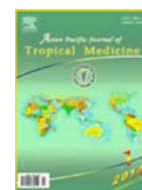




Contents lists available at ScienceDirect

Asian Pacific Journal of Tropical Medicine

journal homepage: www.elsevier.com/locate/apjtm

Document heading doi: 10.1016/S1995-7645(14)60200-5

A review on most important herbal and synthetic antihelmintic drugs

Mahmoud Bahmani¹, Mahmoud Rafieian-Kopaei^{2*}, Hassan Hassanzadazar³, Kourosh Saki⁴, Seyed Ahmad Karamati⁵, Bahram Delfan¹¹Razi Herbal Medicines Research Center, Lorestan University of Medical Sciences, Khorramabad, Iran²Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran³Deputy for Food and Drug, Urmia University of Medical Sciences, Urmia, Iran⁴Shahid Beheshti University of Medical Sciences, Tehran, Iran⁵Department of Medical Parasitology and Mycology, Faculty of Medicine, Shahid Beheshti University of Medical Sciences, Tehran, Iran

ARTICLE INFO

Article history:

Received 3 Jun 2014

Received in revised form 25 Aug 2014

Accepted 20 Sep 2014

Available online 27 Sep 2014

Keywords:

Herbal medicine

Medicinal plant

Antihelmintic drugs

Antinematoda

Anticestoda

ABSTRACT

Parasites and parasitic diseases are widely spread in the world. Their adverse effects on health and social-economic society cause tremendous public health problems. Parasitic infections in different ways (water, soil, food and vegetables) can affect humans and induce other complications such as gastrointestinal disorders, malnutrition, anemia and allergies and sometimes even life threatening. Medicinal plants are being widely used, either as a single drug or in combination with synthetic drugs. These medicinal plants are considered as a valuable source of unique natural products and drugs for development of medicines against various disorders and diseases. In this article the recently published papers about medicinal plants and parasites were reviewed, using scientific sites such as Medline, PubMed and Google Scholar. The used terms included: herbal medicine, medicinal plants, and antihelmintic drugs, antinematoda, anticestoda, antitrematoda. From the above collected literature it might be concluded that these plants are promising potential sources for preparation of new drugs or for pharmacological and therapeutic applications.

1. Introduction

Parasites and parasitic diseases are widely spread in the world. Their adverse effects on health and social-economic society are more visible and has been considered in some areas of Iran with tremendous public health importance. Parasitic infections in different ways (water, soil, food and vegetables) can affect humans and induce other complications such as gastrointestinal disorders, malnutrition, anemia and allergies and sometimes even life threatening^[1,2].

Worms are in three categories, Nematoda, Cestoda and Trematoda. For these three categories, three groups of drugs are available.

2. Antinematoda, Anticestoda and Antitrematoda drugs

Antinematoda drugs against pinworm, hookworms, *Ascaris* and *Strongyloides* include piperazine, mebendazole, thiabendazole, pyrantel, ivermectin and diethyl carbamazone. Antitrematoda drugs include praziquantel, bithionol sulfoxide, oxamniquine, metrifonate. The third group of antihelminths are anticestoda such as niclosamide which are applied against tapeworms such as *Taenia*, *Echinococcus* and *Diphyllobothrium*^[3]. Levamisole is an antibiotic which is often prescribed as anti-parasitic drugs against nematodes such as *Ascaris*, tricostrongyloids and various hooked worms^[3].

Albendazole mechanism of action is degeneration of cytoplasmic microtubules in parasite cells^[3]. Praziquantel increases cell membrane permeability to calcium, causing cup muscle paralysis, resulting in removing from

*Corresponding author: Prof. Mahmoud Rafieian-Kopaei, Medical Plants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran.
E-mail: rafieian@yahoo.com

Foundation project: Supported by Deputy for Research and Technology of Lorestan University of Medical Sciences, research grant (No. 224).

the vessel wall[3]. Mebendazole causes immobility and death of the worms by selectively inhibiting irreversible absorption of glucose. Mebendazole has not good intestinal absorption after excessive use and is found unchanged in the feces[3]. Niclosamide can inhibit oxidative phosphorylation in mitochondria of flat worms, resulting in worm death[3]. Thiabendazole is a benzimidazole that can inhibit anaerobic metabolism and damage microtubule of the parasite[3], and prevents tubulin polymerization and microtubules creation in parasite cells. Microtubules have a main role in building cellular cytoskeleton[3]. Quinine is obtained from *Cinchona* bark and has anti-inflammatory effects in addition to degradation ability of *Plasmodium*. Quinine is an alkaloid with accumulation ability in acidic vesicles of malaria parasites which causes cells death because of changing intracellular pH[3].

