Original Article:

Ethnobotanical Study on Medicinal Plants for Dermatological Disorders at Chittagong Hill Tracts, Bangladesh

Shejuti Rahman Brishty1,2, Nurul Islam Setu3, Md. Rafi Anwar4*, Raunak Jahan5, M.M.K. Mia6, Mohammad Fahim Kadir4,7, Md. Rabiul Islam2,4*

1. Department of Neuroscience, Uppsala University, Uppsala, Sweden.
2. Department of Clinical Pharmacy and Pharmacology, University of Dhaka, Dhaka, Bangladesh.
3. Department of Pharmaceutical Chemistry, University of Dhaka, Dhaka, Bangladesh.
4. Department of Pharmacy, University of Asia Pacific, Dhaka, Bangladesh.
5. Sinhgad Institute of Pharmacy, University of Pune, Pune, India.
6. Former Principal Scientific Officer and Consultant, Bangladesh National Herbarium, Dhaka, Bangladesh.
7. Department of Pharmacology, University of Cambridge, Cambridge, UK.

* Corresponding Author:
Md. Rabiul Islam, PhD.
Address: Department of Pharmacy, University of Asia Pacific, Dhaka, Bangladesh.
Phone: +880 (19) 16031831
E-mail: robi.ayaan@gmail.com

Background: Dermatological disorders affect people in all age groups and prevail all around the globe. In this regard, medicinal plants play a significant role as they are usually the first line of treatment in dermatological disorders. Because traditional healers in Bangladesh know little about the use of plants to treat different skin diseases, we carried out an ethnobotanical survey of medicinal plants in the Chittagong Hill Tracts (CHT) to explore the traditional uses for healing wounds and skin problems.

Objectives: This study aimed to list the plants employed as remedies against various dermatological disorders in CHT.

Methods: The survey was performed from January 2016 to December 2017 with fieldwork undertaken in CHT of Rangamati, Bandarban, and Khagrachari. Open-ended and semi-structured questionnaires were used for interviewing a total of 387 people comprising traditional healers, Ayurvedic/Unani drug manufacturers, and local inhabitants. A total of 56 plant species of 32 families were documented. The most frequently used plant parts were leaves. The majority of the species were shrub in nature, while paste represented their main mode of drug preparation. Most plants grew wild in forests, with some cultivated in homestead and gardens.

Results: There was remarkable diversity in the doses of different plant preparations for various treatments. The presence of identified active compounds can rationalize the conventional use of many plants to treat dermatological disorders in Bangladesh.

Conclusion: This documentation accounts for the preliminary information necessary to perform future phytochemical investigations and is vital for the conservation of these plants.

Keywords:
Bangladesh, Ethnobotanical survey, Dermatological disorders, Medicinal plants, Traditional healers

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ABSTRACT

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Introduction

Herbal plants have long been used as medications in all cultures around the globe [1]. The use of Traditional Medicine (TM) has expanded globally during the last decade and continued to gain popularity. TM has been used not only in developing countries for primary health care of the poor but also in countries where conventional medicine is the predominant practice in the national health care system [2]. According to one study, about two-thirds of the world population relies on medicinal plants for treating a variety of illnesses [3, 4].

Despite being more effective than phytomedicines, synthetic drugs and antibiotics often come along with unavoidable side effects and high prices. Moreover, because of the historical and cultural biases prevailing among people, synthetic drugs still have limited usage in different parts of the world, especially in the rural areas of developing countries. Consequently, the researchers have accelerated their quest to explore new drugs from natural sources in recent years [5]. The study of medicinal plants and their traditional uses has increased during the last few decades in different parts of the world [6]. Plants are extensively being studied to identify the phytochemicals and lead compounds responsible for their pharmacological and therapeutic efficacy. In this regard, ethnobotanical surveys of medicinal plants have made essential contributions to the discovery and conservation of novel biological resources [7, 8].

Bangladesh is a country gifted with a rich plant diversity because of its various environmental conditions such as warm and humid climate and fertile alluvial land. About 6000 species of indigenous and naturalized plants grow in the country [9], among which more than 1000 species contain medicinally active chemical substances [10]. Chittagong Hill Tracts (CHT) is the only extensive hilly region of Bangladesh located in the southeastern part. Known as a land of splendid natural beauty with landscape, lakes, and rivers, the area has hills and cliffs covered with dense jungles of bamboo, shrubs, and creepers harboring an abundance of floral species [9]. The tribal and other native communities are mainly dependent on traditional medicinal healers for treating different ailments.

Local inhabitants hold a strong belief in the healing properties of herbal medicine. A large portion of the population are deprived of modern medical facilities. This condition has also contributed to their dependence on TM [11, 12]. Unfortunately, medicinal plants and the abundant knowledge associated with them are facing the risk of serious loss owing to aberrant climate, deforestation and other human-made hazards, and migrations of traditional medicinal healers to different jobs [13]. Besides, the knowledge of traditional therapeutic practice has been passed only verbally from one generation to the other [14], and the written documents are unavailable in most cases [15, 16].

Skin diseases are general disorders that affect people from all age groups and produce damages in various ways [17]. It is difficult to define skin diseases precisely since they include a wide range of different disorders. Their prevalence rates are influenced by nutrition, habits, genetics, and socioeconomic status of a particular community [18]. The growing proportion of dermatological diseases encountered in general practice causes a significant part of morbidity in children; however, little information is available about the frequency of specific skin diseases. Although the overall incidence rate of all diseases combined has decreased in general practice, the incidence rates of the bacterial, mycotic, and atopic skin diseases have increased [19].

Transmissible skin diseases are major public health problems in many developing countries like Bangladesh. Lack of proper hygiene and basic amenities, and especially the difficulty of traveling to distant health care facilities in hilly terrains, are the major risk factors of dermatological diseases [20]. Herbal plants are considered as the first line of treatment against skin disorders in many rural areas of Bangladesh. According to the literature, some ethnobotanical studies have already been performed on dermatological diseases in the country [21-25]. However, these studies have not covered the areas, which we have specifically focused on our research. Our research is the first to document the plants used for treating dermatological diseases in some particular hilly regions located in CHT of Bangladesh. Because of the diversity of dermatological disorders, we attempted to focus on those disorders which are found to be treated by the preparations of the documented plants in our survey. The most prominent disorders include boils, eczema, bruise, itching, sore on different areas of the body (such as mouth, throat, tongue, and foot), dandruff, acne, scabies, scurvy, chickenpox, measles, leprosy, and skin ulcer. Apart from documenting the plants, our study aimed to provide relevant information about the plants and their potential applications in novel drug discovery.

Materials and Methods

Study area

CHT, with an area of about 13184 km², is bordered by Myanmar to the southeast, the Tripura state of India to the north, Mizoram state of India to the east, and Chittagong district of Bangladesh to the west. It is situated between
21°25’N to 23°45’N and 91°54’E to 92°50’E [9, 26]. Tropi-
cal monsoon climate prevails in the region with an aver-
age annual rainfall of 2540 mm in the north and east, and
2540 mm to 3810 mm in the south and west. The hills soils,
characterized by strongly acidic nature, are chiefly yel-
loish-brown to reddish-brown loams graded into broken
shales, mottled sands or sandstones at varying depth. The
vegetation type of the area falls under semi-evergreen (de-
ciduous) and tropical evergreen forests. Along with natural
vegetation, Jhum cultivation is practiced on the slopes of
the hills. The main rivers are Karnafuli, Sangu, Feni, and
Matamuhuri, which drain into the Bay of Bengal. Accord-
ing to the 1991 census, the area population is about 1.042
million dominated by Mongolian, Chakma, Tripura, Mur-
ong, and Magh tribes. The inhabitants mainly depend on the
resources coming from the hilly areas [9]. The present eth-
nobotanical study was conducted in three districts of CHT:
Rangamati, Bandarban, and Khagrachari. Figure 1 shows
the different areas of data collection.

