



RESEARCH PAPER

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Phenology, distribution and cultivation of endangered medicinal plant species (*Dorema aucheri* Boiss), in Kohgiluyeh-va-Boyerahmad Province, Iran

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Abstract

Dorema aucheri Boiss is one of the endemic and endangered plant species of Iran which has been extensively used as food and medicinal herb for many years. Present study was conducted to investigate the phenology, distribution and cultivation of *D. aucheri* during 2008- 2010. All geographical data and distribution map of the plant were obtained by using GPS device. Soil minerals (Fe, Zn, N, P, K, Cu and Mn), electrical conductivity (EC), soil texture, soil water capacity and organic matter of plant natural habitat were compared to those of cultivated field condition. Plant seeds were obtained from a growing plant in wild and planted in a field plot at the Chamkhani research station, Yasouj, Iran. Under natural conditions, *D. aucheri* grew only in the cold regions at the slopes of 45-75 % in silt-clay and clay soil. Under field condition, *D. aucheri* germinated in early March and grew until the end of June. There were not any phenological differences between the wild type and farmed plants.

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Introduction

Topographic factors and diverse edaphic conditions in Iran are responsible for the diversity of microclimate that favors more than 8000 plant species (Haghighi and Mozaffarian, 2011; Jafari *et al.*, 2008; Hasani and Shahmoradi, 2007).

Dorema aucheri Boiss, is one of the endemic plant species with economical and ecological values, growing in central Zagros mountains of the southwest of Iran. Increasing anthropogenic pressures, including deforestation, re-forestation, intensification of agriculture, drainage of wetland, have already had a great impact on the growth, survival and distribution of native species in Iran, especially the rare and endemic species (Jafari and Akhiani, 2008).

Kohgiluyeh-va-Boyerahmad (KB) is a mountainous province situated (N, 29° 56' - 31° 29' and E 49° 53' - 51° 53') in South West of Iran. About 3/4 of the area is rugged and plains comprise only 1/4 of the province area (Mosaddegh *et al.*, 2012). This varying topography resulted in varying climates that include cold-and-dry as well as hot-and-humid conditions. These factors favor the plant and animal biodiversity in KB province (Mirinejad *et al.*, 2009; Mirinejad *et al.*, 2013).

One of the plant species that grows wild in KB is *Dorema aucheri* Boiss. fig.s 1 and 2, (Mozaffarian, 2007). This species is one of the seven members of *Apiaceae* that are endemic to Iran. The two species ie *D. glabrum* Fisch C.A. Mey, and *D. ammonicum* D. Don, are also growing wild in KB (Asnaashari, 2011). *D. aucheri* has various uses such as medicine, animal feed, and for soil conservation (Azarniushan *et al.*, 2009; Dehghan *et al.*, 2009).

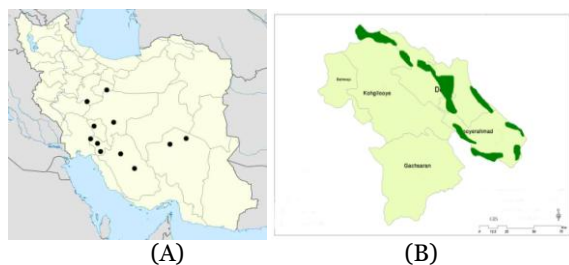


Fig. 1. Maps of geographical distribution of *Dorema aucheri* in Iran (A) and KB province (B).



Fig. 2. Different phenological states of *Dorema aucheri*.

D. aucheri is a perennial plant with thick stems, as tall as 180 to 250 cm, glabrous, purple-in-Groove, the upper part of the panicle branches, leaves with little tomentous, canopy of branch with a pedicle (Mozaffarian, 2007). This plant grows well in sub-humid to humid climate, with a mean annual rainfall of 750-850 mm. Under the favorable conditions, and according to the elevation, the seed begins to germinate in late March until mid-April (Kazemi *et al.*, 2010; Mirinejad, 2011). Various members of *Dorema*, are effective antispasmodic, expectorant diuretic, carminative, diaphoretic, vasodilator, (Azarniushan *et al.*, 2009; Ghollassi, 2008; Yousefzadi, 2011a), antimicrobial and antifungal (Mokhtari *et al.*, 2008b; Shahidi & Moein 2002; Yousefzadi, 2011b), hepatoprotector (Govind, 2011; Mokhtari *et al.*, 2008b) and are intensively used as a green vegetable or as a popular medicine for treatment of many human diseases (Ibadullayeva, 2011). According to the popular believes among Armenians and Azeri, *D. glabrum* can cure many diseases especially different kinds of cancer. It seems that extensive use of this plant for medicinal and domestic purposes is the major cause of dramatic reduction in the natural resources of *D. glabrum* (Gabrielian, 1981; badullayeva *et al.*, 2011). In addition to the crude extract of the plant that demonstrated antioxidant activity and anti-lipidemic effects (Dehghan *et al.*, 2009; Sadeghi, 2007), the resin that

