

“Dry Mouth” From the Perspective of Traditional Persian Medicine and Comparison with Current Management

Journal of Evidence-Based
Complementary & Alternative Medicine
2015, Vol. 20(2) 137-142
© The Author(s) 2014
Reprints and permission:
sagepub.com/journalsPermissions.nav
DOI: 10.1177/2156587214558596
cam.sagepub.com



Ghazaleh Heydarirad, MD¹, and Rasool Choopani, MD, PhD¹

Abstract

Xerostomia is a common problem, particularly in an elderly population, with a range of causes that affect important aspects of life, such as chewing, swallowing, and speaking. Xerostomia has been explained in traditional medicine throughout history. Traditional Persian medicine, with more than 4000 years of history, consists of the sum total of all the knowledge and practices used in diagnosis, prevention, and exclusion in Iran from ancient times to the present. Based on leading Persian medical manuscripts, the current study focuses on the medieval concept of xerostomia as an important general disorder to review the aetiology of xerostomia and xerostomia types, the control and treatment of xerostomia by lifestyle modification, and medicinal plants for xerostomia suppression according to the theory and practice of traditional Persian medicine. Xerostomia was treated with 3 major approaches in traditional Persian medicine: lifestyle modification, simple single herbal remedies, and compound medicines. It appears that all the factors that cause xerostomia in current studies can be described by using the theories of traditional Persian medicine; furthermore, therapies aimed at both medicines (current and traditional) focus on protecting salivary glands and salivary flow. As a conclusion while current managements of xerostomia are still inadequate and traditional approaches have found experimental support over the centuries, some of these traditional treatments may still be useful to current medicine as alternative medicine.

Keywords

dry mouth, salivary flow, treatment

Received September 16, 2014. Accepted for publication October 14, 2014.

Introduction

Xerostomia is the subjective sensation of dry mouth and has been demonstrated to affect sufferers' oral health-related quality of life.¹ Dry mouth is a common problem with a range of causes. The symptom might be due to a reduction in the quantity of saliva produced, or a change in the composition of saliva, but a feeling of dry mouth may also be present in people with normal saliva production.² Dry mouth is a common problem with an estimated incidence of between 10% and 26% in men and between 10% and 33% in women, which may or may not be due to reduced saliva secretion.³ Xerostomia is more common in middle-aged and elderly people, and its main causes are anxiety, fear, stress, depression, and the use of some drugs, as well as autoimmune disease, viral or bacterial salivary gland infections, salivary gland tumours, radiotherapy and chemotherapy, diabetes mellitus, AIDS, hepatitis C virus infections, and hormonal disturbances such as menopause and climacteric conditions.⁴ Many commonly prescribed medications are associated with a feeling of dry mouth, despite normal saliva production.²

Xerostomia affects important aspects of life such as speaking, the enjoyment and ingestion of food, and the wearing of

dental prostheses. These impacts on the daily lives of patients lend assistance to the assertion that dry mouth is an important condition that merits concerted research attention in order to further understand how best to prevent and treat it.⁵ Despite the advantages in current medications for treatment of xerostomia, there is no completely effective treatment for xerostomia; so many patients consider searching for complementary or alternative treatment methods.⁶

The traditional Persian medicine was combined by different medical traditions from Egypt, Greece, India, and China over more than 4000 years and merged to form what became the nucleus and foundation of medical practice in Europe in the 13th century.⁷ During the Renaissance, in the transition from humoral medicine to more popular paradigms of medicine,

¹ Shahid Beheshti University of Medical Sciences, Tehran, Iran

Corresponding Author:

Ghazaleh Heydarirad, MD, The School of Traditional Medicine, School of Traditional Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: ghazalrad@yahoo.com

many traditional practices from ancient times fell out of favour or were forgotten. Traditional Persian medicine consists of the sum total of all the knowledge and practices used in diagnosis, prevention, and exclusion in Iran from ancient times to the present. Traditional Persian medicine or humoral medicine was based on the 4 humors; every humor has a specific temperament, comprising balgham or phlegm (cold and wet qualities), dam or blood (hot and wet qualities), safra or yellow bile (hot and dry qualities), and sauda or black bile (cold and dry qualities). Every humor is a substance made from digestion and permutation of foodstuffs in the gastrointestinal system.⁸ The imbalance in body temperament and humors leads to the onset of disease.⁹ There is information and data in traditional Persian documents or books about medicinal herbs that are used by traditional Persian medicine scientists for the treatment of xerostomia.¹⁰ A review of historical manuscripts on medical science proposes that approaches and medication developed over centuries of human experience have the potential to improve conventional medical approaches and practices.¹¹

