



Topical herbal remedies for treatment of joint pain according to Iranian Traditional Medicine

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Abstract

Joint pain is one of the most common complaints with many possible causes. Some medicines used for joint pain relief such as NSAIDs have substantial and frequent side effects. Topical route possibly reduces adverse reactions by maximizing local delivery and minimizing systemic toxicity. Throughout history, plants have been the most important sources of medicines for human health and Iranian Traditional Medicine (ITM) is well known for its extensive use of herbal medicines to treat diseases accompanied with joint pain for centuries. In the present study, the plants used topically for relieving joint pain in ITM were searched. Moreover, their pharmacological effectiveness in modern medicine was reviewed. The terms “*Waja mafasil*” (joint pain), “*Waja-ol-mafasil*” (joint pain), “*Irq-on-nasa*” (sciatica), “*Waja-ol-warik*” (coxalgia), “*Waja-ol-zahr*” (back pain), “*Waja-ol-rakbah*” (knee pain) and “*Niqris*” (gout) were searched in three important Iranian traditional books including “*Canon*”, “*Al-Hawi*” and “*Tohfah al-mu'minin*” and topical preparations introduced as “*Tela*” and “*Zemad*” were selected. The scientific literatures were searched for their effectiveness related to the analgesic and anti-inflammatory activities. Thirty five plants were selected on the basis of their topical use to relieve joint pain. Among these plants, 22 species have been found to exhibit anti-inflammatory and analgesic activities.

Keywords: herbal remedies, Iranian Traditional Medicine, joint pain, remedy, topical

Introduction

Musculoskeletal complaints are major health concerns around the world and topical analgesics such as non-steroidal anti-inflammatory drugs (NSAIDs) and local anesthetics are used to relieve pain in muscles, joints and tendons [1]; however, NSAIDs are associated with significant

risk of serious gastrointestinal adverse events in chronic use [2] and local anesthetics may cause cardiovascular, CNS toxicity and allergic reactions [3]. Iranian Traditional Medicine (ITM) is one of the most credible and well known medical systems that include experiences and

lessons taught by Iranian leading philosophers and their disciples [4]. In ITM, joint pain is an important disorder, which can occur in different situations. Iranian physicians have introduced many herbal drugs for treating different types of joint pain.

There are several references in ITM for finding effective medicinal plants which were used in joint pain, three of which are “*Al-Hawi*”, “*Canon*” and “*Tohfah al-Mu'minin*”.

The book “*Al-Hawi*” was written by Rhazes (865-925 AD) who is also known as Razi. His major contribution to medicine, *Al-Hawi*, is a masterpiece which comprised abstracts from preceding authors respecting various diseases and therapies and has also recorded clinical cases of his own experience [5].

“*Canon*” that was written by Avicenna (980-1037 AD) became the reference of medicine for almost six centuries. The second volume of “*Canon*” is referred to the usage of medicinal plants [6]. In the third volume, under a section named “*visible peripheral diseases*”, disorders accompanied with joint pain have been described and various related medications and pain relievers have been prescribed.

The book “*Tohfah al-Mu'minin*” is a comprehensive pharmacopoeia of the singular and compound drugs, written by a great Iranian physician and pharmacist, Mir Muhammad Mu'min Husaini Tonekaboni, known as “Hakim Mu'min”, in the 16th century [7]. This book is still one of the most valuable sources among the followers of traditional medicine.

Among different forms of medicinal preparations which were used in ITM, “*tela*” and “*zamad*” were applied in joint pain. These are two topical forms that are frequently used to cure and manage various diseases in ITM. In the present study, the topical plants used as “*Tela*” (similar to lotion) and “*Zamad*” (similar to ointment or a cream) for treating different diseases with joint pain were evaluated. Moreover, the anti-inflammatory and analgesic effects of the plants were searched in new databases as well.

Methods

In this survey, herbal medicines that were introduced to treat different kinds of joint pain were looked in three valuable books of ITM. These books are among the most important references of ITM and have been widely used by natural healers of Iran. “*Canon*” and “*Al-Hawi*”, and “*Tohfah al-Mu'minin*” are the main references that all traditional medical healers used extensively.

