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Traditional Ethno-Medicinal Plants Use By The *Darlong* Tribes In Tripura, Northeast India.

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The present investigation deals with indigenous ethno-medicinal knowledge of Darlong community in Tripura, northeast India. The ethno-medicinal exploration reveals their traditional usage of diverse plant species as both deterrent and therapeutic agent for different ailments. The study comprises customary usage of 39 plant species belonging to 38 genera and 24 families, along with their local name and various parts used. It is observed that Asteraceae, Verbenaceae and Euphorbiaceae are the most prevailing families (4 genera, 4 species in Asteraceae; 3 genera, 4 species in Verbenaceae and; 3 genera, 3 species in Euphorbiaceae), followed by Araceae, Lamiaceae and Zingiberaceae etc. The most common plant part used in their formulations are leaves and barks for various ailments like gonorrhea, jaundice, diarrhea, ascariasis, arthritis, gall bladder and kidney stone, etc. The herbal formulation provided in this paper may afford further possibility for potential drug development.

Key Words: Ascariasis, Darlong, Diarrhea, ethno-medicinal, Jaundice, Tripura.

Introduction

The northeast region represents important part of Indo-Myanmar biodiversity hotspot and is one of the renowned 25th global biodiversity region (Myers *et al*, 2000). This area contains more than one-third of the India's total biodiversity. Out of 450 tribal communities in India, the northeastern states alone are the dwelling place of 225 ethnic communities (Sajem and Gosai, 2006). These ethnic groups have their own culture and heritage (Sajem and Gosai, 2008; De *et al*. 2010, WHO 2001). Most of the ethnic peoples in this region live in the remote areas with close harmony to the adjacent forest areas. Being a resident of forested areas these ethnic communities are dependent on biotic resources immediately available to them for subsistence livelihood. It is now believed that they have developed their own traditional knowledge of herbal medicine to treat primary health care system rich with unique medicinal plants lore. Their socio-economic condition is very poor which restricts them to afford any modern medicinal facilities. These situations have bound them to depend upon plants for their primary health care by generation after generation (Majumdar *et al*, 2007). Considering this importance, increasing attention of several researchers has been directed to this field. In Assam, the workers like Bhattacharjee *et al.* (1980) worked on folklore medicine from Kamrup district; Baruah and Sharma (1984) worked out ethnological aspects of Bodo tribes; Borthakur (1976, 1995) worked on lesser known medicinal usage of plants among the tribes of Mikir Hills, and ethno-botanical knowledge of Dimasa tribe of Kamrup District; Bora (1999) explores the traditional knowledge of plants among Bodo tribes of Sonipur. Where as in Arunachal Pradesh, Hazra (1977) have worked some important medicinal plants from Kamang District, Tiwary *et al*. (1978, 1979) explores some medicinal plants from district of Tirap. In Meghalaya, Joseph and Kharkongor (1980) studied the ethno-botanical plants in Khasi and Jaintia Hills. Rao & Jamir (1982) worked on ethno-botanical plants of Nagaland- I & II; Jamir *et al* (2008) introduced the folk lore medicine of Yimchunger Naga tribes; Lanusunep (2010) listed folk medicinal herbs used by Sumi Naga tribes.

Ethno-botanically, the documentation of plants used by the tribal groups in Tripura was not studied broadly till date compared to other northeastern states (Majumdar *et al*, 2006). However, earlier worker like

