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### **Quantitative Ethnobotanical study on traditional use of medicinal plants in Malda district of West Bengal, India**

**Mukherjee Sweta and Moktan Saurav\***

Department of Botany, University of Calcutta, 35, B.C. Road, Kolkata, West Bengal 700019, India \*Email: [smbot@caluniv.ac.in](mailto:smbot@caluniv.ac.in)

#### **ABSTRACT**

The present communication reports the ethnobotanical study on traditional medicinal plants used by the indigenous communities. The study was carried out during 2018-2019 in Malda district of West Bengal. The study represents quantitative documentation of plants used for various aspects including ethnomedicine, ethnoveterinary, ethno-religious including food, fodder, etc. Fidelity level, use value and informant consensus factor were used to analyze the importance of medicinal plants. A total of 73 plant species under 61 genera and 29 families used ethnobotanically were documented. Plant family with highest number of medicinal plants use against various ailments was Leguminosae (14%) followed by Euphorbiaceae and Cucurbitaceae (10%). The habit group showed that shrubs constituted the highest percent of plants (34%) followed by herbs (31%) and leaves were the most used plant parts for medicine (34%) whereas paste form (26%) was the most popular formulation for preparation of ethnomedicine. The highest use value of 4.0 was reported against jaundice and the lowest against asthma (1.16). The highest ICF (1.0) value was obtained for rheumatism and the least ICF of 0.16 was linked with antiseptic. The traditional knowledge is confined only to the elderly and relative members of community and therefore, sincere effort on conservation and translation to the next generation is utmost necessary for the sustainable use of medicinal plants.

**KEYWORDS:** Ethnobotanical, medicinal plants, Malda

#### **\*CORRESPONDING AUTHOR**

**Saurav Moktan**

Department of Botany, University of Calcutta, 35, B.C. Road,  
Kolkata, West Bengal 700019, India

Mob No: +91 7384336285; Email: [smbot@caluniv.ac.in](mailto:smbot@caluniv.ac.in)

## **INTRODUCTION**

The relationship between man and the environment in general has never been static. But this is not the case with tribal or aboriginal communities who have remained almost undisturbed and static for ancient traditions and cultural heritage. Ethnobotany is a total natural and traditional relationship and the interrelations between man and his surrounding plants wealth<sup>1</sup>. Practical interests in ethnobotany go back to the beginning of civilization when people relied on plants for survival. Use of ethnobotanical information in medicinal plants research has gained considerable attention in segments of science community<sup>2</sup>. A large proportion of people from India and other continents are ecosystem people dependent on their healthy base of natural resources from their own surroundings for well being<sup>3</sup>. After proper scrutiny, this rich traditional knowledge in primitive societies indicates how very valuable this asset of academic as well as practical uses of the world's flora could benefit the mankind in several ways. Ethnobotanical informations represent best avenues for screening new economic plants for food, medicine etc, as well as for gene pool source for the development of agricultural and medicinal crops<sup>4</sup>. The traditional knowledge has been known to be transferred verbally from generation to generation<sup>5</sup>. Every year new species are being discovered or are being rediscovered for modern world to preserve and gather all information on the utility of these plants. So, the efficacy of such uses of plants is yet to be scientifically verified. It is still unknown to what degree the survivability of indigenous people is jeopardized by the loss of either plant species or knowledge about their services<sup>6</sup>. There are over 705 different tribal and other ethnic groups in India constituting about 8.6 percent of India's population and among them 89.97% lives in the rural areas<sup>7</sup>. Over 50% of all pharmaceutical drugs could be traced back to ethnomedicine<sup>8</sup>. Of the 252 drugs considered as basic and essential by the WHO, 11% are exclusively of plant origin and significant number are synthetic drugs obtained from natural precursors<sup>9</sup>.

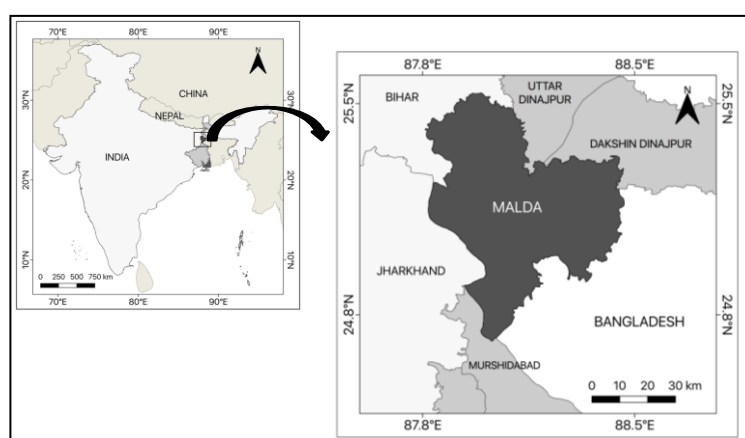
Practices of ethnobotanical knowledge are widespread in India, China, Japan, Pakistan, Sri Lanka, Thailand, and Korea<sup>10</sup>. Reports on ethnobotanical uses of plants from West Bengal region of India have been carried out by several workers<sup>11,12,13,14,15,16,17,18,19</sup>. The present study was initiated with an aim to identify ethnobotanical knowledge from the ethnic communities residing in remote villages and gram Panchayats in blocks of Malda district of West Bengal.

