

Research Article

A review of treatments for leishmaniasis wound using the prescriptions of traditional medicine

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ABSTRACT

Leishmania protozoan is an intracellular pathogen that can cause a wide spectrum of diseases in human ranging from a skin wound to visceral infections. Annually, around 15000 people acquire leishmaniasis in Iran. Trivalent and pentavalent antimonials are used to treat leishmaniasis. Treatment with antimonials is usually long term and causes drug resistance and toxicity. Leishmaniasis is an important parasitic disease that is currently expanding in the world. Because traditional medicine prescriptions are effective and useful to treat diseases, this review seeks to introduce the prescriptions of Iranian traditional medicine to treat leishmaniasis wound. To conduct this review, the search terms *Leishmania*, *leishmaniasis*, *Salak*, *traditional medicine*, *ethnomedicine*, *ethnopharmacology*, *Iran*, and *medicinal plants* were used to retrieve traditional medicine prescriptions for leishmaniasis from databases including *Scopus*, *Institute for Scientific Information*, *Scientific Information Database*, and *Magiran*. According to the evidence on traditional medicine, gillyflower, fleawort, peach, medlar, henna, armenian flower, olive, common soda-plant and purging cassia containing minerals, etc. are used to treat leishmaniasis. Geraniol, linalool, citronellol, stearoptene, allopurinol, flavonoid, phenolic compounds, proanthocyanidin, sterols, chromones, flavonoids, anthraquinones, diterpenoids, triterpenoids, catechin, furfural, chrysophanine, carotenes, and other organic compounds include amino acids, aspartic acid, glutamic acid, acetic acid, anthocyanin, carotene, and beta-cryptoxanthin are effective compounds on leishmaniasis and can be used to produce effective drugs for this infection.

Keywords: Leishmaniasis, wound, traditional medicine, Iran

INTRODUCTION

Leishmania protozoan is an intracellular pathogen that can cause a wide spectrum of diseases in human ranging from a skin wound to visceral infections. This pathogenic parasite is transmitted to mammalian hosts, including human, via mosquito bite (1). Cutaneous leishmaniasis is a

chronic infection and granulomatous disease that is developed by *Leishmania* (2). Leishmaniasis remains one of the health issues worldwide including the Middle East (3). Cutaneous leishmaniasis is an important disease that has attracted much attention in many parts of the

world especially Mediterranean region, a number of African countries, approximately all Southeast Asian countries, and Iran (4). Annually, around 15000 people acquire leishmaniasis in Iran. Evidence indicates that the incidence rate of leishmaniasis in Iran is 0.28/1000 population (5,6). The life cycle of *Leishmania* species includes a flagellated step, i.e. motile promastigotes that are able to live outside the gut cells of mosquito, and the next step in the mammalian cells where promastigotes inside vertebral host macrophages are converted to amastigotes (7).

Trivalent and pentavalent antimonials are used to treat leishmaniasis including glucanthium, allopurinol, pentostame, and amphotericin B (8). These treatments are usually long term and are associated with certain side effects in the long term including anorexia, liver dysfunction, weakness, leukopenia, and thrombocytopenia (9). In addition, development of drug resistance and drug toxicity due to using such drugs has led to the use of physical therapies such as photodynamic therapy, cryotherapy, and thermotherapy (10). However, more efficient treatments should be sought out due to the inefficiency of the methods of controlling the source and carriers, healthcare costs, complications due to antimonials-assisted treatments, the lengthy period of the available treatments, and lack of responding to them (11). Currently, large studies are being conducted on treatments for leishmaniasis. In Iranian traditional medicine, medicinal plants are used to treat or relieve lesions due to cutaneous leishmaniasis (12,13). Parasitic diseases are one of the most widely known groups of diseases affecting human being, and many endeavors have been made to

identify their causes, and treat and control them. Medicinal plants have long been used to treat various illnesses (14-20). Although these plants may also have toxicities, they mostly have shown promising results with low toxicity in experimental and clinical trials (21-28). The extracts or the by-products of these plants might be used for preparation of new drugs (29-35). The majority of the currently used drugs are chemicals-based, however, 1/3 of the whole pharmaceutical products are estimated to be plant-based (36-38). In Iranian traditional medicine, medicinal plants and natural compounds have been used to treat disorders and infectious and non-infectious diseases.

