

ORIGINAL ARTICLES

A Survey of Medicinal Plant Usage by Folk Medicinal Practitioners in Seven Villages of Ishwardi Upazilla, Pabna District, Bangladesh

¹Mohammad Mehedi Hasan, ¹Mst. Eashmat Ara Annay, ¹Mariz Sintaha, ¹Himel Nahreen Khaleque, ¹Farjana Akther Noor, ¹Aynun Nahar, ¹Syeda Seraj, ¹Rownak Jahan, ²Majeedul H. Chowdhury, ¹Mohammed Rahmatullah

¹Department of Biotechnology and Genetic Engineering, University of Development Alternative, Dhanmondi, Dhaka, Bangladesh

²Present address: New York City College of Technology The City University of New York 300 Jay Street, Brooklyn, NY 11201, USA.

Mohammad Mehedi Hasan, Mst. Eashmat Ara Annay, Mariz Sintaha, Himel Nahreen Khaleque, Farjana Akther Noor, Aynun Nahar, Syeda Seraj, Rownak Jahan, Majeedul H. Chowdhury, Mohammed Rahmatullah: A Survey of Medicinal Plant Usage by Folk Medicinal Practitioners in Seven Villages of Ishwardi Upazilla, Pabna District, Bangladesh

ABSTRACT

Folk medicinal practitioners (Kavirajes) are the primary health-care providers to substantial segments of the rural population as well as the urban population of Bangladesh. Every village of Bangladesh has at least one practicing Kaviraj. The Kavirajes rely primarily on simple formulations of medicinal plants for treatment of ailments. While overall, simple ailments are treated by the Kavirajes, occasionally complicated ailments, which are hard to cure with allopathic medicine, are also treated by them. In previous ethnomedicinal surveys, we have observed considerable variation in the use of medicinal plants by the Kavirajes of different regions of Bangladesh, which extended to Kavirajes of even the same village or adjoining villages. To get a comprehensive picture of the medicinal plants used by the Kavirajes, it is therefore necessary to conduct surveys of individual villages. The objective of the present study was to conduct a survey among Kavirajes of seven villages in Ishwardi Upazilla (sub-district), which is in Pabna district of Bangladesh. A total of 80 plants distributed into 45 families were observed to be used by the Kavirajes. The Euphorbiaceae and the Lamiaceae family contributed 7 plants per family, followed by the Apocynaceae family with 5 plants, and the Araceae, Asteraceae, Combretaceae, Menispermaceae, and Solanaceae family with 3 plants each. The Kavirajes used both whole plant as well as plant parts for treatment of ailments. Leaves constituted 35.1% of the total uses, followed by roots at 17.5%, and barks and fruits at 11.4% each. Twenty one plants were used for treatment of gastrointestinal disorders like constipation, dysentery, loss of appetite, and acidity. Thirteen plants were used to treat skin disorders like eczema, pimples, and itches, while twelve plants were used for treatment of respiratory tract disorders like asthma, coughs, and colds. The Kavirajes also treated hepatic disorders (e.g. jaundice), sexual disorders, pain, fever, bleeding from cuts and wounds, bone fractures, eye disorders, ear problems, toothache, loss of hair, hemorrhoids, gonorrhoea, infections, physical weakness, helminthiasis, leprosy, vomiting, snake bite, gall bladder stones, burns, chicken pox, malaria, rheumatic fever, diphtheria, anemia, rheumatism, menstrual problems, urinary problems, and physical weakness. Other complicated diseases treated by the Kavirajes, included diabetes, hypertension, heart disorders, tumors, malnutrition of fetus, and leukemia. The medicinal plants used by the Kavirajes can form a rich source of plants for further scientific studies leading to discovery of novel therapeutic compounds.

Key words: Folk medicine, medicinal plants, Ishwardi, Bangladesh

Corresponding Author: Dr. Mohammed Rahmatullah, Pro-Vice Chancellor University of Development Alternative House No. 78, Road No. 11A (new) Dhanmondi R/A, Dhaka-1205 Bangladesh
Email: rahamatm@hotmail.com; Fax: 88-02-8157339

Introduction

Bangladesh has over 150 million people, the majority of which resides in the 86,000 villages spread throughout the country. The villages suffer from lack of modern medicinal facilities, as well as adequate transportation system to allow them to visit modern allopathic doctors in towns and cities, which are also few in the country. Moreover, the villagers suffer from inadequate drinking water and sanitary facilities, which is the cause for occurrence of various diseases like gastrointestinal disorders, skin diseases, respiratory tract infections, and fever. Overall, the rural population depends on the treatment of these ailments together with other complicated ailments on folk medicinal practitioners, otherwise known as Kavirajes. Practically every village in Bangladesh has one or more practicing Kavirajes. Since the Kavirajes reside in the same village with the other villagers, i.e. potential patients, the villagers also feel freer to discuss their ailments with the Kavirajes with whom they have developed social relationships. Moreover, the cost of modern allopathic medicine also deters villagers from seeking allopathic doctors. The fact also remains that folk medicinal practices have been present in Bangladesh from time immemorial, and the villagers have developed a reliance on such practices. That folk medicinal practices have continued for centuries testifies to their efficacy in the treatment of various ailments.

