horticulturae

Article

Fruit Quality and Production Parameters of Some Bitter Cherry Cultivars

Ionel Perju [1], Iulia Mineață [1,*], Sorina Sîrbu [1], Iuliana Elena Golache [1], Ionuț Vasile Ungureanu [1] and Carmen Doina Jităreanu [2,*]

[1] Research Station for Fruit Growing, 3 Ion Vodă cel Viteaz Street, Miroslava, 707305 Iasi, Romania; ionel_perju@yahoo.com (I.P.); sorinas66@yahoo.com (S.S.); iulianagolache@yahoo.com (I.E.G.); ungureanu_ionut91@yahoo.ro (I.V.U.)

[2] Department of Plant Science, "Ion Ionescu de la Brad" Iasi University of Life Sciences, M. Sadoveanu Alley, 700490 Iasi, Romania

* Correspondence: iulia_mineata@yahoo.com (I.M.); doina.jitareanu@iuls.ro (C.D.J.)

Abstract: Bitter cherries (*Prunus avium* var. *sylvestris* Ser.) represent a valuable raw material in the traditional Eastern European food industry with high potential within the horticultural chain and circular economy in the context of global food security due to exceptional nutritional properties. The present study was carried out in the period 2022–2024 and had as its main purpose the evaluation of the fruit quality and production indices of some bitter cherry cultivars suitable for the technological norms specific to industrial processing. Five bitter cherry cultivars (C_1-Amaris, C_2-Amar Maxut, C_3-Amar Galata, C_4-Silva, C_5-Amara) were studied and analyzed in terms of fruit quality—morpho-physiological and organoleptic traits, and physical and chemical parameters—and general productivity—tree vigor, fruiting, and yield indices. The results highlighted a wide variability in the physical characteristics of bitter cherries, with an average weight between 3.3 and 4.9 g and the color of the skin varying from yellow with redness to dark red and blackish. Regarding the chemical attributes, antioxidant activity was relatively higher in fruits with a more intense bitter taste (89.3 μg Trolox·g^{-1} f.w for C_2 and 89.1 μg Trolox·g^{-1} f.w. for C_4 and C_5), a fact also found in the content total of polyphenols (with a maximum value of 743.2 mg GAE·100 g^{-1} f.w at C_2). Total soluble solids content had an average value of 20.51°Brix and titratable acidity of 0.85 g malic acid·100 g^{-1} f.w. The influence of local environmental factors on the productivity of bitter cherry cultivars was highlighted by significant statistical differences ($p < 0.05$) between cultivars. Thus, the resistance to frost in the full flowering phenophase had an average value of 86.69%, and regarding the resistance to fruit cracking, the highest percentage was found in C_1, with 99.79% unaffected fruits. The productivity index per tree had an average value of 0.24 kg per cm^2 trunk cross-section area. The physico-chemical properties of the fruits and the productivity of bitter cherry cultivars support the possibility of their efficient use in processing and the food industry, yielding high-quality products with nutraceutical value.

Keywords: *Prunus avium* var. *sylvestris*; antioxidant activity; productivity index; bitter cherry; fruits

Academic Editor: Xuming Huang

Received: 6 December 2024
Revised: 10 January 2025
Accepted: 10 January 2025
Published: 14 January 2025

Citation: Perju, I.; Mineață, I.; Sîrbu, S.; Golache, I.E.; Ungureanu, I.V.; Jităreanu, C.D. Fruit Quality and Production Parameters of Some Bitter Cherry Cultivars. *Horticulturae* **2025**, *11*, 87. https://doi.org/10.3390/horticulturae11010087

1. Introduction

Prunus avium L. is a valuable tree species that grows both as a wild and as a cultivated plant that finds optimal conditions in Romania to manifest its agrobiological potential [1] (Figure 1). As it is a traditional fruit crop with great industrial but also medicinal importance due to the nutritional, technological, and commercial characteristics of the fruits, the forms of *P. avium* from the spontaneous and semi-cultivated flora are exploited by breeders for germplasm diversity [2,3].

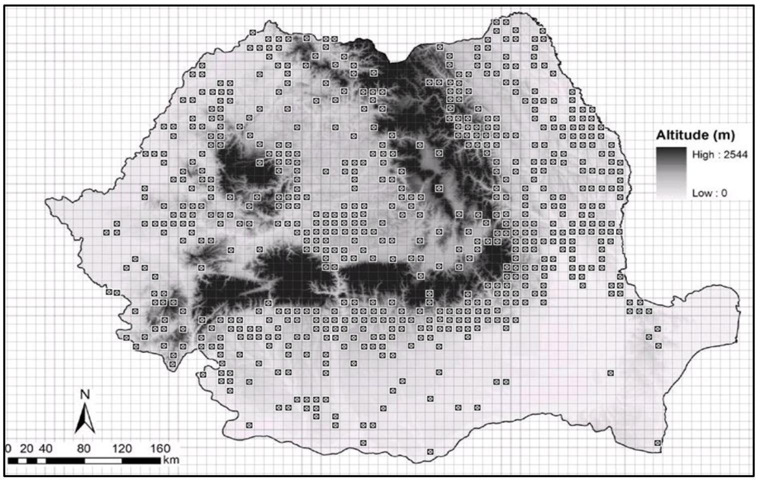

Figure 1. The distribution of *Prunus* sp. across the territory of Romania (original). The points on the map represent the distribution both as a wild and cultivated plant across the entire country and at different relief altitudes.

Due to the seasonal nature of the fruit and the imbalance between production and consumption in certain periods of time, the cherry processing industry is particularly important to ensure the necessary fruit supply throughout the year [4]. The processing of cherries results in nutritional products such as natural juices, nectars, syrups, compote, jellies, jams, marmalade, ice cream, and dehydrated or frozen fruits as well as being an integral part of pastry products [2,5].

Although in the South and South-East of Europe, bitter cherries (*Prunus avium* var. *sylvestris* Ser.) are used both fresh and as a valuable raw material in obtaining jams, liqueurs, infusions, drinks, refreshments, and concentrated extracts [6,7], internationally, the use of bitter cherries in the technology and processing of food products are current research topics [8,9].

Most of the created cultivars of bitter cherry are derived from the botanical variety *Prunus avium* var. *sylvestris* Ser., known as wild cherry or bird cherry, with very small, black, bitter-sweet, slightly juicy fruits [3,10].

Taking into account the strong local tradition for the consumption of bitter cherries as a food source and especially for medicinal purposes dating back thousands of years [2], and also the growing global awareness of the need for a natural and healthy diet, the availability and informative value of genetic resources are becoming increasingly important for sustainable use and future conservation in fruit growing [11,12].

Since *P. avium* var. *sylvestris* is widely distributed and has genetic variability, which has not yet been well explored, knowledge is expected to develop in addition to the unique nutritive and organoleptic properties of the fruit and prominent characteristics among cherry accessions such as tree vigor, crop efficiency, pomological traits, and resistance to pests, diseases, and extreme climatic factors [13,14].

Fruits from native or semi-cultivated bitter cherries vary in size, shape, color, and taste and may have antioxidant and antimicrobial properties due to their phenolic compound ingredients [15]. However, research on the evaluation of the biochemical and antioxidant characteristics of bitter fruits with the possibility of use in the food industry and medicine is still rare [16,17]. Therefore, the evaluation of fruit cultivars whose fruits possess such properties remains a useful task and of interest, especially for finding new sources of natural raw materials for functional foods and nutraceuticals [8,18].

