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### Research Article

Essential Oil Contents and Ethnopharmacological Characteristics of Some Spices and Herbal Drugs Traded in Turkey

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#### Abstract

In the present study, some spices and herbal drugs extensively used and traded in Turkey were studied for their essential oil contents. Additionally, some of their used parts, local uses, pharmaceutical traits and ethnopharmacological uses were given. Essential oil contents of investigated spices and herbs changed in a wide range. The rates varied from 0.025% in lemon balm (*Melissa officinalis* L.) to 18.0% in clove (*Syzygium aromaticum* [L.] Merr. et Perry). As a result, the drugs investigated in the present study included high amount of essential oils and the rates were mostly higher than those in the national and international standards.

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Medicinal and aromatic plants have mainly been used as human nutrition, flavoring for meals, remedy for various diseases, dying material for cloths and food for animals. Although these plants had been used for all purposes at the ancient times, they have gradually been replaced by the chemical materials derived from plants, animals or other sources. In the recent century, the side effects of these chemicals have brought out especially in developed countries. As a result of this, medicinal and aromatic plants have regained a great importance in daily life. According to the data revealed by The World Health Organization (WHO), 80 % of the population of undeveloped countries has used these plants as a traditional medicine to cure a number of diseases (Bown, 2001; <http://www.who.int/disasters/repo/14595.pdf> Last updated 19.06.2005).

Turkey is a cradle of the civilizations and has a unique geographical, historical and cultural wealth. Turkey has a wide range of plant genetic resources, most of which are endemic in its flora. Most of these plants have been used as spices and traditional medicine, on the other hand a number of plant drugs have also imported from other countries. Spices derived from national and international sources are used abundantly for food additive and folk medicines in Turkey as well as in the entire world. Although some of these plants are cultivated in a small scale, many of them are gathered from nature (Baytop, 1984; Akgül, 1993).

Most of the young people consuming spices and herbal drugs may not have any information about pharmacological effects of these plant materials, however, the middle-aged and adults are aware enough of their great importance.

In this study, the main spices and herbal drugs used abundantly in Turkey, such as oregano, peppermint, cumin, black cumin, coriander, anise, pepper etc. were analyzed for their essential oil contents. The results were compared with the national standards and international references. Additionally, the pharmaceutical effects, ethno-pharmacological properties and traditional uses of these spices and herbals were discussed (Baytop, 1984; Wagner, *et al.*, 1984; Akgül, 1993; Arslan and Gürbüz, 1994; Asimgil, 1993; Ceylan *et al.*, 1999; Gürbüz *et al.*, 1999; Rose, 1999; Schnaubelt, 1999; Weiss and Fintelman, 2000; Bown, 2001; Özgüven, 2001; Castelman, 2003; <http://www.who.int/disasters/repo/14595.pdf> Last Updated: 19.06.2005. <http://www-ang.kfunigraz.ac.at.htm>. Last Updated:19.06.2005. <http://www.nap.edu/html/fcc/spice.pdf>. Last Updated:19.06.2005. [http://www.saglik.gov.tr/sb/extras/mevzuat/teb\\_baharat.pdf](http://www.saglik.gov.tr/sb/extras/mevzuat/teb_baharat.pdf). Last Updated:19.06.2005. [http://www.hort.purdue.edu/newcrop/Indices/index\\_ab.html](http://www.hort.purdue.edu/newcrop/Indices/index_ab.html) Last Updated:19.06.2005. [http://www.uni-graz.at/~katzer/engl/generic\\_frame.html?spice\\_geo.html](http://www.uni-graz.at/~katzer/engl/generic_frame.html?spice_geo.html) Last Updated:19.06.2005. [http://www.foodindia.org/spices\\_pro.asp](http://www.foodindia.org/spices_pro.asp) Last Updated:19.06.2005.