The Kavirajes rely usually on simple formulations of medicinal plants for treatment of even complicated ailments. Each Kaviraj, over time has built up his or her own unique repertoire of medicinal plants. The knowledge of medicinal plants is usually confined to the Kaviraj and is only passed to successive generations of the family or to trainees, who serve the Kaviraj for years or decades towards accumulation of this medicinal knowledge. As such, the medicinal plants used by the Kavirajes can vary widely even within adjoining villages of the country. To get a comprehensive picture of the medicinal plant usages in Bangladesh, it is therefore imperative that surveys be conducted among individual Kavirajes residing in the thousands of villages. Documentation of such knowledge is important for traditional medicinal practices have contributed enormously to development of modern drugs (Gilani and Rahman, 2005).

We have been continuing ethnomedicinal surveys among the Kavirajes of the mainstream population as well as tribal medicinal practitioners for a number of years (Rahmatullah *et al.*, 2009; Hossan, *et al.*, 2009; Hanif, *et al.*, 2009; Nawaz *et al.*, 2009; Rahmatullah *et al.*, 2010; Hossan *et al.*, 2010; Mollik *et al.*, 2010; Rahmatullah *et al.*, 2010). Our surveys, conducted thus far, clearly indicate the considerable variations existing between medicinal plant usages by Kavirajes of different localities. Towards an attempt to survey the Kavirajes of various villages of Bangladesh and thus to obtain a greater understanding of the medicinal plants used and the ailments treated, the objective of the present study was to conduct an ethnomedicinal survey among the Kavirajes of seven villages in Ishwardi Upazilla (sub-district) in Pabna district, Bangladesh.

Material and Methods

The present survey was conducted among eight Kavirajes practicing in seven villages of Ishwardi Upazilla in Pabna district of Bangladesh. Pabna district is in the west-central part of the country, and Ishwardi Upazilla is a major sub-district of Pabna. The various Kavirajes interviewed were Md. Aftabul Islam from Pakshi village, Hamid Mondol from Muladuli village, Md. Kolom Molla from Ramchandrapur village, Moyez Mondol from Dasuria village, Md. Aminul Islam from Boroichora village, Rawshan Ara Khatun from Silimpur village, and Rahela Khatun and Monowara Khatun from Char Mirkamari village. The latter three Kavirajes were female, while the first five were males.

Informed consent was obtained from each Kaviraj prior to the interview. The Kavirajes were explained as to the purpose of the visit and consent obtained for dissemination of the information collected from each Kaviraj. The Kavirajes had no objections to providing the names of plants and the ailments that were used for treatment. Interviews were conducted in the Bengali language, the language being spoken by both Kavirajes and the interviewers. Actual interviews were conducted with the help of a semi-structured questionnaire and the guided field-walk method as described by Martin (1995) and Maundu (1995). In this method, the Kavirajes took the interviewers on day-time field walks through the areas from where they collected the medicinal plants, pointed out the plants and mentioned the local names of the plants along with describing their uses. All information was cross-checked with the Kavirajes in later evening sessions. Plant specimens were collected and dried in the field and later brought back to Dhaka for complete identification at the Bangladesh National Herbarium.

Results and Discussion

A total of 80 plants distributed into 45 families were observed to be used by the 8 Kavirajes of the 7

villages surveyed. The Euphorbiaceae and the Lamiaceae family contributed 7 plants per family. Five plants were from the Apocynaceae family, while 3 plants each were from the Araceae, Asteraceae, Combretaceae, Menispermaceae, and Solanaceae families. The results are summarized in Table 1. Six plant species were noted to be used by the Kavirajes in the present survey area, which were not used in other areas of Bangladesh surveyed by us thus far. These plant species were *Pergularia extensa*, *Capparis spinosa*, *Leucas lavandulifolia*, *Premna corymbosa*, *Hiptage benghalensis*, and *Solanum erianthum*.

The various plant parts used in their formulations by the Kavirajes included whole plant, leaves, stems, roots, barks, flowers, fruits, seeds, tubers, and gum. Leaves constituted the major plant part used, contributing to 35.1% of the total uses. Roots constituted 17.5% of total uses, followed by barks and fruits at 11.4% each. The results are shown in Table 2.

