Original Article

An ethnomedicinal survey of cucurbitaceae family plants used in the folk medicinal practices of Bangladesh[1]

Abstract

Background: The Cucurbitaceae family comprising about 125 genera and 960 species is a family that is further characterized by commonly having five-angled stems and coiled tendrils and is also known as gourd family of flowering plants. Plant species belonging to this family have a worldwide distribution, but most species can be found in tropical and subtropical countries. A number of the plants belonging to this family have reported important pharmacological activities. Cucurbitaceae family plants are also in use in the folk medicinal system of Bangladesh—a traditional medicinal system, which mainly relies on medicinal plants for treatment of diverse ailments. **Aims:** Since folk medicinal practitioners form the first tier of primary health care in Bangladesh, the objective of this study was to conduct ethnomedicinal surveys among 75 folk medicinal practitioners (Kavirajes) practicing among the mainstream Bengali-speaking population of randomly selected 75 villages in 64 districts of Bangladesh and 8 tribal practitioners (1 each from 8 major indigenous communities or tribes, namely, Bede, Chakma, Garo, Khasia, Marma, Murong, Santal, and Tripura) of the country. **Materials and Methods:** Surveys were carried out with the help of a semi-structured questionnaire and the guided field-walk method. **Results:** It was observed that the folk and tribal medicinal practitioners use a total of 19 Cucurbitaceae family species for treatment of ailments such as dysentery, diabetes, edema, skin disorders, leukoderma, hypertension, jaundice, typhoid, spleen disorders, respiratory problems, leprosy, rheumatoid arthritis, chicken pox, and cancer. The 19 species of Cucurbitaceae family plants in use were *Benincasa hispida, Bryonopsis laciniosa, Citrullus colocynthis, Citrullus lanatu, Coccinia grandis, Cucumis melo, Cucumis sativus, Cucurbita maxima, Cucurbita pepo, Hodgsonia macrocarpa, Lagenaria vulgaris, Luffa acutangula, Luffa cylindrica, Momordica charantia, Momordica cochinchinensis, Trichosanthes anguina, Trichosanthes cordata, Trichosanthes dioica,* and *Trichosanthes kirilowii*. The review of the available scientific literature showed that the use of a number of the above-mentioned plants in folk medicine can be validated based on their reported pharmacological activity studies. **Conclusion:** Taken together, the plants present excellent potential for further scientific studies, which may result in discovery of novel compounds of therapeutic interest.

Key words:
Bangladesh, cucurbitaceae, folk medicine

Introduction

Bangladesh has more than 86,000 villages spread throughout the various regions of the country.[1] The population is predominantly rural with agriculture and agricultural laborer forming the major occupations of the rural people. Although modern allopathic medicine is available in the country, it has yet to reach the rural people, who for the most part lack access to good allopathic doctors and modern medical facilities. Since the rural people have to travel considerable distances, they often turn to folk medicinal practitioners who offer a cheaper mode of treatment for the various

[1]Dedicated to the late Dr. Farnsworth, University of Illinois at Chicago for his pioneer work on bio-active natural products.

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ailments suffered by the people. This practice has gone on for centuries. Practically, every village in Bangladesh has one or more folk medicinal practitioners, depending on the population of the village. The folk medicinal practitioners, locally known as Kavirajes or Vaidyas, practice a simplistic form of treatment with medicinal plants. Folk medicinal practitioners are possibly the most ancient practitioners of traditional medicine in Bangladesh and in general are the primary health care providers to a majority of the rural and a substantial segment of the urban poor population in the country.[2]

Virtually every indigenous culture in the world uses medicinal plants in some form or other for treatment of ailments. The actual knowledge of medicinal plants is possessed by a select group of practitioners, who determine the nature of the ailments and then prescribe remedies. Although indigenous cultures possess a holistic view of ailments and their cure, medicinal plants do form a major part of indigenous medicinal or traditional medicinal practices. Since the advent of modern or allopathic medicine, traditional medicine lost quite a bit of ground, being determined to be somewhat akin to superstitious beliefs or even quackery by allopathic doctors. However, in recent periods, traditional medicine has made a major comeback. It has been realized that a number of important modern pharmaceuticals have been derived from or are plants used by indigenous people.[3] A number of modern drugs such as aspirin, atropine, ephedrine, digoxin, morphine, quinine, reserpine, and tubocurarine are examples, which were originally discovered through observations of traditional cure methods of indigenous peoples.[4]

The Indian subcontinent comprising the countries India, Pakistan, and Bangladesh form one of the richest sources of traditional medicinal practices in the whole world. Overall, the alternative medicinal systems of India use more than 7500 plant species.[5] Bangladesh also has a number of traditional medicinal systems including Ayurveda, Unani, homeopathy, and the folk medicinal system. In addition, Bangladesh has a number of tribes, and the tribal medicinal practitioner's practices can be considered as a variant of the folk medicinal system of the mainstream population with similar emphasis on medicinal plants. In our ethnomedicinal surveys among the various Kavirajes spread throughout the country and the tribal medicinal practitioners of various tribes, we have observed considerable variations about the plant species selected by any individual Kaviraj for treatment of a specific ailment.[1,6-15] Quite naturally, this variation extended to families of plants.

Cucurbitaceae family, worldwide, comprises about 960 species distributed into 125 genera. Some of these species are quite common in Bangladesh. Considerable scientific literature is present on pharmacological activity studies and the traditional uses of plant species belonging to this family.[16-19] The objective of this study was to conduct surveys among the Kavirajes and tribal medicinal practitioners in randomly chosen areas and major tribes of the country to determine the species of Cucurbitaceae family plants used in the folk and tribal medicinal system of Bangladesh. A further objective was to review the scientific literature for available pharmacological studies on the Cucurbitaceae family plants used in Bangladesh to determine the scientific validation of their folk and tribal medicinal uses.

