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## Taxonomic and medicinal survey of *Lamiaceae* in the hilly area of Dir Kohistan, Khyber Pakhtunkhwa, Pakistan

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The local herbalists prepared different herbal drugs from different species of the selected family plant species for the treatment of different diseases. When preparing the drugs the scientific name is used during the processes of labeling of the drugs for this purpose a taxonomic survey was conducted in the study area to identify the plants to solve the problem of labeling. A total of twenty-four plant species and 18 genera of the selected family were collected from Dir Kohistan, with elevation ranges from 1300-45000 meters during 2017-2018. They were taxonomically determined, recorded the information about these native plants, and have been described for the first time in the history of this area. Because the wild plant species are scarcely distributed therefore efforts should be made to conserve them. The key objective of the present research was to file the taxonomic knowledge of plant species of the selected family. Furthermore, a key to the plant genera and species are given. The GPS (Global position system) elevation data and distribution of the species in the selected area are also discussed in this research Work. Nine targeted area were visited like Thall, Kumrat, Shahoor, Janaus Kandio, Ganshal, Jaz banda, Sundarae, Gul dai were visited during blooming season from Jun- August. The study area is rich in terms of floral diversity. Local people of the area use the plant species in traditional ways for the treatment of different diseases like use for flavouring, food preservation, and medicinal purposes with potent antibacterial, antioxidant, anti-inflammatory, antimicrobial, antiviral, fungicides, virucides, antiparasitics, pesticides and anticancer activities which maintains or improves overall health. Since early times. Due to anthropogenic pressure and natural ruins flora of the area facing gigantic pressure of extinction.

**Keywords:** Taxonomic Diversity, Lamiaceae, Elevation, Dir Kohistan.

### INTRODUCTION

The research area in which the study is conducted is situated in the North-East of Dir which is surrounded by the Hindukush Raj on North and West. Torwal and Gabral areas are located in the East. Dodbah Sir Ghair and Batraei Ghair located in the South and Southwest

respectively (Hazrat et al., 2011). District Dir (U) is one of the 26 districts of Khyber Pakhtunkhwa and covers an area of 3699 km<sup>2</sup>. Kohistan valley starts from the gateway of babe Kohistan called Khwgo Oba and extended to up to the valley of Kumrat. (Hazrat et al., 2007). According to forest division the area of Dir (U) Kohistan 645 square miles. Out

of this an area of 140351 acres was covered by coniferous or pine forests (DCR, 2017).

Taxonomic diversity means the varieties of plants of the selected family distributed in the study area. Plants belonging to the selected family of any category of the taxonomic rank of the hierarchy are collected. Flora of the selected family includes all the wild and cultivated plants of the selected area like the study conducted by (Ali, 2008). Similarly, Chitral is an area of rich floristic diversity (Stewart 1972, 1982). Though processes of the evolutionary success of angiosperm and its different innovations remained difficult (Crepet and Niklas, 2009). The Hindukush mountain range on the planet covering an area of 3500 km<sup>2</sup> in South Asia which is globally one of the five floristically most important regions (Myers, 2001; Shinwari, 2010). The selected family is one of the important family of plants. Most of the species of this family are aromatic species which shows that these species are very important for medicinal purposes due to the wealth of high valued chemical constituents. The selected family has great economic export value for Pakistan (Hazrat et al. 2013). Sixteen species of the selected family were checked and identified with the help of morphological characters. And also generate easy taxonomic keys that enable the young researcher's scholar and many others who's interested in the identification of these species (Nasir, 1972). This study is based on the herbarium preserved specimens kept in the herbaria of both Shaheed BB University Sheringal and the University of Malakand. It is very easy for expert and non-expert in the taxonomy to use it. The present study recommended to starting of a national wide program for the conservation of these species and also include other families, species and genera. The objectives of the study were collection, identification and mounting of the plant species of the selected family on standard herbarium sheet as a reference for future researchers.

