

# Folk Medicine and the Use of Herbal Plants in the Kingdom of Bahrain

## الطب الشعبي واستخدام النباتات العشبية في مملكة البحرين

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**Abstract:** A semi-structured questionnaire on the use of medicinal plants in the Kingdom of Bahrain was conducted. The objectives were to (1) determine to what extent herbal plants are used in folk medicine in Bahrain, and (2) compare the results of this study with the results of a previously conducted questionnaire from 1992. Results show that 95.3% of the respondents use herbal plants for medication. However, only 9.9% of males and 6.8% of females collect herbal medicinal plants from the local environment. The results show that 70% of the utilized plants are native while the rest are either introduced cultivated plants or imported from other countries. Also, the results show that the highest number of plants (six species) were used to treat wounds (e.g. *Portulaca oleracea* L.), and as diuretics (e.g. *Asphodelus tenuifolius* Cav.). Many diseases were treated by one plant species each, including asthma (*Datura fastusa* L.), and smallpox (*Peganum hrmala* L.). The top ailments are stomach upset, followed by constipation, diarrhea, dyspepsia and cold symptoms like cough.

**Keywords:** Bahrain, folk medicine, herbal plants.

**المستخلص:** تمت أجريت هذه الدراسة باستخدام استبانة شبه منمطة بهدف التعرف على استخدام النباتات الطبية في مملكة البحرين. وقد اشتملت أهداف الدراسة على: (1) تحديد مدى استخدام النباتات العشبية في الطب الشعبي في البحرين، و(2) مقارنة نتائج هذه الدراسة مع نتائج دراسة سابقة أجريت عام 1992. أظهرت النتائج أن 95.3% من المستعملين يستخدمون النباتات العشبية للعلاج. وبالرغم من ذلك، فقط 9.9% من الذكور و 6.8% من الإناث يقومون بجمع الاعشاب والنباتات الطبية من البيئة المحلية. وأظهرت النتائج أن 70% من النباتات المستخدمة محلية، إما الباقي فهي إما لنباتات غير محلية مزروعة محليا أو لأعشاب مستوردة من بلدان أخرى. وقد بينت النتائج أيضا أن أكبر عدد من النباتات (6 أنواع) استخدمت لعلاج الجروح (على سبيل المثال *Portulaca oleracea* L.)، ولإدرار البول (مثل *Asphodelus tenuifolius* Cav.). وتعالج الكثير من الأمراض بنوع واحد فقط من النباتات بما في ذلك الربو (*Datura fastusa* L.)، والجذري (*Peganum hrmala* L.). وتأتي الأمراض التالية على رأس قائمة الأمراض التي يتم علاجها بالنباتات العشبية: اضطرابات المعدة، تليها الإمساك، الإسهال، عسر الهضم، وأعراض البرد كالسعال.

**كلمات مدخلية:** البحرين، الطب الشعبي، النباتات العشبية.

## INTRODUCTION

In a previous study based on a questionnaire and data reported in literature (Abbas, *et al.* 1992), 52 species were found to be of medicinal interest. Of these, 20 species appear to be native and are being used in traditional herbal remedies for numerous afflictions. Another literature search by Abbas and Al-Saleh (2002) reported that 80 species of Bahrain flora are in current medicinal use in neighboring countries and other geographical regions. Examples of plant use as reported by Abbas, *et al.* (1992) include *Leptadenia pyrotechnica* Decne. (Asclepiadaceae; diuretic); *Capparis spinosa* L. (Capparaceae; aperient, tonic, expectorant, gout, anthelmintic); *Suaeda vermiculata* Forssk. (Chenopodiaceae; asthma); *Anastatica hierochuntica* L. (Cruciferae; birth inducer); *Alhagi graecorum* Medik. (Leguminosae; jaundice, opacity of cornea, migraine, expectorant, rheumatism, diaphoretic, aphrodisiac) and *Teucrium polium* L. (Labiatae; hypoglycemic, anti-inflammatory, antipyretic, coolant).

Some of these plants have been investigated by others in detail, for example, *Teucrium polium*, which is highly used in Bahrain and the Middle Eastern region mainly for its antispasmodic and hypoglycemic activities to treat diabetes as well as for its anti-inflammatory, anti-hypertensive, antinociceptive, anti-ulcer and anorexic effects (Dafni, *et al.* 1984; Suleiman, *et al.* 1998; Atta and Abo El-Sooud, 2004; Afifi, *et al.* 2005; Baluchnejadmojarad, *et al.* 2005). Phytochemical analysis of the medicinal plant has revealed the presence of a number of constituents including diterpenoids, iridoids, flavanoids, hederagenin, and volatile oils (Harborne, *et al.* 1986; Rizk and El-Ghazaly, 1995; Proestos, *et al.* 2006; Sharififar, *et al.* 2009). The antidiarrhoeal activity, antinociceptive, antipyretic, and antibacterial activity were investigated *in vitro* and *in vivo* (Autore, *et al.* 1984; Atta and Abo El-Sooud, 2004; Atta and Mounair, 2004; Khader, *et al.* 2007).

Very few studies on folk medicine in Bahrain are reported (Abbas, *et al.* 1992; Abbas and Al-Saleh, 2002; Mandeel and Al-Laith,

2007). The study by Abbas, *et al.* (1992) is the only report on the use of medicinal plants in folk medicine in Bahrain. The report by Abbas and Al-Saleh (2002) is a review of the use of medicinal plants in Bahrain mainly through a literature search. A recent study by Mandeel and Al-Laith (2007) is an ethnomycological work on the use of truffles in Bahrain. The present study is conducted almost two decades after the first work by Abbas, *et al.* (1992). Therefore, the objectives of this study were to (1) determine to what extent herbal plants are used in folk medicine in Bahrain, and (2) compare the results of this study with the results of a previously conducted questionnaire performed in 1992.