**Sampling of informants**

The ethnobotanical survey was conducted between Janu-
ary 2016 to December 2017, and the aim was to cover at
least five Kabiraj/Hakim/Unani/Ayurvedic practitioners in
each area. In the districts where tribes live, we empha-
sized the fieldwork. Reputed Hakims and Ayurvedic drug
manufacturers such as Hamdard, Ayurvedia Pharmacy, Shakti,
Sadhana, and Kundeshwari, along with the experts in Unani
and Ayurvedic Board were consulted, too. We also inter-
viewed local people with practical or empirical knowledge
on medicinal plants, and a total of 387 people were chosen
for this purpose. The inhabitants with enough knowledge of
local medicinal plants or involved in medical practice with
plants for a long time were the ones selected for interviews.
Besides, the age and gender of interviewees along with their
educational background and experience on the use of tradi-
tional medicinal plants, were also taken into consideration.
Ayurvedic and Unani medical practitioners usually have

| Variables | Categories                          | No. |
|-----------|-------------------------------------|-----|
| Gender    | Female                              | 141 |
|           | Male                                | 246 |
| Age (y)   | <20                                 | 19  |
|           | 20-30                               | 41  |
|           | 30-40                               | 58  |
|           | 40-50                               | 92  |
|           | 50-60                               | 133 |
|           | >60                                 | 44  |
| Educational background | Illiterate                      | 22  |
|           | Completed 5 years education        | 54  |
|           | Completed 8 years education        | 81  |
|           | Completed 10 years education       | 113 |
|           | Completed 12 years education       | 71  |
|           | Some undergraduate degree (16 years education) | 34  |
|           | Graduate (Higher education)        | 12  |
| Experience (y) | <2                             | 38  |
|           | 2-5                                 | 73  |
|           | 5-10                                | 134 |
|           | 10-20                               | 97  |
|           | >20                                 | 45  |
| Profession | Hakim                            | 47  |
|           | Unani                              | 32  |
|           | Ayurvedic                          | 41  |
|           | Independent healer                 | 140 |
|           | Otherb                             | 127 |

* Related to treating people; b People who gained medicinal knowledge by themselves and generally involved in professions not relevant to medicine.
their formularies available in printed form. However, in this survey, the formularies were not enough as their authenticity could not always be confirmed. There could have been biased information, either intentionally put on by the practitioners, or based on local beliefs. This was another aspect where interviewing people with practical knowledge of medicinal plants and a long history of practice provided us with more reliable information.

**Ethnomedicinal data collection**

Verbal consent was obtained by the interviewer from each informant, ensuring that the objectives of the study were clearly explained to them. Most interviews were arranged by local people who were familiar with traditional healers and could communicate with native communities at the same time. Bengali, the official language of the country, was used for conducting interviews. Local bilingual translators helped during the communication with indigenous populations with different mother tongues.

The survey employed open-ended and semi-structured questionnaires [13], which included the following information:

A. The local name;  
B. Plants part/s used;  
C. Source of plant material;  
D. The method of preparation;  
E. Solvent/adjuvant used;  
F. Mode of application;  
G. Dermatological and other medicinal uses;  
H. Voucher specimen number; and  
J. Dose and dosage forms.

The scientific names, family names, habit, habitat, geographical distribution, relative abundance, and conservation status of plants were documented either upon consultation with Botanist Mr. Md. Manzur-ul-Kadir Mia, former Principal Scientific Officer and Curator of Bangladesh National Herbarium, Dhaka (DACB), or by the literature search. The voucher specimen of each plant was deposited in Bangladesh National Herbarium, Dhaka, and after consulting with Botanist Mr. Md. Manzur-ul-Kadir Mia, the accession numbers of the plants, were documented. The accession number of each plant is mentioned in its respective voucher specimen, and all voucher specimens are provided in the supplementary section (Supplementary Tables, Table S.1).

Books, research articles, and relevant web pages were also studied during the survey to collect data on phytochemical compounds of the plants as well as any reported toxicity studies. We also documented the compounds commonly found in the reported plant species.

**Data analysis**

The species of plants were listed in alphabetical order by their scientific name, family, local name, generic name, habit, habitat, geographical distribution, relative abundance, nature, plant parts used, mode of preparation, the solvent used and Frequency of Citation (FC) [21, 27]. The FC of the species of plants in this survey was evaluated using the following formula:

\[
FC = \frac{\text{Number of times a particular species was mentioned}}{\text{The total number of times that all species was mentioned}} \times 100.
\]

Frequency distribution was calculated using the SPSS V. 19 [27].

The taxonomic identification of each plant was performed following the guidelines on the website http://www.tropicals.org/NameSearch.aspx and upon consultation with Botanist Mr. Md. Manzur-ul-Kadir Mia.

**Figure 1.** Location of the study area, Chittagong Hill Tracts, Bangladesh
Table 2. Therapeutic preparation of the available plants

