https://doi.org/10.29321/MAJ.10.A02527

Madras Agric J. 71 (10) 634--639 October 1984

STUDY OF INHERITANCE OF CERTAIN QUANTITATIVE AND QUALITATIVE TRAITS ON DWARF AND TALL *INDICA* RICE VARIETIES (*Oryza Sativa* L.)*

K. S. PARAMASIVAN**

A tall and dwarf *Indica* rice varieties viz., Sandikar and Dee-Geo-Woo-Gen were crossed. Qualitative and quantitative traits were studied in F_1 hybrids. Eight hundred and twenty nine F_2 progenies were raised from randomly selected one F_1 hybrid plant. Quantitative traits viz., length, breadth and L/B ratio of grain, 100 grain weight, grain yield per plant, number of spikelet per panicle and yield of straw per plant in 100 stratified samples were recorded. The entire population was studied for height of plant, number of productive tillers and length of panicle. Simple correlation was worked out between plant height, number of ear bearing tillers, panicle length, number of spikelet in primary panicle, L/B ratio of grain and yield. Positive and highly significant correlation between ear bearing tillers, size of the grain and yield were observed.

The stabilization breeding can take the form of introducing wider adaptability to adverse conditions, resistant to pests and diseases and better grain quality. The greater emphasis on dry farming also demand the inculcation of hardiness to withstand severe moisture stress obtaining under rainfed areas. The evolution of varieties that possess the ideal plant type coupled with drought tolerance is indeed a crying need to suit the large chunks of dry tracts distributed throughout Tamil Nadu. Hene, with the object in view, to incorporate the drought tolerance coupled with high yield short stature and ideal plant type, the study was undertaken.

MATERIALS AND METHODS

The dwarf *indica* rice variety known for its short stature, ideal plant type and high yield, Dee-Geo-Woo-Gen (Dgwg) was crossed with tall *indica* local variety, Sandikar which possess drought tolerance. The seeds were obtained from Paddy Breeding Station, Coimbatore. Since the varieties differed in flowering duration staggared sowing was adopted during Kharif 1971 to synchronise the flowering time. The variety, DgWg, was used as ovule parent. Crossing was done and crossed seeds were collected, dried and sown.

The hybrids were raised in lines with a spacing of 60 cm x 30 cm and selfed. Data on quantitative and qualitative characters were studied in both the parents as well as in F_1 hybrids as described by Hutchinson an Ramiah (1938). The F_2 progenies of one F_1 plant at random was selected and raised between September and January 1971-72. Single seedling per hill with five rows was planted in a plot with

*Part of M. Sc., (Ag.) thesis submitted to The Tamil Nadu Agricultural University, Coimbatore.

**Associate Professor (Rice), School of Genetics, Tamil Nadu Agricultural University, Coimbatore - 641 003.

a spacing of 20 cm x 10 cm. Eight hundred and twenty nine plants were raised. Observations were recorded for the metric traits viz, length, breadth L/B ratio of grain, 100 grain weight, yield of grains per plant, number of spikelet per panicle and yield of straw per plant in 100 stratified samples. The entire population was studied for the traits viz., height of plant, number of productive tillers and length of panicle.

Data were analysed statistically adopting the method suggested by Panse and sukhatme (1957). In order to understand the pattern of segregation for combination of characters, simple correlation was worked out between different attributes separately. The significance was tested by means of Fisher's 't' test.

RESULTS AND DISCUSSION

A. Behaviour of first generation and parents

i) Qualitative characters

The hybrids of F_1 resembled the female parent in habit, general colour and leaf blade colour. They were like male parent in respect of husk colour and pericarp colour. They were above the mid-parental value in duration.

Table 1 Qualitative and quantitative characters of hybrids and parents

Particulars	Dg Wg	F_1	Sandikar
Duration (in days)	135	130	110
Habit	Semi-erect	Semi-erect	Erect
General colour	Dark green	Dark green	Green
Ligule Shape	Long	Long	Long
Leaf blade colour	Dark green	Dark green	Green
Panicle	Compact, erect slightly droopping	Compact, erect slightly drooping later	Compact, erect, slightly drooping later
Apiculus	Green	Green	Light purple
Stigma	White	White	Light purple
Mature spikelet colour	Straw colour, dirty brown in furrows	Straw colour	Straw colour
Pericarp colour	White	Dull white	Dull-white
Shattering	Non-shattering	Non-shattering	Non-shattering
Lodging	Non-lodging	Non-lodging	Non-lodging

ii) Quantitative characters

The mean performance of the parents and the F_1 hybrids with respect to various traits studied are presented in Table 2.