In ancient sources of traditional Persian medicine, xerostomia was identified as a feeling of oral dryness, which is a symptom of the existence of an abnormality in the mouth, salivary glands or in other organs such as the head, stomach, and liver. Dry mouth is one of the most recognizable symptoms and its treatment is based on treating the related disease.¹²⁻¹⁴

The present review discusses the aetiology of xerostomia and xerostomia types, the control and treatment of xerostomia by lifestyle modification, and medicinal plants and pharmaceutical forms for xerostomia suppression according to the theory and practice of traditional Persian medicine.

Materials and Methods

In this literature research, we investigate some important Persian medical and pharmaceutical manuscripts from the 9th to the 19th century CE. The manuscripts were composed of the book of *Al-Havi* (*The Liber Continens*, written by Rhazes in the 10th century CE),¹⁴ *Al-Qanoon fi al-Tibb* (*The Canon of Medicine*, written by Avicenna in 1025 CE),¹³ *Eksir-e-Azam* (*Ekseer-e-Azam* written by Azam Khan in the 19th century CE),¹⁵ and *Tibb-e-Akbari* (written by Hakim Arzani in the 18th century CE).¹⁶ The identification of medicinal herbs is discussed in *Makhzan-ol-advieh* (*Storehouse of Medicaments*, written by Aghili Khorasani in the 18th century CE).¹⁷ These books are identified as Iranian traditional references in medicine and pharmacy and are now used as references for the Iranian PhD programme in the school of traditional medicine. In addition to more recent references, including *Matching the Old Medicinal Plant Names with Scientific Terminology*¹⁸ and *Popular Medicinal Plants of Iran*.⁸ A search was conducted for dryness of the mouth or tongue in the books mentioned above with the words “dry” and “dryness” (jefaf and khoshki). In order to establish relationships between traditional and current findings, a search was undertaken on the management and treatment of xerostomia by using the PubMed and Google Scholar databases.

Results

In the medieval period the humor theory of health was a widely held belief. Traditional Persian practitioners believed that dry

mouth follows the dry temperament. In traditional Persian medicine manuscripts, dry mouth was discussed in the section of mouth disorders. In the tongue chapter of the *Al-Qanoon fi al-Tibb* by Avicenna, he asserted that, there was a relationship between dry mouth and the function of other organs.

In traditional Persian medicine, dry mouth is defined as 2 types: real and nonreal (True or False). In real xerostomia, the body's fluid is low; consequently salivary flow will also be low. This type is due to the hotness and dryness of temperament; and in nonreal types, salivary flow is not low, but it is thick (which might be associated with a change in the composition of saliva); so patients feel dry mouth.^{12,16}

According to traditional Persian medicine texts, causes of dryness in the body include: use of whatever is creating heat and dryness ipso facto in the body, such as some kind of food and spices (which have hot and dry qualities, so they create heat and dryness in the body), eating less and the failure to supply food to the organs (which can cause reduction in body moisture and consequently take body toward dry temperament), use of whatever has the potential of creating dryness inside or outside of the body such as excessive movement, excessive awakening, excessive copulation, etc. Each of the above causes can lead to dryness of the body, and dry mouth can occur consequently; therefore, according to the texts of traditional Persian medicine, treatment is based on creating moisture in the body.

Treatment Approaches

The management of xerostomia employs 3 main approaches. The first is lifestyle modification. Administration of simple herbal medicines and other natural remedies is the second approach, while the last is treatment with pharmaceutical formulations of 2 or more bioactive substances.

Lifestyle Modification

Traditional Persian medicine has given more attention and importance to the prevention of disease rather than its cure.

