

## Importance of Using Ethnobiological Knowledge for the Conservation of Medicinal Plants Biodiversity in the Lar Region (Iran)

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### Article History

Received: 21 February 2022  
Accepted: 11 October 2022  
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### Keywords

Ethnobotany  
Medicinal plants  
Biodiversity  
Lar region

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### ABSTRACT

Today's world is confronted with many environmental concerns, including the extinction of plant species. Plants are harvested indiscriminately due to their usefulness in medicine, the economy, and agriculture. The need to preserve biodiversity, particularly in the case of plants, necessitates the use of ethnobiological knowledge. Ethnobiological knowledge is traditional knowledge based on indigenous peoples' use of nature and the environment, which they have gained over the years through numerous trials and errors. The purpose of this study is to investigate the role of indigenous knowledge in the use and conservation of plants by local people. This study was performed in three villages in Lar National Park: Polour, Ab-e-ask, and Niak, which have the highest population in the Lar region. The primary research method used was qualitative methods such as direct observation, interviews, and questionnaires, as well as instruments such as a voice recorder, Excel software, Arc GIS, and SPSS 25. Our results indicate that indigenous knowledge of local experts in Lar National Park is about the causes of plant decay in this area, germination, flowering time, experts' knowledge about the time and method of harvesting to reduce damage, and valuable therapeutic information about plants. Indigenous knowledge offers significant potential in plant conservation, especially for medicinal plants, exposed to a high risk of extinction due to widespread use. Our results highlight the importance of including local knowledge holders as active partners in biodiversity protection in the Lar region.

### INTRODUCTION

Plant species are an important part of Iran's flora and play a significant role in the composition of different plant communities. According to studies conducted around the world, approximately 250 to 500 thousand plant species are known as heterospecific plants, of which 35,000 are medicinal plants [1,2]. Iran has around 8000 plant species, of which 1810 are native [3, 4]. Iran has a large plant genetic bank, yet there is not enough information on many plants' ecological properties and use [5]. Plants in today's world serve numerous services in modern urban and local communities, such as their therapeutic role, breeding of plants using wild plants, and economic income from the sale of plants in nature or their cultivation [6]. Numerous studies have been conducted around the world using indigenous knowledge of plant

ethnography for various purposes, all of which have resulted in the preservation and recording of indigenous knowledge of local communities in the field of plants, some of which are briefly mentioned here.

Another study by [10] mentions the role of local knowledge in protecting fish and marine resources in fisheries by linking indigenous knowledge and academic information. A lot has been learned by [11] by employing traditional knowledge of ethnographic plants in the Ria Azbo region in Tigris, Ethiopia, using plants to repel insects and as pesticides, and managing disease transmission in agriculture. The indigenous knowledge of plant ethnology and medicinal species has been investigated in the northeast of Golestan [9]. According to their research findings, indigenous knowledge not only contains

information about the species' therapeutic properties but also includes essential information about the ecological characteristics of plants that may be evaluated without the need for ecological operations or spending significant time and money. Local people's traditional ecological knowledge was investigated by [12] about the medicinal properties of herbaceous plants and shrubs in the field of IgnehChai Arasbaran, and a lot was obtained about plants and how to use them. In recent years, the widespread use of medicinal plants has resulted in the improper harvesting of these plants. On the other hand, many of these medicinal plants are rare and have protective value [13]. Thus, this study investigates the effect of using indigenous plant ethnographic knowledge of local people in the Lar region.

