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A Survey of Medicinal and Functional Food Plants Used by the Folk Medicinal Practitioners of Three Villages in Sreepur Upazilla, Magura District, Bangladesh

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ABSTRACT

Folk medicinal practitioners (Kavirajes) provide medical care to substantial segments of the rural and urban population of Bangladesh. The Kavirajes specialize in the use of medicinal plants for treatment of ailments or their symptoms. Besides use of medicinal plants for therapeutic purposes, the Kavirajes also prescribe medicinal plants for preventive purposes, which may include plants for maintenance of overall good health, or to maintain various parts of the body and their functions in a healthy state. As such, the latter group of medicinal plants can be classified as functional foods or nutraceuticals. This latter aspect of the Kavirajes, although quite commonly practiced, has rarely been documented or reported. It was the objective of the present study to conduct an ethnomedicinal survey among the Kavirajes of three villages in Sreepur Upazilla (sub-district) of Magura district, Bangladesh to gather information on medicinal plants used by the Kavirajes for both therapeutic as well as preventive purposes. Information was collected from the Kavirajes with the help of a semi-structured questionnaire and the guided field-walk method. It was observed that the Kavirajes used a total of 54 plants, among which a number of plants served both therapeutic and preventive purposes. The plants were distributed into 37 families; the Fabaceae and the Lamiaceae families provided 4 plants per family, followed by the Combretaceae family with 3 plants. Leaves were the major plant part used, constituting 41.4% of total uses. It was further observed that all medicinal plants used by the Kavirajes served to treat multiple ailments. 38 plants were used for treatment of respiratory tract disorders, 33 plants for hepatic disorders, 36 plants for gastrointestinal tract problems, and 26 plants for treatment of various types of sexual disorders. 17 plants were used for treatment of fever, 16 for treatment of leprosy, 19 for treatment of piles, 15 for treatment of edema, and 16 for treatment of skin disorders. 17 plants were used as astringent, 11 plants used as bitter, and 12 plants as blood purifier. Other ailments treated by the Kavirajes included tuberculosis, cuts and wounds, rheumatism, helminthiasis, menstrual problems, urinary problems, heart disorders, tumor, burning sensations in body, spleen disorders, vaginal diseases, goiter, eye problems, leucorrhea, insanity, infections, throat diseases, fractures, vomiting, obesity, pain, and anal diseases. The various uses of medicinal plants as functional foods included to maintain healthy brain functions, to regularize urine and stool, to maintain good eyes, to maintain healthy hair, to improve voice, to increase intelligence and memory, and to increase longevity. The plants used for both therapeutic and preventive purposes by the Kavirajes have obvious potentiality for scientific studies, which can lead to discoveries of better medicines as well as functional foods. The latter is important, because it can lessen the incidences of diseases and provide a cost-effective way to maintaining the body and its vital organs in good health.

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Introduction

Human beings have used plants as a mean towards cure for various ailments since antiquity. Since plants cannot move in response to biotic or abiotic insults, they produce a wide array of phytochemicals in response to stressful conditions 1. Prithiviraj *et al.*, (2006). These phytochemicals, also referred to as secondary metabolites, are responsible for diverse pharmacological activities, many of which have been found useful by humans in the alleviation of the numerous ailments that afflict them. Prior to the advent of modern allopathic medicine, which consists of a systematic introduction of any given medicine following appropriate clinical trials and adoption of precautionary measures during and following the administration of the medicine, people in all societies have relied on traditional medicinal practitioners for treatment of their ailments. Such medicinal practitioners still exist, in various countries, tribes and societies, for a number of reasons. Allopathic medicine is not infallible, they tend to be costly, they can have serious side-effects, and they may be out of reach of people living in remote areas or areas where modern clinical facilities and allopathic doctors may be absent. Moreover, as centuries of usage have made people both reliant and attuned to traditional medicines, even in modern days, a huge number of people throughout the various countries of the world are still dependent on traditional medicine for cure of their various ailments. Plants form the major ingredient of traditional medicinal practices. A number of modern allopathic drugs also owe their very existence to the observances of medical practices of indigenous peoples (Gilani and Rahman, 2005).

