Molecular Breeding for Abiotic Stress Tolerance in Food Legumes

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Abstract

Legumes as food crops play an important nutritional role in the diet of millions of people living in developing countries, and are referred to as the "poor man's meat". They provide vital sources of protein, calcium, iron, phosphorus and other minerals. In addition to those legumes cultivated for human consumption, many yield important fodder, forages and green manure since they assist in nitrogen fixation. In spite of their great importance in national, regional and climatological contexts, poor productivity is a cause of concern. Legumes are often exposed to environmental stresses (biotic and abiotic) that decrease productivity throughout the world. Abiotic stresses (salt, drought, UV, nutrient deficiency) alone are responsible for more than 50% yield losses due to use of traditional practices, lack of adequate quantity of improved seeds. A better understanding of genetic basis of abiotic stress tolerance in crop plants based on various morpho-physiological traits is a pre-requisite to evolve superior genotypes through either conventional breeding methodology or genetic engineering and a great deal of work needs to be done to use diverse sources of resistance and develop cultivars with tolerance to multiple stress factors. In recent years, tremendous progress has been made towards developing genetic markers especially SSRs, SNPs, and or construction of high density linkage maps which have enabled breeders to more precisely characterize genetic diversity, identify trait based genetically diverse germplasm and target genes underlying key agronomic traits and develop molecular assays that are both relevant and of appropriate scale for breeding applications. Use of high-throughput and cost effective genotyping platforms, combined with automation in plant phenotyping, will encourage application of genomic tools into breeding programmes, and thus, lead in an era of genomics-enabled molecular breeding in legumes.

Keywords: Molecular breeding, genetic markers, genetic diversity, genotyping