There are 6 factors that are essential for the maintenance of good health, referred to as the 6 essential factors (*Setteh-e-Zaruriea* in traditional Persian medicine). These essential factors are as follows:

1. Air
2. Food and drink
3. Sleep and wakefulness
4. Evacuation and retention
5. Body movement and repose
6. Mental movement and repose

Lifestyle modification is based on *Setteh-e-Zarurieah*, such as using moisturizing foods like rice cooked with milk,¹² fresh fish, goat meat, foods that are prepared with pumpkin and spinach as well as purslane. The best fruits for patients with xerostomia are almonds, figs, grapes, peaches, and fresh broad bean.¹⁵ Sleep and comfort are also very useful.¹³ Salty, sour, and sharp edibles were considered harmful¹² and patients

should avoid excessive movement, exercise, and walking in the sun. Furthermore, they should avoid stresses such as anger, sorrow, and excessive fear.¹⁵

Simple Medicines

Simple medicines are a single mineral, botanical, or animal agent that are generally preferred to compound medicines in traditional Persian medicine, because they usually cause fewer undesirable side effects, which leads to higher patient compliance.¹⁴ In traditional Persian manuscripts, a lot of plants were used in various ways for treating xerostomia; some of these simple medicines, which were most important and commonly used, are demonstrated.

One of the known forms of application for treating dry mouth, via topical or systemic administration, is medicinal mucilages prepared from numerous medicinal herbs.¹³

Gargling simple mucilage medicinal herbs such as ispaghula (*Plantago psyllium* Linn.), quince seed (*Cydonia semina*), and gum tragacanth (*Astragalus gummifera* Lb.) was suggested.¹⁶ Also gargling extract of purslane (*Portulaca oleracea* Linn.) seeds or extract of purslane and cucumber (*Cucumis sativus*) has known beneficial effects.¹² Another form of application for treatment of dry mouth, are medicinal oils, such as sweet violet (*Viola odorata* Linn.) and pumpkin (*Cucurbita pepo* Linn.). In addition, sipping some fresh juice such as barley juice, pumpkin juice, and cucumber juice is considered helpful for improving xerostomia.¹²

Compound Medicines

The third line of treatment in traditional Persian medicine is administration of compound medicines comprising 2 or more bioactive substances in pharmaceutical dosages, which are synergistic effects or reducing side effects of each other.¹⁴ When the xerostomia was not improving, compound preparations were prescribed by Persian practitioners, such as the following:

- Oral administrations and topical uses of quince seed combined with White Water Lily (*Nymphaea alba* Linn.) and sugar
- Combine the above with the extract of pumpkin (*Cucurbita pepo* Linn.) seeds and/or purslane (*Portulaca oleracea* Linn.) seeds
- Gum tragacanth (*Astragalus gummifera* Lb.) combined with sugar (especially if dry mouth is due to passing air through the mouth)
- Oral administration and/or gargle mucilage of ispaghula with mucilage of quince seeds and/or gum tragacanth (*Astragalus gummifera* Lb.)
- Gargling ispaghula mucilage with apple lemon oxymel (sikanjbeen; known as *sikanjbeen-e-tufahi-limonee* in traditional Persian medicine; oxymel is a Persian word, which is composed of vinegar or acetic acid (sirka) and honey (angbeen). Therefore, it is called sikanjbeen. It is

a type of syrup in which vinegar or acetic acid (sirka) is an essential part of this formulation. In ancient times it was prepared from vinegar and honey but nowadays it is prepared from sugar, too; which is called simple oxymel (sikanjbeen sada). If other ingredients are included then it may be referred to as apple oxymel (*sikanjbeen e tufahi*) due to its apple ingredient.)

- Gargling a mixture of pumpkin seeds and cucumber seeds that are half pounded, soaked in fresh goat's milk, then the extraction is taken and mixed with quince seeds and Sibestan (*Cordia myxa* Linn.) that are boiled in water.¹²

Discussion

Medieval Persian physicians were aware of the 2 comprehensive forms of xerostomia, relied on etiological theories and treatments¹⁶ that are similar to general classification in current medicine for xerostomia.¹⁹ According to traditional Persian medicine texts, dry mouth can occur following the increasing heat and/or dryness in the mouth, and more important, increasing heat and/or dryness in essential organs such as liver, heart, and brain can cause xerostomia.¹³ As previously mentioned, the causes of heat and dryness are whatever is creating heat and dryness in the body and that result in dry and hot temperaments, thus creating an imbalance in body temperament and humors.¹³ Whereas, the causes of dry mouth in studies are physical and mental stresses such as anxiety, fear, depression, use of some drugs, some disease such as autoimmune and salivary gland infections, salivary gland tumours, radiotherapy, and chemotherapy.⁴ Mentioned causes for xerostomia in studies, from the perspective of traditional Persian medicine, can increase heat and/or dryness in the body, and create dry mouth subsequently.^{12,13}