## **MATERIAL AND METHODS**

### ***Study Area***

The present investigation was focused on the Malda district of the state of West Bengal, India. The district lies between 24<sup>o</sup> 40' 20" N to 25<sup>o</sup>32' 08" N Latitude and 87<sup>o</sup> 45' 50" E to 88<sup>o</sup> 28'

10° E Longitude, covering an area of 3733 sq km. The area is surrounded by Bangladesh and South Dinajpur in the east, Jharkhand state in the west, Uttar Dinajpur in the north and Murshidabad in the South (Fig 1). The district can be divided into two broad zones namely 'Rarh' and 'Barind' region. 88% of tribal population concentrated in Barind area are comprised in four blocks- Gajole, Bamongola, Habibpur and Old Malda<sup>20</sup>. The district comprised mainly 38 sub-communities, of which Santala, Oraon, Mores, Mundas and Malpaharias are main tribal communities. The climate of the study area remains hot and sultry during summer with annual rainfall of about 1453.1mm. The district has floristically rich vegetation; river, ponds, marshy land etc. are good habitats for the wetland undergrowth.



**Fig 1. Map showing study area**

### ***Data collection***

For ethnobotanical data collection, several villages within the blocks namely Old Malda (25.0557° N, 88.1365° E, 288 sq km); English Bazar (25.0108° N, 88.1411° E, 251.85 sq km), Habibpur (23.1698° N, 88.5160° E, 397.10 sq km) and Bamongola (25.1656° N, 88.3367° E, 206 sq km) that are inhabited by communities like Pahari, Munda, Murmu, Hansda, Oraon and Soren were surveyed.

Ethnobotanical informations were collected from the traditional medicine practitioners during the period 2018-2019. Resource persons or traditional healers were identified to collect the ethnomedicinal information through direct interviews/oral conversations. Field datasheet was prepared to record plant details with ethnomedicinal information gathered from traditional healers. Information on local name of plant, plant part used for curing, mode of preparations, any other plants/agents used as ingredients, modes of administration etc. were recorded for each collected ethnomedicinal data. Based on this information obtained from the indigenous people in the study

area, the plants were classified into different categories- ethnomedicinal, economical, ethnoveterinary, ethnoreligious, including plants used daily for several purposes like food, fodder, etc.

### ***Quantitative Data Analysis***

#### ***Fidelity level***

The fidelity level (FL), the percentage of informants claiming the use of a certain plants species for the same major purpose, was calculated for the most frequently reported diseases or ailments<sup>21</sup>.

$$FL (\%) = (N_p / N) \times 100$$

Where,  $N_p$  is the number of informants that claim a use of a plant species to treat a particular disease,  $N$  is the number of informants that uses the plants as a medicine to treat any given disease.

#### ***Use Value***

The use value (UV), of a certain plant species was calculated<sup>22</sup>.

$$UV = \sum U / N$$

Where  $U$  is the total number of used citation by all informants for a given species and  $N$  is the total number of informants. The UV is helpful in determining the plants with highest use (most frequently indicated) in the treatment of an ailment.

#### ***Informant consensus factor (ICF)***

The informant consensus factor was used to see if there was agreement in the use of plants in the ailment categories between the plant users in study area. The ICF was calculated using the formula<sup>23</sup>.

$$ICF = (N_{ur} - N_t) / (N_{ur} - 1)$$

Where  $N_{ur}$  refers to the number of use-reports for a particular ailment category and  $N_t$  refers to the number of taxa used for particular ailment category by all the informants. The product of this factor ranges from 0 to 1.

## **RESULTS**

The present study documented 73 plant species under 61 genera and 29 families used ethnobotanically in several villages of Malda district. For each species, botanical name, family, local name, parts used, mode of use and its purpose are provided in detail (Table 1). Traditional healers and ethnomedicine practitioners have been using these plants for different purposes like for curing diseases related to fever, diabetes, cough and cold, stomach ache, wounds and injury, headache, diarrhoea and dysentery, small pox, snake bites including economic uses, veterinary purposes as well

as food. The informations from the traditional healers and the native people in the study area were reported and the use of plant species have been chiefly segregated into 5 categories as medicinal (66%), religious (10%), economical use (5%), veterinary (2%) and as food (17%).

The growth form of the plants used ethnobotanically includes shrubs (34%) that were found to be used mostly followed by herbs (31%), trees (25%) and climbers (10%) (Fig 2).