exudes from punctures in the stem caused by insect attack has similar impacts. Present study was conducted to know about phenology, distribution and cultivation of *D. aucheri* in Kohgiluyeh-va-Boyerahmad province, Iran.

Materials and methods

Plant distribution

Through exhaustive literature review, examining Iranian herbarium maps, and consulting with naturopath physicians, the natural habitats of *Dorema* species were spotted in KB province. The local characteristics such as geographic coordinates, altitude, direction and percentage of slopes of these habitats were determined by using a GPS device, and a plant distribution map was drawn.

Field studies

By visiting natural habitat of *D. aucheri* on biweekly bases, the phenology and completion of growth (including start of germination, tillage, multi-leaf appearance, flowering, fruit development, milky seed production, seed maturity, seed abscission, temporary wilting and drying, temporary re-growth, and fall-winter dormancy) was studied during the growing season. Other plant species growing around *D. aucheri* natural habitat were also recorded.

Pedology studies

To study soil pedology, and determining soil characteristics (including soil texture, the macro and micro elements and EC), samples were dug and transported to the laboratory and analyzed. During seed maturity, seeds were collected and were planted in the second half of November in field plots. The *D. aucheri* seeds were spaced at 25 cm in lines 35 cm apart. The seed plots were 3 x 3 m. All different phenological stages of plants were recorded.

Results and discussion

Plant distribution

The results of present investigation showed that *D. aucheri* is growing in both cold and subtropical regions of the KB province (fig. 1, B). According to our

observations, *D. aucheri* grows at elevation over 1800 meters on slopes of 45-75 percent in all directions as reported previously (Mirinejad, 2011). Previous study (Mozafarian, 2011) also indicated that this plant is growing well only in the cold regions of the Fars, Esfahan, Chaharmahal va Bakhteyari, Lorestan, Markazi, Kerman and KB provinces of Iran (fig. 1, A).

Compare to the previous studies, because of exhaustive use of *D. aucheri*, large areas of natural habitats are void of the plant, (Kazemi *et al.*, 2010). *D. aucheri* is dug up in early march from nature and consumed by local people as a medicinal as well as food material. *D. aucheri* has become an endangered species because of over consumption by the local residents and also by early grazing. It does not seem that insects cause significant damages to plants (Kazemi *et al.*, 2010).

We also recognized that other plant species accompanying *D. aucheri*, were *Eremurus spectabilis*, *Astragalus* Sp. *Quercus persica*, and *Smyrniopsis aucheri*.

Field studies

Two sites of Baba Hasan and Vezg mountains were selected for field data collection (Table 1). According to local rainfall, *D. aucheri* germinate from early March to early April and continues to grow (Table 2). The initial florescence appears in mid-May and seeds clusters appear in early June. After this stage to mid-June, seeds pass softness tillers to late July that seeds have reached full maturity. The mature seeds begin to fall; the stems dry and are cracked in early September (fig. 2). Similar results to our report have been reported by Kazemi *et al.*, (2010).

In the present study, *D. aucheri* seeds that were planted in plots, germinated in early March, and new plants started to branch and produce leaves in early April. From mid-May until late June plants grow when it stops vegetative growth in the first year, and seeds begin to mature.

