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Diversity of medicinally potential aromatic plants of the Lamiaceae family in Bangladesh Agricultural University Botanical Garden

Ashrafuzzaman M*, Md. Jahid Hasan Jone, Golam Sarwar AKM

ABSTRACT

The mint family Lamiaceae is important for producing strong aromatic essential oils and is widely cultivated for medicinal, perfumery, culinary, and ornamental purposes. Lamiaceae plants are also used for a variety of ethnobotanical and religious purposes. A survey was conducted to update the list of medicinal and aromatic plants belonging to the family Lamiaceae conserved at the Bangladesh Agricultural University Botanical Garden (BAUBG) and review its ethnobotanical uses. A total of 50 species belonging to 18 genera were recorded in BAUBG. *Clerodendrum* was the most dominant genus with nine species, followed by the genus *Ocimum* with five, *Vitex* with four, and *Callicarpa*, *Hyptis*, *Leucas*, *Mentha*, and *Salvia* with three species each; and the remaining genera contributed only one species each. In terms of habit formation, herbs were the highest percentage (46%) followed by trees (30%) and shrubs (24%). Leaves were the most commonly used part (31 species) followed by roots (14 species) and fruit (13 species). According to IUCN conservation categories, forty plant species are categorized as “Least Concern”, while seven species are categorized as “Not Evaluated”. The three remaining species are classified as Conservation Dependent, Data Deficient, and Vulnerable. Various species of the genera *Hyptis*, *Leonurus*, *Mentha*, *Ocimum*, *Origanum*, and *Salvia* are the most popular plants in Bangladesh's traditional remedies and are often used for the treatment of wounds, skin diseases, gastritis, infections, dermatitis, bronchitis, and inflammation.

Keywords: Medicinal Plants, Aromatic Plants, Diversity, Lamiaceae, Bangladesh

1. INTRODUCTION

The mint family Lamiaceae, one of the largest plant families, is composed of 236 genera and over 7,000 species of aromatic herbs, shrubs, trees, and rarely of vines. The plants of the Lamiaceae family are mostly originated in Southern

Europe around the Mediterranean Sea because some of them produce large quantities of essential oils, which enable them to endure the sweltering heat and have now distributed all over the world (Suthar and Patel, 2014). Some genera of Lamiaceae, such as *Callicarpa*, *Clerodendrum*, *Gmelina*, *Premna*, *Tectona*, and *Vitex* were previously reported in the family Verbenaceae, the closest relative of this family. The most popular members of this family are several aromatic herbs and spices, including thyme, mint, oregano, basil, sage, rosemary, lemon balm, and a few others with more specialized uses. These are significant due to their medicinal benefits, fragrance, culinary, vegetable, and ornamental uses, and they are a rich source of biologically active substances such as tannins, saponins, and organic acids. They are also important as they possess therapeutic potential (Naghbi et al., 2005; Sharma and Bhadange, 2013). Over 60% of the world's population, including 80% in developing countries, still focuses entirely on medicinal plants for their healthcare needs, making traditional medicine the preferred primary healthcare system in many communities. This is a result of a wide range of factors, including economic feasibility, accessibility, and affordability. Sedative, diuretic, tonic, antispasmodic, antifungal, antibacterial, anti-inflammatory, and antiseptic properties are among the numerous therapeutic potentials of the medicinal plants of this family (Rai et al., 2013). In addition to their aromatic properties, many members of this family are frequently cultivated due to their ease of cultivation. In addition to those planted for their edible leaves, some are grown for their ornamental foliage, such as *Coleus*, while others are grown for food (Raja, 2012). Due to its aroma, flavor, and medicinal properties, this family is one of the most widely utilized and traded in the world. This study is an inventory to provide a list of medicinal plants belonging to the family Lamiaceae. This paper presents a description of the species with botanical name, author's citation, synonym (if any), habit, available vernacular name, uses, parts used, ailments treated, and conservation status. Species diversity along with their medicinal uses in the family Lamiaceae is a pioneering effort in Bangladesh. Therefore, a significant number of people who are interested in this topic may find this study to be incredibly helpful.

2. MATERIALS AND METHODS

Study area

This study was conducted at the Botanical Garden, Department of Crop Botany, Bangladesh Agricultural University, the second largest Botanical Garden in the country. It contains over 1800 species belonging to 168 families and 287 genera, making it the largest in terms of species number and biodiversity (Jone et al., 2022). This number increasing steadily by collecting from the forest resources.

