IJAFLS
e-ISSN: 2602-4381
International Journal of Agriculture, Forestry and Life Sciences
Original Article | Open access | Int J Agric For Life Sci (2024) 8(1): 1-4

Identification of Quality Characteristics of Different Blackberry Varieties under Bursa-Kestel Ecological Conditions

Melike Urfalı[1]* **Cenap Yılmaz[2]**

[1]Eskişehir Osmangazi University, Institute of Science, Eskişehir, Türkiye
[2]Eskişehir Osmangazi University, Faculty of Agriculture, Department of Horticulture, Eskişehir,Türkiye
***Correspondence:** urfalimelike@gmail.com

Citation
Urfalı, M., Yılmaz, C. (2024). Identification of Quality Characteristics of Different Blackberry Varieties under Bursa-Kestel Ecological Conditions. Int J Agric For Life Sci (2024) 8(1): 1-3.

Received :25 April 2024
Accepted :4 May 2024
Published Online :25 May 2024
Year: :2024
Volume :8
Issue :1 (June)
Pages :1-4

This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY-NC) license https://creativecommons.org/licenses/by-nc/4.0/

International Journal of Agriculture, Forestry and Life Sciences; Edit Publishing, Eskişehir, Türkiye.
Copyright © 2024

Available online https://dergipark.org.tr/ijafls

Abstract
Blackberry is one of the most important fruit species. Its production has been increasing in Türkiye in recent years. This study was conducted in the Kestel/Bursa region, where blackberry cultivation is intense in Turkey. In the study, the physical and chemical properties of three blackberry varieties (Chester, Jumbo and Prime-Jim) were examined. Priority results were obtained in terms of fruit quality criteria for the examined traits. According to correlation studies the highest positive correlations were found between fruit weight and Fruit Lenght, TEA, AsA and TPS. In addition to this, some other parameters also had strong positive relationships, such as SSC and pH, DPPH also between TEA and AsA. The examined varieties were found to be significant in both physical and chemical properties. Especially, Jumbo and Chester varieties stood out in terms of fruit size.

Key words
Blackberry, quality, DPPH, total phenolic, Bursa.

Introduction
Blackberry, a berry fruit, is a botanically compound fruit consisting of shrubby plants belonging to the genus Rubus L., which is divided into two subgenera, Ideaobatus and Euabatus, within the Rosaceae family, Rosineae subfamily, and Rosales order (Ağaoğlu, 2003). Blackberries can be found in every region of Türkiye. Blackberry cultivation is especially common in the Marmara Region of Turkiye. It is known that 82% of the production is in the Marmara Region, and approximately 2,739 tons of blackberries are produced in Turkey, with 80.3% of it in Bursa province. It is reported that about 37 tons of blackberries are obtained from approximately 224.5 hectares of land annually (Fidan et al., 2013).
Blackberries are plants with cane-like shrubs. The plant shoots can be thornless (in newly bred varieties) or thorny. They have biennial shoots. Generative shoots (floricanes) grow on two-year-old branches, while vegetative shoots (primocanes) develop on branches formed in the first year. Most varieties do not yield fruit on primocanes. The fruits are obtained from two-year-old branches. After harvest, the two-year-old branches dry up. However, in some newly bred varieties, fruit can be obtained from both one-year-old and two-year-old shoots. These varieties are thornless, highly adaptable, quite productive, show strong growth and quality tendencies, and have the potential for annual shoot formation of 3-4 meters in length (Strik et al., 2007; Thompson et al., 2009; Yetgin, 2013). Blackberries have a wide range of uses not only for fresh consumption but also in the food industry. Therefore, it is known to have a very special place among other fruits. Additionally, certain pigments, flavonoids, flavones, phenols, fibers, and vitamins found in blackberries are highly compatible compared to other fruit types (Kähkönen et al., 1999; Halvorsen et al., 2002). Since 1989, the terms 'functional foods' and 'nutraceuticals' have been used in food products and substances with health or medical benefits. Especially abundant in berry fruits, phenolics such as ellagic acid, anthocyanin, and flavonoids like kaempferol, myricetin, and quercetin are among the most important plant chemicals with "functional foods" or "nutraceutical" value (Costantino et al., 1992; Heinonen et al., 1998). Blackberries are highly important in terms of nutritional value, containing significant amounts of minerals and vitamins beneficial for health. They possess small amounts of vitamins A, B, and C, and their fibrous structures, whether soluble or insoluble, hold great value for the diet. Blackberries contain approximately 4-6 grams of fiber per 100 grams. Due to their high fiber content, they have been found to have protective effects against heart disease and colon cancer. Naturally, blackberries are low in cholesterol, saturated fats, sodium, and calories (Çağlar and Demirci., 2017).
The aim of this study is to evaluate the fruit quality criteria of certain blackberry varieties grown intensively in the Kestel/Bursa region.