The main use of diethylcarbamazine drug is used in treating some parasitic diseases such as lymphatic filariasis (elephantiasis). These drugs inhibit the metabolism of arachidonic acid in nematodes that cause lymphatic filariasis (*Wuchereria bancrofti*, *Brugia malayi*, *Loa loa*, etc.)[3]. Dehydroemetine is used to treat for *Fasciola hepatica* infection. Its mechanism action is not clear exactly, but probably is effective on cell proliferation[3]. Pyrvinium pamoate inhibits oxygen uptake and use of exogenous carbohydrates in aerobic parasites[3]. At present lymphatic filariasis is treated with diethylcarbamazine and ivermectin or in combination with Albendazole[4].

Drug-resistant is the main problem in parasite therapy. Hence, new drugs are urgently needed[5]. At present time many medicinal plants have been studied in traditional medicine including Ayurveda and Chinese medicine. On the other hand a number of promising drugs or natural products have been identified not only in eradication of parasites[6–8], but also in treating other infective[9–11], and none infective diseases[12–15]. Studies have shown that *Streblus asper* from the Moraceae family has anti-filarial activity[8]. Onchocerciasis is treated with ivermectin in combination with albendazole, which are not known to treat dracunculiasis[4]. The number of plants which have been tested against onchocerciasis and dracunculiasis are much less than filariasis, but a few African plants have been recorded in this regard[16].

Medicinal herb extracts have examined in most studies and phytochemical profiles of secondary metabolites have been published.

Schistosomiasis has also treated with praziquantel alone or in combination with albendazole or ivermectin. Also oxamniquine and anti-malarial drugs such as artemisinin and quinoline alkaloids and its derivatives are used[4]. Anthraquinones in *Rheum palmatum* and *Rumex dentatus* (Polygonaceae) and phorbol esters from *Jatropha curcas* (Euphorbiaceae) had molluscicidal activity against

schistosomiasis vector snails *Oncomelania*, *Biomphalaria* and *Bulinus*[17].

Anthelmintic drug compounds have also been obtained from plants including arecoline, pelletierine, filixic acid, ascaridole, aspidin and curcumin (Figure 1)[18].

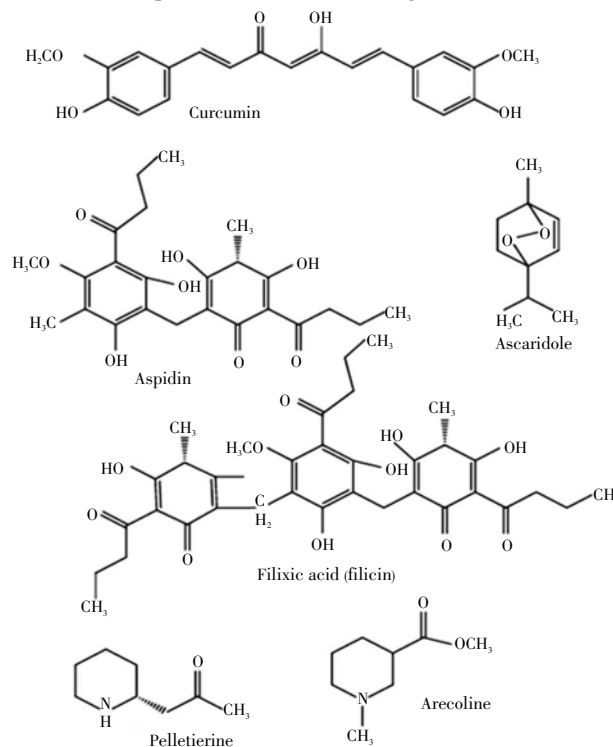


Figure 1. Chemical structures of arecoline, pelletierine, filixic acid, ascaridole, aspidin and curcumin.