The major family of the taxa that were reported include Leguminosae (10 species), Euphorbiaceae and Cucurbitaceae (7 spp), Lamiaceae (5 spp), Apocynaceae, Acanthaceae, Moraceae (4 spp), Rutaceae, Malvaceae (3 spp), Combretaceae, Apiaceae, Plantaginaceae, Arecaceae, Solanaceae, Poaceae (2 spp) and the remaining 14 family with single species each (Fig 3).

The plant parts that were used in traditional medicine include mostly leaves (34%) followed by fruit (23%), root and rhizome (15%), whole plants (9%), stem (7%), bark and latex (6%), flower and inflorescence (2%) and stem (1%) (Fig 4). The native people employed various approaches for mode of preparation of traditional formulations as medicine for different diseases and ailments. The principal mode of remedy preparation documented mostly showed the use of raw plants (33%), paste form (26%), decoction (21%), cooked (11%) and as dried parts (9%) (Fig 5). Different routes of administration were applied for medicinal plants that include orally, external applications as paste, herbal drinks etc. The dosage use by the local people include units of measurement such as pinch, finger length, numbers and spoon to quantify the amount of dose. As per the respondents, the prescription for the dose was different for different age group and gender. Decrease in the signs and symptoms of ailments, fading out of disease were some observations for determining the amount of dose with response to disease recovery. It was also observed that due to traditional herbal medicine preparation, there was no any adverse effect from the remedy adopted.

The percentage of plant species that were used ethno-medicinally against different ailments has been documented and it was observed that 22% were used against relieving pain, 18% against diarrhea and dysentery, stomach problems (15%), cough and asthma (13%), diabetes (11%), for wounds and injury (9%), for treating fever (7%) and skin related problems (5%). Besides these common ailments, the practice of ethnomedicine was also carried out against other health issues like jaundice, kala azar, dental issues, conjunctivitis and female related problems.

Table 1. Plants and their uses as recorded from the study area

Plant Name	Family	Local Name	Parts Used	Mode of Use	Purpose
<i>Abrus precatorius</i> L.	Leguminosae	Karneck	Leaf	Applied on pain along with warm kerosene	Reduce and cures pain
<i>Acacia catechu</i> (L.f.) Willd.	Leguminosae	Khayer	Bark	Bark paste to be consumed	Effective in menstrual complaints, dysentery and diarrhea
<i>Aegle marmelos</i> (L.) Correa	Rutaceae	Bael	Fruit	Consumed	Food; against constipation, diabetes, urinary diseases
<i>Andrographis paniculata</i> (Burm.f.)Nees	Acanthaceae	Kalmegh	Leaf and Root	Extract is consumed, Paste to be applied	Cures cough and cold; Reduce the pain
<i>Annona squamosa</i> L.	Annonaceae	Ata, Madargom	Fruit	Consumed	As food
<i>Argemone mexicana</i> L.	Papaveraceae	Sialkata	Root	Paste of root is applied on affected area	Used to treat inflammation
<i>Artocarpus lacucha</i> Buch.-Ham.	Moraceae	Dahu (Bonkathal)	Fruit	Consumed	As food; effective against ameobic dysentery
<i>Azadirachta indica</i> A. Juss.	Meliaceae	Neem	Stem, Leaf	Outer layer of stem is removed and consumed raw; Leaves are fried and consumed	As toothpaste; food and antiseptic
<i>Bacopa monnieri</i> (L.)Wettst.	Plantaginaceae	Brahmi	Leaf with young shoot	Decoction is consumed	Used as brain tonic; effective against asthma
<i>Benincasa hispida</i> (Thunb.) Cogn.	Cucurbitaceae	Kumdo	Fruit	Consumed	As food
<i>Caesalpinia bonduc</i> (L.) Roxb.	Leguminosae	Gabhin	Fruit, Leaf, Seed	A small part inside the fruit is grounded and consumed, leaf paste is consumed too	Reduces and cure pain in stomach; Effective in case of dysentery among calf
<i>Cajanus cajan</i> (L.) Mill.	Leguminosae	Arhar	Leaf	Make a paste and consumed	Effective in case of jaundice

<i>Calotropis procera</i> (Aiton) Dryand.	Apocynaceae	Akauna	The exudates from stem	Gum is applied on the painful areas	It reduces pain
<i>Cardiospermum halicacabum</i> L.	Sapindaceae	Fokafuio	Leaf, Roots	Fried with oil and applied on pox's rashes & Tied around the neck and waist; Grounded roots applied on pain	Rashes heals rapidly, reduce gout's pain
<i>Carica papaya</i> L.	Caricaceae	Popita, Pepe	Fruit, Latex	Consumed raw and sometimes after cooking, Fruit and latex are used as raw	Food; Latex is effective in eczema
<i>Cassia</i> sp.	Leguminosae	Chakauda	Leaf	Fried and consumed	As vegetable
<i>Cassia fistula</i> L.	Leguminosae	Nurui	Fruit	To be consumed	To reduce fever in Pig
<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Nayantara	Leaf	Extract of leaves along with the leaves of <i>Andrographis paniculata</i> is taken in empty stomach	Used to cure diabetes
<i>Centella asiatica</i> (L.) Urb.	Apiaceae	Thankuni	Leaf	Decoction	Used to cure amoebic dysentery and reduce pain during stomachache
<i>Citrus maxima</i> (Burm.) Merr.	Rutaceae	Dabha	Dried exocarp, Fruit	Grounded and paste with dried faecal remnant of Tortoise and mole rat's faecal remnants applied on cracked scalp of infants; The exocarp is to be used for making paste and applied	Effective and cure cracked scalp ; in case of injury
<i>Clerodendrum infortunatum</i> L.	Lamiaceae	Titbhat	Whole plant, stem	Dried stems are used	Worshipped as Lord Shiva; Used as toothbrush and as a fuel

