



Determination of some ecological characteristics and economical importance of *Vitex agnus-castus*

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Abstract

This study was conducted in order to exhibit some of the ecological and economical attributes of *Vitex agnus-castus*, a typical Mediterranean plant. The study was conducted in two different stages. At first, soil samples of *V. agnus-castus* were collected from 38 different localities in the Western Anatolian part of Turkey during flowering to investigate the soil properties. It was observed that this plant generally prefers loamy-textured, neutral, and slightly alkaline soils poor in calcium carbonate, containing varying amounts of organic matter, moderate and rich in nitrogen, rich in phosphorus and deficient in potassium. In addition, the economical and ethnobotanical importance of *V. agnus-castus* was investigated. It was observed that the species is widely used as a pharmaceutical drug, as a dye plant, as a source of honey, as a material in basket weaving, and for ornamental use. It is used in landscape architecture because it is a shrub with beautiful flowers and aroma.

Keywords: Ecology, ethnobotany, Turkey, *Vitex agnus-castus*.

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INTRODUCTION

Chaste tree (*Vitex agnus-castus* L., Verbenaceae) is an aromatic, ornamental, and deciduous shrub native to the arid and semi arid Mediterranean and Western Asia, and widely cultivated in the warm temperate regions and subtropics (Schopmeyer 1974). The species generally grows in humid habitats like stream banks and valleys, in littoral habitats, mostly on sandy soils, parched alluvial soils and rocky areas near the sea, sometimes on limestone slopes, in sunny and hot places, and in ditches (Dogan and Mert 1998). The species is also very desirable in several rehabilitation programs in degraded lands, because it can grow in nutritionally poor soils and dry regions and has edible, medicinal and many other uses (Watanabe et al. 1995, Hirobe et al. 1997). It grows along the Mediterranean coasts, penetrating inwards up to approximately 250 km and between the altitudes from sea level to 750

m, particularly in areas in which the Mediterranean climate is dominant (Dogan and Mert 1998). However, Boissier (1963) has reported its existence up to 1200 m.

The specific epithet of the plant *agnus-castus* comes from the Latin words "castitas" (chastity) and "agnus" (lamb). The plant is also known under the common name "chaste tree" because of its ability to decrease sexual desire and promote chastity in women and celibacy in monks. The monks use it as a spice in cooking and the plant is therefore known as "monk's pepper" (Daniele et al. 2005). The chaste tree is probably one of the most important herbs used by medical herbalist for centuries and it is also known as the women's herb, because of its great ability to treat several female hormonal disorders (Bartram 1995, Padmalatha et al. 2009).

There are more than 250 species of *Vitex*

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genus in the world (Dutta 1970). The distributions vary from the Mediterranean area, Southern Europe, West Asia, Crimea, Caucasia, Iran, North Africa, Central Asia to India, and in sheltered positions in the American State of New York (Dogan and Mert 1998), while in Turkey, only two species, *V. agnus-castus* and *V. pseudo-negundo* (Hauskn. ex Bornm.) Hand.-Mazz., are found.

The use of these species for medicinal and ornamental purposes was observed. It is economically very important to further study and determine the medicinal and ecological properties of *V. agnus-castus*, a widely used ornamental plant. This study was conducted in order to show the ecological and ethnobotanical importance of *V. agnus-castus*, a typical plant of the Mediterranean.

MATERIAL AND METHODS

The aim of this paper was to investigate the ecology of *Vitex agnus-castus* L. by evaluating the soil properties in its natural distribution in the Western Anatolian part of Turkey and to show the economical importance of this species. The study was realized in two different stages.

Evaluating the soil properties of *V. agnus-castus*

Soil samples of *V. agnus-castus* localities were collected from the Western Anatolian part of Turkey during the flowering period. For this purpose, samples from a total of 38 localities were collected; 5 different localities from Manisa, 6 different localities from Balikesir, 4 different localities from Canakkale, 8 different localities from Izmir, 5 different localities from Mugla, 3 different localities from Denizli and 7 different localities from Aydin, all provinces in Western Anatolia (Fig. 1).

Soil samples were collected from 15-20 cm depth, taken to the laboratory, air-dried, and sieved using a 2 mm mesh. The texture, pH, total soluble salts, calcium carbonate and organic matter content determinations were made according to the methods detailed by Ozturk et al. (1997). For nitrogen, phosphorus, and potassium determination in



Fig. 1. Map of the study area.

the soils, samples were prepared using the Kjeldahl method and the percentage content determined using a Spectronic-2 Bausch and Lomb spectrophotometer and Flame photometer 655, respectively (Kacar 1962).

