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EVALUATION OF THE BIOCHEMICAL CONTENT OF FRUITS ON SOME PLUM GENOTYPES

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Abstract: *In Romania, the plum has a wide spread area (about 50% of the country's orchards), its fruits being consumed fresh or processed since long times ago. Fruits quality through its indicators (soluble dry matter and acidity) is influenced by the intake of water and fertilizers (in this case of the foliar ones) and especially the agro-biological value of the variety. Plums are a significant source of antioxidants with potential in neutralizing free radicals. The present paper presents the results of the plums quality as regard the fruits chemical indicators (dry mater content, total titrable acidity, sugar content, anthocyanins and polyphenols). The genotypes studied were: 'Agent', 'Alina', 'Andreea', 'Carpatin', 'Centenar', 'Gras ameliorat', 'Iulia', 'Roman', 'Romanța', 'Tita', 'Tuleu timpuriu', 'Tuleu gras', 'HR 7/48', 'HL 10/31', 'H 6/78 P' compared with 'Stanley' and 'Jojo', which are the most spread cultivars in commercial orchards from Europe. In this study, we observed the tendency to increase the total anthocyanins, polyphenols and total sugar content with the loss of water from the fruit.*

• Introduction

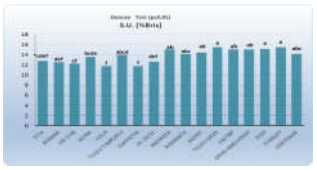
Prunus domestica L. is an important fruit species in Romania, occupying an area of 75,292 ha (7). In 2017, a production of 434,390 tons (27) was registered in our country for this species. Due to the particularly favorable climate and soil conditions in our country, plum varieties have spread widely. The plum genetic breeding program in Romania aims to create varieties with resistance to diseases and pests but also with very good fruits quality (7). Plums are considered some of the most important fruits on the market due to the increased interest of consumers (16). Biochemical compounds in plums have shown beneficial effects on the body (15). Plums are a significant source of antioxidants with the potential to neutralize free radicals (12), radicals that in large quantities can cause many diseases (24). Plums have a content of high phenolic substances (between 298 and 563 mg / 100g) (5). Polyphenols in plums and other plant products have a role in protecting cells and cell organs by acting against chronic diseases, coronary heart disease and type 2 diabetes (25; 26). Phenolic substances are unevenly distributed inside the fruit, these being present in larger quantities in the fruit epicarp and in smaller quantities in the mesocarp (4). Following the research conducted (8) on 12 plum genotypes, the distribution of phenolic substances in the skin was 4.5 times higher than in the pulp and 3.2 times higher compared to the whole fruit.
Anthocyanins belong to a class of chemicals called flavonoids, which give red, purple or blue colors to fruits or vegetables. They are pigments in glycosidic form in which the hydroxyl groups of phenols are combined with reducing carbohydrates. They have anti-inflammatory, antioxidant, anticancer (17; 19), antidiabetic (13) and prevent cardiovascular diseases such as atherosclerosis (1). Anthocyanin pigments are found in the vacuolar juice of plants and their color is influenced by pH as follows: at acidic pH (pH = 3) they are red, at pH = 8.5 they are purple and at pH = 11 the color is blue (5, 11). Among anthocyanins, in plum, predominates: cyanidin 3-rutinoside, followed by peonidine 3-rutinoside, cyanidin 3-glucoside, cyanidim 3- xyloside and peonidine 3-glucoside (23). The total anthocyanin content of plums differs depending on the variety, the degree of fruit ripening and the environmental conditions (22). The objectives of the study were to determine the content of substances with antioxidant role in plums and the comparison between Romanian varieties and two varieties of foreign origin.

