

## Medicinal Plants for Joint Pain in Traditional Persian Medicine

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### Abstract

Joint pains can be resulted by many factors of which osteoarthritis (OA) and rheumatoid arthritis (RA) are the most popular ones. Treatment of both conditions usually involves pain killers. Chronic joint pains are associated with a high usage of herbal medicines. Herbal remedies are the main part of many traditional medical schools specially Traditional Persian Medicine. This study is conducted to present herbal remedies for joint pain from important treatises of Traditional Persian Medicine. Five manuscripts of the most comprehensive pharmacopeias in TPM which cover more than 900 years of golden ages and also commonly used by natural healers were used. Totally more than 120 medicinal herbs were mentioned for joint pain in those treatises, but 105 herbs from 59 different families were identified. This list of traditional herbal medicines, some of which were used for 1000 years for joint pain, this perennial problem, can provide a basis for further studies and therefore finding more effective drugs to help solving more problems in this area.

*Keywords:* Herbal, Joint pain, Traditional Persian Medicine.

### 1. Introduction

Joint pains can be resulted by many factors of which osteoarthritis (OA) and rheumatoid arthritis (RA) are the most popular ones (1). Osteoarthritis known as degenerative joint disease is the most prevalent type of arthritis (2). This disease is one of the most common causes of pain, stiffness and disability in Western adult populations. The majority of people by 65 years of age and approximately 80% of those aged over 75 years have radiographic evidence of OA (3). The most usual clinical sign of OA are pain, stiffness, swelling and inflammation (4). Rheumatoid Arthritis (RA) is a common autoimmune disorders and an inflammatory condition that causes pain and swelling of the joints. Studies represent prevalence of 0.5% to 1%

of rheumatoid arthritis (5) which can cause irreversible joint deformities and functional impairment (6). Treatment of both conditions usually involves pain killers including acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs) and opioid drugs(4, 6). Due to gastrointestinal ulcers or/and cardiac toxicity of these drugs (7-8), serious need for other kinds of ways to relief pain is obvious. Pain relief is the most frequently cited reason for using complementary and alternative medicine (CAM) (9). Chronic joint pains are associated with a high usage of herbal medicines (10-11). Herbal remedies are the main part of many traditional medical schools specially Traditional Persian Medicine (TPM). Many books of various types have been remained from this medical school in Persian and Arabic languages. *Materia medica* is one type that can be a separated book or a part of a comprehensive medical encyclopedia. In this kind of book the main therapeutic proper-

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ties of single drugs (herbal, animal and mineral) as well as some outward features, dosages, adverse effects and their modifications are mentioned. Studying these books are highly rewarding as they contain many experienced information of previous scholars as well as their own authors'. On the other hand, many large pharmaceutical companies have been interested in using traditional medical knowledge in drug discovery (12). This study is conducted to present herbal remedies for joint pain from important treatises of Traditional Persian Medicine.

## 2. Materials and Methods

The employed study method for this investigation was based on the information in most popular pharmaceutical manuscripts of Traditional Persian Medicine. These manuscripts are of the most comprehensive pharmacopeias in TPM which cover more than 900 years of golden ages and also commonly used by natural healers. The term "joint pain" (*Vaja-ol-mafasel* in Arabic or *Dard-e-mafasel* in Persian) was search in these traditional texts including the 20<sup>th</sup> and 21<sup>st</sup> book of *Al-Havi (The Liber Continents)* by Rhazes (9<sup>th</sup> and 10<sup>th</sup> centuries), the second book of *Canon Fi Tibb (The Canon of Medicine)* by Avicenna (10<sup>th</sup> and 11<sup>th</sup> centuries), *Alabnieh an haghagh-ol-advieh* by Aboo mansour Heravi (11<sup>th</sup> century), *Ekhtiyarat-e-Badiyee* by Zein al-Din Attar Ansari Shirazi (14<sup>th</sup> century), and *Makhzan ol Advieh* by Aghili-Shirazi (18<sup>th</sup> century) (13-17). For complying scientific names of these medicinal plants the botanical descriptions of *Makhzan-ol-Advieh*" (17) and some other books such as "*Seydaneh fit Teb*" (18), "Popular Medicinal Plants of Iran and

Iraq"(19) and "Pharmacographia Indica," (20) were used. In addition for each herb the anti-inflammatory and analgesic effects were searched in scientific data banks such as Medline and Scopus.

## 3. Results

All results are summarized in Table 1. Totally more than 120 medicinal herbs were mentioned for joint pain in those treatises, but 105 herbs from 59 different families were identified. Also, the part used and the rout of administration (oral or topical) as well as the results of analgesic and anti-inflammatory studies for each plant are listed in the same table.

Two families of Apiaceae and Asteraceae are the most cited ones with 8 members followed by Fabaceae with 7 and then Brassicaceae and Lamiaceae with 5 (Figure 1). Among these 105 plants, *Inula helenium* L. (Asteraceae) is the only one which is listed in all investigated traditional treatises. Eleven plants including *Dorema ammoniacum* D. Don. (Asteraceae), *Lepidium latifolium* L. (Brassicaceae), *Brassica oleracea* L. (Brassicaceae), *Ecballium elaterium* (L.) A.Rich. (Cucurbitaceae), *Euphorbia lathyris* L. (Euphorbiaceae), *Cassia fistula* L. (Fabaceae), *Colchicum autumnale* L. (Liliaceae), *Ruta graveolens* L. (Rutaceae), *Verbascum thapsus* L. (Scrophulariaceae), *Withania somnifera* (L.) Dunal (Solanaceae) and *Peganum harmala* L. (Zygophyllaceae) are in the next level with 4 traditional references.

