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Studies on the Ethno-veterinary plants used by the Nepali community of Nagaon and Sonitpur Districts of Assam, India

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Abstract

Cattle farming is one of the most income generating occupation of the Nepali community of Nagaon and Sonitpur Districts of Assam. Nepali community of Nagaon and Sonitpur have been depending on cattle farming for their livelihood since a long time. This community of Nagaon and Sonitpur district is a repository of rich ethno-veterinary knowledge of plants. The study was aimed to explore the ethno-veterinary plants associated with this particular community. As a result of this , 95 plant species from 79 genera belonging to 50 families, used for treating as many as 25 nos. of ailments of domestic animals (*i.e.* Cow, Buffalo and Goat) have been documented. These were based on the ethno-veterinary surveys conducted (interview-questionnaire method). The most commonly and effectively used ethnoveterinary plants are *Caesalpinia bonduc* (Linnaeus) Roxburgh for treating endoparasites; *Bambusa tulda* Roxburgh, *Benincasa hispida* (Thunberg) Cogniaux, *Saccharum officnarum* Linnaeus are used for retension of placenta in cattle, *Litsea glutinosa* (Loureiro) C.B. Robinson for treating indigestion, *Euphorbia neriifolia* Linnaeus for treating diarrhoea and dysentery. *Curcuma longa* Linnaeus for treating foot and mouth disease, *Cissus quadrangularis* Linnaeus and *Cereus triangularis* Miller for healing of bone fracture, *Dioscorea batatus* Linnaeus for treating haemorrhagic septicaemia, *Diplazium esculentum* (Retzius) Swartz used for treating hump sore etc. in domestic animals. Due to changing life style, this unexplored and undocumented knowledge is at the risk of extinction and therefore deserve careful attention, so that this ethno-veterinary knowledge can be conserved for the benefit of the future generation at large.

***Key words*:** Ethnoveterinary, Cattle farming, Nepali community, Nagaon and Sonitpur Districts, Assam

INTRODUCTION

The relation between healing plants and human beings dates back to pre-historic era and so is the relation between man and his domesticated animals. Apart from all the modern medical systems, even today man is dependent on several plants for primary healthcare both for himself and for his pets. This dependency on medicinal herbs is still more in rural areas. But many of these herbal remedies, which are evolved over generations of experiences and practices, are unknown to the modern world. Efforts are made to document all the ethnomedicinal knowledge, but there are few reports on the plants used in veterinary medicine (Pal G.D. 1984; Pal D.C. 1980, 1981; Joshi 1995). Ethno-veterinary medicines have been used since 1800B.C. at the time of King Hamurabi of Babylon who formulated laws on veterinary fees and charged for treating cattle and donkeys (Veen 1996). Many traditional medicines have been abandoned following the discovery of the modern chemotherapy. But,

for more than a decade now ethno-veterinary medicines have experienced a revival and several reports have been published (Selvaraju *et al.* 2011). This growing interest in traditional practices have been encouraged by the recognition of some efficacious ethno-veterinary medicinal products (Selvaraju *et al.* 2011). Ethno-veterinary medicine often provides cheaper options than comparable western drugs, and the products are locally available and more easily accessible. In the face of these and other factors, there is increasing interest in the field of ethno-veterinary research and development (Zschocke *et al*. 2000; Masika *et al*. 2000; Tabuti *et al*. 2003; Yineger *et al*. 2007; Masika & Afolayan 2003; Kone & Atindehou 2008). Resource-poor livestock farmers all over the world have limited access to modern disease prevention and treatment practices particularly in the areas with inadequate health service coverage. They frequently depend on traditional knowledge for the management of animal health problems and to improve their productivity. Despite the fact that ethno-veterinary medicine has been very crucial in animal health-care for most developing countries, it has not yet been well documented and much effort is needed in research for integrating activities in such countries (Yineger *et al*. 2007). The possible benefit of plant derived medications constitutes a rewarding area of research, particularly in countries like India, which have a rich diversity of natural plant resources coupled with a high prevalence and variety of infectious diseases. The characteristics, sophistication, and intensity of the ethno-veterinary systems differ greatly among individuals, societies, and regions. Hence, documentation of ethno-veterinary medicine from regions having a rich ethnographic and biodiversity setting would be of great significance.

Some studies on ethno-veterinary practices from different regions of India have been reported (Pinokiyo *et al*. 2014; Singh *et al.* 2013; Harsh *et al.* 2005; Katewa *et al.* 2006; Deshmukh *et al.* 2010; Das *et al.* 2013) but there are only few (Borthakur *et al.* 1996) investigations available from Sonitpur district, Assam. Therefore, the present study was conducted to identify, collect and document the ethno-veterinary medicinal plants used by the Nepali community of Nagaon and Sonitpur district, Assam and their utilization for primary health care and to treat different ailments of animals.

Nepali community, amongst different communities existing in Assam has rich cultural heritage. They are scattered all over Assam and other North Eastern states as well. They are basically known for their dairy business and cattle rearing had started migrating in large numbers in this part of the country since 1816, when the British recruited Gorkhas in their Army. Gorkhas who are warriors are generally known for their bravery.

Nagaon is situated in central part of Assam. The boundary of the district is that by north it is bounded by Sonitpur district and the River Brahmaputra, south is bounded by West Karbi Anglong and N.C. Hills, East is bounded by East Karbi Anglong and Golaghat district.The district lies between 25° 45' to 26° 45' North latitude and 92° 33' to 92° 41' E. The average altitude is about 60.6 M. The area of the district is about 4435.3 sq km with total population 1893171 (1991) persons. The climate of this district in general monsoon type of climate. The temperature of the Nagaon is about Max. 24.8 ° C and Min. 11.2° C during winter and summer Max. 32.9 ° C and Min. 25.5 ° C. Forests in Nagaon district are mostly of moist deciduous type.

