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ETHNOBOTANICAL STUDY OF MEDICINAL PLANTS USED BY THE ETHNIC COMMUNITIES OF ALIPURDUAR DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT

Scientific documentation of traditional knowledge on ethnobotanical plants used by the ethnic people of Alipurduar district of West Bengal, India has been done by conducting field surveys during July 2018 to January 2020. With the help of pretested semi-structured questionnaires, knowledgeable ethnic people of the studied areas were interviewed to record their traditional knowledge on plants and their utilization for daily livelihood. The questionnaires covers various aspects (vernacular name(s), parts use, ethno medicinal uses, disease treated, mode of preparation, other uses, among others) of each and every plant species having ethnobotanical values. Standard methods for plant collection and herbarium techniques were followed and identification was done with the help of relevant sources. In the present survey, 84 plant species of 44 families have been documented. Asteraceae dominates (8 species) among the plant families. Based on growth habit, herb (35.71 %) dominates among plant types and were mostly collected from their natural habitat (58.33 %). A total of 143 ethnobotanical uses were recorded under 5 numbers of used categories, viz. ethnomedicine (EM), edible plant (EP), magico-religious (MR), ethno-veterinary (EV) and narcotic (N), of which all the plants (100.0 %) were used under ethno medicinal category. Altogether 77 types of common physical problems, grouped into 22 major problems were found to be treated by the herbal medicine. Leaves were found to be the dominant (40.91 %) plant part among others used for the preparation of medicine. In most of the cases medicines were prepared following extraction methodology (41.11 %) and were taken orally (62.64 %) or topically (36.36 %). Collected information clearly suggests that the ethnic people are largely dependent on plant species for their daily needs, especially for primary healthcare. Future research on these medicinal plants can lead to the discovery of unique phytochemical and newer drugs for the treatment of diverse diseases.

Keywords: Ethnobotany, Ethnomedicine, Ethnic People, Traditional Knowledge, Alipurduar, West Bengal

INTRODUCTION

The scientific study of the relationship between plants and the people is termed as ethnobotany. Human beings have been using plant resources since time immemorial for daily livelihood, as source for food, fodder, fuel, among others (Pei, 1995), magico-religious belief (Ratna and Pirta, 2007; Sharma and Joshi, 2010; Sharma and Pegu, 2011; Rana *et al.*, 2016; Pangging *et al.*, 2019; Sutrisno *et al.*, 2020) and especially for ethnomedicine (Uniyal *et al.*, 2006; Datta *et al.*, 2014; Dey *et al.*, 2015; Chaudhury *et al.*, 2018; Raj *et al.*, 2018; Mandal *et al.*, 2020a; 2020b). More than 80% population living in developing countries is still directly dependent on traditional medicine for daily healthcare (Farnsworth *et al.*, 1985; WHO, 2003; Ngbolua *et al.*, 2016) and even today all the countries across the world rely on medicinal plants (Bekalo *et al.*, 2009) for primary healthcare. India, a mega biodiversity country, has the world's largest number of indigenous people (Faizi and Nair, 2016) who mostly reside on rural areas depend on herbal medicine due to low cost, lack of primary healthcare system, among others (Tiwari, 1999). The ethnic people are very rich in ethnobotanical knowledge and such knowledge is very rarely documented as most of the knowledge passed down from one generation to another by verbal communications. Now-a-days they are showing less interest in carrying traditional knowledge due to adoption of Western lifestyle (Khatun and Rahman, 2019). Several reports (Saynez-Vaquest *et al.*, 2016; Navia *et al.*, 2020) have also reflected the inability of the older people to pass the knowledge to the younger ones which is also creating less interest on the usefulness of medicinal plants in their area. So, it is utmost necessary to document traditional knowledge which can play an important role in the conservation of plants as well as such scientific documentation may lead to discovery of newer and effective products for betterment of our future life.

The district Alipurduar, situated at the foothills of Eastern Himalayas, is known for its rich floristic composition. Unfortunately, Alipurduar, is still in the under developing status (Mandal *et al.*, 2020b) and here most of the rural people depend on forest products for their daily livelihood. Although the district is very rich in floristic composition, literature survey reveals that a few numbers of works (Shukla and Chakravarty, 2012; Dey *et al.*, 2015; Chaudhury *et al.*, 2018; Raj *et al.*, 2018; Mandal *et al.*, 2020b) have been done

previously to document the traditional knowledge of ethnic people. With a view to it, the present field survey has been undertaken to document the ethnobotanical knowledge of ethnic people living in different villages of Alipurduar district of West Bengal, India.

