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Review

Identification of medicinal plants of Urmia for treatment of gastrointestinal disorders

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ABSTRACT

The gastrointestinal tract is one of the most important organs of the human body and is vulnerable to different diseases. Available drugs often have low efficacy or are associated with many adverse effects. Therefore, alternative drugs are necessary to treat gastrointestinal complications. This study intended to identify medicinal plants in Urmia, Iran, that can affect common gastrointestinal disorders and diseases. Data was collected from public resources via interviews and questionnaires applied from April to June 2013. Herbarium specimens were collected from the region and authenticated by a botanist. A total of 41 indigenous medicinal plants from the Urmia region, belonging to twenty families, have a traditional medicinal role in the treatment of parasitic and infectious diseases, diarrhea, reflux, gastroenteritis, peptic ulcer, constipation, bloating, among other gastrointestinal tract disorders. Analysis showed that most plants affecting the gastrointestinal tract belonged in the Asteraceae family (24%). The most used part of the plants was the seed at 17%. Decoction at 65% was the most popular form of treatment used. Some of the medicinal plants discussed in this article have new implications presented for the first time. Pharmacological studies on the therapeutic effects of the indigenous plants mentioned in this study are necessary in order to investigate their claimed clinical effects and the use of their effective compounds to produce natural and useful drugs. Currently, there is no data on the herbal plants used to treat gastrointestinal disorders in northwestern Iran. Therefore, these findings are important for the management of gastrointestinal disorders and to conduct future studies on traditional medicine for drug development.

Introduction

Gastrointestinal disorders have a high prevalence in human societies. Functional digestive disorders are the most important ones, and about 50% of patients who refer to gastroenterology care centers suffer from them. The gastrointestinal (GI) tract is one of the most important organs in the human body, and it is vulnerable to a great diversity of diseases such as parasitic and infectious disorders, diarrhea, reflux, gastroenteritis, constipation, and bloating (Kasper et al., 2005). Today, diarrhea is defined as an

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increase in stool weight of greater than 200 g per day followed by an increase in stool liquidity, stool frequency, perianal problems, and defecation urgency. Diarrhea is a major worldwide health problem, especially among children. Annually, 3 to 5 million diarrhea-related deaths occur in the world, and is one of the most prevalent causes of mortality in children. Infectious diarrhea is one of the main causes of disease and mortality in developing countries. Studies have reported that infectious diarrhea occurs in 19-83 per 100 people in one year (Porcelli et al., 2004). In Iran the second leading cause of death in children, after respiratory infections, is diarrhea (Bagheri et al., 2008).

Duodenogastric reflux is said to be the upward flow of biliary fluid from the duodenum into the stomach that causes gastritis. Duodenum contents including bile acids, the main cause of gastric mucosal injury, can produce mucosal atrophy and intestinal metaplasia; and in esophageal mucosa it can develop into intestinal metaplasia and malignancy (Rezaei et al., 2009). Gastroenteritis is the cause of 5 million deaths per year worldwide. Gastrointestinal ulcers, particularly those in the stomach, can develop from an increase of acid secretion caused by different reasons like the consumption of non-steroidal anti-inflammatory drugs, alcohol abuse, long starvation, bad eating habits, and severe and persistent stress. Increased gastric acid secretion is the main cause of gastric mucosal injury. Thus, the relationship between the amount of gastric acid secreted and peptic ulcers development has been proven (Ziaei et al., 2009). According to a World Health Organization report, one out of ten Americans suffers from peptic ulcer disease during their lifetime, and annually 15,000 deaths occur due to the consequences of this disease.

The economic effects of this disease are also very significant. In the USA over $10 billion are spent annually on treatments (Hilmarsdottir et al., 2012).

Gas accumulation is one of the most common disorders of the digestive system. This problem refers to a feeling of abdominal distention and elongation that is accompanied by excessive gas, which pushes the diaphragm upward and decreases lung expansion. The prevalence of bloating in Asian populations is about 15%-23% and in American societies is about 15%-30% (Vere et al., 2005). Constipation is defined as a delay or severity in passing stools that continues for two weeks or more. The diagnosis of constipation depends on stool consistency, bowel movement times, and severity in passing stools. Constipation is a prevalent problem of the GI tract, which develops in about 2%-28% of adults and is 3 to 5 times more common in women than men (Chen et al., 2005).

Digestive diseases directly and indirectly have psychological effects. They are ranked first among medical diseases for which psychiatric consultation is requested. This reflects the relationship between psychiatric disorders and the physical symptoms of GI tract disorders.