Sonitpur is situated in the North bank of River Brahmaputra. Its geographical location is 92° 16' E to 93° 43' E longitude and 26° 30' to 27° 1' N latitude. Arunachal Pradesh bound Sonitpur district on the North, River Brahmaputra on the South, Lakhimpur district on the East and Darrang district on the West. The temperature varies from 17° C - 37° C. The vegetation is tropical rain- forest and includes semi-evergreen and mixed deciduous forests.

MATERIALS AND METHODS

The study has been conducted among the Nepali community during March 2011 – October 2014 in *Missa, Jakhalabandha* and *Sulung* villages of Nagaon district and *Tezpur, Biswanath Chariali, Gohpur* and *Dhekiajuli* villages of Sonitpur district of Assam. The study was concentrated on the common diseases of cow, buffalo and goat.

The primary information regarding the use and values of plants were collected during the field work comprising two approaches i.e. survey technique and inventory technique. The survey technique (Deshmukh *et al.* 2010) included individuals and in-depth interviews, and focus group discussion among the local plant users, community members and healers, persons having indigenous knowledge etc. The inventory technique comprised the collection of different plant specimens from the study area, their identification with vernacular names, parts used, and purpose of use etc with the participation of medicine men, *Gaon Burahs*, *Ojah/Dhami* as well by interaction with the local people. Details of use including the approximate amounts and number of doses per day or week were recorded for specific diseases for authentication and validation (Jain 1989). The study was concentrated on the common diseases in domestic animals (i.e. Cow, buffalo and goat) possessed by the farmers, and local plants and plant parts used for treating these diseases. The primary health care system has been documented through interviews with the knowledgeable and elderly persons of the community using semi-structured questionnaire. Permission was taken from the Community leaders for publishing the knowledge imparted by them.

The collected plant specimens were processed into mounted herbarium sheets (Jain & Rao 1977) and were identified with the help of various literature including Hooker (1872 - 1897), Kanjilal *et.al.* (1934 – 1940), Bor (1940), Deb (1961a,b) and Sinha (1987) and by consulting experts. Identification of specimens were confirmed by matching at Assam University Herbarium and at ASSAM. Secondary informations were collected by reviewing numerous published works related to the present study and are referred appropriately.

Almost all possible information regarding the medicinal uses of collected plants by the Nepali community has been included in the text/result.

RESULTS AND DISCUSSION

Various plants and ingredients used by local herbalists to treat livestock (cow, buffalo and goat) in the study area are enumerated in Table 1. Plants are arranged in alphabetical order with their botanical name, family, vernacular name, parts used and method of application. A total of 95 species under 79 genera belonging to 50 families has been recorded, of which 94 species are angiosperms and only one species is Pteridophyte.

From the study it has been observed that there are about 7 dominant families of the plants being used by the Nepali community *viz*, Leguminosae (10 spp.), Poaceae, Solanaceae and Rutaceae (6 spp. each), Asteraceae, Moraceae and Cucurbitaceae (4 spp. each) (Fig.1).

It has been observed that, different parts of different species are used by the Nepali community as medicine. For curing diverse form of ailments, the use of above ground plant/ aerial parts are higher than the underground parts (Fig 2). Of the aerial parts, leaf is mostly used (from 33 species), followed by fruits of 17 species, and seeds of 10 species). Different underground parts like roots and rhizomes also have been found to be in use.

It has also been observed that out of the total 25 different types of animal ailments recorded, 21 species of plants are used for the treatment of stomach troubles like indigestion, diarrhoea and dysentery. About 80 species are used in curing major diseases like urinary troubles (8 species), 3-days sickness (3 species), Ectoparasites (7 species), Endoparasites (18 species),

Table1. Ethno-veterinary plants used by the Nepali community of Nagaon and Sonitpur districts of Assam