Forty nine of these plants were prescribed only topically since 38 ones only orally and 18 ones in both ways to relief pain (Figure 2). More than half of (58%) of all these traditional herbal remedies are studied for anti-inflammatory (9.52%)

**Table 1.** Traditional Persian Medicinal Plants used for joint pain.

Plant Family	Plant Scientific name	Plant Traditional Name	Part(s)a	Formb	Refc	Related work in current medicined	
						AI	A
Acoraceae	<i>Acorus calamus</i> L.	<i>Vaj</i>	R	T	M, H	+ (21)	+ (22)
Altingiaceae	<i>Liquidambar orientalis</i> Mill.	<i>Meyeh sayeleh</i>	G	T	M, A	x	x
Amaranthaceae	<i>Spinacia oleracea</i> L.	<i>Esfanakh</i>	L	T	M	+ (23)	x
	<i>Beta vulgaris</i> L.	<i>Selgh</i>	L	O	M, E	+ (24)	+ (24)
Amaryllidaceae	<i>Narcissus tazetta</i> L.	<i>Narjes</i>	R	T	M, C, H	x	+ (25)
Anacardiaceae	<i>Pistacia lentiscus</i> L.	<i>Mastaki</i>	G	T	M	+ (26-27)	x

Apiaceae	<i>Ammi visnaga</i> (L.) Lam.	<i>Bastiaj</i>	L	T	M	+ (28)	+ (28)
	<i>Anethum graveolens</i> L.	<i>Shebet</i>	L	T	M, C	+ (29)	+ (30)
	<i>Dorema ammoniacum</i> D. Don.	<i>Oshagh</i>	G	O,T	M, E, C, H	x	x
	<i>Falcaria vulgaris</i> Bernh.	<i>Rejl olghoraab</i>	R, L	T	M, E	x	x
	<i>Ferula assa-foetida</i> L.	<i>Anjedan</i>	S, G	O	M, E, C	+ (31)	x
	<i>Ferula persica</i> Wild	<i>Sakbinaj</i>	G	O	M, C	+ (32)	x
	<i>Prangos ferulacea</i> (L.) Lindl	<i>Javshir</i>	G	O,T	M, E, C	x	x
	<i>Thapsia garganica</i> L.	<i>Safsia</i>	G	T	M, E	x	x
Apocynaceae	<i>Nerium oleander</i> L.	<i>Defli</i>	L	T	E, C	+ (33)	+ (33)
Araliaceae	<i>Panax ginseng</i> C.A. Meyer	<i>Choob-e-chini</i>	R	O	M	+ (34)	+ (35)
Arecaceae	<i>Lodoicea maldivica</i> (J.F.Gmel.) Pers.	<i>Narjil bahri</i>	Fr	O	M	x	x
Aristolochiaceae	<i>Asarum europaeum</i> L.	<i>Asaroon</i>	R	O	M, E	x	x
Asparagaceae	<i>Urginea indica</i> (Roxb.) Kunth	<i>Esghil</i>	R	O,T	M, C	x	x
Asteraceae	<i>Anthemis pyrethrum</i> L.	<i>Aghargharha</i>	R	O,T	M	x	x
	<i>Arctium tomentosum</i> Mill.	<i>Arghitoon</i>	L	O,T	M	x	x
	<i>Artemisia absinthium</i> L.	<i>Afsantin</i>	F	O	M, E	+ (36)	+ (36)
	<i>Calendula officinalis</i> L.	<i>Azariun</i>	L, F	T	M, E	+ (37)	+ (38)
	<i>Cichorium intybus</i> L.	<i>Hendebe</i>	R	O	M	+ (39)	+ (40)
	<i>Cirsium arvense</i> (L.) Scop.	<i>Zanb-ol-sabe</i>	R	T	M	x	x
	<i>Inula helenium</i> L.	<i>Raasan</i>	R	O	M, E, A, C, H	x	x
	<i>Matricaria chamomilla</i> L.	<i>Babooneh</i>	F	T	M	+ (41)	+ (42)
Brassicaceae	<i>Lepidium latifolium</i> L.	<i>Shitaraj</i>	L	O	M, E, A, C	x	x
	<i>Brassica nigra</i> (L.) Koch.	<i>Khardal</i>	S	O	A, C	x	+ (43)
	<i>Brassica oleracea</i> L.	<i>Koronob</i>	L	T	M, E, C, H	+ (44)	x
	<i>Morettia canescens</i>	<i>Hoom-ol-majoos</i>	F	T	M, A	x	x
	<i>Raphanus</i> sp.	<i>Fojl</i>	S	T	M, C, H	x	x
Burseraceae	<i>Boswellia serrata</i> Roxb. ex Colebr.	<i>Kondor</i>	G	T	M	+ (45)	+ (45)
	<i>Commiphora myrrha</i> (Nees) Engl.	<i>Morr</i>	G	O,T	M, E	+(46)	x
Capparaceae	<i>Capparis spinosa</i> L.	<i>Kabar</i>	R	O	M	+(47)	-(48)
Caprifoliaceae	<i>Valeriana tuberosa</i> L.	<i>Mov</i>	R	O	M, E, H	x	x
Caryophyllaceae	<i>Acanthophyllum squarrosum</i> Boiss.	<i>Azarboo</i>	R	T	M	x	x
	<i>Gypsophila struthium</i> Loefl.	<i>Kondosh</i>	R	O,T	M	x	x
Combretaceae	<i>Terminalia chebula</i> Retz.	<i>Halileh</i>	Fr	O	E	+(49)	+(50)
Convolvulaceae	<i>Convolvulus scammonia</i> L.	<i>Saghmoonia</i>	G	T	M, C	x	x
	<i>Cuscuta epithimum</i> Murray	<i>Aftimoon</i>	S	O	M	x	x
Costaceae	<i>Costus</i> sp.	<i>Ghost</i>	R	O,T	M	x	x
Crassulaceae	<i>Sempervivum tectorum</i> L.	<i>Abroon</i>	L	T	M	+(51)	+(52)

