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Study of Pattern of Variation in Hybrids of Tall and Dwarf Indica Rice (*Oryza sativa* L.)

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In order to study the pattern of variation in hybrids of Tall and Dwarf *indica* rice varieties, crosses were effected between the tall *indica* rice, CO. 29 and short stature with ideal plant type *indica* rice Dee-Geo-Woo-Gen. and F1 hybrids were raised and selfed. One of the F1 hybrids was selected at random and raised as F2 generation. Data on metric traits were collected in F1 hybrids, F2 populations and the parents studied. The correlations studied on different attributes and yield separately revealed that the size of grain, number of ear bearing tillers, plant height panicle length and number of spikelets/primary ear are highly correlated with yield.

Rice production has been increased manifold in the recent past through the advance in breeding techniques. This could be largely ascribed to the identification and utilization of the better genotypes in the hybridization programme and the change on the plant type concept has contributed in no small measures. The consumers now-a-days prefer fine grain type. With this object, to improve the quality, the tall *indica* variety that possess the fine grain type is hybridised, to single gene, ideal plant type, high yielder dwarf variety. The pattern of variation in plant attributes and yield with other economic attributes were studied and presented in this paper.

MATERIAL AND METHODS

The dwarf *indica* variety namely Dee-Geo-Woo-Gen and the tall popular *ndica* variety namely CO. 29 were aised in Kharif 1971. Crosses were effected and seeds collected. F1 hybrids and parent were grown. Data on morphological characters like height of plants, ear length, number of productive tillers, spikelet number per panicle, spikelet sterility, length of internodes, length and breadth of boot leaf; length, breadth, thickness and L/B ratio of grain, 100 grain weight, grain yield per plant and straw yield per plant were collected in all the available F1 hybrids and parents. The hybrids were selfed and the F2 progenis of one F1 plant selected at random was grown during Kharif, 1972.

Observations were recorded for characters individually in 393 plants for the pattern of variation in F2 generation as rocorded in F1 generation. However, in the following cases viz., the length, breadth, L/B ratio of grain, 100 grain weight, yield of grain per plant and yield of straw per plant, the data were collected and

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studied in 100 stratified samples. The data were analysed statistically adopting the method suggested by Panse and Sukhatme (1957). The mean differences, standard error, co-efficient of variability were estimated for parents, F1 hybrids and F2 progenies in respect of all the characters. In order to understand the segregating pattern of combination of characters, correlation was worked out between the different attributes separately. The significance was tested by means of Fisher's 't' test.

RESULTS AND DISCUSSION

The mean data collected for various quantitative traits in F1 hybrids and parents are presented in Table I.

The simple correlation coefficient between each of the five following characters and the yield of grain in the F_2 generation is presented in Table II.

TABLE II Simple correlation coefficient of characters with the grain yield in the F2 progenies

Particulars	CO.29 × D.G.W.G.
Plant height	0.181
Number of ear bearing tillers	0.740**
Panicle length	0.221
Number spikelet in the primary ear	0.307**
L/B ratio of grain	0.609**

** Significant at 1% level

Heterosis was manifested in plant height in F1 hybrids. The over dominance observed provide evidence for interactions of genes both inter and intra-allelic in nature. Similar results have been recorded by Dhulappanavar and Mensinkai (1967). Transgressive segregation was exhibited for plant height. Hetrosis was found expressed for tillering capacity by the F1 hybrids. This conforms the report of Karunakaran *et al.* (1964). In F2 generation, the cross showed 43 per cent of population recording value exceeding the tillers of the better parent. It found to be intermediate for number of ear bearing tillers. Wide range of panicle length and higher coefficient of variability encountered would suggest that the character, length of panicle, is governed by polygenes as reported by Ramiah (1930). The curve exhibited skewness toward the lower panicle length and transgression was observed. It is clear from the F2 distribution for panicle length that in simple ratio could be attributed for the segregation obtained. A possible reason for this situation is the problem of pollen and spikelet sterility found in the F1 hybrids. Previous workers like Riccharia and Misra (1959) have pointed out the hybrid sterility must restrict segregation and recombination in subsequent generations. Modified segregation ratios and restricted recombinations due to genetic and zygotic selection in hybrid progenies has been presented by Oka (1957). In F1 hybrids and F2 populations, lower number of spikelets, was recorded. The extent of variability was high with co-efficient of variability for number

