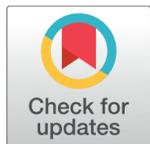


## RESEARCH ARTICLE



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## Ethnomedicinal uses of plants by Santal tribe of Alipurduar district, West Bengal, India

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## Abstract

**Objectives:** To document the traditional knowledge on medicinal plants used by the Santal tribe residing at seven different villages in Alipurduar district of West Bengal, India to treat common human ailments. **Methods:** The field survey was conducted during July 2018 to January 2020 using guided field-walk method. Santal traditional medicinal practitioners (locally called Kabiraj) and local knowledgeable Santal men and women were interviewed with the help of pretested semi-structured questionnaires to record their knowledge on ethnomedicinal uses of local vegetation in their surroundings. The questionnaire covered aspects like local name, scientific name, family, used parts, ethnomedicinal uses, among others. Plants were collected mostly during the flowering stage and routine method of herbarium techniques was followed and the collected plants were identified using relevant sources. **Findings:** Altogether 73 medicinal plants of 45 families were recorded to be used to treat 38 types of diseases ranging from very common physical problems to complex diseases. Fabaceae represents the highest number (5 species) of medicinal plants. Herbs (39.73%) and trees (38.36%) represents the dominant life-forms and mostly the plants were collected from the natural habitat (56.16%). For the preparation of medicine, leaves were found to be most frequently used (47.50%) plant part than the others. In general, ethnomedicines were prepared from the fresh plant materials and were administered orally (66.25%) or topically (33.75%). **Applications:** Documentation of medicinal plants used by the Santals in the treatment of various diseases could further be utilised to develop new drugs and pharmaceutical products. However, to achieve sustainable development, conservation, cultivation and proper utilisation of medicinal plants should be monitored scientifically. **Novelty:** Utilization of medicinal plants by the Santal tribe has been documented for the first time from Alipurduar district and has enriched the existing database of medicinal plants.

**Keywords:** Ethnomedicine; medicinal plants; Santal; traditional knowledge; Alipurduar; West Bengal

## 1 Introduction

India, the home of the World's largest number of indigenous people (8.6% of the total population of India)<sup>(1)</sup> has a rich herbal heritage. It is well known that the tribal people are mostly dependent on plants than the other communities for their daily livelihood, especially for herbal medicine. Even today, in developing countries, more than 80% population is directly dependent on herbal medicine for healthcare<sup>(2,3)</sup>. In India, the use of medicinal plants for the treatment of diverse variety of ailments has been recorded from ancient times<sup>(4,5)</sup> and the documentation of such traditional knowledge on ethnomedicine has developed many modern medicines<sup>(6,7)</sup>.

Santals, one of the Adivasi, the third-largest tribes in India after Bhil and Gond, mainly found in the states like Jharkhand, West Bengal, Assam, Tripura, Bihar and Odisha. In West Bengal, they constitute 47.43% of the total tribal population, of which 94.02% lives in rural areas (Census India 2011; <http://censusindia.gov.in/>). The people from rural areas mostly depend on the herbal or traditional medicine in spite of the development of modern medicine due to low cost of herbal medicine, unavailability of primary healthcare services and the side effect of the synthetic drugs<sup>(8)</sup>. Santals are the descendants of the Austric-speaking Proto-Australoid race<sup>(9)</sup>. As they have lived on this land probably for thousands of years, they are a rich depository and guardians of indigenous traditional knowledge on medicinal plants<sup>(10)</sup> and most of the knowledge passed on by verbal means from one generation to another and very rarely documented<sup>(11)</sup>. So, documentation of the medicinal plants used by them can play an important role in the conservation of indigenous knowledge as well as such documentation may be a potential source of discovery of newer and effective drugs. However, day-by-day the population to carry on traditional knowledge is reducing due to the impact of Western lifestyle<sup>(12)</sup> and less interest on the usefulness of medicinal plants are available in their surroundings<sup>(13)</sup>.

Several ethnobotanical studies on medicinal plants have been conducted in different districts of West Bengal over the past six decades<sup>(14–36)</sup>, focusing primarily on various ethnic groups, but documentation of the ethnobotanical knowledge of Santal tribe is very scanty<sup>(37–39)</sup>.