Cucurbitaceae	<i>Ecballium elaterium</i> (L.) A.Rich.	<i>Khiar khar</i>	Fr, L, S, F	O, T	M, E, A, C	+(53)	+(54)
	<i>Citrullus colocynthis</i> (L.) Schrad.	<i>Hanzal</i>	F	O	E, A, C	+(55)	+(55)
Dryopteridaceae	<i>Dryopteris filix-mas</i> (L.) Schott	<i>Serakhs</i>	R	O	M, E	x	x
Elaeagnaceae	<i>Elaeagnus angustifolia</i> L.	<i>Ghobeira</i>	L	T	M	+(56)	+(56)
Euphorbiaceae	<i>Euphorbia lathyris</i> L.	<i>Mahoodaneh</i>	L	O	M, E, A, C	x	x
	<i>Euphorbia pithyusa</i>	<i>Shobrom</i>	L, S	O	M	x	x
	<i>Ricinus communis</i> L.	<i>Kherva</i>	S, L	T	M, E	+(57)	+(58)
Fabaceae	<i>Alhagi maurorum</i> Medik.	<i>Haj</i>	L	T	M	+(59)	+(59)
	<i>Cassia fistula</i> L.	<i>Khiarshanbar</i>	Fr	T	M, E, A, C	+(60)	+(61)
	<i>Indigofera tinctoria</i> L.	<i>Hab-ol-nil</i>	S	O	M	x	+(62)
	<i>Lupinus albus</i> subsp. <i>albus</i> L.	<i>Tormes</i>	S	T	M, E	x	x
	<i>Senna italica</i> Mill.	<i>Sanaa makki</i>	L	O	M, E	x	x
	<i>Tragacantha fasciculifolia</i> (Boiss.) Kuntze.	<i>Anzaroot</i>	G	O	M	x	x
	<i>Trifolium aureum</i> Pollich	<i>H a n d a g h o o g h i bostani</i>	L	T	M, E, C	x	x
Gentianaceae	<i>Centaurium erythraea</i> Rafn	<i>Ghantarioon saghir</i>	F	O	M	+(63)	+(63)
Juglandaceae	<i>Juglans regia</i> L.	<i>Jowz</i>	Fr	T	M	+(64)	+(33)
Lamiaceae	<i>Ajuga chamaepitys</i> (L.) Schreb.	<i>Komafeytos</i>	S, L, F	O	A	x	x
	<i>Lavandula stoechas</i> L.	<i>Ostokhodoos</i>	AP	T	M, E	x	x
	<i>Melissa officinalis</i> L.	<i>Badranjbooyeh</i>	L, F	T	M, E	+(65)	+(66)
	<i>Teucrium polium</i> L.	<i>Jaadeh</i>	AP	O	M	+(67)	+(68)
	<i>Zataria multiflora</i> Boiss.	<i>Saatar</i>	L, F	T	M, C	+(69)	+(69)
Lauraceae	<i>Laurus nobilis</i> L.	<i>Ghaar</i>	S	O, T	M	+(70)	+(70)
Lecythidaceae	<i>Barringtonia racemosa</i> (L.) Spreng.	<i>Jadvaar</i>	R	O, T	M	x	+(71)
Lemnaceae	<i>Lemna minor</i> L.	<i>Tahlab</i>	L	T	E, A, C	x	x
Liliaceae	<i>Allium sativum</i> L.	<i>Soom</i>	R	O, T	M, H	+(72)	+(73)
	<i>Colchicum autumnale</i> L.	<i>Soorenan</i>	F, R	O, T	M, E, C, H	+(74)	+(74)
	<i>Aloe vera</i> L.	<i>Sabr</i>	G	O	M, C, H	+(75)	+(76)
Linaceae	<i>Linum usitatissimum</i> L.	<i>Kataan</i>	S	T	M	+(77)	+(78)
Loganiaceae	<i>Strychnos nux-vomica</i> L.	<i>Azaraghi</i>	S	O, T	M	+(79)	+(79)
Lythraceae	<i>Lawsonia inermis</i> L.	<i>Hana</i>	L	T	M	+(80)	+(80)
Malvaceae	<i>Alcea officinalis</i> L.	<i>Khatmi</i>	L	T	M, E, C	x	x
	<i>Gossypium herbaceum</i> L.	<i>Ghoton</i>	L	T	M	x	x
	<i>Glossostemon bruguieri</i> Desf.	<i>Moghas</i>	R	O	E, A	x	x
Melanthiaceae	<i>Veratrum album</i> L.	<i>Kharbagh Abyaz</i>	R	T	E	x	x
Melastomataceae	<i>Memecylon sphaerocarpum</i> DC.	<i>Osabe Safr</i>	R	O, T	M	x	x
Meliaceae	<i>Azadirachta indica</i> A. Juss.	<i>Neem</i>	L	O	M	+(81)	+(82)
Moraceae	<i>Ficus carica</i> L.	<i>Anjir</i>	Fr	T	M	+(83)	x

Myrtaceae	<i>Myrtus communis</i> Linn.	Moord	L	T	M, H	+(84)	+(84)
Oleaceae	<i>Jasminum officinale</i> L.	Yasameen	F	O	M	+(24)	+(24)
Oxalidaceae	<i>Oxalis acetosella</i> L.	Hommaz	R	T	M, E	x	x
Papaveraceae	<i>Glaucium corniculatum</i> (L.) Rudolph.	Mamisa	S	T	M	x	x
Pinaceae	<i>Pinus</i> sp.	Senobar	S	O	M	+(85)	x
Piperaceae	<i>Piper longum</i> L.	Darfelfel	R	O	A	+(86)	+(87)
Plantaginaceae	<i>Plantago ovata</i> Forsk.	Bazr-e- ghatuna	S	T	M, A, C	+(88)	x
Platanaceae	<i>Platanus orientalis</i> L.	Dalb	L	T	C	+(89)	+(89)
Poaceae	<i>Cymbopogon schoenanthus</i> (L.) Spreng.	Ezkher	L	T	M	x	+(90)
Polygonaceae	<i>Rheum palmatum</i> L.	Raavand	R	O	M	x	x
Ranunculaceae	<i>Helleborus niger</i> L.	Kharbagh Asvad	R	T	C, H	x	x
	<i>Nigella sativa</i> L.	Shooniz	S	O,T	M	+(91)	+(92)
Rosaceae	<i>Potentilla reptans</i> L.	Bantafelon	R	O	M, C, H	x	x
	<i>Prunus mahaleb</i> L.	Hab-ol-mahlab	S	T	M	+(93)	x
	<i>Rosa damascena</i> Mill.	Jolanjabin	F	O	M	x	+(94)
Rutaceae	<i>Citrus medica</i> L.	Otroj	Fr	T	M	+(95)	+(96)
	<i>Ruta graveolens</i> L.	Soddab	L	O,T	M, E, C, H	+(24)	+(24)
Scrophulariaceae	<i>Verbascum thapsus</i> L.	Mahizahraj	B	O	M, A, C, H	+(97)	+(98)
Smilacaceae	<i>Smilax aspera</i> L.	Oshbeye maghrebieh	AP	T	M	x	x
Solanaceae	<i>Mandragora officinarum</i> L.	Yabrooh-ol-sanam	R	O,T	M, C, H	x	x
	<i>Solanum nigrum</i> L.	Tajrizi	Fr	O	A,	+(99)	+(99)
	<i>Withania somnifera</i> (L.) Dunal	Boozeydan	R	O	M, E, A, C	+(100)	+(101)
Zingiberaceae	<i>Zingiber officinale</i> Rosc	Zanjebeel	R	O	M	+(102)	+(103)
Zygophyllaceae	<i>Peganum harmala</i> L.	Harmal	S	T	M, E, A, C	x	+(104)
	<i>Tribulus terrestris</i> L.	Hasak	S	T	M, A	x	x

