CONTRIBUTIONS ON THE BIOCHEMICAL COMPOSITION IN FRUITS OF TWO *ROSA* L. TAXA FROM THE SPONTANEOUS FLORA

CONTRIBUȚII PRIVIND STUDIUL COMPOZIȚIEI BIOCHIMICE A FRUCTELOR A DOI TAXONI AI GENULUI *ROSA* L. DIN FLORA SPONTANĂ

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Abstract. *The aim of this study was to assess comparatively some biochemical parameters in ripen rose fruits of two spontaneous taxa. The wild fruits of Rosa corymbifera and R. nitidula were collected during the autumn of 2012 from Suceava district. The variations in moisture level, dry matter, total polyphenol compounds and flavonoids contents have been analyzed in achenes and hypanthium of both taxa. The results show that in hypanthium and achenes of both species, the water and dry matter contents were relatively constant. The amount of total polyphenol and flavonoids was slightly increased in R. nitidula than in R. corymbifera, both in hypanthium and achenes. The total anthocyanins content (in hypanthium) ranged from 12,04 mg/100 FW in R. nitidula and 19 mg/100 FW in R. corymbifera.*
Key words: *rose hips, polyphenol compounds, flavonoids, anthocyanins*

Rezumat.. *Scopul acestui studiu a fost de a analiza comparativ o serie de parametri biochimici în fructe mature provenite de la 2 taxoni spontani. Astfel, fructele sălbatice de Rosa corymbifera și R. nitidula au fost recoltate în toamna anului 2012, din județul Suceava. Au fost analizate variațiile în conținutul de apă și substanță uscată, conținutul total de compuși polifenolici și flavonoide atât în hipanțiu cât și în achene, pentru ambii taxoni. Rezultatele evidențiază faptul că, în hipanțiul și achenele ambelor specii, conținuturile de apă și substanță uscată au fost relativ constante. Cantitatea totală de compuși polifenolici și flavonoide a fost ușor mai ridicată la R. nitidula comparativ cu R. corymbifera, atât în hipanțiu cât și în achene. Conținutul total în antociani (în hipanțiu) variază între 12,04 mg/100g material proaspăt la R. nitidula și 19 mg/100g material proaspăt la R. corymbifera.*
Cuvinte cheie: *măceșe, compuși polifenolici, flavonoide, antociani*

INTRODUCTION

Genus *Rosa* L. is well represented in Romanian spontaneous flora (23 species described). The false fruit of *Rosa* species has been known since ancient times as having important medicinal properties. Rose hip extracts have antibacterial, antifungal and anti-inflammatory properties and antioxidant activity has also been shown. They contain large amounts of pharmacologically active

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compounds such as ascorbic acid, flavonoids, carotenoids and tannins. (Nădășan, 2011, Adamczak et al., 2012).

The real fruits (achenes) are enclosed in hypanthium, forming the rose hip. Hypanthium and achenes both contain pharmacologically active compounds, such as ascorbic acid, carotenoids and a number of phenolic compounds (flavonoids and anthocyanins) (Drocan, 1973, Adamczak et al., 2012, Arsenescu-Popa et al., 2008, Novruzov și Shamsizade, 2011, Szentmihályi et al., 2002). These compounds can be found in variable amounts in fruits of the spontaneous *Rosa* species; the content varies with genetic differences between species, but also with the altitude, soil type, climate and harvesting time (Adamczak et al., 2012, Drocan, 1973). The content in pharmacologically active compounds varies in fruits from different species of the *Rosa* L. genus, but also varies between individuals from the same species, grown in different altitudes and climatic conditions and even in different fruits of the same plant (Drocan, 1973).

The achenes contain a toxic glycoside (Nădășan, 2011) and are generally considered a waste material when rose hips are processed (Szentmihályi et al., 2002).

The main useful compounds of rose hips are ascorbic acid and carotenoids, but total polyphenols, flavonoids and anthocyanins contents are also very important. These compounds are secondary metabolites wich play multiple roles in plants; the protective role against pathogens and other destructive environmental factors is especially important (Daglia, 2012). It is generally considered that the hypanthium represents the useful part of rose hips and for a long time, achenes were thought to be only a waste material (Szentmihályi et al., 2002). But studies (Perédi et al., 1995, Szentmihályi et al., 2002) showed that achenes display a valuable content of useful substances (carotenoids, tocopherol, fatty acids, proteins, microelements) and they could be valorised in cosmetic industry and also for medicinal use.

