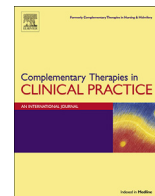




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## Medicinal herbs and methodologies for their pharmaceutical compounding in the West Bank/Palestine

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### A B S T R A C T

**Keywords:**  
Medicinal plants  
Stability  
Extraction

This study focused on herbalists, herbal shops and people currently using traditional Arabic medicine. Informants were asked to list plants and methods for obtaining plant herbal extracts used to manage a range of illnesses. A total of 109 plants were identified, of these, principle plant elements included, leaves (47.3%), fruits (18.5%) and seeds (18.0%) were most commonly utilized. Extraction methods included decoction (boiling) 51%, and infusion 17% and prepared as creams, powders, syrups, food or cooked. Many plant species are used by herbalists for treating a range of ailments. This study suggests that a lack of methodological standardization during herbal extraction could compromise herbal stability. There is also a need to monitor for potential adverse drug interactions when used concurrently with prescribed medications.

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### 1. Introduction

Herbs have been used as a food source and as medicine for several thousand years. In turn, Ancient Arabic medicine was influenced by the medicinal practices in Persia, Mesopotamia, Greece and Rome, and India [1]. Throughout history, various herbs have been used to ameliorate a range of diseases and illnesses, it would appear that herbal medicines have remained popular due to historical and cultural reasons; and we are witnessing renewed interest in natural medicines across western countries. Indigenous plants and plant extracts continue to provide a foundation for the development of modern pharmaceutical development and. Ethnopharmacological research is crucial in the development and discovery of new drugs from natural sources [2,3].

In Palestine, numerous medicinal plants are described as treatments for a range of illnesses and symptoms. Herbal medicine is considered an integral part of the Palestinian culture and plays a pivotal role in current public healthcare. Palestine is a small country but has a diversity of wild plants due to its varied geography and climate. The hills and mountains of Palestine are

covered with more than 2600 plant species of which over 700 are noted for use as medicinal herbs or botanical pesticides [4,5]. However, only a few ethnobotanical studies on medicinal plants have been undertaken [2–4,6]. In this project, herbal products used in folk medicine were investigated. Informants were asked how to extract the medical agent present from plants and to prepare a suitable dosage for patient use. The purpose of this study was to conduct an ethnopharmacological survey on natural products currently used in healing diseases and the methodology used in extraction of active compounds and preparing a suitable dosages.

### 2. Method

#### 2.1. Study design

A questionnaire based cross-sectional study was conducted in the West Bank/Palestine between January and August 2012 by pharmacy students from An-Najah National University. The study was approved by Institutional Review Board (IRB) of An-Najah National University. The survey included all major regions in the West Bank: Jenin, Tulkarm, Qalqilya, Nablus, Salfit, Ramalaha, East Jerusalem, Bethlehem and Hebron. The West Bank is divided into four major biogeographical zones: semi-coastal zone, central highlands, eastern slopes, and the Jordan Rift Valley [5] (Fig. 1).

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## 2.2. Population and sampling

The study included visits to herbalists, herbal shops and individuals involved in the use of traditional Arabic medicine. Pharmacists were excluded from this study as law prohibits them from selling herbal products unless they are registered and approved by the ministry of health. The aim of this study was to evaluate traditional methods of herbal extraction. A convenience sample of 100 informants used including well known herbal practitioners.

## 2.3. Data collection

A pilot study was undertaken of 10 herbalists from different geographical areas of the country. The questions were subsequently modified and assessed for content analysis, areas was conducted and the questionnaire was modified according to their comments. The informants were asked to answer a face to face questionnaire after obtaining an oral consent. The data collection form included a list of common diseases and conditions and participants were asked to list plants, specific plant parts used, such as seeds, leaves, roots, etc. and methods of preparation. Descriptive statistical analysis was used.

## 3. Results

Of 100 informants approached, 92 answered the questionnaire. A total of 109 plants were identified as ethno-medical plants across the study area. Table 1 lists plants, parts used and consumption/application procedure for 17 medical problems. Plants reported by two informants or more were included. Some plants were also perceived as common edible plants.

Leaves (47.3%), fruits (18.5%) and seeds (18.0%) were most widely used (Fig. 2).