Materials and Methods

A total of 75 village Kavirajes were interviewed from 75 randomly selected villages scattered throughout the 64 districts of the country. Care was taken that at least one village was from every district of the various districts of Bangladesh. In more densely populated districts of the country such as Dhaka, Netrakona, Mymensingh, Chittagong, Rajshahi, Rangpur, Bogra, Khulna, Kushtia, Jessore, and Sylhet, two Kavirajes were chosen from those districts. These Kavirajes practiced among the mainstream Bengali-speaking population. In addition, eight tribal medicinal practitioners (TMPs) were chosen from eight major tribes of Bangladesh, namely, the Bede, Chakma, Garo, Khasia, Marma, Murong, Santal and Tripura tribe. TMPs belonged to the respective indigenous community or tribe from where they were chosen, practiced among their communities, and could speak the Bengali language in addition to their tribal language.

Informed consent was initially obtained from the Kavirajes and the TMPs. The practitioners were informed in details as to the nature and purpose of our visits, and consent was obtained for disseminating any information obtained, both nationally and internationally. Where tribes were concerned, informed consent was also obtained from the Headman of the particular tribal community. Interviews were carried out in Bengali language. Where any TMP was concerned, interviews were carried out in presence of the Headman, who was in all the tribes surveyed, fluent in the Bengali language, the language spoken by the interviewers.

Interviews were conducted with the help of a semi-structured questionnaire and the guided field-walk method of Martin[20] and Maundu.[21] In this method, the practitioners took the interviewers on guided day time field-walks through places from where they usually collected their medicinal plants, pointed out the plants, and described their uses. Interviews were open-ended where the Kavirajes and the TMPs were allowed to speak at length on medicinal plants with only occasional interruption from the interviewers. Plant specimens as pointed out by the practitioners were photographed and collected on the spot, field-dried, and brought back to Dhaka for identification by Mr. Manjur-Ul-Kadir Mia, ex-Curator and Scientific Officer of the Bangladesh National Herbarium. Voucher specimens

were deposited at the Medicinal Plant Collection Wing of the University of Development Alternative. All information was double-checked with Kavirajes and TMPs in later evening sessions. It is to be noted that although formulations and dosages were asked from every practitioner, very few chose to give them on grounds that such information may destroy their practices through the dissemination of such knowledge among other people. Also to be noted that data were collected for various plant species belonging to a number of families; information on plants belonging only to the Cucurbitaceae family is presented in this study.

Results

Results obtained in the present survey indicated that 19 Cucurbitaceae family plant species were used by the Kavirajes and TMPs of various regions and tribes of Bangladesh. The diseases for which these plants were used included alopecia, bed wetting in children, bleeding from external cuts and wounds, burns, cancer, cholera, diabetes, debility, dizziness, ear disorders, edema, eye disorders, fever, gastrointestinal disorders, goiter, heart disorders, helminthiasis, hematemesis, hemorrhoids, hepatic disorders, infections, infertility, inflammation, insanity, lesions, leucorrhea, malaria, menstrual disorders, mumps, pain, paralysis, pox, respiratory tract disorders, rheumatoid arthritis, skin disorders, sexual disorders, sexually transmitted diseases, sun stroke, tetanus, tuberculosis, typhoid, and vomiting. Additionally, some plants were used to keep whole body or body parts cool. The summer months are hot in Bangladesh, and rural people have to work whole day in the sun tending to the fields for cultivation and harvesting of crops. As a result, people visit Kavirajes or TMPs for use of medications (plants), which can keep the whole body or exposed body parts cool while working in the summer heat. Some plants also had ethnoveterinary uses. The results are shown in [Table 1].

Whole plants, a single plant part, or a combination of plant parts were mentioned by the Kavirajes and TMPs to be used in their treatments. The same plant part or combination of plant parts could be used for treatment of ailments, which were diverse in nature. For instance, a combination of roots, seeds, and fruits of the plant *Benincasa hispida* was used for treatment of diverse ailments such as infertility, tumor, gonorrhea, mucus, and helminthiasis. Seeds of the same plant were used for treatment of helminthiasis and colic. The formulation prescribed was a little different for the above two ailments; while pulp of seeds was macerated and taken in the morning on an empty stomach for helminthiasis, pulp of seeds was dried, burnt, and taken with warm water to relieve colic pain.

The plant which was used for treatment of the maximum number of diseases was *Coccinia grandis*. Consistent with the maximum number of ailments treated with this plant species was the observation that this plant had the most number of its parts used in the treatments. In fact, whole plant, leaves, roots, stems, flowers, fruits, and meristems from the plant were used in the treatment singly or in combination. Merely, the leaves alone were used by different Kavirajes and TMPs for treatment of stomach pain, diabetes, fever, dizziness, coughs, jaundice, increased temperature of hands or head, hypertension, flatulence, blood disorders, sun stroke, eczema, leucoderma, burning sensations in hands or feet, whitish discharge in urine of men, oral lesions, scabies, bed wetting in children, head ache, and insanity. 73 of the 83 Kavirajes and TMPs surveyed reported using this plant for treatment of one or other diseases. Apart from the Murong TMP, the other seven TMPs from various tribes reported using the plant in their treatments, of which the most common ailment being treated is diabetes. Diabetes was also one of the major ailments being treated with this plant by the mainstream Kavirajes.

