

# Ethnomedicinal study of the khumi indigenous community in Bandarban district, Bangladesh

Md Salah Uddin<sup>1\*</sup>, Vashkar Chowdhury<sup>2</sup>, Shaikh Bokhtear Uddin<sup>2</sup>

## To Cite:

Uddin MS, Chowdhury V, Uddin SB. Ethnomedicinal study of the khumi indigenous community in Bandarban District, Bangladesh.

*Drug Discovery* 2023; 17: e3dd1004

doi: <https://doi.org/10.54905/disssi.v17i39.e3dd1004>

## Author Affiliation:

<sup>1</sup>Department of Biology, Kyungpook National University, Daegu 41566, Korea Republic

<sup>2</sup>Ethnobotany and Pharmacognosy Lab, Department of Botany, University of Chittagong, Chattogram 4331, Bangladesh; plantsofbd@gmail.com

## \*Corresponding author

Department of Biology, Kyungpook National University, Daegu 41566,

Korea Republic

plantsofbd@gmail.com

## Peer-Review History

Received: 02 November 2022

Reviewed & Revised: 09/November/2022 to 06/January/2023

Accepted: 14 January 2023

Published: 20 January 2023

## Peer-Review Model

External peer-review was done through double-blind method.

Drug Discovery

pISSN 2278-540X; eISSN 2278-5396

URL: <https://www.discoveryjournals.org/drugdiscovery>



© The Author(s) 2023. Open Access. This article is licensed under a [Creative Commons Attribution License 4.0 \(CC BY 4.0\)](https://creativecommons.org/licenses/by/4.0/), which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

## ABSTRACT

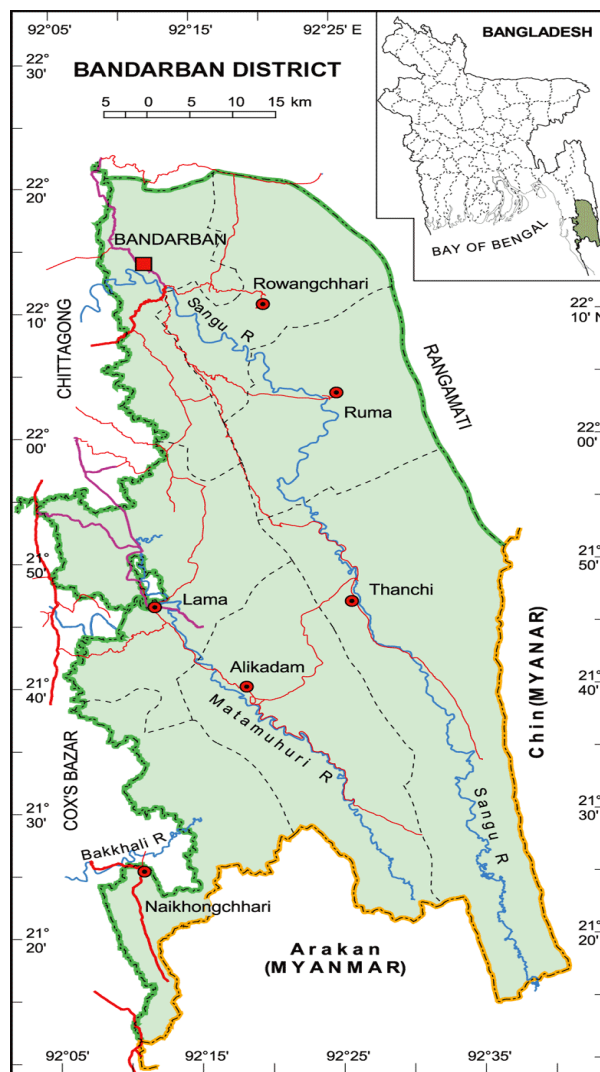
The current study documents the traditional healers' concept of ethnomedicine among the indigenous Khumi community in Bangladesh's Bandarban Hill District. A Khumi ethnomedical study was done for the first time in Bangladesh. We set out to record ethnomedicinal knowledge from both traditional healers and elder members of the community in order to collect and document all information on plant use and preserve it for future generations. We specifically sought to draw attention to brand-new ethnomedicinal plant species and their therapeutic advantages. There are 87 plant species with Khumi names in total and 67 diseases and illnesses are treated with them. These species, which come from 83 genera and 49 families, are listed alphabetically with the family, Khumi name, parts used, illness treated, preparation method and mode of use. This study demonstrated that the Khumi community still heavily relies on ethnomedicinal plants to cure a variety of maladies and disorders and that several of these plants are being employed in novel ways or for the first time in medicinal contexts.

**Keywords:** Ethnomedicine, Khumi, Bandarban, Bangladesh.

## 1. INTRODUCTION

Between botany and tribal knowledge of the therapeutic properties of plants, medico-ethno botany serves as a link. Traditional knowledge of medicinal plants and their use by indigenous cultures are helpful for community healthcare and drug development in the present and the future, in addition to helping to preserve cultural traditions and biodiversity (Sheng-Ji, 2001). However, of the estimated 350,000 plant species in the globe, only a small portion have been fully explored in terms of their pharmacological qualities through phytochemical investigation (Rates, 2001).

Khumi is a small indigenous community of Chittagong Hill Tracts. According to their physical makeup, the Khumi are of mongoloid descent. The Khumis currently residing in the Bandarban district's Thanchhi, Ruma, Roangchhari and Sadar upazila. The Khumi people live in a remote part of a hilly country, especially in the highest of the hills far from other settlements. Every day, they must struggle and travel great distances to get drinking water. They moved from Arakan in Myanmar and established down here at the end of the seventeenth century (Kamal et al., 2007).



