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Research Article

TRADITIONAL KNOWLEDGE OF ETHNOMEDICINAL HEPATOPROTECTIVE PLANTS USED BY CERTAIN ETHNIC COMMUNITIES OF TRIPURA STATE

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ABSTRACT
Hepatoprotective plants constitute an important part in the traditional medicinal practices of the different ethnic communities of Tripura. Recent studies on the traditional knowledge of the Tripuri, Halam, Chakma and Darlong ethnic communities of Tripura state recorded around 52 hepatoprotective plants from 36 families. A maximum of 19 hepatoprotective plants have been recorded from the Chakma medicine men followed by 16 from the Tripuris, 13 amongst the Halam people and 6 plants recorded from the Darlong informants. Plants have been found to be used as individual component or in combinations of two or more. Almost all plant parts are used in the different hepatoprotective formulations. Many of the plants are used by more than one communities in different combinations. However, administration of the crude drug and its dosage depends widely on the different forms of hepatic illness like ordinary jaundice, childhood jaundice, long term jaundice, cirrhosis, liver injury due to alcoholism, etc. Some of the important plants recorded include *Cassia alata, Kaempferia rotunda, Keampferia galanga, Abelmoschus manihot*, and many more. The hepatoprotective property of 21 plants has been recorded for the first time during this study.

Key Words: *Hepatoprotective, Traditional Knowledge, Ethnic Communities, Tripura*

INTRODUCTION
Despite the advances in allopathic medicine, herbal drugs play an important role in treatment of various ailments including hepatopathy (liver ailments) (Ibrahim, *et al*., 2008). Medicinal herbs are widely used in the treatment of liver diseases like hepatitis, cirrhosis, and loss of appetite (Cupp, 1999). *Silybum marianum*, *Picrrorhiza kurroa, Andrographis paniculata*, *Phyllanthus niruri*, and *Eclipta alba* are some of the proven hepatoprotective medicinal herbs (Bisset (ed),1994). Dependence on plants is still seen widely among the ethnic groups of the world and the ethnic communities of Tripura are no exception. Plants and their use in ethnomedicine occupies a major portion of tribal ethnomedicine in Tripura.
Tripura a land of diverse ethnic groups is also blessed with great variety of ethnomedicinal plants. The present work specially highlights the hepatoprotective plants used by three of the ethnic communities of the state. The ethnomedicinal lore of the people of the state on the use of plants as hepatoprotective agents has been enlisted in detail in the enumeration part.

MATERIALS AND METHODS
Study site: The study site included the Exhaustive field surveys have been undertaken covering all seasons for gathering information on each and every species used by tribal people as medicines.
Communities under study: Surveys were conducted in different villages of Tripura inhabited respectively by the Halam, Darlong, Tripuri and Chakma communities.
Plants have been collected in their flowering and fruiting stage as far as possible from the natural habitat and serially tagged with field numbers and recorded different information in the field note book.

Specimens were processed into mounted herbarium sheets following Jain & Rao (1977) and were deposited in the Silchar Herbarium for further use. Plants were identified using local flora including Hooker (1872 - 1897), Kanjilal *et al* 1934 – 1940), Bor (1940) and Deb (1981 - 1983). A set of the specimens will be deposited at Assam University Herbarium.

