Ethnomedicinal study on plant resources from sacred groves of Dakshin Dinajpur district, West Bengal, India

Kushankur Sarkar, Priyankar Roy, Subhasis Panda, Chandrani Choudhuri and Monoranjan Chowdhury

Correspondence

Kushankur Sarkar1, Priyankar Roy2, Subhasis Panda3, Chandrani Choudhuri4 and Monoranjan Chowdhury1*  

1Taxonomy of Angiosperms and Biosystematics Laboratory, Department of Botany, University of North Bengal, Raja Rammohunpur, Darjeeling, West Bengal, India 734013  
2Molecular Cytogenetics Laboratory, Department of Botany, University of North Bengal, Raja Rammohunpur, Darjeeling, West Bengal, India 734013  
3Biodiversity Conservation Laboratory, Government General Degree College, Chapra, University of Kalyani, Nadia, West Bengal, India 741123  
4Department of Botany, North Bengal St. Xavier's College, University of North Bengal, West Bengal, India 735134  

*Corresponding Author: mchowdhury@nbu.ac.in

Ethnobotany Research and Applications 25:32 (2023) - http://dx.doi.org/10.32859/era.25.32.1-35  
Manuscript received: 26/12/2022 – Revised manuscript received: 07/03/2023 - Published: 10/03/2023

Research

Abstract

**Background:** Sacred groves found in Dakshin Dinajpur district are natural *in-situ* conservatories that provide a home to numerous biological entities with rich ethnomedicinal plant diversity. Native communities have been conserving these groves through their own beliefs and folklore practices and they possess vast knowledge of herbal ethnic medicines. The current study aims to explore the ethnic traditional practices of medicinally important plants among different indigenous communities residing in sacred grove-centric villages throughout the district.

**Methods:** For the current study, 15 ethnomedicinally enriched sacred groves were selected. Ethnomedicinal data were collected from 179 informants and were quantitatively analyzed using various statistical indices viz. Use value, Informant consensus factor, Fidelity level, and Relative Frequency of citation. With the help of an *in-silico* network pharmacological study, the findings were revalidated.

**Results:** In the present study, a total of 105 ethnic plants belonging to 93 genera and 47 families were documented and the most dominant plant family was Fabaceae. The diseases reported by the informants were classified into 16 different disease clusters. *Cuscuta reflexa* Roxb., *Heliotropium indicum* L. and *Cynodon dactylon* (L.) Pers. were the most popular medicinal plants.

**Conclusion:** Gathering such first-hand information about ancient traditional practices will be helpful in further pharmacological studies and may show new paths to modern therapeutic approaches.

**Keywords:** Sacred Groves; Traditional Knowledge; Dakshin Dinajpur; Quantitative analysis; *in-silico*

Background

Since time immemorial, India has been a valuable source of traditional medicine systems and has been documented and explored by various people across the globe (Verma et al. 2007). Medicinal plants are hidden treasures of
nature. Until now, over 35000 to 70000 plant species with medicinal properties, recorded worldwide (Dapar et al. 2020). These plants can act as the savior of humankind through their natural healing properties.

Although Dakshin Dinajpur, geographically, is a small district in the state of West Bengal, it has a unique range full of biodiversity under varied environments and complex ecology. Local inhabitants of almost all the villages in the district have been conserving innumerable trees, animals, forests, and wetlands through their own beliefs and folklore practices. In ecology, those lives and ritual practices with nature described as ‘sacred’ and associated conserved patches are called Sacred Groves. The groves were seen as the abode of deities and were therefore considered sacred. The trees and other vegetation in these groves were not to be cut down or disturbed in any way. This traditional knowledge and practice of protecting sacred groves has helped preserve biodiversity in India for centuries. Sacred groves are critical to biodiversity conservation because they provide a refuge for many species of plants and animals that are under threat due to habitat loss and fragmentation. The groves act as a gene pool for the surrounding landscape, providing a source of seeds and propagules for natural regeneration. They also act as ecological islands, allowing species to move between fragmented habitats. Due to the distinctive biological and cultural features, sacred groves also have received recognition from Indian agencies including the Forest Department and the National Biodiversity Authority as significant places for the protection of biodiversity. To preserve biological diversity, including sacred groves and water bodies, section 41 of the Biological Diversity Act of 2002 created Biodiversity Management Committees (BMCs). BMCs establish the People’s Biodiversity Registry (PBR) with the express purpose of concentrating on the documentation of regional biodiversity and folklore. These groves have higher richness and restore ecological niches with superior regeneration capacity of endangered medicinal plants than usual forest patches (Borahal et al. 2003). The rural people of West Bengal, especially in the northern part of the state, still believe in their traditional medicines and healing therapies (Mitra & Mukherjee 2010; Biswakarma et al. 2015). And these patches act as a repository of a large number of indigenous Tribal & Folk medicines as well as Ayurvedic and Unani medicine (Bhakat & Sen 2008). These groves are home to numerous medicinal plants, which can provide lifesaving drugs. Some researchers conducted ethnomedicinal studies in West Bengal (Sen 2019; Chowdhury & Mukherjee 2010) and in the current study area (Talukdar & Talukdar 2012; Chowdhury et al. 2014); however, no detailed sacred grove-specific quantitative ethnomedicinal studies had been carried out to date. It is the first kind of study carried out in these sacred groves where medicinal plants were quantitatively analyzed. In addition to this, an *in-silico* network pharmacological study also conducted as ethnobotanical knowledge can provide a rich source of information for identifying novel drug candidates, while network pharmacology can help to validate traditional knowledge and provide a mechanistic understanding of the therapeutic effects of natural compounds thereby providing a scientific basis for their traditional use (Chinnasamy et al. 2019).

Therefore, the study aimed to gather the ethnic knowledge of those sacred grove-centric communities, to document the ethnomedicinal usage of plants and formulations, utilization of different plant parts established by the local communities as well as the indigenous herbal practitioners, and to evaluate the plants in a quantitative process to find the importance of those medicinal plants to stimulate future opportunities to discover new drugs.

### Materials and Methods

#### Description of Study Area

Dakshin Dinajpur is a district in the northern part of West Bengal in the Republic of India and geographically lies between latitudes 24°20’N and 25°35’N and longitudes 88°20’E and 89°30’E. The district covers a vast area of 2162 square kilometers (http://ddinajpur.nic.in) and is bordered on the east by Bangladesh and on the other side by various districts of West Bengal. The district comprises two sub-divisions, viz., Balurghat and Gangarampur, of which Balurghat consists of four community development blocks (Hili, Balurghat, Kumarganj, and Tapan) and Gangarampur consists of three community development blocks (Gangarampur, Banshihari, and Harirampur). It lies in a warm and temperate region with an average annual temperature ranges from 18°C to 29°C, and yearly precipitation of about 1756 mm (Climate-Data.org).

#### Field Surveys and Data Collection

For the present study, extensive field surveys were conducted in all blocks of Dakshin Dinajpur district during October 2021 to September 2022 (Fig 2). Primarily, we visited sacred groves throughout the district, from which 15 well-preserved and medicinal plant-rich sacred groves were selected for the study (Fig 1). Three sacred groves each from Balurghat, Tapan, and Kumarganj blocks, two from Hili and Banshihari, and one from Gangarampur, Harirampur, and Tapan blocks were initially selected for the study (Table 1). These sacred groves were selected due to their vast and varied ecological diversity and medicinal plant resources. A total of 179 informants, including men,
women, and herbal practitioners from different age groups and literacy stages, were interviewed (Table 2). At first, the snowball sampling method was applied to identify individuals with a particular experience or expertise then a semi-structured questionnaire technique was used to gather ethnomedicinal data from the informants (Alexiades & Sheldon 1996; Chhetri & Chowdhury 2018). As the local people are predominantly Bengali speakers, the questionnaire was made in Bengali and later translated into English.

Figure 1. Map showing the survey area with the location of sacred groves (Here the numbering of sacred groves is according to Table 1).
Table 1. Detailed location of surveyed sacred groves of Dakshin Dinajpur district, West Bengal, India

<table>
<thead>
<tr>
<th>Sacred Groves</th>
<th>GP</th>
<th>Block</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetuli Surkali</td>
<td>Debra</td>
<td>Hili</td>
<td>25°17.424’N</td>
<td>88°55.465’E</td>
</tr>
<tr>
<td>Shitalasthal</td>
<td>Panjole</td>
<td>Hili</td>
<td>25°16.590’N</td>
<td>88°58.684’E</td>
</tr>
<tr>
<td>Bura Mashna Bon</td>
<td>Uday</td>
<td>Gangarampur</td>
<td>25°24.383’N</td>
<td>88°37.955’E</td>
</tr>
<tr>
<td>Shree Tarasagar Shiva Bon</td>
<td>Nazirpur</td>
<td>Balurghat</td>
<td>25°19.061’N</td>
<td>88°49.513’E</td>
</tr>
<tr>
<td>Batkhorna Akhraghath</td>
<td>Nazirpur</td>
<td>Balurghat</td>
<td>25°19.543’N</td>
<td>88°47.973’E</td>
</tr>
<tr>
<td>Takshoil Surkalighati</td>
<td>Bolla</td>
<td>Balurghat</td>
<td>25°18.915’N</td>
<td>88°42.222’E</td>
</tr>
<tr>
<td>Pir Than</td>
<td>Raynanda</td>
<td>Kumarganj</td>
<td>88°46.610’E</td>
<td>25°29.839’N</td>
</tr>
<tr>
<td>Radha Surkali</td>
<td>Radhakrishnapur</td>
<td>Kumarganj</td>
<td>25°24.508’N</td>
<td>88°48.798’E</td>
</tr>
<tr>
<td>Sasthi Shiva Kali Bon</td>
<td>Gobindapur</td>
<td>Kumarganj</td>
<td>25°21.825’N</td>
<td>88°46.806’E</td>
</tr>
<tr>
<td>Burapir Than</td>
<td>Elahabad</td>
<td>Banshihari</td>
<td>25°27.029’N</td>
<td>88°27.960’E</td>
</tr>
<tr>
<td>Telpir Ghat</td>
<td>Buniadpur</td>
<td>Banshihari</td>
<td>25°23.107’N</td>
<td>88°23.185’E</td>
</tr>
<tr>
<td>Darga-e-pirbaba</td>
<td>Jagadishbati</td>
<td>Tapan</td>
<td>25°20.378’N</td>
<td>88°37.787’E</td>
</tr>
<tr>
<td>Gambhira Bon</td>
<td>Harsura</td>
<td>Tapan</td>
<td>25°20.067’N</td>
<td>88°37.767’E</td>
</tr>
<tr>
<td>Daralhat Samshan Bon</td>
<td>Dipukhonda</td>
<td>Tapan</td>
<td>25°18.083’N</td>
<td>88°37.260’E</td>
</tr>
</tbody>
</table>

Identification of medicinal plant species

Primarily, the medicinal plants cited by the informants and commonly used by the local communities were collected and tagged based on vernacular names provided by the informants. The collected plant samples were processed following the standard herbarium protocol (Paul et al. 2020). For taxonomic authentication and correct identification purposes, "The Plant List" (http://theplantlist.org), "The International Plant Name Index" (http://www.ipni.org), and "POWO: Plants of the World Online" (https://powo.science.kew.org) were followed. The voucher specimens were submitted to the North Bengal University Herbarium (NBU), University of North Bengal, West Bengal, India.

Quantitative Ethnobotany

The quantitative ethnomedicinal analysis is carried out by the following indices:

**Informant Consensus Factor**

ICF is calculated to test the homogeneity of the knowledge or information provided by the informants on the use of medicinal plants for particular ailment categories. ICF or Informant Consensus Factor was obtained by the following formula (Heinrich et al. 1998)

\[
ICF = (N_u - N_t) / (N_u - 1)
\]

Where, \(N_u\) indicates the total number of use reports for a specific disease cluster and \(N_t\) indicates the total number of plant species used for that specific disease cluster. The value of ICF ranges from 0 to 1.

**Use Report and Use Value**

To determine the relative importance of plant species Use Value is calculated. The UV was calculated using the following formula (Phillips et al. 1994)

\[
UV = \sum U_i / N
\]

Where, UV refers to the Use Value, \(U_i\) refers to the total number of use reports provided by the ITK informants for a particular species and \(N\) is the total number of informants participated in the survey. High use value means that the plant is more important.

**Frequency of Citation and Relative Frequency of Citation**

Relative Frequency of Citation (RFC) indicates the significance of a particular plant species in a study area. The RFC index was calculated by dividing the number of informants referred the use of the particular species (FC) by the total number of informants in the survey (N). The RFC was obtained by the following formula (Tardío & Pardo-De-Santayana 2008)

\[
RFC = FC / N (0 < RFC < 1)
\]
Fidelity Level

By calculating Fidelity Level (FL) index we can determine the most suitable medicinal plant species preferred by the informants to cure a particular disease. It was calculated by the following formula (Friedman et al. 1986) -

\[ \text{FL} \% = \left( \frac{N_p}{N} \times 100 \right) \]

Where, \( N_p \) refers to the number of ITK informants mentioned the use of a particular plant for a specific disease and \( N \) refers to the total number of informants citing the species for any disease.

