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Short Communication

Genetics of salt tolerance in rice (*Oryza sativa* L.)

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An attempt has been made to study the genetics of salt tolerance adopting generation mean analysis involving eight crosses in rice (*Oryza sativa* L.). The eight crosses involved four salt tolerant genotypes (IET 14543, IET 14552, SSRC 92058 and SSRC 92076) and two susceptible genotypes (TKM 9 and ADT 36). Six generations *viz*., P_1, P_2, F_1, F_2, BC_1 and BC_2 of each cross were raised in a randomized block design with three replications during February 1997 at Pandit Jawaharlal Nehru College of Agriculture and Research Institute Karaikal with saline water. The irrigation water used in the study, as per United States Soil Salinity Laboratory (USSL) classification (1), is saline-alkaline as indicated by high Sodium Adsorption Ratio (SAR) and Residual Sodium Carbonate (RSC) respectively (EC = 2.44 dS/m, pH = 8.40, SAR = 22.40 and RSC = 18.60 meq/l). The spacing was 30 cm between rows and 20 cm within rows. The total number of plants raised in each replication was 30 for parents and F_1, 60 for backcross generations and 200 for F_2's. Observations on days to 50% flowering, plant height, productive tillers plant^{-1}, grain number panicle^{-1}, spikelet sterility, panicle length (cm) and grain yield plant^{-1} were recorded on 10 plants each on parents and F_1, 120 plants in F_2 and 35 plants each in BC_1 and BC_2 generations. The means and variances of means of the seven traits were computed for each generation of all the crosses. The genetic effects were estimated using the models suggested by Mather and Jinks [2].

An epistatic digenic interaction model was assumed as evidenced from the significance of all the scales for all the traits in all the crosses. In general, the dominance effect (h) was predominant for all the traits except grain yield plant^{-1}. The ranges of (h) and (d) estimates are –104.86 to 227.94 and 0.90 to 13.94 for days to 50% flowering; –351.28 to 4.06 and –1.12 to 8.86 for plant height; –8.11 to 58.77 and 0.70 to 4.36 for productive tillers plant^{-1}; –132.17 to 293.79 and –18.65 to 7.43 for grain number panicle^{-1}; –55.32 to 90.02 and –2.94 to 6.71 for spikelet sterility; –42.58 to 66.55 and –1.23 to 2.45 for panicle length; –41.16 to 68.66 and –1.43 to 1.80 for grain yield plant^{-1}. The predominance of dominant effect for these traits was earlier reported by many workers in rice under salinity (3). However for grain yield plant^{-1}, both additive and dominance effects were important. This is in conformity with the results obtained by Mishra *et al* (4). The interaction effects (*l*) ranges from –136.20 to 59.13 for days to 50% flowering; –3.29 to 245.32 for plant height; –39.98 to 8.90 for productive tillers plant^{-1}; –82.80 to 93.76 for grain number panicle^{-1}; -80.48 to 23.85 for spikelet sterility; –34.11 to 28.56 for panicle length; –44.12 to 22.13 for grain yield plant^{-1}. Among the interaction components, dominance × dominance (*l*) gene effect was predominant for all the traits except productive tillers plant^{-1} and grain yield plant^{-1} where both additive × dominance (j) and dominant × dominant (*l*) gene effects played a major role in all the traits studied.

In majority of the crosses (h) and (*l*) effects had opposite signs for all the traits. Eight crosses for days to 50% flowering and panicle length; seven crosses for plant height, productive tillers plant^{-1} and spikelet sterility; six crosses for grain number panicle^{-1} and grain yield plant^{-1}. Therefore duplicate kind of epistasis played a prominent role in governing all the traits than complimentary type of interaction.

As a whole, the dominance and epistatic interaction effects appear to govern grain yield plant^{-1} and its components. Since the preponderance of non-additive gene action for majority of the traits, improvement of these traits appeared to be difficult as simple pedigree breeding will not be able to fix useful segregants in the early generation. Hence one or two cycles of recurrent selection followed by pedigree breeding will be more effective and useful for improvement of these traits. In another approach the improvement of these characters could also be achieved by adopting biparental mating in F_2 among the selected plants or following selection procedures such as diallel selective mating (5). Due to presence of considerable amount of dominance component for most of the traits, heterosis breeding will also by rewarding for the improvement of economic traits adopting cytoplasmic male sterile line.

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