

# Ethnoveterinary practices of Garo tribes from West Garo Hills district of Meghalaya, India: perspective and future prospects

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## Abstract

The present study contributes to document indigenous traditional knowledge associated with Garo tribes on the use of specific plant species in preparation of herbal medicine and practices for curing animal ailments. A total of 45 plants belonging to 32 families, comprising 18 trees, 6 shrubs, 14 herbs and 7 climbers used by the Garo tribes in the preparation of 34 formulations, for curing 24 types of diseases and ailments of livestock and technological knowledge pertaining to the utilization of plants have been recorded. It generates valuable knowledge for the department of veterinary and animal husbandry. The study brings in other values too for society besides conserving traditional knowledge, helps to identify plants with market potential that can generate income for local communities. The documentation of cultural heritage as a whole and ethnopharmacological information medicinal plants of the country in particular is one of the ways in preserving the indigenous knowledge of the people on medicinal plants before it is lost irretrievably. The people of the region will be greatly benefitted from this study.

**Keywords:** Ailments and remedies for animals, Ethnoveterinary medicine, Garo tribes, Indigenous knowledge, Traditional healers

## 1. Introduction

Ethnoveterinary medicine (EVM) is the use of traditional skills, knowledge, methods and practices for treating domestic animals. The present study deals with Ethnoveterinary practices of Garo tribes. For Garo tribes agriculture is the main livelihood and are dependent on animal husbandry for subsidiary income and food. Livestock comprises of cows, bullocks, buffaloes, pigs and poultry. The communities in Garo Hills district of Meghalaya are dependent on the forest to meet their needs for fodder, fuel-wood, timber and medicines for their primary healthcare as well as for their domestic animals. Garo Hills harbours a vast diversity of medicinal plants (Meghalaya biodiversity.nic.in/floral-biodiversity.html). The

ethnic and rural folk have developed a wealth of domestic animal healthcare practices over a long period of time and through trial and error. Such indigenous knowledge is based on experience, while the practices are time-tested (Waren, 1989). Information on medicinal plants is held by traditional healers, ‘*Ojas*’, who are mostly aged. Most of the traditional healers were ardent in participating in their field of interest and willing to share their knowledge. But some traditional healers chose not to reveal their knowledge to others. Younger generation is not concerned about their uses because of their inclination towards allopathic medicines, but they have strong faith in traditional medicine also. Despite gradual socio-cultural transformation, local communities have immense knowledge of medicinal plants and rely on them for treatment of common

diseases. This reliance on medicinal plants is partly due to the high cost of allopathic drugs, inaccessibility to modern health institutions, and cultural acceptability of the traditional system (Hynniewta & Kumar, 2008; Dessica & Binggeli, 2014). Since there are no written records on uses of medicinal plants, knowledge is passed on from generation to generation orally; there is chance of losing it in the coming years. It is therefore essential to record and revitalize the traditional veterinary practices and cultivate and conserve plant species used for medicine and the indigenous knowledge of Garo tribes, which could provide future drugs for some dreadful diseases of animals.

Proper documentation of ethnoveterinary practices and their assessment have become essential for the management of livestock. EVM is gaining recognition as it is safe, cost effective and free from antibiotic residues unlike modern medicine. The major constraint of livestock and poultry production is ignorance of the majority of the farmers about the modern technology and improved practices of livestock and poultry rearing. There are very few healthcare centers for humans and veterinary hospitals for animals. Most of the hospitals are situated in District headquarters or in blocks and the facilities are only utilized by roadside villagers. This has forced the rural people to adopt their own traditional herbal medicine for their healthcare and of their animals. They depend largely on wild herbs for preparation of traditional medicine. The sources of these medicinal plant species are cultivated plants from homesteads, farm lands, cultivation fields or wild plants from forest lands.

The plant part such as leaves, barks, root, seeds, fruits, etc., are used in fresh and in dried form for the preparation of ethnoveterinary medicines. Sometimes, the plant parts are collected and stored for later use, when the plant is not available. The traditional healers usually collect medicinal plants from their known localities. A few folk healers have started cultivating them in their herbal gardens while, some medicinal plants are brought from the markets. Over-exploitation by the local people has pushed many of the medicinal plants into threatened categories (Barik *et al.*, 2017).