Leishmaniasis is an important parasitic disease that is currently expanding in the world. Because traditional medicine prescriptions are effective and useful to treat diseases, this review seeks to introduce the prescriptions of Iranian traditional medicine to treat diseases.

MATERIALS AND METHODS

To conduct this review, the search terms *Leishmania*, *leishmaniasis*, *Salak*, *traditional medicine*, *ethnomedicine*, *ethnopharmacology*, *Iran*, and *medicinal plants* were used to retrieve traditional medicine prescriptions for leishmaniasis from databases including *Scopus*, *Institute for Scientific Information*, *Scientific Information Database*, and *Magiran*.

RESULTS

According to the evidence on traditional medicine, gillyflower, fleawort, peach, medlar, henna, armenian flower, olive, common soda-plant and purging cassia containing minerals, etc. are used to treat leishmaniasis.

Table 1. Anti-cutaneous leishmaniasis plants based on the references of Iranian traditional medicine and ethnopharmacology

Row	Herbs	Descriptions
1	Gillyflower	Gillyflower leaf juice is used, alongside a small amount of gillyflower to dress leishmaniasis wound.
2	Fleawort	An amount of fleawort is dissolved in vinegar and applied on leishmaniasis wound.
3	Peach	Peach core is burned, its kernel is rubbed and mixed with rose and the resulting mixture is applied on leishmaniasis wound once a day.
4	Medlar	Medlar leaf is boiled to concentrate, filtered, and used to wash

		leishmaniasis wound.
5	Gillyflower	Gillyflower leaf juice is extracted, combined with small amount of gum tragacanth and used to dress leishmaniasis wound.
6	Henna	(Henna) <i>Lawsonia inermis</i> with honey or date extract are used to dress leishmaniasis wound.
7	Armenian flower	Armenian flower is dissolved in vinegar and applied on leishmaniasis wound three times a day.
8	Olive	Olive oil is mixed with lime and applied on the lesion.
9	Common soda-plant	An amount of common soda-plant root is pulverized, mixed with honey, and applied on leishmaniasis wound.
10	Purging cassia	Purging cassia is washed and soaked in water so that its core is separated from its extract. Then, the extract, dissolved in water, is heated to concentrate, and applied on leishmaniasis wound. Then, the wound area is dressed with a clean cloth. Two days later, the site is washed with already boiled, lukeworn water and the above procedure is duplicated till the wound area is improved.

DISCUSSION

Despite considerable advances in treatments for leishmaniasis, this disease remains one of the main health issues in some countries (39). According to the evidence on traditional medicine, red rose containing minerals, etc. are used to treat leishmaniasis. Red rose exerts anti-diabetic, anti-cough, antibacterial, antioxidant, and anti-AIDS effects (40,41). The most important compounds of red rose are geraniol, linalool, citronellol, and stearoptene (42,43). *L. inermis* was reported to help treat infectious wounds due to gram-positive bacteria and treat boil, and exert potent antifungal, astringent, and anti-inflammatory effects (44). Saffron is rich in phenolic compounds and allopurinol (45). Fleawort is laxative and anti-lipidemic and contains benzoic acid, caffeic acid, histidine, asparagine, and ascorbic acid (46-48) that are flavonoid and phenolic compounds. A positive correlation was demonstrated between the amounts of flavonoid and phenolic compounds in saffron extract and its antioxidant capacity (49).

Purging cassia is effective on gastric diseases, menstrual disorders, anorexia, jaundice, and constipation. Purging cassia plant contains flavonoid and phenolic compounds and proanthocyanidin (50,51). Purging cassia plant contains sterols, chromones, flavonoids, anthraquinones, diterpenoids, triterpenoids, catechin, furfural, chrysophanole, and chrysophanine (52,53). Medlar is used to treat heart burn, burning stool, kidney stone, bladder infection and complications due to fever, mouth

and throat abscess, angina, thrush, and children diarrhea, regulates bowel movements, and throat discomfort (54-57). In addition, medlar exerts antioxidant, immunostimulatory, antimicrobial, and antitumor effects (58,59). Peach also contains polysaccharides, flavonoids, carotenes, and other organic compounds, phenolic compounds, amino acids, aspartic acid, glutamic acid, acetic acid and nutrients, flavonoids, and phenolic compounds (59-62). Peach contains anthocyanin, carotene, beta-cryptoxanthin, etc (63). Geraniol, linalool, citronellol, stearoptene, allopurinol, flavonoid, phenolic compounds, proanthocyanidin, sterols, chromones, flavonoids, anthraquinones, diterpenoids, triterpenoids, catechin, furfural, chrysophanine, carotenes, and other organic compounds, amino acids, aspartic acid, glutamic acid, acetic acid, anthocyanin, carotene, and beta-cryptoxanthin are effective compounds on leishmaniasis and can be used to produce effective drugs for this infection.

