

Publisher: African Networks on Ethnomedicines

Web page: /http://journals.sfu.ca/africanem/index.php/ajtcam/index

<http://dx.doi.org/10.4314/ajtcam.v9i3.10>

SURVEY AND SCIENTIFIC EVALUATION OF MEDICINAL PLANTS USED BY THE PAHAN AND TELI TRIBAL COMMUNITIES OF NATORE DISTRICT, BANGLADESH

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Abstract

The Pahans and the Telis are two of the smallest indigenous communities in Bangladesh. The Pahans, numbering about 14,000 people are widely scattered in several northern districts of the country, while the Telis are such a small community that nothing has been reported on their numbers and lifestyle. Both tribes are on the verge of disappearance. One each of the Pahan and the Teli community was located after much search in two adjoining villages of Natore district, Bangladesh. Since the tribes were found to still depend on their traditional medicinal practitioners for treatment of ailments, it was the objective of the present study to document their traditional usage of medicinal plants and to evaluate such plants against modern research-based pharmacological activity studies on these plants. Interviews were conducted of the practitioners of the Pahan and Teli community of Natore district with the help of a semi-structured questionnaire and using the guided field-walk method. Plant specimens as pointed out by the practitioners were collected and pressed on the field and identification completed at the Bangladesh National Herbarium. The Pahan tribal practitioners used 13 plants distributed into 9 families for treatment of 14 different ailments. The Teli tribal practitioner used 15 plants divided into 14 families for treatment of 17 different ailments. Eight out of the thirteen plants used by the Pahan tribal practitioner (61.5%) had reported relevant pharmacological activities in the scientific literature, while six out of the fifteen plants used by the Teli tribal practitioners (40%) had such relevant pharmacological activities in accordance with their usage. The medicinal plants used by the Pahans and Telis warrant further scientific studies toward discovery of lead compounds and efficacious drugs and the documentation and protection of the traditional medical knowledge held by these tribes.

Key words: Asian medicine, CAM, ethnomedicine, alternative therapy

Introduction

Various indigenous communities throughout the world have through their long association with nature gathered extensive knowledge on medicinal plants and their properties, which they have used for treatment of various ailments (Grosvenor et al., 1995; Bourbonnais-Spear et al., 2007; Au et al., 2008; Asase et al., 2010; Maroyi, 2011). Modern allopathic medicine since its advent has looked down upon these traditional medicinal practices, dismissing them as superstitions or quackery. Yet, a number of modern medicines owe their existence to observation of indigenous medicinal practices (Balick and Cox, 1996). It has even been pointed out that the initial discovery of modern drugs has been possible by knowing about medicinal plants of the indigenous people (Cotton, 1996). In recent years, it has been increasingly observed that many modern synthetic drugs have serious side-effects or have developed drug-resistant vectors; for instance many microorganisms have developed antibiotic resistance. As a result, scientists are now turning their attention to the plant kingdom with its known 250,000 floral species as potential sources for new and efficacious drugs. For this reason, it is important to document the indigenous medicinal practices, which though increasingly studied, are few in number. Such documentation can help a scientist to look for proper applications of any particular medicinal plant instead of blindly groping his way through the thousands of floral species of the world. It is to be noted in this regard that only 6-15% of the floral species of the world have been researched upon in terms of phytochemicals or pharmacological activities present (Verpoorte, 2000), and even then this research has not been a complete screening of all the phytochemicals and pharmacological activities of any given plant. Both indigenous communities and forests are fast disappearing because of encroachment of modern civilization. It is necessary to document the knowledge of these communities and perform research on endangered plant species before they become totally extinct.

According to official accounts there are about 30 tribes presently living in Bangladesh. These tribes are mainly large tribes and who have separate entities in the form of still maintaining to some extent their original habitats, cultures and languages. However, a recent anthropological book on the tribes of Bangladesh put the number of tribes as well beyond 80, the majority being small tribes, which have more or less integrated into the mainstream Bengali-speaking population and who only maintain remnants of their original language and culture (Murmu, 2009). The Pahan and the Teli tribe are two such indigenous communities, who still survive in isolated pockets in various districts in the northern parts of Bangladesh. While the Pahan

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population has been estimated at about 14,000 scattered in the districts of Rajshahi, Naogaon, Joypurhat, Sirajganj, Natore, Pabna, Rangpur, Dinajpur, Nilphamari, Thakurgaon and Panchagarh, any estimate of the Teli tribal population does not exist. The Pahans are included in the Bangladesh Indigenous Community Forum, but the Telis are not.

