

THE B1 LOCUS THAT CONTROLS APICAL SHOOT BRANCHING IN *HELIANTHUS ANNUUS* EXHIBITS A MOLECULAR DIVERSITY LINKED TO THE BREEDING HISTORY OF HYBRIDS

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ABSTRACT

During domestication, shoot branching has been discarded for selection in sunflower. However, when selection entered the F1 hybrid era approximately 50 years ago, a recessive shoot branching gene was widely deployed in male lines in numerous breeding programs, mainly because multi-head architecture allows a more extended time window for pollen availability, thus securing hybrid seeds production. The vast majority of male lines used in breeding programs for sunflower have the branched phenotype. The *b1* locus controlling apical shoot branching mapped on LG10 in a segregating population (recombinant inbred lines) obtained from the cross between XRQ (an unbranched line) and PSC8 (a branched line). We developed two near isogenic lines (NILs) that only differed one from the other by the genomic region of the chromosome 10 containing the *b1* gene. A large F2 population (approximately 6500 individuals), derived from the two NILs, was used to reduce the genetic window containing the *b1* locus. The entire population was genotyped with two markers surrounding the *b1* locus. All recombinant plants were phenotyped and the locus was mapped in a 0.3cM window. BAC clones located in the *b1* region were identified *in silico* and sequenced. The genomic region didn't fully cover the genetic interval but candidate genes were identified. Re-sequencing experiments inside and around the *b1* locus, on a set of 192 lines, allowed us to analyze the molecular diversity. We performed diversity analysis (HKA test, Tajima's D, π) in order to describe the history of the branching in sunflower. Our results suggest that the *b1* locus, including the branching gene, was under selection during domestication and modern breeding. We also developed universal molecular markers to follow this trait in breeding programs.

Key Words : shoot branching, map-based cloning, molecular diversity, breeding