aHerbs part: "Ap"=Aerial parts, "Bk"=Bark, "F"=Flower, "Fr"=Fruit, "Gm"=Gum, "L"=Leaf, "R"=Root, "S"=Seed, "bRoute of administration: "O"=Oral, "T"=Topical, cReferences: "A"= Alabnieh an hagmaegh-ol-advieh, "C"= Canoon fi-teb, "E"= Ekhtiyarat-e-Badiyee, "H"= Al-Havi, "M"= Makhzan-ol-Advieh. dPharmacological effect: "AI"=Anti infl ammatory, "A"=Analgesic

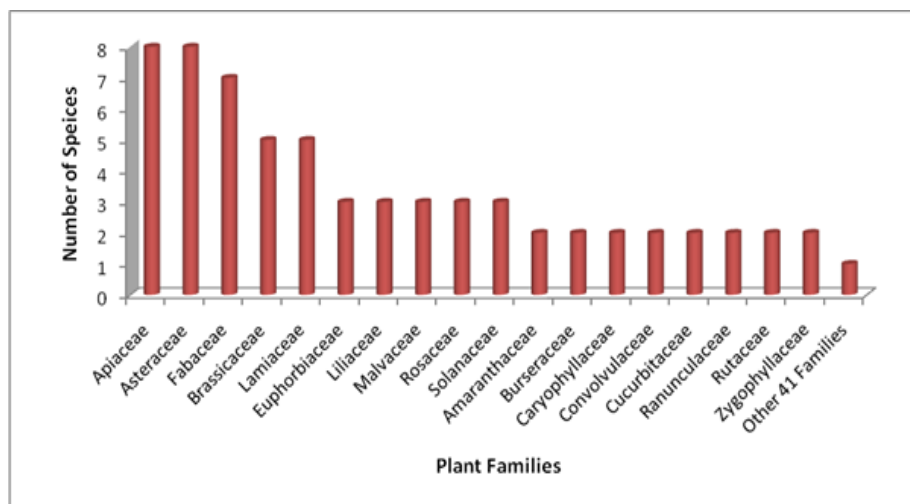
or analgesic (6.66%) or both effects (41.90%) in recent years.

#### 4. Discussion

Traditional Persian Medicine (TPM) persists from ancient period until now. Many books of various types have been remained from this medical school in Persian and Arabic languages. Despite the once wide use of these old herbals produced in many editions for centuries, modern science had barely started to scientifically explore these treatises. Fortunately, today this possibility has been provided. Studying these books may be highly rewarding indeed. One just has to look at the amount

of scientific and popular attention traditional Chinese medicine (TCM) has been attracting lately. Drug discovery by using traditional medicinal knowledge seems so helpful that large Pharmaceutical Companies show interest in this area. For example, production of antimalarial drug Coartem® which is derived from *Artemisia annua* L. from Traditional Chinese Medicine in 1971 by Novartis. So we see clearly that scientific examination of historic works can be the base for the "rediscovery" of long forgotten remedies and a source of information for a more focused screening for new leads.

In this project we first presented herbal remedies for joint pain from most important and popu-



**Figure 1.** Families of plant species used for joint pain in TPM.

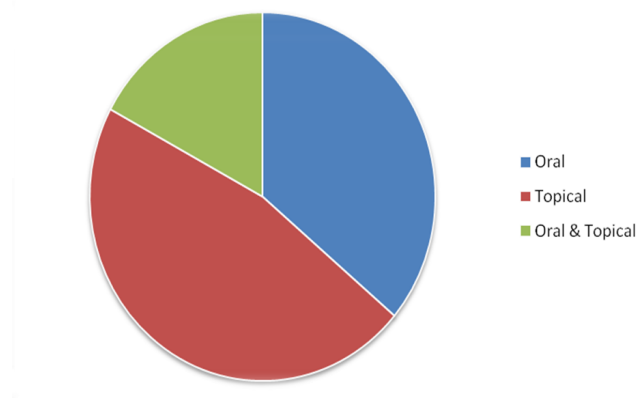
lar pharmaceutical treatises of Traditional Persian Medicine which cover more than 900 years of golden ages and also commonly used by natural healers.

As it has been shown in Table 1 and Figure 1, amongst the families of plants Apiaceae and Asteraceae were most strongly represented with 8 species, Fabaceae with 7 and Brassicaceae and Lamiaceae with 5 spices. Euphorbiaceae, Liliaceae, Malvaceae, Rosaceae and Solanaceae represented with 3. Amaranthaceae, Burseraceae, Caryophyllaceae, Convulvulacea, Cucurbitaceae, Ranunculaceae, Rutaceae and Zygophyllaceae were presented with 2 species, and all other families (41 ones) only had one species mentioned. High consumption of Apiaceae and Asteraceae families in joint pain could be due to their volatile oil content. Analgesic-like (215) and anti-inflammatory (216) activities of essential oils constituents have been proven in today’s studies.

Figure 2 showed that most of the herbal remedies in TPM for joint pain were used topically. On the other hand, because of side effects of oral administrations, today’s osteoarthritis patients prefer topical medicines (9).

This list of traditional herbal medicines, some of which were used for 1000 years for joint pain, this perennial problem, can provide a basis for further studies and therefore finding more effective drugs to help solving more problems in this area.