Although the mechanisms involved in the function of medicinal plants are not established, however, it has been shown that microbial pathogens and cancer cells act and become resistant to drugs by various mechanisms (54-72). Herbal medicines having a complex of active ingredients usually act against these organisms by various mechanisms, hence they usually are effective even on resisted ones. The phenolic compounds in these plants are one of the most important phytochemicals that are effective against microorganisms (73,74). Therefore, medicinal plants which have these

group of compounds (75-88) probably have anti-leishmania activities. More importantly, these compounds have antioxidant property and antioxidant are beneficial in various diseases and toxicities (89-103). Hence, they might be useful in this regard, too.

REFERENCES

- White JM, Salisbury JR, Jones J, Higgins EM, Vega-Lopez F. Cutaneous leishmaniasis: three children with Leishmania major successfully treated with itraconazole. *Pediatr Dermatol* 2006; 23 (1): 78-80.
- Murray HW, Berman JD, Davies CR, Saravia NG. Advances in leishmaniasis. *Lancet* 2005; 4; 366 (9496):1561-77.
- Wanasen N, MacLeod CL, Ellies LG, Soong L. L-arginine and cationic amino acid transporter 2B regulate growth and survival of *Leishmania amazonensis* amastigotes in macrophages. *Infect Immun* 2007; 75 (6): 2802-10.
- Talari SA, Talaei R, Shajari G, Vakili Z, Taghavi Ardakani A. Childhood cutaneous leishmaniasis: report of 117 cases from Iran. *Korean J Parasitol*. 2006; 44(4):355-60.
- John DT, Petri WA. *Markell and Voge's Medical Parasitology*. 9th ed. Philadelphia: WB. Saunders; 2006.
- Saebi A. *Parasitic Disease In Iran, Protozoan Diseases*. Tehran: Enghelab Eslami Publications and Education Organization; 2003
- Singh S. New developments in diagnosis of leishmaniasis. *Indian J Med Res* 2006; 123 (3): 311-30.
- Akhondzadeh S. *Encyclopedia of Iranian Medicinal Plants*. Tehran: Arjomand Press. 2000; 199-209.
- Akilov OE, Kosaka S, O'Riordan K, Hasan T. Photodynamic therapy for cutaneous leishmaniasis: the effectiveness of topical phenothiaziniums in parasite eradication and Th1 immune response stimulation. *Photochem Photobiol Sci* 2007; 6(10):1067-75
- Bristow CA, Hudson R, Paget TA, Boyle RW. Potential of cationic porphyrins for photodynamic treatment of cutaneous Leishmaniasis. *Photodiagn Photodyn Ther* 2006; 3: 162-7.
- Postigo JA. Leishmaniasis in the World Health Organization Eastern Mediterranean Region. *International Journal of Antimicrob Agents* 2010; 36 (1): 62 - 5.
- Pearson RD, Mandell GL. *Leishmania species visceral, cutaneous and mucosal leishmaniasis*. Infectious Disease. 2th ed. London: Churchill Livingstone; 1995.
- Narvaez A, Simmond DE. Incidence of localized cutaneous leishmaniasis in Mexico. *T Roy Soc Trop Med* 1990; 84(2): 219-2017.
- Rouhi-Boroujeni H, Heidarian E, Rouhi-Boroujeni H, Deris F, Rafieian-Kopaei M. Medicinal Plants with multiple effects on cardiovascular diseases: a systematic review. *Curr Pharm Des* 2017; 23(7): 999 – 1015.
- Sarrafchi A, Bahmani M, Shirzad H, Rafieian-Kopaei M. Oxidative stress and Parkinson's disease: New hopes in treatment with herbal antioxidants. *Curr Pharm Des* 2016; 22(2): 238 – 246.
- Shaygani E, Bahmani M, Asgary S, Rafieian-Kopaei M. Inflammation and cardiovascular disease: Management by medicinal plants, *Phytomedicine*. 2015, <http://dx.doi.org/10.1016/j.phymed.2015.11.004>
- Rabie Z, Gholami M, Rafieian-Kopaei M. Antidepressant effects of *Mentha pulegium* in mice. *Bangladesh J Pharmacol* 2016; 11(3): 711-715.
- Sharafati-Chaleshtori R, Shirzad H, Rafieian-Kopaei M, Soltani A. Melatonin and human mitochondrial diseases. *J Res Med Sci* 2016; 21:138.
- Rafieian-Kopaei M, Shahinfard N, Rouhi-Boroujeni H, Gharipour M, Darvishzadeh-Boroujeni P. Effects of *Ferulago angulata* extract on serum lipids and lipid peroxidation. *Evidence-Based*

