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Autecology of Endemic plant *Eremostachys adenantha* Juab. & Spach in South-west of Zagros Mountains, Iran

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ABSTRACT: The research has been performed to investigate the ecological conditions, habitat, and phenology of endemic and endangered medicinal plant, *Eremostachys adenantha* during 2008-2010. *Eremostachys adenantha* is endemic plant in Iran and is growing only on Zagros Mountains in Iranian southern and west southern provinces. This research, using scientific resources and GPS device obtained the geographic characteristics of the region such as latitude, longitude, height, direction and slope and the plant distribution map. The results showed that *Eremostachys adenantha* plant in the mountainous and hilly areas grows from the altitude of 1800 meters to 2500 meters without geographic limitation with the slope of 35-10 percent. Our studies have shown that *Eremostachys adenantha* from late March starts the germination and continues its vegetative growth up to the late May. Reproductive phase of the plant starts in May and its flowers are formed, then in late June the seeds of plant become salient.

Keywords: Autecology, *Eremostachys adenantha*, Iran, Kohgiluyeh-va-Boyer Ahmad Province

INTRODUCTION

Iran is one of the major centers of endemic plant and animal species in the world. Topographic factors conditions in Iran are responsible for the diversity of microclimate that favors more than 8000 plant species (Haghighi and Mozafarian, 2011). Increasing anthropogenic pressures, including deforestation, re-forestation, intensification of agriculture already had a great impact on the growth, survival and distribution of native species in Iran, especially the rare and endemic species (Jafari and Akhani, 2008). Kohgiluyeh-va-Boyerahmad (KB) is a mountainous province situated (29° 56' - 31° 29' N, 49° 53' - 51° 53' E) in South West of Iran. About 3.4 of the area are rugged and plains comprise only 1.4 of the province area (Mirinejad *et al,* 2011) (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).

E. adenantha (Fig. 1) is endemic plant in Iran and is growing only on Zagros Mountains in Iranian southern and west southern provinces, such as Lorestan, Khoozestan, Fars, Charmahal-va- Bakhtiari, and KB provinces (Fig. 2) (Rechinger, 1982) (Mozaffarian, 1996).

E. adenantha is a perennial plant with erect stems of Lamiaceae family, glabrous or pubescent erect stems to a height of 80 cm. Leaf length of 9-25 cm and width of 5-8 cm. Calyx 20-18 mm long, corolla of 35 mm with glandular trichomes. Flowers are in white and light brown color. Calyx apex is spiny; fruit is multifaceted and perennial within the calyx (Reshinger, 1982).

Based on the researches conducted by (Amiri *et al,* 2007) the main components of *Eremostachys laevigata* are Hexaconic acid and 2-Decanol. The results of (Delazar *et al,* 2005) experiments showed that compounds obtained from rhizomes, another specie of *Eremostachys* has the antioxidant properties.

MATERIAL AND METHODS

Using library resources, publications, consulting experts in medicinal plants and study the maps, flora and herbarium, habitats of species found in KB province and with field properties refer to field, such as the coordinates, altitude, direction and percentage of slopes notes using GPS device were obtained and plant distribution maps was provided (Mirinejad, 2011).

Fig.1. *Eremostachysadenantha* in KB province, Iran.

Fig. 2. Distribution map of *Eremostachys adenantha* in Iran.

To determine the phenology and growth period of the plant from the beginning of the growing season, biweekly refer was paid to the vegetative growth area and different stages of plant growths were recorded in related forms. In pedological studies, as well as determination of soil appearance condition and stone or grains presence in the soil, profiles were dug in the plant habitat and samples of the soil were collected and transported to the laboratory in order to measure the experimental of soil texture, pH, EC, and the macro and micro elements included in (Mirinejad, 2011).

RESULTS AND DISCUSSION

E. adenantha is distributed in different areas of KB province and does not form a population. In general, *Eremostachys* species always have a spot distribution (Mirinejad, 2012). Fig. 3 shows the plant distribution map in KB province. According to the conducted investigations and studies this plant often grows in road margins in Margoon, ShabLiz, Gandom Kesh and Bensanjan areas of the province. Two base of the plant has been marked at Margoon, ShabLiz habitats in 2009 but due to road widening some of the bushes has been destroyed in next year recorded. Based on (Table 1).

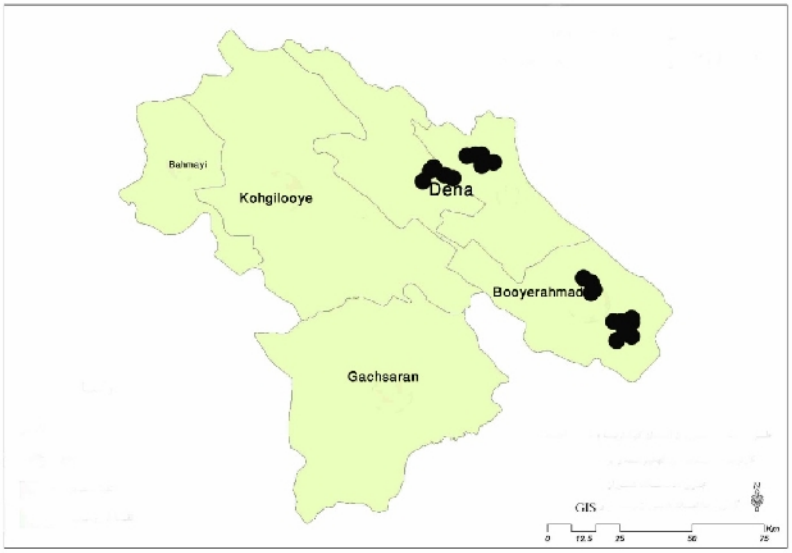


Fig. 3. Distribution map of *Eremostachys adenanta* Kohgilouyeh-va-Boyerahmad Province.