Curcumin extracted from turmeric have anti-parasitic effects against schistosoma[18]. Ascaridole is another antihelmintic compound isolated from *Chenopodium* plant[19]. Ascaridole is an effective drug against hookworm infection, but it is mutagenic and toxic[20]. Another traditional herb is the fern *Dryopteris filix-mas* (Dryopteridaceae) which contains vermucidal phloroglucinols, such as aspidin, deaspidin, and filixic acid (syn. filicin). They are active against intestinal cestodes and probably paralyze the worm's muscles[21]. However, this drug has considerable side effects for humans but filixic acid is used as an anthelmintic in veterinary praxis.

Other paralyzed agents are the anthelmintic alkaloids such as pelletierine from *Punica granatum* (Lythraceae) and arecoline from *Areca catechu* (Arecaceae), which target acetylcholine receptors[20]. Other anthelmintic plants include *Artemisia maritima* (with santonin), *Artemisia abrotanum* (Asteraceae), *Zanthoxylum liebmannianum* (Rutaceae), *Thymus vulgaris* (Lamiaceae), *Millettia thonningii*, *Albizia anthelmintica*, *Butea frondosa* (Fabaceae), *Embelia schimperi* (Myrsinaceae), *Teloxys graveolens* (Amaranthaceae) and several others such as: *Punica granatum*, *Allium sativum*, *Cucurbita maxima* and *Cucurbita pepo*, *Polypodium vulgare*, *Aspidium filix-mas*,

Pleurotus eryngii, *Delphinium consolida*, *Ruta graveolence*, *Fraxinus excelsior*, *Berberia* spp., *Artemia salina*, *Artemisia inculata*, *Artemisia abyssinica*, *Artemisia absantin*, *Albizia grandibracteata*, *Ficus exasperata*, *Zygophyllum album*, *Zygophyllum coccineum*, *Citrullus colocynthis*, *Artemisia vulgaris*, *Calamintha nepeta*, *Datura stramonium*, *Nerium oleander*, *Nicotina tabacum*, *Pteridium aquilinum*, *Sambucus nigra*, *Tanacetum vulgare*, *Artemisia abrotanum*, *Salvia officinalis*, *Zingiber officinale*, *Allium sativum*, *Olea europaea*[22–29].

Nicotin is another antihelminth compound (Figure 2). *Nicotiana tabacum* (Tobacco) contains the alkaloid nicotine, nicotine, nicotelleine, nicotimin mainly in leaves. These substances are highly toxic but the main effect of them is anti-parasitic effect[30].

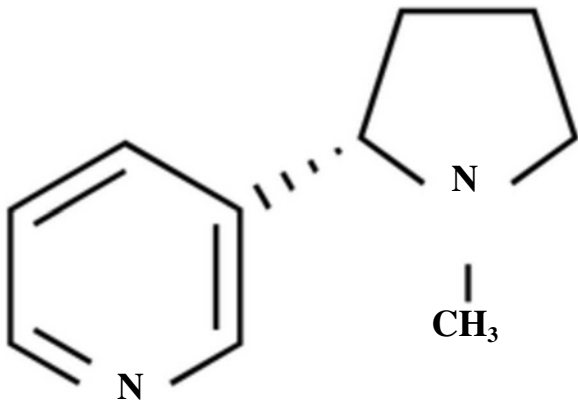


Figure 2. Nicotin chemical structure.

Mallotus philippensis plant or kamala tree grows in Asia and Australia regions and its fruits or extracts have strong antihelminth effect. It is used to treat infection with *Bothriocephalus* in carp fish[30].

Agrimophol is a vermicide drug obtained from *Agrimonia eupatoria* L. plant. Arecoline is a herbal remedy obtained from *Areca catechu*. Kainic acid material is an anti-ascaris drug with obtained from *Digenea simplex* plant. Quisqualic acid is another herbal vermicide drug obtained from *Quisqualis indica* L. plant. Santonin as an anti-ascaris drug obtained from *Artemisia maritima*[31].