## **MATERIALS AND METHODS**

The spices and herbal drugs were obtained from spice shops in some provinces (Kilis, Gaziantep, Hatay, Adana and Mersin) in Southern Turkey. In these provinces, most of the spices and herbals are collected from natural resources, some are obtained from other provinces and the others are imported from tropical countries.

Because of abundant consumption of the spices and herbal drugs, the sold products in this region are of good quality and fresh all the time. Most of the spices and herbals have essential oils in their compositions. The essential oil contents and composition of the drugs are also one of the crucial quality criteria.

In this study, spices and herbal drugs amply used in Southern Turkey were analyzed for their essential oil contents. The essential oils were extracted by water steam distillation for 2 h using a Clevenger Apparatus. The laboratory experiments were undertaken at Çukurova University, Agricultural Faculty, Field Crops Department, Medicinal and Aromatic Plants Laboratory in 2004.

The essential oil content values of the all drug samples compared with their national food codex and international literature findings. Furthermore, the regional and traditional uses of these drugs were clarified. The ethno-pharmacological traits were also discussed.

## **RESULTS AND DISCUSSION**

In this section the plant scientific names, plant family, common names, Turkish names, used parts, traditional uses and

ethno-pharmaceutical properties of sampled plants are given. Average essential oil contents of analyzed drugs, Turkish Food Codex (Spice Chapter) and international literature findings for essential oil contents are given in [Table 1](#).

***Alpinia officinarum* Hance, *Langras galaga* (L.) Stantz.-Zingiberaceae-(Ing. Galangal, Tr. Havlican):** Whole or powdered galangal's rhizomes are used as spice and traditional medicine in Turkey. In winter, galangal, cinnamon, clove, nutmeg and ginger are boiled together for making herbal tea. This tea is used for colds, coughs and influenza. Furthermore, after pregnancy ceremonies this special warm herbal tea dressed with nuts "Kaynar or Lohusa Syrup" is served to guests. As a folk medicine, a powdered mixture of the above spices with honey. "Şüdüt" is a good supplement for new mothers for fast recovering and more milk production. And this mixture is also well-known its aphrodisiacal effects. Galangal is completely imported from other countries and sold in Turkey.

***Anethum graveolens* L.-Apiaceae-(Ing. Dill, Tr. Dereotu):** It has been used in herbal healing the drawn of Egyptian Civilization. Fresh plant material is used as a vegetable and salad in Turkey. Powdered fruits and herba are consumed as a spice for flavoring foods. Because of its carminative effects, herbal tea prepared with dill fruits is also used for babies. Dill is grown in small house gardens for household consumption and at fields for export in Turkey.

***Artemisia dracunculus*-Asteraceae-(Ing. Tarragon-Estragon, Tr. Tarhin):** Fresh and dried tarragon leaves are especially used as spice and salad in Southern Turkey. In addition, tarragon leaves are used as folk medicine destroying for intestinal worms in children. Tarragon is grown in small areas for local requirements in Turkey.

***Boswellia carterii*-Burseraceae-(Ing. Frankincense, Tr. Günlük):** Since the gum has a lot of pharmaceutical features as well as strengthening, sedative, diuretic, expectorant and antiseptic effects. This drug is used as incense in the holy places and is also locally known as a remedy for rheumatic pains.

***Cinnamomum zeylanicum*-Lauraceae-(Ing. Cinnamon, Tr. Tarçin):** In Turkey, the bark of the cinnamon tree is used as spice, herbal tea and traditional remedy for some complaints and powdered cinnamon bark is used as a dressing of milky sweets and pies. This spice is also added to some meat products. The whole cinnamon barks is used for preparing herbal tea and mixture of şüdüt mentioned in galangal. Additionally, the warm cinnamon tea is of the best choices for medical treatment of influenza in winter.

***Coriandrum sativum* L.-Apiaceae-(Ing. Coriander, Tr. Kişniş, Küzbara, Kinzi):** Fresh topsoil parts of the plants are locally used as vegetable and salad and grown in the house gardens. Powdered coriander fruits are used as spice in some special foods with cumin. The fruits are also used for digestive problems in making folk medicine. Coriander is also commercially grown for its fruits in Turkey and is exported to other countries.