Some ITM diseases which have a relation to joint pains such as “*Waja-ol-mafasil*” (joint pain), “*Irq-on-nasa*” (sciatica), “*Waja-ol-warik*” (coxalgia), “*Waja-ol-zahr*” (back pain), “*Waja-ol-rakbah*” (knee pain) and “*Niqris*” (gout) were selected through these books [7-10]. Although correlating the modern terminologies for those of traditional diseases are not entirely possible but close definitions have been considered as equivalents to disorders in modern medicine. The traditional name of diseases was matched with modern names through some old and modern dictionaries [11-13]. The definitions are summarized, extracted from selected historical ITM manuscripts, prepared by the author (table 1).

The medicinal herbs introduced for joint pain in the form of “*Tela*” (similar to lotion) and “*Zamad*” (similar to ointment or cream) were investigated through the three previously mentioned Iranian traditional books by keywords [7-10]. The selected ITM medicinal plants names were matched to their scientific names [14-19]. The animal and mineral-derived drugs and also the plants that could not be matched to a scientific name were excluded.

After selecting the plants, the electronic databases including Pubmed, Science direct, Scopus, and Google Scholar were searched for the terms ‘anti-inflammatory’ and ‘analgesia or antinociceptive’.

Results and Discussion

Completing the first phase of the study, 196 medicinal plants were found to alleviate joint pain through investigating traditional medical

Table 1. Some of traditional joint pain terms described in ITM books

ITM terms (arabic)	Phonography of ITM terms by IPA ^a	ITM terms English translation	ITM term definition
<i>Waja -ol-mafasil</i>	/vædʒæe-mæfəsəl/	Joint pain	The pain encompasses joints; further pain and inflammation occurs in the joints of the hands and legs
<i>Irq -on-nasa</i>	/vædʒæe-eryonesə/	Sciatica	The pain which starts from the hip joint and radiates downward to the thigh, even sometimes to the knees and ankles
<i>Waja -ol-warik</i>	/vædʒæeværæk/	Coxalgia	The pain which occurs in hip joint
<i>Waja -ol- rakbah</i>	/vædʒæerækbe/	Knee joint pain	The pain specially in the larger joints like knee and hip joints
<i>Niqris</i>	/negres/	Gout	The pain with swelling in ankle and other joints of the foot
<i>Waja -ol-zahr</i>	/vædʒæezæhr/	Back pain	The pain in deep and superficial muscles and tendons around the vertebral column

^a International phonetic alphabet

manuscripts. In the next step, herbal drugs with topical use were selected and 35 herbs (18%) in the forms of “Zemad” (75%) and “Tela” (25%) were obtained. The list of plants has been presented in table 2.

The investigation of their analgesic and anti-inflammatory effects through scientific literatures led to 22 pharmacologically effective plants.

The characteristics of these plants have been described as follows:

Acorus calamus L.

Acorus calamus has long been used in traditional medicine as a remedy for pain and inflammation [20] and is a part of an Ayurvedic formulation for the treatment of arthritis [21]. The dried and powdered rhizomes have been used in ITM for its analgesic effect on joints, against edema in “Zemad” form [9] and also the cooked rhizomes have been used to reduce muscular pain [9]. Most of its effects have been attributed to the essential oil of the rhizomes [22]. An investigation has confirmed the analgesic properties of oral administration of *A. calamus* extract using *in vivo* methods [23]. The anti-inflammatory property of *A. calamus* leaf extract has been demonstrated in *in vitro/in vivo* experiments [23,24].

Allium sativum L.

The bulb and leaves of *Allium sativum* (garlic) have been used in ITM. It is effective for mitigation of sciatica, gout, and joint pain by itself or in oil form [7-9]. Garlic is one of the most widely used plants with anti-inflammatory activity [25]. Studies have confirmed that oral use of *A. sativum* suppresses inflammation in

inflammatory diseases [26].

Althea officinalis L.