• Material and method

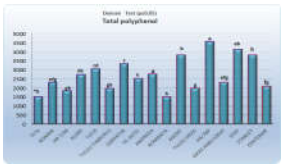
The experimental field was placed at Research Institute for Fruit Growing Pitesti, in the Genetics and Breeding Laboratory, on a terrace of the Argeş River, on the ground flat, with a clay-brown soil type, with a loamy to loamy-clayey texture in the first 60-70 cm, and in depth the texture becomes sandy. The determined agrochemical fertility indicators (total nitrogen content, organic matter and mobile phosphorus) characterize a soil with very low fertility, and the pH is moderately acidic (2). The biological material studied in 2019 is made up of fifteen Romanian plum genotypes ('Agent', 'Alina', 'Andreea', 'Carpatin', 'Centenar', 'Gras ameliorat', 'Iulia', 'Roman', 'Romanța', 'Tita', 'Tuleu timpuriu', 'Tuleu gras', 'HR 7/48', 'HL 10/31', 'H 6/78P'). Two cultivars ('Stanley' and 'Jojo') were used as controls. The samples were harvested at the optimal stage of maturity, between the last decade of July and the first decade of September.
Chemical analyzes and laboratory determinations consisted in determining the total content of anthocyanin pigments, total polyphenols, vitamin C, total sugar, organic acids and soluble dry matter. All biochemical determinations were performed in three repetitions.
The dosage of total anthocyanin pigments in fruits was performed by the Fuleki method (10). The method consists in the extraction of anthocyanins with appropriate extractive solutions and the measurement of the absorbance of the extract, spectrophotocolorimetric at the wavelength λ = 535 nm. The determined total anthocyanins were expressed as cyanidin-3-rutinoside mg / kg fresh fruit.
The determination of total polyphenols was performed spectrophotocolorimetrically, by the Folin-Ciocâlteu method (20) and was expressed as mg GAE / kg fresh fruit. For the extraction of polyphenols was used as solvent methanol: water in a volume ratio of 80:20. The extracts obtained were read on a Zeiss Jena spectrophotometer.
The soluble dry matter content (% Brix) was determined using a refractometer, the organic acids (%) were measured by titration with 0,1N NaOH, ascorbic acid by the iodometric method and expressed in mg / 100g fresh fruit and total sugars (%) by the Fehling-Soxhlet method, 1965.

• Results and discussions

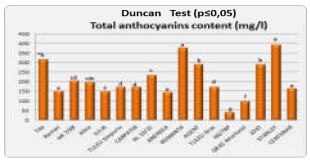
Soluble dry matter content



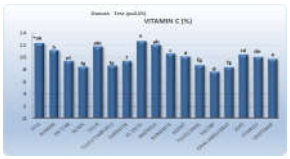
Polyphenol content



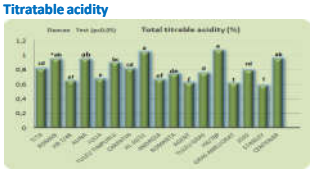
Content of anthocyanin



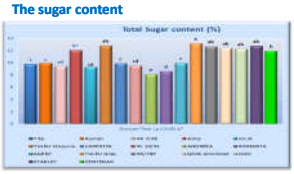
Ascorbic acid content (vitamin C)



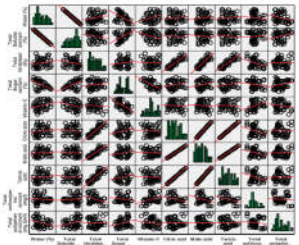
Titratable acidity



The sugar content



Matrix of correlation (Pearson "r" correlation coefficients "r") of the main biochemical indicators (average for the 17 genotypes of plum studied)



• Conclusions

The results obtained showed to the 'Tuleu gras' variety, the highest soluble dry matter content among the Romanian plum genotypes analyzed, content similar to the 'Stanley' and 'Jojo' control.
Of the 15 Romanian plum genotypes studied, only the 'H 6/78 P' genotype had a higher polyphenol content compared to the 'Stanley' and 'Jojo' varieties. The 'Agent' variety had a polyphenol content similar to control 'Stanley'.
From the point of view of the total anthocyanin content, nine of the Romanian plum genotypes studied had higher anthocyanin pigment content than the 'Stanley' control. The Romanian plum genotypes with higher anthocyanin content than the 'Jojo'' control were 'Romanța' and 'Tita'.
The Romanian plum genotypes with a higher vitamin C content than the control varieties 'Stanley' and 'Jojo' were: 'HL 10/31', 'Tita', 'Andreea', 'Iulia', 'Roman' and 'Romanța'. The 'Agent' variety had higher vitamin C content than the 'Stanley' variety but lower than the 'Jojo' variety.
The analyzed fruits had a rich content of sugars and organic acids, important components that determine their sensory quality. Of the plum genotypes studied, the highest total sugar content had 'Tuleu gras'. Results similar to the two control varieties in terms of total sugar content were also recorded by the genotypes 'Tuleu timpuriu', 'H 6/78 P', 'Gras ameliorat' and 'Centenar'. Among the plum genotypes studied, 'Stanley', 'Gras ameliorat', 'Agent' and 'Andreea' had the lowest total acidity content, expressed as malic acid.
The biochemical composition of Romanian plum genotypes is similar to the results obtained in the literature.