Evaluating the economical and ethnobotanical importance of *V. agnus-castus*

In order to determine the economical and ethnobotanical importance of the plant, field observations were performed and interviews were conducted with the people who live in the area where the plant samples were collected. Interviews were done with elderly people of the provinces and districts, with experienced adults and patients in various places by a non-structured interview method. Five inhabitants were selected in the application provinces (n= 35) based on one of the methods for ethnobotanical data collection (Martin 1995). The selected people were born or lived in the regions that cover most of the territory of the country. The local people were asked for their consent to share their knowledge only for the purpose of this study. Also the obtained data were supported by literature concerning the economical importance of the plant.

RESULTS AND DISCUSSION

The soil properties of *V. agnus-castus* localities

The soil texture results show that 57.90% are loamy, 36.85% clayey loam and 5.26% silty in nature according to Bouyoucos (1962). Thus indicating that the plant grows mainly on loamy soils (Fig. 2). It has been reported by

various researchers that plants such as *Ceratonia siliqua* L., *Inula graveolens* (L.) Desf. and *Asphodelus aestivus* L., which, like *V. agnus-castus*, are Mediterranean elements, and generally prefer loamy soils (Secmen 1973, Ozturk 1982, Pirdal 1989).

The pH of the soils varied between 6.28-7.98. Respectively, 2.63% of the soils were weakly acidic, 44.74% neutral, 47.38% slightly alkaline and 5.26% moderately alkaline according to Jackson (1958) (Fig. 3). It has been observed that Mediterranean plants such as *Myrtus communis* L. (Ozturk 1979), *I. graveolens* (Secmen 1973), *Pistacia lentiscus* L. (Ozturk 1982), *A. aestivus* (Pirdal 1989), *Vicia sativa* L. (Kanisani and Oflas 1993) and *Capparis ovata* Desf. (Ozdemir and Ozturk 1996) prefer neutral or slightly alkaline soils, as does *V. agnus-castus*.

Soil salinity values varied between 0.40-29.29% and in 92.12% of the soils salinity effect was very rare but in 7.90% it was rare (Anonymous 1951) (Fig. 4). From this it is clear than our plant grows in soils where very little salinity effect is observed. It has been reported that *A. aestivus*, *V. sativa*, *Capparis spinosa* L. and *C. ovata*, prefer soils where the salinity effect is negligible, as does *V. agnus-castus* (Pirdal 1989, Kanisani and Oflas 1993, Ozdemir and Ozturk 1996).

The CaCO₃ content of the soils was between 0.40-29.29%. In accordance with this, 52.63% of these soils were poor, 18.42% medium, 15.79% rich and 13.16% very rich in CaCO₃, depicting the fact that *V. agnus-castus* prefers soils poor in CaCO₃ according to Scheffer and Schachtschabel (1956) (Fig. 5). Species such as *P. lentiscus* (Ozturk 1982), *A. aestivus* (Pirdal 1989), *V. sativa* (Kanisani and Oflas 1993), *C. spinosa* and *C. ovata* (Ozdemir and Ozturk 1996), distributed in Western Anatolia, have been reported to prefer soils poor in CaCO₃. We can thus conclude that a major part of the typical Mediterranean elements prefer soils poor in CaCO₃. An increase in the CaCO₃ content in the soils results in a decrease in the growth behaviour of *V. agnus-castus*.

The organic matter content of the soils varies between 0.31-5.80% as follows:

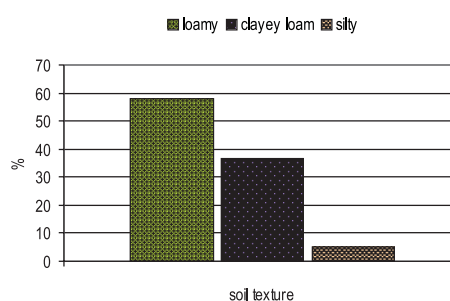


Fig. 2. The soil texture of *V. agnus-castus*.

