

Phytochemical analysis of some plants from Lamiaceae family frequently used in folk medicine in Aligudarz region of Lorestan province

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ABSTRACT

Many of the plants from the Lamiaceae family have been traditionally used as medicine all over the world. Also, some of the secondary metabolites isolated from this family have shown interesting biological function. In this study we have analyzed phytochemicals of some plants from Lamiaceae family frequently used in folk medicine in Aligudarz region of Lorestan province. In this regard, the plant species were collected and systematically identified during 2014-2015. The traditional and local uses of collected plants were questioned through informed consent semi-structured interviews with local informants. Phytochemical analysis was conducted to test the presence of compounds such as alkaloids, flavonoids, saponins, tannins,

anthraquinone and glycosides. 25 plant species belonging to 13 genes were collected and identified. The most uses of the plants were in treating cold, gastrointestinal disorders and as flavoring agents. From 25 plant species, a number of 23 species had tannin, 22 species exhibited positive reactions to flavonoids, 4 species showed positive reactions to alkaloids and 1 species exhibited positive reactions to saponins. This research has provided insights on the use of secondary metabolites in folk medicine for promotion of appropriate human health. The studied plants in this article can be seen as a potential source for discovering new drugs.

Keywords: Medicinal plants, Lamiaceae, Ethnobotany, Pharmacognosy.

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INTRODUCTION:

The study and identify of used medicinal plants by local people is desirable, not only for the discovery of therapeutic agents, but also because such information may be valuable for disclosing new sources of such economic materials as tannins, oils, gums, precursors for the synthesis of complex chemical substances, etc (1-5). In addition, the knowledge of the chemical constituents of plants would further be valuable in discovering the actual value of folkloric remedies (6-9). Medicinal plants are so important for healthy of individuals and communities for prevention and treatment of their diseases (10-14).

Many of the plants from the Lamiaceae have been traditionally used as medicine all over the world (15). The value of these plants lies in somechemical substances that produce a definite physiological action on the human body, especially through flavonoids and phenolic compounds (16). Many of these indigenous medicinal plants are used as spices and food plants (17). Also the Lamiaceae taxa have a significant role and are applied as infusion of the aerial parts or as powder

mixed with honey or olive oil. The indigenous population also uses in folk-medicine derived from mineral and animal origin (18). Lamiaceae family with 46 genera and 410 species and subspecies have a great diversity and distribution in Iran. From these species, 124 species and subspecies (30%) are endemic to Iran (19-21). *Nepeta* (76 sp.), *Salvia* (56 sp.), *Stachys* (34 sp.), *Scutellaria* (19 sp.), *Phlomis* (17 sp.), *Eremostachys* (16 sp.), *Thymus* (16 sp.) and *Teucrium* (12 sp.) are the largest genera in Iran (22). This family contains a wide variety of chemicals. Many species of the family have been experimentally studied and the efficiency of some traditional applications was confirmed by these researches. For example, the anti-bacterial characteristic of *Thymus spp.* (thyme) is due to the occurrence of thymol in this genus. Many other species such as *Mentha spp.* (mints) have also been shown to be antibacterial. These properties are due to the mono- and sesquiterpene in the essential oils of these plants, but, it is becoming increasingly apparent that other compounds (eg. diterpenoids) may be responsible (23). The therapy provided by the plant species could be attributed to the presence of wide arrangement of phytochemicals such as alkaloids, flavonoids, saponins, tannins, terpenoids and anthraquinone glycosides which have a curative activity against pathogens and therefore support their folklore medicinal plant (24-27).

Aligudarz is one of the most important geographic regions in Iran because of its ancient history of cultivating traditional medicinal plants. Some wild species of Lamiaceae family

grow in this region. For this reason, they are used by the local herbalists for the treatment of various diseases and food additives. Thus, this study reviewed and analyzed the phytochemicals of plants from Lamiaceae family frequently used in folk medicine in Aligudarz, Iran.

MATERIALS AND METHODS

Geographic and climatic overview

Aligudarz is one of cities of the province of Lorestan in Iran, located 147 kilometers east of the center of the Lorestan. Its population is almost 142000. Aligudarz city center mountainous have situated in the central Zagros Mountains, between 33°23' northern altitude and 49°42' eastern longitudes. The city's altitude is approximately 2000 meters above sea level. Aligudarz region between 48°47' and 50°03' eastern latitudes and 33°44' and 33°35' northern longitudes with an altitude ranging almost from 1300 to 4050 meters. Annually, it rains 265mm and the average temperature is 12°C. District covers an area of approximately 5870 Km² (Figure 1).

