

ORIGINAL ARTICLES

An Ethnomedicinal Survey of Dhamrai Sub-district in Dhaka District, Bangladesh

¹Mohammed Rahmatullah, ¹Anuj Kumar Das, ¹Md. Ariful Haque Mollik, ¹Rownak Jahan, ¹Mujib Khan, ²Taufiq Rahman, ³Majeedul H. Chowdhury

¹Faculty of Life Sciences, University of Development Alternative, House No. 78, Road No. 11A, Dhanmondi, Dhaka, Bangladesh

²Department of Pharmacology, University of Cambridge, Tennis Court Road, CB2 1PD, Cambridge, UK

³New York City College of Technology The City University of New York 300 Jay Street, Brooklyn, NY 11201, USA

Mohammed Rahmatullah, Anuj Kumar Das, Md. Ariful Haque Mollik, Rownak Jahan, Mujib Khan, Taufiq Rahman, Majeedul H. Chowdhury; An Ethnomedicinal Survey of Dhamrai Sub-district in Dhaka District, Bangladesh; *Am.-Eurasian J. Sustain. Agric.*, 3(4): 881-888, 2009

ABSTRACT

Primary health-care service is provided to a substantial section of the population of Bangladesh by folk medicinal practitioners known as Kavirajes, who use medicinal plants for treatment of diverse ailments. Since the medicinal plants used by the Kavirajes can vary even between adjoining areas, it was the objective of the present study to conduct an ethnomedicinal survey among the Kavirajes of Dhamrai area, which is a sub-district within Dhaka district, Bangladesh. The survey was conducted with the help of a semi-structured questionnaire and guided field-walk method where the Kavirajes pointed out various medicinal plants and described their uses. All plant specimens as pointed out by the Kavirajes were collected and identified at the Bangladesh National Herbarium. Information on a total of 46 plant species distributed into 33 families was obtained. The various diseases treated with these plants included respiratory tract disorders (cough, mucus), fever, gastrointestinal disorders (constipation, bloating, diarrhea, dysentery, stomachache), helminthiasis, pain, tooth infections, cuts and wounds, diabetes, tumor and swellings, eye diseases like conjunctivitis, ear infections, skin diseases, debility, abscesses, insect bites, urinary tract disorders, and hypertension. Two plants were also used to treat cattle diseases along with human ailments. The uses of several of the plants could be validated by available scientific reports. Other plants are of importance in the sense that they can prove to be sources of novel bio-active compounds leading to discovery of new drugs with more efficacy and less side-effects.

Key words: Medicinal plants, Kavirajes, folk medicine, Dhamrai, Bangladesh

Introduction

The history of use of medicinal plants by human beings to treat diverse ailments goes back to thousands of years ago (Sofowara, A., 1982; Hill, A.F., 1989). Though the advent of modern or allopathic medicine has somehow diminished the role of medicinal plants in favor of synthetic drugs, even now a number of modern drug discoveries have been based on medicinal plants used by indigenous people (Balick, J.M. and P.A. Cox, 1996). In recent years, because of the costs as well as serious side-effects of a number of modern drugs, attention has turned back to medicinal plants as a source for discovery of newer drugs with less cost and side-effects. It has been reported that about 64% of the total world population is using traditional medicine to satisfy their health-care needs (Cotton, C.M., 1996). The sheer number of papers published in ethnobotanical or traditional medicinal scientific journals attest to the fact that scientists are increasingly turning their attention

Corresponding Author: Professor Dr. Mohammed Rahmatullah, Pro-Vice Chancellor University of Development Alternative House No. 78, Road No. 11A (new) Dhanmondi R/A, Dhaka-1205 Bangladesh
Email: rahamatm@hotmail.com
Telephone (mobile): 88-01715032621 Fax: 88-02-8157339

to ethnobotanical practices of indigenous people as a strategy for discovery of novel drugs against both ancient and newly emerging diseases.

