

Ethnomedicinal plants used to cure stomach disorders in forest fringe communities in Northern part of West Bengal

Saroj Biswakarma, Nazir A. Pala*, Gopal Shukla, Vineeta and Sumit Chakravarty

Department of Forestry, Uttar Banga Krishi Vishwavidyalaya, Cooch Behar-736165, West Bengal, India

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The present study was carried out in the eight forest fringe villages of Chilapatta Reserve Forest in the Northern part of West Bengal, India. The aim of the study was to document the ethno-medicinal plant resources used against stomach related disorders and their application procedure. A total of 43 plant species belonging to 40 genera and 31 families were documented. These documented species were dominated by trees (22) followed by herbs (11), shrubs (6) and climbers (4). The dominant plant families were Combretaceae, Rutaceae and Lamiaceae with 3 species each. Among various stomach related disorders, gastroenteritis was cured by maximum number of plant species (15), followed by dysentery (14) and stomach pain (9). Most dominant plant parts used were leaf of (20) species followed by fruit (13) and bark (8). The plant parts were employed by the inhabitants in the form of infusion, decoction, paste, latex etc. either as a sole drug or in the combination of other species. The documented plant species can be utilized by scientific community for further evaluation and recommendations to the practicing communities.

Keywords: Ethnic, Gastroenteritis, Therapy, Traditional knowledge.

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Introduction

Medicinal plants are the backbone of primary health care system and play a vital role in the health care system of human beings since the dawn of civilization. Excess use of modern drugs can have adverse impacts on human health and people are going back to nature with hope of safety and security¹. It is evident that many valuable herbal drugs have been discovered by the ancient folk healers for the treatment of some kind of ailment². Herbal medicine is currently experiencing a revival in Western society, along with other complementary therapies such as traditional Chinese Medicines, Osteopathy and Homeopathy³. Most of the people are susceptible to digestive problems, regardless of gender, ethnic and socioeconomic backgrounds⁴. Due to varying nature of life style, the type of food we consume, the compatibility of consumed food to our body system, number of stomach disorder like stomachache, indigestion, constipation, dyspepsia, ulcer, intestinal worms, vermifuge, laxative, infection and flatulence have been reported⁵⁻¹⁰. Serious diarrhoea/ dysentery/

cholera outbreaks were reported in Ethiopia⁶, Haiti⁷, Vietnam⁸, Zimbabwe⁹, and Nepal¹⁰, all with high death tolls.

Traditional medicine forms a valuable resource for the development of new pharmaceuticals¹¹. The exploration, utilization and conservation of these ethno-botanic resources are essential for restoration and preservation of traditional and indigenous knowledge^{12,13}. This acquired knowledge about the plants is very essential to be used in near future¹⁴. The communities under the present study are also suffering from stomach disorders due to water quality and still dependent on traditional medicines for treatments¹⁵⁻¹⁸. The knowledge of the uses of plants as a source of medicine in stomach related problem is very common among the ethnic group. The current study was therefore, carried out to document the plant species used against stomach disorders, plant parts used application procedure.

Materials and Methods

Study area

The present study was carried out at the forest fringe villages of Chilapatta Reserve Forest in foothills of the eastern sub-Himalayan mountain belts

*Correspondent author
Email : nazirpaul@gmail.com

of West Bengal, India. The elevation of the working site as measured by GPS (Garmin Montana 680) was latitude 26° 32.85' N and longitude 89° 22.99' E. The mean altitude of the area was 47 m above MSL. The study was conducted from December 2014 to May 2016. Purposive sampling method was used for selection of area. The area is inhabited by aboriginal community like Raj Bangshis, Mech, Ravas, Totos, Limbus, Lepchas, Nageshias, Uraons and Mundas of Indo-Mongoloid origin with around 1000 households having a family size of 5-7. A total number of 400 respondents including traditional medicinal practitioners were selected randomly for personal interview schedule through open ended questionnaire (Plate 1a-d). Majority of the respondents 91 % were male and rest females. Females of the study area generally did not responded to our questionnaire without their male folk; and so only female respondents were considered who responded independently. 49 % of the respondents were young (i.e. 33-52 years), 39 % middle aged (53-72 years) and 12 % elder (73-92 years). Majority of the respondents were literate (71 %) i.e. have attended school up to primary level or

more while rest of them were illiterate or not attended school at all. The livelihood of the respondents centred on non-timber forest products and subsistence rain-fed farming on forest adjacent lands.