MATERIALS AND METHODS

Study Area: The field survey was carried out in different tribal inhabited villages of Alipurduar district (26.489°N 89.527°E), West Bengal, India (Fig. 1). The villages namely, Dakshin Mendabari (26°36'15.6"N 89°25'08.1"E), Uttar Mendabari (26°37'36.1"N 89°24'37.0"E), Nimti Domohani (26°36'58.0"N 89°25'52.8"E), Dakshin Latabari (26°38'38.4"N 89°25'34.8"E) and Hamiltonganj (26°40'53.2"N 89°25'04.8"E) - situated between east side of Chilapata Forest and West side of Buxa Tiger Reserve; and adjoining tribal villages (Mejbil - 26°30'37.9"N 89°17'06.0"E, Mathurabagan - 26°31'06.0"N 89°16'32.5"E, Sirubari - 26°31'39.2"N 89°19'10.7"E, Jogendranagar - 26°32'20.2"N 89°16'53.6"E, Kalabaria - 26°33'01.7"N 89°17'15.8"E) in between Palash Bari (26°32'38.2"N 89°16'51.2"E) and Torsa Forest (26°33'08.4"N 89°16'18.9"E). The areas were mainly inhabited by Rajbanshi, Nepali, Bodo, Garo and Oraon communities.

Data Collection: For data collection, two teams consisting of five people each were selected to survey the study areas. One team surveyed the areas adjoining to Palashbari and Torsa Forest while another team covered the areas situated between east side of Chilapata Forest and West side of Buxa Tiger Reserve. Altogether four field trips were carried out across different seasons during July 2018 to January 2020. Data were collected through in-depth interviews with the local knowledgeable persons of the ethnic communities. Prior Informed Consent (PIC) was taken from each informant before interview. With the help of pretested semi-structured questionnaires (Sajem, 2010), the traditional knowledge of the ethnic communities were recorded with regards to plant's vernacular name, parts used, medicinal uses, mode of preparation and administration of medicine for the treatment of a particular disease, among others. Other uses of plants associated with edible purpose, ethno-veterinary and magico-religious beliefs were also recorded. Plants were collected mostly in their flowering condition as far as possible and digital photographs were also taken wherever possible. Routine methods were followed for plant collection and herbarium techniques (Jain and Rao, 1977). Identification of plant specimens were done with the help of relevant floras and standard literatures (Prain, 1963; Hooker, 1989; Anonymous, 1997) and the voucher specimens were kept at Department of Botany, A. B. N. Seal College, Cooch Behar.

RESULTS AND DISCUSSION

In all, the ethnic people in the studied areas uses a total of 84 different plant species (Table 1) belonging to 78 genera and 44 families (Fig. 2) for various ethnobotanical purposes. The recorded plants are arranged in alphabetical order according to families and then according to genus and species within - each family. The vernacular name(s) (as recorded during the field work), scientific name, family, habit, habitat, parts used, use categories, ethnomedicinal uses, mode of preparation and mode of administration for each species have also been included.

In the present survey, the highest number of species (8 species; 9.52 %) is represented by the family Asteraceae followed by Apocynaceae, Fabaceae, Lamiaceae and Poaceae (4 species each, 4.76 %), Acanthaceae, Combretaceae, Euphorbiaceae, Malvaceae, Moraceae, Piperaceae, Rutaceae and Zingiberaceae (3 species each, 3.57 %), Amaryllidaceae, Araceae, Menispermaceae, Rubiaceae and Solanaceae (2 species each, 2.38 %) and the rest families represented by single species (1.19 %). The plant family Asteraceae, one of the largest family of flowering plants, contain several active phytochemical compounds like polyphenols, flavonoids, diterpenoids, etc. (Shing *et al.*, 2002; Ertürk and Demirbağ, 2003; Koc *et al.*, 2015).

On the basis of growth habit (Table 1) of the collected plants, herb (30 species; 35.71 %) dominates among plant types followed by tree (24 species; 28.57 %), shrub (20 species; 23.81 %) and climber (10 species; 11.90 %). The plants were mostly collected from their natural habitat (49 species; 58.33 %) and rest from the home gardens (35 species; 41.67 %) of the ethnic people. Cultivation of medicinal plants in their home garden has been attributed towards their dependency of herbal medicine bypassing the synthetic one to treat common physical problems (Mandal *et al.*, 2020b).

