

## Development of mapping population (s) for 21 days submergence tolerance in rice: characterization of Sub1 locus using CRISPR-Cas9 approach

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### Abstract:

Submergence stress unfavorably affects poor farmers' living in 15 million ha of rice-growing areas in the rainfed lowlands in south and south-east Asia. Cultivation of non-tolerant submergence high yielding rice varieties endures crop losses to the farmers due to periodic flash floods in the monsoon season. India has the largest area (17.2 million hectares) under rainfed lowland amongst the South-east Asian countries while about 75% of the world lowland rice is in the belt across Eastern India, Bangladesh, Myanmar and Thailand. To address such problem, development of rice varieties with tolerance to flood is the need of the hour. Though the Sub1 gene possessing 14 days (two weeks) tolerance to submergence has been identified, cloned and characterized from FR13A and transferred to number of rice varieties through marker assisted introgression, additional genes imparting flood tolerance for 21 days (3 weeks) or more is required because of regular flooding in India and south-east Asia due to climate change. Therefore, ICAR-NRRI, Cuttack identified a genotype, AC 20431B which imparts submergence tolerance up to 21 days. The mapping population, Recombinant Inbreed Lines (RILs, F7) and BC2F2 have been developed for genotyping and mapping of 21 days submergence tolerance genes. Moreover, the Sub1 locus in AC20431B was also assessed using a total of 10 gene-based markers. It was found that Sub1A tolerant allele is also present in AC20431B along with Sub1B and Sub1C genes. Further, CRISPR/Cas9 based gene editing approach will be followed which will help in understanding the Sub1 association with 21 days tolerance.