- Complementary and Alternative Medicine; 2014, Article ID 680856, 4 pages <http://dx.doi.org/10.1155/2014/680856>
20. Bahmani M, Sarrafchi A, Shirzad H, Rafieian-Kopaei M. Autism: Pathophysiology and promising herbal remedies. *Curr Pharm Des* 2016; 22(3):277–285.
 21. Rafieian-Kopaei M, Nasri H, Baradaran A. *Teucrium polium*: Liver and kidney effects. *J Res Med Sci*. 2014;19(5):478-9.
 22. Nasri H, Rafieian-Kopaei M. Tubular Kidney Protection by Antioxidants. *Iran J Public Health*. 2013; 42(10):1194-6.
 23. Sharafati-Chaleshtori R, Rokni N, Rafieian-Kopaei M, Drees F, Sharafati-Chaleshtori A, Salehi E. Use of Tarragon (*Artemisia Dracunculus*) Essential Oil as a Natural Preservative in Beef Burger. *Ital J Food Sci*. 2014;26(4):427-32.
 24. Bahmani M, Shirzad H, Majlesi M, Shahinfard N, Rafieian-Kopaei M. A review study on analgesic applications of Iranian medicinal plants. *Asian Pac J Trop Med* 2014;7: 43-53.
 25. Namjoo A, Nasri H, Talebi-Juneghani A, Baradaran A, Rafieian-Kopaei M. Safety Profile of *Carthamus Tinctorius L.* in Lactation: Brain, Renal and Hepatotoxicity. *Pak J Med Sci* 2013; 29:378-83.
 26. Hasanpour Z, Nasri H, Rafieian-Kopaei M, Ahmadi A, Baradaran A, Nasri P, et al. Paradoxical Effects of Atorvastatin on Renal Tubular Cells An Experimental Investigation. *Iran J Kidney Dis* 2015; 9(3):215-20.
 27. Asgari S, Setorki M, Rafieian-Kopaei M, Heidarian E, Shahinfard N, Ansari R, et al. Postprandial hypolipidemic and hypoglycemic effects of *Allium hertifolium* and *Sesamum indicum* on hypercholesterolemic rabbits. *Afr J Pharm Pharmacol* 2012;6(15):1131-5.
 28. Baradaran A, Nasri H, Rafieian-Kopaei M. Protection of Renal Tubular Cells by Antioxidants: Current Knowledge and New Trends. *Cell J* 2015;16(4):568-71.
 29. Heidarian E, Rafieian-Kopaei M. Protective effect of artichoke (*Cynara scolymus*) leaf extract against lead toxicity in rat. *Pharm Biol* 2013; 51(9):1104-9.
 30. Nasri H, Rafieian-Kopaei M. Protective effects of herbal antioxidants on diabetic kidney disease. *J Res Med Sci* 2014; 19(1):82-3.
 31. Baradaran A, Nasri H, Rafieian-Kopaei M. Oxidative stress and hypertension: Possibility of hypertension therapy with antioxidants. *J Res Med Sci* 2014;19(4):358-67.
 32. Rafieian-Kopaei M, Baradaran A, Rafieian M. Oxidative stress and the paradoxical effects of antioxidants. *J Res Med Sci* 2013;18(7):628-.
 33. Baradaran A, Madihi Y, Merrikhi A, Rafieian-Kopaei M, Nematbakhsh M, Asgari A, et al. Nephrotoxicity of hydroalcoholic extract of *Teucrium polium* in Wistar rats. *Pak J Med Sci* 2013; 29:329-33.
 34. Rabiei Z, Rafieian-Kopaei M. Neuroprotective effect of pretreatment with *Lavandula officinalis* ethanolic extract on blood-brain barrier permeability in a rat stroke model. *Asian Pac J Trop Med* 2014; 7:S421-S6.
 35. Fathi F, Oryan S, Rafieian-Kopaei M, Eidi A. Neuroprotective effect of pretreatment with *mentha longifolia l.* extract on brain ischemia in the rat stroke model. *Arch Biol Sci* 2015; 67(4):1151-63.
 36. Nasri H, Rafieian-Kopaei M. Metformin and Diabetic Kidney Disease: A Mini-Review on Recent Findings. *Iran J Pediatr* 2014;24(5):565-8.
 37. Nasri H, Rafieian-Kopaei M. Metformin: Current knowledge. *J Res Med Sci* 2014; 19(7):658-64.
 38. Bahmani M, Saki K, Rafieian-Kopaei M, Karamati SA, Eftekhari Z, Jelodari M. The most common herbal medicines affecting *sarcomastigophora* branches: a review study. *Asian Pac J Trop Med* 2014; 7:14-21.