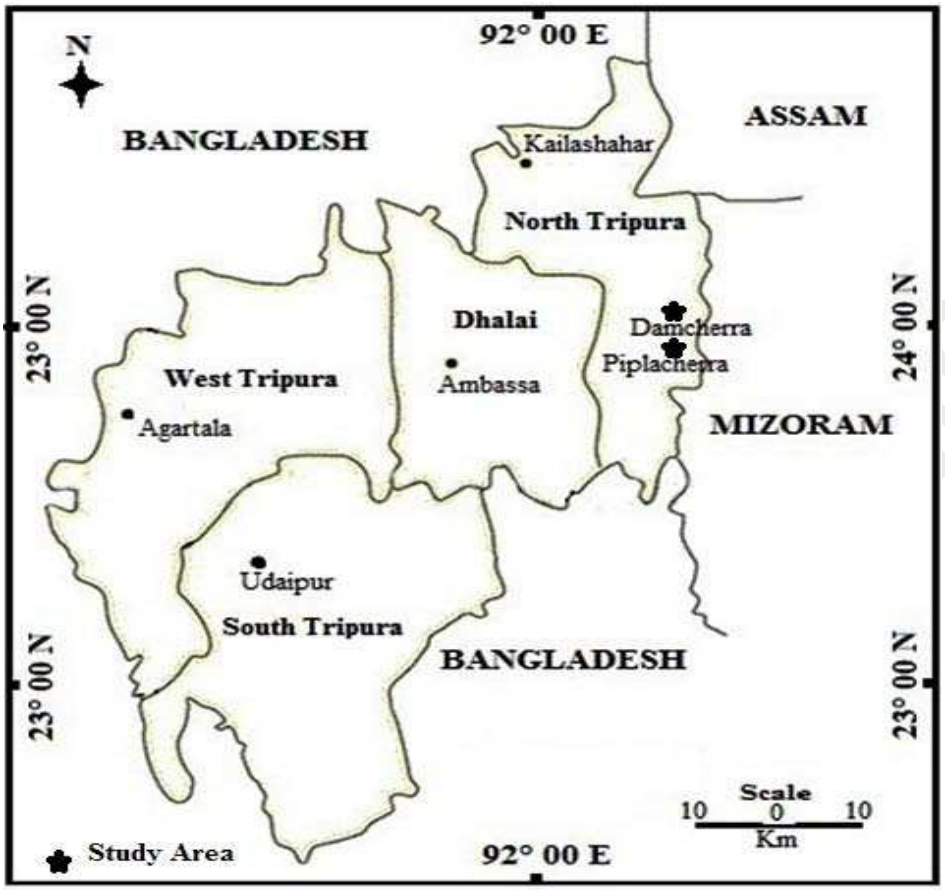
Deb (1968) and Singh *et al*. (1997) gave some information about several medicinal plants use by different tribes of Tripura. Now the study of ethno-botany in Tripura has gradually gained increasing attention. Majumdar and Datta (2007) worked on traditional uses of plants among the tribal of Tripura, Das *et al* (2009) exposed the ethno-botanical uses of plants by Tripuri and Reang Tribe, Roy *et al* (2010) worked on medicinal plants used by Chakma tribes. Recently, Sen *et al* (2011) documented the ethno-botanical plants used by ethnic peoples in West and South district of Tripura.

With a rich floristic diversity and vast forest cover extend up to 57.73% of the state geographycal area (State of Forest Reports, FSI, 2011); in Tripura there area tribal communities viz. - Chakma, Darlong, Halam, Hrankhwal, Jamatia, Kuki, Lusai, Mog, Reang, Shantal, Tripuri and others (Majumdar *et al*, 2007). Although Darlong is one of the indigenous communities under the so-called Kuki-Chin groups and their population is confined only in Tripura. Historically and culturally, they are very close to the Halams, Mizos, and other Kuki communities (Das *et al*, 2011). The language spoken by the Darlong called 'Darlong tawng' or 'Hriam tawng'. Like other tribal groups they have their own administrative and customary law through democratize system. So, it was felt necessary to record and preserve the valuable traditional wisdom about plant wealth which is to serve as baseline information for ethno-medicinal facts of this community.