### **1.1 Study area**

The study was conducted during 2015-16 in two selected villages of West Garo Hills district Chongpotgre under Gambegre block and Gangbanga under Dalu block (Fig. 1). The Gangbanga village lies between 25°14'19.2"N latitude and 90°15'30.1"E longitude and is 52 km distance from headquarters Tura. Gangbanga village has 164 households with a population of 963 people and the literacy rate is 67.88% (Census 2011). The Chongpotgre village lies between 25°31'47.2" N latitude and 90°10'32.1" E longitude and is 30 km from Tura. Chongpotgre village has 64 households comprising of 176 males and 177 females and literacy rate is 72.76% (Census 2011). The villages are mainly inhabited by Garo tribes. Agriculture is the main occupation in the two villages. There are very few health centers for animals in West Garo Hills. There is only one veterinary dispensary in Dalu C&RD Block and it is about 9 km from Gangbanga Village.

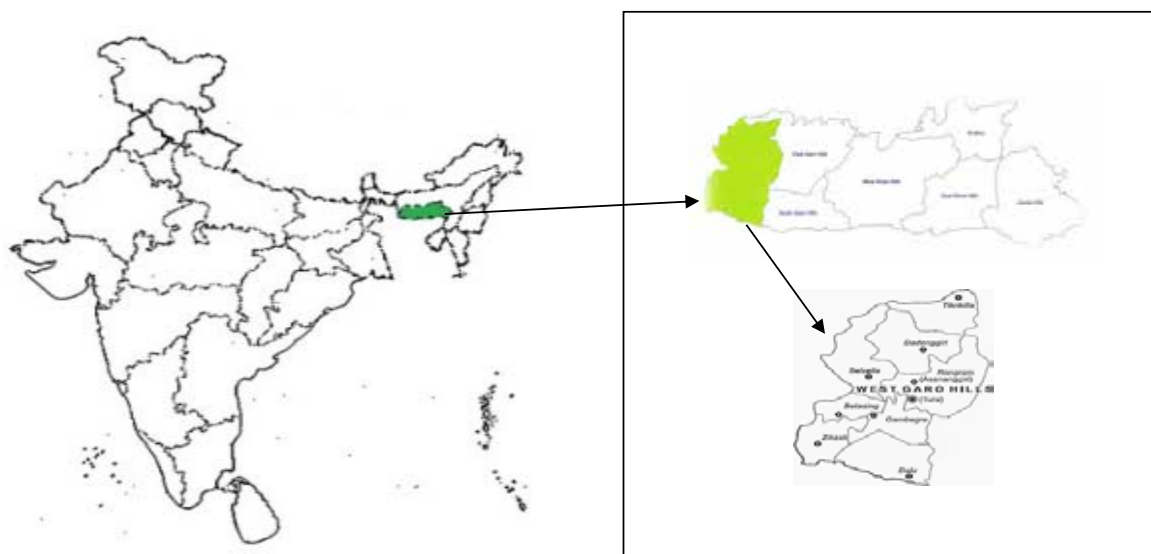


Fig. 1- Map of the study area, West Garo Hills district of Meghalaya

## 2. Methodology

The Prior Informed Consent (PIC) was obtained from the community and village headman to carry out the present study. Information on the traditional uses of plants was collected through participatory method by conducting various formal and informal meetings, followed by group discussions with village headman, owners of animals, farmers, head of the house and traditional healers or ‘Ojas’ who are having immense knowledge of plants in local dialect and well versed with their use (Jain, 1987, 1991, 1999). The information were collected using questionnaires from the respondents. The data for prevailing animal diseases in West Garo Hills were collected from the resource person and was crosschecked by discussing with Veterinary Doctors of the surveyed area. The medicinal plants and other raw materials, methods of preparation and

administration for different ailments were recorded. The plant materials of all traditional drug plants were collected in their flowering and fruiting conditions and herbarium sheets were prepared following standard procedure (Rao, 1977). Plant specimens were identified using regional (Haridasan & Rao, 1985-1987; Joseph, 1982; Kanjilal *et al.*, 1935, 1938, 1939, 1940) and national Flora’s (Hooker, 1872-1897) and confirmed with the help of BSI, Shillong, Meghalaya. The voucher specimens were deposited at the Herbaria of Rain Forest Research Institute, Jorhat, Assam for future reference. An attempt has been made to assess the diversity and current status of conservation of medicinal plants used in the EVM by Garo tribes and also to throw light on other age-old traditional plant-based knowledge on healthcare from other parts of India and abroad.

