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**ARTICLE**

# Changes of polyphenol, anthocyanin and rutin content in sour cherry varieties during ripening

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**ABSTRACT** In our experiments we studied the variation of inner content values in connection to ripening time in the case of four tart cherry varieties (*Prunus cerasus* L.). Our aim was to optimize the harvest time on the base of antioxidant capacity. The experiments were carried out in orchards of the Research Institute for Fruitgrowing and Ornamentals in Érd-Elvira major (varieties 'Érdi bőtermő, 'Kántorjánosi 3') and in orchards of the Agárd Frucht Ltd. in Agárd (varieties 'Érdi jubileum', 'Maliga emléke'). Anthocyanin, polyphenol and rutin content of fruits were investigated in laboratory. According to the results it can be stated, that in case of the studied varieties the optimal harvest time for industrial processing is the second picking. At this time the anthocyanin, polyphenol and rutin contents of varieties are suitable. In general, at the end of maturity period the fruits shrink, fruit weight and juicity decreases in consequence of water loss, therefore determining optimal harvest time for the desired utilization purpose is very important. According to our results, among the four studied varieties, 'Érdi jubileum' has the highest values regarding polyphenol as well as anthocyanin and rutin contents.
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**KEY WORDS**

cherry varieties
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Free radicals and the oxidative stress processes occurring in the living organisms have been in the spotlight of scientific research for long. Nowadays the emphasis shifted towards the investigation of polyphenols, since these dietary components are extremely important in the prevention of diseases and in maintaining healthy conditions. In their positive psychological effect, their antioxidative capacity plays a crucial role.

Among polyphenols that consist of several hundreds of different compounds the non-tannin type flavonoids play a very important role. The scale of the biological effect of flavonoids is considerably wide. The anti-mutagenic, antiallergenic, anti-diabetic and anti-carcinogen all together called health preventing effects have been extensively documented in the literature. In food products they serve as flavour components and antioxidants. (Lugasi, Blázovics et al. 2001; Narayana et al 2001). All molecule has hydrogen donor capability, so they are able to function as antioxidants, moreover they have powerful reducing capability, too. This enables them to act as secondary (preventive) antioxidants as well. Quercetin, *kempferol, luteolin,* and *apigenin and rutin* have a potenetial anticarcinogen effect. The rutin or rutosid (quercetin-3-rutinoside, sophorin) is the rutinose-dischacharide glycoside of a quercetin flavonol (Brown 1996).

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In human body they bind to $Fe^{2+}$, ions and prevent hydrogen-peroxide to bind to it that would cause the formation of free radicals and cell damage. It hinders the formation of cancer, strengthens capillary vessels and enhance the tone of veins. It may reduce the cytotoxicity of the oxidised LDL cholesterol thus reduces the risk of the formation of heart diseases.

Rutin is also known as vitamin P that usually occurs together with vitamin C. It prevents vitamin C from oxidisation and helps its absorption.

## Materials and Methods

We examined 'Érdi jubileum', 'Érdi bőtermő', 'Maliga emléke' and 'Kántorjánosi 3' sour cherry cultivars 3 times during their ripening time in 2007.

The examination of colouring material was carried out according to Füleki and Francis's method (1968) on λ=530 nm with HITACHI U-2800A spectrophotometer.

The polyphenol content was determinated on λ=765nm with spectrophotometer according to the method described by Singleton and Rossi (1965), calibration curve was made by gallic acid.

Rutin content of the sour cherry was analyzed by HPLC using a method of Meixner et al. (2007), Brunori and Végvári (2007), Végvári et al. (2008). Two replicate analyses were