Traditional medicinal practitioners use plants for both their curative as well as their preventive properties. While some plants are prescribed for cure of diseases, there are other plants which are advised by the traditional medicinal practitioners to be consumed on a periodic basis to maintain good body health and smooth body functions besides providing essential nutrients. This latter group of plants or plant products is generally known as functional foods or nutraceuticals. A common example is the use of various spices, which not only can impart color or flavor to foods but also can be digestive aids or serve in the prevention of diseases, when regularly consumed. Oats and bean products, besides providing nutrition, have further been reported to lower cholesterol (Anderson Gustafson, 1988). Various edible herbaceous plants, namely *Serenoa repens*, *Pygeum africanum*, *Urtica dioica radix*, and *Cucurbita peponis semen* have shown promising effects in the treatment of benign prostatic hyperplasia (Dvorkin and Song, 2002). It has been shown that consumption of onions can reduce incidences of stomach carcinoma (Dorant, *et al.*, 1996). It has been reported from a study conducted in Turkey that various Turkish herbs, which are consumed, contain active principles for generating better human health and for prevention of cancer (Esiyok, *et al.*, 2004). The traditional crops of the original population of Peru included *Smallanthus sonchifolius* (yacon) and *Lepidium meyenii* (maca), which are still being used as folk medicines. A number of beneficial effects have been attributed to the two plants, including reducing blood sugar, alleviation of kidney problems, skin rejuvenation, cytoprotective activity, fertility enhancer, and to act as immunostimulant (Valentová and Ulrichová, 2003). In short, side by side with prescribing medicinal plants providing therapeutic values, traditional medicinal practitioners prescribe and the population furthermore consumes edible plants, which besides providing nutrition also serve as preventive agents against various diseases.

Bangladesh is a small developing country with over 150 million people, most of them scattered among the 86,000 villages of the country. The rural population, in particular, lacks access to modern clinical facilities and allopathic doctors. Folk medicinal practitioners, otherwise known as Kavirajes, have practiced both in urban and rural areas of Bangladesh till time immemorial, and continue practicing as of this date. They enjoy a wide clientele, especially among the rural population. Over 40% of the population of Bangladesh have incomes below the poverty line of US \$1 per day, and folk medicinal practitioners provide a cheaper and to a certain extent, a more reliable alternative to them for treatment of various ailments. Bangladesh also has a number of tribes; the tribal medicinal practitioners and the Kavirajes rely mainly on medicinal plants for treatment. We had been conducting ethnomedicinal surveys among the various tribes and various regions of the country for quite some time (Rahmatullah, *et al.*, 2009; Hossan, *et al.*, 2009; Hanif, *et al.*, 2009; Nawaz *et al.*, 2009; Rahmatullah 2010; Hossan *et al.*, 2010; Mollik *et al.*, 2010; Rahmatullah *et al.*, 2010). During our surveys, we have observed that besides prescribing medicinal plants for curative purposes, the Kavirajes also prescribe medicinal plants for preventive purposes, which plants can be defined as functional foods (Rahmatullah, 2009). The objective of the present study was to conduct a survey among the Kavirajes of three villages of Sreepur Upazilla (sub-district) in Magura district of Bangladesh to find out about medicinal plants, which are prescribed by the Kavirajes for both curative as well as preventive (i.e. functional food) purposes.

Materials and Methods

The present survey was conducted among the Kavirajes of three villages, namely Amtoil, Tupipara, and Kajoli in Sreepur Upazilla of Magura district, Bangladesh. The three Kavirajes practicing in the above three villages were Abul Hossain Mollah, Idrish Ali Khan, and Ms. Jesmin Akhter, the latter being a female, while the first two were males. The main occupation of the village people were agriculture and agricultural laborer (i.e. people who did not possess any land of their own, but instead worked as laborer on other people's land).

Informed consent was obtained from all Kavirajes prior to the survey. The actual survey was conducted with the help of a semi-structured questionnaire and the guided field-walk method as described by Martin (Martin, G.J., 1995) and Maundu (1995). Briefly, in this method, the Kavirajes took the interviewers to spots from where they collected their medicinal plants, pointed out the plants, and gave their local names and uses. All interviews were conducted in Bengali, the language being spoken alike by interviewers and Kavirajes. Plant specimens as pointed out by the Kavirajes were photographed, collected, dried and brought back to Bangladesh National Herbarium at Dhaka for complete identification. Voucher specimens were deposited at the Medicinal Plant Collection Wing of the University of Development Alternative.

Results and Discussion

It was observed that the Kavirajes of the three surveyed villages used 54 plants for treatment of various ailments. The plants were distributed into 37 families. The Fabaceae and the Lamiaceae family contributed 4 plants each, followed by the Combretaceae family with 3 plants. The results are shown in Table 1. A particular plant used by the Kavirajes of the area surveyed was *Scirpus grossus*, which in our previous surveys we did not find any evidence for its use. Notably, the plant was used for treatment of diverse ailments like loss of sexual desire, constipation, respiratory problems, mucus, biliary disorders, burning sensations in the body (which the Kavirajes attributed to accumulation of toxins in blood), eye diseases, and leucorrhoea, as well as to maintain healthy hair, and to increase lactation in nursing mothers.