The Indian sub-continent has a long history of traditional medicinal systems among which the known major systems are Ayurvedic, Unani and the Sidha system. Besides the above systems, another system exists, which can be termed as folk medicine. Similar to the Ayurvedic system, the medicinal practitioners of folk medicinal systems are also known in Bangladesh as Kavirajes. However, unlike the Ayurvedic system, which may involve multiple medicinal plants and complicated systems of processing to prepare medicines, folk medicinal practitioners use mostly a single medicinal plant and simplified plant preparation procedures for preparation of various formulations and treatment. The Kavirajes possess considerable expertise on medicinal plants, which they usually guard closely and information on which is passed from generation to generation within the family. Thus the medicinal plants used by the Kavirajes in the folk medicinal system vary widely between even adjoining areas as well as among the various tribal people who inhabit Bangladesh, who may inhabit the same area. We had been conducting a systematic ethnomedicinal survey of Bangladesh. Our ongoing survey conducted in different regions of the country and among various tribes highlights the important differences between medicinal plant usage by Kavirajes of different areas and tribes (Hanif, A., 2005; Hossan, Md. S., 2009; Mia, Md. M.K., 2009; Nawaz, A.H. Md., 2009). Towards getting a comprehensive picture of medicinal plant usage by the Kavirajes of folk medicine, it was the objective of the present study to conduct an ethnomedicinal survey among the Kavirajes of Dhamrai, which is a sub-district within the district of Dhaka, Bangladesh.

Materials and Methods

Area of survey

Dhamrai sub-district is situated roughly between 90°00 - 90°16 E and 23°48 - 24°04 N. The sub-district consists of the town of Dhamrai and a number of villages. The total area of the sub-district is about 307.4 square kilometers. The population is mainly rural and agriculture including fisheries forms the main occupation of the population. The main crops are paddy, jute, wheat, potato, onion, mustard, garlic, sugarcane and vegetables. The area is notable in its lacking of any modern medical facilities with only one health complex being present in the whole sub-district. The survey was conducted in the town of Dhamrai and several villages situated within Dhamrai sub-district, namely Chunna, Char Kushnai, Dhantara, Panch-lakshmi, and Saitta.

Data collection and mode of survey

A total of 8 Kavirajes from the six areas were interviewed in the present survey. Informed consent was obtained from the Kavirajes prior to the survey. Explanations were given to the Kavirajes as to the reason for the survey and consent obtained that the Kavirajes have no objections to the survey report in the form of medicinal plants used and ailments treated being presented nationally or internationally. They, however, had reservations as to publication of formulations and dosages, which they wanted not to disseminate on grounds of safe-guarding their professional interests. Surveys were conducted in Bangla language, which was spoken both by the Kavirajes as well as the authors and is the national language of Bangladesh. A semi-structured questionnaire was used in the survey. The basic method followed was that of Martin [9] and Maundu [10]. The Kavirajes took the authors on guided field-walks through areas from where they collected their medicinal plants. Plants were shown and detailed information given on the local name, mode of use and ailments treated by the plants. All information was later cross-checked with the Kavirajes following the guided field-walks. Plant specimens were collected, pressed, and dried *in situ* and identified at the Bangladesh National Herbarium.

3. Results and discussion

Plants and their distribution into families

The information obtained in the present survey showed that the Kavirajes of Dhamrai sub-district use 46 plants distributed into 33 families for medicinal purposes. The results are shown in Table 1. The Araceae, Lamiaceae, Malvaceae and Solanaceae families provided the largest number of species, with three plants each. Among the plant species obtained, *Centella asiatica*, *Alocasia macrorrhizos*, *Momordica charantia*, *Diospyros peregrina*, *Tamarindus indica*, *Musa sapientum*, and *Piper betle* were occasionally cultivated around homesteads for personal consumption or commercial purposes. It is notable that fruits of *Momordica charantia*, *Diospyros peregrina*, *Tamarindus indica* and *Musa sapientum*, and whole plants of *Centella asiatica* and *Alocasia*

macrorrhizos are edible. The leaves of *Piper betle* are chewed by a sizeable number of the population a number of times daily along with other ingredients like betel nuts, lime and tobacco. *Adhatoda vasica*, *Catharanthus roseus*, *Aloe barbadensis*, *Tagetes erecta*, *Ocimum tenuiflorum*, *Hibiscus rosa-sinensis*, and *Anthocephalus chinensis* are also occasionally planted around homesteads for medicinal or ornamental purposes. Other plants were collected from the wild.

Plant parts used and mode of preparation

The various plant parts used included whole plant, leaves, stems, barks, roots, fruits, seeds, flowers and gum. Of the total of 61 uses found in the present survey, leaves formed the most frequently used plant part (57.4%), followed by roots (9.8%) and stems (8.2%). For human ailments, whole plant or plant parts were either orally administered or topically applied. This could take a number of forms. For instance, oral administration included extraction of juice followed by taking of the juice (e.g. *Adhatoda vasica*), cooking and eating of the plant (e.g. *Alocasia macrorrhizos*, *Colocasia esculenta*), partaking of crushed plant part (e.g. *Typhonium trilobatum*), crushed plant parts taken in the form of sherbet (e.g. *Trema orientalis*), or boiling of plant part in water followed by drinking of the water (e.g. *Tamarindus indica*). Topical applications included application of extracted juice from plant part (e.g. *Alocasia macrorrhizos*), application of pulp made from plant part (e.g. *Aloe barbadensis*), application of crushed plant part (e.g. *Mikania cordata*), and brushing of teeth with plant part (e.g. *Clerodendrum viscosum*).