The Pahans are thought to originate from Jharkhand state in India. They probably are descendants of the Munda tribe of India. Like the Mundas, their skin complexion is dark; they have black curly hair, and are of medium height. They have an intimate connection with forests, for which reason they are also sometimes referred to as “Bunos”, buno being Bengali for wild. In previous days, the tribe used to have a Headman but no longer do so as they are so scattered. Most of the Pahans presently work as day laborers of Bengali-speaking farmers. Their religion is animistic in nature with touches of Hindu influence. Their various religious worships or pujas include Korom (worship of stem of tree), Dal, Saharai, Gorai, Goal, Monsha and Kali, the last two worships being performed also by Hindus. Their diet includes meat of pigs and tortoises and their much preferred fish is the earthworm-like eel, *Monopterusuchia* (Hamilton 1822).

Practically nothing is known about the origin of the Telis. The Pahans think that Telis are a sect of the Pahans; the Telis, however, claim that they are a distinct tribe. On the other hand, the Telis speak the Nagori language, indicating that they have come from Nagpur in Jharkhand state of India. This language is distinct from the Pahan language, suggesting that the Telis may have evolved from the Pahans but have formed a separate entity in ancient times. The Teli religion is also animistic with Hindu influences, and their main worship, like the Pahans, is the Korom puja. Teli Headman is known as Pramanik. The Teli diet includes snails, tortoises, mongooses, and their preferred fish is like the Pahans, *Monopterusuchia*. Beef and buffalo meat are not consumed by the Telis.

We had been conducting systematic ethnomedicinal surveys of the tribes of Bangladesh for the last several years (Hanif et al., 2009; Mia et al., 2009; Rahmatullah et al., 2009a-d; Rahmatullah et al., 2010a-c; Rahmatullah et al., 2011). During the course of one such survey in Rajshahi district of Bangladesh, we came to learn of the existence of one isolated community each of the Pahans and the Telis residing in two adjoining villages of Natore district, which borders Rajshahi district and was close to our survey area. Since these were two virtually unknown tribes of Bangladesh, the objective of the present survey was to study the medicinal plant usage among these two tribes, and to evaluate at the same time whether the medicinal plants prescribed by the traditional practitioners of these two tribes can be scientifically validated through existing scientific literature on the relevant pharmacological properties of these plants.

Materials and Methods

The present study was conducted between May 2010 and March 2011. The Pahan community, numbering about 400 resided in the village of Gokulnagar in Natore district, Bangladesh. There were three traditional medicinal practitioners within the Pahan community, namely Bankim Pahan, Hari Pahan, and Sandhya Rani Pahan. Apparently, the medicinal practice was a family practice because all three of them belonged to the same family. Interviews were conducted of the three practitioners as a group at their request. The Teli community, numbering about 200 resided in the adjoining village of Paikordol in the same district. They had one traditional medicinal practitioner, namely Ganesh Chandra Teli. It was noticed that the first and middle names (if any) of the practitioners were essentially Hindu names with the name of the tribe used as the last name to denote their origin.

Informed consent was initially obtained from all four practitioners. They were mentioned in details as to the reason for the survey and consent obtained that the information provided by them may be disseminated in national and international publications. Access and benefit sharing” (ABS) were discussed with the practitioners in the event of a new drug development stemming from this survey of their traditional medical knowledge. Interviews were conducted with the help of a semi-structured questionnaire and the guided field-walk method of Martin (1995) and Maundu (1995). In this method, the practitioners took the interviewers on guided field-walks through areas from where they collected their medicinal plants, pointed out the plants and described their uses. Interviews were conducted in Bengali, a language spoken by the interviewers and spoken fluently by both the Pahans and the Telis. All information provided was double-checked with the practitioners in later evening sessions, which was the session where detailed information on various formulations was obtained. Plant specimens were collected, pressed and dried in the field and later brought back to Dhaka for identification by Mr. Manjur-Ul-Kadir Mia, ex-Curator and Principal Scientific Officer of the Bangladesh National Herbarium. All plant specimens were deposited at the Medicinal Plant Collection Wing of the University of Development Alternative.

