



Scholars Research Library

Der Pharmacia Lettre, 2015, 7 (12):419-426  
 (<http://scholarsresearchlibrary.com/archive.html>)



## Ethnobotanical identification of medicinal plants effective on toothache in Shiraz, south Iran

Shokoufeh Ahmadipour<sup>1</sup>, Azam Mohsenzadeh<sup>1</sup>, Saeedeh Ahmadipour<sup>2\*</sup>, Zohreh Eftekhari<sup>3</sup> and Pegah Tajeddini<sup>4</sup>

<sup>1</sup>Department of Pediatrics, Faculty of Medicine, Lorestan University of Medical Sciences, Khorramabad, Iran

<sup>2</sup>Department of Pharmaceutical, School of Medicine, Isfahan University of Medical Sciences, Isfahan, Iran

<sup>3</sup>Pasteur Institute of Iran, Tehran, Iran

<sup>4</sup>Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran

### ABSTRACT

Pain is an unpleasant sensory experience which is developed by acute or potential tissue damage. Currently, some drugs such as nonsteroidal anti-inflammatory drugs such as aspirin and ibuprofen, opioids such as morphine, meperidine, methadone, tramadol, buprenorphine, butorphanol, and nalbuphine as well as other drugs including tricyclic antidepressants and corticosteroids are being used to control pain. These drugs could cause side effects. Given the high prevalence of toothache and that a variety of plants are used to relieve toothache in Iranian traditional medicine, this study was conducted to document the data of medicinal plants effective on relief of toothache in Shiraz. In this study, the data on traditional treatments were gathered from the groceries across Shiraz between 23 July, 2015 and 23 October, 2015 by pre-developed questionnaires administered to the grocers by researcher. The data obtained from the questionnaires were meticulously tabulated and recorded and analyzed by Excel. Finally 20 plants from 14 families were identified as being used for toothache in Shiraz. Most plants effective on toothache were from Composite family. Aerial parts were (38%) were the most frequently used organs and concentrated extract (70%) was the most frequent traditional method of use in the studied region. *Papaver tennifolium* (37.03%) obtained the highest percentage of frequency of citation of the toothache-relieving plants in Shiraz. It is necessary to identify the effective substances in the medicinal plants native to Shiraz used to relieve toothache and to study these substances' therapeutic effects.

**Key words:** Toothache, Iran, Shiraz, Medicinal plants

### INTRODUCTION

Pain is an unpleasant sensory experience which is developed by acute or potential tissue damage. Pain is also a protective mechanism of the body leading to an appropriate response to eliminate the pain causing agent, and is used as an index to diagnose the diseases [1]. The perception of pain is influenced by the neurotransmitters balance and cortex descending fibers of pain control [2]. Chronic diseases are projected to be the most genuine reason for mortality and general disability in 2020 and will comprise 2/3 of all diseases [5].

Studies have indicated that the body exerts chemical, hormonal responses to the stimulants such as pain, and these responses lead to developing some complications in the body's different organs and increased mortality in children. The damage to peripheral tissue and development of chronic diseases damage nervous system and remarkably decline pain threshold [3].

Analgesic drugs are divided into opioids and non opioids. Opioids exert their effect through connecting to the receptors of nervous system  $\mu$ ,  $\kappa$ , and  $\delta$  central opioid, that is, they exert their analgesic effect centrally. Opioids include morphine, codeine, and heroine.

Long term use of opioids leads to physical tolerance and dependency and also increased sensitivity to pain hyperalgesia [4]. Most non opioids lack central function and exert their analgesic effect peripherally. Non opioids mainly include nonsteroidal anti-inflammatory drugs (NSAIDs), which work through preventing synthesis of icozanoids by inhibiting cyclo-oxygenase (COX). Long term use of non opioids does not result in tolerance or dependency but causes gastrointestinal diseases because of inhibiting COX-1 [5].

Toothache is dumb. However some intense and sudden pain is developed since the third day, which is caused by dry cavity, with the prevalence rate of 68.4%. Dentistry environment has been always stressful for most patients including anesthetics administration, previous disturbing treatments, environment's smell, and dental material [6].

Currently, some drugs such as NSAIDs such as aspirin and ibuprofen, opioids such as morphine, meperidine, methadone, tramadol, buprenorphine, butorphanol, and nalbuphine as well as other drugs including tricyclic antidepressants, corticosteroids, and adjuvant analgesic are being used to control pain [7].

Iranian traditional medicine and herbal therapy are one of the richest and oldest treasures of human knowledge [8-15]. Nowadays, world community is paying special attention to traditional treatments and identifying and generating biological and pharmaceutical effective substances from medicinal plants [16-23]. Recent research has mainly demonstrated the positive effects of these plants [24-35]. Given the importance of documenting precious native knowledge of traditional treatments and treating diseases economically, effectively, and safely, the high prevalence of toothache and that a variety of plants are used to relieve toothache in Iranian traditional medicine, this study was conducted to document the data of medicinal plants effective on relief of toothache in Shiraz.

