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## Study of Environmental Characteristics of wild *Pistacia* sp. Habitats (Case Study: Markazi Province)

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### Abstract

Considering the appropriate adaptability of different wild species of *Pistachio* in different arid and semi-arid environments of the country as well as its high values from the point of view of Resin and other chemical production, oil, and different pharmacological consumption of their seeds, finding their habitats in the different Provinces of Iran seems to be important. In this project, the basic information including topographic, soil, climate, geologic, and land use map of the area with a 1/50000 scale of the Markazi Province of Iran was first prepared and digitized. Then all the areas covered by wild Pistachio were visited, recorded, and digitized by GPS. To study the quality and quantity characteristics of the species, some samples were taken from 1600m<sup>2</sup> in some important areas covered by wild Pistachio species according to different climatic conditions of the Province. The parameters, such as the number of trees in the samples, trees' height, trees width, the time of flowering, the time of leaf appearance, the number of seeds, etc. were recorded in sampling areas. After establishing the DEM of the areas, aspect and slope maps were also produced using dfox and dfdy filters in the Ilwis academic GIS program Package. Based on this investigation the following results were obtained: 20 polygons of wild species of Pistachio with total areas of 2216 ha were recognized in Markazi Province of Iran, The species-environment relationship was determined using maps integrating and data overlying.

## 1. Introduction

There is much research work and several documents and reports regarding the wild *Pistachio* in the world and Iran in particular. Most of the research work in Iran has been carried out during the last decade (1990-2000). Some researchers have demonstrated the botany, *Genomic and Breeding*, ecology and phonology of the species (Hormaza & Wünsch; Ak *et al.*, 2010; Ben Ahmed *et al.*, 2021) and others studied the social and economic problems involved in habitat management (Hossinzadeh & Tahmasebi, 1395), pest and diseases and species values (Sajadi & Mirdavoodi, 1995; Mohammadi, 1995), utilization policies (Abdellahpour, 1995), the traditional uses, phytochemistry, and pharmacology (Bozorgi *et al.*, 2013; Mahjoub *et al.*, 2018), oil content,

composition and antioxidant properties (Hazrati et al., 2020). the rangelands plants phenology and animal habits(Ahmadi & Peiravi, 2010).

According to the literature, the genus *Pistacia* has different species from which 3 species including; 1- *Pistacia vera* 2- *Pistacia Khinjuk*, and 3- *Pistacia atlantica* with 2 subspecies of *Mutica* and *Kurdica* observed in Iran (Fatahi, 1995). The wild species of *Pistacia* has widespread distribution all around the country except the northern part of Iran and covers 2400000ha of the country.

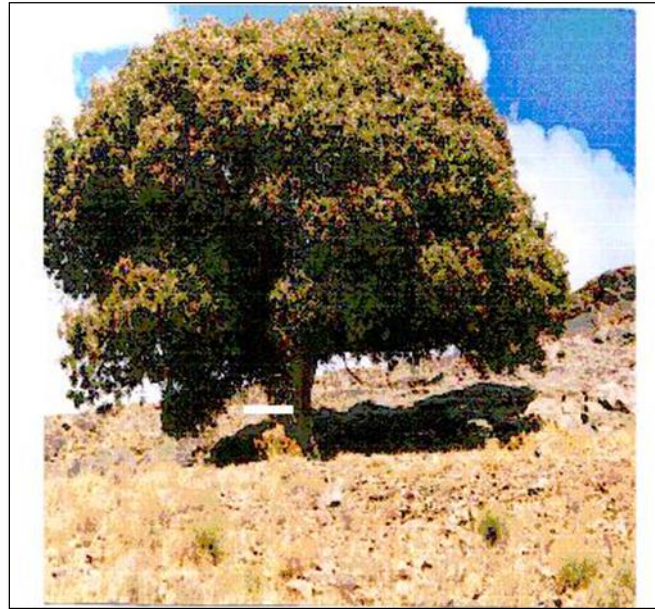
Resin, gum, and oil production, medical and industrial usage, resistance to dry environmental conditions, and its role in protecting watersheds from soil erosion in dryland areas as well as its forage values, give it outstanding value among the other forest species in Iran, the so-called (green gold). Changes in land, overgrazing, lack of management, pests, and diseases, unsuitable and over-harvesting the Traditional extraction of the Samgh, and the other human impact caused the habitats of the species to become progressively insular zed and deteriorated all around the country. Therefore optimal management of the species and its habitat tats needs recognition and determining the most important ecological influencing factors in species distribution and the exact amount of the area covered by the species around the country. The use of GIS helps forest managers and decision-makers to have good management with optimum use of resources to achieve the aims.

