THE MOST IMPORTANT NATIVE MEDICINAL PLANTS EFFECTIVE AGAINST CUTANEOUS LEISHMANIASIS IN MOUSE

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ABSTRACT

Leishmaniasis is a zoonotic parasitic disease that is caused by different Leishmania species. Most cases of leishmaniasis are reported from Afghanistan, Saudi Arabia, Algeria, Brazil, Iraq, and Iran. Antimony compounds have long been used as standard treatment and first line drugs for leishmaniasis, but Leishmania species have recently acquired drug resistance. Nowadays, medicinal plants are being increasingly used to treat parasitic diseases especially leishmaniasis. In this review, the search terms Leishmania, leishmaniasis, mouse, Iran, and medicinal plants were used to retrieve publications from databases such as Scopus, Islamic World Science Citation Center, Scientific Information Database, and Magiran. According to the results of this review, nine medicinal plants, Eucalyptus camaldulensis, Matricaria chamomilla, Cathrantus roseus, Echinacea purpurea, Lawsonia inermis, Artemisia sieberi, Berberis vulgaris, Allium sativum L., and Lavandula spica L. have been reported to be effective on leishmaniasis wound in mouse model. Lawson, berberine, jatrorrhizine, colombamine, palmatine, oxyacanthine, berbamime, berulcin, magnoflorine, allicin, eucalyptol, paracymene, alpha-pinene, caffeic acids, alkylamides, echinacosides, glycoproteins, polysaccharide, chamazulene, pigenin, trihydroxyflavone, and patholiterin, berberrubine, flavonoid compounds, santonin, and coumarin are the active compounds of the native medicinal plants of Iran that are effective on leishmaniasis wound.

KEYWORDS: Mouse, leishmaniasis, medicinal plants, Iran

INTRODUCTION

Leishmaniasis is a zoonotic parasitic disease that is caused by different Leishmania species¹. The most common form of leishmaniasis is cutaneous that is widely known as Salak in Iran². Each year, about two million cases of leishmaniasis are reported³. In Iran, about 15000 cases of cutaneous leishmaniasis occur each year⁴. Depending on the type of Leishmania species, leishmaniasis causes a wide spectrum of clinical manifestations⁵. Most cases of leishmaniasis are reported from Afghanistan, Saudi Arabia, Algeria, Brazil, Iraq, and Iran⁶. Antimony compounds have long been used as standard treatment and first line drugs for leishmaniasis. These drugs require repeated injections and therefore are not well tolerated by the patients, which is a reason for low efficiency of such drugs⁷. In the recent years, Leishmania species have acquired drug resistance⁸,⁹. Although the cause of leishmaniasis has long been detected, there has not yet been any definite treatment for cutaneous leishmaniasis⁵. Complementary and alternative medicine refers to those medical interventions that are not widely taught in medical schools and are not commonly accessible in hospitals¹⁰. Complementary and alternative medicine includes several disciplines, namely phytotherapy, massage therapy, and acupuncture, most of which were derived from nations’ cultures and histories¹¹. Herbal medicine and phytotherapy have long attracted public attention¹²-¹⁵. Medicinal plants represent the most important constituent of phytotherapy. Medicinal plants are those plants whose one or more parts contain active compounds¹⁶-²². Medicinal plants are closely linked with the...
history of human life. Man in all historical periods needed medicinal plants to relieve his physical suffering, and using these plants has always been one of the effective methods of treatment 23. Nowadays, medicinal plants are being increasingly used to treat parasitic diseases especially leishmaniasis 24-27. Nowadays, medicinal plants are being increasingly used to treat parasitic diseases especially leishmaniasis, Therefore, this study was conducted with the aim of identifying medicinal herbs affecting cutaneous leishmaniasis.

MATERIALS AND METHODS

In this review, the search terms Leishmania, leishmaniasis, mouse, Iran, and medicinal plants were used to retrieve publications from databases such as Scopus, Islamic World Science Citation Center, Scientific Information Database, and Magiran. Then, the relevant articles were reviewed.

RESULTS

According to the results of this review, nine medicinal plants, Eucalyptus camaldulensis, Matricaria chamomilla, Cathrantus roseus, Echinacea purpurea, Lawsonia inermis, Artemisia sieberi, Berberis vulgaris, Allium sativum L., and Lavandula spica L., have been reported to be effective on leishmaniasis wound in mouse model (Table 1).

