High variability in anthocyanin contents between different blackcurrant varieties

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Introduction

Blackcurrants (*Ribes nigrum*) are economically significant horticultural products in eastern Europe and Scandinavia. Blackcurrants are primarily grown for juice but berries are processed also for jams, jellies and other food products. The characteristic dark purple-red colour of blackcurrant comes from anthocyanins, water-soluble polyphenolic pigments with many potential health benefits (Castañeda-Ovando et al., 2009). Anthocyanin content is a very important quality factor of blackcurrant. Biosynthesis and accumulation of anthocyanins is determined by the variety and cultivar of the berry, its degree of ripeness, and the growing conditions (Chalker-Scott, 1999). The major anthocyanins in blackcurrants are 3-O-rutinosides and 3-O-glucosides of delphinidin and cyanidin, although traces of other anthocyanins have also been detected (Wu et al., 2004). In this study the content of four major anthocyanins was determined in 33 botanical varieties of blackcurrant grown in Piikkiö, Finland.

Materials and Methods

Blackcurrants were provided from the *ex situ* gene bank collection of MTT Horticulture, Piikkiö, South-West Finland. The collection comprises mostly named old and present cultivars as well as unidentified varieties found in Finland. All blackcurrants were grown in one basically homogenous field and the berries were picked at their full-ripe stage during August 2009. Three samples of each variety were collected from three different shrubs. Berries were freeze-dried before analyses.

Anthocyanins were extracted with 4% acetic acid in 65% aqueous methanol and determined by reversed-phase HPLC with a gradient elution of methanol into 5% formic acid (aq). Anthocyanins were detected by UV detection at 518 nm and quantified against external standard derived from authentic anthocyanins (delphinidin-3-rutinoside, delphinidin-3-glucoside, cyanidin-3-rutinoside, cyanidin-3-glucoside).

Statistical analyses were performed by the version 9.2 of the SAS/STAT software using general linear model (ANOVA).

Results

In every blackcurrant variety the anthocyanin profile was generally very similar and dominated by rutinosides of delphinidin and cyanidin (*Fig. 1*). Usually delphinidin-3-rutinoside was the major anthocyanin (26 varieties), yet, higher proportion of cyanidin-3-rutinoside was detected in 6 varieties. One variety had an exceptional anthocyanin profile with delphinidin-3-glucoside as the major anthocyanin. Otherwise the anthocyanidin rutinosides corresponded to 72-92% of total anthocyanins and glucosides to 8-28%. Furthermore, several additional peaks with anthocyanin kind of UV-spectrum were always detected in HPLC chromatograms indicating that blackcurrants have traces of some other anthocyanins as already shown by Wu et al. (2004). However, these minor anthocyanins were not identified or quantified in this study.

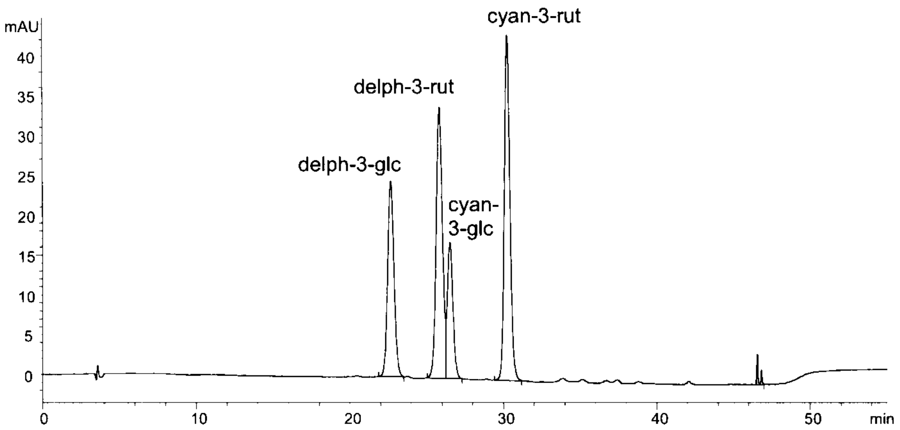

Fig. 1. HPLC-DAD chromatogram of blackcurrant anthocyanins recorded at 518 nm.

The total anthocyanin content was on average 470mg/100g fresh weight (2050mg/100g dry weight) but significant variation between different blackcurrant varieties occurred ($p < 0.0001$). There was over twofold difference in the anthocyanin content between the poorest (280±40 mg/100g fresh weight) and the richest (670±60 mg/100g fresh weight) variety.

Conclusions

The results confirm that blackcurrant is a good source of anthocyanins. However, remarkable variation in the anthocyanin content between varieties is evident. The anthocyanin profile is always dominated by four major anthocyanins, yet some variation appears in their relative proportions. The high anthocyanin content is usually most desirable in the blackcurrant products and this study shows that the choice of variety may have a great impact on it.

Acknowledgements

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