Table 2. Quantitative Characters of F_1 hybrids and parents

Particulars	DgWg	DgWg X Sandikar (F_1)	Sandikar
Height of plant (in cm)	90.7	84.4	134.3
Number of productive tillers	6	43	7
Ear length (in cm)	21.8	20.5	22.6
Spikelet number per panicle	148.20	129.50	131.00
Spikelet sterility	19.84	35.00	14.70
Length of internodes (in cm)			
First	5.1	5.5	4.2
Second	15.8	12.0	20.9
Third	22.1	18.3	29.3
Fourth	28.3	24.5	39.0
Boot leaf (in cm)			
Length	25.0	18.8	33.4
Breadth	1.4	1.1	1.4
Grain Length (mm)	7.97	7.34	7.97
Breadth	3.19	2.78	3.06
Thickness	1.87	1.87	2.01
L/B ratio	2.45	2.58	2.72
Weight of 100 seeds (gm)	2.498	2.80	2.875
Grain yield per plant (gm)	18.852	35.261	19.310
Straw yield per plant (gm)	15.600	111.000	13.000

B. Behaviour of F_2 generation

Quantitative trait

Comparisons were made between parents and progenies. The frequency distribution and mean values of parents and F_2 population were calculated ; besides standard error and coefficient of variation and discussed.

C. Correlation

Simple correlation coefficients between each of the five characters viz., (1) plant height, (2) number of ear bearing tillers, (3) panicle length, (4) number of spikelet in the primary ear, (5) L/B ratio of grain set grain yield, in F_2 generation were estimated and presented below (Table 3).

Table 3: Simple correlation coefficients of characters with grain yield in the F_2 population

Particulars	Values
Plant height with yield	0.106
Number of ear bearing tillers with yield	0.602**
Panicle length with yield	0.205
Number of spikelet in the primary ear with yield	0.166
L/B ratio of grain with yield	0.625**

**Significant at 1% level

Depression of height was observed in F_1 hybrids compared to the parents which indicates the presence of modifiers, negative in effect. None of the F_2 segregants showed similarity in height to that of tall parents and more F_2 plants occurred with values lesser than the shorter parent. No clear cut segregation could be computed. This feature indicates the action of modifiers on the major dwarfing genes brought in from the dwarf parent contributing to the apparent discontinuity in the F_2 distribution.

Heterosis was expressed for number of ear bearing tillers by the F_1 hybrids This conforms to the work done at IRRI, Philippines (Anon, 1965) Intermediate value was recorded for panicle length in the F_1 hybrids. In F_2 progenies, transgressive segregation was obtained forpanicle length indicating the action of polygenes and showed skewness towards higher panicle length. Similar results were recorded by Ramiah (1930). It is clear from the F_2 distri-

bution for panicle length that no simple ratios can be attributed for the segregation A possible reason for this situation is the problem of pollen and spikelet sterility found in the F_1 hybrids. Oka (1955, 1956, 1957) has pointed out that hybrid sterility might restrict segregation and recombination in subsequent generations. Modified segregation ratios and restricted recombinations due to gametic and zygotic selection in hybrid progenies have been obtained by Oka (1955, 1956 and 1957).

There was reduction in number of spikelet per panicle in F_1 hybrids and in F_2 progenies compared to the parents. In no case, the segregation pattern could be fitted into definite ratios. The reason pointed out already viz, sterility restricting recombination may apply here as well. Transgressive segregation noticed for this trait and coupled with high coefficient of variability would indicate that this character is also governed by polygenes as reported by Ramiah (1930). The F_1 hybrids showed value below the value of parents for length of grain. Transgressive segregation was expressed in F_2 progenies. It was evident that this situation is also brought about by polygenic system as observed by Murthy and Govindasamy (1967). Intermediate value was obtained for thickness of grain in F_1 hybrids. More F_2 plants with values better than the shorter parent was observed. In L/B ratio of grain and 100 seed weight, the hybrids expressed intermediate values. This finding is in conformity with the work of Parnell *et al* (1922). In F_2 progenies, transgressive segregation was obtained for 100 seed weight indicating polygenic system.

Dominance was noticed in F_1 hybrids for grain yield per plant. This is in conformity with Anon, (1963) Lower value than the low parent was recorded in F_2 segregants for this trait. Heterosis was manifested in F_1 hybrids due to over-dominance for yield of straw. For length and breadth of boot leaf, the plants registered low values than the shorter parent.

Significant positive correlation between ear bearing tillers and grain yield was obtained This is in agreement with previous work of wang (1967). The size of the grain (L / B ratio of grain) showed significant positive correlation with grain yield. This finding does not agree with the work of Sane (1962). No significant correlation was obtained for plant height, panicle length and number of spikelet in the primary ear.

The study has given positive information about the genetics of characters governing tall verses dwarf indices. The information provided herein can be made use of by the breeders for improvement of characters effecting yield. In particular, correlation studies are useful and provide guidelines for selection. By judicious use of the above indices in selection and combining improved selections,

new and superior plants possessing superior plant type and other agronomic characters can be built up.

ACKNOWLEDGEMENT

The author expresses his deep sense of gratitude to Dr. P. Chandrasekharan, the then Professor and Head, Department of Agricultural Botany, Agricultural College and Research Institute, Madurai, for his valuable guidance and encouragement in the progress of study The author expresses his heartfelt thanks to the Tamil Nadu Agricultural University, Coimbatore for granting permission to publish this article from M. Sc. (Ag) dissertation.

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