## 2. Materials and methods

This research was carried out in Markazi Province of Iran. The province was located in 48° 58` to 51° 5` longitude and 33° 23` to 35° 34` latitude with a total area of 1789172 ha. The Province contains 9 Townships with the centrality of Arak. The mean annual rainfall of the Province is 290 mm with a Maximum of 400mm in very humid areas and a minimum of 170mm in arid and semi-arid areas. The maximum elevation of the province is 3370m and the minimum elevation is 950m above sea level. The Province contains two temperature regimes Mesic and Thermic. According to Dumartin's method of climate classification, the province contains 6 discrete climatic conditions. The wild *Pistacia* is distributed in the entire Province in the form of both very dispersed individuals and small areas with recognizable boundaries. The geology of the areas consists of mountainous areas belonging to the Jurassic, Keretacea, and Paleozoic periods and the litho logy including limestone with conglomerate, sandstone, granite, dolomite, shale, schist, marble.

In this research first of all, the basic information of the areas including topography, soil, geology, land use, climate, and vegetation map with 1/50000 scale as well as attribute information were prepared. Field investigations were carried out using GPS to determine the boundary of the species-distributed areas. Then all the recorded points were digitized and connected to create a segment map or boundary of each area then polygonized using the Ilwis academic GIS program package. In parallel. The contour of each area also was digitized and interpolated to create DEM, slope, and aspect maps of each area containing the species. According to the climatic condition of the Province, 5 sample plots each with 1600m<sup>2</sup> were taken to determine the quantity and quality characteristics of the habitats. Some parameters including, tree diameter, tree height, crown height, type of growth form, male and female no, trees health, the amount of seeds, pests and diseases, etc were recorded. Habitats were classified according to

the Fatahi classification method (Fatahi, 1999). The very dispersed as well as very old-age individuals also were recorded with GPS and mapped as two discrete point maps. The crossing operation was applied to overly all the maps and attribute tables and also to determine species-area relationships.



**Figure1.** The old-age tree in west Ashtian township

### 3. Results and discussion

Tables (1, 2, 3, 4, and 5) show the average tree height, the maximum height, the average height of the vertical crown, the average horizontal crown, the average tree trunk (at breast height) of the trees, the amount of slope and geographic aspect, and some other ecological factors of the areas.

**Table 1.** The most important areas of wild *Pistacia* species In Markazi Province

No	Area name	No/h	Height range	ha/Area
1	Amjak mountain of Tafresh Township	25-40	1800-2400	27/92
2	Lajvar mountain of Shazand mountain	25-40	2087-2400	64/87
3	Saghez mountain of Tafresh Township	40-70	1845-2030	16/52
4	Township Deraz mountain of Saveh	25-40	1320-1530	58/82
5	Charkhi mountain of Saveh Township	25-40	1813-2000	27/92
6	Nazar kardeh mountain of Saveh Township	25-40	1080-1293	235
7	Siahend mountain of Delijan township	5-25	1850-2400	637
8				<b>1856/11</b>

