HORNED SAINFOIN (*ONOBRYCHIS CORNUTA* (L.) DESV.): IS IT AN AMUSING OR NUISANCE PLANT FOR STEPPE RANGELANDS?

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Abstract

This review provides information about biology, ecology, benefits and management of Onobrychis cornuta (L.) species which has a wide spread area in the mountains region of Iran-Turan and 1200-3100 m elevation of Turkey, except the West and Northeast Anatolia. According to the literatures, Onobrychis cornuta (L.) species is common in the alpine and subalpine zone, especially in the northern slopes. However, despite of that it has a wide spread area in our country, extensive researches on this species have not been carried.

Key words: *legume, ecology, benefit*

1. INTRODUCTION

Onobrychis, sainfoin is an important plant with the ability of extending all over the world in especially arid and semiarid regions and undertaking various functions in ecosystems. Belonging to Fabaceae family sainfoin has more than 160 species (Yildiz et al., 1999; Aktoklu 2001). Origin of this species, which can exhibit a dispersion in an extended region lying from Baltic Sea to Mediterranean, Caucasia to Central Asia, is accepted to be Anatolia, entire Trans-Caucasian region, highlands of Iran and Turkmenistan (Vavilov 1949). Turkey flora shelters 53 recorded sainfoin species (Davis 1970; Aktoklu 2001). Even though the species number of this plant is very high and diverse, only *Onobrychis sativa Lam*, *Onobrychis arenaria* Kit. Ex. Wild. D.C. and *Onobrychis transcaucacia* Gross H.) species are known to be suitable for agricultural production (Acikgoz 2001). However, all sainfoin species can have various functions such as supplying forage in fresh or dried form to grazing animals or live stocks, nitrogen fixation, providing nectar for bees, hosting wild life and controlling erosion.

Onobrychis cornuta (L.) grows in cushion form and develops an extended crown. This species, showing expansion in especially northward slopes exposed to erosion and heavy grazing in Iran – Turan floristic geography, can hardly be grazed by animals due to its thorn (when in short of forage sheep and goats can collect its fruits and leaves falling on the ground) (Tamartash et al., 2010; Kohestani 2000; Saberian 2003).

In the present study, hornedsainfoin (*Onobrychis cornuta* (L.) is defined in general terms and biology, ecology and the use of this species are expressed by making a general evaluation for the management of natural reserves.

2. GENERAL DESCRIPTION

Hornedsainfoin (*Onobrychis cornuta* (L.) expands in northward slopes exposed to erosion and excessively grazed rangelands and stony and rocky lands in West Syria, Caucasia, Iran, Afghanistan, Turkmenistan and Turkey i.e. Iran- Turan floristic geography (Atay et al., 2009). This species growing naturally in many parts of Turkey is a perennial, cushion – formed and thorny plant. Hornedsainfoin, a member of Onobrychis genera, is confused mainly with the thorny and cushion – formed members of Astragalus and Acantholimon genera. From a general view, plant resembles greatly these two forms (Karahan and Yilmaz 2001). According to the definition of Davis (1970), *Onobrychis cornuta* (L.) species can grow up to 50 cm height and has double leaflet. Ends of its leave stems have thorny

structures, length of double leaflets is 2 to 2.5 mm, its flowers are pink–purple, length of sepals is 4.5 to 6 mm and that of flag leaflets is between 12 and 15 mm.

3. BIOLOGY

Horned sainfoin (*Onobrychis cornuta* (L.) is a perennial and semi – bushy plant with leaves ending with thorns. It can form cushions with a 100 cm radius and the height of the plant can reach 35 to 50 cm and its flowers are purple and pink (Davis 1970). It was stated in a study carried out by Okçu (2009) in Erzurum, Turkey that height of this species in the study area is 33±1.876 cm, the number of principal branches is 3.60±0.702, length of flower bunch is 4.90±0.716 cm, the number of flowers and fruit in each bunch is 26.40±2.094 and 14.00±1.279, respectively (Okcu 2009). End of leaves is sharp (Stearn 1967), edge of leaflets is smooth (Altınayar 1987) and the plant has pinnate leaves (Lawrence 1951).