					for cooking
<i>Clerodendrum L.</i>	Lamiaceae	Dhela	Fruit	Consumed	As food
<i>Coccinia sp.</i>	Cucurbitaceae	Kundri	Fruit, Leaf	Whole fruit is to be consumed; Leaf grounded and paste and applied on infant scalp	As food, reduces fever, soft premature scalp of infant gets hardened
<i>Coccinia grandis L.</i>	Cucurbitaceae	Telkuch	Root	Root decoction is pasted with fruit pills and consumed	Used to treat rheumatism
<i>Cocos nucifera L.</i>	Arecaceae	Narkel	Fruit	Tender fruit water is to be consumed and applied over spot	Effective in kidney stone dissolver and to remove the skin's spot
<i>Colocasia esculenta (L.) Schott</i>	Araceae	Man-kachu	Leaf	Decoction or sometimes cooked and consumed	Effective in cough and cold
<i>Combretum indicum (L.) DeFilipps</i>	Combretaceae	Myerju baha	Bark	Made paste and to be consumed	Reduces fever
<i>Coriandrum sativum L.</i>	Apiaceae	Dhone pata	Whole plant	Whole plant and Zinger to be pasted and mixed and then to be consumed	Used to stop vomiting
<i>Croton bonplandianus Baill.</i>	Euphorbiaceae	Bontulsi	Leaf	The extract of the leaf is to be applied	In case of small cut
<i>Cucurbita maxima Duchesne</i>	Cucurbitaceae	Alagnori	Root	Make a paste of roots	To reduce stomachache
<i>Curcuma longa L.</i>	Zingiberaceae	Jangli hardi	Rhizome	Consumed as raw or sometimes after cooking; the paste form is to be applied	Effective in blood diseases, appetizer, Antiseptic & carminative
<i>Cuscuta reflexa Roxb.</i>	Convolvulaceae	Swarnalata	Roots	2-3 Cuscuta roots and <i>Madhuca longifolia</i> roots to be tied on the knee	Reduces pain during Arthritis
<i>Cynodon dactylon (L.) Pers.</i>	Poaceae	Dubba	Leafy shoot, Whole plant	Paste sometimes consumed and sometimes applied as raw, Leaf paste applied on cut or injury	Effective in vomiting, dysentery, liver cirrhosis and to stop nose bleeding and any small cut bleeding



<i>Datura stramonium</i> L.	Solanaceae	Dhutra	Root, Leaf	Paste mixed with pepper and consumed; Grounded paste applied too	In case of stomachache, in order to reduce pain in the ear
<i>Euphorbia hirta</i> L.	Euphorbiaceae	Pusidudh	Root	Decoction to be consumed	Effective in case of dysentery, colic pain
<i>Euphorbia nivulia</i> Buch.-Ham.	Euphorbiaceae	Atkal	Whole plant, Leaf	Worshipped; Juice obtained after extraction of leaf is to be applied	Mansha puja, reduce pain in case of fracture in Cow's leg
<i>Euphorbia</i> sp.	Euphorbiaceae	Monosa	Whole plant, Latex, Leaf	Applied as raw on the affected area; Make a paste and applied over the area	Worshipped; Effective in case of eczema, used as primary aid against snake bite
<i>Euphorbia nerifolia</i> L.	Euphorbiaceae	Lonkoshir	Stem	The extracted stem juice is to be applied	Reduce the pain of gout and increase the breast milk production
<i>Ficus benghalensis</i> L.	Moraceae	Baridari	Whole tree	Whole tree	Worshipped as lord
<i>Ficus racemosa</i> L.	Moraceae	Dumur	Fruit	Decoction is taken	Useful for treatment of asthma
<i>Ficus sycomorus</i> L.	Moraceae	Dumur	Fruit	Consumed	As Food
<i>Glycosmis pentaphylla</i> (Retz.) DC.	Rutaceae	Projo, Ateshwar	Leaf, Stem	Paste made and applied; Dried stem is to be used	Cures old injury, Used as a toothbrush and also as fuel
<i>Heliotropium indicum</i> L.	Boraginaceae	Haatishur	Leaf, Whole plant	Sterilized leaf is to squeezed and drop is to be applied, extract applied too	Effective against conjunctivitis; to prevent ear blocking
<i>Hibiscus rosa-sinensis</i> L.	Malvaceae	Atal joba	Flower	Flower	Used during Worship
<i>Hygrophila auriculata</i> (Schumach.)Heine	Acanthaceae	Kulekhara	Leaf along with young shoot	Decoction or sometimes extract is consumed	Effective against anemia, diarrhoea and diabetes
<i>Ichnocarpus</i> <i>frutescens</i> (L.)W.T. Aiton	Apocynaceae	Goth	Leaf and roots	Grounded and paste with sugar is consumed	Effective during stomachache