Based on the use categories, altogether 143 ethnobotanical uses (Table 1) have been recorded of which all the species come under the category ethnomedicine (EM; 84 species; 100.0 %), followed by magico-religious belief (MR; 29 species; 20.71 %), edible plant (EP; 22 species; 15.71 %), ethno-veterinary (EV; 6 species; 4.29 %) and narcotics (N; 2 species; 1.43 %). Chaudhury *et al.*, (2018) have documented 728 ethnobotanical uses of plants belong to the 12 number of use categories used by the Lodha tribal group from different Lodha inhabited villages of Paschim Medinipur, Jhargram, Bankura, Purulia, Alipurduar and South 24 Parganas districts of West Bengal and mostly the plant species were come under ethnomedicine category.

It has been clearly noticed that the ethnic people of the studied area are mostly dependent on plants for their daily needs and among them use of

Table 1: Ethnobotanical plants used by the ethnic people in the studies area

SN	Common Name	*Scientific Name*	Family	Habit	Wild / HG	Use Category	Parts Used	Ethno Medicinal Use	Mode of Preparation	Mode of Administration
1.	Kalomegh, Chirata	*Andrographis paniculata (*Burm. f.*) Nees*	Acanthaceae	Herb	HG	EM	Leaf	Constipation	Extract	Oral
2.	Kulekhara	*Hygrophila auriculata (*Schumach.*) Heine*	Acanthaceae	Herb	HG	EM	Leaf	Anemia	Extract	Oral
3.	Asuro, Basak	*Justicia adhatoda L.*	Acanthaceae	Shrub	Wild	EM	Leaf	Cough and cold	Extract	Oral
4.	Lalpata, Bisalyakarani	*Aerva sanguinolenta (*L.*) Blume*	Amaranthaceae	Herb	HG	EM	Leaf	Wound	Paste	Topical
5.	Rasun, Sambramgupur	*Allium sativum* L.	Amaryllidaceae	Herb	HG	EM, EP, MR	Bulb	Body pains	Raw or as vegetable	Oral
6.	Dab-dub (Bo)	*Crinum amoenum Ker Gawl. ex Roxb.*	Amaryllidaceae	Herb	HG	EM	Leaf	Sprained ankle	Heated leaf	Topical
7.	Mani-muni, Dholamanamuni, Khudimanamuni	*Centella asiatica (*L.*) Urb.*	Apiaceae	Herb	Wild	EM, EP	Whole Plant	Gastric and eyesight problems	Raw	Oral
8.	Chhaiton, Chhaitonia	*Alstonia scholaris* L. R.Br.	Apocynaceae	Tree	Wild	EM, MR	Bark	Intestinal worm	Extract	Oral
9.	Swarpagandha	*Rauvolfia serpentina (*L.*) Benth. ex Kurz*	Apocynaceae	Shrub	Wild	EM, MR	Leaf, root	Hypertension, dengue, asthma	Extract	Oral
10.	Phul-daudai	*Tabernaemontana divaricata R.Br. ex Roem. & Schult.*	Apocynaceae	Shrub	Wild	EM, MR	Flower	Conjunctivitis	Extract	Topical
11.	Parvatiphul	*Catharanthus roseus (*L.*) G.Don*	Apocynaceae	Shrub	HG	EM, MR	Root	Wasp sting, stomachache, muscle pain	Extract or decoction	Oral
12.	Mani	*Alocasia macrorrhizos (*L*) G.Don*	Araceae	Shrub	Wild	EM, EP	Stem	Diarrhea, gastric problems	Extract	Oral
13.	Kala kochu	*Xanthosoma sagittifolium* (L.*) Schott*	Araceae	Herb	Wild	EM, MR	Stem	Bleeding wounds	Extract	Topical
14.	Guya	*Areca cathechu* L.	Arecaceae	Tree	HG	EM	Root	Toothache	Decoction	Oral
15.	Ghrit-kumari	*Aloe vera (*L.*) Burn. f.*	Asphodelaceae	Herb	HG	EM, MR	Stem	Burn wounds	Gel	Topical
16.	Hemcha	*Enydra fluctuans Lour.*	Asteraceae	Herb	HG	EM, EP	Whole plant	Diarrhea, dysentery, gastric problems	Extract	Oral
17.	German gachh, Banmara, Asamiapatta	*Ageratina adenophora (*Spreng.*) R.M. King & H. Rob.*	Asteraceae	Shrub	Wild	EM	Bark	Wounds	Paste	Topical
18.	Elome	*Ageratum conyzoides* L.	Asteraceae	Herb	Wild	EM	Whole plant	Blood coagulant/ bleeding wounds	Juice	Topical