## MATERIALS AND METHODS

### *Region of study*

Shiraz is a big city of Iran and capital of Fars Province, with a rectangular area of 1268 square kilometers located in central region of Fars Province, southwest Iran. Shiraz population amounted to over 1460665 individuals (1700687 including the population in the suburbs) in 2011-2012. Shiraz is located at 1486-meter altitude in Zagros mountainous region and enjoys a moderate climate. This city is neighbored Bamoo, Sabzpushan, Chehalmaghham, and Babakouhi (of Zagros) Mountains from north and by Derak Mountain from west. The mean temperature is 30°C in *Tir* (June-July) (hottest month of the year), 5°C in *Dey* (December-January) (coldest month of the year), 17°C in *Farvardin* (March-April), and 20°C in *Mehr* (September-October), with the mean annual temperature of 18°C and annual rainfall of 3378 mm [46].

### *Method of identifying and gathering therapeutic effects of medicinal plants*

In this study, the data on traditional treatments were gathered from the groceries across Shiraz between 23 July, 2015 and 23 October, 2015 by pre-developed questionnaires administered to the grocers by researcher. The questionnaire included items regarding the location, characteristics of the interviewees, local name of the plants, indications of local use, the used organs, the method of use, season of growth, and the type of plants maintained at home [47-49]. The interviewers referred the groceries in person and gathered and recorded the data on herbal therapy. The obtained data were meticulously tabulated and analyzed by Excel.

Overall, 20 plants from 14 families were identified as being used for toothache in Shiraz. Most plants effective on toothache were from Composite family. Aerial parts were (38%) were the most frequently used organs and concentrated extract (70%) was the most frequent traditional use in the studied region. Table 1 and Graphs 1-3 illustrate further data.

Table 1. Scientific name, family name, used organ(s), and traditional method(s) of use of medicinal plants effective on toothache

Scientific name	Family	Persian names	Usable Part of plant	How to use	Uss
<i>Achillea eriophora</i> DC.	Caryophyllaceae	Bomadaran	Aerial parts	Decoction	Tootache
<i>Amygdalus scoparia</i> Spach.	Rosaceae	Badam-Koochi-Arzhak	Fruits and Leaves	Decoction	Tootache
<i>Salvia atropatana</i> Bunge	Lamiaceae	Maryam-Goli-Azarbayejan	Aerial parts	Decoction	Tootache
<i>Dianthus hafezi</i> Assadi, sp.nova.	Caryophyllaceae	Mikhak Hafezi	Aerial parts	Paste	Tootache
<i>Matricaria recutita</i>	Asteraceae	Babooneh	Flowers and Leaves	Decoction	Tootache
<i>Ziziphora persica</i> Bfe	Labiatae	Kakuti	Aerial parts	Decoction	Tootache
<i>Amygdalus lycioides</i> Spach.	Rosaceae	Tangars-Badamak	Aerial parts	Paste	Tootache
<i>Borago officinalis</i>	Boraginaceae	Gavzaban	Flowers	Decoction	Tootache
<i>Gundelia tournefortii</i> L.	Compositae	Kangar	Stem and Leaves	Paste	Tootache
<i>Prangos acaulis</i> (DC.) Bornm	Apiaceae	Jashi-Kootoleh	Aerial parts	Decoction	Tootache
<i>Centaurea depresso</i> M.	Compositae	Golegandom	Aerial parts	Decoction	Tootache
<i>Acanthophyllum</i> spp.	Caryophyllaceae	Choovak	Aerial parts	Decoction	Tootache
<i>Nigella ciliaris</i> L.	Ranunculaceae	Siahdaneh	Seeds	Decoction	Tootache
<i>Papaver tennifolium</i> Boiss & Hohen ex Boiss.	Papaveraceae	Khashkhash-Lirzi	Flowers and Leaves	Decoction	Tootache
<i>Glaucium grandiflorum</i> Boiss & Huet.	Papaveraceae	Shaghayegh-Golbozoegh	Leaves	Decoction	Tootache
<i>Cinnamomum verum</i>	Lauraceae	Darchin	Bark	Paste	Tootache
<i>Zingiber officinale</i>	Zingiberaceae	Zanjebil	Aerial parts and Root	Paste	Tootache
<i>Haplophyllum perforatum</i> L.	Rutaceae	Moord-Kazeb	Aerial parts	Paste	Tootache
<i>Zataria multiflora</i>	Lamiaceae	Avishan-Shirazi	Leaves	Decoction	Tootache
<i>Pyrethrum roseum</i>	Compositae	Mokhallaseh	Leaves	Decoction	Tootache