Medical applications

It was observed that in a few cases, a plant was used to treat a single ailment (e.g. *Adhatoda vasica* for treatment of mucus, *Crataeva religiosa* for treatment of tumor). In most cases, a plant was used to treat multiple ailments. For treatment of multiple ailments the same plant part or different parts of the same plant may be used. For instance, the flowers of *Catharanthus roseus* were used for treatment of diabetes, while the leaves of the same plant were used to treat helminthiasis. The leaves of *Ricinus communis* were used for treatment of decreased eyesight and conjunctivitis, while seed oil was taken for stomachache and bloating. Some examples of the same plant part used to treat multiple ailments included treatment with leaves of *Heliotropium indicum* of swelling due to hurt as well as conjunctivitis, and treatment with roots of *Costus speciosus* of itches, scabies as well as debility.

Two of the forty six plants had ethnoveterinary applications as well as being used for treatment of human ailments. These plants were *Amaranthus spinosus* (to increase lactation in cows, diabetes in humans), and *Alocasia macrorrhizos* (pus in ears and decreased eye sight in humans, swelling of throat in cattle). The rest of the plants were used solely for the treatment of human ailments with the exception of *Glycosmis pentaphylla*, which was used for treatment of diabetes as well as to prevent termite damage to households.

Discussion

It is always important to find out whether the various medicinal plants used by traditional medicinal practitioners have been validated by modern scientific methods. A perusal of the scientific literature suggests the scientific validation of a number of the medicinal plants used by Kavirajes of Dhamrai sub-district. For instance, a bronchodilator alkaloid vasicinone has been isolated from *Adhatoda vasica*, used by the Kavirajes to treat mucus formation (Amin, A.H. and D.R. Mehta, 1959). Anti-diabetic and anti-hyperlipidemic effects have been observed with *Amaranthus spinosus* in streptozotocin-induced diabetic rats. This plant is used by Kavirajes for treatment of diabetes (Sangameswaran, B. and B. Jayakar, 2008).

Centella asiatica is widely used in the various traditional medicinal systems of south and south-east Asia. In the Ayurvedic system of India, the plant is used for various ailments including abdominal disorders and wound healing. In the Chinese traditional medicinal system, the plant is used for wound healing. The Kavirajes of Dhamrai use this plant for treatment of diarrhea and gastric problems. Extract of this plant has been reported to significantly inhibit gastric ulceration induced by cold and restraint stress in Charles-Foster rats (Chatterjee, T.K., 1992). Extract of the plant also reportedly inhibited ethanol-induced gastric mucosal lesions in rats (Cheng, C.L. and M.W. Koo, 2000). Fresh juice of the plant has been shown to inhibit ethanol-, aspirin-, cold-restraint stress- and pyloric ligation-induced gastric ulcers in rats (Sairam, K., 2001). The gastric ulcer healing effect of the plant has been attributed to one of its phytochemical constituent, asiaticoside and mediated through inhibition of nitric oxide synthesis (Guo, J.S., 2004). Anti-bacterial activity has been reported in crude extracts of leaves (Zaidan, M.R., 2005), which may be of importance for therapeutic purposes in the plant's local use against diarrhea.

Table 1: Medicinal plants used by Kavirajes of Dhamrai area, Dhaka district, Bangladesh.