39. Karami M, Douidi M, Setorki M. Assessing epidemiology of cutaneous leishmaniasis in Isfahan, Iran. *J Vector Borne Dis* 2013;50(1): 30-37.
40. Boskabady, M.H., Shafei, M.N., Saberi, Z., Amini, S. (2011). Pharmacological effects of *Rosa damascena*. *Iranian Journal of Basic Medical Sciences* 14:295-307.
41. Demir F, Ozcan M. Chemical and technological properties of rose (*Rosa canina* L.) fruits grown wild in Turkey. *Journal of Food Engineering* 2001; 47: 333-6.
42. Price S. Shirley Price's Aromatherapy Workbook. London, UK: Thorsons; 1993. p. 54-5.
43. Kevala R. Essential Oil Advice and Information. The Kevala Centre 2000; 206-17.
44. Malekzadeh F. Antimicrobial activity of *Lawsonia inermis* L. *Applied Microbiology* 1986; 16(4): 663-664.
45. Lujan RJ, Rodriguez JML and Castro MDL. Dynamic ultrasound-assisted extraction of oleuropein and related biophenols from olive leaves. *Journal of Chromatography A* 2006; 1108: 76-82.
46. Ziai SA, Larijani B, Akhondzadeh S, et al. Psyllium decreased serum glucose and glycosylated hemoglobin significantly in diabetic outpatients. *Ethnopharmacology* 2005; 102:202-7.
47. Kendall CWC. The health benefits of psyllium. *Dieteric Practice and Research. Can J Diet Pract Res* 2004; 65:3.
48. Gudio M, Eldon AS, Alun LE, et al. Effect of time of administration on cholesterol lowering by psyllium: a randomized crossover study in normocholesterolemic or slightly hypercholesterolemic subjects. 2004.
49. Ito H, Kobayashi E, Takamatsu Y, Li SH, Hatano T, Sakagami H, Kusama K, Satoh K, Sugita D, Shimura S, Itoh Y and Yoshida T. Polyphenols from *Eriobotrya japonica* and their cytotoxicity against human oral tumor cell lines. *Chemical and Pharmaceutical Bulletin (Tokyo)*, 2000; 48(5): 687-693.
50. Akanmu MA, Iwalewa EO, Elujoba AA, Adelusola KA. Toxicity potentials of Cassia fistula fruits as laxative with reference to Senna. *African J Biomed Res* 2004;7(1):23-6.
51. Duraipandiyar V, Ignacimuthu S. Antibacterial and antifungal activity of Cassia fistula L.: an ethnomedicinal plant. *J Ethnopharmacol* 2007; 112(3):590-4.
52. Daisy P, Balasubramanian K, Rajalakshmi M, Eliza J, Selvaraj J. Insulin mimetic impact of Catechin isolated from Cassia fistula on the glucose oxidation and molecular mechanisms of glucose uptake on Streptozotocin-induced diabetic Wistar rats. *Phytomedicine* 2010;17(1):28-36.
53. Kuo YH, Lee PH, Wein YS. Four new compounds from the seeds of Cassia fistula. *J Nat Prod* 2002; 65(8): 1165-7.
54. Potter D, Eriksson T, Evans RC, Oh S, Smedmark JEE, Morgan DR, et al. Phylogeny and classification of Rosaceae. *Plant Systematics and Evolution* 2007;266:5-43.
55. Phipps JB, O'Kennon RJ, Lance RW. Hawthorns and medlars. U.K: Royal Horticultural Society Press; 2003.
56. Glowinski L. The complete book of fruit growing in Australia. Melbourne: Thomas C. Lothian Press; 1991.
57. Safari-Zarafshan M. Child Cultivation in Islam. Tehran: Fateh Press; 1979.
58. Phipps JB, O'Kennon R, Lance RW. Hawthorns and medlars: Timber Press; 2003.
59. Potter D, Eriksson T, Evans RC, Oh S, Smedmark J, Morgan DR, et al. Phylogeny and classification of Rosaceae. *Plant Systematics and Evolution*. 2007;266(1-2):5-43.
60. Sadat Tabatabaei N, Mazandarane M, editors. Autecology and ethnopharmacology of

