Concise review: Medicinal plants are effective against leishmaniasis

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Abstract

Leishmaniasis is an important zoonotic parasitic disease in tropical areas. It is a neglected disease and is a great health catastrophe in Iran. Pentavalent antimony compounds are used for its treatment, but they have adverse effects. Therefore, the use of natural herbs with low adverse effects seems necessary for treatment of Leishmaniasis. In this study, we tried to introduce the natural medicines effective against Leishmaniasis. In this review study, keywords searched included natural medicines, herbal medicines, medicinal plants, Leishmaniasis, and treatment in relevant publications published between 1990 and 2017. Searching was on databases including ISI Web of Science, PubMed, PubMed Central, Scopus, ISC, SID, Magiran and some other databases. The relevant articles were reviewed for the review study. The results showed that medicinal plants: Ferula assafoatida (with IC50 of 0.38 mg/ml), Glycyrrhiza glabra (with IC50 of 25 mg/ml), Allium sativum (with IC50 of 0.57 mg/ml), Cephalis ipecacuana (with IC50 of 0.01 mg/ml), Artemisia aucheri (with IC50 of 0.46 mg/ml) and Eucalyptus globulus (with IC50 of 0.17 mg/ml) were the natural medicines effective against the disease. Compositions with di-, tri-, tetra-Sulfide, Coumarin derivatives, Camou-nephrole, Episamarcandine, Amblipernine, Car nephrole, Azafoetidine, Froxolicin, Azafoetidinole, Saradaferine, 1, 8 Cineole, Scopodreniole, Semen, Sabinine, Cineole, Inaleole, Eojenole, Farenzole, Borneol, Allicin, acid Glycerisic, Emetine and Cephalin can have the potential to produce potent drugs against Leishmaniasis. In sum, there are some specific medicinal plants and compounds effective against Leishmaniasis which can be used per se or following changes in their formula to prepare and introduce new drugs against this disease.

Keywords

Disease, Leishmaniasis, Natural medicines, Treatment
Introduction

History of consumption of herbal drugs in treatment of diseases goes back to the first human living that has revolted and developed during centuries (Fankam Aime and Jules, 2014; Rahmatullah et al., 2013). Great tendency of people toward natural treatments, which are harmless, cost-effective, and cultural compatible, has caused extensive use of pharmaceutical plants in Iranian traditional medicine (Bahmani et al., 2016; Mahomoodally and Fawzi, 2013; Mustafa et al., 2017; Rouhi-Boroujeni et al., 2017). Although in the past half century, the use of chemical and synthetic drugs has advanced; the adverse effects of these drugs on life have caused a second trend to herbal drugs (Li et al., 2011; Sarrafchi et al., 2016; Tomlinson and Akerele, 2015). Natural substances, extracted from medicinal plants, are reliable sources of procurement of medicines and the original foundation in development of pharmaceutical compounds (Ntie-Kang et al., 2013). Herbal drugs have a better general compliance due to low adverse effects (Medagama and Bandara, 2014; Shayganni et al., 2016). Parasitic diseases infecting humans are important and serious health problems that result in significant effects on individuals and great economic and social costs (Akhoundi et al., 2013; Belkaid et al., 2002; Conceicao et al., 2016; Gutierrez et al., 2016; Mahmoudi et al., 2013; Mirzaei et al., 2013; Petitdidier et al., 2016; Sacks and Perkins, 1984; Soares et al., 2017). Various herbal drugs are used for the treatment of parasitic diseases (dos Santos Silva, 2014; Oliveira et al., 2015; Tahir et al., 1998). Leishmaniasis is an important parasitic zoonotic disease in tropical areas, and is considered a neglected disease (Ndjonka et al., 2013). Studies and statistics show that about 350 million people worldwide are at risk of being infected with the disease (WHO, 2010). Annually, approximately two million new cases of the disease are reported (Mohajery et al., 2004). Iran, Algeria, Nicaragua, Colombia, Peru, Bolivia, Afghanistan, Brazil, Syria, and Saudi Arabia are the inhabitant countries of cutaneous leishmaniasis (Gramiccia and Gradoni, 2005). Cutaneous Leishmaniasis is the most important parasitic disease in Iran and even in Middle East area (Governorate, 1985). Leishmaniasis is a great health catastrophe in Iran (Shirazi et al., 2006). In Iran, the regions like Khorasan, Yazd, Bushehr, Fars, Khuzestan, Ilam, and Esfahan have the highest rate of this disease in the country (Tabatabaei et al., 2007). Leishmaniasis imposes a great economic burden on the community in developing countries (Ashford et al., 2010). Cutaneous Leishmaniasis causes skin lesions with remaining scars. Pentavalent antimonials are used for its treatment, but have high level of adverse effects (Mohajery et al., 2004).