## MATERIALS AND METHODS

### Scope of the Study

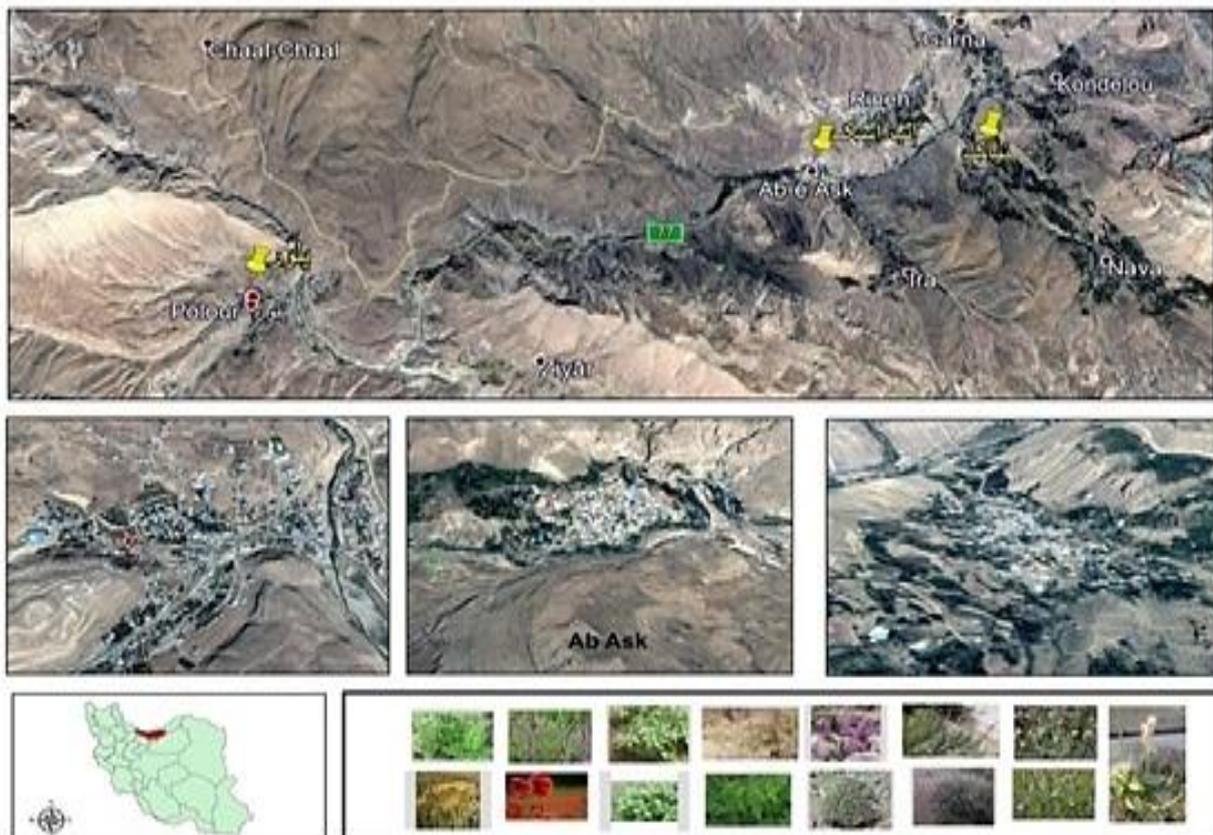
Our research area, Lar National Park (Fig. 1), is a large region with many villages, located between the two provinces of Tehran and Mazandaran; Larijan district in Mazandaran province has 15 villages: Vana, Gaznak, Kenar Anjam, Bayjan, Abgarm,

Grana, Nava, Gilas, Niak, Ab-e-Ask, Ira, Polour, Zabar, Lasem, Katl Imamzadeh Hashem.

Lar National Park is about 30000 hectares, classified as a protected area since 1976 and again as a national park in 2001.

Lar National Park, located on the western slope of Damavand Peak in Mazandaran and Tehran provinces, is an example of a mountain habitat index. The elevation is from 2500 to 4200 meters, with an average annual rainfall of 760 millimeters. The climate in the area is cold and humid.

Because the first step in bio-ethnographic (ethnobotanical) investigations is the proper understanding of the area under study, a suitable plan for field studies, interviews, and plant samples was developed following library studies and articles besides the presence in the area and the use of indigenous information. In late spring and early summer of 2019, field research was conducted in three villages: Ab-e-ask, Niak, and Polour, which were the most populated villages in the Larijan region of Lar National Park, and sampling was done. Local specialists first identified the collected plants, and their local names were recorded.



**Fig. 1** Geographical location of the study area

The vernacular information of plants and their usages were collected from well-experienced people and finally all collected plants specimens were dried and pressed.

After preparing the herbarium with reliable Iranian botanical sources, papers, and Shahid Beheshti University experts, their scientific and Persian names were determined. Because the study was qualitative, observation instruments, questionnaires, and interviews were used. To develop the questionnaire, an expert examined and updated a designed questionnaire numerous times based on the study of publications and bio-ethnological (ethnobotanical) questionnaires to produce a suitable framework.

