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EVALUATION OF TWO CHOKEBERRY CULTIVARS ACCORDING TO FRUIT QUALITY PARAMETERS

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ABSTRACT

This study evaluates the growth performance and fruit quality parameters of 'Melrom' and 'Nero' chokeberry cultivars in southeastern Romania. The research monitors phenological stages from early spring bud swelling until full fruit ripening, which occurred in mid-August for both genotypes. Morphological traits and biochemical properties were analyzed to determine the adaptability of these cultivars to local climatic conditions. The results indicators showed that 'Melrom' obtained a higher initial fruit production, reaching a yield of 157.00 g per plant. Conversely, 'Nero' recorded a lower yield of 138.00 g per plant, but demonstrated larger clusters with more berries per cluster. Regarding processing quality, 'Nero' showed a superior juice yield at pressing (74.00 %), making it highly efficient for liquid extraction. Chemical analysis revealed that 'Melrom' excelled in fruit sweetness, accumulating the highest total soluble solids of 19.97 % Brix. The colorimetric data confirmed distinct visual differences, characterizing 'Nero' with lighter berries and 'Melrom' with darker fruits.

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INTRODUCTION

Black chokeberry (*Aronia melanocarpa*) Michx. Elliott, is a deciduous shrub of the Rosaceae family, 1.5 to 2.5 m tall depending on the cultivar (Jeppsson, 2000; Kulling et al., 2008; Ünal et al. 2023). The genus includes three main taxa: *A. melanocarpa* with black fruit, *A. arbutifolia* with red fruit and the intermediate hybrid *A. x prunifolia* with purple fruit. Almost the entire commercial and scientific interest is concentrated on the black-fruited species, because of its higher content in anthocyanins and proanthocyanidins (Platonova et al., 2021; Zhang et al., 2021). Fruits also contain abundant bioactive polyphenolic compounds (Mazilu et al., 2022; Jovanović et al., 2023; Stach and Kolniak-Ostek, 2023).The fruits, rich in antioxidants, are known to contribute to overall health and well-being, according to Torović et al. (2023).

The species originates in eastern North America, where the fruit was used by the native populations both as food and for medicinal purposes. Its conversion from a wild shrub into a crop has a well-documented turning point in the breeding work of I. V. Michurin, who crossed *A. melanocarpa* with *Sorbus aucuparia*; the resulting tetraploid, classified today as x Sorbaronia mitschurinii (Skvortsov &

Majtulina 1982; Skvortsov et al. 1983; Shipunov et al., 2019), is the origin of most modern commercial cultivars, 'Viking' and 'Nero' included.

The selection of the cultivar likewise impacts the fruit's flavor and biochemical properties. In Romania, the ‘Nero’ and ‘Melrom’ cultivars are commonly grown. However, the thorough understanding of chokeberry cultivars' growth performance, taste, and detailed fruit biochemical properties under Romanian growing conditions remains limited. Further investigation is indeed required to comprehend these factors more thoroughly.The objective of the research was to evaluate certain morphological traits, characteristics, and chemical content in two varieties of chokeberry fruit.

MATERIALS AND METHOD

‘Melrom' and ‘Nero', two chokeberry cultivars, were examined in the study. Chokeberry plants were cultivated at the Research Station for Fruit Growing in Constanta, which is situated in southeastern Romania, close to the Black Sea. The site's coordinates are 44°10' North latitude and 28°29' East longitude, with an elevation of 70 meters above sea level. The mean annual temperature is 12.0°C and the total active temperature is 3988°C, out of which 3170°C during the growing season; the annual precipitation amount is 400 mm, out of which during the growing season (April 1 to September 30), 240.7 mm. The temperatures below -20°C, and the spring frosts, occur infrequently: about once in 10-15 years, and these both can lead to damage to the aronia yield. The annual climatic water deficit can reach up to 400 mm/year, indicating the need for irrigation in aronia cultivation. In 2023, the chokeberry cultivars were planted in plots of 3 meters by 2 meters (3 m x 2 m scheme) with north-south aligned rows, and the plant shape was bush-like. In 2023, the chokeberry cultivars were planted in plots of 3 meters by 2 meters (3 m x 2 m scheme) with north-south aligned rows, and the plant shape was bush-like. A total of 416 plants were planted: 208 "Melorm" plants and 208 "Nero" plants. During 2026 the fruit yield was recorded, phenological observations were per formed weekly or every 2–3 days.The indicators studied were recorded on a sample of 50 chokeberry fruits. The fruit output was calculated by measuring the ripe fruit from each plant (grams per plant). Fruit weights and average weight of a fruit cluster were determined by using the HL-400 digital balance. Number of fruits per cluster were observed by counting. The fruit firmness was determined for each sample with a penetrometer Bareiss HPE II FFF. The non-destructive test had a measuring surface of 0.25 cm^2. PH values were determined in fresh chokeberry juice (Song et al., 2018) through a pH meter (ISFET pH Meter, IQ 125, Japan). The soluble solids were measured using the PR Series digital refractometer.The external fruit color was determined with a colorimeter Konica Minolta CR 400, based on system Huntel L*, a*, b* on both sides of the fruit (L* corresponds to brightness, a* and b* chromaticity coordinates from green to red and from blue to yellow, respectively). Chroma index was calculated using the formula C = (a*2 + b*2)1/2, and the hue angle was h^0 = arctangent (b*/a*), where 0^0= red-purple, 90^0= yellow, 180^0= bluish-green and 270^0 = blue, as noted by McGuire (1992).

RESULTS AND DISCUSSIONS

The onset of vegetation began within the first days of March; the flowering began in the third decade of April, and fruit ripening was triggered from the second decade of August for the two chokeberry cultivars studied (Table 1). From the blooming until fruit ripening passed 93-94 days.

