

INVESTIGATIONS on POPULATION of BLUEBERRY (*Vaccinium myrtillus* L.) in ULUDAG (MOUNT OLYMPUS) in BURSA, TURKEY

Cihat TURKBEN^{1a} Erdogan BARUT¹ Bige INCEDAYI²

¹Department of Horticulture, Faculty of Agriculture, University of Uludag, Gorukle Campus, 16059 Bursa - Turkey

²Department of Food Engineering, Faculty of Agriculture, University of Uludag, Gorukle Campus, 16059 Bursa - Turkey

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Abstract

The objective of this study was to determine the current situation of *Vaccinium myrtillus* L. population which is endemic to Mount Olympus in Bursa, Turkey. The samples were taken from different regions of Uludag (Kirazlıyayla, Sarıalan, Çobankaya, Bakacak and Alaçam) and investigated for various properties including information about the descriptions of blueberry plants, ecology and soil structure. In addition, fruit samples were taken and various chemical (ascorbic acid, total acidity, pH and total soluble solid) and physical (100 fruit-weight and fruit color) analyses were conducted. Observations in the different regions of the Uludag Mountain showed that *Vaccinium myrtillus* L. populations were usually located under *Abies nordmanniana* subsp. *bornmüelleriana* trees in humid northern regions of the mountain at 1250-1900 m elevation. The pH of the soil where *Vaccinium myrtillus* L. populations have been growing ranged from 4.9 to 6.6. Although the fruits of these plants were small, the ascorbic acid level was high. Our study revealed that valuable *Vaccinium* genetic resources are present in Mount Olympus (Uludag) region which may have exceptional horticultural characteristics.

Key words: Blueberry, *Vaccinium myrtillus* L., Bursa, Uludag

Bursa -Uludağ (Mount Olympus)'daki Yaban Mersini (*Vaccinium myrtillus* L) Popülasyonları Üzerinde İncelemeler

Özet

Bu çalışma, 2005 yılında Bursa-Uludağ' da yayılışı saptanan "Çoban üzümü" veya "yabani mersini" olarak bilinen *Vaccinium myrtillus* L. popülasyonlarının durumunu tespit etmek amacıyla gerçekleştirilmiştir. Bu nedenle, türün Uludağ'ın farklı yörelerinden (Kirazlıyayla, Sarıalan, Çobankaya, Bakacak ve Alaçam) alınan örneklerde incelemeler yapılmıştır. Çalışmada yaban mersininin tanımlaması, yayılışı, ekolojisi ve toprak yapıları hakkında bilgiler verilmiştir. Ayrıca bu bitkilerden meyve örnekleri alınarak, bazı fiziksel (100 tane ağırlığı, meyve rengi) ve kimyasal (askorbik asit, toplam asit, pH ve suda çözünür kuru madde) analizler yapılmıştır. Uludağ'ın farklı yörelerinde yapılan gözlemler sonucunda bitkinin, dağın kuzey yönündeki nemli bölgelerde, 1250-1900 m yüksekliklerde ve çoğunlukla göknar (*Abies nordmanniana* subsp. *bornmüelleriana*) ağaçları altında yoğun popülasyonlar halinde yayılış gösterdiği saptanmıştır. Bitkinin incelenen popülasyonlarındaki toprakların pH düzeyinin 4.9-6.6 arsında değiştiği görülmüştür. Bu yörelerden derimi yapılan meyvelerin askorbik asit düzeylerinin de oldukça yüksek olduğu saptanmıştır. Çalışmamız, yaban mersini genetik kaynakları açısından Uludağ yöresinin önemli özelliğe sahip olduğunu ortaya koymuştur.

Anahtar Kelimeler: Yaban Mersini, *Vaccinium myrtillus* L., Bursa, Uludağ

1. Introduction

Blueberry (*Vaccinium myrtillus* L.) is a very interesting crop for small fruit family. Blueberries are grown in almost all parts of the world in the suitable ecological

conditions especially in acidic soils. Total production of all blueberry species is about 210 000 tons in the world (Çelik, 2003; Çelik, 2004; Çelik, 2005). In particular,

^a Corresponding author: C. Turkben, E-mai: cturkben@uludag.edu.tr

Vaccinium myrtillus L. known as an ancient medicinal plant has rich in phenolic compounds, e.g. phenolic acids and flavonoids which may act as natural antioxidants, anticarcinogens and antimicrobial agents (Prior *et al.*, 1998; Häkkinen and Törrönen, 2000; Rauha *et al.*, 2000). Main flavonoid subgroups in berries and fruits are anthocyanins, proanthocyanins, flavonols and catechins (Duy, 1995; Aragon *et al.*, 1998) which have positive effects in some types of cancer and prevention of coronary diseases.

