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GENOTYPIC VARIATION IN YIELD ATTRIBUTES AND YIELD OF RICE

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ABSTRACT

Experiment was carried out to bring out the genotypic variations from a broad genetic base and to utilise the best attribute in achieving higher grain yields. The results indicated significant genotypic differences in yield attributes and yield. The association analysis showed a significant positive relationship of grain yield with productive tillers, filled grain number per panicle, 1000 grain weight and harvest index. Among the yield attributes productive tillers, filled grain number per panicle and harvest index contributed to a greater extent in achieving the productivity. This indicates, the selection of numerically high value for each yield attribute and incorporating in a single genotype may boost the grain yields significantly to a higher level. However, grain size is not a preferable character in consumer point of view. Therefore, selection of genotypes with large number of productive tillers and filled grain per panicle may be worthwhile.

KEY WORDS : Rice, Yield Attributes, Yield, Genotypic Variation.

During the course of time, the yield potential of rice has been increased to a considerable extent with the introduction of semi- dwarf cultivars. However, this has reached a plateu and thus necessitates to break the yield barrier to meet the evergrowing demands of expanding population of the country. Exploitation of genetic potential in terms of yield from a broad genetic base is of much concern in the present trend. It has been demonstrated that, the grain yield of rice is the product of productive tillers per hill (Remabai *et al.*, 1992), number of filled grains per panicle (Schnier *et al.*, 1990; Samanthray *et al.*, 1992) and test weight (Rosamma *et al.*, 1992). Therefore to increase the grain yield beyond the currently attainable levels, cultivars must be found with larger yield contributing attributes. Thus, the objective of the study is to investigate the genotypic variations in yield attributes and yield among 49 medium duration rice genotypes and, to study the association and contribution of these attributes to grain yield.

MATERIALS AND METHODS

The study was conducted during rainy season at the University of Agricultural Sciences, Bangalore on clay loam soils (pH 6.9) of wet land. Experiment was laid out in randomised block design using 49 medium duration rice genotypes in four replications. Twenty-eight- day-old seedlings were transplanted in 10 lines of 50 hill rows with a spacing of 20 x 10 cm for each genotype in a replication. The crop was raised according to recommended package of practices for wet land paddy.

At the time of harvest, the yield attributes *viz.* tiller and productive tiller number per hill, number of filled grains per panicle, 1000 grain weight and grain yield were recorded from randomly selected 1.0 m row length in each replication. Harvest index was computed. Association between these characteristics was also studied. In addition, the contribution of each attribute towards grain yield across the genotypes was computed through multiple regression analysis.

RESULTS AND DISCUSSION

Significant genotypic variations were observed in all the yield attributes studied (Table 1). Similarly in the earlier studies, genotypic variations in grain yield were attributed to number of tillers (Ananda Kumar, 1992) and productive tillers (Choi, 1987; Remabai *et al.*, 1992), number of filled grains per panicle (Jiang *et al.*, 1989; Samanthray *et al.*, 1992), 1000 grain weight (Liu *et al.*, 1989; Rosamma *et al.*, 1992). Though there was a gradual increase in productive tillers with yield, the filled grain number per panicle and 1000 grain weight contributed to a greater extent towards the grain yield (Table 1). For instance, genotypes IET 8215, IET 8682 and IET 9279 had lower test weight where, the higher seed number per panicle was the yield determinent attribute. This indicates the possibility of selecting high yielding genotypes through these characters.