Total antioxidant capacity and polyphenol content are considered fundamental indicators of the biological value of food products [19], and the quality parameters of some fruits include a wide spectrum of attributes, ranging from physical characteristics such as color, size, texture, sugar content, acidity, and aroma to intrinsic factors of tree genetics, such as productivity, frost resistance, and fruit cracking resistance [20,21].

Therefore, in the present study, the variability in the physico-chemical characteristics of selected cultivars of bitter cherry with fruits of different colors belonging to *Prunus avium*, as well as several characteristics of the trees and their production, alongside the relationships between these parameters, were investigated.

2. Materials and Methods

2.1. Research Area and Growing Conditions

The study was carried out in the orchard of the experimental field of the Iași Fruit Growing Research Station (RSFG), North-Eastern Romania (47°20′ N; 27°60′ E) (North-Eastern Europe). The experimental plantation is located on a meso-relief with a gently sloping plateau and includes predominantly cambic chernozem-type soils with good natural drainage, with a pH of 6.6–8.1 and an average humus content of 3.7–4.3%. The parent rock is loessoid clay type [22].

The climate is of a pronounced temperate continental type, with temperature variations between a minimum of −36 °C and a maximum of +40 °C, with a mean annual temperature during the years 2000–2020 of +9.8 °C and total precipitations of 568.7 mm [23]. As a general aspect, the trend in the average annual temperature is increasing, and from a seasonal point of view, significant warming events have been observed in the early spring and late autumn seasons.

Precipitation amounts to approximately 450–550 mm annually, and atmospheric humidity is on average between 57–64%. Isolated hail can also occur. Solar radiation has an average value of 116 Kcal/cm^2 with an uneven distribution throughout the year, so that 40% of the total falls in the summer period, and only 10% occurs in winter. The quantification of agroclimatic resources in the research area can be framed in the global context of current climate change through the increase in average annual temperature and abnormal distribution or major deficit in precipitation.

During the growth period of the research years (2022–2024), the meteorological conditions in the experimental area were as shown in Table 1.

Table 1. Average monthly values of environmental conditions during the experimental period (RSFG Iasi, Romania, 2022–2024).

Month	Air Temperature (°C)	Solar Radiation (W/m^2)	Precipitation (mm)	Relative Humidity (%)
March	4.8	114.2	44.8	56.2
April	10.9	189.0	46.8	59.4
May	16.3	249.0	46.0	58.0
June	21.6	267.4	45.7	53.6
July	23.5	266.7	55.7	55.0
August	23.2	226.2	59.6	65.2
September	16.3	204.0	60.1	69.7

2.2. Experimental Protocol and Management Practices

The study was carried out over a period of three consecutive years (2022–2024), using as study material five bitter cherry cultivars (C_1-Amaris, C_2-Amar Maxut, C_3-Amar Galata, C_4-Silva, C_5-Amara) created and approved as results of the selection process of some valuable biotypes of cherries with bitter-tasting fruits in spontaneous and semi-cultivated flora [1,2].

The studied orchard is 14 years old and planted with a spacing of 5 m × 4 m. The trees are arranged using a randomized block design and the experimental practices were replicated three times and each replicate contains 9 trees. The trees of the mentioned cultivars were reared on high-vigor rootstocks of *Prunus mahaleb* L., and trained as a free palmette, without an irrigation system.

Crop management was of a conventional type following the specific agronomic technique of the genus *Prunus* [24], i.e., irrigation, fertilization, and phytosanitary treatments during vegetative rest (Bouillie Bordelaise WDG, 5 $kg \cdot ha^{-1}$), at the bud burst phase up to the white button, to combat moniliosis (*Monilinia laxa*) and anthracnose (*Blumeriella jaapii*) (Mospilan 0.45%, Ovipron Top 35 $L \cdot ha^{-1}$ and Bouillie Bordelaise WDG, 5 $kg \cdot ha^{-1}$), from the beginning of flowering to the fading of the petals (Signum 0.5 $kg \cdot ha^{-1}$, Decis Expert 0.15 $L \cdot ha^{-1}$ in 300–400 L water), from the beginning to 80% of fruit growth (Folicur Solo, 1 $L \cdot ha^{-1}$ and Karate Zeon, 0.2 $L \cdot ha^{-1}$ in 600 L of water), at the beginning of fruit coloring (Signum 0.5 kg/ha and Exirel 0.75–1 $L \cdot ha^{-1}$), and after harvesting and leaf fall, using fungicides (Folicur Solo, 1 $L \cdot ha^{-1}$, Bouillie Bordelaise WDG, 5 $kg \cdot ha^{-1}$).

In order to stimulate growth and fruiting, fertilization was practiced, applying 1–3 $L \cdot ha^{-1}$ of Polyactiv Zn (10.8% Zn, 13.5% sulfuric anhydride and 15% B), 3–5 $kg \cdot ha^{-1}$ of Rezistevo (14% N, 18% Ca, 1.7% K_2O, 4.2% Mg), and 1–5 $L \cdot ha^{-1}$ of Kerafol (5.4% N, 27% amino acids).

2.3. Sampling Procedures

Fruit samples were harvested at full maturity of each cultivar based on visual analysis of color, texture, and pedicel detachment [24]. For a uniform evaluation, the fruits were taken from several areas of the crown. A total of 30 fruits of each variety were analyzed, in three repetitions. To determine the degree of frost damage to the generative organs, 100 buds were taken from the lower, middle, and upper third of the crown of the tree for each cultivar.

Fruit and bud samples were placed in labeled plastic bags and immediately transported under appropriate conditions to the laboratory for determination and analysis.

2.4. Morphological and Physicochemical Determinations for Quality Parameters of Bitter CHERRIES

2.4.1. Morpho-Physiological and Organoleptic Quality Traits

The quality of the fruits (shape, color of skin, flesh and juice, bitter taste, and adherence to stone) was determined by phenotypic characterization based on a set of descriptors to be prioritized in the assessment of *Prunus* spp. species using UPOV TG/35/7 2006 categories and scales [25]. This method includes an extensive survey to determine the variability in the most frequently used descriptors through multiple descriptor rankings [26].

2.4.2. The Physical Parameters

Fruit and stone weight (g) and diameter (mm) were determined by weighing all samples using a Kern ADB 100–4 (KERN & SOHN GmbH, Balingen, Germany) analytical balance accurate to 0.0001 g and a Luumytools LT15240 digital caliper accurate to 0.02 mm.

Fruit color was analyzed by the CIE L* a* b* uniform color space, measured with a CR 400 C portable colorimeter (Konica Minolta Measuring Instruments). The value of

L* reflects the brightness and intensity of the color, a* the proportions of red, and b* the proportion of yellow (positive values). The parameters a* and b* define the chromaticity of the color [27,28].

2.4.3. The Chemical Composition

The amount of total soluble solids (TSS) was determined using a HI96800 digital refractometer from Hanna Instruments (Woonsocket, RI, USA). The results are expressed in °Brix and denote the sugar content of the fruits and the content of a small number of organic acids, minerals, and soluble amino acids [29].