Some of the causes of xerostomia in current medicine are psychology disorders (such as anxiety, fear, depression), which play an important role in traditional Persian medicine. Avicenna stated that psychology disorders affect the body more than any other factors.¹³ In Persian traditional books psychology disorders are known as *Aaraz-e-nafsani* and include happiness, sadness, anger, joy, fear, and embarrassment; sadness, anger, fear, and embarrassment can lead to dryness of the body.^{13,14}

In current medicine, xerostomia may be caused by many drugs, such as some antidepressants, antipsychotics, sedatives, anti-parkinsonians, antiseizures, antispasmodics and analgesics, some antihypertensives (diuretics, calcium channel blockers, alpha- and beta-blockers, angiotensin converting enzyme inhibitors), and cytotoxic agents. Most of the drugs mentioned have anticholinergic effects and as they cause salivary dysfunction, they subsequently cause dry mouth.²⁰ Also, in traditional Persian medicine some medications act as something that has the potential to cause dryness in the body, so they cause dry temperament and dry temperament may cause salivary dysfunction and consequently dry mouth.¹³

Several studies have reported a higher prevalence of xerostomia in elderly populations; in the elderly, the long-term use of medications and aging are regarded as major causes of

Table 1. Some Examples of Simple Herbal Medicines.

Name in Persian	Scientific Name	Name in English	Useful Effects in Current Investigations	Qualities in Humoral Medicine	Part Used for Activity
Safarjal	<i>Cydonia semina</i>	Quince	Antioxidant ²³ Antimicrobial ²³	Moderation/wet	Seed
Bazreqatuna	<i>Plantago psyllium</i> Linn.	Ispaghula	Wound healing ²⁴ Antiulcer ²⁴	Cold/wet	Seed
Sibestan	<i>Cordia myxa</i> Linn.	Sibistan	Antioxidant ²⁵ Anti-inflammatory ²⁵	Moderation/wet	Fruit
Kathira	<i>Astragalus gummifer</i> Lab	Gum tragacanth	Immunostimulant ²⁶ Immunomodulation ²⁶ Antioxidant ²⁶ Antiviral ²⁶	Moderation/wet	Exudate
Baqlahamqa	<i>Portulaca oleracea</i> Linn.	Purslane	Antibacterial ²⁷ Antioxidant ²⁸	Cold/wet	Seed
Banafsaj	<i>Viola odorata</i> Linn.	Sweet violet (Garden Violet)	Antioxidant ²⁹ Antimicrobial ³⁰	Cold/wet	Flower and leaves
Qiththa	<i>Cucumis sativus</i>	Cucumber	Antioxidant ¹⁸ Antimicrobial ³¹	Cold/wet	Seed
Qar'	<i>Cucurbita pepo</i> Linn.	White Pumpkin	Antioxidant ³² Antimicrobial ^{33,34}	Cold/wet	Seed
Khitmi	<i>Althaea officinalis</i> Linn.	Marshmallow	Mucositis ³⁵ Antioxidant ³⁶ Anti-inflammatory ³⁷ Soothing ³⁸ Antitussive ³⁹ Immune stimulant ³⁸ Antimicrobial ³⁸	Moderation/wet	Flower and leaves
Khubbazi	<i>Malva sylvestris</i> Linn.	Jews mallow	Antioxidant ⁴⁰ Anti-inflammatory ⁴¹ Antiseptic ⁴² Wound healing ⁴³ Laxative ⁴⁴	Cold/wet	Flower and leaves

xerostomia²¹; that are according to ancient Persian scholars who believed that as a person gets older, his or her body moisture is reduced, so dry temperament is more common in middle-aged and elderly people; and in addition to dry mouth, dryness occurs in other parts of the body, including the eyes, vagina, and lungs among others. In order to prevent this situation, traditional Persian medicine physicians recommended the use of foods with high moisture content as well as a little hot and dry qualities after the age of 40 years.¹³

Studies mention that dry mouth occurs in some systemic problems, such as systemic autoimmune disorder (eg, Sjogren's syndrome), infectious diseases and diabetes. These systemic disorders are associated with inflammation of epithelial tissues, particularly exocrine glands, on which salivary dysfunction causes xerostomia.²⁰ These results are in accordance with the ideas of Persian traditional physicians, that the inflammatory process produces heat in the body, which causes dryness.

