

A review of the most important native medicinal plants of Iran effective on diarrhea

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ABSTRACT

Diarrhea is an intestinal disease which is developed because of malabsorption of ions, solutes, and water or increased release of electrolytes which leads to water accumulation in duct. Diarrhea also is defined as over 200 g stool per day which is usually reported as decreased consistency of stool from clinical perspective. In this review article, we sought to report the medicinal plants that are used as antidiarrheal agents according to the traditional medicine and ethnobotany of different provinces of Iran. The relevant articles, books, and documents about Iranian traditional medicine were searched for by the words, diarrhea, ethnobotany, and medicinal plants, in domestic and international databases including International Sciences Institute, Web of Science, PubMed, Scopus, and Islamic World Science Citation Center. *Achillea eriophora* DC, *Rhus coriaria* L, *Satureja hortensis*, *Agrimonia eupatoria* L, *Geum urbanum* L, *Artemisia sieberi* Besser, *Lonicera nummulariifolia*, Jaub. & Spach, *Rhus coriaria* L, *Achillea eriophora*, *Descurainia sophia*, *Fumaria parviflora*, *Rhamnus prostrata*, *Amaranthus paniculatus* L, *Bunium persicum*, *Foeniculum vulgare* Miller, *Phoenix dactylifera* L, *Ornithogalum persicum*, *Berberis vulgaris* L, *Descurainia sophia*, *Elaeagnus angustifolia* L, *Organum vulgare* L, *Satureja khuzistanica* Jamzad, *Stachis lavandulifolia* L, *Astragalus adscendens* Boiss. & Hausskn, *Faba vulgaris* Moench, *Medicago sativa* L, *Rumex pulcher* L, *Zizyphus spina-christi* L. Willd, *Crataegus curvisepala* Lindm, *Amaranthus retroflexus* L, *Nigella sativa* L, *Plantago psyllium* L, *Conyza canadensis* (L) Cronq, *Lythrum salicaria* L, *Sisymbrium irio* L, *Thymus daenensis* celak, *Achillea santolina*, *Chamomilla recutita* L, *Cydonia blonga* Mill, *Cuminum cyminum* L, *Allium cepa* L, *Elaeagnus angustifolia* L, *Mentha pulegium* L, *Viola tricolor* L, *Rumex crispus* L, *Punica granatum* L, *Plantago lanceolata* Soejarto, *Ocimum basilicum* L, *Foeniculum vulgare* Mill, *Rhus coriaria* L, *Cornus mas* L, *Urtica dioica* L, *Salix aegyptiaca* L, *Gundelia tournefortii* L, *Quercus brantii* Lindl were reported to be some of the antidiarrheal plants of Iran. Because diarrhea may be developed by fungal, bacterial, viral, and non-infectious causes and many of the plants reported in this study contain antioxidant, pharmaceutically bioactive compounds, including flavones, flavonoids, phenolic compounds, tannins, and anthocyanins, then these plants can be investigated in the studies on treatments for diarrhea to produce nature-based and effective drugs used for this common disease with fewer side effects than chemical drugs.

KEY WORDS: Diarrhea, medicinal plants, Iran.

1. INTRODUCTION

Diarrhea is defined as having each day more than three loose or liquid bowel movements. The causes dehydration and loss of the normal stretchiness of the skin. Acute diarrhea is defined by World Gastroenterology Organization as less than 14 days frequent discharge of semisolid or fluid fecal matter from the bowel (Talley, 1991; Braunwdd, 2001). Diarrhea was previously defined as over 200 g stool per day which was usually reported as decreased consistency of stool from clinical perspective (Singh, 2013). Diarrhea might be infectious or non-infectious, and can have many causes including viral, bacterial, and fungal. Diarrhea is a main cause of mortality, especially among children (Thapar and Sanderson, 2004; Toila, 2002).

Diarrhea is the cause of approximately two million deaths each year (Schmidt-Ott, 2005). Mortality is lower from diarrheal diseases in developed countries and these diseases' impacts are assessed mainly from financial perspective (Zimmerman, 2001). Currently, diarrhea is controlled by prevention and dehydration management with oral or venous rehydration (Fontaine, 2006).