V. myrtillus L. is a plant which has been adapted to temperate climate in the world. There are a lot of wild *Vaccinium* species in the nature. *V. corymbosum*, *V. angustifolium* and *V. ashei* are species which are grown economically (Çelik, 2006; Gough, 1996). As botanically, *V. myrtillus* L. stems angled and green. Leaves notably bright green, slightly toothed, not leathery and 1-3 cm long. Plant hairless. Flowers solitary or in pairs, pinkish, globular with tiny reflexed lobes at mouth. Flower diameter 4-6 mm, Fruit a black berry and fruit diameter 6-9 mm.

Due to their antioxidant capacities and anticancerous effects, *Vaccinium* species are getting more popular in almost all parts of the world. In Turkey, there are many wild *Vaccinium* species such as *V. vitis-idea*, *V. myrtillus*, *V. uliginosum* and *V. arctostaphylos* distributed over many provinces including Artvin, Rize, Trabzon, Ordu, Giresun, Gümüşhane, samsun, Sinop, Kastamonu, Zonguldak, Bolu, Bartın, Düzce, Kocaeli, Sakarya, İstanbul, Kırklareli, Bursa, Balıkesir, Erzurum-Şenkaya ve Ardahan. In these regions, wild *Vaccinium* species were given different names like likapa, kaskanaka, çela in Rize; ligarba, lifos in Trabzon; mostvi, morsvi, merhauk in Artvin; çalı çileği in Ordu and Giresun; göğen in Ardahan and çay üzümü and ayı üzümü in some other provinces. They known as blueberry in the world. Therefore, it is more appropriate to call these species as “maviyemiş” rather than “yaban mersini” in Turkish (Çelik, 2006).

Vaccinium myrtillus L. (Bilberry, Blueberry; Shepherd’s Grape, *Ericaceae* family) is also known as “Çoban Üzümü” or

“Yaban Mersini” in Turkey. The genus *Vaccinium* is represented in Turkey by 4 species and 1 taxa. *V. myrtillus* L. represents Mount Olympus in Bursa, Ida (Kaz dağları) Mounts in Balıkesir, Istranca Mounts in Kırklareli and in North Anatolia Mounts among *Rhodendron caucasicum*, *Pinus* or *Juniperus* at 1280-2700 m (Davis, 1978; Ağaoğlu, 1986). It grows naturally in acid soils (pH: 4 – 5.5) and rich in organic material soils (Gough, 1996; Smith, 2001)

Many studies have been conducted on black blueberries but there has been little research done on this crop in Turkey. Therefore, this study was carried out to characterize wild blueberry populations in Uludag (Mount Olympus in Bursa, Turkey).

2. Materials and Methods

Blueberry (*Vaccinium myrtillus* L.) fruit samples were harvested at dark blue color from the Northern side of Mount Olympus (Kirazlıyayla, Sarıalan, Çobankaya, Bakacak and Alaçam) in June 2005. But Blueberry plants were found to collect fruit samples in the Southern side of Mount Olympus (Keles).

Of all the blueberry fruits harvested, some physical characteristics such as fruit weight of 100 berries and fruit color and some chemical compositions such as ascorbic acid (mg kg⁻¹), titratable acidity (%), pH and total soluble solids (%) were determined. Moreover, descriptions, habitats and soil texture (0-30 cm) of blueberry areas were recorded.

The result of physical and chemical analyses were analyzed according to a randomized block design with three replication, and the mean values were compared by Duncan’s Test at P= 0.01 level.

3. Results and Discussion

We concluded that wild blueberry populations were most abundant in Alpine area (Çobankaya and Bakacak) and in the humid regions of the northern side of Mount Olympus (Kirazlıyayla, Sarıalan and Alaçam). We failed to located any *V.*

myrtillus L. sample in the regions of the southern side of Mount Olympus (Keles) (Table 1).

Observations in different regions of the Uludag Mountain showed that *Vaccinium myrtillus* L. populations were usually located under *Abies nordmanniana* subsp. *bornmüelleriana* and *Pinus nigra* in Kirazlıyayla, *Juniperus communis* var. *Saxatilis* and *Abies nordmanniana* subsp. *bornmüelleriana* in Sarıalan and Çobankaya, *Juniperus communis* var. *saxatilis*, *Abies nordmanniana* subsp. *bornmüelleriana* and *Fagus orientalis* in Bakacak, *Fagus orientalis* and *Abies nordmanniana* subsp. *bornmüelleriana* in Alaçam at 1250-1900 m elevations. Davis (1978) and Ağaoğlu (1986) pointed out that *V. myrtillus* L.

represented in North Anatolia Mounts among *Rhodendron caucasicum*, *Pinus* or *Juniperus* at 1280-2700 m.