Network Pharmacological (in-silico) analysis

Mining of phytochemicals

Medicinal plants are composed of a wide variety of phytochemicals. The phytochemicals of three most popular plants were detected from IMPPAT (Indian Medicinal Plants, Phytochemistry And Therapeutics) database (Mohanraj et al. 2018). Chemical compositions, Canonical smiles and InChI keys which were obtained from IMPPAT, were validated from PubChem. PubChem is an open database with a broad range of chemical information (Kim et al. 2021). It is maintained by NCBI (National Center for Biotechnology Information).

Mining of synthetic drugs

The DrugBank Online database (https://go.drugbank.com/) is a richly annotated resource that combines detailed drug data with comprehensive drug target and drug action information (Wishart et al. 2008). In this study, the latest release of DrugBank database (version 5.1.9) was employed to search synthetic drugs of different diseases.

Target prediction and validation of targets

BindingDB is a web-accessible public database platform of protein target entities (Liu et al. 2007). All the targets (phytochemical targets) were screened from BindingDB with equivalent molecules having compound similarity greater than 0.85. To validate these protein targets, all targets were re-retrieved with their gene names from UniProt (Wang et al. 2021), an open access platform of protein sequences with functional information. Synthetic drug targets were directly collected from UniProt. From the organism section only human (Homo sapiens) protein targets were taken.

Construction of Networks

Cytoscape is widely used, JavaScript-based open-source software for visualizing highly complex interaction networks. All the networks were made using Cytoscape 3.7.2 (Shannon et al. 2003). In this graphic network, molecular species (compounds and proteins) or diseases were represented as nodes and intermolecular interactions (plant-phytochemical-target or plant-phytochemical-common target-synthetic drug-disease interactions), which were indicated as links, i.e., edges between nodes.

Programs and software used for statistical analysis

For data analysis various data application software and online programs were used. Principal Component Analysis (PCA) was performed by Origin Pro 2021 (OriginLab Corporation, USA). Principle Component Analysis (PCA) (Gabriel 1971) was performed based on quantitative variables of ethnomedicinal indices and to create the biplots PC1 and PC2 were used. PCA was executed by Origin Pro 2021 (OriginLab Corporation, USA). Heatmap was carried out based on the quantitative results found, using the web enabled program Clustvis (Metsalu & Vilo 2015; Haydar et al. 2022).

Results

Demographic Attributes of Informants

A total of 179 informants were interviewed in the surveys conducted for the current study. Among them, 12 were traditional health practitioners, and 162 were local Rajbanshi and ethnic people (Fig 2). The Rajbanshis were very interested in their heritage and tradition in this study area, so they are still practicing their traditional healing with great faith (Kundu & Bag 2012). The local informants we interviewed were of different age groups and educational levels. The informants were mainly of five different age groups. Based on the information obtained about the informants they were characterized into different demographic classes (Table 2). The informants interviewed were from various occupational fields. As we surveyed the sacred groves which were mostly in rural areas, a large number of informants were farmers and from a farming background. Besides they are of various occupations likely herdsmen, people working in crafts, college students, housewives, teachers, small shopkeepers, etc. The informants
were very helpful and possess vast knowledge of medicinal plants and their therapeutic applications. Several traditional health practitioners were also interviewed. Based on the working experience in the field, the traditional health practitioners we interviewed (6.7% of total informants), were classified into five different classes: viz., below 2 years (25%), 2-5 years (33.33%), 5-10 years (8.33%), 10-20 years (16.66%), above 20 years (16.66%).

Figure 2. Pictorial view of different stages at study sites a. Rituals performed at sacred groves under sacred tree. b. Horse clay idol offered to deity c. Deity place in different sacred groves d. and e. Interaction with informants and local people f. Indigenous tribe with flute g. and h. Therapeutic herbal healers showing medicinal plants i. Traditional medicine preparation from medicinal plants

Table 2. Statistical attributes of the informants

<table>
<thead>
<tr>
<th>Variable</th>
<th>Categories</th>
<th>No. of individuals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Informant Category</td>
<td>Traditional Health Practitioner</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Indigenous People</td>
<td>167</td>
</tr>
<tr>
<td>Gender</td>
<td>Male</td>
<td>125</td>
</tr>
<tr>
<td></td>
<td>Female</td>
<td>54</td>
</tr>
<tr>
<td>Age Group</td>
<td>20-30</td>
<td>9</td>
</tr>
<tr>
<td></td>
<td>31-40</td>
<td>22</td>
</tr>
<tr>
<td></td>
<td>41-50</td>
<td>36</td>
</tr>
<tr>
<td></td>
<td>51-60</td>
<td>63</td>
</tr>
<tr>
<td></td>
<td>&gt;60</td>
<td>49</td>
</tr>
<tr>
<td>Educational Qualification</td>
<td>Illiterate</td>
<td>47</td>
</tr>
<tr>
<td></td>
<td>Elementary or Primary (4th standard)</td>
<td>69</td>
</tr>
<tr>
<td></td>
<td>Upper Primary (8th standard)</td>
<td>37</td>
</tr>
<tr>
<td></td>
<td>Secondary (10th standard)</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Higher Secondary (10+2 Standard)</td>
<td>9</td>
</tr>
</tbody>
</table>
In the present study, a total of 105 medicinally important plants belonging to 93 genera and 47 families were documented (Table 3). Fabaceae was the most dominant plant family with 9 genera and 10 species, whereas the second most utilized family was Asteraceae with 8 species, followed by Moraceae with 7 species, Rubiaceae and Solanaceae with 6 species each, Malvaceae with 5 species; Apocynaceae, Poaceae, and Lamiaceae with 4 species each, and Menispermaceae, Myrtaceae, and Rutaceae with 3 species each. Other plant families were documented by either 1 or 2 species. Similar results were found in previous ethnomedicinal studies in the Dakshin Dinajpur area (Chowdhury et al. 2014). Of the documented plant species, the majority were herbs (44%), followed by trees (31%), climbers (14.2%), shrubs (11.4%), aquatic herbs, epiphytic herbs, and parasitic twiners (0.95% each) (Table 4). Similar results were obtained in the work of (Li et al. 2021). In the case of life span, most of the plant species were perennial (69.5%), followed by annual (27.6%), and biennial (2.85%). Among the collected species, 26 species were found to be in the 'Least Concerned' category under the IUCN threatened category, 1 species in the 'Data Deficient' category, and the rest of the plants have not been assessed, hence they were in the 'Not Evaluated' category (IUCN 2022).

Usage of plant parts, preparation and mode of application

In the present study, the most used plant part documented was 'leaf' with 44.05% usage (Fig 3). The second most utilized plant part was Root (20.3%); The third most utilized part was fruit (11.8%) followed by stem (6.16%), whole plant (5.7%) following bark, seeds, rhizome, and flower. Various kinds of herbal preparation methods by local communities were documented during the present study. Most commonly ten different preparation methods were reported (Fig 3). Among these, the most frequently used preparation mode was extract (32.58%) and decoction (30.35%) followed by paste (18.3%), whole leaf (5.8%), powder (5.4%), oil decoction (3.1%), consumption of raw twig (1.7%), cooked (1.3%), latex (0.89%) and ash (0.44%). Besides these preparation methods, a number of application modes were also reported. The most common mode was oral consumption (56.87%) followed by topical application (31.87%), as a toothbrush (3.12%), ophthalmic (2.5%), chewing (1.87%), gargle (1.87%) and aural application (0.625%) respectively.

Informant Consensus Factor

In the present study, the diseases reported by the informants were differentiated into 16 different categories (Table 5). Disease clustering was done by going through the survey responses and creating a list of all the diseases mentioned. After identifying the diseases, we categorize them into different groups, such as respiratory diseases, digestive diseases, neurological diseases, etc., based on their symptoms, causes, or any other relevant criteria. The value of the ICF data ranges from 0 (Antidote, Respiratory Problems) to 0.33. The highest ICF value of 0.33 was documented in the case of sexual and gynecological disorders. Fever, cough, and cold disease category ranked second with an ICF value of 0.32, and gastrointestinal disorders are in the third rank with an ICF value of 0.30 followed by dermatological problems, infectious diseases, tonic, oral problems, endocrine-related disorders, parasitic diseases, neurological problems, ear-eye-nose and throat problems, urological disorders, blood circulatory system disorders along with muscular and skeletal disorders respectively (Fig 4). In the present study, the average ICF value of all disease clusters was 0.17.

Use Value and Relative Frequency of citation

The use value of a species is quite important as it shows the relative importance of a particular plant species in the ethnomedicinal ground by local indigenous communities (Raj et al. 2018). In the present survey, the Use Value ranged between 0.02 and 0.50 (Table 4). The highest UV was calculated in some plants which were reported with multiple uses in the study area by the informants. Some most commonly utilized plants such as Aegle marmelos (L.) Correa (0.50), Mucuna pruriens (L.) DC (0.39), Artocarpus lacucha Buch.-Ham. (0.31), Rumex maritimus L. (0.31), etc. were documented with higher use values. This indicates the high and common use of these plants in the recorded study area. The use of these plant species was triggered by their easy availability and abundance in those areas.
<table>
<thead>
<tr>
<th>Plant Family</th>
<th>No. of Genera</th>
<th>Percentage(%) of Genera</th>
<th>No. of Plant Species</th>
<th>Percentage(%) of Plant Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Amaranthaceae</td>
<td>2</td>
<td>2.15</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Anacardiaceae</td>
<td>1</td>
<td>2.15</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Apiceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Apocynaceae</td>
<td>4</td>
<td>4.30</td>
<td>4</td>
<td>3.80</td>
</tr>
<tr>
<td>Araceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Areaceae</td>
<td>2</td>
<td>2.15</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Asteraceae</td>
<td>7</td>
<td>7.52</td>
<td>8</td>
<td>7.62</td>
</tr>
<tr>
<td>Bignoniaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Boraginaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Cannabaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Commelinaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Convolvulaceae</td>
<td>2</td>
<td>2.15</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Crassulaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Cucurbitaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Dioscoreaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Ebenaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>2</td>
<td>2.15</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>9</td>
<td>9.68</td>
<td>10</td>
<td>9.52</td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>4</td>
<td>4.30</td>
<td>4</td>
<td>3.80</td>
</tr>
<tr>
<td>Malvaceae</td>
<td>5</td>
<td>5.37</td>
<td>5</td>
<td>4.76</td>
</tr>
<tr>
<td>Melliaceae</td>
<td>2</td>
<td>2.15</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Menispermaceae</td>
<td>3</td>
<td>3.22</td>
<td>3</td>
<td>2.85</td>
</tr>
<tr>
<td>Moraceae</td>
<td>3</td>
<td>3.22</td>
<td>7</td>
<td>6.66</td>
</tr>
<tr>
<td>Moringaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Musaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td>2</td>
<td>2.15</td>
<td>3</td>
<td>2.85</td>
</tr>
<tr>
<td>Nyctaginaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Oleaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Orchidaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Oxalidaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Passifloraceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Phyllanthaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Piperaceae</td>
<td>1</td>
<td>1.07</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Plumbaginaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Poaceae</td>
<td>4</td>
<td>4.30</td>
<td>4</td>
<td>3.80</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td>1</td>
<td>1.07</td>
<td>2</td>
<td>1.90</td>
</tr>
<tr>
<td>Pontederiaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Rhamnaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>6</td>
<td>6.45</td>
<td>6</td>
<td>5.71</td>
</tr>
<tr>
<td>Rutaceae</td>
<td>3</td>
<td>3.22</td>
<td>3</td>
<td>2.85</td>
</tr>
<tr>
<td>Schizaeaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Scrophulariaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Simarouanaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Smilacaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
<tr>
<td>Solanaceae</td>
<td>3</td>
<td>3.22</td>
<td>6</td>
<td>5.71</td>
</tr>
<tr>
<td>Verbenaceae</td>
<td>1</td>
<td>1.07</td>
<td>1</td>
<td>0.95</td>
</tr>
</tbody>
</table>
Table 4. Ethnomedicinal uses of plant species from the study area