## MATERIALS AND METHOD

### Study Area

Bahrain is a group of 33 islands located in the Arabian Gulf off the east coast of Saudi Arabia with a total area of 665 km<sup>2</sup> and a total population of 760 thousand (Bahrain Government, 2008). Bahrain is connected to the eastern coast of Saudi Arabia by a 26 km causeway. The largest island is the island of Bahrain, followed by Muharraq and Sitra. These two islands are connected to the main island of Bahrain by small bridges, the oldest of which dates back to the thirties of the last century. On the other hand, the Hawar Islands are a group of islands to the southeast of Bahrain which are less inhabited in comparison to the main islands of Bahrain, Muharraq, and Sitra. Bahrain falls in a climatologically arid belt extending from Morocco in North Africa to Mid Asia.

During the summer months, from April to October, the average temperature is 40°C with a maximum of 48°C during June and July. Temperatures are moderate in the winter months (November to March) when the range of temperature is between 10<sup>o</sup> and 20°C. Rainfall is low and scattered with an average annual of 74 mm. The flora of Bahrain is comprised of 323 species (El-Oqlah and Abbas, 1994). It belongs to the Saharo-Arabian phytogeographical region (El-Oqlah and Abbas, 1992) and the majority of native plant species are ephemerals (*Aizoon canariense* L., *Erodium glaucophyllum* Ait.,

and *Asphodelus tenuifolius* Cav.) that appear following the rainy season in winter and spring. Dominant perennial species of the flora include *Zygophyllum qatarense* Hadidi, *Suaeda vermiculata* and *Arthrocnemum macrostachyum* Mor. & Delporte.

## Survey

A pre-structured questionnaire consisting of two parts was adequately designed and implemented. The first part of the questionnaire was about demographic data. This part included level of education, age group, monthly income, nationality, gender and residential area. In the second part of the questionnaire, informants were asked to list herbal plants that are collected locally or used to treat illnesses and to indicate parts which were used. Also, the informant was asked to list the top 10 diseases used for herbal plants for or in treatment. Prior to the distribution of the questionnaire, a pilot testing of the questionnaire was conducted with 40 randomly selected individuals. The feedback from the pilot testing was used to re-structure the questionnaire. Collection of information was based on random sampling (Heath, 1995). The questionnaire was not directed at any particular group of people. A total of 312 questionnaire forms were randomly distributed in the three main inhabited islands of the Kingdom of Bahrain. All of the respondents were Arabic speaking Bahrainis, some with the old, traditional lifestyle, while others, usually young, more affected by the modern western lifestyle. The questionnaire was not directed at any particular group of people.

A team of 15 volunteers, including many university students, participated in the distribution of the questionnaire. The volunteers assisted the illiterate respondents in filling out the questionnaire in the form of an interview. Otherwise, respondent filled the questionnaire by themselves. Out of the 312 distributed and received questionnaires, 307 were valid. The five nonvalid responses were mainly from people who either did not fill the questionnaire because of their unawareness of medicinal plants, or those who answered the questions despite their unawareness about medicinal plants. Out of the 307 valid questionnaires, 297 answered the

question on gender, i.e. male or female. Based on those who answered the gender question, males represented 53% (157 responses) and females represented 47% (140 responses) of those surveyed. The study lasted for six months (from September 2006 to February 2007).

## Verification of Plant Names

Each interviewee provided vernacular plant names generally used in folk medicine as individual plants (not prepared, mixed drugs) which are known locally. Vernacular names of local plants were documented at the herbarium of the University of Bahrain from previous works and studies by the first author and others (El-Oqlah and Abbas, 1994). At that time, matching vernacular names and scientific names was achieved through showing local people pictures and specimens of plants. Also, field trips with highly knowledgeable people had provided opportunities for matching vernacular names with scientific names. Plant specimens deposited at the University of Bahrain Herbarium were identified and given voucher numbers after verification carried out by taxonomists at the Kew Gardens, in London, United Kingdom. The official vernacular names from the herbarium were used for cross-referencing names provided by the interviewees involved in this study.

## Data Analysis

Demographical data was analyzed using SPSS statistical software (Version 14). Chi-square test was used to compare male and female data responses.

## RESULTS AND DISCUSSION

### Demographical Data

Comparison between male and female monthly income showed a significant difference (Table 1). However, there was no significant difference between the two genders when the level of education was considered. It should be noted that 58.9% of the sample had a university or postgraduate degree. The overlap between males and females in education is most likely the result of the beginning relatively early start of education in Bahrain for both genders. Official

school education started with the first male school in 1919, compared to the first female starting school in 1929 (Almahadeen, 2003).

Also, data reflects Bahraini society having no clear distinction between the distribution of males and females in relation to the residential areas, i.e. village or urban residence. The results show that 42.2 % of informants were more than

40 years old. Informants less than 40 years of age were 46.6% males and 70.2% females (Table 1).

This relatively high percentage of young people did not appear to minimize their use of herbal medicine. The effect of the older generation on an Eastern society with close bonds among family members could explain the common use of herbal medicine by the majority of people.

**Table 1.** Demographical data among genders of people of Bahrain.

Demography	Category	Male N (%)	Female N (%)	Both Genders N (%)	P-Value
Age Group N = 277	Below 40 years	68 (46.6)	92 (70.2)	160 (57.8)	0.000*
	41-60 years	68 (46.6)	31 (23.7)	99 (35.7)	
	61 and above	10 (6.8)	8 (6.1)	18 (6.5)	
Level of Education N = 297	Postgraduate	9 (5.7)	6 (4.3)	15 (5)	0.341
	University	78 (49.7)	82 (58.6)	160 (53.9)	
	High School	52 (33.1)	34 (24.3)	86 (28.9)	
	Middle School	10 (6.4)	7 (5)	17 (5.8)	
	Illiterate	8 (5.1)	11 (7.8)	19 (6.4)	
Monthly Income (BD) N = 239	Below 200	18 (13)	32 (31.7)	50 (20.9)	0.000*
	200-500	48 (34.8)	41 (40.6)	89 (37.3)	
	500-1000	62 (44.9)	25 (24.7)	87 (36.3)	
	Above 1000	10 (7.3)	3 (3)	13 (5.5)	
Residential Area N = 301	Village	69 (43.4)	61 (43.)	130 (43.2)	0.892
	Urban	49 (30.8)	47 (33.1)	96 (31.9)	
	Unknown	41 (25.8)	34 (23.9)	75 (24.9)	

\* Significant difference at  $p = 0.05$  level.