The Kavirajes of the present survey areas did not use any combination of plants in their treatment. A single plant was used for treatment of one or multiple ailments. For instance, *Achyranthes aspera* was used to treat a single ailment, namely, eczema, while *Adhatoda vasica* was used for treatment of two diverse types of ailments like chronic asthma and leprosy. A combination of plant parts from the same plant was observed to be occasionally used by the Kavirajes for treatment of a single ailment. To cite just one instance, the roots and fruits of *Citrullus colocynthis* were used in combination for treatment of irritation in soles of feet or palms of hands.

A number of the plants used by the Kavirajes were not wild plants, but systematically cultivated by the villagers around homesteads or in the fields for personal consumption or commercial values. These plants included *Carissa carandas*, *Alocasia macrorrhizos*, *Amorphophalus campanulatus*, *Typhonium trilobatum*, *Terminalia belerica*, *Terminalia chebula*, *Phyllanthus emblica*, *Ficus racemosa*, *Syzygium cumini*, *Averrhoa carambola*, and *Centella asiatica*. Among the above plants, *Alocasia macrorrhizos*, *Amorphophalus campanulatus*, *Typhonium trilobatum*, and *Centella asiatica* were cultivated and consumed as vegetables; the above-mentioned other plants were cultivated for their consumable fruits.

Gastrointestinal disorders like constipation, dysentery, loss of appetite, and acidity were the major complaint treated by the Kavirajes and a total of 21 plants were used for that purpose. Thirteen plants were used for treatment of skin disorders (eczema, pimples, itches), and 12 plants were used for treatment of respiratory tract disorders (asthma, coughs, colds). Eleven plants were used for treatment of various types of pain, the most common being headache. With the exception of a few ailments, the Kavirajes mostly treated common problems like bleeding from cuts and wounds, burns, menstrual disorders, fever, infections, urinary problems, bone fractures, loss of hair, helminthiasis, hepatic disorders like jaundice, earache, toothache, chicken pox, and anemia. However, the Kavirajes also had treatment for several hard to cure or incurable diseases with modern medicines. Such diseases included malaria, heart disorders, rheumatism, hypertension, leukemia, and tumors. Interestingly, the Kavirajes also treated what they claimed as malnutrition of fetus. Notably, the Kavirajes had their own internal methodology for diagnosis of such diseases (which was not disclosed), since they do not use any modern clinical diagnostic procedures (X-rays, blood tests) in their diagnosis.

The use of several plants by the Kavirajes for the ailments that are being treated with those plants has been validated through modern scientific research. For instance *Adhatoda vasica* was observed to be used by the Kavirajes for chronic asthma. A bronchodilator alkaloid, vasicinone, has been reported from the plant (Amin and Mehta, 1959). *Terminalia arjuna* was used by the Kavirajes for treatment of heart disorders. Reported cardioprotective and other beneficial effects of the plant on heart disorders include protective effects of plant bark against Doxorubicin-induced cardiotoxicity (Singh *et al.*, 2008); significant inotropic and hypotensive effect of bark, also increased coronary artery flow and protection of myocardium against ischemic damage, reviewed by Dwivedi (2007); protection of rabbit heart by bark against ischemic-reperfusion injury (Gauthaman *et al.*, 2005); cardioprotective effect of alcoholic extract of bark in an *in vivo* model of myocardial ischemic-reperfusion injury (Karthikeyan *et al.*, 2003); efficacy of the plant in chronic stable angina (Dwivedi and Gupta, 2002; Bharani *et al.*, 2002); beneficial effects of bark of the plant in isolated ischemic-reperfused rat heart (Gauthaman *et al.*, 2001); beneficial effects in coronary artery disease (significant reductions in angular frequency) (Dwivedi and Jauhari, 1997).

Catharanthus roseus was used by the Kavirajes for treatment of diabetes and leukemia. A petroleum ether fraction of the plant has been reported to reduce blood sugar levels in glucose-induced hyperglycemic rats (Islam *et al.*, 2009). Other reported anti-diabetic effects include hypoglycemic effect in normal and streptozotocin-induced diabetic rats (Ahmed *et al.*, 2007), reduction of blood glucose level in alloxan diabetic rabbits (Nammi *et al.*, 2003), and hypoglycemic activity in streptozotocin diabetic rats (Singh *et al.*, 2001). The plant is also known to contain alkaloids, which are useful in the treatment of a variety of cancers (Noble, R.L., 1990).

