



Importance of Some Bangladeshi Ethnomedicinal Plants: A Review

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ABSTRACT

This review article was conducted to identify the effective ethnomedicinal plants on different diseases in the traditional culture of different regions across Bangladesh. Plants are very crucial to the human being not only for the uses in health-care, but plants are also used for various other purposes such as sources of new pharmaceuticals. Ethnomedicinal plants have been used since a long time for human healthcare and most widely used for medication system in developing and least developing countries. People of different communities in Bangladesh use medicinal plants and rely on ethnomedicine because of cost-effectiveness, acceptability, biomedical benefits and less or no side-effects. It is very likely that these phytochemicals will find their way into the arsenal of antimicrobial drugs prescribed by physicians. People in Bangladesh are becoming concerned with the over-prescription and misuse of allopathic antibiotics and antimicrobial resistance is increasing

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simultaneously in this regard. Ethnomedicine can be used as alternatives to traditional antibiotics, hence, can overcome the problems of antibiotics.

Keywords: Ethnomedicine; medicine; disease; antibiotics; effectiveness.

1. INTRODUCTION

In accordance with a report of World Health Organization (WHO) around 80% of the world's people rely on traditional medicine for their primary health care. Herbal medicine has been widely practiced from ancient period throughout the world because they are safer to intake and environmentally well-disposed [1]. The importance of many ethnomedicinal plants is also mentioned in the major religious books- potential usage of nutmeg, pepper, clove etc. is mentioned in the holy book Vedas. Furthermore, the effective use of honey in healing a wide range of ailments is mentioned in the Holy Qur'an for several times [2].

Rural people of many developing countries still depend on traditional medicines for primary health care needs and have found a place in day-to-day life. These medicines are relatively safer and cheaper than synthetic medicine. For instance, a large number of Nepalese use traditional plants to treat several ailments. Ethnomedicinal plants are a great source of curious research in science, academy institutions, pharmaceutical companies and any other relevant arenas. This review paper piles up the effective role of ethno-medicinal plants in curing and preventing different sorts of ailments (i.e. cold and fever to cancer, and HIV) along with the scientific, local and english names of the medicinal plants.

2. ANTIMICROBIAL IMPORTANCE OF ETHNOMEDICINE

People have been using the plants in one or the other way in the treatment of various ailments. Only one third of the infectious diseases can be treated by the synthetic antibiotics discovered in the twentieth century. However, due to the incessant use of these antibiotics over years, pathogens have become resistant to the synthetic medicines [3]. Bacteria's genetic ability to acquire drug resistance is another concerning issue for the pharmaceuticals and doctors now [4]. Thereby, herbs have been prioritized as traditional medicines containing medicinal

ingredients because of their curative potentials [5]; thus they are used in further development of drugs. In the west, these plants are called, 'Alternative Medicines' [6]. Research has been conducted on the anti-bacterial agent of plants all over the world; India, for instance, has dealt with the ethnomedicinal plants successfully [7]; although scientists are yet to completely discover the chemical properties of the herbal or ethnomedicinal plants, researches are scientifically proved [8]. Developing countries are widely using medicinal plants because of their higher affordability. Besides them, people of USA also use ethnomedicinal plants to fight certain ailments. Moreover, plants have synergetic effect which means they can both work against microbial infection in human bodies and can simultaneously neutralize their possible negative effects [9]. Many of these plants have multi-drug resisting power. Also, different parts of a single plant act against different ailments [10]. Ethnomedicine is a sub-field of ethnobotany that deals with the study of traditional medicines. The usage of ethnomedicinal plants for preparation of drugs was started 5000 years ago [11]. Additionally, in the Bible and the holy Jewish book the Talmud [11] also mentioned the usages of some aromatic plants such as myrtle and incense which were used to treat colon cancer, snake bite, liver swelling and splenomegaly [12]. A wide variety of active phytochemicals such as alkaloids, essential oil, flavonoids, phytosterols, polysaccharides, polyphenols, tannins, saponins, proteins and peptides vincristine, hypericinhexane, methanol, primary metabolites and secondary metabolites from hundreds of plants inhibited various steps in microbial life cycle and act as antimicrobial agents [13].

3. PLANTS HEAL VARIOUS AILMENTS

For thousands of years, individuals from all corners of the world have used herbs and plants to cure or prevent illness. There are many terms for this type of medicine: Aromatherapy, homeopathy, flora-therapy, alternative medicine, and herbal therapy. Tables 1 and 2 contains some important ethnomedicinal plants found in Bangladesh and their potentials.