Scientific documentation of the traditional knowledge of Santal tribe in Alipurduar district of West Bengal is not made so far as per literature surveyed. Sukla and Chakravarty<sup>(40)</sup> and Raj et al.<sup>(41)</sup> have reported 18 and 140 medicinal plant species respectively, from the adjoining villages of Chilapatta Reserve Forest of Alipurduar district, West Bengal utilised by several communities like Rava, Ekka, Oraon, Mech, Nepali, Cherwa, etc. other than the Santal tribe. Chaudhury et al.<sup>(42)</sup> have documented 215 ethnomedicinal plant species used by the Lodha tribe from six different districts of West Bengal including the district Alipurduar.

Keeping this in view, the present study is designed to explore the traditional knowledge on medicinal plants used by Santal tribe residing at seven different villages in Alipurduar district of West Bengal, India.

## 2 Methodology

### 2.1 Study area

Alipurduar district is situated on the East bank of Kaljani River on the foothills of the Himalayas (26.489°N 89.527°E), it is known for its rich floristic composition. The district is in under developing status and mostly the rural people depend on the forest plants to treat common physical problems. The present field survey was carried out at seven different villages. The villages namely, Paschim Jitpur (26°32'48.89"N 89°31'14.31"E), Dakshin Majherdabri (26°31'9.12"N 89°33'47.93"E), Jasodanga (26°31'30.45"N 89°37'34.26"E), Salsalabari (26°30'2.64"N 89°36'16.96"E) and Bhelukdabri (26°29'20.69"N 89°34'33.10"E) - located at the south side of Buxa Wildlife Sanctuary; Kunjanagar (26°33'26.80"N 89°14'41.02"E) – adjoining village of Torsa Forest; and the village Kadambini Tea Garden (26°31'15.49"N 89°14'5.93"E) are mostly inhabited by Santals (Figure 1).

### 2.2 Data collection

A total of four field trips were completed for the documentation of traditional knowledge on medicinal plants during July 2018 to January 2020. The data were collected with the help of pretested semi-structured questionnaires<sup>(43)</sup>. Two Santal traditional healers and other knowledgeable persons were interviewed. Prior Informed Consent (PIC) was taken from each informant before interview. Information about the plants were recorded with regards to their vernacular/ Santal name(s), plant parts used, uses, process of preparation of medicine either individually or in combination with other plant parts, and mode of application and dosages for the treatment of a particular disease(s). Plant specimens were collected in their flowering condition as far as possible with guided-walk. Routine methods of plant collection and herbarium techniques<sup>(44)</sup> have been followed during the study. Digital photographs of the plants were also taken wherever possible. Plant specimens were identified with the help of relevant floras and standard literatures<sup>(45–47)</sup> and the voucher specimens were kept at the Department of Botany, A. B. N. Seal College, Cooch Behar.

## 3 Results and Discussion

The results of the field survey have been presented in Table 1. The collected medicinal plants are arranged in alphabetical order according to families and then according to genus and species within - each family. Information regarding Santal name(s) (as recorded during the field work), scientific name, family, habit, parts used and ethnomedicinal uses for each species have also been provided. In most cases, however, the precise method of the preparation of medicine and dosage of administration were not disclosed. As the tribal healers were afraid that on disclosure of such knowledge to the outsiders, their value as a medicine man gets affected.

