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A Diversity Analysis of Fruits of Strawberry Tree (*Arbutus andrachne* L.) Grown in Isparta-Türkiye

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ABSTRACT

The growing locations of plants may affect product quality adversely in several ways. Fruits containing a different percentage of chemicals may cause adverse physicochemical properties. This study, it was evaluated certain physicochemical properties of fruits obtained from Strawberry Tree fruits (*Arbutus andrachne* L.) which were collected from four different geographical locations of stands that are managed Regional Directorate of Forestry. A considerable physicochemical difference was found among the fruit samples. The highest color differences among samples were found with sample IV (ΔE: 15.4), followed by sample I (ΔE: 15.1), sample III (ΔE: 7.6) and sample II (ΔE: 3.6), respectively. However, the size properties (diameter and weight) of samples also show some variations. The highest average diameter (12.42 mm) and weight (1.13 g) with a sugar content of 33.81 °Bx were found to be in sample I. The sugar content difference is realizable result was found to be high at lower diameters but at higher weights. Moreover, the total existence of 43 essential oil compounds is determined for sample I and 35 compounds for sample IV, while 31 of them are similar, which represents 97.07% for sample I and 91.78% for sample IV. These values may be a good indication of the geographical locations of the physicochemical properties of fruits of *A. andrachne.*

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Isparta-Türkiye'de Yetişen Çilek Ağacı (*Arbutus andrachne* L.) Meyvelerinin Çeşitlilik Analizi

ÖZET

Yetişme ortamları bitkilerden elde edilen ürünlerin kalitesine birçok yönden etkileyebilir. Değişik oranlarda kimyasal madde içeren meyvelerin özelliklerinin farklı olması beklenebilir. Bu çalışmada, Isparta Orman Bölge Müdürlüğü yetki alanındaki dört farklı coğrafi bölgeden toplanan Çilek Ağaçlarından (*Arbutus andrachne* L.) meyvelerin genel özellikleri incelenmiştir. Elde edilen sonuçların istatistiksel analizi sonucu meyve örnekleri arasında, fizikokimyasal özellikler bakımından (renk, ağırlık, uçucu yağ içeriği) önemli farklılıklar bulunmuştur. Numuneler arasında en yüksek renk farkı (ΔE) numune IV (ΔE: 15.4) ile ve daha sonra sırasıyla numune I (ΔE: 15.1), numune III (ΔE: 7.6) ve numune II (ΔE: 3.6) de gözlemlenmiştir. Ayrıca meyvelerin fiziksel boyut özellikleri (çap ve ağırlık) bakımından da önemli farklılıklar gözlemlenmiştir. En yüksek ortalama çap (12.42 mm) ve ağırlık (1.13 g) ile birlikte şeker içeriği (brix sayısı) 33.81 °Bx ile numune I'de hesaplanmıştır. Numuneler arasında şeker oranı, fark edilebilir olarak daha düşük çapa fakat daha yüksek ağırlığa sahip meyvelerde hesaplanmıştır. Ayrıca, numune I için toplam 43, numune IV için ise toplam 35 uçucu yağ bileşiği tespit edilmiş fakat bunlardan 31'inin her iki meyve örneklerinde de ortak olarak bulunduğu anlaşılmıştır. Bu ortak bileşikler, toplam uçucu yağ oranının numune I için %97.07'ini numune IV için ise %91.78'ini oluşturduğu hesaplanmıştır. Bu çalışmada elde edilen verilerden, *A. andrachne* meyvelerinin fizikokimyasal

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Arbutus andrachne meyvesi
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Uçucu yağlar
Isparta-Türkiye

özelliklerinin, coğrafi yetişme ortamlarının açıklanması bakımından bir gösterge olabileceği olarak değerlendirilmiştir.

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INTRODUCTION

Plant growth is greatly affected by the environment, which needs suitable atmospheric conditions to survive. However, the need for planting must be optimal, otherwise it limits growth or distribution. Some of the important environmental factors that affect plant growth include light, temperature, water, humidity, elevation, and nutrition (Körner et al., 1989; Anonymous, 2024a).