Results and Discussion

The Pahan tribal practitioners used 13 plants distributed into 9 families for treatment of 14 different ailments. The results are shown in Table 1. The Teli tribal practitioner used 15 plants distributed into 14 families for treatment of 17 different ailments. The results are shown in Table 2. Only one plant, namely *Withania somnifera* was found to be in common use between the Pahan and the Teli practitioners. The Pahan practitioners used the plant for treatment of weakness of any type, which included physical, mental and sexual weaknesses. The Teli practitioner used the plant for treatment of debility, which according to him meant in general physical weakness, but did not preclude sexual weakness. Notably the Teli practitioner used the plant in

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combination with two other plant parts, namely roots of *Curculigo orchioides* and *Bombax ceiba*. In other ethnomedicinal studies conducted among mainstream folk medicinal practitioners (Kavirajes) of Bangladesh, we have observed that the roots of *Bombax*

Table 1: Medicinal plants and formulations of the Pahan tribe of Gokulnagar village in Natore district, Bangladesh

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Dog bite	Roots of <i>Datura metel</i> L. (Solanaceae) are soaked in raw cow milk and then the milk is taken in the morning for 3 days.	<i>Datura metel</i> : Kalo dhutura, Konok dhutura
2	Blood dysentery	3-4 leaves of <i>Phyllanthus reticulatus</i> Poir. (Euphorbiaceae) are chewed with salt for up to 7 days.	<i>Phyllanthus reticulatus</i> : Chikti gach
3	Snake bite	4g root of <i>Vernonia cinerea</i> (L.) Less. (Asteraceae) is boiled in water. The water is strained through a piece of cloth and taken 3-4 times.	<i>Vernonia cinerea</i> : Shorpomoni
4	Flatulence	Juice obtained from macerated leaves of <i>Mikania cordata</i> (Burm.f.) B. L. Robinson (Asteraceae) is taken twice daily.	<i>Mikania cordata</i> : Assam lota, Jarman lota
5	Infections	10-12 pieces of whole plants of <i>Cuscuta reflexa</i> Roxb. (Cuscutaceae) are macerated and placed upon the infected area.	<i>Cuscuta reflexa</i> : Alok lota, Shorno lota
6	Infections due to burns	Leaves of <i>Streblus asper</i> Lour. (Moraceae) are macerated with salt and applied to infected areas as a poultice. This is done for 2-3 days.	<i>Streblus asper</i> : Shaora
7	To stop bleeding from cuts and wounds	Macerated leaves of <i>Plumbago indica</i> L. (Plumbaginaceae) are applied to cuts and wounds.	<i>Plumbago indica</i> : Rokto chita
8	Rheumatism, chicken pox, snake repellent	For rheumatism, stems of <i>Moringa oleifera</i> Lam. (Moringaceae) are eaten. During this time, barley, gram, plantains, bottle gourd, bitter gourd, and duck eggs cannot be eaten. For chicken pox, flowers are cooked like vegetable and eaten. Bark of the plant repels snakes when kept inside the house.	<i>Moringa oleifera</i> : Sojina
9	Blood dysentery, piles	For blood dysentery, 2g bark of <i>Lannea coromandelica</i> (Houtt.) Merr. (Anacardiaceae) is mixed with 1g bark of <i>Mangifera indica</i> L. (Anacardiaceae) and 1g bark of <i>Azadirachta indica</i> A. Juss. (Meliaceae) and sugar. The whole mix is powdered and taken once daily on an empty stomach for 3 days. For piles, 1 glass juice from macerated bark of <i>Lannea coromandelica</i> is taken in the morning on an empty stomach for 7 days.	<i>Lannea coromandelica</i> : Jiga gach, Jibli gach <i>Mangifera indica</i> : Aam <i>Azadirachta indica</i> : Neem
10	Itches due to allergy	Macerated roots of <i>Tragia involucrata</i> L. (Euphorbiaceae) are mixed with coconut oil and applied to itches. At the same time, juice obtained from macerated roots is also taken.	<i>Tragia involucrata</i> : Bichuti lota
11	Weakness of any type, sexual disease in males	For weakness of any type, 6-8 leaves of <i>Withania somnifera</i> (L.) Dunal (Solanaceae) are taken with cow milk for 21 days. For sexual disease in males, 5g root is taken with cow milk.	<i>Withania somnifera</i> : Ashwogondha

