Medicinal Plants Used for Gastrointestinal Disorders in Some Districts of Izmir Province, Turkey

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Medicinal Plants. Ethnobotany. Gastrointestinal Disorders. Izmir

ABSTRACT
This study was carried out in order to determine which plants and the ways in which these plants are used for the treatment of gastrointestinal disorders among the people of some districts of Izmir province, located in the Western Anatolian part of Turkey. Field study was carried out over a period of approximately three years (2009-2011). During the field trips, the information was collected through interviews, including various data obtained from local healers and traditional medicine men, herbalists, shepherds, patients and elderly persons. In addition, informant consensus factor (Fic) values were calculated for the medicinal plants included in the study. A total of 33 plants belonging to 25 families were documented for their therapeutic use against gastrointestinal disorders. Further analysis on the families of medicinal plants that are used against gastrointestinal disorders has shown that family Lamiaceae is represented by the highest number of species. Also, it was determined that gastrointestinal system ailments for which the folk medicinal plants are mostly used, are as follows: constipation, diarrhea, gastritis and ulcer, intestinal winds, nausea, gastralgia and indigestion. Informant consensus of medicinal plant usage within Izmir resulted in Fic values between 0.56 and 0.84 per gastrointestinal disorder category. This study showed that plants are actively used for the treatment of gastrointestinal disorders in the area of Izmir.

INTRODUCTION

Since ancient times, humanity used various natural materials as a source of medicines and probably plants have always had the most important role to play in medicine and public health (Ghorbani 2005). As a result of centuries of accumulated experience, humans used plants for treatment purposes until the development of modern medicine. But this knowledge and transmission is in danger because transmission between older and younger generation is not always assured (Anyinam 1995).

Documentation of the local knowledge through ethnobotanical studies is important for the conservation and utilization of biological resources (Muthu et al. 2006; Ugulu 2013). For this reason, ethnobotanical studies have become increasingly valuable for the development of healthcare and conservation programs in such regions (Osoşki et al. 2002). In this context, many studies have been conducted in Turkey about usages of the medicinal plants and herbal products (Erci 2007; Kultur 2007; Karşıoğlu et al. 2008; Ugulu et al. 2009; Dogan et al. 2011; Ugulu 2011; Ugulu and Aydın 2011). These studies indicated that herbal therapies (40.6%) are used most frequently (Tan et al. 2004; Isikhan et al. 2005). Another study found that patients were mostly using herbal products (72.5%) in Turkey (Oğuz and Pınar 2000).

¹Traditional ethnobotanical knowledge, complementary and alternative medicine therapies and prevalence of medicinal plants have been investigated in different areas of Turkey (Dogan and Mert 1998; Dogan et al. 2003; Dogan et al. 2004a; Dogan et al. 2005; Nedelcheva et al. 2007; Dogan et al. 2008; Çakılıcigoğlu and Türkoglu 2010; Dogan et al. 2010a; Ugulu and Baslar 2010; Nedelcheva et al. 2011; Dogan 2012; Ugulu 2012; Ugulu et al. 2012a; Dogan et al. 2013). The results of these studies show that applications toward the treatment of gastrointestinal disorders occupy an important place among the usage of plants for medicinal purposes (Simşek et al. 2004; Kultur 2007; Karşıoğlu et al. 2008; Ugulu and Secmen 2008; Ugulu et al. 2009). Gastrointestinal disorders include symptoms like abdominal pain, acidity, constipation, dyspepsia, indigestion, flatulence, etc., caused by
eating indigestible, excessive or irregular foods, imbalanced and spicy diets, and adulteration of food and contamination of drinking water. Diarrhea, dysentery, colic and colitis also occur due to digestive complaints (Dwivedi et al. 2006; Olajuyigbe and Afolayan 2012).

This study was carried out in order to determine the plants and the ways in which these plants are used for the treatment of gastrointestinal disorders among the people of the study area.

**MATERIAL AND METHODS**

**General Characteristics of the Study Area**

The study area consisted of towns and counties of Beydag (38° 05' N, 28° 11' E), Kiraz (38° 14' N, 28° 12' E), Odemis (38° 16' N, 27° 59' E) and Tire (38° 05' N, 27° 46' E), all of which lie within the administrative borders of Izmir province. The area was approximately 2600 km² (Fig. 1). The area consisted of the Küçük Menderes delta, one of the important deltas of Western Anatolia (Atalay 2002). To the north of the delta lies Bozdaglar and to the south lies the Aydın Mountains. The Küçük Menderes River, which rises in Bozdaglar and is 175 km long, passes through first Kiraz, then Beydag, Odemis and Tire town borders and finally reaches the Aegean Sea.