Plant species	Nepali name	Parts used	Use
Abrus precatorius Linnaeus [Leguminosae: Papilionoideae]; *Rinju 0145*	*Siltimur*	Seed	Seeds soaked in water for overnight; its paste give instant cure for any urinary trouble and in indigestion (goat, cow & buffalo)
Ageratum conyzoids (Linnaeus) Linnaeus [Compositae]; *Rinju 0029*	*Ilamjehar*	Stem, Leaf	Paste applied on cuts and wounds
Albizia lebbeck (Linnaeus) Bentham [Leguminosae : Mimosoideae]; *Rinju 0114*	*Siris*	Bark	Bark powder boiled in water and applied on cuts and wounds (goat, cow &buffalo)
Allium cepa Linnaeus [Amaryllidaceae]; *Rinju 0025*	*Piyaz*	Bulb	Juice is given for 3-days sickness and in indigestion of cows; paste smeared to kill ectoparasites of cows& buffalos
Allium sativum Linnaeus [Amaryllidaceae]; *Rinju 0144*.	*Lesun*	Bulb	Juice mixed with *Zingiber officinale* rhizome given for 3-days sickness and in indigestion; paste mixed with mustard oil applied on infected nipple
Alpinia nigra (Gaertner) Burtt [Zingiberaceae]; *Rinju 0132*	*Tora gojali*	Root	Juice is given for 3 days in empty stomach for endoparasitic infestations
Alstonia scholaris (Linnaeus) R. Brown[Apocynaceae]; *Rinju 0042*	*Chatyan*	Bark	Juice or dried powder (2/3 tablespoon) is given 3 times daily for good health of cow
Alternanthera sessilis (Linnaeus) R. Brown *ex* A.P. de Candolle [Amaranthaceae]; *Rinju 0165*	-------	Stem, Leaf	Juice of leaf and stem mixed with (4 nos.) of green chilli, trace amount of salt and half onion bulb is given in indigestion of cow & goat.
Amphineuron opulentum (Kaulfuss) Holttum [Thelypteridaceae]; *Rinju 0043*	*Bihlong-ini*	Leaf , Stem	Paste is applied in skin diseases of cow and goat.
Annona squamosa Linnaeus [Annonaceae]; *Rinju 0127*	*Chittaph ol*	Leaf	The crushed leaf is applied to kill ectoparasites of goat and cow.
Areca catacheu Linnaeus [Arecaceae]; *Rinju 0137*	*Supari*	Fruit	Juice mixed with trace amount of lime and leaf juice of *Nicotiana tabacum* is applied in kerato-conjunctivitis.
Artocarpus chaplasha Gamble [Moraceae]; *Rinju 0167*	*Borero*	Fruit, Stem	Juice mixed with leaf juice of *Ficus glomerata* is given for milk production of cow and buffalo. Stem juice is given for endoparasitic infestations in calf.
Azadirachta indica A. Jussieu [Meliaceae]; *Rinju 0048*	*Neem*	Leaf	Decoction of leaf is given for endoparasitic infestations (cow & goat).
Bambusa balcooa Roxburgh [Poaceae]; *Rinju 0149*	*Bhulkab-ans*	Leaf	Given to hasten placental discharge of cow following delivery also given for milk fever (hypercalcaemia).
Bambusa tulda Roxburgh [Poaceae]; *Rinju 0150*	*Bijuli bans*	Leaf	Given to hasten placental discharge of cow following delivery
Bambusa vulgaris Schrader [Poaceae]; *Rinju 0151*	*Bans*	Leaf	Given to hasten placental discharge of cow following delivery. Crushed leaves are applied in bone fracture of cattle.
Benincasa hispida (Thunberg) Cogniaux [Cucurbitaceae]; *Rinju 0050*	*Kumra*	Seed , Leaf	Juice is given to calf for expulsion of worms. Leaves are given to hasten placental discharge of cow following delivery
Brassica nigra (Linnaeus) K. Koch [Brassicaceae]; *Rinju 0024*	*Kalo sarso*	Seed	Mustard oil cake mixed with water and warmed slightly and given for milk fever (hypercalcaemia). Mustard oil mixed with *Curcuma longa* is applied on naval infection of new born calf. Mustard oil mixed with *Curcuma longa* and jaggery is given to hasten placental discharge of cow following delivery. Mustard oil mixed with *Allium sativum* is applied on the nipple infection of lactating cow.
Bryophyllum pinnatum (Lamarck) Oken [Crassulaceae]; *Rinju 0045*	*Bidyap-aat*	Leaf	Juice is given for any kind of urinary troubles of cow and buffalo. Crushed leaves are applied on wound infections.

Plant species	Nepali name	Parts used	Use
Caesalpinia bonduc (Linnaeus) Roxburgh [Leguminosae: Caesalpinioideae]; *Rinju 0108*	*Late guti*	Seeds	Juice mixed with the leaf and stem juice of *Grewia asiatica* is given for endoparasitic infestations of cattle.
Cajanus cajan (Linnaeus) Millspaugh [Leguminosae: Faboideae]; *Rinju 0159*	*Arhar*	Leaf	Crushed leaves are rubbed on tongue infection of cow.
Calotropis gigantea (Linnaeus) Dryander [Apocynaceae: Asclepiadoideae]; *Rinju 0006*	*Ank*	Latex	Latex is applied on the other part of the body for another new infection so that flies get attracted to that part and hump sore is cured.
Cannabis sativa Linnaeus [Cannabaceae]; *Rinju 0092*	*Bhang*	Leaf	Juice is given in indigestion and dysentery of cow and goat
Capsicum annum Linnaeus [Solanaceae]; *Rinju 0155*	*Khurch-ani*	Fruit	Fruit boiled in water and the foot and mouth is washed thoroughly for FMD of cow.
Capsicum frutescens Linnaeus [Solanaceae]; *Rinju 0135*	*Khurch-ani*	Fruit	Paste of ripe fruit mixed with mustard oil is applied on tongue infections.
Carica papaya Linnaeus [Caricaceae]; *Rinju 0104*	*Mewa*	Root	Juice is given two times daily for urinary troubles till cure.
Carum copticum (Linnaeus) Bentham [Apiaceae]; *Rinju 0026*	*Ajwain*	Seed	Decoction of seeds given in any kind of stomach troubles. Also in endoparasitic infestations.
Cassia fistula Linnaeus [Leguminosae : Caesalpinioideae]; *Rinju 0093*	*Sunaru*	Seed	Dried powder mixed with water is given in urine trouble as instant cure.
Cayratia trifolia (Linnaeus) Domin [Vitaceae]; *Rinju 0128*	-------	Whole Plant	Paste is applied on the neck to reduce the swelling (haemorrhagic septicaemia).
Centella asiatica (Linnaeus) Urban [Apiaceae]; *Rinju 0031*	*Taaprej-har*	Whole Plant	Juice is given in pneumonia.
Cereus triangularis Miller [Cactaceae]; *Rinju 0035*	*Hodjor*	Phylloclade	Crushed phylloclade is applied to cure bone fracture of cattle for healing.
Cheilocostus speciosus (J. Koening) C.D. Specht [Costaceae]; *Rinju 0129*	*Betlori*	Root	Juice mixed with *Cereus triangularis*, bark of *Oroxylum indicum* and fruit juice of *Psidium guajava* is given for any kind of stomach troubles.
Chromolaena odorata (Linnaeus) R.M. King & H.E. Robinson [Asteraceae]; *Rinju 0139*	*Titipaate*	Leaf	Juice mixed with trace amount of salt is given in kerato-conjunctivitis
Cissus quadrangularis Linnaeus [Vitaceae]; *Rinju 0036*	*Hodjor*	Stem	Crushed stem parasites is applied to cure bone fracture of cattle for healing.
Citrus aurantiifolia (Christmann) Swingle [Rutaceae]; *Rinju 0118*	*Kaji nimbu*	Fruit	Paste is applied on foot of a cow (FMD). Fruit is preserved in common salt for 2-3 years is given during mucous in the faeces. Juice is given in empty stomach for expulsion of worms of cattle.
Citrus x aurantium Linnaeus [Rutaceae]; *Rinju 0119*	*Kamla*	Fruit	It is given in dysentery and diarrhoea.
Citrus grandis Osbeck [Rutaceae]; *Rinju 0059*	*Rabab tenga*	Fruit	Dried skin powder of fruit is mixed water or fruit juice is given endoparasitic infestation for cattle.
Citrus limon (Linnaeus) Osbeck [Rutaceae]; *Rinju 0120*	*Thulla nimbu*	Fruit	Fruit juice is given for endoparasitic infestation and in indigestion
Citrus medica Linnaeus [Rutaceae]; *Rinju 0117*	*Jara nimbu*	Fruit	Juice is given for endoparasitic infestations and in indigestion.
Citrus paradisi Macfadyen [Rutaceae]; *Rinju 0056*	*Gol nimbu*	Fruit	Juice is given for dysentery, diarrhoea & indigestion
Cocos nucifera Linnaeus [Arecaceae]; *Rinju 0103*	*Nariol*	Fruit	Coconut oil mixed with the paste of *Curcuma longa* is applied in naval infection of calf. Tender coconut water is given in diarrhoea and dysentery.
Colocasia sp. [Araceae]; *Rinju 0237*	*Phutuki kochu*	Rhizome	Crushed rhizome is rubbed on the tongue 2-3 times daily to reduce the swelling of neck (Haemorrhagic septicaemia).