Study Area

Tripura having a geographical area of 10,491 sq. km. is a hilly state of India is the second smallest among the eight northeastern states. It is situated in the bio-geographic zone of 9B-North-East Hills (Champion and Seth, 1968) and lies between 22°56' to 24°32' N latitude and 90°09' to 92°20' E longitude. Tripura has a rich floristic variety. The forest covers about 6294.278 km^2 i.e. 59% of the state geographical area, along with 587.633 km^2 are Proposed Reserve Forests (PRF) and 2116.874 km^2 unclassified Government Forests (UGF). It is bordered by Bangladesh (856 km) with three sides in the North, West and South, and in the east by Mizoram (109 km), in the north-east by the state of Assam (53 km). The present investigation was done in Damcherra (24˚ 14′ to 24˚ 12′ N and 92˚ 17′ to 92˚ 15′ E) reserve forest area of North Tripura District. It is situated at the Mizoram-Assam border and is separated by the river Longai. The vegetation of the study area is semi-evergreen; temperature ranges to 12-29 ºC. The Darlong community spread over several small villages of Damcherra forest area viz. Ureacherra, Piplacherra, Khedacherra, Vaisam, and Jaladhan, which are very rich in floristic diversity (Fig 1).

Fig 1: Geographical map of Tripura state showing different districts, international boundary and the study area.



Materials And Methods

Ethnobotanical survey was conducted during the year of January 2010 to February 2011 considering all seasons. The plants of ethno medicinal importance were documented by semi structured questionnaires, interviewing with herbal healers, knowledgeable woman and visiting community vegetable market (Rao & Hazra, 1994). Data collected from informants of one village was cross-checked with that of other villages to determine the validity of information. Based on the methodology suggested by Jain and Rao (1977) for plant specimen collection and herbarium technique was followed, collected specimens were identified with the help of standard text viz. Kanjilal *et al* (1934 – 1949), Prain (1903) and Deb (1981, 1983) and the voucher specimens were deposited in the herbarium of Department of Botany, Tripura University. Most of the information was collected from the local medicine man popularly known as 'PUITHIAUM'. The present study also records the habit of plants, vernacular names, parts used, traditional methods of preparation and ailments treated.

Results & Discussion

During the survey, 39 medicinal plant species were recorded under 38 genera and 24 families. Out of these 39 plants species, 5 species belong to primitive monocot and rests are dicot (Figure 4). Twenty two species occurred exclusively in the wild habitat, 4 species (*Andrographis paniculata* (Burm.f.)Wall.ex Nees, *Alocasia indica* (Roxb.) Schott, *Gmelina arborea* Roxb, *Ocimum sanctum* L.) were recorded in the wild as well as cultivated areas and remaining 13 species are found only in cultivated lands (Figure 3). Habit-wise distribution of plants species showed that 15 plants are herbs, followed by 13 trees, 6 shrubs and 5 climbers (Table. 1). Local people use these plants for various ailments like cold and cough, headache, skin diseases, dysentery, diarrhea, cataract, jaundice, and several other common diseases (Table. 1). The analysis of data reveals that leaves and barks are used in most of the

medicinal preparations (23 and 4 species, respectively), seeds are used in a single ailment; whole plant, root, rhizome, fruit are used for 2 occasions each, respectively. In the preparation of traditional medicine leaf decoction is best preferred. Although, some medicinal plant species mentioned in this paper were already reported by earlier worker for the other ethnic groups but the preparation and method of application is different *viz. Aegle marmelos* **(L.)** is efficient against cold and cough, *Ananas comosus* (L.) Merr is used against worm (Khan *et al.*, 2011); *Cajanas cajan* (L.) Millsp prescribed in measles and dysentery, *Centella asiatica* (L.) used in hypertension, *Oroxylum indicum* (L.) Vent used in diabetes, asthma, muscle pain by Naga tribes (Devi *et al*, 2011).

Table 1: All documented plants are represented in the tabular form.