Serial Number	Scientific Name	Family Name	Local Name	Plant part utilized	Ailment(s) and Administration
1	<i>Adhatoda vasica</i> Nees	Acanthaceae	Bashok	Leaf	Mucus. 3-4 teaspoonfuls of leaf juice are fed thrice daily.
2	<i>Amaranthus spinosus</i> L.	Amaranthaceae	Khure-kata	Whole plant, leaf	To increase lactation in cows, diabetes. Whole plant is fed to cows. Leaves are taken for diabetes.
3	<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Taka-pata	Leaf	Diarrhea, gastric problems. Leaf juice is taken.
4	<i>Catharanthus roseus</i> (L.) G. Don.	Apocynaceae	Noyon-tara	Leaf, flower	Diabetes, helminthiasis. Flowers are chewed during diabetes. Leaf juice is taken for helminthiasis.
5	<i>Alocasia macrorrhizos</i> (L.) G. Don.	Araceae	Maan-kochu	Lower part of plant, stem	Pus in ears, decreased eyesight, swelling of throat in cattle. The lower part of the plant is cooked and eaten to improve eyesight. Stem juice is applied to ears for pus formation in ears. Crushed stems are applied to swelling of throat in cattle.
6	<i>Colocasia esculenta</i> (L.) Schott	Araceae	Jongla-kochu	Whole plant, stem	Anti-hemorrhagic, blood purifier, to strengthen bones. Whole plant juice is applied to cuts. Stems are cooked and eaten to purify blood and strengthen bones.
7	<i>Typhonium trilobatum</i> (L.) Schott	Araceae	Kharkon-shak	Leaf	Loss of appetite, mucus. Leaf juice is taken for mucus. Crushed leaves are taken for loss of appetite.
8	<i>Aloe barbadensis</i> Mill.	Asphodelaceae	Ghrito-kanchon	Leaf pulp	To keep head cool, dysentery. Pulp is applied to head to keep head cool. Sherbet made from pulp is taken for dysentery.
9	<i>Mikania cordata</i> (Burm.f.) B.L. Robinson	Asteraceae	Bhanga-lota	Whole plant, stem, seed	Bloating, stomachache, helminthiasis, sprain, fracture. Whole plant juice is taken for stomachache or bloating. Seeds are taken for helminthiasis. Crushed stems are applied to sprains or fractures.
10	<i>Tagetes erecta</i> L.	Asteraceae	Genda-phool	Leaf	Anti-hemorrhagic. Leaf juice is applied to bleeding.
11	<i>Heliotropium indicum</i> L.	Boraginaceae	Hatisuri	Leaf	Swelling due to hurt, conjunctivitis. Crushed leaves are warmed and applied to swelling. 2 drops of leaf juice is applied to eyes for conjunctivitis.
12	<i>Trema orientalis</i> (L.) Blume	Cannabaceae	Kath-gach	Leaf	Dysentery, tiredness due to heat. Sherbet from crushed leaves is taken.
13	<i>Crataeva religiosa</i> G. Forst.	Capparidaceae	Boinna	Leaf	Tumor. Leaf juice is applied to swelling.
14	<i>Ipomoea fistulosa</i>	Convolvulaceae	Dhol-kolmi	Leaf	Swelling due to fracture. Crushed leaves are applied to affected area.
15	<i>Costus speciosus</i> (J. König.) Sm.	Costaceae	Keow-gach	Root	Itch, scabies, debility. Root juice is mixed with water for itches and scabies. Root juice is mixed with water, warmed and taken twice daily for debility.
16	<i>Coccinia grandis</i> (L.) J. Voigt	Cucurbitaceae	Telakuch	Leaf	Dysentery, oral lesions. Leaf juice is taken with sugar for dysentery. Leaves are chewed as remedy for oral lesions.
17	<i>Momordica charantia</i> L.	Cucurbitaceae	Ustha, Korola-gach	Leaf	Helminthiasis, diabetes. Leaf juice is taken.
18	<i>Cuscuta reflexa</i> Roxb.	Cuscutaceae	Shunnyo-lota	Stem	To stop bleeding from wounds, jaundice. Crushed stem is applied to stop bleeding from wounds. 1-2 drops of stem juice is taken daily for jaundice.
19	<i>Diospyros peregrina</i> (Gaertn.) Gürke.	Ebenaceae	Gab	Bark	Dysentery, injury. 1 teaspoonful of bark juice is taken for dysentery. Crushed bark is applied to injured area.