Mediterranean climate prevailed in the area. Mediterranean climate is characterized by warm and rainy winters and hot and dry summers and occurs in more than half of Turkey. Yearly rainfall in the area varied between 650-700 mm.

In the study area, maquis was prevalent where *Pinus brutia* Ten. (Turkish red pine) was destroyed. In areas where vegetation cover was destroyed, the prevalent maquis species was *Quercus coccifera* L. (kermes oak). In other areas, *Pistacia terebinthus* L. (terebinth), *Laurus nobilis* L. (bay laurel), *Arbutus andrachne* L. (Grecian strawberry tree), *Arbutus unedo* L. (Strawberry tree), *Myrtus communis* L. (true myrtle) and *Spartium junceum* L. (Spanish broom) were quite common. *Nerium oleander* L. (oleander) and *Vitex agnus-castus* L. (chaste tree) were seen in riverbeds. *P. brutia* could be seen as high as 1000 m on the north slopes of Aydın Mountains. Beyond this altitude, *Pinus nigra* Arnold. subsp. *pallasiana* (Lamb.) Holmboe (Anatolian black pine) dominated. On the north slopes of Aydın Mountain, *Castanea sativa* Mill. (sweet chestnut) and *Juglans regia* L. (walnut) communities were encountered. It was possible to come across to *Quercus ithaburensis* Decne. subsp. *macrolepis* (Kotschy) Hedge and Yalt. (Valonia oak) on some dry slopes. *Olea europaea* L. (olive) was planted in large areas in the region (Akman and Ketenonlu 1986; Baslar et al. 1999; Atalay 2002; Dogan et al. 2004b; Dogan et al. 2007; Baslar et al. 2009; Dogan et al. 2010b; Ugulu et al. 2012b).

**DATA COLLECTION AND METHODOLOGY**

**Ethnobotanical Survey**

The field studies were carried out in collaboration with urban and rural inhabitants of the towns of Beydag, Kiraz, Odemis and Tire, situated in the Western Anatolian part of Turkey (Fig. 1). The study was performed between 2009 and 2011. During this period, contacts were established with women (32 interviews) and men (21 interviews) who are practicing herbal medicine. The information was collected during field trips through semi-structured interviews including various data (local names, ailments and diseases treated, therapeutic effects, part(s) of plants used, methods of administration) obtained from local healers and traditional medicine men, herbalists, shepherds, patients and elderly persons, based on one of the methods for ethnobotanical data collection (Martin 1995). The local people were asked for their consent to share their knowledge only for the purpose of this study. Also, the obtained data were supported by literature concerning the plants used for gastrointestinal disorders.

Throughout interviews and discussions, information about many of the plants used in their medicine was gathered. The data collected were arranged in alphabetical order of the botanical name. The common name for each taxon in local language was given in the table. In addition, the medicinal uses, parts used methods of preparation, and similar use or different uses for the same purpose of the plant were given.

**Identification of Plant Specimens**

The identification of the plant specimens was authentically and basically carried out using “Flora of Turkey and East Aegean Islands” (Davis 1965-1982). The collected information
was cross-checked with the available literature about medicinal plants and ethnobotany in Turkey and other areas of the world. Herbarium specimens are kept in the personal collection of the first author.

Data Analysis and Quantitative Ethnobotany

The level of homogeneity between information provided by different informants was calculated using the Informants’ Consensus Factor, $F_{ic}$ (Trotter and Logan 1986). It is calculated as

$$F_{ic} = \frac{N_u - N_t}{(N_u - 1)}$$

where $N_u$ is the number of use reports from informants for a particular plant-usage category and $N_t$ is the number of taxa or species that are used for a particular plant usage category for all informants. Values range between 0 and 1, where “1” indicates the highest level of informant consent. For instance, if few taxa are used by informants, then a high degree of consensus is reached and medicinal tradition is thus viewed as welldefined (Heinrich 2000).

The Fidelity Level (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was calculated for the most frequently reported diseases or ailments as:

$$FL \% = \left(\frac{N_p}{N}\right) \times 100$$

where $N_p$ is the number of informants that claim a use of a plant species to treat a particular disease, and $N$ is the number of informants that use the plants as a medicine to treat any given disease (Alexiades 1996).

RESULTS AND DISCUSSION

Information about Medicinal Plants

In terms of flora, Turkey’s biodiversity provides a great source for herbal therapies. Hence, an ethnobotanical survey was carried out to determine plants used as folk medicines by rural and urban inhabitants of some cities of the Western Anatolia in Turkey, where Mediterranean climate and landscape dominates. The study was carried out by means of 53 interviews with medicinal plant users, extractors and traditional healers.