Leaves constituted the major portion of the plants used, forming 41.4% of total uses. Leaves were followed by roots at 17.1%, and fruits at 15.7%. Barks were used 12.9% of the time, flowers at 7.1%, whole plant at 4.3%, and rhizomes constituted 1.4% of total uses. Surprisingly, and unlike other parts of Bangladesh, the Kavirajes of the three villages surveyed did not use any stems, seeds, or gum in their medicinal preparations. The results are shown in Table 2.

A notable feature of the Kavirajes of the three villages surveyed was that they did not use any combination of plants for treatment of a specific ailment. Instead, a single plant or plant part(s) was used for treatment of a wide array of diseases. In fact, the diseases treated by a single plant were more often than not, extremely diverse in their nature, origins, and symptoms. To cite just one instance, the leaves of *Justicia adhatoda* were used for treatment of coughs, biliary problems, respiratory problems, frequent thirsts, fever, vomiting tendency, diabetes, leprosy, and tuberculosis. While coughs may be a symptom of tuberculosis, there is certainly no common symptoms between tuberculosis and leprosy, or say leprosy and biliary problems. Moreover, the biliary problem treated had very specific symptoms as to the bile turning the color of blood. Whether this color change by itself was a disease or merely a symptom of a disease was not mentioned by the Kavirajes. The Kavirajes also did not mention as to how they determined the color change of bile.

On several occasions it was observed that the Kavirajes used different parts from the same plant to treat different diseases. The leaves of *Achyranthes aspera* were used as bitter, to increase appetite, and for treatment of vomiting tendency, coughs, obesity, respiratory tract disorders, piles, pain, and gastrointestinal disorders. The roots of the same plant were used for treatment of jaundice. Distinctions were made even as to the color of flowers for treatment of ailments. The white flowers of *Calotropis gigantea* were used for treatment of gynecological problems and piles, as well as to increase sperm count. On the other hand, the red flowers from the same species were used for treatment of leprosy, helminthiasis, coughs, piles, poisoning, and edema. Pile was the only common disease treated by both color of flowers. A conclusion that can be drawn from the use of different colored flowers for treatment of different diseases is that in all probability the chemical constituents responsible for the different color of flowers were serving as the active ingredients for amelioration of the diseases treated.

A total of 38 plants were used for treatment of respiratory tract disorders, 33 plants for treatment of hepatic disorders, and 36 plants for treatment of gastrointestinal tract disorders. A substantial number of the plants used for treatment of the above three disorders were classified in local terms by the Kavirajes as "tri-dosh nashok". A literal translation is tri (three), dosh (ailment), and nashok (amelioration), so the whole term can be translated as simultaneous amelioration of three types of disorders of three vital organs of the body, namely the respiratory tract, stomach and intestines, and liver. In Table 1, "tri-dosh nashok" have been

mentioned under Ailments as alleviation or prevention of respiratory, stomach and hepatic problems. Their actual use by the Kavirajes suggested that the plants are not only used for actual treatment of ailments of the three vital organs (occurring simultaneously) as mentioned above, but also can serve as preventive purposes. Apparently regular consumption of such plants, according to the Kavirajes, can prove useful in prevention of simultaneous occurrences of respiratory tract, gastrointestinal, and stomach diseases. These plants can as such, be also classified as nutraceuticals or functional food plants, as will be discussed later. It is also to be noted that tri-dosh nashok plants are to be distinguished from plants like *Scirpus grossus* or *Punica granatum*. The first plant is used for treatment of constipation (a gastrointestinal problem), biliary disorders (a hepatic problem), and respiratory problems. Although *Scirpus grossus* was used for treatment of ailments of the three vital organs, it was not classified by the Kavirajes as tri-dosh nashok for the plant was used for separate treatment of any manifestations of ailment of any one of the three vital organs at any one given time. The plant was not used for simultaneous disorders of the three vital organs. The same applies to *Punica granatum*, which was used for separate treatments of problems of the respiratory tract, biliary or hepatic problems, as well as used as a carminative (gastrointestinal problem).

