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Original Article

Habitat Conditions of the Most Important Medicinal Plants from Lamiaceae Family in Mazandaran Province

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Abstract

The production and proper utilization of medicinal plants in natural habitats need to review and identify the natural conditions and climate of the habitat of these plants and separating them from harmful and poisonous plants. The current study was aimed to introduce and determine the distribution of medicinal plants from Lamiaceae family in Mazandaran province as well as the introduction of natural habitats in order to provide information for executive agencies and administrators of land use plan to be used for optimal utilization of potentials of natural resources. In this study, after collecting the documents, the aromatic and medicinal species (wild species) of Mazandaran province were identified and their distribution was investigated. According to the obtained results, the medicinal species of Lamiaceae family in Mazandaran province contain 23 species, belonging to 11 genera among which *Stachys* spp. with seven species is known as the riches genus in Lamiaceae family, distributed in an area of 16322 km^2 in Mazandaran province. As a result of this study, the distribution map of natural habitats, habitat conditions, life form, and utilizable organs of medicinal species belonging to Lamiaceae family in Mazandaran province have been provided. According to the rich flora of Mazandaran province, the results of this study could help in financing, planning, cultivation and production of medicinal plants at industrial levels. In addition, the production of herbal medicines could be used in pharmaceutical, medical and food industries.

Key words: Medicinal species, Habitat conditions, Lamiaceae family, Mazandaran province, Iran

Introduction

Medicinal plants are a wide variety of species that all or parts of them are used as fresh, dried or processed in order to diagnosis, treatment, prevention, help physiological functions, and maintain the health of humans or animals.

The use of medicinal plants and their natural compositions in industry particularly in pharmaceutical industry has a very wide application. It has been emphasized by the World Health Organization (WHO). Accordingly, most of the countries have invested in production and cultivation of medicinal plants to be used in pharmaceutical, health, cosmetics, and food industries to replace chemical drugs. In Iran, due to the cultural roots, vegetation diversity and richness, and the growth of medicinal plants in different climates and ecological conditions, this issue should be emphasized as a belief. It should be defined as a national necessity within a specific program so that with a scientific knowledge and preservation, improvement, development and proper utilization of medicinal plants, important steps could be taken to improve community health, employment and export.

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Ghahraman [1] reported that Lamiaceae contains 187 genera and 3000 species, distributed throughout the globe, but the most distribution is in the Mediterranean region. In Iran, about 49 genera with hundreds of species from Lamiaceae are distributed [1]. Species are generally annual or perennial herbs, having right or creeping shoots. Some of them like *Thymus* spp. are shrub species with multiple woody stems. A square stem is the characteristic of these species. Among the species from Lamiaceae family, some are grown for medical consumption, nutritional consumption, essential oil and beauty [2].

Medicinal and aromatic plants from Lamiaceae family are considered as one of the most important plant genetic resources due to very high ecological flexibility to different climates. Due to the existence of various aromatic compounds, they also have many applications in cosmetics and health products [3].

According to the importance of medicinal plants in treatment and trade, research and studies on the identification of medicinal species have been increased considerably during the last decade. A few studies can be pointed out as follows:

Hosseini *et al.* [4] identified the medicinal plants of Golestan province. Observations showed that the Golestan province included 409 medicinal species, of which 156 species in the forests, 98 species in the rangelands and 47 species in agricultural and residential lands were found and 108 species were distributed commonly in these lands. Forty five species of these plants have been identified by people and are used traditionally. Seventy plant species were also introduced as medicinal species for the first time.

Soltanipour [5] investigated the medicinal plants of Hormozgan province based on natural areas. According to the results, 218 genera of 77 families were identified, of which 152 species in vast plains, hills and mountain slopes, 103 species in mountainous areas, 26 species in waterways, springs and humid areas, 16 species on coastal dunes and its low margins, and finally 16 species in saline soils are growing. Among them, 209 species are native to the province and 172 species have common and traditional therapeutic uses.

Javidtash [6] identified the medicinal plants of Fars province. In this work, 483 species from 94 families and 252 seed samples from 73 families were collected and identified. In addition, the phenological stages of 144 species from 41 families were investigated.

Akbarinia and Babakhanlou [7] studied the medicinal plants of Qazvin province. As a result, about 250 medicinal species were collected in this province and it was observed that more than 40 species were collected and brought to the pharmaceutical markets by people.