| Sl. No. | Scientific Name of the Plant               | Prescription                                                                                                                                 |
|---------|-------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------|
| 1       | Aloe barbadensis Mill.                    | A mucilaginous substance separated from the leaf of the plant is applied externally on the infected skin twice a day for 3 days. Also, musabber (dried mucilaginous substance of the leaves of the plant) can be used for the treatment of the disease. |
| 2       | Anamira cocculus (L.) Wight & Arn.        | An extract is made with the leaves of the plant by boiling in water. It is used for washing hairs twice a week until the disease is cured.          |
| 3       | Ardisia solanacea Roxb.                   | An extract is made with the root-barks of the plant. It is used to wash the sore once a day for 4 days.                                       |
| 4       | Argyreia capitiformis (Poir.) Ooststr.     | A paste is made with the stems and leaves of the plant and used for having a hot bath once a day for 5 days. Fresh juice is extracted from the leaves of the plants. After warming, it is applied to the infected skin externally once a day until the disease is cured. |
| 5       | Azadirachta indica A. Juss.               | Cottonseed-sized pills are made with the dried leaves of the plant. It is taken once a day (One pill each time) for 7 days. A decoction is made with the leaves of the plants by boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. It is taken thrice a day (50 mL each time) for 7 days, after adding some sugar. An extract is made with the leaves of the plant by boiling with water. It is used or having hot bath once a day until the disease is cured. |
| 6       | Buddleja asiatica Lour.                   | An extract is made with the barks and leaves of the plants. A hot bath is advised to have once a day for 7 days until the disease is cured.         |
| 7       | Byttneria pilosa Roxb.                    | A paste is made with the leaves of the plant. It is used for washing hairs once a day until the disease is cured. The paste is also made with the roots of the plant. Before washing, it is applied externally on the head. The medicine should be used for one week. |
| 8       | Cassia occidentalis L.                    | A decoction is made with the leaves and roots of the plants by boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. Seeds are taken raw. It is used for having a hot bath once a day until the disease is cured. |
| 9       | Cassia sophera L.                         | A decoction is made with the leaves and roots of the plants through boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. Seeds are taken raw. The decoction is taken thrice a day (50 mL each time) for 7 days, after adding some sugar. |
| 10      | Cissus quadrangularis L.                  | Fresh juice is extracted from the leaves of the plant. A paste is made with the shoots and stems of the plant. The juice is taken twice a day (200 mL each time) for 4 days. |
| 11      | Clerodendrum viscosum Vent.               | An extract is made with the leaves of the plant by boiling with water. It is used for having a hot bath once a day until the disease is cured.        |
| 12      | Commelina erecta L.                       | The fresh juice is extracted from the leaves of the plant, which is applied externally on the acne twice a day (1 to 2 drops each time) for 4 days. A paste is made with the leaves and stems of the plant, and it is applied to the infected face twice a day until the disease is cured. |
| 13      | Crossocephalum crepidioides (Benth.) S. Moore | Leaf paste of the plant is applied twice a day externally for 5 days on the mouth of the boils.                                           |
| 14      | Crotalaria pallida Aiton                   | An extract is made with the seeds of the plants. It is advised to apply it externally to the infected site once a day until the disease cured.    |
| 15      | Croton caudatus Geiseler                   | A paste is made with the leaves of the plant. It is applied externally on the boils once a time for 7 days. At the same time, an extract is also made with the leaves of the plant by boiling in water. It is taken thrice a day (100 mL each time) for 7 days. |
| 16      | Cucumis melo L.                           | The fresh juice is extracted from the fruits and seeds of the plant. The juice is taken twice a day (200 mL each time) for 4 days.               |
| 17      | Curcuma longa L.                          | A paste is made with rhizome of the plant. After adding a little amount of mustard oil and warming in the sun, it is applied externally on the affected skin once a day until the disease is cured. The newly-made paste is advised to use every day. |
| 18      | Dioscorea anguina Roxb.                   | A paste is made with the leaves of plants. It is applied externally on the sore twice a day for 4 days.                                    |
| Sl. No. | Scientific Name of the Plant | Prescription |
|-------|-----------------------------|--------------|
| 19    | Diospyros blancoi A. DC.    | Fresh juice is extracted by squeezing the unripe fruits of the plants. The juice is taken twice a day (200 mL each time) for 3 days. |
| 20    | Eclipta alba (L.) Hassk.     | A paste is made with the leaves and stems of the plant. It is applied externally on the affected skin for 7 days. Besides, fresh juice is also extracted from the stems and leaves of the plant by squeezing. It is taken thrice a day (5 mL each time) for 7 days. |
| 21    | Entada rheedii Spreng.       | A paste is made with the leaves of the plants. It is applied externally on the infected skin twice a day until the disease is healed. |
| 22    | Flemingia congesta Roxb. ex WT. Alton | Fresh juice is extracted from the roots of the plants by squeezing. It is applied externally on the cutting wound twice a day for 2 days. A paste is made with the leaves and stems of the plant. It is applied externally on the boils once a day for 5 days. |
| 23    | Holarrhena pubescens Wall. ex G. Don | A paste is made with the seed of the plant and is applied externally on the infected skin twice a day until the disease is cured. |
| 24    | Hyptis suaveolens (L.) Poit. | A paste is made with the leaves of the plant. It is applied externally on the infected skin once a day for 5 days. |
| 25    | Ichnocarpus frutescens (L.) R. Br. | A decoction is made with the roots of the plants by boiling with water (1:3 ratio) to reduce the quantity of the water into about 1/3 of its original volume. It is applied externally on the infected skin twice a day until the disease is cured. A paste is made with the leaves of the plants. It is applied externally on the infected skin, after washing, twice a day for 3 days. |
| 26    | Ixora acuminata Roxb.        | A paste is made with the leaves of the plant, which is applied externally on the wound twice a day for 3 days. |
| 27    | Ixora athroantha Bremek.     | An extract is made with the barks and leaves of the plant by boiling in water. It is taken twice a day (200 mL each time) for 4 days. At the same time, it is used for taking a hot bath once a day for 3 days. |
| 28    | Lagerstroemia speciosa (L.) Pers. | A paste is made with the leaves of the plants. It is advised to apply externally to the infected site once a day until the disease is cured. |
| 29    | Lawsonia inermis L.          | Fresh juice is extracted from the leaves of the first plant by squeezing, and then it is mixed with the green fruit paste of the second plant. The paste is applied externally on the head-skin once a day until the disease is cured. Ten grams of the dried root powder of the plant is taken per day for 7 days, after adding little amount of salt and water. |
| 30    | Leea indica (Burm. f.) Merr. | The fresh juice is extracted from the leaves and roots of the plant by squeezing. About 10 mL of that juice is taken every day until the disease is cured. |
| 31    | Melia azedarach L.           | An extract is made with the leaves of the plant. It is used in hair washing once a day for 7 consecutive days. A mixture is made with the dried bark powder of the plant, sugar and water. It is taken twice a day (10 mL each time) until the disease is cured. |
| 32    | Mimosa pudica L.             | A paste is made with the roots, stems, and leaves of the plant. About 10 g of that paste is mixed in 200 mL of water. It is applied externally on the infected skin twice a day until the disease is cured. |
| 33    | Mirabilis Jalapa L.          | An infusion is made with the leaves of the plant. At the same time, a paste is made with the roots of the plant. They are applied externally on the infected skin twice a day until the disease is cured. |
| 34    | Musa paradisiaca L.          | Pea-sized pills are made with the roots and leaves of the plant. Those pills are advised to take one per day (one tablet each time) until the disease is cured. |
| 35    | Mussaenda roxburghii Hook. f. | A paste is made with the leaves of the plant. It is applied externally on the infected skin twice a day until the disease is cured. |
| 36    | Ocimum americanum L.         | Fresh juice is extracted from the leaves of the plants by squeezing. It is taken twice a day (200 mL each time) for 4 days. |
| 37    | Ocimum tenuiflorum L.         | A paste is made with the leaves of the plants. It is applied externally on the affected part of the body thrice a day for 2 days. |
| 38    | Ophiarrhiza harrisiensis B. Heyne | Fresh juice is extracted from the barks of the plants by squeezing. It is taken thrice a day (5 mL each time) until the disease is cured. |
| Sl. No. | Scientific Name of the Plant | Prescription |
|--------|-----------------------------|--------------|
| 39     | *Peperomia pellucida* (L.) Kunth | A paste is made with the leaves and stems of the plant. It is applied externally on the infected skin twice a day until the disease is cured. |
| 40     | *Piper sylvaticum* Roxb.  | An extract is made with the whole plant by boiling in water (1:10). It is used for having a hot bath once a day for 3 days. |
| 41     | *Plumbago indica* L.        | A paste is made with the leaves of the plant. It is applied externally on the infected skin and kept there for 3 days. In the same way, the medicine should be used 6 times. |
| 42     | *Portulaca oleracea* L.     | Fresh juice is made with the whole plant by boiling in water. It is advised to use for washing the infected skin twice a day for 4 days. |
| 43     | *Psychotria calocarpa* Kurz | An extract is made with the whole plant by boiling in water. It is advised to use it for washing the infected skin twice a day for 7 days. |
| 44     | *Pterocarpus santalinus* L. f. | Infusion and fresh juice are made from the stems of the plant by boiling in water. They are applied externally on the head-skin twice a day until the disease is cured. |
| 45     | *Rhynechotechum ellipticum* (Wall. ex D. Dietr.) A. DC. | The fresh juice is extracted from the roots of the plant by rubbing with a stone. It is taken thrice a day (5 mL each time) until the disease is cured. |
| 46     | *Rourea commutata*          | Decocction and fresh juices are made with the root-barks of the plant. It is used to wash the sore once a day for 6 days. |
| 47     | *Sarcochlamys pulcherrima*   | A paste is made with the leaves of the plant. After cleaning the skin, it is applied externally to the infected place twice a day until the disease is cured. The paste is also made with the leaves of the first plant and fruits of the second plant. It is applied externally on the wetted head and kept half an hour. Then the head is washed with soap and water. The procedure should be followed for consecutive 7 days. |
| 48     | *Saurauja roxburghii*       | Fresh juice is extracted from the roots and leaves of the plant by squeezing. It is taken thrice a day (5 mL each time) until the disease is cured. |
| 49     | *Senna alata* (L.) Roxb.   | A paste is made with the leaves of the plant. It is applied externally on the infected skin twice a day for 3 days. At the same time, a hot bath is advised to have once a day for 7 days with that extract. |
| 50     | *Sesamum indicum* L.        | A paste is made with the leaves of the plants; it is used for washing hairs once a day until the disease is cured. |
| 51     | *Sida acuta* Burm. f.       | The fresh juice is extracted from the roots of the plants by rubbing with a stone. It is applied externally on the boils thrice a day for 4 days and on the acne twice a day until the disease is cured. |
| 52     | *Solena amblica* (Lam.) Gandhi | Fomentation is given on infected skin, with the fresh leaves of the plant after heated on fire. |
| 53     | *Staurogyne argentea* Wall. | A paste is made with the leaves of the plants. After washing the infected skin, it is applied externally on the infected skin two times a day for 3 days. |
| 54     | *Syneidrella nodiflora* (L.) Gaertn. | A paste is made with the leaves and stems of the plant. It is applied externally on the infected skin twice a day until the disease is cured. |
| 55     | *Zizyphus mauritiana* Lam. | An infusion is made with the fruits of the plant. At the same time, fresh juice is extracted from the stems of the plant by boiling in water. It is taken thrice a day (100 mL each time) for 7 days. |
| 56     | *Zizyphus oenoplia* (L.) Mill. | Fresh juice is extracted from the fruits of the plants by squeezing. It is taken thrice a day (5 mL each time) until the disease is cured. |
3. Results

Informants

Of 387 informants interviewed, the majority were male. Most of them were 50-60 years old, followed by informants aged 40-50 years. Nearly every interviewee was an independent healer and completed at least 10 years of education. Also, a substantial number of professional alternative medicine practitioners were interviewed. The majority of interviewees had 5-10 years of practical experience or empirical knowledge who were followed by people with 10-20 years and 2-5 years of experience (Table 1).

