

Ethnobotany of Chanchal Block of Malda District of West Bengal (India): plants used in local healthcare

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Abstract

The ethnobotanical survey in Chanchal block of Malda district recorded a total of 49 species belonging to 29 families were used to treat 25 local ailments. Root was the most frequently used plant part in preparing herbal remedies followed by leaf. The most common diseases treated in the study area were bone fracture, gastritis, diabetes, rheumatism, gastritis, asthma, bronchitis, skin disorders etc. In most of the cases, more than one species has been utilized to treat one disease. For instance, five plant species namely *Acacia nilotica* (Linnaeus) Delile, *Musa x paradisiaca* Linnaeus, *Bombax ceiba* Linnaeus, *Catharanthus roseus* (Linnaeus) G. Don, *Syzygium cumini* (Linnaeus) Skeels were used to treat diabetes whereas six different plant species were utilized to alleviate gastritis problems. Now-a-days, the indigenous knowledge is on the way of erosion due to several extrinsic factors. Therefore, the documentation of plant resources and their sustainable utilization is a necessary step towards the goal of raising awareness in local people about the importance of these plants and their further conservation.

Key words: Ethnobotany, Medicinal plants, Healthcare, Tribe, Chanchal, Malda, West Bengal.

INTRODUCTION

Man has been dependent on nature for their survival and medicine since time immemorial. This dependency led the indigenous people living in harmony with nature to evolve a unique system of medicinal plant practices (Ghosh *et al.* 2004; Teron & Borthakur 2014). This knowledge and description of the use of a variety of plant-derived medications has been passed orally generation to generation. In India, there are about 54 million aboriginal people of different ethnic groups inhabiting various regions. The aboriginal groups have their own distinctive culture, religious rites, food habit and a rich knowledge of plant utilization (Parinitha *et al.* 2005; Boro & Sarma 2013). The indigenous knowledge of medicinal plants and their use in treating several ailments might reasonably be expected in India due to its rich floristic vegetation (Gupta *et al.* 2004; Shil *et al.* 2014). Virtually, ethnobotanical survey may be regarded as one of the most reliable approaches to new drug discovery and it is a prerequisite for any developmental planning concerned with the welfare of tribal and their environment (Lokho & Narasimhan 2013).

However despite being rich in biodiversity and with diversified ethnic communities, Malda district (Fig. 1) of West Bengal in India is still remained elusive for ethnobotanists (Saha *et al.*

2014). The district is characterized by its rich wetland and forest vegetation which consist chiefly of herbs, shrubs, thorny scrub bushes and large trees. *Santals*, *Rajbanshi*, *Oraon*, *Namasudra*, *Polia*, *Mundas*, *Malpaharias* etc. are the main aboriginal communities living throughout the district. Practices of Traditional Medicines using plant species is a common phenomenon to them apart from agriculture. Even today, the ethnic people of the district practice herbal medicine to treat a variety of ailments using wild medicinal plants due to its efficiency, ease and low cost.

