

Ethnobotanical Insights into Medicinal Plants Used by the Inhabitants of Ilam City for Managing Musculoskeletal Pain, Western Iran

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ABSTRACT

The use of traditional medicine and herbal remedies is deeply rooted in Iran, a country endowed with extensive biodiversity and a large variety of medicinal plant species. The present study aimed to document ethnobotanical knowledge related to medicinal plants traditionally employed for managing musculoskeletal pain (MSP) in Ilam, a city located in western Iran. A mixed-methods design incorporating both qualitative and quantitative components was adopted. Data were gathered through semi-structured interviews conducted with local herbalists and traditional healers. Plant species were identified using reputable sources, including online botanical databases, Dr. Valiollah Mozaffarian's flora of Ilam, and expert support from the Medicinal Plants Center at Ilam University of Medical Sciences. In total, 30 medicinal plant species belonging to 23 families were recorded as remedies commonly used for MSP among the inhabitants of Ilam. The most frequently cited species included *Achillea biebersteinii*, *Thymbra spicata* L., *Nigella sativa*, *Crocus haussknechtii*, *Datura innoxia* Miller, *Nerium oleander* L., *Ricinus communis*, and *Melissa officinalis*. These taxa exhibited the highest levels of traditional relevance, with a usage report (UR) of 5, a relative frequency of citation (RFC) of 0.20, and a percentage familiarity and use (PFU) of 57.6%. Overall, the findings emphasize the significant role of native medicinal flora of Ilam in the traditional management of MSP. Beyond safeguarding valuable ethnobotanical heritage, these results also highlight promising prospects for developing novel phytotherapeutic agents. Further phytochemical and pharmacological investigations will be essential to validate the therapeutic efficacy of these plants and support their potential incorporation into contemporary medical practice

Keywords: Ethnobotany, Medicinal plants, Musculoskeletal pain, Traditional medicine, Ilam Iran.

Mathematics Subject Classification: 62P12

Journal of Economic Literature (JEL) Classification: I11, O13

Introduction

Ethnobotany is the scientific study of the interactions between plants and human societies, focusing on how people recognize, utilize, and manage the medicinal and nutritional properties of plants. Beyond

safeguarding traditional knowledge, this discipline also offers valuable opportunities for the development of new pharmaceuticals and innovative plant-based applications (Saki and Pourrahim, 2025 ; Hooshmand Garehbagh, 2025). Precise identification of medicinal plants is a critical component of ethnobotanical research, as it underpins the documentation of traditional knowledge and ensures the safe and appropriate use of plant species. Moreover, accurate identification allows for rigorous scientific evaluation of their therapeutic potential and supports the development of novel pharmacological agents (Hooshmand Garehbagh, 2025 ; Dawoud and Dawoud, 2025). The medicinal use of plants dates back at least 60,000 years and remains an integral part of healthcare practices worldwide (Fabricant 2001). A 2020 reports indicates that nearly 80% of the global population relies on medicinal plants for primary health needs (Hu 2020). Despite their long-standing use and broad application, only about 6% of the approximately 400,000 flowering plant species on Earth have been scientifically evaluated for their biological activities. This significant gap underscores the importance of ethnobotanical research, which can provide valuable insights into the therapeutic potential of traditionally used plants (Hosseini 2021). Throughout Iran's history, local communities have cultivated a profound understanding of the diverse applications of plants, reflecting a deep-rooted tradition of utilizing botanical resources. Iran is a vast country with a rich diversity of plant resources, including a significant number of medicinal plants (Mosaddegh 2012). 2,300 plant species that have medicinal properties have been listed in Iran (Ghahraman 2004; Nasser 2004). Iran's diverse geography, biodiversity, and cultural richness necessitate further ethnobotanical research to uncover medicinal plant species (Mosaddegh 2012). In the past year, ethnobotanical articles have been published on various Iranian cities such as Semnan (Jalali 2024), Yazd (Minaeifar 2024), and Lorestan (Mehrnia 2024), which shows the importance of this issue.

Ilam Province is located in western Iran and within the Western Zagros Mountains (Sharifinia 2013)). This province is located between the latitudes 31°58' to 34°15' north and longitudes 45°24' to 48°10' east. Ilam, with an area of 19,086 square kilometers, has a diverse topography, with altitudes ranging from 50 meters in the southern regions to 3,060 meters in Kabir Kouh in the west. The climate of this province varies due to its rugged terrain. The south has a hot and dry climate with an average rainfall of 200 mm, while the north experiences 500 mm of rainfall and colder winters. The air temperature in northern winters sometimes drops to -15°C and in southern summers it rises to 45°C. Humidity is significant during the winter months. These diverse climates allow for the growth of various plants, such that Ilam has more than 1,000 plant species (Ghasemi 2013; Razmjoue 2024).

