



RESEARCH PAPER

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Autecological survey of *Smyrniium cordifolium* Boiss. in Rangelands of Iran

Hossein Pouzesh^{1*}, Mohammad Reza Tatian¹, Reza Tamartash²

¹Young Researchers Club, Yasooj Branch, Islamic Azad University, Yasooj, Iran

²Range Science, Sari Agricultural Sciences and Nature Resources, Iran

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Abstract

Nowadays due to genetic erosion and vegetation regress, investigation of autecology to determine ecological desire of rangeland plants is important and necessary. The autecology project of the *S. cordifolium* was performed in rangelands of in Southwest of Iran(Yasooj city) in 2013, Due to importance of this plant which have palatability in class (I) and high abundance in highlands regions of the city, this species was selected. Therefore, this project has been done to increase and development of its habitat by considering ecological, edafical and phenological conditions and relationships between plant and environmental factors and other organisms. So, determination of ecological field and sites selection of this species were conducted. Then plant phenology was evaluated for a year. Reproduction method, the roots system and the presence of other organisms that had relation with studied species were recorded. Preference value and resistance system to grazing, mechanisms to prevent of grazing, abundance of the species, and seed viability were measured too. The result showed that *S. cordifolium* grows from 1400 to 2300 m height and prefer semi-arid, moderate Mediterranean, and cold climates. The beginning grow of this species is second half of April and extend to late of July that plant is wilting. Because of the aromatic properties, these plants do not graze in green state and were harvested for winter forage in some studied areas. The habitats soil texture of *S. cordifolium* was heavy and semi heavy with low or moderate depths.

*Corresponding Author: Hossein Pouzesh ✉ hpouzesh@ut.ac.ir

Introduction

Considering to native species were adapted to the environmental conditions of the past centuries, with identifying their habitat characteristics can use of them rather than the previous limit species, added on genetic resources richness. Nowadays due to genetic erosion and vegetation regress, investigation of autecology to determine ecological desire of rangeland plants is important and necessary.

Some of these species disregarding and without being registered somewhere, not used because there are in surroundings sites and don't have proper management, and Instead of exotic species with high costs and high risk in management functions are used. On *S. cordifolium* species as autecology research has not been done. Only few reports exit related to aromatic analysis of *Smyrniium* species. Constituent aromatic materials of aerial and underground parts of the plant have been reported from *S. perfoliatum*.

The main compounds found in species including *aromadenderene* (49.9%), *α-santalene* (4.9%), *neryl isovalerate* (10.2%) and *γ-muurolen* (4.9%) In the Aviation section and *α-pinene* (39.3%), *Aromadenderene* (13.2%), *α-terpinyl valerate* (10%) is in underground section and finally *Germacrone-D* (45.2) the main compound is in fruit aromatic (Tirillini *et al.*, 1996). Many researches have been carried out about autecology of rangeland species in different locations.

Karimi (1990) studied the autecology of *Vicia villosa* species and stated that this species has many uses and green fodder or hay, pasture, and is grown in soil amended. Most planting time of *V. villosa* is in the low temperate regions and in each agricultural soil which there is sufficient moisture has good performance.

Goldansaz *et al.*, (2010) studied autecology of *Eurotia ceratoides* species in Nadoushan steppe rangelands and indicated that relatively broad ecological

amplitude of the species in areas of with pH 7/8 – 8, EC 0/2 - 0/12 ds/m and in 1500-2500 altitude meters has dispersal. The average annual rainfall in it's habitat of 98/3 mm and mean annual temperature is 14/4 degrees Celsius.

Fakhire *et al.*, (2010) species autecology of *Desmostachiya bipinnata* of in Sistan plain examined And expressed mentioned species growth with annual rainfall of 60/8 mm and annual mean temperature 22 °C. Is on soils of with loam texture to sandy loam and PH 8/03-8/31 and soil salinity from 10-60 ds/m. the roots and rhizomes have been jet that penetrates up to two meters in soil. Given the above, can see that such studies have not been done *Smyrniium cordifolium* species. Due to favorable palatability species after drying and its importance in pasture soil conservation it was decided until Habitat characteristics and individual characteristics in Iran (Yasooj city) pastures be investigated.

Materials and methods

Habitat characteristics of the studied species in order to achieve behavior conditions, studied species with different factors including the environment, topography, pedology and climatic characteristics were studied.

Topography

In this section during of field works of project determine, elevation, percent slope and geographical aspects was also recorded.

Climatic characteristics

In order to evaluate the rainfall and temperature of most elevation and the nearest and the most direction meteorological stations used and their Embrothermic curves was plotted. To realize to minimal rainfall, average temperature and climate type in plant habitats of available maps were used. Temperature and precipitation of precipitation lines maps and the temperature were determined. The climate of habitats using of province's climate maps that prepared by the developed Demarton method were determined.