Overall, it seems that most of the factors that cause xerostomia in current studies can be described by using the theories of traditional Persian medicine.

Therapies aimed at both medicines (current and traditional) have been protecting salivary flow. Conventional medical treatments for dry mouth try to maintain salivary flow in normal range in various ways such as protection of salivary

glands against radiation, infections, inflammation, and so on, or stimulate salivary glands to secrete saliva.²² In traditional Persian medicine, according to traditional Persian manuscripts, treatment is based on creating moisture in the body, to make balance in body temperament and humors.¹²

Xerostomia was treated with 3 major approaches in traditional Persian medicine: lifestyle modification, simple single herbal remedies, and compound medicines.¹³ Lifestyle modification prevents the causes of xerostomia. When somebody has been suffering from xerostomia, treatments included simple single or compound herbal medicines. In these approaches, medicinal plants containing mucilage were often used. It seems that medicinal mucilages can be used for treatment of xerostomia because of 2 causes:

1. Since saliva includes muslin secretion for lubrication and protection of mucus membranes, and has antimicrobial effects, it is expected to have the lubricating, antioxidant, anti-inflammatory, and antimicrobial effects of mucilage plants, which may ameliorate some xerostomia symptoms.
2. According to traditional Persian medicine, mucilage plants have been used for treatment of xerostomia, as have some other medications, such as barley juice,

pumpkin juice, and cucumber juice that have wet and cold/moderating qualities (Table 1). Therefore, they act against hotness and dryness, which are the main causes of xerostomia, and rebalance the humors in the body, thus improving the symptoms of xerostomia.

The first cause is similar to current concepts, but the second can just be described by using the theories of traditional Persian medicine.

Treatment of xerostomia in current medicine includes oral hygiene, salivary stimulation, and salivary substitutes (such as sugar-free chewing gum, candies, and mints), prescription sialagogues (pilocarpine, cevimeline), artificial salivary replacements, lubricants applied to the lips, and acupuncture.²⁰ If prognosis for restoration of normal salivation is poor, such as radiation-induced xerostomia (which is one of the most common causes of dry mouth complaints), approaches include the use of preventive agents and radioprotectors, advances in radiation delivery, promising new approaches for restoration of salivary gland function, medications to stimulate the residual function of salivary glands, acupuncture, and oral lubricants and saliva substitutes.²²

Conclusion

While current managements of xerostomia are still inadequate and traditional approaches have found experimental support over the centuries, some of these traditional treatments may still be useful to current medicine as alternative medicine.

Authors' Note

This research was derived from an ongoing PhD thesis at the School of Traditional Medicine, Shahid Beheshti University of Medical Sciences.

Author Contributions

I am Ghazaleh Heydarirad, a Ph.D student of Iranian traditional medicine and this article is a part of my PhD theses. Rasool Choopani is my professor.

Declaration of Conflicting Interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

Ethical Approval

The study was approved by the relevant local research ethics committees (Office of Research Affairs, Deputy of Research and Technology, Shahid Beheshti University of Medical Sciences; reference number 143) and registered with the Iranian Registry of Clinical Trials (IRCT2014012415860N1).

