



# Mapping of quantitative trait loci for the bolting trait in *Brassica rapa* under vernalizing conditions

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**ABSTRACT.** Premature bolting can occur occasionally during spring cultivation of heading Chinese cabbage in East Asia when the plants encounter low temperatures (vernalization), leading to economic loss. Breeding bolting-resistant cultivars is the best choice for solving this problem. We looked for QTLs responsible for varietal differences in the bolting trait in *Brassica rapa* under environmental conditions that promote vernalization. To achieve this goal, we constructed a linkage map with 107 simple sequence repeats and 54 insertion/deletion markers based on a segregating population of 186 F<sub>2</sub> individuals. The resulting map consisted of 10 linkage groups and covered a total length of 947.1 cM, with an average genetic distance of 5.84 cM between adjacent markers. QTL analysis of the bolting trait was performed by two phenotypic evaluations (bolting index and flowering time) based on the scores in an F<sub>2</sub> population in the spring of 2010, and scores in F<sub>2,3</sub> families in autumn 2010 and spring 2011, respectively. Twenty-six QTLs that controlled bolting were detected, accounting for 2.6 to 31.2% of the phenotypic variance. The detected QTLs with large effects co-localized

mainly on linkage groups A02, A06, and A07. These QTLs may provide useful information for marker-assisted selection in a breeding program for late bolting or bolting-resistant cultivars in *B. rapa* crops.

**Key words:** *Brassica rapa*; Quantitative trait loci; Bolting trait; Linkage mapping