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Vernacular Name</th>
<th>Voucher Specimen Accession No.</th>
<th>1 Habit Life Span 3</th>
<th>1 IUCN category</th>
<th>4 Plant Parts used</th>
<th>Mode of Application</th>
<th>Medicinal uses</th>
<th>5 UV</th>
<th>6 RFC</th>
<th>7 FL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acanthaceae</td>
<td><em>Andrographis paniculata</em> (Burm.f.) Nees</td>
<td>Kalmegh</td>
<td>NBU 00011618</td>
<td>S P NE</td>
<td></td>
<td>Le-extract</td>
<td>Oral</td>
<td>Anthelmintic, Dysentery</td>
<td>0.11</td>
<td>0.10</td>
<td>100</td>
</tr>
<tr>
<td>Acanthaceae</td>
<td><em>Achyranthes aspera</em> L.</td>
<td>Apang</td>
<td>NBU 00011602</td>
<td>H A NE</td>
<td></td>
<td>Rt-extract, decocction, Le-paste decocction</td>
<td>Oral, Topical</td>
<td>Jaundice, Dog Bite, Leucorrhcea</td>
<td>0.14</td>
<td>0.12</td>
<td>77.2</td>
</tr>
<tr>
<td>Acanthaceae</td>
<td><em>Amaranthus spinosus</em> L.</td>
<td>Kantakhuria</td>
<td>NBU 00011591</td>
<td>H A NE</td>
<td></td>
<td>Le-extract</td>
<td>Oral</td>
<td>Dysentery, Diarrhea</td>
<td>0.09</td>
<td>0.12</td>
<td>59</td>
</tr>
<tr>
<td>Anacardiaceae</td>
<td><em>Mangifera indica</em> L.</td>
<td>Aam</td>
<td>NBU 00011575</td>
<td>T P DD</td>
<td></td>
<td>Le-extract, whole leaf, decocction</td>
<td>Oral, Gargle</td>
<td>Sore Throat, Gastritis, ulcer, dysentery</td>
<td>0.17</td>
<td>0.10</td>
<td>78.5</td>
</tr>
<tr>
<td>Acanthaceae</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Apocyanaceae</td>
<td><em>Calotropis gigantea</em> (L.) Dryand</td>
<td>Akanda</td>
<td>NBU 00011606</td>
<td>S P NE</td>
<td></td>
<td>Le-extract, Le-latex</td>
<td>Oral, Topical</td>
<td>Swollen Joint, Wound Healing, Severe Fever, Piles, Conjunctivitis, Bowel problems, Diarrhea, Dysentery</td>
<td>0.18</td>
<td>0.08</td>
<td>62.5</td>
</tr>
<tr>
<td>Apocyanaceae</td>
<td><em>Cascabela thevetia</em> (L.) Lippold</td>
<td>Ghontaful</td>
<td>NBU 00011608</td>
<td>T P NE</td>
<td></td>
<td>Le-extract, decocction, Ba-decoction, Le-extract</td>
<td>Oral, Topical</td>
<td></td>
<td>0.13</td>
<td>0.12</td>
<td>45.4</td>
</tr>
<tr>
<td>Apocyanaceae</td>
<td><em>Ichnocarpus frutescens</em> (L.) W.T.Aiton</td>
<td>Shyama Lata</td>
<td>NBU 00011737</td>
<td>C P NE</td>
<td></td>
<td>Le-extract, decocction</td>
<td>Oral</td>
<td></td>
<td>0.11</td>
<td>0.11</td>
<td>57.9</td>
</tr>
<tr>
<td>Arecaceae</td>
<td><em>Borassus flabellifer</em> L.</td>
<td>Tal</td>
<td>NBU 00011624</td>
<td>T P NE</td>
<td></td>
<td>Fr-extract</td>
<td>Oral</td>
<td>Diarrhea, Dysentery</td>
<td>0.11</td>
<td>0.10</td>
<td>66.6</td>
</tr>
<tr>
<td>Arecaceae</td>
<td><em>Phoenix sylvestris</em> (L.) Roxb.</td>
<td>Khejur</td>
<td>NBU 00011622</td>
<td>T P NE</td>
<td></td>
<td>Fr-whole fruit</td>
<td>Oral</td>
<td></td>
<td>0.08</td>
<td>0.15</td>
<td>68.9</td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Acnella uliginosa</em> (Sw.) Cass.</td>
<td>Titri</td>
<td>NBU 00011567</td>
<td>H A NE</td>
<td></td>
<td>Wp-decoction</td>
<td>Oral</td>
<td></td>
<td>0.08</td>
<td>0.14</td>
<td>52</td>
</tr>
<tr>
<td>Family</td>
<td>Species</td>
<td>Common Name</td>
<td>NBU Number</td>
<td>Plant Part</td>
<td>Form</td>
<td>Method</td>
<td>Uses</td>
<td>Uses</td>
<td>Uses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>-------------------</td>
<td>---------------------------------------------</td>
<td>----------------------</td>
<td>------------</td>
<td>------------</td>
<td>----------</td>
<td>---------------------</td>
<td>-----------------------------------------</td>
<td>-------------------------------</td>
<td>-------------------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Ageratum conyzoides</em> L.</td>
<td>Nilfuli</td>
<td>NBU 00011630</td>
<td>H A NE</td>
<td>Le-paste</td>
<td>Topical</td>
<td>Ringworm, Wound Healing</td>
<td>0.07, 0.15</td>
<td>57.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Ageratum houstonianum</em> Mill.</td>
<td>Jarafuli</td>
<td>NBU 00011759</td>
<td>H A NE</td>
<td>Rt-paste, Le-paste</td>
<td>Topical</td>
<td>Wound Healing, Skin rashes</td>
<td>0.15, 0.07</td>
<td>53.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Blumea lacera</em> (Burm.f.) DC.</td>
<td>Holud ful</td>
<td>NBU 00011728</td>
<td>H B NE</td>
<td>Le-extract</td>
<td>Oral</td>
<td>Blood Purification, Neurological disorder</td>
<td>0.13, 0.09</td>
<td>56.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Chromolaena odorata</em> (L.)R.M. King &amp; H.Rob.</td>
<td>Gondhi</td>
<td>NBU 00011599</td>
<td>H A NE</td>
<td>Le-decoction, extract</td>
<td>Oral</td>
<td>Malaria, Fever, Body ache</td>
<td>0.12, 0.15</td>
<td>42.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Mikania scandens</em> (L.) Willd.</td>
<td>Jongli lata</td>
<td>NBU 00011580</td>
<td>C A NE</td>
<td>Le-paste</td>
<td>Topical</td>
<td>Wound Healing, Antiseptic, Antidandruff</td>
<td>0.10, 0.11</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asteraceae</td>
<td><em>Sphagneticola trilobata</em> (L.) Pruski</td>
<td>Bhringaraj</td>
<td>NBU 00011598</td>
<td>H A LC</td>
<td>Le-extract</td>
<td>Topical</td>
<td>Hair Tonic Cough, Cold, Kidney Pain, Cardiovascular Disease</td>
<td>0.14, 0.08</td>
<td>71.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bignoniaceae</td>
<td><em>Tridax procumbens</em> L. <em>Oroxylum indicum</em> (L.) Kurz</td>
<td>Sonapata</td>
<td>NBU 00011743</td>
<td>H A NE</td>
<td>Wp-decoction, Rt-decoction, extract, Fr-powder</td>
<td>Oral</td>
<td>Oral</td>
<td>Cataract, Gastritis Fever, Body Pain</td>
<td>0.12, 0.15</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>Boraginaceae</td>
<td><em>Heliotropium indicum</em> L.</td>
<td>Hatishura</td>
<td>NBU 00011577</td>
<td>H A NE</td>
<td>Le-extract</td>
<td>Ophthalmic, Oral</td>
<td>Skin rashes, Dermatitis, Gastritis, Jaundice, Appetizer, Dysmenorrheal Pain</td>
<td>0.25, 0.16</td>
<td>100</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cannabaceae</td>
<td><em>Trema orientalis</em> (L.) Blume</td>
<td>Jigmi</td>
<td>NBU 00011748</td>
<td>S P NE</td>
<td>Le-decoction</td>
<td>Oral</td>
<td>Diabetes, Anti-Fungal Lotion, Kidney Stone, Diuretic, Dyspepsia Diabetes</td>
<td>0.09, 0.12</td>
<td>59</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Commelinaceae</td>
<td><em>Commelina diffusa</em> Burm.f.</td>
<td>Kanchira</td>
<td>NBU 00011750</td>
<td>H A LC</td>
<td>Le-paste</td>
<td>Topical</td>
<td>Diabetes, Anti-Fungal Lotion, Kidney Stone, Diuretic, Dyspepsia Diabetes</td>
<td>0.21, 0.07</td>
<td>64.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convolvulaceae</td>
<td><em>Cuscuta reflexa</em> Roxb. <em>Cuscuta reflexa</em> Alokata</td>
<td>Swarnalata/Alokata</td>
<td>NBU 00011569</td>
<td>PT P NE</td>
<td>Wp-oil decoction, decoction, extract, Sd-powder</td>
<td>Oral, Topical, Gargle</td>
<td>Diabetes, Anti-Fungal Lotion, Kidney Stone, Diuretic, Dyspepsia Diabetes</td>
<td>0.15, 0.11</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Convolvulaceae</td>
<td><em>Ipomoea carnea</em> Jacq.</td>
<td>Dhol kolmi</td>
<td>NBU 00011615</td>
<td>S P NE</td>
<td>Le-paste, decoction</td>
<td>Oral, Topical, Oral</td>
<td>Wound Healing, Anthelmintic, Mouth Ulcer</td>
<td>0.12, 0.15</td>
<td>57.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crassulaceae</td>
<td><em>Bryophyllum pinnatum</em> (Lam.) Oken</td>
<td>Patharkuchi</td>
<td>NBU 00011585</td>
<td>H A NE</td>
<td>Le-extract</td>
<td>Oral</td>
<td>Diabetes, Anti-Fungal Lotion, Kidney Stone, Diuretic, Dyspepsia Diabetes</td>
<td>0.15, 0.11</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cucurbitaceae</td>
<td><em>Coccinia grandis</em> (L.) Voigt</td>
<td>Telakochu</td>
<td>NBU 00011604</td>
<td>C P NE</td>
<td>Le-decoction, Rt-decoction</td>
<td>Oral</td>
<td>Oral</td>
<td>Diabetes, Anti-Fungal Lotion, Kidney Stone, Diuretic, Dyspepsia Diabetes</td>
<td>0.15, 0.11</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>Genus</td>
<td>Species</td>
<td>Common Names</td>
<td>Preparation</td>
<td>Use(s)</td>
<td>Uses</td>
<td>Purity</td>
<td>Clinical</td>
<td>Effectiveness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------------</td>
<td>---------------------------------</td>
<td>----------------------------------</td>
<td>-------------------------------</td>
<td>----------------------------------</td>
<td>-------------------------------------------</td>
<td>----------------------------------------------------------------------</td>
<td>--------</td>
<td>----------</td>
<td>--------------</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dioscoreaceae</td>
<td>Dioscorea alata L.</td>
<td>Chupri alu/ Kham alu Deshi Gab</td>
<td>NBU 00011621</td>
<td>C P NE</td>
<td>Rh-cooked</td>
<td>Oral Blood Pressure, Arthritis, Dyspepsia, Appetizer</td>
<td>0.05</td>
<td>0.12</td>
<td>68.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ebenaceae</td>
<td>Diospyros malabarica (Desr.) Kostel</td>
<td>Croton bonplandianus Baill.</td>
<td>NBU 00011763</td>
<td>T P NE</td>
<td>Ba-extract, Le-paste</td>
<td>Topical Jaundice, Dog Bite, Wound Healing</td>
<td>0.04</td>
<td>0.20</td>
<td>69.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euphorbiaceae</td>
<td>Tragia involucrata L.</td>
<td>Chotra pata</td>
<td>NBU 00011614</td>
<td>H P NE</td>
<td>Le-extract, decoction with goat milk</td>
<td>Oral Blood Pressure, Arthritis, Dyspepsia, Appetizer</td>
<td>0.06</td>
<td>0.10</td>
<td>63.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Abrus precatorius L.</td>
<td>Kunch</td>
<td>NBU 00011729</td>
<td>T P NE</td>
<td>Oral, Topical</td>
<td>Oral Better lactation, Jaundice, Dog Bite, Wound Healing</td>
<td>0.04</td>
<td>0.20</td>
<td>61.1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Acacia auriculiformis Benth.</td>
<td>Sonajhuri</td>
<td>NBU 00011616</td>
<td>T P LC</td>
<td>Ba-decoction, Le-decoction</td>
<td>Oral Jaundice, Dog Bite, Wound Healing</td>
<td>0.21</td>
<td>0.08</td>
<td>64.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Caesalpinia bonduc L. Roxb.</td>
<td>Katakanjara / Natagach</td>
<td>NBU 00011592</td>
<td>C P NE</td>
<td>Oral, Topical</td>
<td>Oral Jaundice, Dog Bite, Wound Healing</td>
<td>0.17</td>
<td>0.16</td>
<td>86.2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Crotalaria pallida Aiton</td>
<td>Atashi</td>
<td>NBU 00011594</td>
<td>H A NE</td>
<td>Rt-extract, Sd-decoction</td>
<td>Oral Malaria, Diabetes, Liver Problems, Irregular Menstrual Cycle, Eczema</td>
<td>0.09</td>
<td>0.12</td>
<td>54.5</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Grona triflora (L) H.Ohashi &amp; K.Ohashi Mimosa pudica L.</td>
<td>Dirghamul</td>
<td>NBU 00011767</td>
<td>H P NE</td>
<td>Rt-decoction, paste</td>
<td>Oral Fever, Diarrhea, Dysentery</td>
<td>0.10</td>
<td>0.17</td>
<td>66.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Mimosa pudica L.</td>
<td>Lojaboti</td>
<td>NBU 00011613</td>
<td>H P LC</td>
<td>Rt-Decoction</td>
<td>Oral Fever, Diarrhea, Dysentery</td>
<td>0.13</td>
<td>0.09</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Mucuna pruriens (L) DC</td>
<td>Alkushi/ Badorbicha</td>
<td>NBU 00011761</td>
<td>C P NE</td>
<td>Fr-extract Rt-extract, Sd-powder, Le-paste</td>
<td>Oral Infertility, Erectile Dysfunction, Low Sperm Count, Libido Booster, Diuretic, Arthritis, Scabies, Bowel problems</td>
<td>0.37</td>
<td>0.12</td>
<td>90.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Senna sophera (L) Roxb.</td>
<td>Fotagach</td>
<td>NBU 00011736</td>
<td>H P NE</td>
<td>Rt-paste</td>
<td>Oral Ring worm, Prickly heat</td>
<td>0.13</td>
<td>0.09</td>
<td>56.3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>Species</td>
<td>Common Name/Local Name</td>
<td>Accession No.</td>
<td>Genus/Species Code</td>
<td>Formulations</td>
<td>Uses</td>
<td>Efficacy</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------------------------</td>
<td>------------------------</td>
<td>---------------</td>
<td>--------------------</td>
<td>-----------------------------------</td>
<td>-------------------------------------------</td>
<td>----------</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Senna tora (L.) Roxb.</td>
<td>Chabuk gach</td>
<td>NBU 00011572</td>
<td>H A NE</td>
<td>Sd-powder, Le-paste decoction Fr –wf , Rt-decoction Le-paste</td>
<td>Oral, Topical</td>
<td>0.10 0.17 46.6</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Tamarindus indica L.</td>
<td>Tetul</td>
<td>NBU 00011574</td>
<td>T P NE</td>
<td>Fr –wf, Le-paste decoction</td>
<td>Oral</td>
<td>0.08 0.15 61.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Anisomeles indica (L.) Kuntze</td>
<td>Gopali</td>
<td>NBU 00011603</td>
<td>H A NE</td>
<td>Le-extract</td>
<td>Oral</td>
<td>0.10 0.11 55</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Clerodendrum infortunatum L.</td>
<td>Lal Bhat/Bhandi</td>
<td>NBU 00011611</td>
<td>S P NE</td>
<td>Le-extract</td>
<td>Topical</td>
<td>0.17 0.10 77.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Leucas aspera (Willd.) Link</td>
<td>Dandakalas h/ Kanshisa</td>
<td>NBU 00011629</td>
<td>H A NE</td>
<td>Fl-extract, Le-extract</td>
<td>Oral</td>
<td>0.28 0.10 72.2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lamiaceae</td>
<td>Ocimum gratissimum L.</td>
<td>Lobongo Tulsh/ Bon Tulshi</td>
<td>NBU 00011730</td>
<td>H P NE</td>
<td>Le-extract, decocition, Whole leaf</td>
<td>Oral, Ophthalmic, Nasal, Chewing, Gargle</td>
<td>0.26 0.19 76.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Abroma augusta (L.) L.f</td>
<td>Ulatkambal</td>
<td>NBU 00011619</td>
<td>T P NE</td>
<td>Rt-powder, decocition, Le-extract, decocition</td>
<td>Oral, Topical</td>
<td>0.19 0.12 85.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Bombax ceiba L</td>
<td>Shimul</td>
<td>NBU 00011609</td>
<td>T P NE</td>
<td>Ba-paste, Rt-paste, Rt-decoction, decocition</td>
<td>Oral, Topical</td>
<td>0.13 0.09 56.3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Sida rhombifolia L.</td>
<td>Swet Berela</td>
<td>NBU 00011756</td>
<td>S A NE</td>
<td>Rt-paste, Le-extract, decocition</td>
<td>Oral</td>
<td>0.09 0.12 54.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Triumfetta rhomboidea Jacq.</td>
<td>Jongli Okra</td>
<td>NBU 00011588</td>
<td>H A NE</td>
<td>Le-paste, Rt-paste, oil decocition, Rt-extract, Le-decoction</td>
<td>Oral</td>
<td>0.12 0.15 53.8</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Urena lobata L</td>
<td>Bon Okra</td>
<td>NBU 00011593</td>
<td>S A NE</td>
<td>Le-extract, decocition, St-decoction, Twig</td>
<td>Oral, Topical, Toothbrush</td>
<td>0.23 0.22 67.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meliaceae</td>
<td>Azadirachta indica A.Juss.</td>
<td>Jaat Neem</td>
<td>NBU 00011735</td>
<td>T P NE</td>
<td>Le-extract, decocition, St-decoction, Twig</td>
<td>Oral, Topical, Toothbrush</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Family</td>
<td>Genus</td>
<td>Species</td>
<td>Common Name/Other Names</td>
<td>Species Code</td>
<td>Form(s) Used</td>
<td>Parts Used</td>
<td>Oral/Topical</td>
<td>Treatment Areas</td>
<td>Duration</td>
<td>Usage</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------</td>
<td>----------------------------------</td>
<td>-------------------------</td>
<td>--------------</td>
<td>--------------</td>
<td>------------</td>
<td>--------------</td>
<td>------------------------------------------------------</td>
<td>----------</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>Meliaceae</td>
<td><em>Melia azedarach</em> L.</td>
<td>Ghor neem</td>
<td>C-P-NE-LE-TP-Rt-Ex,Ex</td>
<td>NBU 00011612</td>
<td>T P NE</td>
<td>Le-extract, Topical</td>
<td>Toothache, Anti-fungal lotion, Anthelmintic Headache, Nervous Problems, Malaria, Eczema, Antibacterial Lotion</td>
<td>0.25</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menispermaceae</td>
<td><em>Stephania japonica</em> (Thunb.) Miers</td>
<td>Maknadi</td>
<td>C-P-NE-LE-TP-Rt-Ex,Ex</td>
<td>NBU 00011578</td>
<td>C P NE</td>
<td>Rt-decoction Topical</td>
<td>Headache, Nervous Problems, Malaria, Eczema, Antibacterial Lotion</td>
<td>0.07</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menispermaceae</td>
<td><em>Tiliacora acuminata</em> (Lam.) Hook. f. &amp; Thoms.</td>
<td>Tikagachi</td>
<td>C-P-NE-LE-TP-Rt-Ex,Ex</td>
<td>NBU 00011766</td>
<td>C P NE</td>
<td>Rt-paste, extract Topical</td>
<td>Headache, Nervous Problems, Malaria, Eczema, Antibacterial Lotion</td>
<td>0.18</td>
<td>0.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Menispermaceae</td>
<td><em>Tinospora sinensis</em> (Lour.) Merr.</td>
<td>Gulancha</td>
<td>C-P-NE-LE-TP-Rt-Ex,Ex</td>
<td>NBU 00011586</td>
<td>C P NE</td>
<td>St-decoction Oral</td>
<td>Headache, Nervous Problems, Malaria, Eczema, Antibacterial Lotion</td>
<td>0.13</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Artocarpus heterophyllus</em> Lam.</td>
<td>Kathal</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011573</td>
<td>T P NE</td>
<td>Le-paste, Rt-decoction Oral</td>
<td>Asthma, Diathesis, Skin Rashes</td>
<td>0.15</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Artocarpus lacucha</em> Buch.-Ham.</td>
<td>Bonkathali</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011605</td>
<td>T P NE</td>
<td>Fr-extract, decocit, Le-paste Oral</td>
<td>Wound Healing</td>
<td>0.31</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Ficus benghalensis</em> L.</td>
<td>Bot</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011754</td>
<td>T P NE</td>
<td>Ba-decoction, St-latex, Le-extract Oral</td>
<td>Wound Healing</td>
<td>0.25</td>
<td>0.09</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Ficus racemosa</em> L.</td>
<td>Joggo Dumur</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011753</td>
<td>T P LC</td>
<td>Le-extract, Rt-decoction Oral</td>
<td>Stomach Ulcer</td>
<td>0.10</td>
<td>0.11</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Ficus religiosa</em> L.</td>
<td>Joggo Ashwath, Pipli Pakur</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011740</td>
<td>T P NE</td>
<td>Le-extract, Rt-decoction Oral</td>
<td>Gonorrhea</td>
<td>0.16</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Ficus rumphii</em> Blume</td>
<td>Tikagachi</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011741</td>
<td>T P NE</td>
<td>Le-extract, Fr-wf Topical</td>
<td>Dyspepsia</td>
<td>0.09</td>
<td>0.12</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moraceae</td>
<td><em>Streblus asper</em> Lour.</td>
<td>Sheora</td>
<td>T-P-NE-Ba-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011607</td>
<td>T P NE</td>
<td>St-tw, Ba-paste, decocit, Le-extract, Rt-decoction Oral</td>
<td>Toothache, Better Lactation</td>
<td>0.11</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moringaceae</td>
<td><em>Moringa oleifera</em> Lam.</td>
<td>Sojna</td>
<td>T-P-NE-Fr-Ex,St-Ex,Fr-Ex,Ex</td>
<td>NBU 00011620</td>
<td>T P NE</td>
<td>Fr-Cooked, Le-extract, Fl-extract, Rt-decoction Oral</td>
<td>Reducing High Blood Pressure, Chicken Pox, Diuretic</td>
<td>0.16</td>
<td>0.23</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** The usage and duration may vary depending on the method of preparation and individual health conditions.
<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Common Name</th>
<th>Accession</th>
<th>Species Code</th>
<th>Formulations</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td>Musaceae</td>
<td>Musa paradisiaca L.</td>
<td>Kola</td>
<td>NBU 00011610</td>
<td>H P NE</td>
<td>St-extract, paste, ash, Le-extract, Fr-whole fruit</td>
<td>Jaundice, Liver Problems, Menstrual Abnormalities, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Le-extract, decoction, whole leaf, St-twig</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Topical</td>
<td>Skin Burn, Intestinal Disorders, Piles, Constipation</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Tothbrush, Chewing</td>
<td>Diarrhea, Dysentery, Toothache, Pyorrhya, Bad Breathe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaundice, Dysentery, Diarrhea, Scurvy</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td>Psidium guajava L.</td>
<td>Peyara</td>
<td>NBU 00011590</td>
<td>T P NE</td>
<td>Le-extract, decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Tothbrush</td>
<td>Diarrhea, Dysentery, Toothache, Pyorrhya, Bad Breathe</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaundice, Dysentery, Diarrhea, Scurvy</td>
</tr>
<tr>
<td>Myrtaceae</td>
<td>Syzygium cumini (L.) Skeels</td>
<td>Kala Jam</td>
<td>NBU 00011742</td>
<td>T P NE</td>
<td>Fr-wf, Le-extract, Sd-powder Fr-wf</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Topical</td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaundice, Dysentery, Diarrhea, Scurvy</td>
</tr>
<tr>
<td>Nyctaginaceae</td>
<td>Boerhavia diffusa L.</td>
<td>Punarnaba</td>
<td>NBU 00011752</td>
<td>H A NE</td>
<td>Rt-extract, oil decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Topical</td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td>Oleaceae</td>
<td>Nyctanthes arbor-tristis L.</td>
<td>Shiuli/ Sefali</td>
<td>NBU 00011589</td>
<td>T P NE</td>
<td>Le-extract, Fl-decoction, Ba-decoction Rt-paste,decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Ophthalmic</td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaundice, Dysentery, Diarrhea, Scurvy</td>
</tr>
<tr>
<td>Orchidaceae</td>
<td>Bulbophyllum leopardinum (Wall.) Lindl. ex Wall.</td>
<td>Gachhia</td>
<td>NBU 00011768</td>
<td>A P LC</td>
<td>Le-extract, Fl-decoction, Ba-decoction Rt-paste,decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Topical</td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaundice, Dysentery, Diarrhea, Scurvy</td>
</tr>
<tr>
<td>Oxalidaceae</td>
<td>Oxalis corniculata L.</td>
<td>Tok pata/ Ambuli</td>
<td>NBU 00011758</td>
<td>H A NE</td>
<td>Le-extract, extract, decoction, whole leaf Le-extract, decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Topical</td>
<td>Dyssentery, Blood Purification, Diabetes</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Anaemia, Gastritis</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Rejuvenating Tonic, Anti-ageing lotion</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Fever, Diabetes, Conjunctivitis, Fetal Growth, Wound Healing</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Sexual Stimulant</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Jaundice, Dysentery, Diarrhea, Scurvy</td>
</tr>
<tr>
<td>Passifloraceae</td>
<td>Passiflora foetida L.</td>
<td>Jhumkatala</td>
<td>NBU 00011732</td>
<td>C P NE</td>
<td>Le-extract, decoction, whole leaf Le-extract, decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Aural</td>
<td>Diarrhea, Earache</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gastrointestinal Disorders, Appetizer, Scurvy, Ringworm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Better Lactation, Menstrual Pain, Asthma, Fever</td>
</tr>
<tr>
<td>Phyllanthaceae</td>
<td>Phyllanthus emblica L.</td>
<td>Amloki</td>
<td>NBU 00011570</td>
<td>T P NE</td>
<td>Fr-powder, extract, whole fruit Le-extract, decoction</td>
<td>Oral</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Oral, Topical</td>
<td>Diarrhea, Earache</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Gastrointestinal Disorders, Appetizer, Scurvy, Ringworm</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Better Lactation, Menstrual Pain, Asthma, Fever</td>
</tr>
<tr>
<td>Piperaceae</td>
<td>Piper longum L.</td>
<td>Pipul</td>
<td>NBU 00011597</td>
<td>C P NE</td>
<td>Fr-powder, Wp-extract</td>
<td>Oral</td>
</tr>
<tr>
<td>Family</td>
<td>Genus</td>
<td>Species</td>
<td>Deposition</td>
<td>Use</td>
<td>Properties</td>
<td>Cough</td>
</tr>
<tr>
<td>---------------------</td>
<td>----------------------------</td>
<td>------------------------------</td>
<td>------------</td>
<td>------------------------------</td>
<td>-----------------------------------------------</td>
<td>-------</td>
</tr>
<tr>
<td>Piperaceae</td>
<td><em>Piper nigrum</em> L.</td>
<td>Golmorich</td>
<td>NBU 00011628</td>
<td>C P NE</td>
<td>Fr-powder, decocation with <em>Leea indica</em></td>
<td>0.22</td>
</tr>
<tr>
<td>Plumbaginaceae</td>
<td><em>Plumbago zeylanica</em> L.</td>
<td>Chittrak</td>
<td>NBU 00011627</td>
<td>H A NE</td>
<td>Le-paste, Decoction</td>
<td>0.14</td>
</tr>
<tr>
<td>Poaceae</td>
<td><em>Chrysopogon aciculatus</em> (Retz.) Trin.</td>
<td>Chorkata</td>
<td>NBU 00011583</td>
<td>H P NE</td>
<td>Le-decoction, Rh-decoction</td>
<td>0.12</td>
</tr>
<tr>
<td>Poaceae</td>
<td><em>Cynodon dactylon</em> (L.)Pers.</td>
<td>Durba</td>
<td>NBU 00011596</td>
<td>H P NE</td>
<td>Rh-extract, Wp-paste, extract</td>
<td>0.14</td>
</tr>
<tr>
<td>Poaceae</td>
<td><em>Digitaria ciliaris</em> (Retz.) Koeler</td>
<td>Timathi</td>
<td>NBU 00011751</td>
<td>H P NE</td>
<td>Rh-decoction, Le-extract</td>
<td>0.14</td>
</tr>
<tr>
<td>Poaceae</td>
<td><em>Kyllinga nemoralis</em> (J.R. Forst &amp; G.Forst.)Dandy ex Hutch. &amp; Dalziel</td>
<td>Motha ghas</td>
<td>NBU 00011584</td>
<td>H P LC</td>
<td>Rh-extract</td>
<td>0.12</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td><em>Rumex dentatus</em> L.</td>
<td>Jongli Palang</td>
<td>NBU 00011746</td>
<td>H B NE</td>
<td>Le-paste, extract, Rt-decoction</td>
<td>0.14</td>
</tr>
<tr>
<td>Polygonaceae</td>
<td><em>Rumex maritimus</em> L.</td>
<td>Bonpalak</td>
<td>NBU 00011755</td>
<td>H B NE</td>
<td>Le-paste, extract, Rt-decoction</td>
<td>0.14</td>
</tr>
<tr>
<td>Pontederiaceae</td>
<td><em>Eichhornia crassipes</em> (Mart.) Solms</td>
<td>Kocuripana</td>
<td>NBU 00011600</td>
<td>A P NE</td>
<td>Wp-paste</td>
<td>0.14</td>
</tr>
<tr>
<td>Rhamnaceae</td>
<td><em>Ziziphus jujuba</em> Mill.</td>
<td>Bon Kul</td>
<td>NBU 00011579</td>
<td>A P NE</td>
<td>Le-paste, Rt-decoction Fr-extract</td>
<td>0.14</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td><em>Meyna laxiflora</em> Robyns</td>
<td>Moyna kata</td>
<td>NBU 00011739</td>
<td>S P NE</td>
<td>Le-paste, Rt-decoction Fr-extract</td>
<td>0.14</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td><em>Mitracarpus hirtus</em> (L.) DC.</td>
<td>Jongolbandha</td>
<td>NBU 00011769</td>
<td>H A NE</td>
<td>Wp-paste, oil decocion</td>
<td>0.14</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td><em>Neolamarckia cadamba</em> (Roxb.) Bosser</td>
<td>Kadam</td>
<td>NBU 00011734</td>
<td>T P NE</td>
<td>Le-extract</td>
<td>0.14</td>
</tr>
<tr>
<td>Family</td>
<td>Species</td>
<td>Common Name</td>
<td>Code</td>
<td>Use</td>
<td>Mode of Use</td>
<td>Application</td>
</tr>
<tr>
<td>--------------</td>
<td>----------------------------------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>------------------</td>
<td>-------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td><em>Spermacoce alata</em> Aubl.</td>
<td>Chiki</td>
<td>NBU 00011764</td>
<td>H A NE</td>
<td>Le-extract, decoction, Le-extract, Pt-extract, St-extract, twig</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td><em>Tabernaemontana divaricata</em> (L.) R.Br. ex Roem. &amp;Schult.</td>
<td>Tagar</td>
<td>NBU 00011731</td>
<td>S P NE</td>
<td>Le-extract, Pt-extract, Ft-extract, Fr-extract</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Rutaceae</td>
<td><em>Aegle marmelos</em> (L.) Correa</td>
<td>Bel</td>
<td>NBU 00011568</td>
<td>T P NE</td>
<td>Le-extract, Ft-powder, extract, Ft-extract</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Rutaceae</td>
<td><em>Glycosmis pentaphylla</em> (Retz.) DC.</td>
<td>Atishar/Kendal</td>
<td>NBU 00011625</td>
<td>S P NE</td>
<td>Le-extract, St-extract</td>
<td>Topical</td>
</tr>
<tr>
<td>Rutaceae</td>
<td><em>Murraya koenigii</em> (L.) Spreng.</td>
<td>Karipata/Narasingha pata</td>
<td>NBU 00011571</td>
<td>T P NE</td>
<td>Le-extract, St-extract</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Schizaeeae</td>
<td><em>Lygodium flexuosum</em> (L.) Sw.</td>
<td>Jhirjhira</td>
<td>NBU 00011770</td>
<td>C P NE</td>
<td>Le-paste, decoction, Le-extract, Pt-extract</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Scrophulariaceae</td>
<td><em>Scoparia dulcis</em> L.</td>
<td>Chinipata/Bondhonia</td>
<td>NBU 00011617</td>
<td>H P NE</td>
<td>Le-paste, decoction, Le-extract, Pt-extract</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Simaroubaceae</td>
<td><em>Ailanthus exelsa</em> Roxb.</td>
<td>Prithwiraj</td>
<td>NBU 00011745</td>
<td>T P NE</td>
<td>Le-extract, Pt-decoction</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Smilacaceae</td>
<td><em>Smilax zeylanica</em> L.</td>
<td>Chagalboti</td>
<td>NBU 00011587</td>
<td>C P NE</td>
<td>Wp-paste, Pt-decoction, Le-paste, oil decoction, Ft-powder</td>
<td>Oral, Topical</td>
</tr>
<tr>
<td>Solanaceae</td>
<td><em>Datura metel</em> L.</td>
<td>Dhutura</td>
<td>NBU 00011576</td>
<td>S P NE</td>
<td>Le-extract, Ft-extract, Le-extract, Pt-extract</td>
<td>Oral</td>
</tr>
<tr>
<td>Solanaceae</td>
<td><em>Physalis minima</em> L.</td>
<td>Bontapari</td>
<td>NBU 00011595</td>
<td>H A NE</td>
<td>Le-extract, Ft-extract, Le-extract, Pt-extract</td>
<td>Oral</td>
</tr>
<tr>
<td>Solanaceae</td>
<td><em>Solanum nigrum</em> L.</td>
<td>Kakmachi</td>
<td>NBU 00011757</td>
<td>H P NE</td>
<td>Le-extract, Ft-extract, Le-extract, Pt-extract</td>
<td>Oral</td>
</tr>
</tbody>
</table>
### Ethnobotany Research and Applications