Table 2. Frequency of citation (%) of medicinal plants effective on toothache in Shiraz

Scientific name	The number of herbalists mentioned the plant	The total number of herbalists	Frequency of citation (FC) percentage (%)
<i>Achillea eriophora</i> DC.	9	27	33.33
<i>Amygdalus scoparia</i> Spach.	6	27	22.22
<i>Salvia atropatana</i> Bunge	2	27	7.40
<i>Dianthus hafezi</i> Assadi, sp.nova.	10	27	37.03
<i>Matricaria recutita</i>	4	27	14.81
<i>Ziziphora persica</i> Bfe	5	27	18.51
<i>Amygdalus lycioides</i> Spach.	6	27	22.22
<i>Borago officinalis</i>	6	27	22.22
<i>Gundelia tournefortii</i> L.	4	27	14.81
<i>Prangos acaulis</i> (DC.) Bornm	7	27	25.92
<i>Centaurea depresso</i> M.	3	27	11.11
<i>Acanthophyllum</i> spp.	5	27	18.51
<i>Nigella ciliaris</i> L.	7	27	25.92
<i>Papaver tennifolium</i> Boiss & Hohen ex Boiss.	10	27	37.03
<i>Glaucium grandiflorum</i> Boiss & Huet.	3	27	11.11
<i>Cinnamomum verum</i>	1	27	3.70
<i>Zingiber officinale</i>	5	27	18.51
<i>Haplophyllum perforatum</i> L.	1	27	3.70
<i>Zataria multiflora</i>	6	27	22.22
<i>Pyrethrum roseum</i>	8	27	29.62

*Papaver tennifolium* (10 citations [37.03%]) had the highest frequency of the plants used to relieve toothache in Shiraz. Table 2 gives further data.

