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ANTIOXIDANT ACTIVITY IN FOUR PLUM CULTIVARS

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ABSTRACT

Fruit pulp extracts from four plum cultivars ('Angeleno', 'Anna Späth', 'Silvia' and 'Stanley') locally grown in Constanța county were analyzed for antioxidant activity by using the DPPH method. 'Anna Späth' (88.53 %) and 'Silvia' (82.43 %) had the highest average radical scavenging percentages, while 'Angeleno' (63.63 %) had the lowest one. In terms of IC50, this translates to 18.83 mg/mL for 'Anna Späth' and 26.19 mg/mL for 'Angeleno'.
Results are comparable to data on other known plum varieties. According to known classifications, all plum extracts can be considered as very strongly antioxidant.

INTRODUCTION

The plum is one of the most popular fruit trees in temperate countires. European plum (*Prunus domestica* L.), Japanese plum (*P. salicina* Lindl), are the basis for most cultivars and hybrids currently grown, in some cases, together with *P. simonii* and *P. cerasifera*. Plum trees are mostly grown for their fleshy drupes, with various sizes and colors (Rutgers NJAES 2023).

In Romania and other Southeast European countries, plums are among the most popular due to suitability to local conditions, hardiness, nutritional value and tradition. Plum orchards cover around 1.4 % of Romanian agricultural land (Dascălu & Iordănescu 2010). Plums are mostly consumed raw, but they can be used in sweets, jams, jellies and, through fermentation and distillation, in traditional plum brandies: țuică, palincă and horincă.

Plum fruits are valuable not only for their taste and culinary uses; they are also a source of several major classes of antioxidant bioactive compounds, including phenolic compounds, carotenoids and ascorbic acid (Micu et al. 2024).

The purpose of this paper was to assess the antioxidant activity in extracts from four plum cultivars commonly grown in Southeastern Romania.

MATERIAL AND METHODS

Plums belonging to four cultivars, popular on the Romanian market, were purchased from local vendors in Constanța and analyzed.

'Angeleno' is a cultivar derived from *Prunus salicina*, developed in the USA. It is a late season cultivar, among the few to provide plums during autumn. Its fruits are large (6–7 cm), round, slightly compressed and asymmetrical, with dark red to

blackish epicarp, a yellow, dense, firm mesocarp and small, easily removable endocarp. Though less succulent it has a sweet taste, tempered by medium acidity. (Kubik & Doležajová 2014).

'Anna Späth', like all following cultivars, is a cultivar of *P. domestica*. It was developed in 1874, in Germany, based on Hungarian varieties. A late-season plum tree, it yields fruits in late September. Drought and disease-resistant, partially self-pollinating, it has medium-large, round, purple-reddish drupes, sweet or slightly acidic and less aromatic, with yellow-green, succulent mesocarp and large and easily removable endocarp (Vitanova et al. 2004).

'Silvia' was developed in 1979, in Romania (as hybrid of Althan and Early Rivers). An early cultivar (July-August), it bears large (55 g), oval, elongated drupes, with purple-blue epicarp, yellow, juicy although partly crispy mesocarp and medium, easily removable endocarp. Although low in vigor, it is resistant to Polystigma rubrum, sweet and aromatic in taste, being among the most popular in Romania (Kovacs et al. 2004, Vitanova et al. 2004).

'Stanley' was developed in the USA, as a hybrid of Agen and Grand Duc. Fully self-fertile, hardy and resistant to diseases and frost, it bears medium-sized fruits (30–40 g), oval, with dark blue epicarp, yellow, juicy, firm, sweet mesocarp and large free endocarp. It ripens at in August-September. It is also among the most popular in Romania (Kovacs et al. 2004, Vitanova et al. 2004).

Prior to analysis endo- and mesocarps were removed, while the mesocarp was ground in 70 % ethanol and filtered to produce liquid extracts (10 % plant material concentration).

Antioxidant activity of these extracts was determined through the DPPH method. After 10-fold dilution, 0.1 mL aliquotes were incubated for 60 minutes (with 2.9 mL 2,2-diphenyl-1-picrylhydrazyl (DPPH; incubation ocurred in the dark). Spectrophotometric absorbance was read at 517 nm using a Cecil 2021 spectrophotometer. A calibration curve was made by using gallic acid. Results were expressed as percentages of DPPH radical scavenging (Brand-Williams et al. 1995). IC50 was derived by linear regression.

RESULTS AND DISCUSSIONS

The percentual radical scavenging activity of plum pulp extracts is shown in Figure 1. Table 1 shows the average half maximal inhibitory concentrations (IC50) of extracts from the four plum against free radicals.