SN	Common Name	*Scientific Name*	Family	Habit	Wild / HG	Use Category	Parts Used	Ethno Medicinal Use	Mode of Preparation	Mode of Administration
19.	Titepati	*Artemisia vulgaris* L.	Asteraceae	Herb	Wild	EM, MR	Leaf	Nose bleeding/ blood coagulant Blood coagulant	Extract	Topical
20.	Bhringraj	*Eclipta alba* (L.) *Hassk*	Asteraceae	Herb	Wild	EM	Roots	Skin problems	Dried root powder	Topical
21.	Rakkhasi bijou	*Mikania micrantha Kunth*	Asteraceae	Climber	Wild	EM	Leaf	Bleeding Wounds	Paste	Topical
22.	Chhoypotri, Gada	*Tagetes erecta* L.	Asteraceae	Shrub	HG	EM	Leaf	Pneumonia	Extract	Oral
23.	Bisalyakarani	*Tridax procumbens* L.	Asteraceae	Herb	Wild	EM	Leaf	Wound	Juice	Topical
24.	Puisak	*Basella alba* L.	Basellaceae	Climber	HG	EM, EP	Whole plant	Constipation	Cooked	Oral
25.	Surimara, Kanaidinga	*Oroxylum indicum* (L.) *Benth. ex Kurz*	Bignoniaceae	Tree	Wild	EM, EP	Flower	Laziness, menstrual cramps, pelvic pain	Decoction	Oral
26.	Hatisur	*Heliotropium indicum* L.	Boraginaceae	Herb	Wild	EM, EP	Root	Eyesight problem	Sap	Topical
27.	Beaor, Beshor, Sorisha	*Brassica campestris* L.	Brassicaceae	Shrub	HG	EM, MR, EP	Seed	Skin eruption	Seed oil	Topical
28.	Bhang	*Cannabis sativa* L.	Cannabaceae	Shrub	HG	EM, MR, EV, N	Leaf	Body inflammation, intoxication	Extract	Oral
29.	Ulatchandal	*Gloriosa superba* L.	Colchicaceae	Herb	Wild	EM	Root	Induce abortion	Paste	Oral
30.	Arjun gachh	*Terminalia arjuna* (Roxb.) *Wight & Arn.*	Combretaceae	Tree	Wild	EM	Bark	Heart disease	Extract	Oral
31.	Boyra	*T. bellirica* (Gaertn.) *Roxb.*	Combretaceae	Tree	Wild	EM	Fruit	Stomach problem, indigestion	Powder	Oral
32.	Horitoki	*T. chebula Retz.*	Combretaceae	Tree	Wild	EM, MR	Fruit	Indigestion	Powder	Oral
33.	Swarnalata	*Cuscuta reflexa Roxb.*	Convolvulaceae	Herb	Wild	EM	Whole plant	Jaundice	Decoction	Oral
34.	Patharkuchi	*Kalanchoe pinnata* (Lam.) *Pers.*	Crassulaceae	Herb	Wild	EM	Leaf	Gastric problems, kidney stone	Extract	Oral
35.	Telakucha	*Coccinia grandis* (L.) *Voigt*	Cucurbitaceae	Climber	HG	EM, EP	Leaf	Hyper tension, diabetes	Extract	Oral
36.	Gach Alu	*Dioscorea bulbifera*	Dioscoreaceae	Climber	Wild	EM	Leaf	Jaundice	Decoction	Topical
37.	Shaal	*Shorea robusta Gaertn.*	Dipterocarpaceae	Tree	Wild	EM, MR	Leaf	Dysentery	Extract	Oral