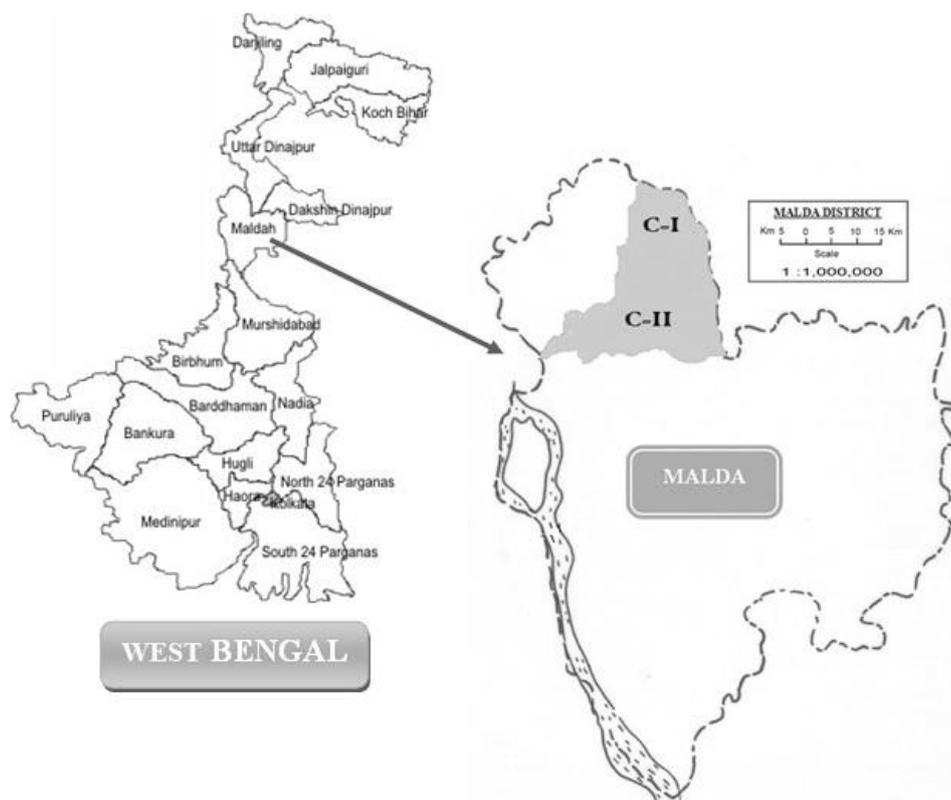


Fig. 1. Location map of study area [C-I= Chanchal block I; C-II= Chanchal block II]

Chanchal block I & II are such areas of the district where medicinal plants are utilized vigorously for local healthcare management by tribal community and located between the latitude and longitude of $25^{\circ}23' N$ and $88^{\circ}0' E$ respectively. The practice of such traditional knowledge is so popular in those provinces that it is deeply rooted in their culture. However, no such documentation has so far been conducted in Chanchal block I & II. The purpose of the current study was, therefore, to gather information on the exploitation of local medicinal plants by ethnic people in Chanchal block I and II of the district to manage diseases.

MATERIALS AND METHODS

Extensive field survey has been conducted in ten villages (Malatipur, Samsi, Ratanpur, Sripur, Chanchal, Mahanandapur, Jalalpur, Kandaron, Vado and Bhakri) of Chanchal blocks I & II, Malda, India was conducted in the year June 2011 to August 2012. The information regarding the traditional knowledge, local uses of plants, parts used (e.g. leaf, root, bark, fruit etc.), purposes, name of diseases, modes of administration, and curative properties were recorded

through intensive interviews and group discussions with traditional healers and elderly knowledgeable persons using semi-structured questionnaire process. Prior Informed Consent (PIC) was also obtained from them. Many practitioners were interviewed in the study area and retained information only from 25 informants. The survey method followed in the present study was that of guided field-walk method as suggested by Jain (1995). The plants used for various purposes were identified using different available literatures including Hooker (1875 – 1897); Prain (1903); Kanjilal *et al.* (1934 – 1940); Balakrishnan (1981 & 1983) and further updated from websites including www.theplantlist.org. For family delimitation APG III system (Chase & Reveal 2009). Voucher specimens were processed into mounted herbarium sheets following Jain & Rao (1977) and stored in the Herbarium of Department of Botany, Raiganj University College.

RESULT AND DISCUSSION

Present study recorded that a total of 49 species belonging to 29 families had been utilized to treat local ailments by tribal people of Chanchal block I & II. Of these, six species, namely *Rauvolfia serpentina*, *Ervatamia coronaria*, *Carissa carandas*, *Catharanthus roseus*, *Hemidesmus indicus* and *Holarrhena pubescens* belonging to Apocynaceae were considered to have ethnobotanical uses, followed by Malvaceae with 4 species including *Abroma augusta*, *Bombax ceiba*, *Hibiscus rosa-sinensis* and *Sida rhombifolia*. Moraceae and Fabaceae with 3 species each whereas Acanthaceae, Apiaceae, Combretaceae, Arecaceae, Rutaceae, Lamiaceae, Vitaceae and Solanaceae contributed 2 species to each and the rest of 17 families were represented by one species in each (Table 1). The present study revealed that trees were the most dominant growth forms with 18 species, followed by herbs with 15 species, shrubs with 13 species and climbers with 3 species.