Material and Method
The study was conducted in 2023 on blackberry varieties (Chester, Jumbo and Prime-Jim) grown in the Kestel region (Bursa/Turkey). The fruits were collected when they reached harvest maturity and brought to Eskişehir Osmangazi University, Faculty of Agriculture, Department of Horticulture for physical and chemical analysis.

Pomological Properties
Pomological characteristics of 20 fruits of each variety were examined. Fruit weight g (0.01), fruit width mm (0.01), fruit length mm (0.01), fruit color values (L, a, b), Water soluble dry matter (%), pH, TEA values were evaluated pomologically.

Chemical Analysis
Vitamin C
Ascorbic acid contents of the fruit samples were determined with high-performance liquid chromatography (HPLC) method proposed by Cemeroglu (2007) and Geçer et al. (2016). Briefly, 5 mL of fruit extracts were mixed with 2.5% (w/v) metaphosphoric acid (Sigma, M6285, 33.5%) and then centrifuged at 5,500 rpm for 15 min at 4°C. Then, 0.5 mL solution was raised to 2.5 mL (w/v) with metaphosphoric acid. The supernatant was then filtered through a 0.45 PTm PTFE syringe filter (Phenomenex, UK). A C18 column (Phenomenex Luna C18, 250 mm □ 4.60 mm, 5 mm) was used at 25°C to identify ascorbic acid.
Total Phenolic Content
Using the Folin-Ciocalteu method, the TPC of blackberry juice extract was determined. 1000 mL of extract was added to 4500 mL of deionized water and 500 lL of undiluted Folin-Ciocalteureagent. Following 60 seconds, 4000 mL of 7.5% (w/v) aquatic Na2CO3 was added. The solution was then allowed to mature for 30 minutes at 30°C before being measured at 765 nm using a UV-Vis spectrophotometer. The results were consistent with a gallic acid calibration curve. All phenols were determined as gallic acid equivalents (mg gallicacid/g extract), and their valves were proposed as a medium for triple assessment (Kähkönen et al. 1999).

Total Anthocyanin
The total anthocyanin concentrations of fruit samples were estimated using spectrophotometer absorbance values at various pH ranges, following the method proposed by Giusti and Wrolstad (2001). To measure the diluted extracts, pH 1.0 (hydrochloric acid-potassium chloride) and pH 4.5 buffer solutions were produced, and absorbance values were taken at 531 and 700 nm. The total anthocyanin content (molar extinction coefficient of 28,000, cyanidin-3-glucoside) and absorbance [(A531-A700) pH 1.0-(A531-A700) pH 4.5] were determined as milligrams per 100 g fresh weight.

DPPH

Determination of DPPH radical scavenging activity was performed by the method of Brand-Williams et al. (1995). The DPPH solution was freshly prepared before analysis. Then, 1 ml of 10-4 M DPPH in a methanol solution was taken and transferred to a glass tube coated with aluminium foil. 3 ml samples of the prepared 0, 3, 1.25, 6.25, 12.5, 25, 50, 100, 200, 400 µg ml-1 antioxidant solutions in methanol were added to the DPPH solution. Instead of the antioxidant solution, 3 ml of pure methanol was added to the control tubes. The samples were kept in the dark and room temperature for 30 minutes and then their absorbance was measured at 517 nm against methanol. Ascorbic acid and Trolox were used as standards (Somparn et al., 2007; Mishra et al., 2012). The percentage of DPPH scavenging activity was calculated using the following equation:

$$\% \text{ DPPH} = [(Ac - As)/Ac] \times 100$$

where Ac was the absorbance of the negative control (containing the extraction solvent instead of the sample) and As was the absorbance of the samples. The results were expressed as EC50 (µg ml-1).