### 3. Results

#### 3.1 Enumeration

A total of 45 plants belonging to 32 families used by traditional healers in formulation of 34 ethnoveterinary remedies that cure 24 types of diseases and ailments have been recorded. Traditional indigenous knowledge associated with the Garo tribes on use of specific plant species in EVM, their scientific names, local/tribal names, families, part(s) use and mode of administration and associated knowledge on use of plant species from other parts of India and elsewhere are summarized (Fig. 2, Table 1). Amongst the plants used for treatment they belong to trees (40%), shrubs (13.30%), herbs (31.10%) and climbers (11.10%). Each of the healer/practitioner is unique in his/her practice i.e. in the combination of ethnomedicinal plants, the methods of preparation of the herbal medicine and the dosage that is given to the animal in treating the ailments. The plants used in preparation of herbal medicines are mostly collected from the wild and some are cultivated in their homestead garden. The herbal remedies are administered orally and as well as applied topically. During oral administration of traditional medicines, animal feeds like rice bran, paddy straw, grass, jaggery, etc. are used as associate. Besides plant species, animal products like pork fats, fermented fish and human urine and other inorganic substances (black salt, ash, naphthalene balls, dettol, fitgiri etc.) are also used in different formulations.

#### Discussion

Ethno Veterinary Medicine (EVM) is wide spread in developing countries and increasing rapidly in developed countries (Ernst, 2000;

Harris & Rees, 2000; WHO, 2000). EVM has been playing a vital role in primary healthcare needs to cure many dreaded diseases of animals and to maintain livestock population in many parts India and at Global level (Swaleh, 1999; Peltzer, 2009; Nair & Unnikrishnan, 2000). The ethnoveterinary systems are eco-system and ethnic-community specific and differ greatly among individuals, societies, and regions. The Garo tribes have good knowledge of the plant resources and still they practice traditional herbal system of medicine for curing veterinary ailments. They believe in ethnomedicine better than modern medicine. Several Ethnoveterinary studies indicate that, the folk health practices largely remain undocumented, and are passed on from one generation to the other by verbal communication and there is a chance of losing in coming years. Hence documenting of Traditional Knowledge is important before it is lost forever. It was observed that for a number of diseases, the formulations are prepared by combination of many plants and plant parts. It was also seen that single plant is used to treat more than one ailment. Some of the species viz., *Citrus latipes*, *C. indica* etc., were endemic to the region and their over exploitation for traditional as well as modern medicine posed a major threat. Therefore, effective conservation measures need to be adopted to prevent them from extinction. Nowadays, tribal people are progressively exposed to modernization and their knowledge on traditional uses of plants are depleting due to the influence of western culture. The younger generation are inclining more towards modern medicines and ignoring their traditional folk protection. The village elders or traditional healers do not take interest in teaching their children or younger generation in whom they can



**Fig. 2. Medicinal plants used in EVM, by Garo Tribes A. *Cissus quadrangularis*, B. *Dillenia indica*, C. *Vinca roseus*, D. *Asparagus racemosus*, E. *Citrus indica*, F. *Stereospermum chelonoides*, G. *Zanthoxylum rhetsa*, H. *Aquilaria malaccensis*, I. *Bryophyllum pinnatum*, J. *Euphorbia royleana*.**