Figure 1. Number of plant families effective on toothache in Shiraz

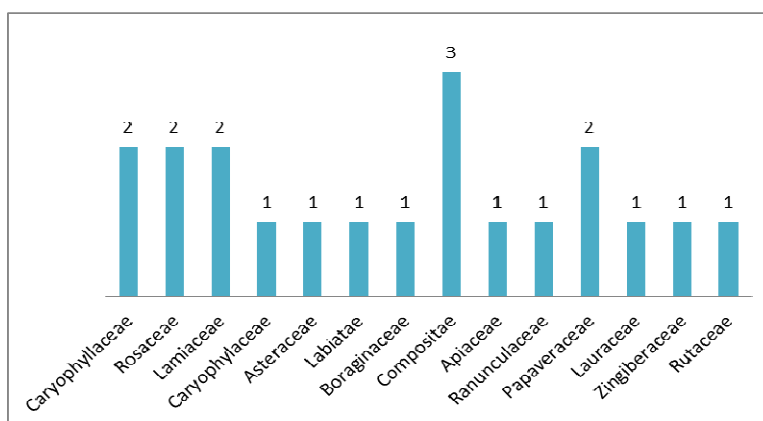


Figure 2. Percentage of used plant organs for toothache in Shiraz

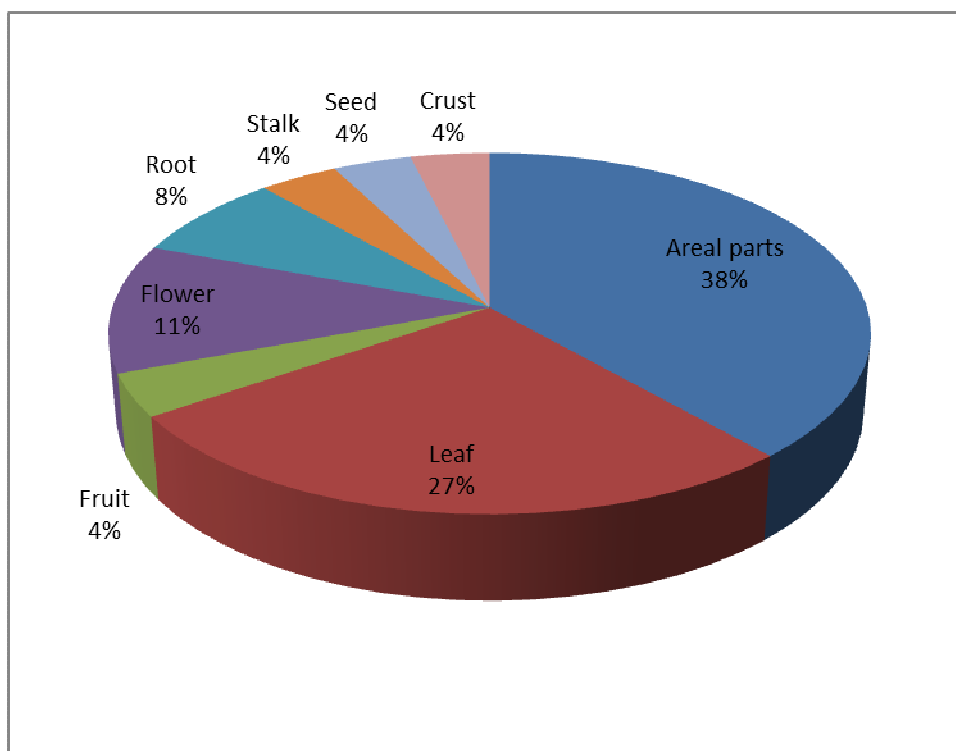
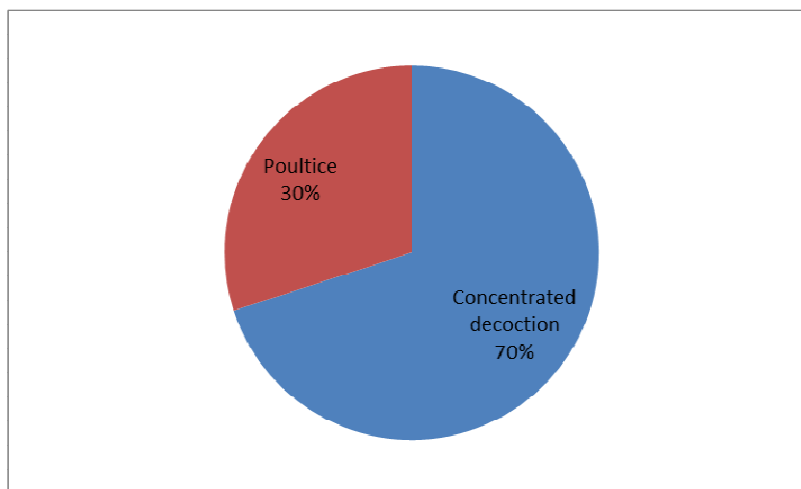


Figure 3. Percentage of method of use of effective plants on toothache in Shiraz



## DISCUSSION

This ethnobotanical study indicated that 20 medicinal plants from 14 families are used to relieve toothache in Shiraz. In Arasbaran (northwest Iran), *Origanum vulgare*, *Papaver oriental*, and *Hyoscyamus niger* are used as anti-toothache [50]. In Sistan and Balouchestan ethnobotany (southeast Iran), *solanum nigrum* L. is taken to relieve toothache [51]. Based on phytopharmacological medicine in Kashan, *Dianthus crinitus*. is taken to remove toothache [52]. In ethnopharmacological knowledge of Sirjan, Kerman, *Dianthus crinitus*, *Dianthus orientalism*, *Faba vulgaris*, and *Sanguisorba minor* are used to relieve toothache [53]. In traditional medicine of Mobarakeh, Isfahan, *Allium cepa* L. *Peganum harmala* L., and *Astragalus verus* Oliv. are used to treat toothache [54]. In traditional herbal therapy of Ilam Province, west Iran *Achilles biebersteinii*, *Capparis spinosa* L., *Dianthus orientalis*, and *Peganum harmala* L. are used to relieve toothache [55]. In herbal medicine of Lorestan Province, *Pistacia atlantica*, *Daphne mucronata*, *Vitis vinifera*, *Pistacia khinjuk*, *Mentha longifolia*, *Papaver rhoeasa*, *Peganum harmala*, *Tanacetum parthenium*, *Juniperus excelsa*, *Salvia hydreange*, *Salvia multicaulis*, *Cerategus monogyna*, and *Glycyrrhiza glabra* are used for treating toothache [56].

Thyme essence mainly enjoys alpha-pinene, terpinene, and thymol [57]. Acanthus contains an effective substance called inulin [58]. Phytochemical studies have indicated that ginger is rich in gingerols and shagavoles, including 6-gingerol and 6-shagavoles that strongly inhibit 5-lipoxygenase [59-61]. The main components of *Ziziphora aragonensis* are thymol and carvacrol [62, 63]. The components of cinnamon include 4-terpineol, terpinene, camphene, corydin, epicatechin, 6-sitosterol, coumarin, cinnamic acid, syringic acid, and vanillic acid [64, 65].

Yarrow contains sesquiterpen lactone and flavonoid as main components [66]. Poppy contains some alkaloids such as protopine, cryptopine, and thebaine [67]. *Borago officinalis* contains flavonoid, saponin, unsaturated esterols, piperolidine alkaloids, equinon, equinoforan, and gamalinolic acid [68]. *Prangos ferulacea* contains bioactive substances consisting of epi- $\alpha$ -bisabolol,  $\delta$ -3-carene, alpha-pinene, beta-pinene, limonene,  $\beta$ -caryophyllene, germacrene D,  $\beta$ -cederene [69]. Black seed has effective substances nigellamine, themioquinon, di-themioquinon, themiohydroquinon, and thymol [70-72].

