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THE YIELD OF A 11 YEARS OLD SASKATOON BERRY (*AMELANCHIER ALNIFOLIA* NUTT.) CULTURE FROM ARAD COUNTY, WESTERN ROMANIA

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Abstract

Recently, in Romania special attention was given to the culture of Saskatoon berry (Amelanchier alnifolia Nutt.), a species originating from North America, whose berries are very appreciated both for their nutritional and medicinal values. The aim of this study was to highlight the yield of a culture installed in Bărzani Farm, Arad county, Romania.. The plants were produced in 2012 from seeds originating from Alberta (Canada). In the first two growing seasons the plants were kept into a nursery and specific treatments were applied. In Autumn 2013, the plants were transferred to two experimental plots, with a total area of 0.74 hectares, and a 3 m x 1 m planting scheme was adopted (i.e. 3 meters between the rows and 1 meter between the plants in the same row). Starting with 2018 different fertilizers were applied and soil analysis were performed. In most of the cases as regards the main micro- and macro-elements from the soil increasing trends were recorded thanks to the applied fertilizers. As regards the harvested quantities in the last five growing seasons, they grew from 1,250 kg (in 2018) to 6,800 kg (in 2022), meaning that, on average, each plant produced from 0.5 kg (in 2018) up to 2.7 kg (in 2022). The results recorded in the two experimental plots from Bărzani Farmrepresent an important step in the breeding program of this species in Romania.

Key words: *Amelanchier alnifolia, fruit, saskatoon, yield*

INTRODUCTION

Genus *Amelanchier* (*Rosaceae*) has a very complicated taxonomy, with about 25 species distributed across North America, Asia and Europe, cultivated for their fruits and/or thanks to their ornamental value [1], [15], [19], [27]. It includes diploids, triploids, and even tetraploids [7], and the most common species are represented by: Canadian serviceberry [*Amelanchier canadensis*(L). Medik.], snowy mespilus (*A. ovalis*Medik.), juneberry (*A.lamarckii* F. G. Schroed) and saskatoon berry (*A. alnifolia* Nutt.) [25].
Canadian serviceberrywas introduced into Europe almost 400 years ago, while *A. lamarckii* was brought in Europe around 1850, while at the end of the previous century, saskatoon berry was reported in the Baltic Region [13]. Regarding the latter species, in some regions, such as in the case of the suburban forests from Kambarka (Western Rusia), it was reported that *A. alnifolia* was an invasive species [3].
Saskatoon berry is very tolerant to site conditions, being able to grow in several soil types, with a broad range of soil reaction, starting from 5.6 up to 8.0 [24]. Thanks to its relative rusticity and its berries and beauty, *A. alnifolia* was also used in the composition of several hedgerows across Central Alberta (Canada), together with Virginia bird berry (*Prunus virginiana* L.) and two representatives of genus *Populus*, namely eastern balsam-poplar (*P. balsamifera* L.) and trembling aspen (*P. tremuloides* Michx.) [2].
Saskatoon berry can be propagated both by seeds and vegetatively, by cuttings, which is difficult, or in vitro [12]. In some cases, no differences were reported between the yields of seed propagated plants versus micropropagated plants [20]. As regards its

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berries, its fruit is a small pome, 1.0 to 1.5 in diameter [21], with several uses, like its related species Canadian serviceberry [8]. The berries of both species are very rich in sugar, with an average content of 8% [14].

Moreover, it was reported that the berries of *A. alnifolia* represent a good source of bioactive components, nutrients, vitamins and other micro- and macro-elements [6], [10], [16], [17], [23], being considered to be a very healthy and useful supplement in human nutrition and medicine [4], [11], [18], [22].

As regards its fruit production, it was reported that an adult shrub is able to produce between 4,500 and almost 10,000 berries [13].

In the next years, it is expected that saskatoon berries to become an important source of organic products across Europe. In this context, both at local and regional level, professional associations expressed their need to work together to obtain as many organic products as possible. The EU actively supports the fruit and vegetable sector through its market management system. An EU Member State may also require compliance with the rules agreed within a professional organization to stimulate sustainable production [9]. However, effective regulation at European level must be uniform [26].

