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Development of miR156 resistant Ideal Plant Architecture (IPA1) gene in 'HKR127' through CRISPR-Cas9: enhancing number of spikelets per panicle in rice

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Abstract:

Rice (*Oryza sativa* L.) is the second most important cereal crop utilized exclusively as human staple food for 50 % of the world's population. World agriculture has been able to meet the rapidly growing global demand for food over the last half century. Hybrid rice is a viable practical genetic option for increasing the rice productivity as it gives 1.0-1.5t/ha additional yield over conventionally bred varieties. However, in recent years, yield growth rate of hybrid rice have slowed down notably in many countries due to climate change. Therefore, it is time to develop the climate resilient hybrid rice varieties which could cope with the prevailing climate variabilities. The need for diverse and multiple genetic ameliorations is generally accompanied by demanding time frames. Since, breeding programs in the conventional mode would not be able to measure up to these challenges. Therefore, an alternative approach like Double haploid breeding is gaining its popularity as it offers a rapid mode of truly homozygous line development that helps to expedite crop breeding programs where homogeneity is an absolutely essential parameter for rapid varietal development. Doubled haploid technology coupled with Marker Assisted Selection (MAS) could be potential in development of improved cultivars in rice. Currently, there is a need to develop hybrid rice which could cope with degenerating climatic conditions and evolving pathotypes. As development of hybrid rice cultivars, a three line system i.e. A, B, R lines were mostly employed as rice is a self-pollinated crop. Therefore, improving parental donor lines (Maintainer (B) and Restorer (R)) by pyramiding of bacterial blight genes such as (Xa21, xa13), submergence (Sub-1), tiller angle control (TAC1), heading date (Hd3a), phosphorus tolerant (PsTol) and spikelet fertility in high temperature (qHTSF4.1) through convergent doubled haploid breeding approach will assist in development of superior hybrids.

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