<i>Jatropha pelargoniifolia</i> Courbai	Euphorbiaceae	Varenda	Stem	Dried stem is used	Cures bleeding gums
<i>Justicia adhatoda</i> L.	Acanthaceae	Basak, Harbakos	Leaf	Decoction	Prevent from constipation; treating stomachache, cough and cold
<i>Justicia gendarussa</i> Burm. f.	Acanthaceae	Bridhhadhar ak	Leaf	Decoction	Gives relief against dysentery
<i>Luffa acutangula</i> (L.)Roxb.	Cucurbitaceae	Duriojhing	Fruit	Consumed	As food
<i>Mangifera indica</i> L.	Anacardiaceae	Aam	Inflorescence	Make a paste	Astringent
<i>Mimosa pudica</i> L.	Leguminosae	Lajjyabati	Root	Root decoction is used	Used to treat leucorrhoea and dysentery
<i>Momordica dioica</i> Roxb. ex Willd.	Cucurbitaceae	Birkarla	Fruit	Cooked	As food
<i>Moringa oleifera</i> Lam.	Moringaceae	Munge, Sojne	Bark, Leaf, Fruit, Roots	Dried bark kept in the room; fried and consumed; Paste prepared mixing neem leaf, Decoction is to be consumed	Snake repellent; Reduces pain in legs and arms; as vegetables; Effective against headache, Reduce the pressure, effective against Kala azar
<i>Musa paradisiaca</i> L.	Musaceae	Kola	Stem	3-5 pieces of stem is taken and extract is to be consumed	Used to cure diabetes
<i>Ocimum gratissimum</i> L.	Lamiaceae	Ramtulsi	Leaf	Leaf extract to be consumed	Prevent from common cold, cough, fever
<i>Ocimum kilimandscharicum</i> Gurke	Lamiaceae	Dimbutulsi	Leaf	Grounded paste applied on forehead	Reduce temperature during fever
<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Laltulsi	Whole plant	Whole plant	Worshipped
<i>Oryza sativa</i> L.	Poaceae	Dhan	Inflorescence	Inflorescence	Lobal puja
<i>Pentapetes phoenicea</i> L.	Malvaceae	Baribaha	Leaf	Paste	At the time of labour, it gives comfort
<i>Phoenix dactylifera</i> L.	Arecaceae	Khejur	Leaf	Dried leaf is used	In making mattresses

<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Amla	Fruit	Consumed as raw	Reduce stomach problems, constipation and prevent from common cold
<i>Psidium guajava</i> L.	Myrtaceae	Eprizam	Fruit	Consumed	As raw fruit
<i>Ricinus communis</i> L.	Euphorbiaceae	Eradam	Leaf	Hot compression is to be applied	After child delivery it comforts
<i>Scoparia dulcis</i> L.	Plantaginaceae	Ban dhane	Leaf	Extraction	Antidiabetic
<i>Senna sophera</i> L.	Leguminosae	Jhunjunia	Leaf, Root	Fried leaf is to be consumed; grounded roots consumed too	As food, to reduce pain
<i>Sida rhombifolia</i> L.	Malvaceae	Chipchirip	Leaf	Paste prepared and applied on affected area	Effective against Leucoderma
<i>Solanum surattense</i> Burm. f.	Solanaceae	Katabegun	Root, Leaf, Fruit	Decoction	Used to treat Syphilis male and female, cough and dental caries
<i>Tabernaemontana divaricata</i> (L.) R.Br. ex Roem & Schult.	Apocynaceae	Tuabaha	Flower	Flower	Used during Worship
<i>Tamarindus indica</i> L.	Leguminosae	Tentul	Fruit	Consumed by mixing with water	To maintain homeostasis and control diabetes
<i>Terminalia arjuna</i> (Roxb. ex DC.) Wight & Arn.	Combretaceae	Arjun	Bark	Make a paste of the bark and consume	Stops bleeding during labour
<i>Trichosanthes cucumerina</i> L.	Cucurbitaceae	Jhinge	Fruit	Cooked & consumed	As food
<i>Vigna unguiculata</i> (L.) Walp.	Leguminosae	Ghangra	Fruit	Cooked & consumed	As food