Statistical Analysis

The replicate data on various quality parameters (fruit weight, width, length), color, soluble solids concentration, pH, titratable acidity, and biochemical parameters such as ascorbic acid, total phenolic substances, antioxidant capacity and anthocyanins of blackberry fruits were first summarized in Excel program. Then, figures were created using means and standard deviations, and then ANOVA and Tukey's test were performed to test the differences between cultivars at 5% significance level. Related tests were performed in SPSS 22 package program. Then, the relationship between the quality parameters was subjected to correlation test using the corplot package of the R program. In addition, cluster analysis was performed with the help of FactoMineR package and PCA- Biplot analysis was performed using factoextra package.

Result and Discussion

Fruit weight, fruit width, fruit length and fruit color (L, a, b) are given in Figure 1. The highest fruit weight was obtained in the Jumbo variety. The highest fruit width value was determined in the Chester variety (23.33 mm). The highest value in terms of fruit length was found in the Jumbo variety (34.74 mm).

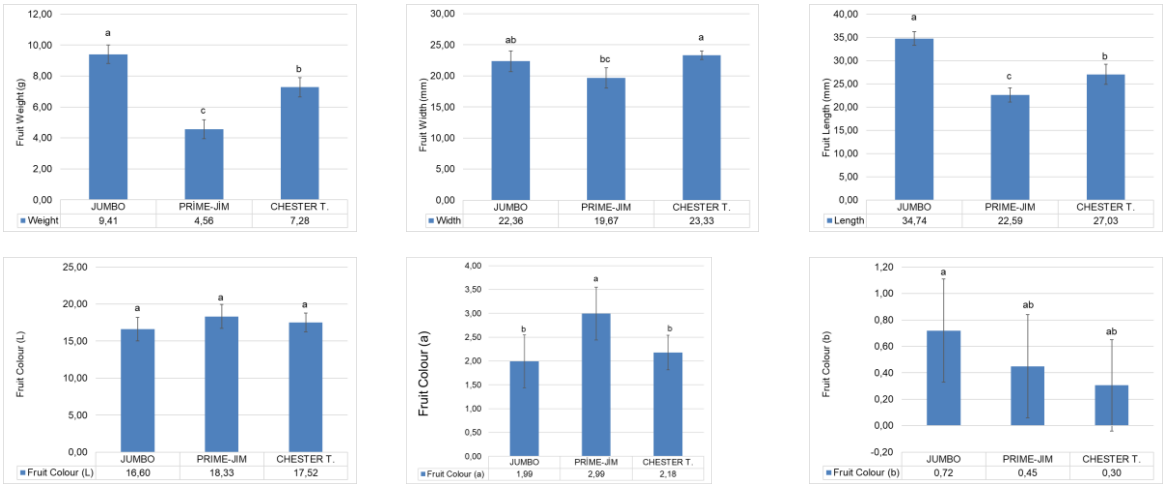

Figure 1. Values of fruit weight, width, length and colours

Values of soluble solids, pH and titratable acidity in fruit juices of blackberry varieties are given in Figure 2. The highest soluble solids value was found in the Prime-Jim variety (16.52 Brix). The highest pH ratio was determined in the Prime-Jim variety (4.77). The highest titratable acidity was observed in the Jumbo variety (2.22%).

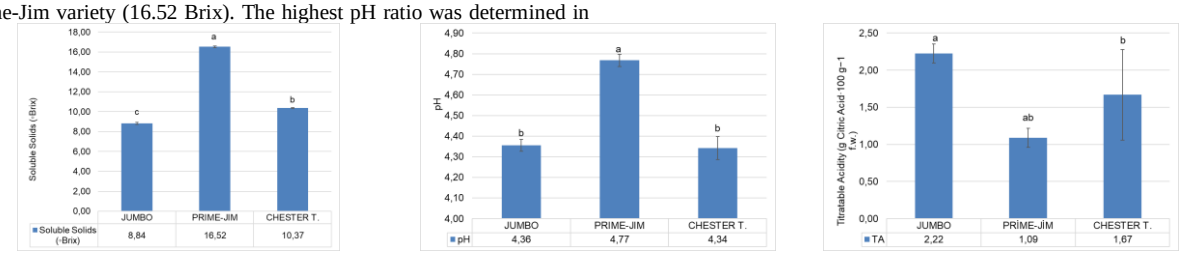

Figure 2. Values of soluble solids, pH and titratable acidity in fruit juices of blackberry varieties