3.1 Cancer Cases

Evaluation of the *in vitro* anti-cancer effects of bioflavonoids, viz. quercetin, catechin, luteolin and rutin against human carcinoma of larynx (Hep-2) and sarcoma 180 (S-180) cell lines showed that only luteolin and quercetin inhibited the proliferation of the cells. Luteolin caused depletion of glutathione in the cells and a decline in DNA synthesis, as seen by thymidine uptake studies, thus demonstrating its anti-cancer potential. The anti-tumor effect of the crude extract of *Centella asiatica* as well as its partially purified fraction was studied in both, *in vitro* short and long term chemo sensitivity test systems and *in vivo* tumor models. *Tritiated thymidine*, uridine and leucine incorporation assays suggest that the purified fraction acts directly on DNA synthesis. Papaya leaf tea extract has demonstrated cancer cell growth inhibition [14]. It was found that seeds extract of *Asphodelus tenuifolius* the tuber extracts of *Asparagus racemosus*, fruit extract of *Balanites aegyptiaca* and leaves extract of *Trigonella foenum* showed antibacterial activity against most of the isolated microbes from the oral cancer cases [15].

3.2 HIV Therapy

Solamargine, a glycoalkaloid from the berries of *Solanum khasianum* may be useful against HIV infection as well as intestinal infections associated with AIDS. The triterpenoid betulinic acid is just one of several terpenoids which have been shown to inhibit HIV [15].

3.3 Oral Contraceptive

Hibiscus rosa-sinensis (PSN-57) belongs to the family Malvaceae. Plants are used traditionally for the control of dysfunctional uterine bleeding and as an oral contraceptive. Some of the chemical constituents isolated from these plants are cyanidin, quercetin, hentriacontane, calcium oxalate, thiamine, riboflavin, flavonoids niacin and ascorbic acid [16].

3.4 Wound Infections and Skin Diseases

Ethiopian medicinal plants, viz. *Clerodendrum myricoides* (Lamiaceae), *Ficus plamata* (Moraceae), *Grewia ferruginea* (Tiliaceae) and *Periploca linearifolia* are commonly used to cure infected wound and skin diseases. *Clerodendrum myricoides* shows significantly a

broader spectrum inhibitory effect than others and also shows the strongest antifungal activity [17].

3.5 Asthma

Leaves of purple fruited pea eggplant (*Solanum trilobatum*) acts effectively against asthma. Methanol, its aqueous extract, is the essential components for the treatment [18]. Decoction of roots saranai (*Trianthema portulacastrum*) is used to treat constipation and asthma [19].

3.6 Blood Circulation

Roots of *Zingiber officinale* [20], *Piper longum*, *Withania somnifera* and *Curcuma longa*, fruits of *Phyllanthus emblica*, *Terminalia bellerica*, *Terminalia chebula* and leaves of *Ocimum sanctum* (*Tulsi*) can be applied for better blood circulation. Various parts of some other plants can be used for the same purpose. These plants are- *Abelia chinensis*, *Abroma augusta*, *Acacia catechu*, *Vachellia farnesiana*, *Bacopa monnieri* (*Barleria prionitis*, *Bauhinia racemosa*, *Phanera variegata*, *Boerhavia diffusa*, *Cajanus cajan*, *Carissa carandas*, *Senna occidentalis* can be used to treat in blood circulation difficulties [21].

3.7 Chronic Constipation

Bark of kutaja (*Holarrhena antidysenterica*), husk of psyllium (*Plantago ovata*), fruits of bahera (*Terminalia bellirica*), chebulic myrobalan (*Terminalia chebula*) and Indian gooseberry (*Phyllanthus emblica*), leaves of *Cassia angustifolia*, and roots of *Lycorys* (*Glycyrrhiza glabra*) can be used to cure chronic constipation. Decoction of roots Soaranai (*Trianthema portulacastrum*) can be used to treat this [19].

3.8 Anemia

These plants are Christmas bush (*Alchornea cordifolia*), *Aframomum albo violaceum*, wild custard-apple (*Annona senegalensis*), *Cymbopogon densiflorus* which is a perennial grass, *Bridelia ferruginea* which is an African plant, kapok tree (*Ceiba pentandra*), brimstone tree (*Morinda lucida*), *Hymenocardia acida*, a small African tree, *Coleus kilimandcharis*, African plum (*Dacryodes edulis*), fried egg tree (*Caloncoba welwithsii*) and yard-long bean (*Vigna unguiculata*) have possible chemical ingredients to fight against anemia [22].