Sl. No.	Scientific Name [Family] Voucher number	Vernacular name [Darlong Tlang Language]	Habit (Tree, Herb, Shrub, Climber)	Occasionality (Wild, Cultivated, Wild as well as Cultivated)	Disease cured	Parts used	Ethno medicinal formulation
1.	*Aegle marmelos* (L.) Correa [Rutaceae] TU/BOT/TRE/DR/17	Belthei	Tree	Cultivated	Urinal problem, Dysentery and Diarrhea	Tender leaves, Fruits	10-20 tender leaves are crushed and the extract is mixed with 1 teaspoonful of sugar .1 cupful is given to the person suffering from nephritis or urine infection. Juice of the fruit is advised in dysentery and diarrhoea.
2.	*Ageratum conyzoides* L. [Asteraceae] TU/BOT/HER/DR/2	Vailianhloi	Herb	Wild	Cut and wounds	Leaves	5-10 numbers of leaves are made into paste and applied on the wounds for 3 days.
3.	*Alocasia indica* (Roxb.)Schott. [Araceae] TU/BOT/HER/DR/5	Kumthumbal	Herb	Wild as well as cultivated	Severe wounds	Stem	4-5 cm long stem is cut; crushed with fried mustard oil; the paste is then applied locally with bandage till recovery.
4.	*Ananas comosus* (L.) Merr. [Bromeliaceae] TU/BOT/HER/DR/19	Birtung	Herb	Cultivated	Cough and Cold	Leaves	3-4 numbers of leaves are boiled in 2 glasses of water and filtered. 1 teaspoonful is prescribed, 3 times a day for 3-4 days.
5.	*Andrographis paniculata* (Burm.f.)Wall.ex Nees [Acanthaceae] TU/BOT/HER/DR/12	Hnakhate	Herb	Wild as well as cultivated	Malaria	Leaves	Fresh matured leaves (5-6 in number) are crushed and the extract is boiled in 1 glass of water for 10-15 minutes; 1-2 tea spoonful of the prepared mixture is advice thrice a day for 1-2 weeks.

6.	*Asphodelus tenuifolius* Cav. [Liliaceae] TU/BOT/HER/DR/7	Kangdai	Herb	Cultivated	Burn	Whole Plant (above ground part)	Whole plant (except root)1-2 numbers of plants were made into paste and applied on the burnt portion till recovery. Immediate application doesn't leave marks after the burnt portion is healed.
7.	*Bryophyllum calycinum* (Lamk.) Pers. [Crassulaceae] TU/BOT/HER/DR/1	Hnatoi	Herb	Cultivated	Kidney and Gall bladder stone	Tender leaves	Tender leaves (7-8 in numbers) are crushed with few drops of water; the extract made is then filtered. 1 table spoonful is prescribed twice a day to the patient, till recovery.
8.	*Cajanas cajan* (L.) Millsp. [Papilionaceae] TU/BOT/TRE/DR/14	Bethliang	Tree	Cultivated	Jaundice	Leaves	Tender leaves (7-8 in numbers) are crushed. The extract obtained is then filtered and the filtrate is given to the person suffering from jaundice in empty stomach once a day for 1 month.
9.	*Cassia alata* L. [Caesalpiniaceae] TU/BOT/SHRB/DR/11	Dadukung	Shrub	Wild	Ringworm and White patches	Leaves	4-5 numbers of matured leaves are made into paste and the paste is applied on the affected area thrice a day until cured. Matured leaves (8-10 in numbers) are crushed and mixed with 3-4 drops of *kerosene* oil *and* applied on the area of white patches, twice a day after bath for 2-3 weeks.
10	*Centella asiatica* (L.) Urban [Apiaceae] TU/BOT/HER/DR/15	Kochomnuhleida	Herb	Wild	Jaundice	Whole Plant	It is taken raw or as cooked vegetable. The whole plant is crushed and 250 mg of the extract obtained is taken in empty stomach before food regularly, once a day for 1 month.
11	*Clausena heptaphylla* (Roxb.) Wt. & Arn. [Rutaceae] TU/BOT/TRE/DR/3	Arhrikth	Tree	Wild	Dysentery	Tender leaves	5-8 numbers of tender leaves are boiled with 2- 3 glasses of water.1 glass is advised thrice a day for 3-4 days.
12	*Clerodendrum indicum* (L.) O. Ktze. [Verbenaceae] TU/BOT/SHRB/DR/27	Reivang	Shrub	Wild	Dysentery	Tender leaves	The tender leaves (20-30 in numbers) are cooked or boiled and taken as vegetable along with food. 2 glasses of the decoction