In several cases, Cucurbitaceae family plants were used in combination with plants from other family species. For treatment of lesions on the tongue, skin of young fruits of *B. hispida* was applied topically following maceration with skin of fruits of *Elettaria cardamomum* and young whole plants of *Ricinus communis*. It is to be noted that during the treatment period, the Santal TMP advised not to eat any of the four fish species, namely, *Wallago attu*, *Puntius puntius*, *Channa marulias*, and *Cirrhenus mrigala*. For treatment of excessive bleeding during menstruation and lower abdominal pain, the Bede TMP used juice obtained from squeezed fruits of *Bryonopsis laciniosa* with juice from leaves of *Eclipta alba*, fruit of *Musa sapientum*, and ash of any metal. The mix was to be taken in a wet cup and with wet hair. While it would be difficult to say without performing the requisite scientific experiments about the efficacy of the procedure, it is very much possible that wet cup and wet hair may be part of a psychological healing process by the TMP, who is trying to induce a strong belief in the patient that such process can lead to healing. Such strengthening of a belief in the patient can lead to a much quicker recovery through built-up of a patient's confidence, and forms a part of the treatment method, even with modern allopathic medicine. The Bede TMP seemed to apply more often this form of psychological healing, while at the same time using plant-based materials. For treatment of edema by the Bede TMP, macerated skins of old fruits of *Lagenaria vulgaris* were mixed with rotten leaves of *Mangifera indica*, ashes of burnt roots of *Corchorus olitorius*, and indigo and then applied to the whole body. It is to be noted that rotten leaves were to be collected from sides of ponds or tube wells; it is possible that such leaves will fall on top of any collected water (in case of tube well) or damp soil (ponds) where they will end up rotting and not drying up, as will be the case if they fall on dry ground. The use of rotten leaves can be of therapeutic efficiency (needs to be proved scientifically), but the use of indigo and the

Table 1: Cucurbitaceae plant species and ailments treated as reported by folk and tribal medicinal practitioners from various regions in Bangladesh

Botanical name	Local name(s)[1]	Plant part(s) used	Diseases, formulation(s) and dosages[2]	Number of reporting practitioners[3]
Benincasa hispida (Thunb.) Cogn.	Kumra, chal kumra, rathsa mannhe (Santal)	Whole plant, leaf, fruit, root, seed	A combination of roots, seeds, and fruits is taken for infertility, tumor, gonorrhea, as expectorant and helminthiasis. Whole plants are taken for spermatorrhea, gastritis, and infertility. Fruits are taken for insanity. Leaves are taken for constipation, flatulence, and stomach ache. Fruits and seeds are taken for helminthiasis, colic, flatulence, and enlarged heart. 2 g pulp from seeds is macerated and taken in the morning on an empty stomach for helminthiasis. Pulp of seeds is dried and burnt and taken with warm water for colic pain. Juice obtained from squeezed fruit is massaged for 10–15 min on the stomach area as treatment for flatulence. Ripe fruits are cooked with goat milk and eaten for enlarged heart conditions (Santal). Skin of young fruits is mixed with pulp from inner part of seeds of *Mangifera indica* L. (Anacardiacaeae), skin of fruits of *Elettaria cardamomum* (L.) Maton (Zingiberaceae), and 4–5 young whole plants of *Ricinus communis* L. (Euphorbiaceae). The mixture is macerated and applied to the tongue as treatment for lesions on the tongue. Note that during this time, eating of the following fish species is forbidden: *Wallago attu*, *Puntius puntius*, *Channa marulias*, and *Cirrhenus mrigala* (Santal).	5
Bryonopsis laciniosa (L.) Naud.	Shib fol (Bede), gorvo fol (Bede), rajmohini fol (Bede)	Fruit	For treatment of kalo bador (Bede term for excessive bleeding during menstruation and lower abdominal pain during menstrual period), squeezed fruits are mixed thoroughly with juice obtained from leaves of *Eclipta alba* (L.) Hassk. (Asteraceae), and ash of any metal (dhatu bhasya, calcined metal) and taken in the morning with banana [fruit of *Musa sapientum* L. variety Shabri (Musaceae)] on an empty stomach for 7 days. Note that the mixture is to be taken in a wet cup and with wet hair (Bede). For treatment of infertility in woman, a fruit is inserted into a banana fruit and taken on an empty stomach in the morning for 1 day only. Alternately, a fruit is inserted into a banana and kept in an open wardrobe for 1 night. The fruits are eaten in the morning before the morning prayer on an empty stomach once daily for 2 weeks (Bede).	
Citrullus colocynthis (L.) Schrad.	Whole plant is known as sthol makal, fruits are known as indro job or indro baruni, makal	Leaf, root, flower, fruit	A combination of leaves, roots, and flowers is taken for jaundice, cancer, rheumatoid arthritis, constipation, and as an abortifacient. A combination of fruits and roots is taken for irritation in sole of foot or palm of hand.	2
Citrullus lanatus (Thunb.) Matsum. and Nakai	Tormuj	Leaf, fruit, seed	A combination of leaves, fruits, and seeds is taken as tonic, as purgative and for treatment of diabetes. Fruits are taken for heart disorders, typhoid fever, and as a diuretic.	2
Coccinia grandis (L.) J. Voigt	Telakucha, telakochu, kosoilla, telakucha (Chakma), telakuchila, goolmo gach, kala kochu (Tripura), kala kuch, nichu bang (Marma), telakucha (Khasia), khuicchala, kuccha lota, kela kuch, telamoon, telakuchi, kelakucha, telakuchi (Santal),	Whole plant, leaf, root, stem, flower, fruit, meristem	Whole plant is used for treatment of diabetes, flatulence, hypertension, fever, inflammation, head ache, typhoid, sunstroke, coughs, diarrhea, blood dysentery, alopecia, skin eruptions, gonorrhea, myopathic spasm, dermatitis, vomiting, burns, eye infections, and purification of blood. Leaves are used for treatment of stomach pain, diabetes, fever, dizziness, coughs, jaundice, increased temperature of hands or head, hypertension, flatulence, blood disorders, sun stroke, eczema, leucoderma, burning sensations in hands or feet, whitish discharge in urine of men, oral lesions, scabies, bed-wetting in children, head ache, and insanity. Roots are used for mental diseases, diabetes, persistent bleeding following menstruation, biliary disorders, coughs, spleen disorders, tumors or swellings, goiter, and as antidote to poison. Fruits are used for eczema, diabetes, acne, typhoid, and lesions of tongue. A combination of leaves and flowers is used for hypertension, diabetes, head ache, sedative, and dermatitis. A combination of leaves and roots is used for diabetes, edema, eye diseases, and dysentery. A combination of leaves and stems is used for mental disease, leucorrhea, diabetes, hematemesis (blood coming out with vomit or sputum, a condition usually arising out from tuberculosis or hypertension), and loss of appetite. A combination of leaves and fruits is used for baldness, diabetes, sun stroke, and removal of scars. A combination of leaves with meristems is used to treat burning sensations in hands or feet.	73