Plant collection and identification

A comprehensive study of the plant genetic resources grown and conserved throughout BAUBG has been conducted through frequent visits to update the database of plant species belonging to the family Lamiaceae. Fresh flowering samples of each plant species were collected during these visits, and by drying the fresh samples following standard technique, herbarium specimens were prepared as vouchers (Anonymous, 1996). The dried specimens were mounted on the herbarium sheet and preserved in Prof. Arshad Ali Herbarium at the botanical garden, Department of Crop Botany, Bangladesh Agricultural University (AAHBAU). In the field, photographs were also taken to record the locations and flora. The collected specimens were identified either as fresh or dry conditions in the field or by comparing them to relevant published literature or herbarium specimens. The morphological description was cross-checked with all available records, *viz.* "Encyclopedia of Flora and Fauna of Bangladesh" and other published papers are available online for the correct identification of botanical names. Finally, a professional plant taxonomist validated the identifications' accuracy, and the voucher specimens with labels were deposited at Prof. Arshad Ali Herbarium. For quick identification of the species, a detailed description and color pictures are included. The botanical names were updated following The World flora online (<http://www.worldfloraonline.org>), previously known as The Plant List (<http://www.theplantlist.org/>), and The Plants of World Online (<https://powo.science.kew.org/>). This information is accompanied by citations inside the text.

Medicinal uses of plants

The "Encyclopedia of Flora and Fauna of Bangladesh", relevant textbooks, and a few other published articles were consulted to know the major medicinal uses and used plant parts of the recorded Lamiaceae plants. In addition, a comprehensive online database of medicinal plants in Bangladesh (<https://www.natureinfo.com.bd/mpb>) as well as internationally recognized databases including ScienceDirect, Scopus, Web of Science, and PubMed were used.

Data analysis

On a Microsoft Excel 2019 spreadsheet, the ethnobotanical data were examined. MS Excel was used to tabulate, create graphs, and calculate sums and percentages. The use of descriptive statistics, such as percentage and frequency distribution, was utilized to examine plant habits, plant parts used, and major medicinal uses.

3. RESULTS AND DISCUSSIONS

A great number of Lamiaceae plants are conserved at Bangladesh Agricultural University Botanical Garden (BAUBG). A total of 50 species belonging to 19 genera of the family Lamiaceae were recorded from the BAUBG (Table 1). The plants were then categorized into different groups based on several characteristics. All the representative genera, species, and intraspecific categories were described morphologically and their diagnostic features were recorded. For each species, up-to-date nomenclature, habit, conservation status, plant parts used and major uses have been mentioned within the tables (Table 1 and Table 2) below with references. A few graphs related to these categorizations are given with a little explanation herewith.

Genus-wise species distribution

Clerodendrum was the most predominant genus as it contains 9 species. *Ocimum* was placed in the second highest position with five species, followed by *Vitex* with four. Here *Callicarpa*, *Hyptis*, *Leucas*, *Mentha*, and *Salvia* each of these genera has 3 species. The remaining genera, namely *Tectona*, *Rotheca*, *Orthosiphon*, *Leonurus*, and *Anisomeles*, however, each had just one species (Table 1, Figure 1).

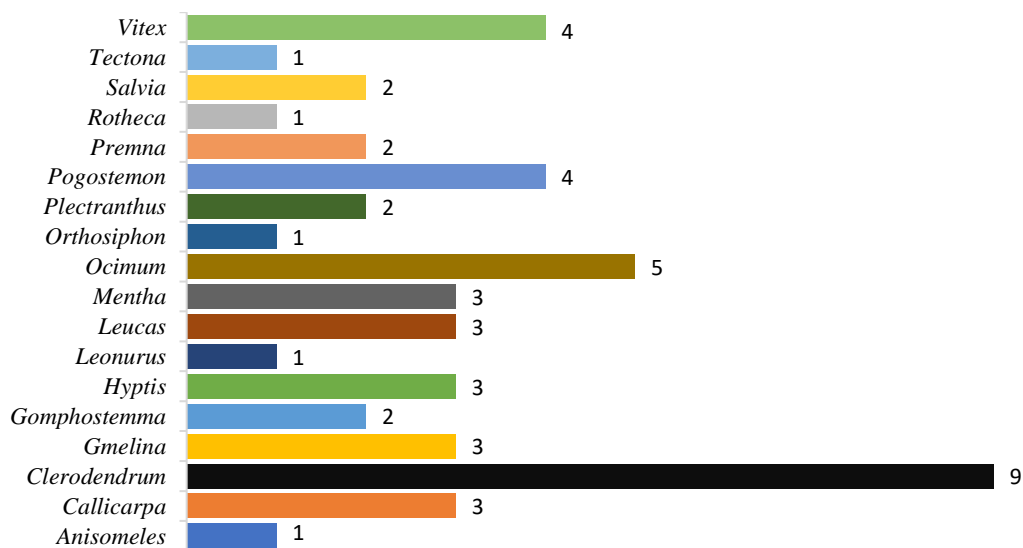


Figure 1 Species distribution of available plants under different genera.

Growth form analysis

The species of medicinal plants that are employed belong to various life forms, according to an examination of their habits. The growth form or habit of available plant species was noted during the field survey. All the plants were primarily divided into three major groups. Herbaceous plants were predominating in this case. About 46% of available species are herbs where 30% of the plants are trees and the rest 24% are shrubs (Table 1, Figure 2).