							obtained can be taken every day after light breakfast.
13	*Clerodendrum viscosum* Vent [Verbenaceae] TU/BOT/SHRB/DR/6	Phuidim	Shrub	Wild	Dysentery	Tender leaves	2 spoonful of the extract obtained by crushing7-8 pieces of root and tender leaves is applied 3 times a day for 2-3 days.
14	*Combretum decundrum* Roxb. [Combretaceae] TU/BOT/CL/DR/32	Damkol	Climber	Wild	Diarrhea	Tender leaves	The tender leaves can be eaten raw. 10-15 numbers of tender leaves are boiled in 1 litre of water for 10 -15 minutes, cooled and stored in a container. 2 glasses are prescribed twice a day till recovery.
15	*Curcuma longa* L. [Zingiberaceae] TU/BOT/HER/DR/21	Ieng	Herb	Cultivated	Cut and wounds	Rhizome	Paste of the rhizome is applied on the affected area.
16	*Diospyros toposia* F.-Ham [Ebenaceae] TU/BOT/TRE/DR/8	Thingvomte	Tree	Wild	Toothache and Foul smell	Bark	50 gm bark is cut into pieces and boiled with 500 ml of water for 1 hour. After cooling it is used as mouth wash every day in two times.
17	*Dischidia nummularia* R. Br. [Asclepidiaceae] TU/BOT/HER/DR/12	Sekittiak	Herb	Wild	Skin disease	Leaves	20- 30 leaves are crushed and the paste is applied on affected skin, 3 times a day until completely cured.
18	*Entada phaseoloides* (L.) Merr. [Mimosaceae] TU/BOT/CL/DR/24	Poi	Climber	Wild	Arthritis, Paralysis, Mumps	Seeds	The inner portion of seeds (2 numbers) is ground to powder and mixed with ½ litre of mustard oil. The mixture is then stored in a container and massaged all over the affected parts of the body twice a day for a month. For patients suffering from mumps, the seed powder is made into paste with few drops of water and applied on the external areas for three days.
19	*Eupatorium odoratum* L. [Asteraceae] TU/BOT/SH/DR/31	Theibua	Shrub	Wild	Cut and wounds	Leaves	Paste of 5-6 leaves is applied on the affected areas.
20	*Euphorbia antiquorum* L.	Rengdai	Shrub	Cultivated	Cough and	Leaves	A single leaves is dipped in a bowl of mustard oil and