Assessment of edaphically

To study studied sites Pedology, while the apparent status of the soil and the presence of stone or grains in soil habitats in each study site, that operations was performed to measure vegetation cover in the middle of each point a profile was dug and 0-15 and 15-30 and 30-60 cm soil profile within the depth profiles of soil samples collected and were transported to the laboratory To test the soil texture, soil type, PH, EC soil is measured.

Evaluation of vegetation types and associated species

After field visiting of studied sites, determine plants types transect have been established systematic-random method in each vegetation type and all associated plants of studied species were recorded.

Measurement of canopy cover, abundance of studied species in different habitats

Measurement of *S. cordifolium* cover as frequency of done.

Evaluation of plant roots

To realize the plant's root volume, some plants were selected randomly in each habitat and rhizosphere removed and then root depth, highly branched, influence, density and root volume were carefully studied.

Phenology

According to the forms that were taken apart every 10-15 days to see studied sites and was recorded at different stages of plant life in studied sites of underlying basis of were selected and marked while traveling to the regions of Germination Time stages, rise of flowering stems, flowering, seeding, seed maturity, experiencing loss, drying and seed shedding was a record.

Simultaneously Embrothermic curves each rain gauge station near the studied sites, Plant phenology studies are interpreted and analyzed.

Plant regeneration and revitalization

According to phenological studies at the onset of germination, germination conditions specified and strategies to multiply and plant regeneration were investigated. To this end, we collected seed and viability and seed thousand weights were studied.

Preference value

To study the preference value of the studied species using a timer device including plural grazing on plant, palatability of the plant was determined.

Climatic characteristics

With regard to the distribution and extent of multiple sites of Yasooj, three research sites were selected to perform research activities of autecology *S. cordifolium* species that include:

- 1) **Kakan** site with 51° 40' 34" E and 30° 57' 15" N
- 2) **Tangsorkh** site 51° 38' 30" E and 30° 29' 45" N
- 3) **Malashora** site 51° 38' 17" E and 30° 29' 45" N.

To investigate climatic characteristics of the studied sites, synoptic station data Yasooj that most height and the nearest stations to studied sites were used. With Embrothermic curves of this station, drought periods that were effective on plant growth have been identified.

Preference value

In the studied sites, due to the diversity abundance and density of the studied species and other associated species, studies were undertaken for the preference value.

Results*Habitat characteristics of the studied species*

S. cordifolium species in the studied areas of 1400 m above sea level to 2,300 meters elevation and in various slopes and are grown in different directions. As shown in Table (1) is gradient different directions with different slope percent representing of habitat dispersion of the species studied.

Table 1. topography characteristics and location of species growing in sites.

Topographic characteristics			growing Location
Gradient(percent)	Geographical directions	Elevational	
30-15	Northern- Eastern	1600-2200	Kakan
40-20	Eastern	1400-2100	Tangsorkh
45-15	Southern – Northern	1750-2500	Malashora

As the diagram shows drought period usually begins in May and continues until late October and practice between 6-7 months of the drought season is in the region (diagram 1). Habitats that *S. cordifolium* species capable growing, areas are with rainfall between 350-750 mm and annual average temperature is between -10 to 35 °C.

Pedology, resources assessment and land capability

Conducted studies show that the soil of growing of mentioned species clay loam texture to silt loam and with depth of medium to deep and has been observed a low to medium gravel. The soil PH 7/00 to 8/1 varies and EC from 0/3 to 0/8 ml/cm fluctuate. Percentage of sand in the soil varies from 6-16 percent. It seems of the results of laboratory analysis that of soil samples that effective factors in the development and establishment of the studied plant are, soil texture, pH and organic material.

Evaluation of plant root

Root in *S. cordifolium* species such a way that first started with major crown and in some places it is separated into two parts or branches. Then each branch has been split into smaller roots have penetrated to a depth of 170 cm. Lateral branches of the plant is expanded to a radius of 75 cm.

Phenology

S. cordifolium studies of phenological conducted with completing field forms shows that start activity of plant in different areas depending on the height and

slope direction and drought and wet periods of the year. According to these stages of plant phenology stages (Table 2), which the first is includes phase of for growth activity or germination at an altitude of 1,400 meters and in the southern slopes of the second half started in February and when in this elevation range, plant is growth stage (completion of leaves, stems and flowers) in 2000 m elevation plant is germination stage about 15-20 days later, and 30-45 days after the plant begins to bloom After two months, seed milky stage and after three months the seed will begin to fall after almost one hundred days into the plant is wilting and drought.