The following two major points are included in the designed questions:

1. Pattern of traditional medicinal plants' usage
2. Concerns raised by local populations, particularly women, about plant protection

Part-time interviews and the Delphi method were utilized in the research. This strategy involved interviewing a group of local experts, ranging from 5 to 20, depending on the research type. At least 100 residences were visited to find specialists in the stated villages, and several interviews were done to identify and interview local experts. Finally, a total of 19 local experts were questioned. Because most interviewees were illiterate, the questionnaire was created in a semi-structured manner so that local experts may answer questions with more freedom of action, and the researcher guides the discussion. Finally, the data was processed and organized into tables and graphs, and audio recordings were used to record information from knowledgeable people. Some of the medicinal plants collected in the Lar protected area are presented, in following figures 2, 3, 4.



**Fig. 2** *Alcea kurdica* (Schlttdl.) Alef. using as medicinal plants is collected in the Margins of gardens in Lar protected area



**Fig. 3** *Convolvulus arvensis* L. is collected in the border of Agricultural lands



**Fig. 4** *Descurainia sophia* (L.) Webb ex Prantl is collected Mountain and hills area of Lar region

## RESULTS

Lar National Park is one of Iran's protected areas, with mountainous, high, and aquatic ecosystems. Lar National Park has no permanent residential zones (city and village). There is no community, but it is one of the main nomadic ecosystems where nomads spend the summer. Beneficiaries are divided into two categories; the first group consists of government entities, while the second consists of the private sector, which includes nomadic nomads, ranchers, and beekeepers. Through the age of folk collectors, interesting aspects in plant collection can be found in ethnic biology research. The role of the age range of collectors in maintaining biodiversity and the ability to use their native knowledge in medicinal plants was among the cases studied in this study, in three age ranges of 26-50, 51-75 years, and more than 75 years. People's ages can be a good indicator of their experience and physical competence in this sector. Among the participants, 63.1% are between the ages of 51 and 75, 31.6 % are between the ages of 26 and 50, and 5.3% are over 75. It demonstrates that this work is frequent among people aged 51 to 75, and indigenous

knowledge is prevalent among them. It also indicates that it is an experimental work that has been carried out since antiquity, and this work is becoming less common among younger generations. About 74% of plant collectors are women, and 26% are men. It shows that most plant collectors are women, and more attention should be paid to them in villages and indigenous groups to provide training on exploitation and reduce environmental harm. Women in rural areas can play an essential role in plant protection and serve as environmental educators in the family center. Harvesting from nature is not limited to perfumers and marketers of medicinal plants; everybody who understands a little about plants has begun collecting plants which these harvests harm the environment and increase the possibility of plant extinction.

Fifty-eight percent of home collectors are self-employed, 21% have freelance jobs, and the remaining 21% work in other occupations.

One of the influential factors in the protection of the biodiversity of a region by local communities is their continuous education.

The results of this research show that women, who have the highest percentage of collecting and preserving plants in the natural environment, are the most important recipients of continuous education in biodiversity conservation.

The level of education of collectors is another parameter used in the investigation. Those who collect this information have acquired it through academia or by relating to and interacting with the environment.

5.3% of participants are illiterate, 57.8% are literate, 5.3% are undergraduates, 15.8% are graduates, and 15.8% are undergraduates. People are not taught information about the harvesting and usage of plants through education, but this information is usually gained through the family, particularly by the mother. As a result, if this knowledge, obtained via experience and time, is not recorded, it will be lost over time. According to research undertaken in the Lar region, 400 plant species belonging to 48 plant families and 36 plant kinds or communities have been found. Thirty of these species have been mentioned by three or more people (although this does not mean that the species mentioned by two people are worthless, but that the knowledge about them is forgotten). Tables list the plant species and the information obtained, including the scientific

name, Persian name, local name, and distribution. The species with therapeutic characteristics were the focus of this study. Species were collected during the end of the spring and the beginning of the summer of 2019. Important information about the indigenous knowledge of the local communities of the Lar region, including the most commonly utilized sections, leaf and stem of plants, the least used parts, roots, and tubers are shown in (Table 1). Local societies may have distinct nutritional and therapeutic purposes for each plant and how to use them as decoction and spice. Plants have several parts, such as leaves, roots, stems, and so on, which serve a purpose for everyone. Its leaves are typically used in food, while its roots, such as chicory (*Cichorium intybus*), are utilized for medicinal purposes. There are several plant species in the Lar region, the majority of which, according to the findings of this study, belong to the Lamiaceae, which has six species, followed by the Composite family, the Brassicaceae family, and the Umbelliferae and Ranunculaceae families with 5, 4, 2, and 2 species, respectively. And each of the following families has one species: Hypericaceae, Plantaginaceae, Fabaceae, Polygonaceae, Malvaceae, Pteridaceae, Amaranthaceae, Allium (Amaryllidaceae), Convolvulaceae, and Ephedraceae.