**Figure 1** Map of Bandarban district, Bangladesh

The Bandarban district, one of Bangladesh's three hill districts and a portion of the erstwhile Chittagong Hill Tracts, is located in the country's extreme southeast between latitudes  $21^{\circ} 11'$  and  $22^{\circ} 22'$  north and longitudes  $92^{\circ} 40'$  and  $92^{\circ} 41'$  east. With a 4479.04 sq km area (Figure 1). It is bounded by Rangamati district in the north, Arakan (Myanmar) and the river Naf in the south, Arakan and Rangamati district in the east and Chittagong and Cox's Bazar district in the west (Shelly, 1992). It is not only the remotest district of the country, but also is the least populated (population 292,900). The three highest peak of Bangladesh-Tahjindong (1280 meters, also known as bijoy, Mowdok Mual (1052 m) and Keokradong (1230 m) are located in Bandarban district, as well as Raikhiang Lake, the highest lake in Bangladesh. The vegetation is characterized by semi-evergreen (deciduous) to tropical evergreen dominated by tall trees belonging to Dipterocarpaceae Euphorbiaceae, Lauraceae, Leguminosae and Rubiaceae.

Bangladesh has rich diversity of medicinal plants distributed in different geographical and environmental conditions. 747 species of Bangladesh's estimated 5,000 angiosperm species have been linked to therapeutic applications (Yusuf et al., 2009). Some medicinal plants from Bangladesh are using in the preparation of alternative medicine viz. Kabiraji, Hakimi, Unani, Ayurvedic, Homeopathic and as well as Allopathic systems of medicine (Kirtikar and Basu, 1935; Chopra et al., 1982). Hutchinson was one of the pioneers of ethnobotanical study in this sub-continent as well as in Bangladesh (Hutchinson, 1909). Rajput began his studies on the CHT tribes in 1965, marking the beginning of Bangladesh's ethnobotanical research. Thereafter, Sirajuddin, (1971), Saigal, (1978), Tanchangya, (1982) and shelly, (1992) worked in this line, but these are less detailed and largely dependent on Hutchinson's earlier work. Khan and Huq, (1975), Hasan and Khan, (1986), Mia and Huq, (1988), Chowdhury et al., (1989), Sarker and Hossain, (2009) worked only on medicinal aspects plant of Bangladesh.

There is some recent research on the ethnobotany of the tribal people in the CHT. Due to conflict between the tribes and Bengalis, the location, which is located in the interior of Bangladesh, has not been accessible for many years. However, this article reviews the patchy knowledge that is currently available on the plant uses by local cultures. The majority of the work was

completed after 1990. Kadir focused on Bangladeshi medicinal plants and their conservation strategy in 1990. Alam, (1992, 1998) provided documentation of Marma's ethnobotanical knowledge and use of medicinal plants. Several works also done by Hasan and Huq, (1993), Tripura, (1994), Yusuf, (1994), Hasan and Khan, (1996) on this field. Chemical analysis of some medicinal plant has done by Chowdhury et al., (1996). Alam et al., (1996), Khisa, (1996a, 1996b, 1998), Millat-e-Mustafa, (1996), Rahman and Yusuf, (1996), Rahman, (1997, 1999), Rahman and Uddin, (1998), Ghani, (1998), Uddin et al., (1998), Begum and Rashid, (1999) also worked on ethnobotanical field. All of them basically worked on the traditional plant use of tribal community as well as also the Bangali people and medicinal plant. The most recent work has done by Rahman and Wilcock, (2000, 2003), Begum et al., (2000), Millat-e-Mustafa, (2001), Khan et al., (2002), Anisuzzaman et al., (2007) and Uddin et al., (2010, 2014, 2015, 2016, 2017, 2019, 2020, 2021 and 2022).

## 2. METHODOLOGY

Direct observation, field interviews, plant interviews, group interviews and market surveys were used to collect the data for this study (Cotton, 1997; Rao, 1996; Alexiades, 1996). The data was recorded in the documentation data sheet during the field interview. Additionally, audio recordings have been made using a digital voice recorder to preserve historical information and document accurate facts.

The details of plant species, habits, Khumi names, availability and uses have all been documented (Table 1). Informal interviews with "baiddyas," elders and tribal leaders were undertaken over the same time period to gather ethnobotanical data. To collect information about ethnobotany, a variety of interviewing approaches have been employed according on the circumstance. Most interviewing approaches used today are semi-structured and open-ended.

Repeated field excursions were used to gather voucher specimens. Care was taken to record all pertinent taxonomic characteristics while recording the data. Professor Dr. Shaikh Bokhtear Uddin, Department of Botany, University of Chittagong, Bangladesh, was consulted for identification along with a number of literature sources. The Plants of the World Online, Kew (POWO, 2022) was used to compare the identified plant species in order to verify their correct scientific names and author citations. Every single voucher specimen was gathered during documentation and is now kept in the Chittagong University Herbarium (HCU).

**Table 1** A plant species along with scientific name, khumi name, habit, family, parts used, illness treated, mode of preparation and mode of application.

| s/n | Scientific Name                                     | Khumi Name       | Habit | Family        | Parts used  | Illness treated                    | Mode of preparation     | Mode of application |
|-----|-----------------------------------------------------|------------------|-------|---------------|-------------|------------------------------------|-------------------------|---------------------|
| 1.  | <i>Abelmoschus moschatus</i> Medik.                 | Taowi-akangnay   | S     | Malvaceae     | Root, seed  | tongue sore                        | Extract                 | La                  |
| 2.  | <i>Abroma augustum</i> (L.) L.f.                    | Paowi-k-achi     | S     | Sterculiaceae | Bark, leaf  | Snake bite                         | Paste                   | La                  |
| 3.  | <i>Acmella paniculata</i> (Wall. ex DC.) R.K.Jansen | Athangdi         | H     | Asteraceae    | flower      | Toothache                          | Plant parts directly    | La                  |
| 4.  | <i>Acorus calamus</i> L.                            | Langhi           | H     | Araceae       | Leaf        | Fever, headache                    | Paste                   | La                  |
| 5.  | <i>Aegle marmelos</i> (L.) Corrêa                   | By-reyei         | T     | Rutaceae      | Fruit, leaf | Acne, epistaxis                    | Paste                   | La                  |
| 6.  | <i>Ageratum conyzoides</i> L.                       | Chettangang-acha | H     | Asteraceae    | Leaf, stem  | Headache, black fever, leucorrhoea | Paste, juice, decoction | La, Oa              |
| 7.  | <i>Allium sativum</i> L.                            | Mezryn-kaleywe   | H     | Liliaceae     | Bulb        | Flatulence, headache               | Extract, paste          | Oa, La              |
| 8.  | <i>Aloe vera</i> (L.) Burm.f.                       | Kolatru          | H     | Aloeaceae     | Leaf        | Rheumatism, swelling, paralysis    | Extract                 | La, Oa              |
| 9.  | <i>Amomum aromaticum</i> Roxb.                      | Pinisomdi        | H     | Zingiberaceae | Rhizome     | Mumps, indigestion                 | Paste, processed        | La, Oa              |