Pharmaceutical compounds of *T. parthenium* include sesquiterpen lactones such as parthenolide, cannin, arctanin, and epokiadnorin and sesquiterpenes such as kamfour and alpha-pinene [73-75]. Chamomile essence contains an aromatherapeutic product obtained from chamomile flower by steam distillation. Its main constituents are alpha-bisabolol, bisabolol oxide, spiroethers, camazulene, and flavonoid [76]. Eugenol, phenol, alpha-copaene, caryophyllene, alpha-humulene, alpha-forenzen, cadinene, and oxide caryophyllene are also found in chamomile [77].

The mechanism of analgesic effect of the used plants has not been yet explained and therefore this mechanism should be established in scientifically investigating these plants. Review of phytochemical findings on medicinal plants indicates that the toothache-relieving plants used in Shiraz contain bioactive and effective substances from flavonoids, flavons, tannins, alkaloids, saponins, and glycosides through which their anti-inflammatory and analgesic effects are exerted. Pain is usually associated with increase in free radicals and development of oxidative stress, and antioxidants have the potential to inhibit oxidative stress and relieve the pain [78]. The above substances are mainly antioxidant agents and could lead to pain relief other similar plants which have antioxidant property [79-96] could be analgesic and should be studied. Traditional knowledge could be considered as a part of the unique culture of any regions, referred to the findings which have been empirically obtained to adapt to the specific conditions of the ecosystem and gradually turned into a part of social and productive knowledge of the community. Therefore, such knowledge is the result of accumulating centuries of experience and hence enjoys a valuable potential for sustainable development. Ethnobotany or plant demography is a discipline of native knowledge addressing the contribution of the plants in a region to environmental knowledge among local ethnicities from multiple perspectives.

In other words, ethnobotany could be considered as a systematic approach to studying human dealings with plants. The present study confirms that traditional data on herbal therapy are reliable to document such therapeutic effects and a potential for ethnopharmacological studies, paving the way for development of natural and safe drugs.

#### Acknowledgement

This article has been prepared by support of Research Deputy of Shahrekord University of Medical Sciences.

#### REFERENCES

- [1] RN Almeida, DS Navarro, JM Barbosa-Filho. *Phytomedicine*. **2001**; 8(4):310-22.
- [2] D Ignatavicus, L Workman, M Mishler. 3rd ed, Toronto Saunders Co **1999**; 1: 366-7.
- [3] Mccaffery M, pasero C. Pain clinical manual. St. Louis: Mosby; **1999**. P. 30-54-364.
- [4] MP Mangione M, Crowley-Matoka M. *J Gen Intern Med*. **2008**; 23(9):1336-8.
- [5] A Rostom, C Dubé, G Lewin, A Tsertsvadze, N Barrowman, C Code, et al. *Ann Intern Med*. **2007**; 146(5): 376-89.
- [6] O Robin, O Alaoui-Ismaili, A Dittmar, E Vernet-Maury. *J Dent Res*. **1998**; 77(8): 1638-46.
- [7] JG Hardman, LE Limbird, and AG Gillman. Mc Graw- Hill, **2001**.
- [8] M Bahmani, T Farkhondeh and P Sadighara. *Comp Clin Pathol*. **2012**; 21(3): 357-359.
- [9] M Bahmani, SA Karamati, EKH Banihabib, K Saki. *Asian Pac J Trop Dis*. **2014**; 4(Suppl 1): 477-480.
- [10] B Delfan, M Bahmani, M Rafieian-Kopaei, M Delfan, K Saki. *Asian Pac J Trop Dis*. **2014**; 4(Suppl 2): 879-884.
- [11] A Azadmehr, R Hajiaghvae, A Afshari, Z Amirghofran, M Refieian-Kopaei, H yousofi, A Darani and SH Hedayatollah. *J Med Plants Res*. **2011**; 5(11): 2365-2368.
- [12] M Bahmani and EKH Banihabib. *Global Veterinaria*. **2013**; 10 (2): 153-157.