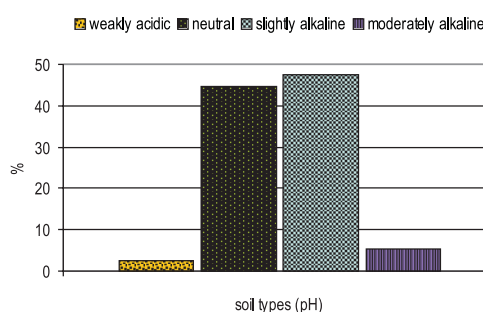


Fig. 3. The pH structure of soil samples of *V. agnus-castus*.

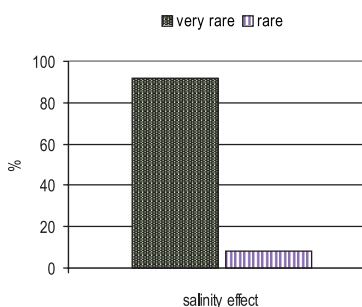


Fig. 4. The salinity effect of soil samples of *V. agnus-castus*.

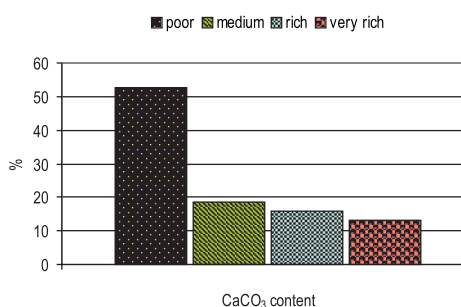


Fig. 5. The CaCO₃ content of soil samples of *V. agnus-castus*.

31.58% of the soils were very poor, 2.63% poor, 34.22% moderately rich, 23.67% rich and 7.90% very rich in organic matter (Fig. 6). *V. agnus-castus* grows on all kinds of soils. On the other hand, it has been reported that *P. lentiscus* (Ozturk, 1982), *Inula viscosa* (L.) (Pirdal 1980), and *C. ovata* (Ozdemir and Ozturk 1996), distributed in Western Anatolia, prefer soils moderately rich and rich in organic matter content, while it has been observed that *M. communis* (Ozturk 1979), *A. aestivus* (Pirdal 1989), and *V. sativa* (Kanisanli and Oflas 1993) grow in soils poorer in organic matter.

Chemical analysis of the soil samples showed that the total nitrogen content varied from 0.102 to 1.304%. These soils can be classified as follows: 50%, sufficient; and 50%, rich in nitrogen (Loue 1968) (Fig. 7). This indicates that this species prefers nitrogenous soils. *Capparis* species growing in Western Anatolia have also been reported to prefer nitrogen-rich soils (Ozdemir and Ozturk 1996).

The phosphorus content of soil samples varies from 0.0001 to 0.0095%. According to Bingham's classification (1949) for phosphorus content in soils, 23.69% of the soils supporting *V. agnus-castus* were poor in phosphorus while 26.32% were moderate and 50% rich in this element (Fig. 8). This reveals that the plant prefers soils rich in phosphorus rather than those poor and moderately rich. It has been reported that Mediterranean plants such as *P. lentiscus*, *C. ovata* and *C. spinosa*, distributed in this region, prefer soils rich in phosphorus (Ozturk 1982, Ozdemir and Ozturk 1996), but that *A. aestivus*, which also grows in this region, prefers soils poor in phosphorus (Pirdal 1989).

The soil potassium values for *V. agnus-castus* were 0.0036-0.0934%. As for potassium content, 44.74% of the soils were deficient, 13.16% low, 7.90% sufficient, 13.16% high and 21.10% very high in this element according to the potassium classification of Pizer (1967) (Fig. 9). From this, it can be concluded that *V. agnus-castus* generally prefers soils deficient in potassium. Species such as *A. aestivus*, *C. ovata* and

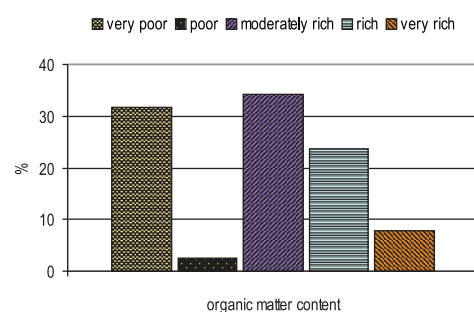


Fig. 6. The organic matter content of soil samples of *V. agnus-castus*.