Plants used in the treatment of dermatological disorders and other relevant information

Among the 189 plants collected from 3 different districts, 56 species were used by the traditional healers to treat dermatological diseases in Bangladesh, and they belong to 32 different families. The most significant number of species belonged to the Fabaceae family (8 species), followed by Rubiaceae (5 species), Lamiaceae (4 species) and Asteraceae (Compositae) (3 species) (Figure 2). Different plant parts were reported to be used, among which leaves (33.9%) were the most frequently used ones. They were followed by leaves and root (10.7%), leaves and stems (7.1%), bark and leaves (5.4%) and the whole plant (5.4%). The dominant mode of preparation was paste (35.7%) fol-
Table 3. Name of the plants similar to our findings used to treat dermatological disorders in other regions of the world

| Sl. No. | Scientific Name of the Plant | Region | Medicinal Use Matching to Our Survey | Other Medicinal Uses | Reference |
|---------|------------------------------|--------|--------------------------------------|----------------------|-----------|
| 1       | *Aloe barbadensis* Mill.     | Jammu, Kashmir, and Ladakh, India | Abscess, burns, boils, wounds | Headache, gonorrhea, irregular periods, diabetes, vermicidal | [50]      |
| 2       | *Anamirta cocculus* (L.) Wight & Arn. | Kurdish autonomous region, Iraq; Bali, Indonesia | Mastitis | Diarrhea, breast cancer | [50, 51] |
| 3       | *Ardisia solanacea* Roxb.    | Central and Western Ghats, Karnataka, India | Itching | - | [52, 53] |
| 4       | *Azadirachta indica* A. Juss. | Nalbari district, Assam, India; South-western Nigeria; Bali, Indonesia | Acne, eczema, skin diseases, scabies, measles | Leucorrhea, fertility problem, diabetes, dental care, diuretic, gastrointestinal disorder, heartburn, malaria | [29, 54, 55] |
| 5       | *Buddleja asiatica* Lour.    | Gallies Abbottabad, Northern Pakistan; Jammu and Kashmir, India | Superficial red color skin lesion | Asthma, coughing with blood | [5, 56] |
| 6       | *Cassia occidentalis* L.     | China; Odisha, India | Ulcer, skin infections | Hepatitis, hyperlipidemia, stomachache, habitual constipation, acute conjunctivitis | [57, 58] |
| 7       | *Cissus quadrangularis* L.   | Gabon; Northern Bengal, India | Antileishmanial, antifungal, anti-inflammatory, antimicrobial | Bone fracture, paralysis, leg pain | [59, 60] |
| 8       | *Clerodendrum viscousum* Vent. | Northern Bengal, India | Skin disease, boils | Stomach worm, stomach pain, tooth pain | [60] |
| 9       | *Commelina erecta* L.        | Valley of Juruena region, Legal Amazon, Mato Grosso, Brazil | Ringworm, wound healing | Inflammation, cleanser, rheumatism | [61] |
| 10      | *Crossocephalum crepidoidea* (Benth.) S. Moore | Batan Island, Philippines | Cut, wounds | Heartburn, indigestion | [62] |
| 11      | *Croton pallida* Alton       | Northern Thailand; Tripura state of India | Ringworm | Kidney stone, urinary problem | [63, 64] |
| 12      | *Crotalaria pallida* Alton   | Nagaland, India | - | Sinusitis, gastrointestinal problem, cancer | [65] |
| 13      | *Cucumis melo* L.           | Kurdistan, Iraq; Albanian Alps, Kosovo | - | Prostate cancer, stomach pain, intestinal inflammation, colon problems, diabetes, diarrhea | [66, 67] |
| 14      | *Curcuma longa* L.          | Papua New Guinea; Mato Grosso, Brazil; Rodrigues Island | Tropical ulcer, leprosy, measles, skin cancer, chickenpox, acne | Obesity, pneumonia, throat infection, asthma, bronchitis, heartache, thrombosis | [68-70] |
| 15      | *Eclipta alba* (L.) Hassk.   | Mato Grosso, Brazil; Krabi and Songkhla provinces of Southern Thailand | Ulcer, wounds, bruises | Flatulence, colic, kidney problems | [61, 71] |
| 16      | *Holarrhena pubescens* Wall. ex G. Don | Guinea-Bissau; Chipinge district, Zimbabwe | - | Stomatache, venereal disease, amoebic dysentery, diarrhea, helminthic infections, hypotenious, toothache | [72, 73] |
| Sl. No. | Scientific Name of the Plant | Region | Medicinal Use Matching to Our Survey | Other Medicinal Uses | Reference |
|--------|-------------------------------|--------|--------------------------------------|----------------------|-----------|
| 17     | Hyptis suaveolens (L.) Poit.  | Ogbomosho, Southwest Nigeria; Tripura, North East India | Allergy, skin diseases | Liver troubles, body pain, malaria | [74, 75] |
| 18     | Ichnocarpus frutescens (L.) R. Br. | West Bengal, India; Odisha, India | Treating sores in between fingers, nail disease, scabies | Piles, anorexia, burning sensation, fever | [58, 76] |
| 19     | Ixora acuminata Roxb.         | Uttarakhand, India | -                                   | Jaundice             | [77]      |
| 20     | Lawsonia inermis L.           | Senegal; Western Sahara; Jammu, Kashmir, and Ladakh, India | Skin diseases, wound healing, itching, leucoderma | To dye and perfume hair, dye skin and nails, hemorrhages, antiphlogistic, toothache, urinary tract infection | [50, 78, 79] |
| 21     | Leea indica (Burm. f.) Merr.  | Andaman and Nicobar Islands; West African countries | Buruli ulcer, skin injuries | Abdominal pain, diarrhoea, dysentery, dysuria, bone fracture, pain in eye, snake bite | [80, 81] |
| 22     | Melia azedarach L.            | Patriata, New Murree, Pakistan; Swat, North Pakistan; Maidan valley, Lower Dir, Pakistan | Boils, pimples, scabies, pustules, allergy, skin disease | Gastric trouble, fever with cough, anhematelic, carminative, sexual tonic, night blindness, vomiting | [82-84] |
| 23     | Mimosa pudica L.              | Northern Bengal, India | Wounds and swelling, reddening of the eye | Piles, infertility, dental pain, hydrocele, jaundice, placenta prolapess | [60]      |
| 24     | Mirabilis Jalapa L.           | Khyber Pakhtunkhwa, Pakistan; Northern Peru | Wound healing, discharging pus, abscess | Epilepsy, renal and hepatic ailments, Body-ache, eye inflammation | [6, 50] |
| 25     | Musa paradisiaca L.           | Amazonia | Leishmaniatis | - | [85] |
| 26     | Mussaenda radburghi Hook. f.  | Assam, India | -                                     | Post-natal care, jaundice | [86]      |
| 27     | Ocimum americanum L.          | Karnataka, India | Dandruff, dark pigmentation on skin | - | [53]      |
| 28     | Ocimum tenuiflorum L.         | Karnataka, India | Dermatitis | - | [53]      |
| 29     | Plumbago indica L.            | Karnataka, India | Eczema | - | [53]      |
| 30     | Portulaca oleracea L.         | Soan valley, Salt Range, Pakistan | Scabies, burns | Headache, piles | [3]       |
| 31     | Psychotria calocarpa Kurz.    | China and Thailand | - | Internal bleeding | [87]      |
| 32     | Pterocarpus santalinus L. f.  | Rwanda | Traditional cosmetics and skin-care herbal | - | [88]      |
| 33     | Senna alata (L.) Roxb.        | Guatemala and Nicaragua, Central America | Skin infections, rashes, sores | Diabetes, kidney and urinary complaints, hypertension | [89]      |
| 34     | Sida acuta Burm. f.           | The Ashanti region, Ghana; Songkhla and Krabi Province of Southern Thailand | Measles, rubella, shingles | Skin, breast, colorectal cancer | [90, 91] |
| 35     | Solena amplexicaulis (Lam.) Gandhi | Parbat district of Western Nepal | - | Menstrual disorder, earache | [92]      |
| 36     | Zizyphus mauritiana Lam.      | India | Hair-fall, dandruff | - | [93]      |
Table 4. Literature review of active phytochemicals of the studied plants