|     |                                                   |                |   |                 |                   |                                                   | plant parts                   |        |
|-----|---------------------------------------------------|----------------|---|-----------------|-------------------|---------------------------------------------------|-------------------------------|--------|
| 10. | <i>Ananas comosus</i> (L.) Merr.                  | Metara         | H | Bromeliaceae    | Leaf, fruit       | Vomiting, hematuria, hook worm infestation        | Extract, juice                | Oa     |
| 11. | <i>Argemone mexicana</i> L.                       | We-kamthu-asi  | H | Papaveraceae    | Leaf, stem        | Hydrophobia, fever, leprosy                       | Paste, decoction, juice       | La, Oa |
| 12. | <i>Asclepias curassavica</i> L.                   | Dumdi          | H | Asclepiadaceae  | Leaf, root        | Worm, hemorrhage, piles, tuberculosis             | Juice, paste, powder,         | La, Oa |
| 13. | <i>Bauhinia acuminata</i> L.                      | Leyei-kaowling | T | Caesalpiniaceae | Bark              | Asthma                                            | Decoction                     | Oa     |
| 14. | <i>Bauhinia purpurea</i> L.                       | Leyee-kamseng  | T | Caesalpiniaceae | Bark              | Hemorrhage, diarrhea                              | Paste, extract                | La, Oa |
| 15. | <i>Bombax ceiba</i> L.                            | Chapang        | T | Bombacaceae     | Flower, bark      | Boils, dysentery                                  | Paste, juice                  | La, Oa |
| 16. | <i>Buddleja asiatica</i> Lour.                    | Kassey-khoyhu  | S | Buddlejaceae    | Leaf, root        | Fever, malaria                                    | Paste, infusion               | La, Oa |
| 17. | <i>Byttneria pilosa</i> Roxb.                     | Shaha          | C | Sterculiaceae   | Leaf, stem        | Bone fracture                                     | Paste                         | La     |
| 18. | <i>Callicarpa tomentosa</i> (L.) L.               | Lykee          | T | Verbenaceae     | Root, leaf        | Fever, epilepsy                                   | Juice, extract                | Oa, La |
| 19. | <i>Calophyllum inophyllum</i> L.                  | Thyklui-wing   | T | Clusiaceae      | Seed, root        | Rheumatism, snake bite                            | Oil, paste                    | La     |
| 20. | <i>Celosia argentea</i> L.                        | Se-ankanlingpo | H | Amaranthaceae   | Leaf              | Boils                                             | Extract                       | La     |
| 21. | <i>Centella asiatica</i> (L.) Urb.                | Ajingkrey      | H | Apiaceae        | Leaf, whole plant | Bronchitis, dysentery, blister, acne, chicken pox | Pills, processed plants parts | Oa     |
| 22. | <i>Hellenia speciosa</i> (J.Koenig) S.R.Dutta     | Kramo-kujii    | H | Costaceae       | Rhizome           | Cough, diabetes, fever, rash                      | Juice                         | Oa     |
| 23. | <i>Chromolaena odorata</i> (L.) R.M.King & H.Rob. | Owila          | H | Asteraceae      | Leaf              | Bleeding, flatulence                              | Paste, juice                  | La, Oa |
| 24. | <i>Chukrasia tabularis</i> A.Juss.                | Aangtingyou    | T | Meliaceae       | Leaf              | Gastritis                                         | Extract                       | Oa     |
| 25. | <i>Cissus repanda</i> (Wight & Arn.) Vahl         | Angrori        | C | Vitaceae        | Leaf              | Jaundice                                          | Processed plant parts         | Oa     |
| 26. | <i>Citrullus lanatus</i> (Thunb.) Matsum. & Nakai | Fray           | C | Cucurbitaceae   | Fruit, root       | Erectile dysfunction, acne, hemorrhage            | Juice                         | Oa     |
| 27. | <i>Citrus maxima</i> (Burm.) Merr.                | Dupa           | T | Rutaceae        | Leaf              | Fever, dysentery                                  | Pills                         | Oa     |
| 28. | <i>Clerodendrum infortunatum</i> L.               | Arong          | S | Verbenaceae     | Leaf              | Jaundice, scabies, anemia                         | Decoction                     | La     |
| 29. | <i>Cocos nucifera</i> L.                          | Kikuii         | T | Arecaceae       | Root              | Sore throat                                       | Infusion                      | Oa     |
| 30. | <i>Coix lacryma-jobi</i> L.                       | Kingku         | H | Poaceae         | Root              | Gonorrhea, chicken pox                            | Decoction                     | Oa     |