SN	Common Name	*Scientific Name*	Family	Habit	Wild / HG	Use Category	Parts Used	Ethno Medicinal Use	Mode of Preparation	Mode of Administration
38.	Rudraksha	*Elaeocarpus ganitrus Roxb. ex G. Don*	Elaeocarpaceae	Tree	HG	EM	Seed	Hypertension,		
39.	Muktojhuri	*Acalypha indica* L.	Euphorbiaceae	Herb	Wild	EM	Leaf	Cough	Extract	Oral
40.	Sijou, Sijo	*Euphorbia nerifolia* L.	Euphorbiaceae	Shrub	HG	EM, MR	Latex	Bleeding wounds	Raw	Topical
41.	Endigachh	*Ricinus communis* L.	Euphorbiaceae	Shrub	Wild	EM	Leaf , seed	Headache	Paste	Topical
42.	Lajjabati	*Mimosa pudica* L.	Fabaceae	Herb	Wild	EM	Whole plant	Indigestion	Decoction	Oral
43.	Arhar	*Cajanus cajan (*L.*) Millsp.*	Fabaceae	Shrub	HG	EM, EP	Leaf	Jaundice	Decoction	Oral
44.	Bokful, Buku	*Sesbania grandiflora (*L.*) Poiret*	Fabaceae	Tree	Wild	EM, EP	Leaf	Jaundice	Extract	Oral
45.	Tetul, Titli	*Tamarindus indica* L.	Fabaceae	Tree	Wild	EM, MR	Leaf	Heart disease, blood sugar	Extract	Oral
46.	Kanchisa	*Leucas aspera (*Willd.*) Link*	Lamiaceae	Herb	Wild	EM	Leaf	Stomach problem	Juice	Oral
47.	Tulsi	*Ocimum tenuiflorum* L.	Lamiaceae	Shrub	HG	EM, MR	Leaf	Bronchial asthma, cough and cold, stomachache	Extract	Oral
48.	Nishinda	*Vitex negundo* L.	Lamiaceae	Shrub	HG	EM	Leaf	Whitening of hair, memory loss	Extract	Topical, oral
49.	Vatigachh	*Clerodendrum infortunatum* L.	Lamiaceae	Shrub	Wild	EM, MR, EV	Leaf	Herbal bath of newborn child	Decoction	Topical
50.	Jarul	*Lagerstroemia speciosa (*L.*) Pers.*	Lythraceae	Tree	Wild	EM	Bark	Astringent	Extract	Oral
51.	Shimul	*Bombax ceiba* L.	Malvaceae	Tree	Wild	EM, MR	Root	Stomachache, mucous diarrhea	Decoction	Oral
52.	Ulotkambal	*Abroma augusta (*L.*) L.f.*	Malvaceae	Shrub	Wild	EM	Root	Leucorrhea	Extract	Oral
53.	Pat, Pata	*Corchorus olitorius* L.	Malvaceae	Shrub	HG	EM, MR	Leaf	Chronic cystitis, gonorrhea, dysuria	Extract	Oral
54.	Neemgachh	*Azadirachta indica A. Juss.*	Meliaceae	Tree	HG	EM, MR	Leaf			
55.	Gulancha	*Tinospora cordifolia (*Thunb.*) Miers*	Menispermaceae	Climber	Wild	EM	Stem	Intestinal worm	Sap	Oral
56.	Akundi	*Stephania japonica (*Thunb.*) Miers*	Menispermaceae	Climber	Wild	EM	Leaf	Diabetes	Extract	Oral
57.	Bot gachh	*Ficus benghalensis* L.	Moraceae	Tree	Wild	EM, MR	Root	Wound	Paste	Topical

SN	Common Name	*Scientific Name*	Family	Habit	Wild / HG	Use Category	Parts Used	Ethno Medicinal Use	Mode of Preparation	Mode of Administration
58.	Pakri	*F. religiosa* L.	Moraceae	Tree	Wild	EM, MR	Bark	Scabies, ulcers, skin problems	Decoction	Topical
59.	Tutegachh	*Morus alba* L.	Moraceae	Tree	Wild	EM	Root	Jaundice	Raw	Topical
60.	Taam	*Psidium guajava* L.	Myrtaceae	Tree	HG	EM, EP, EV	Young Leaf	Dysentery	Extract	Oral
61.	Parijat, Shefali	*Nyctanthes arbor-tristis* L.	Oleaceae	Tree	HG	EM	Leaf	Arthritis , malaria	Extract	Oral
62.	Amrul, Amrulshak	*Oxalis corniculata* L.	Oxalidaceae	Herb	Wild	EM, EV	Whole plant	Stomach cramps	Extract	Oral
63.	Aamlaki	*Phyllanthus emblica* L.	Phyllanthaceae	Tree	HG	EM	Fruit	Indigestion	Extract	Oral
64.	Pan	*Piper betle* L.	Piperaceae	Climber	HG	EM, EP	Leaf	Wounds, boils, bruises	Paste	Topical
65.	Pipli	*P. longum* L.	Piperaceae	Climber	Wild	EM	Fruit	Whooping cough	Dried Fruit	Oral
66.	Golmorich	*P. nigrum L.*	Piperaceae	Climber	HG	EM	Seed	Swollen necks, mumps	Decoction	Oral
67.	Brahmi	*Bacopa monnieri (*L.) *Wettst.*	Plantaginaceae	Herb	HG	EM, EP	Leaf	Improve memory	Extract	Oral
68.	Makla bash	*Bambusa vulgaris Schrad. ex J.C Wendl.*	Poaceae	Tree	Wild	EM, MR	Leaf, stem	Pharyngitis, bronchial, cerebral infection	Juice	Oral
69.	Durbaghas, Dubba	*Cynodon dactylon (*L.*) Pers.*	Poaceae	Herb	Wild	EM, MR	Whole Plant	Jaundice, blood coagulant	Extract	Oral
70.	Amondhan, Lokhi, Arwachawal	*Oryza sativa* L.	Poaceae	Shrub	HG	EM, MR, EP	Seed	Skin blemishes, sores, swellings	Boiled then pasted	Topical
71.	Kasia	*Sacccharum spontaneum* L.	Poaceae	Shrub	Wild	EM, MR	Stem	Snake bite, wounds from poison	Extract	Topical
72.	Jiyeti	*Polygonum barbatum* L.	Polygonaceae	Herb	Wild	EM	Root	Scabies	Powder	Topical
73.	Bogri, Boroi	*Ziziphus mauritiana Lam.*	Rhamnaceae	Tree	Wild	EM, MR, EP	Root	Wounds, ulcers, fever	Powder Decoction Oral	Topical
74.	Kodom, Kadam, Kadwam	*Neolamarckia cadamba (*Roxb.*) Bosser*	Rubiaceae	Tree	Wild	EM, MR, EP	Bark	Infected wound, inflammation of gum	Decoction	Topical Oral