- [13] A Sarrafchi, M Bahmani, H Shirzad, M Rafieian-Kopaei. *Curr Pharm Des.* **2015** Nov 12. [Epub ahead of print].
- [14] M Amirmohammadi, SH Khajoenia, M Bahmani, M Rafieian-Kopaei, Z Eftekhari, M Qorbani. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 1): 250-254.
- [15] M Bahmani, Z Eftekhari. *Comp Clin Path.* **2012**; 22: 403-407.
- [16] Z Eftekhari, M Bahmani, A Mohsenzadegan, M Gholami-Ahangaran, J Abbasi, N Alighazi. *Comp Clin Path.* **2012**; 21: 1219-1222.
- [17] M Bahmani, J Abbasi, A Mohsenzadegan, S Sadeghian, M Gholami-Ahangaran. *Comp Clin Path.* **2013**; 22:165-168.
- [18] M Bahmani, A Sarrafchi, H Shirzad, M Rafieian-Kopaei. *Curr Pharm Des.* **2015** Nov 12. [Epub ahead of print].
- [19] M Bahmani, J Abbasi, A Mohsenzadegan, S Sadeghian, M Gholami Ahangaran. *Comp Clin Pathol.* **2013**; 22:165-168.
- [20] M Gholami-Ahangaran, M Bahmani, N Zia-Jahromi. *Asian Pac J Trop Dis.* **2012**; 2(1): S101-S103.
- [21] M Bahmani, H Golshahi, A Mohsenzadegan, M Ghollami- Ahangarani, E Ghasemi. *Comp Clin Pathol.* **2013**; 22(4): 667-670.
- [22] SH Forouzan, M Bahmani, P Parsaei, A Mohsenzadegan, M Gholami- Ahangaran, et al. *Glob Vet.* **2012**; 9(2): 144-148.
- [23] M Gholami-Ahangaran, M Bahmani, N Zia-Jahrom. *Glob Vet.* **2012**; 8: 229-232.
- [24] M Bahmani, A Zargar, M Rafieian-Kopaei. *Rev Bras Farmacogn.* **2014**; 24(4): 468-48.
- [25] H Nasri, H Shirzad, A Baradaran. M Rafieian-kopaei. *J Res Med Sci.* **2015**; 20:491-50
- [26] M Rafieian-Kopaei, S Asgary, A Adelnia, M Setorki, S Khazaei, S Kazemi, F Shamsi. *J Med Plants Res.* **2011**; 5(13): 2670-2676 .
- [27] M Bahmani, EKH Banihabib M, M Rafieian-Kopaei and M Gholami-Ahangaran. *Kafkas Univ Vet Fak Derg.* **2015**; 21 (1): 9-11.
- [28] B Delfan, M Bahmani, Z Eftekhari, M Jelodari, K Saki, T Mohammadi. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 2): 938-942.
- [29] H Nasri, SH Shabnam Hajian, A Ahmadi, A Baradaran, G Kohi, P Nasri, M Rafieian-Kopaei M. *Iran J KID DIS.* **2015**; 9: 421-6.
- [30] M Rafieian-Kopaei, M Setorki, M Doudi, A Baradaran, H Nasri. *Int J Prev Med.* **2014**;5:927-46.
- [31] M Bahmani, K Saki, M Rafieian-Kopaei, SA Karamati, Z Eftekhari, M Jelodari. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 14-21.
- [32] M Asadi-Samani, M Bahmani, M Rafieian-Kopaei. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 22-28.
- [33] M Bahmani, A Zargar, M Rafieian-Kopaei, K Saki. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 348-354.
- [34] B Delfan, M Bahmani, H Hassanzadazar, K Saki, M Rafieian-Kopaei. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 376-379.
- [35] M Bahmani, M Rafieian-Kopaei, H Hassanzadazar, K Saki, SA Karamati, B Delfan. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 29-33.
- [36] K Saki, M Bahmani, M Rafieian-Kopaei. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 34-42.
- [37] M Bahmani, H Shirzad, M Majlesi, N Shahinfard, M Rafieian-Kopaei. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 43-53.
- [38] M Asadbeigi, T Mohammadi, M Rafieian-Kopaei, K Saki, M Bahmani, B Delfan. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): S364-S368
- [39] SA Karamati, H Hassanzadazar, M Bahmani, M Rafieian-Kopaei. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 2): 599-601.
- [40] M Bahmani, M Rafieian-Kopaei, M Jeloudari, Z Eftekhari, B Delfan, A Zargar, SH Forouzan. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 2): 847-849.
- [41] M Mirhosseini, A Baradaran, M Rafieian-Kopaei. *J Res Med Sci.* **2014**;19:758-61.
- [42] Shayganni E, Bahmani M, Asgary S, Rafieian-Kopaei M. *Phytomedicine*, 2015. <http://dx.doi.org/10.1016/j.phymed.2015.11.004>
- [43] M Rafieian-Kopaei, N Shahinfard, H Rouhi-Boroujeni, M Gharipour, P Darvishzadeh-Boroujeni. *Evidence-Based Complementary and Alternative Medicine*; **2014** (2014), Article ID 680856, 4 pages <http://dx.doi.org/10.1155/2014/680856>
- [44] M Bahmani, M Rafieian, A Baradaran, S Rafieian, M Rafieian-kopaei. *J Nephropathol.* **2014**; 3(2): 81-85.
- [45] M Bahmani, K Saki, M Rafieian-Kopaei, SA Karamati, Z Eftekhari, M Jelodari. *Asian Pac J Trop Med.* **2014**; 7(Suppl 1): 14-21.
- [46] weatherbase of Shiraz, **2011**.
- [47] K Saki, M Bahmani, M Rafieian-Kopaei, H Hassanzadazar, K Dehghan, F Bahmani, J Asadzadeh. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 2): 895-901.