- Mespilus germanica L. in the North of Iran. AIP Conference Proceedings; 200.
61. Le Marchand L. Cancer preventive effects of flavonoids-a review. Biomedicine & pharmacotherapy 2002; 56(6):296-301.
 62. Xiaosong XHH. Status of Processing and Trend of Deep Processing for Lycium Berry in China [J]. Review of China Agricultural Science and Technology 2002;3:53-6.
 63. Jackson D and Looney N E. Temperate and Subtropical Fruit Production. CAB International Publishing, USA 1999; 321.
 64. Bagheri N, Azadegan-Dehkordi F, Shirzad M, Zamanzad B, Rahimian G, Taghikhani A, et al. Mucosal interleukin-21 mRNA expression level is high in patients with Helicobacter pylori and is associated with the severity of gastritis. Cent Eur J Immunol 2015; 40(1):61-7.
 65. Bagheri N, Taghikhani A, Rahimian G, Salimzadeh L, Dehkordi FA, Zandi F, et al. Association between virulence factors of Helicobacter pylori and gastric mucosal interleukin-18 mRNA expression in dyspeptic patients. Microb Pathogenesis. 2013; 65:7-13.
 66. Shirzad H, Burton RC, Smart YC, Rafieian-Kopaei M, Shirzad M. Natural Cytotoxicity of NC-2(+) Cells Against the Growth and Metastasis of WEHI-164 Fibrosarcoma. Scand J Immunol. 2011; 73(2):85-90.
 67. Bagheri N, Rahimian G, Salimzadeh L, Azadegan F, Rafieian-Kopaei M, Taghikhani A, et al. Association of the Virulence Factors of Helicobacter Pylori and Gastric Mucosal Interleukin-17/23 Mrna Expression in Dyspeptic Patients. Excli J 2013;12:5-14.
 68. Bagheri N, Azadegan-Dehkordi F, Sanei H, Taghikhani A, Rahimian G, Salimzadeh L, et al. Associations of a TLR4 single-nucleotide polymorphism with H. pylori associated gastric diseases in Iranian patients. Clin Res Hepatol Gas. 2014; 38(3):366-71.
 69. Bagheri N, Azadegan-Dehkordi F, Shirzad H, Rafieian-Kopaei M, Rahimian G, Razavi A. The biological functions of IL-17 in different clinical expressions of Helicobacter pylori infection. Microb Pathogenesis. 2015; 81:33-8.
 70. Razavi A, Bagheri N, Azadegan-Dehkordi F, Shirzad M, Rahimian G, Rafieian-Kopaei M, et al. Comparative Immune Response in Children and Adults with H. pylori Infection. J Immunol Res. 2015.
 71. Bahmani M, Banihabib E, Rafieian-Kopaei M, Gholami-Ahangaran M. Comparison of Disinfection Activities of Nicotine with Copper Sulphate in water Containing Limnatis nilotica. Kafkas Univ Vet Fak 2015; 21(1):9-11.
 72. Azadegan-Dehkordi F, Bagheri N, Shirzad M, Sanei MH, Hashemzadeh-Chaleshtori M, Rafieian-Kopaei M, et al. Correlation Between Mucosal IL-6 mRNA Expression Level and Virulence Factors of Helicobacter pylori in Iranian Adult Patients With Chronic Gastritis. Jundishapur J Microb 2015;8(8).
 73. Rafieian-Kopaei M, Nasri H, Alizadeh F, Ataei B, Baradaran A. Immunoglobulin A Nephropathy and Malaria falciparum Infection; a Rare Association. Iran J Public Health 2013;42(5):529-33.
 74. Bahmani M, Rafieian-Kopaei M, Parsaei P, Mohsenzadegan A. The anti-leech effect of Peganum harmala L. extract and some anti-parasite drugs on Limnatis nilotica. Afr J Microbiol Res 2012 16; 6(10):2586-90.
 75. Mirhosseini M, Baradaran A, Rafieian-Kopaei M. Anethum graveolens and hyperlipidemia: A randomized clinical trial. J Res Med Sci. 2014; 19(8):758-61.
 76. Amini FG, Rafieian-Kopaei M, Nematbakhsh M, Baradaran A, Nasri H. Ameliorative effects of metformin on renal histologic and biochemical alterations of gentamicin-induced renal toxicity in Wistar rats. J Res Med Sci. 2012; 17(7):621-5.
 77. Setorki M, Nazari B, Asgary S, Azadbakht L, Rafieian-Kopaei M. Anti atherosclerotic effects of verjuice on hypocholesterolemic