A significant percentage of GI tract disorders are functional disorders, and evidence suggests that psychiatric disorders are more prevalent among this kind of patients (Ziaei et al., 2009). Because of the side effects inherent to synthetic drugs, the exploration of new drugs that have minimum side effects is highly regarded. Medicinal plants are suitable sources for this purpose (Rafieian-Kopaei, 2012), especially since they are more compatible with human nature and have fewer side effects (Nasri and Shirzad, 2013). Obviously, the exploration of these molecules from natural resources has special value, and it is logical to focus on medicinal plants used in Iranian traditional medicine. In addition to the high interest in medicinal plants that has developed among people, recent research report promising results about the effects of plants for the treatment of different diseases, even incurable ones like gastrointestinal (Sedighi et al., 2013; Kiani et al., 2013) and cardiovascular disorders (Khosravi-Boroujeni et al., 2013; Asgary et al., 2013), diabetes (Akbari et al., 2013; Gharipour et al., 2013), cancer (Shirzad et al., 2011; 2013), and Alzheimer's disease (Baradaran et al., 2012; Rabiei et al., 2013). In many cases, these plants have been proven to have significant effects in the decrease of side effects caused by synthetic drugs (Ghaed et al., 2012; Heidarian and Rafieian-Kopaei, 2013) or other diseases (Baradaran et al., 2013; Nasri and Rafieian-Kopaei,, 2013).

The current study aimed to identify and report the medicinal plants used to treat prevalent gastrointestinal diseases and disorders in Urmia, Iran.

Urmia, the capital city of the West Azarbaijan province, is located in northwestern Iran (Fig. 1). It is a mountainous area, which has widespread botanical coverage. The use of medicinal plants and ethnopharmacology is deeply rooted in the history of Urmia and is very popular in this region (Bahmani and Eftekhari, 2012). Thus, we chose this area to carry out this project.

Figure 1 – The location of Urmia, Iran.

Materials and methods

In this study, data was collected from public resources using interviews and questionnaires from April to June in 2013. First, a list of traditional healers in Urmia city was prepared, based on information from the Urmia Drug and Food Administration. Next, the necessary information of traditional healers was collected by direct observation and by interviews and questionnaires. Questionnaires were

distributed among Urmia's traditional healers, and interviews were conducted simultaneously. The questionnaires included questions regarding personal information of the traditional healers and questions about the medicinal herbs they use to treat GI disorders, such as the traditional name of the plants, prescription methods, amount of use, directions for use, plant parts used, preparation methods etc.

Samples were collected locally and dried, and the voucher specimens were prepared. Dried samples named by the local traditional physicians in the questionnaire were collected from the region and authenticated by a botanist (Mortaza Rafieian) using a variety of valid references (Townsend, 1985; Davis, 1988; Zargari, 1989; Khatamsaz, 1992; Ghahraman, 2002; Asadi et al., 2008). A voucher specimen from each plant (whole or used parts) were prepared and deposited at the herbarium of Shahrekord University of Medical Sciences. Finally, the data obtained from the questionnaires was analyzed using the Excel 2010 program.

Results

According to the list of traditional healers (*Attars*) provided by the Urmia Drug and Food Administration, 45 individuals had been approved and licensed to work, and 35 whom participated in this project. All of them were older than 18 years and regularly prescribed medicinal plants to patients based on their traditional knowledge.

Data analysis allowed the identification of 41 indigenous medicinal plants in the Urmia region that belong to twenty botanical families. These plants have traditional therapeutic roles in the treatment of parasitic and infectious diseases like diarrhea, reflux, gastroenteritis, peptic ulcer, constipation, bloating, and other GI tract disorders (Chart 1).

After the data obtained from the questionnaires and interviews were analyzed, 41 medicinal plants belonging to twenty plant families were determined to be effective in treating gastrointestinal disorders. The number of identified species belonging to 20 botanical families, are presented in Fig. 2. The percentage of plant organs used for the treatment of GI tract disorders and diseases are presented in Fig. 3.

Discussion

In this study, 41 medicinal plants used for the treatment of parasitic and infectious diseases, diarrhea, gastroenteritis, stomach ulcer, constipation, and other GI disorders were identified.

Achillea millefolium is a medicinal plant has essential oils, polyphenolic compounds, several types of flavonoids, sesquiterpene lactones, betaine, acetylene compounds, resin, tannins, phosphates, nitrates, potassium salts, and organic acids (Emami et al., 2001).