#### **MATERIALS AND METHODS**

The present survey was carried out in the study area from 2017-2018 and the area was visited frequently. This paper is based on the collection and then identified of the species in the flowering seasons with the help of flora of Pakistan and Taxonomic experts. (Stewart., 1972 and Ali & Qasir., 2009). Some species are easy and identify in the field from the fresh whole plant

material. The flowers were boiled for about 2 to 3 minutes to study them under the stereoscope from the dried specimens. Keys of all the species and genera were drawn and the data regarding the botanical name, local name, part used, elevation and research area are presented in table 1. The data regarding the medicinal uses of the selected family species are listed in table 1.

#### **RESULTS AND DISCUSSION**

The research area showed great taxonomic diversity. All the plants of the selected family are well represented in the research area. The current research was designed to find out the Taxonomic diversity of plants of Dir Kohistan Valley because it is a remote and hilly area which has not been studied previously for such type of studies. A total of 24 species has been collected and preserved from the hilly area of Dir Kohistan. Species keys are generated for all the species. And the data of plants are tabulated in table 1 in the form Voucher Number, Botanical name, Local name, Villages in the research area and Elevation in the meter. The present research work is the first of its kind from this selected area of Kohistan. Based on morphology observation, these species are differentiated from one another. The plants were classified and described in semitechnical language. Bracket keys were constructed to ensure their easy classification and description. All the representative genera, species and infra specific categories were described morphologically and their diagnostic features were recorded. Medicinally almost all the plants had more than one uses by the local people. Most of the plants are important medicinally. Despite various ailments members of the family Lamiaceae collected from the research area are also used for various traditional and religious aspects. The plants have diverse uses in a number of therapeutic classes of disorders. Most of the plants recorded are used in gastric and stomach disorders. The current study provides basis for all the plants reported for the family Lamiaceae from the research area. These works are mostly in accordance with (Ahmad et al., 2009, Burni and Hussain 2011, Shaheen et al., 2012). All the information related to medicinal uses of the plants belonging to the family Lamiaceae were recorded in a comprehensive table 1.

Table 1: Checklist of wild plant species of Lamiaceae of Dir upper

Sr. No	V.N	Botanical Name	Vernacular Name	Research Area	Elevation in meter	Part used	Medicinal uses
1.	308	<i>Ajuga bracteosa</i> Wall. Ex Bth.	Khawaga Bouti , Da Ghra Buti	Common	1300-2000	Leaves	Antibacterial
2.	797	<i>Calamintha hydaspidis</i> (Falconer ex Bth.) Hedge	Nil	Ganshal,Shahor,Dogdara,Sheringal	1500-2500	Whole plant	Stomachic, depression, insomnia and painful menstruation
3.	332	<i>Colebrookea oppositifolia</i> Sm.	Binda	Sawnai, Shahoor, Dogdara,	1400-3000	Whole plant	Anthelmintic, antiseptic
4.	311	<i>Elsholtzia densa</i> Lab.	Nil	Lamutae, Shahoor,	1300-2500	Leaves	Headaches, pharyngitis, fever, diarrhea, digestion disorder, rheumatic arthritis,
5.	248	<i>Isodon rugosus</i> (Wall. Ex Bth.) Codd	Sperkay	Common	1300-2500	Whole plant	Tooth ache, gastric pain, abdominal pain, ear ache, and generalized body pain
6.	238	<i>Lamium album</i> L.	Halam	Sheringal, Shahoor, Dogdara	1300-1400	Seed	Traditional treatment for abnormal vaginal discharge
7.	686	<i>Lamium amplexicaule</i> L.	Halam	Common	1300-1500	Seed	Anti-rheumatic, diaphoretic, an excitant, febrifuge, a laxative and a stimulant.
8.	717	<i>Mentha arvensis</i> L.	Pudina	Sia Sheringal, Shahoor, Dogdara,	700-1300	Leaves	Rheumatic pains, arthritis, and as remedy for inflamed joints
9.	707	<i>Mentha longifolia</i> (L.) L.	Valena, Yenalae	Common	700-1300	Leaves	coughs, colds, stomach cramps, asthma, flatulence, indigestion and headaches
10.	697	<i>Mentha spicata</i> L.	Zangali Pudina	Common	1000-1300	Leaves	antispasmodic, carminative, diuretic, restorative, stimulant and stomachic
11.	228	<i>Mentha x piperita</i> L.	Yakha Podina	Patark, Shahoor, Dogdara,	700-1300	Leaves	Menstrual pains, diarrhea, nausea, depression-related anxiety, muscle and nerve pain,
12.	295	<i>Nepeta brachyantha</i> Rech. F. & Edelb.	Nil	Sunderae, Shahoor, Dogdara, S	1300-1500	Whole plant	Stomach, diarrhea
13.	285	<i>Nepeta laevigata</i> (D. Don) Hand.-Mazz.	Nil	Janus, Shahoor, Dogdara, Sheringal, Sunderae, Lamutai	1300-3000	Whole plant	Repellent <b>properties</b> to insect pests, including aphids
14.	456	<i>Ocimum basilicum</i> L.	Kashmalae	Cultivated	700-1300	Leaves and flower	Antioxidant, antibacterial, antimicrobial, antifungal, antiviral, cytoprotective,

