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ORIGINAL ARTICLE

A Randomized Survey of Medicinal Plants used by Folk Medicinal Healers of Sylhet Division, Bangladesh

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ABSTRACT

Sylhet division lies in the north-eastern corner of Bangladesh and comprises of four districts – Sylhet, Habiganj, Sunamganj, and Moulvibazar. The division contains a diversity of floral species, some of which are quite distinct from the rest of the country. A randomized ethnomedicinal survey was conducted among the folk medicinal practitioners of Komolganj in Moulvibazar district, Gulapganj of Sylhet district, and Chunarughat of Habiganj district. Informed consent was obtained from the healers and the survey was conducted with the help of a semi-structured questionnaire. In the present survey, the methodology employed was that of the guided field-walk, where the healers took the interviewers to localities from where they collected their medicinal plants and pointed out the plants besides describing the plant parts used and the ailments that they were used for. Plant specimens were collected from the field, dried *in situ* and identification completed at the Bangladesh National Herbarium. Information on 107 plant species distributed into 53 families was obtained. The Asteraceae family contributed the largest number of plant species (seven) followed by the Euphorbiaceae, Fabaceae and Rutaceae families (six each). Leaves comprised the major plant part used for the treatment of different ailments (48.3%) followed by fruit (15.9%) and bark (10.3%). Most plants were used to treat common ailments like gastrointestinal disorders, helminthiasis, debility, pain, skin problems, respiratory problems, fever, bleeding from cuts and wounds, urinary tract problems and sexual disorders. However, a number of plants were also used to treat more complicated ailments like cardiovascular disorders, hepatic disorders, epilepsy and cancer or tumors. In the majority of cases, a single plant part was used for treatment of any given ailment. Folk medicine in Bangladesh has a history of usage going back thousands of years. The medicinal plants used by the folk medicinal healers thus possess considerable potential for discovery of lead compounds or novel compounds that may serve as the source of effective modern drugs.

Key words: Medicinal plants, Folk medicine, Sylhet, Bangladesh

Introduction

Human beings have used plants for treatment of their diverse ailments for thousands of years (Sofowara, A., 1982; Hill, A.F., 1989). Even with the advent of modern or allopathic medicine, Balick and Cox (1996) have noted that a number of important modern drugs have been derived from plants used by indigenous people. Of the various pharmaceuticals used in modern medicine, aspirin, atropine, ephedrine, digoxin, morphine, quinine, reserpine and tubocurarine serve as examples of drugs discovered through observations of indigenous

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medical practices (Gilani, A.H. and A.U. Rahman, 2005).

Bangladesh has a rich tradition of folk medicinal practices. Besides the established systems of Ayurvedic and Unani medicine, folk medicinal practitioners have dispensed for hundreds if not thousands of years medicinal plant preparations for treatment of a diverse variety of ailments. The folk medicinal practitioners known as Kavirajes as in the Ayurvedic system relies on simple preparations of medicinal plants or plant parts for treatment and are the primary health-care providers to a substantial number of the country's population. We have been conducting an extensive survey of folk medicinal practices of the Kavirajes of different tribes and areas of Bangladesh, which can vary from area to area, tribe to tribe or even between individual Kavirajes (Hanif, A., 2009; Shahidullah, M., 2009; Nawaz, A.H.M.M., 2009; Nawaz, A.H.M.M., 2009; Nawaz, A.H.M.M., 2009). The present study was conducted in a randomized fashion in three areas of three districts of Sylhet division, Bangladesh to learn about the usage of medicinal plants by the folk medicinal practitioners of that division.

Materials and Methods

2.1 The study area

Sylhet division is located roughly between 91-92^{o} E and 24-25^{o} N. It is situated in the northeast corner of Bangladesh and comprises the districts of Sylhet, Habigang, Moulvibazar, and Sunamgang. The present study was conducted amongst Kavirajes of Komolganj (Moulvibazar district), Gulapganj (Sylhet district), and Chunarughat (Habiganj district).

2.2 Data collection and sampling techniques

Traditional medicinal healers (Kavirajes) were randomly chosen in the three areas as described above. All Kavirajes were interviewed with the help of a semi-structured questionnaire after obtaining informed consent from them. The purpose of the interview was carefully explained and consent was obtained from the Kavirajes that they have no objection to the information being disseminated in publication or any other form of presentation form both within the country as well as internationally. The basic method followed was that of Martin (1995) and Maundu (1995), where the informants took the interviewers on guided field-walks through the areas from where they collected their medicinal plants. Medicinal plants were pointed out, their local names given, and their uses described along with plant parts used and formulations. All information was cross-checked with the Kavirajes in later evening sessions. Plant specimens were collected, dried in the field and later identified at the Bangladesh National Herbarium.

