

## ORIGINAL ARTICLES

### A Survey on Medicinal Plants Used by the Folk Medicinal Practitioners in Three Villages of Panchagarh and Thakurgaon District, Bangladesh

<sup>1</sup>Mohammed Rahmatullah, <sup>1</sup>Md. Ehasanul Hasan, <sup>1</sup>Md. Ariful Islam, <sup>1</sup>Md. Tabibul Islam, <sup>1</sup>Farhana Israt Jahan, <sup>1</sup>Syeda Seraj, <sup>1</sup>Anita Rani Chowdhury, <sup>1</sup>Farhana Jamal, <sup>1</sup>Md. Saiful Islam, <sup>1</sup>Z.U.M. Emdad Ullah Miajee, <sup>1</sup>Rownak Jahan, <sup>2</sup>Majeedul H. Chowdhury

<sup>1</sup>Faculty of Life Sciences, University of Development Alternative, Dhanmondi, Dhaka-1205, Bangladesh.

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

Mohammed Rahmatullah, Md. Ehasanul Hasan, Md. Ariful Islam, Md. Tabibul Islam, Farhana Israt Jahan, Syeda Seraj, Anita Rani Chowdhury, Farhana Jamal, Md. Saiful Islam, Z.U.M. Emdad Ullah Miajee, Rownak Jahan, Majeedul H. Chowdhury: A Survey on Medicinal Plants Used by the Folk Medicinal Practitioners in Three Villages of Panchagarh and Thakurgaon District, Bangladesh

---

#### ABSTRACT

Folk medicinal practitioners, otherwise known as Kavirajes form the first tier of primary health-care providers to a substantial segment of the rural and urban population of Bangladesh. The Kavirajes rely mostly on administration of plants or plant parts for treatment of various ailments. Previous surveys have indicated that the medicinal plants used by the Kavirajes can vary considerably from one Kaviraj to another. The objective of the present study was to conduct a survey among the Kavirajes of three villages in Panchagarh and Thakurgaon districts, Bangladesh to find out about the medicinal plants used by them for treatment of different ailments. The survey was conducted with the help of a semi-structured questionnaire and the guided field-walk method. It was observed that the Kavirajes used a total of 75 plants distributed into 45 families in their treatment of patients. Fabaceae family contributed 8 plants, followed by the Euphorbiaceae family with 5 plants. The Zingiberaceae family contributed 4 plants, while the Acanthaceae, Apocynaceae, and Combretaceae families contributed 3 plants each. Leaves constituted the major plant part used (37.8% of total uses), followed by fruits at 18.9%. Meho (local term used by the Kavirajes to describe urinary problem arising out from endocrinological disorder or diabetes) was the major ailment treated by the Kavirajes. 16 plants were used for treatment of meho. 12 plants were used for treatment of pain, and 7 plants each were used for the treatment of sexual disorders (loss of libido, infertility), skin disorders, and sexually transmitted diseases. Other ailments treated included fever, wasting away of body, burns, dizziness, jaundice gastrointestinal disorders, diabetes, cuts and wounds, heart disorders, debility, bone fractures, kidney problems, puerperal fever, asthma, piles, paralysis, hypertension, insanity, and menstrual problems. Taken together, the medicinal plants used by the Kavirajes of these three villages possess enormous potential for scientific studies to be conducted towards discovery of novel drugs and lead compounds.

**Key words:** Medicinal plants, Panchagarh, Thakurgaon, Kavirajes, Bangladesh

---

#### Introduction

Bangladesh is a developing country. The majority of the population lives in rural areas and do not use modern health care facilities because of inadequate road transport, lack of allopathic doctors and absence of hospitals or clinics, non-affordability to buy modern medicines, and age-old dependency on folk medicinal practitioners, who are locally known as Kavirajes. The Kavirajes depend primarily on medicinal plants for

---

**Corresponding Author:** Dr. Mohammed Rahmatullah, Faculty of Life Sciences University of Development  
Alternative House No. 78, Road No. 11A (new) Dhanmondi, Dhaka-1205  
Bangladesh Telephone: +88-01715032621 ;Fax: +88-02-815739  
Email: rahamatm@hotmail.com

treatment of various ailments. The knowledge attained by a Kaviraj is usually kept within the family and passed on from generation to generation. Over the centuries, the Kavirajes thus have attained considerable expertise on the use of medicinal plants for treatment of a diverse variety of ailments. Bangladesh has over 86,000 villages and each village has one or more practicing Kavirajes. Kavirajes also practice in the urban areas including the capital city of Dhaka, where too they have a substantial clientele.

We had been conducting ethnomedicinal surveys among the Kavirajes of various areas and tribes of Bangladesh for the last three years. Any comprehensive knowledge of folk medicinal plants are noticeably absent in Bangladesh. Yet such knowledge is important, because Bangladesh has over 5,000 floral species – a considerable number of which are used by the Kavirajes. Towards fulfillment of this gap in our ethnomedicinal knowledge of local use of plants, surveys have been conducted in various villages and among various tribes, which has indicated that the different Kavirajes of different villages in most cases do not use similar plants or combination of plants for treatment of any specific ailment (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). Since modern medicine has been found lacking in a number of aspects like side-effects, development of resistance and high prices, the empirical knowledge of the Kavirajes can go a long way towards development of newer and more efficacious drugs. In this aspect it can also be pointed out that about 64% of the total global population reportedly remains dependent on traditional medicine and medicinal plants for provision of their health-care needs Cotton, C.M., (1996). The objective of this present study was to conduct an ethnomedicinal survey among the Kavirajes of three villages in Panchagarh and Thakurgaon districts, which are two of the northernmost districts in Bangladesh.