Arbutus andrachne L. is a member of the Ericaceae family which is called the strawberry tree, naturally spread from the East Mediterranean to the Northern Black Sea area in Turkiye (Beyhan, et al., 2020; Santiso Carral, 2015). However, it is an evergreen with orange-red fruits, generally habitat in the form of shrubs or small trees in forest areas where they are tolerant to heat cold, and moisture. It has been reported by researchers that strawberry trees generally bloom between November and March, displaying white to pink panicle-forming bell flowers, and can mature the fruit all year round (Beyhan et al., 2020; Körner et al., 1989; Nemutlu, 2022; Santiso Carral, 2015). It has matured fruits that ripen simultaneously and are prone to getting black spots on its leaves in the fall (Markovski, 2017). It has been proposed that the shape of fruits is heterogeneous in terms of weights, colors, and ripenings (Markovski, 2017; Santiso Carral, 2015). At maturity, the shape of fruits is generally round with a diameter of 20-30 mm and red in different hues (Beyhan et al., 2020; Körner et al., 1989; Nemutlu, 2022; Santiso Carral, 2015). Because some healing properties have been reported (i.e., antiseptic, diuretic, laxative, anti-diabetic, hypertension, and anti-inflammatory), it has begun to increase emphasis on the properties of its fruits (Beyhan et al., 2020; Santiso Carral, 2015). Several phenolic compounds were reported by the authors in *Arbutus* fruits (Miguel et al., 2014). Besides the multiple vitamin and phenolic compounds, the antioxidant activity of strawberry tree fruits was reported to be one of the highest among 28 fruit kinds (Markovski, 2017).

As mentioned above, strawberry trees can be adapted to many climate conditions well and have aesthetic flowers and fruit with a green leaf structure. Hence, distributed in a variety of landscape situations (Nemutlu, 2022). It could be considered to be pivotal in the genesis of architectural plants which can be used in landscaping areas with shrub forms (Anonymous, 2024b). It is recommended to be used as a low-branching specimen plant in residential and commercial courtyards, in raised planters, and around lawns (Nemutlu, 2022; Tatliyer et al., 2019; Anonymous, 2024c). Due to being tolerant of summer drought, the strawberry tree fruits might be attractive to wildlife which may serve as food for birds, with the flowers of the plant pollinated by bees (Markovski, 2017; Nemutlu, 2022; Miguel et al., 2014). Ten different genotypes of *Arbutus andrachne* in Macedonia were evaluated. It was found that one genotype (genotype) had twice as big a fruit mass (1.87 g) as others while it has also dark red coloration (L: 21.02; a: 18.8; b: 12.0) (Markovski, 2017). The *Arbutus* species could be found in a maquis in natural forestlands while different climatic conditions (e.g., light, elevation, direction, or temperature) affect their morphology directly (Santiso Carral, 2015).

The strawberry tree is perhaps one of the best large shrubs or small trees for inland gardens, where it grows slowly, but provides garden value for many years. It has typically red-orange-red strawberry-shaped berries that can impress people, which makes it an ideal eye-catcher in both small and large gardens (Nemutlu, 2022; Anonymous, 2024b,c). However, fruits from *Arbutus andrachne* are found to be used in the food industry as a filler for many products (i.e. dessert, jelly, marmalade, yogurt) (Beyhan et al., 2020; Nemutlu, 2022; Santiso Carral, 2015).

This study aims to give an overview of *Arbutus andrachne* L. and the physicochemical properties of their fruits, together with evaluating their landscape value. It was assumed that native *Arbutus andrachne* L. species present quality and multifunctional species applicable for use in landscaping.

MATERIAL and METHOD

The strawberry trees (*Arbutus andrachne* L.) were found in their natural environment in Eğirdir and Sütçüler Isparta province in Turkey. The fruits of strawberry trees were collected within the vegetation period in 2022, in the natural forest which is managed by the Regional Directorate of Forestry authorities. Due to the difficulties experienced in sampling, fruits were collected from randomly selected healthy trees considering form, age, and general appearance having greenish-reddish colors. The fruits were collected from four different locations in the same region (I: Northside at elevation 369 m, II: North side at elevation 413 m, III: South side at elevation 364 m, IV: South side at elevation 343 m). Approximately 100 representative samples were collected from all sides of the crown. The collected samples were placed in bags, were labeled after coding, and collection data (collection time, place, and elevation) were marked on the label. Some pomology features (e.g., fruit diameter and weight, color) and essential oil characteristics of collected samples were examined.