Conservation status

Seven plant species are categorized as "Not Evaluated" while forty plant species are categorized as "Least Concern" according to the IUCN conservation status categories. The three remaining species are categorized as Vulnerable (*Plectranthus amboinicus*), Data Deficient (*Gmelina asiatica*), and Conservation Dependent (*Clerodendrum japonicum*) (Table 1, Figure 3).

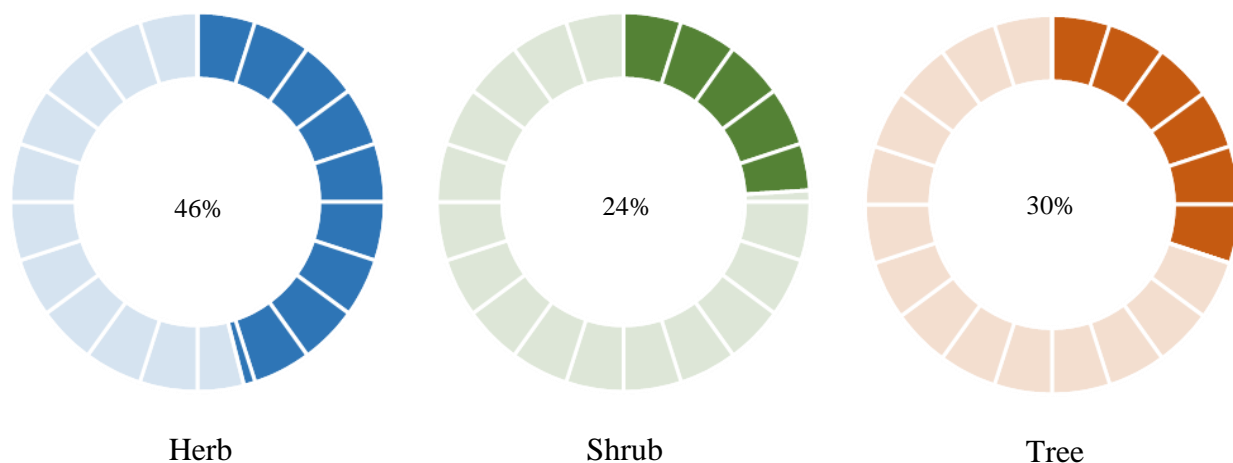


Figure 2 Doughnut Charts for Habit-wise Distribution of the family Lamiaceae.

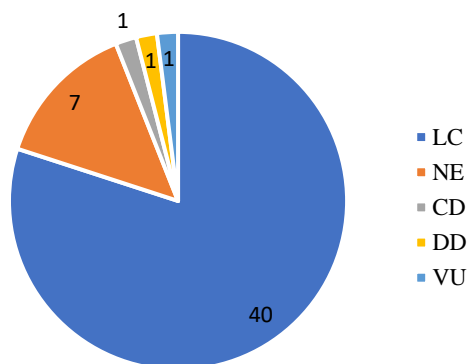


Figure 3 Conservation status-wise distribution of the family Lamiaceae.

Plant part-used

It is evident from the papers reviewed that various parts of plants singly or in combinations were used to treat specific ailments in the traditional medicines used by various communities of the globe. Various plant parts, including leaf, stem, bark, root, etc., are utilized to prevent, alleviate symptoms, and normalize abnormalities. It was indicated from our study that plant leaves (37%) were the most highly used part for the treatment of various ailments followed by roots (17%), fruits (15%), whole parts (10%), barks (8%), stem (4%), flowers (2%), aerial parts (2%), resins (2%), rhizomes (2%) and woods (1%). The leaf was the most frequently used part of medicinal plants as suggested in earlier reports (Tangjitman et al., 2015). Naturally, plants are surrounded by a variety of potential threats, and evolutionarily, they have developed defense methods against viruses, herbivores, and abiotic stresses of various types. Consequently, plants produce a variety of secondary metabolites that are not directly involved in their growth and development. Possibly because the leaves are more exposed to threats, these chemicals provide a protective function (Passalacqua, 2007). Thus, the use of leaves as a major part of a plant in a medicinal concoction could be interpreted as a sign of scientific validity. Notably, the fact that animals feed mostly on the leaves of some plants has historically led to the identification of aliphatic medications, thus establishing the preference for leaves as a source of traditional medicines (Ssegawa et al., 2007). Furthermore, removing aerial portions, such as leaves, provides less of a hazard to medicinal plants than harvesting the roots and barks, as suggested by earlier studies (Ahmad et al., 2014).