Akbarzadeh *et al.* [8] investigated the medicinal plants and their utilizable parts in Gilan province. According to the results, 342 medicinal species from 95 families and 229 genera were identified.

Other researchers including; Hoshidari [9], Rashvand [10], Nemati Peykani and Jalilian[11], Akbarinia *et al.* [12], and Roudi *et al.*[13] studied the medicinal plants.

Analysis of plants species and ecological classification of plants is a method for determining of the relationship between vegetation and environment factors [14]. There are many researches about the relationship between habitat characteristics and plant species worldwide [15-21].

The ecological system is one of the most common vegetation classification systems. In this system, the species having similar ecological relations with environmental factors are classified in a group as ecological species group. These palnt species often have a similar distribution in natural areas. Therefore, the vegetation unites are recognized based on ecological species groups instead of indicator species [21]. In this research, the relationship between frequency of the medicinal plants from Lamiaceae family and habitat characteristics was studied. The purpose of the study was to determine the ecological groups of above-mentioned species having similar relationships with environmental factors. These species cover a widespread area of Mazandaran province and their classification into ecological species groups could be a good guideline to determine suitable cultivation areas.

Material and Methods

Study Area

Mazandaran province with an area of about 23,776 square kilometers is located between longitudes 50° 34' to 54° 10' E and latitudes 35° 47' to 36° 35' N north of Iran. It is limited to the Caspian Sea, Golestan province, the provinces of Semnan, Tehran, Alborz, and Qazvin, and Gilan province,

from north, east, south and west, respectively. Alborz Mountains as a barrier divide Mazandaran province into two parts including lowlands and highlands, and separates it from inside Iran. A part of the western Alborz and all Central Alborz is located within the province of Mazandaran and the slope of land decreases from the mountainous areas to the plains and the sea.

Methods

In order to create of vegetation map of Mazandaran province in a scale of 1:250000, the information of national project entitled recognizing ecological zones of Iran in Sari [22], Amol [23] and Qazvin [24] areas, were used. In the second stage, by using ArcGIS 9.3 software, the attribute table of the last map was completed by adding the most important associated species in each vegetation type according to the above-mentioned schemes. After determining the medicinal species from Lamiaceae family [2], the distribution map of medicinal plants from Lamiaceae family were created (Fig.1 to 23). To create the homogenous map of the study area, four layers of hypsometric, the annual mean of precipitation, the annual mean of temperature and the annual mean of evapotranspiration were crossed using ArcGIS 9.3. In order to create the habitat condition map of each plant species, the spatial distribution maps of plant species were crossed with the homogenous map separately. The attribute tables of the created maps were transported into the Excel software and the range of the mentioned environmental parameters were calculated using appropriate functions. Then, on the basis of the habitat conditions, all studied species were compared to each other and classified with clustering analysis. The classification dendrogram of data was drown with Ward Linkage and Euclidian Distance in a similarity level of 50% using Minitab14 statistical software.

Results

As shown in Table 1, 23 medicinal species were identified in Mazandaran province. The distribution maps of these species are presented in Figures 1-23. Our results clearly show that the medicinal species of Lamiaceae family in Mazandaran province contain 23 species, belonging to 11 genera among which the genera of Stachys (seven species), Phlomis (four species), Thymus (three species), and Teucrium (two species) showed the highest species richness and other genera contain one medicinal species. According to the distribution maps, the studied genera are distributed in an area of 1632278 ha (Stachys), 296007 ha (Phomis), 308325 ha (Thymus), 731362 ha (Teucrium), 391004 ha (Scutellaria), 259630 ha (Mentha), 234004 ha (Ajuga), 214978 ha (Ziziphora), 186920 ha (Dracocephalum), 155659 ha (Nepeta) and 70044 ha (Salvia). It is noteworthy to mention that these areas indicate the area of vegetation types containing the mention medicinal species.