The collected fruit samples were manually cleaned from contaminants, and then carefully washed with distilled water. The clean fruits were stored in standard containers at 4 0C until analyzed. Major morphological characteristics affecting fruit properties of size (diameter, mm), weight (g), and color were determined. The fruit diameters and weights were measured by digital calipers (± 0.01 mm) and a digital scale (± 0.01 gr). Degrees Brix (symbol °Bx) is a measure of the dissolved solids in a liquid (e.g. fruit or vegetables) and is commonly used to measure dissolved sugar and/or soluble solid content of a given substrate. Several researchers have already well proposed that there is a close relationship between a product's Brix value and potential sugar content (Kappes et al., 2007; Chauhan et al., 2014). In this case, the Brix (°Bx) level of samples was determined by a hand refractometer (Palm Abbe PA2021, Solon, OH) and reported as sugar content throughout the study. Due to general appearance characteristics, an RGB color model was used to indicate how much of each of the red, green, and blue is included in the samples. The CIE color difference formula was developed to solve the problem of the differences in the evaluation between color meters and the human eye. The ΔE (total color difference) is a difference in color accuracy and standard measurement, created by the Commission Internationale de l'Eclairage (CIE). However, it is based on ΔL*, Δa*, and Δb* color values, all of which provide a complete numerical descriptor of the color in a rectangular coordinate system (Sahin et al., 2011; Sahin et al., 2020). The meanings are as follows:

L* represents lightness, with 0 being a perfect black, with 0% reflectance or transmission, ΔL* represents a lightness difference between measured samples,

- a* represents the redness-greyness of the color. Positive values of a* are red, while negative values are green, Δa* represents the difference in redness or greyness between measured samples,

- b* denotes the yellow-blueness of the color. Positive values of b* are yellow, while negative values are blue, Δb* denotes blueness-yellowness differences between measured samples.

- In the case of the levels mentioned above, the higher the value, the greater the difference in that dimension.

The mathematical expression of the formula, however, is a bit more intimidating:

$$\Delta E^*_{ab} = \sqrt{(L^*_2 - L^*_1)^2 + (a^*_2 - a^*_1)^2 + (b^*_2 - b^*_1)^2}$$

The RGB and color coordinate measurements (CIE L*a*b* 1976) were made using a Nix2 handheld colorimeter (Nix sensor LTD, Hamilton, Canada), respectively. A single measurement was recorded for each sample and 10 replicated fruits were measured for each group sampling.

The essential oil of fruits of *A. andrachne* was isolated by water distillation, done using the method described by Sagdic et al. (2013). The ground of the fruits (approximately 100 g) was placed into a flask (1 L) treated with distilled water (1:5 w: v) and hydrodistilled for 1 h with the Clevenger apparatus (Ildam, Turkey). Essential oils were obtained from the cooling tunnel. Following the drying of essential oil with anhydrous sodium sulfate to remove any traces of water and after filtration, it was stored in covered test tubes at -20°C until use. The volatile composition of *A. andrachne* essential oil was determined using a GC-MS system (Shimadzu QP 5050, Japan) equipped with a Quadrupole detector and an FFAP polar capillary column [50 m × 0.32 mm (i.d.), film thickness: 0.25 µm]. The temperature program for the column was set from 120 °C (1 min) to 230°C at a rate of 6 °C/min and then held at 230 °C for 35 min. Helium was used as a carrier gas at a flow of 14 psi. (Split 1:10 mL/min) and the injection volume of each sample was 1 µL. The volatile compounds were identified by using the libraries of Flavor 2, Nist05, and Wiley7n. The peak areas were used directly to give the percentage volatile composition of the essential oil by dividing the area of each peak into the total area under all of the peaks. Figure 1 shows the geological map for collecting samples (A), natural habitats of *Arbutus andrachne* L. (B), and collected fruits (C).