Plant species	Nepali name	Parts used	Use
Cucurbita maxima Duchartre [Cucurbitaceae]; *Rinju 0130*	*Kaddu*	Fruit	Fruit mixed with jaggery and *Ipomoea batatus* is given for milk production in lactating cow.
Curcuma longa Linnaeus [Zingiberaceae]; *Rinju 0049*	*Holdi*	Rhizome	Fresh rhizome paste mixed with mustard oil is applied on the naval infection of calf. Crushed rhizome is applied on foot and mouth diseases of cow. Paste is also applied in nipple infection of lactating cow.
Cuscuta reflexa Roxburgh [Convolvulaceae]; *Rinju 0044*	*Poylula-hari*	Stem	Crushed stem parasite is applied on foot disease of cow and buffalo (FMD).
Datura metel Linnaeus [Solanaceae]; *Rinju 0081*	*Dhatura*	Seed	Paste is applied on body to kill ectoparasites of cow and buffalo. Crushed seed is applied when a cattle is bitten by a dog.
Dillenia indica Linnaeus [Dilleniaceae]; *Rinju 0148*	*Ootenga*	Fruit	Juice is given in diarrhoea and dysentery and also given for endoparasitic infestations of cow and buffalo.
Dioscorea batatus Linnaeus [Dioscoreaceae]; *Rinju 0014*	*Bhegur*	Bulbil	Paste is applied on swelling of neck (haemorrhagic septicaemia).
Diplazium esculentum (Retzius) Swartz [Athyriaceae]; *Rinju 0022*	*Dhekia*	Leaf	Crushed leaf is applied on the hump sore.
Eclipta prostrata (Linnaeus) Linnaeus [Asteraceae]; *Rinju 0003*	*Bongiraj*	Whole Plant	Crushed plant is applied on cuts and wounds of cow and goat.
Erythrina stricta Roxburgh [Leguminosae: Faboideae]; *Rinju 0155*	*Phaledor*	Bark Leaf	Juice is sprayed in the cowshed. Paste is applied before infection (FMD) as a preventive cure.
Euphorbia neriifolia Linnaeus [Euphorbiaceae]; *Rinju 0064*	*Seuri*	Latex, Leaf, Stem	Latex is applied on the opposite side of the infected eye in opacity. Leaf decoction is given in diarrhoea and dysentery. Stem mixed with dry chilli and boiled in water and applied in nipple infection.
Ficus glomerata Roxburgh [Moraceae]; *Rinju 0116*	*Khosreto*	Leaf	Leaves are given to hasten placental discharge of cow following delivery. Leaf juice mixed with leaf juice of *Ricinus communis* for milk production.
Garcinia cowa Roxburgh *ex* Choisy [Clusiaceae]; *Rinju 0027*	*Thekera tenga*	Fruit	Juice is given in dysentery and diarrhoea (cow & buffalo). 4-5 pieces dipped in water for overnight and given for endoparasitic infestations of cattle.
Garcinia pedunculata Roxburgh *ex* Buchanan-Hamilton [Clusiaceae]; *Rinju 0028*	*Thekera tenga*	Fruit	Juice is given in dysentery and diarrhoea (cow & buffalo). 4-5 pieces dipped in water for overnight and given for expulsion of worms.
Hibiscus rosa-sinensis Linnaeus [Malvaceae]; *Rinju 0061*	*Devi phul*	Flower	Juice is given three times daily for 2-3 days in blood urination of cow and in indigestion.
Ipomoea batatus (Linnaeus) Lamarck [Convolvulaceae]; *Rinju 0131*	*Mitho aalu*	Tuber	It is given along with Fruit of *Cucurbita maxima* and jaggery for milk production of cow.
Lagenaria vulgaris Seringe [Cucurbitaceae]; *Rinju 0153*	*Lauki*	Leaf	Massage of swelling of neck and leg due to injury by warmed leaf.
Leucas aspera (Willdenow) Link [Lamiaceae]; *Rinju 0058*	*Drunapuspa*	Whole plant	Crushed plant is applied on body to kill ectoparasites of cow and buffalo.
Lilium sp. [Liliaceae]; *Rinju 0238*	*Hare lesun*	Bulb	Juice mixed with juice of *Allium cepa* and *Zingiber officinale* is given in indigestion of cow and buffalo. Juice also given in haemorrhagic septicaemia for 3-4 days.
Litsea glutinosa (Loureiro) C.B. Robinson [Lauraceae]; *Rinju 0156*	*Koulou*	Bark	Paste is applied in bone fracture of cattle. Dried bark powder is given along with Chapati for indigestion and any urinary troubles.
Luffa aegyptiaca Miller [Cucurbitaceae]; *Rinju 0122*	*Bhul*	Leaf	Juice is given for expulsion of worms (cow & goat).