3. Results

3.1 Plants and their distribution into families

It was observed that the Kavirajes interviewed used a total of 107 plants distributed into 53 families. The results are shown in Table 1. The Asteraceae/Compositae family provided the largest number of species (7) followed by the Euphorbiaceae, Fabaceae, and Rutaceae families (6 plants each). The Solanaceae family provided 5 plants, while the Apocynaceae and Moraceae families provided 4 plants each. Some of the plants were not obtained from the wild but instead planted around homesteads or cultivated for personal use and commercial purposes. These plants included *Mangifera indica*, *Coriandrum sativum*, *Cocos nucifera*, *Bombax ceiba*, *Ananas comosus*, *Carica papaya*, *Terminalia belerica*, *Terminalia chebula*, *Momordica charantia*, *Dillenia indica*, *Phyllanthus emblica*, *Tamarindus indica*, *Swertia chirata*, *Cinnamomum tamala*, *Punica granatum*, *Moringa oleifera*, *Artocarpus heterophyllus*, *Musa paradisiaca*, *Psidium guajava*, *Syzygium cumini*, *Averrhoa carambola*, *Piper betle*, *Bambusa bambos*, *Zizyphus mauritiana*, *Aegle marmelos*, *Citrus aurantifolia*, *Citrus grandis*, *Citrus macroptera*, *Manilkara achras*, *Camellia sinensis*, and *Curcuma longa*. The fruits of *Mangifera indica*, *Cocos nucifera*, *Ananas comosus*, *Carica papaya*, *Terminalia belerica*, *Terminalia chebula*, *Dillenia indica*, *Phyllanthus emblica*, *Tamarindus indica*, *Swertia chirata*, *Punica granatum*, *Artocarpus heterophyllus*, *Musa paradisiaca*, *Psidium guajava*, *Syzygium cumini*, *Averrhoa carambola*, *Zizyphus mauritiana*, *Aegle marmelos*, *Citrus aurantifolia*, *Citrus grandis*, *Citrus macroptera*, and *Manilkara achras* were consumed directly when in season, while the fruits of *Momordica charantia* and *Moringa oleifera* were cooked and eaten. It is to be noted as shown in Table 1 that the fruits of some of the above-mentioned plants were also taken for their medicinal properties. The leaves and seeds of *Coriandrum sativum*, leaves of *Cinnamomum tamala*, and rhizomes of *Curcuma longa* were also added to food as spices.

Table 1: Medicinal plants used by the folk medicinal healers of Sylhet Division, Bangladesh

Scientific Name	Family Name	Local Name	Used Part	Indication	Formulation and dosage
Justicia adhatoda L.	Acanthaceae	Bashok	Leaf, bark, flower, root (whole plant)	Respiratory problems.	Juice collected from crushed whole plant is taken twice daily for seven days.
Justicia aurea Schltdl.	Acanthaceae	Kalo bashok	Leaf	Coughs.	100 gm of leaf juice is taken with ginger and black peppers twice daily for three days.
Justicia gendarussa L.	Acanthaceae	Bish jaron	Leaf	Bone fracture, rheumatic pain.	Leaf juice is taken thrice daily (1 cup amount); alternately crushed leaves are applied to affected areas.
Sansevieria roxburghiana Schult. & Schult. f.	Agavaceae alt. Dracanaceae	Nag pata	Leaf	Itches.	Leaves are rubbed on spots having itches.
Aloe vera (L.) Burm.f.	Aloaceae alt. Liliaceae	Ghrito-kumari	Leaf	Constipation, rheumatism, digestive aid.	Leaves are eaten on an empty stomach with water and seeds of *Hyptis suaveolens*.
Amaranthus spinosus L.	Amaranthaceae	Kanta-mair	Leaf, stem	Multi-vitamin source, to increase strength, to stimulate appetite.	Leaves and stems are fried and eaten.
Mangif era indica L.	Anacardiaceae	Aam	Seed, gum	Diabetes, dandruff, cracking of soles of feet.	Seeds are mixed with seeds of *Syzygium jambos*, dried, and powdered. 4 teaspoonful of powder is taken with a glass of water once daily on an empty stomach for diabetes. Gum is applied to head for dandruff and to soles of feet during cracking.
Spondias pinnata (L.)f. Kurz	Anacardiaceae	Amra	Bark	Skin diseases, gastrointestinal disorders.	Bark is boiled and the decoction is mixed with sugar and taken for 5-7 days.
Polyalthia longifolia (Sonn.) Thwaites (PL)	Annonaceae	Devdaru	Leaf, bark	Coughs, mucus, skin disorders.	Crushed leaves and bark are taken during coughs and mucus formation. Crushed leaves and bark are applied to affected areas of skin during skin disorders.
Uvaria hamiltonii Hook.f. & Thom.	Annonaceae	Lotkon	Seed	Gonorrhea, jaundice.	Powdered seeds are mixed with honey and taken 3-4 times daily for 10-15 days.
Centella asiatica (L.) Urb.	Apiaceae alt. Umbelliferae	Thankuni	Whole plant	Indigestion, appetite stimulant.	Juice from whole plant is taken.
Coriandrum sativum L.	Apiaceae	Dhonia	Leaf	Digestive aid, intestinal weakness.	Leaves are eaten with cooked vegetables; alternately leaves are eaten with leaves of *Mentha spicata*.
Alstonia scholaris (L.) R.Br.	Apocynaceae	Chauni, Chatim	Young bark	Nerve stimulant.	Young bark is boiled in a little amount of water and taken with honey.
Catharanthus roseus (L.) G.Don	Apocynaceae	Noyon-tara	Leaf, root	Infections, hypertension.	Leaf juice is mixed with pulses and applied to infections. 3-4 spoonful of root juice is taken every morning on an empty stomach for 4-5 days for hypertension.
Holarrhena pubescens Wall. ex G. Don	Apocynaceae	Kurchi	Bark	Asthma, respiratory problems, coughs.	Bark is soaked in water followed by drinking of the water in the morning and evening; alternately, dried bark is chewed.
Tabernaemontana corymbosa Roxb. ex Wall.	Apocynaceae	Dudh phool	Leaf	Tonsil tumor.	Leaf juice is mixed with sugar and applied externally to tumor area.
Alocasia macrorrhizos (L.) G. Don	Araceae	Fan-kochu, Kochu	Leaf, stem, root	Edema, pain, to stop bleeding from cuts and wounds.	The various parts are cooked and eaten as vegetable for edema and pain. Stem juice is applied to cuts and wounds.
Calamus tenuis Roxb.	Arecaceae	Beth gach	Shoot tip, root	Mucus, antidote to poisoning.	Juice from shoot tips and roots is taken in the morning and evening for seven days.
Cocos nucifera L.	Arecaceae	Narikel	Fruit (pulp of ripe coconut), oil	To strengthen hair, debility.	Pulp of ripe fruit is consumed for debility. Oil is applied to hair for strengthening hair.
Calotropis gigantea (L.) Ait.f.	Asclepiadaceae	Akon	Leaf, bark	Severe pain, eczema, sprain.	Warm leaves are applied to affected areas; alternately, crushed leaves and bark is applied to affected areas.