Preparation of herbarium species:

In the present study, 25 plant species were collected in a proper growing season from plains, farms, and mountains from May



Figure1. Aligudarz region in Lorestan province of Iran.

2014 to September 2015. After sample collection, the plants' species were dried and then pressed, and the samples with standard taxonomic were identified by Mr. Mohamad Taghi Fizi based on flora of Iran, Lamiaceae flora (21, 28), and medicinal plants and traditional medicine books (29, 30). The duplicates were intended for herbarium of Pharmacy and Pharmaceutical Sciences, Isfahan University of Medical Sciences, Isfahan, Iran.

Data collection:

In the first stage, samples were selected based on Morgan table (31). The sample size of local informants was 385. This study was conducted among indigenous people of Aligudarz region. Of the 384 local informants (20 years and above) targeted population, 192 were interviewed using a questionnaire by informed consent. 192 of 384 harmonized information were used in this study.

Observation, oral semi-structured interviews and questionnaires were the tools commonly used for data collection. The plants were collected around the villages of the informants and were shown to them to confirm

the plant names. The oral interviews were directed with the assistance of an interpreter, who was guided by village elders from different districts who were well introduced with the medicinal informants. The questionnaire contained information about local naming, parts which were used for medicinal-medicine-nutritional purposes and mode of folk preparation some of plants from Lamiaceae. All information was recorded. The data collection process, lasted 24 months.

Procedure for phytochemical tests:

Phytochemical analysis was conducted to test for the presence of compounds such as alkaloids, flavonoids, saponins, tannins, anthraquinone and glycosides. Aerial parts of the 25 plant species of Lamiaceae collected from the study area were investigated. The chemical tests were carried out on the aqueous extract and on powdered sample from the aerial part using standard procedures to identify the constituents as described by previous studies (32-38). The phytochemical screening of the various plant species was supposed to reveal the presence or absence of the various secondary metabolites (Table 1).

Table 1. Chemical basis and reagents for phytochemical tests

Tests	Reagents	Positive result
Flavonoids Shinoda's test	Boric acid; Oxalic acid; HCl; Zn; C ₂ H ₅ OH	Strong red At a wavelength of 365nm green/blue greenish yellow
Alkaloid	Mayer's reagent; Wagner's reagent; Dragendorff's reagent; Potassium mercuric iodide (iodine in potassium iodide solution of potassium bismuth iodide)	Orange ppt. yellow colored precipitate brown/reddish precipitate
Tannins Braymer's test	Gelatin; dist. H ₂ O; NaCl; FeCl ₃	Formation of jelly ppt. Blue -black (hydrolysable) Brownish-green (condensed/ nonhydrolysable)
Anthraquinones Borntrager's test	Ammonia solution	Red coloration
Glycosides	Baljet-Reaction Kedde-Reaction NaOH solution; Picric acid	Orange ppt. Purple coloration
Saponins Froth test	H ₂ O	Stable foam