The aerial parts of *Althea officinalis* (marsh-mallow) have been traditionally used in combination with almond oil against pain and edema for sciatica, joint pain, and gout [8-9]. Studies have shown that *A. officinalis* possesses antimicrobial, anti-inflammatory, immunomodulatory, demulcent, calming, and antitussive properties [27]. In an *in vivo* study, the aqueous extract of the flowers (taken orally) has demonstrated anti-inflammatory effects in the treatment of acute and chronic inflammation in rats [28].

Brassica nigra L.

The seeds of *Brassica nigra* (black mustard) have been used in ITM for treatment of disorders with similar symptoms as rheumatoid arthritis, cerebral and pulmonary edema, paralysis, migraines, epilepsy [29] and sciatica [9]. The previous studies showed that *B. nigra* possessed antioxidant, anti-inflammatory, antiepileptic, antidiabetic and many other pharmacological effects [30]. *In vivo* analgesic activity of the extract of *B. nigra* seeds has been confirmed at different doses by oral administration [31].

Brassica oleracea L.

The leaves of *Brassica oleracea* (wild cabbage) have been used for joint pain and gout in combination with other plants [7,9]. The cooked leaves have been commonly used in ITM for treatment of back pain topically [8]. *B. oleracea* is widely used as an anti-inflammatory, anti-