- rabbits. *Afr J Pharm Pharmacol*. 2011; 5(8):1038-45.
78. Rahnema S, Rabiei Z, Alibabaei Z, Mokhtari S, Rafieian-kopaei M, Deris F. Anti-amnesic activity of Citrus aurantium flowers extract against scopolamine-induced memory impairments in rats. *Neurol Sci*. 2015;36(4):553-60.
 79. Sharafati-Chaleshtori R, Rokni N, Rafieian-Kopaei M, Drees F, Salehi E. Antioxidant and Antibacterial Activity of Basil (*Ocimum basilicum* L.) Essential Oil in Beef Burger. *J Agr Sci Tech-Iran*. 2015; 17(4):817-26.
 80. Nasri H, Shirzad H, Baradaran A, Rafieian-Kopaei M. Antioxidant plants and diabetes mellitus. *J Res Med Sci*. 2015; 20(5):491-502.
 81. Taghikhani A, Afrough H, Ansari-Samani R, Shahinfard N, Rafieian-Kopaei M. Assessing the toxic effects of hydroalcoholic extract of *Stachys lavandulifolia* Vahl on rat's liver. *Bratisl Med J* 2014;115(3):121-4.
 82. Samani RA, Baradaran A, Esmaeli E, Shahinfard N, Parvin N, Namjoo AR, et al. The beneficial property of hydroalcoholic extract of Annab on burn healing. *Life Sci J* 2012;9(4):5265-8.
 83. Parsaei P, Karimi M, Asadi SY, Rafieian-kopaei M. Bioactive components and preventive effect of green tea (*Camellia sinensis*) extract on post-laparotomy intra-abdominal adhesion in rats. *Int J Surg* 2013;11(9):811-5.
 84. Madihi Y, Merrikhi A, Baradaran A, Ghobadi S, Shahinfard N, Ansari R, et al. Bioactive components and the effect of hydroalcoholic extract of *Vaccinium myrtillus* on postprandial atherosclerosis risk factors in rabbits. *Pak J Med Sci* 2013;29:384-9.
 85. Asadi-Samani M, Bahmani M, Rafieian-Kopaei M. The chemical composition, botanical characteristic and biological activities of *Borago officinalis*: a review. *Asian Pac J Trop Med* 2014;7:S22-S8.
 86. Akhlaghi M, Shabanian G, Rafieian-Kopaei M, Parvin N, Saadat M, Akhlaghi M. Citrus aurantium Blossom and Preoperative Anxiety. *Rev Bras Anesthesiol* 2011; 61(6):702-12.
 87. Nasri H, Rafieian-Kopaei M. Comment on: The effects of green tea consumption on metabolic and anthropometric indices in patients with type 2 diabetes. *J Res Med Sci* 2014; 19(12):1203-4.
 88. Shirzad H, Shahrani M, Rafieian-Kopaei M. Comparison of morphine and tramadol effects on phagocytic activity of mice peritoneal phagocytes in vivo. *Int Immunopharmacol*. 2009; 9(7-8): 968-70.
 89. Jalaly L, Sharifi G, Faramarzi M, Nematollahi A, Rafieian-Kopaei M, Amiri M, et al. Comparison of the effects of *Crataegus oxyacantha* extract, aerobic exercise and their combination on the serum levels of ICAM-1 and E-Selectin in patients with stable angina pectoris. *Daru*. 2015 19; 23.
 90. Shirzad H, Taji F, Rafieian-Kopaei M. Correlation Between Antioxidant Activity of Garlic Extracts and WEHI-164 Fibrosarcoma Tumor Growth in BALB/c Mice. *J Med Food* 2011;14(9):969-74.
 91. Sedighi M, Rafieian-kopaei M, Noori-Ahmadabadi M. Effect of *Allium ampeloprasum* on ileum function: Involvement of beta-adrenergic receptors and voltage dependent calcium channels. *Life Sci J* 2012; 9(4):1660-7.
 92. Rafieian-Kopaei M, Setorki M, Heidarian E, Shahinfard N, Ansari R. Effect of *Anethum graveolens* on hypelipidemia induced hepatotoxicity. *Toxicol Lett* 2012; 211: 167-S.
 93. Rabiei Z, Rafieian-Kopaei M, Mokhtari S, Shahrani M. Effect of Dietary Ethanolic Extract of *Lavandula officinalis* on Serum Lipids Profile in Rats. *Iran J Pharm Res* 2014;13(4):1295-301.
 94. Asadi SY, Parsaei P, Karimi M, Ezzati S,