3. Reliability of medicinal plants

As it was mentioned medicinal plants and their bioactive ingredients not only are anti-helminthic, but also are used to treat most serious, metabolic and functional diseases such as viral[9], and bacterial infections[32–34], hyperlipidemia[35–38], diabetes[39–42], atherosclerosis[43–46], neurological disorders[47–50], cancer[51–54], wound healing[55–58], gastrointestinal disorders[59–61], and are reliable resources for production and supply of effective drugs with less side effects and low toxicity[62–65].

4. Conclusion

Medicinal plants are being widely used, either as a single drug or in combination delivery system and these herbal plants are considered as a valuable source of unique natural products and drugs against various disorders and diseases and also for development of industrial products.

From the above collected literature it might be concluded that these plants are promising potential sources for preparation of new drugs or for pharmacological and therapeutic applications.

Conflict of interest statement

We declare that we have no conflict of interest.

Acknowledgements

This research was supported by research grant (No. 224) from Deputy for Research and Technology of Lorestan University of Medical Sciences.

References

- [1] Keshavarz H. Manifest of secretary congress. 2nd National congress of parasitic diseases. 1997 Oct; Tehran: 5. Persian.
- [2] Neva F, Brown H. [Basic clinical parasitology]. 3rd ed. Athari A, editor. Tehran: Ayizh publications; 1999, p. 2–162. Persian.
- [3] Bahmani MDVM Thesis. Faculty of veterinary medicine, Islamic Azad University of Shahrekord Branch. Aug 2010. P. 66–67.
- [4] Müllner A, Helfer A, Kotlyar D, Oswald J, Efferth T. Chemistry and pharmacology of neglected helminthic diseases. *Curr Med Chem* 2011; **18**: 767–789.
- [5] Rafieian–Kopaei M. Medicinal plants and the human needs. *J HerbMed Pharmacol* 2012; **1**(1): 1–2.
- [6] Comley JC. New antifilaricidal leads from plant? *Trop Med Parasitol* 1990; **41**: 1–9.
- [7] Bahmani M, Vakili–Saatloo N, Gholami–Ahangaran M, Karamati SA, Banihabib EKh, Hajigholizadeh Gh, et al. A comparison study on the anti-leech effects of onion (*Allium cepa* L) and ginger (*Zingiber officinale*) with levamisole and triclabendazole. *J HerbMed Pharmacol* 2013; **2**(1): 1–3.
- [8] Chatterjee RK, Fatma N, Murthy PK, Sinha P, Kulshreshtha DK, Dhawan BN. Macrophilicidal activity of the stem bark of *Streblus asper* and its major active constituents. *Drug Dev Res* 1992; **26**: 67–78.
- [9] Karimi A, Moradi MT, Saedi M, Asgari S, Rafieian–Kopaei M. Antiviral activity of *Quercus persica* L: high efficacy and low toxicity. *Adv Biomed Res* 2013; **2**(2): 36.
- [10] Sharafati–chaleshtori R, Sharafati–chaleshtori F, Sharafati