Root was the most commonly used plant part to prepare herbal formulations accounting for 31 % of the recorded plants, followed by leaves with 24 %, fruits and stem with 11 % each etc (Fig. 2). It was noticed that most of the formulations prepared were of fresh plant materials and processed by crushing, boiling or frying. A single species was involved more than one occasion to prepare remedies. It had been observed that the mostly used form of herbal preparations were paste, juice or infusion of either single or mixture of plant parts. Honey, sugar-candy (*michri* or *tal-michri*), salt, ginger, fennel seeds, black pepper, milk etc. were often used as additives (Table 1). Result also exhibited that most of the preparations were administrated orally whereas other mode of application was external by directly or tying the preparation with the affected part of the body.

A total of 25 types of local diseases were reported to be cured in the study area. The most common diseases were body pain, bone fracture, rheumatism, asthma, bronchitis, diabetes, gastritis, skin disorders etc. The study revealed that a single species like *Vitex negundo*, *Mimosa pudica*, *Phyllanthus emblica*, *Terminalia chebula* etc. have been utilized more than one occasion to treat several disorders. For instance, *Vitex negundo* was utilized in case of pain, paralysis and tumor while *Mimosa pudica* was used in leucorrhoea and dysentery.

However, Dey & De (2010) and Chakraborty & Bhattacharjee (2006) reported a few plants (*Ampelocissus tomentosa*, *Glossogyne bidens* and *Ichnocarpus frutescens*) which were used against bone fracture at Ajodhya hill region of Purulia district, India whereas in the present study four plants including *Cissus quadrangularis* (stem), *Datura metel* (root), *Ampelocissus latifolia* (stem), *Tamarindus indica* (leaf) were used to prepare traditional remedies and applied on affected area to alleviate bone fracture. Application of 3 species namely *Alstonia scholaris*, *Holarrhena antidysenterica* and *Centella asiatica* were found

Table 1. Name of local diseases and their management practices in Chanchal block of Malda district

Disease	Plant name [Family]; Vernacular name; Voucher no.	Parts used	Ethnic use/Administration
Bone fracture	<i>Cissus quadrangularis</i> Linnaeus [Vitaceae]; <i>Harjora</i> ; RUC/MLD-312	Stem	All plant parts are crushed along with leaves of <i>Tamarindus</i> , ginger, salt to make paste and applied as emollient on affected area of fracture
	<i>Datura metel</i> Linnaeus [Solanaceae]; <i>Kalo dhutura</i> ; RUC/MLD-328	Root	
	<i>Ampelocissus latifolia</i> (Roxburgh) Planchon [Vitaceae]; <i>Goaliar lota</i> ; RUC/MLD-563	Stem	
	<i>Tamarindus indica</i> Linnaeus [Fabaceae]; <i>Tnetul</i> ; RUC/MLD-322	Leaf	
Pain	<i>Glycosmis pentaphylla</i> A.J. Retzius [Rutaceae]; <i>Aatiswar</i> ; RUC/MLD-422	Root	Plant parts are crushed together to make paste and applied as emollient on affected area to relieve the pain
	<i>Datura metel</i> Linnaeus [Solanaceae]; <i>Kalo dhutura</i> ; RUC/MLD-328	Root	
	<i>Vitex negundo</i> Linnaeus [Lamiaceae]; <i>Nisinda</i> ; RUC/MLD-444	Leaf & stem	Leaves are crushed along with ginger, salt, Black pepper and the paste is applied as an emollient
	<i>Litsea glutinosa</i> (Loureiro) C.B. Robinson [Lauraceae]; <i>Daradmoida</i> ; RUC/MLD-259	Stem	Stem bark is crushed to make paste and applied as emollient on affected area
Paralysis	<i>Aegle marmelous</i> (Linnaeus) J.F. Correa [Rutaceae]; <i>Bel</i> ; RUC/MLD-449	Leaf	Leaves of both the plants are fried red in mastered oil and the mixture is sieved and mixed with tarpin oil (4 teaspoon), piperment and camphor and massaged on paralyzed area twice in a day
	<i>Vitex negundo</i> Linnaeus [Lamiaceae]; <i>Nisinda</i> ; RUC/MLD-444	Leaf	
Rheumatism	<i>Justicia gendarussa</i> N.L. Burman [Acanthaceae]; <i>Jagatmadan</i> ; RUC/MLD-467	Root	Root paste is applied in rheumatism
	<i>Coccinia grandis</i> (Linnaeus) J.O. Voigt [Cucurbitaceae]; <i>Telakucha</i> ; RUC/MLD-473	Root & Fruit pills	Root decoction mixed with sugar, goat milk is used to treat rheumatism for 3-4 months (twice a week) Concurrently, the paste of fruit pills are applied on affected area
Tumor	<i>Vitex negundo</i> Linnaeus [Lamiaceae]; <i>Nisinda</i> ; RUC/MLD-444	Leaf	Leaves and bark of both the plants are crushed along with turmeric and ginger to make paste, warmed slightly and applied on tumor
	<i>Neolamarkia kadamba</i> (Roxburgh) J.M. Bosser [Rubiaceae]; <i>Kadam</i> ; RUC/MLD-509	Bark	
Body weakness	<i>Asparagus racemosus</i> Willdenow [Asparagaceae]; <i>Satomul</i> ; RUC/MLD-499		Roots of all plants are crushed together and dried to make powder and taken with milk twice a day to reduce body weakness
	<i>Hemidesmus indicus</i> R. Brown [Apocynaceae]; <i>Anantamul</i> ; RUC/MLD-512		