| Sl. No. | Scientific Name                  | Active Compounds                                                                 | Properties                                      | Reference         |
|---------|----------------------------------|----------------------------------------------------------------------------------|-------------------------------------------------|-------------------|
| 1       | Aloe barbadensis Mill.           | Mannose-6-phosphate and anthraquinone                                             | Wound healing and antibacterial                 | [94, 95]          |
| 2       | Ardisia solanacea Roxb.          | Bergenin                                                                          | Antifungal                                      | [41]              |
| 3       | Azadirachta indica A. Juss.      | Margolone, margolone and isomargolone                                             | Antibacterial                                   | [96, 97]          |
| 4       | Cassia sophera L.                | L-flavonol-C-glycoside, sennosides phyoscin, and beta-sitosterol                  | Antioxidant                                     | [98]              |
| 5       | Clerodendrum viscosum Vent.      | Alkaloids, tannins, reducing sugars, steroids and flavonoids                      | Antioxidant, antispasmodic                      | [99-101]          |
| 6       | Curcuma longa L.                 | Turmeric oil                                                                       | Inhibit dermatophytes and pathogenic molds, antifungal activity | [102]              |
| 7       | Holarrhena pubescens Wall. ex G. Don | Steroid alkaloids                                                                 | Antibacterial                                    | [103]              |
| 8       | Lawsonia inermis L.              | 1,5 Diphenylpent-3-en-1-ynes and methyl naphthalene carboxylates; 2-hydroxy-1, 4-naphthoquinone | Anti-inflammatory and antifungal                | [104-106]         |
| 9       | Leea indica [Burm. f.] Merr.     | Flavonoids, steroids                                                              | Antifungal                                      | [107-109]         |
| 10      | Melia azedarach L.               | Melacarpin, meliacin, hydroxycoumarins, beta-carbone alkaloids, monoterpenes, limonoids | Antiviral, antifungal, anti-inflammatory, antibacterial, antimicrobial and insecticidal | [110-118]         |
| 11      | Mimosa pudica L.                 | Phenols                                                                           | Wound healing                                   | [119]             |
| 12      | Peperomia pellucida [L.] Kunth    | Essential oil and flavonoids                                                      | Against skin complications                      | [120]             |
| 13      | Saurauja roxburghii              | Ursolic acid derivatives                                                          | Cytotoxic                                       | [121]             |
| 14      | Commelina erecta L.              | Antiamoebic and antiplasmodial compounds                                          | Antiamoebic, antiplasmodial                     | [122]             |
| 15      | Crotalaria pallida Aiton         | Antimicrobial peptides                                                            | Antimicrobial                                   | [123]             |
| 16      | Croton caudatus Geiseler         | Anticandidal compounds                                                            | Anticandidal                                    | [124]             |
| 17      | Dioscorea anguina Roxb.          | Cardinolides                                                                      | Nematocidal                                     | [125]             |
| 18      | Diospyros blancoi A. DC.         | Terpenoids                                                                        | Anti-inflammatory                               | [126]             |
| 19      | Holarrhena pubescens Wall. ex G. Don | Steroids                                                                          | Antibacterial                                   | [103, 127]       |
| 20      | Lawsonia inermis L.              | Carboxylates                                                                      | Anti-inflammatory                               | [105]             |
| Sl. No. | Scientific Name          | Active Compounds          | Properties                                      | Reference |
|--------|--------------------------|---------------------------|-------------------------------------------------|-----------|
| 21     | *Mimosa pudica* L.       | Flavonoids, phenol        | Antibacterial, free radical scavenging activity, wound healing, neuroprotective | [119, 128] |
| 22     | *Piper sylvaticum* Roxb. | Alkaloids                 | Antibacterial                                   | [129]     |
| 23     | *Senna alata* [L.]       | Rhein                     | Anti-allergic activity                          | [130]     |
| 24     | *Sesamum indicum* L.     | Lignans                   | Antioxidant                                     | [131]     |
| 25     | *Sida acuta* Burm. f.    | Saponins, tannins and anthraquinones | Antifungal and antibacterial activity           | [132, 133] |

Table 5. Literature review of the surveyed plants with toxicity

| Sl. No. | Scientific Name          | Toxic Part | Toxic Compounds          | Toxic Effects                                      | Reference |
|--------|--------------------------|------------|---------------------------|---------------------------------------------------|-----------|
| 1      | *Aloe barbadensis* Mill. | -          | Toxic carbohydrates and polyphenols | Antitumor, pesticidal, hepatotoxic               | [134-136] |
| 2      | *Anamirta cocculus* (L.) Wight & Arn. | Berry       | Picrotoxin                 | Poisonous                                         | [46, 47] |
| 3      | *Azadirachta indica* A. Juss. | Seed       | Azadirachtin               | Encephalopathy, generalized seizures, ophthalmopathy, pesticidal, tachypnea, drowsiness, loss of consciousness, coma | [48, 49] |
| 4      | *Cassia occidentalis* L. | -          | Pyrrolizidine alkaloid     | Hepatotoxic                                        | [137]     |
| 5      | *Crotalaria pallida* Alton | -          | Pyrrolizidine alkaloid     | Hepatotoxic                                        | [138]     |
| 6      | *Cucumis melo* L.        | -          | -                          | Allergic reactions                                | [139]     |
| 7      | *Eclipta alba* (L.) Hassk. | -          | -                          | Histopathological alterations in liver            | [140]     |
| 8      | *Hyptis suaveolens* (L.) Poit. | -          | -                          | Toxic                                             | [141]     |
| 9      | *Lawsonia inermis* L.    | -          | -                          | Contact allergy and type-I hypersensitivity reactions, hemolysis | [142]     |
| 10     | *Melia azedarach* L.     | -          | -                          | Gastrointestinal and CNS disturbances             | [143]     |
| 11     | *Senna alata* (L.) Roxb. | -          | -                          | Genotoxic                                          | [144]     |
| 12     | *Sesamum indicum* L.     | -          | -                          | Toxic                                             | [145]     |
| 13     | *Zizyphus mauritiana* Lam. | -          | -                          | Latex-fruit syndrome                              | [146]     |
lowed by juice (19.6%) and extract (14.3%) (Figure 3). The solvents used for the preparations were water (33.6%), milk (19.6%), honey (16.1%), and wine (10.7%). The mode of administration was found to be topical (67.9%), oral (21.4%), and both topical and oral (10.7%). Among the reported species, 32.1% was shrub followed by herb (28.6%), and climber and tree (10.7% both). Of the plant species, 19.6%, 14.3% and 12.5% grow in the forest, homestead, hill forest and homestead, respectively. Significant portions also grow in the garden (8.9%) and marshy places (3.6%). Based on availability, the species are categorized as common (66.1%), less frequent (23.2%) and rare (10.7%). The majority of the plants are wild (66.1%); some are both cultivated and wild (17.9%) while others are only grown (16.1%). Figure S.1, Figure S.2, and Figure S.3 elaborate on the use of different solvents, mode of administration and nature of plants, respectively (supplementary figures). The doses of the available plants varied widely (Table 2).

Frequency of citation of the plants

The most cited species of plants were Aloe barbadensis Mill., Azadirachta indica A. Juss., Commelina erecta L., Flemingia congesta Roxb. ex W.T. Aiton, Ichnocarpus frutescens (L.) R. Br., Lawsonia inermis L., Melia azedarach L., Sarchochlamys pulcherrima, and Sida acuta Burm. f. (Supplementary Tables, Table S.1).

Discussion

In the present investigation, Fabaceae was the most dominant family of plants. Being the second-largest family of medicinal plants, Fabaceae covers more than 490 plant species, the majority of which are applied in TM. The worldwide prevalence of a high number (approximately 20000) of species of trees, vines, shrubs, and herbs can also relate to the predominance of this family in our study [28]. Leaves were the major plant parts used against dermatological disorders either alone or mixed with other plant parts. Other previously conducted studies produced similar results [1, 13, 29-32]. The medicinal value of leaves is attributed to the presence of photosynthates, which make them the primary photosynthetic organs [32]. The ease of collection of leaves, compared to other parts of plants such as roots, fruits, and flowers, is another reason behind their widespread use [29, 33]. Fresh leaves are prepared as paste and applied to skin infections as reported in previous studies [34]. That is why paste is the main mode of preparation in our investigation. Shrubs, herbs, and trees were the most common habit of plants. This fact could be attributed to the natural abundance of shrubs or herbaceous plants in this geographical area and their accessibility to the communities of local traditional healers [35, 36].

A comparative study between the cited plants of our research and those of other investigations revealed some noteworthy similarities. Of 56 species, 36 plants have been reported in the treatment of many dermatological problems in other countries such as India, Nepal, Pakistan, South America, etc. (Table 3). The use of the same plants in different communities of the world for similar purposes support the pharmacological efficacy of these plants. However, we did not categorize the medicinal uses of the plants in other communities. Few plants were found in different surveys that were used to treat a particular ailment, while for most of the other plants, the available information was minimal. Therefore, Table 3 lacks the informant consensus of the plants to determine the most widely used plants for a particular disease in that study region.

High FC values indicate the various and numerous medicinal properties of the plants, and thus, they demand further phytochemical, pharmacological, and toxicological analysis for the discovery of potential novel drugs. For instance, Aloe barbadensis Mill., and Azadirachta indica A. Juss., are popular market preparation of reputed pharmaceuticals mainly for their emollient and wound healing properties.

The majority of the plants reported in our study, apart from dermatological disorders, are used in many other diseases, which are listed in the supplementary section (Table S.2). This trend is an indication of the tradition, as mentioned elsewhere, to develop a local healing system through trials and errors for ideal treatment practices [37, 38].

Several studies have been conducted to find the specific compounds responsible for the use of the reported plants to cure dermatological disorders. However, not all plant species in our study have been subjected to extensive phytochemical investigations. Carrying out a detailed phytochemical investigation in all plant species is a gigantic task and somewhat beyond the scope of the study. Nevertheless, based on the previous investigations, Table 4 has identified and listed the compounds behind the dermatological potential of several plants.