Several investigations have previously explored the medicinal plant resources of the Ilam region. *Achillea biebersteinii* and Asteraceae were the most commonly used plants and plant families used for back pain (Razmjoue 2024). spectacular artichoke, andole, black seed and 13 other traditional herbs were used to treat kidney stones (Ghaneialvar 2024). Rosemary, green tea, ginger, and marjoram were among the herbs used for their sedative effect (Saki 2025). Despite pain being a global public health priority characterized by an unpleasant sensory and emotional experience associated with potential tissue damage, no comprehensive study has focused specifically on musculoskeletal pain (MSP) (Raja 2020). It is estimated that approximately one-fifth of the global adult population experiences

pain(Goldberg 2011). Muscle pain, or myalgia, is usually associated with a strain or sprain and manifests as tenderness, redness, swelling, and fever(Schellack 2022). A study in Italy reported MSP as the most important reason for patients to visit the hospital(Salaffi 2005). Given that studies on pain caused by kidney stones, back, and prostate were conducted in Ilam, a study on MSP could help complete knowledge in this region(Abbasi 2024; Ghaneialvar 2024; Razmjoue 2024). The aim of this study is a descriptive-analytical and ethnobotanical assessments have focused on herbs traditionally used for managing musculoskeletal pain (MSP) in Ilam city.

1. Method

Study area

This cross-sectional ethnobotanical investigation was carried out in Ilam Province, between April and November 1402 (2024). Ilam, the provincial capital, had a population of 222,770 in 2015. It borders Kermanshah, Lorestan, Khuzestan, and Iraq. The region is historically and culturally significant, with a population speaking Kurdish and Persian. Agriculture, livestock farming, and handicrafts are key economic activities, with wheat and legumes as primary crops. Historical sites and natural attractions enhance its cultural and economic importance. The study explores indigenous plant use and conservation practices among local communities.

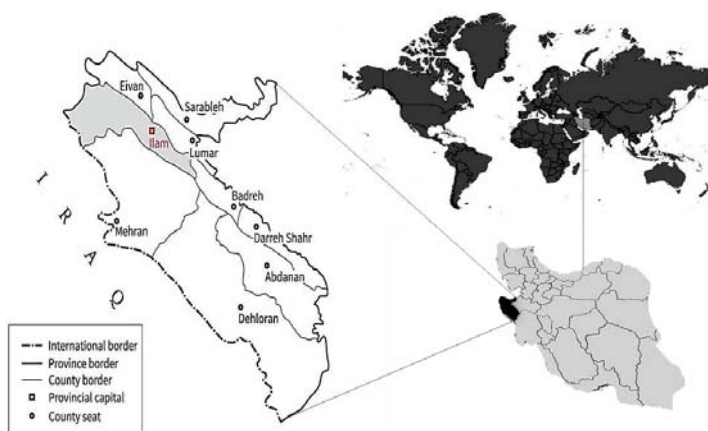


Figure 1. Map of Ilam city

Selection of villages and informants

To document traditional medicinal knowledge on herbs effective for MSP, a standardized ethnobotanical questionnaire was designed. Data collection involved field visits to herbal pharmacies in Ilam. A trained researcher conducted face-to-face interviews with local experts and members of the botanical profession. The complete list of herbal vendors was Collected from the Food and Drugs deputy of Ilam. The questionnaire recorded personal details, native plant names, preparation methods, plant parts used, routes of administration, and perceived therapeutic effects.

Plant authentication

To identify medicinal plants, field surveys were conducted across urban, rural, and nomadic regions, during which traditional knowledge was directly collected from local informants. Following data collection, plant species were verified using the reputable online database The Plant List, the *Flora of Ilam* authored by Dr. Valiollah Mozaffarian, and with assistance from the Medicinal Plants Center at Ilam University of Medical Sciences.