The schedule was administered to the respondent in local Bengali language and the responses were recorded in English on the schedule. The questionnaire covered aspects like plant species used as ethno-medicines against stomach disorder, plant parts used, procedure for dosage and therapy. The ethno-medicinal plant species were identified mostly in the field with their local names and also by consulting available relevant secondary literature like research papers, book and related websites like researchgate and Google scholar. However the unidentified specimens were mounted on herbarium sheets and cross checked with the available herbarium in the Department of Forestry Uttar Banga Krishi Viswavidyala, Pundibari. The documented plant species were compared with different publications like journals, websites, google scholar, research gate and other available links for cross analysis. The collected data were analysed by using Microsoft Excel.



Plate 1— a-d Interaction with respondents during data collection

Results and Discussion

Composition of plants

Traditional medicine and ethnobotanical information play an important role in scientific research, particularly when the literature and field work data have been properly evaluated¹⁹. However, unfortunately information relating to the medicinally useful species and their uses along with traditional knowledge and practices are very Scattered^{20,21}. The present study reported 43 species of plants (Plate 2) used to cure various stomach ailments like stomachache, indigestion, constipation, dyspepsia, ulcer, dysentery, diarrhoea, gastric, hyperacidity, emesis (vomiting), nausea, worm infection, flatulence (Table 1). The reported 43 plant species belong to 40 genera and 31 families. These documented species were dominated by trees (22) followed by herbs (11), shrubs (6) and climber (4).

The plant families having maximum number of species were Combretaceae, Rutaceae and Lamiaceae with 3 species each followed by Apocynaceae, Cucurbitaceae, Euphorbiaceae, Fabaceae, Myrtaceae, Zingiberaceae with 2 species. Family Lamiaceae and Rutaceae were represented by maximum number of (02) genera each. The dominant genus was Terminalia and *Curcuma* represented by three and two genus respectively. After exploring the result it is found that out of 43 species 34 species are cultivated, 8 species are grown wild and 1 species under both cultivated and wild. The plant species as ethnomedicinal to treat various diseases and disorders have been reported from West Midnapur district of West Bengal²². Fifty seven plant species used as ethnomedicinal plants in Purulia district of West Bengal were reported²³. Tribal people of Birbhum district of West Bengal and Dumka district of Jharkhand documented 28 ethnobotanical plant species which are used in formulation of 10 different ethnomedicinal preparations for curing 10 types of diseases and ailments²⁴. About 85 % of the rural population of India utilized wild plants for the treatments of various ailments^{25,26}. The use of ethno medicine to treat various stomach diseases has also been reported in Tamil Nadu²⁷, Ladakh²⁸, and West Bengal²⁹.

Plant part used, application procedure and diseases cured

Our study revealed that almost all the parts of the plants are used for the treatment by applying different mode of application such as direct application, mixing it with other species, by extracting its juice, by

grinding or by making different solutions etc. We concluded that out of documented species the most dominant parts of the plants used are leaf (20) followed by fruit (13), bark (8). The most frequently utilized plant parts are bark, leaves, roots, branches, stem, fruits and seeds^{16,22,30}. Additionally, some have medicinal value in their flowers, rhizomes, tubers and heart-wood. In some cases, the whole plant including the roots was utilized^{16,31}. The plant part used and its utilization pattern can vary from community to community and region to region and may be influenced by the traditional knowledge, type of plant species available and prevailing disease in the area. Most of the ethnobotanical studies confirmed that the leaves are the dominant part of the plant used in the treatment of diseases³²⁻³⁴. The hill tribes and aborigines of West Rarrh region of West Bengal use 46 plant species ethnomedicinally in the form of infusion, decoction, oil paste and latex either as a sole drug or in combination to treat various ailments³⁵. The use of ethno-medicinal plant species for the treatment of various diseases has also been reported from the districts of Bankura and Purulia in West Bengal^{36,37}.