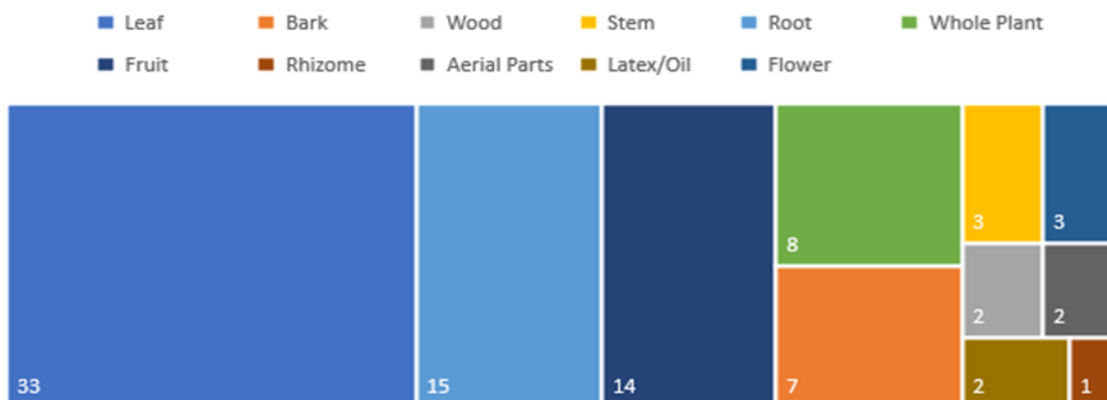


Figure 4 Treemap Chart for Number of Species with the Plant Parts Used.

Disease-wise categorization

Almost all the species are important ethnomedicinally. They are used to treat diseases or disorders like Fever, Cold, Cough, Headache, Rheumatism, Asthma, Bronchitis, Malaria, Wounds, Ulcers, Animal or Snake bites, etc. All the information related to ethnomedicinal uses of the plants belonging to the family Lamiaceae was recorded in a comprehensive table (Table 2). It was found that a total of 48 ailments were treated by these plants, with the majority treating cough, cold and sinusitis (16 spp.), digestive disorders (12 spp.), antiemetic (9 spp.), cuts, wounds, and bruises (7 spp.), fever (7 spp.), malarial fever (5 spp.), anti-helminthic, astringent, breathing pain, gastroenteritis and urine ailments (4 spp.), antiseptic, colic (3 spp.), arthritic pain, cardiac disorder, carminative, eczema, expectorant, febrifuge, headache, stimulant, tonic, and ulcer (2 spp.) and single species each for blood purifier, body swelling, colitis, contraceptive, eye diseases, jaundice, kidney stone, liver disorder, menorrhoea, sciatica, snake-bite, toothache and tuberculosis (Table 2). The results of this study indicate that Lamiaceae plants are effective for treating minor diseases and as an asset to the well-being of present and future generations. *Plectranthus barbatus*, *Ocimum americanum*, *O. basilicum*, *O. gratissimum*, *O. tenuiflorum*, *O. vulgare*, and *Rosemarinus officinalis* were among the species that underwent substantial phytochemical research (Sancheti and Goyal, 2007; Yashaswini and Vasundhara, 2011; Sharma and Babu, 2011; Daniel et al., 2011). However, additional research on other species in the present study should be conducted on a scientific scale to understand the therapeutic properties of these significant species. Also, if these findings are considered for further development, they will greatly benefit local development.

Table 1 List of Plants along with their scientific name, habit, conservation status, and parts used

SN	Local Name	Scientific name	Habit	CS	Parts Used
1	Gobura	<i>Anisomeles indica</i> (L.) Kuntze	Herb	LC	Aerial Part, Leaf, Oil
2	Bormala	<i>Callicarpa arborea</i> Roxb.	Shrub	LC	Wood, Bark, Leaf
3	Bormala, Aplotan	<i>Callicarpa macrophylla</i> Vahl	Tree	NE	Root, Leaf, Fruit
4	Boro Pata	<i>Callicarpa tomentosa</i> (L.) L.	Shrub	NE	Root, Leaf
5	Hazari Beli	<i>Clerodendrum chinense</i> (Osbeck) Mabb.	Shrub	LC	Root
6	Bon Vati	<i>Clerodendrum colebrookianum</i> Walp.	Shrub	LC	Leaf, Stem, Root
7	Bamunhatti	<i>Clerodendrum indicum</i> (L.) Kuntze	Shrub	LC	Leaf
8	Vat	<i>Clerodendrum infortunatum</i> L.	Shrub	LC	Bark, Flower, Leaf
9	Chandanbhat	<i>Clerodendrum japonicum</i> (Thunb.) Sweet	Shrub	CD	Whole Plant
10	Lal Vaddir	<i>Clerodendrum paniculatum</i> L.	Shrub	LC	Leaf
11	Banjui	<i>Clerodendrum phlomidis</i> L. f.	Shrub	LC	Leaf
12	Lota Vaddir	<i>Clerodendrum splendens</i> G. Don	Herb	LC	Root, Leaf
13	Bleeding Heart	<i>Clerodendrum thomsoniae</i> Balf.f.	Herb	LC	Rhizome, Aerial Parts
14	Gamari	<i>Gmelina arborea</i> Roxb.	Herb	LC	Whole Plant
15	Bhadra	<i>Gmelina asiatica</i> L.	Tree	DD	Fruit, Root
16	Vadra	<i>Gmelina philippensis</i> Cham.	Tree	LC	Root, Fruit, Leaf