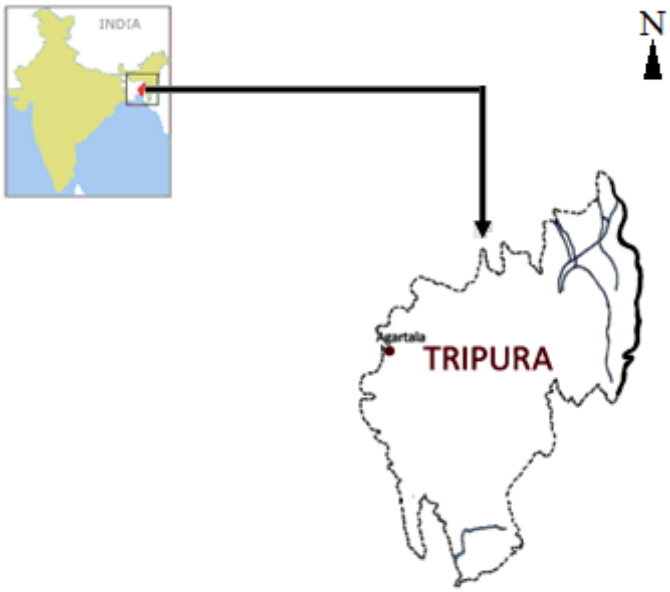

Figure 1: Map of Tripura

Ethnobotanical methodologies as suggested by Schultes (1960, 1962), Jain (1964, 1967, 1991) and Jain & Mudgal (1999) have been followed during field study. Informants include local medicine-men, village headmen and aged and experienced people. Queries have been made repeatedly, occasionally taking help from interpreters for confirmation of data on each medicinal plant. Data on each plant have been recorded as follows: (a) Sl. No. (b)Scientific name (c) Family (d) Vernacular Name (e) name of the tribe (f) Parts used (g) Mode of utilization and (h) Established report of use.
Recorded plants have been enlisted in **Table 1** along with their scientific and local names, family, parts used, mode of use, and established uses of such plants.

Table 1: Detailed description of the Ethnomedicinal Hepatoprotective plants collected

Sl no.	Scientific name	Family	Local name	Name of community	Part used	Process of utilization	Established report
1.	***Abelmoschus manihot*** (L.) Moench	Malvaceae	Kumai	Chakma	Mature seeds	Paste along with a little water administered twice daily.	Applied in menorrhagia (Bourdy and Walter, 1992).
2.	***Achyranthus aspera*** Linn.	Amaranthaceae	Apang	Darlong	Shoot	Administered @ 1 teaspoon thrice daily for 15 days.	Root paste in kidney and urinary disorders and in skin infections (Majumdar *et al.*, 2006).

3.	***Aegle marmelos*** Correa	Rutaceae	Bael	Tripuri and Chakma	Leaves, gum from fruit, ripe fruit,	Chakma: Leaves pounded to paste with equal quantities of leaves of *Cajanas cajan* and a little water and 1 cupful extract taken in the morning in empty stomach in jaundice in combination with red palm candy. One teaspoonful gum daily for 2 days in jaundice. Pulp of ripe fruit in dysentery. Tripuri: Fruit pulp as medicine and as preventive of dysentery.	Pulp of the ripe fruit is laxative. Useful in indigestion and constipation, unripe fruit in dysentery and diarrhoea (Patiri and Borah, 2007).
4.	***Alocasia indica*** Schultes	Araceae	Maitu bulai	Tripuri	Rhizome	Paste of the rhizome administered @ one teaspoon daily for 1 week.	Leaves styptic, astringent, tuber useful in piles and constipation (Chopra *et al.*, 1956).
5.	***Alpinia conchigera*** Griffith	Zingiberaceae	Peitranga	Chakma	Rhizome	Root extract administered @ two teaspoon twice daily.	Different species of *Alpinia* used in fever, rheumatism, bronchial infections and as expectorant, stomachic, stimulant, aphrodisiac, carminative, emetic (Chopra *et al.* 1956).
6.	***Alstonia scholaris*** (Linn.) R. Br.	Apocynaceae	Milmi	Darlong	Bark	Pounded with a little hot water and administered @ ¼ cup thrice daily.	Bark infusion administered once a day in malarial fever (Purakayastha, *et al.*, 2007).
7.	***Amaranthus spinosus*** Linn.	Amaranthaceae	Katakhudura	Tripuri	Root	Root extract administered @ two teaspoon twice daily for 3- 4 days.	Root extract orally in chest pain and snake bite (Dutta Choudhury and Shil
8.	***Andrographis paniculata*** (Burm. f.) Wall ex Nees	Acanthaceae	Kalamegh	Tripuri	Leaves	Extract administered @ 1 teaspoon twice daily for 15 days.	Juice of whole plant in stomach troubles (Purakayastha
9.	***Areca catechu*** Linn**.**	Palmae	Phatui bulai	Tripuri	Nut	Chewed raw after heavy meals.	Crushed nuts and roots as haemostat (Dutta Choudhury and Shil