Methods of preparation included decoction (boiling) (51%), infusion (drenching) (17%). Some plant extracts were prepared as topical creams, powders syrups, added to food or cooked (Fig. 3).

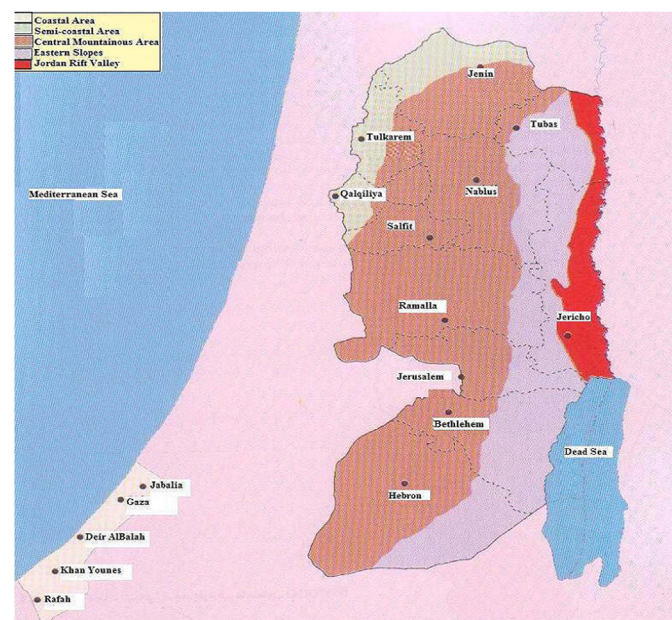


Fig. 1. Study areas in the West Bank.

## 4. Discussion

A high number of plants were used as traditional folk medicine. In this study 109 plants were cited. In a previous Palestinian herbal study 129 plant species were reported and used in Arabic traditional medicine for the management of various diseases [4]. This might be due to the diversity of plant resources available in Palestine. In other studies from other countries, the number of used medicinal plants in ethno-botanical surveys was also high; for instance Turkey (118) [7], Iran (138) [8], Philippines (112) [9]. This contrasts with studies conducted in Jordan (58) [10] and Egypt (48) [11], however careful examination of specific methodologies would be required to ensure parity across these studies.

Many of the plants cited in this study were used both as food and medicine and whilst such concurrent use is well established, this study focused upon the specific methods of active herbal plant extraction [5]. Many of the uses cited by respondents are well known and evidence based [1,2,5,12], however, some of the plants cited require further investigation to identify particular therapeutic benefits. A multidisciplinary approach combining traditional herbal knowledge with pharmaceutical research could be a valuable method for identifying potential herbs with possible clinical benefits [13].

To achieve an efficacious and safe herbal preparations, identification and selection of the medicinally active component, and amounts of the plant should be carefully identified and recorded to ensure standardization during the preparation process. It is well acknowledged that not all the plant parts contain the same concentration of the active constituents. Other factors to considered include harvesting time of the herb soil climactic conditions and methods of drying, processing, and extraction [12]. In the study described here, most plant extracts were prepared by decoction and infusion; however, method of preparation of the plant extract is a significant issue when considering herbal concentrations and dosage.

Moreover, many plant extracts may be rendered unpleasant or unpalatable potentially resulting in poor patient compliance. In this study however, no informants commented upon the taste of a preparation. An example of this is Alum, one of the most commonly cited plants in this study which is described as having a strong stinging taste making consumption as decoction a challenge for patients.

Most informants were scientifically unable to provide a standardized method for either extraction or compounding. Accordingly, this study suggests that pharmacists or specialized trained personnel should undertake herbal extraction and preparation.

Many courses provided by faculties of pharmacy teach and train future pharmacists about the appropriate, extraction compounding and use of medicinal plants. Nevertheless, a greater awareness and understanding about informal, lay, methods of herbal extraction and use should be carefully considered. Not least, the extent to which individuals may continue self-medicate with herbal extracts whilst simultaneously receiving prescribed medications. Variations in the dosage of informally prepared herbal extracts given to individuals, as well as potential drug interactions between herbs and allopathic pharmaceuticals, although difficult to determine present are important considerations and offer future areas for research [5,14].