Titratable acidity (TA) was determined by the method of homogenizing samples with distilled water and titrating with 0.1 N NaOH until pH 8.1 was reached. The results were calculated using Formula (1) and expressed as percentages of malic acid (the most common acid in the sample for cherries), where N is the normality of NaOH, V is the volume of NaOH (mL) used in the titration, m is the weight of the sample (g), and 0.0067 is the conversion factor for malic acid [29,30]. The values are expressed in g malic acid·100 g^{-1} f.w.

$$\text{TA (\%malic acid)} = (V \times N \times 100 \times 0.0067)/m \quad (1)$$

The TSS/TA ratio, also known as the maturity index, is a good indicator of the sweetness and, consequently, the ripeness of the fruit for consumption. This parameter was expressed as °Brix/g malic acid 100 g^{-1} f.w [31].

Dry matter (DM) content was determined by the classical method of drying a 5 g fruit pulp sample in a laboratory oven (CL 53, POL-EKO-Aparatura, Poland) at 103 ± 2 °C until a constant weight was obtained [32,33]. The values are expressed in %.

For the extraction of phytochemicals (extraction of total polyphenols and antioxidant activity using the DPPH method) an ultrasound-assisted method was used from fruit samples. In brief, 1 g of sample was mixed with 10 mL ethanol 70% and subjected to ultrasound treatment for 35 min at a maximum of 30 °C and a frequency of 40 kHz. The resulting crude extract was then centrifuged for 10 min at 6000 rpm and 4 °C.

Total phenolic (TP) content, quantified in mg of gallic acid equivalents per g of dry weight (mg GAE 100 g^{-1} f.w.) was determined using the Folin–Ciocalteu method [34] and a spectrophotometer at 750 nm (Specord 210 PLUS UV-VIS spectrophotometer, Analytik Jena, Jena, Germany).

Antioxidant activity (AA) was evaluated by the DPPH (2,2-diphenyl-1-picrylhdrazyl) method [35]. A total of 100 µL of the diluted extract was combined with 3.9 mL of DPPH solution and shaken for 30 s. After incubation at room temperature for 30 min, the absorbance was measured using a UV-Vis spectrophotometer, Specord 210 Plus, at a wavelength of 515 nm. For the blank, 100 µL of methanol was mixed with 3.9 mL of DPPH. Results are expressed as µg Trolox·g^{-1} f.w.) using a standard calibration curve with Trolox (R^2 = 0.992). The radical scavenging activity was quantified as percent inhibition using Equation (2), where Ablank is the absorbance at 515 nm of the DPPH solution and ASample is the absorbance at 515 nm of the DPPH solution mixed with the bitter cherry extract.

$$\text{DPPH scavenging activity (\%)} = (\text{Ablank} - \text{ASample})/(\text{Ablank}) \times 100 \quad (2)$$

2.4.4. Tree Vigor, Fruiting, and Yield Indices

Tree vigor was determined using the descriptors of the UPOV TG/35/7 2006 questionnaire [25,26].

Bloom duration was quantified by determining the flowering phenophase according to the Biologische Bundesanstalt, Bundessortenamt, and Chemical Industry (BBCH) scale [36] and counting days.

Frost resistance (% affected ovaries) of the generative organs was determined by the classical visual observation method [37], in which 100 flower buds from the lower, middle, and upper third of the crown of the tree were sectioned and analyzed. The percentage of damaged flowers was determined by averaging the damaged samples for all three height levels.

Natural fertility (%) was determined by selecting 100–200 flowers of each cultivar and leaving them for natural pollination in full bloom [38].

Productivity index, also known as the cumulative production efficiency index, was calculated by relating the annual production (kg per tree) to the area of the trunk section and the crown volume of the trees [39].

Resistance to cracking (% cracked fruits) was measured using the Christensen method [40], in which cracked fruits are counted after immersing them in distilled water at 20 °C for six hours.

2.4.5. Statistical Analysis

The data were interpreted and processed statistically by Duncan's multiple range test at $p \leq 0.05$, using SPSS software version 28.

To estimate the relationship between analyzed and monitored indices, the Pearson correlation coefficient (r^2) was also calculated at $p \leq 0.05$. Standard deviation (STDEV) and coefficient of variation (COVAR) were also determined.

3. Results and Discussion

3.1. Morpho-Physiological and Organoleptic Quality Traits of the Bitter Cherry Fruit Cultivars

For the general characterization of the fruits from the point of view of commercial growth, several parameters of interest such as shape, external and internal color, juice color, juiciness, intensity of bitter taste, firmness, and adherence to the stone were included, as presented in Table 2. These morpho-physiological and organoleptic quality traits, representing an appealing taste and skin color, are the most important characteristics of fruits and represent also a limiting factor for certain food processing methods [41].

Table 2. Morpho-physiological and organoleptic quality traits of the bitter cherry fruits cultivars (RSFG Iasi).

Cultivar	Shape [1]	Color			Bitter	Juiciness [6]	Firmness [7]	Adherence to Stone [8]
		Skin [2]	Flesh [3]	Juice [4]	Taste [5]			
C_1	1	7	5	4	5	5	5	5
C_2	1	8	5	5	7	5	5	5
C_3	1	2	2	1	5	5	5	5
C_4	2	8	5	5	7	5	5	5
C_5	1	8	5	5	7	5	5	5

UPOV scale: [1] fruit shape: 1-cordate; 2-reniform; [2] color of skin: 2-yellow with redness; 7-dark red; 8-blackish; [3] flesh color: 2-yellow; 5-dark red; [4] juice color: 1-colorless; 4-red; 5-purple; [5] bitter taste: 5-medium; 7-accentuated; [6] juiciness: 5-medium; [7] firmness: 5-medium; [8] adherence to stone: 5-medium; [26].

The fruits of the studied cultivars were characterized as being mainly cordate in shape (with the exception of C_4, which has the shape of the reniform fruit); as for the visual color, this varies from yellow with redness (C_3), to dark red (C_1), and blackish (C_2, C_4, and C_5) (Figure 2), showing that this is a highly variable characteristic among cherry cultivars [42].

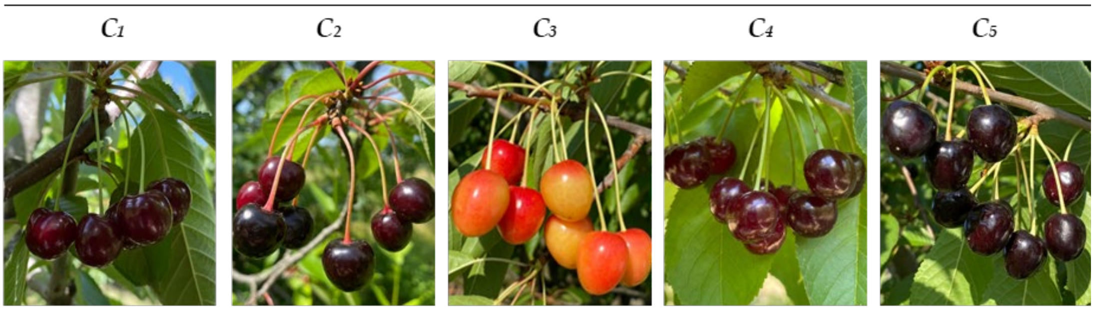

Figure 2. Visual characteristics of fruits (color and shape) in the studied bitter cherry cultivars.

Most of the studied cultivars had a pronounced and accentuated bitter taste (C_2, C_4, C_5), and regarding the processing qualities—juiciness, firmness, and adherence to stone—all cultivars had medium values.