TABLE I Quantitative characters of F1 hybrids and parents

	Co. 29 (Female Parent)			F1 (Co. 29 × D. G. W. G.)			D. G. W. G. (Male Parent)		
	Mean	S. E.	C. V.	Mean	S. E.	C. V.	Mean	S. E.	C. V.
Height of plant (cm)	124.6	± 0.61	0.49	131.9	± 0.73	0.55	90.7	± 0.44	0.49
No. of productive tillers	9	± 1.00	11.11	27	±10.72	36.00	6	± 1.12	18.66
Ear length (cm)	24.0	± 0.67	2.79	24.2	± 5.52	22.81	21.8	± 0.45	2.06
Spikelet number per panicle	139.0	± 6.70	4.82	122.25	± 4.32	3.57	148.20	±11.22	7.57
Spikelet sterility (%)	15.61	—	—	30.50	—	—	19.84	—	—
Length of internodes (cm)									
First	5.9	± 0.74	12.54	6.9	± 2.62	37.98	5.1	± 0.50	9.80
Second	18.0	± 0.80	4.44	17.6	± 4.24	24.09	15.8	± 0.94	5.95
Third	26.1	± 0.36	5.21	27.0	± 0.13	0.48	22.1	± 0.57	2.58
Fourth	32.8	± 0.91	2.78	36.5	± 5.16	14.14	28.3	± 1.57	5.55
Length of boot leaf (cm)	29.5	± 2.08	7.05	30.07	±12.16	39.60	25.0	± 0.77	3.08
Breadth of boot leaf (cm)	1.3	± 0.05	3.84	1.1	± 0.0	0.0	1.4	± 0.05	3.57
GRAIN									
Length (mm)	8.24	± 0.71	8.62	8.05	±43.34	5.38	7.97	± 1.32	0.16
Breadth (mm)	2.84	± 0.72	0.25	2.91	± 8.98	3.02	3.19	± 0.87	0.27
Thickness (mm)	1.89	± 0.71	0.38	1.93	± 4.31	2.24	1.87	± 0.87	0.46
L/B ratio of grain	2.78	± 0.13	4.51	2.62	± 1.70	58.22	2.45	± 0.07	2.86
100 grain weight (gm)	2.266	± 0.0	0.04	2.438	± 0.02	0.82	2.498	± 0.0	0.04
Grain yield/plant (gm)	6.588	± 0.50	7.59	17.746	± 0.84	4.73	18.852	± 3.35	17.77
Straw yield per plant (gm)	25.800	± 1.80	6.98	48.500	± 1.21	2.48	15.600	± 4.27	27.37

spikelet per panicle. Transgression was noticed for number spikelet per panicle.

The F1 hybrids showed intermediate expression for length of grain compared to parents. In F2 population, the cross recorded mid parental value for this trait. It is evident that this situation is also brought about by polygenic system as observed by Murthy and Govindaswamy (1967). Transgressive segregation was observed for length of grain. The segregating progenies for breadth of grain recorded mean values exceeding the midparental value (3.0mm). More number of population fell in the group between 3.01 and 3.11. Heterosis was recorded for thickness of grain in F1 hybrids and transgressive segregation was observed in F2 population. Bimodal curve was observed for this trait. The cross showed intermediate character in F1 hybrids for L/B ratio of grain. This finding is in conformity with the findings of Parnell *at al.* (1922). Transgressive segregation was recorded which indicate fhe polygenic control for this trait. This result is in conformity with the findings of Ramiah 1933). In the frequency distribution. finer grained types than the fine parent was obtained. More number of poputation fell in the group between 2.51 and 2-66. Intermediate value for weight of 100 grain in F1 hybrids was noticed. This supports he findings of Gorai (1968). The cross expressed transgressive segregation indicating polygenic system governing this trait. Bimodal distribution of curve was observed. Transgressive segregation and bimodal distribution of curve observed for yield of grain per plant, suggesting polygenic control for yield. Heterosis was found in F1 hybrids for straw yield. The maximum number of population fell in the group between 15 and 20. Regarding the length of bootleaf, the F1 hybrids expressed overdominance and in F2 generations, transgressive segregation was recorded, suggesting the polygenic control. There was a broader distribution and multimodal curve noticed. For the breadth of bootleaf, the segregating progenies recorded lower than the midparental value (1.17 cm) and transgressed both the parents.

Significant and high correlation between ear bearing tillers and grain yield was observed. This is an agreement with previous work done by Ghose *et al.* (1966). In respect of number of spikelet per panicle, significant positive and high correlation with yield was recorded. This finding is in support of previous work done by Yang (1970). Negative correlation was recorded by Ramiah (1933) for this trait. The size of the grain (L/B ratio of grain) showed significant, moderate and positive correlation with grain yield. This finding does not agree with the finding of Sane (1962).

The judicious use of the correlated characters will help in selection and combining these traits in plants possessing superior plant types.

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