Syzygium cumini was also another plant observed to be used by the Kavirajes against diabetes. Reported anti-diabetic activities of the plant include: anti-hyperglycemic, anti-hyperlipidemic and anti-oxidant effects for

a polyherbal formulation, Dihar containing extract of the plant in streptozotocin diabetic rats (Patel *et al.*, 2009); inhibition of adenosine deaminase activity and reduction of glucose levels in hyperglycemic patients by aqueous extract of leaves (Bopp *et al.*, 2009); anti-oxidant activity for leaf extracts (Ruan *et al.*, 2008); therapeutic effect of ferulic acid isolated from an ethereal fraction of ethanolic extract of seeds against streptozotocin diabetic male rats (Mandal *et al.*, 2008); α -glucosidase inhibitory activity for seed kernel *in vitro* and in Goto-Kakizaki rats (Shinde *et al.*, 2008); decrease of blood sugar on administration of ethanolic extract of seeds in alloxan diabetic albino rats (Singh and Gupta, 2007); anti-hyperglycemic effect for dried bark when administered to mice (Villaseñor and Lamadrid, 2006); high phenolic content and anti-oxidant activity in seeds (Bajpai *et al.*, 2005); hypoglycemic effects found with defatted seeds and water soluble fiber from seeds in alloxan diabetic rats (Pandey and Khan, 2002); reduction of tissue damage in diabetic rat brain for aqueous and alcoholic extract of seeds (Stanely Mainzen Prince, *et al.*, 2003).

Table 1: Medicinal plants used by the Kavirajes of the seven villages surveyed in Ishwardi Upazilla of Pabna district, Bangladesh for treatment of various ailments.

Serial Number	Scientific Name	Family Name	Local Name	Part utilized	Ailment/Symptoms treated
1	<i>Adhatoda vasica</i> Nees	Acanthaceae	Bashok	Leaf, bark	Chronic asthma, leprosy.
2	<i>Justicia paniculata</i> Burm.f.	Acanthaceae	Kalomegh	Leaf	Jaundice, malaria, helminthiasis.
3	<i>Aloe vera</i> (L.) Burm.f.	Aloaceae	Ghee kanchon	Leaf	Strong headache.
4	<i>Achyranthes aspera</i> L.	Amaranthaceae	Apang	Whole plant	Eczema.
5	<i>Curculigo orchoides</i> Gaertn.	Amaryllidaceae	Talmuli	Root	Diabetes, gonorrhoea, sexual weakness.
6	<i>Polyalthia longifolia</i> (Sonn.) Thwaites (PL)	Annonaceae	Debdaru	Bark	Fever, infections (used as an antiseptic).
7	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Satim	Bark, root	Fever, pimple, coughs, anti-bilious.
8	<i>Carissa carandas</i> L.	Apocynaceae	Koromcha	Fruit	Diabetes.
9	<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Noyon tara	Leaf	Diabetes, leukemia, helminthiasis.
10	<i>Rauwolfia serpentina</i> (L.) Benth.ex Kurz	Apocynaceae	Choto chada	Root	Pimple, hypertension, snake bite.
11	<i>Thevetia peruviana</i> (Pers.) K. Schum.	Apocynaceae	Holud korobi	Bark, seed	Continuous vomiting.
12	<i>Alocasia macrorrhizos</i> (L.) G. Don.	Araceae	Mankochu	Whole plant	Joint pain, swelling of legs or hands.
13	<i>Amorphophallus campanulatus</i> Blume	Araceae	Oi	Tuber	Constipation.
14	<i>Typhonium trilobatum</i> (L.) Schott	Araceae	Khanman	Leaf with stem	Dysentery, blood purifier.
15	<i>Aristolochia indica</i> L.	Aristolochiaceae	Ishir mul	Root	Itches.
16	<i>Calotropis gigantea</i> (L.) Ait.f.	Asclepiadaceae	Akondo	Leaf, gum	Asthma, coughs, eczema.
17	<i>Pergularia extensa</i> (Jacq.) N.E. Br.	Asclepiadaceae	Azoshringi	Leaf	Rheumatism, infantile diarrhea, menstruation problems, parturition problems.
18	<i>Chromolaena odorata</i> (L.) R. M. King & H. Rob.	Asteraceae	Motmotir gach	Leaf	Bleeding from cuts and wounds.
19	<i>Erydra fluctuans</i> Lour.	Asteraceae	Helencha	Leaf	Physical weakness, vision problems.
20	<i>Vernonia cinerea</i> (L.) Less.	Asteraceae	Shohodebi	Whole plant	Pain, to increase eye vision, bleeding from eyes, eczema, hemorrhoids.
21	<i>Oroxylum indicum</i> (L.) Vent.	Bignoniaceae	Shona sal	Bark	Heart disorders, loss of appetite.
22	<i>Bombax ceiba</i> L.	Bombacaceae	Shimul	Bark, root, flower	Pimple, spermatorrhea.
23	<i>Capparis spinosa</i> L.	Capparaceae	Kalu kata	Leaf	Lesions.
24	<i>Cleome sp.</i>	Cleomaceae	Shultir gach	Leaf	Headache.
25	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Bark	Heart disease, bone fracture.
26	<i>Terminalia belerica</i> (Gaertn.) Roxb.	Combretaceae	Bohera	Fruit	Helminthiasis, loss of hair.
27	<i>Terminalia chebula</i> Retz.	Combretaceae	Horitoki	Fruit	Constipation, vomiting.
28	<i>Commelina benghalensis</i> L.	Commelinaceae	Chacla	Whole plant	Headache.
29	<i>Costus speciosus</i> (J. König.) Sm.	Costaceae	Keow	Root	Fever, helminthiasis, asthma.
30	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	Pathorkuchi	Leaf	Diarrhea, bleeding from cuts and wounds, gall bladder stones.
31	<i>Citrullus colocynthis</i> (L.) Schrad.	Cucurbitaceae	Makal	Root, fruit	Irritation in sole of foot or palm of hand.
32	<i>Coccinia grandis</i> (L.) J. Voigt	Cucurbitaceae	Telakuch	Leaf	Dysentery, burns.
33	<i>Cyperus rotundus</i> L.	Cyperaceae	Mutha, Bada	Whole plant (but mainly root is used)	Lesions, sexual weakness, diarrhea, vomiting.
34	<i>Acalypha indica</i> L.	Euphorbiaceae	Mukta jhuri	Leaf	Earache, constipation in children.