10.	***Averrhoca carambola*** Linn**.**	Averrhoeaccae	Kamranga	Halam	Ripe fruit	Ripe fruit with stem bark of *Oroxylum indicum* Vent. are smashed and mixed with the ash of shell of a mussel. All the three are made into a liquid mixture in 1:1:1 ratio and taken.	Dried fruits antiscorbutic and used against fever. Ripe fruits in piles & febrile excitements (Chopra, *et al.,* 1956). Ripe fruit pulp in fever, bleeding piles, urinary stone and jaundice (Singh, *et al.*, 2003).Fruit infusion in leucorrhoea. Bark infusion in piles (Purakayastha, *et al.*, 2007).
11.	***Baccaurea sapida*** (Roxb.) Muell. Arg.	Euphorbiaceae	Pheko	Darlong	Stem bark	1 teaspoon paste administered twice a day with ½ cup of hot water for jaundice.	
12.	***Cajanas cajan*** (L.) Millsp.	Fabaceae	Khokhlaing	Halam	Leaves and twigs	Soup is given in stomach troubles. Juice taken as many time as possible in jaundice.	Seeds in snake-bite; paste of seeds and leaves used to control milk flow (Chopra, *et al.*1956).
13.	***Calotropis gigantea*** (L.) R.Brown ex Aiton	Asclepiadaceae	Angarpata	Chakma	Leaves	2 tablespoons of extract administered daily for 2 weeks.	Root bark anti-dysenteric, diaphoretic, expectorant, emetic, applied as paste in elephantiasis; tincture of leaves used in intermittent fevers; latex irritant, purgative; powdered flowers given in cold asthma and indigestion (Chopra *et al.* 1956).
14.	***Canna indica*** Linn.	Cannaceae	Nirbish	Halam	Rhizome	Extract @ 2 teaspoon once daily for 15 days.	Decoction of root with fermented rice in gonorrhea and amenorrhoea. Also considered to be demulcent, diaphoretic and diuretic (Duke and Ayensu, 1985).

15.	***Cardiospermum halicacabum*** L.	Sapindaceae	Heda-bhokta	Chakma	Leaves	Paste administered @ 1 teaspoonful twice daily for 10 days.	Plant used in rheumatism, stiffness of limbs, snake-bite. Root diaphoretic diuretic, aperients, laxative, rubefacient, emmenagogue, occasionally used in rheumatism, lumbago and nervous diseases; leaves rubefacient, poultice in rheumatism; leaf juice used in ear ache (Chopra *et al.* 1956).
16.	***Carica papaya*** L.	Caricaceae	*Paypay*	Chakma and Darlong	Fruits, roots	Chakma- Fruits are used as stomachic. Darlong- Root extract administered @ 2- 3 teaspoon thrice daily in jaundice.	Latex of unripe fruits used to remove freckles and blemishes from skin, anthelmintic; ripe fruits stomachic, carminative, diuretic; seeds vermifuge, emmenagogue, used to quench thirst (Chopra *et al.* 1956).
17.	***Cassia alata*** L.	Caesalpinae	Delong pata	Chakma	Leaf	Leaf paste made to tablets and administered @1 tablet thrice daily after meals for 1 week.	Leaf extract anti-parasitic and anthelmintic (Khan and Rashid, 2006).
18.	***Celosia cristata*** L.	Amaranthaceae	Radhachuro phool	Chakma	Leaf	Juice taken orally as antihemorrhagic during parturition.	Seeds anti-diarrheic, aphrodisiac, useful in blood diseases, eye and for oral sores (Chopra et *al.* 1956).
19.	***Centella asiatica*** (L.) Urban	Apiaceae	Perup	Halam	Leaf	Eaten either as paste or cooked as a vegetable.	Plant useful as alternative and tonic in diseases of skin, leprosy, nerves and blood; leaves useful for improving memory and in syphilitic skin diseases (Chopra *et al.* 1956).
20.	***Cicca acida*** (Linn.) Merr.	Euphorbiaceae	Har boroi	Tripuri	Stem bark	Decoction @ 1 teaspoon thrice daily.	As a remedy for liver troubles and for blood purification (Das *et al.*,