17	Jateri Bormala	<i>Gomphostemma parviflorum</i> Wall. Ex Benth.	Shrub	LC	Aerial Part
18	Not Known	<i>Gomphostemma strobilinum</i> Wall. ex Benth.	Herb	NE	Leaf, Root
19	Not Known	<i>Hyptis brevipes</i> Poit.	Tree	LC	Leaf, Stem
20	Holkhusa	<i>Hyptis capitata</i> Jacq.	Herb	LC	Leaf, Root
21	Tokma	<i>Hyptis suaveolens</i> (L.) Poit.	Shrub	LC	Leaf, Latex, Fruit
22	Raktodrone	<i>Leonurus sibiricus</i> L.	Herb	LC	Whole Plant
23	Shetodron	<i>Leucas aspera</i> (Willd.) Link.	Tree	LC	Leaf, Bark
24	Bara-Halkus	<i>Leucas cephalotes</i> (Roth) Spreng.	Tree	LC	Fruit
25	Gatta Tumba	<i>Leucas zeylanica</i> (L.) W.T.Aiton	Tree	LC	Fruit
26	Pudina	<i>Mentha arvensis</i> L.	Herb	LC	Leaf
27	Pudina	<i>Mentha spicata</i> L.	Herb	LC	Whole Plant
28	Peppermint	<i>Mentha × piperita</i> L.	Herb	LC	Leaf, Flower
29	Ban Tulshi	<i>Ocimum americanum</i> L.	Herb	LC	Leaf
30	Babui Tulshi	<i>Ocimum basilicum</i> L.	Herb	NE	Whole Plant,
31	Shrubby Basil	<i>Ocimum gratissimum</i> L.	Herb	LC	Leaf
32	Kalo Tulshi	<i>Ocimum tenuiflorum</i> L.	Herb	LC	Whole Plant
33	Lemon Basil	<i>Ocimum X africanum</i> Lour.	Herb	LC	Leaf
34	Unknown	<i>Orthosiphon aristatus</i> (Blume) Miq.	Herb	NE	Leaf
35	Cuban Oregano	<i>Plectranthus amboinicus</i> (Lour.) Spreng.	Herb	VU	Leaf
36	Coleus	<i>Plectranthus scutellarioides</i> (L.) R.Br.	Herb	NE	Leaf, Root
37	Aripachuli	<i>Pogostemon auricularius</i> (L.) Hassk.	Herb	LC	Whole Plant, Leaf
38	Jui Lata	<i>Pogostemon benghalensis</i> (Bumm. F.) O. Kuntze	Tree	LC	Fruit
39	Unknown	<i>Pogostemon crassicaulis</i> (Benth.) J. R. Press.	Tree	LC	Bark, Fruit
40	Panikula, Shilenta	<i>Pogostemon quadrifolius</i> (Benth.) F.Muell.	Tree	LC	Fruit
41	Lalang, Lolona	<i>Premna esculenta</i> Roxb.	Shrub	LC	Whole Plant
42	Ganiari, Gambari	<i>Premna serratifolia</i> L.	Herb	LC	Leaf, Fruit, Root
43	Musical Notes Plant	<i>Rothea microphylla</i> (Blume) Callm. & Phillipso	Herb	LC	Fruit
44	Salvia	<i>Salvia coccinea</i> Buc'hoz ex Etl.	Herb	LC	Leaf, Stem
45	Scarlet Sage	<i>Salvia splendens</i> Sellow ex Schult.	Herb	LC	Leaf
46	Shegun	<i>Tectona grandis</i> L. f.	Tree	LC	Bark
47	Goda	<i>Vitex glabrata</i> R. Br	Tree	LC	Leaf
48	Nishinda	<i>Vitex negundo</i> L.	Tree	LC	Bark, Wood
49	Horina	<i>Vitex peduncularis</i> Wall. ex Schauer	Tree	NE	Leaf, Bark, Root
50	Sagar Nishinda	<i>Vitex trifolia</i> L. f.	Tree	LC	Leaf, Fruit, Root

Cs= Conservation Status, Lc= Least Concerned, Ne= Not Evaluated, Cd= Conservation Dependent, Dd= Data Deficient, Vu= Vulnerable

Table 2 List of Plants along with their scientific name, major medicinal use(s), references(s)

Scientific name	Major Use(S)	Reference(s)
<i>Anisomeles indica</i>	Muscular Pain, Astringent, Tonic	Kirtikar et al., 1935; Pal, 1984
<i>Callicarpa arborea</i>	Tonic, Carminative	Watt, 1889-1892
<i>Callicarpa macrophylla</i>	Skin Diseases	Chopra et al., 1956
<i>Callicarpa tomentosa</i>	Inflammation, Hemorrhage	Tu et al., 2013
<i>Clerodendrum chinense</i>	Rheumatism, Skin Diseases	Bor and Raizada, 1954
<i>Clerodendrum colebrookianum</i>	Skin Diseases, Hypertension, Dysentery	Jadeja et al., 2012
<i>Clerodendrum indicum</i>	Skin Diseases, Digestive Disorder	Dash et al., 2014
<i>Clerodendrum infortunatum</i>	Asthma, Fever, Bronchitis	Bhattacharjee et al., 2011
<i>Clerodendrum japonicum</i>	Gonorrhoea, Rheumatism, Skin Diseases	Bor and Raizada, 1954
<i>Clerodendrum paniculatum</i>	Wounds, Snakebite, Typhoid	Prashith and Sudharshan, 2018