Table 1: Continue

Eclipta alba (L.) Hassk.	Asteraceae alt. Compositae	Cherry shak	Leaf, stem	Skin diseases, chicken pox.	Leaf is crushed with stem in mustard oil and applied to affected areas.
Enydra fluctuans Lour.	Asteraceae alt. Compositae	Helencha	Leaf, stem	Malnutrition.	Leaf and stems are cooked and eaten.
Eupatorium odoratum L.	Asteraceae alt. Compositae	Ujaru	Leaf	Cuts and wounds on hand or foot.	4-5 leaves are crushed and applied to wounds with lime.
*Helianthus annus*L.	Asteraceae alt. Compositae	Surjo-mukhi	Leaf	Dysentery, body ache.	Leaf juice is mixed with leaf juice of *Swertia chirata* and 1 cup amount is taken on an empty stomach twice daily for three days.
Mikania cordata (Burm.f.) B. L. Robinson	Asteraceae alt. Compositae	Refugee pata	Leaf	To stop bleeding, anti-bacterial.	1 cup amount of leaf juice is taken twice daily for three days.
Spilanthes calva DC	Asteraceae alt. Compositae	Bon nakful	Flower	Toothache.	Teeth are brushed with flower during pain.
Wedelia chinensis (Osbeck) Merr.	Asteraceae alt. Compositae	Bhringoraaz	Leaf, plant sap	To promote hair growth and blacken hair.	Juice from crushed leaves or plant sap is applied to bottom of hair.
Oroxylum indicum (L.) Vent.	Bignoniaceae	Naori	Bark	Jaundice.	1 cup amount of juice obtained from crushed bark is taken daily for seven days.
Bombax ceiba L.	Bombacaceae	Shimul	Root, bark	Stoppage of urination, debility, sexual weakness, to increase semen.	100 gm of dried and powdered roots is mixed with fruits of *Swertia chirata* and mishri* and taken thrice daily for three days for stoppage of urination or debility. For sexual weakness or to increase semen, 7-12 gm of powdered root is taken with sugar once daily for 7-10 days; alternately powdered root is taken with milk once daily for 7-10 days.
Ananas comosus (L.) Merr.	Bromeliaceae	Anarosh	Leaf	Helminthiasis, stomach ache.	Juice from the bottom part of 5-6 leaves are taken (1 cup amount) once daily for 4-5 days.
Opuntia dillenii (Ker-Gawl.) Haw.	Cactaceae	Kanta fou-ir, Foni-monsha	Leaf sap, stem	Sex stimulant, to increase sexual strength, to increase sperm count.	Leaf sap is mixed with mustard oil and rubbed on the soles of feet of males 20 minutes before intercourse. To increase sperm count, sliced stems are soaked in water, and one glass of the water is taken twice daily for 7-12 days.
Carica papaya L.	Caricaceae	Papay	Sap	Blood with cough, eczema, piles.	Sap is applied to affected areas 2-3 times (eczema, piles). Sap is mixed with molasses and taken (blood with cough).
Terminalia arjuna (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Bark	Cardiovascular disorders, appetite stimulant.	One cup amount of juice squeezed from bark is taken twice daily for 7-10 days.
Terminalia belerica (Gaertn.) Roxb.	Combretaceae	Bohera	Fruit, skin of fruit	Coughs, to increase strength, appetite stimulant, to strengthen eyesight.	Sliced fruits are soaked in water followed by drinking of the water for coughs. 5 gm skin of fruit is taken with *Wedelia chinensis* on an empty stomach to increase strength, to improve appetite or to strengthen eyesight.
Terminalia chebula Retz.	Combretaceae	Horitoki	Fruit	Digestive aid, quenches thirst, blood dysentery, bloating, constipation.	Skin of fruits is taken with warm water three times.
Ipomoea fistulosa Mart. ex Choisy	Convolvulaceae	Kolmi lota	Leaf	To stop bleeding from cuts and wounds.	Leaf juice is applied to cuts and wounds.
Kalanchoe pinnata (Lam.) Pers.	Crassulaceae	Him shagor, Pathorkuchi	Leaf	Burning sensations during urination, kidney stones.	One cup leaf juice is taken twice daily for seven days.