The Kavirajes of the three villages surveyed were also observed to treat a number of other ailments. 17 plants were used for treatment of fever, 16 plants for treatment of leprosy, 19 plants for treatment of piles (hemorrhoids), 26 plants for treatment of sexual disorders, 15 plants for treatment of edema, 16 plants for treatment of various skin disorders, 12 plants for treatment of burning sensations in the body, and 7 plants for treatment of tumors or swellings (arising out from no known cause). Other diseases treated included vomiting, tuberculosis, obesity, pain, gynecological problems, cuts and wounds, rheumatism, helminthiasis, menstrual problems, urinary problems, heart disorders, stone formation, spleen disorders, vaginal diseases, goiter, eye diseases, leucorrhea, insanity, nose diseases, infections, throat diseases, fractures, and anal diseases. While several plants were used by the Kavirajes as antidote to poisoning, one plant, namely *Hemidesmus indicus*, was referred specifically as an antidote to mercury poisoning. One interesting aspect of the treatment of sexual disorders was that the Kavirajes treated patients, who suffered from loss of libido or impotency, as well as patients who had excessive sexual desires. Apparently, both Kavirajes and patients considered loss of libido as well as its opposite symptom in the form of excessive sexual desires, as ailments.

A further interesting aspect of the Kavirajes of the three villages surveyed in the present study was the unusually large number of plants, which besides curative purposes, were also used for preventive purposes and for maintaining the whole body or various parts of the body in good health. It was the opinion of the Kavirajes that regular consumption or topical application of these plants or plant parts will have the effect of preventing different ailments or dysfunctions of body organs from happening. These plants, as such, can be termed functional foods or nutraceuticals. A list of plants used as functional foods and the purposes behind the uses of the functional food plants is given in Table 3. The various purposes that these functional food plants were used for included maintenance of healthy brain functions, regularization of passing of urine and stool, maintenance of healthy hair, provision of nutrition, improvement of voice, to increase intelligence and memory, to prevent occurrences of respiratory, stomach and hepatic disorders (tri-dosh), and to increase longevity. 8 plants were prescribed by the Kavirajes to be taken as blood purifier. According to the Kavirajes, toxins accumulating in the blood during normal day to day living can be the cause of many ailments. On the other hand, occurrence of a disease may also be the reason for accumulation of toxins in blood. In either instance, the blood needs to be gotten rid of accumulating toxins both to prevent diseases from occurring as well as to cure diseases. 17 plants were used by the Kavirajes as astringent. An astringent cause contraction of soft body tissues and so can reduce skin disorders. An astringent substance is also considered to stop diarrhea, reduce sweating, and slowing or stopping bleeding. Such substances are antiinflammatory and can be used as treatment for infections or as a preventive measure for infections. 11 plants were used by the Kavirajes as bitter. Bitter tasting substances (inclusive of plants) is considered by the Kavirajes as one of the most healing tastes; a bitter substance can heal a lot of imbalances in the mind and body; it has a cooling effect, which can be useful in fever; it quenches thirst, it is used for fainting, itching, and burning sensations in the body; it promotes digestion and can act as a blood purifier. Taken together, the plants used by the Kavirajes as blood purifier, astringent, and bitter may also be considered as functional food plants, for when used regularly they can help maintain a healthy body with smooth functions of the vital organs and so prevent diseases from occurring. *Justicia adhatoda* was used by the Kavirajes for treatment of tuberculosis among other diseases. The anti-tubercular action of this plant has been well documented in the scientific literature (Gupta and Chopra, 1954; Barry *et al.*, 1955; Grange and Snell, 1996; Gupta *et al.*, 2010). The antinociceptive properties of *Calotropis gigantea* (used by the Kavirajes to alleviate pain) has also been reported (Soares, *et al.*, 2005). *Nyctanthes arbor tristis*, which was observed by the Kavirajes to be used as treatment for fever has been also shown to possess antipyretic activity (Saxena, *et al.*, 1987). The cardioprotective effects, particularly of bark of *Terminalia arjuna* (used by the Kavirajes for treatment of heart disorders) are also well established (Singh *et*

al., 2008; Dwivedi, S., 2007; Gauthaman *et al.*, 2005; Karthikeyan *et al.*, 2003; Dwivedi and Gupta, 2002; Bharani *et al.*, 2002; Gauthaman *et al.*, 2001; Dwivedi and Jauhari, 1997). *Coccinia grandis* and *Embllica officinalis* reportedly possess antioxidant properties, which can be beneficial during diabetes (Umamaheswari and Chatterjee, 2007; 37. Nampoothiri *et al.*, 2010; Hazra *et al.*, 2010). The roots of the first plant and the fruits of the second are used by the Kavirajes for treatment of diabetes. *Curcuma longa* is used by the Kavirajes for treatment of rheumatism. The anti-arthritic effects of essential oils of rhizomes of the plant have been reported (Funk, *et al.*, 2010). In short, a number of plants used by the Kavirajes for treatment of various ailments have had their uses validated by modern scientific research.

Table 1: Medicinal plants used by the Kavirajes of three villages in Sreepur Upazilla of Magura district, Bangladesh.