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus and Species</th>
<th>Habitat</th>
<th>Life Span</th>
<th>IUCN Category</th>
<th>Health Conditions</th>
<th>UV</th>
<th>RFC</th>
<th>FL</th>
<th>Note</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solanaceae</td>
<td><em>Solanum sisymbriifolium</em> Lam.</td>
<td>Katabegun NBU 00011626</td>
<td>H A NE</td>
<td>Fr-extract</td>
<td>Oral</td>
<td>0.07</td>
<td>0.17</td>
<td>56.7</td>
<td>Indigestion, Anthelmintic</td>
</tr>
<tr>
<td>Solanaceae</td>
<td><em>Solanum torvum</em> Sw.</td>
<td>Titbegun NBU 00011581</td>
<td>H P NE</td>
<td>Fr-extract</td>
<td>Oral</td>
<td>0.05</td>
<td>0.10</td>
<td>66.6</td>
<td>Diabetes, High blood pressure</td>
</tr>
<tr>
<td>Solanaceae</td>
<td><em>Solanum virginianum</em> L.</td>
<td>Bonbegni NBU 00011744</td>
<td>H A NE</td>
<td>Rt-decoction, Le-paste</td>
<td>Oral, Topical</td>
<td>0.18</td>
<td>0.06</td>
<td>54.5</td>
<td>Eczema, Painkiller, Ringworm, Skin Rashes, Body ache, Wound Healing</td>
</tr>
<tr>
<td>Verbenaceae</td>
<td><em>Lantana camara</em> L.</td>
<td>Gisani Ful NBU 00011631</td>
<td>S P NE</td>
<td>Le-paste, oil decoction</td>
<td>Topical</td>
<td>0.15</td>
<td>0.15</td>
<td>61.5</td>
<td></td>
</tr>
</tbody>
</table>