It is interesting that *Inula helenium* L. which is the most cited species, to best of our knowledge is not investigated for these results. This is also true about *Dorema ammoniacum* D. Don., *Lepidium latifolium* L., *Euphorbia lathyris* L. and 40 other plants. On the other hand 6 of those 11 plants are proved to have both effects while *Peganum harmala* L. and *Brassica*



**Figure 2.** Rout of administration of herbal remedies used in TPM.

*oleracea* L. shows anti-nociceptive and anti-inflammatory properties, respectively. Thus this list of traditional herbal medicines, some of which were used for 1000 years for joint pain, this perennial problem, can provide a basis for further studies and therefore finding more effective drugs to help solving more problems in this area.

## 5. References

1. Wambugu SN, Mathiu PM, Gakuya DW, Kanui TI, Kabasa JD, Kiama SG. Medicinal plants used in the management of chronic joint pains in Machakos and Makueni counties, Kenya. *J Ethnopharmacol.* 2011;137:945-55.
2. Parment S, Lynn C, Glass RM. JAMA patient page. Osteoarthritis of the knee. *JAMA.* 2003;289:1068.
3. Arden N, Nevitt MC. Osteoarthritis: Epidemiology. *Best Pract Res Clin Rheumatol.* 2006;20:3-25.
4. Gemmell HA, Jacobson BH, Hayes BM. Effect of a topical herbal cream on osteoarthritis of the hand and knee: a pilot study. *J Manipulative Physiol Ther.* 2003;26:e15.
5. Gabriel SE. The epidemiology of rheumatoid arthritis. *Rheum Dis Clin North Am.* 2001;27:269-81.
6. Alarcón GS. Epidemiology of rheumatoid arthritis. *Rheum Dis Clin North Am.* 1995;21:589-604.
7. Stanos SP. Topical Agents for the Management of Musculoskeletal Pain. *J Pain Symptom Manage.* 2007;33:342-55.
8. Argoff CE. Topical Analgesics in the Management of Acute and Chronic Pain. *Mayo Clin Proc.* 2013;88:195-205.
9. Astin JA. Why patients use alternative medicine: Results of a national study. *JAMA.* 1998;279:1548-53.
10. Resch KL, Hill S, Ernst E. Use of complementary therapies by individuals with arthritis. *Clin Rheumatol.* 1997;16:391-5.
11. Setty AR, Sigal LH. Herbal medications commonly used in the practice of rheumatology: mechanisms of action, efficacy and side effects. *Semin Arthritis Rheum.* 2005;34:773-84.
12. Adams M, Berset C, Kessler M, Hamburger M. Medicinal herbs for the treatment of rheumatic disorders-A survey of European herbals from the 16th and 17th century. *J Ethnopharmacol.* 2009;121:343-59.
13. Al-rhazes (Rhazes) M., editor. *Al Havi* (Liber Continens). Tehran: Academy of Medical Sciences Publication; 2005.
14. Avicenna., editor. *Canon Fi Tibb* (Canon of Medicine). New Delhi: Jamia Hamdard Printing Press; 1988.
15. Heravi A. M. *Alabnie an Haghaeigh ol Advieh*. Tehran Iran: Tehran University Press; 1992.
16. Ansari Shirazi Z. A. *Ekhtiyarat-e-Badiyee*. Mir rbMT, editor. Tehran: Pakhsh Razi Press; 1992.
17. Aghili Shirazi S.M.H.I.M.H. *Makhzan ol Advieh*. Tehran: Intisharat va Amoozesh enghelab Islami Press; 1992.
18. Biruni A. R. *Seydaneh fi Teb*. Mozaffarzadeh PtB, editor. Tehran: Iranian Academy of Persian Language and Literature Press; 2004.
19. Hooper D., Field H. *Useful plants and drugs of Iran and Iraq*. Chicago: Field Museum of Natural History; 1937.
20. Dymook W., Warden C. J., Hooper D. *Pharmacographica Indica*. London: Kegan Paul; 1893.
21. Muthuraman A, Singh N, Jaggi AS. Protective effect of *Acorus calamus* L. in rat model of vincristine induced painful neuropathy: An evidence of anti-inflammatory and anti-oxidative activity. *Food Chem Toxicol.* 2011;49:2557-63.
22. Almeida RN, Navarro DS, Barbosa-Filho JM. Plants with central analgesic activity. *Phyto-medicine.* 2001;8:310-22.
23. Garg VR, Jain M, Sharma PK, Garg G. Anti-inflammatory activity of *Spinacia oleracea*. *Int J Pharma Prof Res.* 2010;1:1-4.
24. Atta AH, Alkofahi A. Anti-nociceptive and anti-inflammatory effects of some Jordanian medicinal plant extracts. *J Ethnopharmacol.* 1998;60:117-24.
25. Cakici I, Ulug HY, Inci S, Tunçtan B, Abacioglu N, Kanzik I, Sener B. Antinociceptive effect of some Amaryllidaceae plants in mice. *J*

*Pharm Pharmacol.* 1997;49:828-30.

26. Maxia A, Sanna C, Frau MA, Piras A, Karchuli MS, Kasture V. Anti-inflammatory activity of *Pistacia lentiscus* essential oil: involvement of IL-6 and TNF-alpha. *Nat Prod Commun.* 2011;6:1543-4.

27. Mahmoudi M, Ebrahimzadeh MA, Nabavi SF, Hafezi S, Nabavi SM, Eslami Sh. Anti-inflammatory and antioxidant activities of gum mastic. *Eur Rev Med Pharmacol Sci.* 2010;14:765-9.

28. El-Sawy ER, Ebaid MS, Abo-Salem HM, Al-Sehemi AG, Mandour AH. Synthesis, anti-inflammatory, analgesic and anticonvulsant activities of some new 4,6-dimethoxy-5-(heterocycles) benzofuran starting from naturally occurring visnagin. *Arabian J. Chem.* 2014;7:914-23

29. Naseri M, Mojab F, Khodadoost M, Kamalinejad M, Davati A, Choopani R, *et al.* The Study of Anti-Inflammatory Activity of Oil-Based Dill(*Anethum graveolens* L.) Extract Used Topically in Formalin-Induced Inflammation Male Rat Paw. *Iran J Pharm Res.* 2012;11:1169-74.