Table 1: Continue

20	<i>Ricinus communis</i> L.	Euphorbiaceae	Venna	Leaf, seed	Stomachache, bloating, decreased eyesight, conjunctivitis. Young leaves are fried in clarified butter and eaten to improve eyesight. Leaf juice is warmed and applied to eyes during conjunctivitis. Seed oil is taken for stomachache and bloating.
21	<i>Tamarindus indica</i> L.	Fabaceae	Tetul	Leaf	Dysentery, burning sensations during urination. Leaf juice is taken as remedy for burning sensations during urination. Young leaves are boiled in water and the water taken to treat dysentery.
22	<i>Leonurus sibiricus</i> L.	Lamiaceae	Seth-dron	Leaf, flower	Mucus, helminthiasis. Flowers are taken for mucus. Leaf juice is taken for helminthiasis.
23	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Dondo-kolosh	Leaf, flower	Tooth infection, mucus. Crushed flower is mixed with water and taken for mucus. Honey from flower is also effective for mucus. Leaf juice is mixed with salt and gargled for tooth infections.
24	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Tulshi-gach	Leaf	Cough, mucus. Leaf juice is taken.
25	<i>Lygodium flexuosum</i> (L.) Sw.	Lygodiaceae	Dheki-shak	Leaf	Diarrhea, stomachache. Leaf juice is given for diarrhea. Young leaves are fried and eaten for stomachache.
26	<i>Abutilon indicum</i> (L.) Sweet	Malvaceae	Petari	Leaf, root	Toothache, fever, abscess pain. Crushed roots are taken with water 2-3 times daily for fever. Leaves are boiled in water and the water gargled (for toothache) or applied to abscess (to reduce pain).
27	<i>Bombax ceiba</i> L.	Malvaceae	Shimul	Gum, root	Debility, infrequent urination. Gum is taken with milk for debility. Powdered roots are taken to increase frequency of urination.
28	<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Joba	Bark	Frequent urination. 1 teaspoonful of bark juice is taken with water.
29	<i>Stephania japonica</i> (Thunb.) Miers	Menispermaceae	Doi-pata	Leaf	Helminthiasis, skin diseases. Leaf juice is taken for helminthiasis. Crushed leaves are applied to skin for skin disorders.
30	<i>Ficus benghalensis</i> L.	Moraceae	Bot-gach	Leaf, root	Abscess, to lengthen hair in women. Crushed leaves are applied to abscess. Crushed roots are applied to hair.
31	<i>Streblus asper</i> Lour.	Moraceae	Shaowra	Leaf, root, gum	Constipation, chapped skin in winter. Gum is applied to chapped skin. Leaf or root juice is taken for constipation.
32	<i>Musa sapientum</i> L.	Musaceae	Kola	Leaf, root	Ear ache due to cold, helminthiasis. Root juice is taken on an empty stomach for helminthiasis. 2-3 drops of leaf juice is applied to ears for ear ache.
33	<i>Oxalis lobata</i> Sims	Oxalidaceae	Shushni-pata	Whole plant	Stomachache, debility. Whole plant is cleaned, cooked and eaten.
34	<i>Piper betle</i> L.	Piperaceae	Paan-pata	Leaf	Sex stimulant, to stop bleeding. Leaf juice is taken as sex stimulant. Leaf juice is applied to stop bleeding.
35	<i>Piper longum</i> L.	Piperaceae	Pipul-pata	Leaf	To increase appetite and memory. Leaves are chewed.
36	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Durba	Leaf	To stop bleeding. Leaves are chewed and applied to area of bleeding.
37	<i>Polygonum persicaria</i> L.	Polygonaceae	Bish-katali	Leaf	Severe pain. Crushed leaves are applied to affected areas.
38	<i>Anthocephalus chinensis</i> (Lam.) A. Rich. ex Walp.	Rubiaceae	Kodom	Young leaf, young bark	Helminthiasis, tumor, swelling. Crushed young bark is warmed and applied to tumor or swellings. Juice from crushed young leaves is taken once daily for helminthiasis.
39	<i>Glycosmis pentaphylla</i> (Retz.) Corr.	Rutaceae	Gondho-pata, Mootkila	Leaf	Diabetes, to prevent termite damage. Leaf juice is taken for diabetes. Leaves are kept under the bed to prevent termite damage.
40	<i>Scoparia dulcis</i> L.	Scrophulariaceae	Chinigura	Leaf	Diabetes. Leaf juice is given.

Table 1: Continue

41	<i>Datura stramonium</i> L.	Solanaceae	Dhutra	Seed	To make somebody unconscious. Seeds are taken.
42	<i>Solanum indicum</i> L.	Solanaceae	Khelna-	Leaf morich-gach	Hypertension, poisonous insect bites. Crushed leaves are applied to bites. Leaves are mixed with water, crushed and taken during hypertension.
43	<i>Solanum nigrum</i> L.	Solanaceae	Tiit-begun	Fruit	Stomachache. Fruits are eaten.
44	<i>Boehmeria macrophylla</i> Hornem	Urticaceae	Chulkani-pata	Leaf	Poisonous insect bite. Crushed leaves are applied.
45	<i>Clerodendrum viscosum</i> Vent.	Verbenaceae	Bhat	Leaf, stem	Fever in children, toothache, pain in gums. Leaf juice is given for fever in children. Teeth are brushed with stem to treat aching tooth or gums.
46	<i>Vitex negundo</i> L.	Verbenaceae	Nishinda-gach	Leaf	Dysentery. Leaf juice is taken.