3.9 Arthritis

Cowpea (*Aloe barbadensis*) [23], barmuda or bahama gras (*Boswellia serrata* Linn.) [24], black snakeroot (*Actaea racemosa* Linn.) [25], haritoki (*Terminalia chebula*) [26], ashoka tree (*Saraca asoca* Roxb) [27], headache tree (*Premna serratifolia* Linn.) [28], blistering ammania (*Ammannia baccifera* Linn.) [29] are the medicinal plants believed and applied to treat arthritis.

3.10 Cough

Fruits of Indian gooseberry (*Phyllanthus emblica*), leaves of malabar nut (*Adhatoda vasica*), leaves of Tulsi (*Ocimum sanctum*), fruits of long pepper (*Piper longum*), roots of ginger (*Zingiber officinale*), Juice of whole plant siru peelai (*Aerva lanata*) are taken orally to treat cough, sore throat and wounds. Paste of whole plants of spade flower (*Hybanthus enneaspermus*) is applied typically to lessen suffering with cough [30].

3.11 Dental Diseases

Sweet flag (*Acorus calamus* Linn) [31], bayberry (*Myrica esculenta*) [32], nirgundi (*Vitex negundo* Linn.) [33], and cotton tree (*Bombax ceiba* Linn.) [34] are popular in treating dental diseases.

3.12 Diarrhoea

Bark of kutaja tree (*Holarrhena antidysenterica*), fruits of haritoki (*Terminalia chebula*), wood apple (*Aegle marmelos*) and Indian gooseberry (*Phyllanthus emblica*), nut grass (*Cyperus rotundus*) and seeds of black plum (*Syzygium cumini*) work to lessen diarrhoea (Dorman and Deans, 2000) [35] Tephrosia purpurea can be applied for diarrhoea treatment [36]. It is seen that 3 gm of *Black pepper* mixed powder (three times a day) with curd works against dysentery and diarrhea [35].

3.13 Dislocation of Bones

Three gram of powdered mixture of the roots of satamull (*Asparagus racemosus*) and winter cherry (*Withania somnifera*), bark of neem (*Azadirachta arabica*) and arjun tree (*Terminalia arjuna*), fruits of haritoki (*T. chebula*), bahera (*T. bellerica*) and fruits of Indian gooseberry (*Phyllanthus emblica*) can be given to the patient.

If it is given twice a day with water, they can get rid of dislocation of bones and fractures [35].

3.14 Diabetes

Sugarapple (*Annona squamosa*) (L.) [37], Madagascan Periwinkle (*Cateranthus roseus*) (L.) [38], tumba (*Citrullus colocynthis*) (L.) [39], miracle leaf (*Kalanchoe pinnata*) (Lam.) [40], bitter ground (*Momordica charantia*) [41], thai eggplant (*Solanum xanthocarpum*) [42], and curry leaves (*Murraya koeningii*) [43] are used to treat diabetes.

3.15 Female Sterility

The plants which are used for female sterilization are Mirrh (*Commiphora myrrha*), esfand (*Peganum harmala*) [44], water chestnut (*Trapa natans*) and nagbala (*Grewia hirsute*) [45].

3.16 Male Sterility

Jequirity/ crab's eye/rosary pea (*Abrus precatorius*) [46], Chinese apple or jujube (*Ziziphus mauritiana*) [47], gudhichi/heart leaf moonseed (*Tinospora cordifolia*) [48], big string nettle (*Urtica dioica* Linn.) [49], cloves (*Syzygium aromaticum*) [50], betel-leaf (*Piper betle*) [51] work against male sterility.

3.17 Liver Tonic

Bark of kutaja (*Holarrhena antidysenterica*), leaves of false daisy (*Eclipta alba*), chaste-tree (*Vitex leucoxydon*) [52], tree of heaven (*Ailanthus excelsa*) [53], moon creeper/ moon plant (*Ceropegia juncea*) [54], anjora (*Hygrophila spinosa*) plants are used as liver tonic [55].

3.18 Skin Diseases

Buffalo beans (*Mucuna pruriens*), purple fruited eggplant (*Solanum trilobatum*), heartleaf moonseed (*Tinospora cordifolia*) [56], *Randia dumetorum* and *Cissus quadrangularis* [57] are the plants usually used in many countries for skin care.

