BRE1715: 50K Single Nucleotide Polymorphisms (SNP) Chip Development for Genomic-Enabling Chickpea Breeding

Chickpea is a pulse crop of great economic, environmental, and scientific importance. DNA chip or array-based single nucleotide polymorphism (SNP) technology is becoming widely used as the genotyping platform of choice in breeding programs due to high accuracy, relatively easy workflow, and less requirement for computational resources to process the data. This research focused on the development and application of a DNA chip containing over 60,000 SNPs in chickpea. The SNPs were selected based on the sequence variability of 250 chickpea accessions from the CDC chickpea breeding program including commercial cultivars, breeding lines, and landraces. The SNPs were distributed across all eight chickpea chromosomes with 59% of the SNPs located within the known genes, with the remaining SNPs located in inter-genic regions. Initial tests indicated 82% of the SNPs probes were classified as best performing in assay. The use of the newly developed DNA chip in the analyses of five recombinant inbred populations showed an average of 24% polymorphic rate between the two parents in each population. Quantitative trait loci (QTL) analyses using the genetic maps developed based on the current SNP chip identified a suite of genetic loci associated with phenology and other agronomic traits in chickpea. Further application on a diversity panel in a genome wide association study identified loci associated with seed protein and oil content in chickpea. As global demand for improved nutritional quality is growing, chickpea breeding efforts targeting seed quality, such as protein and oil, becomes increasingly important. The use of the current DNA chip would help in selection targeting seed protein and oil content in chickpea. Moderate accuracy was obtained when the current DNA chip was used in genomic selection (GS) for grain yield and seed quality. In conclusion, we have developed *Cicer* 60K SNP chip that greatly enhances the genetic study and molecular breeding in chickpea.