Various stomach disorder like stomachache, indigestion, constipation, dyspepsia and flatulence have been reported throughout the globe in both rural and urban communities⁵⁻⁹. In the present study maximum number of plant species (15) was used to treat Gastroenteritis followed by, Dysentery (14), Stomach pain (9) and least by one species each for stomach worm, stomach ulcer and vomiting. With the modern lifestyle touching the food plate of every person in some way or another, the stomach environment is bound to be in a crisis mode³⁸. These disorders cause morbidity and can lead to mortality, especially in the developing world where sanitation is deficient^{7,39}. The reported use of plant species for these diseases has also been supported by the findings of⁴⁰⁻⁴³ from different regions of the country. Many stomach diseases are associated with infection of various kinds of bacteria, viruses and parasitic organisms⁴⁴. Historically, it was widely believed that the highly acidic environment of the stomach would keep the stomach immune from infection. However, a large number of studies have indicated that most cases of stomach ulcers, gastritis and stomach cancer are caused by *Helicobacter pylori* infection¹.



Abroma augusta



Acacia catechu



Aegle marmelos



Aloe vera



Alstonia scholaris



Ananas comosus



Andrographis paniculata



Annona squamosa



Azadirachta indica



Bombox ceiba



Carica papaya



Centella asiatica



Cinnamomom camphora



Citrus lemon



Clerodendrum viscosum

Plate 2 — Some of the plant species used for treatment of stomach disorders in the study area (Contd.)

