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***PCKP*, Encoding for Casein Kinase I Protein, Regulates the Rice Flowering Time by Modulating the Circadian**

Eun-Gyeong Kim¹, Jae-Ryoung Park¹, Yoon-Hee Jang¹, Kyung-Min Kim^{1*}

¹Division of Plant Biosciences, School of Applied Biosciences, College of Agriculture and Life Science, Kyungpook National University, Daegu 41566, Korea

[Introduction]

With the alteration of the photoperiod sensitivity, breeders can diversify the flowering time of rice and develop cultivars adapted to a range of growth stages. The circadian rhythm provides the rice with the ability to adapt to a daily and seasonal cycle. Casein kinase I (CK I) protein is an important role protein involved such as the regulation of the circadian rhythm of rice. CK I inhibits rice flowering in long-day conditions. In this research, plants with genome-edited (GE) of putative casein kinase I protein (*PCKP*), a gene related to flowering inhibition in long-day conditions, were selected. And various agricultural traits, including heading date, were compared.

[Materials and Methods]

In this research, CRISPR/Cas9 mediated system was used for generate *PCKP* genome editing rice and finally 20 *PCKP* genome editing lines were developed. Among them, finally, only 2 lines of *PCKP* genome-edited rice with short days to heading were selected than Ilmi. Ilmi and *PCKP* genome editing rice were compared to the heading date, plant length, culm length, panicle length, number of tillers, the content of chlorophyll. And after harvesting the grain of Ilmi and *PCKP* genome editing rice, the length, width, and thickness of the grains were compared.

[Results and Discussion]

The days to heading of *PCKP* genome editing rice were shorter for 3 days than Ilmi. The plant and culm lengths of *PCKP* genome editing rice were similar to Ilmi, no phenotypic differences. And the content of chlorophyll was higher than that of Ilmi. Compared with Ilmi, the grain length of *PCKP* genome editing rice was longer and the width was wider. And the grain thickness was thicker than Ilmi. As a result, this research demonstrated that *PCKP* genome editing rice activates reproductive growth by promoting flowering under long-day conditions, and increases the grain size to increase yield. Therefore, our result through this research will suggest the possibility of double cropping by promoting the flowering time of rice and contribute to increased yield.

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