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GENETICS OF QUANTITATIVE CHARACTERS IN SHORT DURATION RICE(*Oryza sativa* L.)

C.V. DHANAKODI and M. SUBRAMANIAN
School of Genetics, TNAU, Coimbatore.

ABSTRACT

A study with 12 crosses involving short duration rice varieties revealed the predominant role of dominance components over additive components for all the traits studied, indicating the possibility of exploiting hybrid vigour. Additive X additive for ear bearing tillers per plant, grain number per ear and 100-grain weight, additive X dominance for plant height and dominance X dominance for ear length and grain yield were the major components of genetic variance. For all the traits, the most common was the complementary type of epistasis. The crosses Co 41 X ADT 37 and IR 50 X ADT 37 were identified as promising to exploit both additive and additive X additive components in varietal improvement programme through the use of biparental mating in F_2 generation.

In rice, as in other crops, the grain yield is a complex character but its component traits are relatively less complex. If the genetic architecture of the genotypes and the nature of gene action for different traits are known, it will help the breeder to incorporate those genes governing the desirable attributes in an otherwise agronomically acceptable strain. Besides, effective breeding procedure could also be evolved based on the gene action for the improvement of various component traits. With this objective, an investigation was undertaken to know the genetics of yield and its component traits in short duration rice varieties.

MATERIALS AND METHODS

The materials for this study consisted of six generations (P_1, P_2, F_1, F_2, B_1 and B_2) of twelve cross combinations involving ADT 37 (1), Co 41 (2), IR 50 (3) and ADT 36(4). These genetical populations were raised in randomised block design with three replications during June-September 1989 at Rice Research Station, Ambasamudram by adopting a spacing of 20 X 15 cm. between and within rows. Parents and F_1s were shown in two row plots; B_1s and B_2s were raised in four row plots while F_2s were accommodated in eight row plots. The data were recorded on six quantitative characters, namely plant height, ear bearing tillers per plant, ear length, grain number per ear, 100-grain weight and grain yield.

The adequacy of the data for a simple additive-dominance model was tested utilizing the scales A, B and C of Mather and Jinks (1971). The additive-dominance model was considered inadequate when any one of the three scales was found to deviate significantly from zero. In cas where the scales A, B and C values significantl differed from zero, assuming a digenic interactio model six parameters m, ($\hat{d}$), ($\hat{h}$), ($\hat{i}$), ($\hat{j}$) and ($\hat{l}$ were estimated (Jinks and Jones, 1958).

RESULTS AND DISCUSSION

The estimates of genetic effects revealed tha the dominance ($\hat{h}$) component played a major role in the expression of the genetic variation and was positively significant in all the crosses for ear bearing tillers per plant and grain yield and in majority of the crosses for plant hiehgt, ear length and grain number per ear. On the other hand, though, additive ($\hat{d}$) gene effects were also noticed, it was found to be positively significant in majority of the crosses for plant height only. So, in general, the magnitude of dominance gene effects was more than that of additive. Thus, the presence of dominance gene effects in greater proportions indicated the possibility of exploiting hybrid vigour. These findings are in agreement with the results of Subbaraman (1984) in rice.

Scaling tests indicated presence of non-allelic interactions for all the characters in almost all the crosses except a few as reported by Ganapathy (1989). The epistatic effects were, in general, much greater than additive component but lesser than dominance gene effects. This is in conformity with the findings of Subbaraman (1984). Of the three digenic effects, ear bearing tillers per plant, grain number per ear and 100-grain weight were found to be controlled by more of additive X additive ($\hat{i}$) type of interaction component; plant height by additive X dominance ($\hat{j}$) and ear length and grain

yield by predominance of dominance X dominance ($\hat{l}$) interaction effects. Moreover, it is evident from the results on gene effects that positive and significant additive X additive interactions prevailing in crosses 2 X 1 and 3 X 1 for all the traits indicated that selection would be advantageous in further generations. While the presence of negatively significant dominance X dominance gene effects in most of the crosses for ear bearing tillers per plant, ear length, grain number per ear and grain yield showed that a diminishing effect due to this type of gene action could occur. Similar observations were reported by Singh and Rai(1987) in bread wheat. On the basis of unlike signs of ($\hat{h}$) and ($\hat{l}$) components, all the crosses for ear bearing tillers per plant, ear length and grain yield and majority of crosses for plant height, grain number per ear and 100-grain weight showed the operation of complementary type of epistasis for all the traits studied, thus, indicating fixable nature of the characters under selection in advanced generations. Kaushik and Sharma (1988) had also observed similar predominant role of complementary gene action. The additive X additive interaction coupled with duplicate type of epistasis in cross 3x1 for all the traits indicated the possibility of improvement for higher grain yield through yield components.

Of the twelve crosses studied, two viz., Co 41 X ADT 37 and IR 50 X ADT 37 could be used successfully in rice breeding programmes in view of the presence of dominance ($\hat{h}$) component and sizeable amount of additive ($\hat{d}$) component of genetic variance. These two crosses could also be used for the exploitation of both additive and additive X additive components through biparental mating in F_2 generation as suggested by Gill *et al.* (1973).

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RESPONSE OF SORGHUM-WHEAT ROTATION TO DIFFERENT SOURCES OF ZINC IN VERTISOL

J.S. DASALKAR, G.B. RUDRAKSHA, B.T. LAWAND and S.N. RACHEWAD
Marathwada Agricultural University, Parbhani 431 402 (M.S.).

ABSTRACT

A field experiment was conducted to study the efficiency of different sources of zinc in sorghum-wheat crop rotation on calcareous vertisol of Parbhani. Zinc application 4kg Zn/ha through zincated superphosphate proved its superiority over other zinc sources in producing grain and fodder yield of sorghum. Among the zinc sources, the residual effect of zincated superphosphate was significantly higher in producing grain and straw yield of wheat followed by farm yard manure and zinc sulphate. Zinc application @ 4kg Zn/ha through different Zinc sources significantly increased uptake of Zn,N and P by wheat crop. Highest uptake of nutrients was recorded with zincated superphosphate in both the crop.

Takkar (1986) recorded large areas of zinc deficiency in the country followed by iron and manganese. To preserve soil Zn status, it is necessary to develop suitable strategy of Zn management particularly under intensive cropping pattern. Very little information is available on zinc management using different zinc sources in different cropping sequences and their residual values. Zinc containing fertilizers are available for use under the different trade marks and therefore it