

Traditional Usage of Plants of Costus Species in Assam, India

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Abstract

Customary use of plants in the treatment of ailments in Assam, India is a typical situation. Ethno medicinal study was led in a few topographically unique zones of the state and utilization of plants from *Costus* species were reported. The extent of study chose for the investigation range across seven organizational regions spread across Assam, India. The regions include Dibrugarh, Golaghat, Tinsukia, Dhemaji, Karbi Anglong, Goalpara and Kokrajhar. Different plants were reported and plants fitting with the said species were chosen for determining the relevance concerning its use in customary medication. The survey divulged that plants associated to three species of the genus *Costus* namely *Costus speciosus*, *Costus pictus* and *Costus scaber* were espied to be primarily ubiquitous in traditional medicine in the discrete contemplated regions. The species were predominantly utilized as prime ingredients in hepatoprotective and anti-diabetic formulations. *Costus speciosus* was perceived to be chiefly used in the treatment of hepatic disorders and ailments. *Costus pictus* was observed to be used customarily in the upper Assam region bordering Nagaland for treating diabetes and *Costus scaber* was being used in the area bordering Arunachal Pradesh for tending people with jaundice, snake bite etc. The research climaxed with the profiling of the *costus* species as annotated from the ethnomedicinal survey.

Keywords: *Costus*, Ethnomedicine, Assam, *Costus speciosus*, *Costus pictus*, *Costus scaber*

1. Introduction

Customary medical understanding is undergoing augmented consideration globally in health sector. The importance of traditional medicine in catering the health needs cannot be undermined. The herbal medicine sector commercially is already booming with the annual turnover crossing billions of dollars. With the passage of time newer knowledge is being incorporated substantially thereby highlighting the significance of documentation aspects pertaining to these medicinal plants and practices associated with herbal medicine.

Documentation based upon ethnomedicinal survey along with interaction with local healers practicing traditional system of medicine can be said to be the basis for establishing a systematic protocol for validating traditional medical knowledge.

2. Ethnomedicinal survey area

Assam was selected as the targeted study area due to the rich diversity in flora, fauna and above all due to the presence of diverse ethnic groups with a

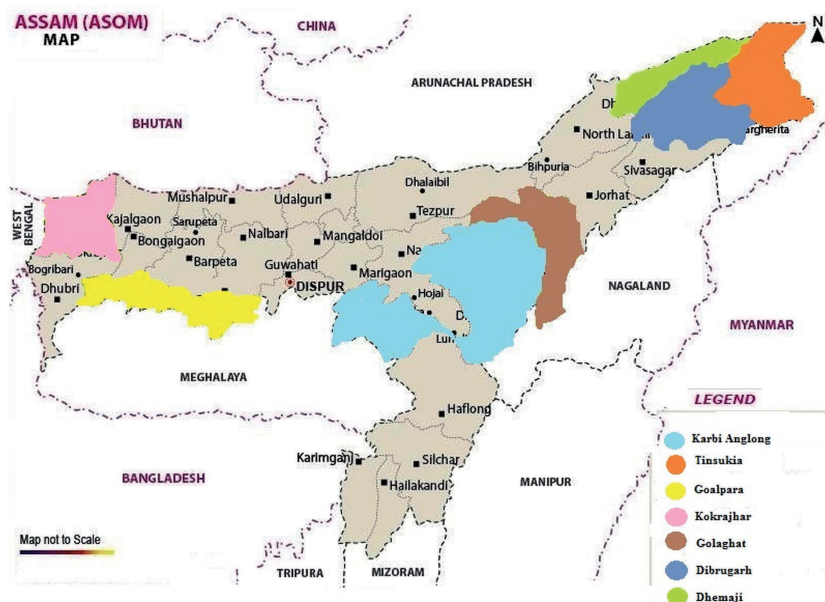


Figure 1.

Map of Assam showing different districts where ethnomedicinal survey was conducted.

wide array of traditional practices. Several geographically distinct zones, encompassing seven administrative districts spread across Assam were considered for the study (**Figure 1**).

The selected areas in which the ethnomedicinal survey was done are as follows:

1. Nagakhelia village and Jokai area, Dibrugarh
2. Naojan and Borghoria area, Golaghat
3. Laipuli, Tinsukia
4. Majarbari village and Sissiborgaon, Dhemaji
5. Kathkatia village, Karbi Anglong
6. Dhupdhora, Goalpara
7. Dotma, Kokrajhar

2.1 Survey area: Dibrugarh

Dibrugarh is known as the Tea City of North-East. To the north and east lays Dhemaji and Tinsukia district respectively. South-east and south-west parts of Dibrugarh are bounded by Tirap and Sivsagar district [1–4].

Two places in Dibrugarh district were selected for ethnomedicinal survey viz. Nagakhelia and Jokai. Nagakhelia is a small village, consisting of around hundred households under Barbaruah block of Dibrugarh district lays about 6 km from Dibrugarh University [5]. The village is located on the banks of river Brahmaputra and the area boasts of thick vegetation which serves as a prime source of medicinal plant materials for the local healers of the area practicing traditional medicine.

