

Comparison of total phenolic compounds amounts in various parts of *Viburnum opulus* L. (European cranberry).

Renāte Šukele^{1,2}, Dace Bandere¹, Rudīte Koka³, Agnese Brangule⁴, Diāna Gorhova²

1.Riga Stradins university (RSU) , Department of Pharmaceutical chemistry, Riga, Latvia

2.Red Cross Medical college of RSU, Department of pharmacy, Riga, Latvia

3.RSU, Department of Biology and microbiology, Riga, Latvia

4.RSU, Department of Human Physiology and Biochemistry, Riga, Latvia

Correspondence: renete.sukele@rsu.lv; renete.sukele@rcmc.lv; +371 26491394

Introduction

Dietary polyphenols are of great interest among nutritionists, medicine researcher and users due to their wide medicinal properties. As secondary metabolites there are widely distributed in plants. More than 8000 phenolic compounds are identified currently. Polyphenols are chemically characterized as compounds with phenolic structure conjugated with mono- or polysaccharides. Phenolic compounds can be classified in several groups - phenolic acids, anthraquinones, coumarins, lignans, flavonoids, tannins, condensed tannins (protoanthocyanidins) (Khoddami et al., 2013). Flavonoids and tannins being of the most interest in food industry and medicine. *Viburnum opulus* (VO) is shrub native to Europe and Northern Asia. Fruits of VO are source of phenolic compounds, especially, flavonoids, and are well known for their antioxidant activities. Other plant parts are studied less giving a new perspective source of antioxidants. Some studies show potential of flower and bark. (Yilmaz et al., 2008, Cesoniene et al.,2014, Andreeva et al., 2016).



Figure 1. *Viburnum opulus* ethanol extracts. 1. Root 2. Leaf and flower 3. Bark 4. Fruit

Aim

The aim of this study was to determine and compare amounts of total phenolic compounds' amounts in 4 different parts of plant - fruit, leaf with flower, bark, and root using Folin-Ciocalteu method.

Materials and methods

Plant material and chemical substances

Plant material - Herbs of *Viburnum Opulus* were harvested in Latvian commercial farm. Dried in ambient temperature. Powder fruits with seeds, bark, roots and mixture of flowers and leaves was used in this study. Material was grinded in mill and sieved through sieve size 1-2mm.

Ethanol used for extraction was analytical grade, Gallic acid, Sodium carbonate were HPLC grade, Folin-Ciocalteu reagent and all substances were purchased from Sigma – Aldrich.

Chemical analysis of Total Phenolic Compounds

To determine the amount of total phenolic compounds Folin - Chicoltou method (Lauberts, 2018) with slight modifications was used. Powdered dried plant material (2.5g) was extracted with 50% ethanol water solvent for 60 min on magnetic stirred at 60°C. After 30 min incubation in dark, measured absorbance at 765nm using Mettler Toledo UV7 spectrophotometer. Gallic acid (c=0.120 mg/L) solution at concentrations 0,0075; 0,015; 0,03; 0,06; 0,09 mg/mL was used as standard for calibration curve. Results expressed as Gallic Acid Equivalents (GAE), mg/100g plant.

All sample analysis was done in triplets. Statistical analysis and visualizations done by Microsoft Excel 2010.

Results

Analysis results show total phenolic compounds (TPC) ranged 4069 - 5951 mg GAE/100g in VO samples. VO fruit berries showed lowest amounts of TPC. In literature TPC amount in fruit ranged from 1400 to 8290 mg GAE/100 g. (Česonienė et al. 2010, Kraujalytė et al., 2013). Our results showed that bark and root contained the highest amount of TPC. Various results are found about other VO parts, some show greater amounts of TPC in flowers, leaves, and roots, but some lower than fruit (Polka et al. 2019, Andreeva, 2011).

Genotype of plant used and sample preparation before analysis could explain different results.