							anticonvulsant, hypoglycaemic,
15.	446	<i>Organum vulgare</i> L.	Shomokay, Shamakae	Common	1300-2000	Whole plant	Antiseptic, antispasmodic, carminative, cholagogue, diaphoretic, emmenagogue, expectorant, stimulant, stomachic and mildly tonic.
16.	436	<i>Otostegia limbata</i> (Bth.) Boiss.	Speen Azghay	Sawani, Shahoor, Dogdara, Sheringal.	1300-2500	Areal portion	antispasmodic, antiulcer, antidepressant, sedative, anxiolytic, anti-inflammatory for eyes inflammation, antibacterial, antioxidant
17.	307	<i>Phlomis bracteosa</i> Royle ex Bth.	Oudegula	Kumrat, Shahoor, Dogdara, Sheringal, Sunderae, Lamutai	1300-2000	Whole plant	cough and cold
18.	1013	<i>Rosmarinus officinalis</i> L.	Rosmera	Cultivated	1300	Leaves	Alleviate muscle pain, improve memory, boost the immune and circulatory system, and promote hair growth
19.	178	<i>Salvia moorcroftiana</i> Wall. ex Bth.	Khardag, Kharghway	Common	700-1300	Leaves and flowers	Colds, coughs emetic, dysentery, haemorrhoids and colic
20.	687	<i>Scutellaria scandens</i> Buch.- Ham. Ex D. Don	Nil	Sheringal, Shahoor, Sunderae, Lamutai	1300-1400	Whole plant	antiinflammatory, antispasmodic, emmenagogue, nervine, sedative, and strong tonic
21.	137	<i>Teucrium royleanum</i> Wall. Ex Bth.	Spenbuty	Common	1300-1700	Areal portion	Antispasmodic
22.	426	<i>Teucrium stocksianum</i> Boiss.	Kwandi boutae	Common	1300-2000	Whole plant	analgesia, liver disorders, jaundice, coughing and miscarriage
23.	416	<i>Thymus linearis</i> Bth.	Sperka	Samang, Shahoor, Dogdara, Sheringal, Sunderae, Lamutai	1300-2800	Whole plant	expectorant, antispasmodic and carminative
24.	406	<i>Ziziphora clinopodioides</i> Lam.	Nil	Cultivated	1300-2000	Whole plant	Sedative, stomachic, carminative