Serial Number	Scientific Name	Family Name	Local Name	Utilized Part and Mode of Administration	Ailment
1	<i>Justicia adhatoda</i> L.	Acanthaceae	Bashok	Leaf	Coughs, biliary problem (bile turns the color of blood), frequent thirsts, respiratory problems, fever, vomiting tendency, diabetes (symptom: wasting away of body, inability to take food), leprosy, tuberculosis.
2	<i>Achyranthes aspera</i> L.	Amaranthaceae	Apang	Leaf, root	Bitter (this taste is considered by the Kavirajes as one of the most healing tastes; a bitter substance can heal a lot of imbalances in the mind and body; it has a cooling effect, which can be useful in fever; it quenches thirst, it is used for fainting, itching, and burning sensations in the body; it promotes digestion and can act as a blood purifier), to increase appetite, vomiting tendency, coughs, obesity, respiratory tract disorders, piles, pain, gastrointestinal disorders (leaf). Jaundice (root).
3	<i>Amaranthus spinosus</i>	Amaranthaceae	Kata-note	Leaf, root	To regularize urine and stool, lack of appetite, all food tastes bitter, blood purifier (defined as an herb or substance, which speeds up the process of detoxification and excretion of waste products in the blood by stimulating intestinal, liver, or bile functions, or creating laxative effects), antidote to poisoning.
4	<i>Calotropis gigantea</i> (L.) Ait.f.	Apocynaceae	Akondo	Leaf, white flower, red flower	Pain due to injuries (leaf). Leaves are roasted over a fire and applied to painful areas while still warm. To increase sperm, gynecological problems, piles (white flower). Leprosy, helminthiasis, coughs, piles, poisoning, edema (red flower).
5	<i>Hemidesmus indicus</i> R. Br.	Apocynaceae	Anantomool	Root	To increase sperm, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), to induce sweat, diuretic, to increase strength, acidity, loss of appetite, all types of skin diseases, skin allergy, antidote to mercury poisoning.
6	<i>Enydra fluctuans</i> Lour.	Asteraceae	Helencha-shak	Leaf	Constipation, bitter, astringent (having the property of causing contraction of soft organic tissues), leprosy, disorders of biliary secretion or respiratory tract, blood purifier.
7	<i>Mikania cordata</i> (Burm.f.) B. L. Robinson	Asteraceae	Jarmani	Leaf	To stop bleeding from cuts and wounds. Crushed leaf is applied.
8	<i>Oroxylum indicum</i> (L.) Vent.	Bignoniaceae	Shona	Bark, fruit	Respiratory and biliary problems, coughs (bark), rheumatism, coughs, restless feeling, constipation, to stimulate appetite, helminthiasis, piles (fruit).
9	<i>Cannabis sativa</i> L.	Cannabaceae	Vang	Leaf	Bitter, increases bile secretion, hallucinogenic, sex stimulant, to induce sleep, to induce pleasant sensations, excessive menstruation, urination problems.