Table 1. Average amounts of TPC in VO parts

	Average, GAE mg/100g	Standard deviation	Confidence interval
VO Leaf and flower	4953.67	422.68	4677.51 - 5229.82
VO Bark	5951.11	116.26	5875.16 - 6027.07
VO Fruit	4069.22	233.52	3916.65 - 4221.79
VO Root	5577.56	868.56	5010.10 - 6145.01



Figure 2. *Viburnum opulus*

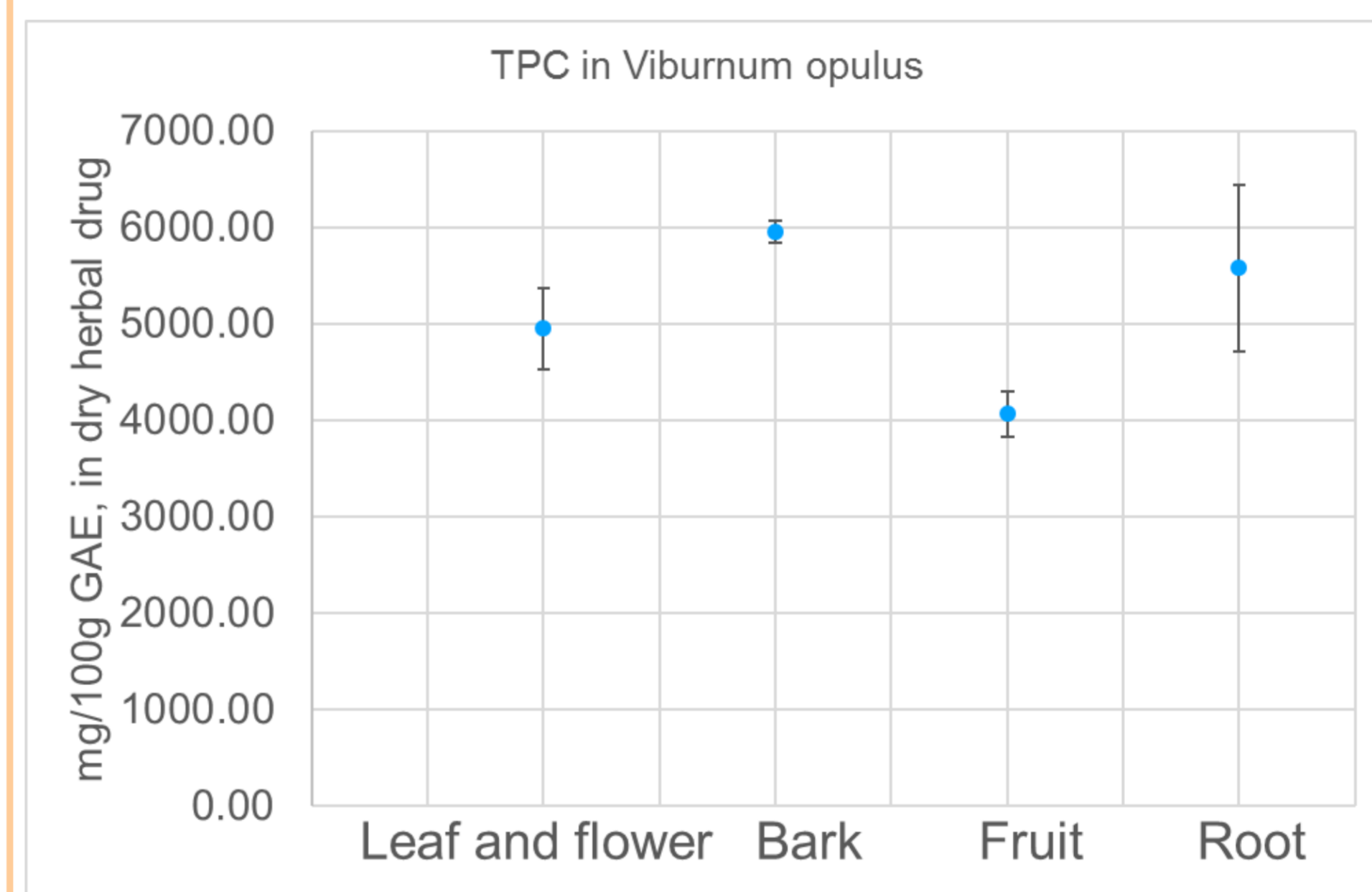


Figure 3. Total phenolic compound amounts in dried parts of *Viburnum opulus*.

Conclusions

- All parts of *Viburnum opulus* contained high amounts of phenolic compounds.
- Bark and root exceeded fruit, flower and leaf combination in total phenolic contents.
- Various factors effect yield of phenolic compounds.
- Further studies are needed to determine exact types of polyphenols in plant parts of *Viburnum opulus* and their relation medicinal properties.

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