References

1. Thomson WM, van der Putten GJ, de Baat C, et al. Shortening the xerostomia inventory. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol*. 2011;112:322-327.
2. Furness S, Worthington HV, Bryan G, Birchenough S, McMillan R. Interventions for the management of dry mouth: topical therapies. *Cochrane Database Syst Rev*. 2011;(12):CD008934.
3. Furness S, Bryan G, McMillan R, Birchenough S, Worthington HV. Interventions for the management of dry mouth: non-pharmacological interventions. *Cochrane Database Syst Rev*. 2013;9:CD009603.
4. Minicucci E, Pires R, Vieira R, Miot HA, Spoto MR. Assessing the impact of menopause on salivary flow and xerostomia. *Aust Dent J*. 2013;58:230-234.
5. Rad M, Chamani G, Shahravan A, Alizadeh N, Hedayati F. Survey of prevalence of xerostomia in a population of Kerman, Iran, attending medical and dental clinics. *J Oral Health Oral Epidemiol*. 2013;2:28-34.
6. Braga FP, Lemos Junior CA, Alves FA, Migliari DA. Acupuncture for the prevention of radiation-induced xerostomia in patients with head and neck cancer. *Braz Oral Res*. 2011;25:180-185.
7. Gorji A, Khaleghi Ghadiri M. History of epilepsy in Medieval Iranian medicine. *Neurosci Biobehav Rev*. 2001;25:455-461.
8. Emtiazy M, Choopani R, Khodadoost M, Tansaz M, Nazem E. Atheroprotector role of the spleen based on the teaching of Avicenna (Ibn Sina). *Int J Cardiol*. 2013;167:26-28.
9. Rezaeizadeh H, Alizadeh M, Naseri M, Ardakani MS. The traditional Iranian medicine point of view on health and disease. *Iran J Public Health*. 2009;38:169-172.
10. Abdollahi Fard M, Shojaii A. Efficacy of Iranian traditional medicine in the treatment of epilepsy. *Biomed Res Int*. 2013;2013:692751.
11. Zargarani A, Zarshenas MM, Karimi A, Yarmohammadi H, Borhani-Haghighi A. Management of stroke as described by Ibn Sina (Avicenna) in the *Canon of Medicine*. *Int J Cardiol*. 2013;169:233-237.
12. AzamKhan M. *Exir Azam* (lithograph in Persian) [Great Elixir]. Lucknow, India: Monshi Nou; 1869. (Original work published 1810).
13. Avicenna. *Canon of Medicine* (Lithograph in Arabic). Rome, Italy: Typographia Medicea; 1593. (Original work published 1025).
14. Rhazes M. *Al-havi*. Tehran, Iran: International Academy of Medical Sciences; 2005. (Original work published 10th century).
15. Naseri M, Rezaeizadeh H, Choopani R, Anooshiravani M. *General Overview of Iranian Traditional Medicine*. Tehran, Iran: Nashr-e- Shahr; 2009.
16. Arzani MA. *Tebb-E-Akbari*, vol. 1. Tehran, Iran: Institute of Medical History, Islamic and Complementary Medicine, Iran University of Medical Sciences; 2005.
17. AghiliKhorasani M. *Makhzan-ol-Advieh* [Storehouse of Medicaments]. Tehran, Iran: Intisharat va Amoozesh Enghelab Islami Press; 1992. (Original work published 1771).
18. Zhu Z, Wei G, Li J, QiAn Q, Yu J. Silicon alleviates salt stress and increases antioxidant enzymes activity in leaves of salt-