The hypoglycemic properties and anti-diabetic potential of leaves and flowers of *Catharanthus roseus* have also been well documented. Juice obtained from fresh leaves of the plant reportedly demonstrated significant anti-diabetic activity in alloxan-induced diabetic rabbits (Nammi, S., 2003). Crude leaf juice as well as an aqueous extract also demonstrated hypoglycemic effect in normal and streptozotocin-induced diabetic rats (Ahmed, A.U., 2007). Aqueous extract of flowers of the plant, when administered to alloxan-induced diabetic rats significantly reduced blood sugar level (Kaleem, M., 2005). Petroleum ether fraction of the plant containing tannins, flavonoids and alkaloid compounds also demonstrated hypoglycemic activity in oral glucose tolerance test in rats (Islam, M.A., 2009). Similar to *Catharanthus roseus*, the hypoglycemic properties and anti-diabetic potential of *Momordica charantia* (particularly fruits) have also been well documented. The plant is one of the principal plants used in five districts of Lagos State of Nigeria for treatment of diabetes (Gbolade, A.A., 2009). The plant is also used against diabetes in Indian traditional medicine (Modak, M., 2007). Alcoholic extract of fruits of the plant reportedly lowered blood sugar levels in alloxan-induced diabetic albino rats (Singh, N., 2008). Hypoglycemic activity of fruit extract has also been shown in alloxan-induced diabetic Wistar rats. The authors concluded that the various effects induced by the fruit extract to lower blood sugar levels included enhanced insulin secretion by the islets of Langerhans, reduced glycogenesis in liver tissue, enhanced peripheral glucose utilization and increased serum protein levels (Fernandes, N.P., 2007). Acute oral administration of whole plant extract also reportedly caused significant hypoglycemia in normal and streptozotocin-treated diabetic rats. Acute intravenous administration of the extract produced significant reductions in systemic arterial blood pressure and heart rates of normal and hypertensive Dahl salt-sensitive rats (Ojewole, J.A., 2006).

The leaves and flowers of *Leonurus sibiricus* are used by the Kavirajes for treatment of helminthiasis and mucus, respectively. The analgesic, anti-inflammatory and antibacterial activities of extracts of the plant has been reported (Shin, H.Y., 2009; Ahmed, F., 2006; Islam, M.A., 2005; de Souza, G.C., 2004), which may indicate its usefulness in treatment of mucus and helminthiasis (with any associated pain). The leaves and flowers of *Leucas aspera* are used by the Kavirajes to treat tooth infections and mucus. The plant has been reported to be used in Dharwad district of Karnataka, India to treat toothache (Hebbar, S.S., 2004). Other activities reported from various parts of the plant, which may be relevant for treatment of mucus and tooth infections are antinociceptive and antioxidant activities (Rahman, M.S., 2007), prostaglandin inhibitory and antioxidant activities (Sadhu, S.K., 2003), and anti-microbial activity (Mangathayaru, K., 2005). *Abutilon indicum* (used by the Kavirajes for treatment of toothache, fever, and abscess pain) contains eugenol, which reportedly possess significant analgesic activity (Ahmed, M., 2000).

Scoparic acid D, a diterpenoid has been isolated from *Scoparia dulcis* – a plant used by the Kavirajes for treatment of diabetes. The compound has been shown to demonstrate anti-diabetic effects in streptozotocin-induced diabetic rats (Latha, M., 2009). In the traditional medicinal system of Trinidad and Tobago, the plant is used for treatment of diabetes (Lans, C.A., 2006). Aqueous extract of the plant has been shown to reduce blood glucose and decrease free radical formation in streptozotocin-induced diabetic rats; it is to be noted that oxidative damage has been implicated in the development and complications of diabetes (Pari, L. and M. Latha, 2005). Ethanolic extract of the fruits of *Solanum indicum* (leaves are used by the Kavirajes for treatment of hypertension) has been found to be effective against L-NAME [N(W)-nitro-L-arginine methylester]-induced hypertension in rats (Bahgat, A., 2008). Methanol and aqueous extracts of *Solanum nigrum* (used by the Kavirajes to treat stomachache) reportedly demonstrated anti-microbial activity against multi-drug resistant *Salmonella typhi* (Rani, P. and N. Khullar, 2004).

Taken together, a number of scientific studies validate the use of a number of medicinal plants by the Kavirajes. Other plants used by the Kavirajes have not been studied at all or relevant pharmacological studies (i.e. relevant for the purposes that the plants are used by the Kavirajes) are yet to be conducted. The plants thus possess considerable potential for further studies and isolation of novel compounds, which can serve as efficacious drugs. Since Bangladesh is densely populated with a very low percentage of forest and un-cultivated

area), it is also imperative that serious conservation efforts be undertaken within the shortest possible time to protect the medicinal plants in their wild habitat, as well as clonal propagation and mass cultivation of these plants for medicinal uses.