- Zamiri A, Mohammadzadeh F, et al. Effect of green tea (*Camellia sinensis*) extract on healing process of surgical wounds in rat. *Int J Surg* 2013;11(4):332-7.
95. Jafarzadeh L, Rafieian-Kopaei M, Samani RA, Asgari A. The Effect of Hydroalcoholic Extract of *Stachys Lavandulifolia* Vahl on Pregnant Mice. *Excli J* 2012; 11:357-62.
96. Saki K, Bahmani M, Rafieian-Kopaei M. The effect of most important medicinal plants on two important psychiatric disorders (anxiety and depression)-a review. *Asian Pac J Trop Med*. 2014; 7:S34-S42.
97. Rafieian-kopaei M, Shahinfard N, Rouhi-Boroujeni H, Gharipour M, Darvishzadeh-Boroujeni P. Effects of *Ferulago angulata* Extract on Serum Lipids and Lipid Peroxidation. *Evid-Based Compl Alt*. 2014.
98. Rabiei Z, Rafieian-kopaei M, Heidarian E, Saghaei E, Mokhtari S. Effects of *Zizyphus jujube* Extract on Memory and Learning Impairment Induced by Bilateral Electric Lesions of the Nucleus Basalis of Meynert in Rat. *Neurochem Res* 2014; 39(2):353-60.
99. Bahmani M, Zargaran A, Rafieian-Kopaei M, Saki K. Ethnobotanical study of medicinal plants used in the management of diabetes mellitus in the Urmia, Northwest Iran. *Asian Pac J Trop Med*. 2014; 7: 348-54.
100. Nasri H, Nematbakhsh M, Rafieian-Kopaei M. Ethanolic Extract of Garlic for Attenuation of Gentamicin-induced Nephrotoxicity in Wistar Rats. *Iran J Kidney Dis*. 2013; 7(5):376-82.
101. Asadi N, Bahmani M, Shahsavari S and Asadi-Samani M. Identification and Introduction of The Medicinal Plants Used by Honeybees in Markazi Province. *International Journal of Pharmaceutical and Phytopharmacological Research* 2017; 7(2): 15-18.
102. Naserifar R, Bahmani M, Abdi J, Abbaszadeh S, Nourmohammadi GHA and Rafieian-Kopaei M. A review of the most important native medicinal plants of Iran effective on leishmaniasis according to Iranian ethnobotanical references. *International Journal of Advanced Biotechnology and Research* 2017; 8(2): 1330-1336.
103. Naserifar R, Bahmani M, Abdi J, Abbaszadeh S, Adineh SH and Rafieian-Kopaei M. Phytotherapy in *Leishmania infantum* and *Leishmania tropica*. *International Journal of Advanced Biotechnology and Research* 2017; 8(2): 1337-1343.