Table 2. Plants introduced in ITM for treatment of joint pain

NO	Scientific name	Family	Traditional name	Persian name	Phonetics	Forms	Part used	type
1.	<i>Acorus calamus</i> L.	Araceae	Waj	Agir turki	/ægir turki/	Z	Rhizome	Jp
2.	<i>Allium sativum</i> L.	Liliaceae	Soum	Sir	/sir/	Z	Leaf, Bulb	Jp -Sc-Gout
3.	<i>Althea officinalis</i> L.	Malvaceae	Khatmi	Khatmi	/xætmi/	Z	Aerial part	Jp -Sc-Gout
4.	<i>Alyssum homalocarpum</i>	Brassicaceae	Todari	Todari	/tudæri/	Z	Seed	Gout
5.	<i>Artemis nobelis</i> L.	Compositae	Baboonaj	Baboone	/bɒbone/	T	Flower	Bp-Jp
6.	<i>Aristolochia rotunda</i> L.	Aristolochiaceae	Zaravand	Zaravand	/zærvænd/	T	Root	Gout
7.	<i>Brassica nigra</i> (L.)Koch.	Brassicaceae	Khardal	Khardal	/xærdæl/	Z	Seed	Jp-Sc
8.	<i>Brassica oleracea</i> (L.)DC.	Brassicaceae	Kornob	Kalam	/kælæm/	Z	Leaf	Gout-Jp-Bp
9.	<i>Calendula officinalis</i> L.	Compositae	Azarion	Hamishe bahar	/hæmifebæhr/	Z	Flower	Sc-J.P
10.	<i>Cassia fistula</i> L.	Fabaceae	Khiar Shanbar	Folus	/folus/	T	Fruit	Jp
11.	<i>Cichorium intybus</i> L.	Asteraceae	Hendba	Kasni	/kɒsni/	Z	Arial parts	Jp- Gout
12.	<i>Cocos mucifera</i> L.	Arecaceae	Nargil	Nargil	/nɒrgil/	Z	Fruit	Sp-Bp-Jp
13.	<i>Colchicum autumnale</i> L.	Colchicaceae	Souranjan	Souranjan	/surændʒɒn/	Z	Bulb	Gout
14.	<i>Conium maculatum</i> L.	Apiaceae	Shokaran	Shokaran	/ʃokæron/	T	Fruit, Leaf	Gout
15.	<i>Ecballium elaterium</i> (L.) A. Rich.	Cucurbitaceae	Ghesa ol hemar	Khiar dashti	/xiɒr xæt/	Z	Fruit Leaf	Sci -Jp-Gout
16.	<i>Glossostemon bruguieri</i> D.C.	Sterculiaceae	Moghas	Anar dashti	/ænrðæʃti/	Z	Root	Gout-Sc-Jp-Bp
17.	<i>Hordeum vulgare</i> Linn.	Poaceae	Shaeir	Jou	/dʒu/	T	Seed	Gout
18.	<i>Hyoscyamus albus</i> L.	Solanaceae	Banj	Bang daneh	/bæŋdne/	T	Seed	Gout
19.	<i>Inula helenium</i> L.	Asteraceae	Rasan	Rasan	/rɒsen/	Z	Root	Jp
20.	<i>Lawsonia inermis</i> L.	Lythraceae	Hanna	Hanna	/hænb/	Z	Leaf	Kp
21.	<i>Lepidium sativum</i> L.	Brassicaceae	Horf	Taretizak	/tæretizæk/	Z	Seed	Sc
22.	<i>Lupinus spp.</i>	Fabaceae	Tormes	Baghala mesri	/bɒgælb mesri/	Z	Seed	Sc
23.	<i>Mandragora officinarum</i> L.	Solanaceae	Yabrouh	Mehr giah	/mehrgiɒh/	Z	Root	Jp
24.	<i>Nerium oleander</i> L.	Apocyanaceae	Defli	Kharzahreh	/xærzæhreh/	Z	Leaf	Bp-Kp
25.	<i>Ocimum filamentosum</i> Forsk.	Lamiaceae	Reihan soleimani	Reihan Soleiman	/rejhn/	T	Leaf	Gout
26.	<i>Olea europea</i> L.	Oleraceae	Zeitoon	Zeitoon	/zejtown/	T	Fruit	Gout- Sc
27.	<i>Opopanax chironium</i> Koch.	Apiaceae	Javoshir	Javoshir	/gɒvoʃɪr/	Z	Resin	Jp-Gout
28.	<i>Papaver somniferum</i> L.	Papaveraceae	Afion	Khashkhash	/xæʃxɒʃ/	T	Fruit	Gout
29.	<i>Platanus orientalis</i> L.	Platanaceae	Dolb	Chenar	/tʃenɒr/	Z	Leaf	Jp- Sp
30.	<i>Populus canadensis</i> L.	Salicaceae	Hour	Toz	/towz/	Z	Bark	Sc- Gout
31.	<i>Ruta graveolens</i> L.	Rutaceae	Sodab	Sodab	/sɒɒb/	Z	Aerial part	Jp
32.	<i>Scilla maritima</i> L.	Liliaceae	Esgheel	Piaz dashti	/piɒz/	Z	Bulb	Jp-Sc
33.	<i>Spinacia oleracea</i> L.	Chenopodiaceae	Esfanakh	Esfenaj	/esfenɒdʒ/	Z	Leaf	Bp-Jp
34.	<i>Thymus spp.</i>	Lamiaceae	Saetar	Avishan	/vɪʃæ/	Z	Leaf	Bp-Jp
35.	<i>Viola odorata</i> L.	Violaceae	Banafsaj	Banafshe	/bænfʃe/	Z	Flower	Jp

Jp: joint pain, Bp: back pain, Co: coxalgia, Sc: sciatica, Kp: knee pain, Z: *Zemad* (ointment, cream), T: *Tela* (lotion)

bacterial, anti-rheumatic, diuretic, emollient, anthelmintic, and cardiogenic agent. *In vivo* anti-inflammatory and analgesic activity of the ethanol extract of *B. olearcea* has been confirmed by oral administration [32].

Calendula officinalis L.

The flowers of *Calendula officinalis* (marigold) have been used in ITM as “Zemad” for joint pain and sciatica [8-9]. It has been reported to possess many pharmacological activities, which include antioxidant, anti-inflammatory, antibacterial, antifungal and antiviral properties. [33] *In vivo* anti-inflammatory activities of *C. officinalis* flower extract have been shown significant against chemically-induced acute paw edema by oral administration [34].

Cassia fistula L.

The seeds of *Cassia fistula* have been used in ITM in the form of “Tela” to reduce the pain and stiffness of joints and gout [8-9]. Oral administration of the bark extract has been assessed in rats to show significant anti-inflammatory properties in both acute and chronic models [35]. The bark extract of *C. fistula* has been found to have a significant analgesic effect against chemically-induced nociceptive pain in mice [36].

