Phenolic Profiling of Red-Fleshed Apples

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INTRODUCTION

Apples (*Malus x domestica* L.) are a common dietary source of phenolic compounds. Phenolic compounds in general contribute to the quality and sensorial criteria of apples such as browning susceptibility, bitterness, and astringency [1,2]. Localization of these compounds varies among cultivars and tissue types. Anthocyanins are the major determinants of the red color of apple fruit skin and, in case of red-fleshed apples, fruit flesh. Red-fleshed apples show strong antioxidant activity [2].

Consumption of apples has been associated with many health benefits including prevention of chronic diseases, lowered risk of cancer incidence, particularly prostate, liver colon, and lung cancers, and cardiovascular diseases [1,3]. Nowadays, consumers expect new, attractive foods and beverages, with a preference for natural and healthier products with low content of artificial additives [1]. However, color is one of the most important factors that influences consumers' attitudes and creates positive or negative feelings about the products [1]. Therefore, in this context, red-fleshed apples have great potential as functional fruits [1,4].

Ripe fruits of seven red-fleshed apple genotypes (Fig. 1) were obtained from the breeding program at the Bavarian Centre of Pomology and Fruit Breeding, in Halbergmoos. They are all progenies of the white fleshed apple variety 'Pomona' and the red-fleshed apple variety 'Weirouge'. Their fruit flesh was either fully or partially red colored, depending on the genotype. The flesh was divided into outer (red) and inner (white) part. The separated sections were frozen in liquid nitrogen and stored at -20°C until lyophilisation.

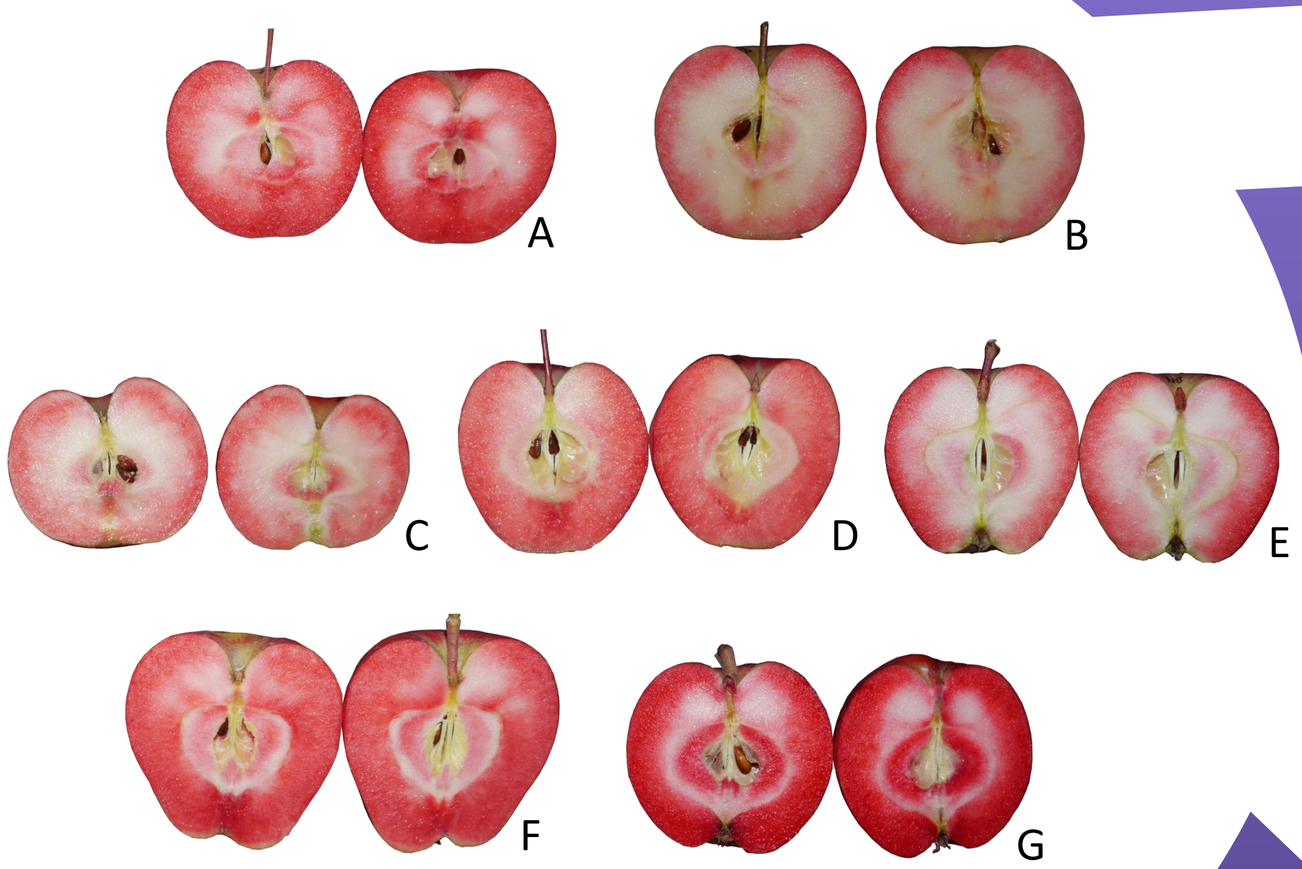
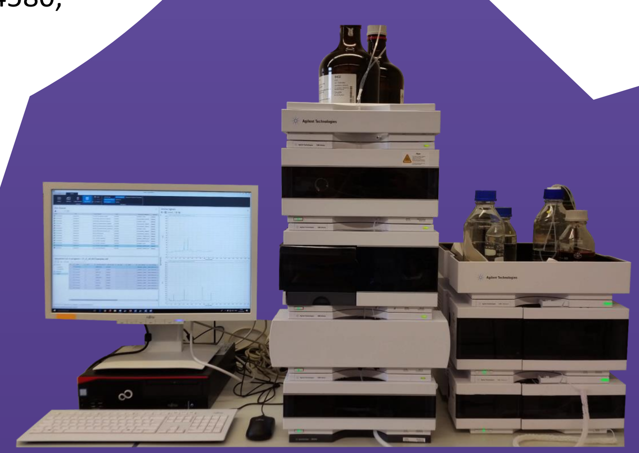