To explain the mode of action of all 56 reported plants individually is beyond our scope. Generalizing the mechanism of actions of all plants would not be rational either since it would result in the exclusion of lots of valuable information. Nonetheless, several studies have been carried out to underpin the role of these active compounds, which would validate their contribution to treating dermatological disorders. For instance, anthraquinone derivatives are known as antibacterial agents that, in particular, are highly effective against the gram-positive bacterium S. aureus. They can penetrate the bacterium by interacting with the
### Table S.1. Other relevant information about the plants

| Sl. No. | Scientific Name of the Plant | Habit | Habitat | Nature | Plants parts used | Preparation | 6 Solvent/ Adjuvant | 7 Mode of Application | 8 Relative Abundance | 9 Conservation Status | 10FC | Voucher Specimen |
|---------|-----------------------------|-------|---------|--------|-------------------|-------------|---------------------|----------------------|---------------------|----------------------|-------|-----------------|
| 1       | Aloe barbadensis Mill.       | H     | Hs      | W      | L                 | extract, J | W                   | T                   | Sy                  | C                    | 3.20  | NIS 05 (DACB)   |
| 2       | Anamirta cocculus (L.) Wight & Arn. | C     | F, P    | W      | L                 | extract    | W                   | T                   | Rm                  | C                    | 1.81  | NIS 247 (DACB)  |
| 3       | Ardisia solanacea Roxb.      | S     | F       | Cu     | B, R              | extract    | W                   | T                   | K                   | C                    | 2.10  | NIS 161 (DACB)  |
| 4       | Aegle marmelos (Poir) (Curtis) | S     | Hf      | W      | L, St             | Pa          | H                   | T                   | Ch                | Lc                   | 1.50  | NIS 367 (DACB)  |
| 5       | Aegle marmelos (A. Juss.)     | T     | F       | Cu, W  | L                 | cotton-seed-sized pills, D, extract | W | O, T | Sy | C | 3.71 | NIS 39 (DACB) |
| 6       | Buddleja asiatica Lour.      | S, T  | Hf      | W      | B, L              | extract    | Wi                  | T                   | B                  | Lc                   | 1.58  | NIS 209 (DACB)  |
| 7       | Byttneria pilosa Roxb.       | Wc    | Hf      | W      | L, R              | Pa          | W                   | T                   | Rm                  | R                    | 2.90  | NIS 98 (DACB)   |
| 8       | Cassia occidentalis L.        | H     | Hf, Hs  | W      | L, R, S           | D, R        | M                   | T                   | Sr                  | C                    | 1.30  | SRB 103 (DACB) |
| 9       | Cassia sophera L.            | S     | F, R, Wp | W      | L, R, S           | D, R        | M                   | O                   | Su                  | C                    | 1.50  | NIS 141 (DACB) |
| 10      | Gynura aconitifolia L.       | C     | Hs      | Cu     | L, Sh, St         | J, Pa       | W                   | O                   | H                  | C                    | 1.75  | NIS 324 (DACB) |
| 11      | Oroxylum incisum Vent.       | S, T  | Hf, Hs  | Cu     | L                 | extract    | W                   | T                   | Sr                  | C                    | 1.64  | NIS 92 (DACB)   |
| 12      | Combretum erectum L.         | H     | F, Op   | W      | L, St             | J, Pa       | H                   | T                   | Ch                | Lc                   | 2.90  | NIS 244 (DACB) |
| Sl. No. | Scientific Name of the Plant | Habit | Habitat | Nature | Plants parts used | Preparation | 6 Solvent/Adjuvant | 7 Mode of Application | Relative Abundance | Conservation Status | 9 Voucher Specimen |
|---------|----------------------------|-------|---------|--------|------------------|-------------|-------------------|---------------------|-------------------|--------------------|-------------------|
| 13      | Crassocephalum crepidioides (Benth.) S. Moore | H, F, W, L | Pa | M | T | Sh | C | 1.66 | NIS 128 (DACB) |
| 14      | Crotalaria pallida Aiton | H, S, Rs, Wp, Cu, W | S, extract | M | T | Sh | C | 1.71 | NIS 411 (DACB) |
| 15      | Croton cordatus Geissler | S, Hs, W, L | extract, Pa | Wi, O, T | Su, Lc | 1.48 | NIS 42 (DACB) |
| 16      | Guanum moso L. | C, Hs, Cu, W, Fr, S | J, Wi, O | Chl, Lc | 1.30 | NIS 94 (DACB) |
| 17      | Guanum Angia L. | H, Hs, Cu, Rh, Pa | W, T | Cb, C | 1.50 | NIS 158 (DACB) |
| 18      | Dioscorea anquida Roxb. | C, Hf, Hs, W | L, Pa | W, T | Sy, C | 1.65 | SRB 95 (DACB) |
| 19      | Diospyros iono A. DC. | C, Hf, Hs, W | Fr, J | W, O | Sy, C | 1.50 | SRB 129 (DACB) |
| 20      | Eclipta alba J. | H, Wi, W, L, St, J, W, O, T | Rm, Lc | 1.50 | NIS 232 (DACB) |
| 21      | Eclipta rhedii Spring. | H, F, W, L | Pa | M, T | B, Lc | 1.50 | NIS 102 (DACB) |
| 22      | Flemingia congesta Wall. ex G. Don | S, Hf, Wi, W, L, R, St, J, Pa, Wi | T, K, C | 3.13 | NIS 281 (DACB) |
| 23      | Heliotropium plumosum Wall. ex G. Don | T, Hf, W, S | Pa | H, T, Su | R, 1.53 | NIS 442 (DACB) |
| 24      | Helianthus annuus (L.) Poel. | S, Hf, Hs, W, L | Pa | W, T, Cht | R, 1.64 | NIS 116 (DACB) |
| Sl. No. | Scientific Name of the Plant | Habit | Habitat | Nature | Plants parts used | Preparation | Solvent/Adjuvant | Mode of Application | Relative Abundance | Conservation Status | FC | Voucher Specimen |
|--------|-----------------------------|-------|---------|--------|-------------------|-------------|-----------------|--------------------|-------------------|-------------------|----|-----------------|
| 25     | Ichnocarpus frutescens (L.) R. Br. | C, S | Hf, Hs, Sc | W, L, R | D, Pa | W | T | Chit | C | 3.55 | SRB 425 (DACB) |
| 26     | Ixora acuminata Roxb. | S | Hs | W, L | Pa | M | T | Chit, Lc | 1.21 | SRB 322 (DACB) |
| 27     | Ixora athroantha Bremek. | S | Hs | W, B, L | extract & | W | O, T | B | C | 1.34 | SRB 44 (DACB) |
| 28     | Lagerstroemia speciosa (L.) Pers. | S | F | Cu, W | L | Pa | W | T | B | C | 1.67 | SRB 419 (DACB) |
| 29     | Lawsonia inermis L. | S, T | F, Hs | Cu, W | Fr, L, R | J, P | Pa | W | O, T | Rm | C | 2.95 | SRB 373 (DACB) |
| 30     | Lawsonia inermis L. (Rumph.) A. DC. | S | G | W | L, R | J | H | O | K | C | 1.50 | SRB 105 (DACB) |
| 31     | Melia azedarach L. | T | F | Cu, W | B, L | extract, P | W | O, T | H | C | 3.08 | SRB 581 (DACB) |
| 32     | Mimusops elengi L. (Ehret.) Miers. | H | Hf, Hs | Cu, W | L, R, St | Pa | W | T | Sr | C | 1.50 | NIS 168 (DACB) |
| 33     | Mirabilis jalapa L. | H | F, G | Cu, W | L, R | I, Pa | Wi | T | Sy | C | 1.84 | NIS 273 (DACB) |
| 34     | Musa paradisiaca L. | T | Mp | Cu, W | L, R | pea-sized pills | W | O | H | C | 0.92 | NIS 342 (DACB) |
| 35     | Mussaenda roxburghii Hook. f. | S | F | W | L | Pa | W | T | H | Lc | 1.26 | NIS 19 (DACB) |
| 36     | Dometum americanum L. | H | Hs | W | L | J | M | O | B | C | 1.71 | NIS 175 (DACB) |
| Sl. No. | Scientific Name of the Plant | 1 Habit | 2 Habitat | 3 Nature | 4 Plants parts used | 5 Preparation | 6 Solvent/Adjuvant | 7 Mode of Application | 8 Relative Abundance | 9 Conservation Status | 10 FC Voucher Specimen |
|--------|-------------------------------|---------|-----------|----------|--------------------|---------------|-------------------|----------------------|----------------------|----------------------|------------------------|
| 37     | Ocimum tenuiflorum L. | Ss       | G         | Cu       | L       | Pa                | H               | T                   | B                    | C                    | 1.09                   | NIS 408 (DACB)          |
| 38     | Galbanotis harriana B. Heyne | H       | Hf        | W        | B       | J                 | H               | O                   | Rm                   | Lc                   | 1.61                   | NIS 113 (DACB)          |
| 39     | Pterocarpus pubescens (L.) Kurth | H       | Mp        | W        | R, St   | Pa                | W               | T                   | Chn                  | Lc                   | 1.79                   | NIS 364 (DACB)          |
| 40     | Piper sulcatum R. B. | H       | F         | W        | Wp      | extract           | W               | T                   | Chn                  | C                    | 1.93                   | NIS 279 (DACB)          |
| 41     | Pelargonium indicum L. | S       | Rs        | Cu, W    | L       | Pa                | W               | T                   | Su                   | C                    | 0.82                   | NIS 09 (DACB)           |
| 42     | Psychotria cucumbaria Kurz | S       | G, Rs, Wp | Cu       | Wp      | J                 | M               | T                   | Su                   | R                    | 1.63                   | SRB 517 (DACB)          |
| 43     | Psychotria cucumbaria Kurz | S       | G         | Cu       | Wp      | extract           | M               | T                   | Rm                   | R                    | 1.27                   | SRB 180 (DACB)          |
| 44     | Pierocarpus emarginatus Spreng. ex DC. | T       | F         | W        | St      | I, J              | H               | T                   | Sy                   | C                    | 0.75                   | SRB 348 (DACB)          |
| 45     | Rhus communis Willd. | Us       | F, Hf     | W        | R       | J                 | W               | O                   | Rm                   | R                    | 1.89                   | SRB 104 (DACB)          |
| 46     | Ruusus communis | S       | F, Sc     | W        | B, R    | D, J              | H               | T                   | B                    | Lc                   | 1.86                   | SRB 485 (DACB)          |
| 47     | Sasaia chirapa pullcherrima | Su       | F         | W        | Fr, L   | Pa                | W               | T                   | B                    | C                    | 2.95                   | SRB 177 (DACB)          |
| 48     | Scutellaria roxburghii | T       | F         | W        | L, R    | J                 | Wi              | O                   | Sh                   | C                    | 1.48                   | SRB 511 (DACB)          |
| 49     | Semeleoth Belon. | S       | G         | Cu       | L       | Pa                | W               | T                   | Cb                   | R                    | 1.69                   | SRB 148 (DACB)          |