|     |                                                         |                   |   |                 |                          |                                |                       |        |
|-----|---------------------------------------------------------|-------------------|---|-----------------|--------------------------|--------------------------------|-----------------------|--------|
| 31. | <i>Commelina diffusa</i> Burm.f.                        | Atdoshoichoi      | H | Commelinaceae   | Stem                     | Boils                          | Extract               | La     |
| 32. | <i>Crassocephalum crepidioides</i> (Benth.) S.Moore     | Prindey           | H | Asteraceae      | Whole plant              | Constipation, stomach disorder | Juice                 | Oa     |
| 33. | <i>Cyanthillium patulum</i> (Aiton) H.Rob.              | Proydoy-kamnuch   | H | Asteraceae      | Stem, leaf               | Fever, headache                | Paste                 | La     |
| 34. | <i>Cyathula prostrata</i> (L.) Blume                    | Lebbeteaowi       | H | Amaranthaceae   | Leaf                     | Cough, asthma, tongue sore     | Decoction             | Oa, La |
| 35. | <i>Cymbopogon citratus</i> (DC.) Stapf                  | Longthing         | H | Poaceae         | Leaf                     | Asthma, cold, cough            | Extract               | Oa     |
| 36. | <i>Cyperus rotundus</i> L.                              | Aemuie-acha       | H | Cyperaceae      | Leaf, tuber              | Headache, fever                | Paste                 | La, Oa |
| 37. | <i>Dalbergia volubilis</i> Roxb.                        | Boinneye          | C | Fabaceae        | Leaf                     | Gastritis                      | Juice                 | Oa     |
| 38. | <i>Dendrocide sinuata</i> (Blume) Chew                  | Aatran            | S | Urticaceae      | Root                     | Intestinal worm                | Extract               | Oa     |
| 39. | <i>Dendrophthoe falcata</i> (L.f.) Ettingsh.            | Alikhowng         | S | Loranthaceae    | Leaf, stem               | Body pain, rheumatism          | Paste                 | La     |
| 40. | <i>Drimia indica</i> (Roxb.) Jessop                     | Owameya           | H | Liliaceae       | Bulb                     | Body burning                   | Extract               | La     |
| 41. | <i>Embelia ribes</i> Burm.f.                            | Mahaka            | C | Myrsinaceae     | Root                     | Constipation                   | Extract               | Oa     |
| 42. | <i>Euphorbia hirta</i> L.                               | Labeng-aaowi-asi  | H | Euphorbiaceae   | Leaf, stem               | Breast sore, lip sore          | Paste                 | La     |
| 43. | <i>Limonia acidissima</i> L.                            | Angklu            | T | Rutaceae        | Root                     | Typhoid                        | Extract               | Oa     |
| 44. | <i>Gmelina arborea</i> Roxb. ex Sm.                     | Aabbey            | T | Verbenaceae     | Bark                     | Fever                          | Extract               | Oa     |
| 45. | <i>Microcos paniculata</i> L.                           | Bakong            | T | Tiliaceae       | Leaf                     | Jaundice                       | Processed plant parts | Oa     |
| 46. | <i>Trichosanthes costata</i> Blume                      | Aachoroy          | C | Cucurbitaceae   | Root                     | Body pain                      | Paste                 | La     |
| 47. | <i>Heliotropium indicum</i> L.                          | Maha-tala         | H | Boraginaceae    | Flower, leaf, stem, root | Dermatitis, eczema             | Powder                | La, Oa |
| 48. | <i>Helminthostachys zeylanica</i> (L.) Hook.            | Asakkhu           | H | Ophioglossaceae | Frond                    | Dysuria                        | Processed plant parts | Oa     |
| 49. | <i>Mesosphaerum suaveolens</i> (L.) Kuntze              | Ky-sy-sheiyprang  | H | Lamiaceae       | Seed, root               | Constipation, stomach pain     | Juice                 | Oa     |
| 50. | <i>Jatropha gossypifolia</i> L.                         | Ley-abeowe        | S | Euphorbiaceae   | Leaf                     | Body pain                      | Paste                 | La     |
| 51. | <i>Justicia gendarussa</i> Burm.f.                      | Aawe              | H | Acanthaceae     | Leaf                     | Rheumatism, eczema             | Paste                 | La     |
| 52. | <i>Kalanchoe pinnata</i> (Lam.) Pers.                   | Gang-amprony-king | H | Crassulaceae    | Leaf                     | Asthma, bone fracture          | Extract, paste        | Oa, La |
| 53. | <i>Lablab purpureus</i> (L.) Sweet                      | Khubi             | C | Fabaceae        | Leaf                     | Throat pain                    | Decoction             | Oa     |
| 54. | <i>Camonea vitifolia</i> (Burm.f.) A.R.Simões & Staples | Engffeyei         | C | Convolvulaceae  | Leaf                     | Fever                          | Juice                 | Oa     |
| 55. | <i>Mesua ferrea</i> L.                                  | Seutump           | T | Clusiaceae      | Root                     | Fever                          | Extract               | Oa     |
| 56. | <i>Mikania micrantha</i> Kunth                          | Lyhu-azing        | H | Asteraceae      | Leaf                     | Hemorrhage                     | Paste                 | La     |
| 57. | <i>Mimosa pudica</i> L.                                 | Aangze            | S | Mimosaceae      | Root                     | Piles                          | Extract               | Oa     |
| 58. | <i>Trigastrotheca pentaphylla</i> (L.) Thulin           | Somtam            | H | Molluginaceae   | Leaf                     | Asthma                         | Extract               | Oa     |