Achillea millefolium is used for blood coagulation, menstrual disorders, relieving hemorrhoids, hematuria, insomnia, visual disturbances, epilepsy, and to relieve acute and chronic gastritis. Because it has tannins, and bitter and aromatic compounds, this plant affects the central nervous system and is used to treat general fatigue, heart attack, kidney stones, and some neurological diseases as neurasthenia, hysteria, epilepsy, and hysterogenic colic (Zargari, 1994; Arzi and Akhavan, 2001). It contains unsaturated sterols, triterpenes, tannins, carbohydrates, glycosides, flavonols, flavonoids, proanthocyanidin, alhagitin, and alhagidin (Khushbaktova et al., 1992; Atta and El-Sooud, 2004; Singh et al., 1999).

Alhagi maurorum is used to treat kidney and gallbladder stones. It is known to have diuretic, anti-pertussis, and anti-ague activities as well (Zargari, 1985; Dehkordi, 2002). The root of the *Althaea officinalis* plant has antitussive and pain relieving effects and is used in traditional medicine to decrease inflammation, chronic cough, angina, bronchitis (Bone, 1993; Mirhaidar, 2010). *Althaea officinalis* has effective ingredients such as flavonoids of the polyphenols group, polysaccharides, mucins, antocyanins, and fiber (Bradley, 1992; Razavi, 2003; Kardosova and Machova, 2006; Sutovska et al., 2007; Pakravan et al., 2007; ESCOP, 1996).

Almonds have antioxidant properties (Esfahlan et al., 2010). During phytochemical studies, several benzodiazepines and similar ligands were identified in natural resources and medicinal plants. For example, flavonoids, similar-acting to benzodiazepines and phytoestrogen, as well as flavonoids have been extracted from chamomile plants. Apigenin isolated from chamomile has a strong affinity to benzodiazepine receptors, thus it has important hypnotic and anxiolytic effects (Viola et al., 1995; Pelissero et al., 1996; Avallone et al., 2000; Zand et al., 2001).

Chamomilla recutita (*Matricaria chamomilla*) is known around the world. The aqueous and ethanol extracts obtained from the flower have anti-inflammatory and antispasmodic effects. It also has sedative and anti-agitation effects and is used to treat digestive and neurological disorders, travel-related diseases, and cold symptoms (Barene et al., 2003). *Cichorium intybus* L. has been identified to have anti-hepatotoxic effects, anti-malarial, anti-diabetic, antioxidant, and anti-inflammatory properties. This plant is tonic to the liver, has diuretic, laxative and orexigenic properties (Ghanadi et al., 2010).

Datura stramonium has been identified in Traditional Persian Medicine (TPM) as a pain reliever plant (Khorasani, 1992). In recent years it has been used by European and American communities as a hallucinogenic and narcotic (Schulman and Bolton, 1998). *Ficus carica* is used in the treatment of diarrhea, respiratory problems, and skin inflammation, and it reduces blood triacylglycerides and cholesterol. This plant has anti-worm, anti-cancer, anti-diabetic and anti-papilloma activities (Khorasani, 1992; Schulman and Bolton, 1998; Ahmed et al., 1988). Research has shown that flavonoids, isoflavonoids, chalkon, and glycyrrhizic acid contents of this plant have antibacterial effects on *Helicobacter pylori*. Moreover, clinical and experimental studies on this plant have reported its therapeutic properties against hepatitis C, skin and lung diseases, as well as liver and heart failure; in addition to its anti-inflammatory, antiviral, antibacterial, antioxidant, anti-cancer activities along with its ability to strengthen the immune system (Campillo et al., 1994; Wang et al., 1995; Haraguchi et al., 1998; De-Amorin et al., 1999; Perez et al., 1999; 2003; Rubnov et al., 2000; Canal et al., 2002; Fukai et al., 2002; Hemmatzadeh et al., 2003; Khanahmadi et al., 2013).

Chart 1
The medicinal plants used in the treatment of gastrointestinal disorders in Urmia, Iran.