							2009).
21.	***Clerodendrum viscosum*** Ventenat	Verbenaceae	Chakma-Killiashak Halam-Bhatipaata	Chakma and Halam	Leaves, root	Extract used as expectorant; decoction used in high blood pressure. Root extract administered @ 1 teaspoon thrice daily in fever.	Root paste applied locally in dental caries. Root extract in abdominal pain (Rahman, *et al.*, 2007).
22.	***Costus specious*** (Koenig ex Retzius) Smith	Costaceae	Mylongma Khotomai	Tripuri	Leaves and stem	Leaf juice used as an ingredient of a medicine for jaundice; sap of stem used to remove parasites from ears.	Root astringent, purgative, depurative, stimulant, tonic, anthelmintic, antinode in snake bite (Chopra *et al.* 1956).
23.	***Crinum asiaticum*** L.	Amaryllidaceae	Khobaron	Chakma	Leaves	Leaf juice used in rheumatism both for man and domestic animals.	Many species of *Crinum* used as laxative, expectorant, anti-bilious and in urinary troubles; also used as emollient, emetic, burns, infections, etc.; bulbs used as rubefacient, in piles and abscesses; leaf juice used in ear-ache (Chopra *et al.* 1956).
24.	***Cynodom dactylon*** (L.) Persoon	Poaceae	Dubba	Halam	Young twigs	Ingredient of a four component mixture for jaundice.	Decoction of roots diuretic in dropsy, secondary syphilis; root infusion in piles, crushed roots in chronic gleets; plant juice astringent, useful in cuts and wounds, diuretic, used in dropsy and anasarca, useful in diarrhoea, dysentery, nervous diseases and eye troubles (Chopra *et al.* 1956).
25.	***Eclipta alba*** L. Mant.	Asteraceae	Kalasona	Chakma	Leaf	Administered @ 2 teaspoon twice daily	Leaf extract administered orally in bleeding from nose and mouth (Yusuf, *et al.*, 2007).
26.	***Elusine indica*** (L.) Gaertn	Poaceae		Halam	Leaves	Decoction along with *Mimosa pudica*, *Centella asiatica*,	Plants of this genus are reported for their activity in abdominal

						Averrhoea carambola leaves in 1: 1: 1: 1 ratio administered daily as many times as possible.	distension (Kamble *et al.*, 2008).
27.	***Enhydra fluctuans*** Lour.	Asteraceae	Halancha	Chakma	Leaves and twigs	Extract in equal quantity with *Ipomea aquatica* and *Jussiaea repens* administered @ 1teaspoon thrice daily for 1 week.	Used in treatment of nervous ailments, skin diseases and as a laxative (Chopra *et al.* 1956).
28.	***Entada scandens*** *Benth.*	Papilionaceae	Gila	Halam	Root bark	Pasted and taken in very low concentration with water.	Seeds antiperiodic, emetic & anthelmintic, seed paste in local glandular swellings. Stem is emetic. Juice of wood & bark in ulcers (Chopra, *et al.*, 1956). Bark powder in stomach ulcer, seed powder in fever and headache (Singh, *et al*., 2003).
29.	***Euphorbia nerifolia*** L.	Euphorbiaceae	Sairapal	Halam	Leaves	Leaves heated on fire and placed on chest to control cough.	Milky juice used as purgative, for skin diseases; roots in scorpion sting, snake bite, as antiseptic and fish poison (Chopra *et al.* 1956).
30.	***Ficus hispida*** Linn. f.	Moraceae	Mayungmai	Tripuri	Unripe fruit	2- 3 fruits are smashed lightly & dipped in a glass of milk for 3- 4 days. Then the fruit is taken out and the milk is administered @ ½ cup at 2 hours interval.	Fruit, seed & bark purgative, emetic (Chopra *et al.* 1956).
31.	***Jatropha curcas*** Linn**.**	Euphorbiaceae	Girogaach	Chakma	Branches	Sap of the branches applied locally at the sites of tooth infections	Seeds and roasted nuts purgative; latex useful in scabies, eczema and ringworm; leaves lactagogue, rubefacient (Chopra *et al.* 1956).
32.	***Kaempferia galanga*** L.	Zingiberaceae	Kamala	Chakma	Mature leaves	Two teaspoon of extract every morning in empty stomach for 1 week.	Essential oils from rhizomes in indigestion, cold, pectoral and abdominal pains, headache and toothache.