**Notes:**

- **Habit:** H-Herbs, S-Shrubs, T-Tree, C-Climber, AQ-Aquatic, AH-Arial Herb, PT-Parasitic Twiners
- **Life Span:** A-Annual, B-Biennial, P-Perennial
- **IUCN category:** NE-Not Evaluated, LC-Least Concerned, DD-Data Deficient
- **Plant parts used:** Rt-Root, St-Stem, Ba-Bark, Le-Leaf, Fl-Flower, Fr-Fruit, Sd-Seed, Wp-Whole plant, wf-Whole fruit, Rh-Rhizome
- **UV:** Use Value; **RFC:** Relative Frequency of Citation; **FL:** Fidelity Level
- *Main therapeutic uses of plants are in bold text*
Figure 3. Graph showing different plant parts used with their mode of consumptions (PST= Paste, EXT= Extract, DCC= Decoction, ODCC= Oil Decoction, PWD= Powder, WL= Whole Leaf, LTX= Latex)

Figure 4. Chord diagram representing the Informant Consensus factor attributes for different ailment categories (ANTD= Antidote, BLD= blood circulatory system disorders, DER= dermatological problems, EENT= ear-eye-nose and throat problems, FCC= Fever, cough and cold, GAS= gastrointestinal disorders, END= endocrine related disorders, MSS= muscular and skeletal disorders, NEU= neurological problems, ORL= oral problems, PAR= parasitic diseases, RES= respiratory problems, SEG= Sexual and Gynecological Disorders, TON=tonic, URO=urological disorders, INF= infectious diseases)
The RFC values of the documented plant species range from 0.05 to 0.23 with an average RFC value of 0.12. *Moringa oleifera* Lam. (0.23) plant was recorded with the highest RFC followed by *Azadirachta indica* A.Juss. (0.22), *Ocimum gratissimum* L. (0.19) and whereas *Neolamarckia cadamba* (Roxb.) Bosser (0.05), *Trema orientalis* (L.) Blume (0.05), *Commelina diffusa* Burm.f. (0.06), *Tridax procumbens* L. (0.06), *Ageratum houstonia* Mill. (0.07) and *Alstonia scholaris* (L.) R.Br. (0.07) were recorded with the lowest RFC values. A higher RFC value indicates that the plants are most commonly used and are popular among the local inhabitants.

**Fidelity Level**

In the present study, the fidelity level ranges between 42.3 to 100% (Table 4). Fidelity level (FL) was calculated for the plants that were used for various kinds of ailments viz. leucorrhea, rejuvenating agent, malaria, diabetes, dysmenorrheal pain, jaundice, toothache, cataract, reducing high blood pressure, men infertility, fever, cough, asthma, arthritis, diarrhea, etc. In this study four medicinal plants, viz., *Cuscuta reflexa* Roxb., *Heliotropium indicum* L., *Cynodon dactylon* (L.) Pers., *Andrographis paniculata* (Burm.f.) Nees and *Moringa oleifera* Lam. were depicted with an FL range of 100% followed by *Mucuna pruriens* (L.) DC. with 90.9%.