The main causes of diarrheal diseases are widely different in developing and developed countries (Guerrant, 2002; Black, 1990), such that in developed countries, viruses are the main causes while in developing countries, some bacteria, such as Enterotoxigenic *Escherichia coli*, *Sampylobacter* species, *Shigella*, and *Salmonella* species are the main causes (Baudry, 1990; Jertborn and Svennerholm, 1991).

Worldwide infectious diseases have caused major problems especially socioeconomic losses (Soroush, 2010; Taherikalani, 2008; Hagh-Asteiani, 2007; Nakhjavani, 2013; Jabalameli, 2012; Khoramrooz, 2012; Shahsavan, 2012; Sahebkhari, 2011; Shahsavan, 2011; Mahdi, 2010; Kalantari, 2007). People have recently preferred to use herbal drugs with fewer side effects than chemical drugs (Baharvand-Ahmadi, 2015; Bahmani, 2014; Saki, 2014; Delfan, 2014; Bahmani, 2012; Eftekhari, 2012; Bahmani, 2014; Bahmani, 2014; Delfan, 2014; Amirmohammadi, 2014; Bahmani, 2015). The main aim of ethnobotany is to detect the traditional therapeutic effects of plants according

to folk ideas and knowledge in a specific culture (Bahmani, 2013; Bahmani, 2015; Gholami-Ahangaran, 2012; Bahmani, 2013; Forouzan, 2012; Gholami-Ahangaran, 2012; Bahmani, 2014; Bahmani, 2015).

Surrounding nature is full of plant species with pharmaceutical and therapeutic properties that might have not been identified to date (Bahmani, 2014; Asadi-Samani, 2014; Delfan, 2014; Bahmani, 2014; Saki, 2014; Asadbeigi, 2014; Karamati, 2014; Bahmani, 2014). Recent investigations have demonstrated that many companies and researchers have used the findings of ethnobotanical studies to develop and optimize new drugs (Bahmani, 2013; Bahmani, 2014; Shaygannia, 2015; Bahmani, 2016; Rafieian-Kopaei, 2014; Baharvand-Ahmadi, 2015; Baharvand-Ahmadi, 2015; Bahmani, 2015). In any regions of Iran, specific medicinal plants are used to treat diarrhea. Therefore, the aim of this review article is to report the medicinal plants used as antidiarrheal agents according to traditional medicine and ethnobotany of different provinces of Iran.

2. METHODS

The relevant articles, books, and documents about Iranian traditional medicine were searched for by the words, diarrhea, ethnobotany, and medicinal plants, in domestic and international databases including International Sciences Institute, Web of Science, Pub Med, Scopus, and Islamic World Science Citation Center.

3. RESULTS

In north, west, east, south and central Iran, 55 plants are traditionally used to treat diarrhea, including *Achillea eriophora* DC, *Rhus coriaria* L, *Satureja hortensis*, *Agrimonia eupatoria* L, *Geum urbanum* L, *Artemisia sieberi* Besser, *Lonicera nummulariifolia*, Jaub. & Spach, *Rhus coriaria* L, *Achillea eriophora*, *Descurainia sophia*, *Fumaria parviflora*, *Rhamnus prostrata*, *Amaranthus paniculatus* L, *Bunium persicum*, *Foeniculum vulgare* Miller, *Phonix dactylifera* L, *Ornithogalum persicum*, *Berberis vulgaris* L, *Descurainia sophia*, *Elaeagnus angustifolia* L, *Organum vulgare* L, *Satureja khuzistanica* Jamzad, *Stachis lavandulifolia* L, *Astragalus adscendens* Boiss. & Hausskn, *Faba vulgaris* Moenchris, *Medicago sativa* L, *Rumex pulcher* L, *Zizyphus spina-christi* L. Willd, *Crataegus curvisepala* Lindm, *Amaranthus retroflexus* L, *Nigella sativa* L, *Plantago psyllium* L, *Conyza canadensis* (L.) Cronq, *Lythrum salicaria* L, *Sisymbrium irio* L, *Thymus daenensis* celak, *Achillea santolina*, *Chamomilla recutita* L, *Cydonia blonga* Mill, *Cuminum cyminum* L, *Allium cepa* L, *Elaeagnus angustifolia* L, *Mentha pulegium* L, *Viola tricolor* L, *Rumex crispus* L, *Punica granatum* L, *Plantago lanceolata* Soejarto, *Ocimum basilicum* L, *Foeniculum vulgare* Mill, *Rhus coriaria* L, *Cornus mas* L, *Urtica dioica* L, *Salix aegyptiaca* L, *Gundelia tournefortii* L, *Quercus brantii* Lindl. Table 1 shows further information about anridiarrheal medicinal plants of Iran.