Table 1: Continue

35	<i>Euphorbia hirta</i> L.	Euphorbiaceae	Acholer gach	Root	Blotches on skin.
36	<i>Jatropha curcas</i> L.	Euphorbiaceae	Jamal guta	Gum	Bleeding from cuts and wounds, lesions.
37	<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Amloki	Fruit	Loss of hair, irritation during urination.
38	<i>Phyllanthus reticulatus</i> Poir.	Euphorbiaceae	Panishitki	Leaf	Chicken pox, swelling of hands or legs.
39	<i>Ricinus communis</i> L.	Euphorbiaceae	Venna	Leaf, seed	Headache, joint pain, rheumatic fever.
40	<i>Tragia involucrata</i> L.	Euphorbiaceae	Berela	Root	Cold.
41	<i>Desmodium gangeticum</i> (L.) DC.	Fabaceae	Shalpani	Whole plant	Weakness, lesions, diphtheria, diarrhea.
42	<i>Erythrina variegata</i> L.	Fabaceae	Madar	Leaf	Fever, cold, asthma.
43	<i>Clerodendrum indicum</i> (L.) Kuntze	Lamiaceae	Bamon hati	Leaf	Jaundice.
44	<i>Clerodendrum viscosum</i> Vent.	Lamiaceae	Vite	Leaf	Skin diseases, sexual weakness.
45	<i>Gmelina arborea</i> Roxb.	Lamiaceae	Gamari	Fruit	Malnutrition of fetus, blood dysentery.
46	<i>Leucas lavandulifolia</i> Sm.	Lamiaceae	Dur kolosh	Leaf	Jaundice.
47	<i>Ocimum basilicum</i> L.	Lamiaceae	Babui tulshi	Mainly leaf, seed (occasionally)	Jaundice, skin diseases, hearing problems.
48	<i>Ocimum sanctum</i> L.	Lamiaceae	Kalo tulshi	Mainly leaf, occasionally seed	Cold, skin disease, toothache.
49	<i>Premna corymbosa</i> (Burman f.) Rottler & Willdenow	Lamiaceae	Gunirer gach	Root	Excessive menstruation.
50	<i>Leea macrophylla</i> Roxb.	Leeaceae	Hosti korno	Leaf, root polash	Sexual weakness, tumor.
51	<i>Asparagus racemosus</i> Willd.	Liliaceae	Shotomul	Root	Hypertension, to increase lactation in mother.
52	<i>Crinum asiaticum</i> L.	Liliaceae	Go-roshun	Tuber	Rheumatic fever.
53	<i>Lawsonia inermis</i> L.	Lythraceae	Mendi	Leaf, bark	Anti-dandruff, antiseptic, burns.
54	<i>Michelia champaca</i> L.	Magnoliaceae	Chapa	Bark, fruit	Chronic headache, abnormal absence of menstruation.
55	<i>Hiptage benghalensis</i> (L.) Kurz.	Malphiaceae	Madhobi lota	Flower, root	Diabetes, cold.
56	<i>Sida cordifolia</i> L.	Malvaceae	Berela	Root	Rheumatic fever.
57	<i>Aphanamixis polystachya</i> (Wall.) R. Parker	Meliaceae	Pittoraj	Bark	Spleen and liver diseases, rheumatism.
58	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Leaf	Antiseptic, skin diseases, helminthiasis, pimples, acidity, blood purifier.
59	<i>Cocculus hirsutus</i> L. Diels	Menispermaceae	Doiraj	Leaf, stem	Strong headache.
60	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Patha	Leaf, root	Dysentery.
61	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thoms.	Menispermaceae	Guloncho	Leaf, stem	Chronic fever.
62	<i>Artocarpus lakoocha</i> Roxb.	Moraceae	Bon kathal	Fruit	Constipation, loss of appetite.
63	<i>Ficus racemosa</i> L.	Moraceae	Dumur	Leaf, root, bark, fruit	Pimples, eczema, bleeding due to external cuts or wounds, burning sensations during urination.
64	<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Jaam	Fruit, seed	Diabetes.
65	<i>Boerhaavia diffusa</i> L.	Nyctaginaceae	Punornova	Leaf, root	Jaundice, dysentery, anemia, blood purifier, stomach pain.
66	<i>Averrhoa carambola</i> L.	Oxalidaceae	Kamranga	Leaf, fruit	Bone fracture, jaundice, bleeding from hemorrhoids.
67	<i>Piper cubeba</i> L.f.	Piperaceae	Pipul	Whole plant	Cold.
68	<i>Piper longum</i> L.	Piperaceae	Pipulti	Bark, fruit	Uncontrolled bleeding during menstruation, colds, coughs, fever, hemorrhoids.
69	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Cham ghas	Whole plant	Dysentery.
70	<i>Paederia foetida</i> L.	Rubiaceae	Gondho vaduli	Leaf	Internal lesions, stomach problems, to recuperate from illness.
71	<i>Glycosmis pentaphylla</i> (Retz.) Corr.	Rutaceae	Hamjhum	Leaf, stem	Toothache, bleeding.
72	<i>Murraya koenigii</i> (L.) Spreng	Rutaceae	Rashik mal	Leaf, stem, root	Dysentery, swelling of leg.
73	<i>Madhuca indica</i> J.F. Gmel.	Sapotaceae	Mohua	Flower, fruit, seed	Joint pain, headache.
74	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Chini gura	Leaf	Gastric ulcer, anemia.
75	<i>Datura metel</i> L.	Solanaceae	Kalo dhutura	Leaf	Joint pain.
76	<i>Physalis micrantha</i> Link	Solanaceae	Kopal futi	Leaf	Constipation, stomach problems.
77	<i>Solanum erianthum</i> D. Don	Solanaceae	Arshali	Bark	Cold, asthma.
78	<i>Abroma augusta</i> L.f.	Sterculiaceae	Ulot kombol	Leaf, young stem, root	Gonorrhoea, sexual weakness.
79	<i>Centella asiatica</i> (L.) Urb.	Umbelliferae	Thankuni	Whole plant, leaf	Cold, dysentery, blood purifier.
80	<i>Nyctanthes arbor tristis</i> L.	Verbenaceae	Shefali	Leaf	Allergy, joint pain.