References

- Ahmed, A.U., A.H. Ferdous, S.K. Saha, S. Nahar, M.A. Awal and F. Parvin, 2007. Hypoglycemic effect of *Catharanthus roseus* in normal and streptozotocin-induced diabetic rats. *Mymensingh Medical Journal*, 16: 143-148.
- Ahmed, F., M.A. Islam and M.M. Rahman, 2006. Antibacterial activity of *Leonurus sibiricus* aerial parts. *Fitoterapia*, 77: 316-317.
- Amin, A.H. and D.R. Mehta, 1959. A bronchodilator alkaloid (vasicinone) from *Adhatoda vasica* Nees. *Nature*, 184(Suppl 17): 1317.
- Ahmed, M., S. Amin, M. Islam, M. Takahashi, E. Okuyama and C.F. Hossain, 2000. Analgesic principle from *Abutilon indicum*. *Pharmazie*, 55: 314-316.
- Bahgat, A., H. Abdel-Aziz, M. Raafat, A. Mahdy, A.S. El-Khatib, A. Ismail and M.T. Khayyal, 2008. Solanum indicum ssp. distichum extract is effective against L-NAME-induced hypertension in rats. *Fundamental & Clinical Pharmacology*, 22: 693-699.
- Balick, J.M. and P.A. Cox, 1996. *Plants, People and Culture: the Science of Ethnobotany*, Scientific American Library, New York, pp: 228.
- Cotton, C.M., 1996. *Ethnobotany: Principle and Application*, John Wiley and Sons, New York.
- Chatterjee, T.K., A. Chakraborty, M. Pathak and G.C. Sengupta, 1992. Effects of plant extract *Centella asiatica* (Linn.) on cold restraint stress ulcer in rats. *Indian Journal of Experimental Biology*, 30: 889-891.
- Cheng, C.L. and M.W. Koo, 2000. Effects of *Centella asiatica* on ethanol induced gastric mucosal lesions in rats. *Life Sciences*, 67: 2647-2653.
- de Souza, G.C., A.P. Haas, G.L. von Poser, E.E. Schapoval and E. Elisabetsky, 2004. Ethnopharmacological studies of antimicrobial remedies in the south of Brazil. *Journal of Ethnopharmacology*, 90: 135-143.
- Fernandes, N.P., C.V. Lagishetty, V.S. Panda and S.R. Naik, 2007. An experimental evaluation of the antidiabetic and antilipidemic properties of a standardized *Momordica charantia* fruit extract. *BMC Complementary and Alternative Medicine*, 7: 29.
- Guo, J.S., C.L. Cheng and M.W. Koo, 2004. Inhibitory effects of *Centella asiatica* water extract and asiaticoside on inducible nitric oxide synthase during gastric ulcer healing in rats. *Planta Medica*, 70: 1150-1154.
- Gbolade, A.A., 2009. Inventory of antidiabetic plants in selected districts of Lagos State, Nigeria. *Journal of Ethnopharmacology*, 121: 135-139.
- Hebbar, S.S., V.H. Harsha, V. Shripathi and G.R. Hegde, 2004. Ethnomedicine of Dharwad district in Karnataka, India – plants used in oral health care. *Journal of Ethnopharmacology*, 94: 261-266.
- Hill, A.F., 1989. *Economic Botany: A Text Book of Useful Plants and Plant Products*, 2nd Edn., McGraw Hill Book Company, Inc., New York.
- Hanif, A., Md. S. Hossain, Md. M.K. Mia, M.J. Islam, R. Jahan and M. Rahmatullah, 2009. Ethnobotanical survey of the Rakhain tribe inhabiting the Chittagong Hill Tracts region of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3: 172-180.
- Hossain, Md. S., A. Hanif, M. Khan, S. Bari, R. Jahan and M. Rahmatullah, 2009. Ethnobotanical survey of the Tripura tribe of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3: 253-261.
- Islam, M.A., F. Ahmed, A.K. Das and S.C. Bachar, 2005. Analgesic and anti-inflammatory activity of *Leonurus sibiricus*. *Fitoterapia*, 76: 359-362.
- Kaleem, M., Sarmad H. Sheema and B. Bano, 2005. Protective effects of *Piper nigrum* and *Vinca rosea* in alloxan induced diabetic rats. *Indian Journal of Physiology and Pharmacology*, 49: 65-71.
- Latha, M., L. Pari, K.M. Ramkumar, P. Rajaguru, T. Suresh, T. Dhanabal, S. Sitasawad and R. Bhone, 2009. Antidiabetic effects of scoparic acid D isolated from *Scoparia dulcis* in rats with streptozotocin-induced diabetes. *Natural Product Research*, 1-13 [Epub ahead of print].
- Lans, C.A., 2006. Ethnomedicines used in Trinidad and Tobago for urinary problems and diabetes mellitus. *Journal of Ethnobiology and Ethnomedicine*, 2: 45.
- Mia, Md. M.K., M.F. Kadir, Md. S. Hossain and M. Rahmatullah, 2009. Medicinal plants of the Garo tribe inhabiting the Madhupur forest region of Bangladesh. *American Eurasian Journal of Sustainable Agriculture*, 3: 165-171.
- 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.