	[Euphorbiaceae] TU/BOT/SH/DR/20				Throat pain		warmed on fire for a few seconds. The oil on the leaf is then dripped in throat, once a day for 3 days.
2	*Gmelina arborea* Roxb. [Verbenaceae] TU/BOT/TRE/DR/29	Rivong	Tree	Wild as well as cultivated	Skin disease	Fruit	The fruit juice is applied on the affected skin twice a day for 1-2 weeks.
2	*Jatropha curcus* L. [Euphorbiaceae] TU/BOT/SH/DR/23	Semvuang	Shrub	Cultivated	Burn	Latex	The latex is applied on burnt portion of the skin thrice a day for 2-3 days.
2	*Mallotus philippensis* (Lamk.) Muel.-Arg. [Euphorbiaceae] TU/BOT/TRE/DR/26	Hnathap	Tree	Wild	Sinus problems	Leaves	Fresh leaves (10-15 in numbers) are boiled in 2 glasses of water for 20-25 minutes.1 glass per day is prescribed till recovery. Powder of dried leaves is smoked with pipes.
2	*Mangifera indica* L. [Anacardiaceae] TU/BOT/TRE/DR/33	Theihai	Tree	Cultivated	Dysentery	Tender leaves	Extract of 10-15 tender leaves are filtered and mixed with 1 glass of water.1 glass three times a day for 3 days is prescribed.
2	*Mikania micrantha* (L.) Kunth. [Asteraceae] TU/BOT/CL/DR/9	Hruipochuak	Climber	Wild	Cut and wounds	Leaves	2-3 drops of juice by crushing 5-7 leaves are applied on cuts and wound for quick coagulation of blood.
2	*Mimosa pudica* L. [Mimosaceae] TU/BOT/HER/DR/34	Tonthi	Herb	Wild	Tooth ache, boil	Root and leaves	2-3 drops of juice obtained by crushing the root are dripped into the affected portion of tooth for 3-4 days. The leaves (20-30 in numbers) are made into paste and applied on boils, twice a day for 3-4 days.
2	*Ocimum sanctum* L. [Lamiaceae] TU/BOT/HER/DR/10	Tulsi vom	Herb	Wild as well as cultivated	Whooping cough	Leaves	1-2 gm of leaves is crushed and the extract is mixed with goat milk. 1 teaspoonful of the mixture is prescribed 3 times a day, for 3 days.
2	*Oroxylum indicum* (L.) Vent [Bignonaceae] TU/BOT/TRE/DR/39	Bakilong	Tree	Wild	Jaundice	Bark	1/2 kg of bark is boiled in 1 litre of water for 30 minutes. 1 glass per day for 1 week is applicable.
2	*Psidium guajava* L. [Myrtaceae] TU/BOT/TRE/DR/35	Hopbiri	Tree	Cultivated	Dysentery	Leaves	A few tender leaves (10-12 in numbers) are crushed and mixed with 500 ml of water. 1 teacup full, 3 times

							a day for 3-4 days.
3(	*Sansevieria roxburghiana* Schult & Schult.f. [Agavaceae] TU/BOT/HER/DR/30	Sakhitiak	Herb	Cultivated	Burn, Snake bite	Leaves	Paste of 1-2 leaves are applied externally on affected areas once a day for 2 -3 days.
3]	*Scoparia dulcis* L. [Scrophulariaceae] TU/BOT/HER/DR/28	Boltecanja	Herb	Wild	Cut and wounds	Leaves	The leaves are crushed together with *Eupatorium odoratum* L. leaves and *Mikania micrantha* leaves and the paste is applied on cuts and wounds.
3]	*Spilanthes paniculata* Wall. ex DC [Asteraceae] TU/BOT/HER/DR/38	Ramansa	Herb	Wild	Ascariasis	Leaves	Fresh leaves are eaten raw or boiled with water. The boiled leaves are taken in empty stomach before meal at morning and before going to bed at night.
3]	*Spondius pinnata* (L.f.) Kurz [Anacardiaceae] TU/BOT/TRE/DR/22	Taito	Tree	Wild	Gonorrhea	Root	The root of young plant is crushed with garlic and black piper. The extract is filtered and 2 teaspoonfuls of the filtrate are intake after food, 3 times a day for 2-3 weeks.
3]	*Steriospermum personatus* (Hassk.) Chatterjii [Bignonaceae] TU/BOT/TRE/DR/37	Zekong	Tree	Wild	Arthritis/ Body ache	Bark	The bark is made into paste with few drops of water and is applied externally.
3]	*Tamarindus indica* L. [Caesalpiniaceae] TU/BOT/TRE/DR/16	Tengtare	Tree	Cultivated	Migrain pain/ Headache	Leaves	Few matured leaves are made into paste and applied on forehead. Cold water is poured from time to time for 1 hour.
3(	*Thunbergia grandiflora* Roxb. [Acanthaceae] TU/BOT/HER/DR/4	Thangvakuirang	Climber	Wild	Cataract/ Eye infection	Watery latex	2-3 cm of the stem is selected and cut with knife on both side. Bubbles of 1-2 drops of the watery latex are blown gently into the infected eyes, 3 times a day for 4-5 days.
3]	*Tinospora cordifolia* (DC.) Miers. [Menispermaceae] TU/BOT/CL/DR/18	Vanahruihrual	Climber	Wild	Chicken pox, Measles	Stem	10-20 pieces of the stem are boiled in 2 litres water for 15-20 minutes. The boiled water is then mixed with normal water and bathed to the diseased person, once a day for 1 week.