Colchicum autumnale L.

C. autumnale bulbs have been used in ITM as “Zemad” to treating gout, joint pain, and inflammation [7-9]. The bulb-like corms of *Colchicum autumnale* contain colchicine, a useful drug with a narrow therapeutic index. Oral consumption of colchicine has suppressed the development of edema in rats and has shown anti-inflammatory properties [37]; however, colchicine fell out of favor because it routinely causes diarrhea and requires caution in patients with renal insufficiency [38].

Conium maculatum L.

The fruits and leaves of *C. maculatum* have been

traditionally used for treatment of spasmodic disorders and to relieve nervous excitation, rheumatic pain, the pain of gastric ulcers, nervousness, and restlessness [39]. It has been used as “Tela” to relieve the pain of warm gout [9]. *Conium maculatum* (hemlock) is a highly poisonous plant. One study has shown that the alkaloidal fraction of the aerial parts of *C. maculatum* demonstrated *in vivo* analgesic and anti-inflammatory properties [40].

Ecballium elantherium (L.) A. Rich.

The fruits of *Ecballium elantherium* have been used in ITM as “Zemad” for reducing the joint pains and the cooked leaves to treat sciatica, and in vinegar for treating gout [9]. The dried or fresh juice of *E. elantherium* is used to treat various inflammatory conditions and has exhibited analgesic properties in several animal models [41]. It has been investigated for its anti-inflammatory properties and its component, cucurbitacin B, was found to have significant anti-inflammatory properties [42].

Hyoscyamus albus L.

Hyoscyamus albus (white henbane) seeds have been used in ITM as “Tela” for reducing the pain of gout [8-9]. *H. albus* is also traditionally applied for its nervous sedative effect [46]. It has been found to possess *in vivo* analgesic and antipyretic properties [43].

Lawsonia inermis L.

Lawsonia inermis (henna) leaves have been used in combination with other herbs and oils in ITM to reduce knee pain [9]. *L. inermis* leaves were used to treat leprosy, burns, headaches, and flank pain. They also possessed cosmetic benefits such as accelerating hair growth and for dyeing hair and nails [44]. It has been reported to have anti-inflammatory, antinociceptive, and antipyretic properties [45]. *In vivo* anti-inflammatory properties of aqueous, ethanol and methanol extracts of *Lawsonia alba* have been demonstrated in albino Wistar rats [46].

Lepidium sativum L.

Lepidium sativum (garden cress) seeds have been used since ancient times topically as “Zemad” to treat sciatica pain [9]. The analgesic properties of the seeds of *L. sativum* have been reported in pharmacological tests [47]. It was also found to show moderate *in vivo* anti-inflammatory activity [48].

Nerium oleander L.

The cooked leaves of *Nerium oleander* have been used traditionally for reducing back pains and in “Zemad” and “Tela” forms to relieve knee pain [9-10]. *N. oleander* is a poisonous plant and contains numerous toxic compounds [49]. The dried and fresh flowers of *N. oleander* have exhibited potent *in vivo* antinociceptive and anti-inflammatory activity [50].

Olea europea L.

Olive oil has been traditionally used to relieve sciatica and gout pain in “Tela” form [9]. Studies have reported that the leaves of *O. europea* possess anti-arrhythmic, spasmolytic, immunostimulant, cardioprotective, hypotensive, antihyperglycemic, and antimicrobial properties [51].

It is rich in bioactive phenolic compounds that are reported to have anti-inflammatory properties [54]. An *in vivo* study has reported a mild anti-inflammatory and anti-nociceptive effects even when the fruits of *O. europea* are consumed orally [52].

Papaver somniferum L.

Papaver somniferum (opium poppy) fruits have been used to relieve the pain of gout in “Tela” form. Opium poppy contains narcotic analgesic alkaloids including morphine, papaverine, and thebaine [53]. The analgesic actions of morphine in various pain models have been evaluated in laboratory animals and showed significant analgesic activities [54-57].

Platanus orientalis L.