Disease	Plant name [Family]; Vernacular name; Voucher no.	Parts used	Ethnic use/Administration
Body weakness (contd.)	<i>Rauvolfia serpentina</i> (Linnaeus) Benth <i>ex Kurz</i> [Apocynaceae]; <i>Chandramul</i> ; <i>RUC/MLD-145</i>	Root	
	<i>Aristolochia indica</i> Linnaeus [Aristolochiaceae]; <i>Iswarmul</i> ; <i>RUC/MLD-177</i>		
	<i>Bombax ceiba</i> Linnaeus [Malvaceae]; <i>Simul</i> ; <i>RUC/MLD-283</i>		
Asthma	<i>Ficus glomerata</i> Roxburgh [Moraceae]; <i>Dumur</i> ; <i>RUC/MLD-256</i>	Fruit	Fruits boiled in water, mixed with little amount of piperment and sieved; the decoction is taken to treat asthma
	<i>Solanum xanthocarpum</i> M.L. Schrad & J.C. Wendland [Solanaceae]; <i>Kontikari</i> ; <i>RUC/MLD-293</i>	Root	Roots are crushed to powder along with joan, clove, black pepper, dry ginger and little salt and taken two table spoons twice a day after meals
Bleeding on the body	<i>Ageratum conyzoides</i> Linnaeus [Asteraceae]; <i>Chikasunga</i> ; <i>RUC/MLD-92</i>	Root	Roots are crushed along with turmeric and the extract is applied twice a day to reduce bleeding from nose, ear etc.
Gastritis	<i>Phyllanthus emblica</i> Linnaeus [Phyllanthaceae]; <i>Amloki</i> ; <i>RUC/MLD-270</i>	Fruit	Fruits are dried and powdered with salt and taken twice a day in empty stomach
	<i>Terminalia bellirica</i> (Gaertner) Roxburgh [Combretaceae]; <i>Boahera</i> ; <i>RUC/MLD-126</i>		
	<i>Terminalia chebula</i> A.J. Retzius [Combretaceae]; <i>Haritaki</i> ; <i>RUC/MLD-341</i>		
	<i>Trachyspermum copticum</i> T.A. Sprague [Apiaceae]; <i>Ajoan</i> ; <i>RUC/MLD-510</i>	Hypanthodium /Fruit	Extract of its fruits and seeds of <i>Sesamum indicum</i> Linnaeus is applied on head to lower the gas from head
	<i>Ficus benghalensis</i> Linnaeus [Moraceae]; <i>Bot</i> ; <i>RUC/MLD-257</i>	Prop root	Paste of slender prop roots is taken with batasa (a product made from sugar) to treat gastritis
Azoospermia	<i>Curculigo orchioides</i> J. Gaertner [Hypoxidaceae]; <i>Talmuli</i> ; <i>RUC/MLD-335</i>	Root	1-2 pieces of root is chewed in the morning for 15-20 days to improve sperm production and density
Kidney stone	<i>Phyllanthus emblica</i> Linnaeus [Phyllanthaceae]; <i>Amloki</i> ; <i>RUC/MLD-270</i>	Fruit	Powder of dried fruits are taken twice a day to dissolve kidney stone
	<i>Terminalia bellirica</i> (Gaertner) Roxburgh [Combretaceae]; <i>Boahera</i> ; <i>RUC/MLD-126</i>		
	<i>Terminalia chebula</i> A.J. Retzius [Combretaceae]; <i>Haritaki</i> ; <i>RUC/MLD-341</i>		
	<i>Kalanchoe pinnata</i> (Lamarck) Persoon [Crassulaceae]; <i>Patharkuchi</i> ; <i>RUC/MLD-69</i>	Leaf	Boiled fresh leaves are very much effective to dissolve stone in kidney