Among the most intensely used *Rosa* species in phytotheraphy, *Rosa canina* (dog rose, wild rose) owned the top position (Bârcă, 1981; Dihoru, 1984; Popescu, 1984; Grigorescu *et al.,* 1986; Nădășan, 2011), as one of the most common species in Romania and most intensely investigated. *Rosa corymbifera*, also a wide distributed species in Romania, was only mentioned by few authors as showing medicinal properties (Dihoru, 1984).

Both *R. corymbifera* and *R. nitidula* are closely related taxa to *R. canina*; all three taxa are parts of the same subdivision of *Rosa* L. genus, section *Caninae* (Zanoschi et al., 2000).

The aim of this study was to assess comparatively some biochemical parameters in ripen rose hips of two spontaneous taxa, *Rosa corymbifera* Borkh. and *Rosa nitidula* Besser, collected from the montainous area of Suceava district.

MATERIAL AND METHOD

The material, consisting in ripen fruits of *R. corymbifera* and *R. nitidula,* was collected in october 2012, from the montainous area of Suceava district (Suhardului Mountains). Analysed individuals from each species were identified since the

flowering phenophase and were marked in the field. Biological material was stored at 4º C until processing. Fresh material was used for assessing the anthocyanins content and dry material, for the determination of polyphenolic compounds and flavonoids contents.

Dry matter and water contents were determined by gravimetric method (drying fresh material at 105ºC to constant weight) (Boldor, 1983); samples of hypanthium and achenes were analysed separately. Total polyphenols content was assesed with modified Folin-Ciocalteu method (Singleton et al., 1999). Spectrophotometric method was used to determine flavonoids content (Dewanto et al., 2002). Anthocyanins contents in hypanthium were determined by the spectrophotometric method.

RESULTS AND DISCUSSIONS

So far, relatively few studies have investigated dry matter and active substances contents in fruits of *R. corymbifera* and *R. nitidula* taxa from Romania.

Both investigated taxa show an average value of dry matter content in hypanthium around 43% (43.77% in *R. corymbifera* and 43,52% in *R. nitidula*, respectively) (fig. 1). Dry matter contents in achenes range from an average value of 74.50% in *R. nitidula* to a relatively higher average - 76.54% in *R. corymbifera*.

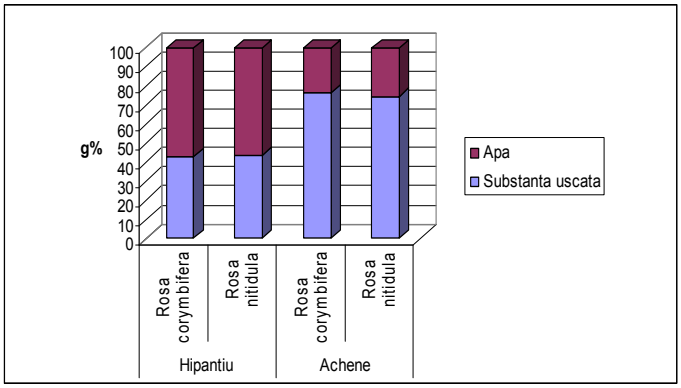

Fig. 1 - Variation of water and dry matter contents in *R. corymbifera* and *R. nitidula*

Our results for *Rosa nitidula* confirm the values previously reported in literature (42.12-44.8% dry matter in hypanthium of fruits collected from N-E Romania (Roșu et al., 2011)). The amount of dry matter in hypanthium of *R. corymbifera* fruits is slightly higher (43.77%) than the values provided by literature for *R. corymbifera* fruits harvested from N-E Romania, 31.9-38.7% dry matter in hypanthium (Roșu et al., 2011).

In *R. canina* and *R. corymbifera* fruits harvested in Portugal, Barros et al. reported an average value for dry matter content of 51.32% (Barros et al. 2010). Drocan (1973) reported, for *R. rugosa* fruits collected from Romania, maximum 29.55% dry matter and also maximum 38.75% for *R. canina* fruits, while Arsenescu (2009) reported 37.55% dry matter content in *R. canina* collected from Romania. The higher value of dry matter contents in our *R. corymbifera* samples

could be explained both by interspecific differences and the fact that the vegetation season of the year 2012, in our study area, was affected by periods of drought, amplified by the S-W exposition of the slope.