Table 2: Percent use of various plant parts by Kavirajes of the seven villages surveyed in Ishwardi Upazilla, Pabna district, Bangladesh.

Plant part	Percent use
Whole plant	7.9
Leaf	35.1
Stem	5.3
Bark	11.4
Flower	2.6
Fruit	11.4
Seed	5.3
Root	17.5
Gum	1.8
Tuber	1.8

Overall, the scientific reports when available as to the plants used by the Kavirajes of the present survey area have validated the traditional uses of these plants. It is reasonable to expect that since the medicinal plants have a long history of usage by the Kavirajes, they will also be validated in their traditional uses when the relevant scientific experiments on their pharmacological activities are performed. The plants, as such, can potentially be valuable sources of newer and more efficacious drugs.

References

- Ahmed, A.U., A.H. Ferdous, S.K. Saha, S. Nahar, M.A. Awal and F. Parvin, 2007. Hypoglycemic effect of *Catharanthus roseus* in normal and streptozotocin-induced diabetic rats. *Mymensingh Medical Journal*, 16: 143-148.
- Amin, A.H. and D.R. Mehta, 1959. A bronchodilator alkaloid (vasicinone) from *Adhatoda vasica* Nees. *Nature*, 184(Suppl 17): 1317.
- Bajpai, M., A. Pande, S.K. Tewari and D. Prakash, 2005. Phenolic contents and antioxidant activity of some food and medicinal plants. *International Journal of Food Sciences and Nutrition*, 56: 287-291.
- Bharani, A., A. Ganguli, L.K. Mathur, Y. Jamra and P.G. Raman, 2002. Efficacy of *Terminalia arjuna* in chronic stable angina: a double-blind, placebo-controlled, crossover study comparing *Terminalia arjuna* with isosorbide mononitrate. *Indian Heart Journal*, 54: 170-175.
- Bopp, A., K.S. De Bona, L.P. Bellé, R.N. Moresco and M.B. Moretto, 2009. *Syzygium cumini* inhibits adenosine deaminase activity and reduces glucose levels in hyperglycemic patients. *Fundamental & Clinical Pharmacology*, 23: 501-507.
- Dwivedi, S. and R. Jauhari, 1997. Beneficial effects of *Terminalia arjuna* in coronary artery disease. *Indian Heart Journal*, 49: 507-510.
- Dwivedi, S., 2007. *Terminalia arjuna* Wight & Arn. – a useful drug for cardiovascular disorders. *Journal of Ethnopharmacology*, 114: 114-129.
- Dwivedi, S. and D. Gupta, 2002. Efficacy of *Terminalia arjuna* in chronic stable angina. *Indian Heart Journal*, 54: 441.
- Gilani, A.H. and A.U. Rahman, 2005. Trends in ethnopharmacology. *Journal of Ethnopharmacology*, 100: 43-49.
- Gauthaman, K., S.K. Banerjee, A.K. Dinda, C.C. Ghosh and S.K. Maulik, 2005. *Terminalia arjuna* (Roxb.) protects rabbit heart against ischemic-reperfusion injury: role of antioxidant enzymes and heat shock protein. *Journal of Ethnopharmacology*, 96: 403-409.
- Gauthaman, K., M. Maulik, R. Kumari, S.C. Manchanda, A.K. Dinda and S.K. Maulik 2001. Effect of chronic treatment with bark of *Terminalia arjuna*: a study on the isolated ischemic-reperfused rat heart. *Journal of Ethnopharmacology*, 75: 197-201.
- Hanif, A., M.S. Hossan, M.M.K. Mia, M.J. Islam, R. Jahan and M. Rahmatullah, 2009. Ethnobotanical survey of the Rakhain tribe inhabiting the Chittagong Hill Tracts region of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(2): 172-180.
- Hossan, Md. Shahadat, A. Hanif, M. Khan, S. Bari, R. Jahan and M. Rahmatullah, 2009. Ethnobotanical survey of the Tripura tribe of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3(2): 253-261.
- Hossan, M.S., A. Hanif, B. Agarwala, M.S. Sarwar, M. Karim, M.T. Rahman, R. Jahan and Rahmatullah, M., 2010. Traditional use of medicinal plants in Bangladesh to treat urinary tract infections and sexually transmitted diseases. *Ethnobotany Research and Applications*, 8: 61-74.
- Karthikeyan, K., B.R. Bai, K. Gauthaman, K.S. Sathish and S.N. Devaraj, 2003. cardioprotective effect of the alcoholic extract of *Terminalia arjuna* bark in an *in vivo* model of myocardial ischemic reperfusion injury. *Life Sciences*, 73: 2727-2739.