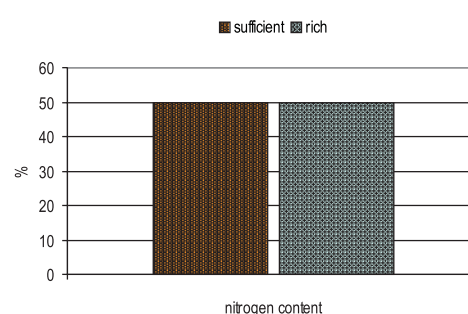


Fig. 7. The nitrogen content of soil samples of *V. agnus-castus*.

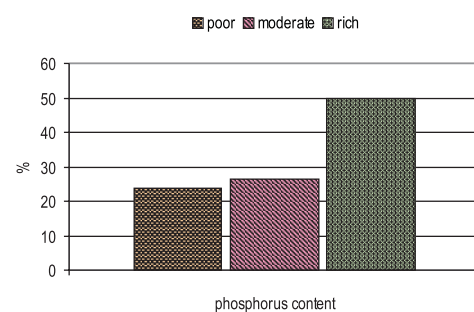


Fig. 8. The phosphorus content of soil samples of *V. agnus-castus*.

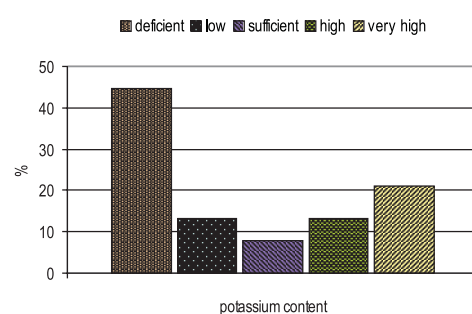


Fig. 9. The potassium content of soil samples of *V. agnus-castus*.

C. spinosa, likewise prefer soils poor in potassium, while *P. lentiscus*, a plant of the same region, prefers soils sufficient in potassium, as reported by Ozturk and Atac (1982), Pirdal (1989) and Ozdemir and Ozturk (1996).

The economical and ethnobotanical importance of *V. agnus-castus*

As a result of the interviews conducted with people living in the areas where the plant samples were collected, it was understood that this plant is widely used for phytotherapy purposes in the area. In interviews with 35 local inhabitants, conducted according to the criteria given in the methods section, regarding the usage of the plant for phytotherapy purposes, 29 of the inhabitants (83%) were recorded to have knowledge about using *V. agnus-castus* for at least one ailment. Ugulu et al. (2009) reported that, this species is used for medicinal and ornamental purposes in the study area.

Furthermore, it was observed that the species is widely used by experts as a pharmaceutical drug. Chaste tree is also known as a dye plant and honey plant. It is used by the locals as a material in basket weaving and for ornamental purpose. In addition, it is a plant used in landscape architecture because it is a shrub with beautiful flowers and aroma.

Field observations and face to face interviews with locals and inhabitants showed that the plant is preferred for apiculture especially in the Mugla-Milas area. From the plant, which is preferred for its aromatic quality, "chaste honey" is produced (Dogan et al. 2008a).

In the data collected from the carpet weaving areas in the Aegean Region, which comprises our study area, it was reported that the plant is used as a dye plant. Especially the green colour which is produced from the plant is preferred as a natural dye for carpet weaving. Due to the climate, *V. agnus-castus* is distributed widely in the study area and widely used by carpet producers in the region (Dogan et al. 2003, Dogan et al. 2008b).

Its long and flexible fresh shoots are used to weave baskets and even panniers and as

beach umbrellas in the study area (Baytop 1999, Dogan et al. 2008b, 2008c). In Italy the dry shoots of the plant are also used for basket production (Passalacqua et al. 2006). There are substantial differences in the use of dry (Italy) and fresh (Turkey) twigs of the plant. It is used in Izmir and Aydin in this manner and it is used together with cane (*Arundo donax* L.) for basket weaving, the handles and bottom of the basket, areas that are the toughest and exposed to pressure, are produced from chaste, while cane is preferred for other parts. However, its use has been declining because the number of basket weavers is decreasing. Plastic baskets and panniers are preferred in the region, much like the rest of the world. Similarly, willow, instead of chaste, is preferred in some areas. In these areas, its production for pannier is different from that for basket. Pannier is produced solely from chaste and no other plant is used for pannier production. The reason for this is that heavy loads (goods) are carried in panniers. Long and flexible shoots of the plant is an ideal material for this purpose. It was observed that this manner of usage is also slowly disappearing. Because it is a long and tedious job as in basket weaving, the number of pannier makers is low and similar products are produced from cheap plastic (Dogan et al. 2008c).