Based on the results of cluster analysis and the obtained dendrogram, the species are classified into six separate groups based on the similarity of the habitat conditions as follows:

The first group: *Ajuga chamaecistus* Ging. ex Benth., *Nepeta cataria* L., *Phlomis* herba-venti L., *Teucrium chamaedrys* L., *Stachys pubescens* Ten. **The second group:** *Mentha longifolia* (L.) Huds. *Stachys inflata* Benth., *Teucrium polium* L., *Stachys byzanthina* K. Koch **The third group:** *Dracocephalum kotschyi* Boiss., *Stachys laxa* Boiss. & Buhse., *Ziziphora clinopodioides* Lam., *Phlomis olivieri* Benth., *Stachys lavandulifolia* Vahl., *Thymus pubescens* Boiss. & Kotschy ex Celak., *Salvia aethiopis* L. **The forth group:** *Stachys setifera* C. A. Mey., *Thymus fallax* Fisch. & C. A. Mey., *Thymus kotschyanus* Boiss. & Hohen. **The fifth group:** *Phlomis anisodonta* Boiss., *Phlomis cancellata* Bunge. **The sixth group:** *Scutellaria tournefortii* Benth., *Stachys turcomanica* Trautv.

Table 1 The habitat conditions of medicinal species from Lamiaceae family in Mazandaran province

Row	Scientific name	Habitat Area (ha)	Life form	Minimum Height (meter)	Maximum Height (meter)	Annual mean of minimum Temperature (centigrade)	Annual mean of maximum Temperature (centigrade)	Annual average of minimum Precipitation (millimeter)	Annual average of maximum Precipitation (millimeter)	Annual mean of minimum Evapotranspiration (millimeter)	Annual mean of maximum Evapotranspiration (millimeter)	Utilizable organ
1	*Ajuga chamaecistus* Ging. ex Benth.	234004	Perennial	<500	4000	3	18	400	1100	700	1400	Flowering stems
2	*Dracocephalum kotschyi* Boiss.	186920	Perennial	<500	5000	3	15	300	900	800	1500	Flowering stems
3	*Mentha longifolia* (L.) Huds.	259630	Annual	500	5000	2	15	400	900	700	1600	Leaves
4	*Nepeta cataria* L.	155659	Perennial	<500	4000	3	18	500	1100	700	1200	Leaves
5	*Phlomis anisodonta* Boiss.	8822	Perennial	1500	4000	3	9	800	900	1000	1200	Flowering stems
6	*Phlomis cancellata* Bunge	74770	Perennial	1000	4000	3	9	600	900	900	1200	Flowering stems
7	*Phlomis* herba-venti L.	123182	Perennial	<500	4000	3	15	300	900	700	1400	Flowering stems
8	*Phlomisolivieri* Benth.	89233	Perennial	<500	5000	3	12	300	900	900	1500	Flowering stems
9	*Salvia aethiopis* L.	70044	Perennial	500	5000	3	15	400	700	900	1800	Flowering stems
10	*Scutellaria tournefortii* Benth.	391004	Shrub	<500	3000	6	18	300	1300	700	1200	Flowering stems
11	*Stachys byzantina* K. Koch	582489	Perennial	<500	5000	3	18	300	1300	700	1400	Flowering stems
12	*Stachys inflata* Benth.	469553	Shrub	<500	5000	3	18	300	1000	700	1600	Flowering stems
13	*Stachys lavandulifolia* Vahl	207309	Shrub	500	4500	3	15	300	900	900	1600	Flowers
14	*Stachys laxa* Boiss. & Buhse	82116	Perennial	<500	4500	3	15	300	900	800	1400	Flowering stems
15	*Stachys pubescens* Ten.	51484	Perennial	<500	4000	3	15	500	900	700	1300	Flowering stems
16	*Stachys setifera* C. A. Mey.	159411	Perennial	500	4000	2	12	300	900	900	1200	Flowering stems,

17	*Stachys turcomanica* Trautv.	79916	Shrub	<500	2500	9	18	500	1100	700	1000	Rhizome Flowering stems
18	*Teucrium chamaedrys* L.	140137	Perennial	<500	4000	3	18	300	900	800	1300	Flowers, Leaves
19	*Teucrium polium* L.	591225	Perennial	<500	5000	2	15	300	1000	700	1900	Flowers, Leaves
20	*Thymus fallax* Fisch. & C. A. Mey.	148656	Perennial	1000	4000	2	9	300	900	900	1500	Flowers, Leaves
21	*Thymus kotschyanus* Boiss. & Hohen.	37698	Perennial	1000	3500	3	9	400	900	1000	1600	Flowers, Leaves
22	*Thymus pubescens* Boiss. & Kotschy ex Celak	121971	Perennial	500	4500	2	12	300	1000	900	1600	Flowers, Leaves
23	*Ziziphora clinopodioides* Lam.	214978	Perennial	500	4500	2	15	300	1000	800	1500	Flowering stems