3.2. The Physical Parameters of the Bitter Cherry Fruit Cultivars

The main physical qualities of the fruits as well as their statistical interpretation are presented in Table 3. Regarding the fruit weight, during the study, this parameter had an average value of 4.02 g, related to an equatorial diameter of 18.53 mm. The minimum values of the size parameters were recorded by C_4 and the maximum by C_1. Although the fruit weight and equatorial diameter values are lower than for sweet cherries intended for fresh consumption, other studies on bitter cherries [5,8,41] showed that for bitter cherries, a weight of more than 3.0 g and an equatorial diameter of more than 17.0 mm are classified as large fruits.

Table 3. The physical parameters of the bitter cherry fruits (RSFG Iasi, 2022–2024).

Cultivar	Fruit Weight *	Stone Weight *	Fruit Diameter *	Colorimetric Parameters		
	(g)		(mm)	*L**	*a**	*b**
C_1	4.90 ^{a}	0.31 ^{b}	21.61 ^{a}	21.23 ^{b}	16.30 ^{a}	2.63 ^{b}
C_2	3.80 ^{b}	0.26 ^{b}	17.70 ^{b}	19.58 ^{b}	11.91 ^{c}	1.23 ^{b}
C_3	4.10 ^{ab}	0.30 ^{b}	18.33 ^{ab}	62.79 ^{a}	3.14 ^{d}	41.26 ^{a}
C_4	3.30 ^{bc}	0.39 ^{a}	17.51 ^{b}	20.89 ^{b}	11.71 ^{c}	1.37 ^{b}
C_5	4.00 ^{b}	0.32 ^{ab}	17.50 ^{b}	20.75 ^{b}	13.67 ^{b}	1.97 ^{b}
Media	4.02	0.32	18.53	29.05	11.35	9.69
STDEV	0.58	0.05	1.75	18.87	4.94	17.66
COVAR	14.44	14.94	9.47	64.97	43.57	182.17

* within each column, values followed by different letters correspond with the significant statistical difference according to Duncan's test at $p \leq 0.05$, $n = 3$.

Regarding the stone size, the average value recorded during the study was between 0.26 g (C_2) and 0.39 g (C_4).

The chromatic characteristics, expressed by brightness parameters (L^*) and the coordinates a^* and b^* for the shades of red and yellow, oscillated according to the genetics of each cultivar. Significant differences existed between the 'Amar Galata' (C_3) cultivar, with yellow with redness skin at the maturity stage.

The results show that the analyzed fruits are attractive in appearance, due to their shine ($L^* = 29.05$), an important appreciation indicator for most consumers [43].

3.3. The Chemical Composition of the Bitter Cherry Fruit Cultivars

The results regarding the concentrations of soluble dry matter, dry matter, titratable acidity, and polyphenols (sums of phenolic compounds determined chromatographically), as well as antioxidant activity, in bitter cherry fruits harvested at the stage of full maturity in the years 2022–2024, are presented in Table 4.

Table 4. The chemical composition of the bitter cherry fruits (RSFG Iasi, 2022–2024).

Cultivar	TSS [1]*	TA [2]*	TSS/TA [3]*	DM [4]*	TP [5]*	AA [6]*
C_1	19.23 [ab]	0.59 [bc]	32.59 [a]	11.73 [b]	516.50 [c]	78.8 [b]
C_2	21.63 [a]	0.88 [b]	24.58 [bc]	9.88 [b]	743.20 [a]	89.3 [a]
C_3	17.60 [b]	1.02 [a]	17.25 [d]	17.78 [a]	235.20 [d]	73.2 [c]
C_4	21.63 [a]	0.93 [ab]	23.26 [cd]	8.02 [c]	712.30 [b]	89.1 [ab]
C_5	22.44 [a]	0.83 [b]	30.68 [ab]	7.99 [c]	733.00 [ab]	89.1 [ab]
Media	20.51	0.85	25.67	11.08	588.04	83.90
STDEV	2.02	0.16	6.14	4.05	218.03	7.48
COVAR	9.86	18.99	23.92	36.57	37.08	8.91

* within each column, values followed by different letters correspond with the significant statistical difference according to Duncan's test at $p \leq 0.05$, $n = 3$; [1] TSS: total soluble solids, as °Brix; [2] TA: titratable acidity, as g malic acid 100 g^{-1} f.w.; [3] TSS/TA ratio, as °Brix/ g malic acid 100 g^{-1} f.w; [4] DM: dry matter content, as %; [5] TP: total phenolic content, as mg GAE 100 g^{-1} f.w.; [6] AA: antioxidant activity (DPPH: 2,2-diphenyl-1-picrylhdrazyl), as µg Trolox·g^{-1} f.w.

Due to the impact of the health food sector, the potential for the use of cherries with high content of bioactive compounds as a source of integration into more complex food products is high, as fruits of the genus *Prunus* are well known for being rich in health-promoting components [31,44].

The TSS content varied during the study between 17.6 °Brix (C_3) and 22.4 °Brix (C_5), with similar values reported in other studies on wild or bitter cherries [8,9,11]. For the geographical area of Europe, TSS values higher than 15% can be considered satisfactory [45], and for industrial processing, high sugar content is advantageous, as an integral part of the organic substances in fruits, reducing the need to add sugar [46].

Regarding the TA, there were significant differences between cultivars, with values that oscillated between 0.59 and 1.02 g malic acid 100 g^{-1} f.w. In addition to sugar content, acidity determines the taste and is also an important indicator of the quality of the fruit, measured by the maturity index (TSS/TA ratio) [29], which had an average value during the study of 25.67 °Brix/g malic acid 100 g^{-1} f.w.

The dry matter in the fruit pulp consists of all biochemical components other than water [47], and in the analyzed fruits it represented between 8.02% (C_4) and 17.78% (C_3), indicating the high perishability of these fruits due to a water content of over 80%.

Due to their antioxidant, anti-inflammatory, anticarcinogenic, and neuroprotective properties, total phenolic compounds are considered to have great positive effects on human health, being of great importance in products considered to be food [48]. Thus, the analyzed fruits were characterized by an average content of polyphenols of 588.04 mg GAE 100 g^{-1} f.w., with a maximum of 743.2 mg GAE 100 g^{-1} f.w. in the C_4 cultivar ('Silva') and an antioxidant activity (DPPH) of 83.9 µg Trolox·g^{-1} f.w.

In the present study, TP content was lower in the fruits of the bicolor cultivar (235.2 mg GAE 100 g^{-1} f.w.), with significant differences compared to the cultivars with fruits whose color is dark red or blackish, due to anthocyanin pigments. In addition, although the AA maintained the same dynamics, the differences between cultivars were not as great as in the case of TP content.

Sensory analysis of the fruits showed a high level of bitterness influenced in addition to genetic factors by the amount of phenolic compounds [20,29]. Therefore, the highest polyphenol content present in fruits of C_2, C_4, and C_5 (over 700 mg GAE 100 g^{-1} f.w.) also corresponds to the accentuated bitter taste in the same cultivars (Table 3).

In bitter cherry fruit, the antioxidant activity determined from the reaction of the extracts with the free radical DPPH (2,2-diphenyl-1-picrylhydrazyl) was between 73.2 and 89.1 µg Trolox·g^{-1} f.w., higher results being found in the darker fruits. These results are in agreement with other similar studies on different cultivars of Prunus avium which showed that sweet cherries, in general, have good antioxidant capacity [8,30,42,49], but with the caveat that results obtained on some wild forms of some genotypes of fruit trees had a higher antioxidant capacity than the cultivated ones [50].