ceiba were generally used for treatment of low sperm count (Rahmatullah et al., 2009d), and as a sex stimulant (Rahmatullah et al., 2010c). Thus the formulation used by the Teli practitioner may also have the use of a sexual stimulant or treatment of sexual dysfunction besides treatment for physical weakness (in this connection see *Curculigo orchioides*, Table 3).

The Pahan practitioners used medicinal plants from the Anacardiaceae, Asteraceae, Cuscutaceae, Euphorbiaceae, Meliaceae, Moraceae, Moringaceae, Plumbaginaceae, and Solanaceae families. Plant parts used in the formulations included whole plant (6.3%), leaf (31.3%), root (25%), stem (6.3%), flower (6.3%), and bark (25%). The Teli practitioners used in his formulations plants from the Acanthaceae, Amaryllidaceae, Asteraceae, Bombacaceae, Convolvulaceae, Costaceae, Euphorbiaceae, Fabaceae, Menispermaceae, Nyctaginaceae, Rutaceae, Smilacaceae, Solanaceae, and Verbenaceae families. Plant parts used in his formulations included whole plant (5.6%), leaf (27.8%), stem (11.1%), root (44.4%), seed (5.6%), and rhizome (5.6%). The results indicate considerable differences between plants, families of plants, and part of the plant used for

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treatment between the Pahan and Teli practitioners. Even the ailments treated were different with the exception of physical weakness, and even then the selection of plants differed between the two tribal practitioners with the exception of *Withania somnifera*. It is possible that considering the low tribal population of the two tribes among which the survey was conducted, the

Table 2: Medicinal plants and formulations of the Teli tribe of Paikordol village in Natore district, Bangladesh