							Alcoholic maceration as liniment for rheumatism (Keys, 1976 and Lieu, 1990).
33.	***Kaempferia rotunda*** L.	Zingiberaceae	Bhojoraphool	Chakma	Rhizome	Aqueous decoction @1/2 cup a day taken for1 week.	Applied in Indonesia as the traditional insect repellant (Chan, *et al.*, 2009).
34.	***Kalanchoe pinnata*** Pers**.**	Crassulaceae	Khurajot	Chakma	Leaves	2- 3 raw leaves chewed in empty stomach in the morning with ½ teaspoon sugar for 1 week in jaundice.	Juice of leaves styptic; seed on fresh cuts and abrasions, bruises, burns and superficial ulcers, given in bilious diarrhoea, lithiasis (Chopra, *et al.*, 1956). Applied in Indonesia as the traditional insect repellant (Chan, *et al.*, 2009).
35.	***Lasianthus lucidus*** Blume	Rubiaceae	Junilat	Chakma	Young vegetative twigs	Extract administered @ 1teaspoon thrice daily for 1 week.	Various species of genus *Lasianthus* are used in veneral diseases (Craib, 1932).
36.	***Leucas aspera*** Spreng**.**	Laminaceae	Doron pushpa	Chakma	Leaves and twigs	Juice is taken @ 2 tb sp. Daily for 3- 4 days.	Plant is antipyretic & insecticide. Flowers in cold, juice of leaves in psoriasis, scabies & chronic skin eruptions. Leaves useful in chronic rheumatism (Chopra, *et al.*, 1956). Leaves in skin diseases and painful swellings (Singh and Pandey, 1998).
37.	***Mangifera indica*** Linn.	Anacardiaceae	Thaihai	Halam	Dry stem bark	Soaked in water overnight and made into paste in 1:1 ratio with young leaves and twigs of *Cajanas cajan.* The paste is converted to tablets and taken twice daily.	Leaves used in scorpion sting; ripe fruits laxative, diuretic, astringentand antihaemorrhagic; unripe fruits in ophthalmia and eruptions; rind of fruit astringent, stimulant and stomachic; seeds used in asthma; cotyledons antihemorrhagic, stops nasal bleeding, anthelmintic; bark