For data analysis, quantitative indices including the Use Report (UR), Relative Frequency of Citation (RFC), and Informant Consensus Factor (ICF) were employed, and statistical analyses were performed using SPSS software. The UR index reflects the total number of usage reports for each species, while RFC measures the relative significance of each plant based on the number of informants mentioning it, calculated as $RFC = FC / N$, where FC represents the number of informants citing a species, and N denotes the total number of participants. The ICF, calculated as $ICF = (N - n) / (N - 1)$, quantifies the degree of agreement among different sources regarding the use of medicinal plants. Together, these indices enable researchers to identify the most culturally and therapeutically significant species for further pharmacological and clinical investigation.

This study focused on documenting traditional knowledge of plants used to alleviate musculoskeletal pain (MSP). By systematically recording and analyzing local expertise, the research not only contributes to the preservation of indigenous medicinal knowledge but also provides a robust foundation for future pharmacological studies. Ultimately, the findings highlight key species with high therapeutic potential, guiding subsequent scientific exploration and facilitating the integration of traditional wisdom into modern medicine.

2. Result

After collecting the data, 25 acceptable questionnaires were obtained. Characteristics data of herbalists are recorded in table 1. The age range was 26 – 55 years. Most of the herbalists were less than 40 years old.

Table 1: Demographic characteristics of herbalists

characteristics		Abundance	Relative abundance
Gender	Male	13	52%
	female	12	48%
Education	Diploma	5	20%
	Associate Degree	2	8%
	Bachelor's degree	15	60%
	Master's degree	3	12%
Age group	20-40	17	68%
	41-60	8	32%
Language	Kurdish	15	60%
	Lor	5	20%
	Persian	5	20%

After analyzing the collected data, the botanical information of herbs effective on MSP in Ilam is shown in Table 2. 30 different plants from 23 different families were used for this purpose in Ilam.

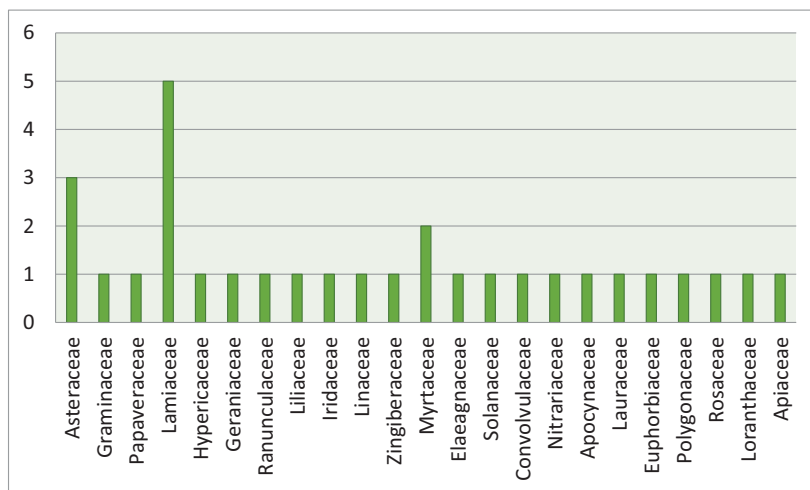


Figure 2. Distribution of plant families affecting MSP in Ilam

The most commonly used families were Lamiaceae, Asteraceae and Myrtaceae, respectively (figure 2). Boiled and brewed were the most common methods of use (figure 3). Mostly, aerial parts and leaves of plants were used (figure 4).

Table 2. Medicinal plants effective on MSP in Ilam city

Plant name	Scientific name	Plant family	Main compound	Traditional method of using	Organ used
Boumadaran	<i>Achillea biebersteinii</i>	Asteraceae		Decoction	Aerial organs
oat	<i>Avena sativa</i>	Graminaceae		Decoction	Aerial organs
Khashkhash	<i>Papaver macrostomum</i>	Papaveraceae		Poultice	Aerial organs
Avishanak	<i>Thymbra spicata</i> L.	Lamiaceae		Decoction and brewed	Aerial organs
Goleraei zagrosi	<i>Hypericum helianthemoides</i>	Hypericaceae		Decoction	Leaf and flower
Adamak	<i>Biebersteinia multifida</i>	Geraniaceae		Decoction and brewed	Aerial organs
Siah daneh	<i>Nigella Sativa</i>	Ranunculaceae		Oil and decoction	Seed
Rosemary	<i>Salvia rosmarinus</i>	Lamiaceae		Decoction and brewed	Leaf
aloevera	<i>Aloe vera</i>	Liliaceae		Extract	Leaf
Hamishe bahar	<i>Calendula persica</i>	Asteraceae		brewed	Aerial organs
Joo ghasem	<i>Crocus haussknechtii</i>	Iridaceae		brewed	Aerial organs
Katan	<i>Linum usitatissimum</i>	Linaceae		Fresh fruit and brewed	Seed
ginger	<i>Zingiber officinale</i>	Zingiberaceae		Decoction	Root