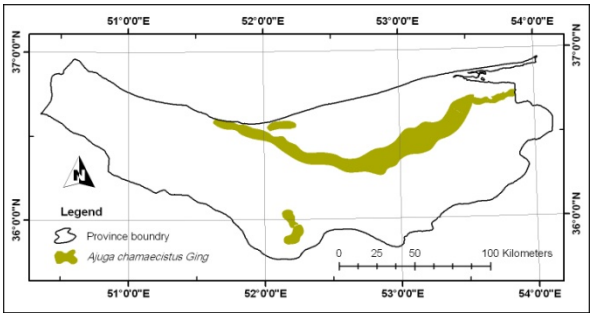

Fig. 1 The distribution map of *Ajuga chamaecistus* Ging. ex Benth.
in Mazandaran province

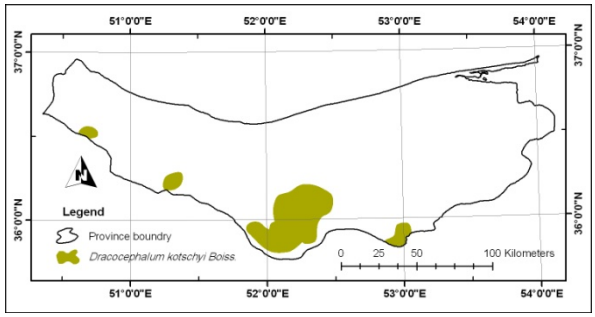

Fig. 2 The distribution map of *Dracocephalum kotschyi* Boiss.
in Mazandaran province

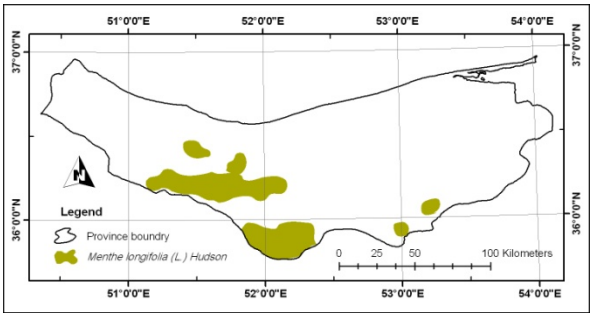

Fig. 3 The distribution map of *Mentha longifolia* (L.) Huds.
in Mazandaran province

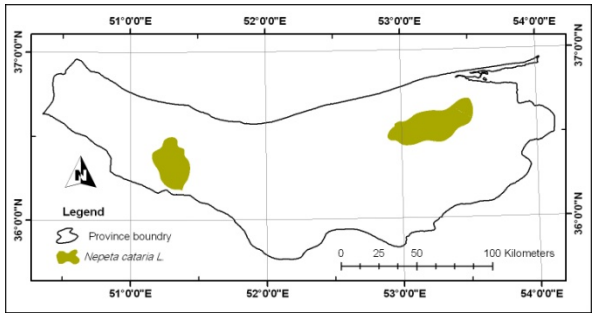

Fig. 4 The distribution map of *Nepeta cataria* L.
in Mazandaran province

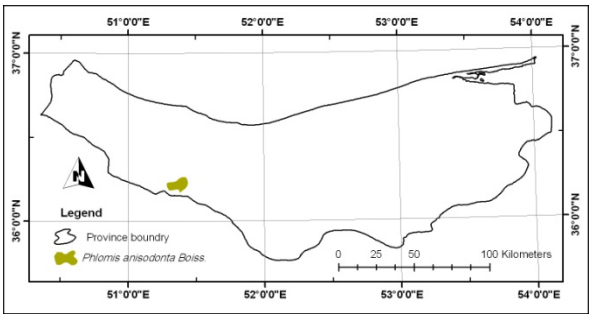

Fig. 5 The distribution map of *Phlomis anisodonta* Boiss.
in Mazandaran province