The phytochemical composition of fruits is influenced, in addition to the genetics of the cultivar, by other factors such as climatic and pedological conditions, geographical position, culture technology, storage, fruit processing, and recurrent variations in applied cultural practices [51]. Most studies on antioxidant properties state that dietary antioxidant intake is generally adequate for maintaining health. Surveys show that the intake of certain antioxidants is suboptimal or deficient in certain population groups such as growing children, the elderly, or those from disadvantaged backgrounds [52,53].

3.4. Tree Vigor, Fruiting, and Yield Indices of the Bitter Cherry Fruit Cultivars

In addition to the fruit characteristics, the genetic value of a genotype or a cultivar involves other characteristics of interest that mainly relate to the diversity of tree habit, plant architecture, interaction with the environment, flowering and fruit ripening time, fertility, and self-compatibility, as well as resistance against numerous stress factors [54,55].

Tree vigor, fruiting, and yield indices of the studied bitter cherry cultivars are highlighted in Table 5. With the exception of cultivar C_1, which has low tree vigor, the cultivars have medium vigor.

Table 5. Tree vigor, fruiting, and yield indices of bitter cherry cultivars (RSFG Iasi, 2022–2024).

Cultivar	Tree Vigor [1]	Bloom Duration *	Frost Resistance [2]*	Natural Fertility *	Productivity Index *		Resistance to Cracking *
		(Days)	(% Unaffected Ovaries)	(%)	(kg per cm²)	(kg per m³)	(% Uncracked Fruits)
C_1	3	11.0 ^{a}	89.80 ^{ab}	30.0 ^{c}	0.34 ^{a}	4.56 ^{a}	99.79 ^{a}
C_2	5	10.0 ^{a}	83.79 ^{bc}	33.0 ^{b}	0.25 ^{b}	4.32 ^{a}	99.57 ^{a}
C_3	5	8.0 ^{a}	86.79 ^{b}	30.0 ^{c}	0.18 ^{c}	2.76 ^{b}	96.49 ^{b}
C_4	5	11.0 ^{a}	82.88 ^{c}	36.5 ^{a}	0.15 ^{c}	2.80 ^{b}	82.48 ^{c}
C_5	5	9.0 ^{a}	90.20 ^{a}	38.3 ^{a}	0.29 ^{b}	3.46 ^{b}	99.68 ^{a}
Media		9.80	86.69	33.56	0.24	3.58	95.60
STDEV		1.30	3.35	3.77	0.08	0.84	7.46
COVAR		13.30	3.87	11.23	32.19	23.38	7.81

* within each column, values followed by different letters correspond with the significant statistical difference according to Duncan's test at $p \leq 0.05$, $n = 3$; [1] UPOV scale: tree vigor on a scale of 1–5: 3—low; 5—medium [26]. [2] Resistance to frost was determined in the complete flowering phenophase.

The time and period of flowering of the trees fluctuate depending on the cultivar and the annual environmental conditions, and on this parameter, the entire production depends [56]. In the evaluated cultivars, the bloom duration had an average number of 9.8 days with statistically insignificant differences between cultivars.

Since the natural setting in which the research was conducted is susceptible to negative temperatures in the spring, it was desirable to monitor frost resistance during flowering.

In this phenological stage, during the years of study, negative temperatures of between −2.7 and −6.0 °C were recorded, which exceeded the critical freezing temperatures of the cherry [57]; however, the floral organs showed different levels of frost resistance, registering values between 82.88% (C_4) and 90.20% unaffected ovaries (C_5) and an average of natural fertility of 33.56%, all studied cultivars being of high productivity.

Among the analyzed cultivars, fruit production related to the structure and vigor of the trees recorded average values of 0.24 kg per cm^2 trunk cross-section area and 3.58 kg per m^3 crown, respectively, the higher values being returned by the 'Amaris' cultivar (C_1).

Cracking represents one of the most important physiological disorders that cause damage to the cherry culture and important economic losses to fruit producers [58]. The susceptibility of cherries to cracking is a complex phenomenon and is considered to be influenced by different factors such as cultivar, rootstock, local and seasonal environmental conditions, irrigation regime, fruit characteristics, pulp osmotic potential, and stage of development [59]. The obtained results highlight a good resistance to fruit cracking of all cultivars, cultivars C_1, C_2, and C_5 recording values of over 99% of unaffected fruits.

These attributes are of the greatest relevance to cherry growers and traders, as they are decisive in the process of fruit acceptance in destination markets or industrial processing [60], but also for assessing food safety, in supporting a healthy lifestyle for the population [61]. The agrobiological potential of the studied bitter cherry cultivars offers the possibility of cultivation on a large scale. The most important results of the Prunus fruit tree species from a commercial point of view were in plantations in temperate climate areas [12].

3.5. Correlation Between Fruit Physicochemical Indicators of Bitter Cherry Cultivars

Table 6 highlights Pearson's correlation values between all fruit quality parameters analyzed during the study to establish the degree of interdependence between them. The qualitative profile of bitter cherries from all analyzed cultivars reflects a predominantly strong correlation ($p < 0.05$) with statistically significant values.

Table 6. Correlation matrix between fruit characteristics of bitter cherry cultivars.

	SW	FD	*L**	TSS	TA	MI	DM	TP	AA	Productivit
FW [1]	−0.434 *	0.891 **	0.090 ^{ns}	−0.522 *	−0.744 **	0.511 *	0.387 ^{ns}	−0.430 *	−0.598 **	0.616 **
SW [2]		−0.146 ^{ns}	−0.168 ^{ns}	0.215 ^{ns}	0.098 ^{ns}	−0.003 ^{ns}	−0.369 ^{ns}	0.174 ^{ns}	0.216 ^{ns}	−0.584 **
FD [3]			−0.046 ^{ns}	−0.523 *	−0.813 **	0.492 *	0.280 ^{ns}	−0.362 ^{ns}	−0.547 *	0.594 **
L [4]				−0.812 **	0.574 *	−0.754 **	0.925 ***	−0.913 ***	−0.811 **	−0.553 **
TSS [5]					−0.059 ^{ns}	0.431 *	−0.948 ***	0.971 ***	0.985 ***	0.126 ^{ns}
TA [6]						−0.897 **	0.287 ^{ns}	−0.211 ^{ns}	−0.004 ^{ns}	−0.799 **
MI [7]							−0.590*	0.510 *	0.340 ^{ns}	0.688 **
DM [8]								−0.969 ***	−0.936 ***	−0.220 ^{ns}
TP [9]									0.978 ***	0.301 ^{ns}
AA [10]										0.123 ^{ns}

***: high significant correlation at $p < 0.05$; **: distinct significant correlation at $p < 0.05$; *: significant correlation at $p < 0.05$; ^{ns}: not significant correlation; [1] FW: fruit weight; [2]: SW: stone weight; [3] FD: fruit diameter; [4] L: colour lightness and intensity; [5] TSS: total soluble solids; [6] TA: titratable acidity; [7] MI: maturity index; [8] DM: dry matter; [9] TP: total phenolic content; [10] AA: antioxidant activity.

The summary of these traits in a single component, of the production obtained, reflected distinctly significant correlation coefficient values in relation to fruit physical parameters and insignificant values in relation to biochemical indicators such as TSS, DM, TP, and AA. Similar variations in the correlation related to fruit efficiency and yield were found in other studies on some bitter cherry [41], sour cherry [62], and sweet cherry [63] cultivars.