- Modak, M., P. Dixit, J. Londhe, S. Ghaskadbi, A. Paul and T. Devasagayam, 2007. Indian herbs and herbal drugs used for the treatment of diabetes. *Journal of Clinical Biochemistry and Nutrition*, 40: 163-173.
- Mangathayaru, K., J. Lakshmikanth, N. Shyam Sundar, R. Swapna, X.F. Grace and J. Vasantha, 2005. Antimicrobial activity of *Leucas aspera* flowers. *Fitoterapia*, 76: 752-754.
- Nawaz, A.H. Md., 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: 143-150.
- Nammi, S., M.K. Boini, S.D. Lodagala and R.B. Behara, 2003. The juice of fresh leaves of *Catharanthus roseus* Linn. reduces blood glucose in normal and alloxan diabetic rabbits. *BMC Complementary and Alternative Medicine*, 3: 4.
- Ojewole, J.A., S.O. Adewole and G. Olayiwola, 2006. Hypoglycaemic and hypotensive effects of *Momordica charantia* Linn (Cucurbitaceae) whole-plant aqueous extract in rats. *Cardiovascular Journal of South Africa*, 17: 227-232.
- Pari, L. and M. Latha, 2005. Antidiabetic effect of *Scoparia dulcis*: effect on lipid peroxidation in streptozotocin diabetes. *General Physiology and Biophysics*, 24: 13-26.
- Rani, P. and N. Khullar, 2004. Antimicrobial evaluation of some medicinal plants for their anti-enteric potential against multi-drug resistant *Salmonella typhi*. *Phytotherapy Research*, 18: 670-673.
- Rahman, M.S., S.K. Sadhu and C.M. Hasan, 2007. Preliminary antinociceptive, antioxidant and cytotoxic activities of *Leucas aspera* root. *Fitoterapia*, 78: 552-555.
- Sofowara, A., 1982. *Medicinal Plants and Traditional Medicinal in Africa*, John Wiley and Sons, New York, pp: 256.
- Sangameswaran, B. and B. Jayakar, 2008. Anti-diabetic, anti-hyperlipidemic and spermatogenic effects of *Amaranthus spinosus* Linn. on streptozotocin-induced diabetic rats. *Nature Medicine (Tokyo)*, 62: 79-82.
- Sairam, K., C.V. Rao and R.K. Goel, 2001. Effect of *Centella asiatica* Linn on physical and chemical factors induced gastric ulceration and secretion in rats. *Indian Journal of Experimental Biology*, 39: 137-142.
- Singh, N., M. Gupta, P. Sirohi and Varsha, 2008. Effects of alcoholic extract of *Momordica charantia* (Linn.) whole fruit powder on the pancreatic islets of alloxan diabetic albino rats. *Journal of Environmental Biology*, 29: 101-106.
- Shin, H.Y., S.H. Kim, S.M. Kang, I.J. Chang, S.Y. Kim, H. Jeon, K.H. leem, W.H. park, J.P. Lim and T.Y. Shin, 2009. Anti-inflammatory activity of Motherwort (*Leonurus sibiricus* L.). *Immunopharmacology and Immunotoxicology*, 31: 209-213.
- Sadhu, S.K., E. Okuyama, H. Fujimoto and M. Ishibashi, 2003. Separation of *Leucas aspera*, a medicinal plant of Bangladesh, guided by prostaglandin inhibitory and antioxidant activities. *Chemical & Pharmaceutical Bulletin (Tokyo)*, 51: 595-598.
- Zaidan, M.R., A. Rain Noor, A.R. Badrul, A. Adlin, A. Norazah and I. Zakiah, 2005. *In vitro* screening of five local medicinal plants for antibacterial activity using disc diffusion method. *Tropical Biomedicine*, 22: 165-170.