Disease	Plant name [Family]; Vernacular name; Voucher no.	Parts used	Ethnic use/Administration
Kidney stone (contd.)	<i>Cocos nucifera</i> Linnaeus [Arecaceae]; <i>Narkel</i> ; RUC/MLD-364	Fruit	The tender fruit water along with seeds of <i>Trigonella foenum-graecum</i> Linnaeus juice is taken as a stone dissolver
Leucoderma	<i>Borassus flabellifer</i> Linnaeus [Arecaceae]; <i>Taal</i> ; RUC/MLD-374	Leaf	Tender leaves are crushed along with seeds of <i>Argemone mexicana</i> Linnaeus shell of <i>Pila</i> and the paste is applied as emollient on affected region with coconut oil
Allergy	<i>Argemone mexicana</i> R. Sweet [Papaveraceae]; <i>Sialkata</i> ; RUC/MLD-311	Seed	Seeds are crushed along with tender leaves of <i>Taal</i> , shell of <i>Pila globosa</i> (apple-samuk) to make paste and applied as emollient on affected region with coconut oil before bath
Inflammation	<i>Sida rhombifolia</i> Linnaeus [Malvaceae]; <i>Peet Berala</i> ; RUC/MLD-310	Root	Paste of roots and fennel seeds is applied to get relief from inflammation in breast
	<i>Argemone mexicana</i> R. Sweet [Papaveraceae]; <i>Sialkata</i> ; RUC/MLD-311	Root	Paste of root is applied on affected area to prevent inflammation
Menstruation	<i>Hibiscus rosa-sinensis</i> Linnaeus [Malvaceae]; <i>Joba</i> ; RUC/MLD-178	Flower	Decoction of crushed flower in water is feed to women to induce menstruation
	<i>Abroma augusta</i> (Linnaeus) Linnaeus f. [Malvaceae]; <i>Ulatkambal</i> ; RUC/MLD-300	Petiole	Petioles are crushed and kept in a bowl of water for whole night, and next morning the decoction is taken against irregular menstruation
Diabetes	<i>Musa x paradisiaca</i> Linnaeus [Musaceae]; <i>Kola</i> ; RUC/MLD-439	Stem	Tender stem (3-5 pieces; 10 – 15 cm long) is crushed along with the root of <i>Alpinia</i> sp. (<i>elach</i>), whole parts of <i>Ipomoea aquatica</i> and sugar candy then the extract is taken orally to treat diabetes
	<i>Acacia nilotica</i> (Linnaeus) Delile [Fabaceae]; <i>Babla</i> ; RUC/MLD-433	Leaf	Tender leaves are crushed along with the stem of <i>Tinospora sinensis</i> (Loureiro) Merrill in 2:1 ratio and the juice is taken at early morning for 3-4 months to treat diabetes
	<i>Bombax ceiba</i> Linnaeus [Malvaceae]; <i>Simul</i> ; RUC/MLD-283	Root	Crushed tender root (2-3 years old tree) is used to cure diabetes
	<i>Catharanthus roseus</i> (Linnaeus) G. Don [Apocynaceae]; <i>Nayantara</i> ; RUC/MLD-76	Leaf	Extract of its leaves along with leaves of <i>Andrographis paniculata</i> is taken in empty stomach at the morning
	<i>Syzygium cumini</i> (Linnaeus) Skeels [Myrtaceae]; <i>Jam</i> ; RUC/MLD-337	Seed	Seed powder is mixed with goat milk and taken at early morning in diabetes
Leucorrhoea	<i>Amaranthus spinosus</i> Linnaeus [Amaranthaceae]; <i>Katanote</i> ; RUC/MLD-251	Root	Root-decoction is mixed with sugar and milk and taken to treat leucorrhoea
	<i>Punica granatum</i> Linnaeus [Lythraceae]; <i>Dalim</i> ; RUC/MLD-179	Leaf	Leaf extract is taken orally at the morning with in empty stomach to reduce leucorrhoea
	<i>Mimosa pudica</i> Linnaeus [Fabaceae]; <i>Lajjabati</i> ; RUC/MLD-307	Root	Root decoction is used for leucorrhoea