**Table 1:** Traditional indigenous knowledge associated with the Garo tribes

Sl. No.	Disease	Scientific Name	Ver. Name	Family	Threat Status	Treatment	Other uses reported in the literature
1	Carious teeth in cattle	<i>Allium sativum</i> L.	Rasin gipok	Amaryllidaceae	Widespread in cultivation	6-7 cloves of garlic are heated with mustard oil. Cotton wool soaked in the preparation is directly placed on the loosened teeth of the cattle. This procedure is done once	The bulb is used against fowl diseases in Latin America (www.hillagric.ac.in/edu/). Paste of the bulb is applied topically once a day to treat external parasite and skin diseases of cattle in Morigaon, Assam (Das & Bordoloi, 2016). Extract of 100 g ginger mixed with 10g of black pepper and 30g of garlic. The mixture is added to 4L of water. Applied externally on the nasal area once a day for three days to treat chronic respiratory diseases in poultry in Assam (Das, 2014). The leaf paste of Rasin gipok ( <i>Allium sativum</i> , garlic) is applied directly on the affected part of animals two times a day by tribals of Central India to heal external wounds (Sikarwar & Kumar, 2015).
2	Plant poisoning in cattle, buffaloes and goats	<i>Ananas comosus</i> (L.) Merr.	Anaros	Bromeliaceae	Widespread in cultivation.	Young leaves of <i>Cajanus cajan</i> and <i>Ananas comosus</i> are grinded and mixed with water and given to drink twice a day for several days to minimize the effect of poisoning in cattle by Cassava plant. The decoction of leaves of <i>Cajanus cajan</i> and <i>Ananas comosus</i> is also given to cure loose motion in cattle caused due to excessive intake of jackfruit leaves.	Leaf extract is given in empty stomach to treat internal parasite in Morigaon, Assam (Das & Bordoloi 2016).
3	Dystocia (difficulty at birth) in cattle, buffaloes.	<i>Aquilaria malaccensis</i> Lamk.	Agor	Thymelaeaceae	Vulnerable (IUCN).	Fresh leaves of <i>Aquilaria malaccensis</i> and roots of wild ginger are pounded and the juice is given to induce cervical dilatation which helps in smooth delivery.	None

4	Foot-rot in cattle, buffaloes and goats	<i>Asparagus racemosus</i> Willd.	Me'mang tamatchi	Asparagaceae	Threatened	Root tubers of <i>Asparagus racemosus</i> are grinded to a paste along with other plant species and heated. The feet of the cattles are massaged 2-3 times a day till it is cured.	The root tubers are dried and ground to powder and mixed with groundnut seed cake. This is given orally once a day for four days as a stimulant (Naik <i>et al.</i> , 2012). Plant tubers are used to increase lactation in lactating cattle in cape Comorin, Tamil Nadu (Kiruba <i>et al.</i> , 2006).
5	Sty in Avian	<i>Bryophyllum pinnatum</i> (Lam.) Oken	Samjaggi	Crassulaceae	Widespread	Leaves of <i>Bryophyllum pinnatum</i> are crushed and juice is dripped directly into the eyes using rice straw or plastic dropper. The procedure was continued for several days till it is cured.	Leaves are fed to cure indigestion in goats in South and North Andaman Islands (Sunder <i>et al.</i> , 2014). Extract of 5-6 leaves is mixed with 50 g of molasses and added to 1 L water and feed to birds orally (for 100 birds) once daily for three days to treat gout disease, abnormal excretion in poultry in Assam (Das, 2014). Fresh leaves are warmed in mustard oil and bandaged on wounds of livestock for killing maggots; and leaves are heated and massaged directly onto the affected part to treat muscular pain and rheumatism in animals in the lesser Himalayas and Pakistan (Abbasi <i>et al.</i> , 2013)
6	Mange in domestic animals	<i>Camellia sinensis</i> (L.) Kuntze	<i>Cha bijak</i>	Theaceae	Widespread in cultivation	Rhizomes of <i>Curcuma longa</i> L. and leaves of <i>Camellia sinensis</i> are ground to a paste and the poultice was applied on the affected part of the animal body once daily till it is cured.	50 g of fresh leaves are boiled in water along with sugar (10 g); 1 glass (100ml) of the decoction is given orally for 5-6 days for treating fever in Lesser Himalayas and Pakistan (Abbasi <i>et al.</i> , 2013) and food poisoning in Uttaranchal (Pande <i>et al.</i> , 2007).
7	Cataract in felines, sty in Avian	<i>Capsicum annuum</i> L.	Jalik	Solanaceae	Least concern (IUCN)	Fruits of <i>Capsicum annuum</i> crushed and mixed with human urine and the extract was applied above the eyes till it is cured.	Curanderos use it as a maceration mixed with aguardiente (liquor) to cause purging in dogs, so as to make them good hunting dogs in Latin America (www.hillagric.ac.in/edu/). Fruit are used against Mastitis and off feeding of live-stock in Pakistan (Khan <i>et al.</i> , 2015). 5 g of fruit paste is dissolved in 1 L of water administered orally thrice daily for 5 days to treat mouth disease in domestic animal in Andhra Pradesh (Murthy & Rao, 2012)