Table 1: Continue

Coccinia grandis (L.) J. Voigt	Cucurbitaceae	Telakuchi, Kawaluli	Leaf	Burning sensations during urination, diabetes.	Leaves are either fried or leaf juice is taken for 7 days in the morning on an empty stomach.
Momordica charantia L.	Cucurbitaceae	Korla, Muiccha, Korolla	Leaf, fruit	Diabetes, chicken pox.	Leaves are dried, made into small pills and taken 2-3 times daily. Fruits are cooked and eaten as vegetable 2-3 times daily.
Cuscuta reflexa Roxb.	Cuscutaceae	Shorno lota	Vine	Gastrointestinal disorders, body ache.	Juice from 4-5 vines is taken twice daily (1 cup amount) for three days.
Dillenia indica L.	Dilleniaceae	Chalta	Leaf, bark, fruit	Boils, epilepsy, to increase lactation.	Juice from leaf and bark is applied to boils. Fruits are taken after epileptic seizures (to prevent further attacks), and to increase lactation.
Elaeocarpus robustus Roxb.	Elaeocarpaceae	Jolpai	Leaf	Dysentery, diuretic.	Leaf juice is taken thrice daily for 7-10 days.
Euphorbia tirucali L.	Euphorbiaceae	Dudh gach	Stem	To increase lactation.	Juice from crushed stems (50 gm) is taken with ginger twice daily for two days.
Jatropha gossypifolia L.	Euphorbiaceae	Bherenda	Leaf, root	Coughs, asthma, tuberculosis, chest infections, malaria, pain.	Juice of combined leaf and root is taken for coughs, asthma, tuberculosis, chest infections, and malaria. Leaves are mixed with salt, warmed and applied to areas affected by pain.
Pedilanthus tithymaloides (L.) Poit.	Euphorbiaceae	Mai long	Leaf	Cat or dog bites.	The leaves are chewed (one leaf each day for seven days).
Phyllanthus emblica L.	Euphorbiaceae	Amloki, Aaula	Fruit	Appetite stimulant, indigestion.	Crushed fruits are mixed with water and 1 glass of the water taken twice daily for seven days.
Phyllanthus niruri L.	Euphorbiaceae	Bhui-amla	Whole plant	Jaundice.	Juice from crushed whole plant is taken with honey in the morning and evening.
Tragia involucrata L.	Euphorbiaceae	Chutra	Leaf	To induce sleep.	Powdered, dried leaves are taken with milk 1-2 times.
Cajanus cajan (L.) Millsp.	Fabaceae	Orhor	Leaf	Jaundice, fever, blood purifier.	Leaf juice is taken twice daily for 5-7 days for jaundice. One spoonful of powdered leaf is taken with *Azadirachta indica* leaf and *Ocimum basilicum* leaf and honey 2-3 times (total amount 3-4 spoonful) daily for 10-15 days for fever or purification of blood.
Delonix regia (Bojer ex Hook.) Raf.	Fabaceae	Krishnochura	Leaf, fruit	Piles, boils.	Fruits are eaten as treatment for piles; crushed leaves and fruits are applied to boils.
Erythrina variegata L.	Fabaceae	Mandar	Leaf	Fever, helminthiasis.	Leaf juice is taken twice daily.
Glycyrrhiza glabra L.	Fabaceae	Josthi-modhu	Root	Stomach pain.	½ cup amount of root juice is taken 1-2 times daily for two days.
Mimosa pudica L. Mimosaceae	Fabaceae alt.	Laal lojjaboti gach	Leaf	Pain in body, head, teeth.	Leaf juice along with ginger juice is taken for pain in body or head; leaves are boiled and the water gargled with for toothache.
Tamarindus indica L.	Fabaceae	Tetul	Ripe fruit	Spleen problems, to reduce obesity.	3-4 gm ripe fruits are taken with sugar 2-3 times daily.
Swertia chirata (Roxb. ex Fleming) H. Karst.	Gentianaceae	Chita, Shada	Root	Obesity, gastric problems.	25-30 gm powdered root is taken with sweet yoghurt twice daily for 1-2 months.
Leucas aspera (Willd.) Link	Labiatae alt. Lamiaceae	Dondo-kolosh	Leaf	Scabies, skin infections.	Leaves are crushed along with turmeric and mustard oil and a little water and applied to affected areas for seven days.
Ocimum basilicum L.	Labiatae	Shada tulshi	Leaf	Coughs.	1 cup amount of leaf juice is taken with ginger and black pepper.
Gmelina arborea Roxb.	Lamiaceae alt. Verbenaceae	Gamar	Leaf	To increase breast size.	Crushed leaves are applied to breasts.
Hyptis suaveolens (L.) Poit.	Lamiaceae	Tukma	Seed	Constipation.	Seeds are soaked in water for some time and taken on an empty stomach.

