

## CHEMICAL FRUIT CHARACTERISTICS OF FOUR PLUM (*PRUNUS DOMESTICA* L.) CULTIVARS

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**Keywords:** plum, reducing sugar, ascorbic acid.

### ABSTRACT

Plums are among the most consumed fruits in Romania, being a good source of health promoting compounds. The purpose of this study was to determine the chemical fruit characteristics in four plum cultivars. Soluble solids content, reducing and total sugars, acidity and ascorbic acid content were determined. High phytochemicals content was reported for all investigated cultivars. The obtained results show that studied chemical indices vary depending on the analyzed cultivar. The highest soluble solid content (17.08%) and reducing sugars content (4.83%) have been observed in Tuleu gras cultivar. The obtained results recommend all analyzed plum cultivars as having high nutritional qualities.

### INTRODUCTION

Plums are among the most consumed fruits in Romania, being a good source of bioactive compounds. Plums are a rich source of health promoting compounds that help prevent many diseases. Consumption of plums has been associated with a reduced risk of degenerative diseases (Walkowiak-Tomczak, 2008; Hooshmand and Arjmani, 2009). These beneficial effects are due to the fact that plums show antioxidant properties attributed to the content in carotenoids, vitamins A, C and E, anthocyanins and phenolic compounds (Nisar et al., 2015, Usenik et al., 2008).

Compounds with antioxidant properties can protect cells from oxidative stress caused by excess free radicals. Epidemiological studies have shown that plums can treat and prevent digestive diseases, cancer, diabetes, obesity (Hooshmand and Arjmani, 2009). Plums contain organic acids, carbohydrates, fibers, pectins, aromatic substances, tannins, enzymes, phenolic compounds, vitamins and minerals such as: potassium, phosphorus, calcium and magnesium (Nisar et al., 2015, Usenik et

al., 2008). The content of sugars, organic acids, volatile substances and phenols is important in determining the organoleptic attributes such as flavor, taste, color and firmness. Fruits firmness is determined by the content in pectic substances while the color is given by the content in chlorophylls, flavonoids, anthocyanins and carotenoids.

Physico-chemical characteristics and organoleptic properties vary with cultivar, environmental conditions and agricultural practices (Ciobanu, 2015; Ciobanu, 2018, Paraschivu et al., 2020; Cichi and Cichi, 2019) In the context of guaranteeing access to a healthy food (Bonciu, 2017, Bonciu, 2019a) for a growing population, special attention is given to increasing crop productivity by cultivating drought and diseases resistant genotypes (Bonciu, 2019b, Bonea 2016, Bonea 2020, Paraschivu et al., 2020; Rosculete et al., 2019).

The objective of this study is to determine and compare the chemical composition of the fruits of four plum cultivars in order to evaluate their nutritional value.

## MATERIAL AND METHOD

**The biological material** was represented by fruits of four cultivars of plum: Tuleu timpuriu, Centenar, Tuleu gras and Stanley, grown in private orchard in Olt county. Fruits were picked at harvest maturity.

**Analytical methods: Total soluble solids** Brix % of the plum fruits was determined using a digital refractometer (Kruss Optronic DR 301-95) at 20°C;

**Reducing sugars (%)** were extracted in distilled water (1:50 w/v), 60 minutes at 60°C and assayed colorimetric with 3,5 dinitrosalicylic acid reagent using glucose as standard (Soare al., 2017a). At 1 mL extract, 2 mL of 3,5-dinitrosalicylic acid reagent (1 g 3,5-dinitrosalicylic acid dissolved in 20 mL of 2M NaOH, 50 mL of distilled water, and 30 g of Na-K- tartrate and the final volume was made up to 100 mL) was added. The mixture was incubated for 10 min at 100°C, cooled and the absorbance was measured at 540 nm after color development. D-Glucose was used as standard and the results were expressed in %. Absorbance was recorded at 540 nm using a Thermo Scientific Evolution 600 UV-Vis spectrophotometer with VISION PRO software.

**Total sugar content (%)** Non-reducing sugars were converting by hydrochloric acid hydrolysis, 15 min at 100°C to reducing sugars. After neutralization, total sugar content (%) was assayed colorimetric with 3,5 dinitrosalicylic acid reagent at 540nm (Babeanu et al., 2017).

**The titratable acid content (acidity)** was determined by titration with 0.1N sodium hydroxide (NaOH) using phenolphthalein as indicator and expressed as % malic acid.