3.19 Urinary Tract

Asthma weed (*Euphorbia hirta*), red water tree (*Erythrophleum suaveolens*) and lucky nut tree (*Thevetia peruviana*) [58] have been used successfully to heal complexities with urinary tract.

4. PHARMACOLOGY OF ETHNOMEDICINAL PLANTS

4.1 Antioxidant Activity

Ethanollic extracts and water infusion of scarlet creeper (*Evolvulus alsinoides*) plants were marked as antioxidant activity in the 2, 2'-azinobis-3-ethyl-benzothiazoline-6-sulfonic acid radical action decolonization assay [59]. *Evolvulus alsinoides* has previously been shown to protect skin cells against INF- γ and TNF- α induced apoptosis, potentially through an antioxidant mechanism [60].

4.2 Anti-microbial Agents

Clausenol, a carbazole alkaloid, isolated from an alcoholic extract of the stem bark of basterperdepis (*Clausena anisata*) was found to be active against gram positive and gram negative bacteria and fungit-butylhydroperoxide (t-BHP) in a dose dependent manner [61].

The alcoholic fraction showed greater protection against both the inducers and the results were comparable to known anti-oxidants like vitamin C. The acetone and alcoholic extracts of the leaves of *Cassia alata* showed significant *in vitro* anti-bacterial activity against micro-organisms such as *Staphylococcus aureus*, *Bacillus subtilis*, *Bacillus cereus*, *Geobacillus stearothermophilus*, *Escherichia coli*, *Salmonella typhi* and *Salmonella dysenteriae* [62].

4.3 Antiulcer and Anticatatonic Activity

The *in vivo* evaluation of the alcoholic extract of scarlet creeper (*E. alsinoides*) revealed its marked antiulcer and anticatatonic activity. Indian olibanum tree (*Boswellia serrata*) showed protective effect in patients suffering from ulcerative colitis (grade II and III) [63].

4.4 Anti-inflammatory and Antipruritic

Sapindus emarginatus Vahl. (PSN-131) belongs to the family Sapindaceae. It contains saponin and glucose. The seed contains oil. Traditionally, it is used as anti-inflammatory and antipruritic. It is also used to purify the blood and its powder is used as nasal insufflations [16].

4.5 Anti-fungal Agents

Theethanollic extract of neem (*Azadirachta indica*) leaves demonstrated much more significant anti-dermatophytic activity [64].

4.6 Anti-viral Agents

In an experiment, the aqueous extract of Indian gooseberry (*Phyllanthus amarus*) was incubated with the Alexandar cell line, a human hepa-tocellular carcinoma derived cell line which has the property of secreting the Hepatitis B surface antigen HbsAg in the supernatant. The results demonstrated that *Phyllanthus amarus* was effective in inhibiting the secretion of HbsAg for 48 hrs thus proving its anti-hepatitis B virus property [65]. Seven extracts were found to be effective five of which bark of *Rhizophora mucronata* and leaves of *Excoecaria agallocha*, *Ceriops decandra*, *Rhizophora apiculata*, *Rhizophora lamarckii* completely inhibited the virus adsorption to the cells [66].

4.7 Anti-protozoal Agents (Antimalarial)

Ethanollic and petroleum extracts of *Artemisia japonica*, *Artemisia maritima* and *Artemisia nilegarica* were tested for anti-malarial activity [67]. Similarly, application of a cream of *Azadirachta indica* on exposed body parts at the rate of 2 gm/person significantly protected against Aedes, Culex and Anopheles mosquito bites [68].

Table 1. Some important plant products having great potential as medicine

Plant	Active ingredients	Pharmacological activity
<i>Rauvolfia serpentine</i>	Reserpine	Antibacterial [69]
<i>Catharanthus roseus</i>	Ajmalicine	Fungal elicitors [70,71]
<i>Berberis sp.</i>	Berberin	Anticancer, antibacterial, hepatoprotective, hypoglycemic, antimalarial, antidiabetic, anti-inflammatory, antioxidant, antidiarrhoeal [72]
<i>Artemisia annua</i>	Artemisinin	Antimalarial [67]
<i>Taxus baccata</i>	Taxol	Anticancer [73]
<i>Clausena anisata</i>	t-butylhydroperoxide (t-BHP)	Antibacterial [62]
<i>Silybum marianum</i>	Silymarin	Hepatoprotective [74]
<i>Valeriana wallichii</i>	Valepotriates	Analgesic [75]