A total of 33 plants belonging to 25 families have been documented for their therapeutic use against gastrointestinal disorders and as herbal care, as enlisted in Table 1, arranged in alphabetical order of their family and botanical names, with the relevant information. The majority of medicinal plants determined in this study grow in the wild, while others are cultivated (that is, *Momordica charantia* and *Citrus x limon*).
Table 1: List of medicinal plants used for gastrointestinal disorders in some districts of Izmir province

<table>
<thead>
<tr>
<th>Scientific name</th>
<th>Family</th>
<th>Local name</th>
<th>English name</th>
<th>Plant part(s) used</th>
<th>Medicinal use</th>
<th>Traditional preparation</th>
<th>Recorded literature sources defining similar usages</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Amygdalus communis</em> L.</td>
<td>Rosaceae</td>
<td>Badem</td>
<td>Almond</td>
<td>Seed oil</td>
<td>Laxative</td>
<td>Almond oil is diluted with water and drunk. Seeds are boiled and the stock is drunk.</td>
<td>Baytop 1999</td>
</tr>
<tr>
<td><em>Anethum graveolens</em> L.</td>
<td>Apiaceae</td>
<td>Dereotu</td>
<td>Dill</td>
<td>Seed</td>
<td>Antispasmodic, Carminative</td>
<td>A strong tea made from the leaves is drunk.</td>
<td>Chevallier 1996; Baytop 1999; Maity et al. 1995; Jackson 1996; Baytop 1999; Borrelli and Izzo 2000</td>
</tr>
<tr>
<td><em>Camellia sinensis</em> (L.) Kuntze</td>
<td>Theaceae</td>
<td>Çay</td>
<td>Tea</td>
<td>Leaf</td>
<td>Against indigestion, Laxative</td>
<td>Leaves are boiled and the stock is drunk.</td>
<td>Baytop 1999; Rivera et al. 2005; Baytop 1999; Merzouki et al. 2000 Baytop 1999; Saghiri et al. 2001; Rivera et al. 2005</td>
</tr>
<tr>
<td><em>Cerasus avium</em> (L.) Moench</td>
<td>Rosaceae</td>
<td>Kiraz</td>
<td>Sweet cherry</td>
<td>Fruit peduncle</td>
<td>Stomachic, Laxative</td>
<td>The fruits are eaten.</td>
<td>Baytop 1999; Karaman and Kocabas 2001; Bnouham et al. 2002; Pieroni and Quave 2005; Rivera et al. 2005</td>
</tr>
<tr>
<td><em>Ceretonia silquka</em> L.</td>
<td>Fabaceae</td>
<td>Keçiboynuzu</td>
<td>Carob tree</td>
<td>Fruit</td>
<td>Stomachic, Laxative</td>
<td>Leaves are boiled and the stock is drunk.</td>
<td>Baytop 1999; Karaman and Kocabas 2001; Bnouham et al. 2002; Pieroni and Quave 2005; Rivera et al. 2005</td>
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<tr>
<td><em>Chenopodium album</em> L.</td>
<td>Chenopodiaceae</td>
<td>Sirken</td>
<td>Lambsquarters</td>
<td>Leaf</td>
<td>Boiled and the stock is drunk.</td>
<td></td>
<td>Baytop 1999; Karaman and Kocabas 2001; Bnouham et al. 2002; Pieroni and Quave 2005; Rivera et al. 2005</td>
</tr>
<tr>
<td><em>Cichorium intybus</em> L.</td>
<td>Asteraceae</td>
<td>Yabani hindiba</td>
<td>Chicory</td>
<td>Leaf</td>
<td>Stomachic, laxative</td>
<td></td>
<td>Baytop 1999; Karaman and Kocabas 2001; Bnouham et al. 2002; Pieroni and Quave 2005; Rivera et al. 2005</td>
</tr>
<tr>
<td><em>Citrus x limon</em> (L.) Burm. f</td>
<td>Rutaceae</td>
<td>Limon</td>
<td>Lemon</td>
<td>Fruit</td>
<td>Against indigestion</td>
<td></td>
<td>Baytop 1999; Karaman and Kocabas 2001; Bnouham et al. 2002; Pieroni and Quave 2005; Rivera et al. 2005</td>
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<tr>
<td><em>Coffeea arabica</em> L.</td>
<td>Rubiaceae</td>
<td>Kahve</td>
<td>Coffee</td>
<td>Seed</td>
<td>Against indigestion</td>
<td>Turkish coffee is drunk after the meal. The sap of fresh root is licked.</td>
<td>Guarrera et al. 2005; Pieroni and Quave 2005; Gedif and Hahn 2003; Cavender 2006 Baytop 1999; Karaman and Kocabas 2001</td>
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<tr>
<td><em>Convolvulus arvensis</em> L.</td>
<td>Convolvulaceae</td>
<td>Tarla sarmapçlı,</td>
<td>Field bindweed</td>
<td>Root</td>
<td>Stomachic, laxative</td>
<td></td>
<td>Baytop 1999; Karaman and Kocabas 2001; Sezik et al. 2004; Rivera et al. 2005</td>
</tr>
<tr>
<td><em>Cydonia oblonga</em> Mill.</td>
<td>Rosaceae</td>
<td>Ayva</td>
<td>Quince</td>
<td>Leaf</td>
<td>Against indigestion, Laxative</td>
<td>Leaves are boiled and the stock is drunk. Fruit is directly eaten.</td>
<td>Baytop 1999; Karaman and Kocabas 2001; Sezik et al. 2004; Rivera et al. 2005</td>
</tr>
<tr>
