV was higher for 100 seed weight, total dry matter production, harvest index, and seed yield per plant in all the seasons as well as pooled analysis. The PCV was closer to GCV for all these traits implying the less influence of environment. The heritability estimates were always high for the aforementioned traits. The genetic advance as a percentage over mean was high for the above said traits. High heritable estimates coupled with high genetic advance over percent of mean revealed that 100 seed weight, total dry matter production, harvest index and seed yield per plant were controlled by additive gene action, irrespective of the seasons. Hence, simple selection would be rewarding. Whereas, the traits *viz*., days to 50% flowering, plant height, number of tillers per plant, number of productive tillers per plant, length of primary panicle and the number of seeds per primary panicle was endowed with high heritability estimates coupled with low genetic advance, implying that these traits were under the influence of non- additive gene action, mostly. Hence, immediate selection for this character may not be possible.

***Key words*:** Rice, over seasons, coastal eco-system, genetic parameters.

Introduction

Rice is life for majority of Asians. It is growing in almost all the states of India. In Tamilnadu, it is cultivated in 32 districts. The East coast area in Tamilnadu includes the districts *viz*., Ramanad, Pudukottai, Thanjavur, Nagapattinam, Cuddalore, kancheepuram, and Thiruvalluvar districts. The rice farmers of these districts are forced to go for rice cultivation in the coastal areas due to urbanization. The yield of rice is very low in the east coastal eco-system. To augment the productivity, it is necessary to excavate the potential traits which will respond to selection. Hence, the present study was formulated to find the traits amenable for simple selection under east coast eco-system.

Materials and Methods

The study was conducted at the plant breeding farm, Department of Genetics and Plant breeding, Annamalai University, Annamalai Nagar (Altitude – 5m MSL). The EC of the soil is 4.2 dS m^{-1} and EC of irrigation water 1.7 dS m^{1}. Twenty six medium duration rice genotypes were obtained from the Tamilnadu Rice Research Institute (TNAU), Aduthurai. Seeds were sown in raised beds. The seedlings were transplanted 28 days after sowing in 4.5 m length plot of two rows, with a spacing of 20×15cm. The crop was raised in three replications in RBD. The experiment was conducted during navarai and samba from 2013 to 2018. Recommended agronomic practices and need based plant protection measures were judiciously followed. Observations were recorded on ten randomly selected plants, leaving border rows and plants, for ten agronomic traits. The data were subjected to statistical analyses as per the method given by Panse and Sukatme (1963); Burton (1953); Johnston *et al*. (1955). The statistical analyses were done with the use of Genres.

Results and Discussion

The ANOVA indicated that the all the traits differed significantly from each other in all the seasons and as well as in the pooled analysis mostly (Table 1). Hence, further analysis in appropriate. In S1, the GCV was higher for X4, X6, X7, X8, X9 and X10. The PCV was also higher for these traits. There was a close agreement between GCV and PCV. The heritability estimates were always high (except X3 and X5). The GA as a percentage over mean were higher for X2, X3, X4, X6, X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were recorded for X2, X4, X6, X7, X8, X9 and X10. These characters may be under the control of additive gene action. Hence, simple selection would be rewarding. The traits *viz.*, X1 showed high heritability coupled with low genetic advance

indicating, the trait was under the control of non-additive gene action (Table 2).

In S_2, the GCV was higher for X6, X7, X8, X9 and X10. The PCV also higher for these traits. There was a close agreement between GCV and PCV. The heritability estimates were always high (except X3 and X5). The GA as percentage over a mean was higher for X2, X3, X4, X6, X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were recorded for X2, X4, X6, X7, X8, X9 and X10. These characters may be under the control of additive gene action. Hence, simple selection would be rewarding. The traits *viz*., X1 showed high heritability coupled with low genetic advance indicating the trait was under the control of non-additive gene action (Table 3).

In S3, the GCV was higher for X6, X7, X8, X9 and X10. The PCV was also higher for these characters. There was a close agreement between GCV and PCV. The heritability estimates were high for X6, X7, X8, X9 and X10. The GA as a percentage over mean were higher for X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were registered for X7, X8, X9 and X10. These characters may be under. The control of additive gene action. The trait *viz.,* x6 had a high heritability estimate coupled with low genetic advance, indicating that the trait was under the control of non-additive gene action (Table 4).

