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Review Article

Phytotherapy in *Leishmania infantum* and *Leishmania tropica*

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ABSTRACT

Leishmaniasis is a tropical zoonotic disease, transferred from conveyer sandflies. Cutaneous Leishmaniasis is the second common disease after malaria, prevalent in many tropical countries of the world. Using herbal medicines as anti-Leishmania is the current world's research hot topic. In this review article, we tried to report Iran's medicinal plants that are effective on Leishmania protozoan infantum and tropica. For this study, articles were searched by the following keywords: Leishmania, *Leishmania infantum*, *Leishmania tropica*, herbs, extract, essence, and Iran. Data from databases were searched, including Google Scholar, ISC, SID, Magiran and a number of other databases.

The relevant articles were identified. Ultimately, 7 relevant articles were selected and reviewed for the study. Based on the obtained results, it was found that Flavanoles and Flavonoids Glycosides, from catechins category and flavonoids such as epigalocatechins, epicatechin gallate, epicatechin, galocatechins, catechin, 2-methyl butyl amide, quercetin, kaempferol, echinasin, echinacosid, echinolon, homolon, caryophyllene, ceteroles, chromones, flavonoids, antraquinon, dyterpenoides, Tripenoids, catechin, furfural, chromon, chrisofanin, derivatives of sesquiterpens, coumarin, sulfur compounds, coumarin glycosides, sulfur compounds of disulfide and trisulfide are important components of Echinacea herbs, Iranian shallots, Green tea, Khoi coma, Coma plain, cassia, and pistachio are effective herbs on Leishmania infantum and tropica in Iran.

Keywords: medicinal herbs, traditional medicine, Leishmania infantum, Leishmania tropica, Iran

INTRODUCTION

Leishmaniasis is a tropical disease from intracellular parasite of Leishmania (1,2). Leishmaniasis zoonotic disease is transferred from conveyer sandflies (3,4). Rodents, small mammals and canine dogs are its common reservoirs and human is the accidental reservoir (5).

Species including Leishmania major, Leishmania tropica, Leishmania etiopica, and Leishmania infantum are the most important causes of cutaneous Leishmaniasis (6,7). The world health organization (WHO) has introduced Leishmaniasis as the sixth most important parasitic diseases in tropical areas of the world. Eighty eight countries are infected with this disease and countries like Afghanistan, Brazil, Iran, Peru, Saudi Arabia, and Syria are the center of the disease (8-11).

It has a global distribution and is reported more in military and non-military people travelling to endemic areas (12). Leishmaniasis is the second common disease after Malaria that is prevalent in many tropical countries of the world (13).

Unfortunately, despite

the high prevalence rate of Leishmaniasis in Iran, there is no method for prevention, control, and definite treatment of this disease (14).

Reports indicate that the prevalence of cutaneous Leishmaniasis is increasing during recent years, due to gradual emigration to cities, destruction of environmental and ecological circumstances, malnutrition, population displacement, and exposure of non-immune people, etc. (15). Currently, five capacity compounds containing two antimoans of meglumine antimoan (glucantime) and sodium stibogluconate (pentostam) are used for the treatment of Leishmaniasis that have various complications and problems (16).

Most drugs used for the treatment of Leishmaniasis have several limitations, such as not being cost-effective, difficult administration methods, toxicities and the most important issue of these medicines is spreading parasite resistance to these medicines (17). Traditional methods for treatment of Leishmaniasis are deeply connected with plants of each area. Traditional medicines used in treatment of this disease include oral crude plants and topical use of the plant for treatment of infection (18,19).

As herbal drugs have fewer adverse effects (20,21) and are more accessible and cheaper (22), using plants of each area can be considered a rich drug source (23,24).

Using herbal medicines and medicinal plants as an anti-leishmania is the world's research hot topic (25-31).

In this review article, we tried to report the medicinal plants of Iran that are effective on Leishmania protozoan infantum and tropica.

MATERIALS AND METHODS

For this study, articles were searched by the following keywords: Leishmania, Leishmania infantum, Leishmania tropica, herbs, extract, essence, and Iran.

Data from databases were searched, including Google Scholar, ISC, SID, Magiran and a number of other databases. The relevant articles were identified. Ultimately, 7 relevant articles were selected, and reviewed for the study.

RESULTS

Based on the results of this study, it was identified that 20 medicinal plants are used in Iran for treatment of Leishmaniasis by the species Leishmania tropica and infantum.

Echinacea, Iranian shallots, green tea, Khoi coma, coma plain, cassia, and pistachio are effective herbs in Iran on Leishmania infantum and tropica.

List of herbs that are effective on Leishmaniasis are shown in Table 1, according to the species infantum and tropica.