Table 1: Continue

10	<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Bark	Loss of sexual desire, heart disorders, constipation, infections due to cuts and wounds, blood purifier, obesity, diabetes, acne, coughs.
11	<i>Terminalia belerica</i> (Gaertn.) Roxb.	Combretaceae	Bohera	Fruit	Astringent, coughs, biliary disorders, good for eyes and hair, helminthiasis, breaking down of voice, thirst, vomiting tendency, rheumatism.
12	<i>Terminalia chebula</i> Retz.	Combretaceae	Horitoki	Fruit	Astringent, excessive sexual desire, to increase intelligence, good for eyes, to increase longevity, respiratory problems, coughs, piles, leprosy, edema, helminthiasis, breaking down of voice, chronic dysentery, constipation, tumor or swelling, jaundice, loss of appetite, stone dissolving.
13	<i>Ipomoea mauritiana</i> Jacq.	Convolvulaceae	Vhui-kumro	Root	Nutritive, improves voice, diuretic, to increase strength, sperm or lactation, skin assuming different color as in jaundice, to increase vitality, biliary disorders, blood purifier, burning sensations in the body.
14	<i>Kalanchoe pinnata</i> (Lam.) Pers.	Crassulaceae	Pathorkuchi, Himshagor	Leaf	Bitter, astringent, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), piles, swelling or tumor – note that swelling without cause is taken as tumor, burning sensations during urination, kidney or gall bladder stones, spleen disorders, urinary problems arising from endocrinological disorders like diabetes, vaginal diseases.
15	<i>Coccinia grandis</i> (L.) J. Voigt	Cucurbitaceae	Rakhal-shosha	Root	Jaundice, biliary disorders, coughs, spleen disorders, respiratory problems, mucus, leprosy, acne, diabetes, tumor or swelling, mucus in stool, goiter, antidote to poison.
16	<i>Scirpus grossus</i> L.f.	Cyperaceae	Keshur	Leaf	Loss of sexual desire, constipation, respiratory problems, mucus, to increase lactation, biliary disorders, burning sensations in the body caused through accumulation of toxins in blood, eye diseases, to maintain healthy hair, leucorrhea.
17	<i>Emblica officinalis</i> Gaertn.	Euphorbiaceae	Amloki	Fruit, fruit pulp	Biliary problem (bile turns the color of blood), diabetes, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems) (fruit), fatigue, thirst, burning sensations in the body especially in the palms of hands or soles of feet, vomiting tendency, insanity (fruit pulp).
18	<i>Euphorbia neriiifolia</i> L.	Euphorbiaceae	Monshaseez	Leaf	Piles, mucus in stool, coughs, tumor or swelling, bloating, insanity, leprosy, obesity, swelling due to injury, acne, edema, fever, spleen disorders, antidote to poisoning.
19	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Polash	Bark	To increase sperm, acne, disorders of stool, piles, helminthiasis, astringent.
20	<i>Cassia fistula</i> L.	Fabaceae	Sondhal	Leaf, fruit, flower	Coughs, obesity (leaf), laxative, fever, heart disorders, biliary problem (bile turning the color of blood), carminative, piles (fruit), constipation, leprosy, coughs (flower).
21	<i>Clitoria ternatea</i> L.	Fabaceae	Aparajita	Flower	Astringent, acidity, to increase intelligence and memory, loss of sexual desire, eye relaxant, leprosy, urinary disorders, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), dysentery, edema, antidote to poisoning.
22	<i>Saraca indica</i> L.	Fabaceae	Ashok	Bark	Dysentery, skin assuming different color as in jaundice, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), thirst, burning sensations in the body, helminthiasis, blood purifier.

Table 1: Continue

23	<i>Swertia chirata</i> (Roxb. ex Fleming) H. Karst.	Gentianaceae	Chirota	Fruit	Jaundice, poisoning, sexual disorder, biliary disorders.
24	<i>Clerodendrum indicum</i> (L.) Kuntze	Lamiaceae	Bamon-hati	Leaf, root	Fever, burning sensations in the body, hiccoughs, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems) (leaf), astringent, bitter, to increase appetite, excessive sexual desire, bloating and acidity, edema, coughs, mucus, respiratory problems, nose diseases, fever, carminative (root).
25	<i>Leonurus sibiricus</i> L.	Lamiaceae	Naag-keshor	Leaf	Astringent, excessive sexual desire, dysentery, fever, thirst, vomiting, leprosy, coughs, biliary/hepatic disorders, antidote to poisoning.
26	<i>Gmelina arborea</i> Roxb.	Lamiaceae	Gaamvari, Gamari	Bark, fruit	Astringent, bitter, excessive sexual desire, to increase intelligence, mental abnormalities, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), thirst, mucus in stool, piles, severe burning sensations in the body, fever, to increase sperm, blood purifier, infections, cuts and wounds.
27	<i>Ocimum sanctum</i> L.	Lamiaceae	Tulshi	Leaf	Restlessness feeling, excessive sexual desire, burning sensations in the body particularly in palms of hands and soles of feet, increases bile secretion, leprosy, less urination, poisoning of blood, i.e. acts as blood purifier, piles, coughs, carminative.
28	<i>Cinnamomum tamala</i> (Buch.-Ham.) Nees & Eberm.	Lauraceae	Tejpata	Leaf	Excessive sexual desire, coughs, bloating, piles, loss of appetite, sexual disorder.
29	<i>Asparagus racemosus</i> L.	Liliaceae	Shotomool	Whole plant	Asthma during winter, all food tastes bitter, nutritive, to increase intelligence, to maintain good eyes, to increase sperm, to increase lactation, to increase strength, diarrhea.
30	<i>Lygodium flexuosum</i> (L.) Sw.	Lygodiaceae	Dheki-shak	Leaf	Irregular menstruation. Crushed leaves are taken with sugarcane molasses.
31	<i>Punica granatum</i> L.	Lythraceae	Dalim	Leaf, flower	Respiratory tract problems, biliary or hepatic problems, coughs, thirsts, burning sensations especially in palms of hands or soles of feet, fever, throat diseases, to induce satisfied feeling, to increase sperm, slightly astringent, to increase strength and memory, to increase appetite, carminative.
32	<i>Sida cordifolia</i> L.	Malvaceae	Berela	Bark of root	To increase strength, biliary problem (bile turns the color of blood), blood purifier, infections, diabetes. Powdered bark of root is taken with milk and sugar during diabetes.
33	<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Leaf, bark, root, flower, fruit	Good for eyes, increases lung capacity, fatigue, thirsts, coughs, fever, loss of appetite, helminthiasis, acne, biliary disorders, leprosy, wasting away of body, diabetes.
34	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Aknadi	Leaf	Bitter, respiratory problems, coughs, piles, fever, vomiting tendency, leprosy, diarrhea, heart diseases, burning sensations in body, helminthiasis, tumor, acne.
35	<i>Tinospora cordifolia</i> (Willd.) Hook.f. & Thoms.	Menispermaceae	Guloncho	Whole plant	Astringent, constipation, excessive sexual desire, to increase strength, tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), dysentery, thirst, burning sensations in the body, diabetes, jaundice, leprosy, poisoning of blood due to rheumatism, vomiting tendency.
36	<i>Ficus racemosa</i> L.	Moraceae	Joggo-dumur	Fruit	Loss of sexual desire, roughness of skin, biliary disorders, coughs, blood purifier, change of color of skin like as in jaundice, acne, astringent.