Contents of vitamin C, total phenolics, DPPH and anthocyanin of blackberry varieties are given in Figure 3. The highest vitamin C value was found in the Jumbo variety (57.90 mg/100 mL). The total phenolic content was highest in the Jumbo variety (7875.33 mg GAE/L). Among the varieties, the highest DPPH appeared in the Chester variety (82.29%). The highest anthocyanin value was found in Chester variety (225.36 100 g FW).

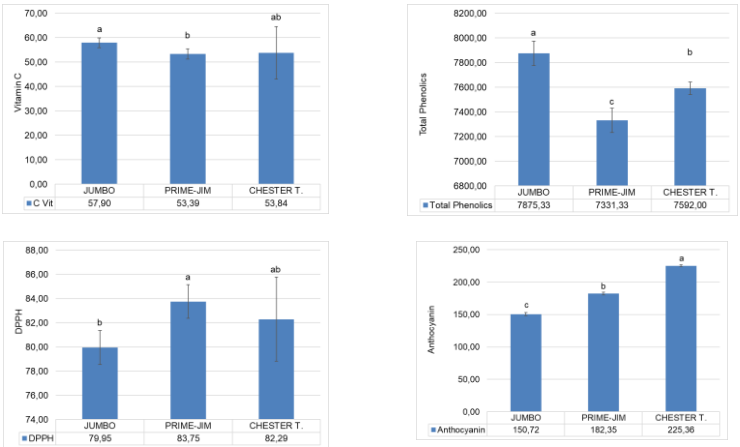

Figure 3. Contents of vitamin C, total phenolics, DPPH and anthocyanin of blackberry varieties

Ağaoğlu et al. (2007) examined the pomological characteristics of certain blackberry cultivars (Arapaho, Black Satin, Bursa 1-2-3, Chester Thornless, Cherokee, Jumbo, Dirksen, Navaho, and Ness) grown for 5 years in Ankara (Ayaş) ecology. They found that the fruit weight of the Chester Thornless variety was 5.40 g, total acidity was 25.56 g/l, and the soluble solid content was 16.66%. Koca et al. (2008) conducted research in the Black Sea Region

on the cultivation of some berry species (blackberry, blueberry, and blackcurrant), examining certain physical and chemical properties of these species. In the study, pH, soluble solids content (SSC), titratable acidity (TA), ascorbic acid, ash, color, total sugar, sucrose, and reducing sugar analyses were conducted on fruits of 10 blackberry cultivars and 7 wild genotypes. The study found that in the fruit juices of the Chester variety, the sugar index was 81.60, pH was 2.85, SSC was 12.03%, TA was 1.40%, and the ascorbic acid value was 21.86 mg/100 g. It was determined that the formal number was lower in the blackberry genotypes obtained from cultivated blackberry varieties, and it was found that the strawberry tree fruit, which is not widely recognized in our country, is an important fruit species in terms of vitamin C content, acidity, and color compared to other berry species. Velde et al. (2016) investigated the adaptation of Dirksen, Black Satin, and Jumbo blackberry varieties to Argentine conditions in a study. The phytochemical properties of these varieties were determined using HPLC-TOF-MS. The highest soluble solids content (SSC) ratio was found in the Black Satin variety (7.0±1.0), while the lowest ratio was observed in the Jumbo variety (5.5±1.0). pH levels

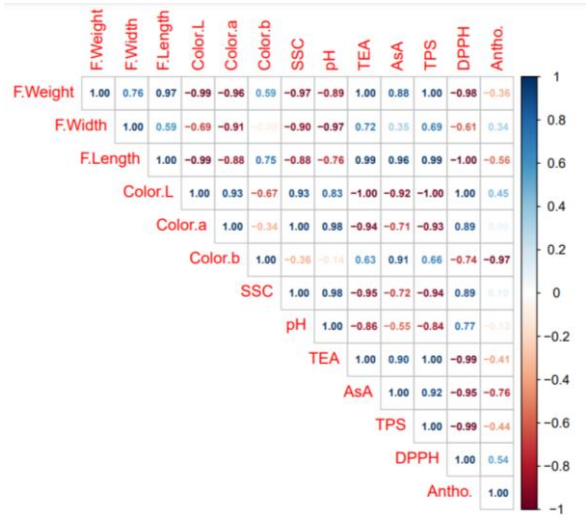

Figure 4. Correlation analysis of the study parameters and cultivars.