<td><em>Glycyrrhiza glabra</em> L.</td>
<td>Fabaceae</td>
<td>Meyan</td>
<td>Liquorice</td>
<td>Root</td>
<td>Stomachic, Against gastralgia, To treat gastritis and ulcer</td>
<td>Liquorice candy that is produced from the root is dissolved in water and drunk.</td>
<td>Baytop 1999; Krausse et al. 2004</td>
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<tr>
<td>Scientific name</td>
<td>Family</td>
<td>Local name</td>
<td>English name</td>
<td>Plant part(s) used</td>
<td>Medicinal use</td>
<td>Traditional preparation</td>
<td>Recorded literature sources defining similar usages</td>
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<tr>
<td>Hypericum perforatum L.</td>
<td>Clusiaceae</td>
<td>Kantaron, Sury kantaron</td>
<td>St. John’s wort</td>
<td>Aerial part</td>
<td>Stomachic, To treat stomach ulcer</td>
<td>Above ground parts are kept in olive oil for at least 3 months and then consumed on an empty stomach in the mornings. Above ground parts are also boiled and the stock is drunk.</td>
<td>Mert et al. 1993; Tuzlaci and Aymaz 2001; Loi et al. 2004; Guerrera 2005; Pieroni at al. 2013</td>
</tr>
<tr>
<td>Linum usitatissimum L.</td>
<td>Linaceae</td>
<td>Keten</td>
<td>Linum</td>
<td>Seed</td>
<td>Laxative</td>
<td>A couple of spoonfuls of seeds are eaten on an empty stomach.</td>
<td></td>
</tr>
<tr>
<td>Malva sylvestris L.</td>
<td>Malvaceae</td>
<td>Ebegümeci</td>
<td>High mallow</td>
<td>Aerial part</td>
<td>Against gastroalgia, Laxative</td>
<td>Especially leaves are boiled and the stock is drunk.</td>
<td></td>
</tr>
<tr>
<td>Matricaria chamomilla L.</td>
<td>Asteraceae</td>
<td>Papatya</td>
<td>German chamomile</td>
<td>Flower</td>
<td>Treatment of gastrointestinal disorders,</td>
<td>Dried flowers are boiled and the stock is drunk on an empty stomach in the morning.</td>
<td></td>
</tr>
<tr>
<td>Scientific name</td>
<td>Family</td>
<td>Local name</td>
<td>English name</td>
<td>Plant part(s) used</td>
<td>Medicinal use</td>
<td>Traditional preparation</td>
<td>Recorded literature sources defining similar usages</td>
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<tr>
<td>Mentha spicata L.</td>
<td>Lamiaceae</td>
<td>Yarpuz</td>
<td>Spearmint</td>
<td>Leaf</td>
<td>Carminative, Against gastralgia</td>
<td>Fresh leaves are boiled and the stock is drunk.</td>
<td>Tuzlaci and Erol 1999; Pieroni and Quave 2005; Pieroni et al. 2005; Estomba et al. 2006; Pieroni at al. 2013 Mert et al. 1993; Baytop 1999; Natarajan et al. 2000; Di Stasi et al. 2002; Sandhu and Heinrich 2005; Cavender 2006; Estomba et al. 2006</td>
</tr>
<tr>
<td>Mentha x piperita L.</td>
<td>Lamiaceae</td>
<td>Nane</td>
<td>Peppermint</td>
<td>Leaf</td>
<td>Stomachic, Against nausea</td>
<td>Fresh and dried leaves are boiled and the stock is drunk.</td>
<td>Mert et al. 1993; Baytop 1999; Gurbuz et al. 2000; Repetto and Llesuy 2002; Murakami et al. 2002; Grover and Yadav 2004; Uzun et al. 2004; Beloin et al. 2005</td>
</tr>
<tr>
<td>Momordica charantia L.</td>
<td>Cucurbitaceae</td>
<td>Kudret narý</td>
<td>Bitter melon</td>
<td>Fruit</td>
<td>Stomachic, To treat gastritis and ulcer</td>
<td>Thinly sliced fruits are kept in honey or olive oil until completely dissolved and then consumed (1-2 tbsp) on an empty stomach in the mornings.</td>
<td>Mert et al. 1993; Baytop 1999; Gurbuz et al. 2000; Repetto and Llesuy 2002; Murakami et al. 2002; Grover and Yadav 2004; Uzun et al. 2004; Beloin et al. 2005</td>
</tr>
<tr>
<td>Morus nigra L.</td>
<td>Moraceae</td>
<td>Karadut</td>
<td>Black mulberry</td>
<td>Fruit</td>
<td>Against diarrhea</td>
<td>Fruits are boiled and the stock is drunk.</td>
<td>Chopra et al. 1986; Baytop 1999; Tuzlaci and Erol 1999; Merzouki et al. 2000; Bnouham et al. 2002; Said et al. 2002; El-Hilaly et al. 2003; Sandhu and Heinrich 2005</td>
</tr>
<tr>
<td>Myrtus communis L.</td>
<td>Myrtaceae</td>
<td>Mersin</td>
<td>Myrtle</td>
<td>Leaf and fruit</td>
<td>Against diarrhea</td>
<td>Leaves and/or fruits are boiled and the stock is drunk.</td>
<td>Chopra et al. 1986; Baytop 1999; Tuzlaci and Erol 1999; Merzouki et al. 2000; Bnouham et al. 2002; Said et al. 2002; El-Hilaly et al. 2003; Sandhu and Heinrich 2005</td>
</tr>
<tr>
<td>Origanum majorana L.</td>
<td>Lamiaceae</td>
<td>Mercankö’k</td>