The analysis of the obtained data was made within the scope of the IBM SPSS Statistics 26 program at a 95% confidence level. An analysis of variance (ANOVA) was used to statistically determine color and size variations.

All multiple comparisons were evaluated separately and significant differences between L*, a*, b*, diameter, and weight averages were determined within themselves. If the differences between the averages of the locations were found to be significant as a result of the analysis of variance in terms of the features emphasized, the Duncan test was used to determine the differences between the averages of which locations.

RESULTS and DISCUSSIONS

The fruits of *A. andrachne* were examined at four different locations in similar regions that coexisted in their natural environment, taking into account that the fruit's colors are differentiated. They appear to be a greenish-reddish color at ambient conditions (Fig. 1C).

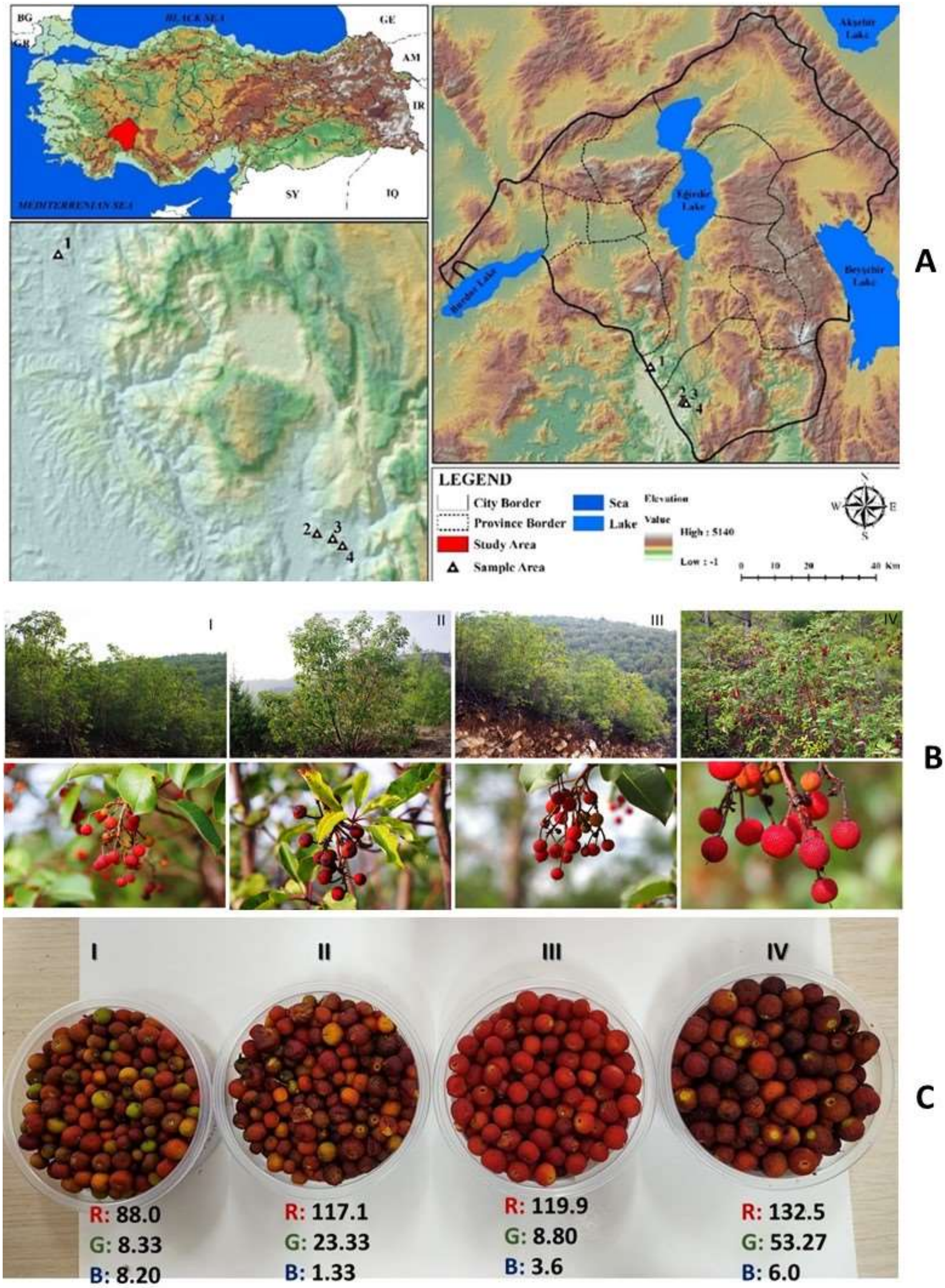

Figure 1. Geological map- (A), natural appearance- (B), and general characteristics (C) of *A. andrachne* fruits.
Şekil 1. A. andrachne meyvelerinin jeolojik haritası- (A), doğal görünümü- (B) ve genel özellikleri (C).

As a result of the analysis of variance in terms of color, diameter, and weight characteristics, the differences between the averages of the locations were found to be statistically significant ($p<0.05$).

However, locational sampling affects variation in the appearance of color, particularly intensity. It was suggested to measure the color intensity of food products using the CIE L*a*b* method (Bible and Singha 1993; Pék et al., 2010). The average color coordinate values of sampling locations are presented in Table 1. The average color values are found to be L: 25.09 (metric), a: 38.05 (metric), and b: 37.29 (metric), respectively. When considering sampling locations, the highest lightness L: 35.48 (metric) and yellowness b: 46.64 (metric) were found with sample IV but the highest redness value of a: 45.81 (metric) was found with sample III. Although, the visual appearance of a fruit is one of the most important acceptance criteria the collected sample may look aesthetically pleasing. It has been well proposed by several researchers that the higher reddish color could be referred to better ripeness of fruits (Alarcão-E-Silva et al., 2001; Santiso Carral, 2015; Vidrih et al., 2013).