## Materials and Methods

A preliminary tour of the survey villages indicated that there was one practicing Kaviraj in each of the villages. The villages were Laxmipur in Panchagarh district, and Dakkhin Uatti Para and Sen Para in Thakurgaon district. The names of the Kavirajes were Md. Aftabur Rahman Chanchal, Md. Dabirul Islam, and Sri Lalit Chandra Roy. Informed consent was obtained from the Kavirajes prior to the survey. The Kavirajes were explained as to the information that we wanted, the purpose for obtaining this information, and told that the survey results may be disseminated both nationally and internationally. The Kavirajes had no objections to further dissemination of the information that they provided us with.

The actual survey was conducted with the help of a semi-structured questionnaire and the guided field-walk method of Martin (1995) and Maundu (1995). In this method, the Kavirajes took the interviewers during daytime to places from where they usually collected their medicinal plants, pointed out the plants, mentioned their local names, and described their uses. Interviews were conducted in the Bangla language, which was spoken by both Kavirajes and interviewers. All information was cross-checked with the Kavirajes during evening sessions. Plant specimens were collected and dried in the field. Plants were identified by Mr. Manjurul-Kadir Mia, ex-Curator and Principal Scientific Officer of Bangladesh National Herbarium at Dhaka.

## Results and Discussion

The three Kavirajes of Panchagarh and Thakurgaon districts used a total of 75 plants distributed into 45 families for treatment of various ailments. The Fabaceae family appeared to be the most important family and contributed 8 plants, followed by the Euphorbiaceae family with 5 plants. The Zingiberaceae family contributed 4 plants, while the Acanthaceae, Apocynaceae, and Combretaceae families contributed 3 plants each. The results are summarized in Table 1.

Surprisingly, the Kavirajes of all three villages surveyed did not use whole plant in their formulations. Leaves constituted the main plant part used (37.8% of total uses), followed by fruits (18.9%). Roots constituted 11.1% of total uses. The results are shown in Table 2.

The Kavirajes used both simple and complex formulations in their treatment. For instance, the crushed leaves of *Aloe vera* were simply applied to the frontal part of head as treatment for dizziness. New leaves of *Mangifera indica* were dried, powdered and taken for diabetes. On the other hand, complex formulations involving multiple plant parts were also used for treatment. For increase of libido, pills made from crushed bark of *Alstonia scholaris* and fruits of *Astercantha longifolia* were taken with honey. A more complex mixture was used for treatment of pain and fever. In this instance, the leaves and roots of *Clerodendrum viscosum* were mixed with leaves of *Azadirachta indica*, *Justicia adhatoda*, and *Murraya koenigii* and boiled in water. The water was then administered orally.

For oral or topical administration, a plant part or juice from a plant part was observed to be mixed with other things prior to administration. Dried and powdered leaves of *Sansevieria roxburghiana* were mixed with

coconut oil and topically applied to affected areas for treatment of eczema. The use of coconut oil possibly served multiple purposes – to create a base for the plant ingredient(s), to facilitate mixing and absorption from the skin, and for possible smooth application to the affected area. For jaundice, juice obtained from roots of *Achyranthes aspera* was orally administered along with milk. In this case also the addition of milk might have served multiple purposes – dissolving of necessary phytochemical constituents of the root or what is more probable, the milk was used as a supplement to provide necessary strength to a possibly weak person suffering from jaundice, while the root constituents formed the main ingredient(s) for treatment of the disease.

**Table 1:** Medicinal plants used by the Kavirajes of the three villages surveyed in Panchagarh and Thakurgaon districts, Bangladesh.