- stressed cucumber (*Cucumis sativus* L.). *Plant Sci.* 2004;167:527-533.
19. Porter S, Scully C, Hegarty A. An update of the etiology and management of xerostomia. *Oral Surg Oral Med Oral Pathol Oral Radiol Endodontol.* 2004;97:28-46.
 20. Ship J. Diagnosing, managing, and preventing salivary gland disorders. *Oral Dis.* 2002;8:77-89.
 21. Han G, Park J-W, Ko S-J, et al. Yukmijihwang-tang for the treatment of xerostomia in the elderly: study protocol for a randomized, double-blind, placebo-controlled, two-center trial. *Trials.* 2013;14:281.
 22. Vissink A, Mitchell JB, Baum BJ, et al. Clinical management of salivary gland hypofunction and xerostomia in head-and-neck cancer patients: successes and barriers. *Int J Radiat Oncol Biol Phys.* 2010;78:983-991.
 23. Jouki M, Yazdi FT, Mortazavi SA, Koocheki A. Quince seed mucilage films incorporated with oregano essential oil: physical, thermal, barrier, antioxidant and antibacterial properties. *Food Hydrocolloids.* 2014;36:9-19.
 24. Patil BS, Mastiholimath VS, Kulkarni AR. Development and evaluation of psyllium seed husk polysaccharide based wound dressing films. *Orient Pharm Exp Med.* 2011;11:123-129.
 25. Al-Awadi FM, Srikumar T, Anim J, Khan I. Antiinflammatory effects of *Cordia myxa* fruit on experimentally induced colitis in rats. *Nutrition.* 2001;17:391-396.
 26. Gruenwald J, Brendler T, Jaenicke C, eds. *PDR for Herbal Medicines*. Montvale, NJ: Thomson PDR; 2004.
 27. Sakai N, Inada K, Okamoto M, Shizuri Y, Fukuyama Y. Portulacide A, a monoterpene glucoside, from *Portulaca oleracea*. *Phytochemistry.* 1996;42:1625-1628.
 28. Zhao R, Gao X, Cai Y, et al. Antitumor activity of *Portulaca oleracea* L. polysaccharides against cervical carcinoma in vitro and in vivo. *Carbohydr Polym.* 2013;96:376-383.
 29. Akhbari M, Batooli H, Kashi FJ. Composition of essential oil and biological activity of extracts of *Viola odorata* L. from central Iran. *Nat Prod Res.* 2012;26:802-809.
 30. Zarrabi M, Dalirfardouei R, Sepehrizade Z, Kermanshahi R. Comparison of the antimicrobial effects of semipurified cyclotides from Iranian *Viola odorata* against some of plant and human pathogenic bacteria. *J Appl Microbiol.* 2013;115:367-375.
 31. Tang J, Meng X, Liu H, et al. Antimicrobial activity of sphingolipids isolated from the stems of cucumber (*Cucumis sativus* L.). *Molecules.* 2010;15:9288-9297.
 32. Tarhan L, Kayali HA, Urek RO. In vitro antioxidant properties of *Cucurbita pepo* L. male and female flowers extracts. *Plant Foods Hum Nutr.* 2007;62:49-51.
 33. Winkler C, Wirleitner B, Schennach KS, Fuchs D. Extracts of pumpkin (*Cucurbita pepo* L.) seeds suppress stimulated peripheral blood mononuclear cells in vitro. *Am J Immunol.* 2005;1:6.
 34. El-Kamali HH, Mahjoub SA-T. Antibacterial activity of *Francoeuria crispa*, *Pulicaria undulata*, *Ziziphus spina-christi* and *Cucurbita pepo* against seven standard pathogenic bacteria. *Ethnobot Leaflets.* 2009;2009:6.
 35. Deters A, Zippel J, Hellenbrand N, Pappai D, Possemeyer C, Hensel A. Aqueous extracts and polysaccharides from Marshmallow roots (*Althea officinalis* L.): cellular internalisation and stimulation of cell physiology of human epithelial cells in vitro. *J Ethnopharmacol.* 2010;127:62-69.
 36. Kardošová A, Machová E. Antioxidant activity of medicinal plant polysaccharides. *Fitoterapia.* 2006;77:367-373.
 37. Hage-Sleiman R, Mroueh M, Daher CF. Pharmacological evaluation of aqueous extract of *Althaea officinalis* flower grown in Lebanon. *Pharm Biol.* 2011;49:327-333.
 38. Al-Snafi AE. The pharmaceutical importance of *Althaea officinalis* and *Althaea rosea*: a review. *Int J PharmTech Res.* 2013;5:1378-1385.
 39. Sutovska M, Capek P, Franova S, et al. Antitussive activity of *Althaea officinalis* L. polysaccharide rhamnogalacturonan and its changes in guinea pigs with ovalbumine-induced airways inflammation. *Bratisl Lek Listy.* 2010;112:670-675.
 40. Samavati V, Manoochehrizade A. Polysaccharide extraction from *Malva sylvestris* and its anti-oxidant activity. *Int J Biol Macromol.* 2013;60:427-436.
 41. Prudente AS, Loddi A, Duarte MR, et al. Pre-clinical anti-inflammatory aspects of a cuisine and medicinal millennial herb: *Malva sylvestris* L. *Food Chem Toxicol.* 2013;58:324-331.
 42. Razavi SM, Zarrini G, Molavi G, Ghasemi G. Bioactivity of *Malva sylvestris* L., a medicinal plant from Iran. *Iran J Basic Med Sci.* 2011;14:574-579.
 43. Pirbalouti AG, Azizi S, Koohpayeh A, Hamed B. Wound healing activity of *Malva sylvestris* and *Punica granatum* in alloxan-induced diabetic rats. *Acta Pol Pharm.* 2010;67:511-516.
 44. Arenas PM, Molares S, Aguilar Contreras A, et al. Ethnobotanical, micrographic and pharmacological features of plant-based weight-loss products sold in naturist stores in Mexico City: the need for better quality control. *Acta Bot Bras.* 2013;27:560-579.