Plant species	Nepali name	Parts used	Use
Lycopersicon esculentum Miller [Solanaceae]; *Rinju 0138*	*Tamatar*	Root	Juice given 2-3 times daily in indigestion of cow.
Mimosa pudica Linnaeus [Leguminosae: Mimosoideae]; *Rinju 0109*	*Lajjebon*	Root	Juice given once daily for 3 days in empty stomach in 3 days sickness and also for expulsion of worms of cow. Pieces of 3 inches of root is tied on a white thread and tied on the neck of cow to hasten placental discharge following delivery.
Mirabilis jalapa Linnaeus [Nyctaginaceae]; *Rinju 0115*	*Malatip-hul*	Root	Juice given for 2 days in any urinary trouble.
Morus alba Linnaeus [Moraceae]; *Rinju 0100*	*Timur*	Bark, Fruit, Root	Juice is used for Melina of cow and buffalo and given for endoparasitic infestations of calf.
Morus sp. [Moraceae]; *Rinju 0231*	*Sindho-ray*	Bark	Juice mixed with root juice of *Costus speciosus*, root juice of *Cereus triangularis*, bark juice of *Oroxylum indicum* and fruit juice of *Psidium guajava* given in diarrhoea (cow & buffalo).
Moringa oleifera Lamarck [Moringaceae]; *Rinju 0057*	*Sajana*	Root	Crushed root is applied on maggot infested wounds of cattle to kill the worms and to heal the wound in legs of cow.
Musa x balbisiana Colla [Musaceae]; *Rinju 0054*	*Aathiak-era*	Inflorescence	Paste is rubbed on tongue infection and also applied in foot and mouth disease (FMD) for 3 days.
Musa sapientum Linnaeus [Musaceae]; *Rinju 0098*	*Bhimkera*	Inflorescence	It is tied on white rope and tied on neck of a cow to hasten placental discharge following delivery.
Myristica longifolia Wallich (Myristicaceae); *Rinju 0147*	*Jai paatri*	Flower	The crushed flower is applied on sores of pox in cattle.
Nicotiana tabacum Linnaeus [Solanaceae]; *Rinju 0037*	*Saadha patta*	Leaf	Crushed leaf is applied to kill ectoparasites and also to cure cuts and wounds due to injury.
Nigella sativa Linnaeus [Ranunculaceae]; *Rinju 0038*	*Kalo jira*	Seeds	Seeds mixed with jaggery, *Carum copticum* and pulses is given after delivery to decrease fat content of milk (colostrums) of cow & buffalo.
Nyctanthes arbor-tristis Linnaeus [Oleaceae]; *Rinju 0012*	*Parijaat*	Leaf Flower	Tender leaf juice given in any urinary troubles of cow and goat. Floral juice mixed with dried seeds of *Piper nigrum* applied in Karato-conjunctivitis(2-3 times daily).
Ocimum americanum Linnaeus [Lamiaceae]; *Rinju 0112*	*Tulsi*	Leaf	Juice mixed with juice of fresh rhizome of *Curcuma longa* is applied in foot and mouth disease of cow.
Ocimum sanctum Linnaeus [Lamiaceae]; *Rinju 0010*	*Tulsi*	Leaf	Juice mixed with juice of fresh rhizome of *Curcuma longa* is applied in foot and mouth disease of cow.
Oroxylum indicum (Linnaeus) Kurz [Bignoniaceae]; *Rinju 0067*	*Totelo*	Fruit Bark	Paste is applied on cuts and wounds due to injury.
Oryza sativa Linnaeus [Poaceae]; *Rinju 0018*	*Dhaan*	Seed	It is given to hasten placental discharge following delivery of cow.
Oxalis corniculata Linnaeus [Oxalidaceae]; *Rinju 0062*	*Sariyomil o*	Whole plant	The crushed plant is mixed with seeds (3-5 nos.) of *Piper nigrum* 2-3 times daily in kerato-conjunctivitis.
Paederia foetida Linnaeus [Rubiaceae]; *Rinju 0039*	*Paadelat a*	Leaf	Leaves are given for general weakness of cattle.
Piper nigrum Linnaeus [Piperaceae]; *Rinju 0099*	*Gol marich*	Seed	Dried seed powder is applied in kerato-conjunctivitis of cow and buffalo.