Disease	Plant name [Family]; Vernacular name; Voucher no.	Parts used	Ethnic use/Administration
Bronchitis	<i>Andrographis paniculata</i> (Burman f.) Wallich ex Nees [Acanthaceae]; <i>Kalmegh</i> ; RUC/MLD-255	Seed	Paste of its leaves with <i>tulsi</i> , <i>basak</i> and honey is taken with warm milk twice a day until it cures
Conjunctivi-tis	<i>Ervatamia coronaria</i> (Jacquin) Stapf [Apocynaceae]; <i>Tagar</i> ; RUC/MLD-533	Flower	Juice from crushed flowers is applied on eyes to relieve from various type of conjunctivitis
	<i>Barringtonia acutangula</i> (Linnaeus) Gaertner [Lecythidaceae]; <i>Hizal</i> ; RUC/MLD-442	Seed	Seed powder is used as emollient in conjunctivitis
Hypertension	<i>Aristolochia indica</i> Linnaeus [Aristolochiaceae]; <i>Iswarmul</i> ; RUC/MLD-177	Root	Its roots along with the roots of <i>Rauwolfia serpentina</i> are crushed and the juice is taken in hypertension twice a day
	<i>Clerodendrum colebrookianum</i> W.G. Walpers [Lamiaceae]; RUC/MLD-392	Leaf	Leaf decoction is used in hypertension
Jaundice	<i>Andrographis paniculata</i> (Burman f.) Wallich ex Nees [Acanthaceae]; <i>Kalmegh</i> ; RUC/MLD-255	Leaf	Leaf decoction is taken orally
Skin disorder	<i>Rauwolfia serpentina</i> (Linnaeus) Bentham ex Kurtz [Apocynaceae]; <i>Sarpagandha</i> ; RUC/MLD-145	Root	Root paste is applied in several kinds of skin diseases
	<i>Holarrhena antidysenterica</i> (Linnaeus) Wallich [Apocynaceae]; <i>Kurci</i> ; RUC/MLD-35	Bark	The bark along with roots of <i>Hemidesmus indicus</i> are crushed to make paste and applied externally to treat skin disorders viz. eczema, puses etc.
Anorexia	<i>Carissa carandas</i> J. Loureiro [Apocynaceae]; <i>Karamcha</i> ; RUC/MLD-475	Fruit	The ripe fruit is used to treat anorexia.
Dysentery	<i>Tinospora sinensis</i> (Loureiro) Merrill [Menispermaceae]; <i>Goronch lata</i> ; RUC/MLD-120	Stem	Extract of its stem along with bark of <i>Alstonia scholaris</i> is taken twice a day
	<i>Mimosa pudica</i> Linnaeus [Fabaceae]; <i>Lajjabati</i> ; RUC/MLD-307	Root	The root and kalmegh leaves are crushed to make juice and used in dysentery
Vomiting	<i>Coriandrum sativum</i> Linnaeus [Apiaceae]; <i>Dhane pata</i> ; RUC/MLD-365	Whole plant	The whole plant along with zinger and black pepper is crushed to make juice and used against vomiting
	<i>Houttuynia cordata</i> C.P. Thunberg [Saururaceae]; <i>Ansta gaach</i> ; RUC/MLD-451	Leaf	The leaves are crushed to make juice and taken to induce vomiting

to be effective on dysentery in Narsinghdi District of Bangladesh (Rahmatullah *et al* 2010) while the authors ascertained new treatment procedures in the studied area by local tribal people for the same purposes using the species, *Tinospora sinensis* (stem) and *Mimosa pudica* (leaf). Chakraborty & Bhattacharjee (2006) reported the use of *Curculigo orchioides* for treating leucorrhoea and nasal bleeding problem in Purulia district of West Bengal in India, however, our findings suggested enhancement of sperm production on consumption of its roots. Five plant species namely, *Musa x paradisiaca*, *Acacia nilotica*, *Bombax ceiba*, *Catharanthus roseus*, *Syzygium cumini* were found to be effective to treat diabetes in the study area while Biswas *et al* (2011) reported the use of *Acacia nilotica* as antidiabetic in