Table 1: Continue

Cinnamomum tamala (Buch.-Ham.) Nees & Eberm.	Lauraceae	Tejpata, Waj turki	Leaf	Bloating, indigestion.	Leaves are boiled in ½ cup water and taken.
Litsea monopetala (Roxb.) Pers.	Lauraceae	Menda, Meda	Leaf, bark	Dysentery, to stimulate appetite.	Leaf and barks are soaked in water. 500 gm of the water is taken with 10 leaves, leaf of *Dillenia indica* and mishri.
Crinum asiaticum L.	Liliaceae	Gurunda	Leaf, root	Bloating and diarrhea in cattle.	Leaves and roots are thinly sliced, wrapped with banana leaf and fed to cattle.
Lagerstroemia speciosa (L.) Pers.	Lythraceae	Jarul	Young leaf, bark	Purgative, stimulant, induces sleep.	2 gm of powdered leaf and bark is taken thrice daily on an empty stomach.
Lawsonia inermis L.	Lythraceae	Mehedi, Nionda	Leaf	Cancer, fever, burning sensations during urination, to keep head cool.	Dried leaves are soaked in water and the water taken thrice daily for 3-7 days.
Punica granatum L.	Lythraceae	Dalim gach	Leaf	Diarrhea, to increase strength.	Leaves are fried and taken twice daily.
Hibiscus rosa sinensis L.	Malvaceae	Laal joba	Leaf, bud	Dysentery.	Juice from leaves and buds are taken (1 cup amount) once daily for seven days.
Sida cordifolia L.	Malvaceae	Barila	Leaf, stem	Skin infections, bloating.	Crushed leaves are applied to skin infections. A stem is kept by the side of chest during bloating.
Melia azedarach L.	Meliaceae	Mitha neem, Ghora neem, Kalo neem	Leaf, bark	Skin diseases, for brushing teeth, loosening or pain of tooth, rheumatic pain, fever, insecticide, stomachache.	For toothache, leaves are heated, powdered and applied to base of tooth. For skin diseases, one handful of leaf is boiled in water followed by application of the water to skin. Powdered leaves and bark are mixed with sugar and taken for rheumatic pain and fever. Powdered leaf is spread as insecticide. Bark is taken during stomach ache.
Swietenia macrophylla King.	Meliaceae	Mahogany	Leaf, bark	Diabetes.	Dried leaves and barks are powdered, made into small pills and taken twice daily.
Stephania japonica (Thunb.) Miers	Menispermaceae	Doi pata, Aknadi	Flower	Blood purifier, ovary problems.	3-4 gm of crushed flowers are taken.
Moringa oleifera Lam.	Moringaceae	Sajina	Leaf	Sex stimulant, headache, coughs, mucus.	Leaves are fried with garlic and taken.
Artocarpus heterophyllus Lam.	Moraceae	Kathal	Fruit	Boils, skin diseases.	Fruits are eaten.
Ficus racemosa L.	Moraceae	Dumur	Leaf	Cough, blood dysentery.	Leaves are fried or made into pills and taken with a handful of leaves of *Ocimum basilicum* for five days.
Morus indica L.	Moraceae	Tuth fol	Fruit	To strengthen liver, fever, colds.	The fruits are sucked 2-3 times a day on an empty stomach.
Streblus asper Lour.	Moraceae	Shaora	Leaf	Gastrointestinal disorders, gastric problems.	1 cup amount of leaf juice is taken with water twice daily for three days.
Musa paradisiaca L.	Musaceae	Kola	Leaf, root, fruit	Anemia, rokto-pitto *** (hematemesis – condition of coming out of blood with vomit or sputum, can arise from either tuberculosis or hypertension), debility, dysentery.	Fruits are cooked and taken as vegetable. Alternately a combination of young leaf and root juice is taken.
Eucalyptus citriodora Hook.	Myrtaceae	Eucalyptus	Root, oil	Respiratory difficulties, skin diseases.	For respiratory difficulties, roots are soaked in water and taken in the morning on an empty stomach; oil is applied to affected areas during skin diseases.