Results show that antioxidant activity varied from 63.63 % ('Angeleno') to 88.53 % ('Anna Späth'). 'Silvia' also had a high radical scavenging percentage, of 82.43 %.

Considering the IC50, the lowest value, for 10 % 'Anna Späth' extracts it was 18.83 mg/mL.

These values are comparable to other data found in literature. For instance, 15 % ethanolic plum extracts from Iranian cultivars had a scavenging rate of over 49 % (higher in methanolic extracts and in dry tissue; Najafabad & Jamei 2014). 12 % extracts of two cultivars ('African Rose' and 'Santa Rosa') had 58-73 % scavenging activity and 13.92-18.42 mg/mL IC50 (El-Beltagi et al. 2019). Extracts of unspecified concentration of 'Mirabelle' plums had up to 82 % scavenging activity in ripe fruits (below 30 % in unripe ones; Nowak et al. 2020). Finally, in a related species, *Prunus spinosa*, 87 % scavenging activity was found in 10 % aqueous extracts, with an IC50 of 19.57 mg/mL (Gegiu et al. 2020).

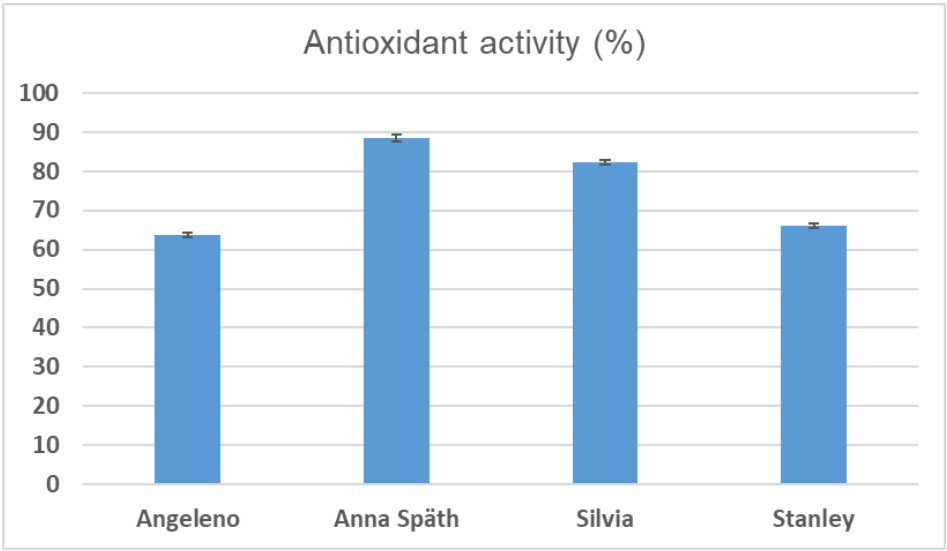


Figure 1. Radical scavenging activity in 10% ethanolic extracts of selected plum cultivars (%).

Table 1.

Average IC50 in 10% ethanolic extracts of selected plum cultivars against free radicals (mg/mL)

Cultivar	Angeleno	Anna Späth	Silvia	Stanley
IC50 (mg/mL)	26.19	18.83	20.22	25.20

A useful direction of interpretation is relating antioxidant activity with the concentrations of various phytochemicals, which are available for the four cultivars. Antioxidant activities are often correlated to levels of phenolic compounds and, in subsidiary, to ascorbic acid and carotenoids. In a previous study (Micu et al. 2024), 'Silvia' was found to exhibit the highest total phenolic levels, while 'Stanley', the lowest. The correlation is alos poor with major classes of phenols, such as flavonoida (maximum in 'Silvia') and phenolic acids (maximum in 'Angeleno'). Stilbenes (resveratrol and related compounds) were the only to follow the same pattern, with maximum concentrations in 'Anna Späth' (7,175 mg/kg) and 'Silvia'. Carotenoids and ascorbic acid also followed a different distribution, with maximum levels in 'Silvia'.

Generally, any extract with IC50 below 50 mg/L can be classified as very strongly antioxidant (Sinay et al. 2022).

CONCLUSIONS

Among the four plum cultivars, 'Anna Späth' (88.53 %), followed by 'Silvia' (82.43 %), had the strongest radical scavenging activities, while 'Angeleno' (63.63 %) and 'Stanley' (66.13 %) were at the lower end. In terms of IC50, this translates to 18.83 mg/mL for 'Anna Späth' and 26.19 mg/mL for 'Angeleno'.

All extracts can be considered as very strongly antioxidant (IC50 < 50 mg/L).

Results are comparable to other known plum varieties. Regarding the relationship with known levels of various potentially antioxidant phytoconstituents in

the four cultivars, antioxidant activities show little correlation to most classes of phenols, carotenoids and ascorbic acid, except for stilbenes.

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