<td>Sweet marjoram</td>
<td>Aerial part</td>
<td>Against indigestion and gastralgia</td>
<td>Aerial parts are boiled and the stock is drunk.</td>
<td>Mert et al. 1993; Baytop 1999; Karaman and Kocabas 2001</td>
</tr>
<tr>
<td>Origanum onites L.</td>
<td>Lamiaceae</td>
<td>İzmir kekiö̈</td>
<td>Pot marjoram</td>
<td>Aerial part</td>
<td>Against gastralgia</td>
<td>Aerial parts are boiled and the stock is drunk.</td>
<td>Mert et al. 1993; Baytop 1999; Karaman and Kocabas 2001</td>
</tr>
<tr>
<td>Paliurus spin-a-christi Mill.</td>
<td>Rhamnaceae</td>
<td>Karaçalý</td>
<td>Jerusalem thorn</td>
<td>Fruit</td>
<td>Stomachic, Laxative</td>
<td>Fresh or dried fruits are boiled and the stock is drunk.</td>
<td>Al-Said et al. 1986; El-Hilaly et al. 2003; Loi et al. 2004</td>
</tr>
<tr>
<td>Pistacia lentiscus L.</td>
<td>Anacardiaceae</td>
<td>Sakýz</td>
<td>Mastic tree</td>
<td>Gum mastic</td>
<td>Against gastralgia</td>
<td>Its gum is chewed.</td>
<td>Al-Said et al. 1986; El-Hilaly et al. 2003; Loi et al. 2004</td>
</tr>
<tr>
<td>Scientific name</td>
<td>Family</td>
<td>Local name</td>
<td>English name</td>
<td>Plant part(s) used</td>
<td>Medicinal use</td>
<td>Traditional preparation</td>
<td>Recorded literature sources defining similar usages</td>
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<tr>
<td><em>Pistacia terebinthus</em> L.</td>
<td>Anacardiaceae</td>
<td>Çitlenbik</td>
<td>Terebinth</td>
<td>Leaf</td>
<td>Stomachic, To treat gastritis and ulcer</td>
<td>Leaves are boiled and the stock is drunk.</td>
<td>Nedelcheva 2012; Vidrich et al. 2004; Yesilada et al. 1995; Tuzlaci and Aymaz 2001</td>
</tr>
<tr>
<td><em>Plantago major</em> L.</td>
<td>Plantaginaceae</td>
<td>Sinirotu</td>
<td>Common plantain</td>
<td>Leaf</td>
<td>Against gastralgia</td>
<td>Fresh leaves are boiled and the stock is drunk.</td>
<td>Yesilada et al. 1993; Baytop 1999; Tuzlaci and Tolon 2000; Sezik et al. 2004; Guerrero 2005; Kala 2005</td>
</tr>
<tr>
<td><em>Punica granatum</em> L.</td>
<td>Punicaceae</td>
<td>Nar</td>
<td>Pomegranate</td>
<td>Fruit</td>
<td>Against diarrhea</td>
<td>Fruit is directly eaten or squeezed and juice is drunk.</td>
<td>Baytop 1999; Borrelli and Izzo 2000; Vidal et al. 2003; Palombo 2006; Ricci et al. 2006; Baytop 1999; Said et al. 2002</td>
</tr>
<tr>
<td><em>Quercus ithaburensis</em> Decne. subsp. macrolepis (Kotschy) Hedge. &amp; Yalt.</td>
<td>Fagaceae</td>
<td>Palamut me’esi</td>
<td>Valonia oak</td>
<td>Fruit</td>
<td>Stomachic, Against diarrhea</td>
<td>Dried, broken or ground fruits are boiled; this stock is mixed with water and drunk.</td>
<td>Baytop 1999; Silig et al. 2004; Suleyman et al. 2004; Zeybek 1985; Mert et al. 1993; Baytop 1999; Zafar et al. 2003</td>
</tr>
<tr>
<td><em>Rumex patientia</em> L.</td>
<td>Polygonaceae</td>
<td>Labada</td>
<td>Dock Patience dock</td>
<td>Leaf</td>
<td>Laxative</td>
<td>Fresh leaves are boiled and the stock is drunk.</td>
<td>Baytop 1999; Said et al. 2002</td>
</tr>
<tr>
<td><em>Salvia officinalis</em> L.</td>
<td>Lamiaceae</td>
<td>Adaçayý</td>
<td>Sage</td>
<td>Leaf</td>
<td>Against gastralgia</td>
<td>Fresh leaves are boiled and the stock is drunk.</td>
<td>Baytop 1999; Pieroni et al. 2005</td>
</tr>
<tr>
<td><em>Viscum album</em> L.</td>
<td>Loranthaceae</td>
<td>Ökseotu</td>
<td>Mistletoe</td>
<td>Leaf and fruit</td>
<td>Against diarrhea</td>
<td>Leaves and fruits are boiled and the stock is drunk.</td>
<td>Baytop 1999; Pieroni et al. 2005</td>
</tr>
</tbody>
</table>
Further analysis on the families of medicinal plants that are used against gastrointestinal disorders has shown that family Lamiaceae is represented by the highest number of species (five species). Rosaceae are represented by three species. These are followed by Anacardiaceae, Asteraceae and Fabaceae, each represented by two species. The rest are represented by one species each (19 families). When the studies conducted in areas close to our study area were examined, it was seen that the medicinal plants used in and around Izmir province were mostly from Lamiaceae, Asteraceae and Fabaceae families (Ugulu et al. 2009), while the medicinal plants used in Western Anatolia belonged to Asteraceae, Rosaceae and Lamiaceae families (Kargioglu et al. 2008).