<i>Clerodendrum phlomidis</i>	Stomach Troubles	Moldenke and Moldenke, 1983
<i>Clerodendrum splendens</i>	Stomach Troubles, Tonic	Moldenke and Moldenke, 1983
<i>Clerodendrum thomsoniae</i>	Cure Cuts and Bruises	Moldenke and Moldenke, 1983
<i>Gmelina arborea</i>	Abdominal Pain, Fever, Wound, Ulcer	Benthall, 1933
<i>Gmelina asiatica</i>	Rheumatism, Syphilis	Moldenke and Moldenke, 1983
<i>Gmelina philippensis</i>	Cough, Soreness of Toes	Moldenke and Moldenke, 1983
<i>Gomphostemma parviflorum</i>	Skin Diseases, Malaria	Bongcheewin et al., 2021
<i>Gomphostemma strobilinum</i>	Skin Diseases, Malaria	Bongcheewin et al., 2022
<i>Hyptis brevipes</i>	Protection Against Worms	Burkill, 1935
<i>Hyptis capitata</i>	Fever, Wounds, Digestive Disorder	To'bungan et al., 2022
<i>Hyptis suaveolens</i>	Catarrh	Ahmed et al., 2009b
<i>Leonurus sibiricus</i>	Emmenagogue, Diuretic, Vasodilator	Ghani, 2003
<i>Leucas aspera</i>	Rheumatism, Skin Diseases, Cough, Cold	Ahmed et al., 2009b
<i>Leucas cephalotes</i>	Scabies, Cough, Cold	Ahmed et al., 2009b
<i>Leucas zeylanica</i>	Headache, Cold, Snakebite	Chopra et al., 1956; Caius, 1998
<i>Mentha arvensis</i>	Jaundice, Animal Bite	Kirtikar et al., 1935; Caius, 1998
<i>Mentha spicata</i>	Flatulence, Respiratory Problems	Mahendran et al., 2021
<i>Mentha × piperita</i>	Body Pain, Stomachache	Barbalho, 2017
<i>Ocimum americanum</i>	Appendicitis, Stomachache, Wounds	Saxena, 1986
<i>Ocimum basilicum</i>	Dysentery, Diarrhea, Sinusitis	Ahmed et al., 2009b
<i>Ocimum gratissimum</i>	Gonorrhea, Piles	Kirtikar et al, 1935
<i>Ocimum tenuiflorum</i>	Malaria, Cough, Fever	Ahmed et al., 2009b
<i>Ocimum X africanum</i>	Wound Healing, Vit-K	Kumar, 2019
<i>Orthosiphon aristatus</i>	Renal Calculi, Kidney Complaints	Kenner and Requena, 1996
<i>Plectranthus amboinicus</i>	Asthma, Fever, And Skin Diseases.	Arumugam, 2016
<i>Plectranthus scutellarioides</i>	Eczema, Insomnia, Convulsions	Sharma and Vasundhara, 2011
<i>Pogostemon auricularius</i>	Fever, Malaria, Sore Throats	Satyaj, 2018
<i>Pogostemon benghalensis</i>	Wounds, Fever, Piles	Ashwini, 2013
<i>Pogostemon crassicaulis</i>	Skin Diseases, Hemorrhoids	Ashwini, 2013
<i>Pogostemon quadrifolius</i>	Blood Purify, Chickenpox	Biswas et al., 2010
<i>Premna esculenta</i>	Stomachache, Diarrhea	Perry and Metzger, 1980
<i>Premna serratifolia</i>	Leucorrhoea, Genital Disease, Cancer Sores	Danita, 2017
<i>Rothea microphylla</i>	Fever, Hemorrhoids, Skin Diseases	Ahmed et al., 2009a
<i>Salvia coccinea</i>	Ulcer, Rheumatism, Inflammation	Ghorbani & Esmailizadeh, 2017
<i>Salvia splendens</i>	Diabetes	Kumar et al, 2010
<i>Tectona grandis</i>	Bronchitis, Scabies, Piles	Kirtikar et al., 1935
<i>Vitex glabrata</i>	As Astringent	Kunkel, 1984
<i>Vitex negundo</i>	Headache, Rheumatism, Ulcer	Ahmed et al., 2009a
<i>Vitex peduncularis</i>	Chest Pain, Malaria	Chopra et al., 1956
<i>Vitex trifolia</i>	Rheumatism, Headache, Fever	Chopra et al., 1956