- [48] M Bahmani, SA Karamati, H Hassanzadazar, SH Forouzan, M Rafieian-Kopaei, B Kazemi-Ghoshchi, J Asadzadeh, AGH Kheiri, E Bahmani. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 2): 906-910.
- [49] SA Karamati, H Hassanzadazar, M Bahmani, M Rafieian-Kopaei. *Asian Pac J Trop Dis.* **2014**; 4(Suppl 2): 599-601.
- [50] Delfan B, Bahmani M, Golshahi H, Saki K, Rafieian-Kopaei M, Rashidipour M. *J Chem Pharmac Sci* **2015**; 8(4): 666-670.
- [51] Bahmani M, Shahinfard N, Rafieian-Kopaei M, Saki K, Shamsavari S, Taherikalani M, Ghafourian S, Naghdi N. *J Chem Pharmac Sci* **2015**; 8(4): 671-681.
- [52] M Bahmani, A Sarrafchi, H Shirzad, N Shahinfard, M Rafieian-Kopaei, S Shamsavari, N Naghdi, Taherikalani M, S Ghafourian. *J Chem Pharmac Sci* **2015**; 8(4): 682-693.
- [53] B Delfan, Varzi M, M Bahmani, N Mohseni, K Saki, M Rafieian-Kopaei, S Shamsavari, N Naghdi, M Taherikalani, S Ghafourian. *J Chem Pharmac Sci* **2015**; 8(4): 694-700.
- [54] B Baharvand-Ahmadi, M Bahmani, N Naghdi, K Saki, S Baharvand-Ahmadi and M Rafieian-Kopaei. *Der Pharmacia Lettre.* **2015**, 7 (11):160-165.
- [55] B Baharvand-Ahmadi, M Bahmani, A Zargaran, Z Eftekhari, K Saki, S Baharvand-Ahmadi and M Rafieian-Kopaei. *Der Pharmacia Lettre.* **2015**, 7 (11):172-173.
- [56] B Baharvand-Ahmadi, M Bahmani, N Naghdi, K Saki, S Baharvand-Ahmadi and M Rafieian-Kopaei. *Der Pharmacia Lettre.* **2015**, 7 (11):189-196.
- [57] A Zargari. 4 th Edition. Tehran Publication. **1993**: 1 - 5.
- [58] G Carabin and W Flamm. *Regulatory Toxic and Pharmacol.* **1999**; 30: 268-282.
- [59] SD Jolad, RC Lantz, AM Solyom, GJ Chen, RB Bates, BN Timmermann. *Phytochemistry.* **2005**; 66: 1614-1635.
- [60] E Tjendraputra, VH Tran, D Liu-Brennan, BD Roufogalis, CC Duke. *Bioorg Chem.* **2001**; 29: 156-163.
- [61] RB van Breemen, Y Tao, W Li. *Fitoterapia.* **2011**; 82: 38-43.
- [62] N Chami, F Chami, S Bennis, J Trouillas, A Remmal. *Braz J Infec Dis.* **2004**; 8 (3): 217-226.
- [63] Z Aghajani, F Assadian, SH Masoudi, F Chalabian, A Esmaeili, M Tabatabaei, A Rustaiyan. *Chemistry Natural Compounds.* **2008**; 44(3): 387-389.
- [64] M Suhaj. *J Food Composition Analysis.* **2006**; 19: 531-537.
- [65] TS Wu, YL Leu, YY Chan, SM Yu, SM Teng & JD Su. *Phytochemistry.* **1994**; 36: 758-788.
- [66] M Azadbakht, K Semnani, N Khansari. *J Med Plan.* **2003**; 2:55-59.
- [67] Bahmani M, Saki K, Shamsavari S, Rafieian-Kopaei M, R Sepahvand, A Adineh. *Asian Pac J Trop Biomed* **2015**: 1-7.
- [68] Z Amirghofran, M F Azadbakt and Keshavarzi. *Iran J Med Sci.* **2000**; 25: 119-24.
- [69] F Sefidkon and M Najafpour Navaii. *DC. J. Essent. Oil Res.* **2001**; 13: 84 - 85.
- [70] M El-Dakhkhny. *Arzneimittelforschung* **1965**; 15: 1227 - 9.
- [71] T Morikawa, F Xu, Y Kashima, H Matsuda, K Ninomiya, M Yoshikawa. *Org Lett.* **2004**; 6: 869 - 72.
- [72] T Morikawa, F Xu, K Ninomiya, H Matsuda, M Yoshikawa. *Chem Pharm Bull.* (Tokyo) **2004**; 52: 494 - 7.
- [73] ER Kandel, JH Schwartz, TM Jessell. 4th ed. New York: McGraw-Hill; **2000**. 472-90
- [74] RK Portenoy. *Cancer Surv.* **1994**; 21: 49-65
- [75] JF Foss. *Am J Surg.* **2001** Nov; 182 (5A suppl): 19-26.
- [76] D Tiran. 2nd ed. Edinburgh: Churchill; Livingstone. **2000**:3-6, 37-44.
- [77] G Wenqiang, L Shufen, Y Ruixiang, T Shaokun. and Q Can. **2007**. Comparison of essential oils of clove buds extracted with supercritical carbon dioxide and other three traditional extraction methods. *Food Chemistry* 101:1558-1564.
- [78] MA Kiani, A Khodadad, S Mohammadi, M Ghayour Mobarhan, M Saeidi, SA Jafari, et al. *J HerbMed Pharmacol.* **2013**; 2(2): 41-44.
- [79] S Mardani, H Nasri, S Hajian, A Ahmadi, R Kazemi, M Rafieian-Kopaei. *J Nephropathol.* **2014**; 3(1):35-40.
- [80] H Nasri, A Ahmadi, A Baradaran, A Momeni, P Nasri, S Mardani, M Rafieian-Kopaei M, M Mubarak. *J Nephropathol.* **2014**; 3(3):115-20.
- [81] H Nasri, M Rafieian-Kopaei. *Iran J Public Health.* **2013**; 42(10):1194-1196.
- [82] H Nasri, M Rafieian-Kopaei. *Int J Prev Med.* **2013**; 4(9): 1101-1102.
- [83] M Setorki, M Rafieian-Kopaei, A Merikhi, E Heidarian, N Shahinfard, R Ansari, H Nasri, N Esmael, A Baradaran. *Int J Prev Med.* **2013**; 4(8):889-95.
- [84] Z Rabiei, M Rafieian-Kopaei, S Mokhtari, Z Alibabaei, M Shahrani. *Biomedicine & Aging Pathology.* **2014**; 4(1):71-6.
- [85] GA Rahimian, Z Rabiei, B Tahmasebi, M Rafieian-Kopaei, F Ganji, R Rahimian. *Iranian j Pharmac Sci.* **2013**; 9(3):63-70.
- [86] M Akhlaghi, GH Shabanian, M Rafieian-Kopaei, N Parvin, M Saadat, M Akhlaghi. *Revista Brasileira de Anestesiologia.* **2011**; 61( 6):702-712.
- [87] A Baradaran, H Nasri, M Nematbakhsh, M Rafieian-Kopaei. *Clin Ter.* **2014**; 165(1):7-11.