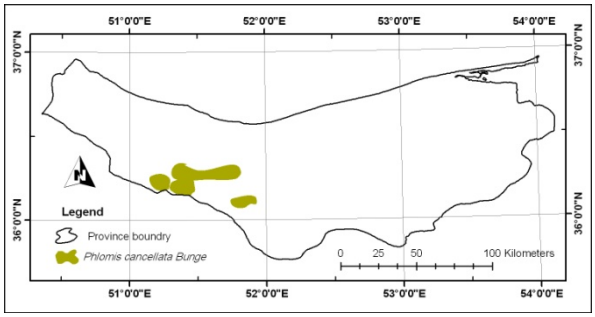

Fig. 6 The distribution map of *Phlomis cancellata* Bunge
in Mazandaran province

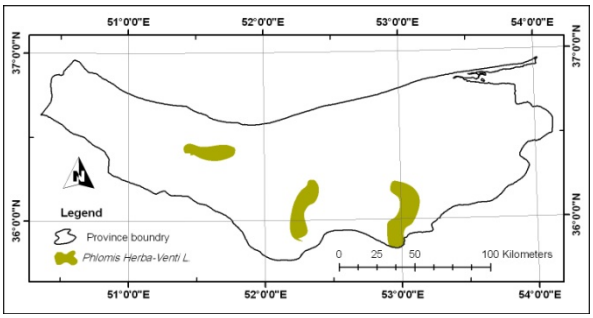

Fig. 7 The distribution map of *Phlomis* herba-ventiL.
in Mazandaran province

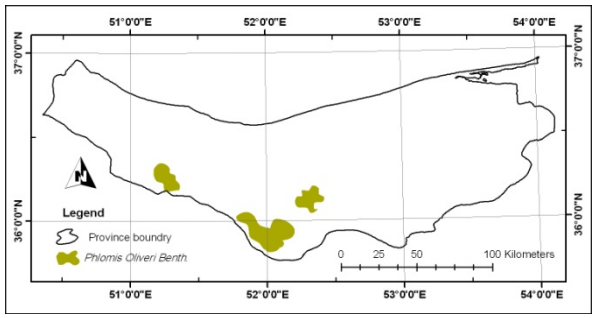

Fig. 8 The distribution map of *Phlomis olivieri* Benth.
in Mazandaran province

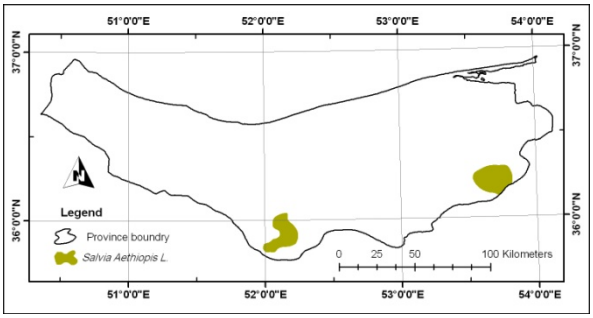

Fig. 9 The distribution map of *Salvia aethiopis* L. in Mazandaran province

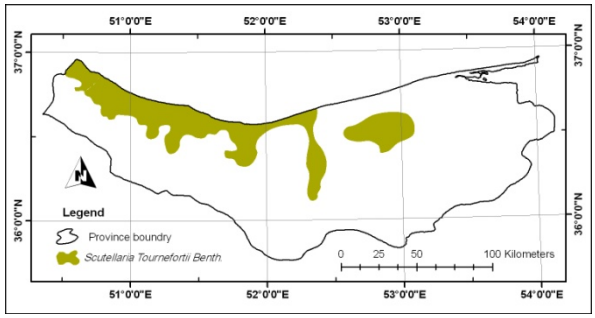

Fig. 10 The distribution map of *Scutellaria tournefortii* Benth. in Mazandaran province

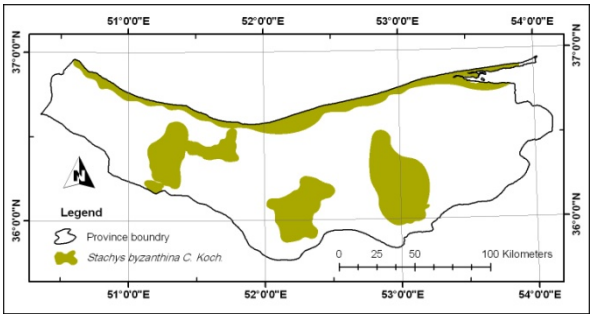

Fig. 11 The distribution map of *Stachys byzantina* K. Koch in Mazandaran province