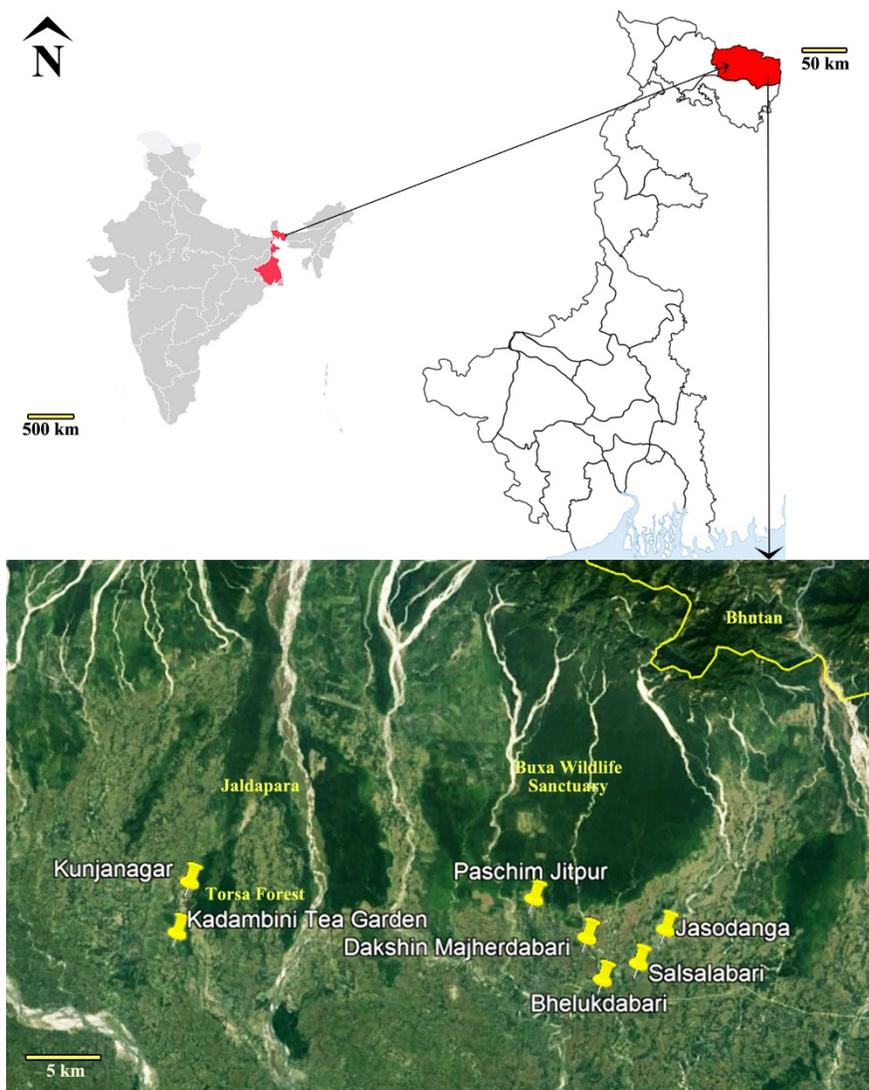


Fig 1. Map of the study area showing localities surveyed (marked in yellow pins) (Map Courtesy: Wikipedia and Google Earth).

### 3.1 Medicinal plants recorded and their distribution into families

The present field survey has recorded a total of 73 ethnomedicinal plants belonging to 69 genera and 45 families ( Table 1 ; Figure 2) used by the Santal tribal healers and other Santal men and women. Distribution of plants within families shows variation. The family Fabaceae is represented by highest number of species (5 species, 6.85 %) followed by Apocynaceae (4 species, 5.48 %), Acanthaceae, Amaranthaceae, Araceae, Cucurbitaceae, Moraceae, Piperaceae and Solanaceae (3 species each, 4.11 %), Amaryllidaceae, Asteraceae, Combretaceae, Lamiaceae, Poaceae, Rutaceae and Zingiberaceae (2 species each, 2.74 %) and the rest 29 families represented by single species (1.37 %). The members of the family Fabaceae contain active chemical constituents like flavonoids, alkaloids, coumarins, tannins, etc. <sup>(48)</sup>, which are used extensively in the treatment of wide variety of human diseases <sup>(49)</sup>.

Result on the growth habit of the plants shows that herb (29 species, 39.73%) and tree (28 species, 38.36%) dominates among the plant type followed by climber (9 species, 12.33%) and shrub (7 species, 9.59%). Mostly the plants were collected from natural habitat (56.16%) and the rest from the home gardens (43.84%). Besides, collection from natural vegetation, cultivation of medicinal plants in their home garden probably indicated their dependency on ethnomedicine to get relief from common physical problems.

### 3.2 Plant parts used, mode of preparation and routes of administration

For the preparation of medicine, various plant parts ( Table 1 ; Figure 3) are found to be used by the Santals. Leaves (47.50%) are found to be the dominant plant parts used followed by fruits (11.25%), bark (10.0 %), roots and seeds (6.25% each), latex (5.0%), bulb, stem, tuber

