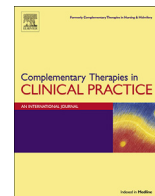




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Medicinal herbs and methodologies for their pharmaceutical compounding in the West Bank/Palestine

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A B S T R A C T

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The aim of this study was to carry an ethnopharmacological survey on medicinal herbs and the methodology used in extraction of active compounds. A survey study was carried out; it included herbalists, herbal shops and people who are involved in traditional Arabic medicine. For each disease included, informants were asked to list plants used, the used part from which the products were prepared as well as the method of preparation. A total of 109 plants were identified. Within the plants used, leaves (47.3%), fruits (18.5%) and seeds (18.0%) were the plant parts most widely used. Methods of preparation were mainly decoction (boiling) by 51%, and then infusion (drenching) by 17%. Some plants were prepared as creams, powders, syrups, added to food or cooked. Many plant species are still used by herbalists in our country for treating various human diseases and ailments. Most plants are prepared by boiling, which may cause degradation of active ingredients. Preparations should take into consideration the stability of the active ingredients.

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1. Introduction

Human being have used herbs both as a food source and as medicine for at least several thousands years. Ancient Arabic medicine was influenced by medicinal practices in Persia, Mesopotamia, Greece and Rome, and India [1]. Throughout history, man used various natural materials as a remedy for various diseases. In the past few decades, most natural products were replaced with synthetic drugs that were based on modern chemistry and biotechnology. However, herbal medicines have often maintained popularity because of historical and cultural reasons; we are recently witnessing a vastly growing and renewed interest in natural medicines in western countries. Furthermore, natural products are still a major source of new drug discoveries. Ethnopharmacological research is considered crucial in the development and discovery of new drugs from natural sources [2,3].

In Palestine, there are numerous medicinal plants described for treatment of many diseases. Herbal medicine is considered an integral part of the Palestinian culture and plays a pivotal and

indispensable role in the current public healthcare. Palestine is a small country but has a great diversity of wild plants due to the varied geography and climate. The hills and mountains of Palestine are covered with more than 2600 plant species of which more than 700 are noted for their uses as medicinal herbs or as botanical pesticides [4,5]. However, only a few ethnobotanical studies on medicinal plants have been undertaken in some parts of the country [2–4,6]. In this project, herbal products used in folk medicine were investigated and recorded. This is the first study where informants were given a group of common diseases and were asked to suggest suitable treatments instead of asking the uses of every plant. Moreover, these informants were asked how to extract the medical agent present in the plant and to prepare a suitable dosage form for patient use. The purpose of this study was to carry an ethnopharmacological survey on natural products that are used in healing diseases and the methodology used in extraction of active compounds and preparing a suitable dosage form.

2. Method

2.1. Study design

The study was a questionnaire based cross-sectional study that was conducted in the West Bank/Palestine between January and

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August 2012. It was carried out by a group of pharmacy students from An-Najah National University. The study was approved by Institutional Review Board (IRB) of An-Najah National University before initiation of the study. The survey included all major regions in the West Bank: Jenin, Tulkarm, Qalqilya, Nablus, Salfit, Ramalha, 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).

2.2. Population and sampling

The study included visits to herbalists, herbal shops and people who are involved in traditional Arabic medicine. Pharmacists were excluded from this study because in our country, the herbal products in pharmacies are usually prepared by factories; they are well packaged and labeled. Pharmacists cannot sell herbal products unless they are registered and approved by the ministry of health and the aim of this study was to evaluate traditional use of herbs. A convenient sample of 100 informants was collected. It included almost all of the famous people who are well known to practice traditional medicine in every discrete.

2.3. Data collection

The questionnaire was simple; it went through content validity by 3 PhD holders in the field. A pilot study that included 10 herbalists from different 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 for which the participants were asked to list plants used, the used part from which the products were prepared (e.g. seeds, leaves, roots, etc) as well as the method of preparation. Descriptive statistical analysis was used.

3. Results

Among 100 informants approached, 92 accepted to answer the questionnaire. A total of 109 plants were identified as

ethnomedical plants from the study area. Table 1 shows the plants, the parts used and the consumption procedure for 17 diseases or medical problems. Plants reported by two informants or more were included. Some of the mentioned plants were common edible plants.

Within the plants used, leaves (47.3%), fruits (18.5%) and seeds (18.0%) were the plant parts most widely used (Fig. 2).

Methods of preparation were mainly decoction (boiling) which was the method reported by 51%, and then infusion (drenching) by 17%. Some plants were prepared as creams, powders, syrups, added to food or cooked (Fig. 3).

4. Discussion

A high number of plants were used as traditional folk medicine. In this study 109 plants were reported, in a previous study from our country, 129 plant species were used in Arabic traditional medicine for the treatments 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 ethnobotanical surveys was also high as in Turkey (118) [7], Iran (138) [8], Philippines (112) [9]. However, it was lower in some other studies as in Jordan (58) [10] and Egypt (48) [11].

Many of the mentioned plants are used as food and medicine. Overlapping between food and medicine is well known in traditional societies [5]. It can be noticed that many of the uses mentioned are well known and evidence based [1,2,5,12], however, some of the plants need further investigations to confirm the benefits if present. A multidisciplinary approach combining traditional herbal knowledge with pharmaceutical research is a valuable method for identifying potential herbs with possible clinical significance as in cancer care [13].

To achieve a positive response to herbal preparations, the proper part of the plant that contains the active constituents should be chosen. It is well known that not all the plant parts contain the same concentration of the active constituents. The other factors to be considered are the harvesting time of the herb (collection time), the soil, the climate conditions, and the method of drying, processing, and extraction [12]. It can be noticed in this study that most plants were prepared by decoction and infusion, this could be suitable for some plants but not for the others. In deed the method of preparation of the plant extract is a very important issue for correct use of these plants.