8	Dog bite	<i>Carica papaya</i> L.	Modipol	Caricaceae	Widespread in cultivation.	Latex of <i>Carica papaya</i> are mixed with glutinous rice and applied to wounds.	Extract of boiled fruit (500 g) is mixed with 1 L water and fed once daily for three days to poultry to improve feeding for getting maximum weight in Assam (Das, 2014).
9	Bee sting	<i>Catharanthus roseus</i> (L.) G. Don.	Askipul	Apocyanaceae	Not assessed (IUCN).	Leaves of <i>Catharanthus roseus</i> are crushed and applied externally as an antidote	Leaves of <i>Catharanthus roseus</i> , <i>Centella asiatica</i> , <i>Streblus asper</i> , <i>Justicia gendarussa</i> and <i>Lygodium scandens</i> are grinded separately and given to the affected animals thrice a day to treat dysentery in Tripura (Reang <i>et al.</i> , 2016). Whole plant extract is applied on wounds caused by Bee sting by tribes of Madhya Pradesh (Singh and Sudip, 2012).
10	Fracture in domestic animals	<i>Cissus quadrangularis</i> L.	Arangjora	Vitaceae	Not assessed (IUCN).	Plant of <i>Cissus quadrangularis</i> is grinded. Paste is applied and tied to the affected part with the help of bamboo stick and wrapped with clothes. The procedure is repeated for 10-15 days till completely cured.	Paste made of <i>Cissus quadrangularis</i> bark is applied to treat broken legs and arms of cattle in Morigaon, Assam (Das & Bordoloi, 2016). The plant is tied on placenta of calves after the delivery to hasten its removal in Comorin region, Tamil Nadu (Khan <i>et al.</i> , 2006). Leaves are ground with pepper and garlic to make decoction. The decoction is given orally to cure fever in goat (Selvaraju <i>et al.</i> , 2011). The decoction is given orally to induce milk in cattle (Shah, 2011)
11	Indigestion in canines, Hog cholera	<i>Citrus indica</i> Tanaka	Memang narang	Rutaceae	Endemic and Endangered.	Fruit or leaves of <i>Citrus indica</i> are crushed and mixed with food and fed to animals to treat indigestion. Crushed leaves or fruits of <i>Citrus indica</i> are mixed with the jaggery and give along with the feed for a few days to treat Hog cholera.	None.
12	Diarrhoea in cattle, buffaloes and goats	<i>Citrus latipes</i> (Swingle) Yu. Tanaka	Chambil	Rutaceae	Endemic and Endangered.	Fruit juice of <i>Citrus latipes</i> is mixed with pork fats and Kagi (extracted from jaggery) and fed to the animal along with the fodder for 2 or 3 days until cured.	None.



13	Diarrhoea in goats	<i>Corchorus capsularis</i> L.	Kosta	Malvaceae	Endangered	<i>Corchorus capsularis</i> (whole plant) is burnt and ashes are mixed with black salt and fed along with the feed to the sick animal for 2 or 3 days twice until cured.	The seed paste is mixed with mustard oil and applied on wounds of cattle two times a day for 3 days as maggoticide. Sikarwar & Kumar, 2005). The seeds of the <i>Corchorus capsularis</i> are grinded into a paste and applied to the wound where maggot attacks in cattle in Jessore district of Bangladesh (Mamun <i>et al.</i> , 2015).
14	Wounds in swine, fungal infestation in canine, swine and goat.	<i>Curcuma longa</i> L.	Haldi	Zingiberaceae	Widespread in cultivation	Fresh rhizomes of <i>Curcuma longa</i> are grinded and mixed with ash and the poultice prepared is applied on to the wounds daily until cured. <i>Curcuma longa</i> rhizome and fermented fish are grinded and mixed in water and used for bathing the animal for a few days until cured.	A paste of rhizome is applied twice a day to treat foot and mouth diseases and external parasite of cattle in Morigaon, Assam (Das & Bordoloi, 2016). Aqueous extract of 50g of raw turmeric mixed with 2L of water. Applied topically during chick development until it grows to medium size to get fine flesh and also to treat against excretory disorders and prevent lamp condition in poultry in Assam (Das 2014). Powder from dried rhizomes is applied and wrapped or sprinkled onto wounds for 2-3 days in Lesser Himalayas, Pakistan (Abbasi <i>et al.</i> , 2013).
15	Cataract in feline	<i>Cymbopogon citratus</i> (DC.) Stapf.	Mip Janet;	Poaceae;	Least concern (IUCN).	Leaves of <i>Cymbopogon citratus</i> are tied around the neck till the plants dry.	Macerated leaves are mixed with water or food and fed to treat diarrhoea, colic or vomiting in canines in Eastern Amazon Brazil (Ritter <i>et al.</i> , 2012).
16	Swine fever, Fowl cholera	<i>Dendrocalamus hamiltonii</i> Munro.	Wa' nok	Poaceae	Endangered	Juice of fermented shoot of <i>Dendrocalamus hamiltonii</i> is mixed with feed and fed for several days until cured.	Leaves and stems are used to treat expulsion of placenta in Hamirpur, India (Sehgal & Sood, 2013).
17	Hog cholera	<i>Dillenia indica</i> L.	Te' di	Dilleniaceae	Least concern	Seeds of <i>Sterculia villosa</i> Roxb., fruits of <i>Dillenia indica</i> , bark of <i>Holarrhena antidysenterica</i> and <i>Entada rheedei</i> Spreng., and leaves of <i>Elaeocarpus floribundus</i> L. are ground to a paste and mixed with feed and fed to the sick animals twice daily until cured.	Leaf of <i>Dillenia indica</i> is given orally to stop the evacuation of the bowel causing diarrhoea in cattle in Jessore district, Bangladesh (Mamun <i>et al.</i> , 2015).