Botanical name	Family	Local name	Parts used	Disease and dosage
<i>Asteracantha longifolia</i> (L.) Nees	Acanthaceae	Talmakhna	Fruit	To increase libido. Pills are made from a mixture of crushed bark of <i>Alstonia scholaris</i> and fruits of <i>Asteracantha longifolia</i> . 1 pill is taken with honey thrice daily.
<i>Justicia adhatoda</i> L.	Acanthaceae	Har-baksha	Leaf	All types of pain, fever. The leaves and roots of <i>Clerodendrum viscosum</i> are mixed with leaves of <i>Azadirachta indica</i> , <i>Justicia adhatoda</i> and leaves of <i>Murraya koenigii</i> and boiled in water. 1 cup of the boiled water is taken thrice daily for 5-7 days.
<i>Justicia gendarussa</i> L.	Acanthaceae	Bishollo-kurni	Leaf	Wasting away of body. Leaves of <i>Justicia gendarussa</i> are mixed with sugar obtained from sap of <i>Borassus flabellifer</i> and macerated. The mixture is taken thrice daily for 7 days.
<i>Sansevieria roxburghiana</i> Schult. & Schult. f.	Agavaceae	Bura chokkor	Leaf	Eczema. Leaves are dried, powdered and mixed with coconut oil and applied to affected areas twice daily for 2-3 days.
<i>Aloe vera</i> (L.) Burm.f.	Aloaceae	Ghrito kumari	Leaf	Burns, mental weakness due to meho (local term used by the Kavirajes, usually denoting urinary problem arising from endocrinological disorder or diabetes), dizziness in elderly people. Leaf juice is applied to burns. Leaf juice is taken with rice puffs in case of mental instability due to meho. Crushed leaves are applied to frontal part of the head during dizziness.
<i>Achyranthes aspera</i> L.	Amaranthaceae	Afang	Root (swollen part just underneath the soil)	Jaundice. The swollen part of root lying just underneath the soil is sliced and the slices dried in the sun. The dried slices are then wrapped in a piece of cloth and soaked in water for 24 hours. The following day the slices are squeezed to extract the juice which is then mixed with 1 kg milk. 1 cup of the mixture is taken thrice daily.
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Kanta khuria	Root	Meho. Roots of <i>Amaranthus spinosus</i> are mixed with fruits of <i>Myristica fragrans</i> and rhizomes of <i>Zingiber officinale</i> , macerated and taken with water (1 cup thrice daily for 7 days).
<i>Lanea coromandelica</i> (Houtt.) Merr.	Anacardiaceae	Shorokjia	Gum	White dysentery. The whitish gum is mixed with mustard oil and made into pills, each the size of a gram seed. 1 pill is taken daily for 3-4 days.
<i>Mangifera indica</i> L.	Anacardiaceae	Aam	Leaf, gum	Cracking of soles in feet, diabetes. Gum is applied to cracking in soles of feet. New leaves are dried, powdered and taken for diabetes.
<i>Alstonia scholaris</i> of (L.) R.Br.	Apocynaceae	Soitton	Bark	To increase libido. Pills are made from a mixture of crushed bark of <i>Alstonia scholaris</i> and fruits of <i>Asteracantha longifolia</i> . 1 pill is taken with honey thrice daily.
<i>Holarrhena antidysenterica</i> (L.) Wall. ex A. DC.	Apocynaceae	Indrojob	Fruit	Gastric ulcer, to stimulate appetite, indigestion. Fruits are dried and powdered and formed into pills the size of a gram seed. 1 pill is taken thrice daily.
<i>Thevetia peruviana</i> (Pers.) K. Schum.	Apocynaceae	Korobi	Flower	Itch, scabies. A few leaves of <i>Solanum torvum</i> are mixed with pulp within the seeds of <i>Thevetia peruviana</i> and sulfur, macerated and applied to affected areas twice daily for 3-4 days.
<i>Borassus flabellifer</i> L.	Arecaceae	Tal	Sap	Wasting away of body. Leaves of <i>Justicia gendarussa</i> are mixed with sugar obtained from sap of <i>Borassus flabellifer</i> and macerated. The mixture is taken thrice daily for 7 days.
<i>Calotropis gigantea</i> (L.) Ait.f.	Asclepiadaceae	Akondo	Leaf	Pain. Warm leaves are applied to painful areas.
	Asclepiadaceae	Otomul	Stem	<i>Tylophora indica</i> (Burm.f) Merr. Loss of libido. The stems are sliced, dried in the sun and powdered. The powder is taken with sugar

<i>Chromolaena odorata</i> (L.) R. M. King & H. Rob.	Asteraceae	Baghjhar	Bud	or molasses twice daily for 6-7 days. Bleeding from cuts and wounds. Crushed buds are applied to cuts and wounds.
<i>Eclipta alba</i> (L.) Hassk.	Asteraceae	Kalokeshrai	Leaf	Dandruff, hair loss, to blacken hair. Fruits of <i>Phyllanthus emblica</i> are mixed with leaves of <i>Eclipta alba</i> , macerated and soaked in oil. The oil is warmed. Following cooling a little amount of camphor is mixed with oil and a small amount of oil is applied to the scalp.
<i>Bombax ceiba</i> L.	Bombacaceae	Shimul	Leaf with stem	Meho, gonorrhea, loss of libido. Leaves and stems are macerated and taken in the form of sherbet thrice daily for 5-7 days.
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Leaf, bark	Heart disorders, debility. Leaves and barks are dried in the sun and powdered. The powder is mixed with 2-3 drops of ghee (clarified butter) and mishri (crystallized sugar) and made into a sherbet. 1 cup of the sherbet is taken thrice daily for heart disorders. For debility, the sherbet is taken without ghee.
<i>Terminalia belerica</i> (Gaertn.) Roxb.	Combretaceae	Bohera	Fruit	Meho, gonorrhea, other diseases not mentioned by the Kavirajes. The leaves of <i>Cassia sophera</i> are soaked in water along with fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> , <i>Terminalia chebula</i> , and <i>Swertia chirata</i> . The water is taken as sherbet (1 cup thrice daily for 7 days). To stop vomiting (anti-emetic). Burnt fruits are soaked in water and then the water is orally administered.
<i>Terminalia chebula</i> Retz.	Combretaceae	Horitoki	Fruit	Meho, gonorrhea, other diseases not mentioned by the Kavirajes. The leaves of <i>Cassia sophera</i> are soaked in water along with fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> , <i>Terminalia chebula</i> , and <i>Swertia chirata</i> . The water is taken as sherbet (1 cup thrice daily for 7 days).
<i>Costus speciosus</i> (J. König.) Sm.	Costaceae	Bawada	Root	Body pain. Juice obtained from crushed roots is applied to affected areas for 3-4 days.
<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	Pathorkuchi	Leaf	Bone fractures. Rhizomes of <i>Zingiber cassumunar</i> and rhizomes of <i>Zingiber officinale</i> are mixed with leaves of <i>Kalanchoe pinnata</i> , leaves of <i>Cissus quadrangularis</i> , and rhizomes of <i>Curcuma longa</i> , macerated and applied to fracture area. This is then covered with a piece of cloth acting as a bandage. The bandage is kept in place with the help of slices of bamboo for 24 hours. After 24 hours, the whole thing is taken off, fractured area washed, and the process repeated for 4-5 times. Kidney stones. A white stone is obtained within the head of Asiatic snakehead fish ( <i>Channa orientalis</i> , local name: taki mach). The stone is macerated with <i>Kalanchoe pinnata</i> leaves and camphor. 1 teaspoonful of the mixture is taken once to get rid of kidney stones.
<i>Cycas pectinata</i> Buch.-Ham	Cycadaceae	Moni raj	Fruit	Meho. The soft pulp within the fruit together with juice obtained from crushed fruit stalk is taken thrice daily (two teaspoonful) for 5-6 days.
<i>Cyperus rotundus</i> L.	Cyperaceae	Mutha, Kellar boi	Leaf, fruit	Girani (local term used by the Kavirajes for meho in men denoting urinary problem arising from endocrinological disorder or diabetes), sutika (puerperal fever). The leaves of <i>Psidium guajava</i> , <i>Punica granatum</i> , and <i>Cyperus rotundus</i> are squeezed to obtain juice. ½ cup of the warmed juice is taken with 10-15 drops of honey twice daily for 3-4 days.
Calcium deficiency, debility. Fruits are eaten.	<i>Dillenia indica</i> L.	Dilleniaceae	Chalta	FruitKidney problems. 1 cup of juice obtained from squeezed fruit is taken thrice daily for 7 days.
<i>Dioscorea bulbifera</i> L.	Dioscoreaceae	Kukur bicha	Fruit	Diarrhea, indigestion. Boiled fruits are mixed with salt and boiled rice and pills are made from the mixture the size of marbles. 1 pill is taken thrice daily.
<i>Euphorbia neriifolia</i> L.	Euphorbiaceae	Kanta shiz	Leaf	Rheumatic pain. Leaves of <i>Euphorbia neriifolia</i> are macerated with ginger (rhizome of <i>Zingiber officinale</i> ) and an amount equivalent to a single gram seed is taken thrice daily. Alternately, leaves