Therefore, using herbal drugs with natural source and low adverse effects seems necessary for the treatment of cutaneous Leishmaniasis. In this study, we introduce natural medicines against Leishmaniasis.
Methods

In this review study, keywords searched included natural medicines, herbal medicines, medicinal plants, Leishmaniasis, and treatment. Searching was on databases including ISI Web of Science, PubMed, PubMed Central, Scopus, ISC, SID, Magiran and some other databases. The relevant articles were reviewed for this review article.

Results

The results of the literature review showed that medicinal plants, including *Ferula assafoatida*, *Glycyrrhiza glabra*, *Allium sativum*, *Cephalis ipecacuana*, *Artemisia aucheri*, and *Eucalyptus globulus* were the herbal medicines effective against the disease. The results of the present study showed that herbal plants such as *Ferula assafoatida* with IC50 of 0.38 mg/ml, *Glycyrrhiza glabra* plant with IC50 of 25mg/ml, *Allium sativum* plant with IC50 of 0.57 of mg/ml, *Cephalis ipecacuana* plant with IC50 of 0.01 mg/ml, *Artemisia aucheri* plant with IC50 of 0.46 mg/ml and *Eucalyptus globulus* herb with IC50 of 0.17 mg/ml were the natural medicines effective against leishmanisis (Table 1).

Table 1. The most important herbal medicines effective against Leishmaniasis with IC50 values in mg/ml

<table>
<thead>
<tr>
<th>Raw</th>
<th>Plant name</th>
<th>Scientific name</th>
<th>Family name</th>
<th>IC50 (mg/ml)</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Asafoetida</td>
<td><em>Ferula assafoatida</em></td>
<td>Apiaceae</td>
<td>0.38</td>
<td>(Alborzi et al., 2003)</td>
</tr>
<tr>
<td>2</td>
<td>Liquorice</td>
<td><em>Glycyrrhiza glabra</em></td>
<td>Fabaceae</td>
<td>0.25</td>
<td>(Chen et al., 1993)</td>
</tr>
<tr>
<td>3</td>
<td>Garlic</td>
<td><em>Allium sativum</em></td>
<td>Liliaceae</td>
<td>0.57</td>
<td>(Ghazonfari et al., 2000)</td>
</tr>
<tr>
<td>4</td>
<td>Ipecacuanha</td>
<td><em>Cephalis ipecacuana</em></td>
<td>Rubiaceae</td>
<td>0.01</td>
<td>(Neal, 1970)</td>
</tr>
<tr>
<td>5</td>
<td>Greek goddess Artemis</td>
<td><em>Artemisia aucheri</em></td>
<td>Asteraceae</td>
<td>0.46</td>
<td>(Sharif et al., 2006)</td>
</tr>
<tr>
<td>6</td>
<td>Tasmanian bluegum</td>
<td><em>Eucalyptus globulus</em></td>
<td>Myrtaceae</td>
<td>0.17</td>
<td>(Tahir et al., 1998)</td>
</tr>
</tbody>
</table>
Discussion