The fresh leaves of *Platanus orientalis* have been

used in ITM for warm temperament joint and knee pain [7,9]. It has been found beneficial for knee edema in “Zemad” form [8]. The polyphenolic and ethanol extracts of *P. orientalis* have shown significant analgesic and anti-inflammatory properties when compared to the standard drugs in pharmacological testings [58].

Populus canadensis L.

P. canadensis bark has been used traditionally for joint pain and topically for gout pain in “Tela” form. *P. canadensis* was mainly used to treat inflammatory diseases and as an anti-diarrheic in East Asian countries. The aqueous extract of *F. populi* possesses anti-inflammatory and analgesic activities shown in different *in vivo* tests and their results support the traditional usage of this plant to cure inflammatory diseases [59].

Ruta graveolens L.

The aerial parts of *Ruta graveolens* combined with honey have been used for the treatment of sciatica and joint pain in ITM [7,9].

It has shown *in vivo* antinociceptive, anti-inflammatory and antipyretic properties, according to the use of this species by practitioners of traditional medicine for management and treatment of pain, inflammation, and fever [60].

Scilla maritima L.

The bulb of *Scilla maritima* has been used traditionally to relieve joint pain when combined with oil in “Tela” form [7,9]. The alcoholic extract of the bulb of *S. maritima* L. has shown *in vivo* anti-inflammatory and anti-arthritic and analgesic properties [61].

Spinacia oleracea L.

Spinacia oleracea leaves have been used topically for back pain in ITM [9] and the cooked leaves have been used in “Zemad” form for joint pain [8]. The ethanol and aqueous extracts of the leaves showed significant *in vivo* anti-inflammatory activity [62].

Thymus spp.

The leaves of *Thymus* spp. have been used in ITM as analgesic for sacroiliac [9] and joint pain when combined with oil [8]. The effect of *Thymus vulgaris* essential oil and its isolated constituents thymol and cava-crol were studied in *in vivo* experimental models [63].

Iranian traditional physicians have gathered all the information of available medicines at their time and have also introduced many new remedies based on their own experiences [64]. They focused on different kinds of joint pain diseases and have introduced many natural drugs for relieving those pains. Our study revealed that traditional scientists suggested different topical forms of herbal drugs either in singular or in combinatory forms for different kinds of joint pain and inflammation.

Among the investigated plants, *Hyoscyamus albus*, *Nerium oleander*, *Conium maculatum* and *Colchicum autumnale* are orally toxic [65] and it is necessary to consider their toxicological effect even for topical application.

A thorough search in Ayurvedic and Unani pharmacopoeia using scientific names of these plants revealed the same medicinal effect of *Acorus calamus*, *Althea officinalis*, *Cassia fistula*, *Conium maculatum*, *Lepidium sativum*, *Brassica nigra*, *Calendula officinalis*, *Scilla maritima* and *Viola odorata* in these traditional systems [66,67].

The anti-inflammatory and analgesic effects of the introduced plants have been confirmed in previous researches. The plants which still have not been investigated for their pharmacological activities, would be good candidates for future analgesic and anti-inflammatory evaluations.

Conclusion

In conclusion, since musculoskeletal disorders are extremely common illnesses worldwide [68], reducing pain by medicinal plants specially those used topically with fewer side effects results in many advantages [69]. Iranian Traditional Medicine has paid a great deal of attention to

joint pain diseases and prescribed medicinal plants in different dosage forms to control the pain.

The results of our review through reliable sources of Iranian Traditional Medicine revealed that the ancient Iranian physicians introduced the some medicinal herbs as “*Tela*” and “*Zemad*” dosage forms to relieve joint pain.

According to our study, among medicinal plants compiled based on their topical analgesic activity, some have not been investigated through pharmacological experiments yet and thus could be good candidates for further pharmacological studies. On the other hand, a number of these plants were found to have pharmacological documented activities related to their anti-inflammatory and analgesic effects which would be appropriate for further clinical studies.

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Declaration of interest

The authors declare that there is no conflict of interest. The authors alone are responsible for the content of the paper.

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