***Cuminum cyminum* L.- *Carum carvi* L.-Apiaceae-(Ing. Cumin, Tr. Kimyon):** Cumin is abundantly used for spice and folk medicine in Turkey. Because of its carminative effects, people use it as herbal tea for newborn babies and as a spice in food legumes. This medicinal and aromatic plant is commercially grown in Turkey.

Table 1: Essential oil contents (%) of spices and herbal drugs studied

Plant scientific name	Analyzed plant samples	Turkish food codex 2002	Intervals in the literatures
<i>Alpinia officinarum</i>	0.73	*	0.90-1.50
<i>Anethum graveolens</i> L.	3.05	*	1.00-3.50
<i>Artemisia dracunculus</i>	0.80	0.30	0.25-2.40
<i>Boswellia</i> spp.	2.20	*	2.00-4.00
<i>Cinnamomum zeylanicum</i>	2.00	1.00	0.30-2.50
<i>Coriandrum sativum</i> L.	1.00	0.40	0.30-1.70
<i>Cuminum cyminum</i> L.	2.25	2.00	2.00-5.00
<i>Curcuma longae</i>	3.00	1.50	0.30-5.00
<i>Elettaria cardamomum</i> (L.) Maton	4.00	3.50	4.00-9.00
<i>Foeniculum vulgare</i> Mill. var. <i>dulce</i>	2.67	1.00	5.00-7.00
<i>Hibiscus sabdariffa</i>	0.06	*	Less than 1.00
<i>Laurus nobilis</i> L.	2.00	1.00	1.00-3.00
<i>Lavandula stoechas</i>	1.00	*	1.00-3.00
<i>Lippia triphylla</i> (L'Hér.) O. Kuntze	0.35	*	Less than 1.00
<i>Melisa officinalis</i> L.	0.03	*	0.01-0.25
<i>Mentha spicata</i> L. subsp. <i>spicata</i>	1.67	0.70	1.00-2.00
<i>Myristica fragrans</i> Houtten	2.30	5.00	6.00-10.00
<i>Nigella arvensis</i> L.	0.40	*	0.20-0.72
<i>Ocimum basilicum</i> L.	0.67	0.30	0.40-1.70
<i>Origanum</i> spp.	3.50	1.00	1.28-7.60
<i>Persea gratissima</i> Gaertner	1.50	*	1.00-3.00
<i>Peganum harmala</i> L.	0.03	*	**
<i>Pimenta dioica</i> L. Merrill	2.00	3.00	3.00-4.00
<i>Pimpinella anisum</i> L.	2.50	1.50	2.00-7.00
<i>Piper nigrum</i> L.	1.00	2.00	1.50-3.50
<i>Prunus mahaleb</i> L.	0.10	*	**
<i>Rosmarinus officinalis</i> L.	1.53	1.00	1.00-2.00
<i>Syzygium aromaticum</i>	18.00	14.00	14.00-20.00
<i>Zingiber officinale</i> Roscoe	0.43	1.50	1.00-3.00

\* There is no standard value in Turkish Food Codex, \*\* Could not be found

***Curcuma longae*-Zingiberaceae-(Ing. Turmeric, Tr. Zerdeçal):** Turmeric has locally been used as a spice and natural colorant for meals and sweets. Powdered turmeric rhizomes are especially used in rice cookies in Southern Turkey. This drug is imported from tropical countries.

***Elettaria cardamomum* (L.) Maton.-Zingiberaceae-(Ing. Cardamom, Tr. Kakule, Hel):** Powdered cardamom fruits have particularly been used together with Turkish coffee as a flavoring in Southeastern Turkey. Also, it is good for easing of gas pains of babies and is locally well known for its aphrodisiacal properties.