SN	Common Name	Scientific Name	Family	Habit	Wild / HG	Use Category	Parts Used	Ethno Medicinal Use	Mode of Preparation	Mode of Administration
75.	Gondhopatali	*Paederia foetida* L.	Rubiaceae	Climber	Wild	EM, EP	Leaf	Dysentery, diarrhea	Extract	Oral
76.	Bel	*Aegle marmelos* (L.) *Correa*	Rutaceae	Tree	HG	EM, MR, EP	Fruit	Shigellosis	Powder	Oral
77.	Ashsewra	*Glycosmis pentaphylla* (Retz.) *DC.*	Rutaceae	Tree	HG	EM	Branches	Pyorrhea	Raw	Oral
78.	Norshing, Jabshree, Karipata	*Murraya koenigii* (L.) *Spreng*	Rutaceae	Tree	Wild	EM, MR	Leaf	Gastric problems	Extract	Oral
79.	Tamakur	*Nicotiana tabacum* L.	Solanaceae	Herb	HG	EM, N, EP, EV	Leaf	Skin disease	Dried Leaf	Topical
80.	Ashwagandha	*Withania somnifera* (L.) *Dunal.*	Solanaceae	Herb	HG	EM	Leaf	Improve memory, hypertension	Extract	Oral
81.	Hatuvanga, Kukurjhiwa	*Leea indica* (Burm. f.) *Merr.*	Vitaceae	Shrub	HG	EM	Roots	Bone fracture	Paste	Topical
82.	Adalu	*Curcuma amada Roxb.*	Zingiberaceae	Herb	Wild	EM	Rhizome	Stomach-ache, wound	Extract Paste	Oral Topical
83.	Haldae	*C. longa* L.	Zingiberaceae	Herb	HG	EM, EP, EV	Rhizome	Skin problems	Paste	Topical
84.	Hayjang, Ada	*Zingiber officinale Roscoe*	Zingiberaceae	Herb	HG	EM, EP	Rhizome	Dyspepsia	Raw	Oral

HG-Home garden, EM- Ethnomedicine, EP- Edible plant, MR- Magico-religious, EV- Ethno-vetenary, N- Narcotic