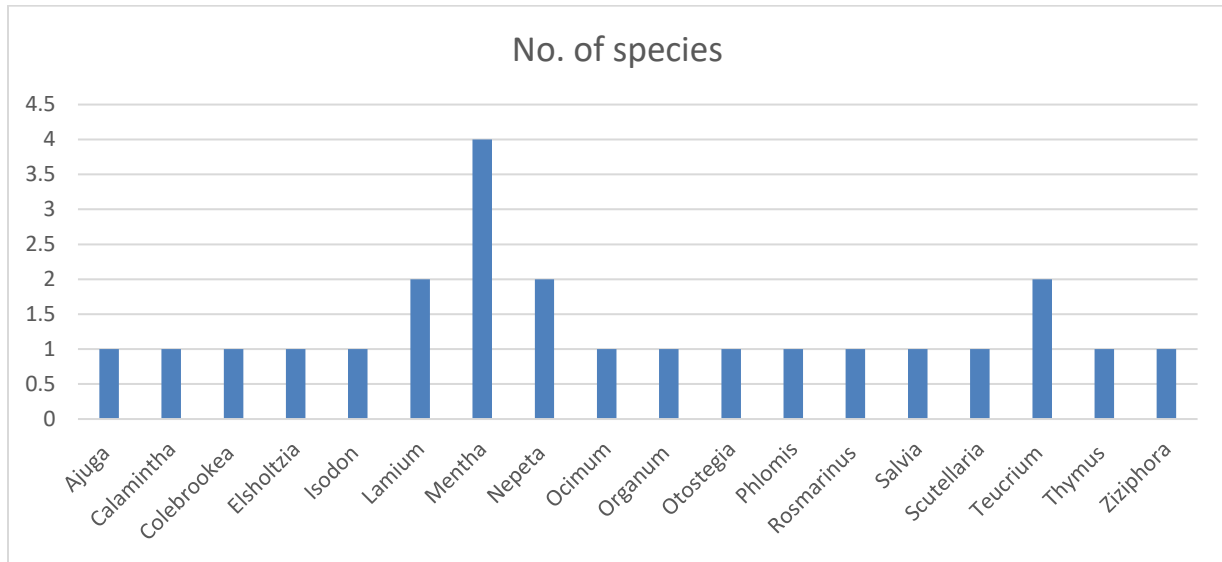


Figure 1: Genus wise distribution of Lamiaceae

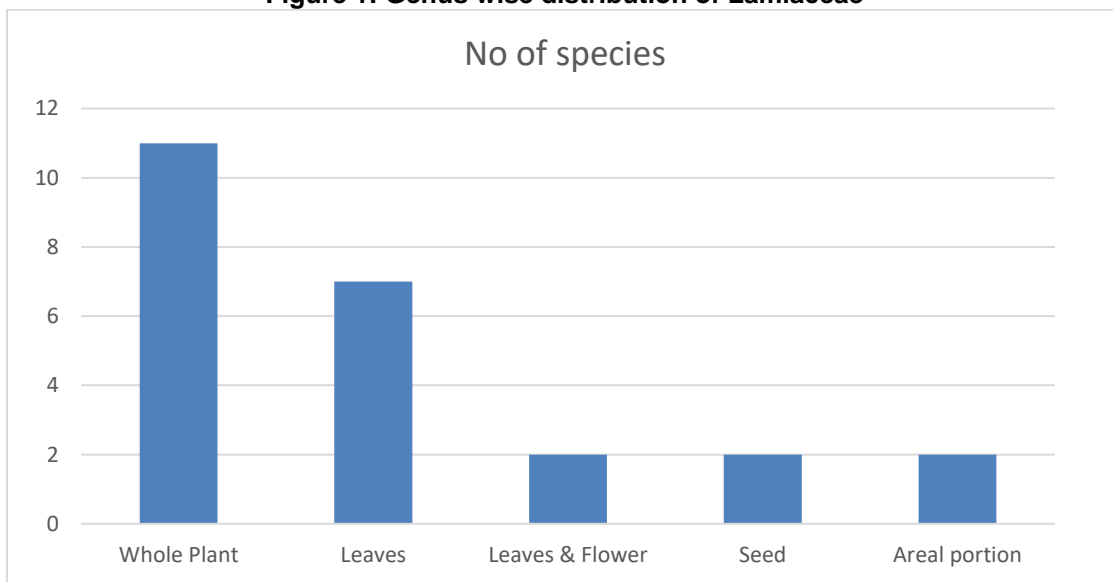


Figure 2: Part used of the species

**Key to the genera**

1. Corolla less than 4 mm long.-----5
- + Corolla 5 mm long or more -----2
2. Plants with at least some branched hairs with hard spines at leaf apex or in leaf axils.-----6
- + Plants with simple unbranched glabrous and axillary spines absent-----3
3. Leaf margin crenulate to serrate or lobed -----8
- + Leaf margins other wise -----4
4. Calyx bilabiate, lobes of upper and lower parts usually unequal in size-----9
- + Calyx not bilabiate; lobes of upper and lower parts of equal size-----11
5. Teeth of fruiting calyx plumose and up to 6 mm long -----*Colebrookea*