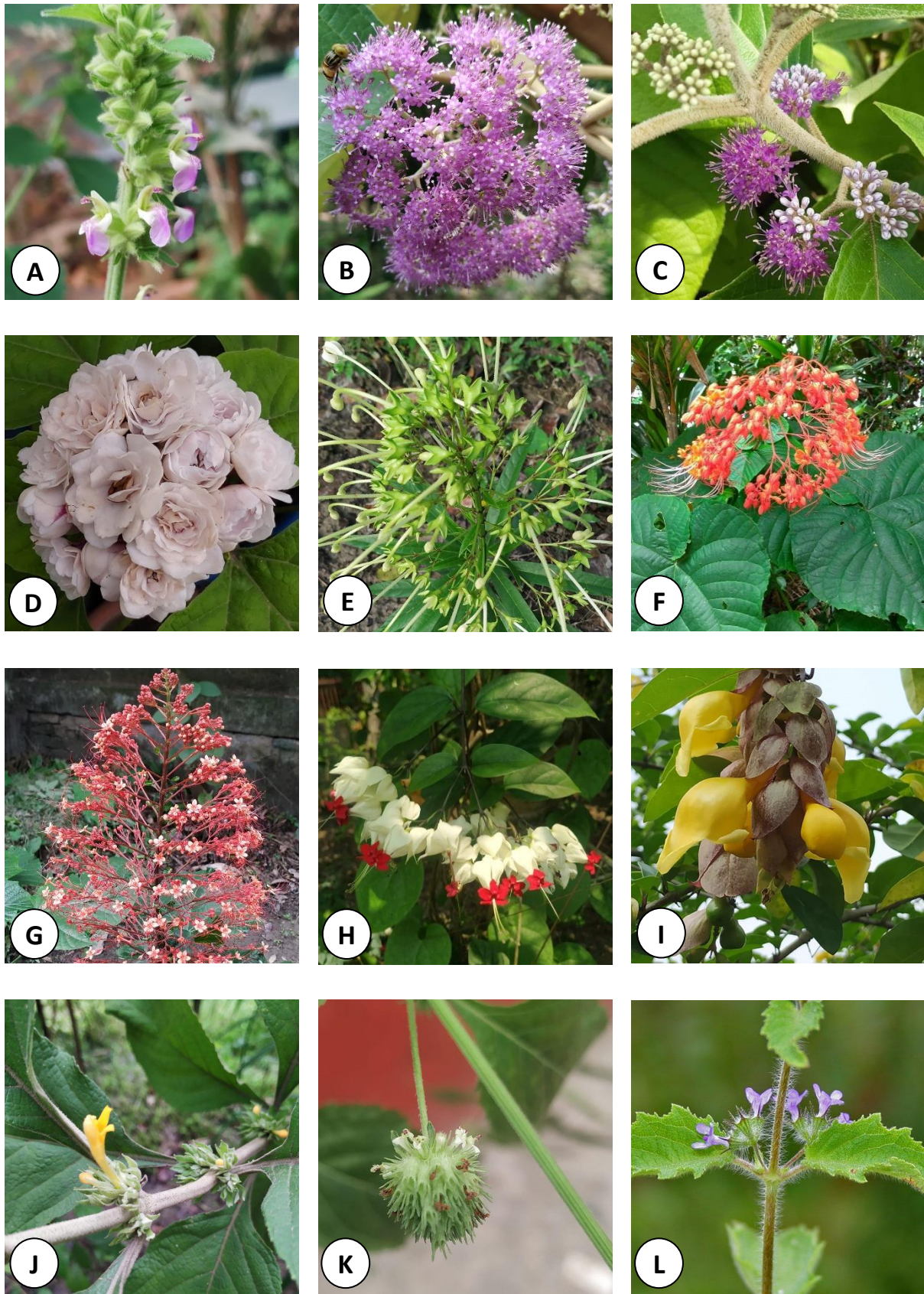


Figure 5

A. *Anisomeles indica* **B.** *Callicarpa microphylla* **C.** *Callicarpa tomentosa* **D.** *Clerodendrum chinense* **E.** *Clerodendrum indicum* **F.** *Clerodendrum japonicum* **G.** *Clerodendrum paniculatum* **H.** *Clerodendrum thomsoniae* **I.** *Gmelina philippensis* **J.** *Gomphostemma parviflorum* **K.** *Hyptis capitata* **L.** *Hyptis suaveolens*