Limitations of this study acknowledges that answers reported by the respondents cannot be validated and recall bias is possible. The study sample might not be representative of practice across all other cities or villages and camps. However, these results offer an insight into the extent of informal herbal extraction and use. It also highlights the need for further research in this area.

**Table 1**  
Plants and herbs used to treat a range of ailments in West Bank/Palestine.

Disease	Latin scientific name	Plant	Arabic name	No. of informants	Method of preparation	Parts used
Cancer	<i>Arum palaestinum</i> Boiss.	Arum	Lufe	46	Cooked (mainly) Powder added to food As herbal tea	Leaves
	<i>Vinca herbacea</i> Waldst. & Kit.	Periwinkle	Wanake	11	Powder	Entire plant
	<i>Nigella sativa</i> L.	Nigella	Habbat albarakah	2	Boiled Added to food	Seeds
Infertility	<i>Cichorium pumilum</i> Jacq.	Cichorium	Hendba'	2	Boiled and eaten	Leaves
	<i>Curcuma longa</i> L.	Turmeric	Curcum	2	Powder	Rhizomes
	<i>Eruca sativa</i> Mill.	Arugula	Jarjeer	13	Eaten raw as salad	Leaves
	<i>Zingiber officinale</i> Roscoe	Ginger	Zangabel	10	Boiled, drenched	Rhizomes
	<i>Trigonella foenum-graecum</i> L.	Fenugreek	Hilbeh	9	Boiled, drenched	Seeds
	<i>Pausinystalia johimbe</i> (K.Schum.) Pierre ex Beille	Yohimbe	Yohimb	9	Powder	Bark
	<i>Coriandrum sativum</i> L.	Coriander	Kozbara	4	Boiled, drenched	Fruits
	<i>Corchorus olitorius</i> L.	Jews mallow	Mlokheya	4	Boiled and eaten	Leaves
	<i>Nigella sativa</i> L.	Nigella	Habbat albarakah	2	Boiled Added to food	Seeds
	<i>Sesamum indicum</i> L.	Sesame	Semsem	2	Roasted, powdered and eaten	Seeds
Colic	<i>Salvia officinalis</i> L.	Sage	Meryamya	38	Boiled	Leaves
	<i>Matricaria recutita</i> L.	Chamomile	Babonach	11	Boiled	Flowers
	<i>Pimpinella anisum</i> L.	Anise, aniseed	Yanson	9	Boiled, drenched	Fruits
	<i>Cuminum cyminum</i> L.	Cumin	Kamoon	4	Boiled, drenched	Fruits
	<i>Mentha piperita</i> L.	Peppermint	Na'ana	2	Boiled	Leaves
Diarrhea	<i>Camellia sinensis</i> (L.) Kuntze	Tea	Shay	27	Boiled	Tea
	<i>Solanum tuberosum</i> L.	Potato	Patata	13	Boiled and eaten	Tubers
	<i>Salvia officinalis</i> L.	Sage	Meryamya	5	Boiled	Leaves
	<i>Oryza sativa</i> L.	Rice	Roz	5	Boiled and eaten	Seeds
	<i>Musa acuminata</i> Colla	Banana	Mus	4	Eaten raw	Fruit
	<i>Coffea arabica</i> L.	Coffee	Kahwa	3	Boiled	Seeds
	<i>Rhus coriaria</i> L.	Sumac	Somak	3	Eaten raw	Fruit
	<i>Allium sativum</i> L.	Garlic	Thom	2	Eaten raw	Cloves
	<i>Punica granatum</i> L.	Pomegranate	Roman	2	Boiled and eaten	Fruits bark
	<i>Malus domestica</i> Borkh.	Apple	Tofah	2	Boiled and eaten	Fruit