Herbarium code	Scientific name	English Common Name	Family	Persian name	Biological Form†	Part use	Method of application	Traditional therapeutic effect	Other therapeutic effects in literature
459	*Achillea millefolium* L.	Yarrow	Astraceae	*Biranjasif*	He	Inflorescence	Decoction or infusion	Decrease of gastric acid	Inhibition of gastric acid secretion by inhibiting vagus nerve (Niyazmand, 2008), Gastritis (Demirci et al., 2009; Ardestani and Yazdanparast, 2007)
482	*Agrimonia eupatoria* L.	Common agrimony	Rosaceae	*Gulkalli*	He	Inflorescence	Decoction or infusion	Stomach ulcers and gastritis	-
443	*Alhagi camelorum Fisch.*	Camelthorn	Fabaceae	*Khaar-e-shatur*	He	Aerial parts	Decoction or infusion	Intestinal infection	Gastrotestinal disorders and stomatch ulcer (Batanouny, 1999; Ghazanfar, 1994), and antidiarrheal (Atta and Mouneir, 2004)
483	*Altheae hirsute* L.	Rough Marsh-mallow	Malvaceae	*A Type of Khatmi*	He	Root	Decoction or infusion	Laxative	Constipation and cramp (Zargari, 2004)
484	*Amygdalus communis* L.	Almond	Rosaceae	*Badam*	Ph	Unripe fruit and seed	Decoction or infusion	Anti-constipation, laxative	Digester (Mardani-Nejhad et al., 2012)
485	*Amygdalus kotschyi Boiss. & Hohen.*	A type of almond	Rosaceae	*Badam*	Ph	Seed	Decoction or infusion	Laxative	Digester (Mardani-Nejhad et al., 2012)
486	*Anthemis tinctoria* L.	Yellow chamomile	Asteraceae	*Babouneh zard*	He	Floral branch	Decoction or infusion	Stomachache, gastritis	Carminative (Zolfaghari et al., 2012); Sexual reluctance (Dolatkhahi et al., 2010); diarrhea (Sadeghi and Borjian, 2013)
512	*Artemisia dracunculus* L.	Tarragon	Asteraceae	*Tarkhon*	He	Twig and leaves	Decoction	Appetizer	Increasing appetize (Ribnichy et al., 2004)
487	*Artemisia vulgaris* L.	Common wormwood	Asteraceae	*Biranjasif*	He	Branch, fruit	Decoction or infusion	Intestinal worm	Carminative (Koohpayeh et al., 2011)
488	*Bryonia dioica Jacq.*	Red bryony	Cucurbitaceae	*Fashra*	He	Root and fruit powder	Decoction	Indigestion, intestinal infection	-
489	*Centaurea solstitialis* L.	Yellow star-thistle	Asteraceae	*Gol Gandome Zard*	Th	Inflorescence	Decoction	Diarrhea	Febrifuge (Sadeghi and Borjian, 2013)
490	*Cichorium intybus* L.	Cichorium	Asteraceae	*Kasni*	He	Root, leave, flower	Decoction	Aids the function of the gallbladder	Laxative and anti-cholesterol (Zolfaghari et al., 2012); tonic to stomach (Dolatkhahi et al., 2010)

Chart 1 *cont.*

Herbarium code	Scientific name	English Common Name	Family	Persian name	Biological Form†	Part use	Method of application	Traditional therapeutic effect	Other therapeutic effects in literature
491	*Cirsium arvense* L.	Creeping Thistle	Asteraceae	*Kangar Harz*	He	Floral branch	Raw edible	Intestinal worms	Tonic to stomach (Sharififar et al., 2010); Indigestion; Laxative (Sadeghi and Borjian, 2013)
464	*Citrullus colocynthis* (L.) Schrad	Colocynth	Cucurbitaceae	*Hendavaneh Kohi*	Hendavaneh abojahl	Seed	Decoction	Intestinal inflammation	Constipation and bacterial infection (Madari and Jacobs, 2004); treatment of disorders digestive (Asfi, 1994); constipation weak bowel actions (Zargari, 1994)
507	*Cuminum cyminum* L.	Cumin	Apiaceae	*Zireh Sabz*		Seed	Decoction	Intestinal inflammation	Antimicrobial (Singh et al., 2002; Iacobelis et al., 2005), carminative, indigestion and antimicrobial (Rojhan, 1982; Beger, 1954; Hager, 1996; Daneshmandi et al., 2010; Khory and Katrak, 1985; Trease and Evans, 1996; Gachkar et al., 2007)
492	*Daphne mucronata* Royle.	Daphne	Thymelaceae	*Barge Bou*	Ph	Aerial organ	Decoction, infusion	Decrease of gastric acid	-
493	*Datura stramonium* L.	Datura	Solanaceae	*Tatoureh*	Th	Seed	Decoction, poultice	Appetizer	Antiparasite (Koohpayeh et al., 2011); sedative (Dolatkhahi et al., 2011)
494	*Dipsacus laciniatus* L.	Cutleaf teasel	Dipsacaceae	*Khaje bashi*	He	Root, leave, seed	Decoction, poultice	Laxative	-
495	*Elaeagnus angustifolia* L.	Silver berry	Elaeagnaceae	*Senjed*	Ph	Fruit and seed skin	Raw edible, Decoction	Detoxification	Antidiarrhea (Mardani-Nejhad et al., 2011)
497	*Ficus carica L.*	Common fig	Moraceae	*Anjir*	Ch	Fruit and leave	Decoction	Laxative, anti-constipation	Indigestion, constipation Antidiarrhea (Ahmed, 1988); Laxative (Beheshtinejad, 2007)
498	*Galium humifusum* M.Bieb.	Galium	Rubiaceae	*Shir panir*	He	Aerial parts	Decoction	Infectious and parasitic diarrhea	Astringent (Zolfaghari et al., 2012)
499	*Galium verum* L.	Yellow Bedstraw	Rubiaceae	*Shirpanir*	He	Aerial parts, root	Decoction	Treatment of parasitic Diarrhea	Astringent (Zolfaghari et al., 2012)