Table 1. Yield and yield attributes in rice genotypes

Genotypes	Tillers / 0.5m row	Prod. tillers / 0.5m row	Grain number / panicle	1000 seed wt. (g)	HI	Grain yield (g/0.5m row)
IET 6686	54.0	41.6	112	23.1	0.42	34.9
IR 26059	78.0	55.6	97	23.0	0.30	36.2
Gowrisanna	59.4	50.0	111	20.3	0.36	39.3
Gama 318	67.2	51.5	98	16.6	0.41	36.5
IET 8344	59.1	50.2	115	17.8	0.41	34.7
IET 6919	64.5	52.9	109	18.3	0.32	34.4
Pusa 150	53.9	41.7	93	18.6	0.42	33.1
IET 9276	57.2	47.9	91	20.0	0.39	38.4
GR 4	66.1	53.9	87	20.7	0.40	36.7
Rasi	57.1	40.7	73	19.9	0.42	34.6
Mangala	70.5	55.5	74	17.1	0.38	31.1
CH 2	73.0	51.0	73	19.4	0.39	36.0
IET 7986	55.6	40.2	160	23.2	0.46	48.7
IET 7303	58.9	51.0	176	22.6	0.40	41.9
IET 6759	49.9	44.4	119	25.2	0.47	47.4
IET 6703	55.7	48.2	186	20.4	0.32	48.6
Prakash	54.1	47.5	175	22.6	0.51	48.4
IET 9266	60.4	48.1	176	27.7	0.34	42.3
IET 8616	65.6	51.9	170	16.9	0.43	44.1
IET 9718	57.2	48.0	138	24.3	0.33	41.2
IET 8609	64.2	54.9	116	20.3	0.42	44.8
IET 8112	62.6	52.9	137	16.1	0.41	41.1
IET 8957	58.9	43.4	115	23.4	0.41	42.3
IET 8657	56.5	48.1	126	22.0	0.43	40.9
IET 7174	77.2	58.6	131	17.2	0.39	41.5
P (132) C	61.9	51.6	146	14.1	0.32	49.5
IET 1834	61.6	54.4	116	17.5	0.43	48.4
IET 7983	69.5	55.4	132	22.4	0.40	43.3
KMP 101	68.4	58.4	133	22.3	0.48	50.3
IET 8215	68.7	59.0	215	20.3	0.46	57.3
Pragathi	65.0	49.7	103	19.2	0.46	51.8
IET 9267	64.7	55.4	144	19.8	0.42	59.3
IR 574	56.5	48.1	100	19.8	0.49	50.1
IET 8659	58.4	51.6	140	19.8	0.31	54.1
IET 8635	64.6	62.2	120	24.3	0.50	53.1
BRNB 36718	51.9	46.9	130	21.8	0.47	52.3
IET 7252	62.6	52.4	102	23.2	0.50	53.8
IET 8893	59.5	49.4	109	22.2	0.50	55.4
IET 8033	59.7	49.2	129	21.5	0.52	51.8
IET 8679	60.2	51.4	187	27.8	0.48	61.8
IET 8682	43.9	33.6	339	19.5	0.50	69.9
A 200	62.1	49.0	161	18.4	0.43	69.0
Rajendran 202	73.1	64.1	126	24.0	0.46	64.1
IET 7978	69.1	57.7	97	26.1	0.51	66.9
KMP 40	59.9	54.9	118	23.1	0.57	71.2
Mahsuri	70.2	60.7	119	21.2	0.55	70.8
Karna	46.4	42.4	166	29.2	0.50	75.8
IET 7988	68.6	58.9	148	21.7	0.53	78.3
IET 7995	59.1	49.7	151	19.8	0.49	73.1
IET 9279	69.2	62.2	287	21.7	0.46	109.4
Mean	61.8	51.1	136	21.2	0.43	50.6
CD (P=0.05)	9.5	8.0	23	0.29	0.07	8.5

HI : Harvest Index

Table 2. Correlation matrix for yield attributes in rice genotypes

	Productive tillers	Seeds / panicle	1000 seed weight	HI	Grain yield
Tillers/hill	0.823 **	-0.273 *	-0.216 NS	-0.144 NS	-0.020 NS
Productive tillers	-	-0.115 NS	-0.064 NS	0.075 NS	0.264 *
Seeds / panicle	-	-	0.117 -	0.150 NS	0.574 **
1000 seed weight	-	-	-	0.321 **	0.298 *
Harvest index	-	-	-	-	0.599 **

NS : Non-Significant; Significant at P=0.05 (*) and P = 0.01 (**) HI : Harvest index