Table 2. Some important ethnomedicinal plants found in Bangladesh and their potentials

No.	Scientific name	Local name (Bengali)	Habit	Name of family	Part(s) used	Ailments
1	<i>Abutilon indicum</i> (L.) Sweet.	Petari	Herb	Malvaceae	Leaf, Root	Diuretic, Demulcent, Fever, Gonorrhoea, Piles
2	<i>Abrus precatorius</i> L.	Kuch	Climber	Fabaceae	Stem	Paralysis
3	<i>Abroma augusta</i>	Ulatkambal	Shrub	Malvaceae	Leaves, stems, roots & root barks	Uterine Tonic, Congestive and Nervous Dysmenorrhoea, Ammenorrhoea, Sterility and Menstrual Disorders, Diabetes, Rheumatic pains of joints.
4	<i>Achyranthes aspera</i> L.	Apang	Herb	Amaranthaceae	Leaf, Root	Abortion, Diuretic, Eczema
5	<i>Adhatoda zeylanica</i> Medic	Bassak	Shrub	Acanthaceae	Leaf	Cough, Fever
6	<i>Aegle marmelos</i> (L.) Corr. Serr	Bel	Tree	Rutaceae	Leaf, Fruit	Abscess, Fever, Dysentery, Indigestion
7	<i>Allium cepa</i> L.	Piaj	Herb	Liliaceae	Bulb	Cough, Headache
8	<i>Allium sativum</i> L.	Rashun	Herb	Liliaceae	Bulb	Piles, Rheumatism
9	<i>Alstonia scholaris</i> (L.) R. Br.	Chatim	Tree	Apocynaceae	Bark	Dysentery, Fever
10	<i>Aloe vera</i> Burm. f.	Ghritakumari	Herb	Aloeaceae	Leaf	Piles, Menstrual Disease, Sexual Problem
11	<i>Alocasia indica</i> (Roxb.) Schott	Mankachu	Herb	Araceae	Leaf, Tuber	Cough, Constipation, Kidney Disease, Stomachic, Colic, Piles,
12	<i>Andrographis paniculata</i> (Burm. f.) Wall ex Nees.	Kalomegh	Herb	Acanthaceae	Leaf, Whole plant	Wound, Itches, Dysentery, Diarrhea, Fever, Parasitic Worms
13	<i>Ananas comosus</i> (L.) Merr.	Anaros	Herb	Bromeliaceae	Fruit	Abortion, Cough, Diuretic, Fever, Helminthiasis, Worm
14	<i>Artocarpus heterophyllus</i> Lamk	Kathal	Tree	Moraceae	Leaf, Root, Bark	Asthma, Itches, Diarrhea, Excessive Menstrual Discharge
15	<i>Asparagus racemosus</i> L.	Satamuli	Climber	Liliaceae	Root, Whole plant	Diarrhoea, Diabetes, Jaundice, Urinary Disease
16	<i>Averrhoa carambola</i> L.	Kamranga	Tree	Averrhoaceae	Fruit	Fever, Jaundice, Bleeding Piles
17	<i>Azadirachta indica</i> A. Juss.	Neem	Tree	Meliaceae	Leaf	Worm, Chicken Pox, Eczema, Itches, Helminthiasis
18	<i>Basella alba</i> L.	Puishak	Climber	Basellaceae	Whole plant, Leaf	Demulcent, Diuretic, Laxative, Gonorrhoea, Constipation
19	<i>Bombax ceiba</i> L.	Shimul	Tree	Bombacaceae	Bark, Root	Dysentery, Excessive Menstrual Discharge, Diabetes, Sexual Problems