							astringent, used in uterine bleeding, haemoptysis and melena, diarrhoea (Chopra *et al.* 1956).
38.	***Mimosa pudica*** L.	Mimosaceae	Cheaken laite	Halam	Leaves and root	Leaf paste applied on acne and pimples. Root extract @ 1 teaspoon twice daily in jaundice.	Leaves and roots used in piles and fistula; leaf paste applied to hydrocele; leaf and stem used in scorpion sting (Chopra *et al.* 1956).
39.	***Momordica charantia*** L.	Cucurbitaceae	Gangrauk	Tripuri	Fruits and twigs	Extract @ 2 teaspoons daily.	Leaf juice emetic, purgative, used in biliousness, burning of soles of feet; fruits and leaves purgative, emetic, used in piles, jaundice, leprosy and as vermifuge (Chopra *et al.* 1956).
40.	***Momordica cochinchinensis***	Cucurbitaceae	Shamokarol	Tripuri	Unripe fruit	Cooked as curry with small fishlings. The curry is administered along with the regular meals of the patient of jaundice.	Fruits and leaves are used in external application for lumbago, ulceration and fracture of bones. The seeds are used in the treatment of ulcers, sores and obstructions of liver and spleen (Vashista, 1974).
41.	***Ocimum gratissimum*** L.	Laminaceae	Bantulsi	Tripuri	Leaves	Extract administered in 1: 1 ratio with rhizome extract of *Zingiber officinale* @ 1 teaspoon twice daily for 1 week.	Used in treatment of upper respiratory tract infections, diarrhea, headache, fever, ophthalmic, skin disease and pneumonia (Correa 1932, Onajobi 1986, IIori *et al* ., 1996).
42.	***Ocimum sanctum*** L.	Laminaceae	Tulsi	Tripuri	Leaves	Extract administered @ 1 teaspoon twice daily for 1 week.	Used against cough, fever, dysentery, stomach diseases and as mosquito repellant (Khan and Rashid, 2006).
43.	***Oldenlandia corymbosa*** Linn.	Rubiaceae	Khetpapra	Tripuri	Leaves	Extract administered @ 2 teaspoon thrice daily for 1 week.	Used in African folk medicine for snake bite, given during labour to induce strong uterine also used in treatment of

							intermittent fever and recommended against nervous depression (Olaniyi *et al*, 1973; Gill, 1992).
44.	***Oroxylum indicum*** (L.) Vent.	Bignoniaceae	Halam-Kaak-rakung Tripuri-Taukharun	Halam and Tripuri	Stem bark	The cooled aqueous extract is taken with 2 tablespoons of sugar in 300ml as many times a day as possible.	Root bark in fever, bronchitis, intestinal worms, leucoderma, asthma, inflammation, anal troubles, etc. Fruits and seeds as expectorant, purgative and bitter tonic (Kirtikar and Basu,1996). Stem bark in jaundice (Mokat and Deokule, 2006). Root bark as tonic and astringent, in diarrhoea, dysentery and rheumatism. Tender fruits refreshing and stomachic. Seeds are purgative (Tiwari, *et al.*, 2007).
45.	***Phlogacanthus thyrsiflorus*** (Hardwicke) Mabberley	Acanthaceae	Basokpata	Chakma	Leaves	Leaf extract @ 1 teaspoon twice daily after meals.	Leaf extract administered orally in cough and cold (Kirtikar and Basu, 1996), gout and rheumatism (Roy, *et al.*, 2008).
46.	***Psidium guajava*** L.	Myrtaceae	Sapri	Halam	Fruits and twigs	Young twigs chewed in empty stomach every morning for 1 week.	Root bark reported to be astringent, used in diarrhoea; fruits laxative; leaves astringent, used against diarrhoea, cholera, vomiting, wounds and ulcers (Chopra *et al.* 1956).
47.	***Scoparia dulcis*** L.	Scrophulariaceae	Darlong-Boltekanza Halam-Naipungchewk	Darlong	Leaves and twigs	½ glass of taken once daily for 3- 4 days in empty stomach.	Plant infusion used as ague and as an emetic (Chopra *et al.* 1956).
48.	***Spilanthes paniculata*** Wallich ex. DC.	Asteraceae	Ansha	Halam	Leaves	Juice administered @1 teaspoon thrice daily for 3- 4 days.	Inflorescence used to brush teeth in toothache (Hynniewta and Kumar, 2008).