***Foeniculum vulgare* Mill. var. *dulce*-Apiaceae-(Ing. Fennel, Tr. Rezene, Mayana):** Fresh fennel leaves and roots are used as vegetable in Turkey. Due to its carminative and digestive properties, fennel fruit tea has locally been used for easing pains of newborn babies. Furthermore, the powdered fruits are widely used as a spice for cookies, sweets and bakeries. Fennel is commercially cultivated in western Turkey.

***Hibiscus sabdariffa*-Malvaceae-(Ing. Roselle, Tr. Karkade):** Because of its high content of **vitamin C**, warm herbal tea and cold syrup is well-known drink in Turkey. Flower calyces of rosella are used for giving color and flavor to mixed herbal teas. It is also used extensively for influenza and colds, particularly in winter time. Dried rosella calyces are imported from Arabic countries.

***Laurus nobilis* L.-Lauraceae-(Ing. Bay, Tr. Defne):** These evergreen plants are used as ornamental in the gardens. The leaves are widely used in meat products and fish as a culinary herb. Additionally, whole dried bay leaves are placed among the meat, fish and dried figs for to delay staling. Furthermore, the dried leaves are locally used to protect honeycomb from comb moth. The special soap with green color is produced by its fruit oil. This soap is good for hair care and scurfy hairs. Bay leaf and its essential oil is one the most exported drugs from Turkey. All the bay products used and traded are obtained

from natural resources of Turkey.

***Lavandula stoechas*-Lamiaceae-(Ing. Spanish Lavender, Tr. Karabasotu):** Dried herba with spikes are locally used as a folk medicine. It is used for healing wounds and eczema, externally. It strengthens of nerves and heart, internally. This old drug has been known and consumed as a folk medicine extensively since the Ottoman Empire in Anatolia. This drug is obtained from only natural resources and there is no cultivation in Turkey.

***Lippia triphylla* (L'Hér.) O. Kuntze-Verbenaceae-(Ing. Lemon Verbena, Tr. Meliza):** In Turkey, the plant's leaves with lemon scent are locally used as a herbal tea in winter for influenza and as a sleep aid. The diabetes believe that the herbal tea is useful for them. The lemon verbena leaves used and traded in Turkey are obtained from trees grown in small home gardens.

***Melissa officinalis* L.-Lamiaceae-(Ing. Lemon Balm, Tr. Ogulotu):** Lemon balm is a perennial herbaceous plant which is native to Mediterranean region. Dioscorides, the ancient Greek physician who lived in Turkey, applied lemon balm leaves to skin wounds and added the herb to wine to treat a variety of illness. Its wide range of pharmaceutical properties, calming, sedative, antidepressant and carminative, digestive and antispasmodic, this drug has been used for treating stress and aiding sleep in Turkey.

***Mentha spicata* L. subsp. *spicata*-Lamiaceae-(Ing. Spearmint, Tr. Nane):** Fresh mint leaves are used as salads, dried and grinded leaves are used as spice and folk medicine in Turkey. This drug is one of the most consumed spices in Turkey. Besides culinary usage, the herbal tea prepared from dried leaves of mint is extensively used as folk medicine for colds and gastrointestinal disorders. This plant is widely grown in Southeastern Turkey, particularly in Gaziantep and Sanliurfa provinces.

***Myristica fragrans* Houtten-Myristicaceae-(Ing. Nutmeg, Tr. Küçük Hindistan Cevizi):** Dried nutmeg fruits are used for culinary and medicinal purposes in Turkey. Nutmeg is an ingredient of herbal tea and südü mixture, as well. It is also known well-aphrodisiacal properties, locally. Addition to other tropical spices such as ginger, cinnamon, allspice, clove, nutmeg is used in some special Turkish meat products such as sucuk, salam and pastirma and in bakeries. This drug is imported from international sources.