Table 1: Continue

37	<i>Morus alba</i> L.	Moraceae	Traimana, Bola-dumur	Leaf	Astringent, biliary disorders, coughs, fever, tumor or swelling without pain, piles, insanity, antidote to poisoning.
38	<i>Moringa oleifera</i> Lam.	Moringaceae	Sajina	Leaf, bark	To stimulate appetite, roughness of skin, to increase sperm, helminthiasis, obesity, coughs, restless feeling, bloating, swelling due to injury, formation of blood clots on skin, goiter, acne, good for eyes, pain, headache.
39	<i>Boerhaavia repens</i> L.	Nyctaginaceae	Gadha-purnima	Leaf	Heart disorders. Leaf juice is taken every morning.
40	<i>Vanda tessellata</i> (Roxb.) G. Don	Orchidaceae	Rashna	Leaf	Coughs, edema, respiratory difficulties, poisoning of blood due to rheumatism, rheumatic pain, fever, 80 types of rheumatism.
41	<i>Piper longum</i> L.	Piperaceae	Pipul	Fruit	Rheumatism, mucus, respiratory problems, coughs, fever, piles, constipation, spleen disorders, skin allergy.
42	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	Sheth-chita	Bark, root	Lack of appetite, constipation, dysentery, leprosy, edema, piles, helminthiasis, coughs, rheumatism, mucus, alleviation of spleen disorders.
43	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durba	Whole plant	Loss of libido, provides a feeling of satisfaction, biliary/hepatic disorders, thirst, vomiting, burning sensations in the body, blood purifier, coughs, fainting, loss of appetite, to remove ghosts or obstacles.
44	<i>Paederia foetida</i> L.	Rubiaceae	Gondho-vaduli	Leaf	Fractures, to increase strength, to increase sperm, rheumatism, pain, piles, skin allergy, constipation.
45	<i>Aegle marmelos</i> (L.) Corr.	Rutaceae	Bael	Unripe fruit	Acidity, skin allergy, excessive sexual desire, carminative, coughs, astringent.
46	<i>Santalum album</i> L.	Santalaceae	Chondon [seth or rokto]	Bark, root	Loss of sexual desire, to induce a satisfactory feeling, slight edema, mucus, biliary disorders, blood purifier, burning sensations in the body.
47	<i>Bacopa monnieri</i>	Scrophulariaceae	Brahmi shak	Leaf	Bitter, astringent, to maintain healthy brain functions, to improve voice, to increase memory, leprosy, swelling due to injuries, blood purifier, edema, fever.
48	<i>Solanum nigrum</i> L.	Solanaceae	Kack-machie	Leaf	Tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems), to have smoothness of voice, good for eyes, edema, piles, fever, diabetes, hiccoughs.
49	<i>Withania somnifera</i> (L.) Dunal	Solanaceae	Ashwogondha	Root	Bitter, astringent. Respiratory problems, coughs, leukoderma, edema, tuberculosis, to increase strength, to increase sperm.
50	<i>Nyctanthes arbor tristis</i> L.	Verbenaceae	Sheuli	Leaf	Bitter, rheumatism, tuberculosis, rheumatism in joints, fever.
51	<i>Vitex negundo</i> L.	Verbenaceae	Nishinda	Leaf	Astringent, to increase memory, good for eyes, biliary disorders, bloating, rheumatism in joint, edema, helminthiasis, spleen disorders, throat infections, piles, loss of appetite, fever, obesity.
52	<i>Cayratia trifolia</i> (L.) Domin.	Vitaceae	Mundi	Leaf	To increase memory, goiter, less urination, vaginal diseases, swelling due to injuries, diarrhea, spleen disorders, obesity, anal diseases.
53	<i>Curcuma longa</i> L.	Zingiberaceae	Holud	Rhizome	Produces coloration of body, excessive sexual desire, rheumatism, leprosy, diabetes, edema.
54	<i>Kaempferia galanga</i> L.	Zingiberaceae	Akangi	Root	Bitter, to increase appetite, excessive sexual desire, leprosy, piles, acne, coughs, respiratory problems, tumor, helminthiasis, goiter, stuttering.