<i>Jatropha curcas</i> L.	Euphorbiaceae	Shada venda	Leaf stalk juice	are cooked with ginger and a leg of goat and taken daily for 5-7 days. White dysentery. Juice that comes out from leaf stalk after tearing of leaf is taken with batasha (a snack food item of Bangladesh) thrice daily for 3-4 days.
<i>Phyllanthus emblica</i> L.	Euphorbiaceae	Amloki	Fruit	Meho, gonorrhoea, other diseases not mentioned by the Kavirajes. The leaves of <i>Cassia sophera</i> are soaked in water along with fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> , <i>Terminalia chebula</i> , and <i>Swertia chirata</i> . The water is taken as sherbet (1 cup thrice daily for 7 days). Dandruff, hair loss, to blacken hair. Fruits of <i>Phyllanthus emblica</i> are mixed with leaves of <i>Eclipta alba</i> , macerated and soaked in oil. The oil is warmed. Following cooling, a small amount of oil is applied to the scalp.
<i>Ricinus communis</i> L.	Euphorbiaceae	Enda	Fruit	Body pain. Oil obtained from fruit is massaged on affected areas for 3-4 days.
<i>Tragia involucrata</i> L.	Euphorbiaceae	Bish chatu	Bark	Asthma. Bark of <i>Tragia involucrata</i> are crushed with 21 black peppers (fruits of <i>Piper nigrum</i> ) and pills made from the mixture. 1 pill is taken thrice daily for 7-8 days.
<i>Abrus precatorius</i> L.	Fabaceae	Josthimodhu	Root	Hoarseness of voice. The stems of <i>Cassia sophera</i> are taken with roots of <i>Abrus precatorius</i> to clear throat.
<i>Albizia odoratissima</i> L.f. Benth.	Fabaceae	Koroi	Bark	White dysentery. From crushed bark, pills are made the size of gram seeds. 1 pill is taken thrice daily for 4-5 days.
<i>Caesalpinia bonduc</i> (L.) Roxb.	Fabaceae	Nata gota	Young bud	Burning sensations during urination, gonorrhoea. Pills (size of gram seeds) are made from macerated young buds of <i>Caesalpinia bonduc</i> and rhizomes of <i>Curcuma longa</i> . 1 pill is taken thrice daily or 4-5 days.
<i>Cassia fistula</i> L.	Fabaceae	Soimal, Shona alu, Bandor	Fruit	Constipation, meho. Fruits are soaked in water and taken with molasses.
<i>Cassia sophera</i> L.	Fabaceae	lathi Shona pata	Leaf, stem	Meho, gonorrhoea, other diseases not mentioned by the Kavirajes. The leaves of <i>Cassia sophera</i> are soaked in water along with fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> , <i>Terminalia chebula</i> , and <i>Swertia chirata</i> . The water is taken as sherbet (1 cup thrice daily for 7 days). Hoarseness of voice. The stems of <i>Cassia sophera</i> are taken with roots of <i>Abrus precatorius</i> to clear throat.
<i>Cassia tora</i> L.	Fabaceae	Chokonda	Root (swollen part of root just underneath the soil) <i>nigrum</i> )	Stomach pain. 7-8 root parts of <i>Cassia tora</i> are crushed with 42 black peppers (fruits of <i>Piper</i> and the juice obtained is dried in the sun and powdered. The powder is taken in the form of sherbet (1 cup) thrice daily.
<i>Lens esculenta</i> Moench	Fabaceae	Moshurir dal	Seed	Any type of pain. Leaves of <i>Paederia foetida</i> are mixed with seeds of <i>Lens esculenta</i> , macerated, and pills made each the size of a gram seed. 1 pill is taken thrice daily for 2-3 days.
<i>Mimosa pudica</i> L.	Fabaceae	Shada lojjaboti	Leaf	Abscess, wounds. Macerated leaves are applied twice daily for 3-4 days.
<i>Swertia chirata</i> (Roxb. ex Fleming) H. Karst.	Gentianaceae	Chirota	Fruit	Meho, gonorrhoea, other diseases not mentioned by the Kavirajes. The leaves of <i>Cassia sophera</i> are soaked in water along with fruits of <i>Phyllanthus emblica</i> , <i>Terminalia belerica</i> , <i>Terminalia chebula</i> , and <i>Swertia chirata</i> . The water is taken as sherbet (1 cup thrice daily for 7 days).
<i>Hyptis suaveolens</i> (L.) Poit.	Lamiaceae	Tokma	Fruit	Loss of libido, to keep body cool, boils. Fruits are soaked in water and the water taken with sugar to restore libido and to keep body cool. Macerated fruits are applied around boils.
<i>Crinum asiaticum</i> L.	Liliaceae	Bon-piyaz	Root (swollen part underneath the soil)	Piles (hemorrhoid). The swollen part of root is burned and the ashes strained through cloth. The strained ash is applied twice daily for 4-5 days. Alternately, the swollen part of root is cut into small pieces, and deep fried in mustard oil with black pepper. The decoction is applied.