PCA-Biplot (Figure 5) results of current study showed the best characteristics of the 3 varieties tested. According to this, CHESTER T variety is superior to the other varieties in terms of anthocyanins. PRIME JIM and JUMBO varieties were found to have opposite characteristics, and accordingly, the characteristic that was good in one cultivar was measured as weak in the other. Accordingly, the most important traits defining the JUMBO variety were fruit weight, titratable acidity, TPS, fruit length and ascorbic acid. On the contrary, DPPH, L-color, SSC, a-color and pH were determined as superior traits for the PRIME JIM variety.

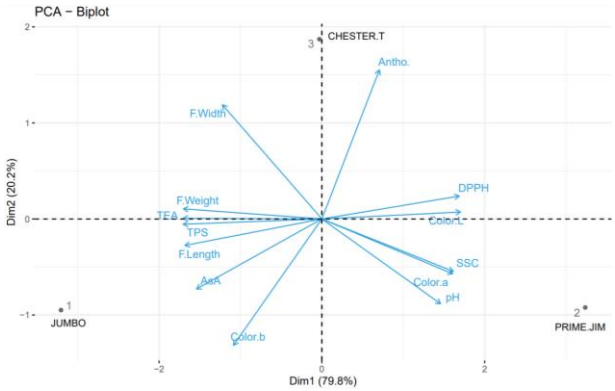

Figure 5. PCA biplot analysis of the study parameters

Conclusions

The Kestel/Bursa region holds significant importance in blackberry production in Turkey. In the study, the physical and chemical properties of three varieties grown in this region, namely Chester, Prime-Jim, and Jumbo, were examined. The examined varieties were found to be significant in both physical and chemical properties. Especially, Jumbo and Chester varieties stood out in terms of fruit size.

Acknowledgements

This study is a part of the master thesis of the first author (Melike Urfalı).

Conflict of Interest

The authors declare that they have no conflict of interest.

Author's Contributions

The authors contributed equally to this manuscript.

were found to be nearly similar in all varieties, averaging around 2.90 across the three varieties. When examining vitamin C values, the highest ratio was found in the Dirksen variety (96±0.3 mg/100 g), while the lowest ratio was observed in the Black Satin variety (7.1±0.6 mg/100 g). Tosun et al. (2008) investigated the physiological and chemical changes in 9 blackberry genotypes at different ripening stages (green, red, black) under Samsun ecological conditions. They found that the total sugar content was on average 45.00 g/kg in the green stage, 97.00 g/kg in the red stage, and 485.00 g/kg in the black stage. In the same genotypes, the total phenolic content was determined to be on average 14,600 mg/kg in the green stage, 11,000 mg/kg in the red stage, and 9,368 mg/kg in the black stage. When looking at total anthocyanin, the average was found to be 1,009 mg/kg in the red stage and 7,927 mg/kg in the black stage for the genotypes.

According to correlation studies (Figure 4), the highest positive correlations were found between fruit weight and F. Lenght, TEA, AsA and TPS. In addition to this, some other parameters also had strong positive relationships, such as SSC and pH, DPPH also between TEA and AsA.

References

Ağaoğlu, Y. S. (2003). Türkiye'de Üzümsü Meyvelerin dünü bugünü ve yarını. Ulusal Kivi ve Üzümsü Meyveler Sempozyumu, 23-25 Ekim 2003, Ordu. s: 1-14.

Ağaoğlu, S., Eyduran, S. P., Eyduran, E. (2007). Ayaş koşullarında yetiştirilen böğürtlen çeşitlerinin bazı pomolojik özelliklerinin karşılaştırılması. Tarım Bilimleri Dergisi, 13(1), 69-74.

