"Genetics of Cold Tolerance in Rice (*Oryza sativa* L.)"

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Abstract

Rice is the foremost important major cereal grown across the world with dietary and rational for the global population. Low temperature or cold affects rice crops from seeding and it's all most all the growth phases *i.e.* germination, seedling, tillering, and pollen development cum seed set whereas; germination, seedling, and pollen development are most sensitive and critical. East and North East India were affected by the cold. Looking at the need of the region the research study was conducted to study the genetic diversity, cold tolerance screening at germination and seedling stage along with inheritance of cold tolerance.

Low temperature exhibits cold tolerance and sensitive genotypes in screening and then were crossed to estimate the genetic variance components, combining ability, gene action and heterosis involving genotypes and crosses. Genetic diversity was evaluated from 53 diverse rice genotypes obtaining data from agro-morphological traits. The genotypes were grouped into13 clusters and maximum numbers of genotype were in cluster I (27). The trait contribution was found to be highest for number of tiller and test weight (25.04) followed by panicle length (26.13), plant height (26.4) and tiller number (21.34).

Three sets of experiments were done to ascertain the genotypes for cold tolerance, namely under natural field condition (5 0c night and 23 0c days temperature) and the laboratory condition (28 0c and 15 0c). The germination % and seedling growth were evaluated for the genotypes. The genotypes, Bhalum 3, CO 51 and Shyamla were identified as promising cold tolerant, whereas the genotype BR 29, Shatabdi, Khitish, IR 64, IBD 1, R. Bhagaboti and MTU 1010 were found to be susceptible to cold.

A hybridization program was carried out between cold tolerant and susceptible genotypes following line (L) x Tester (T) mating design, in subsequent years 24 crosses from 8 lines and 3 testers following L x T matting design were evaluated in the laboratory for germination %, coleoptile (cm), root length (cm) and shoot length (cm). The crosses were also planted in the field in RCBD design and data were analyzed for yield and yield components following L x T mating design The parents, IBD 1 and BR 29 among the lines and Shyamla and Bhalum 3 among the testers were found to be good general combiners for seed yield and yield components as general combing ability (GCA) of these parents were high and positive. The specific combining ability of five crosses for seed yield namely, IBD 1 x Shyamla, BR 29 x Bhalum 3, BR 29 x Co 51, BR 29 x Shyamla and IET 1444 x Shyamla were found to be good and significant. The study gives a preliminary knowledge about impact of low temperature in rice breeding program and further detailed study involving identified crosses. Among the crosses desirable segregants with high yield coupled with cold tolerance especially in the seedling stage and reproductive stage would help to develop new genotypes adoptable to agro-climatic zones of West Bengal.