

Quantitative trait loci (QTL) for Yield and its Related Traits in Chickpea under Drought Conditions in Kenya

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ABSTRACT

Yield and its related traits are complex traits controlled by many genes each contributing small effects. Their expression are also highly affected by environment and genotype x environment interactions. Utilization of molecular markers that are closely linked to the quantitative trait loci (QTL) of interest makes it possible to track these traits with the help of marker assisted approaches. The aim of this research was to identify QTL associated with yield and its related traits under irrigated, rain-fed and across environments. The experiment was conducted using chickpea F₅₋₆ families developed from two crosses, ICCV 05107 x ICCV 94954 in five environments. Genotypic data was obtained using 49 polymorphic simple sequence repeat (SSR) markers conducted in International Crops Research Institute for Semi-Arid Tropics (ICRISAT), India. Phenotypic data was obtained from field experimental setup in 19 x 10 alpha lattice design replicated three times in three sites. Analysis for genotypic data was done using GeneMapper software version 4.0 while phenotypic data analysis was conducted using SAS software version 9.2. QTL detection was achieved using IciMapping. A linkage map spanning a total length of 335.04 cM was generated. Eight QTLs were identified and mapped; three for above ground biomass, one on Linkage Group (LG) 3 and two on LG 4 (8.67-32.4% phenotypic variation expressed, PVE). Two QTL for yield were mapped on LGs 4 and 6 (8.24-11.08% PVE). One QTL each was mapped for 100-seed weight on LG 1 (12.19% PVE), Harvest Index (HI) on LG 8 (9.9% PVE) and days to maturity on LG 4 (13.31% PVE). Marker trait associations and genes associated with QTL for yield related traits identified and mapped will be useful for molecular breeding for yield in chickpea improvement. However, there is need for more markers or actual genes to be mapped in these regions.

Keywords: Chickpea, yield traits, Quantitative trait loci, Drought, Molecular markers