

**Review Article**

**A review of the most important native medicinal plants of Iran effective on leishmaniasis according to Iranian ethnobotanical references**

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**ABSTRACT**

The World Health Organization has declared that leishmaniasis is one of the six leading infectious diseases of tropical regions. The disease is transmitted to humans by the bite of sandflies from the genus *Phlebotomus* and develops cutaneous, mucosal or visceral clinical forms. Although cutaneous leishmaniasis is not a main health issue in terms of mortality, it causes numerous problems due to long period of the wound, tremendous healthcare costs, remaining scar, the likelihood of developing secondary infections or associated complications and sometimes malignancies in the scar site, and complications due to available pharmacotherapies. Studies are being conducted on medicinal plants to identify a suitable drug against *Leishmania* to treat leishmaniasis. We sought to identify medicinal plants that are used to treat cutaneous leishmaniasis according to references of Iranian traditional medicine. To conduct this review, *Leishmania*, *leishmaniasis*, *ethnobotany*, *Iran*, and *medicinal plants* were used to retrieve relevant publications indexed in databases including Scopus, Islamic World Science Citation Center, Scientific Information Database, and Magiran. According to the findings of this review, nine medicinal plants native to Iran are used to treat leishmaniasis. Medicinal plants *Calotropis procera*, *Morus alba*, *Nerium oleander*, *Emex spinose*, *Artemisia absinthium*, *Artemisia absinthium*, and etc are used to treat the wound according to herbal and traditional references. According to phytochemical analysis of these plants, gutaprecha, prenylated flavonoid, scopolin, reseosaid, skimmin, mulberroside A, astroglide, artemisinin, quercetin, and lawson are the most important active anti-leishmaniasis compounds with pharmaceutical potential as well as antiparasitic and disinfectant properties. These compounds can also be used to treat leishmaniasis wound.

**Key words:** *Leishmania*, leishmaniasis, medicinal plants, Iran

## INTRODUCTION

The World Health Organization has declared that leishmaniasis is one of the six leading infectious diseases of tropical regions (1,2). The cause of leishmaniasis is a parasitic protozoan from family heteripanosomatide called Leishmania. Leishmaniasis may occur in three forms: Cutaneous, cutaneous-mucosal, and visceral (3,4). The disease is transmitted to humans by the bite of sandflies from the genus Phlebotomus and develops cutaneous, mucosal or visceral clinical forms (5).

Each year, 1.5-2 million people acquire leishmaniasis with prevalence rate of 12 million people (6). Leishmaniasis is a disease caused by different species of Leishmania. Clinically, leishmaniasis may cause a skin wound or become a life-threatening systemic disease. Leishmaniasis is the second leading cause of mortality and the fourth leading cause of infectious diseases in tropical regions (7,8). In cutaneous leishmaniasis, a wound is developed in the bited site. In cutaneous leishmaniasis, clinical symptoms are wounds that may develop few weeks to few months after acquiring infection (9).

Although cutaneous leishmaniasis is not a main health issue in terms of mortality, it causes numerous problems due to long period of the wound, tremendous healthcare costs, remaining scar, the likelihood of developing secondary infections or associated complications and sometimes malignancies in the scar site, and complications due to available pharmacotherapies (10,11). Studies indicated that leishmaniasis is endemic in 88 countries, but its incidence is reported mainly from Afghanistan, Iran, Brazil, Peru, Saudi Arabia, and Syria (12).

In Iran, cutaneous leishmaniasis (dry and moist) is an important parasitic disease, and can be considered the second leading arthropods-borne disease after malaria (13). To treat leishmaniasis, antimonial compounds including sodium stibogluconate and antimonial maglomma are used, but these compounds cause certain complications, and drug resistance and recurrence after treatment

are likely (14,15).

Several studies indicated that cutaneous leishmaniasis is increasing in prevalence in Iran and worldwide. In addition, in the recent years, leishmaniasis treatment has become challenging because of the emergence of resistance to the standard drugs that are mainly antimonial pentavalent compounds (16).

Studies are being conducted on medicinal plants to identify a suitable drug against Leishmania to treat leishmaniasis (17).

Currently, Leishmania-acquired infections and leishmaniasis are considered a health issue worldwide, and especially cutaneous leishmaniasis remains a common disease in different regions of Iran (18).

Historically, medicinal plants have served as a source of nature-based drugs to treat diseases (19-24). These plants contain different compounds including bioactive, antioxidants, phenols, flavonoids, and anthocyanin (25-31).

Medicinal plants are used, as both therapeutic and pharmaceutical agents, to treat many infectious and non-infectious diseases (32-36). We sought to identify medicinal plants that are used to treat cutaneous leishmaniasis according to references of Iranian traditional medicine so that research ideas can be offered to help produce nature-based drugs effective on cutaneous leishmaniasis.