Plant species	Nepali name	Parts used	Use
Prunus persica (Linnaeus) Batsch [Rosaceae]; *Rinju 0143*	*Aaru*	Leaf	The crushed leaves are applied on new born calf for naval infection. It is mixed with naphthalene ball applied on maggots infested wounds of cattle to kill the worms.
Psidium guajava Linnaeus [Myrtaceae]; *Rinju 0008*	*Ambak*	Leaf	Juice of tender leaves mixed with *Curcuma longa* and curd given in diarrhoea of cow and buffalo.
Punica granatum Linnaeus [Punicaceae]; *Rinju 0121*	*Dalim*	Fruit	Juice is given in diarrhoea and dysentery of cattle.
Ricinus communis Linnaeus [Euphorbiaceae]; *Rinju 0146*	*Eripaata*	Leaf	Juice mixed with leaf juice of *Ficus glomerata* given for milk production. It acts as dietary supplement of cow and buffalo.
Saccharum officinarum Linnaeus [Poaceae]; *Rinju 0034*	*Ganna*	Leaf	Leaves are given to hasten placental discharge following delivery of cow.
Solanum melongena Linnaeus [Solanaceae]; Rinju 0017.	*Baigun*	Leaf	Leaves along with the leaves of *Oryza sativa* are given to hasten placental discharge following delivery of cow.
Senna occidentale (Linnaeus) Link [Leguminosae : Caesalpinioideae]; *Rinju 0106*	*Taapre*	Leaf	Juice given for endoparasitic infestations in calf.
Senna tora (Linnaeus) Roxburgh [Leguminosae : Caesalpinioideae]; *Rinju 0108*	*Taapre*	Leaf	Juice given for endoparasitic infestations in calf.
Spondias pinnata (Linnaeus *f*.) Kurz [Anacardiaceae]; *Rinju 0002*	*Amara*	Seed	The crushed seeds are applied in skin disease of cattle.
Tagetes erecta Linnaeus [Asteraceae]; *Rinju 0030*	------	Leaf	Juice mixed with leaf juice of *Bryophyllum pinnata* given in urinary troubles.
Tamarindus indica Linnaeus [Leguminosae: Caesalpinioideae]; *Rinju 0141*	*Imli*	Fruit	Fruit mixed with the crushed leaves of *Zea mays* is applied on tongue with boils.
Terminalia arjuna (Roxburgh *ex* A.P. de Candolle) Wight & Arnott [Combretaceae]; *Rinju 0071*	*Arjun*	Twig	Twig is kept in the cowshed as prevention from communicable diseases.
Zea mays Linnaeus [Poaceae]; *Rinju 0142*	*Mokoi*	Leaf	The crushed leaves along with fruit of *Tamarindus indica* is applied on tongue with boils.
Zingiber officinale Roscoe [Zingiberaceae]; *Rinju 0026*	*Adrak*	Rhizome	Juice is given two times daily for indigestion of cow. Juice mixed with the bulb juice of *Allium sativum* given for 3 days sickness of cow.

Kerato-conjunctivitis (6 species), bone fracture (4 species), Foot and Mouth Disease (FMD) (7 species), Hemorrhagic septicaemia (4 species) and Hump sore (2species) (Fig.3). Minor ailments i.e. cuts and wounds (10 species), dietary supplements (10 species), cough & cold (1 species), placental discharge (10 species), milk fever (3 species), tongue infection (2 species), naval infections of calf (3 species), nipple infections of lactating cow (3 species), etc.

Some of the noteworthy ethno-veterinary medicinal plants used by most of the interviewed informants from the Nepali community are *Abrus precatorius* for urinary troubles and indigestion; *Bambusa tulda, Bambusa balcooa, Bambusa vulgaris, Benincasa hispida, Brassica nigra, Mimosa pudica, Oryza sativa, Saccharum officinarum* and *Solanum melongena* used to hasten placental discharge following delivery; *Bambusa balcooa, Brassica nigra* and *Lilium sp.* used for milk fever (hypercalcaemia); *Datura metel* for dog bite; *Allium sativum, Brassica nigra* and *Euphorbia neriifolia* in nipple infections of lactating cows; *Morus alba* to treat Melina of cows and buffalos; *Curcuma longa, Cocos nucifera* and *Prunus persica* used for naval infections of calves and *Cajanus cajan* and *Capsicum frutescens* to cure tongue infection of cattle.