## Use of Medicinal Plants

Table (2) lists the scientific names of medicinal plants frequently used by the informants, vernacular plant names, voucher number, parts used and referent usage in neighboring Arab Gulf countries. This list includes, in addition to the native desert plants, many introduced, cultivated plants as well as plants of agricultural habitats or wastelands. Similar uses were found when comparison was made to neighboring Arab Gulf countries, especially Qatar (Rizk and El-Ghazaly, 1995). Results show that 95.3% of the respondents use herbal plants for medication. However, only 9.9% of males and 6.8% of females collect herbal medicinal plants from the local environment. The large gap between percentage of usage and collection reflects a source of plants other than the local environment.

The present study gives a more detailed and comprehensive picture compared to the previous study of 1992 (Abbas, *et al.* 1992). A total of 49 species used by Bahraini people are reported in this study compared to 38 species reported in this study. Only 17 species from the present study correspond to those in the previous study. The remaining 32 species are newly reported medicinal plants used in Bahrain. The previous study list only native plants, while this study includes all plants used in herbal medicine. Table 2 also shows that 70% of the used plants are included in the local flora (El-Oqlah and Abbas, 1994), while the rest are either introduced cultivated plants or imported from other countries. Unpublished data by the authors indicates that most people in Bahrain obtain their herbal medicine from herbalists.

**Table 2.** List of medicinal plants used by informants in Bahrain, medicinal plants uses, plant parts used and plant use reported in other studies. The (+) symbol indicates cultivated or introduced plants.

Scientific Name	Vernacular Name	Accession No.	Medicinal Uses	Preparation	Part Used	References*			
						Bahrain	Qatar	Kuwait	S. Arabia
<i>Aizoon</i>									
<i>Aizoon canariense L.</i>	Di'daa	HB 1140	Carminative	Infusion	Leaves	√	—	—	—
<i>Amaranthaceae</i>									
<i>Amaranthus viridis L.</i>	Sendar	HB 522	Diuretic, Coolant, Anti-Inflammatory	Decoction	Leaves	—	√	—	—
<i>Arecaceae</i>									
<i>Phoenix dactylifera L.</i>	Nakhla	HB 1005	Aphrodisiac, Laxative, Oxytocic, Expectorant	Infusion, eaten	Seeds, spathe, spadix	√	√	—	—
<i>Asclepiadaceae</i>									
<i>Calotropis procera (Ait.) Ait.f.</i>	Osher	HB 1012	Aperient, Bronchitis, Anthelmintic	Infusion	Flowers, leaves	√	—	—	√
<i>Glossonema varians Stocks Benth.</i>	Itter	HB 397	Tonic, Dyspepsia	Boiling	Fruits, seeds	√	—	—	—
<i>Avicenniaceae</i>									
<i>Avicennia marina (Forssk.) Vierh.</i>	Gurm	HB 16	Pimples, Ulcers, Aphrodisiac	Decoction	Bark, leaves	√	√	—	—
<i>Boraginaceae</i>									
<i>Cordia myxa L.+</i>	Bambar	HBN 1	Bechic, Wounds, Anthelmintic	Eaten, topical	Fruits	—	—	√	—
<i>Heliotropium crispum Desf.</i>	Ramram	HB 1011	Pimples, Bruises	Poultice, tea	Leaves	√	—	—	—
<i>Symphytum officinale L.+</i>	Fotan		Gastralgia	Decoction	Leaves	—	—	—	—
<i>Caryophyllaceae</i>									
<i>Herniaria hemistemon J. Gay</i>	Halleeb	HB 724	Astringent, Diuretic	Decoction	Leaves	√	√	—	—
<i>Chenopdiaceae</i>									
<i>Chenopdiaceae</i>									
<i>Beta vulgaris L. var. cicla +</i>	Salag	HB 31	Aperient	Decoction	Leaves	—	√	—	—
<i>Suaeda aegyptiaca (Hasselq.) Zohary</i>	Golluman	HB 36	Diuretic, Galactogenic, Ulcers	Salad	Leaves	√	—	√	—

**Table 2.** (Continued) List of medicinal plants used by informants in Bahrain, medicinal plants uses, plant parts used and plant userreported in other studies. The (+) symbol indicates cultivated or introduced plants.

