Molecular screening and diversity for salt tolerance in rice genotypes

Rice (Oryza sativa L.) is a staple food for almost half of the world's population. The world's population is expected to increase to more than 9 billion by the year 2050, which will increase the pressure for agricultural production from saline wasteland. Soil salinity is a major abiotic stress in plant agriculture and affects about 1000 m ha land worldwide. There is therefore an urgent need to develop high-yielding salt-resistant varieties to ensure the sustainability of agriculture. The key to achieving food security and alleviating poverty is increasing rice productivity at salt affected areas.

Rice is sensitive to salt stress, particularly at the seedling stage and during reproduction, and tolerance at these two stages is weakly associated and involves several independent mechanisms (Ismail et al. 2007). Therefore there is an urgent need to grow salt tolerant crops, which requires reliable screening techniques to evaluate rice genotypes. Molecular markers provide a reliable and fast screening at the early vegetative stage through DNA and PCR analysis which saves time of several years. Molecular markers are tools which allow selection for particular characters to be done on the basis of a simple laboratory test on a small amount of leaf or grain tissue, rather than direct measurement of the character itself and can be used as chromosome landmarks to facilitate the introgression of chromosome segments (genes) associated with economically important traits. With the advent of molecular markers, a new generation of markers has been introduced over the last two decades, which have revolutionized the entire scenario of biological sciences. In conventional breeding along with the gene of interest, undesirable characters also co-inherited, and would be eliminated only through extensive back crossing (BC) followed by rigorous selections because it rely on the transfer of whole genome. Marker assisted breeding increases the efficiency of developing improved varieties by allowing selection at early stage and reduces the number of breeding cycles. It is also evident that molecular markers offer several advantages over traditional phenotypic markers as they provide data that can be analyzed objectively. This gives new dimensions to breeding especially with respect to the time required for developing new and improved crop varieties.

Salinity tolerance in rice is complex and involves several contributing traits. A major quantitative trait locus(QTL), named *SALTOL*, was mapped on rice chromosome 1 at IRRI using a recombinant inbred line (RIL) population between tolerant Pokkali and sensitive IR29 which is involved in ion uptake regulation. (Gregorio 1997, Bonilla et al 2002). To increase the tolerance against salt stress *Saltol* linked markers should be transfer in high yielding rice varieties through marker assisted breeding. The rice genotype with diverse genetic backgrounds differs in adaptation to saline soils. By intercrossing genotypes with diverse salt tolerance mechanisms from microsatellite clusters different salt tolerance components can be combined into a cultivar.