|     |                                                                      |                 |   |                 |                     |                                                          |                       |    |
|-----|----------------------------------------------------------------------|-----------------|---|-----------------|---------------------|----------------------------------------------------------|-----------------------|----|
| 59. | <i>Momordica charantia</i> L.                                        | Achamasi        | C | Cucurbitaceae   | Leaf                | Body pain                                                | Processed plant parts | La |
| 60. | <i>Nicotiana tabacum</i> L.                                          | Sro             | H | Solanaceae      | Leaf                | Toothache                                                | Powder                | La |
| 61. | <i>Ocimum americanum</i> L.                                          | Sheprang        | H | Lamiaceae       | Seed, leaf          | Skin disease                                             | Paste                 | La |
| 62. | <i>Paederia foetida</i> L.                                           | Clemra          | C | Rubiaceae       | Leaf                | Indigestion                                              | Processed plant parts | Oa |
| 63. | <i>Piper betle</i> L.                                                | Mra             | C | Piperaceae      | Leaf                | Flatulence, indigestion                                  | Plant parts directly  | Oa |
| 64. | <i>Plumeria rubra</i> L.                                             | Lingmei-kamseng | T | Apocynaceae     | Root                | Menstruation problem                                     | Extract               | Oa |
| 65. | <i>Pogostemon auricularius</i> (L.) Hassk.                           | Acha-kamsen     | H | Lamiaceae       | Leaf, flower        | Fever                                                    | Paste                 | La |
| 66. | <i>Premna esculenta</i> Roxb.                                        | Angkung-gam     | S | Verbenaceae     | Leaf                | Eczema                                                   | Paste                 | La |
| 67. | <i>Psidium guajava</i> L.                                            | Ka-i            | T | Myrtaceae       | Leaf                | Toothache                                                | Extract               | La |
| 68. | <i>Pueraria tuberosa</i> (Roxb. ex Willd.) DC.                       | Lekuie          | C | Fabaceae        | Stem                | Hemorrhage                                               | Extract               | La |
| 69. | <i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz                      | Braymaraya      | S | Apocynaceae     | Root                | High blood pressure, abdominal pain, diarrhea, dysentery | Extract               | Oa |
| 70. | <i>Ricinus communis</i> L.                                           | Apow            | S | Euphorbiaceae   | Seed, leaf          | Boils, swellings                                         | Paste                 | La |
| 71. | <i>Tripidium arundinaceum</i> (Retz.) Welker, Voronts. & E.A.Kellogg | Spey            | H | Poaceae         | Whole plant         | Dysentery                                                | Extract               | Oa |
| 72. | <i>Saccharum officinarum</i> L.                                      | Pichchi         | H | Poaceae         | Stem                | Jaundice                                                 | Juice                 | Oa |
| 73. | <i>Senna alata</i> (L.) Roxb.                                        | Skly-asi        | S | Caesalpiniaceae | Leaf, flower        | Eczema                                                   | Paste                 | La |
| 74. | <i>Senna obtusifolia</i> (L.) H.S.Irwin & Barneby                    | Aam-aelu        | H | Caesalpiniaceae | Leaf                | Jaundice                                                 | Processed plant parts | Oa |
| 75. | <i>Sida acuta</i> Burm.f.                                            | Sikkhu          | S | Malvaceae       | Leaf, flower, fruit | Baldness, scabies                                        | Paste                 | La |
| 76. | <i>Smilax zeylanica</i> L.                                           | Aawing          | C | Smilacaceae     | Root                | Toothache, pyorrhea                                      | Plant parts directly  | Oa |
| 77. | <i>Solanum torvum</i> Sw.                                            | Engfy-poi       | S | Solanceae       | Fruit               | Gastritis                                                | Processed plant parts | Oa |
| 78. | <i>Solanum violaceum</i> Ortega                                      | Engfy-cha       | S | Solanaceae      | Root                | Diarrhea                                                 | Extract               | Oa |
| 79. | <i>Spermacoce articularis</i> L.f.                                   | Khele acha      | H | Rubiaceae       | Seed                | Diarrhea, dysentery                                      | Powder                | Oa |
| 80. | <i>Stephania japonica</i> (Thunb.) Miers                             | Ajing-kammu     | C | Menispermaceae  | Root                | Diarrhea                                                 | Extract               | Oa |
| 81. | <i>Sterculia villosa</i> Roxb. ex Sm.                                | Langowi         | T | Sterculiaceae   | Leaf                | Weakness                                                 | Infusion              | Oa |

|     |                                                |                  |   |                 |      |                            |                      |        |
|-----|------------------------------------------------|------------------|---|-----------------|------|----------------------------|----------------------|--------|
| 82. | <i>Tamarindus indica</i> L.                    | Mekkesi          | T | Caesalpiniaceae | Seed | Dog bite                   | Plant parts directly | La     |
| 83. | <i>Thunbergia grandiflora</i> Roxb.            | Kaly-kholo-ajing | V | Acanthaceae     | Leaf | Gout                       | Paste                | La     |
| 84. | <i>Tinospora crispa</i> (L.) Hook.f. & Thomson | Atavei-ajing     | C | Menispermaceae  | Stem | High blood pressure, piles | Infusion             | Oa     |
| 85. | <i>Trichosanthes tricuspidata</i> Lour.        | Choim-chapray    | C | Cucurbitaceae   | Root | Body pain                  | Paste, extract       | La, Oa |
| 86. | <i>Vanda tessellata</i> (Roxb.) Hook. ex G.Don | Deli             | H | Orchidaceae     | Root | Rheumatism                 | Paste                | La     |
| 87. | <i>Ziziphus jujuba</i> Mill.                   | Klu              | T | Rhamnaceae      | Bark | Diarrhea                   | Extract              | Oa     |

LEGEND: H=Herb; S=Shrub; T=Tree; C=Climber; Oa=Oral administered; La=Local application.

### 3. RESULTS & DISCUSSION

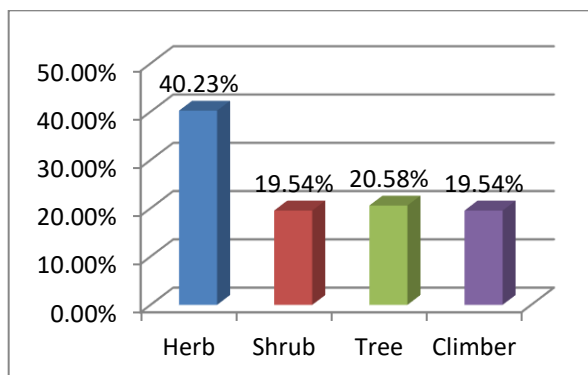
Identification of the voucher specimens showed that 87 species in 83 genera under 50 families have been used for the treatment of 42 diseases/illness. Asteraceae in context to the number of species have been used most frequently. Similarly, other important families used for medicines are Caesalpiniaceae, Verbenaceae, Cucurbitaceae, Poaceae and Liliaceae respectively (Table 2).