Serial Number	Ailment with symptoms	Formulation	Local name of ingredients used
1	Edema, gonorrhoea, chronic coughs	For edema 20-25g whole plants of <i>Boerhaavia repens</i> L. (Nyctaginaceae) is boiled with 3-4g ginger in 3-4 cups of water. The water is then strained through a piece of cloth and taken twice daily in the morning and evening. For gonorrhoea, 3-4 teaspoonful of juice obtained from macerated root is taken. For chronic coughs, whole plant is boiled in water and the water taken for several days.	<i>Boerhaavia repens</i> : Punai-er shak, Noba
2	Arthritis, puerperal fever in women, memory enhancer	For arthritis, juice obtained from macerated leaves of <i>Vitex negundo</i> L. (Verbenaceae) is taken. For puerperal fever, leaves are boiled in water and the water is used for bathing for several days. To enhance memory, 2-4 leaves are fried in ghee (clarified butter) and taken daily.	<i>Vitex negundo</i> : Nishinda
3	Jonishool (burning sensations during urination in mother following childbirth), to blacken hair, edema	For jonishool, 5g bark of roots of <i>Aegle marmelos</i> (L.) Corr. (Rutaceae) is mixed with 5g bark of roots of <i>Wedelia chinensis</i> (Osbeck) Merr. (Asteraceae), macerated and taken with cold water. To blacken hair (white hair due to age or other problems), juice obtained from leaves of <i>Wedelia chinensis</i> is applied to hair every night. For edema, juice obtained from 4-5 macerated leaves of <i>Wedelia chinensis</i> is taken every morning mixed with cow milk.	<i>Wedelia chinensis</i> : Bhringar, Keshoraj <i>Aegle marmelos</i> : Bel
4	Low density of semen, irregular menstruation	For low density of semen, 5 seeds of <i>Mucuna pruriens</i> (L.) DC. (Fabaceae) are soaked in warm cow milk overnight. The following morning, the skins of seeds are taken off and the inner portion macerated and fried in ghee (clarified butter). When the fried portion has cooled down, it is mixed with 1 teaspoonful of sugar and taken once daily for at least 1 month. At the same time, 2 glasses of cow milk is taken daily. To regularize menstruation, dried and powdered seeds are soaked in ½ kg water and the mixture is thoroughly stirred and taken in the morning.	<i>Mucuna pruriens</i> : Alkushie
5	Debility	Roots of <i>Curculigo orchioides</i> Gaertn. (Amaryllidaceae) are boiled in water and the decoction taken twice daily. Alternately, roots of <i>Curculigo orchioides</i> are mixed with roots of <i>Bombax ceiba</i> L. (Bombacaceae) and stems of <i>Withania somnifera</i> (L.) Dunal (Solanaceae). The mixture is powdered and taken with cow milk and sugar.	<i>Curculigo orchioides</i> : Talmul <i>Bombax ceiba</i> : Shimul <i>Withania somnifera</i> : Ashwogondha
6	Helminthiasis, leucorrhoea in women	For helminthiasis, roots of <i>Costus speciosus</i> (J. König.) Sm. (Costaceae) are powdered with sugar and taken. For leucorrhoea, juice from macerated rhizome is taken.	<i>Costus speciosus</i> : Keya mool
7	To increase strength, to increase lactation in nursing mothers	To increase strength, 100g root of <i>Ipomoea mauritiana</i> Jacq. (Convolvulaceae) is macerated and taken with 1 glass goat milk. To increase lactation, macerated roots are taken with water.	<i>Ipomoea mauritiana</i> : Bhui kumra
8	Coughs, fever	Juice obtained from macerated leaves of <i>Justicia adhatoda</i> L. is taken.	<i>Justicia adhatoda</i> : Bashok
9	Gonorrhoea (symptom: painful urination), diabetes	For gonorrhoea, juice obtained from crushed stems of <i>Smilax zeylanica</i> L. (Smilacaceae) is taken. For diabetes, juice obtained from macerated stems is taken twice daily in the morning and evening.	<i>Smilax zeylanica</i> : Kumari lota
10	Lung infections, liver disorders	For lung infections, leaves of <i>Andrographis paniculata</i> (Burm. F.) Wall. ex Nees (Acanthaceae) are boiled in water and the water taken. For liver disorders, juice obtained from macerated leaves is mixed with water and taken 2-3 times daily.	<i>Andrographis paniculata</i> : Kalomegh

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11	Low semen density	Juice from 6-7 macerated leaves of <i>Cocculus hirsutus</i> L. Diels (Menispermaceae) are taken; alternately, leaves are soaked in water for 24 hours followed by squeezing the leaves and orally taking the juice obtained.	<i>Cocculus hirsutus</i> : Doiloch
12	Constipation	5g roots of <i>Tragia involucrata</i> L. (Euphorbiaceae) are boiled in water. The water is then strained through a piece of cloth and taken.	<i>Tragia involucrata</i> : Bichuti lota

Table 3: Relevant pharmacological activities of plants or plant parts used by the Pahan and Teli tribal medicinal practitioners of Natore district, Bangladesh