lavender	Lavandula angustifolia	Lamiaceae		Decoction	Aerial organs
Eucalyptus	Eucalyptus camaldulensis	Myrtaceae		Decoction	Leaf
Sanjed, Pestanak	Elaeagnus angustifolia	Elaeagnaceae		Fresh fruit and brewed	Fruit
Datoureh	Datura innoxia Miller	Solanaceae		brewed	Aerial organs
Shenge abbipshmalou	Leontodon lanatus (L.) Fisch	Asteraceae		brewed	Aerial organs
Pichake sahraei	Convolvulus arvensis L	Convolvulaceae		brewed	Leaf and flower
Kakouti sarsan	Ziziphora capitata	Lamiaceae		Decoction	Aerial organs
Espan	Peganum harmala	Nitrariaceae		Poultice and decoction	Seed and Leaf
Oleander	Nerium oleander L.	Apocynaceae		Poultice	Leaf and flower
Mourd	Myrtus Communis	Myrtaceae		Decoction	Fruit and Leaf
Cinnamon	Cinnamomum verum	Lauraceae		Decoction and brewed	Shell
Karchak	Ricinus communis	Euphorbiaceae		Oil	Fruit
Haftband	Polygonum persicaria	Polygonaceae		Poultice	Aerial organs
Siahtangers	Amygdalus lycioides spach	Rosaceae		Poultice	Aerial organs
Mokhor	Loranthus europaeus Jacq.	Loranthaceae		Poultice	Leaf and fruit
badranjbouyeh	Melissa Officinalis	Lamiaceae		Decoction	Aerial organs
Laelekohestan	Oliveria decumbens Vent	Apiaceae		Decoction	Flower and flowering branch

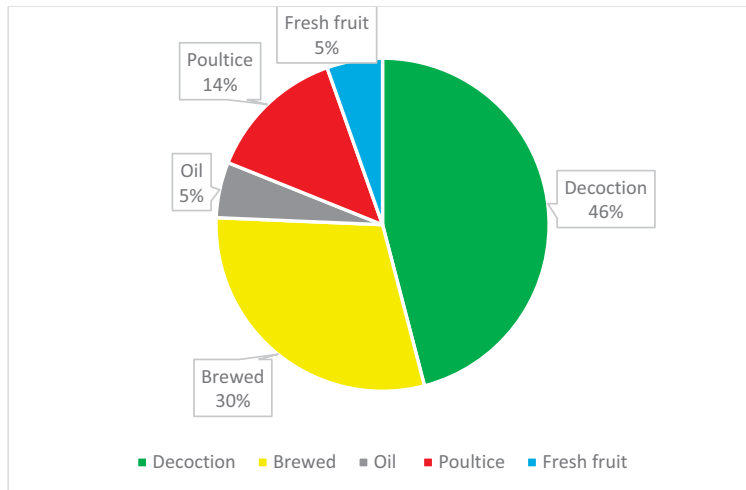


Figure 3. The percentage of the method of use of plant parts effective on MSP in Ilam

Table 3 shows the quantitative analysis to determine the most important traditional plant effective in MSP. *Achillea biebersteinii*, *Thymbra spicata* L., *Nigella Sativa*, *Crocus haussknechtii*, *Datura innoxia*

Miller, *Nerium oleander* L., *Ricinus communis* and *Melissa Officinalis* were identified as the most important plants. PFU, RFC and UR for all these plants were 57.6%, 0.20 and 5, respectively.