Pedology studies

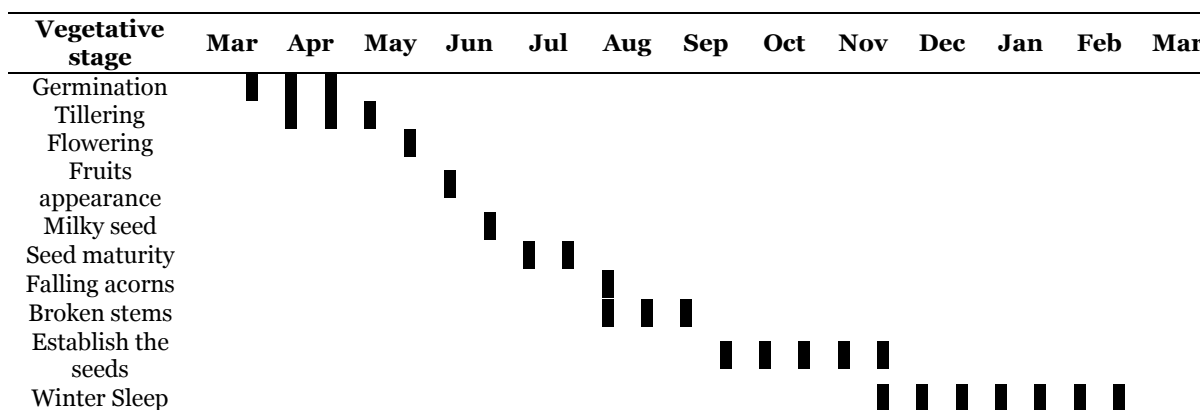
It was not found any previous reports that shown information as well as knowledge about effect of soil chemical conditions on growth parameters of the *D. aucheri* which is endemic plant of Iran. However, in the present investigation, analysis of soil samples collected from *Dorema* habitats shows that the amount of the macro and micro elements with other parameters are as follow: Iron (Fe) from 21.3 - 25.52

ppm, Zinc (Zn) 0.56 -1.08 ppm, copper (Cu) 0.7 - 2.42 ppm, manganese (Mn) 21.04 - 26.26 ppm, saturation 59-61%, Electrical conductivity (EC) 0.53 - 0.6 mmho/cm, mud saturated with 7.6 - 7.7, materials neutral binding 2.5 - 7.5, organic carbon, 1.85 - 2.83, N 0.19 - 0.292 ppm, P 23 - 24.53 ppm, K 431 - 785 ppm, 47 - 63 % clay, 32 - 48 % silt, 5% sand, soil-type Silt-Clay until Clay.

Table 1. Required information for habitats of *Dorema aucheri*.

Habitat 1	Habitat 2	Information
Vezeq	Baba Hasan Neak	Site
2420	2550	Elevation
31° 31' 25/9"	30° 39' 41/6"	Longitude
51° 38' 56/6"	51° 44' 41/4"	Latitude
Mountain	Mountain	Topography condition
All direction	West	slope direction
45-65	55-75	percentage slope
Yasooj	Yasooj	The nearest weather station
Uniform	Random	Plant distribution: 1-hill 2-Uniform 3-Random
<i>Smyrniopsis aucheri</i>	<i>Astragalus</i> Sp	Dominant type name 1
<i>Quercus persica</i>	<i>Eremurus spectabilis</i>	Dominant type name 2
125	130	Height average of 5 sample(cm)
55	45	The average around of 5 sample(cm)
Rocky	Soil- rocky	location of the plant Rocky - soil and rock - soil
<i>Quercus persica- Smyrniopsis aucheri</i>	<i>Eremurus spectabilis- Astragalus</i> Sp	Name of associated species

Table 2. Phenology of *Dorema aucheri*.



Based on our results, *D. aucheri* has deep roots and is not sensitive to varying soil texture, so that this plant grows in heavy soil textures (Clay and Clay-loam) as well as lighter soils (Silt-Clay and Sandy-Clay-loam). Previous studies are in agreement to our result (Kazemi *et al.*, 2010). Our results showed that Soil texture has an important role in abundance of the soil

nutrient content. In the light soil texture, soil nutrients were increased and enriched. The soil of Babahasan area was lighter (Si-cl) than the soil of Vezeq mountain and essential minerals such as iron, copper and zinc in the Baba Hasan area were higher than soil of Vezeq region.

D. aucheri can be cultivated and grow in cold areas of KB province (precipitation mostly snow). To provide this plant for public use (medicinal plant as well as vegetable crop); we demonstrated that it can be cultivated. Also, we recommend that early harvest should be avoided to prevent the exhaustion of plant in the nature.

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