38	*Vitex peduncularis* Wall. Ex Schauenv. [Verbenaceae] TU/BOT/TRE/DR/36	Thlenghreng kung	Tree	Wild	Gall bladder stone	Bark	The barks are cut into pieces and boiled with 1 litre of water for 20-25 minutes and store in a container. 1 glass thrice a day for 2-3 weeks is prescribed.
39	*Zingiber officinale* Rosc. [Zingiberaceae] TU/BOT/HER/DR/25	Thing	Herb	Cultivated	Cough and Throat problem	Rhizome	25-30 gm rhizome is crushed and boiled with 1 glass of water and taken the luke warm mixture, 3 times for 1-2 days.

Fig 2: Comparative Analysis of different plant parts used in the formulation advised by the "Phuithiams"

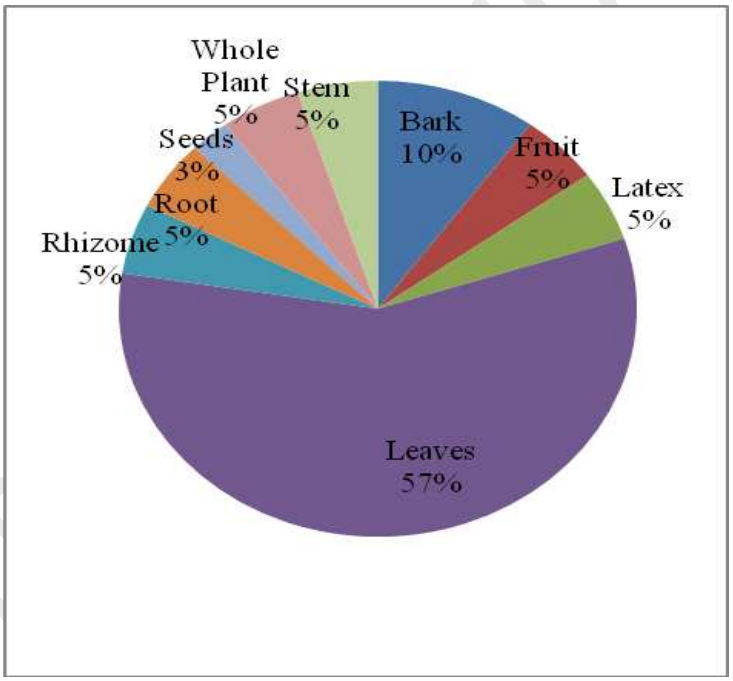


Fig 3: Numerical analysis of the collected plant specimens according to their availability status.