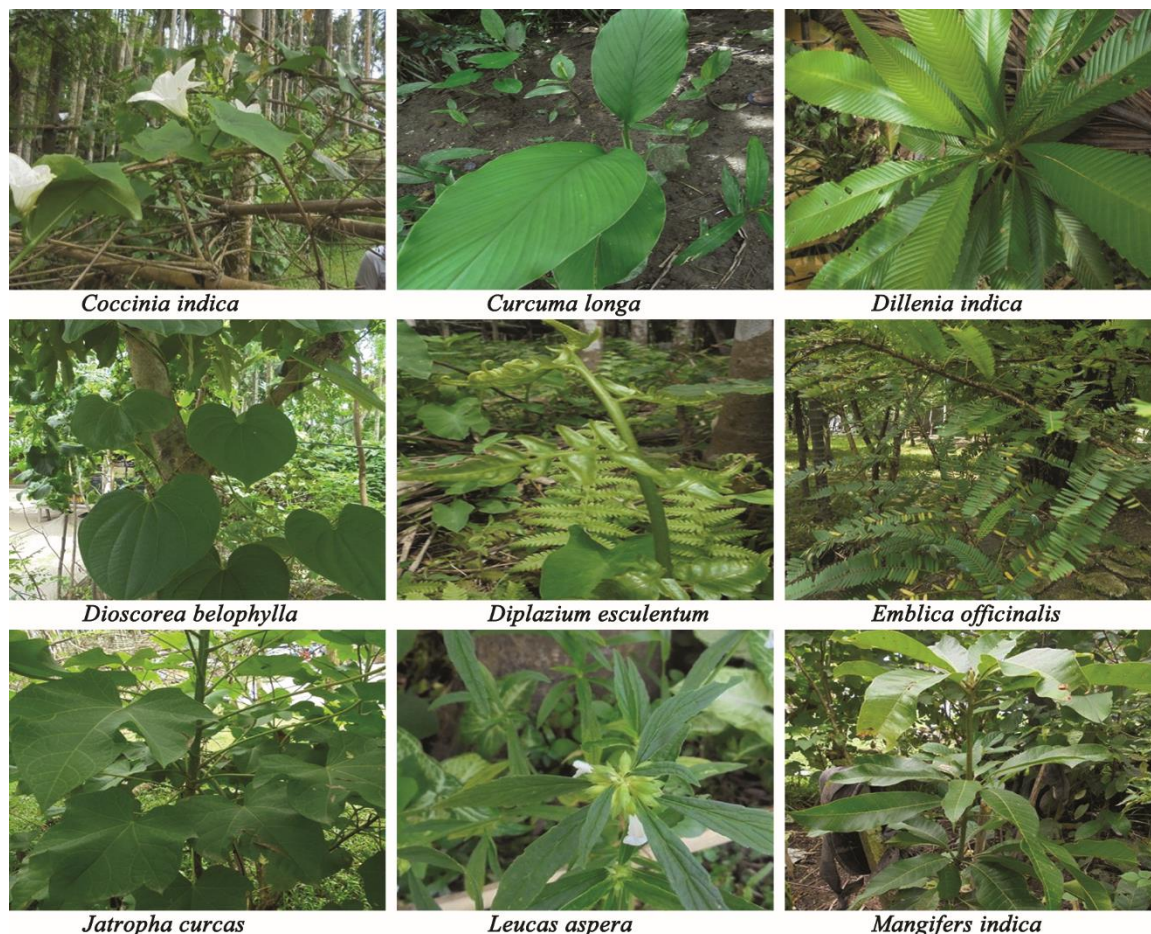


Plate 2 — Some of the plant species used for treatment of stomach disorders in the study area

Table 1 — Details of the documented plants from study area

Scientific name/Common name/Family/Voucher No.	Life form	Uses (Present study)	Therapy/procedure of use	Earlier studies
<i>Abroma augusta</i> (L.) L.f.; Ulat kambal; Malvaceae; UBKV FOR 274	T	Stomach disorders	Decoction of root and bark is used.	Blood dysentery and Diarrhoea ³⁵ ; Antidysenteric, antiemetic ⁴
<i>Acacia catechu</i> (L. f.) Willd.; Khair; Fabaceae; UBKV FOR 251	T	Diarrhoea and Indigestion	Aqueous extract of stem is used for the treatment.	Indigestion ¹⁶ ; Stomach pain ⁴⁵ ; Diarrhoea and dysentery ^{42,46}
<i>Aegle marmelos</i> (L.) Corr.; Bael ; Rutaceae; UBKVFOR218	T	Stomach disorder, Appetizer and Dysentery	Fruit juice is used to cure stomach problem.	Stomach ache ⁴⁷ ;Dysentery ⁴⁸ ; Diarrhoea and Dysentery ^{42,46} ; Abdominal pain; Digestive problem ⁴⁹
<i>Aloe vera</i> L. Burm.f.; Gritokumari; Xanthorrhoeaceae; UBKVFOR279	H	Stomach disorder	The entire plant can be grinded for juice extraction for curing stomach disorder.	Stomachache ⁴² ; Constipation, dysentery, indigestion, liver disorders, stomach disorders and stomachache ⁴³
<i>Alstonia scholaris</i> (L.) R. Br.; Chatian; Apocynaceae; UBKVFOR09	T	Intestinal worms	Bark juice is used for curing intestinal worms.	Stomachache, Diarrhoea and Ulcer ⁴⁶ ; Antidysentric ⁴¹ ; Acidity ⁴⁰
<i>Ananas comosus</i> (L.) Merr.; Anaras ; Bromeliaceae; UBKVFOR282	S	Intestinal worms	Leaves extract of <i>Ananas comosus</i> and also the <i>sefali</i> leaves are used to cure the problem.	Intestinal worms ⁴⁰ ; Digestive problems ⁵⁰

(Contd.)

Table 1 — Details of the documented plants form study area (*Contd.*)