(Continued)

Table 1: (Continued)

	telakucha (Santal), matha sindur, kawaluli, telakustila, telakura, mama kola, telakuja, rakhal sosha, telae kochu, tela kucha (Bede), telakucho (Khasia), telamon (Garo)		The Chakmas use whole plant for treatment of coughs and fever. The Marmas use a combination of leaves and stems for respiratory problems and lung disorders. The Tripuras use leaves for diabetes and dizziness. The Santals use leaves for treatment of mental depression, disability to work, blood dysentery, and body pain. ½ cup of juice obtained from macerated leaves is taken twice daily in the morning on an empty stomach and in the night after meals to control diabetes. 100 g leaves is slightly squeezed in 250 ml water. About 125 ml of the water is taken twice daily for 45–60 days for diabetes. Roots of the plant are mixed with roots of *Solanum torvum* Swartz (Solanaceae), *Urena lobata* L. (Malvaceae) and *Stephania japonica* (Thunb.) Miers (Menispermaceae), macerated, and taken with water for diabetes and debility. Paste prepared from macerated 5–6 tops of young stems is taken orally (1 cup) with the addition of a little salt and warm rice 1–2 times daily for diabetes. Juice obtained from macerated leaves is taken with a little honey for diabetes. Alternately, leaves are cooked and eaten as vegetable. 2– teaspoonfuls of juice obtained from a mixture of crushed leaves and roots is slightly warmed and taken for diabetes (Santal). For treatment of diabetes, juice obtained from macerated leaves of the plant is mixed with dried and powdered fruits of *Ficus racemosa* L. (Moraceae). 3 teaspoonfuls of the mixture is taken 2–3 times daily (Bede). Leaves of the plant are macerated with 50g seeds of *Syzygium cumini* (L.) Skeels (Myrtaceae), 50g seeds of *Momordica charantia* L. (Cucurbitaceae) and 100 g seeds of *Trigonella foenum-greacum* L. (Fabaceae). One teaspoonful of the macerated mix is taken after evening meals for 1 month as treatment for diabetes (Bede). Cooked leaves of the plant are eaten as treatment for diabetes (Khasia). Juice obtained from a crushed mixture of leaves and roots is taken daily in the morning for diabetes (Garo). ½ cup of juice obtained from macerated whole plant is taken 2–3 times daily for 7 days as treatment for burning sensations in the scalp, feeling of hotness in head, or swellings in hands or feet. Roots of the plant are macerated with roots of *Costus speciosus* (J. König.) Sm. (Costaceae), stems of *Ipomoea aquatica* Forssk. (Convolvulaceae), and *Enydra fluctuans* Lour. (Asteraceae) and applied to head to keep head cool and reduce burning sensations in the body. For treatment of dizziness and to keep head cool, macerated leaves of the plant are kept on top of the head from sunrise till sunset for a week (Bede). Leaves and fruits of the plant are mixed with leaves of *Azadirachta indica* A. Juss. (Meliaceae) and stems of *Leucas aspera* (Willd.) Link (Lamiaceae) and taken orally for treatment of diarrhea, purification of blood, loss of appetite, and indigestion. For treatment of rheumatic pain and sciatica, 250 g leaves of the plant are mixed with 250 g each of leaves of *Lygodium flexuosum* (L.) Sw. (Lygodiaceae), *Datura stramonium* L. (Solanaceae), *Cycas rumphii* Miquel (Cycadaceae) and 1 kg of mustard oil and boiled in a pan over a fire. When the decoction turns thick and the volume reduced by approximately half, the decoction is cooled and bottled. The areas affected by pain are first washed with warm water following which the decoction is applied topically. This is done thrice daily for 21 days. For treatment of loss of appetite, especially due to fever or mucus, leaves are boiled and then fried in ghee (clarified butter) and eaten (Santal). 5–6 tablespoonfuls of juice obtained from leaves is administered to patients who are vomiting due to effects of poisoning (Santal). For treatment of head ache or severe body pain, leaves of the plant are crushed with leaves and stems of *Ageratum conyzoides* L. (Asteraceae) and leaves of *Cycas rumphii* and applied to painful areas twice daily for 7 days. Alternately, crushed leaves of the plant are applied to affected areas twice daily for 7 days (Bede). For treatment of infections, abscesses, or boils, macerated leaves of the plant are stirred in a little amount of water in a bowl. A small amount of the mixture is added to bathing water and the patient bathed in the water. This is continued for 3–4 days (Bede). For treatment of jaundice, 2 teaspoonfuls of juice obtained from macerated leaves are taken twice daily till cure (Bede).	
Cucumis melo L.	Bhangi	Seed, bark, fruit	Jaundice, diabetes, constipation, to stop bleeding from cuts and wounds, and eczema.	1
Cucumis sativus L.	Shosha	Seed, bark, fruit	Indigestion (fruit), emetic (bark), diuretic, helminthiasis (seed), and to produce a cooling effect in the body (fruit).	1