According to Table 2, based on many years of experience by local experts, monitoring by environmentalists, and personal research, most plant harvests in the Lar region belong to the families Lamiaceae, Plantaginaceae, Urticaceae, Hypericaceae, and Umbelliferae.

*Thyme*, *lavender*, and other herbs are used to cure colds; chamomile, barium, chicory, and other herbs are used to treat physical pains, such as headaches and stomachaches; and thyme, mountain tea, and other herbs are used to soothe nerves. The table's most remarkable feature is that a plant like lavender is occasionally used to cure various diseases (Table 3).

Figure (2) depicts the parts utilized in each plant. All study participants use plant leaves, 52.6% flowers, 10.5% onions, 78.9% stems, and 42.1% plant roots.

**Table 1** Information about plants used in the Lar region

Scientific name	Farsi Name	Local name	Location of distribution	Number of harvest times	Parts used	Usage	Method of usage
<i>Thymus kotschyanus</i>	Avishan	khasin	Mountain	Once	Leaves and roots	The nervous system, common cold	Vapor, decoction
<i>Ziziphora clinopodioides</i>	Kakuti koohi	Palang Moshk	Mountain	Once	Leaves and roots	Flavoring for food, treatment of stomach pain, Regulation of blood pressure	boiled, brewed, Spice
<i>Anthemis nobilis</i>	Babooneh	_	Everywhere	Once	Leaves and roots	Headache, foot pain, back pain	Brewed, boiled
<i>Mentha longifolia</i>	Pouneh	Petenik	Humid/Wet place	Several times	Leaves and stems	Antibiotic, treatment of stomach ache, blood purification, diarrhea	Dry, boiled, brewed
<i>Allium ampeloprasum</i>	Tareh Koohi	Talm	Mountain of sand	Once	Leaves	Gastric lavage	Dry, spice
<i>Convolvulus arvensis</i>	Pich-e-Sahraee	Kaki mar	Agricultural lands	Several times	Leaves and stems	Cooling agent	Syrup
<i>Mentha aquatica</i>	Pouneh-e- Abi	Ooji	Near water				
<i>Ficaria viciarioides</i>	Zard-e-Morghak	_	Mountains and hills	Once	Leaves and stems	Flavoring agent for food	Spice
<i>Heracleum persicum</i>		Kool Par	Agricultural lands, plains, and gardens	Several times	Leaves and flowers	To relieve allergies, colds, diarrhea	Brewed
<i>Ferula gummosa</i>		_	Mountain	Once	Juice, extract	Pain relief, analgesia, infection treatment, wound healing	Poultice
<i>Tragopogon collinus</i>	Barijeh Sheng	_	Everywhere	Once	Leaves	Stomach clearing, flavoring food for food	Spice, raw
<i>Echium amoenum</i>	Gole gavzaban	_	Everywhere	Once	Flower	Nerve calming, common cold, pneumonia	Brewed, boiled
<i>Fumaria vaillantii</i>	Shah Tareh	_	Agricultural lands	Several times	Leaves	To relieve itching and allergies, 14treat fever	Decoction, dry
<i>Urtica dioica</i>	Gazaneh	Gazna	Agricultural lands	Several times	Leaves	Regulation of blood sugar and blood pressure	Decoction, dry
<i>Cichorium intybus</i>	Kasni	_	Agricultural lands	Once	Roots, leaves and stems	To relieve body pain (head, legs, ...), fever, treatment of fatty liver, reduce blood pressure	extract, decoction
<i>Nepeta cataria</i>	Naana	_	Agricultural lands	Several times	Leaves	Antibiotic, purifying the stomach, treating diarrhea	In the form of extract, decoction, dry

Continue (Table 1)