- Islam, M.A., M.A. Akhtar, M.R. Khan, M.S. Hossain, A.H. Alam, M.I. Ibne-Wahed, M.S. Amran, B.M. Rahman and M. Ahmed, 2009. Oral glucose tolerance test (OGTT) in normal control and glucose induced hyperglycemic rats with *Coccinia cordifolia* L. and *Catharanthus roseus* L. Pakistan Journal of Pharmaceutical Sciences, 22: 402-404.
- Martin, G.J., 1995. Ethnobotany: a 'People and Plants' Conservation Manual, Chapman and Hall, London, pp: 268.
- Maundu, P., 1995. Methodology for collecting and sharing indigenous knowledge: a case study. Indigenous Knowledge and Development Monitor, 3: 3-5.
- Mandal, S., B. Barik, C. Mallick, D. De and D. Ghosh, 2008. Therapeutic effect of ferulic acid, an ethereal fraction of ethanolic extract of seed of *Syzygium cumini* against streptozotocin-induced diabetes in male rat. Methods and Findings in Experimental and Clinical Pharmacology, 30: 121-128.
- Mollik, M.A.H., M.S. Hossain, A.K. Paul, M.T. Rahman, R. Jahan and M. Rahmatullah, 2010. A comparative analysis of medicinal plants used by folk medicinal healers in three districts of Bangladesh and inquiry as to mode of selection of medicinal plants. Ethnobotany Research and Applications, 8: 195-218.
- Nammi, S., M.K. Boini, S.D. Lodagala and R.B. Behara, 2003. The juice of fresh leaves of *Catharanthus roseus* Linn. reduces blood glucose in normal and alloxan diabetic rabbits. BMC Complementary and Alternative Medicine, pp: 4.
- Nawaz, A.H.M.M., M. Hossain, M. Karim, M. Khan, R. Jahan and M. Rahmatullah, 2009. An ethnobotanical survey of Rajshahi district in Rajshahi division, Bangladesh. American Eurasian Journal of Sustainable Agriculture, 3(2): 143-150.
- Noble, R.L., 1990. The discovery of the vinca alkaloids – chemotherapeutic agents against cancer. Biochemistry and Cell Biology, 68: 1344-1351.
- Patel, S.S., R.S. Shah and R.K. Goyal, 2009. Antihyperglycemic, antihyperlipidemic and antioxidant effects of Dihar, a polyherbal ayurvedic formulation in streptozotocin induced diabetic rats. Indian Journal of Experimental Biology, 47: 564-570.
- Pandey, M. and A. Khan, 2002. Hypoglycaemic effect of defatted seeds and water soluble fibre from the seeds of *Syzygium cumini* (Linn.) Skeels in alloxan diabetic rats. Indian Journal of Experimental Biology, 40: 1178-1182.
- Rahmatullah, M., I.J. Mukti, A.K.M.F. Haque, M.A.H. Mollik, K. Parvin, R. Jahan, M.H. Chowdhury and T. Rahman, 2009. An Ethnobotanical Survey and Pharmacological Evaluation of Medicinal Plants used by the Garo Tribal Community living in Netrakona district, Bangladesh. Advances in Natural and Applied Sciences, 3(3): 402-418.
- Rahmatullah, M., M.A.H. Mollik, A.T.M.A. Azam, M.R. Islam, M.A.M. Chowdhury, R. Jahan, M.H. Chowdhury and T. Rahman, 2009. Ethnobotanical Survey of the Santal tribe residing in Thakurgaon District, Bangladesh. American Eurasian Journal of Sustainable Agriculture, 3(4): 889-898.