Table 1.

Phenological growth stages to chokeberry cultivars

Cultivar	Beginning of bud swelling	Beginning of budding	Beginning of flowering-first flowers open	Full flowering:at least 50 % of flowers open, first petal falling	End of flowering all petals fallen	Beginning of ripening	Full ripening
'Melrom'	3-03	15-03	22-04	27-04	6-05	23-07	10-08
'Nero'	4-03	15-03	20-04	27-04	7-05	25-07	12-08

The chokeberry cultivars studied showed variations in production and sizes of fruit (Tab. 2). The study shows that the highest production was obtained by the 'Melrom' cv. (157 g /plant) and the highest weight of fruit (0.92 g/fruit) Table 2. Fruits picked up from 'Nero' variety bushes were considerably smaller (0,71 g/fruit). It is essential to underscore that these values represent the first-year yield following initial planting. According to Ünal N et al. (2023), on average yield per plant for 'Nero' cultivar in Türkiye, was 128,4 g/plant. Ochmian I et al. (2012) reported the fruits of 'Nero' cultivar may be considered large fruits, these cultivar weighed 9,17 g. In certain years of research by Kawecki and Tomaszewska (2006), the weight of harvested fruits varied between 84 and 98 grams.

Table 2.

Productivity and fruit characteristics of chokeberry cultivars

Cultivar	Yield (g/plant)	Fruit weight (g/fruit)	The average weight of a fruit cluster (g)	The count of berries within a cluster (fruits)
'Melrom'	157.00	0.92	10.10	14.33
'Nero'	138.00	0.71	18.05	19.67
Mean	147.50	0.81	14,07	17.00
CV%	39.32	15.02	22,67	33.93

The average weight of a fruit cluster (g) of the 3-year-old 'Nero' and 'Melrom' cultivars is presented in Table 2. Notable differences in terms of average weight of a fruit cluster were observed between the 'Nero' and 'Melrom' cultivars. However, 'Nero' demonstrated a higher average weight of a fruit cluster of 18.05 fruits/cluster, whereas 'Melrom' yielded 10.10 fruits/cluster.

Regarding number of berries per cluster the highest average number of fruits per cluster, was recorded by 'Nero' cultivar (19.67 fruits/cluster), and the lowest average number of fruits was recorded by 'Melrom' also (14.33 fruits/cluster). Present findings are also confirmed by Dragomir et al., 2022 was 13.00 fruits/cluster ('Melrom') and 21 berries/cluster ('Nero').

Table 3.

Fruit characteristics and juice efficiency of chokeberry cultivars

Cultivar	Fruit firmness (Ncm^2)	Juice yield at pressing (%)	Total soluble solid (% Brix)	pH
'Melrom'	44.17	70.00	19.97	3.82
'Nero'	53.80	74.00	18.17	3.74
Mean	48.98	72.00	19.07	3.78
CV%	4.16	12.95	16.65	2.92

During the study, there were differences between genotypes regarding the fruit firmness and was 44.17 Ncm2 ('Melrom') and 53.80 Ncm2 ('Nero'), Tab.3.

Similar amount of juice was obtained from the fruit cultivars -'Melrom' and 'Nero'. They equaled 70.00 % and 74.00 % respectively. Fruit efficiency from cultivars 'Galicjanka' and 'Nero' achieved by Ochmian et al., 2012, they equaled 76.8 % and 78.9 %.

The examination of the chokeberry varieties being studied revealed varying fruit compositional elements (see Table 3). Generally the highest content of a majority of the discussed ingredients was present in the fruits of the 'Melrom' variety (Tab. 3).

The variation in soluble solids content could be influenced by genetic factors, ripening degree, climatic conditions, and other factors (Jeppsson, 2000; Strik et al., 2003). In our study, a significant influence of the genotype on the soluble solids content was recorded in the 'Melrom' cv., which had the highest value of this parameter of the studied varieties (19.97 % Brix) (Table 3).Ochmian et al. (2012) reported that for the 'Nero' and 'Viking' cultivars, the values were 14.4 % Brix and 14.2 % Brix respectively, though the 'Hugin' variety had the highest content at 18.7 % Brix.

Table 4.

Fruit quality colour characteristics of chokeberry cultivars

Cultivar	Brightness (L*)	Chroma Index (C*)	The angle (h °)
'Melrom'	19.59	1.19	27.64
'Nero'	22.28	1.34	33.41
Mean	20.94	1.26	30.52
CV%	4.41	11.33	44.90

The color of the evaluated fruits was assessed through a transmitted mode using photocolorimetric techniques according to the CIE L*a*b* system (Table 4). Colour value measurements for the chokeberry cultivars were taken differently.The greatest readings were found in samples of fruits from the 'Nero' variety: the L* value was 22.28, the C* was 1.34, and the h° was 33.41 (Table 4).

In this area of the color sphere, the lower values L* and ho represent the darker sample color, while the higher values represent the lighter sample. The 'Nero' cultivar is characterized by bright fruits and 'Melrom' cultivar by darker fruits.

CONCLUSIONS

Over the past few years, chokeberry's importance has grown because of its adaptability and broad range of uses, encompassing dried fruits, juices, jams, fruit teas, and marmalade. This investigation concentrated on monitoring chokeberry evaluating the fruit quality of two key cultivars grown in Constanta, southeastern Romania, near the Black Sea. The results of our study demonstrate that the 'Melrom' cultivar exhibited superior performance compared to the 'Nero' cultivar in terms of fruit yield and bioactive compounds. These results carry substantial significance, indicating that chokeberry farming might represent a promising option for fruit cultivation in southeastern Romania.

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