



Identification of the Most Important Medicinal Plants Used for Wound Healing: An Ethnobotanical Study of Sistan and Baluchestan Province, Southeastern Iran

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ABSTRACT

Introduction: Skin damage is a serious problem that has attracted remarkable attention.

Recently, the healing of wounds has become a serious problem. Hence, the aim of this study was to conduct an ethnobotanical study about medicinal plants used for the healing of wounds in Sistan and Baluchestan Province, Southeastern Iran.

Methods: This study was performed in Sistan and Baluchestan Province, Southeastern Iran. Ethnobotanical information was collected through interviews and questionnaires among 20 traditional healers. Demographic information was also obtained from traditional healers. The data were analyzed by Excel.

Results: Eleven medicinal plants from nine families were used for wound healing. The medicinal plants from the Fabaceae family (*Alhagi persarum* Boiss. & Buhse. and *Medicago sativa* L.) had the most application for wound healing. It has been observed that topical administration was the most important type of preparation method for the used medicinal plants. According to the new results, most plant families belong to Zygophyllaceae and Fabaceae. The most used plant organ was the leaf (53%) and the most used method was as topically.

Conclusion: The mentioned medicinal plants showed wound-healing effects. Further research is needed for the suitable application of these plants and their phytochemical constituents in the medical and pharmaceutical industries.

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Intorduction

Skin is the boundary between human body and external environment, protects body from external chemical and physical factors, participates in metabolic and immunological processes, performs function of reabsorption and temperature regulation, and known to be

first line of defense against pathogenic microorganisms (Dzidek et al., 2022). Maintaining integrity of the skin is vital to protect against dehydration, bleeding and prevent the entry of microorganisms (Payne et al. 2020). Wound is defined as a disorder in the natural and functional

structure of skin and underlying soft tissue (Tottoli et al. 2020). Skin wounds are caused by various reasons, including physical, chemical and biological damage, and are divided into chronic and acute types based on the method and duration of repair. Acute wounds such as burns and cuts are usually superficial and heal completely within eight to 12 weeks (Kim et al., 2018). Chronic wounds such as venous or arterial leg ulcers, diabetic foot ulcers, and pressure ulcers are usually associated with physiological disorders caused by the slow or stopped wound healing process, which heals slowly and their recovery time exceeds 12 weeks (Falanga et al. 2022). Wound healing is a complex process that includes four stages of coagulation, inflammation, proliferation, and regeneration that interact with each other (Opneja et al., 2019). Many of the synthetic drugs available for wound management, besides being expensive, also cause problems such as allergies and drug resistance (Homaeigohar yet al., 2020). In general, herbs for wound healing are unexpensive, affordable and safe. So, one third of all traditional medicines are used to treat wounds and skin disorders, which is a very high figure compare to only 1-3% of modern medicines (Fazil et al.m 2020). Medicinal plants have long been used to treat a wide range of diseases. Medicinal plants also play an important role in treating wounds. In fact, these plants help to heal wounds by having a wide range of chemical compounds with various types of biological effects such as antioxidant and anti-inflammatory properties (Yazarlu et al., 2021). Hence, the aim of this study was to conduct an ethnobotanical study about medicinal plants used for the healing of wounds in Sistan and Baluchestan Province, Southeastern Iran.

Materials and Methods

Region of Study

The current study was carried out in Sistan and Baluchestan Province, Southeastern Iran. Sistan and Baluchestan Province is located on the Gulf of Oman in southern Iran. Sistan and Baluchestan Province covers 29.4924°N to 60.8669°E geographical coordinates.

Data Collection

The present ethnobotanical study was conducted through a questionnaire in Sistan and Baluchestan Province. This ethnobotanical investigation was performed from February 2021 to January 2022. This study was conducted through face-to-face visits and through interviews and questionnaires among 20 traditional healers. The questionnaire was distributed among traditional healers. The questionnaires contained demographic information. The questioners personally visited the studied subjects and registered the beliefs of herbal medicine in relation to receiving medicinal and ethnobotanical information. The results obtained from the questionnaires were directly transferred to the relevant tables and recorded. Finally, the data were analyzed by Excel (Bahmani et al., 2014).