**Table 1:** Continue

<i>Litsea sp.</i>	Lauraceae	Khakor, Dorod moida	Leaf, bark	Meho. Leaves or bark is macerated with skin of oranges. 1 cup of the mixture is taken with water thrice daily.
<i>Lygodium flexuosum</i> (L.) Sw.	Lygodiaceae	Durga jhap	Leaf, stem	Paralysis. Leaves and stems of <i>Lygodium flexuosum</i> and <i>Adiantum lunulatum</i> are macerated with black peppers (fruits of <i>Piper nigrum</i> ) and fried in mustard oil. The mix is then applied to the body thrice daily till cure.
<i>Lawsonia inermis</i> L.	Lythraceae	Mehedi	Leaf	Itch, ear ache. About 2 tolas (local measure approximating 12.5g) leaves are boiled and applied to itches twice daily for 4-5 days. Leaf juice is slightly warmed and 2 drops of the warm juice is applied to ears for 4-5 days.
<i>Punica granatum</i> L.	Lythraceae	Dalim	Leaf	Girani (local term used by the Kavirajes for meho in men denoting urinary problem arising from endocrinological disorder or diabetes), sutika (puerperal fever). The leaves of <i>Psidium guajava</i> , <i>Punica granatum</i> , and <i>Cyperus rotundus</i> are squeezed to obtain juice. ½ cup of the warmed juice is taken with 10-15 drops of honey twice daily for 3-4 days.
<i>Michelia champaca</i> L.	Magnoliaceae	Kanthal chompa	Flower	Puerperal fever. The flowers are soaked in water for 5-7 hours. The water is then taken as sherbet (1 cup thrice daily for 3-4 days).
<i>Maranta arundinacea</i> L.	Marantaceae	Ararut barley	Swollen part of plant just beneath the soil	Debility. The swollen part is dried, powdered, cooked and given to children and patients for increasing strength.
<i>Azadirachta indica</i> A. Juss.	Meliaceae	Jat neem	Leaf	All types of pain, fever. The leaves and roots of <i>Clerodendrum viscosum</i> are mixed with leaves of <i>Azadirachta indica</i> , <i>Justicia adhatoda</i> and leaves of <i>Murraya koenigii</i> and boiled in water. 1 cup of the boiled water is taken thrice daily for 5-7 days.
<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Muchi lota	Leaf	Burning sensations during urination, passing of blood in urine, loss of libido. Macerated leaves are mixed with water and sugar and taken (1 cup) thrice daily for burning sensations during urination and passing of blood in urine. Juice obtained from leaves is taken with raw milk (1 cup twice daily) for loss of libido.
<i>Ficus hispida</i> L.f.	Moraceae	Dumur	Seed	Diabetes. Seeds of <i>Syzygium cumini</i> are mixed with seeds of <i>Ficus hispida</i> and powdered. The powder is taken thrice daily in the form of sherbet for diabetes.
<i>Moringa oleifera</i> Lam.	Moringaceae	Sojina	Leaf	High blood pressure, cooked and eaten as vegetable. Teaspoonful of leaf juice is taken before meal for high blood pressure.
<i>Myristica fragrans</i> Houtt.	Myristicaceae	Joiphol	Fruit	Meho. Roots of <i>Amaranthus spinosus</i> are mixed with fruits of <i>Myristica fragrans</i> and rhizomes of <i>Zingiber officinale</i> , macerated and taken with water (1 cup thrice daily for 7 days).
<i>Psidium guajava</i> L.	Myrtaceae	Peyara	Leaf, fruit	Girani (local term used by the Kavirajes for meho in men denoting urinary problem arising from endocrinological disorder or diabetes), sutika (puerperal fever), calcium deficiency, debility. The leaves of <i>Psidium guajava</i> , <i>Punica granatum</i> , and <i>Cyperus rotundus</i> are squeezed to obtain juice. ½ cup of the warmed juice is taken with 10-15 drops of honey twice daily for 3-4 days. The fruits of <i>Psidium guajava</i> are taken for calcium deficiency, and debility.
<i>Syzygium cumini</i> (L.) Skeels	Myrtaceae	Jaam	Leaf, bark, seed	Diabetes, chronic dysentery, blood in urine. Seeds of <i>Syzygium cumini</i> are mixed with seeds of <i>Ficus hispida</i> and powdered. The powder is taken thrice daily in the form of sherbet for diabetes. Juice from leaves and barks of the plant are taken thrice daily (1 cup each time) for chronic dysentery and passing of blood in urine.
<i>Piper longum</i> L.	Piperaceae	Pepulsut	Stem, root (swollen part just underneath the soil)	Blood dysentery. Stems and swollen part of root just underneath the soil are crushed with black peppers to obtain juice. 1 teaspoonful of slightly warm juice is taken thrice daily.