(Continued)

Table 1: (Continued)

Cucurbita maxima Duchesne	Mishti lau, ishit kumra, kaakdo (Santal)	Whole plant, leaf, fruit, seed	A combination of leaves, fruits and seeds is orally taken for cancer and nervous disorders. Seeds are taken for helminthiasis. Fruits are eaten to produce a cooling effect in the body. Fruits are taken for gastrointestinal problems, joint pain, cold, constipation, and piles (Santal).	3
Cucurbita pepo L.	Kumra (Bede)	Leaf, stem	Leaves and stems are cooked and eaten to maintain strength in the body (Bede).	1
Hodgsonia macrocarpa Cogn.	Keha pang (Marma), Rung kopai warui (Murong)	Fruit, rind, and seed of fruits	Fruits are taken for fever and malaria (Marma). Rind and seeds of fruits are orally administered for severe stomach pain in children (Murong).	2
Lagenaria vulgaris Ser.	Chachi lau, lau olabo, gol lau, jail lau, lau (Santal), kodu, lau (Bede)	Leaf, stem, fruit, seed	Leaves are macerated and juice applied topically for acne, eye disorders, and ear ache. Leaf juice is applied to ears for ear ache. (Santal) Leaf juice is orally administered for pain in the umbilicus due to worms. Fruits are boiled with seeds of *Vigna mungo* (L.) Hepper (Fabaceae) and fed to cows to increase milk production. The juice that comes out of the fruit while cutting the fruit is applied to head to keep head cool. The same juice is orally administered with orange peels as remedy for cholera in children. For treatment of edema, macerated skins of old fruits are mixed with rotten leaves of *Mangifera indica* L. (Anacardiaceae) that have collected by the sides of ponds or tube wells, 1 poa (approximately 250 g) indigo and ashes of burnt roots of *Corchorus olitorius* L. (Tiliaceae) (the plant should be collected in the Bengali calendar month of Bhadra). The mixture is applied to the whole body and kept for 72 hours (Bede). Seeds are taken for helminthiasis. Leaves, stems, and fruits are taken for gastritis, edema, gout, and heart disorders. Leaves and fruits are eaten as tonic. Leaves and stems are cooked and eaten to maintain heart in good condition, disorders of the heart (irregular heartbeats, high pulse rate, restlessness), and to maintain navel region cool (Bede). Leaves, fruits, and seeds are taken for jaundice, cooling, fever, coughs, swellings, rheumatoid arthritis, and small pox.	10
Luffa acutangula (L.) Roxb.	Tori	Whole plant	Jaundice, tetanus, anti-emetic, expectorant, insanity, and itches.	1
Luffa cylindrica M. Roem	Kador, dhondhol, ghosa ful, dhundhol, shakkha pang (Garo)	Leaf, root, bark, fruit, seed	Fruits are taken for cancer, head ache, and sinusitis. Seeds are taken for helminthiasis and constipation and as an abortifacient (Garo). Roots are orally taken for bronchitis and topically applied for skin diseases. A combination of leaves and fruits is orally taken as antiemetic, and topically applied for eczema. A combination of leaves, barks, and seeds is orally taken for dysentery with mucus, as antiemetic, and diarrhea and topically applied for skin diseases.	5
Momordica charantia L.	Korla, uichta, tit corolla, ustha, muiccha, bon uccha, karlhe mannhe (Santal), korola (Santal), korola (Garo, Bede), usta (Garo, Bede)	Leaf, root, flower, fruit, seed	Leaves are orally administered for chicken pox (Garo), diabetes, helminthiasis, paralysis, infections, severe diarrhea, dysentery, acidity, arthritis, and blood purification. Fruits are orally taken for flatulence, indigestion, diabetes, fever, pain, edema, rheumatism, jaundice, helminthiasis, and sexual disorders. A combination of juice obtained from root, seed, and fruit is taken orally for cancer, night blindness, rheumatoid arthritis, helminthiasis, diabetes, jaundice, malaria, piles, edema, and itches. A combination of fruit and seed is taken orally for cancer (Santal), dermatitis, diabetes, indigestion, and fever or dysentery in cow or goat (Santal). A combination of leaf and fruit is orally taken for diabetes, constipation, dyspepsia, malaria, peptic ulcer, helminthiasis, jaundice, chicken pox, blood purification, indigestion, and as preventive medicine for avoiding skin disorders like boils and infections. For treatment of diabetes and blood purification, 2 fruits are cut into small pieces and soaked in 50 g water for 20 min. The fruit pieces are then squeezed in the water and the mixture taken in the morning and night 30 minutes before meals. This is continued for 3 months. The patient is asked not to partake of any vegetables that grow under the soil as well as excessively salty or sweet food items during this period. For treatment of diabetes, juice from a fairly large-sized fruit is taken in the morning. Alternately, paste prepared from the fruit is taken in the morning at the beginning of breakfast.	27

