

Description of Additional Supplementary Files

Supplementary Data Legends

Supplementary Data 1: List of 322 accessions for genome-wide association studies in this study.

Supplementary Data 2: Genotyping of BnaMKK9 mutants and their transmission to T1, T2, and T4 generations.

Supplementary Data 3: Detection of potential offtarget sites at each sgRNA target site of Bnamkk9 quadruple mutants (#5 and #7) in T4 progenies.

Supplementary Data 4: Agronomic traits of the J9712 and Bnamkk9 mutants in the experimental field.

Supplementary Data 5: All primers used in this study.