30. Bakhtiarian A, Rezai-Asl M, Sabour M, Nikoui V, Ghamami G, Yadavar-Nikravesh MS, *et al.* The study of analgesic effects of hydroalcoholic extract of seed and crops of *Anethum graveolens*. *Toxicology Letters.* 2012;211:209.

31. Iranshahy M, Iranshahi M. Traditional uses, phytochemistry and pharmacology of asafetida (*Ferula assa-foetida* oleo-gum-resin). *J Ethnopharmacol.* 2011;134:1-10.

32. Shahverdi AR, Saadat F, Khorramzadeh MR, Iranshahi M, Khoshayand MR. Two matrix metalloproteinases inhibitors from *Ferula persica* var. *persica*. *Phytomedicine.* 2006;13:712-7.

33. Erdemoglu N, Küpeli E, Yeşilada E. Anti-inflammatory and antinociceptive activity assessment of plants used as remedy in Turkish folk medicine. *J Ethnopharmacol.* 2003;89:123-9.

34. Bae EA, Yoo YI, Lee IA, Joo Han M, Kim DH. The anti-inflammatory effect of fermented red ginseng in experimental colitic mice. *Food Agr Immunol.* 2008;19:313-23.

35. Choi SS, Han EJ, Han KJ, Lee HK, Suh HW. Antinociceptive Effects of Ginsenosides Injected Intracerebroventricularly or Intrathecally in Substance P-Induced Pain Model. *Planta Med.* 2003;69:1001-4.

36. Fayyaz A, Rafeeq AK, Ibrahim H. Study of analgesic and anti-inflammatory activity from

plant extracts of *Lactuca scariola* and *Artemisia absinthium*. *J Islam Acad Sci.* 1992;5:111-4.

37. Núñez Figueredo Y, Montero Alarcón C, Agüero Fernández S, Muñoz Cernuda A. Pre-clinical anti-inflammatory effects of dry powder of *Calendula officinalis*. Efecto antiinflamatorio pre-clínico del polvo seco de *Caléndula officinalis*. *Lat Am J Pharm.* 2007;26:548-52.

38. Ahmad S, Qureshi S, Atiqur R, Zakirur R, Badar Y. Antipyretic and analgesic activity in crude ethanolic extract of *Calendula officinalis* Linn. *Pak J Sci Ind Res.* 2000;43:50-4.

39. Cavin C, Delannoy M, Malnoe A, Debeve E, Touché A, *et al.* Inhibition of the expression and activity of cyclooxygenase-2 by chicory extract. *Biochem Biophys Res Commun.* 2005;327:742-9.

40. Wesołowska A, Nikiforuk A, Michalska K, Kisiel W, Chojnacka-Wójcik E. Analgesic and sedative activities of lactucin and some lactucin-like guaianolides in mice. *J Ethnopharmacol.* 2006;107:254-8.

41. Wu Y, Xu Y, Yao L. Anti-inflammatory and Anti-allergic Effects of German Chamomile (*Matricaria chamomilla* L.). *Journal of Essential Oil Bearing Plants.* 2011;14(5).

42. Heidari MR, Asadpour A., Ghayour M. Evaluation of Analgesic and Ulcerogenic Effects of Methanolic Extract of *Matricaria chamomilla* L. *J Qazvin Univ Med Sci.* 2003;20:15-23.

43. Bonjardim LR, da Silva AP, Gameiro GH, Tambeli CH, Ferraz de Arruda Veiga MC. Nociceptive behavior induced by mustard oil injection into the temporomandibular joint is blocked by a peripheral non-opioid analgesic and a central opioid analgesic. *Pharmacol Biochem Behav.* 2009;91:321-6.

44. Lin JY, Li CY, Hwang IF. Characterisation of the pigment components in red cabbage (*Brassica oleracea* L. var.) juice and their anti-inflammatory effects on LPS-stimulated murine splenocytes. *Food Chem.* 2008;109:771-81.

45. Su Sh, Hua Y, Wang Y, Gu W, Zhou W, Duan J, *et al.* Evaluation of the anti-inflammatory and analgesic properties of individual and combined extracts from *Commiphora myrrha*, and *Boswellia carterii*. *J Ethnopharmacol.* 2012;139:649-56.

46. Tipton DA, Lyle B, Babich H, Dabbous MKh. *In vitro* cytotoxic and anti-inflammatory effects of myrrh oil on human gingival fibroblasts and epithelial cells. *Toxicol In Vitro.* 2003;17:301-10.