(Continued)

Table 1: (Continued)

			For treatment of chicken pox (to alleviate pain and infections as well as for preventive purposes), pills made from crushed leaves are taken thrice daily. 50 g seeds is macerated with leaves of *Coccinia grandis* (L.) J. Voigt. (Cucurbitaceae), 50g seeds of *Syzygium cumini* (L.) Skeels (Myrtaceae), and 100g seeds of *Trigonella foenum-graecum* L. (Fabaceae). One teaspoonful of the macerated mix is taken after evening meals for 1 month as treatment for diabetes (Bede). For treatment of diabetes, juice obtained from macerated fruits is mixed with juice obtained from macerated leaves of *Azadirachta indica* A. Juss. (Meliaceae), dried and powdered seeds of *Syzygium cumini* (L.) Skeels (Myrtaceae) and powdered seeds of *Trigonella foenum-graecum* L. (Fabaceae) in equal amounts. One teaspoonful of the mixture is taken every morning on an empty stomach for 7 days. Note that this preparation cannot be taken if one has gastritis (Bede). For treatment of diabetes, juice obtained from macerated fruits is mixed with juice obtained from macerated leaves of *Azadirachta indica* A. Juss. (Meliaceae). The combination is taken thrice daily in the morning, afternoon, and evening till diabetic symptoms are under control (Bede). ½ cup of juice obtained from squeezed leaves is taken in the morning on an empty stomach for diabetes. At the same time, fruits are cooked and eaten during afternoon and evening meals (Garo). Young leaves are fried with seeds of *Cuminum cyminum* L. (Apiaceae) and eaten to purify blood and as a preventive medicine for avoiding skin disorders like boils and infections (Bede). Juice obtained from macerated leaf and fruit is taken for jaundice (Bede). One teaspoonful of juice obtained from a combination of leaves and fruits is taken daily for diabetes and cancer. Boiled leaves are applied topically to head or skin for treatment of headache and skin disorders, respectively (Bede). Juice obtained from macerated leaves is mixed with juice obtained from macerated stems of *Tinospora cordifolia* (Willd.) Hook.f. and Thoms. (Menispermaceae) and taken orally for chicken pox (Garo).	
Momordica cochinchinensis (Lour.) Spreng.	Kakroal, karol gach	Leaf, root, fruit, seed	Cancer, malaria, expectorant, liver diseases, edema, itches, constipation, pain, blood purification, rheumatoid arthritis, colic, and dermatitis. Fruits are taken for diabetes. Seeds are taken for rheumatism. Roots are taken for pain and abscesses.	8
Trichosanthes anguina L.	Chichinga	Root, fruit, seed	Syphilis, helminthiasis, anti-hemorrhagic, and vomiting.	1
Trichosanthes cordata Roxb.	Bhuin kumra	Leaf, tuber	Sudden fits of vomiting, fever, and headache. Juice obtained from leaves and tubers is mixed with a little salt and juice obtained from leaves of *Ocimum tenuiflorum* L. (Lamiaceae) to make syrup. ½ teaspoonful of the syrup is taken twice for 1 day only.	1
Trichosanthes dioica Roxb.	Potol	Leaf, fruit, seed	Leaves, fruits, and seeds are considered good for treatment of cancer, constipation, acne, bronchitis, and to stop bleeding from external cuts and wounds. Fruits with seeds are administered as diuretic, and for lack of appetite, debility, fever, and to stop bleeding from external cuts and wounds. Leaves are chewed to get rid of foul odor from mouth.	3
Trichosanthes kirilowii Maxim.	Lota mohakaal, makhol, makhal, mohakaal	Whole plant, leaf, fruit, seed	Whole plant is administered as treatment for cancer, jaundice, mumps, diabetes, constipation, and as an astringent. Leaves are topically applied to itches. In combination with fruits, leaves are orally taken for jaundice, asthma, and flatulence, and topically applied to remove scar marks. A combination of fruits and seeds is orally administered for diabetes and tuberculosis, and topically applied for dermatitis.	4

Survey was conducted among 75 folk medicinal practitioners (Kavirajes) practicing among the mainstream Bengali-speaking population and 8 tribal medicinal practitioners (one each from the Bede, Chakma, Garo, Khasia, Marma, Murong, Santal, and Tripura tribe of Bangladesh). The 75 Kavirajes were randomly selected from villages in the 64 districts of the country. [1]Tribal names are given in parentheses. All other names are in Bengali. Note that in some cases, the Bengali and the tribal names are the same, suggesting that the tribe has, at least to some extent, possibly been influenced by the Bengali language (Bengali language is the language of the mainstream 98% of the population). [2]When information was obtained from a tribal medicinal practitioner, the name of the tribe is given in parentheses. Formulations are given only when disclosed by the practitioner. Not all practitioners disclosed formulations and/or dosages. Any formulation, when obtained, is presented at the bottom of the respective column. [3]Numbers given denote the total number of practitioners out of the 83 surveyed who use that particular species of Cucurbitaceae family plant in their treatment methods

use of whole plants of *C. olitorius* collected in the Bengali calendar month of Bhadra (mid-August to mid-September) again suggests a psychological form of healing on top of plant components. Indigo is a dye obtained from the plant, *Indigofera tinctoria* L. (Fabaceae), and is of dubious value in treatment of edema, except for any psychological effect that the dye may produce when a patient's whole body is thus colored. Also, the use of *C. olitorius* collected only in the month of Bhadra may have a psychological impact on the patient, that in this month the particular plant may have special healing effects.