Skin infections	<i>Citrus limon</i> (L.) Burm. f.	Lemon	Laimon	2	Juice	Fruit
	<i>Matricaria recutita</i> L.	Chamomile	Babonach	20	Infusion	Flower
	<i>Aloe vera</i> (L.) Burm.f., <i>Aloe barbadensis</i> Mill.	Aloe	Sobar	11	Juice, gel	Leaves
	<i>Origanum syriacum</i> L.	Thyme	Za'atar	4	Infusion	Leaves
	<i>Salvia officinalis</i> L.	Sage	Meryamya	2	Infusion	Leaves
Cuts and burns	<i>Ricinus communis</i> L.	Castor	Kharwaa	2	Oil	Seeds
	<i>Pimpinella anisum</i> L.	Anise, aniseed	yanson	2	Boiled	Fruits
	<i>Coffea arabica</i> L.	Coffee	Kahwa	34	Boiled	Seeds
	<i>Aloe vera</i> (L.) Burm.f., <i>Aloe barbadensis</i> Mill.	Aloe	Sobar	20	Juice, boiled, cream	Leaves
	<i>Ricinus communis</i> L.	Castor	Kharwaa	10	Oil	Seeds
	<i>Apis mellifera</i> L.	Beeswax	Shamea	6	Ointment	wax
	<i>Salvia officinalis</i> L.	Sage	Meryamya	5	Infusion	Leaves
	<i>Eucalyptus globulus</i> Labill.	Eucalyptus	Kena	4	Infusion	Leaves
	<i>Punica granatum</i> L.	Pomegranate	Roman	4	Boiled and eaten	Fruits bark
	<i>Inula viscosa</i> (L.) Aiton	Inula	Tayon	2	Boiled and eaten	Leaves
Diabetes mellitus	<i>Hordeum vulgare</i> L.	Barley	Shaer	2	Infusion	Seeds
	<i>Trigonella foenum-graecum</i> L.	Fenugreek	Helbe	43	Powder	Seeds
	<i>Olea europaea</i> L.	Olive	Zaeton	3	Boiled	Leaves
	<i>Cinnamomum verum</i> J.Presl	Cinnamon	Kerfa	5	Boiled	Bark
	<i>Rosmarinus officinalis</i> L.	Rosemary	Has elban	5	Infusion	Leaves
	<i>Lupinus albus</i> L.	Lupine	Tormos	4	Boiled and eaten	Seeds
	<i>Teucreium capitatum</i> L.	<i>Teucreium</i>	Jeade	2	Boiled and drenched	Entire plant
	<i>Citrullus colocynthis</i> (L.) Schrad.	Bitter apple	Hanthal	3	Eaten raw	Fruit
	<i>Allium sativum</i> L.	Garlic	Thom	46	Juice	Cloves
	<i>Crataegus monogyna</i> Jacq.	Hawthorn	Zaaror	6	Boiled and drenched	Fruits and leaves
Hypertension	<i>Hibiscus sabdariffa</i> L.	Roselle	Karkade	8	Boiled and drenched	Flowers
	<i>Pimpinella anisum</i> L.	Anise, aniseed	Yanson	2	Boiled and drenched	Fruits
	<i>Olea europaea</i> L.	Olive	Zaeton	4	Boiled and drenched	Leaves
	<i>Origanum syriacum</i> L.	Thyme	Zaatar	62	Infusion	Leaves
	<i>Matricaria recutita</i> L.	Chamomile	Babonach	7	Infusion	Flower
	<i>Glycyrrhiza glabra</i> L.	Licorice	Arek-sos	2	Extract	Roots
	<i>Salvia officinalis</i> L.	Sage	Meryamya	4	Boiled	Leaves
	<i>Mentha piperita</i> L.	Peppermint	Na'ana	2	Boiled	Leaves
	<i>Zingiber officinale</i> Roscoe	Ginger	Zangabel	3	Boiled, drenched	Rhizomes
	<i>Pimpinella anisum</i> L.	Anise, Aniseed	Yanson	3	Boiled, drenched	Fruits
Cough	<i>Apis mellifera</i> L.	Honey	Asal	3	Eaten raw	Liquid
	<i>Psidium littorale</i> Radd	Guava	Jawafa	2	Boiled and drenched	Leaves