Chart 1 *cont.*

Herbarium code	Scientific name	English Common Name	Family	Persian name	Biological Form†	Part use	Method of application	Traditional therapeutic effect	Other therapeutic effects in literature
500	*Glycyrrhiza glabra* L.	Liquorice	Fabaceae	*Shirin bayan*	He	Root and aerial parts	Decoction	Peptic ulcer, Gastritis	Tonic to stomach (Mardani-Nejhad, 2012); Gastritis (Sharififar et al., 2010)
501	*Grammosciadium daucoide* DC.	Grammosciadium	Apiaceae	*Shevid Kouhi*	He	Fresh leave	Decoction	Decrease of gastric acid	Digestive disorders like bloat; Stomach and intestinal ulcers and indigestion (Duke, 2001); Decreasing gastric acid (Hosseinzadeh et al., 2002)
468	*Juglans regia* L.	Persian walnut	Juglandaceae	*Gerdoo*	Ph	Trunk, fruit, skin, leave	Decoction	Styptic	-
504	*Malva neglecta* Wallr.	Common mallow	Malvaceae	*Panirak*	He	Branch, seed, leaves	Decoction, poultice	Laxative	-
506	*Mentha longifolia* L.	Horse Mint	Lamiaceae	*Pouneh*	Cr	Aerial parts	Decoction, infusion	Stomache	Bloat intestinal colic; carminative; antispasmodic (Newall and Phillipson, 1996)
503	*Mentha spicata* L.	Spearmint	Lamiaceae	*Pouneh Kohi*	Cr	Aerial parts	Decoction	Infectious and parasitic diarrhea	Bloat intestinal colic; antispasmodic; duodenum and ileum muscle relaxants (Newall and Phillipson, 1996) and adnauseam (Iscan et al., 2002)
515	*Ocimum basilicum* L.	Basil	Lamiaceae	*Reyhan*	He	Aerial parts	Decoction	Appetizer	Digestive system booster; carminative, cramps (Zargari, 1997)
508	*Phragmites australis* (Cav.) Trin. ex Steud.	Phragmites	Poaceae	*Ney*	He	Rhizome	Decoction	Gastritis, Intestinal inflammation	-
509	*Plantago major* L.	Broadleaf plantain	Plantaginaceae	*Barhang*	He	Seed leaves, root	Decoction	Peptic ulcer, Gastritis	-
510	*Platanus orientalis* L.	Oriental plane	Platanaceae	*Chenar*	Ph	Bark	Decoction	Appetizer, diarrhea	-
511	*Scorzonera cinerea* Boiss.	Scorzonera	Asteraceae	*A species of Shang*	He	Root	Decoction	Laxative	-

Chart 1 *cont.*

Herbarium code	Scientific name	English Common Name	Family	Persian name	Biological Form†	Part use	Method of application	Traditional therapeutic effect	Other therapeutic effects in literature
496	*Senecio mollis* Wild.	Senecio	Asteraceae	*Pir Giah*	He	Cabitole	Decoction	Diarrhea	Antidiarrhea (Zolfaghari et al., 2012)
513	*Sisymbrium officinale* L.	Hedge mustard	Brassicaceae	*Khakshir Daruei*	Th	Seed	Decoction	Hepatoprotective, laxative	-
514	*Tanacetum parthenium* (L.) Sch. Bip.	Feverfew	Asteraceae	*Baboneh kabir*	He	Leave, flower	Decoction	Gastritis	-
516	*Thymus kotschyanus* Boiss.	A kind of Thymus	Lamiaceae	*Avishan*	Ch	Floral branch	Infusion	Diarrhea, bloat, indigestion	Stomachache, bloat (Amin, 1991), diarrhea (Zargari, 1985), digester (Zargari, 1990), fever and dysentery (Hakim, 1969)
517	*Tragopogon carcifolius* Boiss.	Tragopogon	Asteraceae	*Shang*	He	Leave	Decoction	Laxative	-
479	*Trifolium pratense* L.	Red clover	Fabaceae	*Shabdar*	He	Floral branch	Decoction	Laxative	-
502	*Vaccaria oxyodonta* Boiss.	Cow cockle	Caryophyllaceae	*Sabounak Daneh Zard*	He	Flower	Decoction	Laxative	-
505	*Ziziphora tenuior* L.	Ziziphora	Lamiaceae	*Kakooti*	Th	Inflorescence	Decoction	Diarrhea, bloat, gastritis	Carminative and anti-abdominal pain (Salehi et al., 2005); gastrointestinal infections (Mehrabian et al., 1996); stomach problems (Babakhanloo et al., 1998)