The results show that from 3 species of existing wild *Pistacia* in Iran, 2 species including *P. atlantica* and *P. Khinjuk* with a total area of 2216.2 ha were observed in a different area of the Markazi Province of Iran and associated with *Amygdalus*, *Rosa*, *Efedra*, *Celtis*, *Ficus*, *Berberis* sp. and rarely form a single community and growing in very remote, inaccessible and very limited

rocky mountainous habitats with 4 recognizable community types, including 1- *Amygdalus scoparia* & *P. atlantica* 2- *P. atlantica* 3- *Amygdalus. Scoparia* & *P. Khinjuk*, and 4- *P.khinjuk* & *Ficus* sp. These community types are distributed in 4 climatic conditions of the Province based on demarten climatic classification method.

The geographic distribution map shows that the areas are recognizable in 19 polygons from which 7 polygons with a total area of 1856ha are the most important from the point of view of habitat characteristics and ecology. These species are growing in shallow gravelly soil with a fine texture that mainly places on the limestone, marl, and gypsy marn land unit of 1.2. Nearly all the habitats of the species deteriorated as a result of human impacts such as overgrazing by the animals and outbreaks of pests and diseases as well as lack of tree regeneration. The majority of trees lack single trunks as a consequence of grazed seedlings that force the species to regenerate in vegetative form but in some areas, there are old-age individual trees with 90cm trunk diameter which are very important from the viewpoint of nature conservation. These single individuals have been observed in Ashtian, and Tafresh Township Figure (2).

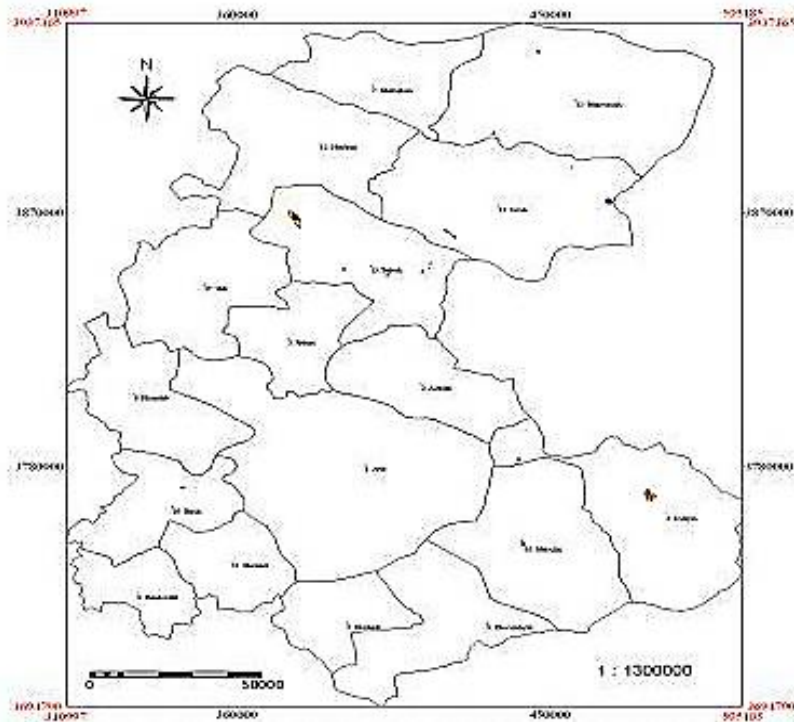


Figure 2. The map of *Pistacia* distribution in Markazi province, Iran

The two growth forms including: vegetative and sexual exist nearly in all habitats. The crown and trunks of %80 individuals are in safe condition but the majority of tree seeds are hollow and lack fruit because of outbreaks of pests and diseases and climatic conditions that decreased tree regeneration as a consequence, the age class of the trees is in highest percentage with very rare young seedlings. It means that regeneration cannot take place as long as the habitats remain stable for a long time.