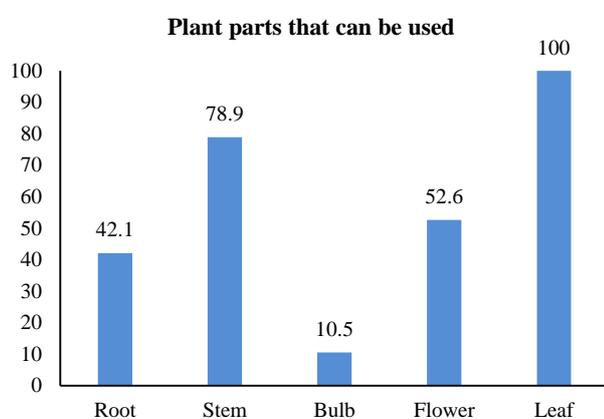
<i>Hypericum perforatum</i>	Chai-e-Koohi	Chai-e- Choopan	Mountain	Once	Leaves	Fat burner, sedative	Herbal tea
<i>Descurainia sophia</i>	Khakeshir	-	Mountains and hills	Once	Seeds	Cooling agent, treatment of constipation, tuberculosis, upset stomach and nausea, treatment of stomach ache	Syrup
<i>Plantago major</i>	Barhang	Kardi	Mountain	Once	Leaves	Pneumonia, relieve cough	Boiled, brewed
<i>Alyssum linifolium</i>	Ghodoomeh	-	Agricultural lands	Once	Leaves	Pneumonia, relieve cough	Decoction
<i>Lavandula stoechas</i>	Ostokhodoos	-	Mountains and agricultural lands	Several times	Leaves and flowers	Sedative, common cold, shortness of breath	Herbal tea, vapor, spices
<i>Glycyrrhiza glabra</i>	Shirin bayan	-	Mountain	Several times	Leaves and stems	Treatment of gastric ulcer, treatment of heartburn	Decoction, dry, extract
<i>Rumex elbursensis</i>	Torshak-e- Alborzi	Osta	Near water and humid/wet places	Several times	Leaves	Cooling agent	Syrup
<i>Portulaca oleracea</i>	Khorfeh	Felvehsar	Agricultural lands	Once	Leaves and stems	Laxative, relieve fever	Dry, decoction
<i>Rununculus arvensis</i>	Alaleh	-	Agricultural lands	Once	Sesame	Bile regulation	Boiled, decoction
<i>Alcea lenkoranica Iljin</i>	Khatmi	Gole khatmi	Margins of gardens	Once	Flower	Treatment of chest pain, treatment of fever, treatment of allergies	Boiled, decoction
<i>Adiantum capillus</i>	Parsiavashan	Siolingevas	Mountain	Once	Leaves, stems, and roots	Relieve cough	Herbal tea
<i>Nasturtium officinale</i>	Alafe cheshmeh	Ootereh	Humid/Wet places	Once	Seeds and aerial parts	Relieve pain, stomach pain, excretion of kidney stones, treatment of rheumatism	Decoction
<i>Gundelia tournefortii</i>	Kangar-e-khoaki	Kangar	Mountain	Once	Leaves, stems	Treatment of fatty liver	Spice, Decoction
<i>Amaranthus retroflexus</i>	Taj-e-ekhoros	Eshkeni	Agricultural lands	Once	Flowers and leaves	Treatment of anemia, treatment of common cold	Decoction, dry
<i>Ephedra major Host</i>	Azmak-e- rangarang	Mokhleseh-e- koohi	Mountain	Once	Leaves and stems	Treatment of stomach ache and heartburn	Extract
<i>Isatis tinctoria</i>	Vasmeh	-	Everywhere	Once	Leaves and stems	Flavoring for food	Spice
<i>Achillea millefolium</i>	Boomadaran	Shal-e-dem	Agricultural lands	Once	Flowers and leaves	Eliminates bloating, relieves constipation	Brewed, boiled

**Table 2** Plants with the highest yields

Plants with the highest yields	Family	Usage
<i>Thyme, Lavender, Ziziphora, Mint</i>	Lamiaceae	Medicinal, food
<i>Broadleaf plantain (Plantago major)</i>	Plantaginaceae	Medicinal, food
<i>Common Nettle (Urtica dioica)</i>	Urticaceae	Medicinal
<i>Perforate St John's-wort (Hypericum perforatum)</i>	Hypericaceae	Medicinal
<i>Ferula gummosa</i>	Umbelliferae	Medicinal, cosmetic