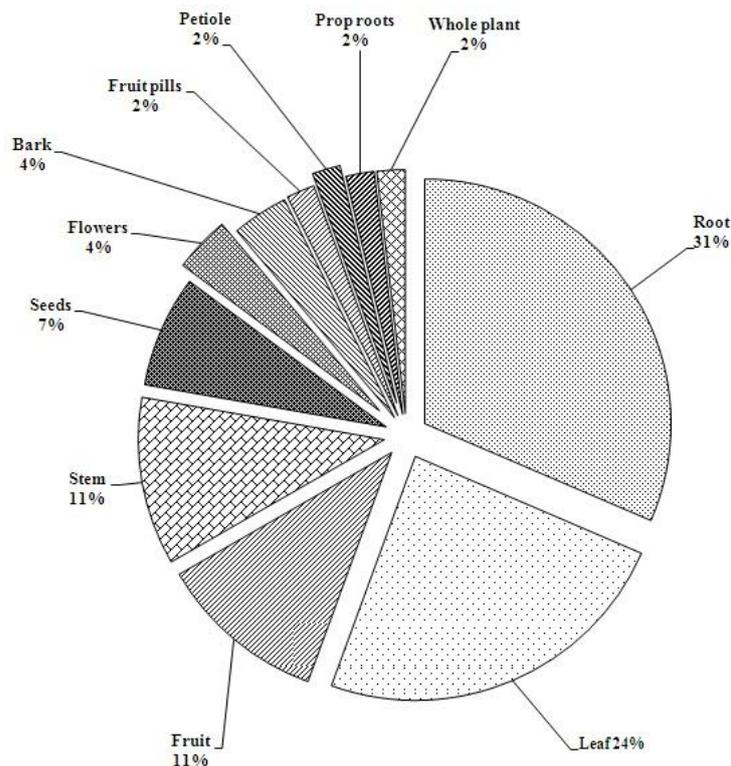


Fig. 2. Used plant parts in the preparation herbal remedies

Narail and Jessore Districts of Bangladesh supporting our result. However, Oyedemi *et al* (2009) accounted 15 plant species employed for the management of diabetes at entire Eastern Cape Province of South Africa. The study revealed that *Rauvolfia serpentina* and *Holarrhena antidysenterica* were exploited for the management of skin disorders whereas fruits of *Ficus glomerata* and roots of *Solanum xanthocarpum* were utilized to expel asthma (Table 1).

The study exhibited a high degree of ethnobotanical novelty and the use of plant resources for medicine by the aboriginal communities. In addition, the comparative studies on medicinal uses of plants among different regions showed similarities and dissimilarities in uses. In recent, the knowledge of medicinal plants or ethnobotany has gained worldwide attention due to its effectiveness, therapeutic and eco-friendly nature.

CONCLUSION

The present documentation is the first systematic study on local healthcare management of Chanchal block I and II as per authors' best knowledge. Despite the large scale environmental degradation and modernization, medicinal plants are still playing a significant role in the management of various human diseases in Malda District. The study was, therefore, intended to document the local knowledge of traditional healers treating different ailments in Chanchal block I and II. The study revealed that a total of 49 species had been utilized to treat 25 different diseases and disorders by local traditional healers. Root was the most frequently used plant part in the preparation of remedies followed by leaf. The common ailments treated in the area were bone fracture, diabetes, rheumatism, body pain, kidney stone, menstruation,

asthma, bronchitis, gastritis, skin disorders etc. A comprehensive phytochemical investigation of those studied plants would be a handy work for the invention of future eco-friendly drug. Besides, a serious awareness is needed be raised among the local people on sustainable utilization and management of the plant resources.