Scientific Name	Vernacular Name	Accession No.	Medicinal Uses	Preparation	Part Used	References*			
						Bahrain	Qatar	Kuwait	S. Arabia
<i>Seidlitzia rosmarinus (Ehrenb) Solms-Laub</i>	Ashnan	HBN 2	Antiseptic	Topical	Leaves	—	—	—	√
<i>Compositae</i>									
<i>Artemisia inculata Del.</i>	Sheeh	HBN 3	Antipyretic, Headache, Diaphoretic	Decoction	Stems	—	√	√	—
<i>Calendula officinalis L.+</i>	Aqhawan	HB 1096	Carminative, Appetizer	Decoction	Flowers	—	—	√	—
<i>Carthamus tinctorius L.+</i>	Asfar	HBN 4	Colic, Antipyretic, Bechic	Boiling	Flowers	—	—	√	—
<i>Cichorium endivia L.+</i>	Hendban	HBN 5	Diabetes	Decoction	Leaves	—	—	—	—
<i>Launaea nudicaulis (L.) Hook f.</i>	Huwa	HB 485	Antipyretic	Infusion, tea	Leaves	√	—	—	—
<i>Convolvulaceae</i>									
<i>Cressa cretica L.</i>	Shuwail	HB 581	Gastralgia, Hepatitis	Decoction	Leaves	√	√	√	√
<i>Cruciferae</i>									
<i>Anastatica heirochuntica L.</i>	Chaf Maryam	HB 621	Oxytotic, Emmenagogue	Infusion	Stems	√	√	√	√
<i>Cucurbitaceae</i>									
<i>Citrullus colocynthis (L.) Schard.</i>	Handhal	HB 888	Laxative, Hemorrhoids, Anthelmintic,	Boiling	Fruits, seeds	√	√	√	—
<i>Cucurbita pepo L.+</i>	Pumpkin	HBN 6	Litholitic, Anthelmintic, Urinary Inflammation	Eaten	Fruits	—	√	—	—
<i>Labiatae</i>									
<i>Mentha piperita L.+</i>	Ne'naa	HBN 7	Carminative, Astringent	Paste, infusion	Leaves	—	—	√	—
<i>Tecrium polium L.</i>	Negdha, Jaad	HB 446	Diabetes, Anthelmintic, Enteritis, Emmenagogue	Boiling	Flowers	√	√	√	√
<i>Lamiaceae</i>									
<i>Ocimum basilicum L. +</i>	Mashmoom	HBN 8	Bleeding Of Wounds, Aperient, Ejection of Placenta	Paste, eaten	Leaves	—	√	—	—

**Table 2.** (Continued) List of medicinal plants used by informants in Bahrain, medicinal plants uses, plant parts used and plant use reported in other studies. The (+) symbol indicates cultivated or introduced plants.

Scientific Name	Vernacular Name	Accession No.	Medicinal Uses	Preparation	Part Used	References*			
						Bahrain	Qatar	Kuwait	S. Arabia
<i>Leguminosae</i>									
<i>Alhagi maurorum</i> Medik.	Agool, Heej	HB 447	Diabetes, Litholitic, Diuretic, Jaundice	Infusion, juice	Stems	√	√	√	√
<i>Cassia italica</i> (Mill.) F.W. Andr.	Ishrig	HB 939	Laxative	Boiled	Leaves	√	√	√	√
<i>Medicago sativa</i> L. +	Gat	HB 693	Tonic, Jaundice	Juice	Leaves	—	√	—	—
<i>Melilotus alba</i> Medic.	Handagoog	HB 466	Diuretic, Aperient	Boiling	Seeds, leaves	√	√	—	—
<i>Prosopis farcta</i> (Banks et. Sol.) Mach.	Yanboot	HB 1006	Colic, Dysentery	Eaten	Leaves	√	√	—	—
<i>Tamarindus indica</i> L.+	Isbar	HBN 9	Laxative, Coolant	Decoction	Fruits	—	—	√	—
<i>Trigonella foenum-graecum</i> L. +	Helba	HBN 10	Litholitic, Oxytocic, Emmenagogue, Expectorant	Salad, boiling	Seeds, leaves	—	—	√	—
<i>Trigonella stellata</i> Forssk.	Nafil	HB 63	Aperient	Infusion	Leaves	—	—	—	—
<i>Liliaceae</i>									
<i>Allium porrum</i> L. +	Bagil	HBN 11	Galactogenic	Eaten	Leaves	—	—	—	—
<i>Asphodelus tenuifolius</i> Cav.	Ansel Bensel	HB 454	Aperient, Wounds, Diuretic	Topical, boiling	Leaves, stem	√	√	—	—
<i>Lythraceae</i>									
<i>Lawsonia inermis</i> L.+	Henna	HBN 12	Coolant, Scalp, Headache, Foot Emollient	Topical	Leaves	—	√	√	—
<i>Malvaceae</i>									
<i>Malva parviflora</i> L.	Khubaiza	HB 459	Ulcers, Galactogenic, Bechic	Infusion, eaten	Leaves	√	√	—	—
<i>Meliaceae</i>									
<i>Azadirachta indica</i> A. Juss.+	Neem	HBN 13	Acne, Pimples, Eczema	Paste	Leaves, bark	—	—	—	—
<i>Moraceae</i>									
<i>Ficus carica</i> L.+	Teen	HBN 14	Aperient, Laryngitis	Eaten	Fruits	—	√	—	—

**Table 2.** (Continued) List of medicinal plants used by informants in Bahrain, medicinal plants uses, plant parts used and plant use reported in other studies. The (+) symbol indicates cultivated or introduced plants.

Scientific Name	Vernacular Name	Accession No.	Medicinal Uses	Preparation	Part Used	References			
						Bahrain	Qatar	Kuwait	S. Arabia
<i>Myrtaceae</i>									
<i>Eucalyptus camaldulensis</i> Dehn. +	Kafoor	HBN 15	Poor Vision	Paste	Leaves	<input type="checkbox"/>	✓	<input type="checkbox"/>	<input type="checkbox"/>
<i>Polygonaceae</i>									
<i>Rumex vesicarius</i> L.	Humaidh	HB 1004	Jaundice, Hepatitis, Aperient, Wounds	Eaten	Leaves	<input type="checkbox"/>	✓	<input type="checkbox"/>	<input type="checkbox"/>
<i>Portulacaceae</i>									
<i>Portulaca oleracea</i> L.	Barbeer	HB 702	Wounds, Ulcers, Acidity, Diuretic	Paste, eaten	Leaves	✓	✓	<input type="checkbox"/>	<input type="checkbox"/>
<i>Primulaceae</i>									
<i>Anagallis arvensis</i> L.	Ain Sannora	HB 147	Ulcers, Wounds, Arthritis	Topical	Leaves	✓	✓	✓	<input type="checkbox"/>
<i>Rhamnaceae</i>									
<i>Ziziphus spina-christi</i> (L.) Willd.	Seder	HB 1938	Dandruff, Wounds, Hair Loss	Topical	Leaves, bark	✓	✓	✓	<input type="checkbox"/>
<i>Salvadoraceae</i>									
<i>Salvadora persica</i> L.	Arak	HBN 16	Tooth Antiseptic	Brushing	Stems	<input type="checkbox"/>	<input type="checkbox"/>	✓	✓
<i>Solanaceae</i>									
<i>Datura fastusa</i> L.	Benj	HB 359	Arthritis, Asthma	Boiling	Fruits	✓	✓	✓	<input type="checkbox"/>
<i>Lycium shawii</i> Roem. Et Schult.	Awsaj	HB 377	Toothache, Carminative	Brushing, boiling	Leaves	✓	<input type="checkbox"/>	<input type="checkbox"/>	✓
<i>Trifeziaceae</i>									
<i>Tirmania nivea</i> (Desf.) Trappe	Fagaa	HBN 100	Tonic, Poor Vision	Eaten	Fruits	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<i>Zygophyllaceae</i>									
<i>Peganum harmala</i> L.	Harmal	HB 996	Aphrodisiac, Anthelmintic, Galactogenic, Smallpox	Powder, decoction	Seeds, leaves	✓	<input type="checkbox"/>	✓	<input type="checkbox"/>