All parts of various plants are used in the traditional medication of different gastrointestinal disorders. However, the most frequently used parts are leaves followed by fruits. These parts are followed by all aboveground parts. Figure 2 displays the result of analysis on medicinal plant parts used to treat gastrointestinal disorders. It was concluded from similar studies on plants used for medicinal purposes that most used parts of the plants are leaves with 54% in China and Thailand (Inta et al. 2008), 44% leaves and 29% root in Ethiopia (Wondimu et al. 2007), 22% leaves in Iran (Ghorbani et al. 2005), 36% leaves in Izmir in Turkey (Ugulu et al. 2009) and 26% leaves in Western Anatolia. These results are in agreement with Giday et al. (2003), where leaves are found to be the most frequently used parts.

Often, different parts of a single plant may be concocted and used for a particular type of ailment. For example the leaves and fruits of *Viscum album*, *Myrtus communis* and *Cydonia oblonga* are concocted to treat diarrhea, while the aerial parts of *Hypericum perforatum* are concocted to treat stomach ulcers.

When other studies concerning nearby areas were evaluated, it was seen that decoction and infusion are the methods mostly used for the preparation of the folk medicine (Tuzlaci and Tolon 2000; Kargioglu et al. 2008; Ugulu et al. 2009). People still continue to follow the traditions of their ancestors. Sometimes, local people also use other ingredients, such as sugar, honey, and oil to prepare the remedies. Some plants are also used as food-vegetable plants (that is, *Malva sylvestris* and *Anethum graveolens*), appetizer (*Amygdalus communis*), fruit (that is, *Cerasus avium* and *Cydonia oblonga*) and beverage (*Coffea arabica*).