According to the chart there was no scientific information for fifteen plants of 41 plants in scientific resources relating therapeutic effects.

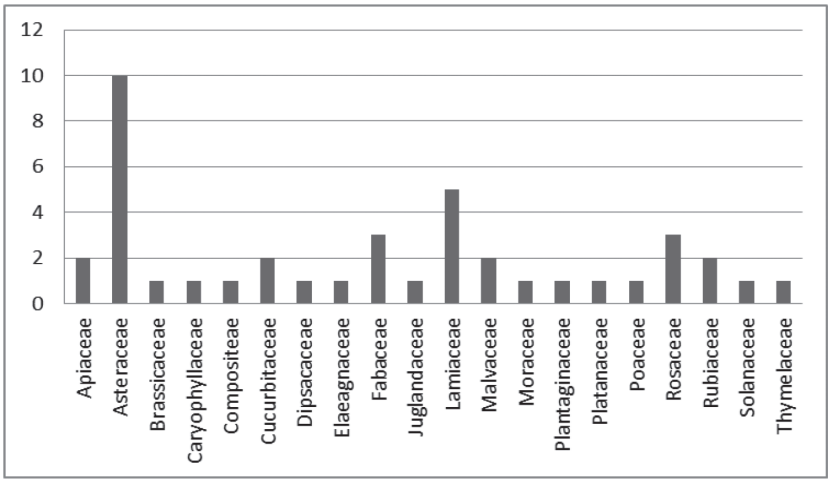

Figure 2 – Number of species from every botanical family used for the treatment of GI tract disorders and diseases in the Urmia Region.

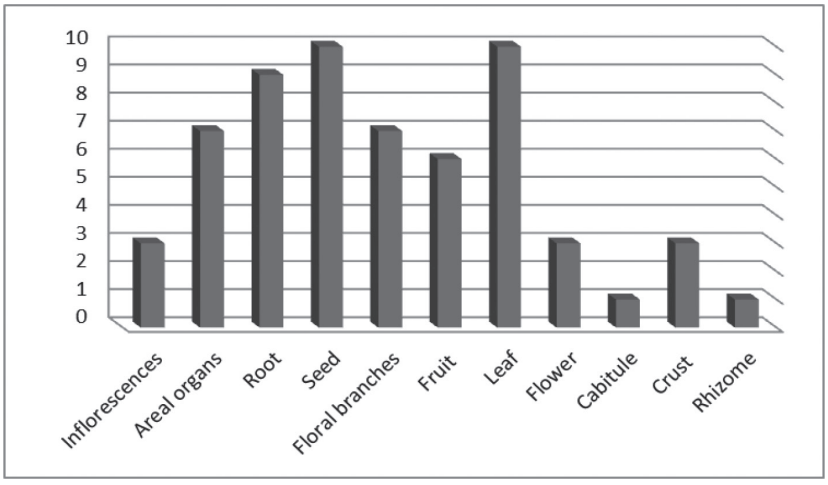

Figure 3 – Percentage of plant organs used in treating GI tract disorders and diseases. Traditional healers of Urmia prescribe medicinal plants in different ways. Data analysis showed that decoction was the most popular method of preparation (used in 65% of cases). Complementary information on traditional prescriptions of medicinal plants is presented in Fig. 4, and the percentage and combination of medicinal plants affecting the treatment of GI tract diseases and disorders can be seen in Fig. 5.