Table 1: Required information for habitats of *Eremostachys adenanta.*

Information	Habitat 1	Habitat 2	Habitat 3	Habitat 4
Site	Margoon	Shabliz	Gandomkesh	Bensenjan
Elevation	2340	2240	2030	1845
Longitude	30˚ 58′ 58″	31˚ 5′ 56″	30˚ 49′ 10.3″	30˚ 41′ 46.5″
Latitude	51˚ 7′ 20.5″	51˚ 2′ 1″	51˚ 13′ 8.4″	51˚ 34′ 6.8″
Topography condition	plain	hill	plain	hill
slope direction	East North	North	South	North
percentage slope	0	30	0	30
The nearest weather station	Margoon	Pataveh	Chitab	Yasooj
Plant distribution: 1-hill 2-Uniform 3-Random	Random	Random	Random	Random
Dominant type name 1	*Hordeum Bolbusum*	*Bromus tectorum*	*Gundelia turnefortii*	*Bromus tectorum*
Dominant type name 2	*Bromustectorum*	*Daphne mucronata*	*Erysimum rependum*	*Quercus persica*
Height average of 5 sample(cm)	90	80	75	90
The average around of 5 sample(cm)	50	40	40	45
Location of the plant rocky-soil and rock-soil	soil	soil	soil	soil
Name of associated species	*Hordeum bulbosum- Bromus tectorum*	*Bromus tectorum – Daphne mucronata*	*Gundelia turnefortii – Erysimum rependum*	*Bromus tectorum Quercus persica*

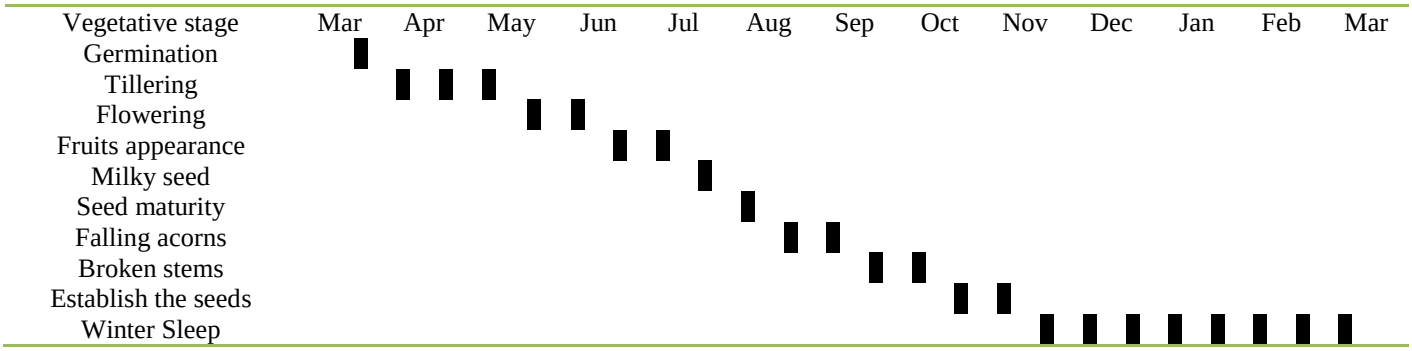
Eremostachys adenantha can grow in all geographical directions with 0-30 percent slope. The average plant height of five bushes in KB Province was 84 cm and round average of five bushes was estimated 44 cm.

The species which grow along with *E.adenantha* in different habitats are namely: *Quercus persica, Bromus tectorum, Gundelia turnefortii, Erysimum rependum, Daphne mucronata, Hordeum bulbosum*.

The results of soil analysis on the plant samples shows the amount of micro elements including: (Fe) iron from 9.72 to 19.6 ppm, zinc (Zn) 0.28 to 1.25 ppm, copper (Cu) 0.72 to 1.58 ppm, manganese (Mn) 12.84 to 18.5 ppm, and other properties of soil habitats, such as saturation of 41 to 56 percent, electrical conductivity (EC) 0.52 to 0.61mmho/cm , mud saturated with 7.8 to 7.9, neutralizing materials 12.5 to 52.5, Organic carbon 1.17 to 93.2, N 0.127 to 0.285 ppm, P 9.2 to 52.13 ppm, K 318 to 376 ppm, Clay 54 to 51 %, silt 38 to 48 %, sand 7 to 11 % and soil texture is Cl and Cl – Si (Mirinejad *et al*, 2012).

The obtained results of phonological observations in the natural areas of the province shows that *E. adenantha* depended on the rain condition of the area in that year from late March starts the germination and continues its tillering and vegetative growth up to the late May. In May flowering stems of plants are emerged and in late June fruit clusters on the flowering stems of the plant are emerged. After this phase from the late July seeds continue to become milky and till the end of august seeds reach full maturity depending on ecological conditions and annual precipitation. From the beginning of September seeds start to fall and to the early November the plant begins to wilt and the stems are dried and crushed. In the early November seeds are established on the soil and to the early December the vital activities of plant are stopped (Table 2).

Table 2: Phenology of *Eremostachys adenanta.*



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