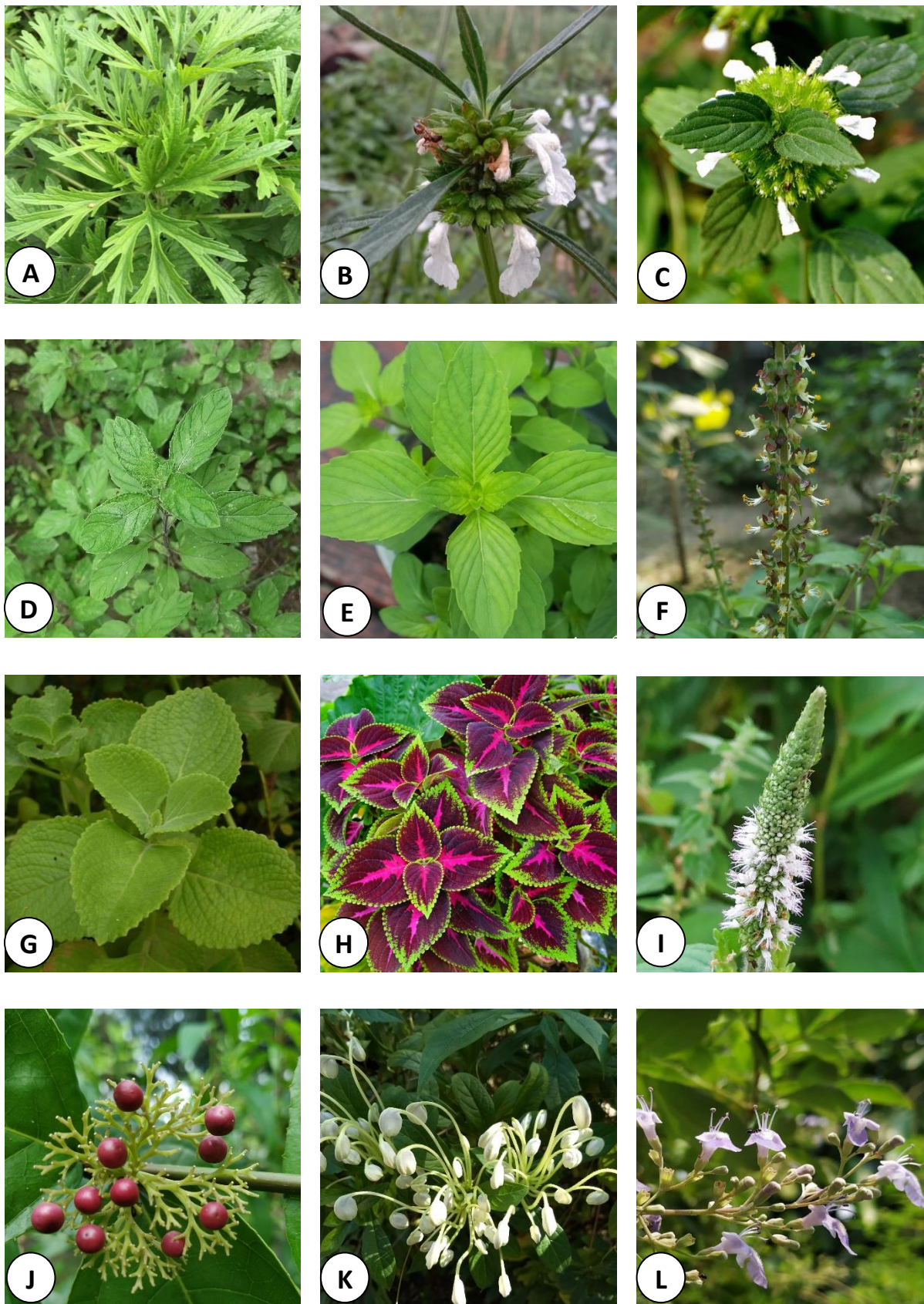


Figure 6

A. *Leonurus sibiricus* **B.** *Leucas aspera* **C.** *Leucas cephalotes* **D.** *Mentha spicata* **E.** *Ocimum americanum* **F.** *Ocimum gratissimum* **G.** *Plectranthus amboinicus* **H.** *Plectranthus scutellarioides* **I.** *Pogostemon auricularius* **J.** *Premna serratifolia* **K.** *Rothea microphylla* **L.** *Vitex trifolia*

4. CONCLUSIONS

All the plants under investigation showed potent activity, confirming their vast range of traditional usage and their capacity to treat common diseases. However, few locals are aware of the medicinal properties of the plants. They can be effectively used to treat various ailments including skin diseases, fever, rheumatism, asthma, cold, and cough, among others. This is preliminary work on the diversity at BAUBG and its therapeutic uses for the scientific community. As a consequence, additional investigations must be conducted on these plants, including the isolation of active chemicals that can be used to create fresh, potent medications and the analysis of their action mechanisms.

Author's contribution

All three authors selected and designed the research. Jone MJH and Ashrafuzzaman M collected the required data, analyzed them, and prepared the first draft. Most of the photographs were taken by Ashrafuzzaman M and some are by Jone MJH. All three authors reviewed and revised the draft several times and finally roved the manuscript for publication.

Ethical approval

Lamiaceae family plants were used in the study. The ethical guidelines for plants & plant materials are followed in the study. The dried specimens were preserved in Prof. Arshad Ali Herbarium at the botanical garden, Department of Crop Botany, Bangladesh Agricultural University (AAHBAU). The morphological description was cross-checked with "Encyclopedia of Flora and Fauna of Bangladesh" and other published papers. The professional plant taxonomist validated the identifications' accuracy, and the voucher specimens with labels were deposited at Prof. Arshad Ali Herbarium, Bangladesh.

Funding

The study has not received any external funding.

Conflicts of interests

The authors declare that there are no conflicts of interest.

Data and materials availability

All data associated with this study are present in the paper.

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