Fig. 1: Ripe red-fleshed apple genotypes: (A) Bay 3355, (B) Baya® Franconia, (C) Bay 3663, (D) Bay 4583, (E) Baya® Marisa, (F) Bay 4580, (G) Bay 2345.

Extraction was done with a mixture of 95 % MeOH and acidified water.



To evaluate the phenolic profiles, reverse phase high performance liquid chromatography (RP-HPLC) analysis was performed with a Nucleosil C18 column followed by post column derivatization with DMACA (p-Dimethylaminocinnamaldehyde) as described in [5].

The main anthocyanin detected in all genotypes (in both outer and inner sections of the fruit flesh) was cyanidin-3-*O*-galactoside (Fig. 2 & 3), which is the predominant anthocyanin found in most red-fleshed apple varieties [2,6].

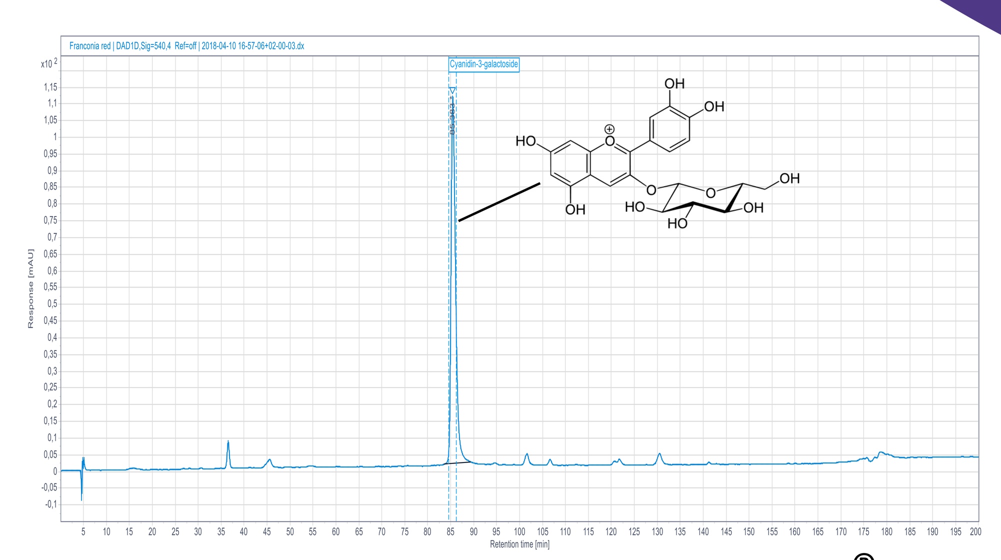


Fig. 2: HPLC Chromatogram obtained from the red tissue of 'Baya® Franconia', at 540 nm. Peak assigned is cyanidin-3-*O*-galactoside.