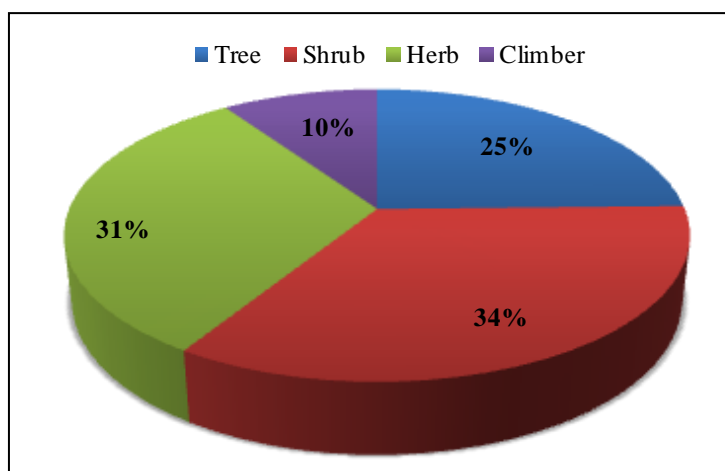


Fig 2. Growth form distribution of ethnomedicinal plants

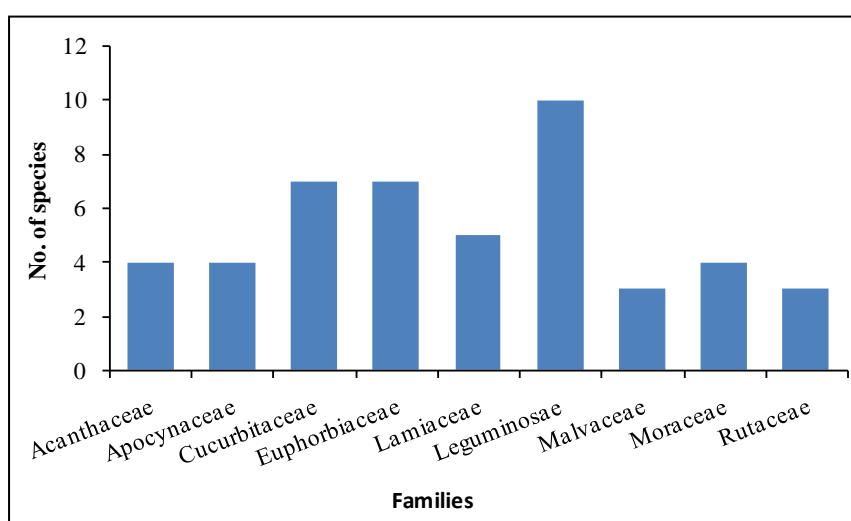


Fig 3. Representation of dominant families

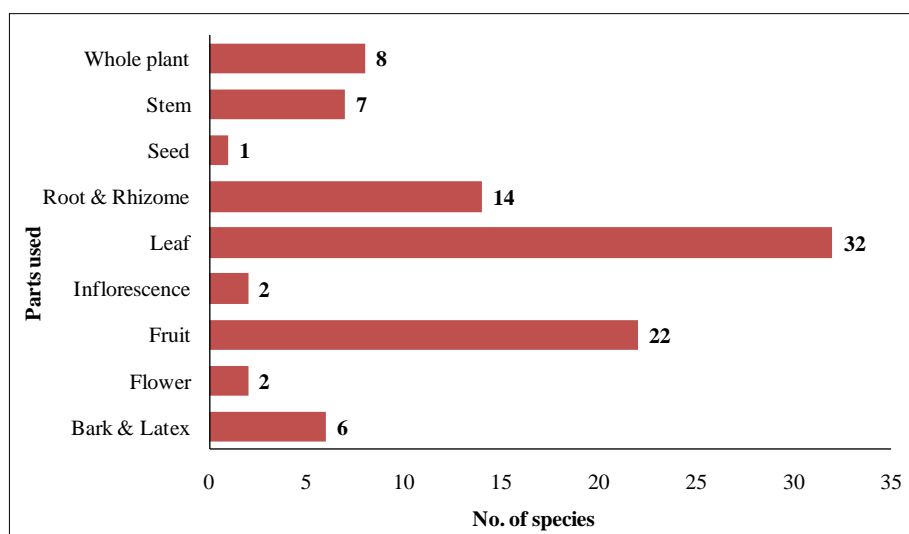


Fig 4. Plant parts used in ethnomedicine

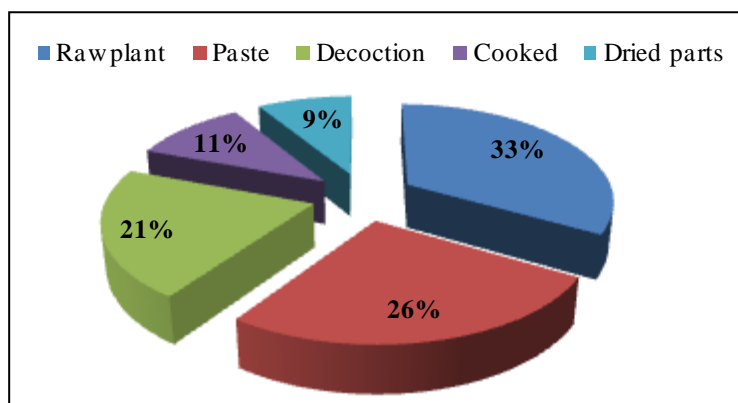


Fig 5. Mode of preparation of ethnomedicine

### Quantitative Ethnobotany

The Fidelity level (FL) and Use value (UV) has been applied for some medicinal plant species Table 2. In the present investigation, the fidelity level of the reported medicinal plant varied from 22.43 to 83.33 and the UV also varied from 1.16 to 4. The highest FL value was calculated for *Hydrophila auriculata* (83.33) against anemia and the lowest value was quantitatively estimated for *Coccinia grandis* (22.43) against rheumatism.

Similarly, the highest UV score was calculated for *Cajanus cajan* (4.0) against jaundice and the lowest UV value was calculated for *Ficus racemosa* (1.16) against asthma. Base on the used value, the dominant taxa were *Cajanus cajan* (4.0), *Centella asiatica* (3.86), *Catharanthus roseus* (3.2), *Aegle marmelos* (3.16), and *Caesalpinia bonduc* (3.0) while the species that were least used were *Ficus racemosa* (1.16), *Justicia gendarussa* (1.2), *Euphorbia* sp. (1.41), *Moringa oleifera* (1.5), *Bacopa monieri* (1.65). The various purpose species were used include jaundice, amoebic dysentery, stomachache and diabetes while the species with the least use value was reported to be used against asthma.

The informant consensus factors have been calculated for each category (Table 3). The highest ICF (1.0) value was obtained for rheumatism followed by kidney related disease (0.91) and the least ICF of 0.16 and 0.79 was associated with antiseptic and stomach problems respectively.

