Artificial Selection for Determinate Growth Habit In Soybean

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Determinacy is an agronomically important trait associated with the domestication in soybean (Glycine max). Most soybean cultivars are classifiable into indeterminate and determinate growth habit, while Glycine soja, the wild progenitor of soybean, is indeterminate. Indeterminate (Dt1) and determinate (dt1) genotypes, when mated, produce progeny that segregate in a monogenic pattern. Here, we show that Dt1 is one of the quadruplicated genes that are orthologous to Arabidopsis terminal flower 1 (TFL1), a regulatory gene encoding a signaling protein of shoot meristems. The transition from indeterminate to determinate types in soybean is shown to be the result of independent human selections of four distinct single-nucleotide substitutions in the Dt1 gene, each of which led to a single amino acid change. Genetic diversity of a mini-core collection of Chinese soybean landraces assessed by SSR markers and allelic variation at the Dt1 locus suggest that human selection for determinacy took place at early stages of landrace radiation. However, the Dt1 homoeolog, despite its more recent divergence from Dt1 than from TFL1, appears to be sub- or neo-functionalized, as revealed by the differential expression of the two genes at multiple plant developmental stages and by allelic analysis at both loci.