

Ethnobotanical Study of Medicinal Plants Used in Ilam City in Western Iran with Anti-Headache Application

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Abstract

Headaches are one of the main causes of disability worldwide and have a negative impact on various aspects of people's lives. Considering inadequate advances in pain management, this ethnobotanical research was carried out to identify medicinal plants for the treatment of headaches within the city of Ilam in western part of Iran. For this purpose, the questionnaires were first distributed to the traditional healers of the city of Ilam, and the regional traditional medical information was collected. The data was analyzed quantitatively and qualitatively. Results showed that medicinal plants including *Seidlitzia rosmarinus* Boiss., *Melissa officinalis* L., *Dianthus orientalis* Adams, *Prunus haussknechtii* C.K.Schneid., *Isatis raphanifolia* Boiss, *Cannabis sativa* L., *Cichorium intybus* L., and *Prunus lycioides* (Spach) C.K.Schneid. were used for treating headache in this region. The most used plant family was the Rosaceae family. The aerial part was the most used part (37%) and decoction was the most traditional method of use. Although some of the plants mentioned are used worldwide to treat headaches, this study recommends using *Seidlitzia rosmarinus* and *Melissa officinalis* as analgesic. The identification, isolation, purification, and other pharmaceutical analyses of the biochemical compounds of these plants pave the way for new pharmacological treatments.

Keywords: Medicinal plants; Remedy; Ethnobotany; Headache; Ilam

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Introduction

Headache is a major cause of disability worldwide, according to "Global Campaign against Headache", a subsection of the World Health Organization (WHO) [1]. Also, headache is not a fatal nor permanent disability, but its occasional incidence has been giving rise to widespread issues. Headache has a profound negative impact on the quality of life, social life, family life, and financial costs of patients and the society [2]. According to the International Classification of Headache Disorders (ICHD), headaches are classified into primary and secondary disorders and neuropathies. Primary headaches include migraine, tension-type headache and trigeminal autonomic cephalalgias. On the other hand, secondary headaches result from underlying medical conditions such as trauma, infection, facial structural disorders [3] or medication-overuse headache [1,3]. Neuropathies are painful lesions of the cranial nerves of the face region [3].

The first step of headache treatment is to distinguish its cause. Lifestyle modification, patient education, and pharmacologic treatments are amongst the therapeutic approaches in headache. Main medicines to manage headaches include acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), anti-emetics, and migraine-specific medications. These medications are used to reduce attack frequency and severity of the headache. These medications have been more or less effective in managing headaches; however, there are some limitations for their administration. Rebound headache (because of headache-medication-overuse), side effects, and contraindications in some patients [4] are important factors, which result in searching for alternative treatments. Considering medicinal plant's potential, they can pave the way for managing headaches.

Ethnopharmacological studies focus on examining the traditional use of medicinal plants across different communities, evaluating their therapeutic effects from both scientific and empirical perspectives [4]. This field of study emphasizes the connection between indigenous knowledge and modern scientific evidence, aiming to identify and validate the medicinal properties of plants. Given the rich cultural and botanical diversity of Iran, such research can contribute to discovering innovative therapeutic approaches [4].

Medicinal plants have long been used as natural remedies for various types of headaches, such as tension, migraine, and sinus headaches. Many of these plants contain bioactive compounds that can alleviate pain, reduce inflammation, and promote relaxation. Specifically, calming herbs can help reduce stress-related headaches; while the oils from certain plants can aid in relieving tension headaches by improving blood circulation and reducing muscle contractions [4].

In this study, we aim to achieve two objectives: first,

to introduce novel native medicinal plants traditionally used to treat headaches, and second, to highlight the active biological compounds in well-known plants that have demonstrated analgesic properties.

Methods

Studied region

Ilam province is located in the southwest of Iran between $31^{\circ}58''$ and $34^{\circ}15''$ north latitude, $45^{\circ}24''$ and $48^{\circ}10''$ east longitude, covering 20,133 square kilometers (Figure 1).



Figure 1. Geography coordinates of the studied region

Geographical features of the studied area

Ilam province is bordered by the country of Iraq to the west and adjoins Iranian cities in other geographical directions (Khuzestan province to the south, Lorestan province to the east, and Kermanshah province to the north). Ilam city is the capital of Ilam province. The maximum altitude is 2,775 meters and the minimum altitude is 36 meters.