Evaluating as many fruit characteristics as possible and correlating them is currently mandatory due to the increased consumer interest in foods and food products with the aim of achieving the optimal combination of taste and health-promoting compounds [64].

If for fresh consumption the visual features of the fruit (size, color, texture) take precedence, from a commercial point of view and the needs of the market, it is important to achieve the optimal combination of taste and compounds that enhance health benefits (health promoters) [65,66].

The fruit quality and production indices of the evaluated bitter cherry cultivars match the technological norms specific to industrial processing [66]: high content of soluble sugars as an integral component of the organic substances, medium acidity, high content of phenolic compounds as a source of natural antioxidants, taste, aroma, texture and also good productivity and ability to adapt to potential climatic stress factors.

Processing and marketing studies have consistently shown that taste, as opposed to perceived nutritional or health value, is the key influence on food selection [67], and the bitter taste of the cherries under study due to the bitterness of the phenolics is reduced by sugar and is substantially improved [67], thus becoming pleasant. Bitterness is a major sensory attribute of several vegetables or food products rich in polyphenolic compounds, known as phytochemicals or phytonutrients reported to be very important for health.

In recent years, studies have found that bitter compounds naturally present in fruits (high polyphenol content), and their application in the food industry elucidate the mechanism of bitter taste detection, as well as the therapeutic role of bitterness in preventing hypertension, diseases, and exhibit neuroprotective effects and other biological activities [68].

4. Conclusions

The studied bitter cherry cultivars possess one or more desirable characteristics from a horticultural point of view, which can classify the fruits as suitable for industrial processing. The trees also have an increased productivity and resistance to biotic and abiotic factors. This makes them a valuable source for improving genetic and breeding programs and strategies.

The powerful phytochemical characteristics of the fruits provide a scientific justification for their use both in the food industry and in ethnomedical practice.

The results obtained in this study may be useful for the conservation and genetic management of fruit tree resources, specifically, *Prunus avium*.

As a result of the data obtained, recommendations are addressed both to the production sector and to the research community to use and capitalize on these cultivars in breeding works and strategies and continue studies on the unique attributes of the fruits in order to develop cultivation or post-harvest strategies that enhance their quality or lead to new products in the agri-food market.

Author Contributions: Conceptualization, I.M. and C.D.J.; methodology, S.S. and I.P.; validation, C.D.J. and S.S.; investigation, I.E.G.; resources, I.V.U. and I.P.; data curation, I.M., I.P. and C.D.J.; writing—original draft preparation, I.M., I.P. and I.E.G.; writing—review and editing, S.S. and C.D.J.; supervision, C.D.J. and S.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: The original contributions presented in the study are included in the article, further inquiries can be directed to the corresponding author.

Acknowledgments: This research work was carried out with the support of the Thematic Plan on the Implementation of the 'A.S.A.S. Strategy on Research—Development—Innovation in Fruit Growing' for the period 2021–2027, research topic: 1.1. Maintaining and exploiting fruit biodiversity.

Conflicts of Interest: The authors declare no conflicts of interest.

References

1. Iurea, E.; Sîrbu, S.; Corneanu, G. Results Obtained in Breeding of Bitter Cherry Assortment at Fruit Growing Research Station Iaşi—Romania. *Cercet. Agron. Mold.* **2015**, *48*, 81–88. [CrossRef]
2. Budan, S. Traditional and commercial uses of romanian bitter cherry cultivars. *Acta Hortic.* **2014**, *1032*, 25–28. [CrossRef]
3. Craciunescu, O.; Seciu-Grama, A.-M.; Mihai, E.; Utoiu, E.; Negreanu-Pirjol, T.; Lupu, C.E.; Artem, V.; Ranca, A.; Negreanu-Pirjol, B.-S. The Chemical Profile, Antioxidant, and Anti-Lipid Droplet Activity of Fluid Extracts from Romanian Cultivars of Haskap Berries, Bitter Cherries, and Red Grape Pomace for the Management of Liver Steatosis. *Int. J. Mol. Sci.* **2023**, *24*, 16849. [CrossRef] [PubMed]
4. Jensen, M. Processing for Industrial Uses. In *Cherries: Botany, Production and Uses*; Quero-García, J., Lezzoni, A., Puławska, J., Lang, G., Eds.; CABI: Boston, MA, USA, 2017; pp. 485–505.
5. Negreanu-Pîrjol, B.; Ștefan, C.E.; Sîrbu, R.; Negreanu-Pîrjol, T. Antioxidant Activity of Some Fluids Extracts of Indigenous Wild Cherry Fruits. *Eur. J. Nat. Sci. Med.* **2021**, *4*, 22–31. [CrossRef]
6. Corneanu, M.; Iurea, E.; Sîrbu, S. Romanian wild cherry genotypes (*Prunus avium* var. *sylvestris* Ser.) suitable for processing. *Hortic. Sci.* **2022**, *49*, 95–101. [CrossRef]
7. Covaci, E. Composition characteristics of alcoholic extracts from black currant (*Ribes nigrum*), sour cherry (*Prunus cerasus*) and bitter cherry (*Prunus avium*). *Akademos* **2024**, *1*, 18–24. [CrossRef]
8. Karlidag, H.; Ercisli, S.; Sengul, M.; Tosun, M. Physico-Chemical Diversity in Fruits of Wild-Growing Sweet Cherries (*Prunus avium* L.). *Biotechnol. Biotechnol. Equip.* **2009**, *23*, 1325–1329. [CrossRef]
9. Karaat, F.E.; Gündüz, K.; Saraçoğlu, O.; Yıldırım, H. Pomological and phytochemical evaluation of different cherry species: Mahaleb (*Prunus mahaleb* L.), wild sweet cherry (*Prunus avium* L.) and wild sour cherry (*Prunus cerasus* L.), sweet and sour cherry cultivars. *Acta Sci. Pol. Hortorum Cultus* **2019**, *18*, 181–191. [CrossRef]
10. Budan, S.; Petre, L.; Gradinariu, G. Evaluation Of Some Native Sweet Cherry Genotypes Collected Ex Situ Into Romanian National Germplasm. *Acta Hortic.* **2009**, *814*, 157–160. [CrossRef]
11. Mratinic, E.; Fotiric-Aksic, M.; Jovkovic, R. Analysis of wild sweet cherry (*Prunus avium* L.) germplasm diversity in south-east Serbia. *ABI Genet.* **2012**, *44*, 259–268. [CrossRef]
12. Lacis, G.; Trajkovski, V.; Rashal, I. Phenotypical Variability and Genetic Diversity within Accessions of the Swedish Sour Cherry (*Prunus cerasus* L.) Genetic Resources Collection. *Biologija* **2010**, *56*, 1–4. [CrossRef]
13. Iezzoni, A.F. Cherries. In *Temperate Fruit Crop Breeding: Germplasm to Genomics*; Hancock, J.F., Ed.; Springer Science & Business Media: Berlin/Heidelberg, Germany, 2008; pp. 151–176.
14. Jolivet, C.; Höltken, A.M.; Liesebach, H.; Steiner, W.; Degen, B. Spatial genetic structure in wild cherry (*Prunus avium* L.): I. variation among natural populations of different density. *Tree Genet. Genomes* **2010**, *7*, 271–283. [CrossRef]
15. Ercisli, S. A short review of the fruit germplasm resources of Turkey. *Genet. Resour. Crop Evol.* **2004**, *51*, 419–435. [CrossRef]
16. Arabshahi-Delouee, S.; Urooj, A. Application of Phenolic Extracts from Selected Plants in Fruit Juice. *Int. J. Food Prop.* **2007**, *10*, 479–488. [CrossRef]
17. Venzon, D.; Izzy, S. Fruit, Vegetables, and Phytochemicals in Human Health and Disease. In *Phytochemicals*; CRC Press: Boca Raton, FL, USA, 2012; p. 20.
18. Miliauskas, G.; Venskutonis, P.R.; Van Beek, T.A. Screening of radical scavenging activity of some medicinal and aromatic plant extracts. *Food Chem.* **2004**, *85*, 231–237. [CrossRef]
19. Wang, H.; Cao, G.; Prior, R.L. Total antioxidant capacity of fruits. *J. Agric. Food Chem.* **1996**, *44*, 701–705. [CrossRef]
20. Barrett, D.M.; Beaulieu, J.C.; Shewfelt, R. Color, flavor, texture, and nutritional quality of fresh-cut fruits and vegetables: Desirablelevels, instrumental and sensory measurement, and the effects of processing. *Crit. Rev. Food Sci. Nutr.* **2010**, *50*, 369–389. [CrossRef]
21. Rusu, M.; Cara, I.-G.; Stoica, F.; Topa, D.; Jităreanu, G. Quality Parameters of Plum Orchard Subjected to Conventional and Ecological Management Systems in Temperate Production Area. *Horticulturae* **2024**, *10*, 907. [CrossRef]
22. Iurea, E.; Sirbu, S.; Corneanu, G.; Corneanu, M. Results obtained from sweet cherry breeding in Iasi, Romania. *J. Appl. Life Sci. Environ.* **2022**, *187*, 333–341. [CrossRef]
23. INSSE, 2023. Available online: https://iasi.insse.ro/wp-content/uploads/2024/05/Anuar-Iasi-2023-INS.pdf (accessed on 13 October 2024).
24. Quero-García, J.; Lezzoni, A.; Puławska, J.; Lang, G. *Cherries: Botany, Production and Uses*; CABI: Wallingford, UK, 2017; Available online: https://www.cabi.org/bookshop/book/9781780648378 (accessed on 14 October 2024).
25. UPOV, 2006. Protocol for Distinctness, Uniformity and Stability Tests of Sweet Cherry (*Prunus avium* L.). Available online: http://www.cpvo.europa.eu (accessed on 26 October 2024).
26. Monika, H.; Daniela, G. Phenotypic Characterization and Evaluation of European Cherry Collections: A Survey to Determine the Most Commonly used Descriptors. *J. Hortic. Sci. Res.* **2017**, *1*, 7–12. [CrossRef]