47. al-Said MS, Abdelsattar EA, Khalifa SI, el-Feraly FS. Isolation and identification of an anti-inflammatory principle from *Capparis spinosa*. *Pharmazie*. 1988;43:640-1.
48. Panico AM, Cardile V, Garufi F, Puglia C, Bonina F, Ronsisvalle G. Protective effect of *Capparis spinosa* on chondrocytes. *Life Sci*. 2005;77:2479-88.
49. Sireeratawong S, Jaijoy K, Panunto W, Soonthornchareonnon N. Anti-inflammatory activity and toxicity of the water extract of *Terminalia chebula* rezt in rats. *Planta Med*. 2012;78:112.
50. Kaur S, Jaggi RK. Antinociceptive activity of chronic administration of different extracts of *Terminalia bellerica* Roxb. and *Terminalia chebula* Retz. fruits. *Indian J Exp Biol*. 2010;48:925-30.
51. Blázovics A, Lugasi A, Szentmihályi K, Kéry Á. Reducing power of the natural polyphenols of *Sempervivum tectorum* *in vitro* and *in vivo*. *Act Biol Szeg*. 2003;47:99-102.
52. Kekesi G, Dobos I, Benedek G, Horvath G. Antinociceptive Activity of *Sempervivum tectorum* L. Extract in Rats. *Phytother Res*. 2003;17:1032-6.
53. Yesilada E, Tanaka S, Sezik E, Tabata M. Isolation of an anti-inflammatory principle from the fruit juice of *Ecballium elaterium*. *J Nat Prod*. 1988;51:504-8.
54. Agil MA, Risco S, Miro M, Navarro MC, Ocete MA, Jimenez J. Analgesic and antipyretic effects of *Ecballium elaterium* (L.) A. Richard. Extract in rodents. *Phytother Res*. 1995;9:135-8.
55. Marzouk B, Marzouk Z, Haloui E, Fenina N, Bouraoui A, Aouni M. Screening of analgesic and anti-inflammatory activities of *Citrullus colocynthis* from southern Tunisia. *J Ethnopharmacol*. 2010;128:15-9.
56. Ahmadiani A, Hosseiny J, Semnianian S, Javan M, Saeedi F, Kamalinejad M. *et al*. Antinociceptive and anti-inflammatory effects of *Elaeagnus angustifolia* fruit extract. *J Ethnopharmacol*. 2000; 72:287-92.
57. Ilavarasan R, Mallika M, Venkataraman S. Anti-inflammatory and free radical scavenging activity of *Ricinus communis* root extract. *J Ethnopharmacol*. 2006;103:478-80.
58. Vieira C, Fetzer S, Sauer SK, Evangelista S, Averbeck B, Kress M, *et al*. Pro- and anti-inflammatory actions of ricinoleic acid: similarities and differences with capsaicin. *Naunyn Schmiedeberg Arch Pharmacol*. 2001;364:87-95.
59. Shaker E, Mahmoud H, Mnaa S. Anti-inflammatory and anti-ulcer activity of the extract from *Alhagi maurorum* (camelthorn). *Food Chem Toxicol*. 2010;48:2785-90.
60. Bhakta T, Mukherjee PK., Saha K, Pal M, Saha BP, Mandal SC. Evaluation of anti-inflammatory effects of *Cassia fistula* (Leguminosae) leaf extract on rats. *J Herbs Spices Med Plants*. 1999;6:67-72.
61. Patwardhan S, Sakhare G, Singhai AK, Jain K, Somani R. Evaluation of analgesic activity of *Cassia fistula* on albino mice. *Pharmacology-online*. 2009;2:887-93
62. Saravana Kumar A, Gandhimathi R, Mohana Lakshmi S, Rahul N, Ashok Kumar CK. Evaluation of the antinociceptive properties from *Indigofera tinctoria* leaves extracts. *J Pharm Sci & Res*. 2009;1:31-7.
63. Berkan T, Ustünes L, Lermioglu F, Ozer A. Antiinflammatory, analgesic, and antipyretic effects of an aqueous extract of *Erythraea centaureum*. *Planta Med*. 1991;57:34-7.
64. Papoutsis Z, Kassi E, Chinou I, Halabalaki M, Skaltsounis LA, Moutsatsou P. Walnut extract (*Juglans regia* L.) and its component ellagic acid exhibit anti-inflammatory activity in human aorta endothelial cells and osteoblastic activity in the cell line KS483. *Br J Nutr*. 2008;99:715-22.
65. Lin JT, Chen YC, Lee YC, Rolis Hou CW, Chen FL, Yang DJ. Antioxidant, anti-proliferative and cyclooxygenase-2 inhibitory activities of ethanolic extracts from lemon balm (*Melissa officinalis* L.) leaves. *Food Sci Tech*. 2012;49:1-7.
66. Guginski G1, Luiz AP, Silva MD, Masaro M, Martins DF, Chaves J, *et al*. Mechanisms involved in the antinociception caused by ethanolic extract obtained from the leaves of *Melissa officinalis* (lemon balm) in mice. *Pharmacol Biochem Behav*. 2009;93:10-6.
67. Tariq M, Ageel AM, al-Yahya MA, Mossa JS, al-Said MS. Anti-inflammatory activity of *Teucrium polium*. *Int J Tissue React*. 1989;11:185-8.
68. Baluchnejadmojarad T, Roghani M, Roghani-Dehkordi F. Antinociceptive effect of *Teucrium polium* leaf extract in the diabetic rat formalin test. *J Ethnopharmacol*. 2005;97:207-10.
69. Hosseinzadeh H, Ramezani M, Salmani G. Antinociceptive, anti-inflammatory and acute toxicity effects of *Zataria multiflora* Boiss extracts in