Study design

This study is a cross-sectional ethnobotanical survey. The inclusion criterion of the study was having a traditional herbal shop in Ilam city. This study was conducted using a standard questionnaire, between March to October 2023. The questionnaire was distributed to all traditional herbal shops in Ilam City (the list of traditional herbal shops was prepared by the Deputy of Food and Drug Administration of Ilam province under the supervision of the Ministry of Health and Medical Education). The questionnaire consisted of two parts. The first part included demographic information about the owners of traditional herbal shops (the traditional healers). The second part contained

the names and parts of the plants and the methods by which each part was used to treat headaches. Considering the various chemicals present in different parts of a plant, understanding which part is used and the extraction methods employed significantly influences the results. Subsequently, the data were analyzed.

Statistical analysis

The data extracted from the questionnaires were transferred to an Excel file and analyzed in order to select the most important species of medicinal plants. Two indexes were calculated for each plant: the usage report index (UR) and the relative frequency of citation (RFC). The UR index was the total number of usage reports for mentioned plants. The RFC index was a qualitative index of the relative frequency of usage indication, which was calculated for the relative importance of the mentioned plants. The RFC index was obtained by the following formula: $RFC = FC / N$. In this formula, FC is the number of interviewees who mentioned a specific species and N is the total number of traditional healers who were interviewed. The RFC index varies from zero (when no local traditional healer has stated the application for the plant) to one (the most locally important among the traditional healers).

Ethical considerations

This study was approved by the ethics committee of the School of Medicine, Ilam University of Medical Sciences (Ilam, Iran; Ethical code: IR.MEDILAM.REC 1401.069).

Informed consent was obtained from all interviewees participating in the study. The demographic information of traditional healers has been confidential.

Results

Demographic information of traditional healers

The data was collected from all local traditional healers, which had a vast knowledge of medicinal plants. A total of 25 traditional healers between the ages of 20 and 60 years old were interviewed. Half of them had a bachelor's degree. Most of them were speaking Kurdish language. The demographical information of these traditional healers is shown in table 1.

Ethnobotanical information of research

Ethnobotanical information, including scientific name, family name, common name, Persian name, plant parts used and the methods are shown in table 2. Two of them *Prunus haussknechtii* and *Prunus lycioides* (Spach) C.K.Schneid. are from Rosaceae family. Aerial parts were the most useful parts to manage headaches in the studied plants. In this study, "decoction" was the most widely used method. It seems that,

Table 1. Demographical information of local traditional healers

Characteristics	Groups	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 (years old)	20-40	17	68%
	41-60	8	32%
Age	The youngest	26	
	The oldest	55	
Language	Kurdish	15	60%
	Lori	5	20%
	Persian	5	20%

over time, the locals have considered this method to be one of the most effective ways of extracting the active substances from these plants.

Qualitative analyses of usage frequency

In this study, the most useful plant to manage headache was *Cannabis sativa* L. seeds (57.6 %), following by *Prunus* species, *Dianthus orientalis* Adams and *Isatis raphanifolia* Boiss. (34.6 %) (Table 3).

In the present study, the aerial parts were the most used in all of the studied plants (37%), followed by leaves (27%). The least parts used were fruit, seeds, flowers, and floral buds all for 9% (Graph 2).

In this study, "decoction" was the most widely used method and oil and fresh methods were the least used methods (both of them for 11%) (Graph 3).

Discussion

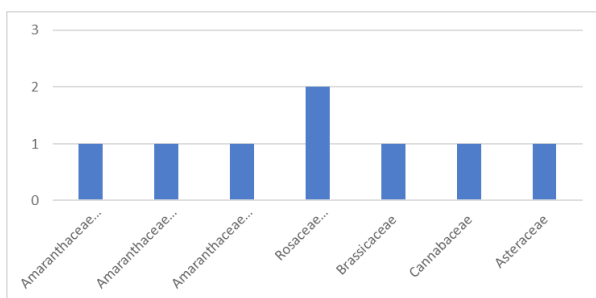
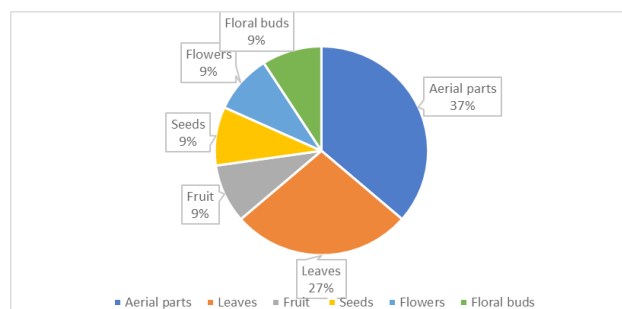
This study reports some medicinal plants that are used for managing headaches by the local population of Ilam province, Iran. Since this information has been passed down verbally between generations, it is important to be documented to be used for further evidence-based studies and treatment of diseases. All people are likely to experience headaches during their lifetime. Although headaches are classified into primary and secondary disorders and neuropathies [3] but in this study, headache is considered as an overall term.