Raw	Scientific name	Family name	Persian name	Effect	Ref
1	Echinacea angustifolia	Asteraceae	Sarkhar gol	The extract of Echinacea flowers possesses caffeic acid in high concentrations, so after 72 hours inhibited the growth of promastigotes of *Leishmania tropica*.	32
2	Allium hirtifolium Boiss	Amaryllidaceae	Mosir irani	The extract of this plant contains sulfide compounds (allicin, ajoene) and has anti-*Leishmania* (*Leishmania infantum)* activity, and shallots extract inhibits the growth of *Leishmania infantum* even at low concentrations, in a short time	33
3	Camellia sinensis	Theaceae	Chaye sabz	The effectiveness of green tea extract to inhibit the activity of parasites of *Leishmania infantum* and *Leishmania major* is due to flavonoids compounds such as catechins.	34
4	Ferula rigidula	Apiaceae	Komaye khoei	Ferula rigidula extract at concentrations of 1 mg/ml and 0.5 mg/ml and 0.25 mg/ml of this plant blocked %86, %36 and %56, respectively, the *Leishmania infantum* promastigotes.	35
5	*Ferula szowitsiana*	Apiaceae	Komaye dashti	Methanol extracts of *F. szowitsiana* on promastigotes of *Leishmania infantum* showed that concentrations of 0.25 mg/ml, 0.375 mg/ml and 0.5 mg/ml had %39, %56 and %62 inhibition and also reduced the number of parasites after 48 hours of incubation./ ($P<0.05$).	35
6	Cassia fistula	Fabaceae	Felous	The plant extract at concentrations of 0.1 and 0.9 inhibited the division and proliferation of promastigotes of the parasite and reduce the number of *L. tropica* and *L. major* in the location of the lesion	36
7	Pistacia khinjuk	Anacardiaceae	Pesteh	Similar to promastigote stage, *P. khinjuk* extract significantly ($p< 0.05$) inhibited the growth rate of intramacrophage amastigotes as a dose-dependent response. The results revealed that promastigote forms of *L. tropica* with no drugs were able to infect 84.3±6.5 percent of macrophage cells, while promastigotes treated with the *P. khinjuk* had potency to infect only 38.6±3.05 percent of macrophages cells. These findings revealed that infectivity of promastigotes of *L. tropica* significantly reduced ($p< 0.05$) with *P. khinjuk* extract pre-incubation.	37

Table 1. List of herbs effective on *Leishmania infantum* and *tropica* species

DISCUSSION

Humans have long been fighting with problems and insufficiencies in the life and have taken different actions to control diseases, such as using medicinal plants to treat some diseases. Despite development of sciences and technology, and using chemical materials, using medicinal plants have still a special place (38,39).

In this study, it was identified that Echinacea, Iranian shallots, Green tea, Khoi coma, Coma plain, Cassia, and Pistachio were effective herbs on Leishmania infantum and tropica in Iran.

The herb *Camelia sinensis* contain Flavanoles, and Flavonoid Glycosides from catechins category and flavonoids such as epigalocatechins, epicatechin gallate, epicatechin, galocatechins, and catechins (40). Green tea has anti-microbial, anti-typhoid, anti-oxidant, anti-inflammation, anti-ancer, anti-allergy effects, and strengthen the immune system (40-46).

Echinacea is used for common cold, chronic respiratory tract infections, and lower urinary tract, chronic wounds, strengthening the immune system, and skin inflammations (47-50). Echinacea contains 2-methyl butyl amide compounds, quercetin, kaempferol, echinasin, echinacosid, echinolon, homolon, caryophyllene (51-55). In the traditional medicine, Cassia is laxative and has antifungal effects, and is used for treatment of abdominal diseases, menstruation discomforts, burns, convulsion, delirium, dysuria, hematuria, syphilis, furuncle, carbuncle, dermatitis, worm, herpes and constipation, for joints' pain relief and fever (56-59). Phytochemical analysis of cassia plant shows that it contains ceteroles, chromones, flavonoids, antraquinon, dyterpenoides, tripenoids, catechin, furfural, chromon, and chrisofanin (60,61).

Coma plant has anti-microbial, anti-cancer, and anti-Leishmania effects (62-65). Its active compounds include derivatives of sesquiterpens, coumarin, sulfur compounds, coumarin glycosides (66-71). Allium hirtifolium Boiss has antibacterial, anti-stress and anti-antioxidant effects and reduces serum lipids (72,73). Sulfur compounds of disulfide and trisulfide are the most important compounds of this plant (74).

Flavanoles, and Flavonoid Glycosides, from catechins category and flavonoids such as epigalocatechins, epicatechin gallate, epicatechin, galocatechins, catechin, 2-methyl butyl amide, quercetin, kaempferol, echinasin, echinacosid, echinolon, homolon, caryophyllene, ceteroles, chromones, flavonoids, antraquinon, dyterpenoides, tripenoids, catechin, furfural, chromon, chrisofanin, derivatives of sesquiterpens, coumarin, sulfur compounds, coumarin glycosides, sulfur compounds of disulfide and trisulfide are important components of Echinacea herbs, Echinacea, Iranian shallots, green tea, Khoi coma, coma plain, cassia, and pistachio are effective herbs on Leishmania infantum and tropica in Iran.

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