**Table 2** Families of the ethnomedicinal plants used by the Khumi community with their frequencies.

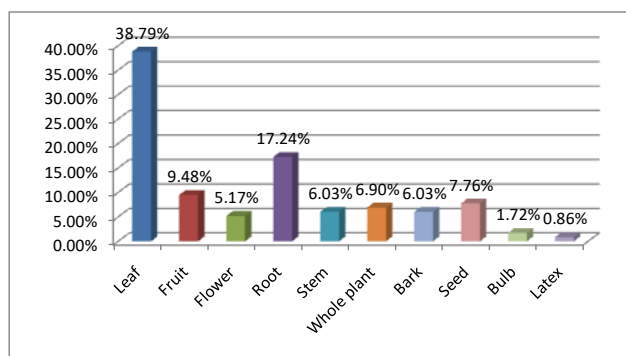
| Family          | Number of species | Family          | Number of species |
|-----------------|-------------------|-----------------|-------------------|
| Asteraceae      | 6                 | Boraginaceae    | 1                 |
| Caesalpiniaceae | 5                 | Bromeliaceae    | 1                 |
| Cucurbitaceae   | 4                 | Buddlejaceae    | 1                 |
| Poaceae         | 4                 | Commelinaceae   | 1                 |
| Verbenaceae     | 4                 | Convolvulaceae  | 1                 |
| Euphorbiaceae   | 3                 | Costaceae       | 1                 |
| Fabaceae        | 3                 | Crassulaceae    | 1                 |
| Lamiaceae       | 3                 | Cyperaceae      | 1                 |
| Rutaceae        | 3                 | Loranthaceae    | 1                 |
| Solanaceae      | 3                 | Meliaceae       | 1                 |
| Sterculiaceae   | 3                 | Mimosaceae      | 1                 |
| Acanthaceae     | 2                 | Molluginaceae   | 1                 |
| Amaranthaceae   | 2                 | Myrsinaceae     | 1                 |
| Apocynaceae     | 2                 | Myrtaceae       | 1                 |
| Clusiaceae      | 2                 | Ophioglossaceae | 1                 |
| Liliaceae       | 2                 | Orchidaceae     | 1                 |
| Malvaceae       | 2                 | Papaveraceae    | 1                 |
| Menispermaceae  | 2                 | Piperaceae      | 1                 |
| Rubiaceae       | 2                 | Rhamnaceae      | 1                 |
| Aloeaceae       | 1                 | Smilacaceae     | 1                 |
| Apiaceae        | 1                 | Tiliaceae       | 1                 |
| Araceae         | 1                 | Urticaceae      | 1                 |
| Arecaceae       | 1                 | Vitaceae        | 1                 |
| Asclepiadaceae  | 1                 | Zingiberaceae   | 1                 |
| Bombacaceae     | 1                 |                 |                   |

According to life form the numbers of species have been used by them are herb 40.23% and shrub tree 20.58% 19.54% and climber 19.54% respectively (Figure 2). Of them herbs and tree are mostly used than others.

The most utilized plant parts for the preparation of herbal medicine are leaf, which is, 38.793% then root 17.241%, fruit 9.483%, seed 7.759% and whole plant 6.899% respectively (Figure 3). Stems and bark are used in a considerable amount. Bulb and latex are used occasionally. The most frequently utilization of leaves refers that they may store high concentration of bioactive compounds. In addition, it is easy to collect, store, transport and help the species in conserving without destroying the plant.



**Figure 2** Showing the percentage of life form of plants used by the khumi community.



**Figure 3** Showing the percentage of plant species according to their used parts.

The uses of the aerial part are 76% and underground parts 17% and whole plant 7%. Leaf, fruit, shoot, stem, seed, grain, flower, bark, spike, stem pith, frond, stem latex are refers to aerial parts and corm, bulb, rhizome, tuber, roots are refers to underground parts. The percentage of nondestructive plant used is 76 and destructive is 24.

By analyzing the present studied ethnomedicinal data it is observed that the Khumi are conservative in plant use and they have the knowledge of sustainable use of plants. Because they use leaves and stem most frequently for the preparation of herbal medicine which is a nondestructive way of use. The recorded medicinal plants species have been used to treat several diseases/illness of which 10 are used for the treatment of fever, 6 for different pain, 6 for hemorrhage and diarrhea, 5 for jaundice, toothache, rheumatism and so on.

The most frequently cited modes of preparation are extract, paste, juice, infusion and ointment. Syrup, powder, decoction are also used occasionally. A high proportion of treatments involve internal application and that is oral administered.

#### 4. CONCLUSIONS

The current study demonstrated that traditional treatment methods utilizing medicinal plants are still widely used in the study area, emphasizing the significance of documenting traditional ethnomedicinal knowledge before this rich resource is lost. This is the first ethnomedicinal study in the study area, as far as we are aware. The current study identifies new ethnomedicinal species and their therapeutic applications, which may result in the creation of novel therapeutics and unique bio resources for phytochemical and pharmacological research.

### Authors' contribution

All authors contributed equally for the successful completion of the research work. Shaikh Bokhtear Uddin designs the work. Data collection and processing was done by Md Salah Uddin. Vashkar Chowdhury did the final correction. Finally, all authors read and approve the final work.

### Ethical approval

The study was conducted in compliance with the International Society of Ethnobiology's Code of Ethics guidelines. Each informant provided verbal informed permission prior to all interviews. Each informant was given an explanation of the research's goals and the interview process during this conversation and confidentiality was guaranteed. Additionally, permission to record audio was secured.

### Acknowledgement

The authors are cordially grateful to the Khumi tribal communities inhabiting in different localities of Bandarban district because of their kind support and co-operation during the field surveys.

### Informed consent

Not applicable.

### Conflicts of interests

The authors declare that there are no conflicts of interests.

### Funding

The study has not received any external funding.