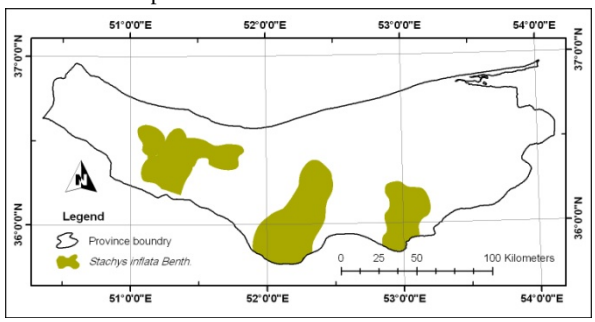

Fig. 12 The distribution map of *Stachys inflata* Benth. in Mazandaran province

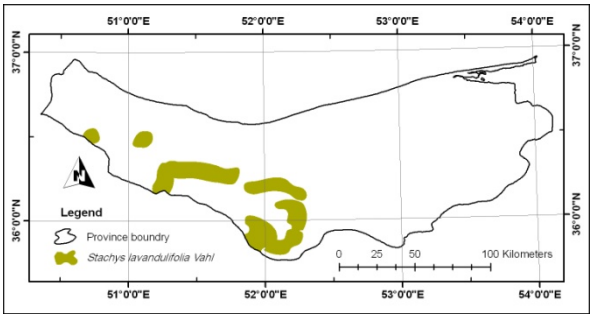

Fig. 13 The distribution map of *Stachys lavandulifolia* Vahl in Mazandaran province

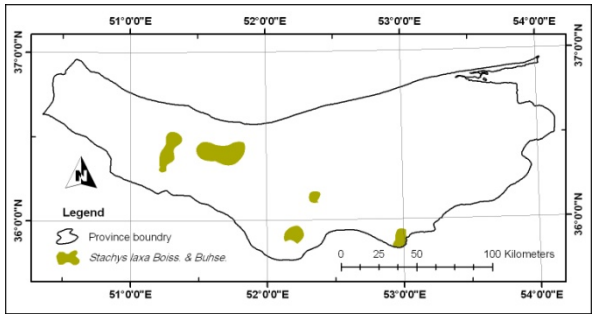

Fig. 14 The distribution map of *Stachys laxa* Boiss. & Buhse in Mazandaran province

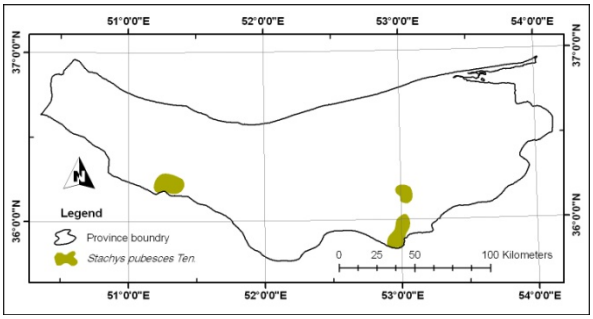

Fig. 15 The distribution map of *Stachys pubescens* Ten in Mazandaran province

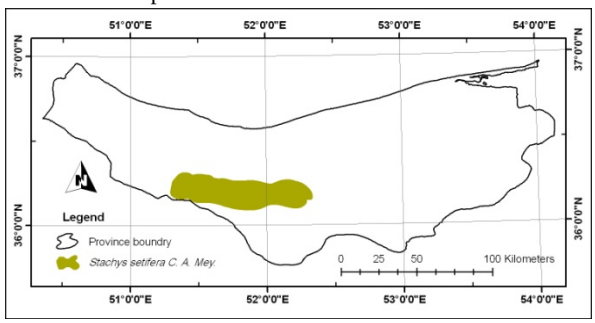

Fig. 16 The distribution map of *Stachys setifera* C. A. Mey. in Mazandaran province

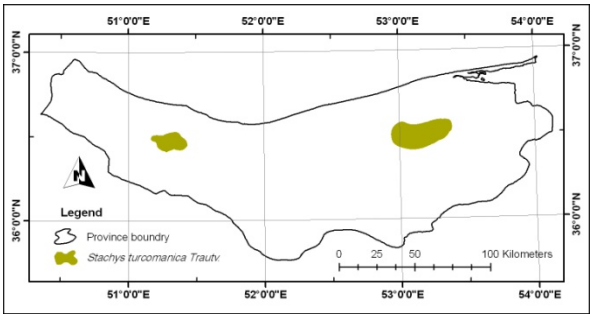

Fig. 17 The distribution map of *Stachys turcomanica* Trautv.
in Mazandaran province