Table 1

<table>
<thead>
<tr>
<th>Row</th>
<th>Scientific name</th>
<th>Family name</th>
<th>Persian name</th>
<th>Effect / Description</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Eucalyptus camaldulensis</td>
<td>Myrtaceae</td>
<td>Eucalyptus</td>
<td>An interventional-experimental study on BALB/c mice demonstrated that 40 µg/ml of methanolic E. camaldulensis extract exerted anti-leishmaniasis effect on cutaneous leishmaniasis due to an Iranian strain Leishmania major.</td>
<td>28</td>
</tr>
<tr>
<td>2</td>
<td>Matricaria chamomilla</td>
<td>Asteraceae</td>
<td>Chamomile</td>
<td>An interventional-experimental study on BALB/c mice demonstrated that leishmaniasis wound improved in 58.3% of group treated with M. chamomilla tea.</td>
<td>29</td>
</tr>
<tr>
<td>3</td>
<td>Cathrantus roseus</td>
<td>Apocynaceae</td>
<td>Vinca</td>
<td>An interventional-experimental study on BALB/c mice demonstrated that 30 µg/ml of purified C. roseus extract caused improvement of leishmaniasis wound due to L. major.</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Echinacea purpurea</td>
<td>Asteraceae</td>
<td>purple coneflower</td>
<td>An interventional-experimental study on laboratory mice demonstrated that 200 µg/ml of purified E. purpurea extract caused improvement of leishmaniasis wound due to L. major.</td>
<td>31</td>
</tr>
<tr>
<td>5</td>
<td>Lawsonia inermis</td>
<td>Lythraceae</td>
<td>Henna</td>
<td>An interventional-experimental study on BALB/c mice demonstrated that Ethanolic L. inermis extract 80% ointment caused decrease in the diameter of leishmaniasis wound due to L. major.</td>
<td>32</td>
</tr>
<tr>
<td>6</td>
<td>Artemisia sieberi</td>
<td>Asteraceae</td>
<td>Sagebrush</td>
<td>An interventional-experimental study on BALB/c mice demonstrated that hydroalcoholic A. sieberi extract 5% ointment caused decrease in the diameter of leishmaniasis wound due to L. major.</td>
<td>33</td>
</tr>
<tr>
<td>7</td>
<td>Berberis vulgaris</td>
<td>Berberidaceae</td>
<td>Barberry</td>
<td>An interventional-experimental study on BALB/c mice demonstrated that alcoholic B. vulgaris extract 80% ointment caused decrease in the diameter of leishmaniasis wound due to L. major.</td>
<td>34</td>
</tr>
</tbody>
</table>
DISCUSSION

According to the evidence on medicinal plants in Iran, E. camaldulensis, M. chamomilla, C. roseus, E. purpurea, L. inermis, A. sieberi, B. vulgaris, A. sativum, and L. spica are effective on leishmaniasis wound. L. inermis has antimicrobial effect and its active compound is lawson. B. vulgaris has hypotensive effect. This plant contains berberine, jatrorrhizine, colomboamine, palmatine, oxyacanthine, berbamine and magnoflorine. A. sativum has antibacterial, antiviral, and antifungal effects. Allicin is the main compound of A. sativum. In traditional medicine, E. camaldulensis is used to treat infection and common cold. Eucalyptol, paracymene, and alpha-pinene are some of the compounds of E. camaldulensis. E. purpurea exerts antioxidant effect. This plant contains caffeic acids, alkylamides, echinacosides, glycoproteins, and polysaccharide. Phytochemical investigations demonstrated that M. chamomilla contains chamazulene, pigenin, trihydroxyflavone and patholiterin. B. vulgaris is rich in antioxidant compounds such as berbamine, berberine, and berberrubine. B. vulgaris is used to treat diabetes and hypertension. A. sieberi contains flavonoid compounds, santonin, and coumarin. The evidence indicates that in addition to anti-worm activity, A. sieberi has many biological activities such as microbicidal, antifungal, virucidal, and antiparasitic. Besides that, the analgesic, antioxidant, and vasodilatory effects of this plant were confirmed. Lawson, berberine, jatrorrhizine, colomboamine, palmatine, oxyacanthine, berbamine, magnoflorine, allicin, eucalyptol, paracymene, alpha-pinene, caffeic acids, alkylamides, echinacosides, glycoproteins, polysaccharide, chamazulene, pigenin, trihydroxyflavone, sirranoside and patholiterin, berberrubine, flavonoid compounds, santonin, and coumarin are the active compounds of the native medicinal plants of Iran that are effective on leishmaniasis wound. The mechanism actions of the presented plants are not clearly established. Plants contain multiple compounds having antimicrobial activities for protection against microorganisms. The mechanisms actions of plant compounds in general have been attributed to various factors including disintegration in cytoplasmic membranes, electron flow, active transport and coagulation of the cell content and destabilization of proton motive force. The most important factors responsible for antimicrobial actions are hydrophobic properties that allow lipids penetration from the bacterial cell membranes, disturbing cell structures which in turn imposes more penetration. They also may act on the proteins of cytoplasmic membranes or ATPase enzymes located on cytoplasmic membranes which are surrounded by lipid molecules, or cause distortion of lipid-protein interaction, or interact with hydrophobic parts of the proteins or act on the enzymes which are involved in the synthesis of microbial structural sections. In some plants, terpenes, for example, obtained from essences have high level of antibacterial activities. Phenolic compounds have been shown to mostly have antibacterial and anti-Leishmania activities. These compounds are available in a lot of plants. Hence, these herbs may also possess anti-Leishmania activities. In sum, plants have been used since ancient times by various communities for treatment various of diseases, including Leishmaniosis. Medicinal plants have the potential for the production of new drugs to be used as alternative or complementary with conventional drugs. They may decrease the costs and improve the quality of treatment. The active ingredients reported in this study can be investigated in clinical and laboratory studies and if they are effective, it should be used to produce effective natural drugs.

CONFLICT OF INTEREST

Conflict of interest declared none.
REFERENCES