The plant was reported to be used for protecting wool garments from moths during the summer, albeit in a small parts of the study area. However due to the use of mothballs (naphtaline) for this purpose, this manner of usage of the plant has been gradually forgotten.

Literature searches showed that, *V. agnus-castus* has been widely used by European and North American herbalists (Amann 1967, Weiss 1988, Newall et al. 1996, Christie and Walker 1997, Blumenthal et al. 1998, and Blumenthal 2003). Traditionally, *V. agnus-castus* has been used by practitioners of phytotherapy in the treatment of many female conditions, including menstrual disorders, premenstrual syndrome, corpus luteum insufficiency, hyperprolactinaemia, infertility, acne, menopause and disrupted lactation

(Christie and Walker 1997, Lans et al. 2006, Padmalatha et al. 2009, Tareen et al. 2010). In popular medicine, *V. agnus-castus* is also considered to be an emmenagogue, vulnerary, sedative, carminative, lactagogue, hypoglycemic, anthelmintic and anti-inflammatory (Du Mee 1993, Guarino et al. 2008, Parada et al. 2009, Redzic et al. 2010). The German Commission E approved the use of *V. agnus-castus* for irregularities of the menstrual cycle, premenstrual disturbances and mastodynia (Blumenthal et al. 1998). In addition, there have been several reports on its chemical constituents. These include iridoid glycosides, flavonoids, progestins, alkaloids, volatile oil and essential fatty acids (Arokiyaraj et al. 2009). Related literature is generally in line with medicinal use of the plant by the locals.

The ornamental plant industry has always strived to increase crop diversity. The genetic diversity of ornamentals is an invaluable

resource (Karaguzel and Girmen 2009). The diversity of cultivars in ornamental horticulture was derived from the selection and breeding of wild plants (Heywood 2003). Developments in genetic engineering provide opportunities for the creation of new forms of plants with interesting visual characteristics (Deroles et al. 2002, Lorito et al. 2002). In this direction, there has been an increasing demand for native plant species to be included in landscape design (Brzuszek et al. 2007). This increasing demand, along with new approaches to plant genetic resource conservation policies (Karaguzel et al. 1999), indicates the importance of recovering and describing the genetic diversity of native species or native populations of cultivated plants. It is economically very important to further study and determine the genetically and ecological properties of *V. agnus-castus*, a widely used ornamental plant.

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***Vitex agnus-castus*'un Bazi Ekolojik Özelliklerinin ve Ekonomik Öneminin Tanımlanması**

Özet

Çalışmanın amacı, tipik Akdeniz bitkilerinden biri olan *Vitex agnus-castus*'un ekolojik ve ekonomik özelliklerinden bazılarının tanımlanmasıdır. Çalışma bu amaç dâhilinde iki aşamada gerçekleştirilmiştir. Öncelikle, bitkinin yaşadığı bölgelerdeki toprak özelliklerinin belirlenmesi amacıyla, Türkiye'de Akdeniz ikliminin hâkim olduğu Batı Anadolu bölgesinde ki 38 farklı lokaliteden bitkinin çiçeklenme periyodunda toprak örnekleri alınmıştır. Bu örnekler incelendiğinde bitkinin genellikle gevsek yapılı, içerdiği kalsiyum karbonat nedeniyle nötr yada hafif alkali, organik madde bakımından zengin, normal yada zengin derecede azot içeren, fosfor bakımından zengin ve potasyum açısından yetersiz topraklarda yaşadığı sonucuna ulaşılmıştır. Diğer yandan, *V. agnus-castus*'un etnobotanik ve ekonomik önemi de araştırılmıştır. Bu yöndeki araştırmalar sonucunda ise, bitkinin bölgede çeşitli hastalıklara karşı ilaç yapımında, boya bitkisi olarak, bal üretiminde, sepet yapımında ve ornamental amaçlarla kullanıldığı gözlemlenmiştir. Bununla birlikte, çalı formundaki bitki güzel görüntüsü ve kokusu nedeniyle çevre düzenlemesi amacıyla da tercih edilmektedir.

Anahtar Kelimeler: Ekoloji, etnobotanik, Türkiye, *Vitex agnus-castus*.