- chaleshtori A, Rafieian M. Antibacterial effects of ethanolic extract of walnut leaves (*Juglans regia*) on *Propionibacterium acnes*. *J Zanjan Univ Med Sci Health Serv* 2010; **18**: 42–49.
- [11] Hosseini-asl K, Rafieian-kopaei M. Can patients with active duodenal ulcer fast Ramadan? *Am J Gastroenterol* 2002; **97**(9): 2471–2472.
- [12] Akbari F, Ansari samani R, Karimi A, Mortazaei S, Shahinfard N, Rafieian M. Effect of turnip on glucose and lipid profiles of alloxan-induced diabetic rats. *Iran J Endocrinol Metab* 2013; **14**(5): 492–497.
- [13] Asgari S, Keshvari M, Sahebkar A, Hashemi M, Rafieian-Kopaei. Clinical investigation of the acute effects of pomegranate juice on blood pressure and endothelial function in hypertensive individuals. *ARYA Atheroscler* 2013; **9**(6): 326–331.
- [14] Charipour M, Ramezani MA, Sadeghi M, Khosravi A, Masjedi M, Khosravi-Boroujeni H, et al. Sex based levels of C-reactive protein and white blood cell count in subjects with metabolic syndrome: Isfahan healthy heart program. *J Res Med Sci* 2013; **18**: 467–472.
- [15] Khosravi-Boroujeni H, Mohammadifard N, Sarrafzadegan N, Sajjadi F, Maghroun M, Khosravi A, et al. Potato consumption and cardiovascular disease risk factors among Iranian population. *Int J Food Sci Nutr* 2012; **63**(8): 913–920.
- [16] Ibrahim MA, Nwude N, Ogunsui RA, Aliu YO. Screening of West African plants for anthelmintic activity. *ILCA Bull* 1984; **17**: 19–23.
- [17] Liu SY, Sporer F, Wink M, Jourdane J, Henning R, Li YL, et al. Anthraquinones in *Rheum palmatum* and *Rumex dentatus* (Polygonaceae) and phorbolsters from *Jatropha curcas* (Euphorbiaceae) with molluscicidal activity against schistosomiasis vector snails *Oncomelania*, *Biomphalaria* and *Bulinus*. *Trop Med Int Health* 1997; **2**: 179–188.
- [18] Nasri H, Sahinfard N, Rafieian M, Rafieian S, Shirzad M, Rafieian-kopaei M. Turmeric: A spice with multifunctional medicinal properties. *J HerbMed Pharmacol* 2014; **3**(1): 5–8.
- [19] Kliks MM. Studies on the traditional herb anthelmintic *Chenopodium ambrosioides* L. ethnopharmacological evaluation and clinical field trials. *Soc Sci Med* 1985; **21**: 879–886.
- [20] Wink M, van Wyk BE. *Mind-altering and poisonous plants of the world*. Portland: Timber Press; 2008.
- [21] Van Wyk BE; Wink M. *Medicinal plants of the world*. Portland: Timber Press; 2004.
- [22] Amirmohammadi M, Khajoenia SH, Bahmani M, Rafieian-Kopaei M, Eftekhari Z, Qorbani M. *In vivo* evaluation of antiparasitic effects of *Artemisia abrotanum* and *Salvia officinalis* extracts on *Syphacia obvelata*, *Aspiculoris tetrapetra* and *Hymenolepis nana* parasites. *Asian Pac J Trop Dis* 2014; **4**(1): 250–254.
- [23] Bahmani M, Karamati SA, Banihabib E, Saki K. Comparison of effect of nicotine and levamisole and ivermectin on mortality of leech. *Asian Pac J Trop Dis* 2014; **4**(Suppl 1): S477–S480.