The aim of this research was to highlight the yield of a 11 years old saskatoon berry culture from Arad County.

MATERIALS AND METHODS

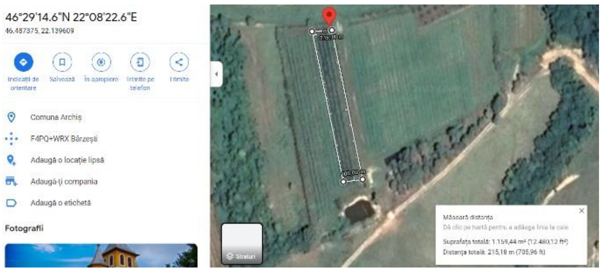
In spring 2012, seeds of Saskatoon berry originating from Alberta (Canada) were sown in the nursery of Bărzani Farm (Arad County) [5].

The young plants obtained from the seeds were kept in a nursery for two years and specific works (*i.e.* weed control works, fertilization, disease and pest control) were applied [5].

At the end of the second growing season (*i.e.* October 2013), the young plants were transferred from the nursery into two experimental plantations (Figure 1), both situated in Bărzani Farm, plot 1 being very close the nearby forest. The first planting plot had an area of 0.11 hectares (Map 1;46°29'12.6"N 22°08'22.9"E), while the second one had an area of 0.63 hectares (Map 2; 46°28'56.6"N 22°07'04.1"E), respectively.

Photo 1. Transferring the young plants from the nursery into the two experimental plots (October 2013)
Source: original.

The planting scheme was 3 x 1, meaning 3 m between the rows and 1 m between the plants on the same row. A total of 367saplings were planted in the first plot and 2,467 saplings were introduced in the second one.



Map 1. Planting plot no. 1
Source: Google Maps, Accessed on 8th of July 2022.

Before planting, the soil was prepared, and a 0.4 m deep plowing was applied and a quantity of 18.5 tones of manure were administrated in the two plots [5].

Map 2. Planting plot no. 2
Source: Google Maps, Accessed on 8th of July 2022.

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During the first two growing seasons (*i.e.* 2012 and 2013), special attention was given to the maintenance of the culture, by transforming the vegetal layer within the rows into mulch and by pest and disease monitoring (Photo 2).

Photo 2. Mulching applied on 8th of August 2014 in the two experimental plots
Source: original.

Starting with 2018, fertilizers were simultaneous applied in the two experimental plots, as follows:
-on 7th of April 2018: NPK Complex fertilizer (16-16-16), with doses of 80 kg/ha, being manually (granulated) applied;
-on 5th of May 2018: Nitrocalcar fertilizer (27%Total N 7%CaO 5% MgO), with doses of 100 kg/ha, being manually (granulated) applied;
-on 7th of March 2019: Doloflor fertilizer [33%CaMg(20%Co_3)$_2$], with doses of 3,000 kg/ha, being manually (powder) applied;
-on 16th of March 2019: NPK Complex fertilizer (16-16-16), with doses of 100 kg/ha, being manually (powder) applied;
-on 24th of March 2020: DAP fertilizer (18%N 46%P_2O_5, with doses of 150 kg/ha, being manually (powder) applied.
No fertilizers were applied in 2021, nor in 2022.
Moreover, for the timeframe 2018-2022, yearly soil analysis were done at Alchimex Laboratory, several parameters of the main and secondary macro-elements, soil reaction, micro-elements, salinity and organic matter being assessed.

The soil samples were collected from the two plots on 20th of April 2018, 24th of April 2019, 6th of March 2020, 23rd of April 2021 and 5th of April 2022, respectively.

RESULTS AND DISCUSSIONS

Since the values of the assessed soil parameters were similar in the two planting plots and since the same treatments were applied, their average values were considered in the followings.
Thanks to the applied fertilizers an increasing trend as regards the nitrogen supply (N index) was observed (Figure 1).