Table 1. The color properties of fruits of *A. andrachne*.
Tablo 1. A. andrachne meyvelerinin renk özellikleri.

Sample	L*	a*	b*
I	16.18±1.66 (D)	37.67±2.70(C)	25.10±2.43 (D)
II	25.82±2.14 (B)	38.97±2.03(B)	40.76±3.21 (B)
III	23.80±0.63 (C)	45.81±2.33 (A)	36.65±1.73 (C)
IV	35.48±1.92 (A)	30.67±4.31 (D)	46.64±2.30 (A)
Average	25.09±1.19	38.05±1.61	37.29±1.58

*Each value represents the mean of at least ten replications. Values sharing the same capital letter (s) within a column are not statistically different at the 0.05 level of confidence.

The quantification of all color values in a simple way is very complicated and includes many phenomenal variations. Therefore, the total color difference (ΔE) which in this study may be useful to determine the color properties, could be used to give an estimation of how the different growing conditions (geographical locations) affect the natural color of *A. andrachne*'s fruits.

Figure 2 shows the different color properties of each group of samples. Among collected fruits, the highest color differences were found with sample IV (ΔE: 15.4), followed by sample I (ΔE: 15.1), sample III (ΔE: 7.6), and sample II (ΔE: 3.6) in that order. In the literature, ΔE values of 2.0 to 3.0 numeric are thought to be observable color differences by observers (Agoston, 2013; Krantz, 1975).

Besides color and general appearances, morphological parameters of fruit (e.g. diameters and weights) have already been reported to be useful methods for determining ripeness characteristics of fruits (Isbilir et al., 2012; Kıvcak et al., 2001; Oliveira et al., 2011). In this regard, the measured average fruit's diameters and weights are presented compared to Table 2. It appears to be a considerable size variation exists among fruit samples ($p<0.05$, $p=0.00$). In four sampling locations, the average diameters are found to be 10.62 mm in diameter and weight 0.77 g, respectively. However, the highest diameter (12.42 mm) and weight (1.13 g) were found to be in sample I. These measured results may be used to distinguish between the geographic sampling locations of *A. andrachne*'s fruits.