(continued on next page)

Table 1 (continued)

Disease	Latin scientific name	Plant	Arabic name	No. of informants	Method of preparation	Parts used	
Common cold	<i>Matricaria recutita</i> L.	Chamomile	Babonach	20	Infusion	Flower	
	<i>Salvia officinalis</i> L.	Sage	Meryamy	20	Boiled	Leaves	
	<i>Pimpinella anisum</i> L.	Anise, aniseed	Yanson	17	Boiled and drenched	Fruits	
	<i>Origanum syriacum</i> L.	Thyme	Zaatar	8	Infusion	Leaves	
	<i>Camellia sinensis</i> (L.) Kuntze	Tea	Shay	7	Boiled and drenched	Leaves	
	<i>Crocus sativus</i> L.	Saffron	Zaafan	3	Boiled and drenched	Flowers	
	<i>Eucalyptus globulus</i> Labill.	Eucalyptus	Kena	2	Boiled and drenched	Leaves	
	<i>Aloe vera</i> (L.) Burm.f., <i>Aloe barbadensis</i> Mill.	Aloe	Sobar	2	Gel, juice	Leaves	
	<i>Citrus limon</i> (L.) Burm. f.	Lemon	Lamon	2	Juice	Fruit	
	Hemorrhoid	<i>Conium maculatum</i> L.	Hemlock	Shokran	12	Paste	Fruit
<i>Aloe vera</i> (L.) Burm.f., <i>Aloe barbadensis</i> Mill.		Aloe	Sobar	6	Gel	leaves	
<i>Eucalyptus globulus</i> Labill.		Eucalyptus	Kena	4	Boiled and drenched	Leaves	
<i>Inula viscosa</i> (L.) Aiton		Inula	Tayon	4	Boiled and eaten	Leaves	
<i>Matricaria recutita</i> L.		Chamomile	Babonach	3	Infusion	Flower	
<i>Allium sativum</i> L.		Garlic	Thom	2	Eaten raw	Cloves	
<i>Olea europaea</i> L.		Olive	Zaeton		Eaten raw oil	fruits	
<i>Allium cepa</i> L.		Onion	Basal	2	Juice	Bulb	
<i>Apis mellifera</i> L.		Honey	Asal	2	Eaten raw	Liquid	
Impotence		<i>Coriandrum sativum</i> L.	Coriander	Kozbara	21	Boiled and drenched	Fruits
	<i>Zingiber officinale</i> Roscoe	Ginger	Zangabel	21	Boiled, drenched	Rhizomes	
	<i>Eruca sativa</i> Mill.	Arugula	Jarger	9	Eaten raw	Leaves	
	<i>Ferula hermonis</i> Boiss.	Ferula	Alhaltet(shersh alzalo'a)	5	Boiled and drenched	Fruits	
	<i>Pausinystalia johimbe</i> (K.Schum.) Pierre ex Beille	Yohimbe	Yohimb	4	Powder	Bark	
	<i>Panax ginseng</i> C.A.Mey.	Ginseng	Ginseng	3	Powder	Roots	
	<i>Petroselinum sativum</i> Hoffm.	Parsley	Bakdones	2	Infusion	Fruits	
	<i>Allium sativum</i> L.	Garlic	Thom	2	Eaten raw	Cloves	
	<i>Zea mays</i> L.	Starch	Thora	12	Powder	Grains	
	Allergy	<i>Matricaria recutita</i> L.	Chamomile	Babonach	3	Infusion	Flower
<i>Olea europaea</i> L.		Olive	Zaeton	3	Boiled and drenched	Leaves	
<i>Crocus sativus</i> L.		saffron	Zaafan	2	Tea	Flowers	
<i>Ixiolirion tataricum</i> (Pall.) Schult. & Schult.f.		Ixiolirion	Zaeta	2	Boiled and drenched	Entire plant	
Kidney stones		<i>Ammi visnaga</i> (L.) Lam.	Khella	Kella	25	Boiled and drenched	Fruits
		<i>Trigonella foenum-graecum</i> L.	Fenugreek	Helbe	19	Boiled, drenched Boiled cooked	Leaves seeds seeds
Heart diseases		<i>Hordeum vulgare</i> L.	Barley	Shaer	16	Infusion	Seeds
		<i>Petroselinum sativum</i> Hoffm.	Parsley	Bakdonas		Boiled	Fruits
		<i>Citrus limon</i> (L.) Burm. f.	Lemon	Lamon	2	Juice	fruit
		<i>Crataegus monogyna</i> Jacq.	Hawthorn	Zaaror	39	Boiled and drenched	Fruits and leaves
	<i>Theobroma cacao</i> L.	Cocoa	Cacao	12	Boiled	seeds	
	<i>Allium sativum</i> L.	Garlic		5	Eaten raw	Bulb	
	<i>Camellia sinensis</i> (L.) Kuntze	Tea	Shay	3	Boiled and drenched	Leaves	
	<i>Mentha piperita</i> L.	Peppermint	Na'ana	2	Boiled	Leaves	
	<i>Malus domestica</i> Borkh.	Apple	Tofah	2	Boiled and eaten	Fruit	
	Headache	<i>Citrus limon</i> (L.) Burm. f.	lemon	Lamon	2	Juice	fruit
<i>Mentha piperita</i> L.		peppermint	Na'ana	14	Boiled	Leaves	
<i>Camellia sinensis</i> (L.) Kuntze		Tea	Shay	8	Boiled and drenched	Leaves	
<i>Zingiber officinale</i> Roscoe		Ginger	Zangabel	6	Boiled and drenched	Rhizomes	
<i>Coffea arabica</i> L.		Coffee	Kahwa	5	Boiled	Seeds	
<i>Salvia officinalis</i> L.		Sage	Meryamy	4	Boiled and drenched	Leaves	
<i>Ginkgo biloba</i> L.		Ginkgo	Gingo	4	Infusion	leaves	
<i>Pimpinella anisum</i> L.		Anise, Aniseed	Yanson	3	Boiled and drenched	Fruits	
<i>Solanum lycopersicum</i> Lam.		Tomato	Pandora	3	Juice	Fruits	
Rhumatoid arthritis		<i>Matricaria recutita</i> L.	Chamomile	Babonach	2	Infusion	Flower
	<i>Piper nigrum</i> L.	Pepper	Felfel aswad	21	Paste	Fruits	
	<i>Brassica nigra</i> (L.) K.Koch	Mustard	Khardal aswad	16	Paste	seeds	
	<i>Urtica dioica</i> L.	Diskette	Kores	9	Paste	Leaves	
	<i>Inula viscosa</i> (L.) Aiton	Inula	Tayon	4	Boiled and eaten	Leaves	
	<i>Citrullus colocynthis</i> (L.) Schrad.	Bitter apple	Hanthal	2	Paste	Fruits	