***Nigella sativa* L.-Ranunculaceae-(Ing. Black cumin, Tr. Çörekotu):** Black cumin seeds are locally consumed as culinary herb and folk medicine in Turkey. The seeds are extensively used for bakeries. Powdered seeds are mixed to honey and used locally for asthma and bronchial complaints. It has also strengthen, aphrodisiacal and laxative effects and useful for all the illness incurable. The seed's oil is believed to have a curing effects on hair loses and ceases hair problems. Black cumin is one of the most cultivated and exported aromatic plants in Turkey.

***Ocimum basilicum* L.-Lamiaceae-(Ing. Basil, Tr. Reyhan, Feslegen):** Fresh and dried leaves of basil are used as culinary and medicinal purposes. These plants are ornamentals in the gardens and pots with insect repellent properties in houses. Fresh leaves are used for salads and spice. Dried and grinded leaves are used as spice in soups. Basil plants are commonly known, grown and used for various purposes in different parts of Turkey.

***Origanum* spp.-Lamiaceae-(Ing. Oregano, Tr. Kekik):** *Origanum* species are used as culinary and in folk medicine in Turkey. Dried leaves are used as spice and herbal tea. Especially in winter months, the *Origanum* tea is extensively used for curing colds, influenza and bronchial complaints. Also, oregano oil and distillation water are used as folk medicine for toothache and stomachache. Furthermore, infused in warm olive oil, *Origanum* has been used for ear infections and rheumatic complaints. Turkey is the biggest *Origanum* supplier of the world.

***Persea gratissima* Gaertner-Lauraceae-(Ing. Avocado, Tr. Avokado):** Fruits of avocado are eaten, fruit peels are used for jam and dried leaves are used for coughs, influenza, high **blood pressure** and bronchial complaints in Turkey.

***Peganum harmala* L.-Zygophyllaceae-(Ing. Syrian rue, harmal, Tr. Üzerlik):** Harmal seeds are used as incense for centuries in the Mediterranean. Powdered seeds are locally used for destroying intestinal worms in the children. Additionally,

fried seeds are locally used to treat hemorrhoids. Harmal naturally grows in Turkey. It is particularly known and extensively used in Southern and Eastern Anatolia.

***Pimenta dioica* L. Merrill-Myrtaceae-(Ing. Allspice, Pimento, Tr. Yenibahar):** Powdered pimento seeds are used as culinary and in folk medicine. Together with black pepper, allspice is extensively used in meat meals. Allspice and other species of Zingiberaceae family members mentioned above are mixed in honey and used locally for aphrodisiacal. Pimento is one of the most imported spices of Turkey.

***Pimpinella anisum* L.-Apiaceae-(Ing. Anise seed, Tr. Anason):** Aniseed is one of the most consumed drugs in folk medicine in Turkey. Herbal tea prepared from aniseed is used for sleeplessness and for carminative disorders in babies. It is extensively used in Raki, an alcoholic drink, production in Turkey. Anise is widely cultivated in Turkey and exported to other countries.

***Piper nigrum* L.-Piperaceae-(Ing. Black Pepper, Tr. Karabiber):** Black pepper is the main spice of traditional Turkish foods. It is also added to the aphrodisiacal mixtures with honey. It is advised for removing cough and influenza and known with strengthen properties. Black pepper is obtained from other countries

***Prunus mahaleb* L.-Rosaceae-(Ing. Mahaleb, Tr. Mahlep):** Kernels of mahaleb are used as culinary and in folk medicine in Turkey. The powdered kernels are used in bakeries and for flavoring cheese. In the folk medicine, it is locally known as aphrodisiacal. Mahaleb trees are grown naturally in Turkey. The kernels are consumed and exported to the other countries.

***Rosmarinus officinalis* L.-Lamiaceae-(Ing. Rosemary, Tr. Biberiye):** Rosemary leaves are used as spice and herbal tea in Turkey. It is used locally to loss weight, to control cholesterol and to treat headache. It is also grown as an ornamental in the home gardens. Rosemary plants grow naturally in Turkey. All the traded rosemary materials are derived from natural resources in Turkey.