Length of bunches in the plant beginning to blossom at the end of spring and beginning of summer is 1.60±0.65 cm and that of fruited branch is 1.96±0.55 cm while length of flower is 15.17±1.98 mm. Width and length of ovary in pistil are 0.75±0,86 and 1.45±0.15 mm, respectively while in stamen, length of anther and filament is 1.00±0.24 and 12.52±1.62 mm respectively (Avci 2010). Fruits of the species are 9-13 mm in length and 5-7 mm in width and their edges are thorny and flat. Due to hard seed crust, it has a though seed dormancy (Elci 2005) and they can remain in soil for several years without germinating (Acikgoz 2001).

4. ECOLOGY

Onobrychis cornuta (L.) has a large extension area in especially mountainous Iran-Turan region. A cold and arid climate is prevalent in the area and mean annual rainfall is about 400 mm. The species is dominant in the area above 1800 m with the sloppiness rate of 15 to 40% (Heshmati 2007). Some authors studying on the relationships between physiographic and plan cover (Asri 1994; Mehdinia et.al., 2007) stated that factors such as elevation, sloppiness and aspect together with soil properties are effective on the expansion of *Onobrychis cornuta* (L.) (Tamartash et al., 2010; Clark et al., 1999; Solon, 2007). Especially elevation and aspect have significant effects on the dispersion of *Onobrychis cornuta* (L.). Bushy formed Onobrychis species are more dominant in high elevations and northward aspect (Tamartash et al., 2010; Kohestani 2000; Saberian 2003). It is also possible to see *Onobrychis cornuta* (L.) in excessively grazed areas (Shahriary et al., 2012).

It is stated in TUBIVES (Turkish Plants Data Service) records that the species has a geographical expansion between 1200 and 3100 m in Turkey (Figure 1) (Tubives 2016). In addition, in the mentioned source, there is no record about that this species grows in Aegean, Thracianand Eastern Blacksea regions. In a survey study carried out by Okcu (2009) in East Anatolia Region it was reported that above 2500m in Kop Mountain the species can be seen.

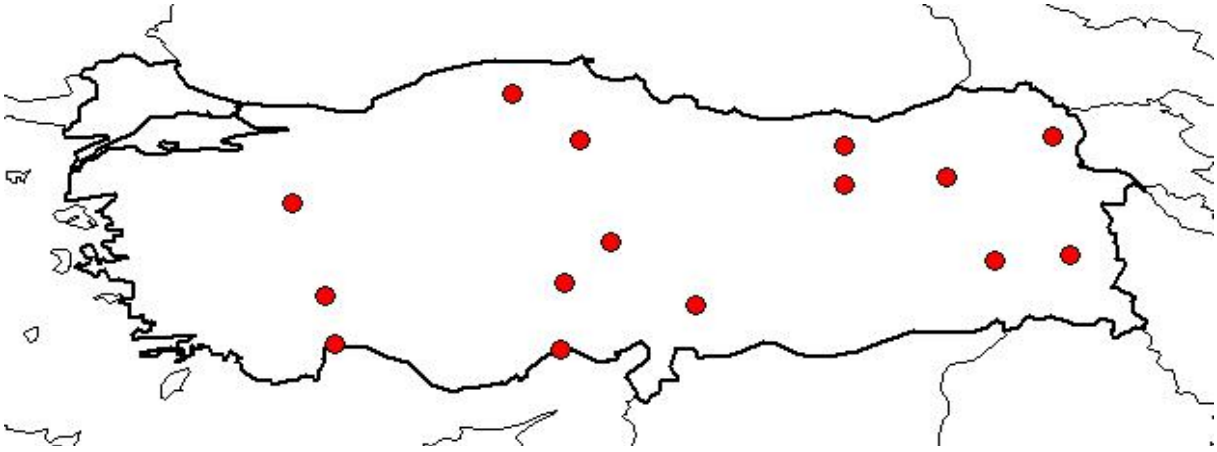


Figure 1. Onobrychis cornuta range map in the Turkey (Tubives 2016)

5. USE

As other legumes do, Onobrychis species also improve soil structure by enriching it in terms of nitrogen. It is drought resistant due to its deeply going root system. Nectar content of Onobrychis' flowers increases makes it important for apiculture (Acikgoz 2001).