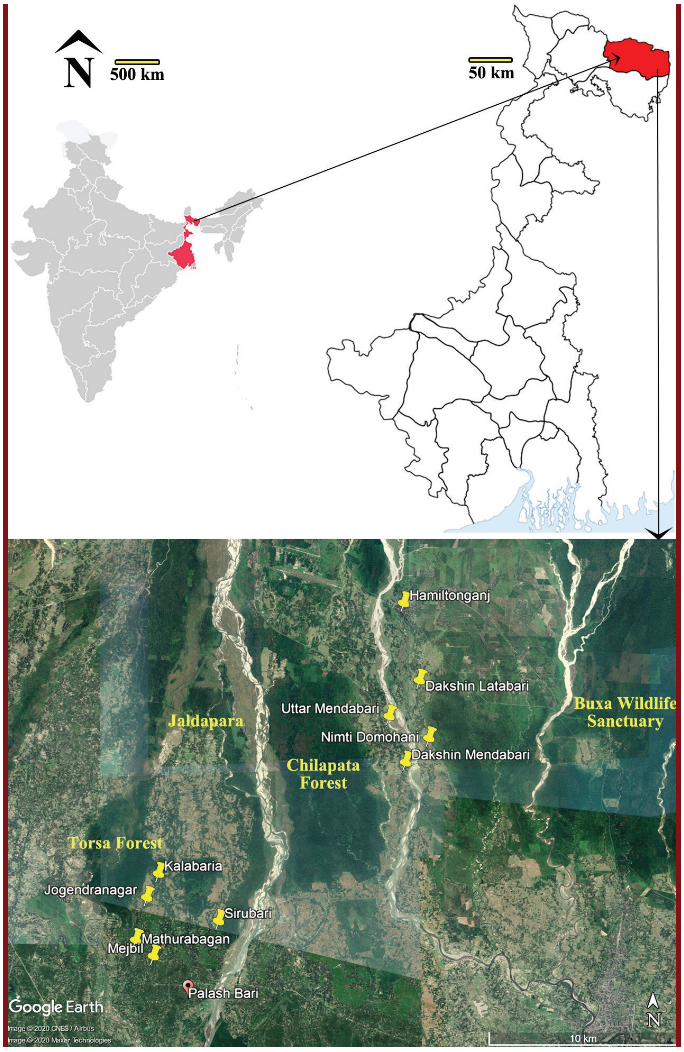

Fig. 1: Map of the study area showing localities surveyed (marked in yellow pins) (Map Courtesy: Wikipedia and Google Earth Pro).

plants in the treatment of physical illness is no doubt of prime priority. A total of 77 types of physical ailments (Table 1) which are again grouped into 22 major groups (Fig. 3) were found to be treated by the collected plants. Mostly physical problems like gastrointestinal problems (43 species; 51.19 %), cuts and wounds (14 species; 16.67 %), skin diseases (12 species; 14.29 %), respiratory problems (8 species; 9.52 %), musculoskeletal and eye related problems (6 species each; 7.14 %), nervous system problems, dental problems and female disorder (4 species each; 4.76 %), were found to be treated by the herbal medicine.

To prepare the herbal medicine, different plant parts (Table 1; Fig. 4) were found to be used by the ethnic people and among them the leaf (36 species; 40.91 %) was found as the dominant plant part used followed by root (13 species; 14.77 %), whole plant (8 species; 9.09 %), bark and stem (6 species each; 6.82 %), fruits and seeds (5 species each; 5.68 %), rhizome (3 species; 3.41 %), branch and flower (2 species each; 2.27 %), and bulb and latex (1 species each; 1.14 %). Previous ethnobotanical studies (Rajendran *et al.*,

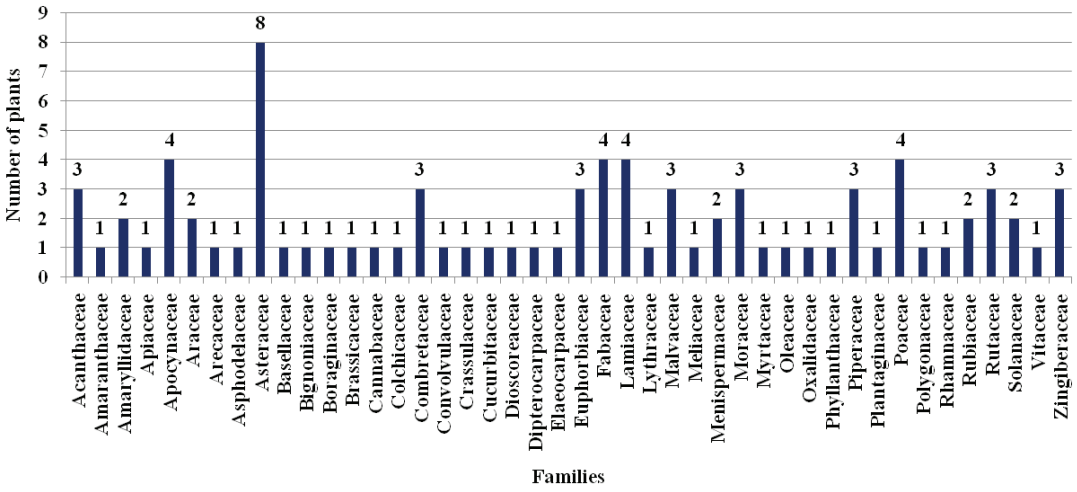

Fig. 2: Family-wise number of ethnobotanical plants.