***Syzygium aromaticum* (L.) Merr. and Perry syn. *Eugenia caryophyllus* (Spreng.) Bullock and Harrison.-Myrtaceae-(Ing. Clove, Tr. Karanfil):** Clove is extensively used as spice and in folk medicine in Turkey. As a spice, clove is commonly consumed together with cinnamon in sweets and pies. It is also added to tea and liquorices syrup as flavoring. Together with the other Zingiberaceae family spices, clove is mixed with honey for their aphrodisiacal effects. It is particularly used locally for toothaches and removing bad mouth scent. The consumed clove material obtained from other countries.

***Zingiber officinale* Roscoe-Zingiberaceae-(Ing. Ginger, Tr. Zencefil):** Ginger is extensively used as spice and herbal remedy in Turkey. It is used together with the same family spices in sweets and used in aphrodisiacal mixtures, locally. For coughs, the powdered ginger rhizomes are mixed to honey. Ginger drug is imported from the tropical countries.

In the present study, essential oil contents of the plant samples varied from 0.025% in lemon balm (*Melissa officinalis* L.) to 18,0% in clove (*Syzygium aromaticum* [L.] Merr. et Perry). The seeds of *Peganum harmala* and *Prunus mahaleb* had the trace level essential oil rates and literatures related to their essential oil contents could not be found. Essential oil contents of the plants vary in plant species, plant parts, ecological conditions, climate, **soil properties**, harvest time, processing, time after harvest etc., (Özgülven and Stahl-Biskup, 1989; Ceylan, 1995; Yaldiz *et al.*, 2005, Özgülven *et al.*, 2005). In the present study, differences among the plant samples for essential oil contents resulted from plant species and parts. Higher essential oil contents were mostly obtained from seeds. There are a lot of studies indicating that different plant species and parts have different essential oil contents in medicinal and aromatic plants (Yilmaz and Özgülven, 1989; Ceylan, 1995; Kirici and Özgülven, 1995). The essential oil contents obtained from the study were mostly higher than those in the literatures. Spices and herbal drugs sold in the region are mostly product of the last harvest year; therefore these products are expected to have higher essential oil contents.

Essential oil content values obtained in the present study were higher than those in Turkish food codex except for *Myristica fragrans*, *Pimenta dioica*, *Piper nigrum* and *Zingiber officinale* (Table 1). Lower essential oil contents of above plants may be resulted from a lot of factors such as old harvest year, unsuitable transport and storing conditions. Especially, in essential oil plants, post harvest processing until consumption excessively affects essential oil content and composition.

## CONCLUSIONS

The essential oil contents of investigated spices and herbs changed in a wide range. The rates varied from 0,025% in lemon balm (*Melissa officinalis* L.) to 18,0% in clove (*Syzygium aromaticum* [L.] Merr. et Perry). As known, essential oil contents of the drugs are affected by a number of factors such as plant species, ecological conditions, climate, soil conditions, harvest time, processing, time after harvest etc. Because of these factors, to make definite judgment is not possible. But, it can be said that the rates should be certain intervals. In the present study, a number of spice and herbal drugs were examined for essential oil contents. As a result, the drugs included high amount of essential oils and the rates were mostly higher than those in the national and international standards.

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Millions of Indians use herbal drugs regularly, as spices, home-remedies, health foods as well as over-the-counter (OTC) as self-medication or also as drugs prescribed in the non-allopathic systems 6. Millions of Indians use herbal drugs regularly, as spices, home-remedies, health foods as well as over-the-counter (OTC) as self-medication or also as drugs prescribed in. Lyantagaye SL: Ethnopharmacological and phytochemical review of *Allium* species (sweet garlic) and *tulbaghia* species (wild garlic) from southern Africa. Tanz. J. Sci 2011; 37: 17-21. Pirzad A, Alyari MR, Shaliba S, Zehtab-Salmasi and Moammadi A: Essential oil content and composition of German chamomile (*Matricaria chamomilla*L.) at different irrigation regimes. J Agron 2006; 5: 451-455.