It is revealed that some of the plants are collected for commercial purposes by local people: *Amygdalus communis*, *Cerasus avium*, *Citrus x
limon, Cydonia oblonga, Malva sylvestris, Mentha x piperita, Morus nigra, Pistacia lentiscus, Punica grandatum, Salvia officinalis are largely cultivated for harvesting. These plants have great economic importance in Turkey and, Malva sylvestris and Cerasus avium are also exported abroad. Anethum graveolens, Ceratonia siliqua, Hypericum perforatum and Origanum onites are wild harvested and these plants are sold bazaars and markets.

Ugulu et al. (2009) have investigated plants used by the locals for medicinal purposes in 28 districts of Izmir province. They determined that a total of 108 plants are used for the treatment of various ailments. Only 34 of these plants are reported to be used against gastrointestinal disorders. When we compare this figure with 33 plant species we obtained in our study encompassing 4 districts of Izmir province, it is possible to allude that, in general, there is a consistency and homogeneity in the use of plants against gastrointestinal disorders in the area.

Data Analysis

At the end of the study, it was seen that gastrointestinal system ailments, for which the folk medicinal plants are mostly used, are as follows: constipation, diarrhea, gastritis and ulcer, intestinal winds, nausea, gastralgia and indigestion. Informant consensus of medicinal plant usage with Izmir resulted in informant consensus factor ($F_{ic}$) values between 0.56 and 0.84 per gastrointestinal disorders category. The category that had the highest $F_{ic}$ value was gastritidis and ulcer (0.84) followed by intestinal winds (0.80). The lowest is gastralgia (0.56) (Table 2).

<table>
<thead>
<tr>
<th>Category</th>
<th>Number of species of use-spect (%) reports ($N_u$)</th>
<th>Number of use-reports ($N_r$)</th>
<th>$F_{ic}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gastritidis and ulcer</td>
<td>5</td>
<td>27</td>
<td>0.84</td>
</tr>
<tr>
<td>Intestinal winds</td>
<td>2</td>
<td>6</td>
<td>0.80</td>
</tr>
<tr>
<td>Constipation</td>
<td>7</td>
<td>29</td>
<td>0.78</td>
</tr>
<tr>
<td>Diarrhea</td>
<td>9</td>
<td>33</td>
<td>0.75</td>
</tr>
<tr>
<td>Indigestion</td>
<td>13</td>
<td>38</td>
<td>0.67</td>
</tr>
<tr>
<td>Gastralgia</td>
<td>8</td>
<td>17</td>
<td>0.56</td>
</tr>
</tbody>
</table>

$F_{ic}$ = $N_u$/$N_u$-$1$, providing a value between 0 and 1, where '1' indicates the highest rate of informant consensus.

When the articles in which the informant consensus factor is calculated are examined, it is seen that; cold and influenza have the highest $F_{ic}$ value (0.82), followed by cough (0.73) and hemorrhoids, and enteritis have the lowest $F_{ic}$ value (0.30). In the present study, it was found that the average $F_{ic}$ value was 0.58.

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Cakilcioglu and Turkoglu (2010) examined the diseases in 10 categories in a study they conducted in another area of Turkey. In these categories, the highest $F_{ic}$ value was reported to be 0.62 while the lowest $F_{ic}$ value was reported to

Table 3: The most commonly used medicinal plants against gastrointestinal disorders and their major uses with their fidelity level

<table>
<thead>
<tr>
<th>Species</th>
<th>Local name</th>
<th>Uses</th>
<th>Fidelity Level (FL) (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Origanum majorana</td>
<td>mercankök</td>
<td>Against indigestion and gastralgia</td>
<td>100</td>
</tr>
<tr>
<td>Origanum onites</td>
<td>İzmir kekiði</td>
<td>Against gastralgia</td>
<td>96</td>
</tr>
<tr>
<td>Hypericum perforatum</td>
<td>kantaron otu</td>
<td>Stomachic, to treat stomach ulcer</td>
<td>95</td>
</tr>
<tr>
<td>Glycyrrhiza glabra</td>
<td>meyan</td>
<td>Stomachic, against gastralgia to treat gastritidis and ulcer</td>
<td>92</td>
</tr>
<tr>
<td>Mentha x piperita</td>
<td>nane</td>
<td>Stomachic, against nausea</td>
<td>87</td>
</tr>
<tr>
<td>Salvia officinalis</td>
<td>adaçayý</td>
<td>Against gastralgia</td>
<td>85</td>
</tr>
<tr>
<td>Camellia sinensis</td>
<td>çay</td>
<td>Against diarrhea</td>
<td>82</td>
</tr>
<tr>
<td>Laurus nobilis</td>
<td>define</td>
<td>Against indigestion</td>
<td>78</td>
</tr>
<tr>
<td>Morus nigra</td>
<td>karadut</td>
<td>Against diarrhea</td>
<td>74</td>
</tr>
<tr>
<td>Matricaria chamomilla</td>
<td>papatyia</td>
<td>Treatment of gastrointestinal disorders, carminative</td>
<td>74</td>
</tr>
<tr>
<td>Amygdalus communis</td>
<td>badem</td>
<td>Laxative</td>
<td>68</td>
</tr>
<tr>
<td>Coffea arabica</td>
<td>kahve</td>
<td>Against indigestion</td>
<td>62</td>
</tr>
<tr>
<td>Citrus x limon</td>
<td>limon</td>
<td>Against diarrhea</td>
<td>53</td>
</tr>
<tr>
<td>Anethum graveolens</td>
<td>dereotu</td>
<td>Antispasmodic, carminative</td>
<td>48</td>
</tr>
<tr>
<td>Convolvulus arvensis</td>
<td>tarlə sarmalşıyı</td>
<td>Stomachic, laxative</td>
<td>42</td>
</tr>
</tbody>
</table>
be 0.26. In the present study, it was found that the average $F_w$ value was 0.40.