## 5. Conclusion

Many plant species continue to be used by traditional herbalists and individuals in Palestine, to treat or manage a broad range of ailments. This study indicates that there continues to be a lack of standardization in methods of active herbal extraction and identification of effective dosage requirements. As a result, it is difficult to accurately determine herbal

concentrations produced, or the exact part and amount of a plant, used during the extraction process. Despite drug standardization throughout pharmacies and the formal medical arena, widespread informal use of herbs in this manner raises concerns regarding safety, efficacy, dosage, and potential drug/herbal interactions and abreactions. There continues to be a clear need to address and investigate these matters through further research.



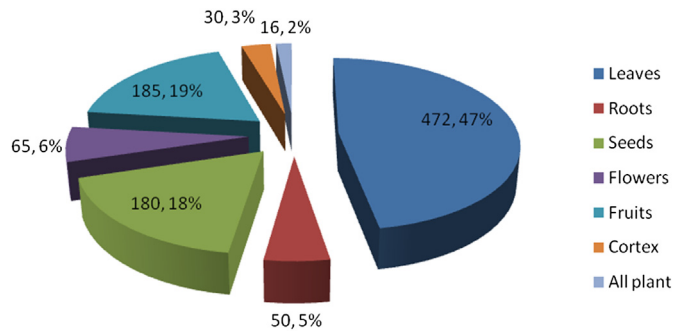


Fig. 2. Plant parts used in preparation of medicinal herbs.

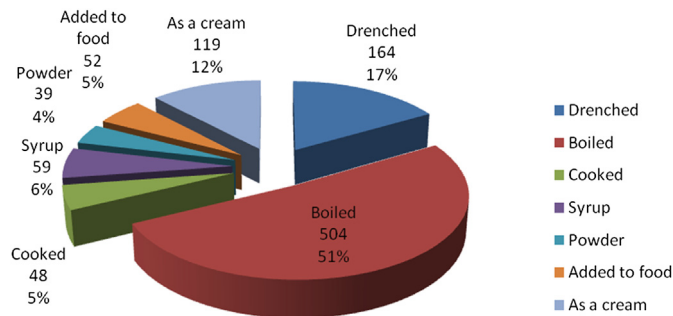


Fig. 3. Methods of preparation for medicinal herbs.

**Conflict of interest statement**  
None declared.

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