18	Eye infection in Canine (mucus coming out from the eyes).	<i>Elephantopus scaber</i> L.	Achaksre	Asteraceae	Least concern	Leaves of <i>Entada scaber</i> is mixed with the food and fed to the animal till cured.	The root paste applied in the morning on wounds as wormicide in cattle, for three days by tribals of Central India (Sikarwar & Kumar, 2005).
19	Eye diseases in cattle, buffaloes.	<i>Euphorbia royleana</i> Boiss.	Su'che	Euphorbiaceae	Least concern	Latex of <i>Euphorbia royleana</i> is applied to the eyes once daily until cured	If the corneal opacity is on the left eye, the milky juice of <i>Euphorbia royleana</i> is massaged at the left side of a forehead and vice versa (Bhat <i>et al.</i> , 2013).
20	Swelling of limbs in cattle, buffaloes.	<i>Ficus hispida</i> L.f.	Sa'kap	Moraceae	Least concern	Fresh leaves of <i>Ficus hispida</i> are fed to the animal daily until cured	The root paste is given in morning for one week to treat weakness by tribals of Central India (Sikarwar & Kumar, 2005)
21	Foot and mouth disease in cattle, buffaloes and goats.	<i>Gmelina arborea</i> Roxb.	Gamatre	Lamiaceae	Least concern	Barks of <i>Gmelina arborea</i> and <i>Erythrina stricta</i> Roxb. are ground and the poultice is applied to treat foot-rot.	The bark boiled with water is applied on tumors in Andhra Pradesh (Murthy & Rao, 2012). Bark and leaf is used to treat tumor and blood in urine in West Bengal, India (Pandit, 2010).
22	Retained placenta in cattle	<i>Hodgsonia heteroclita</i> (Roxb.) Hook.f. & Thomson;	Te'bi	Cucurbitaceae	Rare	Fruits of <i>Hodgsonia heteroclita</i> and Tortoise head (skull is preserved and used) is ground to a paste and mixed with drinking water and fed ones to the animal.	None.
23	Cough, sprain in domestic animals	<i>Justicia gendarussa</i> Burm.f.	Do'jagipe	Acanthaceae	Not assessed (IUCN).	Leaves of <i>Justicia gendarussa</i> are ground to a paste and applied to treat sprains or given orally for several days to treat coughs.	Crushed leaves and seeds are applied to the body of cattle, buffaloes or goats to treat body pain and body lice in Bangladesh (Rahmatullah <i>et al.</i> , 2010).
24	Foot-rot in cattle	<i>Moringa oleifera</i> Lam.	Sojana	Moringaceae	Least concern	Fresh roots of <i>Moringa oleifera</i> are ground to paste and the poultice is applied on to the affected part of the animal till cured.	The bark and gum <i>Moringa oleifera</i> is crushed and mixed thoroughly. Salt and water is added to the mixture and the resultant mixture was boiled to make a decoction and fed to cattle to treat bloating, indigestion and loss of appetite (Rahmatullah <i>et al.</i> , 2010). About 100-200 g leaf paste is given twice daily for 3-5 to cattle for quick relief from diarrhoea and dysentery. The paste is prepared from 450-500g pods and given to cattle for approximate one month for relief from rheumatism (Verma, 2014).