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LITERATURE CITED

- Balakrishnan, N.P. 1981 & 1983. *Flora of Jowai*. Botanical Survey of India, Howrah.
- Biswas, K.R.; Khan, T.; Monalisa, M.N.; Swarna, A.; Ishika, T.; Rahman, M. & Rahmatullah, M. 2011. Medicinal Plants Used by Folk Medicinal Practitioners of Four Adjoining Villages of Narail and Jessore Districts, Bangladesh. *Am. Eurasian J. Sust. Agric.* 5(1): 23-33.
- Boro, A. & Sarma, G.C. 2013. Ethnic uses of some wetland plants by the *Bodo* community in Udalgiri district of Assam, India. *Pleione* 7(1): 155 – 159.
- Chakraborty, M.K. & Bhattacharjee, A. 2006. Some common ethnomedicinal uses of various diseases in Purulia district, West Bengal. *Indian J. Trad. Knowl.* 5(4): 554 – 558.
- Chase, M.W. & Reveal, J. 2009. A phylogenetic classification of the land plants to accompany APG III. *Bot. J. Linn. Soc.* 161: 122 – 127.
- Dey, A. & De, J.N. 2010. A Survey of Ethnomedicinal Plants used by the tribals of Ajoydha Hill Region, Purulia District, India. *Am. Eurasian J. Sust. Agric.* 4(3): 280 – 290
- Ghosh, C.; Sharma, B.D. & Das, A.P. 2004. Weed flora of tea gardens of Darjiling Terai. *Bull. Bot. Surv. India* 43(1-4): 151–161.
- Gupta, S.; Porwal, M.C. & Roy, P.S. 2004. Indigenous knowledge on some medicinal plants among the Nicobari Tribe of Car Nicobar Island. *Indian J. Trad. Knowl.* 3(3): 287 – 293.
- Hoker, J.D. 1875–1897. *Flora of British India*. Vols. I-VII, L. Reve & Co. Ltd., Kent, England.
- Jain, S.K. 1995. *A manual of Ethnobotany*. Scientific Publishers, Jodhpur, India.
- Jain, S.K. & Rao, R.R. 1977. *A Handbook of Field and Herbarium Methods*, Today's and Tomorrow Publishers, New Delhi.
- Kanjilal, U.N.; Kanjilal, P.C.; Das, A.; Purkayastha, C. & Bor, N.L. 1934 – 1940. *Flora of Assam* (5 Volumes), Govt. of Assam Press, Shillong.
- Lokho, K. & Narasimhan, D. 2013. Ethnobotany of Mao-Naga Tribe of Manipur, India. *Pleione* 7(2): 314 - 324.
- Oyedemi, S.O.; Bradley, G. & Afolayan, A.J. 2009. Ethnobotanical survey of medicinal plants used for the management of diabetes mellitus in the Nkonkobe municipality of South Africa. *J. Med. Plant. Res.* 3(12): 1040 – 1044.
- Parinitha, M.; Srinivasa, B.H. & Shivanna, M.B. 2005. Medicinal Plant wealth of local communities in some villages in Shimoga District of Karnataka, India. *J. Ethnopharm.* 98: 307 – 312.

- Prain, D. 1903. *Bengal Plants*, 2-Volumes, W & Co. Printer & Publisher, Calcutta.
- Rahmatullah, M.; Rahman, L.; Rehana, F.; Kalpana, M.A.; Khatun, A.; Jahan, R.; Taufiqur-Rahman, M.; Anwarul Bashar, A.B.M. & Azad, A.K. 2010. A scientific evaluation of medicinal plants used in the folk medicinal system of five villages in Narsinghdi District, Bangladesh. *Am. Eurasian J. Sust. Agric.* 4(1): 55 – 64.
- Saha, M.R.; DeSarker, D. & Sen, A. 2014. Ethnoveterinary practices among the tribal community of Malda district of West Bengal, India. *Indian J. Trad. Knowl.* 13(2): 359 – 367.
- Shil, S.; Choudhury, M.D. & Das, S. 2014. Indigenous knowledge of medicinal plants used by the Reang tribe of Tripura state of India. *J. Ethnopharm.* 152(1): 135 – 141.
- Teron, R. & Borthakur, S.K. 2014. Ethnobotanical appraisal of the Hill-Tiwas of Assam, India. *Pleione* 8(1): 109 – 119.
- The Plant List. Version 1.1. Published on the Internet; <http://www.theplantlist.org/> (accessed 1st January 2014).