- [24] Bahmani M, Rafieian-Kopaei M. Medicinal plants and secondary metabolites for leech control. *Asian Pac J Trop Dis* 2014; **4**(4): 315–316.
- [25] Bahmani M, Farkhondeh T, Sadighara P. The anti-parasitic effects of *Nicotina tabacum* on leeches. *Comp Clin Pathol* 2012; **21**(3): 357–359.
- [26] Eftekhari Z, Bahmani M, Mohsenzadegan A, Gholami-Ahangaran M, Abbasi J, Alighazi N. Evaluating the anti-leech (*Limnatis nilotica*) activity of methanolic extract of *Allium sativum* L. compared with levamisole and metronidazole. *Comp Clin Path* 2012; **21**: 1219–1222.
- [27] Bahmani M, Saki K, Gholami-Ahangaran M, Parsaei P, Mohsenzadegan A, Zia-Jahromi N. Evaluating the anti-leech activity of methanolic extract of *Matricaria chamomilla* L. comparing with ivermectin, mebendasole, praziquantel, rafoxanide, Febantel and Albendasole. *Middle-East J Sci Res* 2012; **12**(2): 260–263.
- [28] Gholami-Ahangaran M, Bahmani M, Zia-Jahromi N. Comparative and evaluation of anti-leech (*Limnatis nilotica*) effect of olive (*Olea europaea* L.) with levamisole and tiabendazole. *Asian Pac J Trop Dis* 2012; **2**(1): S101–S103.
- [29] Forouzan S, Bahmani M, Parsaei P, Mohsenzadegan A, Gholami-Ahangaran M, Sadeghi E, et al. Anti-parasitic activities of *Zingiber officinale* methanolic extract on *Limnatis nilotica*. *Glob Vet* 2012; **9**(2): 144–148.
- [30] Mokhayer B. *Fish diseases*. Tehran University Publication, 1996.
- [31] Ghasemi pirbalouti A. [*Third listen: plants, traditional medicine and ethnoveterinary, 1 edition, medicinal and aromatic plant*]. Shahrekord: Saman-Danesh Pub; 2009, p. 158–190. Persian.
- [32] Sharafati-chaleshtori R, Mahmoud Rafieian-kopaei M. Screening of antibacterial effect of the *Scrophularia Striata* against *E. coli in vitro*. *J HerbMed Pharmacol* 2014; **3**(1): 31–34.
- [33] Bahmani M, Vakili Saatloo N, Maghsoudi R, Momtaz H, Saki K, Kazemi-Ghoshchi B, et al. A comparative study on the effect of ethanol extract of wild *Scrophularia deserti* and streptomycin on *Bruceella melitensis*. *J HerbMed Pharmacol* 2013; **2**(1): 17–20.
- [34] 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.
- [35] Khosravi-Boroujeni H, Sarrafzadegan N, Mohammadifard N, Sajjadi F, Maghroun M, Asgari S, et al. White rice consumption and CVD risk factors among Iranian population. *J Health Popul Nutr* 2013; **31**(2): 252–261.
- [36] Asgari S, Kelishadi R, Rafieian-Kopaei M, Najafi S, Najafi M, Sahebkar A. Investigation of the lipid-modifying and antiinflammatory effects of *Cornus mas* L. supplementation on dyslipidemic children and adolescents. *Pediatr Cardiol* 2013; **34**(7): 1729–1735.
- [37] Nasri H, Sahinfard N, Rafieian M, Rafieian S, Shirzad M, Rafieian-kopaei M. Effects of *Allium sativum* on liver enzymes and atherosclerotic risk factors. *J HerbMed Pharmacol* 2013; **2**(2): 23–28.