25	Milk production in cattle	<i>Musa paradisiaca</i> L.	Te'rik	Musaceae	Least concern	Ripe fruits of <i>Musa paradisiaca</i> , seeds of <i>Bunium persicum</i> (Boiss.) B. Fedtsch. and fruits of <i>Carica papaya</i> are mixed with the fodder and fed daily to the lactating cows.	Stem juice is used to treat retention of placenta of cattle in Pakistan (Khan <i>et al.</i> , 2015). 1- or 2- leaves are fed solely or along with the cattle feed, twice for 1- or 2 days to stop loose motion of mature cows (Mandal & Rahaman, 2014).
26	Mag-gots in wounds	<i>Nicotiana tabacum</i> L.	Sada	Solanaceae	Least concern	Leaves of <i>Nicotiana tabacum</i> and camphor are ground together and the poultice prepared is applied directly on to the wounds.	Powdered tobacco is mixed with aguardiente (liquor) and given to dogs to make them better hunting animals in Latin America ( <a href="http://www.hillagric.ac.in/edu/">www.hillagric.ac.in/edu/</a> ). About 58 g of leaf of <i>Nicotiana tabacum</i> is soaked in 150 ml cold water for overnight. The water is filtered the following day with a thin cloth and the filtrate is boiled to make concentrated solution. After cooling it is mixed with 30 ml oil of <i>Brassica napus</i> seeds and applied externally to the sore daily at night until cured to treat eczema in cattle. Leaf decoction is applied on skin directly in Andhra Pradesh (Murthy & Rao, 2012).
27	Mag-gots in wounds	<i>Prunus persica</i> (L.) Batsch.	Pisbol	Rosaceae	Rare	Fresh leaves of <i>Prunus persica</i> and <i>Phyllanthus emblica</i> L. are ground along with naphthalene balls and mixed with dettol and applied to the wounds to drop maggots.	Leaves of <i>Prunus persica</i> and <i>Phyllanthus emblica</i> are used to treat worm infestation in domestic animals in Pakistan (Khan <i>et al.</i> , 2015).
28	Abortion in cattle	<i>Oxalis corniculata</i> L.	Mekampret	Oxalidaceae	Least concern	Leaves of <i>Oxalis corniculata</i> and roots of wild turmeric are pounded together and used.	About 12g of <i>Oxalis corniculata</i> leaves is made to a paste and mixed with 90ml molasses prepared from juice of <i>Saccharum officinarum</i> (sugar cane) and juice of <i>Neolamarckia cadamba</i> leaf. It is given orally to treat abdominal pain in buffaloes in Bangladesh (Mamun <i>et al.</i> , 2015). Leaf juice is used to cure eye infection (Phondani <i>et al.</i> , 2010).

29	Ranikhet disease	<i>Rhus javanica</i> L.	Kitma	Anacardiaceae	Rare	<i>Rhus javanica</i> are pounded and the juice is mixed with pork fat and the preparation is mixed with the feed and fed.	A decoction of fruit is administered to cure foot and mouth diseases in cattle (Malla & Chhetri, 2012).
30	Paralysis in canines	<i>Stereospermum chelonoides</i> (L.f.) DC.	Bolsil	Bignoneaceae	Rare	Bark of <i>Stereospermum chelonoides</i> is tied around the neck till the plants dried up or disease is cured completely.	None.
31	Conjunctivitis in poultry	<i>Tabernaemontana divaricata</i> (L.) R. Br. ex Roem. & Schult.	Miktosi	Apocynaceae	Rare	Leaves of <i>Tabernaemontana divaricata</i> is crushed and applied directly on the eyes once daily until cured.	None
32	Anorexia in swine	<i>Tamarindus indica</i> L.	Che'eng	Fabaceae	Least concern	Fruits of <i>Tamarindus indica</i> and fermented fish are mixed with feed and fed for few days until cured.	Leaf paste of <i>Tamarindus indica</i> is applied to wounds to reduce swellings and relieve pain (Kiruba <i>et al.</i> , 2006). The fresh leaves (about 400-500 g), of <i>Tamarindus indica</i> are boiled in water and are tied on affected part of the body to cure swelling in Central India (Verma, 2014).
33	Pneumonia	<i>Terminalia chebula</i> Retz.	Aritak	Combretaceae	Vulnerable	Fruits of <i>Terminalia chebula</i> and <i>Andrographis paniculata</i> (Burm. f.) Wall. ex Ness., and stem of <i>Piper betel</i> are ground with some minerals (manjun and pikari, chemically salts of Zn and K) to a paste and fed for 1-2 days until cured.	The macerated juice of <i>Tamarindus indica</i> (fruit) is mixed with <i>Terminalia chebula</i> powder and one jug (1L) full of water is added. The juice is given orally thrice a day to treat bloat (Naik <i>et al.</i> , 2012). Stem bark is ground with pepper and garlic and given to cure fever in goat (Mamun <i>et al.</i> , 2015).
34	Diarrhoea in goats	<i>Zanthoxylum rhetsa</i> DC.	Mecheng	Rutaceae	Not assessed (IUCN).	Fruits of <i>Zanthoxylum rhetsa</i> are crushed and mix with drinking water and give for 2 or 3 days in case of loose motion.	None.