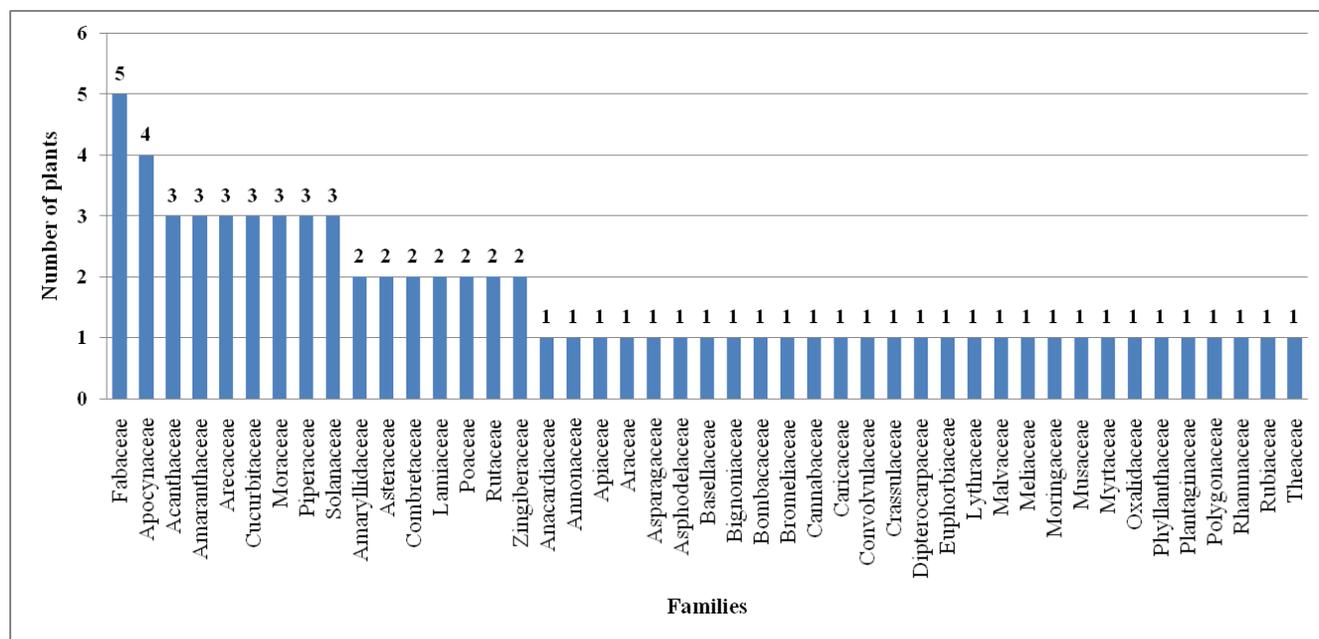


Fig 2. Family wise number of ethnomedicinal plants

and rhizome (2.50% each) and flower, whole plant and branch (1.25% each). Most of the ethnobotanical reports confirmed that leaves are the dominant plant parts used in the preparation of medicine<sup>(30,36,37,41,42,50-54)</sup>. Use of plant parts other than leaves may harm the mother plant<sup>(37,55)</sup> and in the present study maximum utilization of leaves indicates sustainable use of the biological resources by the Santals.

Mode of preparation of the medicine encompasses extract (32.5%), paste (21.25%), decoction (20.0%), juice (15.0%), latex (5.0 %), ointment (3.75%) and cooked (2.5%), and all the time fresh plant parts were used for medicine preparation. They believe that the fresh plant materials are more effective than the dry ones as - reported earlier by Habibur Rahaman and Karmakar<sup>(37)</sup>. Majority of remedies are taken orally (66.25%) followed by topical (33.75%) administration.

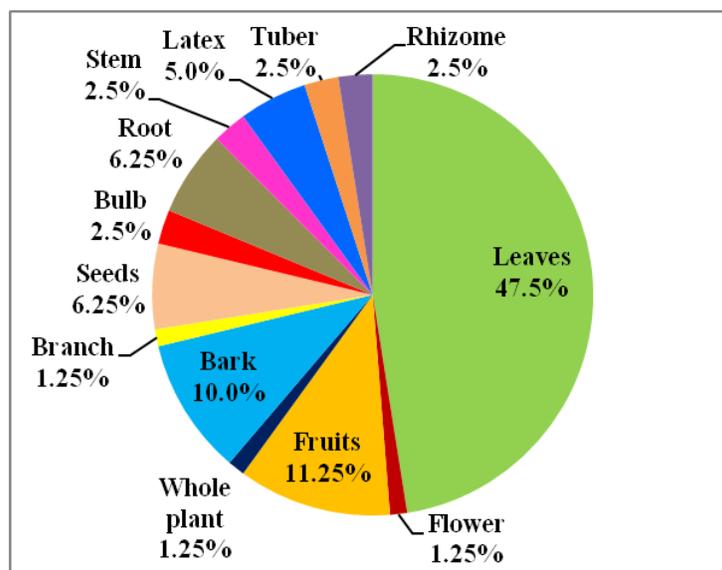


Fig 3. Percentage of plant parts used for herbal preparation.