Table 1. Presence of the Blueberry (*Vaccinium myrtillus* L.) Populations at Mount Olympus (Uludag)

Areas	Altitudes (m)	Population of blueberry
Northern		
Kirazlıyayla	1450 – 1550	+
Sarıalan	1600 – 1650	+
Çobankaya	1750 – 1800	+
Bakacak	1750	+
Alaçam	1300	+
Southern		
Keles	1500	-

Table 2. Soil Texture of Mount Olympus (Uludag)

Areas	Depth (cm)	Particle Size Distribution				Water Saturation (%)	pH	25 °C Total Salt (%)	Phosphorous P ₂ O ₅ kg/da	Potassium K ₂ O kg/da	Organic Matter (%)
		Sand (%)	Silt (%)	Clay (%)	Texture						
Kirazlıyayla	0-30	57,2	28,0	14,8	Sandy Loam	85	6,6	0,03	4,3	38	6,2
Sarıalan	0-30	43,2	38,0	18,8	Loam	96	4,9	0,03	2,8	60	7,8
Çobankaya	0-30	61,2	26,0	12,8	Sandy Loam	74	4,9	0,01	4,1	32	6,2
Bakacak	0-30	65,2	22,0	12,8	Sandy Loam	70	4,9	0,02	3,2	34	4,8
Alaçam	0-30	45,5	36,6	17,8	Loam	77	5,1	0,01	3,5	89	5,1
Keles	0-30	43,2	36,0	20,8	Loam	70	5,6	0,01	3,6	118	5,4

Soil texture of Mount Olympus was given in Table 2. The pH of the soil was ranged from 4.9 to 6.6 and soil texture was loam or sandy loam and had rich in organic matter range from 4.8% to 7.8% in the blueberry growing areas. These results are important since *V. myrtillus* L. grows naturally in acid soils (pH: 4 – 5.5) and soils rich in organic material (Gough, 1996; Smith, 2001). Dale and Hancock (2005) reduced the pH of the soil to 4.5 before planting blueberry.

Blueberry (*Vaccinium myrtillus* L.) fruits were harvested from middle of July until the end of August. Ecological differences of areas affected the physical characteristics and chemical compositions of blueberry fruits which given at Tables 3 and 4.

100 Berry weights of blueberry fruits were determined between 19.44-26.67g. Colors of blueberry fruits ranged from blue to dark-blue.

Table 3. Physical Characteristics of Harvested Blueberry (*Vaccinium myrtillus* L.) Fruits in Mount Olympus (Uludag)

Areas	100 Berry weight (g)	Colour		
		L	a	b
Kirazlıyayla	21.03	13.23	+ 2.12	0.93
Sarıalan	26.67	13.14	+ 4.17	0.61
Çobankaya	19.44	12.80	+ 2.40	0.34
Bakacak	24.44	11.26	+ 2.33	0.37
Alaçam	24.71	16.69	+ 1.55	0.58

Table 4. Chemical Compositions of Harvested Blueberry (*Vaccinium myrtillus* L.) Fruits in Mount Olympus (Uludag)

Areas	Ascorbic acid (mg kg ⁻¹)	Total acidity (%)	pH	Total soluble solids (%)
Kirazlıyayla	88.9 c	1.02 b	2.87 b	10.50 a
Sarıalan	112.6 b	1.19 a	2.87 b	10.00 ab
Çobankaya	97.2 bc	1.23 a	2.77 c	11.00 a
Bakacak	138.6 a	0.90 c	2.87 b	9.00 b
Alaçam	111.8 b	1.15 a	2.95 a	9.00 b

Ascorbic acid content of blueberry fruits were found between 88.9-138,6 mg kg⁻¹. Generally it is manifested that all samples are well-off from ascorbic acid that has an antioxidative effect in body.

Total acidity and pH values of blueberry fruits were found between 0.90 % - 1.23 % and 2.77 - 2.95 respectively. The amount of total acidity and pH values of blueberry fruits recorded in this study was much lower than previously reported results (Kılıç et al. 1997, Jackson et al. 1999).

Total soluble solids of blueberry fruits were determined between 9 % – 11 %. They are little less than the results of Jackson et al. (1999) (13.8 %).

This research is the first research on blueberry fruits (*Vaccinium myrtillus* L.) in Mount Olympus (Uludag). Our study revealed that valuable *Vaccinium* genetic resources. We have conducted that selection and crossing of *Vaccinium myrtillus* L. for breeding purposes should further be investigated.

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