Gastrointestinal disorders appeared to be the most common ailment treated by the practitioners. Altogether, 12 plants were used for treatment. Cancer and respiratory tract disorders were treated with nine different Cucurbitaceae family plant species each, diabetes and fever with six plants, helminthiasis with seven plants, and hepatic disorders and skin disorders with eight plants each. The results are shown in [Table 2]. Gastrointestinal disorders, helminthiasis, skin, and respiratory tract disorders are common in Bangladesh, partly due to the unhygienic conditions of living by the rural and urban poor population and partly because of the hot and humid weather during summer, especially during the monsoon months from May till around October.

Two diseases treated by the practitioners are difficult to treat by modern allopathic medicine. These diseases are cancer and diabetes. The Kavirajes and TMPs did not use any clinical diagnostic procedures for diagnosis of these two diseases. Cancer was when a patient had visible but unexplained swellings or tumors, or when a patient wasted away without any discernible cause, or had continuous loss of appetite and loss in weight. Diabetes was diagnosed by sweet taste of urine, frequent thirsts, and frequent urinary urges. Quite often, a patient would be asked to urinate near an ant nest, followed by closely observing whether ants

Table 2: Types of ailments and their treatment with Cucurbitaceae family plants by Kavirajes and TMPs in Bangladesh

Type of ailment	Plant species used
Alopecia	*Coccinia grandis*
Bed wetting in children	*Coccinia grandis*
Bleeding from external cuts and wounds	*Cucumis melo, Trichosanthes anguina, Trichosanthes dioica*
Burns	*Coccinia grandis*
Cancer, tumor	*Benincasa hispida, Citrullus colocynthis, Coccinia grandis, Cucurbita maxima, Luffa cylindrica, Momordica charantia, Momordica cochinchinensis, Trichosanthes dioica, Trichosanthes kirilowii*
Cholera	*Lagenaria vulgaris*
Diabetes	*Citrullus lanatus, Coccinia grandis, Cucumis melo, Momordica charantia, Momordica cochinchinensis, Trichosanthes kirilowii*
Debility	*Coccinia grandis, Cucurbita pepo, Trichosanthes dioica*
Dizziness	*Coccinia grandis*
Ear disorders (ear ache)	*Lagenaria vulgaris*
Edema	*Coccinia grandis, Lagenaria vulgaris, Momordica charantia, Momordica cochinchinensis*
Eye infections, eye disorders (night blindness)	*Coccinia grandis, Lagenaria vulgaris, Momordica charantia*
Fever	*Coccinia grandis, Hodgsonia macrocarpa, Lagenaria vulgaris, Momordica charantia, Trichosanthes cordata, Trichosanthes dioica*
Gastrointestinal disorders (gastritis, colic, stomach pain, flatulence, diarrhea, loss of appetite, indigestion, dysentery, and constipation)	*Benincasa hispida, Citrullus colocynthis, Coccinia grandis, Cucumis melo, Cucumis sativus, Cucurbita maxima, Hodgsonia macrocarpa, Luffa cylindrica, Momordica charantia, Momordica cochinchinensis, Trichosanthes dioica, Trichosanthes kirilowii*
Goiter	*Coccinia grandis*
Heart disorders (enlarged heart, hypertension, myopathic spasm, and irregular heart beat)	*Benincasa hispida, Citrullus lanatus, Coccinia grandis, Lagenaria vulgaris*
Helminthiasis	*Benincasa hispida, Cucumis sativus, Cucurbita maxima, Lagenaria vulgaris, Luffa cylindrica, Momordica charantia, Trichosanthes anguina*
Hematemesis	*Coccinia grandis*
Hemorrhoids	*Cucurbita maxima, Momordica charantia*
Hepatic disorders (jaundice)	*Citrullus colocynthis, Coccinia grandis, Cucumis melo, Lagenaria vulgaris, Luffa acutangula, Momordica charantia, Momordica cochinchinensis, Trichosanthes kirilowii*
Infections	*Coccinia grandis, Momordica charantia*
Infertility	*Benincasa hispida, Bryonopsis laciniosa*
Inflammation	*Coccinia grandis*
Insanity	*Coccinia grandis, Luffa acutangula*
Irritation/burning sensations in sole or palm or hands and feet	*Citrullus colocynthis, Coccinia grandis*

(Continued)

Table 2: (Continued)

Lesions on tongue and oral lesions	*Benincasa hispida, Coccinia grandis*
Leucorrhea	*Coccinia grandis*
Malaria	*Hodgsonia macrocarpa, Momordica charantia, Momordica cochinchinensis*
Menstrual disorders (excessive bleeding during menstruation)	*Bryonopsis laciniosa, Coccinia grandis*
Mumps	*Trichosanthes kirilowii*
Pain	*Coccinia grandis, Cucurbita maxima, Luffa cylindrica, Momordica charantia, Momordica cochinchinensis, Trichosanthes cordata*
Paralysis	*Momordica charantia*
Pox (chicken pox and small pox)	*Lagenaria vulgaris, Momordica charantia*
Respiratory tract disorders (cold, mucus, coughs, bronchitis, and asthma)	*Benincasa hispida, Coccinia grandis, Cucurbita maxima, Lagenaria vulgaris, Luffa acutangula, Luffa cylindrica, Momordica cochinchinensis, Trichosanthes dioica, Trichosanthes kirilowii*
Rheumatoid arthritis, gout, and arthritis	*Citrullus colocynthis, Lagenaria vulgaris, Momordica charantia, Momordica cochinchinensis*
Skin disorders (dermatitis, boils, eczema, scabies, leucoderma, acne, itches, and abscess)	*Coccinia grandis, Cucumis melo, Lagenaria vulgaris, Luffa acutangula, Luffa cylindrica, Momordica cochinchinensis, Trichosanthes dioica, Trichosanthes kirilowii*
Sexual disorders (spermatorrhea)	*Benincasa hispida, Momordica charantia*
Sexually transmitted diseases (gonorrhea and syphilis)	*Benincasa hispida, Coccinia grandis, Trichosanthes anguina*
Sun stroke	*Coccinia grandis*
Tetanus	*Luffa acutangula*
Tuberculosis	*Trichosanthes kirilowii*
Typhoid	*Citrullus lanatus*
Vomiting	*Coccinia grandis, Luffa acutangula, Luffa cylindrica, Trichosanthes anguina, Trichosanthes cordata*