- [38] Sarrafzadegan N, Khosravi–Boroujeni H, Esmailzadeh A, Sadeghi M, Rafieian–Kopaei M, Asgary S. The association between hypertriglyceridemic waist phenotype, menopause, and cardiovascular risk factors. *Arch Iran Med* 2013; **16**(3): 161–166.
- [39] Baradaran A, Madihi Y, Merrikhi A, Rafieian–Kopaei M, Nasri H. Serum lipoprotein (a) in diabetic patients with various renal function not yet on dialysis. *Pakistan J Med Sci* 2013; **29**: 354–357.
- [40] Mirhoseini M, Baradaran A, Rafieian–Kopaei M. Medicinal plants, diabetes mellitus and urgent needs. *J HerbMed Pharmacol* 2013; **2**(2): 53–54.
- [41] Rahimi–Madiseh M, Heidarian E, Rafieian–kopaei M. Biochemical components of *Berberis lycium* fruit and its effects on lipid profile in diabetic rats. *J HerbMed Pharmacol* 2014; **3**(1): 15–19.
- [42] Behradmanesh S, Horestani MK, Baradaran A, Nasri H. Association of serum uric acid with proteinuria in type 2 diabetic patients. *J Res Med Sci* 2013; **18**: 44–46.
- [43] Madihi Y, Merrikhi A, Baradaran A, Rafieian–kopaei M, Shahinfard N, Ansari R, et al. Impact of sumac on postprandial high–fat oxidative stress. *Pak J Med Sci* 2013; doi: 10.12669/pjms.291(Suppl).3529.
- [44] Rafieian–Kopaei M, Asgary S, Adelnia A, Setorki M, Khazaei M, Kazemi S, et al. The effects of cornelian cherry on atherosclerosis and atherogenic factors in hypercholesterolemic rabbits. *J Med Plants Res* 2011; **5**(13): 2670–2676.
- [45] Setorki M, Rafieian–Kopaei M, Merrikhi A, Heidarian E, Shahinfard N, Ansari R, et al. Suppressive impact of anethum graveolens consumption on biochemical risk factors of atherosclerosis in hypercholesterolemic rabbits. *Int J Prev Med* 2013; **4**(8): 889–895.
- [46] 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**(1 SUPPL): 384–389.
- [47] Akhlaghi M, Shabanian G, Rafieian–Kopaei M, Parvin N, Saadat M, Akhlaghi M. *Citrus aurantium* blossom and preoperative anxiety. *Rev Bras Anesthesiol* 2011; **61**: 702–712.
- [48] Rabiei Z, Rafieian–Kopaei M, Mokhtari S, Alibabaei Z, Shahrani M. The effect of pretreatment with different doses of *Lavandula officinalis* ethanolic extract on memory, learning and nociception. *Biomed Aging Pathol* 2014; **4**: 71–76.
- [49] Roohafza H, Sarrafzadegan N, Sadeghi M, Rafieian–Kopaei M, Sajjadi F, Khosravi–Boroujeni H. The association between stress levels and food consumption among Iranian population. *Arch Iran Med* 2013; **16**(3): 145–148.
- [50] 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**: 353–360.
- [51] Nikokar M, Shirzad M. Does royal jelly affect tumor cells? *J HerbMed Pharmacol* 2013; **2**(2): 45–48.
- [52] Azadmehr A, Hajiaghaee R, Afshari A, Amirghofran Z, Refieian–Kopaei M, Darani HY, et al. Evaluation of *in vivo* immune response activity and *in vitro* anti–cancer effect by *Scrophularia megalantha*. *J Med Plants Res* 2011; **5**(11): 2365–2368.
- [53] 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**: 968–970.
- [54] 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): 969–974.
- [55] Asadi SY, Parsaei P, Karimi M, Rafieian–kopaei M. [Effect of ethanolic extract of green tea (*Camellia sinensis*) on intra–abdominal adhesions in rats]. *Zanjan Univ Med Sci J* 2013; **21**: 86–96. Persian.
- [56] 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): 332–337.
- [57] 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**: 811–815.
- [58] Karim M, Parsaei P, Asadi Y, Ezzati S, Boroujeni RK, Zamiri A, Rafieian M. Effects of *Camellia sinensis* ethanolic extract on histometric and histopathological healing process of burn wound in rat. *Middle–East J Sci Res* 2013; **13**(1): 14–19.
- [59] Sedighi M, Noori–Ahmadabadi M, Rafieian–Kopaei M, Ebrahimpoor–Samani J, Shahinfard N. The effect of *Rosa damascena* Mill hydro–alcoholic extract on the ileum contraction in rat. *J Mazandaran Univ Med Sci* 2014; **23**(108): 30–39.
- [60] Hosseini–asl K, Rafieian–kopaei M. Can patients with active duodenal ulcer fast Ramadan? *Am J Gastroenterol* 2002; **97**(9): 2471–2472.
- [61] Sedighi M, Rafieian–Kopaei M, Noori–Ahmadabadi M. *Kelussia odoratissima* Mozaffarian inhibits ileum contractions through voltage dependent and beta adrenergic receptors. *Life Sci J* 2012; **9**: 1033–1038.
- [62] Nasri H, Shirzad H. Toxicity and safety of medicinal plants. *J HerbMed Pharmacol* 2013; **2**(2): 21–22.
- [63] Nasri H, Tavakoli M, Ahmadi A, Baradaran A, Nematbakhsh M, Rafieian–Kopaei M. Ameliorative effect of melatonin against contrast media induced renal tubular cell injury. *Pak J Med Sci* 2014; **30**(2): 261–265.
- [64] Nasri H, Rafieian–Kopaei M. Tubular kidney protection by antioxidants. *Iranian J Publ Health* 2013; **42**(10): 1194–1196.
- [65] 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 Lek Listy* 2014; **115**(3): 121–124.