Table 2: Percentage use of various plant parts by Kavirajes of three villages in Sreepur Upazilla, Bangladesh

Plant part used	Percent (%) of use
Whole plant	4.3
Leaves	41.4
Stems	0
Barks	12.9
Roots	17.1
Flowers	7.1
Fruits	15.7
Seeds	0
Gum	0
Rhizome	1.4

Table 3: Medicinal plants used by the Kavirajes of the three villages surveyed in Sreepur Upazilla, which can be classified as functional food.

Preventive objective(s)	Name of plant(s)
To maintain healthy brain functions	<i>Bacopa monnieri</i>
To increase intelligence and memory	<i>Terminalia chebula</i> , <i>Clitoria ternatea</i> , <i>Gmelina arborea</i> , <i>Asparagus racemosus</i> , <i>Bacopa monnieri</i> , <i>Vitex negundo</i> , <i>Cayratia trifolia</i>
To regularize urine and stool	<i>Amaranthus spinosus</i>
To maintain good eyesight	<i>Asparagus racemosus</i> , <i>Azadirachta indica</i> , <i>Moringa oleifera</i> , <i>Solanum nigrum</i> , <i>Vitex negundo</i>
To maintain healthy hair	<i>Scirpus grossus</i>
To provide nutrition	<i>Ipomoea mauritiana</i> , <i>Asparagus racemosus</i>
To improve voice	<i>Ipomoea mauritiana</i> , <i>Bacopa monnieri</i> , <i>Solanum nigrum</i>
To increase longevity	<i>Terminalia chebula</i>
Blood purifier	<i>Terminalia arjuna</i> , <i>Amaranthus spinosus</i> , <i>Gmelina arborea</i> , <i>Ocimum sanctum</i> , <i>Sida cordifolia</i> , <i>Ficus racemosus</i> , <i>Cynodon dactylon</i> , <i>Santalum album</i>
Astringent	<i>Enydra fluctuans</i> , <i>Terminalia bellerica</i> , <i>Terminalia chebula</i> , <i>Kalanchoe pinnata</i> , <i>Butea monosperma</i> , <i>Clitoria ternatea</i> , <i>Clerodendrum indicum</i> , <i>Leonurus sibiricus</i> , <i>Gmelina arborea</i> , <i>Punica granatum</i> , <i>Tinospora cordifolia</i> , <i>Ficus racemosa</i> , <i>Morus alba</i> , <i>Aegle marmelos</i> , <i>Bacopa monnieri</i> , <i>Withania somnifera</i> , <i>Vitex negundo</i>
Bitter	<i>Achyranthes aspera</i> , <i>Enydra fluctuans</i> , <i>Cannabis sativa</i> , <i>Kalanchoe pinnata</i> , <i>Clerodendrum indicum</i> , <i>Gmelina arborea</i> , <i>Stephania japonica</i> , <i>Bacopa monnieri</i> , <i>Withania somnifera</i> , <i>Nyctanthes arbor tristis</i> , <i>Kaempferia galanga</i> Tri-dosh nashok (alleviation or prevention of respiratory, stomach and hepatic problems) <i>Hemidesmus indicus</i> , <i>kalanchoe pinnata</i> , <i>Emblca officinalis</i> , <i>Clitoria ternatea</i> , <i>Saraca indica</i> , <i>Clerodendrum indicum</i> , <i>Gmelina arborea</i> , <i>Tinospora cordifolia</i> , <i>Solanum nigrum</i>

The results obtained from the present study are important from two aspects. First, the medicinal properties of the plants, when researched through modern scientific methods, may prove to have enormous potential in the discovery of newer and more efficacious medicines. Second, the functional food attributes of a number of the plants used by the Kavirajes, if validated by scientific research, can prove a cost-effective way of minimizing diseases and keeping the population healthy without the necessity of using costly drugs or nutraceuticals. Such validation can prove to be immensely useful for poverty-stricken populations of many developing countries throughout the world. This would be especially beneficial to the people of Bangladesh, 40% of whom lives below the poverty line, and the vast majority of the population lacks proper access to modern health-care and clinical facilities.

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