Scientific name of plant	Traditional use (tribe)	Relevant pharmacological activity findings
<i>Vernonia cinerea</i>	Snake bite (Pahan)	Analgesic and anti-inflammatory effects in extracts of leaves (Iwalewa et al., 2003); anti-inflammatory effect of methanol extract of whole plant (Mazumder et al., 2003). (Note that snake bite can result in inflammation and pain).
<i>Mikania cordata</i>	Flatulence (Pahan)	Anti-ulcer activity in ethanol fraction of leaves (Paul et al., 2000); anti-ulcer activity of alkaloidal fraction against diclofenac sodium-induced gastrointestinal lesions (Mosaddik and Alam, 2000); protective effect of methanolic extract of root against physical and chemical factors-induced gastric erosions (Bishayee and Chatterjee, 1994). (Note that flatulence or bloating can be a symptom of ulcer).
<i>Cuscuta reflexa</i>	Infections (Pahan)	Anti-inflammatory activity reported in water extract of the plant (Suresh et al., 2011). (Note that infections can result in inflammation).
<i>Streblus asper</i>	Infections due to burns (Pahan)	Anti-inflammatory effect reported for leaf extract (Sripanidkulchai et al., 2009). (Note that both burn and burn-induced infections can cause inflammation).
<i>Plumbago indica</i>	To stop bleeding from cuts and wounds (Pahan)	Wound healing effects reported for a related species, <i>Plumbago zeylanicum</i> (Reddy et al., 2002).
<i>Moringa oleifera</i>	Rheumatism (Pahan)	Immunosuppressive activity of ethanolic extract of seeds in experimental immune inflammation (Mahajan and Mehta, 2010).
<i>Mangifera indica</i>	Blood dysentery (Pahan)	Anti-diarrheal activity reported in seeds (Sairam et al., 2003); anti-inflammatory effect of aqueous extract of plant in experimental colitis (Márquez et al., 2010).
<i>Withania somnifera</i>	Weakness of any type (Pahan), debility (Teli)	Enhanced physical performance and cardiorespiratory endurance in healthy young adult human beings (Sandhu et al., 2010).
<i>Aegle marmelos</i>	Burning sensations during urination in mother following childbirth (Teli)	Anti-inflammatory, antipyretic and analgesic properties reported for leaf extract (Arul et al., 2005).
<i>Mucuna pruriens</i>	Low density of semen (Teli)	Increased sperm concentration and motility in infertile male humans observed with administration of seeds (Ahmad et al., 2008); improvement of semen quality, sperm count and sperm motility in infertile men observed with administration of seed powder (Shukla et al., 2009, 2010; Gupta et al., 2011).
<i>Curculigo orchioides</i>	Debility (Teli)	Ethanolic extract of rhizomes reportedly markedly improved penile erection, mating performance and mount frequency in male rats (Chauhan et al., 2007); aphrodisiac effect noted in male albino rats on administering aqueous extract of rhizomes (Thakur et al., 2009); numerous health benefits reviewed (Chauhan et al., 2010).
<i>Justicia adhatoda</i>	Coughs (Teli)	A bronchodilator alkaloid (vasicinone) isolated from the plant (Amin and Mehta, 1959); anti-tussive effect of plant extract reported on mechanical or chemical stimulation-induced coughing in guinea pigs and rabbits (Dhuley, 1999); beneficial effect of the plant against obstructive airway diseases (Sharafkhaneh et al., 2007).
<i>Andrographis paniculata</i>	Liver disorders (Teli)	Hepatoprotective activity of andrographolide and alcoholic extract of leaves from the plant reported against carbon tetrachloride, galactosamine and paracetamol-induced hepatotoxicity (handa and Sharma, 1990a,b; Rana and Avadhoot, 1991); choleric effect of andrographolide reported in rats and guinea pigs (Shukla et al.,

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		1992); anti-hepatotoxic effects of diterpenoid constituents of the plant (Kapil et al., 1993); protection by andrographolide against paracetamol-induced damage in rat hepatocytes (Visen et al., 1993); protective effect reported for the plant against benzene hexachloride-induced liver damage in mice (Trivedi and Rawal, 2001); reported protective action of andrographolide and arabinogalactan proteins obtained from the plant against ethanol-induced liver damages in mice (Singha et al., 2007); protective action of andrographolide against hexachlorocyclohexane-induced oxidative injury of liver (Trivedi et al., 2007).
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information provided was not indicative of the full repertoire of treatment among the practitioners of the tribe(s). A comprehensive survey involving all practitioners from both tribes might have shown similarities. Nevertheless, the present information shows that albeit the adjoining residences of the two tribes the traditional medicinal practice of one has not influenced the other.