Table.1. Persian and scientific name and family of antidiarrheal plants of Iran, their used parts, and the regions where they are used.

Scientific name	Family	Persian name	Used part(s)	Therapeutic effect	Province
<i>Achillea eriophora</i> DC.	Asteraceae	Bouzhana	Leaves	Diarrhea	West Azarbaijan
<i>Rhus coriaria</i> L.	Anacardiaceae	Somagh	Fruit	Diarrhea	Arasbaran
<i>Satureja hortensis</i>	Labiatae	Marzeh	Flowering shoots	Acute diarrhea	Arasbaran
<i>Agrimonia eupatoria</i> L.	Rosaceae	Ghafez	Flowering shoots	Diarrhea	Arasbaran
<i>Geum urbanum</i> L.	Rosaceae	Alafe mobarak	Rhizome and root	Diarrhea	Arasbaran
<i>Artemisia sieberi</i> Besser.	Asteraceae	Dermaneye zagrosi	Leaves and stem	Diarrhea	Ilam
<i>Lonicera nummulariifolia</i> Jaub. & Spach.	Caprifoliaceae	Pile akhor	Leaves and flowers	Diarrhea	Ilam
<i>Rhus coriaria</i> L.	Anacardiaceae	Somagh	Fruit	Diarrhea	Ilam
<i>Achillea eriophora</i>	Asteraceae	Boumadaran jonoubi	Leaves and flowering shoots	Diarrhea	Kerman
<i>Descurainia sophia</i>	Brasicaceae	Khakeshir	seeds	Diarrhea	Kerman
<i>Fumaria parviflora</i>	Fumariaceae	Shah tareh	Leaves and branches	Diarrhea	Kerman