\* References: Alkhalifa and Sharkas (1984); Batanouny (1994); Rizk and El-Ghazaly (1995); Abbas and Al-Saleh (2002)



Table (3) shows a list of diseases mentioned by the informants and plants used to treat each disease. Also, it shows that the greatest highest number of plants (six species) was used in wounds treatment (e.g. *Portulaca oleracea*), and diuretics (e.g. *Asphodelus tenuifolius*). Many diseases were treated by one plant species each, including asthma (*Datura fastusa*), and smallpox (*Peganum harmala*). Similar findings are noted in reports from neighboring Arab Gulf countries for *Datura metel* L. and *Asphodelus tenuifolius* in Qatar (Rizk and El-Ghazaly, 1995), *Asphodelus tenuifolius* in Saudi Arabia (Alyahya, et al. 1990), and *Asphodelus tenuifolius*, *Portulaca oleracea*, and *Datura fastusa* in Kuwait (Alkahlifa and Sharkas, 1984). In contrast, a plant such as *Peganum harmala* has more uses than those reported in Bahrain (Alyahya, et al. 1990). Table (4) illustrates the result of an inquiry in which the respondents were asked to pick the top 10 ailments for which herbal plants are used.

The accumulated average result shows the top ailment is stomach upset (9.7%), followed by constipation, diarrhea (7%), dyspepsia (7%) and cold symptoms like cough (6.1%). This indicates that ailments for which herbal plants are used are mainly in treatment related to non-sensitive organs. Similar results from different parts of the entire world and the Arab region in particular reveal that herbal plants are mainly used to treat common and mild ailments (Merzouki, et al. 2000; Said, et al. 2002; Atiqur Rahman, et al. 2004; Wilson, et al. 2006; Aburjai, et al. 2007). Merzouki, et al. (2000) used medicinal plant use index (MPUI) as an indicator of herbal plant use in disease treatment. Some of the plants highest on MPUI were used for labor pain, dyspepsia, and gastric pain (100% MPUI). The study by Atiqur Rahman, et al. (2004) shows that many of the plants listed were used for constipation, gastro-intestinal disorders, febrifuge, and as anthelmintics.

**Table 3.** Medicinal plants used to treat specific diseases as reported by informants in Bahrain.

Disease	Plant Species					
Arthritis	<i>Anagalis arvensis</i>	<i>Datura fastusa</i>				
Asthma	<i>Datura fastusa</i>					
Antiseptic	<i>Seidlitzia rosmarinus</i>	<i>Salvadora persica</i>				
Anti-inflammatory	<i>Amaranthus viridis</i>					
Anthelminitic	<i>Citrullus colocynthis</i>	<i>Cordia myxa</i>	<i>Calotropis procera</i>	<i>Cucurbita pepo</i>	<i>Peganum harmala</i>	<i>Teucrium polium</i>
Aperient	<i>Beta vulgaris</i>	<i>Ocimum basilicum</i>	<i>Asphodelus tenuifolius</i>	<i>Ficus carica</i>	<i>Trigonella stellata</i>	<i>Rumex vesicarius</i>
Astringent	<i>Hernaria hemistemon</i>	<i>Mentha piperita</i>				
Aphrodisiac	<i>Avicennia marina</i>	<i>Peganum harmala</i>	<i>Phoenix dactylifera</i>			
Antipyretic	<i>Artemisia inculata</i>	<i>Launaea nudicaulis</i>	<i>Carthamus tinctorius</i>			
Appetizer	<i>Calendula officinalis</i>					
Acidity	<i>Portulaca oleracea</i>					
Acne	<i>Azadirachta indica</i>					
Bronchitis	<i>Calotropis procera</i>					
Bechic	<i>Cordia myxa</i>	<i>Malva parviflora</i>	<i>Carthamus tinctorius</i>			
Bruises	<i>Heliotropium crispum</i>					
Coolant	<i>Tamarindus indica</i>	<i>Lawsonia alba</i>	<i>Amaranthus viridis</i>			