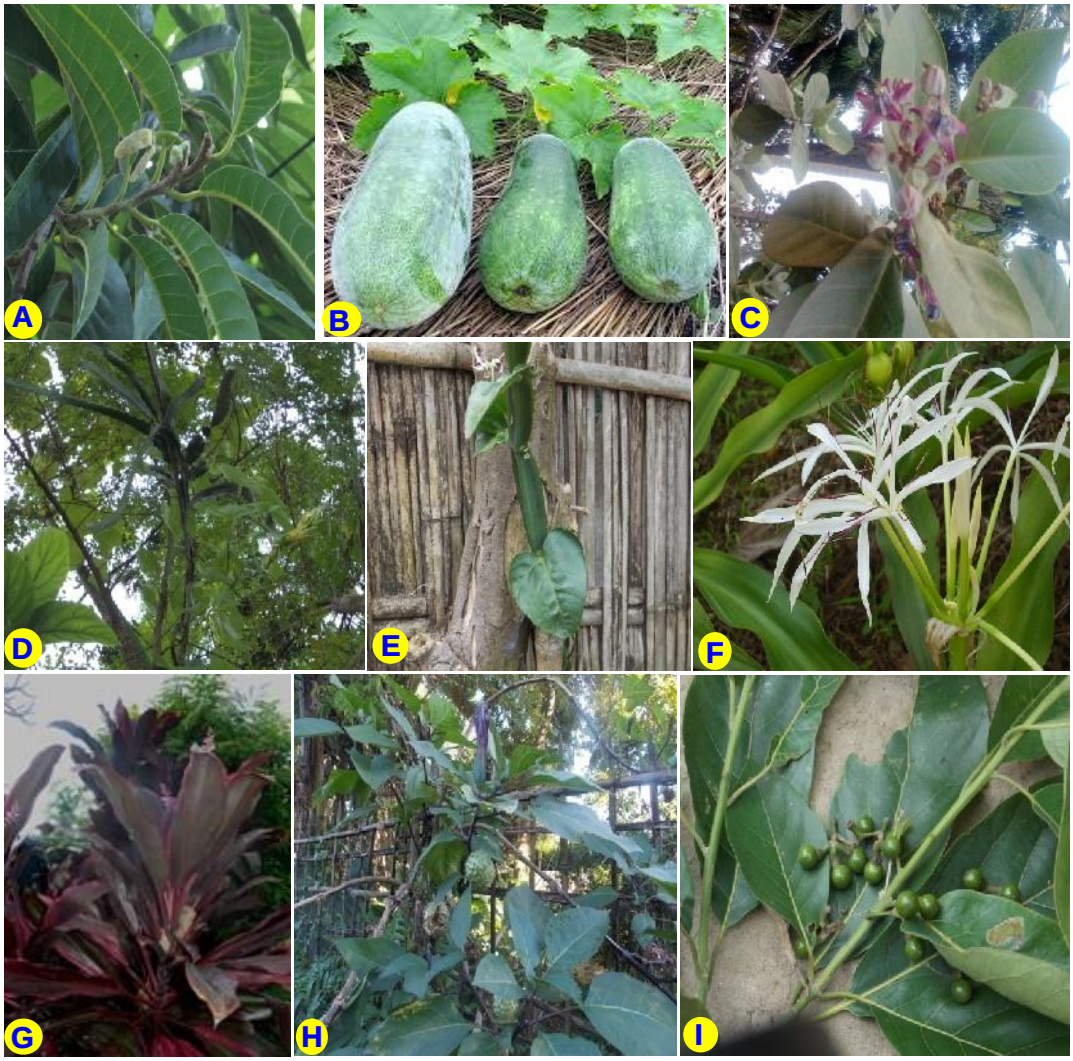

PLATE - I: Some ethnoevterinary plants of Sonitpur and Nagaon districts of Assam. A. *Annona squamosal* Linnaeus; **B**. *Benincasa hispida* (Thunberg) Cogniaux; **C**. *Calotropis giganteum* (Linnaeus) R.Brown; **D**. *Cereus triangularis* Miller; **E**. *Cissus quadrangularis* Linnaeus; **F**. *Crinum asiaticum* Linnaeus; **G**. *Cordyline terminalis* (Linnaeus) Kunth; **H.** *Datura metal* Linnaeus; **I**. *Litsea glutinosa* (Loureiro) C.B. Robinson

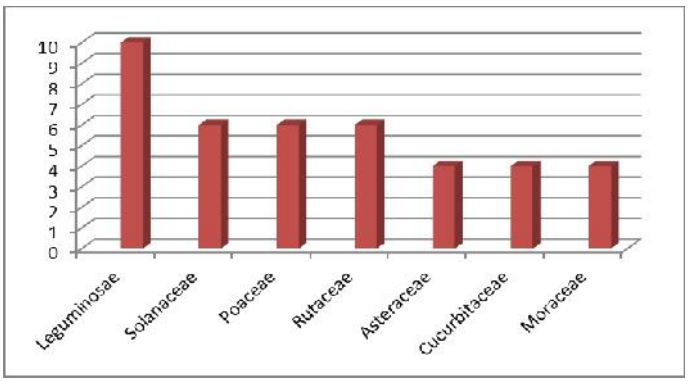

Fig. 1. Dominant families of the collected ethnoveterinary plants with number of species used by the Nepali community of Nagaon and Sonitpur Districts (Assam).

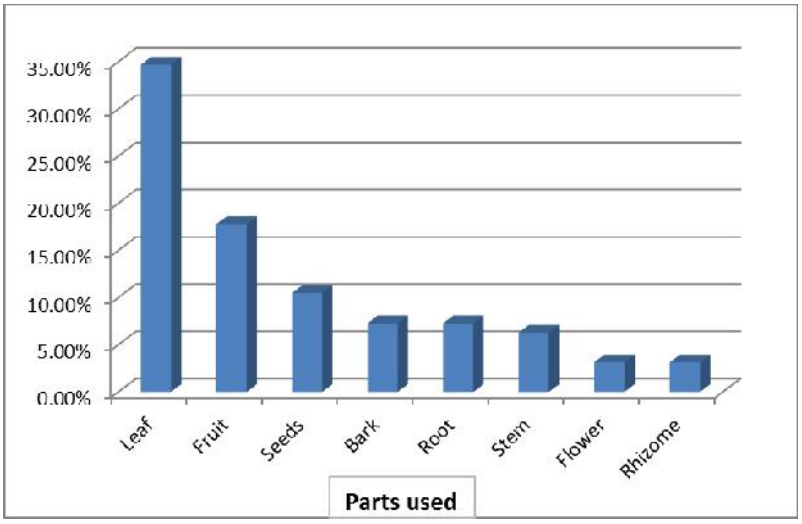

Fig. 2. Percentage of plant parts used as Ethno-veterinary medicine by the Nepali community of Nagaon and Sonitpur Districts of Assam

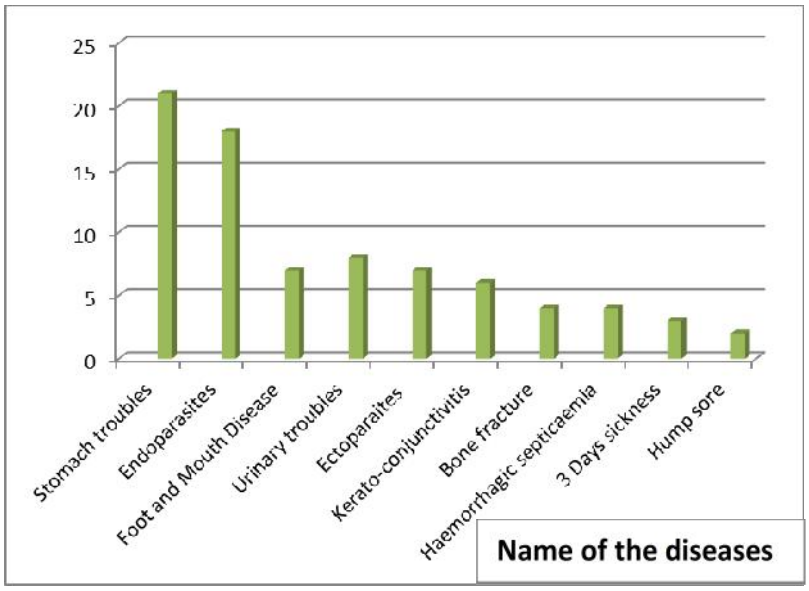

Fig. 3. Number of plant species used for treating major diseases of cattle by the Nepali community of Nagaon and Sonitpur Districts of Assam