- Rahmatullah, M., A.K. Das, M.A.H. Mollik, R. Jahan, M. Khan, T. Rahman and M.H. Chowdhury, 2009. An Ethnomedicinal Survey of Dhamrai Sub-district in Dhaka District, Bangladesh. American Eurasian Journal of Sustainable Agriculture, 3(4): 881-888.
- Rahmatullah, M., A. Noman, M.S. Hossain, M.H. Rashid, T. Rahman, M.H. Chowdhury and R. Jahan, 2009. A survey of medicinal plants in two areas of Dinajpur district, Bangladesh including plants which can be used as functional foods. American Eurasian Journal of Sustainable Agriculture, 3(4): 862-876.
- Rahmatullah, M., D. Ferdousi, M.A.H. Mollik, M.N.K. Azam, M.T. Rahman and R. Jahan, 2009. Ethnomedicinal Survey of Bheramara Area in Kushtia District, Bangladesh. American Eurasian Journal of Sustainable Agriculture, 3(3): 534-541.
- Rahmatullah, M., D. Ferdousi, M.A.H. Mollik, R. Jahan, M.H. Chowdhury and W.M. Haque, 2010. A Survey of Medicinal Plants used by Kavirajes of Chalna area, Khulna District, Bangladesh. African Journal of Traditional, Complementary and Alternative Medicines, 7(2): 91-97.
- Rahmatullah, M., M.A.H. Mollik, M.S. Rahman, M.N. Hasan, B. Agarwala and R. Jahan, 2010. A Medicinal Plant Study of the Santal tribe in Rangpur District, Bangladesh. Journal of Alternative and Complementary Medicine, 16(4): 419-425.
- Ruan, Z.P., L.L. Zhang and Y.M. Lin, 2008. Evaluation of the antioxidant activity of *Syzygium cumini* leaves. Molecules, 13: 2545-2556.
- Singh, G., A.T. Singh, A. Abraham, B. Bhat, A. Mukherjee, R. Verma, S.K. Agarwal, S. Jha, R. Mukherjee and A.C. Burman, 2008. Protective effects of *Terminalia arjuna* against Doxorubicin-induced cardiotoxicity. Journal of Ethnopharmacology, 117: 123-129.
- Singh, S.N., P. Vats, S. Suri, R. Shyam, M.M. Kumria, S. Ranganathan and K. Sridharan, 2001. Effect of an antidiabetic extract of *catharanthus roseus* on enzymic activities in streptozotocin induced diabetic rats. Journal of Ethnopharmacology, 76: 269-277.

- Shinde, J., T. Taldone, M. Barletta, N. Kunaparaju, B. Hu, S. Kumar, J. Placido and S.W. Zito, 2008. α -Glucosidase inhibitory activity of *Syzygium cumini* (Linn.) Skeels seed kernel *in vitro* and in Goto-Kakizaki (GK) rats. *Carbohydrate Research*, 343: 1278-1281.
- Singh, N. and M. Gupta, 2007. Effects of ethanolic extract of *Syzygium cumini* (Linn) seed powder on pancreatic islets of alloxan diabetic rats. *Indian Journal of Experimental Biology*, 45: 861-867.
- Stanely Mainzen Prince, P., N. Kamalakkannan and V.P. Menon, 2003. *Syzygium cumini* seed extracts reduce tissue damage in diabetic rat brain. *Journal of Ethnopharmacology*, 84: 205-209.
- Villaseñor, I.M. and M.R. Lamadrid, 2006. Comparative anti-hyperglycemic potentials of medicinal plants. *Journal of Ethnopharmacology*, 104: 129-131.