PB-13

Identification and quantification of flavonoids and its antioxidant activity in yellow grain mutant of rice (*Oryza sativa* L.)

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[Introduction]

Flavonoids are naturally occurring phenolic compounds with potential health-promoting activities. Although anthocyanins and phenolic acids in coloured rice have been investigated, few studies have focused on flavonoids.

[Materials and Methods]

The yellow grain rice mutant was obtained using the chemical mutagen N-methyl-N-nitrosourea (MNU) and was derived from the Hwacheong (*Oryza sativa* L. ssp. japonica) parent cultivar. Harvested rice grains were air-dried, and the moisture content was reduced to approximately 13%. Samples were stored in a controlled room at 11 °C for 2 months, and then de-husked and hand-selected to eliminate cracked or discoloured seeds. The whole grain was dissected into embryo and endosperm tissue, and the boundary between embryo and endosperm was removed. Each sample was ground using a mill and sieved by passing through a 300 μm filter prior to further experiments.

[Results and Discussions]

Herein, we analysed flavonoids in a yellow grain rice mutant using UHPLC-DAD-ESI-Q-TOF-MS, and identified or tentatively identified 19 flavonoids by comparing retention times and accurate mass measurements. Among them, six flavonoids, isoorientin, isoorientin 2″-O-glucoside, vitexin 2″-O-glucoside, isovitexin, isoscoparin 2″-O-glucoside and isoscoparin, were isolated and fully identified from the yellow grain rice mutant, and levels were highest in embryo and endosperm compared with wild-type rice, with isoorientin particularly abundant in embryo. Significant differences ($p < 0.001$) in total phenolic compounds and antioxidant activity were found in embryo and endosperm tissue in mutant rice by DPPH, FRAP and TEAC assays. The results suggest that the representative six flavonoids may play an important role in the colouration and antioxidant activity of embryo and endosperm tissue. The findings provide insight into flavonoid biosynthesis in rice and could improve the functional quality of this important food crop.

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