Brand-Williams, W., Cuvelier, M. E., Berset, C. L. W. T. (1995). Use of a free radical method to evaluate antioxidant activity. LWT-Food science and Technology, 28(1), 25-30.

Cemeroglu, B. (2007). Food analysis. Food Technology Society Publication, 34, 168-171.

Costantino, L., Albasino, A., Rastelli, G., Benvenuti, S. (1992) Activityof polyphenolic crude extracts as scavengers of superoxideradicals and inhibitors of xanthine oxidase.Planta Medica,58, 342-344.

Çağlar, M., Demirci, M. (2017). Üzümsü meyvelerde bulunan fenolik bileşikler ve beslenmedeki önemi. Avrupa Bilim ve Teknoloji Dergisi, 7(11), 18-26.

Fidan M.S., Öz A., Adanur H., Turan B. (2013). Gümüşhane yöresinde yetişen bazı önemli odun dışı orman ürünleri ve kullanım miktarları. Gümüşhane Üniversitesi, Fen Bilimleri Enstitüsü Dergisi, 3(2).

Gecer, M. K., Akin, M., Gundogdu, M., Eyduran, S. P., Ercisli, S., Eyduran, E. (2016). Organic acids, sugars, phenolic compounds, and some horticultural characteristics of black and white mulberry accessions from Eastern Anatolia. Canadian Journal of Plant Science, 96(1), 27-33.

Giusti, M. M., Wrolstad, R. E. (2001). Anthocyanins characterization and measurement with UV-visible spectroscopy. Current protocols in food analytical chemistry, 1, 1-13.

Halvorsen, B. L., Holte, K., Myhrstad, M. C., Barikmo, I., Hvattum, E., Remberg, S. F., Blomhoff, R. (2002). A systematic screening of total antioxidants in dietary plants. The Journal of nutrition, 132(3), 461-471.

Heinonen, I. M., Meyer, A. S., Frankel, E. N. (1998). Antioxidant activity of berry phenolics on human low-density lipoprotein and liposome oxidation. Journal of agricultural and food chemistry, 46(10), 4107-4112.

Kähkönen, M.P., Hopia, A.I., Heikki, J.V., Rauha, J.P., Pihlaja, K., Kujala, T.S., Heinonen, M. (1999). Antioxidant activity of plant extracts containing phenolic compounds. J. Agric. Food Chem. 47, 3954–3962.

Koca, I., Karadeniz, B., Çelik, H., Demirsoy, L. (2008). Karadeniz bölgesinde yetişen bazı üzümsü meyvelerin özellikleri, Türkiye 10. Gıda Kongresi, 21-23 Mayıs, Erzurum.

Mishra, K., Ojha, H., Chaudhury, N. K. (2012). Estimation of antiradical properties of antioxidants using DPPH assay: A critical review and results. Food chemistry, 130(4), 1036-1043.

Strik, B.C., Clark, J.R., Finn, C.E., Bañados, M.P. (2007). Worldwide blackberry production. HortTechnology, 17(2), 205-213.

Somparn, P., Phisalaphong, C., Nakornchai, S., Unchern, S., Morales, N.P. (2007). Comparative antioxidant activities of curcumin and its demethoxy and hydrogenated derivatives. Biological and Pharmaceutical Bulletin, 30(1), 74-78.

Thompson, E., Strik, B. C., Finn, C. E., Zhao, Y., Clark, J. R. (2009). High tunnel versus open field: management of primocane-fruiting blackberry using pruning and tipping to increase yield and extend the fruiting season. HortScience, 44(6), 1581-1587.

Tosun, İ., Ustun, N.S., Tekguler, B. (2008). Physical and chemical changes during ripening of blackberry fruits. Scientia Agricola. 87-90

Velde, F., Grace, M.H., Esposito, D., Pirovani, M.E. (2016). Quantitative Comparison of Phytochemical Profile, Antioxidant, Andanti-İnflammatory properties of blackberry fruits adapted to Argentina. Journal of Food Composition and Analysis (47) 82–91

Yetgin, M.A. (2009). Üzümsü meyveler. Samsun İl Tarım Müdürlüğü Çiftçi Eğitimi ve Yayım Şubesi Yayını, Samsun.