Table 5. Informant consensus factor (ICF) of reported plant species against different category of ailments

<table>
<thead>
<tr>
<th>Disease category</th>
<th>No. of use reports (N_u)</th>
<th>Number of Plant Species used (N_t)</th>
<th>ICF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Antidote (Dog bite, Snake bite etc.)</td>
<td>4</td>
<td>4</td>
<td>-</td>
</tr>
<tr>
<td>Blood circulatory system disorders (Anemia, High Blood Pressure, Blood purifier, Cardiovascular disorders, Cholesterol)</td>
<td>14</td>
<td>13</td>
<td>0.08</td>
</tr>
<tr>
<td>Dermatological Problems</td>
<td>60</td>
<td>45</td>
<td>0.25</td>
</tr>
<tr>
<td>Eye, Ear, Nose, Throat problems</td>
<td>8</td>
<td>7</td>
<td>0.14</td>
</tr>
<tr>
<td>Fever, Cough and Cold</td>
<td>32</td>
<td>22</td>
<td>0.32</td>
</tr>
<tr>
<td>Gastrointestinal Disorders (Appetizer, Constipation, Indigestion, Diarrhea, Dysentery, Gastritis, Piles, Stomachache)</td>
<td>70</td>
<td>49</td>
<td>0.30</td>
</tr>
<tr>
<td>Endocrine Related Disorders (Jaundice, Liver problems, Diabetes)</td>
<td>25</td>
<td>21</td>
<td>0.17</td>
</tr>
<tr>
<td>Muscular and Skeletal Disorders</td>
<td>14</td>
<td>13</td>
<td>0.07</td>
</tr>
<tr>
<td>Neurological Problems (headache, migraine pain, neurodegenerative diseases, stroke)</td>
<td>8</td>
<td>7</td>
<td>0.14</td>
</tr>
<tr>
<td>Oral problems (Bad breathe, Scurvy, Toothache, Pyorrhea)</td>
<td>12</td>
<td>10</td>
<td>0.18</td>
</tr>
<tr>
<td>Parasitic (Anthemintic, Malaria)</td>
<td>14</td>
<td>12</td>
<td>0.15</td>
</tr>
<tr>
<td>Respiratory Problems (Asthma)</td>
<td>6</td>
<td>6</td>
<td>-</td>
</tr>
<tr>
<td>Sexual and Gynecological Disorders (Libido Booster, Erectile Dysfunction, Sexual Stimulant, Low sperm count, Dysmenorrhea, Menstrual problems, Hydrocele, Leucorrhea, Fetal Growth, Pregnancy, Better lactation)</td>
<td>28</td>
<td>19</td>
<td>0.33</td>
</tr>
<tr>
<td>Tonic (Protein Tonic, Hair Tonic, Rejuvenating Tonic, Weight Loss Tonic)</td>
<td>6</td>
<td>5</td>
<td>0.20</td>
</tr>
<tr>
<td>Urological disorders (Kidney Problems, Kidney Stone, Diuretic, Urinary Tract Infection)</td>
<td>9</td>
<td>8</td>
<td>0.13</td>
</tr>
<tr>
<td>Infectious (Chicken pox, Measles, Cholera, Pneumonia,)</td>
<td>5</td>
<td>4</td>
<td>0.25</td>
</tr>
</tbody>
</table>

**Interplay between surveyed plants and variables as observed through Heatmap and PCA**

PCA was used for the reduction of data and transforming the raw data into principal components or principal factors. Principal component analysis converted high-dimensional data into fewer dimensions or principal factors with minimal loss (Fig. 5). Here the variables mainly form two separate clusters when the first cluster represents UV and FL (both PC1 and PC2 positive). While RFC is present alone in the fourth cluster where PC1 represents a positive value and PC2 represents a negative value. The PCA showed 80.72% overall data variability as only PC1 and PC2 were used to make the biplots. From the factor loading plot, it was observed that the studied plants occupied all four quadrants. Heatmap was also used for arithmetic hierarchical clustering. Heatmap is a technique of data visualization where two-dimensional data can be graphically represented through color gradients. In the present study, the Heatmap result also supports the PCA analysis result (Fig. 6).
Figure 5. Principal component analysis of studied plants on the basis of various quantitative ethnobotanical indices (Plant codes are according to Table 4 and here RFC = Relative Frequency of Citation; FL = Fidelity Level; UV = Use Value)

Figure 6. Heatmap analysis of studied plants on the basis of various quantitative ethnobotanical indices (RFC = Relative Frequency of Citation; UV = Use Value; FL = Fidelity Level)

**Phytochemicals, Synthetic drugs and their targets**

In the present study phytochemicals and targets of the three most popular plants namely *Cuscuta reflexa*, *Heliotropium indicum*, and *Cynodon dactylon*, were obtained. These plants were cited by informants for Dysmenorrhea, Cataracts, and Jaundice respectively. From *Cuscuta reflexa*, 118 protein targets were documented from 29 phytoconstituents. Similarly, 82 protein targets from 69 phytochemicals and 128 protein targets from 31 phytochemicals were obtained from *Heliotropium indicum* and *Cynodon dactylon* respectively (Fig. 7). Mining of
synthetic drugs and drug targets was executed for three disease categories viz. Dysmenorrhea, Cataracts, and Jaundice. For Dysmenorrhea, 93 human targets were obtained from 16 synthetic drugs. In the case of Cataract, 297 targets were mined from 15 synthetic drugs and in jaundice 318 unique targets were collected from 32 synthetic drugs. Only approved synthetic drugs were incorporated for the current study, and experimental, investigational, and withdrawn drugs were screened out. The detailed data files are provided in Supplementary File 1 (for *Cuscuta reflexa*), 2 (for *Heliotropium indicum*), and 3 (for *Cynodon dactylon*).

**Network construction and analysis**

Two networks each were constructed for all three plant-disease categories. In the case of *Cuscuta reflexa*, 10 targets (ABCB1, ABCG2, ALOX5, CA2, CYP1A2, NEU1, PDE5A, PTGS2, RPS6KA3, and SLCO1B1) which were common in both phytochemical and synthetic drug targets were obtained from a set of phytochemicals as well as synthetic drugs. Acetylsalicylic acid, Celecoxib, and Naproxen were the most potent synthetic drugs, whereas Kaempferol, Quercetin, and Hyperoside were the potent phytoconstituents that act against dysmenorrheal targets (Supplementary File 1).

In the disease category, Cataract, among 10 promising phytochemicals of *Heliotropium indicum*, three of them namely (2S,3R)-((1R,7aS)-hexahydro-1H-pyrrolizin-1-yl)methyl 2,3-dihydroxy-2-isopropylbutanoate, (2S)-7-hydroxyflavanone and Naringenin 5-methyl ether were the most potent. Here 10 targets likely ACHE, CHRM1, CHRM3, CHRM4, CYP1B1, CYP17A1, PTGS1, ABCG2, AKR1C3, and GRIN1, appeared to be the common targets from both phytochemicals and synthetic drug targets (Supplementary File 2). Acetylcholine, Carbamoylcholine, and Dexamethasone were the most persuasive synthetic drugs. According to informants and herbal healers, *Cynodon dactylon* acts well against jaundice. Here 13 common human protein targets were obtained viz. ABCB1, ABCG2, CA12, CA2, CA7, CYP1A1, CYP1A2, CYP1B1, DPP4, F2, LCK, PTGS2, and TTR (Fig 8) (Supplementary File 3). Here Tricin, Apigenin, and Luteolin were found to be the most potent phytochemicals and Zinc chloride, Ketoconazole, and Nintedanib appear to be the most potent synthetic drugs.

**Discussion**

The greater parts of informants were males (69.83%), followed by female informants (30.16%). Study reports by Mir et al. (2022) also showed similar results. The majority of respondents (35.19%) were between the ages of 51 and 60, followed by those over 60 (27.37%), 41-50 years (20.11%), 31-40 years (12.29%), and 20-30 years (5.02%), in that order. In the current study, it was observed that older individuals possess a large proportion of ethnic knowledge than young people due to their yearlong ethnic practice and infield experience. Similar observations were also found in the research of other workers (De Almeida et al. 2010; Rana et al. 2019; Khoja et al. 2022). A major fraction of these informants were elementary or primary education recipients (38.54%), followed by a large percentage of illiterate persons (26.25%). A fair number of informants were upper primary education recipients, followed by a comparatively smaller percentage of people who hold a secondary (6.70%), higher secondary (5.02%), and a graduation degree (2.79%).
Illiterate and comparatively less educated people in this area shared more information. They were small-scale farmers or daily wage workers who could not afford modern medicines and hence relied completely on their age-old traditional knowledge and herbal practices. There was a lack of ethnomedicinal as well as ethnic knowledge observed in the comparatively educated inhabitants. It was probably due to their changing behaviors and faded belief in traditional healing practices.

Due to the presence of rich and varied bioactive components (Wink 2013), plants belonging to the family Fabaceae were the most utilized in traditional herbal therapies. Other researchers from neighboring geographic regions (Ahirwar 2022; Ullah et al. 2014; Khan et al. 2015; Faruque et al. 2018) also found Fabaceae to be the most dominant plant family, whereas several previous researchers from different regions of the globe found Asteraceae as the most used plant family (Bano et al. 2014). Moraceae was reported as the dominant family in a study in the northern Terai part of West Bengal (Raj et al. 2018). Previous works in this area also documented the individuals of Fabaceae as the first choice for the herbal healers as well as the indigenous communities in the study area (Das & Chakraborty 2019). These reports support the abundance of this family in the sacred groves of Dakshin Dinajpur district. Herbs were predominantly used in this study area due to their comparatively easy collection and preparation procedure and frequent availability. Similar statements were also drawn by several other workers from different places (Shrestha et al. 2003; Kayani et al. 2015). The use of perennial plants over annual or biennial herbs was observed during the study. It might be because perennial plants live for a longer period than the other forms, and therefore these could be available throughout the year.

Indigenous people utilize different plant parts for curing different types of illnesses (Hosseini et al. 2021). According to local indigenous people, different parts of a plant are often used to cure different types of ailments. For example, roots of Caesalpinia bonduc (L.) Roxb. is used to treat malaria and irregular menstrual cycle problems whereas seeds and leaves are used to treat diabetes and eczema, respectively. The leaf part was the most utilized plant part in the present study. Previous studies in this area showed similar results (Chowdhury et al. 2014), whereas several other researchers found the ‘root’ as the most utilized part (Saikia 2006; Teklehaymanot & Giday 2010). Many other researchers who worked in this field (Faruque et al. 2018; Rana et al. 2019; Basualdo et al. 1995; Singh et al. 2018; Umair et al. 2017) also found the leaf to be the most utilized plant part. In most herbal preparations, leaves are frequently used due to the presence of various bioactive compounds and secondary metabolites (Kayani et al. 2015). Besides, leaves are predominantly used because of the conservation purpose of plants, as the collection of whole plants or roots could restrict the plant colony and push it into endangered conditions (Khan et al. 2015;
Ghorbani et al. 2011; Kadir et al. 2012). Here, the most frequent mode of preparation of herbal medicines was extraction and decoction. The extract is the simplest way to consume and prepare herbal medicine hence it was most preferred, and the decoction method is very popular in brewing herbal medicine. Various researchers have documented these methods as the most preferable (Gurdal & Kultur 2012; Bibi et al. 2015). Besides, different modes of application including internal and external applications or consumptions were also documented during the study. Oral consumption was the most common, as it is the easiest way of obtaining medicine.

The ICF values acquired for different ailment categories indicate the level of knowledge shared by the informants concerning the use of ethnomedicinal plants in the treatment of disease (Cakilcioglu et al. 2011). Sexual and gynecological disorders obtained the highest ICF value. A former population-based cross-sectional study revealed that women living in the rural part of India have a high chance of gynecological disorders (Bang et al. 1989). It might be because women in rural areas may have limited access to education and information about reproductive health, leading to a lack of knowledge about safe sex practices and contraception. They may also have limited autonomy in decision-making about their reproductive health and may face pressure to engage in early marriage, early childbirth, and multiple pregnancies, all of which increase the risk of gynecological disorders. Besides, medical resources were scarce as well as doctors with whom they could consult. Hence, they were largely dependent on herbal medicines obtained from the plants of the sacred groves. *Cuscuta reflexa* Roxb is frequently used to treat dysmenorrhea. It was also documented in an earlier study (Roy et al. 2017) conducted in the Terai and Duars regions of West Bengal. *Mucuna pruriens* (L.) DC is widely used in various sexual disorders. In a previous study in India (Singh et al. 2018), liver disorders were reported with the highest ICF value. In the present study, *Cynodon dactylon* (L.)Pers. is predominantly used against jaundice along with *Abras precatorius* L., *Achyranthes aspera* L., and *Diospyros malabarica* (Desr.) Kostel. To season the fishing nets, fruits of *Diospyros malabarica* (Desr.) Kostel are also used by indigenous communities. Some researchers from neighboring countries (Faruque et al. 2018; Umair et al. 2017; Yaseen 2015) reported gastrointestinal diseases with the highest ICF values. Gastrointestinal problems are a major issue in rural parts of the Indian subcontinent (Mutheeswaran et al. 2021). This might be due to the hot and humid weather and the rich oily, and spicy food habits of the inhabitants. *Ichnocarpus frutescens* (L.) W.T.Aiton, *Digitaria ciliaris* (Retz.) Koehler. and *Amaranthus spinosus* L. are also used by the local indigenous people have a higher Fidelity Level than those plants that are not as much of popular (Khan et al. 2015). Plants with higher Fidelity levels are the first choice of herbal medicine for treating a particular disease (Rajakumar & Shivanna 2009; Islam et al. 2014). One such plant is *Heliotropium indicum* L., which is commonly used to treat cataracts. Kyei et al. (2016) supported it by stating that *Heliotropium indicum* L. can be used to delay galactose-induced cataracts. The network pharmacological study of *Cuscuta reflexa* Roxb., *Heliotropium indicum* L., and *Cynodon dactylon* (L.)Pers. highlights the potential of traditional medicinal plants as a source of natural compounds with therapeutic potential. By utilizing advanced computational tools, the study was able to identify the specific phytochemicals within these plants that target human proteins. From the above study it was observed that the ethnomedicinal information given by the local indigenous people was found to be correct, as the in-silico study revealed that these plants contain such phytochemicals that target human proteins against those diseases, the same as the synthetic drugs. Further phytochemical, as well as pharmacological, approaches are required to justify these findings.