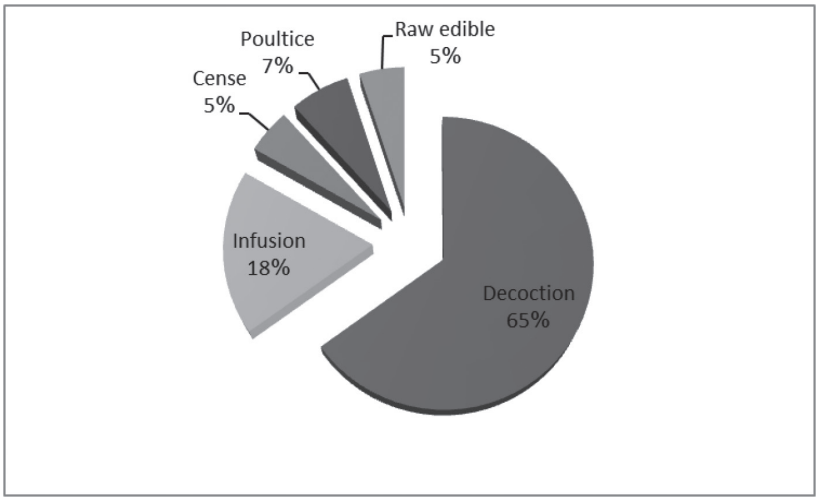

Figure 4 – Percentage of traditional methods of preparation of medicinal plant prescribed for the treatment of GI tract diseases and disorders in Urmia Region.

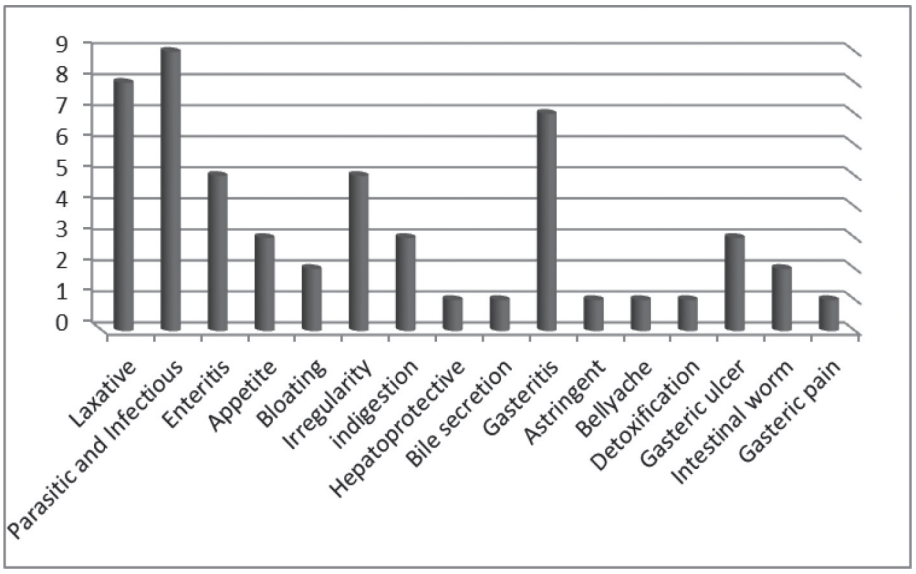

Figure 5 – Percentage of medicinal plants used to treat defined GI tract diseases and disorders.

The content of *Glycyrrhiza glabra* includes glycyrrhizic acid, glabridin, and liquiritin. Liquiritin has antiviral and antioxidant properties and is the most abundant flavonoid in the *glycyrrhiza glabra* root. Glycyrrhizic acid is a well-studied compound present in *Glycyrrhiza glabra*, which has anti-inflammatory, wound-healing, and antiviral properties. In many countries, it is used to treat wounds and chronic viral hepatitis. Another compound found in *Glycyrrhiza glabra* root is glabridin, which has antimicrobial and antitumor properties (Aya et al., 1997; Kuo et al., 1998; Ujisawa et al., 2002; Tanahashi et al., 2002; Cinatl et al., 2003; Choi, 2005; Fu et al., 2005; Im et al., 2006; Ong and Lin, 2007; Monavari et al., 2008;).

Anethum graveolens fruit has anti-convulsant, stomach tonic, digestive, carminative, anti-convulsant and diuretic effects. It also inhibits vomiting and increases the secretion of milk. *Anethum graveolens* seeds and leaves are used as edible spices. Some other properties reported for this plant include antibacterial, antifungal, anti-spasmodic, antioxidant, anticancer, and gastric mucosa protective effects. It also aids in decreasing gastric acid secretion, sugar and cholesterol in circulation (Dickshit and Husain, 1984; Zheng et al., 1992; Gharibnaseri et al., 2005; Gibbons and Stavri, 2005; Yazdanparast and Bahramikia, 2008). The *Anethum graveolens* seed has an essence that includes D-carvone ,D-limonene, α-phellandrene, and dihydrocarvone (Carvalho et al., 2006). It is possible that digestive disorders like bloating, indigestion, and stomach and intestinal ulcers may improve and that gastric acid secretion is decreased through the effective substances in *Anethum graveolens*.