Table 2. Fidelity level and Use value of different species

Plant species	Diseases	FL	UV
<i>Cardiospermum halicacabum</i>	Rashes	47.0	2.0
<i>Jatropha pelargonifolia</i>	Gout	62.5	1.83
<i>Acacia catechu</i>	Dysentery and diarrhoea	70.88	1.91
<i>Artocarpus lacucha</i>	Amoebic dysentery	50.0	1.8
<i>Bacopa monieri</i>	Asthma	53.33	1.65
<i>Caesalpinia bonduc</i>	Stomachache	40.0	2.4
<i>Centella asiatica</i>	Amoebic dysentery	42.85	3.86
<i>Curcuma longa</i>	Antiseptic and carminative	36.33	2.6
<i>Cajanus cajan</i>	Jaundice	72.86	4.0
<i>Catharanthus roseus</i>	Diabetes	51.65	3.2
<i>Aegle marmelos</i>	Diabetes	62.46	3.16
<i>Azadirachta indica</i>	Antiseptic	37.56	1.83
<i>Coccinia grandis</i>	Rheumatism	22.43	1.66
<i>Cocos nucifera</i>	Kidney stone	33.33	2.1
<i>Cuscuta reflexa</i>	Arthritis	64.23	1.5
<i>Euphorbia</i> sp.	Snake bite	66.67	1.41
<i>Ficus racemosa</i>	Asthma	42.83	1.16
<i>Hygrophila auriculata</i>	Anemia	83.33	1.8
<i>Justicia gendarussa</i>	Dysentery	24.65	1.2
<i>Moringa oleifera</i>	Kala azar	43.32	1.5

Table 3. Informant consensus factor by diseases category in the study area

Disease category	No. of species	Used citation	ICF
Pain (gout, arthritis)	7	36	0.82
Female disease (menstrual complaints, labour pain)	4	20	0.84
Stomachache (indigestion, belly pain)	6	25	0.79
Kidney disease (kidney stone, urine disease)	2	13	0.91
Skin disease (eczema, rashes, scalp lesions)	2	8	0.85
Fever, cough & cold	4	27	0.88
Dysentery (amoebic dysentery, diarrhea)	7	42	0.85
Diabetes	5	23	0.81
Asthma	3	15	0.85
Rheumatism	1	7	1.0
Antiseptic and carminative	2	30	0.16