Table 2. Medicinal plants used by the indigenous people of Aligudarz region

Scientific names Voucher number	Local names	Parts Used	Local Usage	Persian names	Preparation
<i>Ajuga chamaecistus</i> Ging. ex Benth 3100	Unknown	L.	Analgesic	Moshkak sefis	Decoction; Poultice
<i>Dracocephalum kotschyi</i> Boiss 3101	Zar avi	L.	Removing renal pain; Analgesic; Tonic; Dyspepsia; Stomach ache; Abdominal pain; Joints pain; antitumor	Zarin giah	Decoction; Food additive
<i>Eremostachys laevigata</i> Bung e 3102	Kandal Kouhi Kangal	L.; R.	relief of the pain caused by insects infection Female urinary tract	Gandna kouhi	Infusion; Poultice
<i>Lamium amplexicaule</i> L. 3103	Gazaneh sa	A.p	Diarrhea; Diaphoretic; Anti diabetics; Analgesic	Charkhak	Infusion; Poultice
<i>Lamium album</i> L. 3104	Gezgazo	A.p	Diarrhea; Diaphoretic; Anti diabetics; Analgesic	Gazaneh-sefid	Decoction
<i>Lallemantia iberica</i> F. & C. M 3105	Balangoo shahri	S.	Common cold; Stomach ache; Coughing; Abdominal pain	Balangoo shahri	Infusion; Tea; Soaked in water
<i>Marrubium anisodon</i> K.Koch. 3106	Gandna kouhi	S.; A.p.	High blood pressure; Cardiac; Common cold; Analgesic; Anti- inflammatory; Pain caused by insects Flatulence; Dyspepsia; Women infertility	Ferasuon sefid	Decoction; Poultice
<i>Mentha longifolia</i> (L.) Hudson 3107	Pine	A.p.	Flavoring agent; Dyspepsia; Stomach tonic; Diarrhea; Common cold; Infertility; Joints pain; Dysmenorrhea; High blood pressure; Coughing; Flatus; Abdominal pain	Poneh	Infusion; Decoction
<i>Phlomis olivieri</i> Benth. 3108	Chlpo	Wh.p.	Wound healing; Heart Diseases; Gastrointestinal diseases	Goshbare	Poultice; Decoction
<i>Salvia ceratophylla</i> L.3109	Balbal Goosh	A.p.	Common cold.	Maryam goli	Decoction
<i>Salvia reuterana</i> Boiss 3110	Shadona	Fr.; S.	Abdominal pain; Edible; Diarrhea; Eye pain; Depression	Maryam goli-e- kouhi Esfahani	Decoction; Edible

<i>Salvia syrica</i> L. 3111	Bala goosha	Fr.; A.p.	Edible abdominal pain	Maryam goli sori	Edible; Scorched
<i>Salvia multicaulis</i> Vahl 3112	Earuneh Bala	Fl.	Common cold; Migraine	Gol-earuneh	Decoction
<i>Salvia hydrangea</i> DC. ex Benth 3113	Gol-earuneh	Fr.; A.p.	Common cold; Headache	Maryam goli	Decoction.
<i>Salvia nemorosa</i> L. 3114	Bala Gooshae	Fl.	Bile; Common cold.	Maryam goli	Decoction.
<i>Stachys acerosa</i> Boiss 3115	Unknown	A.p.	Common cold.	Sonbole kohsari	Decoction
<i>Stachys pilifera</i> Benth. 3116	Korkegorbe	A.p	Toothache; Edible; Tonic; Analgesic; Edema; Expectorant; tussive	Sonbole korkaloud	Decoction.
<i>Stachys inflata</i> Benth 3117	Olile	A.p	Common cold; Analgesic; High blood pressure.	Sonbole badkonaki	Decoction.
<i>Stachys lavandulifolia</i> Vahl 3118	Korkegorbe	A.p	Headache, renal calculus Common cold. Sedative Flavoring agent. abdominal pain	Chay kouhi	Decoction. Food additive
<i>Teucrium polium</i> L. 3119	Chez	A.p	Jaundice; Fever; Abdominal pain; Diarrhea; Nausea; Blood sugar; Respiratory distress	Kalporeh	Infusion
<i>Thymus daenesis</i> spp. daenensis Celak 3120	Oshom orishom mahali	Wh.p.	Flatus; Fever; Kidney disorders; Fever; Diuretic; Coughing; Flavoring agent; Antispasmodic	Avishan denai	Food additive; Decoction.
<i>Thymus eriocalyx</i> (Ronniger) Jals 3121	Orishom	L.	Flatus. Fever. Kidney disorders Common cold. Asthma. Antispasmodic	Avishan kouhi	Food additive Decoction.
<i>Thymus lancifolius</i> Celak 3122	Orishom	L.	Common cold; Coughing; Flavoring agent; Antispasmodic	Avishan kouhi	Food additive; Decoction.
<i>Ziziphora clinopodioides</i> Lam. 3123	Pine kouhi	A.p.	Headache; Common cold; Flavoring agent; Stomach ache; Nausea; Appetizer; Stomach tonic	Kakuti Kouhi; Avishan bargbarik	Food additive Decoction.
<i>Ziziphora tenuior</i> L. 3124	Pine kouhi	A.p.	Appetizer; Stomach tonic; Common cold	Kakuti; Pinah koei	Food additive Decoction.

RESULTS

A total of 25 plant species of Lamiaceae family collected from the study area were investigated. These plants belonged to 13 genera which were most commonly used by the indigenous people of Aligudarz region. The most parts of the plants that were frequently used by native people include aerial parts (52%), leaf (20%), flowers (16%), seeds (12%), roots (4%) and whole plant (8%).