<b>Colic</b>	<i>Carthamus tinctorius</i>	<i>Prosopis farcta</i>				
<b>Carminative</b>	<i>Mentha piperita</i>	<i>Calendula officinalis</i>	<i>Aizoon canariense</i>	<i>Lycium shawii</i>		
<b>Diabetes</b>	<i>Alhagi maurorum</i>	<i>Teucrium polium</i>	<i>Cichorium endivia</i>			
<b>Diuretic</b>	<i>Alhagi maurorum</i>	<i>Melilotus alba</i>	<i>Portulaca oleracea</i>	<i>Amaranthus viridis</i>	<i>Asphodelus tenuifolius</i>	<i>Hernaria hemistemon</i>
<b>Dyspepsia</b>	<i>Glossonema varians</i>					
<b>Dandruff</b>	<i>Ziziphus spina-christi</i>	<i>Lawsonia alba</i>				
<b>Diaphoretic</b>	<i>Artemisia inculata</i>					
<b>Dysentery</b>	<i>Prosopis farcta</i>					
<b>Expectorant</b>	<i>Trigonella foenum-graecum</i>	<i>Phoenix dactylifera</i>				
<b>Emmenagogue</b>	<i>Trigonella foenum-graecum</i>	<i>Teucrium polium</i>	<i>Anastatica heirochuntica</i>			
<b>Enteritis</b>	<i>Teucrium polium</i>					
<b>Ejection of placenta</b>	<i>Ocimum basilicum</i>					
<b>Emollient (foot)</b>	<i>Lawsonia alba</i>					
<b>Galactogenic</b>	<i>Malva parviflora</i>	<i>Suaeda aegyptiaca</i>	<i>Peganum harmala</i>	<i>Allium porum</i>		
<b>Gastralgia</b>	<i>Symphytum officinale</i>	<i>Cressa cretica</i>				
<b>Hepatitis</b>	<i>Rumex vesicarius</i>	<i>Cressa cretica</i>				
<b>Headache</b>	<i>Artemisia inculata</i>	<i>Lawsonia alba</i>				
<b>Hemorrhoids</b>	<i>Citrullus colocynthis</i>					
<b>Hair loss</b>	<i>Ziziphus spina-christi</i>	<i>Lawsonia alba</i>				
<b>Jaundice</b>	<i>Medicago sativa</i>	<i>Rumex vesicarius</i>	<i>Alhagi maurorum</i>			
<b>Laxative</b>	<i>Tamarindus indica</i>	<i>Citrullus colocynthis</i>	<i>Cassia italica</i>	<i>Phoenix dactylifera</i>		
<b>Litholitic</b>	<i>Alhagi maurorum</i>	<i>Cucurbita pepo</i>	<i>Trigonella foenum-graecum</i>			
<b>Laryngitis</b>	<i>Ficus carica</i>					
<b>Oxytotic</b>	<i>Anastatica heirochuntica</i>	<i>Phoenix dactylifera</i>	<i>Trigonella foenum-graecum</i>			
<b>Poor vision</b>	<i>Eucalyptus camaldulensis</i>	<i>Tirmania nivea</i>				
<b>Pimples</b>	<i>Avicennia marina</i>	<i>Heliotropium crispum</i>	<i>Azadirachia indica</i>			
<b>Smalpox</b>	<i>Peganum harmala</i>					
<b>Tonic</b>	<i>Glossonema varians</i>	<i>Medicago sativa</i>				
<b>Toothache</b>	<i>Salvadora persica</i>	<i>Lycium shawii</i>				
<b>Ulcers</b>	<i>Portulaca oleracea</i>	<i>Malva parviflora</i>	<i>Avicennia marina</i>	<i>Anagalis arvensis</i>	<i>Suaeda aegyptiaca</i>	

Urinary inflammation	<i>Cucurpita pepo</i>					
Wounds	<i>Ocimum basilicum</i>	<i>Ziziphus spina-christi</i>	<i>Portulaca oleracea</i>	<i>Rumex vesicarius</i>	<i>Cordia myxa</i>	<i>Asphodelus tenuifolius</i>

**Table 4.** Priority-based list of diseases, conditions, or symptoms treated by herbal plants in Bahrain as reported by informants. Total responses for all listed diseases by males is 1351 and by females 1272.

Disease/ Condition/ Symptom	Male (%)	Female (%)	Average
Stomach upset	9.3	10.1	9.7
Constipation	7.3	7.6	7.5
Dyspepsia	7.1	7.0	7.0
Diarrhea	7.6	6.4	7.0
Cough	5.6	6.7	6.1
Difficult labor	3.9	6.2	5.0
Blood pressure	5.0	5.1	5.0
Intestinal worms	5.6	4.1	4.8
Diabetes	4.3	5.0	4.6
Jaundice	4.1	4.9	4.5
Overweight	3.9	4.6	4.2
Flu and cold	3.7	4.1	3.9
Headache	3.5	4.1	3.8
Sexual impotency	4.9	2.2	3.6
Arthritis	3.5	3.2	3.3
Teeth pain	3.1	2.7	2.9
Renal stones	3.0	2.4	2.7
Bladder diseases	3.5	1.7	2.7
Fatigue	2.6	2.7	2.7
Skin diseases	2.4	2.0	2.2
Hemorrhoids	2.4	1.9	2.1
Anemia	1.5	2.3	1.9
Vaginal inflammation	1.3	1.9	1.6
Eye diseases	0.8	1.0	0.9

Phytochemical studies in Bahrain and other countries indicate that many of the plants listed by informants contain active ingredients. Table (5) lists medicinal plants frequently used by informants as indicated by the frequency with which plants were reported. Also, Table (5) lists the major active compounds for each plant. Many of these compounds were reported to have medicinal effects. For example, apeginin has

anti-proliferative and causes apoptotic induction in human cancer cells (Chiang, *et al.* 2006; Park, *et al.* 2006), cucurbitans have anticancer and anti-inflammatory properties (Jayaprakasam, *et al.* 2003; Molavi, *et al.* 2008), anastatins have hepatoprotective qualities (Yoshikawa, *et al.* 2003) and carvacrol and caryophyllene have anti-inflammatory and anti-tumor properties (Menchini, *et al.* 2009).

**Table 5.** Active chemical compounds of the most frequently used medicinal plants in Bahrain as indicated by number of times the plant was reported by informants (frequency). References: Burbott, *et al.* (1983); Garg and Bhakuni (1984); Nawwar, *et al.* (1984); Voirin & Bayet (1992); Rizk & El-Ghazaly (1995); Weinges & Schick (1995); Ramji, *et al.* (1996); Ragasa, *et al.* (1997); Maffel, *et al.* (2001); Siddiqui, *et al.* (2004); Menichini, *et al.* (2009).