49.	***Stephania japonica*** (Thunb.) Miers.	Menispermaceae	Thandamanik	Chakma	Leaves	Leaf paste is applied on the belly in stomach-ache during jaundice.	Various species used as astringent, in pulmonary tuberculosis, asthma, dysentery, fever, diarrhoea, dyspepsia, urinary troubles (Chopra *et al.* 1956). Leaf paste locally in facial paralysis (Yusuf, *et al.*, 2007).
50.	***Typhonium trilobatum*** (L.) Schott.	Araceae	Kharkun	Tripuri	Leaves	Paste with a little salt administered @ ¼ cup once daily with rice.	Used in curing skin eruption, in treatment of piles, stomach complaints, haemorrhoids traumatic injury, lymph tuberculosis and tetanus (Kandhasamy and Arunachalam, 2008).
51.	***Urena lobata*** L.	Malvaceae	Rongaachh (C)	Chakma (C)	Stem bark	Used in 1:1 ratio with *Mimosa pudica* root @ 1 teaspoon twice daily for 1 week.	Roots are dieuretic and useful in rheumatic pain (Sikdar and Dutta, 2008).
52.	***Zingiber officinale*** Rosc.	Zingiberaceae	Aada	Tripuri	Rhizome	Extract administered in 1: 1 ratio with leaf extract of *Ocimum gratissimum* @ 1 teaspoon twice daily for 1 week.	Rhizome in fever, cough and menstrual disorder (Singh, *et al.*, 2003). Extract of rhizome in asthma, bronchitis, stomach troubles, insect bites (Kumar, 2002). Sap of rhizome in sores of tongue and choked throat (Singh and Pandey, 1998).

RESULTS

A total of 52 species of plants of ethnomedicinal importance belonging to 36 families of angiosperms were collected. These plants are enumerated here along with their scientific and local names, family, parts used, mode of use, and established uses. A note has been provided wherever necessary.

All the plants recorded were found to be angiosperms. Of all the plants recorded 22 plants have been reported from the respective tribes for the first time to have hepatoprotective property. Among these, plants, 6 have been reported from the Tripuri community, 10 from the Chakmas, 5 from Halams and 1 plant have been reported from the Darlongs (Figure 2).

Out of the 34 species identified taxonomically, 25 are in their wild state and 24 are cultivated for several medicinal purposes. Remaining 3 species are reported to cultivated as well as growing in the wild. As shown in Figure 3, a maximum of 29 formulations have been reported from leaves and twigs followed by

9 from stem and stem bark, 6 from fruits, 5 from rhizome, 3from roots, 2 from seeds and nuts and 1 formulation from branch. No hepatoprotective formulation was reported from the floral organs.

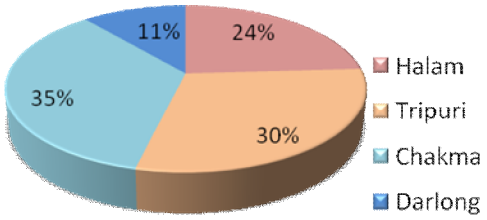

Figure 2: Percentage of plants collected from different communities

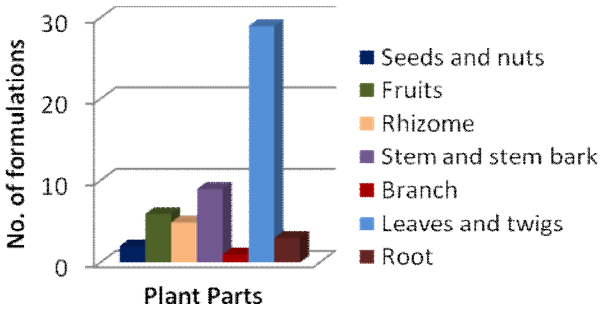

Figure 3: Number of formulations reported from different plant parts

Conclusion

The ethnobotanical lore of the four communities studied shows wide usage of medicinal plants, in different proportions and different combinations in the treatment of various hepatic ailments. The present work reports the use of 52 such plants of which 21 plants have been reported for the first time for their hepatoprotective property during the present work.

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