In this study, it was found that herbal medicines, including *Ferula assafoatida*, *Glycyrrhiza glabra*, *Allium sativum*, *Cephalis ipecacuana*, *Artemisia aucheri* and *Eucalyptus globulus* were medicinal plants effective against Leishmaniasis. In traditional medicine, Asafoetida plant is used against seizures, worms, neural diseases, intestinal dysmotility, renal pain, rheumatism, muscular clench, and hypertension, and for elimination of fatty foods’ harms, as well as for enhancing appetite and memory (Lee et al., 2009; Leung, 1996; Mohammadi, 2009; Sadraei et al., 2003). Asafoetida has di-, tri-, and tetra-sulfide, coumarin derivatives, camuonephrole, episamarcandine, amblipernine, carnephrole, azafoetidine, froxolicin, azafoetidinole, saradaferine, and foetidine (Abd El-Razek et al., 2001; Bandyopadhyay, 2006; Banerji et al., 1998; Fraga, 1999; Kajimoto et al., 1989; Kojima et al., 2000; Nassar et al., 1995). Eucalyptus has antibacterial, antifungal, antioxidan, anti-infectious, and antispasmatic effects. It is also fever palliative and putative, hypoglycemic and anheltmignant plant (Ministry of health and medical education, 2004; Zargary, 1996). Eucalyptus plant contains a compound called 1, and 8 cineole or Eucalyptole that is the main composition of this plant (Mulyaningsih et al., 2010; Oyedeji et al., 1996). Artemisia has astringent property, disinfectant activity, antimicrobial, antiparasite, anti-poisoning, and anti-insect effects (AliAbadi et al., 2010; AzadBakht, 2003). Artemisia contains scopodreniole, semen, sabinine, cineole, inaleole, eojenole, farenzole, and borneol (AliAbadi et al., 2010; AzadBakht, 2003). Garlic has cardiovascular effects, prevents cancer, has antidiabetic effects, and anti-microbial activity. The main active ingredient of this plant is called allicin (Heinrich and Larry, 1996; Leistner and Gorris, 1995). Licorice is used to treat bloating, respiratory infections, peptic ulcers and gastritis. It is also used as antitussive, anti-hepatitis, and anti-tumor agent (Baba and Shigeta, 1993; Lentihet and Nygren, 1997; Sato et al., 1996; Li et al., 2011; Haraguchi et al., 1998; Csuk et al., 2010; Fukai et al., 2002). The major component of licorice is glyceroisic acid (Alan Teck et al., 2007; Mehravar, 1991; Marzi et al., 1993). Cephalis ipecacuana is used in the treatment of cough, children’s bronchitis, and amoebic diarrhea. This plant has active compounds including emetine, and cephalin (Vetrichevan et al., 1996).

Asafoetida plant with compositions such as di-, tri-, tetra-Sulfide, coumarin derivatives, camuonephrole, episamarcandine, amblipernine, carnephrole, azafoetidinole, froxolicin, azafoetidinole, saradaferine, 1, 8 cineole, scopodreniole, semen, sabinine, cineole, inaleole, eojenole, farenzole, borneol, allicin, acid glyceroisic, emetine and cephalin has the potential for production of potent drugs against Leishmaniasis.

Other compounds of these plants may also be involved in anti-leishmania activities of these plants. Phenolic compounds are a group of compounds which have been shown to be effective against a wide variety of microbial infections as well as other diseases (Hosseinazadeh et al., 2015; Lorigooini et al., 2014; Lorigooini et al., 2015; Ghasemi and Lorigooini, 2016). They should be examined for treatment of Leishmaniasis and for preparation of new drugs.
Conclusion

There are some specific medicinal plants or compounds effective against Leishmaniasis which can be used per se or following changes in their formula to prepare and introduce new drags against Leishmaniasis.

Abbreviations

IC50= The half maximal inhibitory concentration

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Author Contribution

All authors contributed to the design of the research. MB, NA, MH and MRK collected the data. MRK write, edited and revised it. All authors reviewed and commented on final draft

References