hover near the urination site after the urine has soaked in to the soil.

Discussion

It was of interest to review the scientific literature and evaluate whether the use of any Cucurbitaceae family plant species for treatment of a given ailment could be validated through existing scientific studies. Such evaluation would lend credence to the belief that folk medicine is at least not quackery, but to some extent may have evolved through trials with the plant species by the practitioners. Accordingly, a search was made of the established scientific databases for relevant data. The scientific data search clearly indicated that the use of a number of Cucurbitaceae family plant species by the Kavirajes and the TMPs can be validated by existing scientific studies.

B. hispida was observed to be used, among other ailments, for treatment of heart and gastrointestinal disorders. The hypotensive effects and antiangiogenic effects of fruits and seeds, respectively, have been reported.[22,23] Gastroprotective effects against gastric ulcers have also been reported.[24-26] Various plant parts of *C. colocynthis* were reported by the Kavirajes to be used for treatment of cancer, rheumatoid arthritis, and as an abortifacient. *In vitro* and *in vivo* studies have demonstrated the efficacy of cucurbitacins-type triterpene glucoside obtained from this plant against hepatocellular carcinoma.[27] The anti-inflammatory and analgesic effects of the plant have been reported, which suggests that the plant may prove useful in the treatment of rheumatoid arthritis.[28,29] Additionally, the plant reportedly has abortifacient effects.[30]

C. grandis was found to be used extensively by the Kavirajes and the TMPs for treatment of diabetes. Blood sugar lowering effect of the plant has been reported.[31] Potent α-amylase inhibitory activity has also been reported for the plant, suggestive of its antidiabetic potential.[32] In addition, antidyslipidemic activity of polyprenol obtained from the plant has been shown in high-fat diet-fed hamster model.[33] *In vitro* antioxidant activities of leaf extract have further been reported.[34] Cumulatively, the results suggest that the plant can prove efficacious in ameliorating various diabetic symptoms or diabetes-induced complications. Diabetes, over time, can lead to neurological, cardiovascular, and nephropathic disorders, and diabetic patients have an increased risk for developing heart-related complications with time, especially if they also suffer from obesity. From that view point, use of the plant, *Cucumis melo* by Kavirajes for treatment of diabetes can be significant, for the plant has been shown to ameliorate atherogenic diet-induced dyslipidemia, hypothyroidism, and hyperglycemia.[35]

Luffa acutangula, which is used by the Kavirajes for treatment of jaundice, has been found to have hepatoprotective effects against carbon tetrachloride and rifampicin-induced liver toxicity in rats.[36] *Luffa cylindrica* was observed to be used for treatment of diarrhea and dysentery by the Kavirajes. Fruit and seed extracts of the plant have been demonstrated to

be effective for disinfecting waterborne coliform bacteria.[37] The antidiabetic and anticancer potentials of *Momordica charantia* have been quite extensively documented.[38-43] Notably, the plant is used for treatment of diabetes, as well as cancer, by the folk medicinal practitioners and TMPs of Bangladesh. The anticancer potential of *Momordica cochinchinensis* has been shown through the ability of water extract of its fruit in inhibiting tumor growth and angiogenesis.[44] The fruits of this plant are also used by the Kavirajes for treatment of cancer.

Trichosanthes dioica is used by the Kavirajes to treat, among other ailments, cancer, constipation, and bleeding from external cuts and wounds. Roots of the plant have been shown to have stimulant laxative activity in mice.[45] Roots have also been shown to possess antitumor efficacy and ameliorated oxidative stress against Ehrlich ascites carcinoma in mice models.[46] Additionally, roots reportedly demonstrated *in vitro* cytotoxic effects.[47] The wound healing potential of fruits of the plant has been reported.[48] *Trichosanthes kirilowii* was observed to be used by the folk medicinal practitioners for treatment of diabetes and cancer. Several glycans, namely, trichosans A-E, have been reported from the roots of this plant with hypoglycemic properties.[49] Anticancer activities have been reported for trichosanthin and cucurbitacin D, isolated from the plant.[50-53]

Taken together, a review of relevant scientific literature indicated that a number of medicinal plants used by the Kavirajes and TMPs of Bangladesh for treatment of various ailments can be validated scientifically. Among such ailments are two difficult to cure diseases with allopathic medicine like cancer and diabetes. Only some forms of cancer can be cured through allopathic medicines and then if only the cancer is at the early to midstages of the disease. Moreover, the forms of treatment of cancer are costly and can have many deleterious side-effects. Diabetes cannot be totally cured at all with allopathic medicine. It is expected that the formulations of the Kavirajes can become the subject of scientific studies leading to discovery of novel and efficacious drugs at affordable prices to the poor.

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