Table 3. Percentage of frequency of use, Relative frequency of citation and usage report index of studied plants

Scientific name	Percentage of frequency of use	Relative frequency of citation	Usage report index
<i>Achillea biebersteinii</i>	57.6 %	0.20	5
<i>Avena sativa</i>	15.3 %	0.28	7
<i>Papaver macrostomum</i>	19.2 %	0.16	4
<i>Thymbra spicata</i> L.	57.6 %	0.20	5
<i>Hypericum helianthemoides</i>	15.3 %	0.28	7
<i>Biebersteinia multifida</i>	34.6 %	0.24	6
<i>Nigella Sativa</i>	57.6 %	0.20	5
<i>Salvia rosmarinus</i>	34.6 %	0.16	4
<i>Aloe vera</i>	15.3 %	0.28	7
<i>Calendula persica</i>	15.3 %	0.28	7
<i>Crocus haussknechtii</i>	57.6 %	0.20	5
<i>Linum usitatissimum</i>	42.3 %	0.48	12
<i>Zingiber officinale</i>	34.6 %	0.24	6
<i>Lavandula angustifolia</i>	19.2 %	0.16	4
<i>Eucalyptus camaldulensis</i>	19.2 %	0.16	4
<i>Elaeagnus angustifolia</i>	19.2 %	0.16	4
<i>Datura innoxia</i> Miller	57.6 %	0.20	5
<i>Leontodon lanatus</i> (L.) Fisch	19.2 %	0.16	4
<i>Convolvulus arvensis</i> L	34.6 %	0.24	6
<i>Ziziphora capitata</i>	57.6 %	0.20	5
<i>Peganum harmala</i>	34.6 %	0.24	6
<i>Nerium oleander</i> L.	57.6 %	0.20	5
<i>Myrtus Communis</i>	15.3 %	0.28	7
<i>Cinnamomum verum</i>	19.2 %	0.16	4
<i>Ricinus communis</i>	57.6 %	0.20	5
<i>Polygonum persicaria</i>	19.2 %	0.16	4
<i>Amygdalus lycioides</i> spach	15.3 %	0.28	7
<i>Loranthus europaeus</i> Jacq.	19.2 %	0.16	4
<i>Melissa Officinalis</i>	57.6 %	0.20	5
<i>Oliveria decumbens</i> Vent	19.2 %	0.16	4

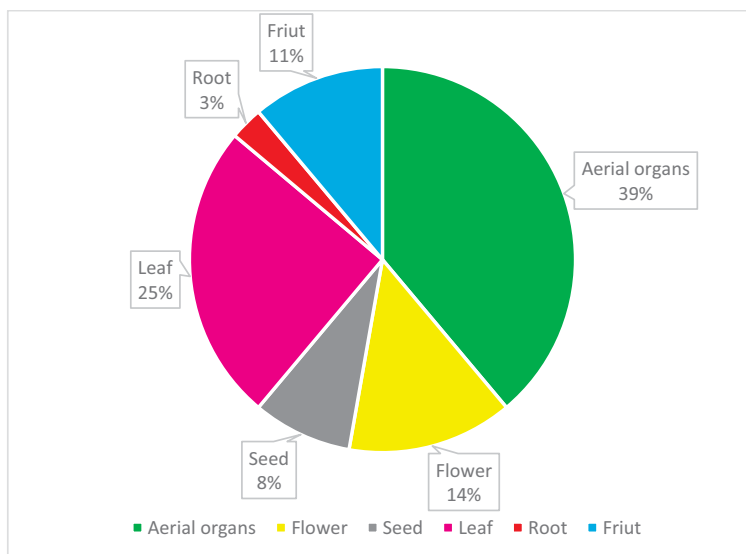


Figure 4. The percentage of use of plant organs effective on MSP in Ilam

3. Discussion

In recent years, adverse effects of chemicals have been recognized, and measures have been implemented to address this issue. As a result, even in advanced nations, individuals continue to depend on the traditional healthcare system, not only due to its affordability but also because it tends to have fewer side effects compared to contemporary allopathic medicine (Dolatkhahi 2014).