Scientific Name	Frequency	Chemical Compounds*
<i>Ocimum basilicum</i>	11	camphor, linalool, methylchavicol, cineol, eugenol, estragole, thymol, quercetin, isoquercitrin, rutin, quercetin 3-o-diglucoside, esculein, caffeic acid, xanthomicrol
<i>Alhagi maurorum</i>	9	phenylamine alkaloids, tetraisoquinoline, 24-alkylsterols
<i>Suaeda aegyptiaca</i>	7	palmitic, oleic, linoleic acids, stigmasterol, $\beta$ -sitosterol, campesterol
<i>Ziziphus spina-christi</i>	5	cyclopeptide alkaloids, betulic acid, ceanothic acid, $\beta$ -sitosterol, octacosanol, ziziphine-f, tannins, rutin, hyperin, quercitrin
<i>Trigonella foenum-graecum</i>	4	diosgenin, yamogenin, vitexin, isovitexin, trigoforin
<i>Malva parviflora</i>	4	sterols, terpenes
<i>Azadirachta indica</i>	3	11-epi-azadirachtin, isoprenylated flavanone, tetracyclic triterpenoidas
<i>Anastatica heirochuntica</i>	3	luteolin 7-glucoside isovitexin, kaempferol 3-rhamnoglucoside, quercetin, rutin, glucoiberin, sterols
<i>Teucrium polium</i>	3	carvacrol, caryophyllene, icropolin, 6-acetylpicropolin, 19-acetgnaphalin, montanin, 7-deacetylcapitatin, picropolinol, montanin c, teulamifin
<i>Lawsonia alba</i>	3	isoplumbagin, lawsone, xanthones, apigenin, luteolin glycosides, lacoumarin, fraxetin, scopoletin, gallic acid, stigmasterol, lawsoniaside, lalioside, lupeol, hennadiol
<i>Mentha piperita</i>	3	limonene, cineole, menthufuran, neomenthol, monoterpenes, pipertones, flavanoid aglycones
<i>Launaea nudicaulis</i>	3	apigenin, luteolin glycosides, aesculetin, cichoriin, taraxasterol, triterpene acetates, campesterol, cholesterol
<i>Citrullus colocynthis</i>	3	cucurbitacins, colocynthin, sterols, aliphatic alcohols, alkaloids
<i>Cassia italica</i>	3	anthrone glycosides, sennoside, 6-hydroxymusizin glucoside, pipecolic acid, rhein, aloe-emodin, sennidins

## CONCLUSION

The study shows that a very high percentage of people in Bahrain use herbal plants for medication. However, very few collect these plants from the wild. Also, the study shows that 70% of the plants used are from Bahrain. In addition, many of the plants used contain compounds with properties reported to be linked to a number of health problems.

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## REFERENCES

- Abbas, JA, El-Oqlah, AA and Mahasneh, A (1992) Herbal plants in the traditional medicine of Bahrain. *Economic Botany* **46**:158-163.
- Abbas, J, and Al-Saleh, F (2002) *Medicinal Plants of Bahrain* (In Arabic). University of Bahrain Publications, Kingdom of Bahrain.
- Aburj ai, T, Hudaib, M, Ttayem, R, Yousef, M, and Qishawi, M (2007) Ethnopharmacological survey of medicinal herbs in Jordan, the Ajloun Heights region. *J. Ethnopharmacology* **110**: 294-304.
- Affi, FU, Al-Khalidi, B, and Khalil, E (2005) Studies on the *in vivo* hypoglycemic activities of two medicinal plants used in the treatment of diabetes in Jordanian traditional medicine

- following intranasal administration. *J. of Ethnopharmacology* **100**: 314-318.
- Alkahlifa, E, and Sharkas, M** (1984) *Medicinal Plants of Kuwait*. Kuwait Establishment for the Advancement of Science, Kuwait.
- Almahadeen, AS** (2003) *Exiting the Twilight* (In Arabic). Arab Establishment for Studies and Publishing, Bahrain.
- Al-Yahya, MA, Al-Meshal, IA, Mossa, JS, Al-Bader, AA, and Tariq, M** (1990) *Saudi Plants: a Phytochemical and Biological Approach*. Published by General Directorate of Research Grants Program, King Abdulaziz City for Science and Technology, Kingdom of Saudi Arabia.
- Atiqur Rahman, M, Mossa, JS, Al-Said, MS, and Al-Yahya, MA** (2004) Medicinal plant diversity in the flora of Saudi Arabia 1: a report on seven plant families. *Fitoterapia* **75**:149-161.
- Atta, AH, and Abo El-Sooud, K** (2004) The antinociceptive effect of some Egyptian medicinal extracts. *J. Ethnopharmacology* **95**: 235-238.
- Atta, AH and Mouneir, SM** (2004) Antidiarrhoeal activity of some Egyptian medicinal plant extracts. *J. Ethnopharmacology* **92**:303-309.
- Autore, G, Capasso, F, De Fusco, R, Fasulo, MP, Lembo, M, Mascolo, N, and Menghini, A** (1984) Antipyretic and antibacterial actions of *Teucrium polium* (L.). *Pharm. Res. Communications* **16**:21-29.
- Bahrain Government** (2008) <http://www.e.gov.bh/>
- Baluchnejadmojarad, T, Roghani, M, and Roghani-Dehkordi, F** (2005) Antinociceptive effect of *Teucrium polium* leaf extract in the diabetic rat formalin test. *J. Ethnopharmacology* **97**:207-210.
- Batanouny, K** (1994) *Secrets of Drugs Remedies* (Arabic). Kuwait Establishment for the Advancement of Science, Kuwait.
- Burbott, AJ, Hennessey Jr, JP, Johnson Jr., WC, and Loomis, WD** (1983) Configuration of piperitone from oil of *Mentha piperita*. *Phytochemistry* **22**:2227-2230.
- Chiang, L, Teik Ng, L, Lin, I, Kuo, P, and Lin, C** (2006) Anti-proliferative effect of apigenin and its apoptotic induction in human Hep G2 cells. *Cancer Letters* **237**: 207-214.
- Dafni, A, Yanif, Z, and Palevitch, D** (1984) Ethnobotanical survey of medicinal plants in northern Israel. *J. Ethnopharmacology* **10**:295-310.
- El-Oqlah, AA, and Abbas, JA** (1994) A checklist of vascular plants of Bahrain. *Dirasat* **21**:95-118.
- El-Oqlah, AA, and Abbas, JA** (1992) Preliminary studies on the natural flora and vegetation of Bahrain. *Dirasat* **19**:123-137.
- Garg, H, and Bhakuni, D** (1984) An isoprenylated flavanone from leaves of *Azadirachta indica*. *Phytochemistry* **23**:2115-2118.
- Harborne, JB, Tomás-Barberán, FA, Williams, CA, and Gil, MI** (1986) A chemotaxonomic study of flavonoids from European *teucrium* species. *Phytochemistry* **25**:2811-2816.
- Heath, D** (1995) *An Introduction to Experimental Design and Statistics for Biology*. UCL Press, UK.
- Jayaprakasam, B, Seeram, N, and Nair, M** (2003) Anti-cancer and anti-inflammatory activities of cucurbitacins from *Cucurbita andreana*. *Cancer Letters* **189**:11-16.
- Khader, M, Eckl, PM, and Bresgen, N** (2007) Effects of aqueous extracts of medicinal plants on MNNG-treated rat hepatocytes in primary cultures. *J. Ethnopharmacology* **112**:199-202.
- Mandeel, QA, and Al-Laith, AA** (2007) Ethnomycological aspects of the desert truffle among native Bahraini and non-Bahraini peoples of the Kingdom of Bahrain. *J. Ethnopharmacology* **110**:118-129.
- Maffei, M, Camusso, W, and Sacco, S** (2001) Effect of *Mentha piperita* essential oil and monoterpenes on cucumber root membrane potential. *Phytochemistry* **58**:703-707.
- Menichini, F, Conforti, F, Rigano, D, Formisano, C, Piozzi, F, and Senatore, F** (2009) Phytochemical composition, anti-inflammatory and anti-tumor activities of four *Teucrium* essential oils from Greece. *Food Chem.* **115**:679-686.
- Merzouki, A, Ed-derfoufi, F, and Molero Mesa, J** (2000) Contribution to the knowledge of Rifian traditional medicine. II: Folk medicine in Ksar Lakbir district (NW Morocco).