In fact, most of the interviewed informants advised the boiling of the plant parts or to use a hot water for their extraction. This may cause degradation of heat sensitive components or the production of new byproducts which may be toxic and cause undesirable side effects to patients.

Moreover, many plants have bad or unsuitable taste, which results in poor patient compliance. In this study there is no any informant who reported any method about the taste of the preparation. In fact one of the most popular medicinal plants reported in this study is Arum. Arum has a very strong stinging taste which makes its direct consumption as decoction a challenge for many patients.

Most informants were scientifically unable to provide a correct method for neither extraction nor compounding. Accordingly, this study suggests that only pharmacists or specialized and well trained persons should deal with these preparations and their use as medicinal plants.

In fact many courses are available in the faculties of pharmacy and the main objectives of these courses are to teach and train future pharmacists about correct use, correct extraction and correct compounding of medicinal plants.

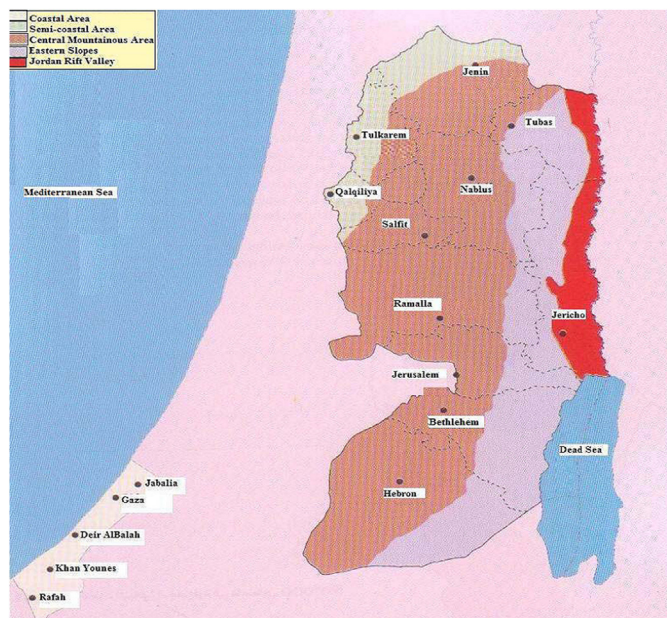


Fig. 1. Study areas in the West Bank.

Table 1
Plants and herbs used for treatment of various human 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	
	<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	
Cuts and burns	<i>Apis mellifera</i> L.	Beeswax	Shameya	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	
	<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	
Diabetes mellitus	<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	
	<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	
	Cough	<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	
<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	Seeds
						Boiled	Leaves
						cooked	seeds
		<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	
	Heart diseases	<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	

The dosage is another concern also, to have the expected benefits, the patients should receive a fixed well defined dosage, but in traditional medicine the suitable doses are not clear [14], so studies are needed to determine the concentration of active ingredients depending on their method of preparation to give the suitable recommended doses.

In this study, leaves were the most commonly used parts, in a previous study in our country, within the edible plants, leaves (24%), and stems (21%) were the plant parts most widely used [5]. In

a study from Ethiopia, leaves followed by roots were the dominant plant parts used for preparation of most remedies [14].

The first limitation of this study is that the answers reported by the respondents cannot be validated and recall bias is possible, but this cannot be avoided in survey studies. Another limitation is that the sample might not be representative to the practice in other cities or villages and camps. However, these results can give a baseline data that can be useful in evaluating the current practice and performing other related studies.

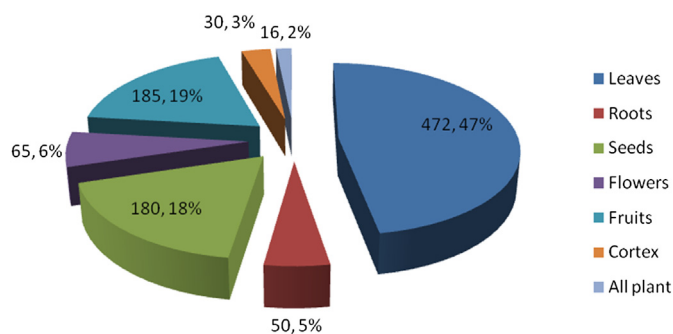


Fig. 2. Plant parts used in preparation of medicinal herbs.

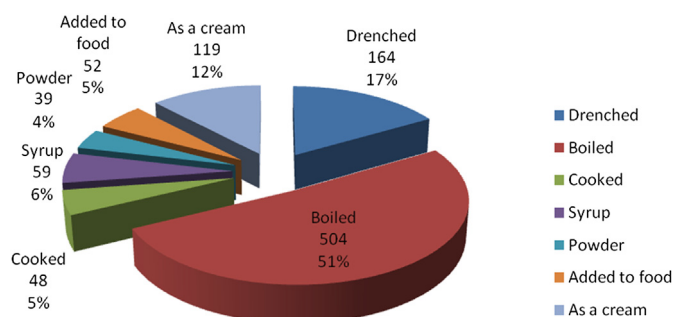


Fig. 3. Methods of preparation for medicinal herbs.

5. Conclusion

Many plant species are still used by herbalists in our country for treating various human diseases and ailments. Most plants are prepared by boiling which may cause degradation of active ingredients. Preparations of these medicinal plants should take in consideration the stability of the active ingredients and the organoleptic properties of the final formulation. Evaluation for

potential pharmacological activity for the promising medicinal plants is suggested.

Conflict of interest statement

None declared.

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