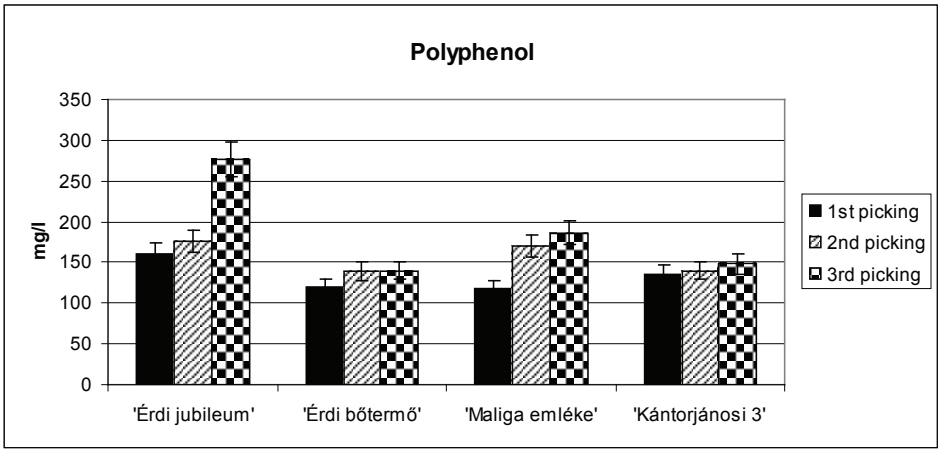


**Figure 1.** Chaning of polyphenol content of examined cultivars during the ripening time

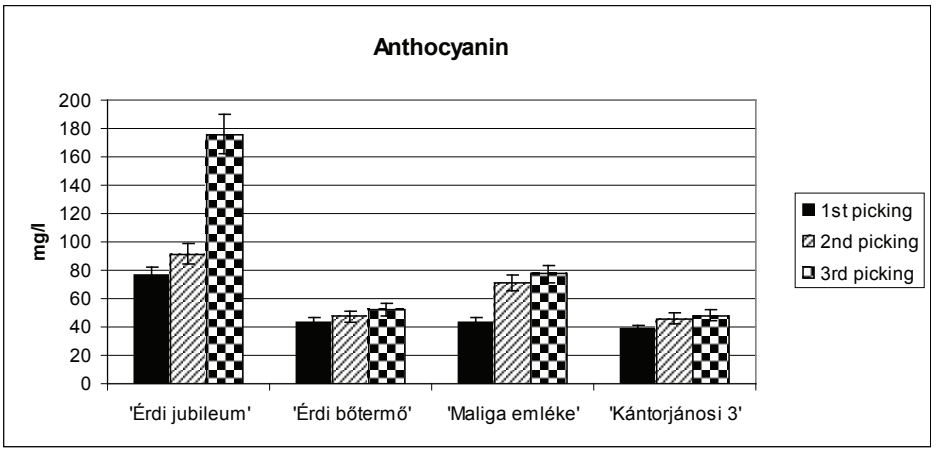


**Figure 2.** Chaning of antocianin content of examined cultivars during the ripening time.

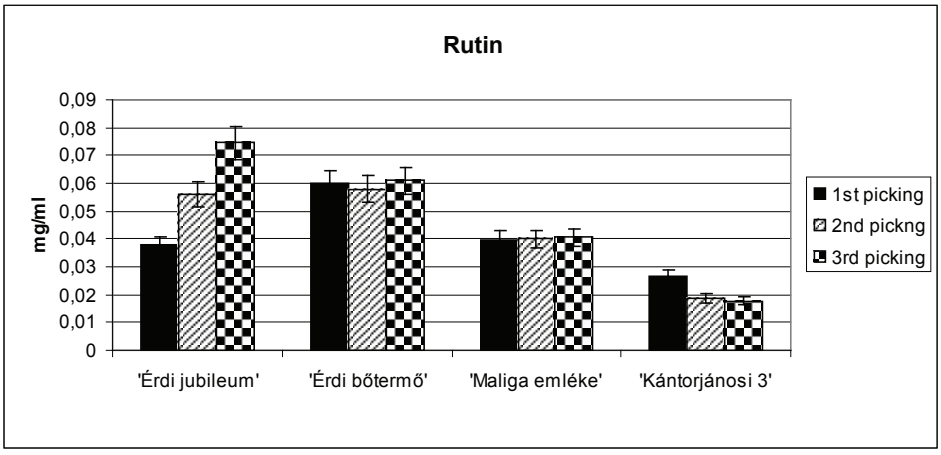


**Figure 3.** Chaning of rutin content of examined cultivars during the ripening time.

run for each sample. Reference was made of 2.65 mg rutin hydrate [153-18-4] dissolved in 25 ml methanol. The analysis was assisted by EMPOWER ²TM software. Analytical grade IBA (indole-3-butyric acid) [133-32-4], methanol [67-56-1] and acetic-acid [64-19-7] (HPLC-grade) were purchased from Sigma Aldrich Chemical Co. The double distilled water was further cleaned by 0,45 µm Millipore-filter. IAA was used in a methanol stock solution (0.01 g/50 ml) and a 50X dilution of it was used as working standard in HPLC.

We used SPSS program package for statistical analysis of data. The statistical analysises were made by non-parametric methods with Kruskal-Wallis test and Mann-Whitney test.

## Results and Discussion

The were statistical differences in the changing of polyphenol content of 'Érdi jubileum' és 'Érdi bőtermő between second and third picking time. In the case of 'Maliga emléke' cultivars there was significant difference between first and second picking time but between the second and third picking time there were not statistical differences. The quantities of polyphenols don't depend on picking time by 'Kántorjánosi 3' (Fig. 1). According to our results the 'Érdi jubileum' had outstandigly high polyphenol content at the end of ripening time but the lowest polyphenol content was measured in 'Érdi bőtermő' and 'Kántorjánosi 3'.

During the ripening time there were statistical differences in the changes of antocyanin between second and third picking time of 'Érdi jubileum', 'Érdi bőtermő' and 'Kántorjánosi 3'. In the variety, 'Maliga emléke' there was no significant difference between the second and third picking time but between the first and second picking time.

Based on our results 'Érdi jubileum' cultivar had high antocyanin content (Fig. 2) showed high value in the beginning and at the end of ripening period too. 'Maliga emléke' and 'Érdi bőtermő' had smaller antocianin content and 'Kántorjánosi 3' had the smallest one.

In the case of 'Érdi jubileum' the changes of rutin contents during the ripening time were similar to antocianin and polyphenol contents (Fig. 3). There were statistical differences in the rutin contents during the ripening time in 'Érdi jubileum'. The rutin content of 'Érdi bőtermő' and 'Maliga emléke' did not change significantly during the ripening time. The rutin content of 'Kántorjánosi 3' increased to small degree. Based on the rutin content the 'Érdi jubileum' (Fig. 3) exhibited outstandigly high value at the end of ripening time. The second one was 'Érdi bőtermő' after 'Érdi jubileum'. The smallest rutin content was measured in 'Kántorjánosi 3'.

## Conclusions

Antioxidant status of fruits can be well characterized by their polyphenol, anthocyanin and rutin content. According to our results we can state, that the examined varieties contained antioxidant materials in the highest concentration at the end of maturation period, between 2nd and 3rd pickings.

According to our measurement data, 'Érdi jubileum' contained antioxidant materials (polyphenol, anthocyanin, rutin) in the highest concentration at the end of maturation. 'Érdi jubileum' is followed by varieties 'Maliga emléke', 'Kántorjánosi 3' and 'Érdi bőtermő' considering antioxidant content. Our results are informative, further examinations are needed to conclude more profound correlations.

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