Scientific name/Common name/Family/Voucher No.	Life form	Uses (Present study)	Therapy/procedure of use	Earlier studies
<i>Andrographis paniculata</i> (Burm.f.) Wall. ex Nees; Kalmegh; Acanthaceae; UBKVFOR253	H	Stomach pain	Tablets made from the powder of entire plant parts or decoction is used for curing stomach pain.	Intestinal worms and dysentery ⁴² ; Stomach complaints ⁴⁶
<i>Annona squamosa</i> L.; Atafol ; Annonaceae; UBKVFOR284	T	Stomach disorders	Ripened fruits are directly eaten.	Diarrhoea, Dysentery and Digestive upset ⁴² ; Diarrhoea ⁴⁶
<i>Azadirachta indica</i> A. Juss; Neem; Meliaceae; UBKVFOR256	T	Appetite problem, Stomach disorder	Tablets prepared from the leaves and juice extracted from the leaves is used to cure stomach problems.	Stomach pain ³⁶ ; Dysentery ⁵¹ ; Stomachache ⁵²
<i>Bombax ceiba</i> L.; Simul; Bambocaceae; UBKVFOR35	T	Stomach pain and diarrhoea	Tablets prepared from the leaves and juice extracted from the leaves is used to cure stomach problems.	Stomach pain ³⁶ ; Dysentery ⁵¹ ; Stomachache ⁵²
<i>Careya arborea</i> Roxb.; Kumbhi; Lecythidaceae; UBKVFOR125	T	Dysentery	Juice extracted from bark is used for curing dysentery.	Blood dysentery ⁴⁰ ; Indigestion and Constipation ⁵³
<i>Carica papaya</i> L.; Papita; Caricaceae UBKVFOR298	T	Gastroenteritis, Appetizer and Indigestion	Unripe fruits and flowers are helps in maintaining stomach digestion.	Dysentery ¹⁷ ; Indigestion ^{36,54}
<i>Cassia sophera</i> L.; Choto-Kalkasunda; Fabaceae; UBKVFOR300	S	Dysentery	Juice extracted from leaves, flowers and roots is taken for curing the dysentery.	Purgative, digestive ⁵⁵ ; stomach-ache ⁵⁶ .
<i>Centella asiatica</i> (L.) Urban ; Bang Sag; Apiaceae; UBKVFOR257	H	Gastroenteritis, Dysentery and Stomach disorder	Entire plant/leaves are cooked as a vegetable, entire plant juice with talmisri (local sweet) is used; leaves paste is used to cure the disorder	Constipation, Indigestion, Diarrhoea, Dysentery, stomach ache, Intestinal worm ^{22,48,49,45}
<i>Chenopodium album</i> L.; Bethu sag; Chenopodiaceae; UBKVFOR302	H	Gastroenteritis	Entire plant is cooked as vegetable in curing gastric problems.	Constipation and Intestinal worms ⁵⁷ ; laxative, anthelmintic and Diuretic ⁵⁸ .
<i>Cinnamomum camphora</i> (L.) J. resl.; Dalchini; Lauraceae; UBKVFOR303	T	Stomach disorder	Dried bark or leaves can be taken as such for curing stomach disorder.	
<i>Citrus lemon</i> Burm f.; Golo lebu; Rutaceae; UBKVFOR306	S	Vomiting and Dysentery	Ripen fruits with little amount of salt and oil are dried in sun for few days to cure stomach disorder, vomiting stomach pain ⁵⁹ . Leaves and fruits are smelled or consumed as raw to avoid vomiting.	Constipation, digestive, dysentery, intestinal worms, stomach-ache and vomiting stomach pain ⁵⁹ .
<i>Clerodendrum viscosum</i> Vent.; Bhauti; Lamiaceae; UBKVFOR246	S	Stomach worm and Stomach pain.	Juice of tender leaves of <i>C. visocum</i> with <i>Centella asiatica</i> leaves is used to cure stomach disorder	Stomach disorder ⁶⁰ ; stomach disorder ⁶¹ .
<i>Coccinia indica</i> L.; Kundli; Cucurbitaceae; UBKVFOR308	Cl	Gastroenteritis	Leaves are made into paste by adding water for curing gastric problems.	Dysentery ⁵³ ; stomach problem ⁶² .
<i>Curcuma caesia</i> Roxb.; Kala haldi ; Zingiberaceae; UBKVFOR259	H	Stomach pain and Gastroenteritis	Extracted tuber juice is mixed with water and taken for the treatment.	Antidiarrhoeic and to get relief from stomach-ache ¹⁰ ; dysentery ⁶³ .

(Contd.)