*Fitoterapia* **71**:278-307.

- Molavi, O, Ma, Z, Mahmud, A, Aishamsan, A, Samuel, J, Lai, R, Kown, G, and Lavasanifar, A** (2008) Polymeric micelles for the solubilization and delivery of STAT3 inhibitor cucurbitacins in solid tumors. *Int. J. of Pharmaceutics* **347**:118-127.
- Nawwar, MAM, Ishak, MS, and Buddrust, J** (1984) Leaf flavonoids of *Ziziphus spina-christi*. *Phytochemistry* **23**:2110-2111.
- Park, J, Kim, S, and Kim, T** (2006) Inhibition of interleukin-4 production in activated T- cells via down-regulation of NF-AT DNA binding activity by apigenin, a flavonoid present in dietary plants. *Immun. Letters* **103**:108-114.
- Proestos, C, Sereli, D, and Komaitis, M** (2006) Determination of phenolic compounds in aromatic plants by RP-HPLC and GC-MS. *Food Chem.* **95**:44-52.
- Ragasa, C, Nacpil, Z, Natividad, G, Tada, M, Coll, J, and Rideout, J** (1997) Tetranortriterpenoids from *Azadirachta indica*. *Phytochemistry* **46**:555-558.
- Ramji, N, Venkatakrishnan, K, and Madyastha, K** (1996) 11-Epi-azadirachtin H from *Azadirachta indica*. *Phytochemistry* **42**:561-562.
- Rizk, AM, and El-Ghazali, GA** (1995) *Medicinal and Poisonous Plants of Qatar*. The Scientific and Applied Research Centre, University of Qatar, Qatar.
- Said, O, Khalil, K, Fulder, S, and, H** (2002) Ethnopharmacological survey of medicinal herbs in Israel, the Golan Heights and the West Bank region. *J. Ethnopharmacology* **83**:252-265.
- Shariffar, F, Dehghn-Nudeh, G, and Mirtajaldini, M** (2009) Major flavonoids with antioxidant activity from *Teucrium polium L.* *Food Chem.* **112**: 885-888.
- Siddiqui, BS, Afshan, F, Gulzar, T, and Hanif, M** (2004) Tetracyclic triterpenoids from the leaves of *Azadirachta indica*. *Phytochemistry* **65**:2363-2367.
- Suleiman, M S, Abdul-Ghani, AS, Al-Khalil, S, and Amin, R** (1998) Effect of *Teucrium polium* boiled leaf extract on intestinal motility and blood pressure. *J. Ethnopharmacology* **22**:111-116.
- Voirin, B, and Bayet, C** (1992) Developmental variations in leaf flavonoid a-glycones of *Mentha piperita*. *Phytochemistry* **31**:2299-2304.
- Weinges, K, and Schick, H** (1995) Dodecaacetylprodelphinidin B3 from the dried leaves of *Ziziphus spina-christi*. *Phytochemistry* **38**:505-507.
- Wilson, K M, Klein, JD, Sesselberg, TS, Yussman, SM, Markow, DB, Green, AE, West, JC, and Gray, NJ** (2006) Use of complementary medicine and dietary supplements among U.S. adolescents. *J. Adol. Health* **38**:385-394.
- Yoshikawa, M, Xu, F, Morikawa, T, Ninomiya, K, and Matsuda, H** (2003) Anastatins A and B, new skeletal flavonoids with hepatoprotective activities from the desert plant *Anastatica hierochuntica*. *Bioorg. & Med. Chem. Letters* **13**:1045-1049.

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