**Table 1:** Continue

<i>Piper nigrum</i> L.	Piperaceae	Gol-morich	Fruit	Asthma. Bark of <i>Tragia involucrata</i> are crushed with 21 black peppers (fruits of <i>Piper nigrum</i> ) and pills made from the mixture. 1 pill is taken thrice daily for 7-8 days. Stomach pain. 7-8 root parts of <i>Cassia tora</i> are crushed with 42 black peppers (fruits of <i>Piper nigrum</i> ) and the juice obtained is dried in the sun and powdered. The powder is taken in the form of sherbet (1 cup) thrice daily. Paralysis. Leaves and stems of <i>Lygodium flexuosum</i> , <i>Adiantum lunulatum</i> are macerated with black peppers (fruits of <i>Piper nigrum</i> ) and fried in mustard oil. The mix is then applied to the body thrice daily till cure.
<i>Bambusa sp.</i>	Poaceae	Jetha bash	Shoot	Diabetes. The shoot is sliced into small pieces and dried in the sun and powdered. The powder is taken with sea salt in the form of sherbet.
<i>Adiantum lunulatum</i> Burm.f.	Pteridaceae	Kali jhap	Leaf, stem	Paralysis. Leaves and stems of <i>Lygodium flexuosum</i> and <i>Adiantum lunulatum</i> are macerated with black peppers and fried in mustard oil. The mix is then applied to the body thrice daily till cure (51).
<i>Paederia foetida</i> L.	Rubiaceae	Gondho pata	Leaf	Any type of pain. Leaves of <i>Paederia foetida</i> are mixed with seeds of <i>Lens esculenta</i> , macerated, and pills made each the size of a gram seed. 1 pill is taken thrice daily for 2-3 days.
<i>Glycosmis pentaphylla</i> (Retz.) Corr.	Rutaceae	Atishor	Leaf	Lack of pregnancy in women. ½ cup of crushed leaves are taken twice daily (morning and evening on an empty stomach) for 10-12 days.
<i>Murraya koenigii</i> (L.) Spreng	Rutaceae	Norsingh, Merali	Leaf	All types of pain, fever. The leaves and roots of <i>Clerodendrum viscosum</i> are mixed with leaves of <i>Azadirachta indica</i> , leaves and stems of <i>Cissus quadrangularis</i> and leaves of <i>Murraya koenigii</i> and boiled in water 1 cup of the boiled water is taken thrice daily for 5-7 days.
<i>Datura metel</i> L.	Solanaceae	Dhutura	Root, seed	Wasting away of body in children. Crushed leaves are mixed with mustard oil and applied to body. Insanity. The seeds if fed with leaves of Piper betel causes insanity. On the other hand, juice extracted from crushed roots if taken with sour yoghurt, lemon, and salt in the form of sherbet cures insanity. 10-12 seeds when powdered and taken with something else causes unconsciousness.
<i>Solanum torvum</i> Swartz	Solanaceae	Baeguni	Leaf	Itch, scabies. A few leaves of <i>Solanum torvum</i> are mixed with pulp within the seeds of <i>Thevetia peruviana</i> and sulfur, macerated and applied to affected areas twice daily for 3-4 days.
<i>Abroma augusta</i> L.f.	Sterculiaceae	Ulot-kombol	Leaf	Diabetes. Leaves are macerated with ginger and the juice collected. 1 cup juice is taken thrice daily for 5-7 days.
<i>Pterospermum acerifolium</i> (L.) Willd.	Sterculiaceae	Konok champa	Flower	Wasting of body, burning sensations in the body. Flowers are macerated and taken with sugar in the form of sherbet (1/2 cup thrice daily for 7-8 days).
<i>Averrhoa carambola</i> L.	Oxalidaceae	Kamranga	Leaf, bark, fruit	Absence of menstruation. 1 cup of juice obtained from squeezed leaf, bark and fruit is taken thrice daily. The fruit is also used for treatment of coughs and mucus.
<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	Vati	Leaf, root	All types of pain, fever. The leaves and roots of <i>Clerodendrum viscosum</i> are mixed with leaves of <i>Azadirachta indica</i> , leaves and stems of <i>Cissus quadrangularis</i> and leaves of <i>Murraya koenigii</i> and boiled in water 1 cup of the boiled water is taken thrice daily for 5-7 days.
<i>Nyctanthes arbor tristis</i> L.	Verbenaceae	Shefali phool	Leaf	Fever. 3 cups of juice obtained from squeezed leaves are taken daily for 7 days.
<i>Cissus quadrangularis</i> L.	Vitaceae	Harjora	Leaf, stem	Bone fractures. Rhizomes of <i>Zingiber cassumunar</i> and rhizomes of <i>Zingiber officinale</i> are mixed with leaves of <i>Kalanchoe pinnata</i> , leaves of <i>Cissus quadrangularis</i> , and rhizomes of <i>Curcuma longa</i> , macerated and applied to fracture area. This is then covered with a piece of cloth acting as a bandage. The bandage is kept in place with the help of slices of bamboo for 24 hours. After 24 hours, the whole thing is taken off, fractured area washed, and the process repeated for 4-5 times.