No.	Scientific name	Local name (Bengali)	Habit	Name of family	Part(s) used	Ailments
20	<i>Bombax ceiba</i>	Shimul	Tree	Malvaceae	Leaves, stems, roots, fruits, flowers, barks and gum	Bleeding Gums, Toothache and Carries, Sores In Mouth, Pain In Leg, Fever, Enlarged Spleen, Atrophy, Emaciation, Rheumatism, Spermatorrhoea, Haematuria, Cholera, Pneumonia, Pleurisy, Intercostal Neuralgia and Leprosy
21	<i>Borassus flabellifer</i> L.	Tal	Tree	Arecaceae	Fruit	Diuretic
22	<i>Cassia sophera</i> L.	Kalkasunda	Herb	Caesalpiaceae	Leaf	Dyspepsia
23	<i>Carica papaya</i> L.	Papaya	Tree	Caricaceae	Latex, Fruit	Itches, Constipation, Indigestion, Liver Disease, Diarrhoea
24	<i>Cajanus cajan</i> (L.) Millsp.	Arhar	Shrub	Fabaceae	Leaf, Root	Diabetes, Jaundice
25	<i>Calotropis procera</i> (Aiton) W.T. Aiton	Akanda	Shrub	Asclepiadaceae	Leaf	Piles
26	<i>Centella asiatica</i> (L.) Urban	Thankuni	Herb	Apiaceae	Whole plant, Leaf	Dysentery, Eczema, Headache
27	<i>Citrus grandis</i> (L.) Osb.	Jambura	Tree	Rutaceae	Fruit	Anaemia
28	<i>Coccinea grandis</i> (L.) J. Voigt	Telakucha	Climber	Cucurbitaceae	Leaf	Diabetes, Fever
29	<i>Cocos nucifera</i> L.	Narikel	Tree	Arecaceae	Root, Fruit	Diuretic, Menstrual Disease, Diarrhoea
30	<i>Colocasia esculenta</i> (L.) Schott.	Kachu	Herb	Araceae	Leaf, Tuber	Constipation, Colic, Digestive
31	<i>Curcuma longa</i> L.	Holdi	Herb	Zingiberaceae	Rhizome	Abscess, Eczema
32	<i>Cyperus rotundus</i>	Mutha	Herb	Cyperaceae	Tuber or bulbous roots	Indigestion, Diarrhoea, and other intestinal problem of children. An infusion of soup of tubers is useful in Diarrhoea, Dysentery, Dyspepsia, Vomiting, Cholera, and Fever
33	<i>Cucurbita pepo</i> L.	Mistikumra	Climber	Cucurbitaceae	Stem	Tooth Infection
34	<i>Cuscuta reflexa</i> Roxb.	Sarnalata	Climber	Convolvulaceae	Whole plant	Liver Disease
35	<i>Cynodon dactylon</i> (L.) Pers.	Durba	Herb	Poaceae	Leaf, Whole plant	Skin Disease, Stop Bleeding, Wound
36	<i>Datura metel</i> L.	Dhutra	Shrub	Solanaceae	Leaf	Asthma, Rheumatism
37	<i>Dillenia indica</i> L.	Chalta	Tree	Dilleniaceae	Fruit	Hair Tonic
38	<i>Eclipta alba</i> (L.) Hassk	Kalokesh	Herb	Asteraceae	Leaf	Wound, Skin Disease, Hair problems
39	<i>Enhydra fluctuans</i> Lour	Helencha	Herb	Asteraceae	Leaf	Inflammation, Leucoderma, Bronchitis, Bilioussness, Small Pox, Gonorrhoea, Headache