| 50     | Sesameum indicum L. | H       | G         | Cu       | L       | Pa                | W               | T                   | Chn                  | C                    | 0.83                   | NIS 389 (DACB)          |
| Sl. No. | Scientific Name of the Plant | Local/ Bangla Name | English Name | Family | Dermatological Applications | Other Medicinal Uses |
|--------|-----------------------------|--------------------|--------------|--------|-----------------------------|---------------------|
| 1      | Aloe barbadensis Mill.       | Ghritokumari       | Common Indian aloe | Xanthorrhoeaceae | Eczema, dullness of skin, facial paralysis | Asthma, cirrhosis, constipation, dehydration |
| 2      | Anamirta cocculus (L.) Wight & Arn. | Kabukbi fang | Crow’s bane | Menispermaceae | Dandruff | Constipation, dysmenorrhea, fever, gout |
| 3      | Ardisia solanacea Roxb.      | So kra pong        | Shoebutton ardisia | Primulaceae | Skin sore, bruise | Diarrhea, dysmenorrhea, gout, mental disorder |
| 4      | Argyreia capitiformis (Por.) Ooststr. | Bobu toring, Bhouto turing | - | Convolvulaceae | Boils, eczema | Bone fracture, epilepsy, fever, liver cancer |
| Sl. No | The Scientific Name of the Plant | Local/ Bangla Name | English Name | Family | Dermatological Applications | Other Medicinal Uses |
|--------|---------------------------------|-------------------|-------------|--------|-----------------------------|-------------------|
| 5      | Azadirachta indica A. Juss.     | Neem gach, Tamagach | Indian lilac | Meliaceae | Boils, itching, scabies, skin diseases | Allergy, chest pain, gastric ulcer, jaundice |
| 6      | Buddleja asiatica Lour.         | Dhubtora, ludi     | White butterfly bush | Scrophulariaceae | Boils, skin disease | Cough, leucorrhea, mania inanium, rheumatism |
| 7      | Byttneria pilosa Roxb.           | Choiloimrobang, Choloing paing | - | Malvaceae | Boils, dandruff, lice infestation | Rheumatalgia, snake-bite, syphilis |
| 8      | Cassia occidentalis L.           | Boro kalkeshande   | Western senna | Fabaceae | Skin disease | Purgative |
| 9      | Cassia sophera L.                | Kalkeshande        | Senna sophera | Fabaceae | Skin disease | Purgative |
| 10     | Cissus quadrangularis L.         | Hadjorha lata      | Granadilla | Vitaceae | Scurvy | Stomachic, menstruation, fracture |
| 11     | Clerodendrum viscosum Vent.      | Bhat gach          | Glorybower, bagflower, and bleeding-heart | Lamiaceae | Itching, scabies | Anemia, cluster headache, diabetes, diarrhea |
| 12     | Commelina erecta L.              | Woak kre, woak kry, Woak cri woak | Erect day flower | Commelinaeae | Acne, scabies | Otitis media, rheumatoid arthritis, weight loss |
| 13     | Crassocephalum crepidoides (Benth.) S. Moore | Dhub baishak | Ebolo, thickhead, redflower ragleaf, or fireweed | Asteraceae (Compositae) | Boils | Body pain, epilepsy, headache, tuberculosis |
| 14     | Croton caudatus Geiseler         | Ning nojja         | - | Euphorbiaceae | Boils | - |
| 15     | Crotalaria pallida Alt.          | Shon phul          | Rattlepods | Fabaceae | Boils, skin disease | Anemia, cold, cough, flatulence |
| 16     | Cucumis melo L.                  | Photi              | Muskmelon | Cucurbitaceae | Eczema | Diuretic |
| 17     | Curcuma longa L.                 | Kaji alid          | Turmeric | Zingiberaceae | Eczema, scabies | Anal blister, bone discoloration, bone fracture, gonorrhea |
| 18     | Dioscorea anguina Roxb.          | Mou alu            | - | Dioscoreaceae | Skin sore | - |
| 19     | Diospyros blancoi A. DC.         | Gab gach           | Mabolo | Ebenaceae | Skin disease | - |
| 20     | Eclipta alba (L.) Hassk.         | Kala sona          | False daisy | Asteraceae (Compositae) | Boils, burning wound, foot mud sore, leprosy | Gout, irregular menstruation, pneumonia, vertigo |
| Sl. No | The Scientific Name of the Plant | Local/ Bangla Name | English Name | Family | Dermatological Applications | Other Medicinal Uses |
|--------|---------------------------------|--------------------|--------------|--------|-----------------------------|---------------------|
| 21     | Entada rheedii Spreng.          | Giley ludi        | Mackary bean, ladynut | Fabaceae | Skin ulcer (cancer)         | -                   |
| 22     | Flemingia congesta Roxb. ex W.T. Alton | Lahok woa rok, Ara lichu | -            | Fabaceae | Boils, skin sore            | Abdominal pain, bone fracture, epistaxis, food poisoning |
| 23     | Holarrhena pubescens Wall. ex G. Don | Baro tita        | -            | Apocynaceae | Leprosy, sore in the mouth | Abdominal pain, amoebic dysentery, gastric tumor, gastric ulcer |
| 24     | Hyptis suaveolens (L.) Poit.    | Nang gri          | Chinese mint, Mint weed | Lamiaceae | Itching                      | -                   |
| 25     | Ichnocarpus frutescens (L.) R. Br. | Dudhilata, Sikam- chu aunty | Black Creeper | Apocynaceae | Skin disease, eczema         | Bone fracture, dental caries, measles, lipoma (tumor), leucorrhea |
| 26     | Ixora acuminata Roxb.           | Baro muiya        | -            | Rubiaceae | Boils, skin sore, scabies   | Blood dysentery, epilepsy, fever, jaundice, painful micturition |
| 27     | Ixora athroantha Bremek.        | Singi nuk mahagi  | -            | Rubiaceae | Boils, skin sore, scabies   | Blood dysentery, epilepsy, fever, jaundice, painful micturition |
| 28     | Lagerstroemia speciosa (L.) Pers.  | Jari phul         | Queen of flowers, Pride of India | Lythraceae | Eczema                       | Abdominal pain, anemia, antenatal care, body pain |
| 29     | Lawsonia inermis L.             | Mendi bofang      | Henna, Jamaica mignonette | Lythraceae | Dandruff, skin disease, sore in the mouth, sore in the throat | General weakness, leucorrhea, spermaturia |
| 30     | Leea indica (Burm. f.) Merr.    | Kurbakchara      | Bandicoot Berry | Vitaceae | Boils, itching               | Bone fracture, epilepsy, gastric tumor, gout |
| 31     | Melia azedarach L.              | Ghora neem        | -            | Meliaceae | Skin disease, dandruff, lice infestation | Allergy, septic sore |
| 32     | Mimosa pudica L.                | Chanachi          | Sensitive plant | Fabaceae | Boils, measles, sore on breast | Amoebic dysentery, bronchitis, gastric tumor, gonorrhea |
| Sl. No | The Scientific Name of the Plant | Local/ Bangla Name | English Name | Family | Dermatological Applications | Other Medicinal Uses |
|--------|---------------------------------|--------------------|--------------|--------|-----------------------------|----------------------|
| 33     | Mirabilis Jalapa L.            | Krisnakoli/Sanda malati | Four o’clock flower, Marvel of Peru | Nyctaginaceae | Boils | Purgative, aphrodisiac |
| 34     | Musa paradisiaca L.            | Atta kola gach      | -            | Musaceae | Boils in rectum | Asthma, blood dysentery, diarrhea, lipoma (tumor) |
| 35     | Mussaenda raxburchii Hook. f.  | Gach ranirak         | -            | Rubiaceae | Skin disease | Abdominal pain, bleeding, breast pain, cirrhosis, epilepsy, food poisoning |
| 36     | Ocimum americanum L.           | Bontulsi            | Hoary Basil, Rosary Basil | Lamiaceae | Skin disease | - |
| 37     | Ocimum tenuiflorum L.          | Tuli bofang         | -            | Lamiaceae | Chickenpox, measles, itching | Asthma, bronchitis, cold, cough, pricky heat, respiratory troubles |
| 38     | Ophiopilosa harrisiana B. Heyne | Jariphul            | -            | Rubiaceae | Boils, bruise, sore on tongue, sore in the mouth | Chest pain, dysentery, epilepsy, febrile convulsion |
| 39     | Peperomia pellucida (L.) Kunth | Hangara giluk shak | Shiny bush   | Piperaceae | Boils, eczema | Allergy, gastric tumor, headache, poisonous insect sting, snakebite |
| 40     | Piper sylavicum Roxb.          | Bhot pan            | Mountain long pepper | Piperaceae | Boils | Abdominal pain, allergy, asthma, bronchitis |
| 41     | Plumbago indica L.             | Aguni tida          | Rosy-flowered leadwort | Plumbaginaceae | Leprosy | Abortion, body pain, diarrhea, dysentery, jaundice, piles, rheumatism |
| 42     | Portulaca oleracea L.          | Noma                | Common Purslane, Garden Purslane | Portulacaceae | Scurvy | Liver disease |
| 43     | Psychotria calcarpa Kurz       | Mr i rang khey      | -            | Rubiaceae | Itching, scabies | Allergy, paralysis, rheumatic arthritis, rheumatism |
| 44     | Pterocarpus santalinus L. f.   | Rakta chandan       | Red Sanders, Red Sandalwood | Fabaceae | Boils | Astringent, tonic |
| Sl. No | The Scientific Name of the Plant | Local/ Bangla Name | English Name | Family | Dermatological Applications | Other Medicinal Uses |
|--------|---------------------------------|-------------------|-------------|--------|-----------------------------|----------------------|
| 45     | *Rhynchotechum ellipticum* (Wall. ex D. Dietr.) A. DC. | Chifai mang | - | Gesneriaceae | Boils | Cirrhosis, hoarseness, rheumatism |
| 46     | *Rourea commutata* | Anone lou chari/ Hrung mung | - | Connaraceae | Skin sore | - |
| 47     | *Sarchochlamys pulcherrima* | Chechsabing | Dogal tree | Urticaceae | Dandruff, eczema | Cutting wound, bone fracture, flatulence, jaundice, painful micturition, paralysis |
| 48     | *Saurauja roxburghii* | Panipuri gach | - | Ternstroemiaceae | Boils, eczema | Epilepsy, fever, gout, hydrocele, piles |
| 49     | *Senna alata* (L.) Roxb. | Dattalong | Ringworm shrub | Fabaceae | Skin disease | Goiter, hookworm infestation, ringworm |
| 50     | *Sesamum indicum* L. | Nahaing pang | Sesame | Pedaliaceae | Dandruff | - |
| 51     | *Sida acuta* Burm. f. | Predolulang, Wak khi peleh | Broom weed, spinyhead sida | Malvaceae | Acne, boils | Blister, carbuncle, hematuria, jaundice, painful micturition |
| 52     | *Solena amplexicaulis* (Lam.) Gandhi | Sejak shak | Clasping-stemmed Solena | Cucurbitaceae | Skin disease | Abdominal pain, asthma, belching, diabetes, epilepsy, flatulence, hysteria |
| 53     | *Staurogyne argentea* Wall. | Woanabalaai | - | Acanthaceae | Skin disease | - |
| 54     | *Synedrella nodiflora* (L.) Gaertn. | Heid ozon | Synedrella, Cinderella weed | Asteraceae (Compositae) | Eczema, foot mud sore | Vertigo |
| 55     | *Zizyphus mauritiana* Lam. | Borai | Jujube fruit tree | Rhamnaceae | Scabies, boils | Cooling, astringent |
| 56     | *Zizyphus oenoplia* (L.) Mill. | Shiakul, Bon | Jackal Jujube, Small-fruited Jujube | Rhamnaceae | Wound | Stomachic |
Figure S.1. Solvent/adjuvant used for the plants