Table 1: Continue

Psidium guajava L.	Myrtaceae	Piyara, Goiash	Leaf, bark, fruit	Toothache, diarrhea.	Young leaves are boiled with camphor and the water gargled with for toothache. Bark juice or fruit is taken for diarrhea.
Syzygium cumini (L.) Skeels	Myrtaceae	Jaam	Fruit, seed	Dysentery, debility, anti-emetic, diabetes.	Fruits are taken with leaf juice of *Punica granatum* 3-4 times daily for 7-10 days for dysentery, debility and as anti-emetic. Powdered seeds are mixed with powdered seeds of *Trigonella foenum-graceum* and taken 2-3 times daily for diabetes.
Averrhoa carambola L.	Oxalidaceae alt. Averrhoaceae	Kamranga	Leaf, fruit	Eczema, digestive aid, to keep body cool.	3-4 spoonfuls of dried and powdered leaves is taken twice daily with fruit juice.
Piper betle L.	Piperaceae	Paan	Leaf	To remove head lice, boils.	Leaf juice is applied to hair for head lice. Leaf juice is applied to boils.
Piper longum L.	Piperaceae	Pipul	Leaf, seed	Coughs, asthma, digestive aid.	Crushed leaves are taken for coughs or asthma. Powdered seeds are taken as digestive aid.
Bambusa bambos (L.) Voss.	Poaceae	Bash	Meristem, root	Coughs, whole body edema.	Juice from meristem and root is taken once daily for 4-5 days.
Cynodon dactylon (L.) Pers.	Poaceae	Durba ghas	Whole plant	Cuts and wounds, infections.	Juice from whole plant is applied to affected areas.
Zizyphus mauritiana Lam.	Rhamnaceae	Boroi	Leaf, bark	Chicken pox, measles.	Leaves and bark are boiled in water (10-15 leaves with bark in about 2-3 kg water) followed by sprinkling of the water on the body.
Anthocephalus indicus A. Rich	Rubiaceae	Kodom	Leaf	Snake bite.	The leaves are chewed with salt; at the same time crushed leaves with salt are applied to bitten area.
Paederia foetida L.	Rubiaceae	Badali pata	Leaf	Bloating, indigestion.	Crushed leaves are made into pills and taken.
Aegle marmelos (L.) Corr.	Rutaceae	Bel gach	Leaf	Urinary bladder stone.	Leaves are mixed with *Syzygium jambos* leaves and *Lawsonia inermis* leaves, crushed and made into ½ tola amount pills. Pills are taken twice daily for three days.
Citrus aurantifolia (Christm.) Swingle	Rutaceae	Kagji lebu	Fruit	Bloating, alcohol effects.	Fruit juice is taken to reduce bloating or effects of excessive alcohol drinking.
Citrus grandis (L.) Osbeck	Rutaceae	Jambura, Matu phol	Leaf, fruit	Appetite stimulant, vomiting, fever.	Young leaves are chewed to stimulate appetite and stop vomiting. Fruits are taken for fever.
Citrus macroptera Montrouz.	Rutaceae	Shatkora	Fruit	Fever, appetite stimulant.	Fruits are eaten with cooked vegetables.
Citrus medica L.	Rutaceae	Shasni jamir	Leaf, fruit	Indigestion, appetite stimulant.	Young leaf is smelled as treatment for indigestion. Fruit juice is taken to stimulate appetite.
Murraya paniculata (L.) Jack	Rutaceae	Kamini	Leaf	Kidney and urinary bladder stones, throat cancer, throat infections.	Leaves are mixed with leaves of *Syzygium jambos*, leaves of *Lawsonia inermis* and giger to make pills weighing ½ tola**. Pills are taken twice daily for seven days.
Manilkara achras (Mill.) Fosberg	Sapotaceae	Sofeda	Fruit	Diseases arising from malnutrition.	Fruits are eaten.
Scoparia dulcis L.	Scrophulariaceae	Michri dana	Root, fruit	Sexual diseases, nerve disorders.	3-4 gm of root and fruit juice is mixed with oil and taken for two months.
Capsicum frutescens L.	Solanaceae	Puk morich	Fruit	Helminthiasis, dysentery.	Fruits are taken with other foods or vegetables.
Datura metel L.	Solanaceae	Dhutra	Leaf	Body ache.	4-5 leaves are crushed with garlic and applied to affected areas twice daily for three days.
Solanum indicum L.	Solanaceae	Tit baegun	Fruit	Biliary disorders nerve stimulant, to strengthen liver, burning sensations during urination.	Fruit juice is taken with onion juice 2-3 times.

Table 1: Continue

Solanum nigrum L.	Solanaceae	Kack-machie	Leaf, whole plant	To strengthen liver, helminthiasis, blood purifier, bruises.	1-2 spoonful of leaf juice is taken twice daily for helminthiasis, to strengthen liver, and as a blood purifier. Crushed whole plant is applied to bruises.
Solanum torvum Swartz	Solanaceae	Pahari baegun, Boot baigun	Seed	Tooth infections.	The seeds are roasted over a fire such that the smoke warms up the inside of the mouth.
Abroma augusta L.f.	Sterculiaceae	Ulot-kombol	Leaf	Spermatorrhea.	250 gm leaf is taken with *Aloe vera* twice daily for seven days.
Camellia sinensis (L.) Kuntze	Theaceae	Cha pata	Leaf	Cancer.	Young leaves are soaked in water overnight followed by drinking of the water the following morning. Alternately, juice obtained from young leaves is taken on an empty stomach in the morning.
Aquilaria agallocha Roxb.	Thymeliaceae	Agor	Wood, oil	Nerve stimulant, sexual weakness, rheumatic pain.	3-4 gm of powdered wood is mixed with 3-4 spoonful of honey and taken twice daily for stimulation of nerves and to increase sexual strength. Oil is applied to areas affected by rheumatic pain.
Clerodendrum viscosum Vent.	Verbenaceae alt. Lamiaceae	Bite pita	Leaf	Cough in children.	Leaf juice is mixed with leaf juices of *Justicia aurea* and *Ocimum basilicum* and black pepper and taken twice daily for three days.
Vitex negundo L.	Verbenaceae alt. Lamiaceae	Nishinda	Leaf	Rheumatoid arthritis, rheumatism, diuretic.	Leaf juice is taken in the morning on an empty stomach for 5-7 days.
Curcuma longa L.	Zingiberaceae	Holud	Rhizome	Helminthiasis, itches.	Rhizome juice is taken for helminthiasis; crushed rhizomes are applied to itches.
Zingiber montanum (J. Koenig) Link ex A. Dietr.	Zingiberaceae	Bon ada	Leaf, rhizome	Bloating, indigestion, coughs.	Rhizomes are sliced in small pieces and taken with salt for bloating and coughs. Leaves are chewed as treatment for indigestion.

