How gene editing can keep melons fresher for longer

The gaseous plant hormone ethylene has been long known to promote fruit ripening and play a certain role in shelf-life. In this study, the researchers performed gene editing using the (Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR)/Cas9 system via modi?cation of the ethylene synthesis pathway in the Japanese luxury melon (*Cucumis melo var. reticulatus* “Harukei-3”) to increase its shelf-life.

The enzyme 1-aminocyclopropane-1-carboxylic acid oxidase (ACO) is associated with the ?nal step of the ethylene production pathway and has multiple homologous genes. The research group has previously demonstrated five *CmACO* genes (homologous genes of ACO) in the melon genome and shown that the *CmACO1* gene is predominantly expressed in the harvested fruit. Therefore, we expected that *CmACO1* would be an important gene for enhancing the preservation of the melon fruit.

In this study, we selected *CmACO1* as a target of gene editing and attempted to introduce mutations in the gene. Consequently, the harvested melons exhibited no foreign genes and the mutations induced were inherited for at least two generations. In the non-gene-edited line (wild type), ethylene generation was observed in the fruit 14 days postharvest, the rind turned yellow, and the flesh softened. However, in the genome-edited mutant, ethylene generation was reduced to one-tenth of that in the wild type, with the skin color remaining green and the fruit remaining firm. This indicates that introducing *CmACO1* mutation via gene editing enhanced the shelf life of the melons. The results of this study indicate that gene editing can contribute to food loss reduction and improve food security.

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