Results

We found that eleven medicinal plants from nine families were used for wound healing. The medicinal plants include *Alhagi persarum* Boiss. & Buhse. and *Medicago*

sativa L. from the Fabaceae family were found with the most application for wound healing. It has been concluded that leaves, stems, and seeds were the most usable parts of the mentioned plants. Moreover, topical administration was observed as the most important type of preparation methods for medicinal plants (Table 1).

The data in Table 1 were analyzed with the Excel program. The results of the analysis of the number of plant families in this study are shown in figure 1. Also, the results of usable part of plants and preparation methods are specified in figures 2 and 3.

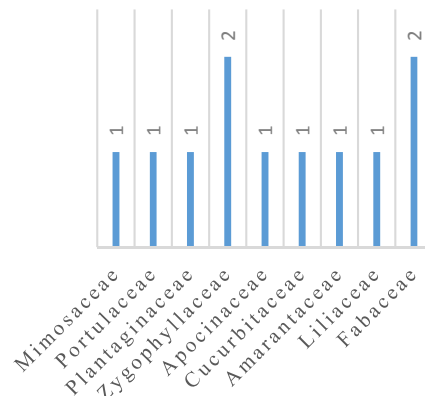


Figure 1. Number of herbal families

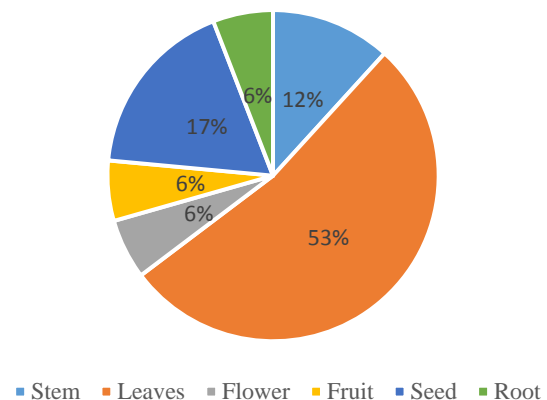


Figure 2. Usable parts of plants

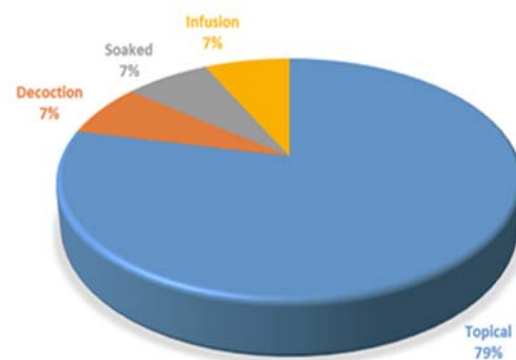


Figure 3. Preparation methods

Table 1. Medicinal plants used for the wound healing in Sistan and Baluchestan province.

Scientific Name	Family	Persian name	Usable part of plant	Preparation methods
<i>Alhagi persarum</i> Boiss. & Buhse.	Fabaceae	Khar shotor	Stem, leaves, flower	Topical
<i>Aloe vera</i> L.	Liliaceae	Sabre zard	Leaves	Topical
<i>Amaranthus retroflexus</i> L.	Amarantaceae	Taje khoroos	Leaves	Topical
<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	Hendevane aboojahl	Fruit	Topical
<i>Medicago sativa</i> L.	Fabaceae	Ionje	Stem, leaves	Topical
<i>Nerium oleander</i> L.	Apocinaceae	Khar zahreh	Leaves	Topical, decoction
<i>Peganum harmala</i> L.	Zygophyllaceae	Espan	Seeds, leaves	Topical, soaked
<i>Plantago lanceolata</i> L.	Plantaginaceae	Barhang neizei	Seeds, leaves	Topical, infusion
<i>Portulaca oleracea</i> L.	Portulacaceae	Khorfeh	Leaves	Topical
<i>Prosopis frakta</i> (Banks & Soland.) J.F. Macbr	Mimosaceae	Kahoorak	Seeds	Topical
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Khare khoshk	Leaves, root	Topical