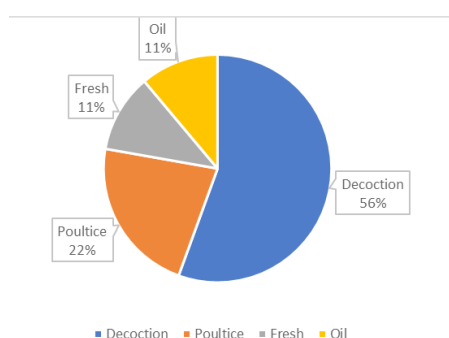
Table 2. Ethnobotanical information of the studied plants

Scientific name	Family	Common name	Persian name	Part used of plant	Using method
<i>Seidlitzia rosmarinus</i> Boiss	Amaranthaceae	Seidlitzia	Oshnan	Aerial parts	Decoction
<i>Melissa officinalis</i> L.	Lamiaceae	Lemon balm	Badranjboye	Leaves	Decoction
<i>Dianthus orientalis</i> Adams	Caryophyllaceae	Eastern Dianthus	Gherenghel sharghi	Dried buds, leaves and flowers	Plant poultice
<i>Prunus haussknechtii</i> C.K.Schneid	Rosaceae	Wild almond	Badam	Fruit and leaves	Fresh, oil, decoction
<i>Isatis raphanifolia</i> Boiss	Brassicaceae	Dyer's woad	Isatis bargradish	Aerial parts	Decoction
<i>Cannabis sativa</i> L.	Cannabaceae	Hemp	Shahdane	Seeds	Decoction
<i>Cichorium intybus</i> L.	Asteraceae	Chicory	Kasni	Aerial parts	Decoction
<i>Prunus lycioides</i> (Spach) C.K.Schneid.	Rosaceae	Lycioides Almond	Badam Talkh kuhi	Aerial parts	Plant poultice

Table 3. Qualitative analyses of usage frequency including UR and RFC indexes

Scientific name of plants	Percentage of usage frequency	RCF	UR
<i>Seidlitzia Rosmarinus</i> Boiss.	15.3 %	0.153	4
<i>Melissa officinalis</i> L.	19.2 %	0.192	5
<i>Dianthus orientalis</i> Adams	34.6 %	0.346	9
<i>Prunus haussknechtii</i> C.K.Schneid.	34.6 %	0.346	9
<i>Isatis raphanifolia</i> Boiss.	34.6 %	0.346	6
<i>Cannabis sativa</i> L.	57.6 %	0.576	5
<i>Cichorium intybus</i> L.	15.3 %	0.153	7
<i>Prunus lycioides</i> (Spach) C.K.Schneid.	30.7 %	0.307	8

**Graph 1.** Distribution of the plants' family**Graph 2.** Distribution of plant parts



Graph 3. The distribution of methods used for plant consumption

Considering the importance of headaches in reducing the quality of life and the lack of assertive effect of other treatments, alternative approaches including medicinal plants may be a solution. In this study, the use of eight medicinal plants (*Seidlitzia rosmarinus*, *Melissa officinalis*, *Dianthus orientalis* Adams, *Prunus haussknechtii*, *Isatis raphanifolia* Boiss, *Cannabis sativa*, *Cichorium intybus* and *Prunus lycioides*) for the treatment of headache is reported.

Seidlitzia rosmarinus has been used to treat headaches, itching, and bruises by northern Iranians [5]. In line with these narrative medicinal applications, a phytochemical study showed a very high amount of saponin ginsenosides (Rg1) in aqueous solvent [6], which have shown anti-inflammatory, antioxidant and antitumor properties [7,8]. The role of inflammation as one of the prominent factors in the occurrence of headaches has been proven before [9,10]. Also, cytotoxicity is a vital factor in introducing new medications. In previous research the antitumor activity of *S. Rosmarinus* was studied. This study compared the cytotoxicity of different solvents of *S. rosmarinus* on HeLa cell lines. All of them were considered good cytotoxic agents, except for the aqueous extract [11]. In the present study, the decoction of the aerial part of *S. rosmarinus* has been used to manage headache symptoms by Ilamian local population.