Formulations used by both Pahan and Teli practitioners were in general simple, i.e. administration of one plant part for treatment of any given ailment. For instance, among the Pahans, the leaves of *Phyllanthus reticulatus* were simply chewed with salt for treatment of blood dysentery. Leaves of *Streblus asper* were macerated with salt and applied as poultice to infections as a result of burns. The Teli practitioner similarly used simple formulations like administration of juice obtained from macerated roots of *Boerhaavia repens* for gonorrhoea. For treatment of arthritis, juice obtained from macerated leaves of *Vitex negundo* was orally administered by the Teli practitioner. However, a major difference between the Pahan and the Teli practitioners was that while the Pahan practitioners usually used a single plant for treatment of a single ailment, the Teli practitioner used a single plant for treatment of multiple and diverse ailments. *Boerhaavia repens* was used by the Teli practitioner for treatment of edema, gonorrhoea, and chronic coughs. *Vitex negundo* was used by the same practitioner for treatment of arthritis, puerperal fever, and as a memory enhancer. This suggests a more extensive experience of medicinal plants and their various parts in the Teli practitioner than the Pahan practitioners, and further may be indicative that Teli traditional medicinal practices may have deeper roots or evolved more extensively than Pahan medicinal practices. To substantiate this theory, will however, need more surveys among the other isolated communities of the Pahans and the Telis in Bangladesh.

It is always a point of interest as to how much of the traditional uses of medicinal plants by indigenous communities have been validated by findings of relevant phytochemicals and/or pharmacological activities in the given plant through modern scientific research. The results of such findings on the medicinal plants of the Pahans and the Telis are shown in Table 3. Eight out of the thirteen medicinal plants (i.e. 61.5%) used by the Pahan practitioners have been shown in scientific studies to possess relevant pharmacological activities, thus validating their traditional uses. A similar perusal of the available scientific literature showed that six out of the fifteen plants (or 40%) used by the Teli healer had reported relevant pharmacological activities and so validating their traditional uses.

Both Pahan and Teli traditional medicinal practices may have been influenced to some extent by the Ayurvedic medicine of India, and which is thought to be several thousand years old. *Datura metel*, which is used by the Pahans to treat dog bite, is also used for the same purpose in Ayurvedic medicine (Dey, 1994). The same applies to the plant *Phyllanthus reticulatus* (used by the Pahans to treat blood dysentery), which is used in Ayurvedic preparations for treatment of diarrhea (The Wealth of India, 2005). Similarly, *Vitex negundo* (used by the Telis for treatment of arthritis) is considered in Ayurveda to be one of the most potent anti-arthritis plants. *Mucuna pruriens* (used by the Teli practitioner for treatment of low density of semen) is used in Ayurveda for treatment of erectile problems. This Ayurvedic influence is not surprising for the Pahans and the Telis are thought to have originated from the Jharkhand state in India, and so probably have had contacts with the Ayurvedic medicinal system in the past, if not in present times.

It is noteworthy that a number of plants used by the practitioners of these two tribes on the verge of disappearance have been found to have relevant pharmacological activities, which validate their traditional usages. Among the plants used by the Pahan practitioners, the plants *Moringa oleifera* and *Withania somnifera* merit extensive scientific researches. The first was observed to be used for treatment of rheumatism for which allopathic medicine has no known cure. The second was for the treatment of weakness of any type, including sexual weakness. Such weakness can lead to infertility and is a condition suffered by many males and females of the world. Among the plants used by the Teli practitioner, *Vitex negundo*, *Mucuna pruriens*, *Curculigo orchoides* and *Cocculus hirsutus* are particularly suitable for further scientific studies because of their traditional uses for arthritis, debility (including sexual weakness), and low semen density. These are all afflictions affecting millions of people in the world and can cause enormous benefits to human beings if efficacious drugs are discovered from these plants. While modern medicine can benefit from new drugs obtained from these plants, such knowledge when passed on to the Pahans and the Telis can also prove beneficial to the traditional medicinal practitioners in more effective treatment of the diseases and at the same time help them in active conservation of the plant species.

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Web page: /http://journals.sfu.ca/africanem/index.php/ajtcam/index

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Publisher: African Networks on Ethnomedicines

Web page: /http://journals.sfu.ca/africanem/index.php/ajtcam/index

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