No.	Scientific name	Local name (Bengali)	Habit	Name of family	Part(s) used	Ailments
40	<i>Ficus benghalensis</i> L.	Bot	Tree	Moraceae	Leaf	Abscess
41	<i>Foeniculum vulgare</i>	Mouri	Herb	Apiaceae	Fruits, leaves, roots & oil from fruits	Stimulant, Aromatic, Appetizer, Diuretic, Emmenagogue, Carminative, Spasmodic, Galactagogue and Stomachic.
42	<i>Hyptis suaveolens</i>	Tokma	Shrub	Lamiaceae	Seeds	Stimulant and Antiseptic
43	<i>Ipomoea digitata</i>	Bhui-kumra	Climber	Convolvulaceae	Roots & resins	Tonic, Alterative, Aphrodisiac, Demulcent, Lactagogue and Purgative.
44	<i>Kalanchoe pinnata</i> (Lamk.) Pers.	Patharkuchi	Herb	Crassulaceae	Leaf	Cough, Dysentery, Diuretic, Diabetes, Fracture
45	<i>Lawsonia inermis</i> L.	Mehendi	Shrub	Lythraceae	Leaf	Wound, Burning Sensation
46	<i>Mangifera indica</i> L.	Aam	Tree	Anacardiaceae	Leaf	Toothache
47	<i>Mentha spicata</i>	Pudina	Herb	Lamiaceae	Whole plant	Stimulant, Carminative and Antispasmodic, Fever and Bronchitis
48	<i>Mimosa pudica</i> L.	Lajjabati	Climber	Fabaceae	Root	Fever, Snake-Bite
49	<i>Momordica charantia</i> Descourt	Korola	Climber	Cucurbitaceae	Leaf, Fruit	Chickenpox, Rheumatism, Diabetes
50	<i>Moringa oleifera</i> Lamk	Sogina	Tree	Moringaceae	Fruit, Root	Chicken Pox, Diabetes, Paralysis, Fever
51	<i>Ocimum sanctum</i> L.	Tulsi	Shrub	Lamiaceae	Leaf, Root	Cough, Fever
52	<i>Piper longum</i>	Peepul	Climber	Piperaceae	Fruits & roots	Acrid, Digestive, Appetizer, Aphrodisiac and Tonic, Dispelling Diseases
53	<i>Phyllanthus Emblica</i> L.	Amloki	Tree	Euphorbiaceae	Fruit	Burning Sensation, Vomiting, Cough, Indigestion, Jaundice
54	<i>Piper betel</i> L.	Pan	Climber	Piperaceae	Leaf	Cut Injury, Stomachache
55	<i>Psidium guajava</i> L.	Peyara	Tree	Myrtaceae	Leaf, Bark, Fruit	Toothache, Dysentery, Diarrhoea, Worm
56	<i>Sida cordifolia</i>	Berela	Shrub	Herbaceous	Seeds, barks, roots, leaves & flowers	Ophthalmic, Astringent, Stomachic, Cooling, Tonic
57	<i>Solanum melongena</i> L.	Begun	Shrub	Solanaceae	Fruit	Pain Waiver
58	<i>Swertia chirata</i>	Cheerota	Shrub	Gentianaceae	Whole plant	Bitter and Tonic. Anti-Malarial, Stomachic, Laxative, Anthelmintic and Antidiarrhoeal.
59	<i>Syzygium cumini</i> (L.) Skeels.	Jam	Tree	Myrtaceae	Bark, Stem	Dysentery, Wound, Diabetes
60	<i>Rauwolfia serpenita</i>	Sarpagandha	Shrub	Apocynaceae	Leaves & roots	Bitter Tonic, Hypnotic, Sedative, Specific For Insanity, Reduces Blood Pressure, Nervous System Disorders

No.	Scientific name	Local name (Bengali)	Habit	Name of family	Part(s) used	Ailments
61	<i>Terminalia bellirica</i> (Gaertn.) Roxb.	Bohera	Tree	Combretaceae	Fruit, Stem	Burning Sensation, Rheumatism
62	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Arjun	Tree	Combretaceae	Leaf, Bark, Fruit	Burning Sensation, Blood Pressure, Heart Disease, Worm
63	<i>Terminalia Chebula</i> Retz.	Haritaki	Tree	Combretaceae	Fruit	Constipation, Indigestion, Rheumatism, Urinary diseases
64	<i>Tamarindus indica</i> L.	Tentul	Tree	Fabaceae	Fruit, Leaf	Burning Sensation, Heart Disease
65	<i>Withania somnifera</i>	Arshwagandha	Shrub	Solanaceae	Roots, leaves, fruits and seeds	Constipation, Insomnia, Tissue-Building, Nervous Breakdown
66	<i>Woodfordia fruticosa</i>	Dhaiphul	Shrub	Lythraceae	Flowers	Fermentation of all ayurvedic products
67	<i>Zizyphus mauritiana</i> Lamk.	Boroi	Tree	Rhamnaceae	Leaf	Headache
68	<i>Trainthema portula castrum</i>	Soaranai	herb	Aizoaceae	Root	Asthma
69	<i>Hemidesinus ndicus</i> Linn	Nannari	Shrub	Apocynaceae	Whole plant	Body Cool
70	<i>Aerva lanata</i>	Siru peelai	Shrub	Amaranthaceae	Whole plant	Cough
71	<i>Tamarindus indica</i>	Pulia maram	Tree	Fabaceae	Fruits	Eye Infection
72	<i>Wattakaka volubitis cooke</i>	Kurinjan Notchi	Tree	Apocynaceae	Leaf, Leaves	Fever
73	<i>Spermacoce hispida</i>	Nathaichuri	Herb	Rubiaceae	Seed	Stomach Problem
74	<i>Antrographis paniculata</i>	Nilavembu	Shrub	Acanthaceae	Leaf	Snakes Bites
75	<i>Sphaeranthus indicus</i>	Kottai kkarantai	Herb	Asteraceae	Leaf, Flower, Seeds	Skin Disease
76	<i>Tribulus terrestris</i>	Nerunchimul	Tree	Zygophyllaceae	Fruit, Root	Urinary Troubles
77	<i>Zinnia elegans</i> L.	Zinnia	Herb	Asteraceae	Leaf, Stem	Skin Disease, Leprosy, Boils, Tetanus, Wound
78	<i>Murraya koenigii</i>	Karuveppilai	Tree	Rutaceae	Leaf	Vomiting
79	<i>Chrysopogon acciculatus</i>	Premkata	Shrub	Leguminoseae	Root	Jaundice
80	<i>Ocimum tenuiflorum</i> L.	Kalo Tulshi	Shrub	Lamiaceae	Root	Headache