**Table 2.** The percentages of geographic aspect of the areas In Markazi Province of Iran

%	Geographic aspect
16	NW
0	N
40	NE
1	W
2	FLAT
0	E
24	SW
1	S
16	SE

So it is necessary to protect and exclude some areas from grazing by the animals and in some others should be conserved as a nature conservation area and genetic heritage of the country and in remaining parts, the wildlife management with ecotourism should be taken into consideration.

**Table 3.** The slopes percentages of the areas of Markazi Province of Iran

%	Slop
37	0-10
28	20-30
16	20-30
11	30-45
6	45-60
27	60-80

**Table 4.** The amount of geographic aspect for each discrete habitat in Markazi Province (ha)

Aspect/Area	Amjak	Deraz	Saghez	Siah hend	Lajvar	Nazar kardeh	Charkhi
NW	35.97	0.79	0	177.98	2.32	67.19	0
N	1.59	0	0.02	0.94	0	4.61	0.1
NE	642.57	0	0.16	9.16	0.51	59.17	9.52
W	0.86	0.04	0.04	7.18	0.17	6.07	0
Flat	5.3	0.23	0.06	3.17	10.76	10.8	0
E	3.5	0	0.15	1.86	0.11	3.15	0.11
SW	50.99	50.21	0.73	282.79	33.39	56.34	1.39
S	0.77	0.06	0.12	7.19	0.43	4.2	0.13
SE	82.52	0	15.08	147.03	14.47	21.6	15.91
Total	824.07	51.33	16.36	637.3	62.16	233.13	17.64

The distribution of the species ranges from 1080 (Nazar Kardeh mountain in Saveh township) to 2400m (Sia hend mountain in Delijan township) from the sea level. The maximum density is 45-70 individuals per ha which belongs to Saghez mountain in Tafresh township and the minimum is 5-25 individuals per hectare table (1).

**Table 5.** Some Quality and quantity characteristics of distributed areas in Markazi Province

Area name	Species name	Crown condition	Growth form	Average trees height	Average Trunk height	Canopy cover	Tree trunk diameter	Small Crown height	Great crown
Unit				m*	m	%	m	m	M
Saghez	<i>P. atlantica</i>	Safe	Vegetative, sexual	3/85	2/69	7	0/27	4/56	2/69
Deraz	<i>P.Khinjuk</i>	Safe	Vegetative, sexual	2/58	0/6	12	0/53	2/19	2/22
Lajvar	<i>P. atlantica</i>	Safe	Vegetative, sexual	6	1/8	4	0/86	5/5	8
Nazar Kardeh	<i>P.Khinjuk</i>	Safe	Vegetative sexual,	3/27	1/18	4/17	0/73	2/2	3/08
Amjak	<i>P. atlantica</i>	Safe	Vegetative, sexual	2	0/6	1	0.8	1	1/3
Charkhi	<i>P. atlantica</i>	Safe	Vegetative sexual,	2/20	0/44	2	0/25	1/94	2/85
Siah Hend	<i>P.Khinjuk</i>	Safe	Vegetative, sexual	1/20	0/3	0/08	0/30	1/3	1/6

\*m= Meter

Considering appropriate adaptability of different wild species of *Pistacia* in different arid and semi-arid environment of the country as well as its high values from the point of view of Resin and other chemical production, oil and different pharmacological consumption of their seeds, founding their habitats in the different Provinces of Iran seems to be important. On the basis of this investigation the following results were obtained: 20 polygons of wild species of *Pistacia* with total areas of 2216 ha were recognized in Markazi Province of Iran, The species-environment relationship determined using maps integrating and data overlying. Study of the *Pistacia* species in Markazi provinces demonstrated that the most of the habitats of the *Pistacia* species deteriorated as a result of human impacts such as overgrazing by the animals and outbreaks of pest and diseases as well as lack of trees regeneration. Among the studied habitat of the wild *Pistacia* some of them should be considered as outstanding value for the landscape management. For some of the single stands of the *Pistacia* on site maintenance program should be carried out.

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