https://doi.org/10.29321/MAJ.10.A02191

Madras Agric. J. 74 (8 & 9) 369-372 August & September 1987

GENETIC ANALYSIS IN RICE (*Oryza sativa* L.)

S. KALAIMANI and M. KADAMBAVANA SUNDARAM

Genetic analysis of grain yield and yield attributes in rice, with 7x7 diallel revealed that although both additive and dominance components are significant for all the characters studied, additive genetic component was predominant for plant height and grain yield and non-additive genetic components for days to flowering, productive tillers per plant and number of grains per panicle. Over dominance was observed for days to flowering, productive tillers per plant and number of grains per panicle, dominance for grain yield and partial dominance for plant height and 100 grain weight. The breeding techniques to exploit the genetic components have been discussed.

In rice while the study of combining ability will be useful in proper choice of parents, a successful selection programme depends on the methods to exploit the available genetic variation in the population. In order to achieve this, a sound knowledge on the genetic architecture of the characters is a prerequisite. In the present study, an attempt has been made to elucidate information on nature of gene action involved on the six quantitative traits in rice using 7 x 7 diallel.

MATERIALS AND METHODS

Seven rice varieties viz, Cult. 340, ADT 3, ADT 16, Co 33, Co 37, IR 8 and IR 20 were chosen for the study and crossed in all possible combinations. The F_1s were raised in Randomised Block Design with three replications during *Kharif* 1983. Observations were recorded on ten randomly chosen plants and the mean values were used for statistical analysis. The genetic analysis was carried out using the methodology given by Hayman (1954).

RESULTS AND DISCUSSION

The results of analysis of variance for different characters revealed significant differences among parents and hybrids. The t^2 estimates to test the uniformity of the Wr. Vr values were not significant indicating fulfilment of assumptions. The estimates of genetic parameters for the characters studied are given in Tables 1 and 2. For all characters except 100 grain weight, the D and H_1 components were highly significant Similarly the H_2 component was also significant for all the characters except days to flowering. Only for productive tillers per plant, all the genetic parameters estimated were significant.

Plant Breeding and Genetics, Tamil Nadu Agrl. University, Coimbatore-641003.

Table 1. Estimates of t^2 and genetic parameters

Characters	D	H1	H2	h^2	F	E	t^2
Days to flowering	237.81±57.81 **	343.62±139.20 **	248.46±122.65	11.82±82.37	138.69+138.70	3.57±20 44	2 118
Plant height (cm)	301.43±12.00 **	136.63± 28.88 **	108.86± 25.45 **	167.07±17.09 **	—9.15± 28.78	3.32± 4.24	1.671
Productive tillers/plane	5.98± 1.04 **	7.31± 2 51 **	6.72± 2.21 **	6 72± 2.21 **	—5.33± 2 50 **	1.34± 0.37 **	3.457
Number of grains per panicle	355.38±31.98 **	488.60± 76.99 **	305.63± 67.84 **	361.82±45.56 **	—235.03± 76.72 **	2.50±11.31	0.399
100 grain weight (g)	0.13± 6.72	0.03± 0.02	0.02± 0.01 **	0.01± 9.57	1.04± 0.02 **	7.93± 2 37 **	1.648
Grain yield per plant (g)	45.00± 5.47 **	37.37± 13.16 **	35.94± 11.60 **	57.56± 7.79 **	—7.32± 13.12	1.56±1 93	0.252

** Significant at 1% level

* Significant at 5% level

Table 2. The ratios of genetic parameters

Characters	$(H1/D)^{\frac{1}{2}}$	H2/4H1	KD/KR	h^2/H2	Heritability	r(Wr+Vr)Yr
Days to flowering	1.202	0.181	1.641	0.048	0.965	—0.560
Plant height (cm)	0.673	0.199	0 956	1.535	0.981	—0.757
Productive tillers Plant	1.106	0 230	0.425	1.219	0.816	—0.409
Number of grains per panicle	1.173	0.156	0.560	1.181	0.994	—0.930
100 grain weight (g)	0.499	0.201	1.016	0 414	0.895	—0.819
Grain yield per plant (g)	0.911	0.210	0.836	1.434	0.945	—0.727