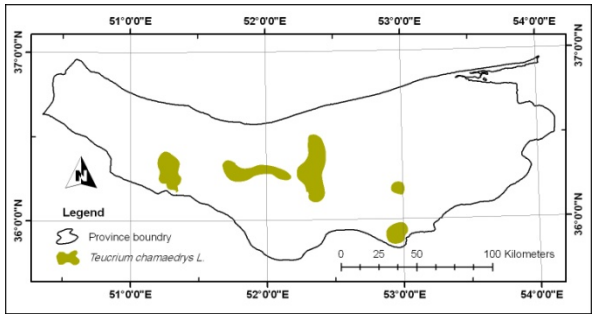

Fig. 18 The distribution map of *Teucrium chamaedrys* L.
in Mazandaran province

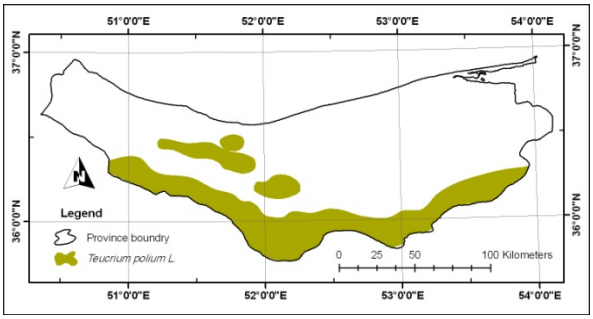

Fig.19 The distribution map of *Teucrium polium* L.
in Mazandaran province

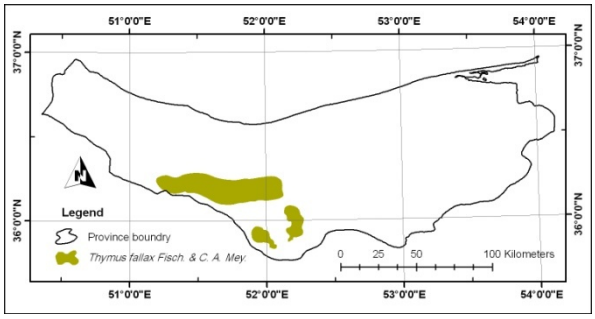

Fig. 20 The distribution map of *Thymus fallax* Fisch. & C. A. Mey.
in Mazandaran province

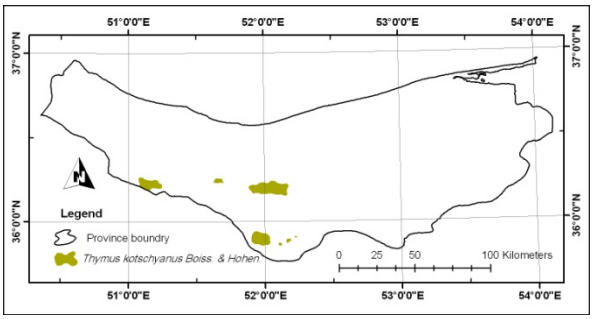

Fig. 21 The distribution map of *Thymus kotschyanus* Boiss. & Hohen. in Mazandaran province

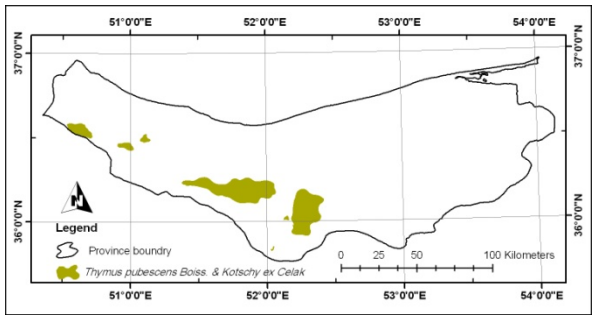

Fig. 22 The distribution map of *Thymus pubescens* Boiss. & Kotschy ex Celak in Mazandaran province