In S4, the GCV was higher for X7, X8, X9 and X10. The PCV was also higher for these traits. There was a close agreement between GCV and PCV. The heritability estimates were high for X6, X7, X9 and X10. The GA as a percentage over mean was higher for X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were recorded for X7, X9 and X10. These traits may be under the control of additive gene action. The traits X6 had high heritability coupled with low genetic advance indicating the trait was under the control of non-additive gene action (Table 5).

In S5, the GCV was higher for X6, X7, X8, X9 and X10. The PCV was also higher for these characters. These were a close agreement between GCV and PCV. The heritability estimates were always high for all the traits. The GA as a percentage over mean were higher for X2, X4, X5, X6, X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were recorded for X2, X4, X5, X6, X7, X8, X9 and X10. These traits may be under the control of additive gene action. Hence simple selection would be additive gene action. The traits *viz*., X1 and X3 showed high heritability estimates coupled with low genetic advance, indicating that these traits were under the control of non-additive gene action (Table 6).

In S6, the GCV was higher X3, X4, X6, X7, X8, X9 and X10. The PCV was also higher for these characters. There was a close agreement between GCV and PCV. The heritability estimates were always high for all the traits. The GA as a percentage over mean was higher for X2, X3, X4, X5, X6, X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were recorded for X2, X3, X4, X6, X7, X8, X9 and X10. These traits may be under the control of additive gene action. Hence, simple selection would be rewarding. The traits *viz*., X1 showed a high heritability estimate coupled with low genetic advance indicating that the trait was under the control of non-additive gene action (Table 7).

In the pooled analysis, GCV was higher for X9 and X10. The PCV was also higher for these traits. There was close agreement between GCV and PCV. The heritability estimates were always high (except X3, X4 and X5). The GA as a percentage over mean was higher for X6, X7, X8, X9 and X10. High heritability estimates coupled with high genetic advance as a percentage over mean were recorded for X7, X8, X9 and X10. Indicating that these traits may be under the control of additive gene action. The traits *viz* X1 and X2 had high heritability estimates with low genetic advance, indicating that these traits were under the control of non-additive gene action (Table 8).

It is quite interesting to conceive that the traits *viz*., 100 seed weight (X7) Total dry matter production (X8), Harvest Index (X9) and seed yield per plant (X10) had high heritability estimates coupled with high genetic advance consistently, over the seasons. They may be under the control of additive gene action. Similar results were reported by Kirubakaran (2018). Hence simple selection for anyone of the aforementioned four traits is likely to improve the productivity of rice in the east coast eco-system. It is also envisaged that gene action is influenced by the seasons.

Table 1: ANOVA

Traits	S_1	S_2	S_3	S_4	S_5	S_6	P
	GMS						
X1) Days to 50% flowering	130.2825**	143.9925**	67.2392	57.3083*	50.2175**	22.3550**	31.1575**
X2) Plant height	400.1792**	344.1583**	180.5158**	260.67	589.3633*	380.8450**	147.5567**
X3) Number of tillers per plant	30.8330*	20.0764*	14.1979*	17.5605	11.4992**	30.8728**	6.2270*
X4) Number of productive tillers per plant	20.7699**	16.8155**	9.1102	11.3352*	9.4620**	12.6973**	2.3460
X5) Panicle length	18.8176*	12.5823*	1.9828	6.2870**	23.1610**	21.6383**	4.1378*
X6) Number of grains per panicle	5258.2383**	4515.7866*	468.3667**	1158.7700**	2762.8015**	2222.1768**	948.4417**
X7) 100 Seed Weight	0.7148**	0.8279**	0.2095**	0.2172**	0.2538**	0.4975**	0.1792**
X8) Total dry matter production	846.9567**	629.2313**	422.3046**	534.6746*	889.9612**	308.5123**	227.2675**
X9) Harvest Index	318.9150**	301.6578**	243.1135**	320.4271**	161.8484**	311.4260**	98.9032**
X10) Seed yield per plant	221.4649**	204.3424**	37.34**	75.7022**	122.1223**	52.6172**	40.5332*