### Data and materials availability

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

## REFERENCES AND NOTES

1. Alam MK. Documentation of ethnobiological information. In: Banik RL, Alam MK, Pei SJ, Rastogi A. (eds.), Applied Ethnobotany. Proceedings of Sub regional Training Workshop on Applied Ethnobotany. BFRI, Chittagong, Bangladesh 1998; 28-29.
2. Alam MK. Medicinal ethnobotany of Marma tribe of Bangladesh. *Econ Bot* 1992; 46(3):330-335.
3. Alam MK, Chowdhury JU, Hasan MA. Some folk formularies from Bangladesh. *Bang J of Life Scie* 1996; 81(1):49-69.
4. Alexiades MN. Protocol for conducting ethnobotanical research in the tropics. In: Alexiades MN, Sheldon JW. (Eds.). Selected Guidelines for Ethnobotanical Research: A Field Manual. The New York Botanical Garden, Bronx, New York 1996.
5. Anisuzzaman M, Rahaman AHMM, Harun-or-Rashid M, Naderuzzaman ATM, Islam AKMR. An Ethnobotanical Study of Madhupur, Tangail. *J Appl Sci Res* 2007; 3(7):519-530.
6. Begum N, Haq MF, Naher K. Medicinal Plants for the survival of rural People. In: Sillitoe P. (Editor). Indigenous Knowledge Development in Bangladesh-Present and Future. The University Press Limited. Dhaka 2000; 97-106.
7. Begum R, Rashid H. Medicinal Plants and its Cultivation. Minor Forest Products Division, Bangladesh Forest Research Institute. Chittagong 1999.
8. Chopra R, Chopra I, Handa K, Kapoor L. Indigenous drugs of India Academic publishers. Calcutta-New Delhi 306 1982.
9. Chowdhury FZ, Roy SK, Hossain ABM. Enayet. Ethnomedicinal Survey of Bhawalgarh region of Bangladesh. *Bang J of Life Scie* 1989; 2:18-20.
10. Chowdhury JU, Alam MK, Hasan MA. Some traditional folk formularies against diversity and diarrhoea in Bangladesh. *J of Econ Tax Bot Additional Series* 1996; 12:20-23.
11. Cotton CM. Ethnobotany, Principals and Application. John Wiley and Sons Ltd., Chichester 1997.
12. Ghani A. Medicinal Plants of Bangladesh, Asiatic Society of Bangladesh, Dhaka-1205 1998.
13. Hasan MA, Khan MS. Ethnobotanical records in Bangladesh. Plants used for healing cuts and wounds. *Bangladesh J of Plant Taxon* 1996; 3(2):49-52.
14. Hasan MA, Huq AM. Amader Bonoushudi Shampad. Hasan Book House, Dhaka, Bangladesh 1993; 184.

15. Hasan MA, Khan MS. Ethnobotanical records in Bangladesh. Plants use for healing fractured bones. J Asiatic Soc Bangladesh (Sci) 1986; 12:33-39.
16. Hutchinson SRH. The Chittagong Hill Tracts. Vivek publishing Company, Delhi, India 1909.
17. Kadir MH. Bangladesh flora as a potential Source of Medicinal plants and its conservation Strategies. In: Ghani A. (Editor). Traditional Medicine. Institute of life sciences, Jahangirnagar University, Savar, Dhaka 1990; 73-77.
18. Kamal M, Islam Z, Chakma S. Indigenous Communities. Asiatic Society of Bangladesh. Dhaka-1000, Bangladesh 2007; 5:102-107.
19. Khan MS, Huq AM. Medicinal Plants of Bangladesh, BARC, Dhaka 1975.
20. Khan MS, Hassan MA, Uddin MJ. Ethnobotanical Survey in Rema Kelanga Wildlife Sanctuary (Habiganj) in Bangladesh. Bangladesh J Plant Taxon 2002; 9(1):51-60.
21. Khisa B. Herbal Treatment of Chakma People (In Bengali). Herbal Medicine Centre Committee, Rangamati 1996a.
22. Khisa. Ethnobotanical and cultural background of ethnic communities of forest resource management in Chittagong Hill Tracts. In Banik RL, Alam K, Pel SJ, Rastogi A. (ed.), Applied Ethnobotany. Proceedings of Sub regional Training Workshop on Applied Ethnobotany, BFRI, Chittagong, Bangladesh 1998; 56-63.
23. Khisa SK. Chakma Talik Chikitsa (in Bengali). Tribal Cultural Centre, Rangamati 1996b.
24. Kim YN, Kim NH, Souliya O, Uddin MS., Lee SW, Kim SY, Choi S, Heo JD, Jeong EJ. The Extract of *Couroupita guianensis* Aubl. Ameliorates Benign Prostatic Hyperplasia In Vitro and In Vivo. Nat Prod Sci 2021; 27(4):274-9.
25. Kirtikar K, Basu B. Indian Medicinal Plants 1935.
26. Lee H, Song Y, Park YH, Uddin MS, Park JB. Evaluation of the Effects of *Cuminum cyminum* on Cellular Viability, Osteogenic Differentiation and Mineralization of Human Bone Marrow-Derived Stem Cells. Medicina 2021; 57(1):38.
27. Lee SJ, Kim JE, Choi YJ, Jin YJ, Roh YJ, Seol AY, Song HJ, Park SH, Uddin MS, Lee SW, Hwang DY. Antioxidative Role of *Hygrophila erecta* (Brum. F.) Hochr. On UV-Induced Photoaging of Dermal Fibroblasts and Melanoma Cells. Antioxidants 2022; 11(7):1317.
28. Mia MK, Huq AM. A preliminary ethnobotanical survey in the Jaintapur, Tamabil and Jafong area, Sylhet. Bull Bangladesh National Harbarium, Dhaka 1988; 3:1-10.
29. Millat-e-Mustafa M. The Ecology and Management of Traditional Homegardens in Bangladesh. Phd Thesis. University of Wales, Bangor, Uk 1996.
30. Millat-e-Mustafa M, Begeum K, Al-Amin M, Alam SM. Medicinal plant resources of the traditional home gardens in Bangladesh. J Trop Med Plants 2001; 2(1).
31. POWO. Plants of the World Online. Kew Science. Published on the Internet 2022. URL <http://powo.science.kew.org>
32. Rahman MA, Khisha A, Uddin SB, Wilcock CC. Indigenous Knowledge of Plant use by Tribal Communities in the Hill Tracts Districts of Bangladesh and its sustainable development. In: Paul Sillitoe, Indigenous Knowledge Development in Bangladesh. Present and Future. UPL 2000; 75-78.
33. Rahman MA, Yusuf M. Diversity, ecology and ethnobotany of the Zingiberaceae of Bangladesh. J of Econ Taxon Bot Additional series 1996; 12:13-19.
34. Rahman MA, Uddin SB. Some anti rheumatic plants used by tribal people of Hill tracts districts of Bangladesh. Biodiversity Newsletter of Bangladesh 1998; 2:4.
35. Rahman MA. Ethno-medico-botanical knowledge among tribals of Bangladesh. Econ Taxon Bot 1999; 23:89-93.
36. Rahman MA. Tribal Knowledge of Plant use in Hill Tracts district of Bangladesh. Biodiversity Newsletter of Bangladesh 1997; 1:1.
37. Rahman MA, Uddin SB, Wilcock CC. Indigenous knowledge of herbal medicine in Bangladesh diarrhea, dysentery, indigestion and stomach pains. J of Med and Aroma plant Scie 2003; 25:1001-1009.
38. Rao NR, Henry NA. The ethnobotany of Eastern Ghats in Andhra Pradesh, India. Botanical survey of India 1996; 1-2.
39. Rates SMK. Plants as source of drugs. Toxicon 2001; 39:603-613.
40. Saigal O. Tripura. Bengal publishing Co., Calcutta, India 1978.
41. Sarker SK, Hossain ABM. Enayet Pteridophytes of greater Mymensingh District of Bangladesh used as vegetables and medicines. Bangladesh J of Plant Taxon 2009; 16(1):47-56.
42. Shelly MR. The Chittagong hill tracts of Bangladesh: The untold story. Centre for Development Research, Bangladesh 1992.
43. Sheng-Ji P. Ethnobotanical Approaches of Traditional Medicine Studies: Some Experiences From Asia. Pharm Biol 2001; 39:74-79.
44. Sirajuddin AM. The Rajas of Chittagong Hill Tracts and their relation with the Mughals and the East India Company in the Eighteenth Century. J of the Pak Hist Soc 1971; 19(1):1-52.
45. Tanchangya JC. Tanchangya Upajati Sankhito Parichiti (in Bengali). Tribal Cultural Institute, Rangamati, Bangladesh 1982.
46. Tripura SL. Parbattya Chattagramer Prakiiti Of Sanskriti (in Bengali). Tribal Cultural Institute, Rangamati, Bangladesh 1994.
47. Uddin MG, Mirza MM, Pasha MK. The Medicinal Uses of Pteridophytes of Bangladesh. Bangladesh J Plant Taxon 1998; 5(2):29-41.

