Association between Anthocyanin Levels and Antioxidant Activities of Grape Varieties

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【Background】

An adequate intake of fruits and vegetables is a vital component of living a healthy life. A plethora of works have reported that consuming more vegetables and fruits is associated with a decreased incidence rate of major human illnesses, such as cardiovascular diseases (CVDs), and cancers. Anthocyanins are responsible for the diverse hues of fruits, vegetables, and plants. Anthocyanins are a class of secondary plant metabolites, with phenolic groups in their chemical structure, a type of flavonoid, and a polyphenol.

This study aimed to quantitatively investigate to what extent anthocyanins play role in antioxidant activities of grape ---- one of popular anthocyanin-rich fruits consumed in Japan. At the same time, this study provides information about the parts of grapes where anthocyanins exist.

【Method】

The grapes (n=16) were purchased in supermarkets in Ikebukuro, Urawa, Omiya, and Itakura in autumn of 2022. Grape samples were washed in distilled water before separating the peel, pulp, and seed fractions. 7.5g of peel, pulp/or pulp+seed were individually homogenized for 20 minutes in 30 ml methanol, and the methanol was collected after centrifugation. Anthocyanins concentrations in the extracts were determined by the pH differential method (Lee et al. 2005). Antioxidant activity of the extract was determined by FRAP assay (Guo et al. 2003).

【Result and Discussion】

Anthocyanin was detected only in peel samples at the concentrations ranging from <1.9 mg/100 g (Shine Muscat) to 212 mg/100 g (Nagano Purple) while it was not detected in any of pulp and/or pulp+seed samples (<1.9 mg/100 g).

Antioxidant activity was detected in peel samples (11.4 mmol Fe(II)/g or 0.764 mmol Trolox/g to 11.8 mmol Fe(II)/g or 0.802 mmol Trolox/g). Different from the result of anthocyanin contents, antioxidant activity was also found in pulp samples (<1.89 mmol Fe(II)/g or < 0.10 mmol Trolox/g to 7.99 mmol Fe(II)/g or 0.522 mmol Trolox/g) /or pulp+seed samples　(19.4 mmol Fe(II)/g or 1.32 mmol Trolox/g to 31.8 mmol Fe(II)/g or 2.19 mmol Trolox/g). This result indicates that other materials also can provide antioxidant activity.

The correlation coefficient between anthocyanin concentration and antioxidant activity (Fig. 1) was significant at $p<0.01$, the correlation coefficient is 0.852(Trolox) and 0.865(Fe(II)). This means that 71%(Trolox) and 72% (Fe(II)) of variation in antioxidant activity of grapes was explained by its anthocyanin content, indicating that anthocyanin is the predominant antioxidant of grapes among other antioxidants. Furthermore, it also shows that antioxidants of grape are mostly found in peels.

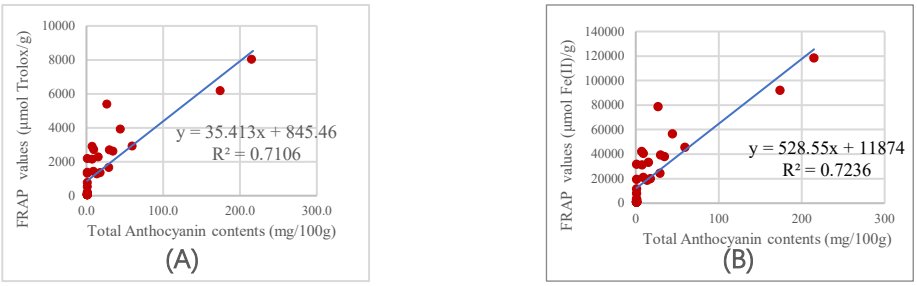

Fig. 1 Correlations between FRAP values Trolox (A), Fe(II)（B）and total anthocyanin contents of grapes