<i>Rhamnus prostrata</i>	Rhamnaceae	Siahtangers	Fruit	Diarrhea	Kerman
<i>Amaranthus paniculatus L.</i>	Amaranthaceae	Tajkhorous	Flowers and leaves	Diarrhea	Khouzestan
<i>Bunuim persicum</i>	Apiaceae	Zireye kouhi	Fruit	Diarrhea	Khouzestan
<i>Foeniculum vulgare Miller.</i>	Apiaceae	Razianeh	Fruit, branches and leaves	Diarrhea	Khouzestan
<i>phoneix dactylifera L.</i>	Arecaceae	Khorma	Fruit	Diarrhea	Khouzestan
<i>Ornithogalum persicum</i>	Asparagaceae	Molir	Leaves and stem	Diarrhea	Khouzestan
<i>Berberis vulgaris L.</i>	Berberidaceae	Zereshk	Fruit	Diarrhea	Khouzestan
<i>Descurainia sophia</i>	Brassicaceae	Khakeshir	seeds	Diarrhea	Khouzestan
<i>Elaeagnus angustifolia L.</i>	Elaeagnaceae	Senjed	Fruit	Diarrhea	Khouzestan
<i>Organumvulgare L.</i>	Lamiaceae	Marzanjoush	Aerial parts	Diarrhea	Khouzestan
<i>Satureja khuzistanica Jamzad.</i>	Lamiaceae	Marzeye khuzestani	Aerial parts	Diarrhea	Khouzestan
<i>Stachis lavandulifolia L.</i>	Lamiaceae	Chaye kouhi	Leaves and flowering shoots	Diarrhea	Khouzestan
<i>Astragalus adscendens Boiss. & Hausskn.</i>	Papilionacea	Gaze khansar	-	Dysentery	Khouzestan
<i>Faba vulgaris Moenchris</i>	Papilionacea	Baghela	Leaves and seeds	Diarrhea	Khouzestan
<i>Medicago sativa L.</i>	Papilionacea	Yonjeh	seeds, leaves, and stem	Diarrhea	Khouzestan
<i>Rumex pulcher L.</i>	Polygonaceae	Torshak	Root	Diarrhea	Khouzestan
<i>Zizyphus spina-christi L. Willd.</i>	Rhamnaceae	Sedr	Leaves and fruit	Diarrhea	Khouzestan
<i>Crataegus curvisepala Lindm.</i>	Rosaceae	Zalzalak	Leaves, fruit, and flowers	Diarrhea	Khouzestan
<i>Amaranthusretroflexus L.</i>	Amarantaceae	Taj khorous	Leaves	Diarrhea	Sistan
<i>Nigella sativa L.</i>	Ranunculaceae	Siah daneh	seedss	Diarrhea	Sistan
<i>Plantago psyllium L</i>	Plantaginaceae	Esfarzeh	Leaves and seeds	Diarrhea	Sistan
<i>Conyza canadensis (L.) Cronq.</i>	Asteraceae	Pir giah	-	Diarrhea	Kazeroun
<i>Lythrum salicaria L</i>	Lythraceae	Khonfam	-	Diarrhea and dysentery	Kazeroun
<i>Sisymbrium irio L.</i>	Brassicaceae	Khakeshir	seeds and aerial parts	Diarrhea	Mobarakeh, Isfahan
<i>Thymus daenensis celak.</i>	Lamiaceae	Avishan	Leaves and flowering shoots	Diarrhea	Mobarakeh, Isfahan
<i>Achillea santolina</i>	Asteraceae	Boumadaran	Flowering shoots	Diarrhea	Mobarakeh, Isfahan
<i>Chamomilla recutita L.</i>	Asteraceae	Babouneh	Flowers	Diarrhea	Mobarakeh, Isfahan

<i>Cydonia blonga Mill</i>	Rosaceae	Beh	Fruit	Diarrhea	Mobarakeh, Isfahan
<i>Cuminum cyminum L.</i>	Apiaceae	Zireye sabz	Seeds	Diarrhea	Mobarakeh, Isfahan
<i>Allium cepa L.</i>	Alliaceae	Piaz	Bulb	Diarrhea	Mobarakeh, Isfahan
<i>Elaeagnus angustifolia L.</i>	Elaeagnaceae	Senjed	Leaves and fruit	Diarrhea	Mobarakeh, Isfahan
<i>Mentha pulegium L.</i>	Lamiaceae	Pouneh	Leaves and aerial parts	Diarrhea	Mobarakeh, Isfahan
<i>Viola tricolor L.</i>	Violaceae	Banafsheh	Flowers and whole plant	Diarrhea	Mobarakeh, Isfahan
<i>Rumex crispus L.</i>	Polygonaceae	Torshak	Leaves	Diarrhea	Mobarakeh, Isfahan
<i>Punica granatum L.</i>	Punicaceae	Anar	Flowers	Diarrhea	Mobarakeh, Isfahan
<i>Plantago lanceolata Soejarto</i>	Plantaginaceae	Barhang	Root, leaves, and seedss	Diarrhea	Mobarakeh, Isfahan
<i>Ocimum basilicum L.</i>	Lamiaceae	Reyhan	Aerial parts	Diarrhea	Mobarakeh, Isfahan
<i>Foeniculum vulgare Mill</i>	Apiaceae	Razianeh	seedss	Diarrhea	Mobarakeh, Isfahan
<i>Rhus coriaria L.</i>	Anacardiaceae	Somagh	Fruit	Diarrhea	Mobarakeh, Isfahan
<i>Cornus mas L.</i>	Cornaceae	Zoghal akhte	Fruit	Diarrhea	Mobarakeh, Isfahan
<i>Urtica dioica L.</i>	Urticaceae	Gazaneh	Leaves	Diarrhea	Mobarakeh, Isfahan
<i>Salix aegyptiaca L.</i>	Salicaceae	Bidmeshk	Flowering shoots	Diarrhea	Mobarakeh, Isfahan
<i>Gundelia tournefortii L.</i>	-	Kangar	Flowers and seedss	Dysentery	Mobarakeh, Isfahan
<i>Quercus brantii Lindl.</i>	Fagaceae	Balout	Leaves and fruit	Diarrhea	Mobarakeh, Isfahan