Lamiaceae was identified as the most effective family in treating MSP in Ilam. Lamiaceae is also known to be the most important plant family in the Hezar Mountains in southeastern Iran (Rajaei 2012). Fever, blood pressure, heart pain, colds, and skin swelling were among their uses. *Ziziphora tenuir* and *Ziziphora clinopodioides* Lam. have muscle relaxant effects and can be effective in reducing pain. According to our study, *Thymbra spicata* L., *Salvia rosmarinus*, *Lavandula angustifolia*, *Ziziphora capitata*, and *Melissa Officinalis* from this family are effective in relieving MSP. *Thymbra spicata* L. is found in many regions of the world, especially in the Mediterranean region, and has been used to alleviate headaches, toothaches, colds, and asthma (Golmakani 2008; Gedikoğlu 2019). *Salvia rosmarinus*, or as it is more commonly known, Rosemary, has antioxidant and anti-inflammatory properties (de Macedo 2020). In addition to MSP, its use has also been reported in disorders related to the nervous, cardiovascular, gastrointestinal systems (Begum 2013). According to a review article, most articles on the use of *Lavandula angustifolia* or lavender in complementary therapies for adults were from Iran, indicating the importance of this plant in this country. The analgesic and anxiety-reducing properties of this plant have been highly regarded (Silva 2023). There are 4 species of the genus *Ziziphora* L. in Iran (Modiri 2013). *Ziziphora* L. has been widely used in Mashhad, especially for kidney pain, diarrhea, and antacids (Amiri 2013). In West Azerbaijan, they have been used as an anti-cough agent (Azizi 2015). In Ilam, in addition to its muscle pain-relieving properties, *Ziziphora capitata* L. is also used as a spice and culinary (Ghasemi 2013). *Melissa Officinalis* has been of particular interest in traditional medicine in Europe and Iran since the past (Shakeri 2016). This plant has been used for many

purposes, including pain (Petrisor 2022). In the city of Bushehr, Iran, this plant is used as a sedative (Dolatkhahi 2012).

The second most common plant family in this study was Asteraceae. This family is the most common traditional herbal family used among Kurdish tribes, reported in the cities of Abadan and Dehloran (Ghasemi 2013). 13 different species of this family have been identified and consumed by people in Fars. *Calendula persica* was common between our article and Fars, of course, where it is used to treat skin diseases (Dolatkhahi 2014). *Achillea biebersteinii* and *Leontodon lanatus* (L.) Fisch were two other species found in this region. *Achillea biebersteinii*, which was one of the most important plants, has also been used for back pain (Razmjoue 2024). This plant is used in Golestan for cramps and spasms (Radulović 2012).

Another plant family in the study was Myrtaceae. Myrtaceae is the eighth largest flowering plant family in the world and has great ecological and economic importance worldwide (Saber 2024). From the this family, *Eucalyptus camaldulensis* and *Myrtus communis* were used in Ilam to alleviate MSP. *Eucalyptus* has been used in Iran for sinusitis, antidiabetic, cold, and headache. *Myrtus Communis* has been used in relieving muscle pain as well as in epilepsy, rheumatoid arthritis, eczema, tuberculosis, psoriasis, and many other disorders (Mosaddegh 2012; Nadaf 2023).

Nigella sativa, which was one of the important plants identified, is native to Southwest Asia, large areas of North Africa, the Indian subcontinent and the Eastern Mediterranean (Mousavi 2024). Its traditional use has been reported for musculoskeletal and joint pain (Mahboubi 2018).

Crocus haussknechtii is a wild saffron species indigenous to the Zagros Mountains, spanning regions of Iran, northern Iraq, and southern Jordan (Anastasaki 2009). The antioxidant and antibacterial properties of this plant have been noted in the past (Mosaviniya 2019).

Amygdalus communis L., *Biebersteinia multifida*, *Hypericum helianthemoides*, *Zingiber officinale*, *Elaeagnus angustifolia*, *Nerium oleander*, *Ricinus communis* have been used to treat prostate problems and back pain in Ilam. This study proved that these plants can also be used to treat MSP (Abbasi 2024; Razmjoue 2024).

Datura innoxia Miller was one of the plants identified in Ilam, which has also been used in Kohgiluyeh and Boyer Ahmad to alleviate muscle pain (Mosaddegh 2012).

This study faces several limitations. The lack of cooperation of some herbalists may introduce bias, despite efforts to achieve reliable results through standardized questionnaires. In addition, interview selection bias and seasonal variations in plant availability can affect the completeness of the data and may lead to an underestimation of the diversity of herbal plant uses in the region.

4. Conclusion

This study showed that Ilam has a high level of use of medicinal plants for MSP. The research results confirm the richness of the region's ethnobotanical knowledge. Plants such as *Achillea biebersteinii*, *Thymra spicata*, *Nigella sativa*, *Crocus haussknechtii*, *Datura innoxia*, *Nerium oleander*, *Ricinus communis*, and *Melissa officinalis* are effective in relieving these pains. The preservation of this valuable

heritage, along with phytochemical and pharmacological research, paves the way for the development of novel herbal medicines. Expanding ethnobotanical studies and conducting clinical research will accelerate the industrialization of this knowledge and the commercialization of natural medicines.

Conflicts of interest

The authors declare that they have no conflict of interest.

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