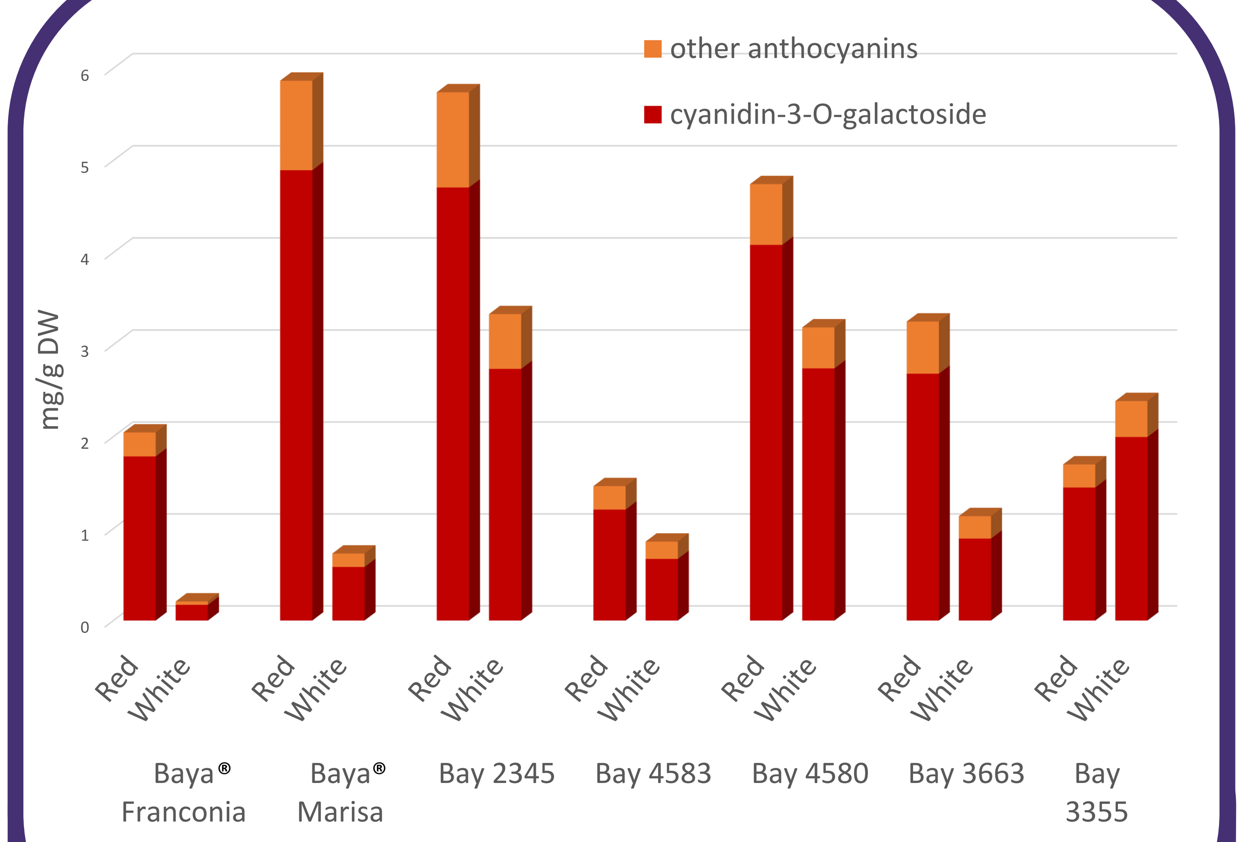


Fig. 3: HPLC analysis of the seven ripe red-fleshed apple genotypes showing total anthocyanin content and the content of cyanidin-3-O-galactoside in red and white tissue.

The cyanidin-3-*O*-galactoside content of the red tissue is increased in six out of seven genotypes in comparison to the white tissue. In addition to cyanidin-3-*O*-galactoside, epicatechin was also detected (data not shown) within the flavan-3-ols group in all seven genotypes in varying concentrations.

Further steps will include HPLC and gene expression analysis of red and white tissues of ripe and unripe fruits of red-fleshed apple cultivars and their parental lines to unravel the differential biosynthesis of polyphenols in red-fleshed apple fruit tissues.

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ACKNOWLEDGEMENT
This project gratefully received funding from the European Union's Horizon 2020 research and innovation program under the Marie Sklodowska-Curie grant agreement No 675657.
Special thanks to our technicians Anja Forstner and Marlene Kramler for their expert technical assistance and support.