**Table 1.** Medicinal plants used by the Santal people to treat common ailments in the studied area

SN	Vernacular Name(s)	Scientific Name	Family	Habit	Parts used	Ethnomedicinal uses
1	Kalmegh	<i>Andrographis paniculata</i> (Brum. f.) Nees	Acanthaceae	Herb	Leaf	Leaf extract is taken orally for 3 days in stomach problems.
2	Kulekhara	<i>Hygrophila auriculata</i> Schumach.	Acanthaceae	Herb	Leaf	Freshly prepared leaf extract is used to treat anemia.
3	Harbakama	<i>Justicia adhatoda</i> L.	Acanthaceae	Shrub	Leaf	Leaf extract is given in an iron pot for purification and then taken orally to treat cough.
4	Cipcirap	<i>Achyranthes aspera</i> L.	Amaranthaceae	Herb	Leaf, root	i) Leaf paste is used to treat skin disease. ii) Fresh root decoction is used for abortion.
5	Gai gandhaori	<i>Amaranthus viridis</i> L.	Amaranthaceae	Herb	Whole plant	Crushed whole plant is applied to snake bite.
6	Kukruchubaha	<i>Celosia cristata</i> (L.) Kuntze	Amaranthaceae	Herb	Flower	The flower extract is used in dysentery.
7	Peaj	<i>Allium cepa</i> L.	Amaryllidaceae	Herb	Bulb	The paste of the bulb is used in the treatment of joint pain.
8	Rasun	<i>A. sativum</i> L.	Amaryllidaceae	Herb	Bulb	The juice made from the bulb is used in the treatment of ear problems.
9	Aam	<i>Mangifera indica</i> L.	Anacardiaceae	Tree	Bark	Juice obtained from crushed bark is orally administered for diarrhoea.
10	Mandargom	<i>Annona squamosa</i> L.	Annonaceae	Tree	Fruit	Fruit is given for digestion.
11	Rote ara, Dhola-manamoni	<i>Centella asiatica</i> (L.) Urban	Apiaceae	Herb	Leaf	Leaf extract is mixed with a pinch of salt and taken orally in dysentery.
12	Chatni	<i>Alstonia scholaris</i> (L.) R.Br.	Apocynaceae	Tree	Latex	The Latex is massaged on the fractured bone.
13	Akana	<i>Calotropis gigantea</i> (L.) Dryand.	Apocynaceae	Shrub	Leaf	Heated leaves with a layer of oil are used as heat treatment in fractured bone.
14	Baromasia	<i>Catharanthus roseus</i> (L.) G.Don	Apocynaceae	Herb	Leaf	Leaf decoction is used in the treatment of diabetes.
15	Sarpagandha	<i>Rauvolfia serpentina</i> (L.) Benth. ex Kurz	Apocynaceae	Herb	Root	Root paste is used to treat cuts and wounds and applied on snake bite. Decoction of the root is also used to treat fever and hypertension.
16	Kachu	<i>Colocasia esculenta</i> (L.) Schott	Araceae	Herb	Leaf, tuber	Leaf and tuber curry is taken with food to treat constipation.
17	Berel gua	<i>Areca catechu</i> L.	Arecaceae	Tree	Seed	Nuts are chewed to treat dysentery.
18	Taal	<i>Borassus flabellifer</i> L.	Arecaceae	Tree	Young leaf	The juice of young leaves mixed with water is given in cases of dysentery.
19	Narkol	<i>Cocos nucifera</i> L.	Arecaceae	Tree	Dry fruit	Copra of the dry fruit is crushed to extract oil which is used for ear pain.
20	Shatamul	<i>Asparagus racemosus</i> Willd.	Asparagaceae	Climber	Root	Dried root extract is used to treat dysentery and urine disorder.
21	Ghritakumari	<i>Aloe vera</i> (L.) Burm.f.	Asphodelaceae	Herb	Leaf	Paste prepared from leaf used for skincare.
22	Tite pati	<i>Artemisia vulgaris</i> L.	Asteraceae	Herb	Leaf	It is used to treat nose bleeding, asthma, nervous affections.
23	Kusumbibaha	<i>Tagetes erecta</i> L.	Asteraceae	Herb	Leaf	Leaves extract is used to stop bleeding.
24	Purai nari	<i>Basella alba</i> L.	Basellaceae	Climber	Leaf	Leaf decoction is used in the treatment of diarrhoea.
25	Banahata, Suri-mala	<i>Oroxylum indicum</i> (L.) Benth. ex Kurz	Bignoniaceae	Tree	Bark	Stem bark paste is taken orally in the morning in an empty stomach to treat jaundice.
26	Shimul	<i>Bombax ceiba</i> L.	Bombacaceae	Tree	Bark	Juice made from the bark is used in excessive menstrual discharge.