However, when the current study’s medicinal plant data were compared to previously published reports in this study area (Mitra & Mukherjee 2010; Talukdar & Talukdar 2012; Chowdhury et al. 2014; Das & Chakraborty 2019; Kundu & Bag 2012; Sur et al. 1990), it was discovered that ethnomedicinal data for 57 new plants were recorded (Table 6). Also, among the common plants that have been studied previously, several new pieces of information have been documented in the present study. Besides, several unique medicinal plants with new therapeutic uses have been documented in this study. Rhizomes of *Lysodium flexuosum* (L.) Sw. is used in the treatment of poisonous snake bites. It is the first report of this plant for the said ailment category. *Tiliacora acuminata* (Lam.) Hook. f. & Thoms., a sacred grove-specific woody climber, has also been recorded and is used to treat wounds and snake bites.
Table 6. Comparative analysis of common ethnomedicinal plants with the previously published works in Dakshin Dinajpur district

<table>
<thead>
<tr>
<th>Plant Name</th>
<th>Previous Study/Studies</th>
<th>Present Study</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abroma augusta (L.) L.f</td>
<td>The plant cures leucorrhea. A paste of root bark and two peppers is prepared and given thrice daily for three months to a woman who fails to conceive. (Sur et al., 1990). Young petiole cut into small pieces and kept in a glass of water for overnight and infusion is used at early morning in empty stomach to cure &quot;Meho&quot; (gonorrhea) and physical weakness (Chowdhury et al., 2014). Leaf and bark reduces blood sugar, kidney/urinary tract infection, reduces urine sugar, male sterility, sexual diseases of female (Das and Chakraborty, 2019).</td>
<td>Root decoction used to cure leucorrhea, consumption of root powder with lukewarm milk used to lessen dysmenorrheal pain, leaf decoction used to cure, irregular menstrual cycle, leaf extract used in gonorrhea.</td>
</tr>
<tr>
<td>Abrus precatorius L.</td>
<td>Seed powder in induction of abortion, paste in arthritis (Talukdar and Talukdar, 2012). Fresh root decoction used for &quot;Meho&quot; (gonorrhea) and jaundice (Chowdhury et al., 2014).</td>
<td>Root decoction used to treat jaundice; leaf extract used in dog bite and wound healing, seed powder used to cure gonorrhea.</td>
</tr>
<tr>
<td>Achyranthes aspera L.</td>
<td>A paste prepared with lime (kalichun) and leaf of non-flowering plants is applied to cure eczema. (Sur et al., 1990) Paste made of leaves in case of Apan and in paste out of green leaves from Bot. Then it is applied on boil (Kundu and Bag, 2012). Root infusion is used for malarial fever, induction of abortion, prevention of post abortion bleeding, leaf extract facilitate delivery, also used in bronchitis (Talukdar and Talukdar, 2012). Joining of bones, rheumatism reduces urine sugar, male sterility, piles, menstrual problem, urinary tract infection (Das and Chakraborty, 2019).</td>
<td>Root extract of Achyranthes aspera with banana (Musa paradisiaca) leaf extract used to cure jaundice, root decoction used in leucorrhea, leaf paste in dog bite.</td>
</tr>
<tr>
<td>Aegle marmelos (L.) Correa</td>
<td>Raw fruits used against constipation and extreme sun heat (Talukdar and Talukdar, 2012).</td>
<td>Leaf extract mixed with fruit powder with ice cold water used to cure dysentery and diarrhea, raw fruit extract used in stomach ulcer and stomachache, leaf extract with...</td>
</tr>
<tr>
<td>Plant Name</td>
<td>Uses</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td><em>Ageratum conyzoides</em> L.</td>
<td>Reduces blood sugar, dysentery, stomach/liver problem (Das and Chakraborty, 2019). One teaspoonful of young, dried fruit powder mixed with water is given at early morning in empty stomach to cure dysentery and gastric problems (Chowdhury et al., 2014).</td>
<td></td>
</tr>
<tr>
<td><em>Alstonia scholaris</em> (L.) R.Br.</td>
<td>Plant paste used in sores, cut and various ailments (Talukdar and Talukdar, 2012). Bark reduces urine sugar, male sterility (Das and Chakraborty, 2019). Stem bark paste applied on breast for better lactation (Chowdhury et al., 2014).</td>
<td></td>
</tr>
<tr>
<td><em>Amaranthus spinosus</em> L.</td>
<td>Whole plant and leaf reduces urine sugar, male sterility (Das and Chakraborty, 2019). Root decoction used to treat Dysentery and diarrhea</td>
<td></td>
</tr>
<tr>
<td><em>Andrographis paniculata</em> (Burm.f.) Nees</td>
<td>Used in treating worm infection, antidiabetic, indigestion (Talukdar and Talukdar, 2012). Leaf and whole plant used in fever, worm, stomach/liver problem (Das and Chakraborty, 2019). Leaf decoction used for could and cough, diabetes and leaf paste applied on hair before 30 minutes of bath to control dandruff (Chowdhury et al., 2014).</td>
<td></td>
</tr>
<tr>
<td><em>Azadirachta indica</em> A.Juss.</td>
<td>Used as insecticidal, preventive of chicken pox, anti-diabetic, dried leaf powder used on skin as paste (antiseptic), root paste in treating syphilis (Talukdar and Talukdar, 2012). Stem bark and leaves boiled with water and applied on carbuncle, boil and skin diseases for quick healing (Chowdhury et al., 2014).</td>
<td></td>
</tr>
<tr>
<td><em>Blumea lacera</em> (Burm.f.) DC.</td>
<td>Stomach/liver problem, loss of appetite (Das and Chakraborty, 2019). Root (2-3 pieces) decoction mixed with &quot;Ada&quot; (<em>Zingiber officinale</em>) and pinch of salt is given to cure flatulence and indigestion problem (Chowdhury et al., 2014).</td>
<td></td>
</tr>
<tr>
<td><em>Boerhavia diffusa</em> L.</td>
<td>A paste is made with about 1 gm of root, a little ginger and two peppers. It is taken for 7 days once in the morning to cure asthma (Sur et al., 1990).</td>
<td></td>
</tr>
<tr>
<td><em>Honey</em></td>
<td>Honey used in cough, root extract with goat milk used in the treatment of stroke, sometimes root extract at nighttime used for better lactation.</td>
<td></td>
</tr>
<tr>
<td><em>Leaf</em></td>
<td>Leaf paste used in the treatment of ringworm and applied on wounds as an antiseptic. Stem and bark decoction used to cure severe fever, root powder with lukewarm water at night used in neurological problems</td>
<td></td>
</tr>
<tr>
<td><em>Root</em></td>
<td>root extract as anthelmintic tonic, it is also used in dysentery. Leaf extract used as anthelmintic tonic, it is also used in dysentery. Leaf extract used as anthelmintic tonic; leaf decoction on empty stomach used in diabetes, stem decoction with Ada (<em>Zingiber officinale</em>) used in the treatment of Malaria; brushing with raw twig in case of toothache; leaf extract and boiled water with leaf used to treat measles, scabies, ringworm and as an anti-fungal lotion. Leaf extract twice a day for chicken pox, measles and as an anthelmintic tonic; leaf decoction on empty stomach used in diabetes, stem decoction with Ada (<em>Zingiber officinale</em>) used in the treatment of Malaria; brushing with raw twig in case of toothache; leaf extract and boiled water with leaf used to treat measles, scabies, ringworm and as an anti-fungal lotion. Leaf extract used to purify blood and in neurological disorder. Root extract used as rejuvenating tonic; root decoction with coconut (<em>Cocos nucifera</em>) oil used as anti-ageing lotion.</td>
<td></td>
</tr>
<tr>
<td>Plant Name</td>
<td>Uses</td>
<td></td>
</tr>
<tr>
<td>------------</td>
<td>------</td>
<td></td>
</tr>
<tr>
<td><em>Bombax ceiba</em> L.</td>
<td>Plant infusion is used in asthma and bronchitis. Leaf extract in eye complaints, root is chewed as energy tonic (Talukdar and Talukdar, 2012). Leaf used in rheumatism, urinary tract infection (Das and Chakraborty, 2019). Whole plant decoction is given to cure burning sensation during urination (Chowdhury et al., 2014). The root is taken with sugar in empty stomach in the morning for 7 days to cure spermatorrhoea (Sur et al., 1990). Fresh root (1-2 years old plant) used in &quot;Meho&quot; (gonorrhea) and physical weakness (Chowdhury et al., 2014).</td>
<td></td>
</tr>
<tr>
<td><em>Borassus flabellifer</em> L.</td>
<td>Bark paste applied to cure acne; root extract with garlic (<em>Alium sativum</em>) used to cure leucorrhoea.</td>
<td></td>
</tr>
<tr>
<td><em>Calotropis gigantea</em> (L.) Dryand</td>
<td>A leaf warm with “Ghee” is applied to relief from paralysis, rheumatism and body pain (Chowdhury et al., 2014). Raw fruit extract used in the treatment of diarrhea and dysentery.</td>
<td></td>
</tr>
<tr>
<td><em>Centella asiatica</em> (L.) Urb.</td>
<td>It is used in amoebic dysentery (Sur et al., 1990). Fresh leaves (5-6) chewed at early morning preferably in empty stomach to control diabetes, chronic dysentery, blood stool and diarrhea (Chowdhury et al., 2014). Leaf extract is used to cure severe fever, it is also applied 0 wounds for rapid healing; Leaf latex applied on attacked area followed by hot water treatment as a cure of swollen joint. Leaf paste used to treat ulcer; leaf decoction used in gastritis and dysentery.</td>
<td></td>
</tr>
<tr>
<td><em>Coccinia grandis</em> (L.) Voigt</td>
<td>Leaf decoction used in the treatment of diabetes; it is also used in reducing high blood pressure; root decoction used to cure arthritis.</td>
<td></td>
</tr>
<tr>
<td><em>Crotalaria pallida</em> Aiton</td>
<td>Leaf extract used as an eye drop for reddish eye; it is also used in wound healing.</td>
<td></td>
</tr>
<tr>
<td><em>Croton bonplandianus</em> Baill.</td>
<td>Root extract used in indigestion; seed decoction used to treat anemia.</td>
<td></td>
</tr>
</tbody>
</table>
**Cuscuta reflexa** Roxb  
Plant juice mixed with 50 g of *Polygonum* sp. (Bishkatal) and 3 peppers is given for abortion (Sur et al., 1990).  
Whole plant decoction intake in empty stomach to cure “Meho” (gonorrhea) (Chowdhury et al., 2014).  
Whole plant chewed and the paste applied on cuts and wounds for stop bleeding. Fresh plant decoction mixed with one slice of *Curcuma longa* is given to cure leucorrhoea and infertility (Chowdhury et al., 2014).

**Cynodon dactylon** (L.)Pers.  
Decoction of root is diuretic and used in secondary syphilis. Plant juice is astringent and used in hysteria, epilepsy, fever, insanity, chronic diarrhea, dysentery, opthalmic and in injury (Talukdar and Talukdar, 2012).  
Whole plant chewed and the paste applied on cuts and wounds for stop bleeding. Fresh plant decoction mixed with one slice of *Curcuma longa* is given to cure leucorrhoea and infertility (Chowdhury et al., 2014).

**Datura metel** L.  
Root juice is mixed with the decoction of 'Halud' and rubbed over the affected area to cure rheumatism (Sur et al., 1990). Leaf paste applied as massage balm to get relief from rhumatic pain (Chowdhury et al., 2014). Leaf paste used to cure scabies; oil decoction of leaf applied in the treatment of rheumatic pain; fruit powder used to treat neurodegenerative diseases; it is also used as pain killer.

**Ficus racemosa** L.  
Receptacle cooked as vegetable used in anemia and nutrition deficiency. (Talukdar and Talukdar, 2012) Leaf extract applied on skin to prevent skin rashes; root decoction used in the treatment of stomach ulcer.