The genetic analysis showed the predominance of dominance genetic components for days to flowering, productive tillers per plant and number of grains per panicle and additive components for plant height and grain yield although both these were important for all the characters studied. The H_2 component is smaller than H_1 thereby indicating the unequal proportion of positive and negative alleles in the loci governing the characters. The asymmetrical distribution of genes in the parents was evidenced by the value of $H_2/4H_1$ which was less than 0.25 in all the cases. The value of KD,KR was less than the unity for productive tillers per plant, number of grains per panicle and grain yield showing the presence of more than one recessive allele per dominant allele. The number of alleles or groups of alleles showing dominance was more than one for plant height, productive tillers per plant, number of grains per panicle and grain yield as revealed by the h^2/H_2 value. However, this ratio usually under estimates the number of genes and provides no valid interpretation about gene groups exhibiting dominance (Singh *et al.*, 1979). Complementary interaction also depresses this value (Mather and Jinks, 1971). The mean degree of dominance indicated overdominance for days to flowering, productive tillers per plant and number of grains per panicle which was also brought about by the higher magnitude of overall heterosis for the traits. In the case of grain yield, dominance was observed which was also substantiated by the non-availability of exploitable level of heterosis over best check (IR 8). The high heritability value and higher magnitude of dominance effect for all the characters suggest the use of reciprocal recurrent selection technique for improving the characters. However, rice being a highly self pollinated crop forming single seed per pollination, this selection procedure is not practicable. So a possible choice is the use of biparental mating in early generation among selected crosses or use of selection procedure such as diallel selective mating (Jensen, 1970) to exploit both the additive and non-additive genetic components.

ACKNOWLEDGEMENT

The authors are thankful to the Tamil Nadu Agricultural University, Coimbatore for providing required facilities for the study.

REFERENCES

HAYMAN, B. I 1954. The theory and analysis of diallel crosses. *Genetics, 39* : 789-809.

JENSEN. N. F. 1970. A diallel selective mating system for cereal breeding *Crop Sci.*, *10* : 629-35.

MATHER, K. and J. L. JINKS. 1971. *Biometrical Genetics* 2nd ed. Chapman and HallLtd., London.

SINGH, F., R. M. SINGH, R. K. SINGH and R. B. SINGH. 1979. Genetic architecture of yield and its components in pearl millet. *Indian J. Genet.*, *39* : 292-297.

Madras Agric. J. *74* [8&9]: 372—376 August & September, 1987

NEED FOR MICRONUTRIENT FERTILIZATION IN INCREASING YIELD AND QUALITY OF SUGARCANE

K. R. KUMARESAN, R. DEVARAJAN P. SAVITHRI, T. S MANICKAM and G. V. KOTHANDARAMAN

A survey of sugarcane growing soils of Tamil Nadu state indicated micronutrient deficiencies of Zn (74%) followed by Fe (32%) and Cu (19%). Field experiments at five locations were conducted in the farmers field. The treatments comprised of different levels of $ZnSO_4$ (0, 37.5, 75 kg/ha), $FeSO_4$ (0, 100, 200 300 kg/ha), $CuSO_4$ (0, 12.5, 25 kg/ha) as soil application and foliar application of 0.5% $ZnSO_4$, 1 to 2% $FeSO_4$ on 90th, 110th, and 130th days. The sugarcane varieties tested were COC 671, COC 8001. Over all consideration of the five trials indicated that individual application of $ZnSO_4$ 37.5 kg/ha, $FeSO_4$ 100 kg/ha and $CuSO_4$ 12.5 kg/ha to the soils wherever these elements are deficient increased the cane yield. The increase was ranged form 0.75 to 11.8 tons/ha Foliar application of 0.5% $ZnSO_4$ and $FeSO_4$ were found to be equally effective. Combined application of Zn, Cu, and Fe failed to have an additional advantage and also at higher levels of $ZnSO_4$ 112.5 kg/ha and $FeSO_4$ 300 kg/ha, the cane yield was decreased. Micronutrient fertilisation of Zn and Fe improved the pole per cent of cane juice by 0.1 to 2.3%. The effect was more pronounced for Zn rather than Fe. COC 671 and COC 8601 had responsed well for the micronutrient fertilisation in increasing the cane yield and juice quality.

* Dept of Soil Science and Agrl chemistry, Tamil Nadu Agrl. University, Coimbatore-641003