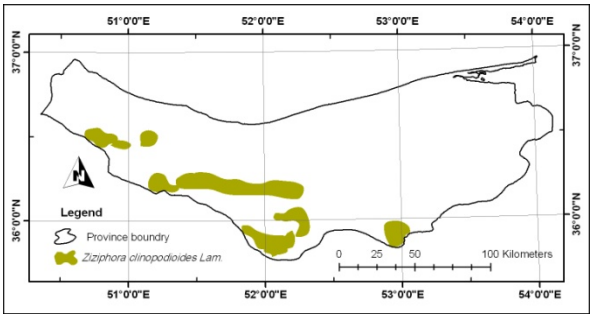

Fig. 23 The distribution map of *Ziziphora clinopodioides* Lam. in Mazandaran province

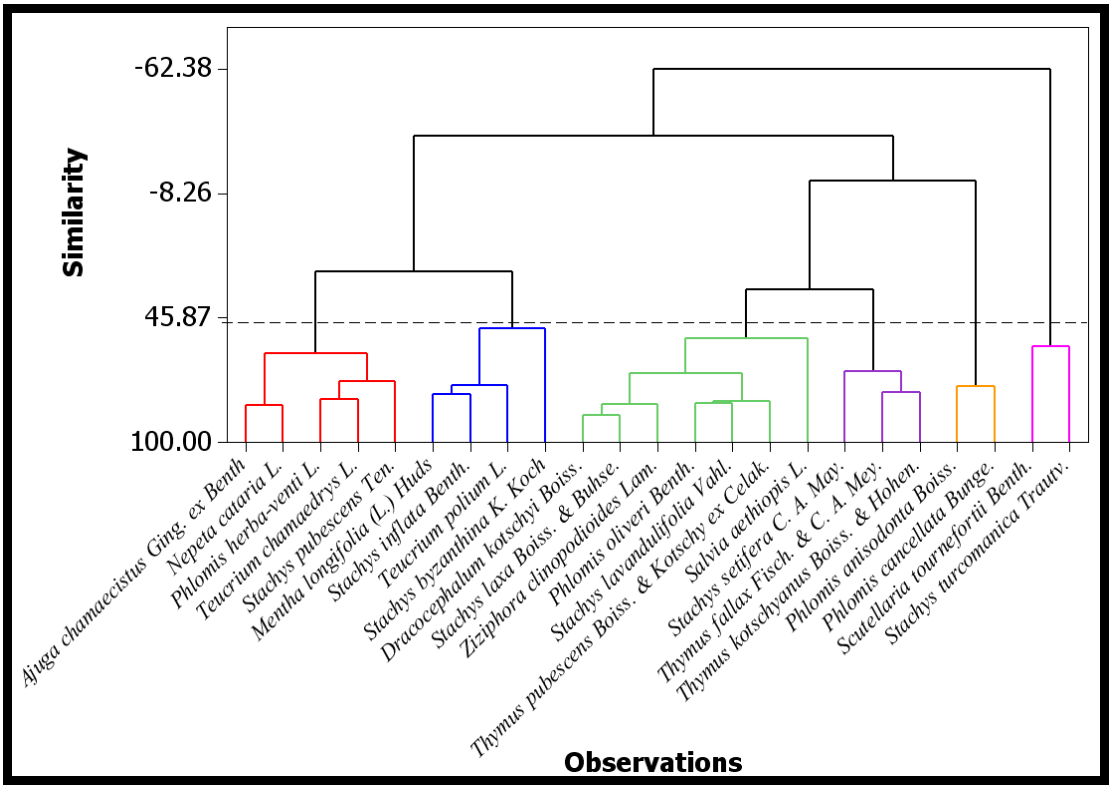

Fig. 24 Dendrogram of the species studied with Ward Linkage and Euclidean Distance at a similarity level of 50%

Discussion

Knowledge of species habitat conditions and their classification in ecological species groups is of particular importance. To achieve this goal, in the current research, the distribution and habitat conditions of the medicinal plants from Lamiaceae family in Mazandaran province were identified and they were classified based on the habitat similarities. Accordingly, the mentioned species were classified in six ecological species groups. The cultivation of medicinal plants as the byproducts of rangelands could be considered as a useful means to reduce the grazing pressure on rangelands. Therefore, the modeling of natural habitats of these species is recommended for the cultivation of these plants in areas with similar habitat requirements

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