**Table 3** Plants used to treat diseases.

Plants used to treat diseases	Disorder's name
<i>Thyme, Red Feathers (Iranian echium), Lavender, Persian hogweed</i>	Common cold
<i>Roman chamomile, Ferula gummosa, Lavender, Chicory, Watercress, Ephedra, Liquorice</i>	Relieve body pain (legs, back, head, stomach)
<i>Broadleaf plantain, Alyssum linifolium, Viper's-buglosses</i>	Pneumonia
<i>Thyme Viper's-buglosses Perforate St John's-wort Lavender</i>	Nervous system disorders
<i>Few-flower fumitory, Persian hogweed</i>	Treatment of Allergies
<i>Water Mint, Mint, Wild leek, Goatsbeard (salsify), Common Purslane</i>	Laxative
<i>Common Purslane</i>	Fever treatment
<i>Redroot pigweed</i>	Treatment of anemia
<i>Common Nettle</i>	Regulation of blood sugar and blood pressure

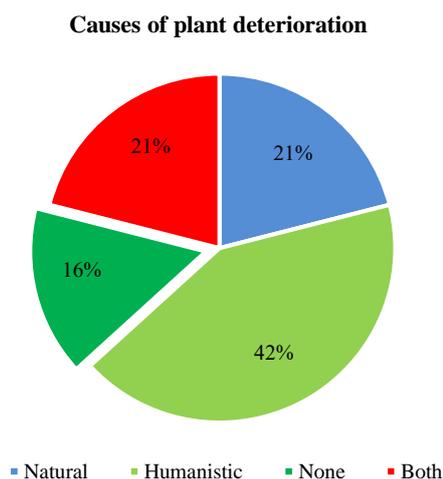
**Fig. 5** Plant parts that can be used

The fact that the percentage of root use is in the fourth place shows the level of awareness of the local community in the use of plants, as the roots of some plants are harvested and collected in a limited way for medicinal use. Chicory, Thyme, Mint, and Onion are among the plants whose roots are used by the local community.

The factors affecting plant decay in the Lar region have been divided into two categories: natural factors (reduction of rainfall, global warming, and climate change) and human factors (harvesting, tourism, and livestock grazing).

Local experts' perspectives examine the impact of natural and human factors on plant degradation (Fig. 5). The only method to address the trend of climate

change is to develop national and global initiatives to address these changes, such as reducing the use of fossil fuels and increasing the use of public transportation.

**Fig. 6** The impact of natural and human causes on plant decrease

However, in human factors, all programs, whether in education, people's participation in the conservation, or anything else, are carried out at the regional level. As shown in Figure (6), 42% of respondents thought the cause of plant decrease was humanistic, 21% thought it was natural, 21% thought both variables were a reduction component, and 16% thought neither factor was a reduction

factor. It should be noted that none of the current causes are considered the main cause of plant deterioration. These are the people who are not aware of the condition of the environment and plants. In their opinion, there has been no change in the state of the plants that they can say whether it is natural or human. Therefore, for plant conservation, it is necessary to collect information about the condition of the plants and the dangers facing plants. Then, conservation programs should be carried out in this field, and people should be encouraged to participate in these programs.

## DISCUSSION

Ethnobotanical science is concerned with the use of plants in the lives of people. Data gained from the natural life of a nation's people (about their attitude toward plants) is an essential component of the sources of information in an ethnobotanical study [14]. In a survey conducted in the Lar region, local experts were mainly housewives over forty and illiterate. It suggests that women's engagement in plant preservation should be explored (in the field of training or assistance in reproducing more harvested species). The role of women and their housewifery was addressed in a study performed by [15] in Golestan province, indicating that women participation should be taken into account in plant conservation (in the field of education or support for species reproduction). Due to the need to record indigenous knowledge, including the fact that most of this information is with the elderly [15], urban development, migration, vegetation destruction, climate change, and other factors [16], reducing the transfer of knowledge from the old generation to the new [17], has been mentioned in various studies. In a study conducted in the Lar region, the spread of urbanization, diminishing the transfer of information from old to new generations, destruction of vegetation, etc., is evident, emphasizing the need to document indigenous knowledge in this area. Traditional beliefs regarding the health benefits of medicinal plant use and the origins of these natural resources have created a solid foundation for the use of medicinal plants in Iran [18]. Studies by [19, 20, 21] all agree that most automotive medicinal plants in different places serve nearly identical oral and medicinal functions among local cultures. According to a study conducted in the Lar region, the majority of plant utilization is associated with