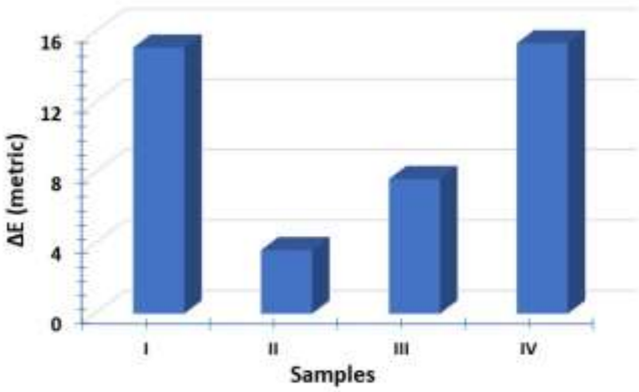

Figure 2. The color properties of fruits of *A. andrachne*.
Şekil 2. A. andrachne meyvelerinin renk özellikleri.

Table 2. The size properties of fruits of *A. andrachne*.
Tablo 2. A. andrachne meyvelerinin boyut özellikleri.

Sample	Diameter (mm)	Weight (g)
I	12.42±0.43 (A)	1.13±0.13 (A)
II	9.78±0.43 (D)	0.65±0.06 (C)
III	10.25±0.52 (B)	0.77±0.07(B)
IV	10.01±0.28 (C)	0.52±0.05 (D)
Average	10.62±0.25	0.77±0.05

*Each value represents the mean of at least ten replications. Values sharing the same capital letter (s) within a column are not statistically different at the 0.05 level of confidence.

The brix value (°Bx) is a numerical index, typically used to determine the ripeness or sugar content of a food sample (Uggla et al., 2005). The measurements exposed that fruit samples did not well correlate with brix (Figure 3), although distinguished from samples by their diameters. The highest value of 33.81 °Bx was found for sample I, followed by 32.97 °Bx (sample II), 32.58 °Bx (sample III), and 27.89 °Bx (sample IV), in that order.

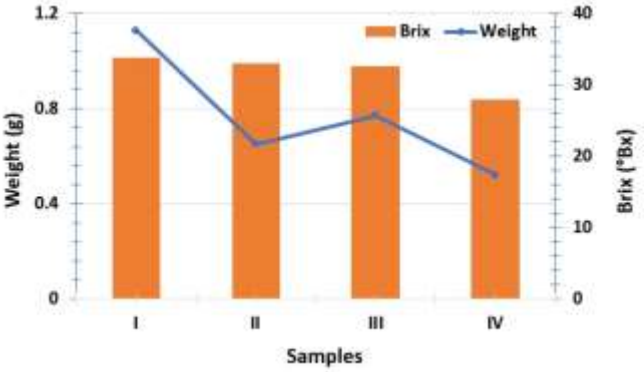

Figure 3. The Brix and weight properties of fruits of *A. andrachne*.

Şekil 3. A. andrachne meyvelerinin briks ve ağırlık özellikleri.

The degree or value of Brix (°Bx) is traditionally used in various food industries (i.e., alcohol, soft drinks, fruit juice honey, and so on.). Because it is generally used to assess the quality of flavor or sweetness, it is an important subject criterion.

It has already been well documented that there is a direct correlation between a food's Brix value and potential sugar content (Kappes et al., 2007; Bolade et al., 2009; Chauhan et al., 2014). In our study, the brix values were measured in the range of 27.89 °Bx (sample IV) to 33.81 °Bx (sample I). But when Figure 4 is carefully analyzed, it is difficult to correlate sampling locations with the diameters of fruit *A. andrachne*.

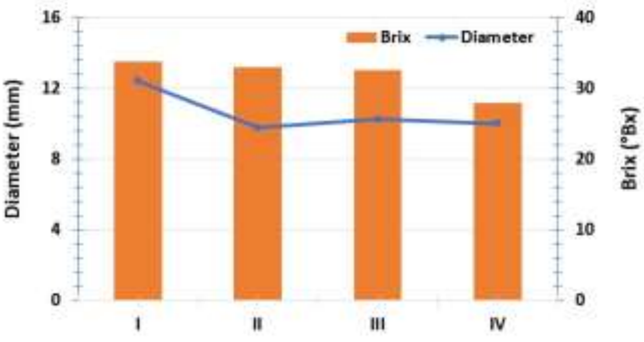

Figure 4. The Brix and diameter properties of fruits of *A. andrachne*.