Continued on next page

Table 1 continued

SN	Vernacular Name(s)	Scientific Name	Family	Habit	Parts used	Ethnomedicinal uses
27	Anaros	<i>Ananas comosus</i> (L.) Merr.	Bromeliaceae	Herb	Leaf	The whitish thick basal portion of the leaf is made into a paste and consumed in the treatment of fever.
28	Ganja	<i>Cannabis sativa</i> L.	Cannabaceae	Herb	Leaf	Leaf paste is used in bowel complaints
29	Papaya	<i>Carica papaya</i> L.	Caricaceae	Tree	Latex, leaf	i) Latex is used as a cleansing agent during menstruation and abortion. ii) Leaf paste is used in bone fracture.
30	Kouha	<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.	Combretaceae	Tree	Bark	Bathing with bark decoction reduces body pain.
31	Boyra	<i>T. bellirica</i> (Gaertn.) Roxb.	Combretaceae	Tree	Seed	Seeds are used to treat dysentery.
32	Sornolota	<i>Cuscuta reflexa</i> Roxb.	Convolvulaceae	Climber	Stem	Juice prepared from the stem is used in stomach problem.
33	Pathorkuchi	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Crassulaceae	Herb	Leaf	A red hot iron rod is dipped into leaf juice and two teaspoon juice is taken orally thrice daily for a week in diuretic, muscle relaxant, tumor, abdominal pain, etc.
34	Kenduri	<i>Coccinia grandis</i> (L.) Voigt	Cucurbitaceae	Climber	Leaf	Leaves extract is used to treat hypertension, diabetes.
35	Kahu botke	<i>Diplocyclos palmatus</i> (L.) C. Jeffrey	Cucurbitaceae	Climber	Leaf	Leaf decoction is used in the treatment of stomach pain.
36	Karla	<i>Momordica charantia</i> L.	Cucurbitaceae	Climber	Leaf, fruit	Five teaspoon of leaf or fruit extract is taken orally once daily to prevent diabetes, stomach disorder, asthma, anemia.
37	Sarjam	<i>Shorea robusta</i> Roth	Dipterocarpaceae	Tree	Young leaf	Young leaf paste is used to treat wounds.
38	Eradam	<i>Ricinus communis</i> L.	Euphorbiaceae	Shrub	Seed	Seed oil applied on belly in stomach ache.
39	Babla	<i>Vachellia nilotica</i> (L.) P.J.H.Hurter & Mabb.	Fabaceae	Tree	Pods	Pods are prescribed in dysentery.
40	Murut	<i>Butea monosperma</i> (Lam.) Taub.	Fabaceae	Tree	Seed	Seed are ground into powder and one teaspoon full of powder is mixed with half cup full of water and taken orally once a day in an empty stomach in the treatment of intestinal worm.
41	Raher	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	Shrub	Leaf	Leaves extract is used in jaundice.
42	Chakoda, Chakaoda	<i>Senna sophera</i> (L.) Roxb.	Fabaceae	Shrub	Leaf	Leaves decoction is used as laxative.
43	Jojo dare	<i>Tamarindus indica</i> L.	Fabaceae	Tree	Fruit	Fruit is used as laxative.
44	Durfa	<i>Leucas aspera</i> (Willd.) Link	Lamiaceae	Herb	Leaf	Leaves are crushed and mixed with a little salt and two drops of the juice applied to the nose in headache problem.
45	Tulsi	<i>Ocimum tenuiflorum</i> L.	Lamiaceae	Herb	Leaf	Leaves extract is mixed with ginger paste and honey is used to treat cough.
46	Jarul	<i>Lagerstroemia speciosa</i> (L.) Pers.	Lythraceae	Tree	Bark	Bark extract is used as astringent.
47	Ulatkambal	<i>Abroma augustum</i> (L.) L.f.	Malvaceae	Shrub	Root	Root extract is used to treat the menstrual disorder.
48	Neem	<i>Azadirachta indica</i> A.Juss.	Meliaceae	Tree	Leaf	Take a regular bath in warm Neem water in the itching problem.
49	Kanthal	<i>Artocarpus heterophyllus</i> Lam.	Moraceae	Tree	Latex	Latex is used to treat skin problem.
50	Loa	<i>Ficus racemosa</i> L.	Moraceae	Tree	Latex	Latex mixed with water taken orally to treat diarrhoea.