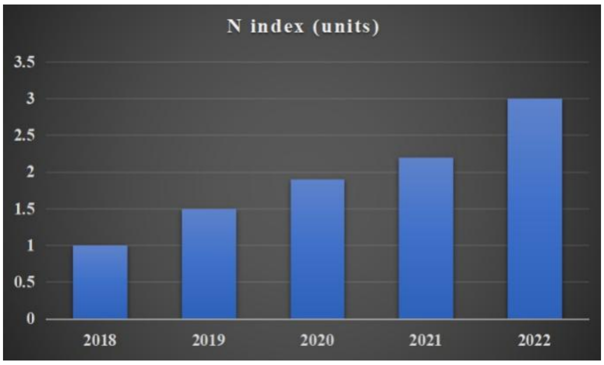

Fig. 1. N index evolution in the timeframe 2018-2022
Source: original.

N index is a synthetic indicator that expresses the capacity of the soil to make available to the crop, during the vegetation period, quantities of nitrogen by mineralizing the soil. According to the recorded values, between 2018 and 2020, the soil had a poor nitrogen supply, while in 2021 and 2022, the soil benefited from a medium supply of nitrogen.
As regards the main assessed macroelements from the soil, in general, their content increased in the considered timeframe (Figure 2).
The most significant increasing trend was recorded for Phosphorous [P] content, which grew from 24.3 mg/kg of soil (in 2018) up to 241.7 mg/kg of soil (in 2022).
A similar trend was also observed in the case of the Potassium [K] content, which grew from 78.1 mg/kg of soil (in 2018) to 247.4 mg/kg of soil (in 2022).

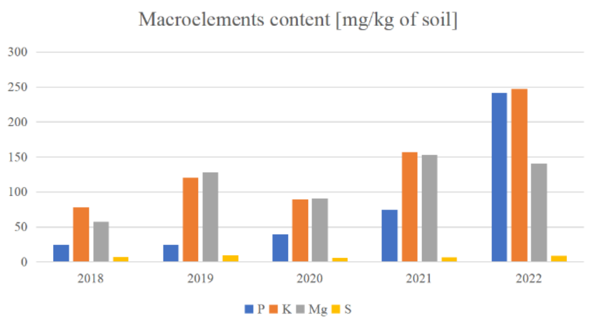

Fig. 2. Macroelements content [mg/kg of soil]
Source: original.

In the case of Magnesium [Mg] content, with the exception of the year 2018, when the soil was medium supplied with this macroelement, in the timeframe 2019-2022, the soil benefited of a good supply.

A variable trend was recorded for Sulfur [S] content, namely 7.2 mg/kg of soil (in 2018), 9.6 mg/kg of soil (in 2019), 5.4 mg/kg of soil (in 2020), 6.3 mg/kg of soil (in 2021) and 8.8 mg/kg of soil (in 2022), respectively.

The soil reaction (*i.e.* pH) recorded the lowest value (5.09) in 2019 and the highest one (6.26) in 2021. Thus, the soil reaction varied from moderately acid to slightly acid (Figure 3).

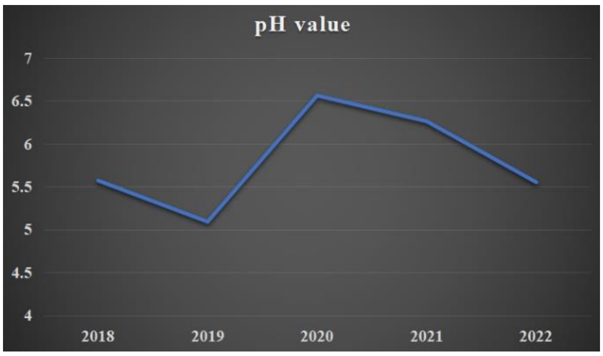

Fig. 3. pH values across the considered timeframe
Source: Original.

It is well known that the pH value influences the entire nutritional dynamics of the soil and therefore the knowledge and improvement of the soil reaction (pH) is of prime agrochemical importance.

A very low value of the pH usually indicates a deficiency of calcium [Ca], magnesium [Mg] and especially phosphorus [K]. This low value can sometimes be associated with a risk of toxicity of aluminum [Al], manganese [Mn] and iron [Fe].

Such a situation requires measures to improve and avoid certain types of fertilizers that can further acidify the soil.

As regards the content of the microelements, the soil had a good Iron [Fe] and Manganese [Mn] supply, ranging from 51.2 mg/kg of soil (in 2020) to 198.0 mg/kg of soil (in 2018), in the case of the Iron, and from from 36.4 mg/kg of soil (in 2020) to 354.9 mg/kg of soil (in 2018), in the case of the Manganese, respectively (Figure 4).