In Aligudarz city, traditional medicines are mostly used to treat common cold and gastrointestinal disorders, although they are also used to treat variety of diseases. The information collected from folk medical practitioners were summarized

and tabulated. Most of the researched plants were found to be very effective in the treatment of gastrointestinal infections and complications (Table 2).

From 25 plant species, a number of 23 species had tannin; 22 species exhibited positive reactions to flavonoid, 4 plants showed positive reaction to alkaloids and 1 plant species exhibited positive reactions to saponins. From about 25 plant species, certain phytochemicals combinations such glycosides and anthraquinone were absent among the studied species. The most frequent components were tannins and the least frequent were saponins (Table 3).

Table 3: Results of phytochemical tests/screening

No.	Scientific name	Alkaloids	Flavonoids	Saponins	Tannins
1	<i>Ajuga chamaecistus</i> Ging. ex Benth	+	-	-	+
2	<i>Dracocephalum kotschyi</i> Boiss.	-	+++	-	+++
3	<i>Eremostachys laevigata</i> Bunge	-	-	-	++
4	<i>Lallemantia iberica</i> F. & C. M	-	+	-	+
5	<i>Lamium album</i> L.	-	+	-	+
6	<i>Lamium amplexicaule</i> L.	-	+	-	-
7	<i>Marrubium astracanicum</i> Jacq.	+	++	-	+
8	<i>Mentha longifolia</i> (L.) Hudson	+	++	-	+++
9	<i>Phlomis olivieri</i> Benth.	-	+	-	-
10	<i>Salvia nemorosa</i> L.	-	+	-	++
11	<i>Salvia reuterana</i> Boiss	-	+	-	+
12	<i>Salvia syrica</i> L.	-	+	-	+
13	<i>Salvia ceratophylla</i> L.	-	+	-	++
14	<i>Salvia multicaulis</i> Vahl	-	+	-	+
15	<i>Salvia hydrangea</i> DC. ex Benth.	-	+	-	+
16	<i>Stachys acerosa</i> Boiss	-	+	-	+
17	<i>Stachys lavandulifolia</i> Vahl	+	+	-	+
18	<i>Stachys pilifera</i> Benth.	-	+	++	++
19	<i>Stachys inflata</i> Benth.	-	+	-	++
20	<i>Teucrium polium</i> L.	-	++	-	++
21	<i>Thymus daenesis</i> spp. daenensis Celak	-	++	-	+
22	<i>Thymus eriocalyx</i> (Ronniger) Jalas	-	++	-	++
23	<i>Thymus lancifolius</i> Celak	-	+	-	+
24	<i>Ziziphora clinopodioides</i> Lam.	-	++	-	+
25	<i>Ziziphora tenuior</i> L.	-	-	-	+

Key: + = Presences of constituents; - = Absence of constituents; (+) score was recorded if the reagent produced only a slight opaqueness; (++) score was recorded if a definite turbidity, but no flocculation was observed and (+++) score was recorded if a definite heavy precipitate or flocculation was produced.

DISCUSSION

This study introduced 25 plant species used by local people the Aligudarz, Iran. Although ancient sages through trial and error methods have developed herbal medicines, the reported uses of plant species do not certify their efficacy (39). Reports on ethnomedicinal uses of plant species required pharmacological screenings, chemical analysis, and the tests for their bioactive activities (40-43).

In this study, pharmacological screening of plant extracts provided an insight regarding both their therapeutic and toxic features. The presence of phytochemicals with various pharmacological and biological properties determines the medicinal values of various plant species as useful sources of drugs in ethnomedicine. These phytochemicals are the active ingredients in plants that make them useful in folk medicine (44, 45). These properties of plants have been confirmed in different trials (46-50).

Many species of the Lamiaceae family, especially endemics, are used locally by indigenous people in different parts of Iran. There is little information or documented references about their uses. For example, *Phlomis olivieri* Benth. L. is used locally in the Aligudarz region for wound healing and treatment of gastrointestinal diseases. Lamiaceae family is useful for scientists and pharmaceutical industries compared with other species. They can help us to identify medicinal plants as well as to eliminate the practices that may be harmful (51). Also the therapeutic effects of plants can be attributed to the phytochemicals such as alkaloids, flavonoids, sterols, saponins, tannins, terpenoids and glycosides which can show a curative activity against pathogens and therefore support their traditional usage in various illnesses (52, 53).