*Mishri: Local name for crystallized sugar. Sugar is added to hot water till it no longer dissolves. The water is allowed to cool when the sugar appears in a crystallized solid form, which is dried. The dry crystalline sugar is known as mishri and is taken with a number of folk medicinal preparations.
**Tola: Local measure (about 11 gm).
***Rokto-pitto: A local term used for what may be described as hematemesis.

3.2 Plant parts used and mode of preparation

The various plant parts used for medicinal preparations included whole plant, leaves, stems, barks, roots, flowers, fruits, seeds, gum, oil, and rhizomes. Of these, leaves were among the highest frequency used, forming 48.3% of the total uses of whole plant or plant parts. Leaves were followed by fruits (15.9%), barks (10.3%), and roots (8.3%). It was observed that a particular plant part may be used in several ways. For instance juice obtained from leaves of *Justicia aurea* was orally administered for treatment of coughs. On the other hand, leaves of *Aloe vera* were eaten on an empty stomach for treatment of constipation. For treatment of itches, leaves of *Sansevieria roxburghiana* were topically applied, i.e. rubbed on spots having itches. For bone fracture or rheumatic pain, juice obtained from leaves of *Justicia gendarussa* were either orally administered or topically applied to affected areas. Occasionally, a plant part may be mixed with other substances prior to administration. Juice obtained from the leaves of *Justicia aurea* was taken with ginger and black peppers for coughs. The leaves of *Aloe vera* were administered with water and seeds of *Hyptis suaveolens*. The powdered roots of *Bombax ceiba* were mixed with fruits of *Swertia chirata* and a locally prepared crystallized form of sugar (mishri) and taken for treatment of stoppage of urination or debility. The plant sap of *Carica papaya* was taken with molasses and orally taken as treatment for blood with coughs. For topical applications, it was observed that more than one procedure was followed. To promote hair growth or to blacken hair, juice from crushed leaves of *Wedelia chinensis* was applied to bottom of hair. On the other hand, teeth were brushed with flowers of *Spilanthes calva* as remedy for toothache.

3.3 Medical applications

The various ailments for which medicinal plants or plant parts were used included both common ailments like respiratory tract problems (cough, mucus), fever, helminthiasis, debility, skin disorders (itches),

gastrointestinal disorders (dysentery, bloating, indigestion), pain, bleeding from cuts and wounds, animal bites, insomnia, tooth problems as well as some complicated ailments like diabetes, cancer or tumor, cardiovascular problems, hepatic disorders, spleen disorders, and nerve disorders. A single plant was found to be used for treatment of a single ailment or multiple ailments. The leaves of *Justicia aurea* were used to treat coughs. On the other hand the leaves of *Justicia gendarussa* were used for treatment of bone fracture as well as rheumatic pain. The seeds of *Uvaria hamiltonii* were used to treat diverse ailments like gonorrhea and jaundice.

Various parts of the same plant may be used in combination to treat a single ailment or used separately to treat different ailments. The crushed leaves and barks of *Polyalthia longifolia* were administered simultaneously for treatment of coughs and mucus formation. Crushed leaves and barks of the same plant were used topically during skin disorders. On the other hand, the leaf juice of *Catharanthus roseus* was used to treat infections, while root juice from the same plant was administered orally for treatment of hypertension. On a few occasions it was noted that two plants or plant parts were used in combination for treatment of any given ailment. The leaves of *Aloe vera* were taken with seeds of *Hyptis suaveolens* for treatment of constipation, rheumatism, and as a digestive aid. The seeds of *Mangifera indica* were mixed with seeds of *Syzygium jambos* and taken for diabetes. The leaf juice of *Helianthus annus* were mixed with leaf juice of *Swertia chirata* and administered orally as treatment for dysentery or body ache. In only one instance, it was observed that a combination of three plant parts was used. Leaves of *Cajanus cajan, Azadirachta indica* and *Ocimum basilicum* were used together for treatment of fever or for purification of blood. The Kavirajes believe that blood can occasionally get impure through accumulation of toxic components, and which condition can give rise to different ailments. Hence they treat patients with various plant parts to purify the blood and help the blood get rid of any toxic elements present.

4. Discussion

Although traditional medicinal healers have used medicinal plants for treatment of ailments for hundreds of years, there has always been a lingering question in scientific circles as to the efficacy of these plants in really being effective as cures. As a consequence, the pharmacological activity of thousands of medicinal plants has been studied, even though the vast majority of medicinal plants remain to be studied for their phytochemical components and pharmacological effects. A review of the scientific literature of the medicinal plants reported in the present survey shows that a number of plants have been scientifically studied and their traditional medicinal uses have been scientifically validated through these studies. Some of the pertinent literature shall be reviewed in this section.