Most of the reported plants in the present study are also used by the different other tribal people in India for the treatment of various diseases in livestock (Girach *et al.*1998; Reddy *et al.* 2006; Mini & Sivadasan 2007; Harsha *et al.* 2005; Satya & Solanki 2009;Yadhav 2009; Rahman *et al.* 2009). Of the plants used by the Nepali community in the present study, some of the plants were reported to treat other diseases in animals by the previous researchers. Geetha *et al.* (2006) reported that plants like *Aloe vera, Azadiracta indica, Cardiospermum halicacabum, Cissus quadrangularis, Citrullus colocynthis* and *Pedalium murex* are used by the Malaiyali tribals in Kolli hills of Namakkal district, Tamil Nadu for the treatment of different types of diseases in livestock. Traditional veterinary practices reported from Dindigul district, Andhra Pradesh (Rajan & Sethuraman 1997) and some southern districts

of Tamil Nadu (Ganesan *et al.* 2008) showed some resemblance with the present study but most of the uses are found to be different. Kiruba *et al.* (2006) reported that *Abrus precatorius, Abutilon indicum, Acalypha indica, Achyranthes aspera, Aloe vera, Andrographis paniculata, Aristolochia bracteolata, Azadirachta indica, Calotropis gigantea, Senna tora, Cissus quadrangularis, Dendrocalamus strictus, Euphorbia hirta, Gymnema sylvestre, Pergularia deamia* and *Vitex negundo* are used by the indigenous people of Kanyakumari district, Tamil Nadu for the treatment of different types of diseases in livestock. Takhar & Chaudhury (2004) have reported the use of *Abrus precatorius* in cattle for the expulsion of placenta by the folk people of Southern Rajasthan. Dey & De (2010) have found the use of *Abrus precatorius* in curing eye diseases of cattle. *Azadirachta indica* has been found to be very useful in different ethno-veterinary practices in Uttaranchal, India, like retention of urine, broken horn, burn, indigestion, snake-bite, foot & mouth diseases and lockjaw (tetanus). Acharya & Achraya (2010) have reported the use of *Azadirachta indica* as anthelmintic by the people of Sardikhola VDC, Kaski of Nepal to treat livestock diseases. Takhar & Choudhary (2004) have mentioned the use of this plant in swellings and inflammations of cattle. Dey & De (2010) have found that the seed-oil of *Azadirachta indica* is used to cure parasitic skin diseases of cattle by the tribals in Purulia district of West Bengal. *Calotropis gigantea* has been reported to be useful to cure fever by the Gond tribe of Andhra Pradesh, India (Reddy *et al*. 2006). In rural Sundarbans, West Bengal, at the appearance of swelling of throat region due to hemorrhagic septicemia or worm infestation in cattle, *Calotropis gigantea* is being used (Das & Tripathy 2009). *Cassia fistula* has been found to be used in constipation and food poisoning of cattle in Uttaranchal (Pande *et al*. 2007), whereas the fruits are heated and applied on the neck of cattle to reduce swelling due to cold by the tribals of Purulia. *Erythrina arborescens* is used to treat eye diseases of cattle by the tribes of Uttaranchal (Pande *et al*. 2007). *Erythrina variegata* has been found to be used in treating sprains of cattle by the tribals of Purulia. *Litsea glutinosa* has been found to be used in bone fracture of cow, buffalo and goat by the Nepali community of Sonitpur district in Assam, this information is in agreement with the study of Chakraborty & Bhattacharjee (2006), who have described its use in bone fracture of animals.

The study revealed that Sonitpur Region is extremely rich in potential ethno-veterinary plant wealth and traditional knowledge. The important and common domestic animals of this community are cow, buffalo and goat. The Nepali community generates income by rearing these animals. Dairy farming is their main occupation.

The traditional healers of this area grow many of their required plants in the home gardens and the remaining plants they collect from the nearby vegetation.

All their knowledge on ethno-veterinary has been transmitted orally through the generations and most of these are closely guarded treasures. Therefore, there is no written document.

It has also been noticed that the younger generation have less interest to learn the uses of these plants. Therefore, it is important to survey and document their indigenous knowledge immediately. At the same time the wisdom of the community on the process of preparation by the medicine-men and their utilization should be given due importance.

CONCLUSION

Livestock provides a wide range of services and products including animal power and supplementary nutrition for the mankind (Maitkuri 1992). The Nepali Community in the study area is mainly found dwelling in riverine and the forest areas. As settled in remote areas they are directly dependent on the plant resources of their surroundings and as a result

they have acquired sufficient knowledge to get the benefit from the wild plants in their day to day life. Besides, they preserve considerable wealth of information of any wild plants used as herbal medicine. As such the people of the community possess their own household remedies for common ailments. The medicine-men thus play an important role in rural health care and preserve the Medical lore as a guarded treasure. The community has their own nomenclature for the plants in relation to diseases and other uses of plants resources available in the environment, which they try to conserve for the future use of the community.

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