27. Ibraheem, N.A.; Hasan, M.M.; Khan, R.Z.; Mishra, P.K. Understanding Color Models: A Review. *ARPN J. Sci. Technol.* **2012**, *2*, 265–275.
28. Rutkowski, K.; Łysiak, G.P. Weather Conditions, Orchard Age and Nitrogen Fertilization Influences Yield and Quality of 'Łutówka' Sour Cherry Fruit. *Agriculture* **2022**, *12*, 2008. [CrossRef]
29. Ricardo-Rodrigues, S.; Laranjo, M.; Agulheiro-Santos, A.C. Methods for quality evaluation of sweet cherry. *J. Sci. Food Agric.* **2022**, *103*, 463–478. [CrossRef]
30. Hayaloglu, A.A.; Demir, N. Phenolic compounds, volatiles, and sensory characteristics of twelve sweet cherry (*Prunus avium* L.) cultivars grown in Turkey. *J. Food Sci.* **2016**, *81*, 7–18. [CrossRef] [PubMed]
31. Chockchaisawasdee, S.; Golding, J.B.; Vuong, Q.V.; Papoutsis, K.; Stathopoulos, C.E. Sweet cherry: Composition, postharvest preservation, processing and trends for its future use. *Trends Food Sci. Technol.* **2016**, *55*, 72–83. [CrossRef]
32. Escribano, S.; Biasi, W.V.; Lerud, R.; Slaughter, D.C.; Mitcham, E.J. Non-destructive prediction of soluble solids and dry matter content using NIR spectroscopy and its relationship with sensory quality in sweet cherries. *Postharvest Biol. Technol.* **2017**, *128*, 112–120. [CrossRef]
33. Murariu, O.C.; Lipșa, F.D.; Cârlescu, P.M.; Frunză, G.; Ciobanu, M.M.; Cara, I.G.; Murariu, F.; Stoica, F.; Albu, A.; Tallarita, A.V.; et al. The Effect of Including Sea Buckthorn Berry By-Products on White Chocolate Quality and Bioactive Characteristics under a Circular Economy Context. *Plants* **2024**, *13*, 2799. [CrossRef] [PubMed]
34. Dziadek, K.; Kopeć, A.; Piątkowska, E.; Leszczyńska, T.; Pisulewska, E.; Witkowicz, R.; Bystrowska, B.; Francik, R. Identification of polyphenolic compounds and determination of antioxidant activity in extracts and infusions of buckwheat leaves. *Eur. Food Res. Technol.* **2017**, *244*, 333–343. [CrossRef]
35. Rop, O.; Jurikova, T.; Mlcek, J.; Kramarova, D. Sengee Antioxidant activity and selected nutritional values of plums (*Prunus domestica* L.) typical of the White Carpathian Mountains. *Sci. Hortic.* **2009**, *122*, 545–549. [CrossRef]
36. Meier, U. *BBCH-Monograph: Growth Stages of Mono-and Dicotyledonous Plants Technical Report*, 2nd ed.; Federal Biological Research Centre for Agriculture and Forestry: Berlin, Germany, 2001; Available online: https://www.julius-kuehn.de/media/Veroeffentlichungen/bbch%20epaper%20en/page.pdf (accessed on 27 October 2024).
37. Kaya, O.; Kose, C. Sensitivity of Some Sweet Cherry (*Prunus Avium* L.) Genotypes To Late Spring Frosts During Different Phenological Stages Following Bud Burst. *Theor. Appl. Climatol.* **2022**, *148*, 1713–1725. [CrossRef]
38. Békefi, Z. Self-fertility studies of some sweet cherry (*Prunus avium* L.) cultivars and selections. *Int. J. Hortic. Sci.* **2004**, *10*, 21–26. [CrossRef]
39. Perju, I.; Mineaţă, I.; Ungureanu, I.V.; Sîrbu, S.; Golache, I.E.; Iurea, E. Agroproductive Evaluation of Some Sweet Cherry Cultivars in the Pedoclimatic Conditions of NE Romania. *Sci. Pap. Ser. B. Hortic.* **2024**, *68*, 105–110.
40. Michailidis, M.; Karagiannis, E.; Tanou, G.; Sarrou, E.; Karamanoli, K.; Lazaridou, A.; Martens, S.; Molassiotis, A. Sweet cherry fruit cracking: Follow-up testing methods and cultivar-metabolic screening. *Plant Methods* **2020**, *16*, 51. [CrossRef] [PubMed]
41. Rakonjac, V.; Šurlan-Momirovic, G.; Ljubanovic-Ralevic, I.; Ralevic, N.; Milutinovic, M. Morphological and Biochemical Variability in Different Populations of Wild Sweet Cherry (*Prunus avium* L.). *Acta Hortic.* **1996**, *410*, 413–422. [CrossRef]
42. Usenik, V.; Fabčič, J.; Štampar, F. Sugars, organic acids, phenolic composition and antioxidant activity of sweet cherry (*Prunus avium* L.). *Food Chem.* **2008**, *107*, 185–192. [CrossRef]
43. Dirlewanger, E.; Claverie, J.; Wünsch, A.; Iezzoni, A.F. *Cherry. Fruits and Nuts*; Springer: Berlin/Heidelberg, Germany, 2007; pp. 103–118.
44. Mineață, I.; Murariu, O.C.; Sîrbu, S.; Tallarita, A.V.; Caruso, G.; Jităreanu, C.D. Effects of Ripening Phase and Cultivar under Sustainable Management on Fruit Quality and Antioxidants of Sweet Cherry. *Horticulturae* **2024**, *10*, 720. [CrossRef]
45. Dolenc, K.; Åtampar, F. Determining the Quality of Different Cherry Cultivars Using The Hplc Method. *Acta Hortic.* **1998**, *468*, 705–712. [CrossRef]
46. Shinwari, K.J.; Rao, P.S. Stability of bioactive compounds in fruit jam and jelly during processing and storage: A review. *Trends Food Sci. Technol.* **2018**, *75*, 181–193. [CrossRef]
47. Scalisi, A.; O'Connell, M.G. Relationships between Soluble Solids and Dry Matter in the Flesh of Stone Fruit at Harvest. *Analytica* **2021**, *2*, 14–24. [CrossRef]
48. Nile, S.H.; Park, S.W. Edible berries: Bioactive components and their effect on human health. *Nutrition* **2014**, *30*, 134–144. [CrossRef]
49. Halvorsen, B.L.; Holte, K.; Myhrstad, M.C.W.; Barikmo, I.; Hvattum, E.; Remberg, S.F.; Wold, A.-B.; Haffner, K.; Baugerød, H.; Andersen, L.F.; et al. A Systematic Screening of Total Antioxidants in Dietary Plants. *J. Nutr.* **2002**, *132*, 461–471. [CrossRef] [PubMed]
50. Netzel, M.; Netzel, G.; Tian, Q.; Schwartz, S.; Konczak, I. Native Australian fruits—A novel source of antioxidants for food. *Innov. Food Sci. Emerg. Technol.* **2007**, *8*, 339–346. [CrossRef]
51. Tiwari, U.; Cummins, E. Factors influencing levels of phytochemicals in selected fruit and vegetables during pre- and post-harvest food processing operations. *Food Res. Int.* **2013**, *50*, 497–506. [CrossRef]