Alkaloids have analgesic, antispasmodic, antidiarrheal, and antibacterial properties (54-56). In the present study, some of the plant species with analgesic effects were *Ajuga chamaecistus* Ging. ex Benth, *Marrubium astracanicum* Jacq., *Mentha longifolia* (L.) Hudson, and *Stachys lavandulifolia* Vahl.

The flavonoids display a remarkable array of biochemical and pharmacological actions as well as anti-inflammatory,

antioxidant, antiallergic, hepatoprotective, antithrombotic, antiviral antidiarrheal, and anti-carcinogenic activities (52, 56, 57). In the present study, 22 out of the 25 plant species analyzed by exhibited qualitative methods had flavonoids. For example, *Dracocephalum kotschyi* Boiss. which contains flavonoids, is used in various illnesses including removing renal pain, analgesic; tonic seizure, dyspepsia, stomach ache, abdominal pain, Joints pain, and antitumor. Also it has been shown that thymus species have been used in folk medicine as antimicrobial, antispasmodic, antibacterial, and analgesic agents due to the presence of their flavonoids (52).

Saponins are glycoside of both triterpenes and sterols and are used as expectorant and emulsifying agent (58-60). *Stachys pilifera* Benth is used in various illnesses including toothache, analgesic, edema, and tussive. Its extract was revealed to contain saponins and flavonoids which are known to produce inhibitory effects on inflammation.

Tannins have been reported to show antimicrobial, antitumor, antiinflammatory and wound healing properties in other organs (56). Moreover, tannins have been used for immediate relief of sore throats, diarrhea, dysentery, hemorrhaging, fatigue, and skin ulcers (61). Therefore, plant species from this study found to contain tannins which could have useful therapeutic aspects to cure various diseases. For example, *Eremostachys laevigata* is used for relief of the pain caused by insects and infection in female urinary tract.

CONCLUSION

According to our results, used plants in Aligudarz region can be as a potential source of useful drugs. Thus the evaluation of the pharmacological private for medicinal plants of this region is suggested and further researches on the secondary metabolites of the plants are recommended.

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Lorestan ilinin Aligudarz bölgesinde halk ilacı olarak sıkça kullanılan Lamiaceae familyasından bazı bitkilerin fitokimyasal analizi

ÖZ

Lamiaceae familyasından birçok bitki tüm dünyada geleneksel halk ilacı olarak kullanılmaktadır. Bu familyadan hareketle izole edilen sekonder metabolitlerinde ilgi çekici biyolojik etkilere sahip olduğu gösterilmiştir. Çalışmamızda, Lorestan ilinin Aligudarz bölgesinde halk ilacı olarak sıkça kullanılan Lamiaceae familyasından bazı bitkilerin fitokimyasal analizi yapılmıştır. Bu amaçla 2014-2015 yılları arasında bitkiler toplanmış ve sistematik olarak tanımlanmıştır. Bitkilerin geleneksel ve bölgesel kullanılışları bölge halkından bilgilendirilmiş onam ve yarı yapılandırılmış görüşme yöntemiyle derlenmiştir. Bitkilerde; alkaloidler, flavonoidler, saponinler, taninler,

antrakınon ve glikozitler gibi bileşenlerin varlığını saptamak için fitokimyasal analizler yapılmıştır. 13 Gene ait 25 bitki türü toplanmış ve tanımlanmıştır. Bitkilerin en çok, soğuk algınlığı ve gastrointestinal rahatsızlıkların tedavisinde ve aroma verici olarak kullanıldığı saptanmıştır. 25 Bitki türünden 23'ünün tanen içerdiği, 22 türün flavonoid, 4 türün alkaloid ve 1 türün saponin tanı tepkimeleri sonucunda pozitif sonuç verdiği tespit edilmiştir. Bu araştırma insan sağlığına katkıda bulunmak için geleneksel halk ilacı olarak kullanılan sekonder metabolitlerin kullanımı için bir yaklaşım sağlamaktadır. Bu makale kapsamında incelenen bitkiler, yeni ilaçlar keşfetmek için potansiyel birer kaynak olarak değerlendirilebilir.

Anahtar kelimeler: Tıbbî bitkiler, Lamiaceae, Etnobotanik, Farmakognozi

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