Table 2: Genetic parameters for yield and yield component traits in medium duration rice genotypes- S_1

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	6.33	6.46	96	12.77
X2	11.63	12.47	87.09	22.37
X3	17.12	22.50	57.88	26.83
X4	21.99	26.76	67.54	37.23
X5	9.53	13.18	52.29	14.19
X6	31.67	32.31	96.12	63.97
X7	25.04	26.37	90.18	48.98
X8	28.91	29.20	98	58.95
X9	24.56	27.59	79.24	45.04
X10	36.91	38.40	92.42	73.10

Table 3: Genetic parameters for yield and yield component traits in medium duration rice genotypes- S_2

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	6.64	6.72	97.53	13.50
X2	11.64	12.09	92.74	23.09
X3	15.65	21.75	51.82	23.21
X4	20.62	26.50	60.57	33.06
X5	8.08	11.89	46.17	11.31
X6	32.00	33.36	92.03	63.24
X7	24.92	25.49	95.62	50.20
X8	25.17	25.54	97.14	51.10
X9	24.53	27.07	82.1	45.78
X10	37.08	38.66	91.97	73.25

Table 4: Genetic parameters for yield and yield component traits in medium duration rice genotypes- S_3

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	0.12	2.70	90.02	10.20
X2	5.86	10.51	31.11	6.73
X3	8.37	16.20	26.73	8.92
X4	12.32	23.51	27.44	13.29
X5	2.27	5.03	20.31	2.11
X6	6.88	8.80	61.16	11.08
X7	15.04	15.43	95.08	30.22
X8	19.01	23.07	67.89	32.27
X9	25.82	31.00	69.39	44.31
X10	19.57	20.66	89.76	38.19

Table 5: Genetic parameters for yield and yield component traits in medium duration rice genotypes- S_4

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	1.23	2.00	37.71	1.55
X2	5.79	13.51	18.35	5.11
X3	8.38	19.77	17.95	7.31
X4	14.25	30.70	21.56	13.64
X5	3.61	9.08	15.84	2.96
X6	10.71	13.47	63.22	17.54
X7	15.20	15.91	91.34	29.93
X8	20.48	26.87	58.13	32.17
X9	29.60	34.29	74.54	52.64
X10	26.66	29.54	81.44	49.57

Table 6: Genetic parameters for yield and yield component traits in medium duration rice genotypes- S_5

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	3.87	4.23	83.7	7.29
X2	13.64	13.94	95.83	27.52
X3	8.68	10.46	68.9	14.85
X4	13.26	15.83	70.13	22.87
X5	11.24	11.84	90.01	21.96
X6	20.84	21.01	98.43	42.60
X7	15.26	17.43	76.6	27.51
X8	24.87	25.24	97.09	50.48
X9	17.94	18.86	90.52	35.17
X10	23.49	23.74	97.92	47.89

Table 7: Genetic parameters for yield and yield component traits in medium duration rice genotypes- S_6

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	2.64	2.77	90.93	5.19
X2	14.16	15.60	82.29	26.45
X3	20.33	24.06	71.43	35.40
X4	18.09	21.92	68.15	30.77
X5	13.12	15.98	67.45	22.20
X6	30.72	32.58	88.88	59.66
X7	19.58	19.68	98.97	40.12
X8	20.70	20.79	99.07	42.44
X9	27.58	30.16	83.63	51.96
X10	23.78	26.44	80.93	44.07

Table 8: Genetic parameters for yield and yield component traits in medium duration rice genotypes- pooled analysis

Traits	GCV	PCV	Heritability	GA (%) of mean
X1	3.12	3.21	94.43	6.25
X2	7.05	8.04	76.89	12.73
X3	7.12	10.28	47.92	10.15
X4	6.92	10.73	41.55	9.18
X5	4.65	6.15	57.13	7.24
X6	12.91	13.41	92.57	25.58
X7	12.81	13.01	96.93	25.98
X8	14.62	15.55	88.44	28.33
X9	15.15	16.35	85.8	28.90
X10	17.46	18.09	93.09	34.70

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