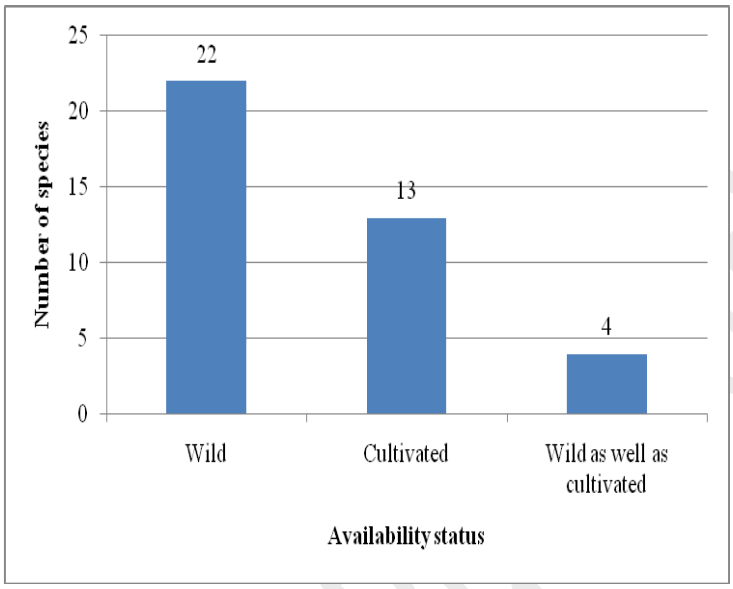
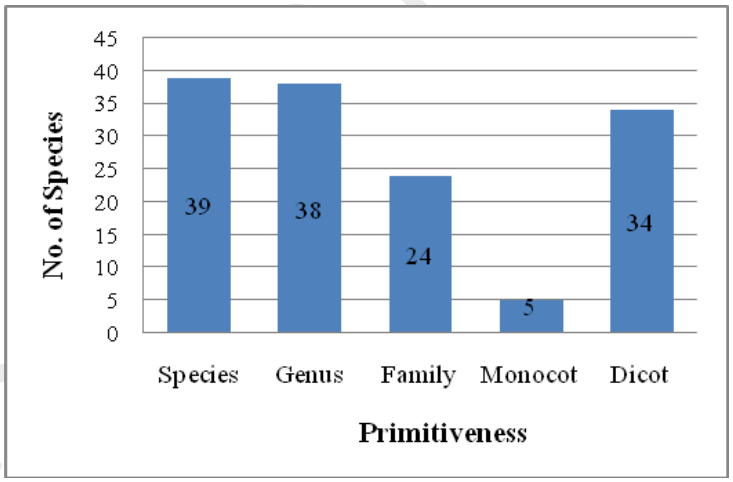


Fig 4: Analysis of documented plant according to their taxonomic lavel.



Conclusion

There are number of medical institution and doctors present in the state of Tripura. But it is for namesake, and the real implementation of health care is still far beyond. Most of the tribal people live in proximity of the forest; where the modern medical facilities are out of reach. So, they are bound to depend on the folk medicine for their primary health problems. The study suggested that the knowledge about the traditional folklore medicine of Darlong tribe who residing in proximity of the forest areas facilitated the rural health care system, where medical facilities, health care program and transportation facility are very inadequate. So, the healers are quite succeeding to cure deadly diseases with folk medicine, as their knowledge is not up-to-the-minute. Perhaps, by combining the traditional wisdom with recent scientific knowledge higher output may achieve without causing any ecological humiliation. The indigenous wisdom is complementing the prevailing knowledge of western scientific sources

by its own prehistoric acceptability (Thangjam and Arunachalam, 2009). The traditional knowledge of Darlong tribe is eroding generation after generation. While, now a days this flow of familiar folk knowledge from elder to younger generation is interrupted by unenthusiastic view to learn the wisdom (Das *et al*, 2009). Due to gradual disappearing of the forest, the ethnic knowledge of many important species may become limited and will be forgotten in near future. Therefore, the present documentation of ethno medicinal plants may provide a sufficient scope to the pharmacological inquiries to find out new potent drugs in near future (Majumdar *et al*, 2007). The rich traditional lore of plant resource used by this ethnic group is important to preserve in a written form before we lose this valuable wealth forever. For better utilization of herbal medicine people's motivation, awareness in terms of sustainable utilization and conservation of regional medicinal plant diversity may take part.

Fig 5: Some ethno-medicinal plants collected from the study area.

a. *Clausena heptaphylla* (Roxb.) Wt. & Arn.

b. *Clerodendrum indicum* (L.) O. Ktze.

c. *Oroxylum indicum* (L.) Vent.

d. *Entada phaseoloides* (L.) Merr.

e. *Steriospermum personatum* (Hassk.) Chatterjii.

f. Landscape overview of the study area.

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