Mentha pulegium has been used in traditional medicine to treat bloating and intestinal colic. It is also used as a carminative, antispasmodic, insect repellent, and antiseptic. This plant stimulates menstruation and is used as a spice in cooking and to give fragrance to soap and detergents (Shahidivagheidahande, 1987; Duke, 1989; Low, 1994; Lawless, 1995). Several studies have determined that the anthocyanins in *Malva sylvestris* are antioxidants (Zhen-yu, 2005). *Ziziphora tenuior* belongs to the Labiatae family and is effective for the treatment of digestive disorders such as diarrhea and cramps and to treat the common cold. This plant has antibacterial, pain-relieving, anti-inflammatory, antipyretic, and menstrual pain-relieving properties and is used in stomach tonics (Yao and Chiou, 1993; Zarabi, 2000; Naghibi et al., 2005; De Sousa et al., 2007; Ozturk and Ercisli, 2007).

Chemical compounds identified in the fruit of *Citrullus colocynthis* include crystallizable glucoside, or colocinthine, which is intensely bitter and is changed to glucose, and the result of this hydrolysis is a substance called as colocyntheine. It also contains some substances like citrulline, colocynthiline, resinous materials, pectins, and various salts (Zargari, 1993). The fruit of *Cuminum cyminum* contains 2-5% essence, a major part of which includes α- and β-pinene, α- and β-phellandrene, cuminaldehyde, cumin alcohol, eugenol, propyl-aldehyde, α-terpineol and myrcene. Found in cumin is 13.5% resin, 8% gum and mucilage, 7.7% oil, and 15.5% protein (Steinegger and Hansel, 1972; Haghiroalsadat et al., 2010). The chemical constituents of *Plantago major* include mucilage, organic acids, polysaccharides, plantagel, flavonoids, carotenoids, aucubin, catalpin, saponin, invertin, apigenin, sorbitol, minerals, vitamins, tannin, resins and others (Green, 2007).

It seems that the positive therapeutic effects of plants come from their available chemical compounds. Inulin is a fermentable insoluble dietary fiber that helps improve bowel function by improving regularity and increasing the defecation frequency as well as the stool bulk. A diet containing inulin stimulates the growth of lactobacilli and *Bifidobacterium* and selectively inhibits the growth of pathogens. Inulin exists naturally in 15% of flowering plants, like onion, garlic, banana, *Asparagus officinalis*, artichoke, chicory, leek, *Scrozonera* spp., and root of *Arctium*. Some bacteria and fungi also produce it.

The inulin content in the before-mentioned plants range from 1 to 20 by fresh plant weight (Campos et al., 2009; Rastall and Maitin, 2002; Roberfroid, 2007).

Artemisia dracunculus contains estragole, methyl eugenol and benzodiazepines. The benzodiazepines provide anxiolytic, hypnotic, sedative, and antiepileptic effects by binding to GABA-A receptors (Kavvadias et al., 2000). The orexigenic effects of *Artemisia dracunculus* may be applied through the sedative property of this plant. *Ocimum basilicum* contains various compounds like monoterpenes (thujone, myrcene, linanol, geraniol, fenchone, cineole, and carrone), triterpenoids (ursolic acid), sesquiterpenoids (caryophyllene and farnesol), and flavonoids (apigenin) (Chiang, 2005; Telci et al., 2006; Sajjadi et al., 2006).

The comparison of the therapeutic effects presented in this report, along with other studies, and the effects of the bioactive substances identified in plants, it can be determined that the secondary compounds of medicinal plants are responsible for different therapeutic effects. It is necessary to record traditional and remedial information during ethnobotanical studies so that this treasured knowledge is not forgotten with the passing of time, because: a) different cultures in different regions use medicinal plants; b) the treatment for many diseases needs complementary medical therapies that are cheap and accessible; and c) people in remote rural areas have less access to modern drugs, (Bahmani et al., 2010; 2013; Rafieian-Kopaei, 2012; Gholami-Ahangaran et al., 2012; Forouzan et al., 2012; Eftekhari et al., 2012). The frequency and widespread use of medicinal plants in the Urmia region suggests that further investigation could help identify the therapeutic effects of local plants, thus leading to the production of herbal medicines by ethnopharmacology.

Currently, there are no previous reports on plants used to treat gastrointestinal disorders in northwestern Iran. Therefore, these findings are of great importance for the management of gastrointestinal disorders and for future studies on traditional medicine for drug development.

Conflicts of interest

The authors declare no conflicts of interest.

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