The important point is that after milky seed 7-10 days if the seed that in pods are 3-6 cm instead and of 2 to 5 seeds varies, not collected, pods with a twist of broken and seeds are shed the breaking of pods, seeds sometimes to a radius of 1-2 are thrown that either eaten by birds or prey are ants.

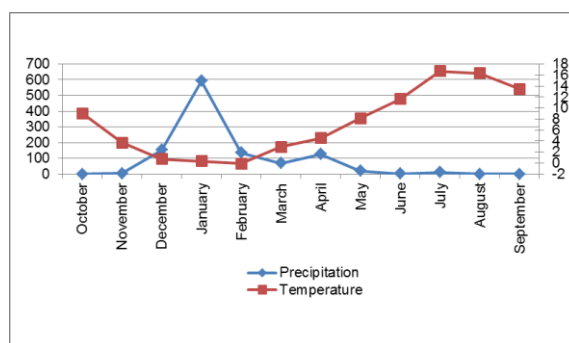


Fig. 1. Embrothermic curve of Yasooj station related to 2013-2014.

Table 2. phenological stages of *S. cordifolium* species.

March	April	May	June	July	August	September	October	November	December	Vegetative stages
										Plant starts growing
										Leaves appear
										Flowering
										Seed formation
										Seed maturity
										Seed loss
										stem Broken
215/8	128	34	0/6	7/8	5/6	1/7	10/3	87/5	5/219	The average rainfall
2/9	4/5	8/1	11/6	16/7	17/3	13	9	3/7	7/0	temperature minimum
16/9	17/7	23/8	31	33/16	35/3	32/6	27/5	17/4	12/9	temperature maximum
7/5	11/9	17/3	22/3	26/1	26/8	23/5	18	13/1	8/1	temperature mean

The investigations concluded that *S. perfoliatum* species growing range of 1400 to 2300 meters.

Temperature fluctuations of -10 °C to 28 degrees Celsius. *S. perfoliatum* species growing in all directions, but in steep slopes the southern and southeastern the greater density of habitats.

Also slope gradient of less than 15% in Kakan site to over 45% in site Malashora is growing.

According to laboratory results that from studies of areas soils seems in Malashora site, soils were clay loam to Silty loam and soils varies of Shallow deep to deep half and EC weinberg of 0/4 to 0/8 ml/cm. PH in the soil from 7/2 will not exceed. in Tangsorkh site soils were silty clay texture and soils varies of deep half to deep PH in the soil from 7/3 to 8/1 and EC weinberg of 0/3 to 0/6 ml/cm.

In Kakan site soils varies of deep half to deep and EC weinberg of 0/3 to 0/7 ml/cm and PH was from 7 to 7/6. Soil texture was silty loam. *S. perfoliatum* species more in trees sub-epoch *Pyrus sp*, *Pistacia atlantica*, *Fraxinus excelsior* and *Crataegus aronia* is grown. Rangeland species associated with the way can

be pointed to a variety of annual and perennial gramineae, *Ferula gummosa*, *Ferula asa-foetida*, *Astragalus*, *Acantholimon bracteatum*, *Dorema aucheri*, *Prangos ferulaceae*.

With investigated the depths taken root volume, it is concluded plant roots penetrate to a depth of 150 cm and 75 cm its secondary radius distribution of roots. Phenological stages during the 92 year in sites were examined According to the phenological stages, based on climatic conditions is different. In some years which cold period is short, plant growth will begin in March late in the years that cold period is longer the plant will begin to grow of the second half of April.

After the different periods of flowering and floriferous and seed milky, seeds fully mature in June late and early July, the seeds will begin to fall and in the second half of July plant begins to wilt. The important point is that *S. perfoliatum* species free (after drying) is feed in the rangeland. In some cases, the stepping was extremely weak and consequently leads to destruction of the plant. As mentioned, the two-year-old plant and its reproduction in sexual and somatic, *S. perfoliatum* species by root growth period starts next year and also by seed.

Collected seed to determine the viability of the seed to the gene bank department was transferred, has shown which seed purity was 95 percent and viability was 70 percent. If all seeds collected directly from the plant any seed harvested in the years before this series are not interfering. Preference value of studied plant also examined it seems that the heavy animals more than light animals show interest to this species.

That was shown this species due to its palatable (but not in green state) is everyone's favorite animals. It appears that the heavy animals more than light animals show interest to this species.

Examining other important rangeland species that play an important role in soil protection and helps prevent soil erosion and economic assessment of this species in ecological processes and performance (food and water cycle) can be hoped clarify the role of these species and to inform the general public of the ecological and economic values, more aware.

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