48. Uddin MS. Ethnobotanical Database of Bangladesh: Plants of Bangladesh. Version 3.1, Electronic Database 2010. accessible at <http://www.ethnobotanybd.com>
49. Uddin MS. Medicinal Plants of Bangladesh-MPB. Electronic Database 2019. Accessible at <https://www.natureinfo.com.bd/mpb>
50. Uddin MS, Chowdhury V, Uddin SB, Mazumder AAMM, Howlader SA. Ethnobotanical Survey of Medicinal Plants Used by the Lushai Community in Bandarban District, Bangladesh J adv botany zool 2015; 2(4):1-9.
51. Uddin MS, Chowdhury V, Uddin SB, Howlader MSA. Ethnomedicinal Plants Used for the Treatment of Diarrhoea and Dysentery by the Lushai Community in Bandarban District, Bangladesh. J Adv Med Life Sci 2015; 2(4):1-7.
52. Uddin MS, Lee SW, Lee J. Medicinal Plants of Bangladesh. International Biological Material Research Center (IBMRC), Korea Research Institute of Bioscience and Biotechnology (KRIBB), Daejeon, Republic of Korea 2014; 1-238.
53. Uddin MS, Lee SW. MPB 3.1: An Useful Medicinal Plants Database of Bangladesh. J Adv Med Life Sci 2020; 8(1):1-4.
54. Uddin MS, Lee SW, Choi S, Paik J, Kim S, Lee C, Kim Y, Park J, Park M. Herbal Plants of Bangladesh. International Biological Material Research Center (IBMRC), Korea Research Institute of Bioscience and Biotechnology (KRIBB), Daejeon, Republic of Korea 2017; 200.
55. Uddin MS, Lee SW, Choi S, Paik J, Kim S, Lee C, Kim, Park M. Traditional Knowledge of Medicinal Plants in Bangladesh. International Biological Material Research Center (IBMRC), Korea Research Institute of Bioscience & Biotechnology (KRIBB), Daejeon, Republic of Korea 2019; 151.
56. Uddin MS, Uddin SB, Lee SW, Oh SR, Choi S, Lee C, Kim J, Bae DY, Park JK. Ethnomedicinal Plants of Bangladesh. International Biological Material Research Center (IBMRC), Korea Research Institute of Bioscience and Biotechnology (KRIBB), Daejeon, Republic of Korea 2016; 204.
57. Yusuf M, Begum J, Hoque M, Chowdhury J, Medicinal Plants of Bangladesh, Bangladesh Council of Scientific and Industrial Research. Dhaka, Bangladesh 2009.
58. Yusuf M, Chowdhury JU, Wahab MA, Begum J. Medicinal Plants of Bangladesh. Bangladesh Council of Scientific and Industrial Research, Dhaka 1205, Bangladesh 1994.