rely on. They harbor some kind of superstitious beliefs that they can't share the knowledge of medicinal herbs to strangers and if they share the quality or the healing properties of the particular plant will become ineffective or doesn't work on particular diseases. Because of these superstitions even the small percentage of younger generation who aspire to learn this traditional knowledge of medicinal plants doesn't get full knowledge on the subject. It was also observed that rural people residing near healthcare centers or veterinary dispensaries generally resort to allopathic medicine. This is because of the instant relief provided from this system. The rural people are ignorant of the side effects caused by allopathic medicines. Some of the traditional healers of Garo Hills used to treat like fracture, cancer and other deadly diseases. But this knowledge is on the verge of extinction due to lack of written records as most of these practitioners are illiterate. Besides most of the medicinal herbs are available inside deep forest areas, on high mountain cliffs, are difficult to collect and often encounter wild animals. Nowadays, traditional healers though having immense knowledge on medicinal plants, cannot render their service due to the difficulty in collecting medicinal plants and also financial constraints. Some of the plants or minerals used in the formulations need to be purchased at high prices. However, there are instances of veneer (deceptive) individuals who for reputation and monetary gain try to deceive innocent people with adulterated medicines. The traditional medicine is the most affordable and easily available source of treatment for the rural population in their primary healthcare system. A large number of medicinal plants used in different formulations for treating common veterinary diseases are being threatened by

different human activities like deforestation due to shifting cultivation, urbanization, construction of roads, etc and due to minimal conservation efforts in the area. *Jhuming* and illegal trading of tree species are serious threat to medicinal plants in the study area. To save medicinal plants from further loss, local people should be educated on sustainable methods of harvesting. Cultivation and domestication of rare and endangered plant species are needed. The preservation of these plant species will help to develop efficacious remedies to treat various animal diseases. Therefore, it is important to document the indigenous traditional knowledge associated with EVM by the Garo tribe for future study. This may provide information to biochemists and pharmacologists in screening of individual species for active principles and in scientific validation of the treatment for various diseases.

Most of the medicinal plant species documented from the district of Garo Hills were also reported to be used in other parts of the world. The literatures were collected from books, scientific journals, papers etc. Some newly recorded medicinal plants were also documented from the study area like *Citrus latipes*, *Citrus indica*, *Hodgsonia heteroclita* and *Zanthoxylum rhetsa*. The scientific and chemical screening of these medicinal plants is needed to explore the vast treasure of nature for effective management of number of diseases in animals. The side effects of ethnoveterinary medicines must also be investigated, for revival of interest in phytomedicine at global level.

## 5. Conclusions

The present study will contribute valuable knowledge for the department of veterinary and

animal husbandry. The people of the region will be greatly benefitted. These studies can have other values too for society besides conserving traditional knowledge, for they can help to identify plants with market potential that can generate incomes for local communities. The documentation of cultural heritages as a whole and ethnopharmacological information of medicinal plants of the country in particular is one of the ways in preserving the indigenous knowledge of the people on medicinal plants before it is lost irretrievably.

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### Conflict of Interest

The authors have no conflict of interest.

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