Şekil 4. A. andrachne meyvelerinin briks ve çap özellikleri.

To find the combined effects of morphological properties (fruit diameters and weights) on fruit's sugar content (°Bx), the obtained values were plotted against them, as shown in Figure 5. The figure suggests that all monitoring properties bring an effect of changing the brix values. However, the sugar content difference is realizable. The sugar content was found to be high at lower diameters but at higher weights, then lowered with increasing diameter and lowering weights. This could be expected considering vast literature information has been reported, on which growth locations impact on maturity and morphological properties of food products (Alarcão-E-Silva 2001; Pék et al., 2010; Vidrih et al., 2013; Ugga et al., 2005; Isbilir et al., 2012; Oliveira et al., 2011; Kivcak et al., 2001).

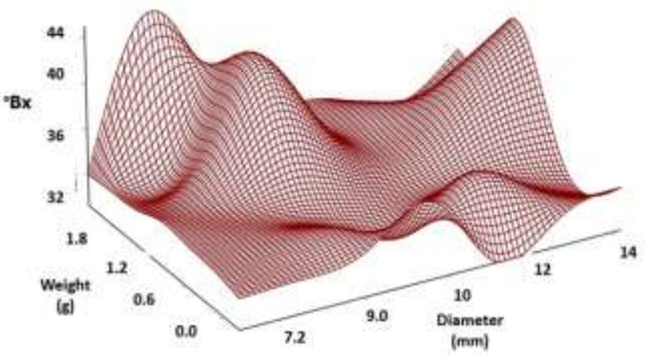

Figure 5. The fruit size effects on brix properties of fruits of *A. andrachne*.

Şekil 5. Meyve boyutunun A. andrachne meyvelerinin briks özelliklerine etkisi.

Some research has already been conducted to determine the chemical composition of physical properties of strawberry tree fruits (Bento and Pereira 2011; Özcan and Hacıseferoğulları 2007). There were reported very useful results considering the medicinal properties of the strawberry tree. In this regard, we have made an effort to determine the essential oil composition of *A. Andrachne*'s fruits. Considering the natural environment, their relative essential oil constituents from two different locations (samples I and IV) are comparatively given in Table 3. However, the total existence of 43 essential oil compounds is determined for sample I and 35 compounds for sample IV, respectively, while 31 of them are similar, which represents 97.07% for sample I and 91.78% for sample IV. The main essential oil components for sample I were found to be Ethyl alcohol (31.89%), (E)-2-Hexenal (16.61%), Hexanal (15.36%), (Z)- 3-Hexen-1-ol (11.02%), Penten-3-one (5.29%), Hexanol (2.86%), Ethyl acetate (2.50%), Cyclopentanol (2.06%), (E)-2-Pentenal (1.43%), 2-Methyl-1-propanol (1.43%), (E)-2-Hexen-1-ol (1.06%). Moreover, the main components for sample 2 were found to be ethyl alcohol (46.66%), (Z)-3-Hexen-1-ol (8.90%), Hexanal (7.29%),2-Methyl-1-

propanol (7.25%), (E)-2-Hexenal (6.17%), Hexanol (5.80%), Ethyl acetate (1.765%), (E)-2-Hexen-1-ol (0.96%), Penten-3-one (0.80%), in that order.

Although the evaluation of all these components is difficult and not intended in this study, major component ratios were considerably different for both groups of samples.

Table 3. The essential oil constituents of fruits of *A. andrachne*.
Çizelge 3. A. andrachne meyvelerinin uçucu yağ bileşenleri.