- Honey
- Milk
- Water
- Wine

Figure S.2. Mode of application of plant

- Oral
- Oral and Topical
- Topical

Figure S.3. Nature of plants used for treating dermatological disorders in Chittagong Hill Tracts, Bangladesh

- Cultivated
- Cultivated and wild
- Wild
cell membrane which ultimately results in the inhibition of the cell growth at its logarithmic phase [39]. Mannose-6-phosphate is responsible for the wound healing property of certain medicinal plants by inhibiting transforming growth factor-beta [40]. Besides, bergenin is one of the compounds accountable for antifungal action, which works by inhibition of spore germination [41]. However, alkaloids, tannins, and flavonoids are well-known antioxidants that work by inhibiting either the formation or the proliferation of free radicals. The increase of free radicals is blocked either by scavenging species that initiate peroxidation or chelating metal ions so that they are incapable of producing reactive species or decompose lipid peroxides [42, 43]. The anti-inflammatory property of hydroxycoumarins and terpenoids is due to the inhibition of interleukin-6 production [44] and modification of critical cell signaling pathways, respectively [45].

Through the literature study, 13 plant species have been found to possess potential toxic compounds (Table 5). Apart from picrotoxin and azadirachtin found respectively in the berries of *Anamirta cocculus* [46, 47] and seeds of *Azadirachta indica* [48, 49], the rest are toxic mainly due to high doses of ingestion.

**Conclusion**

The present inventory sheds light on the contribution and importance of the natural flora of Bangladesh in treating different dermatological disorders. The knowledge in this survey supports the potential development of novel plant-based medications. Preliminary studies in these medicinal plants have provided the basis of their pharmacological efficacy against dermatological disorders; however, further investigations are necessary for ensuring safe therapy concerning traditional medicinal plants.

**Ethical Considerations**

**Compliance with ethical guidelines**

The authors took verbal consent from all the traditional medicine practitioners and indigenous people for participating and providing the relevant information in this survey.

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**Authors’ contributions**

Conceptualization: M.M.K. Mia; Methodology: M.M.K. Mia, Mohammad Fahim Kadir; Investigation: M.M.K. Mia, Md. Rafi Anwar, Nurul Islam Setu, Raunak Jahan; Writing-original draft: Shejuti Rahman Brishty, Mohammad Fahim Kadir; Writing-review & editing: Shejuti Rahman Brishty and Rabiul Islam; Resources: Shejuti Rahman Brishty, Rafi Anwar, Rabiul Islam, Nurul Islam Setu; Supervision: M.M.K. Mia, Mohammad Fahim Kadir, and Rabiul Islam.

**Conflict of interest**

The authors declared no conflict of interest.

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