## MATERIALS AND METHODS

To conduct this review, *Leishmania*, *leishmaniasis*, *ethnobotany*, *Iran*, and *medicinal plants* were used to retrieve relevant publications indexed in databases including Scopus, Islamic World Science Citation Center, Scientific Information Database, and Magiran.

## RESULTS

According to the findings of this review, nine medicinal plants native to Iran are used to treat leishmaniasis. Medicinal plants that are used to treat leishmaniasis wound according to Iran ethnobotanical references are listed in Table 1.

According to phytochemical analysis of these plants, gutaprecha, prenylated flavonoid, scopolin, reseosaid, skimmin, mulberroside A, astroglide, artemisinin, quercetin, and lawson are the most important active anti-leishmaniasis compounds with pharmaceutical potential as well as antiparasitic and disinfectant properties. These compounds can also be used to treat leishmaniasis wound.

throat, ear infection, constipation, and chronic diarrhea, heal wounds, and as an anthelmintic and disinfectant agent (56).

Artemisinin and quercetin are the main active compounds of *Artemisia absinthium* (57). *Artemisia absinthium* has analgesic, immune system-boosting, anti-stress, and anti-inflammatory effects and is useful for spermatogenesis (58-64). The main isolated

Row	Scientific name	Family name	Persian name	Organs use	Therapeutic effect	Region
1	<i>Calotropis procera</i>	Asclepiadaceae	Astabragh	Extract and leaf	Leishmaniasis	Eastern Persian Gulf (37)
2	<i>Morus alba</i> L.	Moraceae	Toute sefid	Leaf and stem	Leishmaniasis	Eastern Persian Gulf (37)
3	<i>Nerium oleander</i> L.	Apocynaceae	Kharzahreh	Leaf	Cutaneous leishmaniasis	Eastern Persian Gulf (37)
4	<i>Emex spinosa</i>	Polygonaceae	Torshak	Aerial parts	Leishmaniasis	Eastern Persian Gulf (37)
5	<i>Eryngiumnoeanum</i>	Apiaceae	Zoul	Root	Treating cutaneous leishmaniasis	Abadeh, Shiraz (38)
6	<i>Evonymuslatifolia</i>	Celasteraceae	Goshvarak	Fruit and leaf	Purulent wound	Arasbaran (39)
7	<i>Artemisia absinthium</i>	Compositae	Afsantin	Flowering shoot	Insect-repellent	Arasbaran (39)
8	<i>Lawsonia inermis</i>	Lythraceae	Hana	Leaf	Leishmaniasis	Ilam (40)
9	<i>Tamarix spp.</i>	Tamaricaceae	Gaz	Leaf	Leishmaniasis	Ilam (40)

**Table 1.** Anti-leishmaniasis wound plants according to Iran ethnobotanical references

## DISCUSSION

According to the evidence, *Calotropis procera*, *Morus alba*, *Nerium oleander*, *Emex spinose*, *Artemisia absinthium*, *Artemisia absinthium*, and etc are the most important medicinal plants effective on leishmaniasis according to Iran ethnobotanical references. In traditional medicine, *Calotropis procera* is used to treat leprosy, asthma, diarrhea, vomiting, wound, boil, and hepatic diseases (41). According to phytochemical analysis, *Calotropis procera* contains gutaprecha (42). *Morus alba* has antibacterial, sedative, anti-toothache, hypotensive, diuretic, and antispasmodic effects, relieves joint pain, and is used to treat eye inflammation (43-46). Phytochemical analysis indicated that *Morus alba* contains prenylated flavonoid, scopolin, reseoside, skimmin, mulberroside A, astroglide, etc. (47-49). *Tamarix* spp. has anti-diabetic, anti-influenza, immune system-boosting, and anticancer effects (50-53). *Artemisia absinthium* exerts antiparasitic effects (54,55). In traditional medicine, *Artemisia absinthium* is used to treat liver failure, sore

compound from *Nerium oleander* is oleandrin (65,66). In old times, *Lawsonia inermis*

was used to treat leprosy, infection, burn, irritation, and eczema (67-73). In traditional medicine, *Lawsonia inermis* is considered an disinfectant plant and used to treat skin diseases (74-77). The main compound of *Lawsonia inermis* is lawson (78,79). According to phytochemical analysis of these plants, gutaprecha, prenylated flavonoid, scopolin, reseosaid, skimmin, mulberroside A, astroglide, artemisinin, quercetin, and lawson are the most important active anti-leishmaniasis compounds with pharmaceutical potential as well as antiparasitic and disinfectant properties. These compounds can also be used to treat leishmaniasis wound.

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