Table 1 — Details of the documented plants form study area (*Contd.*)

Scientific name/Common name/Family/Voucher No.	Life form	Uses (Present study)	Therapy/procedure of use	Earlier studies
<i>Curcuma longa</i> L.; Halud; Zingiberaceae; UBKVFOR260	H	Stomach disorder	Fresh rhizome juice is used for the	Stomachache ^{64, 65} ; stomach-ache ⁶⁶ . treatment.
<i>Dillenia indica</i> L.; Pachkol ; Dilleniaceae; UBKVFOR62	T	Stomach disorder	Bark is peeled, washed and boiled	Indigestion ¹⁶ ; Gastric and Diarrhoea ⁵⁴ . and taken for curing stomach disorder.
<i>Dioscorea belophylla</i> Voigt ex Haines ; Jangli alu; Dioscoreaceae; UBKVFOR65	Cl	Appetizer	Boiled fruits are taken as a food	Dysentery ⁶⁷ for curing appetite problems.
<i>Diplazium esculentum</i> (Retz.) Sw.; Dhekia sag; Athyriaceae; UBKVFOR33	H	Stomach problem	Leaves along with stem is cooked	As vegetables for laxative ⁴ . as vegetables and eaten to cure stomach problem.
<i>Emblica officinalis</i> Gaerth.; Amloki; Euphorbiaceae; UBKVFOR263	T	Stomach pain	Fruits are eaten as raw which	Digestive problem ⁴⁵ ; Gastric trouble ⁶⁴ helps in giving relief from stomach pain.
<i>Jatropha curcas</i> L. ; Arandi; Euphorbiaceae; UBKV FOR 264	S	Diarrhoea		
<i>Leucas aspera</i> (Willd.) Link.; Kanshisa; Lamiaceae; UBKVFOR331	H	Stomach disorder	<i>Batasi mithai</i> (local sweet) and few drops of <i>Jatropha curcas</i> latex is added into it and taken for treatment of diarrhoea.	Purgative ⁶⁸ ; constipation ⁶⁹ .
<i>Mangifera indica</i> L.; Amba; Anacardiaceae; UBKVFOR265	T	Blood dysentery and Diarrhoea	Leaves juice with salt or young plants as vegetable helps to reduce and cure gastroenteritis.	Stomach pain ⁵³
<i>Melastoma malabathricum</i> L.; Datrangi; Melastomataceae; UBKVFOR144	S	Stomach Ulcers, Dysentery and Diarrhoea	Young leaves of <i>Mangifera</i> <i>indica</i> , <i>Syzygium cuminii</i> , and <i>Psidium guajava</i> are mixed with <i>misri</i> (local sweet) and then crushed with mentha, <i>Piper</i> <i>nigrum</i> and <i>Centella asiatica</i> . Bark of <i>Mangifera indica</i> , ambara (sadri lang) and <i>Syzygium cuminii</i> are cooked by adding banana leaves and the prepared material is taken to cure blood dysentery.	Indigestion and Dysentery ^{16,70} ; Dysentery, Intestinal worm ⁴⁵
<i>Momordica dioica</i> Roxb. ex Willd.; Ban karola; Cucurbitaceae; UBKVFOR335	Cl	Stomach disorder		Diarrhoea ⁵⁴ ; Antidysenteric ⁴
<i>Moringa oleifera</i> L.; Sajana; Moringaceae; UBKVFOR336	T	Gastroenteritis	Fruits as vegetables for curing stomach disorder.	Dysentery ⁷¹
<i>Murraya koenigii</i> (L.) Sprengel Karipatta; Rutaceae; UBKVFOR266	T	Gastroenteritis	Leaves extract is taken to cure gastroenteritis.	Diarrhoea and Dysentery ⁷² ; Digestive disorder ³⁸ ; dysentery ⁵³ .
<i>Musa balbisiana</i> Colla Kola; Musaceae; UBKVFOR338	T	Gastroenteritis, dysentery, stomach disorder	Leaves are consumed directly or as extract for curing digestive problem.	Diarrhoea ¹⁶ ; Dysentery ⁷¹ ; Dysentery and Diarrhoea ⁴²

(Contd.)