**Table 1:** Continue

<i>Curcuma longa</i> L.	Zingiberaceae	Holud	Rhizome	Bone fractures. Rhizomes of <i>Zingiber cassumunar</i> and rhizomes of <i>Zingiber officinale</i> are mixed with leaves of <i>Kalanchoe pinnata</i> , leaves of <i>Cissus quadrangularis</i> , and rhizomes of <i>Curcuma longa</i> , macerated and applied to fracture area. This is then covered with a piece of cloth acting as a bandage. The bandage is kept in place with the help of slices of bamboo for 24 hours. After 24 hours, the whole thing is taken off, fractured area washed, and the process repeated for 4-5 times. Burning sensations during urination, gonorrhoea. Pills (size of gram seeds) are made from macerated young buds of <i>Caesalpinia bonduc</i> and rhizomes of <i>Curcuma longa</i> . 1 pill is taken thrice daily for 4-5 days.
<i>Curcuma zedoaria</i> (Christm.) Roscoe	Zingiberaceae	Shotiput	Rhizome	Pain in the waist, knee, or neck. Rhizomes are macerated and applied to affected areas following which the areas are bandaged with a piece of cloth. The cloth is to be kept for 2-3 days.
<i>Zingiber cassumunar</i> Roxb.	Zingiberaceae	Bon ada	Rhizome	Bone fractures. Rhizomes of <i>Zingiber cassumunar</i> and rhizomes of <i>Zingiber officinale</i> are mixed with leaves of <i>Kalanchoe pinnata</i> , leaves of <i>Cissus quadrangularis</i> , and rhizomes of <i>Curcuma longa</i> , macerated and applied to fracture area. This is then covered with a piece of cloth acting as a bandage. The bandage is kept in place with the help of slices of bamboo for 24 hours. After 24 hours, the whole thing is taken off, fractured area washed, and the process repeated for 4-5 times.
<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Ada	Rhizome	Bone fractures. Rhizomes of <i>Zingiber cassumunar</i> and rhizomes of <i>Zingiber officinale</i> are mixed with leaves of <i>Kalanchoe pinnata</i> , leaves of <i>Cissus quadrangularis</i> , and rhizomes of <i>Curcuma longa</i> , macerated and applied to fracture area. This is then covered with a piece of cloth acting as a bandage. The bandage is kept in place with the help of slices of bamboo for 24 hours. After 24 hours, the whole thing is taken off, fractured area washed, and the process repeated for 4-5 times. Rheumatic pain. Leaves of <i>Euphorbia nerifolia</i> are macerated with ginger (rhizome of <i>Zingiber officinale</i> ) and an amount equivalent to a single gram seed is taken thrice daily. Alternately, leaves are cooked with ginger and a leg of goat and taken daily for 5-7 days. Meho. Roots of <i>Amaranthus spinosus</i> are mixed with fruits of <i>Myristica fragrans</i> and rhizomes of <i>Zingiber officinale</i> , macerated and taken with water (1 cup thrice daily for 7 days).

**Table 2:** Percent use of various plant parts by Kavirajes of the three villages surveyed in Panchagarh and Thakurgaon district, Bangladesh.

Plant part	Percent use
Whole plant	0
Leaf	37.8
Stem	6.7
Bark	7.8
Flower	3.3
Fruit	18.9
Seed	4.4
Root	11.1
Rhizome	4.4
Sap	1.1
Gum	2.2
Bud	2.2

A plant part could be used for treatment of a single ailment or multiple ailments. The leaves of *Calotropis gigantea* were used for treatment of pain. On the other hand, the fruits of *Holarrhena antidysenterica* were used for treatment of gastric ulcer, indigestion as well as to stimulate appetite. In this case, it may be pointed out that all ailments treated were related to problems with the gastrointestinal tract. However, the fruits of *Cassia fistula* were used for treatment of constipation and meho (local term used by the Kavirajes usually

denoting urinary problems arising from endocrinological disorders or diabetes), which were totally unrelated diseases.

There was one instance where it was observed that a white stone obtained from the head of a fish (*Channa orientalis*) was used in combination with camphor and leaves of a plant *Kalanchoe pinnata* for treatment of kidney stones. The medicinal purpose of the stone remains unclear. However, it can be an instance of a fundamental principle underlying some treatments by the Kavirajes that “like can remove like”. In this case, the stone from the fish was used to remove stones from the kidney.

Black pepper (dried fruits of *Piper nigrum*) formed a secondary ingredient with several plant formulations used by the Kavirajes. The swollen part of root of *Crinum asiaticum* was cut into small pieces, mixed with mustard oil and black pepper, fried and then applied to piles. For treatment of paralysis, the leaves and stems of *Lygodium flexuosum* and *Adiantum lunulatum* were macerated with black peppers, fried in mustard oil and then applied to the paralyzed sections of the body. Several common features in the above two treatments were use of mustard oil, use of black peppers, frying of the mixture of medicinal plants and black pepper in mustard oil, and topical applications. Whether the frying of plant parts in mustard oil in combination with black peppers facilitate release of bioactive principles from the plant parts remain to be investigated.