Continued on next page

Table 1 continued

SN	Vernacular Name(s)	Scientific Name	Family	Habit	Parts used	Ethnomedicinal uses
51	Sahora	<i>Streblus asper</i> Lour.	Moraceae	Tree	Twig/branch	Used in toothache, also used as tooth brush.
52	Chainna	<i>Moringa oleifera</i> Lam.	Moringaceae	Tree	Leaf, bark	i) Mature leaves are boiled and taken orally to treat high blood pressure. ii) Bark extract is used to treat epilepsy.
53	Kayra	<i>Musa paradisiaca</i> L.	Musaceae	Herb	Stem	The sap obtained by injuring the lower side of the stock is used in liver problem.
54	Kodedare	<i>Syzygium cumuni</i> (L.) Skeels.	Myrtaceae	Tree	Bark	Juice is made from bark and taken orally in stomach ache and gastric problem.
55	Tandi chatam ara	<i>Oxalis corniculata</i> L.	Oxalidaceae	Herb	Leaf	Leaves are made into a paste and taken two teaspoons for 2-3 days for stomach ache or 10-12 days for gastric problems.
56	Amla, merel	<i>Phyllanthus emblica</i> L.	Phyllanthaceae	Tree	Fruit, leaf	i) Decoction of dried fruit juice is used in the treatment of diarrhoea, dysentery and anemia. ii) Leaf decoction is used to treat fever.
57	Pan	<i>Piper betle</i> L.	Piperaceae	Climber	Leaf	Leaf juice is used externally for head-ache. Also used for easy delivery.
58	Ralee	<i>P. longum</i> L.	Piperaceae	Climber	Fruit, bark	i) Fruit decoction is used to treat dysentery. ii) Bark extract is used to reduce lethargy.
59	Golmirac	<i>P. nigrum</i> L.	Piperaceae	Climber	Fruit	Dried fruit decoction is used to treat cough, dysentery.
60	Chini daare	<i>Scoparia dulcis</i> L.	Plantaginaceae	Herb	Leaf	The leaves of the plant are crushed and taken orally to treat blood dysentery.
61	Dhubi ghas	<i>Cynodon dactylon</i> (L.) Pers.	Poaceae	Herb	Leaf	Leaves are made into a paste (by teeth) and used to stop bleeding.
62	Kharkosa, Patoa ghas	<i>Eleusine indica</i> (L.) Gaertn.	Poaceae	Herb	Root	The root paste is used to treat vaginal disease.
63	Jiyeti	<i>Persicaria barbata</i> (L.) H.Hara	Polygonaceae	Herb	Leaf	The leaf extract is taken orally to prevent pregnancy.
64	Kul	<i>Ziziphus mauritiana</i> Lam.	Rhamnaceae	Tree	Seed	Paste of seeds is good for leucorrhoea.
65	Kodom	<i>Neolamarckia cadamba</i> (Roxb.) Bosser	Rubiaceae	Tree	Leaf	Leaf decoction is used to treat aphthae.
66	Singedaro	<i>Aegle marmelos</i> (L.) Corrêa	Rutaceae	Tree	Ripe fruit, leaf	i) Fruit juice is taken orally in stomach problem. ii) Leaf paste used to treat fever.
67	Jambir	<i>Citrus medica</i> L.	Rutaceae	Tree	Fruit	Fruit juice is used to treat intestinal worm.
68	Dhutra	<i>Datura metel</i> L.	Solanaceae	Shrub	Leaf	Leaves are made into a paste, warmed and applied on the abscess.
69	Tamakur	<i>Nicotiana tabacum</i> L.	Solanaceae	Herb	Leaf	Leaf decoction is given orally to the snake-bite patient.
70	Alu	<i>Solanum tuberosum</i> L.	Solanaceae	Herb	Tuber	Boiled tubers are taken with a little salt in stomach pain.
71	Cha	<i>Camellia sinensis</i> (L.) Kuntze	Theaceae	Tree	Leaf	Leaf decoction is taken orally with sugar for nerve stimulant.
72	Shasang	<i>Curcuma longa</i> L.	Zingiberaceae	Herb	Rhizome	Rhizome paste is used to treat cuts and wounds.
73	Ada	<i>Zingiber officinale</i> Roscoe	Zingiberaceae	Herb	Rhizome	The rhizome paste is used to treat cough.