In the present study, Ilamian traditional healers mentioned that the leaves of *M. officinalis* could manage headache pain. In addition, it has been used to treat headaches, toothache, and fever worldwide [12]. *M. officinalis*'s leaves contain various phytochemicals, which have proven to ameliorate various illnesses, including the relief of headaches in practice [13,14]. In this regard, various solvents, including menthol [15,16], carvacrol [17], camphor [18], eucalyptol [19], and thymol [20] have been used. Considering these compounds, it can be a potential medication to treat headaches.

Present study showed that the poultice of *D. orientalis* aerial parts could heal headaches. A previous

study compared *D. orientalis* leaves aqueous extract with paracetamol. It showed antioxidant capacity at various dosages compared to paracetamol [21], which supports our findings. Also, phytochemicals of aerial parts (leaves and flowers) crude extracts were investigated in a study. It showed this plant mainly contained saponins, flavonoids, alkaloids, and phenolic compounds. These chemicals have been proven to relieve pain [22]. In addition, other studies reported no adverse clinical signs or mortality related to *D. orientalis* [8,23,24].

Previous studies on the phytochemical analysis of the leaf extract of *P. haussknechtii* showed that this plant was rich in phenolic (gallic acid) and flavonoid content and represents a natural antioxidant [25-28], which could heal the pain. In the present study, traditional healers reported that the leaves and fruits of this plant have been used to manage headaches. In the context of toxicology, a previous study analyzed the resin of the *P. haussknechtii* tree trunk. It showed that considering the agro-climate features of the growing area, the gum trunk may contain toxic metals (including lead, chromium, and nickel) and essential metals (including copper, zinc, and iron) [29]. In this study, the extracts of *Alhagi maurorum* and *Prunus haussknechtii* were evaluated for their anticancer effects on 4T1 breast cancer cells. The results showed that *A. maurorum* exhibited a synergistic effect with docetaxel, inhibiting cell growth and inducing apoptosis. However, *P. haussknechtii* demonstrated acceptable antitumor activity, but did not show a synergistic effect when combined with docetaxel. These combinations may serve as valuable options for complementary and alternative cancer therapies [29].

Since metal toxicity can be an important limitation in producing pharmaceuticals, quantification of these metals is important in subsequent studies.

Isatis raphanifolia has been used to treat asthma and stinking cold historically in other parts of Iran [30]. Treating asthma as an inflammatory disease can indicate that *I. raphanifolia* may have anti-inflammatory effects. To our knowledge, there is no previous study on the phytochemicals of *I. raphanifolia*.

Cannabis sativa is known to have various effects other than analgesic properties for centuries [31,32]. It contains various phytochemicals including tetrahydrocannabinol [33], cannabidiol [34,35], D-limonene [36], dronabinol [37], moupinamide [38] and guaiacol [39] with proven analgesic effects in clinical studies [31,40,41]. Previous studies have shown side effects following consuming this plant, including psychiatric disorders, disorientation, dissociation, euphoria, hallucinations, and development of dependence [42]. These findings affect further studies on this plant.

Cichorium intybus has been used to treat inflammatory diseases such as diabetes, cancer and arthritis rheu-

matoid [43,44]. Phytochemical analysis showed that aerial parts of *C. intybus* contains several compounds with anti-inflammatory effects, including sesquiterpene lactones [45], chiroric acid [46,47], and chlorogenic acid [48].

Prunus lycioides has been used to treat diabetes, dyslipidemia, pain, colds, and asthma in Iran since old times [49,50]. Phytochemical analysis of aerial parts showed that quercetin 3-O-rhamnoside [51,52], kaempferol 3-O-rhamnoside [53,54], apigenin [55,56], and naringenin [57,58] had anti-inflammatory effects. As it was mentioned, drugs with anti-inflammatory activity usually have anti-headache properties. The anti-inflammatory activities of a lot of other plants [59,60] have been proven. Hence, the antiheadache properties of these plants are worth examining.

Limitations and future research suggestions

Our study has some limitations, as well. We reported plant usage only in the Ilam province, which caused an average sample population. Also, our data may be influenced by the self-experience of perfumeries. In addition, the lack of previous pharmacological data for some plants prevented detailed evaluation of therapeutic and toxic doses of the mentioned plants, the therapeutic window, and possible side effects and interactions with other drugs and foods.

Conclusion

Our study proposes *Seidlitzia rosmarinus* Boiss. and *Melissa officinalis* L. for future studies on headache. Also, Further studies on the pharmacological action of these plants' main phytochemicals, their toxicity profile and possible interactions are recommended.

Conflict of Interests

None.

Acknowledgements

None.

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