Some of the medicinal plants noted in Table 1 were observed to be systematically cultivated or planted around homesteads for their edible fruits, use as vegetable and spice, or for ornamental and other purposes. The plants cultivated for their edible fruits or use as vegetable and spice included *Mangifera indica*, *Borassus flabellifer*, *Terminalia belerica*, *Terminalia chebula*, *Dillenia indica*, *Phyllanthus emblica*, *Lens esculenta*, *Maranta arundinacea*, *Myristica fragrans*, *Swertia chirata*, *Punica granatum*, *Ficus hispida*, *Moringa oleifera*, *Psidium guajava*, *Syzygium cumini*, *Piper nigrum*, *Averrhoa carambola*, *Curcuma longa*, and *Zingiber officinale*. Plants that were planted around homesteads for ornamental or other purposes included *Bombax ceiba* (cotton plant), *Lawsonia inermis* (leaves used to dye hair, hands, and feet), *Michelia champaca* (fragrant flowers), and *Nyctanthes arbor tristis* (fragrant flowers).

Some of the plants in Table 1 have already had some of their phytochemical constituents and pharmacological activity aspects reported in the scientific literature. For instance, *Justicia adhatoda* contains alkaloids with positive effects on inflammatory diseases Chakraborty, A. and Brantner, A.H., (2001); extract of the plant also has been shown to have anti-tussive effect Dhuley, J.N., (1999), and a bronchodilator alkaloid (vasicinone) has been isolated from the plant (Amin, A.H., and Mehta, D.R., 1959). All these can be relevant to its local use for pain and fever, which may be accompanied by coughs and have vaso-constrictory effects. Anti-inflammatory and analgesic effects has been reported for root extract of *Calotropis gigantea* (Basu, A., and Chaudhuri, A.K., 1991), which validates the use by the Kavirajes of this plant for treatment of pain.

*Terminalia arjuna* was found to be used by the Kavirajes for treatment of heart disorders. The reported cardiovascular effects of this plant include protective effects of plant bark against Doxorubicin-induced cardiotoxicity Singh *et al.*, (2008); significant inotropic and hypotensive effect of bark, also increases coronary artery flow and protects 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, S., and Gupta, D., 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 anginal frequency) Dwivedi, S., and Jauhari, R., (1997).

Taken together, the medicinal plants used by the Kavirajes of the three villages surveyed appear to have excellent potential for conducting further scientific studies. Such studies can result in validation of their folk medicinal uses as has been demonstrated above with three of the plants. An important point that needs to be pointed out regarding Kavirajes is that their empirical knowledge is based on centuries old usage of medicinal plants. As a result the plants that they use have been proven useful for the purpose that they are used for. From a practical point of view such empirical knowledge can be translated comparatively easily into new drugs because the scientists working on such plants can conduct their scientific studies based on the demonstrated usefulness of the plants. The net result can be discovery of lead compounds and newer drugs, which could be more price-affordable and with greater efficacy and lesser side-effects than existing drugs. At the same time, scientific experiments providing validation of traditional uses can bring confidence to the patient's mind as to the traditional medicinal treatment that the patient is receiving. A further benefit is that once the importance of a particular medicinal plant is realized, it can spur efforts by both Government and the public about the conservation and sustainable cultivation of not only the plant in question but medicinal plants in general. This is important because a number of once widely available medicinal plants are rapidly becoming endangered and even extinct in the wild.

## References

- Amin, A.H. and D.R. Mehta, 1959. A bronchodilator alkaloid (vasicinone) from *Adhatoda vasica* Nees. Nature, 184(Suppl 17): 1317.
- Basu, A. and A.K. Chaudhuri, 1991. Preliminary studies on the antiinflammatory and analgesic activities of *Calotropis procera* root extract. Journal of Ethnopharmacology, 31: 319-324.
- 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.
- Chakraborty, A. and A.H. Brantner, 2001. Study of alkaloids from *Adhatoda vasica* Nees on their antiinflammatory activity. Phytotherapy Research, 15: 532-534.
- Cotton, C.M., 1996. Ethnobotany: Principle and Application. John Wiley and Sons, New York, pp: 399.
- Dhuley, J.N., 1999. Antitussive effect of *Adhatoda vasica* extract on mechanical or chemical stimulation-induced coughing in animals. Journal of Ethnopharmacology, 67: 361-365.
- Dwivedi, S. and D. Gupta, 2002. Efficacy of *Terminalia arjuna* in chronic stable angina. Indian Heart Journal, 54: 441.
- 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.
- 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., Md. Shahadat Hossan, Md. Manzurul Kadir Mia, Mohammad Jahirul Islam, Rownak Jahan and Mohammed 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, Abu Hanif, Mujib Khan, Sazzadul Bari, Rownak Jahan and Mohammed Rahmatullah, 2009. Ethnobotanical survey of the Tripura tribe of Bangladesh. American Eurasian Journal of Sustainable Agriculture, 3(2): 253-261.
- Hossan, M.S., Hanif, B. Agarwala, M.S. Sarwar, M. Karim, M.T. Rahman, R. Jahan and M. Rahmatullah, 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.
- 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.
- Mollik, M.A.H., M.S. Hossan, 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.
- 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.
- 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.
- 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., 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. Hossan, 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.
- 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.