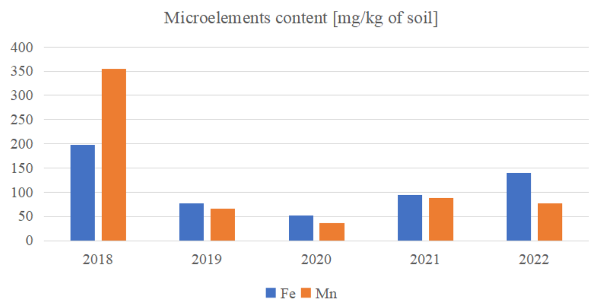

Fig. 4. Iron [Fe] and Manganese [Mn] content
Source: original.

In the case of the other two assessed microelements (Copper and Zinc), their shares were lower, namely ranging from 0.9 mg/kg of soil (in 2019) to 2.6 mg/kg of soil (in 2018) in the case of Copper [Cu], and from 1.0 mg/kg of soil (in 2019) to 3.5 mg/kg of soil (in 2018) in the case of Zinc [Zn], respectively (Figure 5).

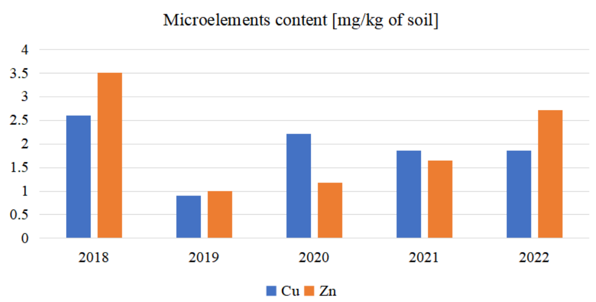

Fig. 5. Copper [Cu] and Zinc [Zn] content
Source: Original.

According to the soil analysis, during the studied timeframe, the soil was unsalted, the values of the salinity ranging from 12.5 mg/100g of soil (in 2018) to 33.1 mg/100g of soil (in 2019), being suitable for planting Saskatoon berry.

As regards the organic matter content [%], an increasing trend was recorded both for organic carbon and total humus (Figure 6).

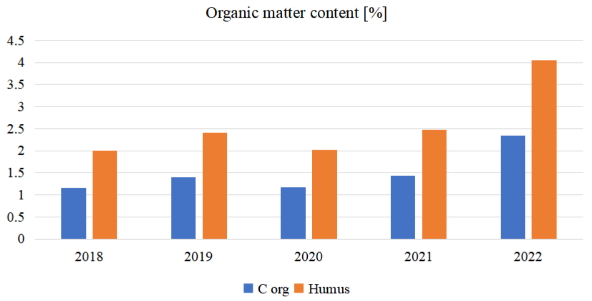

Fig. 6. Organic Carbon and total humus content
Source: original.

During the considered timeframe (2018-2022), the berries harvesting was done in June, with a 4-5 days delay between the two experimental plots, since the small one being placed nearby the forest, the flower blooming started 4-5 days later.

The total quantities of the harvested berries from the two plots were the following ones: 1,250 kg (in 2018), 2,370 kg (in 2019), 4,880 kg (in 2020), 6,290 kg (in 2021) and 6,800 kg (in 2022), respectively. This means that, on average, each plant produced 0.5 kg (in 2018, in their seven growing season), and 2.7 kg (in 2022, in their eleventh growing season) (Photo 3).

Photo 3. Berries of *Amelanchier alnifolia* from Bărzani Farm
Source: Original.

CONCLUSIONS

Based on the obtained results, it can be concluded that Saskatoon berry represents a good option for producing high and valuable quantities of berries, which are very appreciated both for their nutritional and medicinal values.

The results recorded in the two experimental plots from Bărzani Farm (Arad County) represent an important step in the breeding program of this species in Romania. Future research should be focus also on assessing both the morphological variability (especially regarding the fruit traits), genetic variation by the aid of the molecular markers and the flowering phenology. By doing so, it is expected to increase the number of varieties that can be introduced in several sites across Romania.

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