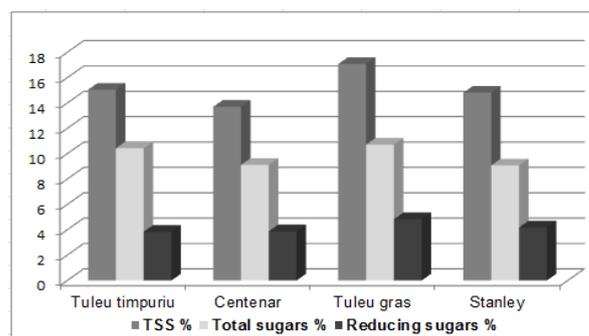
**Ascorbic acid** was extracted in 2% hydrochloric acid, HCl; 5:50 w/v (Soare al., 2017b). The determination of ascorbic acid is performed from the supernatant with iodometric redox titration in which iodine reacts with ascorbic acid, oxidizing it to dehydroascorbic acid. The ascorbic

acid content was expressed as mg/100 g fresh weight.

All determinations were performed in triplicate, and all results were calculated as mean.

## RESULTS AND DISCUSSIONS

The obtained results show that studied chemical indices vary depending on the analyzed cultivar. **Total soluble solids content (TSS)** varies with the analyzed cultivar. The values determined in our study vary between 13.7% (Centenar) and 17.08% (Tuleu gras) in the order: Centenar < Stanley < Tuleu timpuriu < Tuleu Gras (figure 1). Our results are similar to data reported in the scientific literature. Nisar et al., 2015 reports values between 8.17% and 16.23%, Usenik et al., 2008 finds values between 13.4% and 15.6 and Ciobanu, 2015 values between 12.66% and 23.10%.

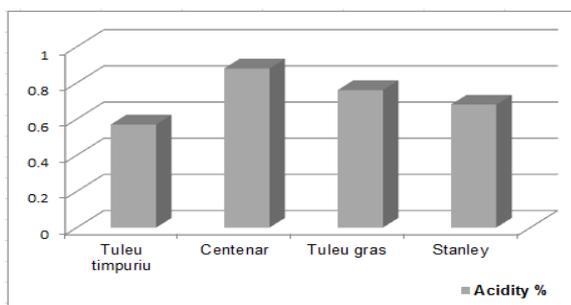


**Figure 1. Soluble solid content, total sugars and reducing sugars content**

**The total sugars content** varies between 9.08% (Stanley) and 10.72% (Tuleu gras). **Reducing sugars content:** The results obtained vary between 3.84% (Tuleu timpuriu) and 4.83% (Tuleu Gras) in the order < Tuleu Timpuriu < Centenar < Stanley < Tuleu Gras (figure 1). The values obtained are similar to the results obtained by Nisar et al., 2015 which shows that the content in reducing sugar varies between 25.27 mg / kg and 65.0 mg / kg. Nergiz and Yildiz, 1997, obtains an average value of 51.9 g kg<sup>-1</sup>; Among the carbohydrates in plum fruits, glucose

is the main component followed by sucrose, fructose and sorbitol (Usenik et al., 2008).

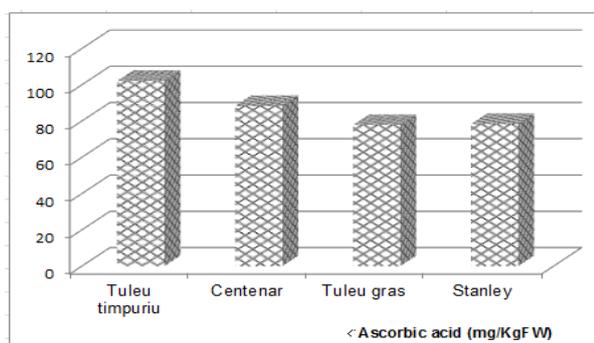
Values for **total acidity** vary between 0.57% and 0.88% in the order: Tuleu Timpuriu (0.57%) < Stanley (0.68%) < Tuleu Gras (0.76%) < Centenar (0.88%). (figure 2).



**Figure 2. The titratable acid content**

The acidity is determined by the content in organic acids. Through HPLC studies, Usenik et al., 2008 finds that malic acid is the predominant acid in plum fruits and also detects the presence of fumaric and shikimic acid, while in another study the presence of tartaric acid and citric acid is determined (Ionica et al., 2013).

**Ascorbic acid** is one of the most important water-soluble vitamins, naturally present in fruits and vegetables. Ascorbic acid content varies between 77.82 mg / Kg FW and 102.16 mg / Kg FW in the order of Tuleu Gras < Stanley < Centenar < Tuleu Timpuriu (Figure 3).



**Figure 3. The ascorbic acid content**

The results of this study are similar to data reported by other authors. In a review that summarizes characteristics of

plums as a raw material with valuable nutritional and dietary properties, it is shown that plums are poor in vitamin C the values ranging between 3mg/100g and 10mg/100g (Walkowiak-Tomczak, 2008).

## CONCLUSIONS

The obtained results show that studied chemical indices vary depending on the analyzed cultivar. High phytochemicals content was reported for all investigated cultivars. The highest soluble solid content (17.08%) and reducing sugars content (4.83%) have been observed in Tuleu gras cultivar.

The obtained results recommend all analyzed plum cultivars as having high nutritional qualities.

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