Justicia adhatoda was found to be used by traditional healers for treatment of respiratory problems. The anti-inflammatory effects of this plant and others, which can prove beneficial in the treatment of inflammatory lung diseases has been reviewed (Sharafkhaneh, A., 2007). The anti-inflammatory activity of alkaloid fraction of the plant has been demonstrated through modified hen's egg chorioallantoic membrane test (Chakraborty, A. and A.H. Brantner, 2001). Antitussive activity of the plant extract has also been reported in studies conducted with mechanically and electrically induced coughing in anesthetized guinea pigs and rabbits and in un-anesthetized guinea pigs (Dhuley, J.N., 1999).

The leaf extract of *Catharanthus roseus* has been demonstrated to possess hypotensive effects in adrenaline-induced hypertensive rats (Ara, N., 2009). Notably, the plant is used by folk medicinal healers of Sylhet division for treatment of hypertension. Extracts of *Ananas comosus* has been found to be effective against exsheathed infective larvae of a gastrointestinal nematode, *Haemonchus contortus* (Hördegen, P., 2006). The leaves of this plant are used for treatment of helminthiasis and stomach ache (which may be a consequence of helminthiasis) by the folk healers.

The leaves of *Momordica charantia* are used by the folk healers for treatment of diabetes. The anti-diabetic and hypoglycemic properties of the plant have been recently reviewed (Leung, L., 2009). The hypoglycemic activity of the plant has been attributed to saponin fraction present in the plant in studies conducted with alloxan-induced hyperglycemic mice (Han, C., 2008). Alcoholic extract of fruits obtained from the plant reportedly decreased blood sugar level in adult healthy albino rats. Feeding of the extract also showed definite improvement in the islets of Langerhans (Singh, N., 2008).

Aqueous and methanolic extracts of *Lawsonia inermis* demonstrated significant potential in scavenging free radicals and in inhibiting lipid peroxidation as well as inhibiting DNA damage caused by exposure of cells to hexavalent chromium (a very strong oxidant). Thus the plant could play a positive effect in amelioration of cancer, which is one of the ailments treated by the folk medicinal healers with this plant. Indeed, a distinct decline in Cr(VI)-induced cytotoxicity has been noticed in MDA-MB-435S (human breast carcinoma) cells with both extracts (Guha, G.,). Lawsone, a naphthoquinone derivative isolated from the plant has been shown to possess cytotoxic activity (Sauriasari, R., 2007). Several compounds have been isolated from the methanolic

extract of leaves of the plant, namely, *p*-coumaric acid, 2-methoxy-3-methyl-1,4-naphthoquinone, apiin, lawsone, apigenin, luteolin, and cosmosiin. All the isolated compounds exhibited anti-oxidant activity, which can have a direct bearing on the treatment of cancer (Mikhaeil, B.R., 2004). The ethyl acetate extract of the plant reportedly demonstrated anti-bacterial activity against both Gram-positive and Gram-negative bacteria (Ali, N.A., 2001), which may have relevance in the folk medicinal use of the plant against fever and burning sensations during urination – all of which could be due to bacterial infections.

Amongst the manifold uses of *Melia azedarach*, one particular treatment by the folk medicinal healers involved treatment for skin diseases. A herbal cream containing methanolic extract of flowers of the plant has been shown to be effective against bacterial skin diseases in children including cellulitis, pustules, and pyogenic infections (Saleem, R., 2008). The plant is also used by the people of Assam, India for treatment of multiple skin afflictions (Saikia, A.P., 2006). The leaves and bark of *Swietenia macrophylla* are used by folk medicinal healers for treatment of diabetes. A hypoglycemic constituent, swietenine has been isolated from hydroalcohol extract of seeds from the plant and its effect has been found comparable to that of human insulin (Maiti, A., 2009). *In vivo* hypoglycemic activity of swietenine has also been confirmed in neonatal-streptozotocin induced type 2 diabetic rats (Dewanjee, S., 2009). The seeds of *Syzygium cumini* have also found use among folk medicinal healers for treatment of diabetes. In support of this scientific findings have indicated that aqueous leaf extract of the plant inhibited adenosine deaminase activity and reduced glucose levels in hyperglycemic patients. The activity of adenosine deaminase was higher in hyperglycemic serum than in normoglycemic serum (Bopp, A., 2009). Aqueous extract of seeds also demonstrated high inhibitory activities against porcine pancreatic a-amylase, suggesting a potential mechanism for anti-diabetic action (Karthic, K., 2008). An extract of seed kernels of this plant was observed *in vitro* to inhibit a-glucosidase from mammalian, bacterial and yeast sources. *In vivo* studies using Goto-Kakizaki rats further indicated that acetone extract of seed kernels was a potent inhibitor of a-glucosidase hydrolysis of maltose, suggesting a further potential mechanism of the seeds of this plant exerting an anti-diabetic effect (Shinde, J., 2008). Ethanol extract of seeds have also been shown to increase body weight and decrease blood sugar level in alloxan-induced diabetic rats (Singh, N. and M. Gupta, 2007).

Taken together, scientific studies conducted on a number of medicinal plants used by the folk medicinal healers of Sylhet division validate their folkloric use. A considerable number of other medicinal plants need to be studied for their potential in obtaining newer drugs from those plants. At the same time, it must be pointed out that indiscriminate collection of these medicinal plants from the wild is fast depleting these natural resources. Serious conservation efforts along with mass cultivation need to be done as soon as possible for preservation of these medicinal plant species. Otherwise, resources will be lost that may never be replaced and with that will be lost the potential for effective and newer drugs.

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