In the studies by Akerreta et al. (2007) and Black et al. (2008), the $F_w$ values were found to be 0.65 and 0.75, respectively. Although the values reached in these studies are reported to be relatively high, they are lower than the values obtained in the studies conducted in various areas of the Iberian Peninsula: 0.85 and 0.91 for a Portuguese and a Catalan region respectively (Bonet et al. 2003; Camejo-Rodrigues et al. 2003). According to the results of these studies, it is seen that $F_w$ values in these areas are high. It could be concluded that the knowledge of plants with high $F_w$ values will be transferred more as a result of satisfactory use and therefore could be utilized more effectively in treatment of certain illnesses (Teklehaymanot and Giday 2007).

The fidelity level calculated for each medicinal plant agrees with $F_w$ value. Obviously, the remedies for frequently reported ailments have the highest FL value and those with low number of reports have the lowest FL values. The remedies, such as *Convolvulus arvensis* (42%), have low FL value because the majority of the informants do not know the dosage and the methods of preparation of the remedies. The average $F_w$ value for all gastrointestinal disorder categories was 0.73, indicating a fairly high level of informant consensus compared with similar studies (Heinrich 2000).

### Review of Local Names of Plants

As a result of the analysis of plant names in the Turkish Language Association (TLA) web page (http://tdkterim.gov.tr/bts/), it was seen that although some plant names were adopted from Arabic (harnup, hindiba, kahve, keten, kudret narý, nar, nane), from Persian (badem, dut, meþe, meyan) and from Greek (defne, kantaron, kiraz, labada, limon, mersin, palamut, papatya), most of the plant names were found to be of Turkish origin.

The plants used in Beydag, Kiraz, Odemis and Tire are known by the same or different local names in various parts of Anatolia. For example, the local names of *Hypericum perforatum*, *Amygdalus communis* in Sivrice, *Matricaria chamomilla*, *Hypericum perforatum*, *Malva sylvestris*, *Morus nigra*, *Cichorium intybus*, *Ceretonia siliqua*, *Amygdalus communis*, *Cerasus avium*, *Cydonia oblonga*, in Kýrklareli, *Chenopodium album*, *Convolvulus arvensis*, *Malva sylvestris* in Ankara, *Amygdalus communis*, *Cerasus avium*, *Hypericum perforatum*, *Laurus nobilis*, *Malva sylvestris*, *Mentha piperita*, *Morus nigra*, *Viscum album*, *Ceretonia siliqua*, *Cypripedium calceolus*, *Laurus nobilis*, *Malva sylvestris*, *Pistacia lentiscus* in Bodrum (Cakilcioglu and Turkoglu 2010; Ertug 2000; Kultur 2007; Simsek et al. 2004; Ugurlu and Secmen 2008) are the same with the local names used in Izmir.


### CONCLUSION

In the scope of the present study, 33 plants belonging to 25 families were detected to be used by the local people for curative purposes. The majority of medicinal plants determined in this study grow in the wild, while others are cultivated (i.e. *Momordica charantia* and *Citrus x limon*). By drying, decoctions or infusions of these plants, local people use them during the whole seasons of the year. Most commonly used plants are *Origanum majorana*, *Origanum onites*, *Hypericum perforatum*, *Glycyrrhiza glabra*, *Mentha x piperita*, *Salvia officinalis*, *Camellia sinensis*, *Laurus nobilis*, *Morus nigra*, *Matricaria chamomilla*. Most commonly used parts of the plants were the leaves and fruits. The fidelity level of plant species and informant consensus factor values for plants were calculated. The $F_w$ values were found to be fairly high level (0.73) in our calculations. Therefore, it can be thought that the data obtained are reliable.

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MEDICINAL PLANTS USED FOR GASTROINTESTINAL DISORDERS