4.8 Anthelmintic Agents

Palasonin inhibited glucose uptake and depleted the glycogen content and thus the possible mechanism of its anthelmintic action may be related to inhibition of energy metabolism [76]. Both aqueous and alcoholic extracts of the leaves of *Sencio nudicaulis*. Buch Hamwas found to exert anti-filarial activity when tested against *Setaria cervi* (*Nematoda filarioidea*) [77].

4.9 Immune Active Plants

Modulation of the immune response through stimulation or suppression may help in maintaining a disease free state [78]. Agents that activate host defense mechanisms in the presence of an impaired immune responsiveness can provide supportive therapy to conventional chemotherapy. It has been found to activate the mononuclear cells to release cytokines like GM-CSF and IL-1 in a dose dependent manner. Active principles of *Tinospora cordifolia* were found to possess anticomplementary and immunomodulatory activities [79], the compounds also gave rise to significant increases in IgG antibodies in serum. Both hormonal and cell-mediated immunity were dose-dependently enhanced. Macrophage activation was reported for cordioside (TC-2), cordiofolioside A (TC-5) and cordiol (TC-7) [80] and this activation was more pronounced with increasing incubation times [81]. Neem (*Azadirachta indica*) [82] an example of an immune active plant.

5. DISCUSSION

The number of ethnomedicinal plants somehow indicates the high richness of Bangladesh's medicinal plants and traditional medicine, addressing use of natural resources to treat various diseases and associated problems for a long time. As plant extracts have great potential as antimicrobial activity against microorganisms, they can be used in the treatment of diseases caused by microbes [7]. Since ancient times, ethnomedicinal plants have been used by several communities in the world to treat a large number of diseases [9]. Roots of ginger (*Zingiber officinale*) [83] and other plants are used for the treatment of different disease from ancient time. Diseases could be due to a variety of reasons such as infectious (e.g. paediatric infectious) diseases, viral, bacterial, and fungal diseases. Since many of the plants in this study are

antimicrobial plants and contain effective antimicrobial compounds, their contribution to treating diseases could be attributed to their antimicrobial property [84,85]. Some ethnomedicinal plants could serve as useful source of new antimicrobial agents also [86]. Further, some pharmaceutical industries of Bangladesh that usually produce chemical drugs are currently producing herbal medicinal those are effective on cold, rhinorhea (nasal congestion), cough, pain, blood pressure, heart disease and so on, so that they may be able to replace chemical drugs with plant derived ones. *Adovas*, *Amocid*, *AmCivit*, *Inacea*, *Giloba*, *Torel*, *Arubin*, *Dubarel*, *Eyebil*, *Jort*, *Gintex*, *Livolite*, *Navit*, *Probio* etc. are some medicines made from medicinal plant which are used for treatment of different diseases. All of these herbal medicines have been derived from Bangladeshi traditional medicine and have been introduced into pharmaceutical market. However, many of the medicinal plants identified in this study remain to be known and their other medicinal effects have not been yet investigated and confirmed in clinical trials. Therefore, researchers can do complementary studies on the ethnomedicinal plants whose therapeutic effects on different diseases have not been yet investigated, considering the plants used to treat different diseases in country's traditional medicine, and conduct clinical trials to develop the herbal medicines and help to make them commercially available.

6. CONCLUSION

The most cited threats to ethno-medicinal plants of the area were deforestation, drought, fire, overgrazing/over browsing and agricultural expansion. The majority of ethnomedicinal plant species were used for firewood, forage, construction, food and fencing, as well as timber, toothbrush and live fencing by the local people.

CONSENT

It is not applicable.

ETHICAL APPROVAL

It is not applicable.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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