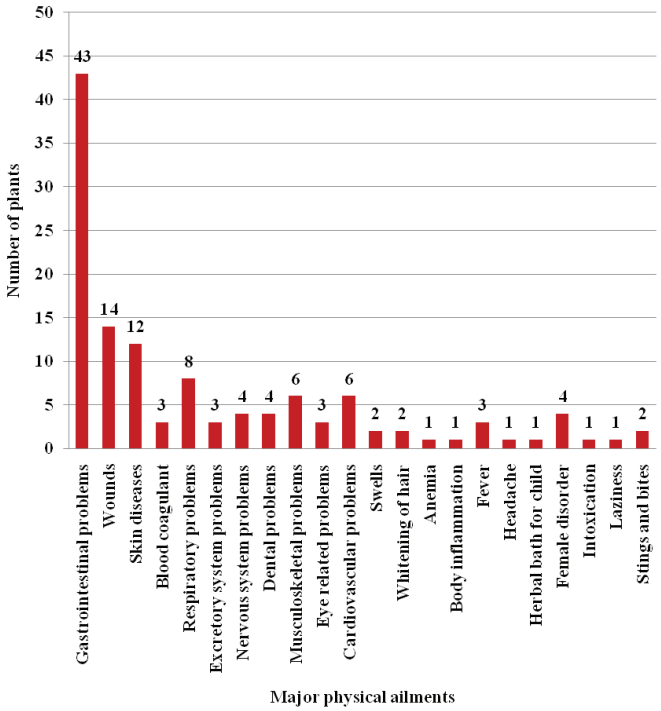

Fig. 3: Number of plants used for treating various major physical ailments

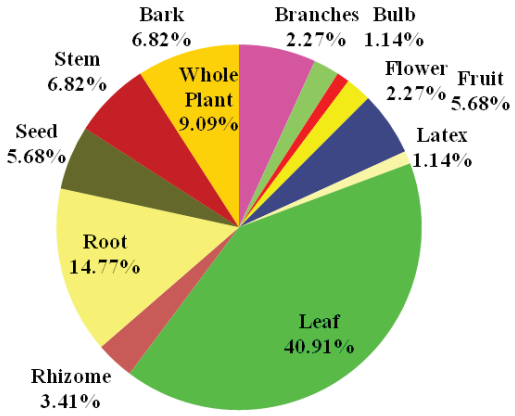

Fig. 4: Percentage of plant parts used for herbal preparation.

2002; Mahishi *et al.*, 2005; Ignacimuthu *et al.*, 2006; Jagtap *et al.*, 2006; Choudhury *et al.*, 2012; Datta *et al.*, 2014; Habibur Rahaman and Karmakar, 2015; Chaudhury *et al.*, 2018; Raj *et al.*, 2018; Mandal *et al.*, 2020a; 2020b) also revealed that leaves were the most commonly used plant part in many herbal preparations. Leaves, easily available plant part throughout the year than others, are reported to be one of the important sites for synthesis of a huge variety of bioactive compounds (Ghorbani, 2005; Tantengco *et al.*, 2018; Jain *et al.*, 2019; Larayetan *et al.*, 2019) that could be the reason for its pharmacological effects towards illness encountered by the ethnic people. Maximum use of leaves than other plant parts may less affect the main plant (Abebe and Ayehu, 1993; Habibur Rahaman and Karmakar, 2015) and such act also reflects the sustainable use of the biological resources (Mandal *et al.*, 2020b).

The mode of preparation of herbal medicine include extract (41.11 %), decoction (14.44 %), paste (12.22 %), raw (8.89 %), powder and juice and sap (7.78 % each), cooked (2.22 %), dried fruit and leaf, gel, heated leaf and oil (1.11 %) and were mostly taken orally (62.64 %) followed by topical (36.36 %) administration (Table 1). In the present study, we could not get exact information regarding the methods of the medicine preparation and dosages of administration as they believe that disclosure of such knowledge to the outsiders may affect the effect of the medicine (Mandal *et al.*, 2020a), also the value of the traditional healers will not be praised (Mandal *et al.*, 2020b).

CONCLUSION

Throughout the ages, the ethnic people directly depended on plants for their basic needs, especially for herbal medicine. It is well known that they are very rich depository of traditional knowledge and such knowledge is less documented as it passed down from one generation to another by verbally. Due to lack of proper documentation, many such traditional knowledge has been facing threats of extinction. Now-a-days, there is a trend to use the herbal medicine across the world in spite of development of advanced synthetic drugs to treat common physical ailments. So, scientific documentation of such knowledge will definitely enrich the database of medicinal plants of our country which could be utilized for future research

programmes.

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