DISCUSSION

Diarrhea may be infectious or non-infectious. Diarrhea can be developed by viral, bacterial, and fungal infection causes. In Iran, 55 plants are traditionally used to treat diarrhea. Herbal medicines have been used for thousands of years for treatment and prevention of various diseases (Moradi, 2013; Hajigholizadeh, 2013; Bahmani, 2013, 2016; Setorki, 2013; Akhlaghi, 2011; Baradaran, 2012; Rabiei, 2013, 2014; Rahimian, 2013; Rahnama, 2015; Shaygannia, 2015; Rafieian-Kopaei, 2011; Nasri, 2015; Rafieian-Kopaei, 2014; Mirhosseini, 2014; Asadi, 2013; Parsaei, 2013). The Iran traditional medicine is rich in medicinal plants which also might be used against various diseases for numerous human diseases including diarrhea (Sharafati, 2011; Bahmani, 2014; Shirzad, 2009; Sharafati, 2011; Heidarian, 2013; Sedighi, 2012; Roohafza, 2013; Shirzad, 2011; Madihi, 2013; Sarrafzadegan, 2013; Madihi, 2013; Setorki, 2011; Azadmehr, 2011; Mardani, 2014; Nasri, 2014, 2015; Bahmani, 2015; Delfan, 2015).

Diarrhea is yet a major cause of morbidity and mortality. Due to the side effects of synthetic drugs there is renewed interest in preparation of natural compounds that might be safely used against these diseases. The trials which have evaluated the use of these plants reported that these plants may reduce electrolyte secretion, stimulate water adsorption, suppress gut motility, have antispasmodic effects or delay intestinal transit. Of the numerous phytochemicals, tannins, flavonoids and other phenolic compounds are thought to be responsible for antidiarrheal properties of these plants. Due to the potential toxicity, the plants and herbal medicine preparations should be evaluated regard to the safety and tolerability. Although, it has been generally considered that minimal side effects

are observed with the use of medicinal plants, however, the clinical trials which have examined the safety of plants preparations are scarce. In this regard, other than *in-vitro* and *in-vivo* evaluations, the benefits and the probable dangers of the plant derived medicines must be considered.

The information presented here, might be served as a basis for further phytochemical and pharmacological studies, but clinical trials are needed to determine their efficacy and safety before considering them in the national health systems.

The medicinal plants reported in this article are traditionally used to treat diarrhea. Since diarrhea may occur because of fungal, bacterial, viral, and non-infectious causes and many of the plants reported in this study contain antioxidant, pharmaceutically bioactive compounds, including flavones, flavonoids, phenolic compounds, tannins, and anthocyanins, then these compounds should be investigated in order to determine the main component effective in diarrhea and produce nature-based and effective drugs used for this common disease with fewer side effects than chemical drugs.

It should be noted that most of the plants and plant derivatives presented in this study have phenolic compounds. Phenolic compounds possess antioxidant activity and antioxidant are effective in numerous diseases (Nasri, 2013; Sarrafchi, 2016; Nasri, 2013; Rafieian-Kopaei, 2013; Nasri, 2013; Baradaran, 2014; Nasri, 2014; Rafieian-Kopaei, 2013; Nasri, 2013; Kafash-Farkhad, 2013; Nasri, 2013; Rafieian-Kopaei, 2014; Nasri, 2014; Rafieian-Kopaei, 2014; Baradaran, 2014; Nasri, 2013; Baradaran, 2013; Nasri, 2013; Ghaed, 2012; Baradaran, 2013; Rafieian-Kopaei, 2013;). Diarrhea is associated with increase in oxidative stress and hence, these plants may also be beneficial by counteracting oxidative stress.

4. CONCLUSION

Therefore, the plants of this review study with antioxidant activity might also be effective in these diseases.

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