- mice and rats. *J Ethnopharmacol.* 2000;73:379-85.
70. Sayyah M, Saroukhani G, Peirovi A, Kamalinejad M. Analgesic and anti-inflammatory activity of the leaf essential oil of *Laurus nobilis* Linn. *Phytother Res.* 2003;17:733-6.
71. Deraniyagala SA, Ratnasooriya WD, Goonasekara CL. Antinociceptive effect and toxicological study of the aqueous bark extract of *Barringtonia racemosa* on rats. *J Ethnopharmacol.* 2003;86:21-6.
72. Hodge G, Hodge S, Han P. *Allium sativum* (garlic) suppresses leukocyte inflammatory cytokine production *in vitro*: potential therapeutic use in the treatment of inflammatory bowel disease. *Cytometry.* 2002;48:209-15.
73. Hyun SH, Kim MB, Lim SB. Physiological activities of garlic extracts from Daejeong Jeju and major cultivating areas in Korea. *J Korean Soc Food Sci Nutr.* 2008;37:1542-7.
74. Chandrasekaran AN, Porkodi R. Thiocolchicoside an anti-inflammatory analgesic agent with muscle relaxant action. *J Indian Rheum Assoc.* 1994;2:137-9.
75. Vázquez B, Avila G, Segura D, Escalante B. Antiinflammatory activity of extracts from *Aloe vera* gel. *J Ethnopharmacol.* 1996; 55:69-75.
76. Shahraki MR, Mirshikari H. The Anti-Nociceptive effect of *Aloe vera* aqueous extract in fructose-fed male rats. *Basic Clin Neurosci* 2010;1:39-43.
77. Dupasquier CM, Dibrov E, Kneesh AL, Cheung PK, Lee KG, Alexander HK, *et al.* Dietary flaxseed inhibits atherosclerosis in the LDL receptor-deficient mouse in part through antiproliferative and anti-inflammatory actions. *Am J Physiol Heart Circ Physiol.* 2007;293:2394-402.
78. Ahmad F, Khan RA, Rashid S. Pharmacological evaluation of medicinal plants for their analgesic activity in mice. *Med J Islam Repub Iran.* 1996;10:149-52.
79. Chen J, Wang X, Qu YG, Chen ZP, Cai H, Liu X, *et al.* Analgesic and anti-inflammatory activity and pharmacokinetics of alkaloids from seeds of *Strychnos nux-vomica* after transdermal administration: Effect of changes in alkaloid composition. *J Ethnopharmacol.* 2012;139:181-8.
80. Ali BH, Bashir AK, Tanira MO. Anti-inflammatory, antipyretic, and analgesic effects of *Lawsonia inermis* L. (henna) in rats. *Pharmacology.* 1995;51:356-63.
81. Koley KM, Lal J, Tandan SK. Anti-inflammatory activity of *Azadirachta indica* (neem) leaves. *Fitoterapia.* 1994;65:524-8.
82. Patel JP, Hemavathi KG, Bhatt JD. Study of the antinociceptive effect of neem leaf extract and its interaction with morphine in mice. *Indian J Pharmacol.* 2005;37:37-8.
83. Ali H, Monga J, Gupta L, Singh A, Narayan S, Siddiqui ZA, *et al.* Anti-inflammatory effects of hydro-methanolic extract of *Ficus carica*. *Biomed Pharmacol J.* 2009;2:129-32.
84. Hosseinzadeh H, Khoshdel M, Ghorbani M. Antinociceptive, anti-inflammatory effects and acute toxicity of aqueous and ethanolic extracts of *Myrtus communis* L. Aerial parts in mice. *J Acupunct Meridian Stud.* 2011;4:242-7.
85. Süntar I, Tumen I, Ustün O, Keleş H, Akkol EK. Appraisal on the wound healing and anti-inflammatory activities of the essential oils obtained from the cones and needles of *Pinus species* by *in vivo* and *in vitro* experimental models. *J Ethnopharmacol.* 2012;139:533-40.
86. Devan P, Bani S, Suri KA, Satti NK, Qazi GN. Immunomodulation exhibited by piperinic acid through suppression of proinflammatory cytokines. *Int Immunopharmacol.* 2007;7:889-99.
87. Park JE, Choi HJ, Jung SH, Kim NJ, Kim DH. Analgesic and antiinflammatory activities of some oriental herbal medicines. *Kor J Pharmacog.* 2001;32:257-68.
88. Rodríguez-Cabezas ME, Gálvez J, Camuesco D, Lorente MD, Concha A, Martínez-Augustín O, *et al.* Intestinal anti-inflammatory activity of dietary fiber (*Plantago ovata* seeds) in HLA-B27 transgenic rats. *Clin Nutr.* 2003;22:463-71.
89. Haider S, Nazreen S, Alam MM, Hamid H, Alam MS. Anti-inflammatory and anti-nociceptive activities of *Platanus orientalis* Linn. and its ulcerogenic risk evaluation. *J Ethnopharmacol.* 2012;143:236-40.
90. Almeida RN, Navarro DS, Barbosa-Filho JM. Plants with central analgesic activity. *Phyto-medicine.* 2001;8:310-22.
91. Chehl N, Chipitsyna G, Gong Q, Yeo CJ, Arafat HA. Anti-inflammatory effects of the *Nigella sativa* seed extract, thymoquinone, in pancreatic cancer cells. *HPB (Oxford).* 2009;11:373-81.
92. Bashir MU, Qureshi HJ. Analgesic effect of *Nigella sativa* seeds extract on experimentally induced pain in albino mice. *J Coll Physicians*

- Surg Pak*. 2010;20:464-7.
93. Shams KA, Schmidt R. Lipid fraction constituents and evaluation of anti-anaphylactic activity of *Prunus mahaleb* L. kernels. *Afr J Tradit Complement Altern Med*. 2007;4:289-93.
94. Rakhshandeh H, Vahdati-Mashhadian N, Dolati K, Hosseini M. Antinociceptive effect of *Rosa damascena* in mice. *J Biol Sci*. 2008;8:176-80.
95. Chan YY, Li CH, Shen YC, Wu TS. Anti-inflammatory principles from the stem and root barks of *Citrus medica*. *Chem Pharm Bull (Tokyo)*. 2010;58:61-5.
96. Sood S, Bansal S, Muthuraman A, Gill NS, Bali M. Therapeutic potential of *Citrus medica* L. peel extract in carrageenan induced inflammatory pain in rat. *Res J Med Plant*. 2009;3:123-33.
97. Sarrell EM, Mandelberg A, Cohen HA. Efficacy of naturopathic extracts in the management of ear pain associated with acute otitis media. *Arch Pediatr Adolesc Med*. 2001;155:796-9.
98. Sarrell EM, Cohen HA, Kahan E. Naturopathic treatment for ear pain in children. *Pediatrics*. 2003;111:574-9.
99. Wannang NN, Anuka JA, Kwanashie HO, Gyang SS, Auta A. Analgesic and anti-inflammatory activities of the aqueous leaf extract of *Solanum nigrum* Linn (solanaceae) in rats. *Niger J Pharm Res*. 2006;5:74-9.
100. Kaileh M, Vanden Berghe W, Boone E, Essawi T, Haegeman G. Screening of indigenous Palestinian medicinal plants for potential anti-inflammatory and cytotoxic activity. *J Ethnopharmacol*. 2007;113:510-6.
101. Sharma MC, Sharma S, Kohli DV. Formulation and evaluation of analgesic activity, anti-inflammatory and anti-anxiety activity of using plant extracts. *Dig J Nanomater Biostruct*. 2010;5:147-51.
102. Schuhbaum H, Bürgermeister J, Paper DH, Franz G. Anti-inflammatory activity of *Zingiber officinale* extracts. *Pharmaceut Pharmacol Lett*. 2000;10:82-5.
103. Black CD, Herring MP, Hurley DJ, O'Connor PJ. Ginger (*Zingiber officinale*) Reduces Muscle Pain Caused by Eccentric Exercise. *J Pain*. 2010;11:894-903
104. Farouk L, Laroubi A, Aboufatima R, Benharref A, Chait A. Evaluation of the analgesic effect of alkaloid extract of *Peganum harmala* L.: possible mechanisms involved. *J Ethnopharmacol*. 2008;115:449-54.