food and medical purposes. Plants such as chamomile and rose have been observed on rare occasions to be utilized for health and cosmetic purposes, indicating that the people of Lar are more conscious of using plants. How to use plants is one of the issues addressed in the study of indigenous plant ethnological knowledge; in the Lar region, plants are used as a decoction, raw, ointment, poultice, etc., in contrast to the study conducted by [12], which is only used in two forms of decoction. The use of plants in this study takes on more varied forms as part of the study of indigenous plant ethnological knowledge in connection with the study of plant organs.

In addition, [12], the study based in Tanzania, Kiko Yu village, and the leaves of plants are the most commonly used in the plants.

Plant leaves were shown to be more useable than other plant parts in a study conducted in the Lar region. The fact that the leaves of plants are the most extensively used part of plants in many local communities provides a valuable chance to obtain the essential skills to avoid the removal of plants from their roots among local experts and through them. Others who harvest take measures to protect the plants in these places. Indigenous knowledge includes not only the qualities and applications of medicinal plants but also the ecological properties of plants, which can aid researchers in plant conservation without the need for ecological operations or a high amount of time spent on the plot to calculate their estimated distribution. According to the findings of [22, 23], some species, such as mint, prefer moist soils and can be found near springs, valleys, and wet spots, which are consistent with the findings of our study. Furthermore, in this study, plants such as *Gundelia tournefortii*, *Adiantum capillus*, *Ferula gummosa*, *Plantago major*, and *Stachys lavandulifolia* grow along rocks and steep slopes. According to the findings of [22, 23], some species, such as mint, prefer moist soils and can be found near springs, valleys, and wet spots, which are consistent with the findings of our study. Furthermore, in this study, plants such as *Gundelia tournefortii*, *Adiantum capillus*, *Ferula gummosa*, *Plantago major*, and *Stachys lavandulifolia* grow along rocks and steep slopes. This result is consistent with the study conducted by \*\*\* () based on the fact that some

species have a wide distribution in areas inhabited by livestock.

In the Lar region, 33 species were identified, with 89 percent herbaceous and 11 percent shrubs, compared to the study conducted by [9], in the northeast of Golestan province, which was based on the medicinal use of 45 plant species, four of which were woody species and the rest were shrubs and herbs. Because of the importance of the traditional use of medicinal plants to relieve diseases and afflictions, this rich information in the treatment is vital and needed

According to the results of the ethnobotanical studies in the Lar protected area, the local communities, along with the proper use of medicinal plants in common diseases such as digestive diseases, colds, pain relief, fatty liver, kidney stones, sugar regulation, and blood pressure, can play a significant role in protecting the biological continuity of these plants.

Medicinal plants in natural places are threatened with extinction. In addition, [15, 22, 29, 30] conducted studies on the cause of livestock grazing on plant decrease and extinction. The influence of visitors on the decrease and plant extinction is noted by [30], conducted in the Cocuy-Güicán region of Colombia. Meanwhile, according to research conducted in the Lar region, in addition to uncontrolled harvesting of plants, livestock grazing, the presence of tourists, the entry of off-road vehicles, the crushing of plants, and the construction of villas, have caused habitat destruction in this region.

## CONCLUSION

Ethnobiological knowledge is traditional knowledge based on indigenous peoples' use of nature and the environment, which they have gained over the years through numerous trials and errors. Our study was performed in three villages in Lar National Park: Polour, Ab-e-ask, and Niak, which have the largest population in the Lar region. We can conclude that indigenous knowledge of local experts in Lar National Park is mainly about the causes of plant decay in this area, germination, flowering time, experts' knowledge about the time and method of harvesting to reduce damage, and valuable therapeutic information about plants. Indigenous knowledge offers significant potential in plant conservation, especially for medicinal plants,

exposed to a high risk of extinction due to widespread use.

## ACKNOWLEDGMENT

The authors would like to thank the people and indigenous experts of the Lar region for their active participation in this study and the Research Institute of Shahid Beheshti University for their contributions.

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