Discussion

Wound healing consists of regaining the physical integrity of internal and external structures and includes complex interactions between cells and various factors. Wound healing is a hemostatic mechanism for the return of physiological balance and it starts with disconnection between adjacent cells and their support or as a result of cell death. In the healing process, a series of events including inflammatory responses, regeneration of the epidermis, wound healing, and finally the formation of connective tissue and re-formation take place in a sequence that overlaps with each other at specific times (Dong et al., 2021). Based on the above notes, finding therapeutic agents for faster restoration of dermis and epidermis against skin damage is of particular importance (Ranjith et al., 2019). Nowadays, use of medicinal plants are welcomed to reduce side effects caused by the use of synthetic drugs for therapeutic purposes (Ghuman et al., 2019). Hence, the aim of this study was to conduct an ethnobotanical study about medicinal plants used for the healing of wounds in Sistan and Baluchestan Province, Southeastern Iran. Various medicinal plants are used in traditional medicine to heal wounds of various forms. The results of the present study revealed that eleven medicinal plants including *Alhagi persarum* Boiss. & Buhse., *Aloe vera* L., *Amaranthus retroflexus* L., *Citrullus colocynthis* (L.) Schrad., *Medicago sativa* L., *Nerium oleander* L., *Peganum harmala* L., *Plantago lanceolata* L., *Portulaca oleracea* L., *Prosopis frakta* (Banks & Soland.) J.F. Macbr and *Tribulus terrestris* L. from nine families (Fabaceae, Liliaceae, Amarantaceae, Cucurbitaceae, Apocinaceae, Zygophyllaceae, Plantaginaceae, Portulacaceae and Mimosaceae) were used for wound healing. *Alhagi persarum* Boiss. & Buhse. and *Aloe vera* L. are two main medicinal plants for the wound healing in traditional medicine. In a study conducted by Solati K and his team, their results revealed that *Alhagi persarum* Boiss. & Buhse. and *Aloe vera* L. play an important role in phytotherapy for wound healing. Indeed, the findings of this study displayed that 139 medicinal plants such as *Verbascum* spp., *Glycyrrhiza glabra*, *Salvia officinalis*, *Echium amoenum*, *Medicago sativa*, *Mentha pulegium*, *Aloe vera*, *Datura stramonium* L., *Alhagi* spp., *Pistacia atlantica*, *Hypericum perforatum*, and *Prosopis cineraria* were useful for the wound healing. In fact, it was concluded that there are a positive association between the

presence of antioxidants and biological compounds in these medicinal plants and their ability for the wound healing (Solati et al., 2021). There are several pieces of evidence about the use of medicinal plants in Iranian traditional medicine for the wound healing. For instance, in a study conducted by Delfan and his colleagues, their finding highlighted that eighteen medicinal plants from eleven plant families were used for the wound healing and skin disorders in Lorestan province, west of Iran. Furthermore, the authors of the above investigation reported that *Althaea officinalis*, *Artemisia annua*, *Cherzophora oblique*, *Citrus limonum*, *Daphne mucronata*, *Eqinops* spp., *Lens culinaris*, *Malva neglecta*, *Mentha longifolia*, *Narcissus papyraceus*, *Peganum harmala*, *Picromon acarna* (L.), *Pistacia atlantica*, *Pistacia khinjuk*, *Plantago major*, *Scrophularia striata*, *Urtica dioica* and *Vigna radiate* were the most commonly used medicinal plants for the wound healing in Lorestan province, west of Iran. It has been shown that presence of wide range of phytochemical constituents including D-limonene, anthocyanin, mucilage, alkaloids, resins, glycosides, iridoids and cryptophilic acid in these plant, were responsible for various biological effects such as antioxidant, anti-inflammatory, antibacterial and wound healing effects (Delfan et al., 2014).

Conclusions

In sum, the results of our study documented that eleven species of medicinal plants in Sistan and Baluchestan Province can exert a wound-healing effect. In fact, a wide range of medicinal plant species with several active ingredients showed various biological effects. Ethnobotanical studies provided a unique perspective on the use of medicinal plants in different regions of the world to treat diseases. However, more extensive studies are needed on the mechanism of action of these herbs along with their safety and therapeutic effects.

Conflict of interest

The author stated that there is no conflict of interest.

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Consent for publications

The author approved the manuscript for publication.

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None.

Authors' contributions

ND conceived the research idea and ND designed the work. ND and RL carried out the experiment and statistical analysis. ND and RL wrote the first draft of the manuscript and approved the final revision.

Ethical considerations

Ethical issues (including plagiarism, misconduct, data fabrication, falsification, double publication or submission, redundancy) have been completely observed by the author.

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