**Heliotropium indicum** L.  
Leaf used in rheumatism, fever, typhoid, cold-cough (Das and Chakraborty, 2019). Root paste warm with mustard oil and massage to cure rheumatism (Chowdhury et al., 2014). Leaf extract applied on eyes two drops/ twice a day to cure cataract, it is also consumed on empty stomach for gastritis.

**Leucas aspera** (Willd.) Link  
Paste of young leaves when applied cures ringworm (Sur et al., 1990). Fresh root decoction given in empty stomach and taking smell of the plant used to treat asthma and tuberculosis (Chowdhury et al., 2014). Flower extract infant dysentery; leaf extract with honey used to treat cough and cold; leaf extract on empty stomach used to treat diabetes; it is also used as an anthelmintic tonic.

**Mangifera indica** L.  
Tender leaf decoction used for stomachache. Bark decoction mixed with lime water is given to cure dysentery and diarrhea (Chowdhury et al., 2014). Leaf decoction used in the treatment of sore throat; whole leaf chewed in the treatment of toothache; leaf extract used to cure dysentery.

**Melia azedarach** L.  
Leaf, bark, root bark, flower, fruit, seed reduces blood sugar, fever, contraception (Das and Chakraborty, 2019). Leaf extract taken in the treatment of malaria, leaf paste used as antibacterial lotion, leaf paste applied to cure eczema; leaf
<p>| <strong>Mimosa pudica L.</strong> | Root reduces blood sugar, stomach/liver problem, reduces urine sugar, male sterility, sexual diseases of female, menstrual problem (Das and Chakraborty, 2019). Fresh root boiled with water and used as gargle to cure toothache. Root decoction also used for leucorrhea and blood dysentery (Chowdhury et al., 2014). | Decoction used in the treatment of headache and nervous problems. Root decoction commonly used in the treatment of menstrual problems; it is also used in dysentery. |
| <strong>Moringa oleifera Lam.</strong> | Leaf, fruit reduces blood sugar, rheumatism, cardiac problem (Das and Chakraborty, 2019). Cooked fruit used as diuretic; leaf extract used to reduce high blood pressure; it is also used in the treatment of chicken pox and diabetes; flower extract used to cure jaundice and liver problems; root decoction used in the treatment of menstrual abnormalities. |
| <strong>Mucuna pruriens (L.) DC</strong> | Root, seed reduces urine sugar, male sterility, male sexual problem, sexual diseases of female, rheumatism (Das and Chakraborty, 2019). The seeds are fried with “Ghee” and sugar and make pills. Each pill taken during bedtime for sexual stimulant and vitality (Chowdhury et al., 2014). Fruit extract used to cure bowel problems; seed powder commonly used to treat erectile dysfunction and low sperm count, it is used as libido booster; it is also used as diuretic; root extract with warm milk taken at bedtime to treat infertility, it is also applied to treat scabies; root decoction used to treat arthritis. |
| <strong>Murraya koenigii (L.) Spreng.</strong> | Fresh leaf decoction is given at early morning to control blood sugar (Chowdhury et al., 2014). Leaf extract given at empty stomach to control diabetes; it is also used in indigestion; leaf extract with Hibiscus petals used as anti hair fall tonic; leaf decoction is used in the treatment of rheumatic pain. |
| <strong>Nyctanthes arbor-tristis L.</strong> | The seeds are powdered and mixed with coconut oil and kept in sunlight. When applied to the scalp, it prevents premature whitening of hairs (Sur et al., 1990). Stem bark and leaf decoction is given to control of remittent fever and blood sugar (Chowdhury et al., 2014). Leaf extract on empty stomach used to cure fever; it is also used to treat diabetes; flower extract applied on eyes drop by drop to cure conjunctivitis; Bark decoction taken as a precaution of fetal growth. |
| <strong>Ocimum gratissimum L.</strong> | Leaf decoction mixed with a few drops of honey is given at early morning for come out of dry cough (Chowdhury et al., 2014). Leaf extract used as diuretic, using leaf extract as eye drop is good for cataract, it is also used in the treatment of migraine pain; leaf decoction used to treat cough, cold, fever and sore throat; to cure pneumonia leaf decoction with honey is given; chewing whole leaf is good to rid of bad breathe. |
| <strong>Oroxylum indicum</strong> (L.) Kurz | The root is applied to cure diseases of gum. (Sur et al., 1990) | Root decoction used in the treatment of kidney pain; root extract with honey used in cardiovascular diseases; fruit powder with cold water used to treat diarrhea. |
| <strong>Oxalis corniculata</strong> L. | Leaf juice used in cataract and conjunctivitis (Talukdar and Talukdar, 2012). Leaf decoction used to cure smokers cough (Chowdhury et al., 2014). | Leaf extract used to treat jaundice; leaf decoction used to cure diarrhea and dysentery; applying leaf paste and chewing whole leaf is good for scurvy. |
| <strong>Piper longum</strong> L. | Whole plant cooked as vegetable is given after childbirth for better lactation and relief from birth pain (Chowdhury et al., 2014). | Fruit powder with lukewarm water used to cure asthma; same medication also used in fever; fruit powder with warm milk used in the treatment of menstrual pain; Whole plant extract taken twice a day for better lactation. |
| <strong>Phyllanthus emblica</strong> L. | Infusion of dried fruits useful in acidity, constipation, insomnia and also in diabetes (Chowdhury et al., 2014). Dried fruit and seed used in acidity, blood sugar, purging, leucorrhea, biliary colic, insomnia (Das and Chakraborty, 2019). | Fruit powder with cold water used in the treatment of gastrointestinal disorders, fruit extract used to treat scurvy; whole fruit used as appetizer; leaf extract used against ringworm. |
| <strong>Psidium guajava</strong> L. | Tender leaves (2-3) chewed to cure mouth ulcer, pyorrhea, bad breath and sluggish fever. Stem bark infusion mixed with lime water used to cure diarrhea and dysentery (Chowdhury et al., 2014). | Leaf extract is very useful in diarrhea and decocetion in dysentery; chewing whole leaf to cure pyorrhea and toothache; brushing with stem twig to get rid of bad breath. |
| <strong>Scoparia dulcis</strong> L. | The plant is used to cure gonorrhea (Sur et al., 1990). Leaf and plant body educes blood sugar, anti-inflammatory, sore throat, cough (Das and Chakraborty, 2019). Fresh leaves decoction is given at early morning to cure dysentery (Chowdhury et al., 2014). | Leaf paste with <em>Cajanus cajan</em> leaf used to cure jaundice; leaf decoction used in the treatment of diabetes. |
| <strong>Sida rhombifolia</strong> L. | Root is burnt and mixed with powdered hoofs of dead cattle and used for curing wound in the shoulder of the cattle. The decoction of the root bark is applied to cure eczema. (Sur et al., 1990) | Root paste used in wound healing; root decoction used in the treatment of cardiovascular pain. |
| <strong>Solanum nigrum</strong> L. | Root mixed with pepper and ginger is fed to cows to reduce gas formation in the stomach. (Sur et al., 1990) | Leaf extract, decoction used in the treatment of cough and cold; fruit extract used in gastric ulcer. |
| <strong>Solanum torvum</strong> Sw. | Ripe fruit or root decoction is added to mustard oil and boiled. It | Fruit extract used in the treatment of high blood pressure and diabetes. |</p>
<table>
<thead>
<tr>
<th>Species</th>
<th>Uses</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Solanum virginianum</em> L.</td>
<td>Root used in cold-cough, rheumatism, fever, influenza, enlargement of liver and spleen (Das and Chakraborty, 2019). Mature fruits crushed with “Golmarich” (<em>Piper nigrum</em>) and make paste, which is used as massage to reduce pain, swelling of arthritis and paralysis (Chowdhury et al., 2014). Root decoction used as painkiller; application of leaf paste for curing eczema.</td>
</tr>
<tr>
<td><em>Stephania japonica</em> (Thunb.) Miers</td>
<td>Fresh leaf applied on carbuncle or boil for rupture and relief from pain (Chowdhury et al., 2014). Root decoction used in the treatment of asthma. It is also used in fever. Raw fruit eaten for blood purification; leaf extract used to cure dysentery; seed powder used in the treatment of diabetes. Fruit used in cold-fever; root decoction used to treat constipation.</td>
</tr>
<tr>
<td><em>Syzygium cumini</em> (L.) Skeels</td>
<td>Fresh leaf decoction mixed with pinch of table salt is given in empty stomach to control dysentery (Chowdhury et al., 2014). Leaves and fruits used as cooling agents, helps in digestion and rehydration. (Talukdar and Talukdar, 2012) Leaf, bark, fruit and seed reduces blood sugar, dysentery, stomach/liver problem, pox, rheumatism (Das and Chakraborty, 2019).</td>
</tr>
<tr>
<td><em>Tamarindus indica</em> L.</td>
<td>Aqueous root extract used in treating fever (Talukdar and Talukdar, 2012). Branch used in stomach/liver problem, jaundice, loss of appetite, fever, rheumatism, gall bladder infection, blood purifier (Das and Chakraborty, 2019). Stem (1.5 kg) boiled with water (3 lit) and make into 1 lit from there half cup of mixture is given daily in empty stomach to control blood sugar, cholesterol and physical weakness (Chowdhury et al., 2014). Stem decoction in empty stomach for the treatment of diabetes and cholesterol.</td>
</tr>
<tr>
<td><em>Tinospora sinensis</em> (Lour.) Merr.</td>
<td>Root and fruit used in stomach/liver problem, rheumatism, irregular stool, asthma (Das and Chakraborty, 2019). Leaf extract used in the treatment of high blood pressure; leaf decoction with goat milk used for better lactation.</td>
</tr>
<tr>
<td><em>Tragia involucrata</em> L.</td>
<td>The leaf is burnt, and the ash is mixed with mustard oil and applied to cure scabies. (Sur et al., 1990) Root decoction used in menorrhagia. (Talukdar and Talukdar, 2012) Leaf decoction used to treat fever and body pain.</td>
</tr>
</tbody>
</table>
Among all the good things, it is a matter of concern that, many sacred groves with higher natural resources are under threat due to excessive anthropogenic activities and over-exploitation of natural resources, as a result of which medicinal plants are disappearing in a vigorous manner (Savithramma et al. 2013). Therefore, it should be our objective to draw the kind attention of the local and indigenous communities as well as the concerned authorities to protect these abodes to nurture nature. It is important to publish and propagate the sacred biodiversity, traditional forests, and wetlands of all regions of the country where all communities have their folklore practices, and the current state of biodiversity will be registered subject to the prior permission and consent of the community.

**Conclusion**

The current study depicted that the indigenous people of this district still believe in the healing power of nature and believe in the infallible herbal gift of nature, i.e., the plants. Sacred groves here act as a repository of such valuable gifts, as well as a storehouse of herbal medicines. They are like a haven for these medicinally important plants. A sustainable system grew up around these groves where nature and humankind dissolve like a homologous solution in a symbiotic manner. The survey also showed that the local Rajbanshi and ethnic people of the study area possess vast knowledge in the ethnobotanical field and rely on their knowing for curing various ailments. Study reports of previous workers (Das & Chakraborty 2019) also supported this statement. We gathered several such data on plant-based healing sources and formulations and tried to quantify the societal importance of each plant with the help of various statistical indices. In this study, we tried to convert the raw ethnomedicinal knowledge of informants to scientific data that can play a pivotal role in finding new drugs or bioactive compounds of interest as well as to draw the kind attention of the concerned authorities to protect repositories of these valuable assets, the sacred groves. There are still a lot of protected and unexplored sacred groves in all corners of the district which is very important for finding and conserving various ethnomedicinal resources present in them. We have to find, document and protect them for us, for mankind.

**Declarations**

*List of abbreviations:* ICF= Informant Consensus Factor, UV= Use value, FC= Frequency of Citation, RFC= Relative Frequency of Citation, FL= Fidelity Level, THP= Traditional Health Practitioner, BMC= Biodiversity Management Committees

*Ethics approval and consent to participate:* Prior oral consent was taken from the communities conserving sacred groves and every single informant. The study was carried out maintaining the scientific sanctity and without harming any plant or animal or destroying the natural plant resources of the sacred groves.

*Consent for publication:* Prior consent was taken from all the informants during the present study and ethnomedicinal survey was carried out with only the participants who were willing to share their ethnic knowledge. All participants shown in images agreed to have their image published.

*Availability of data and materials:* Information or data related to this study may be availed upon reasonable request.

*Competing interests:* The authors declare that they have no competing interests.

*Funding:* The research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

*Author Contribution:* KS: Writing - Original Draft, Investigation, Methodology, Software, PR: Investigation SP: Validation, Formal analysis, CC: Writing- Reviewing and Editing, MC: Conceptualization, Supervision

**Acknowledgements**

The authors are thankful to the local and indigenous communities of Dakshin Dinajpur district for sharing their ethnomedicinal knowledge and provide valuable information. All the authors are thankful to West Bengal Biodiversity Board for sharing the insights of sacred groves in the study area. The first author is thankful to the University Grants Commission for providing Research Fellowship. The first author is grateful to his beloved teacher Late Dr. Palash Mandal. This work would not have been possible without his ideas and suggestions.

**Literature cited**


