

# Chemical Characterisation of the Fruit of Black Chokeberry Grown on Different Types of Soil

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*Plant samples were collected in March 2012 using the sampling method defined in (ISO 10381: 3, 2001), and delivered to the Laboratory, of Faculty of Agronomy, from Čačak for analysis. Black chokeberry was grown on four types of soil viz. Luvisol, Pseudogley, Fluvisol and Vertisol. The total sugar content was highest in black chokeberry fruits sampled from the Vertisol, followed by those grown on Luvisol, Fluvisol and Pseudogley soils. Black chokeberries were found to contain sorbitol, a sugar alcohol, which is not a characteristic common to other berries. The dominating organic acids in black chokeberry fruits include malic acid and citric acid, regardless of soil type. The fruits are rich in vitamin C content – 0.2 g/L, irrespective of soil type.*

**Keywords:** Black chokeberry, soil type, total acids, total sugars, vitamin C

Black chokeberry (*Aronia melanocarpa* Michx.) is a deciduous shrub native to North America, botanically classified as belonging to the family *Rosaceae* [1]. It grows to 2-3 m, producing beautiful white flowers and fruits quite resembling blueberries in shape. Black chokeberry was imported from America to Russia in mid 18th century, and it was only at the end of the 20th century that it was further spread to other parts of Europe. The most likely reason for its slow spread throughout Europe is the astringent taste of the berry [2]. Notwithstanding their taste, the berries have high levels of vitamins, flavonoids, tannins and other substances beneficial in improving the human immune system [3,4]. Many scientific studies in the fields of nutrition and medicine have proved the positive effect of chokeberry fruit in preventing cardiovascular diseases and treating colon cancer, uveitis and many other diseases [5-7]. Due to the high nutritive value of black chokeberry and the growing market demand, many fruit growers in Serbia have expanded their production to include black chokeberry, with some of them specifically orienting towards the production of this fruit only. Another advantage of black chokeberry production is the fact that the chokeberry has no specific cultivation requirements, it is a cold-hardy plant tolerant of very low temperatures, due to which it is found in a wide range of habitats, providing reliable easy-to-earn income. To date, most studies have focused on the qualitative composition of black chokeberry fruit [8-11], without addressing fruit quality in terms of the effect of agro-climate and the type of soil used. Given the fact that black chokeberry cultivation is increasingly spreading to southwestern Serbia, the objective of this study was to evaluate the effect of soil chemical properties on the qualitative composition of black chokeberry fruit. The fruit qualitative traits analysed include particular parameters that confer characteristic quality to the fruit viz. the qualitative and quantitative composition of both acids and sugars, and vitamin C content.

The research involved fruits of black chokeberry grown on four soil types: Luvisol, Pseudogley, Fluvisol and Vertisol, commonly used for black chokeberry production in southwestern Serbia. To assess soil quality, chemical analysis was carried out for each soil type to determine soil pH, nitrogen, humus, available phosphorus, and available potassium.

## Experimental part

### Material and methods

Black chokeberry plantings located at four different sites in southwestern Serbia: Trbušani, Prijepolje, Golija and Loznica, were used in the experiment. The four soil types at the experimental sites were a Luvisol (Loznica), a Pseudogley (Golija), a Fluvisol (Trbušani), and a Vertisol (Prijepolje). Each soil was sampled in March 2012 using the sampling method defined in [12]. Soil samples were delivered to the Laboratory, of Faculty of Agronomy, from Čačak for chemical analysis including soil pH, nitrogen, humus, and available forms of phosphorus and potassium. Soil pH was determined by a digital pH metre [13], nitrogen content by the Kjeldahl method, humus content by the bichromatic method [14], and available forms of phosphorus and potassium by AL-method [15]. The objective of the analysis was to assess the chemical properties of the four soil types prior to the onset of the black chokeberry growing season.

Cultural practices included soil fertilisation at a rate of 3 kg per 100m<sup>2</sup> at three stages: at the beginning of the growing season, high-nitrogen (CAN) fertilisers were applied; at mid season, the soil was fertilised with an identical content of nitrogen, phosphorus and potassium (20-20-20); and at the end of the growing season, fertilisers with an increased content of potassium (5-20-30) were used.

At each site, black chokeberries were sampled for the analysis of qualitative composition at harvest maturity, reached in mid-September at all sites. Immediately after harvest, the fruits were placed in a mobile refrigerator and delivered to the laboratory to produce 100% fruit that was refrigerated at +4° C until analysis. Identification and quantification of sugars and acids in fresh black chokeberry fruits (100 % black chokeberry fruit juice) were conducted at the Chemical Laboratory, Enological Station, Vršac, in December 2012, using high-pressure liquid chromatography coupled with FID detection.

The data obtained were subject to statistical analysis using SAS Institute program 9.1.3. The results were interpreted based on the data analysed, and conclusions were drawn.

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