Compounds	Sample I	Sample IV
Ethyl alcohol	31.89%	46.66%
(E)-2-Hexenal	16.61%	6.17%
Hexanal	15.36%	7.29%
(Z)- 3-Hexen-1-ol	11.02%	8.90%
Penten-3-one	5.29%	0.80%
Hexanol	2.86%	5.80%
Ethyl Acetate	2.50%	1.76%
Cyclopentanol	2.06%	0.47%
(E)-2-Pentenal	1.43%	0.28%
2-Methyl-1-propanol	1.43%	7.25%
(E)-2-Hexen-1-ol	1.06%	0.96%
(E)-2-Heptenal	0.76%	0.06%
2-Butanone, 3-hydroxy- (CAS) Acetoin	0.59%	0.31%
Eucalyptol (1,8-Cineole)	0.57%	0.25%
Linalool	0.50%	0.58%
p-Cymene	0.42%	0.33%
(E,E)-2,4-Hexadienal	0.38%	0.07%
alpha- Pinene	0.32%	0.23%
Nonanal	0.27%	0.34%
Limonene	0.26%	0.15%
Ethyl caproate	0.23%	0.12%
3-Methylbutanal	0.22%	0.91%
Heptanal	0.21%	0.04%
1-Pentanol	0.16%	0.02%
Hexane	0.14%	0.10%
Camphor	0.14%	0.05%
Styrene	0.12%	0.55%
Octanal	0.10%	0.11%
Ethyl carbonate	0.09%	0.05%
2-Methylbutanal	0.06%	0.73%
gamma- Terpinene	0.04%	0.24%
Propyl bromide	0.20%	-
Butyl acetate	0.14%	-
(Z)-2-pentanol	0.87%	-
alpha- Thujene	0.05%	-
Benzaldehyde	0.19%	-
Sabinene	0.07%	-
1-Octen-3-ol	0.04%	-
6-Methyl-5-hepten-2-one	0.10%	-
3-Isobutylcyclohexene	0.12%	-
(E,E)- 2,4-Heptadienal	0.28%	-
Oct-2(E)-enal	0.13%	-
alpha- Terpinolen	0.53%	-
beta- Cyclocitral	0.05%	-
Ionone <(E)-, beta->	0.16%	-
2,3-Butanedione	-	0.08%
3-Methyl-1-butanol	-	3.71%
2-Methyl-1-butanol	-	4.38%
4-Terpineol	-	0.05%
TOTAL	100%	100%

However, it was observed that the components of (E)-2-Hexenal, Hexanal, (Z)- 3-Hexen-1-ol, Penten-3-one, Ethyl Acetate, Cyclopentanol, (E)-2-Pentenal, (E)-2-Hexen-1-ol were found to be higher in sample I whereas Ethyl alcohol, Hexanol, 2-Methyl-1-propanol were higher in sample IV. Moreover, 3-methyl-1-butanol (3.71%) and 2-methyl-1-butanol (4.38%) which have considerably high concentration have only found in sample IV. It is important to note that sample I contains 14 different components which comprise 2.97% whereas sample IV had 4 different components which comprise 8.72%.

CONCLUSIONS

Species in natural vegetation could be important for plant designs, especially in terms of minimizing maintenance needs. This study was carried out in Isparta province on the *Arbutus andrachne* (Strawberry tree) plant, which is widely distributed in Mediterranean regions. The natural habitats of the *Arbutus andrachne* L. plants in Isparta were examined in situ and fruits were collected and analyzed in terms of selected physicochemical properties. As a result of the study, the characteristics of the fruits were determined and it was then to compare them with different growing locations.

The different parts of plants (i.e., leaves, cones, fruits, flowers) have gained increasing attention and are widely utilized, but there are still some concerns, particularly due to the growing locations' effects on properties. However, special attention should be paid to the use of those plants. The experimental results showed that variations in growing locations had a definite effect on the physicochemical properties of *A. andrachne*. However distinct characteristics were determined by the size, color, sugar content, and essential oil constituents, which were influenced by the geographic locations. However, the characteristics of *A. andrachne*'s fruits did follow some trends, which emphasized that growing conditions affected physical properties. It is important to note that many phenomenological properties were reported for plant substrates and the quantification of all those is very complicated and needs further investigation.

Contribution Rate Statement Summary of Researchers

The authors declare that they have contributed equally to the article.

Statement of Conflict of Interest

The authors of the article declare that there is no conflict of interest between them.

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