- [89] H Nasri, M Rafieian-Kopaei. *Iranian J Publ Health*. **2013**; 42(10): 1194-1196.
- [90] Z Rabiei, M Rafieian-Kopaei, S Mokhtari, M Shahrani. *Iranian Journal of Pharmaceutical Research*. **2014**; 13(4).
- [91] M Bahmani , Z Eftekhari , K Saki , EA Fazeli-Moghadam , M Jelodari , M Rafieian-Kopaei. *J Evid Based Complementary Altern Med*. 2015 Aug 12. pii: 2156587215599105. [Epub ahead of print].
- [92] Shaygannia E, Bahmani M, Zamanzad B, Rafieian-Kopaei M. A Review Study on Punica granatum L. *J Evid Based Complementary Altern Med*. **2015** Jul 30. pii: 2156587215598039. [Epub ahead of print].
- [93] M Bahmani , H Shirzad , M Mirhosseini, A Mesripour, M Rafieian-Kopaei . *J Evid Based Complementary Altern Med*. **2015** Apr 27. pii: 2156587215583405. [Epub ahead of print].
- [94] M Ebrahimie , M Bahmani , H Shirzad , M Rafieian-Kopaei, K Saki . *J Evid Based Complementary Altern Med*. **2015**; 20(4):302-9.
- [95] M Bahmani, M Mirhoseini, H Shirzad, M Sedighi, N Shahinfard, M Rafieian-Kopaei . *J Evid Based Complementary Altern Med*. **2015** Jul;20(3):228-38. doi: 10.1177/2156587214568457. Epub 2015 Jan 28.
- [96] B Delfan, H Kazemeini , M Bahmani . *J Evid Based Complementary Altern Med*. **2015**; 20(3):173-9.