

PB-100

Breeding of Early Heading Date with High Yield Using CRISPR/Cas9 in Rice

Eun-Gyeong Kim¹, Jae-Ryoung Park^{2,3}, Yoon-Hee Jang¹, Kyung-Min Kim^{1,3*}

¹Department of Applied Biosciences, Kyungpook National University, Daegu, 41566, Korea

²Crop Breeding Division, National Institute of Crop Science, Rural Development Administration, Wanju, 55365, Republic of Korea

³Coastal Agriculture Research Institute, Kyungpook National University, Daegu 41566, Republic of Korea

[Abstract]

Recent unpredictable climate change is a major cause of rice yield loss. In particular, methane is a key factor in global warming. Therefore rice breeders are trying to breed the reducing-methane gas emission rice using the crossbreeding method. However, the traditional crossbreeding method takes 8 to 10 years to breed a cultivar, and the anther culture method developed to shorten the breeding cycle also takes 6 to 7 years. On the other hand, CRISPR/Cas9 accurately edits the target trait and can rapidly breed rice cultivars by editing the target trait as a homozygous in 2-3 years. In addition, exogenous genetic elements such as *Cas9* can be isolated from the G₁ generation. Therefore, the flowering time was regulated by applying CRISPR/Cas9 technology, and *OsCKq1* genome-editing (*OsCKq1-G*) rice with early flowered and high yield was bred in the field. Genome-editing of *OsCKq1* applied CRISPR/Cas9 technology up-regulates the expression of the flowering promotion gene *Ehd1* under long-day conditions induces early flowering and increases the yield by increasing the 1,000-grain weight. And as the generations advanced, each agricultural trait indicated a low coefficient of variation. As a result, indicated that *OsCKq1* plays an important role in regulating the flowering time and is related to the trait determining yield. Therefore, *OsCKq1-G* can suggest a breeding strategy for the Net-Zero national policy for reducing-methane gas emission rice by shortening the breeding cycle with the early flowered, and high-yield rice. CRISPR/Cas9 technology is a rapid and accurate breeding technology for breeding rice cultivars with important characteristics.

[Acknowledgement]

This work was supported by a grant from the New breeding technologies development Program (Project No. PJ016531012022), Rural Development Administration, Republic of Korea.

*Corresponding author: E-mail. kkm@knu.ac.kr Tel. +82-53-950-5711