- + Teeth of fruiting calyx not plumose and less than 5 mm long-----*Elsholtzia*
- 6. Spiny shrubs or subshrubs-----*Otostegia*
- + Perennial herbs or shrub without spines-----7
- 7. Inflorescence of cymes borne on slender lateral branches-----*Isodon*
- + Inflorescence of ± sessile verticillasters-----*Mentha*
- 8. Corolla 6-10 mm long; calyx 3.5-5 mm long; nutlets rounded-----*Nepeta*
- + Corolla more than 20 mm long; calyx more than 10 mm long; nutlets truncate-----*Phlomis*
- 9. Annuals, dwarf-----*Ziziphora*
- + Perennial or suffruticose herbs-----10
- 10. Lower calyx teeth subulate, leaves ciliate near base of lamina-----*Thymus*
- + Lower calyx teeth not subulate, leaves not basally ciliate-----*Origanum*
- 11. Lower lip of corolla entire-----*Ocimum*
- + Lower lip of corolla 3-lobed-- -----12
- 12. Stamens 2; staminal connectives clearly developed, separating the thecae-----*Salvia*
- + Stamens 4; staminal connectives not separating the thecae-----13
- 13. Calyx upper and lower lips entire, rounded-----*Scutellaria*
- + Calyx upper and lower lips divided into teeth or lobes-----14
- 14. Slender annual; corolla 6 mm long-----*Calamintha*
- + Perennial; corolla 7-14 mm long-----15
- 15. Upper lip of corolla very short or absent; nutlets with lateral attachment scar-----16
- + Upper lip of corolla present; nutlets with a basal attachment scar-----*Lamium*
- 16. Upper lip of corolla small, bilobed; lower lip 3-lobed-----*Ajuga*
- + Upper lip of corolla absent; lower lip 5-lobed-----*Teucrium*

Note: *Rosmarinus officinalis* is cultivated specie in the area that's why not included in the key.

Genus: *Mentha* L., Sp. Pl. 576. 1753.

**Key to the species**

- 1 Verticillasters in axils of upper leaves----- *Mentha arvensis*
- + Verticillasters subtended by small linear to lanceolate bracts-----2
- 2 Stem and leaves glabrous----- *Mentha spicata*
- + Stem and leaves hairy-----3
- 3 Leaves sessile or almost so----- *Mentha longifolia*
- + Leaves petiolated-----4
- 4 Calyx 3-4 mm; stem and leaves with a thin indumentum; plants sterile-----*Mentha piperita*
- + Calyx 1.5-2 mm; stem and leaves with a thick indumentum; plants fertile-*Mentha royleana*

Genus: *Nepeta* L., Sp. Pl. 570. 1753.

**Key to the species**

- 1 Stem 10-25cm, not branched -----*Nepeta brachyantha*
- + Stem 30-80cm, branched-----*Nepeta laevigata*

Genus: *Lamium* L., Sp. Pl. 579. 1753.

- 1 Annual with pink-purple flowers----- *Lamium amplexicaule*
- + Perennial with white flowers-----*Lamium album*

Genus: *Teucrium* Diagn. ser. 2, 4: 58. 1859.

**Key to the species**

- 1 Calyx 4-5 mm long, bilabiate -----*Teucrium royleanum*
- + Calyx 5-7.5 mm, obliquely campanulate -----*Teucrium stocksianum*

## CONCLUSION

The majorities of the local inhabitants in the study area are illiterate and need to be trained about the handling of plants and also medicinal plants on the scientific basis for harvesting and preservation. There is an urgent need for a more detailed analysis of the economic value and cultural practices associated with the collected species.

## CONFLICT OF INTEREST

The authors declared that the present study was performed in the absence of any conflict of interest.

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## AUTHOR CONTRIBUTIONS

AH, KS and ZA designed and performed the experiments and also wrote the paper, MM, ZF and SB help in medicinal uses survey, JZ, SZ and GR help in the collection and identification, AU and MN help in data analysis and reviewed the manuscript. All authors read and approved the final version.

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