Table 1 — Details of the documented plants from study area (*Contd.*)

Scientific name/Common name/Family/Voucher No.	Life form	Uses (Present study)	Therapy/procedure of use	Earlier studies
<i>Ocimum sanctum</i> L. ; Tulsi; Lamiaceae; UBKVFOR267	H	Gastroenteritis	Fruits or flowers as vegetables, Ripened fruits are consumed for curing diarrhoea, as well as the sap of pseudo stem orally taken.	Diarrhoea ⁴⁰ ; dysentery ⁷³
<i>Psidium guajava</i> L. ; Peyara; Myrtaceae; UBKVFOR270	T	Dysentery and Stomach pain.	Leaves extract is consumed.	Diarrhea and vomiting ⁷⁴ ; indigestion, constipation ⁷⁵ .
<i>Rauvolfia serpentina</i> (L.) Benth ex Kurz.; Sarpaganda ; Apocynaceae; UBKVFOR271	H	Intestinal worm, Dysentery, Gastroenteritis and Stomach pain.	Leaves and ripened fruits are eaten directly for curing dysentery.	Indigestion, dysentery ¹⁶ ; Diarrhoea and Dysentery ^{54,17} ; Diarrhoea ⁴²
<i>Scoparia dulcis</i> Roxb. ; Pith berela; Scrophulariaceae; UBKVFOR347	H	Diarrhoea and Gastroenteritis.	Leaves can simply be chewed.	Vomiting ⁴⁶ ; diarrhoea and dysentery ⁷⁶ .
<i>Shorea robusta</i> Gaerth f. ; Sal; Diptocarpaceae; UBKVFOR68	T	Stomach pain and Dysentery	Extract of entire plant except root is crushed and taken.	Diarrhea, stomach disorders ^{77,78} ; gastric hypersecretion ⁷⁹ .
<i>Syzygium cuminii</i> (Linn.) Skeels.; Jamura; Myrtaceae; UBKVFOR169	T	Blood dysentery and Gastroenteritis	Bark powder and bark peel is taken for curing stomach problems.	Dysentery ^{40,45} ; Diarrhoea ⁵⁴ ; Diarrhoea and Blood dysentery ^{80,81}
<i>Terminalia arjuna</i> (Roxb.) Wight & Arn.; Arjun; Combretaceae; UBK FO 272	T	Stomach disorder and Gastroenteritis	Fruits are eaten to cure blood dysentery and gastroenteritis.	Indigestion, Dysentery, Diarrhoea, Stomachache ^{72,49,45,47,70}
<i>Terminalia bellirica</i> (Gaertn.) Roxb. ; Boir; Combretaceae; UBK FOR45	T	Stomach disorder, indigestion, gastroenteritis.	Bark of <i>Terminalia arjuna</i> , <i>Alstonia scholaris</i> and fruits of <i>Terminalia chebula</i> , <i>Terminalia bellirica</i> and <i>Emblica officinalis</i> are taken in powdered form.	Indigestion and Dysentery ^{65,16,46}
<i>Terminalia chebula</i> Retz.; Haritaki; Combretaceae; UBKVFOR46	T	Gastroenteritis	Crushed root. Fruit peel juice and dry fruit is crushed to powder and taken to cure stomach problem.	Indigestion ¹⁶ ; Diarrhoea ⁴² ; Diarrhoea and Dysentery ⁴⁹
<i>Tinospora cordifolia</i> (Willd.) Hook. F & Thom.; Gulanchara; Menispermaceae; UBKVFOR146	Cl	Stomach pain	Fruit peel is used to cure the problem.	Indigestion ²⁹ ; Stomach disorder ⁴⁰ ; Stomach complaints ⁴⁶

Conclusion

The present study shows that forest fringe communities around Chilapatta reserve forest have good diversity of plant species used as remedies for several stomach related ailments. These plant species can be useful to the economically poor people who cannot afford modern medical care to cure the diseases. Traditional knowledge and application procedure of these species for treatment of various stomach disorders can be useful tools for preservation and conservation of indigenous knowledge and cultural importance of these species. The rural people residing in forest fringe areas are highly dependent on medicinal plants available in forest as they are easily available and proved to be cost effective. Hence, these medicinal

plants can be taken up for more pharmacological and clinical research so that its formulation gets an advance technique to develop a new drug.

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