Table 3. Contribution of yield components to the grain yield in rice genotypes

	DC	SPRC	F-test	PC (%)
Tillers/hill	-0.239	-0.120	NS	-
Productive tillers	0.905	0.393	**	29.8
Seeds / panicle	0.150	0.508	**	38.5
1000 seed weight	0.438	0.094	NS	7.1
Harvest index	0.978	0.445	**	33.7

CD : Determination coefficient
SPRC : Standard Partial Regression Coefficient
PC : Per cent contribution of each attribute to grain yield

The correlation analysis showed that, grain yield was positively and significantly related with productive tillers, grain number per panicle, 1000 seed weight and harvest index (Table 2). Similar responses were reported by Niranjana Murthy *et al.* (1991), Remabai *et al.* (1992), Rosamma *et al* 1992), Roy and Kar (1992) and Samanthray *et al.* (1992). Total number of tillers, which are potentially capable of producing panicles and the number of productive tillers were related positively and significantly (r = 0.823). However, the total number of tillers did not have relationship to grain yield, because this varies depending on the cultivar and crop environment. This indicates, the no limitation of tiller production in present day cultivars, however, number of productive tillers are very important in determining grain yield compared to total tillers per hill (Krishnakumari, 1983). Total tiller number was negatively and significantly correlated with seed number per panicle and test weight. This infers the competition for the assimilates between tiller formation and other attributes. However, no relationship of productive tillers with seed number or weight suggests the possibility of achieving higher grain yields by altering any of these characters. Significant and positive relationship between test weight with harvest index and grain yields indicates the importance of grain size in producing higher grain yields. Highly significant and positive relationship of grain yield with panicle number and harvest index compared to other attributes indicates the sink potentiality and partitioning of assimilates in the determining the grain yields of rice.

Further, the contribution of each attribute (Table 3) to grain yield studied through multiple regression analysis prompts that, the productive tillers, grain number per panicle and harvest index are more important in yield determination across the genotypes. The lower contribution of test weight may be attributed to drastic variations usually observed, depending upon the genotype.

The data emphatically shows that, the selection of genotypes with high yielding attributes individually or in combination may enhance the grain yields further.

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YIELD GAP ANALYSIS IN RICE : THANJAVUR DISTRICT

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ABSTRACT

Yield gap was estimated for rice in Thanjavur district for three regions (old delta, new delta and coastal regions) and for dominant varieties only, covering 90 respondents during *samba* season for the year 1990-91. Yield gap I was highest in ADT 39 (9.2 kg per ha) followed by CO 43 and CR 1009 (679.6 kg). Yield Gap II was highest in CR 1009 (2011.7 kg) followed by CO 43 and ADT 39 (1506.35 kg).

KEY WORDS : Rice, Yield gap, Thanjavur Delta.

In Tamil Nadu, rice occupied an area of about 2.23 million ha and production is estimated around 5.6 million tonnes. It stands eight in area and seventh in production among the Indian States. There is considerable yield variation due to differential adoption level of new technology, varying degrees of water control, imbalances in infrastructural development and other associated factors. Rajasekar (1987) estimated the yield gap for rice in (1064 kg/ha) in Madurai district.

Swaminathan (1977) identified three types of yield gap *viz.*, yield gap I, II and III for wheat crop. According to him, the gap between the yield possible on theoretical considerations and the best yield so for achieved can be referred to as yield gap I which represents 'research gap' yield gap II can be referred as 'research - cum - management gap' is the gap between the best yield obtained in a research farm and progressive farmers yield. The yield gap III is the difference between the best yield realised by a farmer in a state and the state's average yield and it can be called as 'extension gap'.

The specific objective of the study is to estimate the yield gap in rice in a major paddy growing area. Though several studies have been carried out in the past to estimate the yield gap, the changing socio-economic scenario and time warrants more and more studies on this aspect. Hence this study was envisaged.

MATERIALS AND METHODS

For this study, Thanjavur district was purposely selected and has been characterised into three agricultural divisions each one representing the old, new and coastal area.

Based on area and production of paddy, one block was selected for each of the old, new and