### 3.3 Diseases treated

Altogether 38 types of physical problems ( Figure 4) were found to be treated by the use of the documented medicinal plants. Most of the herbal preparations are found to be used by the Santals to treat dysentery (11 species, 15.07%), followed by abdominal pain and skin diseases (6 species, 8.22% each), stomach problems and female disorders (5 species, 6.85% each), cough and cold, diarrhoea and fever (4 species, 5.48%

each), anemia, bone fracture, cuts and wounds, diabetes, hypertension, snake bite (3 species, 4.11% each), among others. This clearly suggests the great extent of traditional knowledge possessed by the healers and the other tribal people to treat several diseases. This knowledge is passed down by verbal means from one generation to another. In the study area, the traditional knowledge is also taught to the interested younger ones (only Santals) by the elders in a 5-days custom (starts on Maha Panchami of Durga puja festival) called Dasaibonga. However, recent generations are less aware regarding the importance of the rich traditional knowledge on medicinal plants in their elders. This observation is corroborated with the previous studies as reported by Khatun and Rahman<sup>(12)</sup> and Uniyal et al.<sup>(13)</sup>.

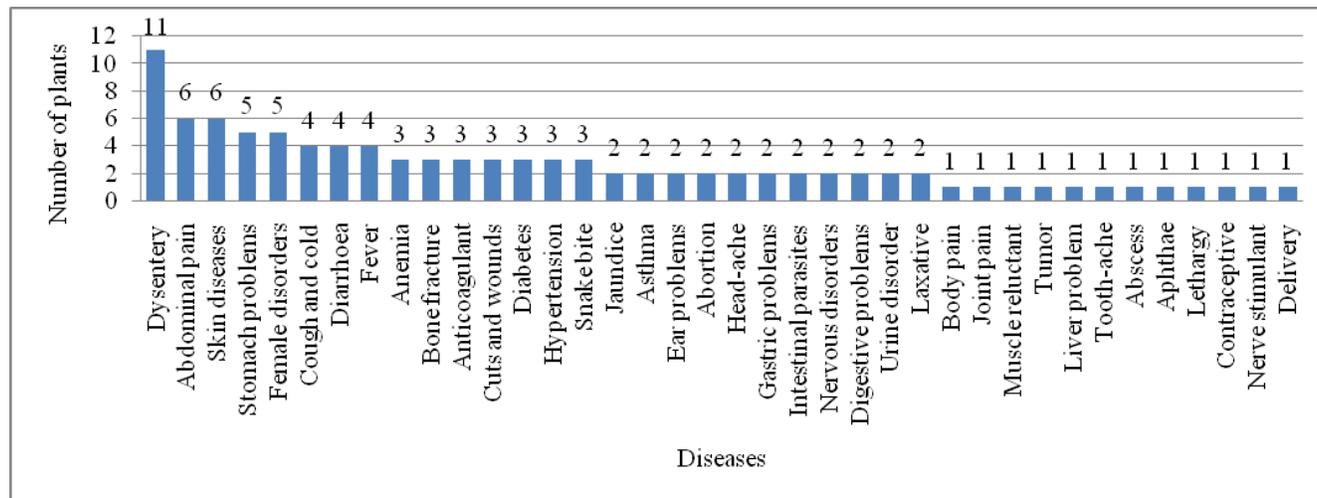


Fig 4. Number of plants used for treating various diseases.

## 4 Conclusion

Scientific documentation of traditional knowledge of Santal tribe from the district Alipurduar is done for the first time which will definitely enrich the database. Their knowledge on ethnomedicinal plants is no doubt very rich in the treatment of very common physical problems to complex diseases. This knowledge may be helpful for the development of modern drugs. Day-by-day due to various reasons the natural vegetation degradation is rampant, it will be helpful for further research. Cultivation and sustainable utilization of the threatened taxa is utmost necessity in order to maintain their population in nature.

## Acknowledgement

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