52. Brezeanu, C.; Brezeanu, P.M.; Stoleru, V.; Irimia, L.M.; Lipșa, F.D.; Teliban, G.-C.; Ciobanu, M.M.; Murariu, F.; Puiu, I.; Branca, F.; et al. Nutritional Value of New Sweet Pepper Genotypes Grown in Organic System. *Agriculture* **2022**, *12*, 1863. [CrossRef]
53. Marta, A.E.; Slabu, C.; Covasa, M.; Motrescu, I.; Lungoci, C.; Jitareanu, C.D. Influence of Environmental Factors on Some Biochemical and Physiological Indicators in Grapevine from Copou Vineyard, Iasi, Romania. *Agronomy* **2023**, *13*, 886. [CrossRef]
54. Jubojević, M.; Ognjanov, V.; Barać, G.; Dulić, J.; Miodragović, M.; Sekulić, M.; Jovanović Lješković, N. Cherry Tree Growth Models For Orchard Management Improvement. *Turk. J. Agric. For.* **2016**, *40*, 839–854. [CrossRef]
55. Predieri, S. Mutation induction and tissue culture in improving fruits. *Plant Cell Tissue Organ Cult.* **2001**, *64*, 185–210. [CrossRef]
56. Blažková, J.; Drahošová, H.; Hlušičková, I. Tree vigour, cropping, and phenology of sweet cherries in two systems of tree training on dwarf rootstocks. *Hortic. Sci.* **2010**, *37*, 127–138. [CrossRef]
57. Matzneller, P.; Götz, K.-P.; Chmielewski, F.M. Spring frost vulnerability of sweet cherries under controlled conditions. *Int. J. Biometeorol.* **2015**, *60*, 123–130. [CrossRef]
58. Pereira, S.; Silva, V.; Bacelar, E.; Guedes, F.; Silva, A.P.; Ribeiro, C.; Gonçalves, B. Cracking in Sweet Cherry Cultivars Early Bigi and Lapins: Correlation with Quality Attributes. *Plants* **2020**, *9*, 1557. [CrossRef]
59. Giné-Bordonaba, J.; Echeverria, G.; Ubach, D.; Aguiló-Aguayo, I.; López, M.L.; Larrigaudière, C. Biochemical and physiological changes during fruit development and ripening of two sweet cherry varieties with different levels of cracking tolerance. *Plant Physiol. Biochem.* **2017**, *111*, 216–225. [CrossRef]
60. Dangi, G.; Singh, D.; Chauhan, N.; Dogra, R.; Verma, P.; Sharma, S. Characterization of Selected Sweet Cherry (*Prunus avium* L.) Varieties using DUS Test Guidelines. *Indian J. Plant Genet. Resour.* **2021**, *34*, 290–294. [CrossRef]
61. Murariu, F.; Voda, A.D.; Murariu, O.C. Researches on food safety assessment—Supporting a healthy lifestyle for the population from NE of Romania. *J. Biotechnol.* **2019**, *305*, S68. [CrossRef]
62. Rakonjac, V.; Akšić, M.F.; Nikolić, D.; Milatović, D.; Čolić, S. Morphological characterization of 'Oblačinska' sour cherry by multivariate analysis. *Sci. Hortic.* **2010**, *125*, 679–684. [CrossRef]
63. Demirsoy, H.; Demirsoy, L. A study on the relationships between some fruit characteristics in cherries. *Fruits* **2004**, *59*, 219–223. [CrossRef]
64. Silva, V.; Pereira, S.; Vilela, A.; Bacelar, E.; Guedes, F.; Ribeiro, C.; Silva, A.P.; Gonçalves, B. Preliminary Insights in Sensory Profile of Sweet Cherries. *Foods* **2021**, *10*, 612. [CrossRef] [PubMed]
65. Devasirvatham, V.; Tan, D.K.Y. Key Determinants of the Physiological and Fruit Quality Traits in Sweet Cherries and Their Importance in a Breeding Programme. *Horticulturae* **2022**, *8*, 694. [CrossRef]
66. Romano, G.S.; Cittadini, E.D.; Pugh, B.; Schouten, R. Sweet cherry quality in the horticultural production chain. *Stewart Postharvest Rev.* **2006**, *6*, 1–9.
67. Drewnowski, A.; Gomez-Carneros, C. Bitter taste, phytonutrients, and the consumer: A review. *Am. J. Clin. Nutr.* **2000**, *72*, 1424–1435. [CrossRef] [PubMed]
68. Qiao, K.; Zhao, M.; Huang, Y.; Liang, L.; Zhang, Y. Bitter Perception and Effects of Foods Rich in Bitter Compounds on Human Health: A Comprehensive Review. *Foods* **2024**, *13*, 3747. [CrossRef]