## DISCUSSION

More than 30 different types of diseases and ailments were reported to be cured by ethno-medicinal plants in the study area. The most common diseases were fever, pain, diabetes, cough and cold, stomach problems, asthma including skin diseases. The study revealed that a single species like *Glycosmis pentaphylla*, *Cardiospermum halicacabum*, *Acacia catechu*, *Aegle marmelos*, *Artocarpus lacucha*, *Bacopa monnieri*, *Caesalpinia bonduc*, *Centella asiatica*, *Curcuma longa*, *Cynodon dactylon*, *Heliotropium indicum*, *Hygrophila auriculata*, *Justicia adhatoda* have been utilized for more than one occasion to treat several ailment and disorder. *Caesalpinia bonduc* was utilized to reduce and cure stomach pain and was also found to be effective in case of dysentery among calf. However, Dey & De <sup>24</sup> and Chakraborty & Bhattacharjee <sup>25</sup> reported a few plants (*Ampelocissus tomentosa*, *Glossogyne bidens* and *Ichnocarpus frutescens*) that were used against bone fracture in Purulia district, India whereas in the present study four plants including *Scoparia dulcis* (leaf), *Datura metel* (root), *Cardiospermum halicacabum* (leaf), *Combretum indicum* (bark) were used to prepare traditional remedies and applied on similar ailments. Application of 3 species namely *Alstonia scholaris*, *Holarrhena antidysenterica* and *Centella asiatica* were found to be effective on dysentery in Narsinghdi District of Bangladesh <sup>26</sup>, while the authors ascertained new treatment procedures in the studied area by local tribal people for the same purposes using the species, *Mimosa pudica*, *Justicia gendarussa*, *Cynodon dactylon*, *Centella asiatica*, *Caesalpinia bonduc*, *Artocarpus lacucha* and *Acacia catechu*. Chakraborty & Bhattacharjee <sup>25</sup>, reported the use of *Curculigo orchioides* for treating leucorrhoea and nasal bleeding problem in Purulia district of West Bengal. However, our findings suggested enhancement of sperm production on consumption of its roots. Five plant species namely, *Musa paradisiaca*, *Aegle marmelos*, *Tamarindus indica*, *Catharanthus roseus*, *Hygrophila auriculata* were found to be effective to treat diabetes in the study area while Biswas et al. <sup>27</sup>, reported the use of some of these species as antidiabetic in Bangladesh. Oyedemi et al. <sup>28</sup>, accounted 15 plant species employed for the management of diabetes at entire Eastern Cape Province of South Africa while the present study highlighted the use of around 7 percent taxa against diabetes. The study accounted that species like *Sida rhombifolia*, *Cardiospermum halicacabum*, *Carica papaya*, *Cocos nucifera* were used for the treatment of skin disorders whereas fruits of *Ficus racemosa* and leaf of *Bacopa monnieri* were utilized to expel asthma. There are many more diseases they suffer and treat including common fever, cough and cold, high temperature and use of species like *Andrographis paniculata*, *Colocassia esculenta*, *Justicia adhatoda*, *Ocimum gratissimum*. Paduranga et al. <sup>29</sup>, reported *Abutilon indicum*, *Achyranthes aspera* used against menstrual disorders, *Anamirta cocculus* used for contraction of uterus by Konda Reddis of Andhra Pradesh. *Acacia*

*catechu*, *Terminalia arjuna* were found to be effective in female diseases in the studied area. Muthu et al.<sup>30</sup>, reported the use of *Ricinus communis*, *Coleus aromaticus* to treat stomachache and *Citrus aurantifolia* against fever and headache in Kancheepuram district of Tamil Nadu. The species that are reported in the present study such as *Cucurbita maxima*, *Caesalpinia bonduc*, *Centella asiatica*, *Datura stramonium*, *Justicia adhatoda* have been known to be used against stomachache and *Moringa oleifera* against headache. The survey also revealed the uses of plants like *Euphorbia neriifolia*, *Caesalpinia bonduc*, *Cassia fistula* for veterinary purposes.

The present study exhibited a high degree of ethnobotanical novelty and the use of plant resources for medicine by the aboriginal communities. Recently, the knowledge of medicinal plants or ethnobotany has gained worldwide attention due to its effectiveness, therapeutic purposes. However, the traditional knowledge is confined only to the elderly and relative members of community and it becomes difficult to translate it to the younger generations as it is affected by the modernization and less interest shown by the youngsters<sup>31</sup>. Therefore, sincere action on documentation, conservation and creating public awareness is utmost necessary for the sustainable use of medicinal plants.

## CONCLUSION

In the present communication, it was observed that the study area has plenty of medicinal plants to treat a wide spectrum of human ailments, economically significant plants and plants which are important as food. Much ethnobotanical knowledge in different blocks of Malda has not been meticulously documented and transmitted from generation to generation. The knowledge has been restricted to a few elderly people of the rural and tribal areas due to rapid modernization and urbanizations. Therefore, in order to bridge this lacuna, systematic documentation and investigation on the ethnobotanical practices by the rural and tribal people living in the remote and far flung areas is utmost necessary. Nowadays due to lack of interest among the younger generation as well as their tendency to migrate to cities for lucrative jobs, there is a possibility of losing this wealth of knowledge in the near future. It thus becomes very crucial to preserve the traditional knowledge.

## Conflicts of Interest

The authors declare that they have no any conflicts of interest.

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