



# Heterosis for phenological and root morphological traits in rice (*Oryza sativa* L.) under moisture stress

N. NARESH BABU\* AND SHAILAJA HITTALMANI

Marker Assisted Selection Laboratory, Department of Genetics and Plant Breeding, University of Agricultural Sciences, G.K.V.K., BENGALURU (KARNATAKA) INDIA

**Abstract :** Rice is one of the important food security crop of world. Drought is the major yield destabilizing factor in irrigated rice cultivation. To maintain rice production stable there is need to develop drought tolerant genotypes with better root characters like increased root growth, increased number of roots and volume/mass. The material for the present study comprised of four cytoplasmic sterile lines and eight testers are crossed in line X tester design to produce  $F_1$  hybrids during *Kharif* 2009 Z.A.R.S, V. C. Farm, Mandya. Lines, testers and hybrids were grown in PVC pipes and low moisture stress was imposed for 15 days at vegetative stage during summer 2010 under green house condition at GKVK, UAS, Bengaluru. Observations were recorded and statistical analysis was done using standard methods. Analysis of variance showed significant variation in all seven characters studied. IR68897B, IR 58025B, MAS 868, qRT(1+7)-8 and MAS 25 exhibited largest root length, total number of roots, root volume under stress. These lines and testers can be used for development of hybrids for moisture stress and aerobic condition. Among hybrids IR68888A/OYR-128, IR68897A/OYR-128 and IR79156A/OYR-128 showed high per cent of heterosis over better parent. These hybrids can be further evaluated for yield under varied moisture condition and superior hybrids can be proposed for commercial cultivation under drought condition. The heterosis of root traits is the one of the major cause for increased drought tolerance of hybrids over parents which can be exploited with high yield under drought situation to stabilize rice yields.

**Key Words :** Heterosis, Drought, Moisture stress, Rice, Root characters

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## INTRODUCTION

Rice (*Oryza sativa* L.) is the staple crop for more than two thirds of the world population and gives 35-60 per cent of calories requirement (Khush, 2005). Drought is the most important abiotic constraint that reduces yield in rainfed areas. Limited water availability due to inadequate and erratic rainfall has contributed 15 per cent loss in rice production (Dey and Upadhaya, 1996). Drought tolerance is a complex trait, depends on several expressed and constitutive traits. Root characteristics are the one of the important traits in phenotyping of drought as root is the first organ that comes in contact drought stress (Adanan *et al.*, 2004). Increased root growth, increased number of roots and volume/mass and its ability to grow deep during moisture stress to withstand water deficit situation is important for a genotype (Ganapathy

and Ganesh, 2008). Even though there are several varieties developed for aerobic and drought stress conditions many of them have to be complimented to break the ceiling of yield and exhibit vigour for higher production with limited water available (Naresh Babu *et al.*, 2011). Hybrids play a great role to increase yield due to heterosis (Virmani and Edwards, 1983). In some of the cases the hybrids attain yields 100 per cent higher than varieties. There is need to breed a genotype for better root characteristics along with higher grain yield and recovery after drought spell and these genotypes can be used in heterosis breeding. The objective of this study was to identify genotypes and hybrids having heterosis for better root characteristics to thrive well under moisture stress. This will provide insight into the development of high yielding drought tolerant hybrid rice cultivars with good root characters.

\* Author for correspondence.