Even though only three Onobrychis species are grown for agricultural aims today (*O. sativa; O. arenaria* Kit. Ex. Wild. D.C; *O. transcacacia* Gross H*)*, some other uncultured species are also used for various aims. Among the mentioned uncultured species, *Onobrychis cornuta* (L.) attracts attentions for its short woody stem, horns, shortened internodes and small leaflets sequenced in the cushion. Such morphological properties cause both limited transpiration surface and prevention from grazing. Due to developed root system it can grow even in very poor soils thus contributing to the sustainability of ecosystem. *Onobrychis cornuta* (L.) can develop resistance to extreme temperatures and violent winds (Akman and Ketenoglu 1987).

Onobrychis cornuta (L.) has the function of being a good protector from erosion by growing in distorted rangelands especially in northward aspects since it cannot be grazed by animals at least excessively due to its cushions in thorny and semi – bushy structure. Since the species has characteristic well developed taproot, it can protect soil surface against erosion (Venterink 2011). Its dense and cushion – like crown can serve as a shelter for protective tent. When animals eat *Onobrychis cornuta* (L.), their milk may taste sour. In addition, *Onobrychis cornuta* (L.) is the plant where bees take nectar as in other Onobrychis species. *Astragalus* species can be used for the same purposes as *Onobrychis cornuta* (L.). Since it can show antibacterial characteristics (Joudi et al., 2010), flowers and seeds of *Onobrychis cornuta* (L.) are used also as medicinal plant material (Jahantab et al., 2014). When consumed after boiling leaves of *Onobrychis cornuta* (L.) it can show libido effect increasing sexual potency (Bahmani et al., 2016)

6. MANAGEMENT

Even though horned sainfoin (Onobrychis cornuta (L.) is accepted to be weed in terms of grazing management since it doesn't give growing chances to other species close to it in an extended area and lowers seriously the grazing capacity, functions and other uses of the plant can give it different characteristics. This species is used for medicinal purposes, nectar collection and animal feeding after removing thorns. Prevalent in Alpine and sub-alpine belts, the species grows in Turkey between 1200 and 3100m in rocky slopes (Atay et al., 2009). *Onobrychis cornuta* L. is low quality forage since it has small leaves, thorns, and secondary metabolites (Díaz et al., 2001; Gibson 2009; Ward 2006). This invasive species is preferred by animals only when other delicious species are not present in the area. It can be seen expensively in excessively grazed areas (Shahriary et al., 2012). This wild *Onobrychis*

species has high resistance capacity to high temperature, aridity, disease and pests and therefore these characteristics are used in the plant breeding studies (Hart 2001). Resistance of this species to wireworm (*Dipsosphecia scopigera, Sphenoptera carceli*), which is the largest problem in sainfoin production in Turkey may show that it can be used for gene transferring to cultivated sainfoin species since there are no clues and evidence about that *Onobrychis cornuta* L. is affected by these worms and individual observations sometimes validate this condition.

Some struggling methods can be used for invasive *Onobrychis cornuta* L. to rarefy it in the areas showing high grazing potentials when its density increases. Such methods can be mechanic, cultural and chemical. In mechanical methods, the species can be removed completely or its growth or expansion can be slowed down by harming its leaves, stalks and roots physically. Among mechanical struggling methods are mowing, hoeing, cutting and pressing by bulldozer. However, such methods may sometimes cause harms to soil structures. Chemical intervention is not recommended due to its irreversible hazards to environment, natural life cycle, agricultural products and their consumers. Apart from the aforementioned methods, possibly the most effective one may be the firing operations. In especially dormant terms of turf lands, fires are adopted to be both effective and cheap method to control the Onobrychis species like Astragalus species. Since such fires do not harm plant species in turf land especially like desired grassy plants in their in dormant period (Erkovan et al., 2016).

As a conclusion, *Onobrychis cornuta* L. is not preferred much by animals due to its thorns and it is accepted to be a weed in the lands with high grazing potentials since it reduces the grazing quality and capacity seriously in the areas it grows. However, in such highlands, it is among the species to be conserved for the sustainability of ecosystem. It may be employed as an important species in erosion control in especially highlands in northward and eastward slopes. In such areas, in addition to erosion control, it can be used for various aims such as nectar plant and obtaining drug by collecting it in a controlled way. In addition, the species is vitally important for wild life since it serves as a host to many animal species by protecting them from various dangers and attacks.

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