

Functional verification of key genes BnLAZY1.A03 for rapeseed branch angle

Jia Liu¹

Yinhai Xu¹
Rijin Zhou¹
Wenkai Yu¹
Qiong Hu¹

¹ Oil Crops Research
Institute, Chinese Academy
of Agricultural Sciences,
Wuhan, China

Background:

Compact rapeseed has small branch angle and high consistency of pod maturity. It is an ideotype for rapeseed high yield. In the early stage, our research group located two LAZY1 homologues on A03 and C03 chromosomes underlying two QTL of rapeseed branch angle by GWAS (Liu et al., 2016).

Objective:

We aim to further explore the function of the LAZY1 homologues in rapeseed. At the same time, we expect to apply the favourable genetic variation of key genes for improving the elite germplasms ideotype.

Methods:

We used optical photography to obtain accurate phenotypes of branch angles, while traditional methods were used to investigate agronomic traits with at least 5 individual plants for each line. Genome-wide association study, bioinformatics analysis, gene cloning, overexpression and genome editing were adopted to this study. Finally, the KASP marker for key mutation site was developed based on haplotype analysis.

Results:

By bioinformatics analysis, we found the gene sequence and predicted protein had complete nuclear localization signal on BnLAZY1.A03, however the nuclear localization signal was absent on BnLAZY1.C03. The BnLAZY1.A03 is mainly highly expressed in the apical meristem and expressed marginally in the lateral root by Gus transient expression analysis. The whole branch angles of over-expression BnLAZY1.A03 rapeseed decreased significantly comparing to wild type (WT). In addition, it was also found that over-expression of BnLAZY1.A03 rapeseed could significantly increase the thousand-grain weight and yield per plant. We gained two types of BnLAZY1.A03 editing lines. The phenotype data of T1 editing plants will be collected including branch angle and other agronomic characters. Based on haplotype analysis, we identified the key mutation site of BnLAZY1.A03 determining the phenotype variation. The KASP marker was developed original for the mutation which could effectively genotype varieties with different branch angles.

Conclusions:

By our result, the gene BnLAZY1.A03 was proved with the function of regulating the branching angle and could increase thousand-grain weight and yield per plant. The cultivate compact rapeseed is of great significance to promote rapeseed production under high-density cultivation by modifying the function genes.

References:

Liu J, Wang W, Mei D, Wang H, Fu L, Liu D, Li Y and Hu Q. (2016). Characterizing variation of branch angle and genome-wide association mapping in rapeseed (*Brassica napus* L.). *Frontiers in Plant Science*. 7,21. DOI: 10.3389/fpls.2016.00021