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Short communication

Phenolic compounds and antioxidant capacity of plum fruits of *cv* "Čačanska Lepotica" grown on different rootstocks

Viktoria Ivanova[*1], Boryana Trusheva[1], Sava Tabakov[2], Antoaneta Trendafilova[1]

[1]*Institute of Organic Chemistry with Centre of Phytochemistry, Bulgarian Academy of Sciences, Acad. G. Bonchev Str., bl. 9, 1113 Sofia, Bulgaria*
[2]*Agricultural University, Department of Fruit Growing, Mendeleev Bld., 12, 4000 Plovdiv, Bulgaria*

Introduction

Balanced diets, including the regular consumption of fruits play a major protective role against many diseases. Fruits are valuable sources of nutrients, vitamins, minerals, dietary fiber, nonessential phytochemicals, water and especially an abundance of antioxidant compounds. Phenolic compounds are biologically active substances which have antioxidant properties and positive effect on human health. Plum fruits (*Prunus domestica*) are characterized by high healthy potential because they are rich in numerous biologically active compounds (polyphenols, especially phenolic acids, flavonoids and anthocyanins), as well as vitamin C (Hallmann et al., 2017). The phenolic content of plums can vary greatly depending on several factors (variety, climate, soil, analytical methods, etc.) (Milijic et al., 2017). Although fruit quality is mostly cultivar associated trait, it has been reported that the rootstocks have significant effects on the fruit quality (size and color) and fruit nutritional quality including on the production of biologically active compounds (Yagmur and Taskin, 2011).

The aim of this study was to determine the content of phenolic compounds (total phenolics, flavonoids and anthocyanins) and their antioxidant capacity in the fruits of the plum cultivar "Čačanska Lepotica" grown on 5 different rootstocks namely Wavit, Janka, Ishtara, GF 677 and GXN15.

Materials and methods

Plum samples

The fruits of plum cultivar "Čačanska Lepotica", grown on Wavit, Janka, Ishtara, GF 677 and GXN 15 rootstocks were collected from trees cultivated in the experimental nursery of the Agricultural University near Plovdiv, Southern Bulgaria between 25-28 July in three consecutive years 2019 - 2021. The fruits of each sample were frozen separately and kept at -20°C until analysis.

Extraction of plum fruit

Frozen fruits were left to defrost at room temperature and homogenized in a laboratory blender. Approximately 15 g of the fruit mash were weighted, transferred to an Erlenmeyer flask and mixed with 20 mL of methanol. The extraction was performed twice for 20 min in an ultrasonic bath at room temperature. The mixture was filtered and the filtrates were adjusted to 50 ml with methanol.

Determination of total phenolic content

Total phenolic content (TPC) was determined with Folin-Ciocalteu's reagent (Popova et al., 2017). The results were expressed as mg gallic acid equivalents (GAE) per 100 g fresh weight (FW) [mgGAE/100 g FW].

Determination of total flavonoid content

Flavonoid content (FC) was measured using a colorimetric $AlCl_3$ method (Popova et al., 2017). The results were expressed as mg quercetin equivalents per 100 g fresh weight [mg Qu/100 g FW].

*Viktoria.Genova@orgchm.bas.bg

Determination of total anthocyanin content

Total anthocyanin content was determined by the pH-differential method (Lee et al., 2005) and expressed as mg cyanidin-3-glucoside equivalents per 100 g fresh weight [mg CGE/100 g FW].

Determination of antioxidant capacity

The 1,1-diphenyl-2-picrylhydrazyl radical (DPPH) scavenging activity assay was performed according to the procedure described by Thaipong et al. (2006). The IC_{50} values were obtained by plotting DPPH scavenging percentage of each sample against the concentration.

Results and discussion

The total phenolic (TPC), flavonoid (FC) and anthocyanin contents in the methanol extracts of fruits of the plum cultivar "Čačanska Lepotica" grown on 5 different rootstocks (Wavit, Janka, Ishtara, GF 677 and GXN15) in three consecutive years 2019 – 2021 were found to vary in a wide range (45.87 – 156.11 mg GAE/ 100 g FW, 11.34 – 18.91 mg QuE/ 100 g FW and 8.17 – 20.2 mg CGE/ 100 g FW, respectively). In general, the content of flavonoids and anthocyanins in all studied samples was low and was in agreement with previous reports.

The richest in total phenolic compounds were the plum fruits from trees grafted on Wavit rootstock followed by GXN 15, Janka, GF 677 and Ishtara. Fruits from trees grown on Wavit rootstock were also the richest in total flavonoids, while the other rootstocks did not affect significantly on the content of flavonoids. The highest content of anthocyanins was registered in the extracts of plum grafted on Wavit and Janka rootstocks, while the extract of plum grown on Ishtara rootstock was the poorest one.

The highest total phenolic and anthocyanin contents were obtained in the fruits collected in 2021 and 2020, respectively. The year effect could be explained by the annual temperatures and crop load differences observed during the three years of study. In contract, the total flavonoid content was found to be almost equal in the three concessive years.

Further, the methanol extracts of plum fruits were studied for their potential to scavenge the stable DPPH radical. The extracts exhibited a dose dependent DPPH radical scavenging activity with a 50% inhibition (IC_{50}) at concentrations between 9.16 and 18.6 mg/ml extract. Plums grown on Wavit rootstock were the most active DPPH scavengers, while those grafted on GF 677 rootstock showed the lowest values. The antioxidant capacity assessed with the DPPH test showed a good correlation with TPC and FC (Pearson, r = 0.81 and 0.71, respectively) and a weak/moderate correlation with total anthocyanins (Pearson, r = 0.41).

Conclusion

The results of this study showed that rootstocks affected fruit phytochemical composition, although it was also influenced by year. The total phenolic content of the plum fruits was found to be more rootstock-dependent than the total flavonoid and anthocyanin contents. Among the studied samples, the fruits of the plum cultivar "Čačanska Lepotica" grafted on Wavit rootstock were found to be richest in total phenolic compounds, flavonoids and anthocyanins and the best DPPH radical scavengers.

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