Polyphenolic compounds are secondary metabolites produced by higher plants, wich play an important role in plant's defense against pathogens and herbivores. These compounds are also produced as a plant response to abiotic stress, like UV exposure (Daglia, 2012).

Table 1

Variation of polyphenolic compounds and flavonoids contents in hypanthium and achenes in *R. corymbifera* and *R. nitidula* (DW= dry weight)

Taxa	Material (DW)	Polyphenols (mg GAE/g DW)	Flavonoids (g catechin/g DW)
R. corymbifera	hypanthium	82.66	57.35
	achenes	30.85	14.51
R. nitidula	hypanthium	87.63	50.25
	achenes	33.11	19.22

Our researches show, both in hypanthium and achenes, a slightly higher content of polyphenolic compounds in *R. nitidula* (87.63 mg GAE/g DW in hypanthium and 33.11 mg GAE/DW in achenes) than in *R. corymbifera* (82.66 mg GAE/g DW and 30.85 mg GAE/g DW, respectively) (table 1).

Polyphenolic compounds content in fruits of investigated taxa is similar to that obtained for the fruits of *Rosa* species collected in Turkey, ranging between 73-96 mg GAE/g DW (Ercisli, 2007). Barros et al. (2011) reports 149.35 mg GAE/g extract as total polyphenols content in hypanthium of ripen fruits of *R. canina* and 23.54 mg GAE/g extract in achenes.

Flavonoids are a class of phenolic compounds giving specific colors to flowers and fruits of a large number of plant species. In oxidoreduction processes, the flavonoids act as vitamin P (Gherghi et al., 2001); they also play a role in regulating plant growth and in plant reactions to biotic stress (bacteria, viruses) (Havsteen, 2002). Flavonoids (flavonols, isoflavones, flavones, catechins and flavanones) are considered some of the most important antioxidants (Gherghi et al., 2001), displaying useful properties for human health, such as the ability to inhibate the activity of certain enzymes, to simulate the activity of a number of hormones and neurotransmitters and also the ability to scavenge free radicals (Havsteen, 2002).

Our researches show that the flavonoids content, in hypanthium, is higher in *R. corymbifera* (57.53 mg catechin/g DW) than in *R. nitidula* (50.25 mg catechin/g DW). In *R. nitidula*, our results showed a flavonoids content of 19.22 mg catechin/g DW, slightly higher than the value in achenes of *R. corymbifera* (14.51 mg catechin/g DW, respectively) (Table 1).

Anthocyanins, located in cell vacuoles from vegetal tissues, according to local pH values, can produce red-colored (pH=3), violet (pH=8.5) or blue (pH=11) salts. Anthocyanins accumulation in plants is influenced by factors like temperature, light intensity, nitrogen content of the soil etc. Similar to flavonols,

anthocyanins are important compounds for human health, possibly contributing in the reduction of coronary diseases (Gherghi et al., 2001). In *R. corymbifera* fruits, the average value of the anthocyanins content was 19.00 mg/ g FW, higher than in *R. nitidula* (12.04 mg/g FW) (fig. 2).

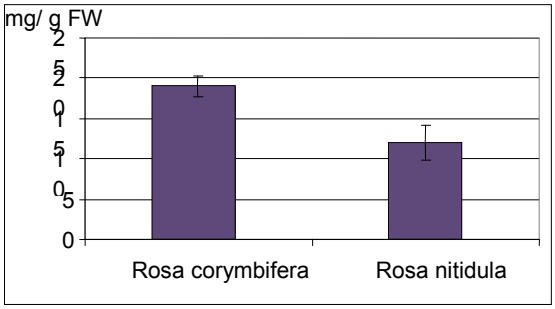

Fig. 2 - Variation of anthocyanins content in hypanthium of *R. corymbifera* and *R. nitidula* (FW = fresh weight)

CONCLUSIONS

1.Our results on the study of some biochemical parameters in *R. corymbifera* and *R. nitidula* show a variation in polyphenolic compounds, flavonoids, anthocyanins, dry matter and water contents, both in hypanthium and achenes.

2. Water and dry matter contents in both analysed taxa show relatively equal values, both in hypanthium and achenes.

3. *R. nitidula* showed a higher content of total polyphenolic compounds and flavonoids than *R. corymbifera*.

4. The amount of anthocyanins found in *R. corymbifera* was higher than in *R. nitidula*.

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