Jokai comes under Barbaruah block in Dibrugarh district. It is located about 10 km south from Dibrugarh University. It is also home to the over twelve hectare Jokai reserve forest within which Jokai Botanical Garden cum Germplasm Centre is located. The reserve forest is endowed with different flora species of medicinal, oil bearing and aromatic plants. It also has diverse fauna species like flying squirrel, black panther and leopard including various species of butterflies and fishes. The villages surrounding the forest areas in Jokai has a rich heritage of prescribing traditional medicine, mostly from plants for many types of ailments like jaundice, diabetes, malaria, fever, skin infection etc.

2.2 Survey area: Golaghat

Golaghat is an important district of upper Assam having its own historical and cultural heritage. Golaghat is bordered by the Brahmaputra River in north, towards south lays Nagaland, whereas in the east it is bounded by Jorhat district and the western side lays Karbi Anglong and Nagaon district [4]. The major rivers of the district are Brahmaputra, Dhansiri, Kakodonga, Doyand, Gelabil and Diplolu [6]. The vast geography of Golaghat district also includes tropical evergreen and semi evergreen forest; tropical grassland in Kaziranga National Park and swampy vegetation. The topography of Golaghat is dominated by a diverse array of flora and fauna [7, 8].

Borghoria and Naojan were the areas selected for ethnomedicinal survey in Golaghat district. Borghoria village and Naojan are located about 30 km and 60 km from Golaghat town and about 2.5 km and nearly 70 km from Numaligarh Refinery township, respectively. Naojan, due to its close proximity to Barpathar, an archaeological site where the remains of an 8th century temple made of square bricks and a stone inscription of Brahmi characters belonging to the 5th century were excavated along with the hot water springs and Garampani Wildlife Sanctuary of Garampani, has a very rich abundance of diverse flora and fauna. Borghoria situated in the vicinity of Dhansiri river has an exposure to vast and varied natural resources. Traditional healers around the area are mainly engaged in agricultural activities and prescriptions of traditional medicine by these healers are done on philanthropic basis [3].

2.3 Survey area: Tinsukia

Tinsukia is situated in the northernmost portion of Assam [2]. The district is surrounded on three sides by Arunachal Pradesh. The south part is encompassed by Dibrugarh. As the district falls in the far east of North-East region of Assam (India), it is a part of global bio-diversity hot spot and has great biodiversity significance [9, 10]. The high biological diversity found in the district is often related to its forest cover, which is categorized into tropical wet evergreen forests. The important sanctuary located in the district is Dibru-Chaikhowa Sanctuary. It has an area of 640 sq. km and is famous for rare, endangered animals and birds such as white-winged wood duck, elephant, tiger, sambar, buffalo, aquatic avifauna and wild white horse. The other protected areas and important forests are Dum Duma-Dangori-Kumsong Reserve Forests, Tirap-Burhidihing, Sadiya plains, Upper Dihing (East) and Upper Dihing (West).

Ethnomedicinal survey in Tinsukia district was conducted in Laipuli area. Laipuli is located at a distance of around 6 km from Tinsukia town [3].

2.4 Survey area: Dhemaji

Situated in the northern bank of the mighty river Brahmaputra, Dhemaji can be suitably described to be located in one of the remote area of north eastern region

of India. In its northern and eastern end the state of Arunachal Pradesh lies. The western part is bounded by Lakhimpur district followed by river Brahmaputra in the South. Dhemaji has a total geographical area of 3237 sq. km [1–4].

Two places selected for the ethnomedicinal survey in Dhemaji district were Majarbari and Sissiborgaon.

2.5 Survey area: Karbi Anglong

The district of Karbi Anglong is located in the central Assam region. The eastern part is surrounded by Golaghat district, in its west lies the state of Meghalaya and Morigaon district, the north is bounded by Nagaon and Golaghat district whereas North Cachar Hills and the state of Nagaland is located towards south. Karbi Anglong district is home to thick forest cover having numerous species of flora and fauna. It is to be noted that a new district, West Karbi Anglong was carved out from erstwhile Karbi Anglong district on 15th of August, 2015 [1, 3].

The district can be broadly divided into two physiographic units viz. hills and plains. About 85 percent of the district is covered by hills [4]. Environmental and topology studies of Karbi Anglong specify a great degree of diversity among the existing plant and animal species. The forest areas serves as the natural gene bank of important types and sub types pertaining to various species.

Kathkatia village located in Silonijan of Karbi Anglong district was selected for the ethnomedicinal survey [11].

2.6 Survey area: Goalpara

Goalpara is sited towards the southern bank of Brahmaputra River. The district is surrounded by the state of Meghalaya in the South, towards east lays Kamrup district, the western end is bounded by Dhubri district and, the northern part is covered by the mighty Brahmaputra. In 1983, Goalpara Civil sub-division was separated from original Goalpara district to form the present Goalpara district [1, 2].

Dhupdhara selected for the ethnomedicinal survey, is a village in Rongjuli circle in Goalpara district of Assam. It is located about 58 km east of district headquarter Goalpara and 13 km from Rangjuli [3, 4].

2.7 Survey area: Kokrajhar

Kokrajhar district is the entry point to the NER of India. It is bordered by Bhutan in the north, followed by the district of Dhubri in its south, whereas Bongaigaon and West Bengal is situated in the east and west directions.

On the 1st of July, 1983 the Kokrajhar Sub-division was upgraded into Kokrajhar district with headquarter at Kokrajhar town [3]. The district is situated in a humid sub-tropical climate, which is the characteristic of the lower Brahmaputra Valley of Assam. The district also has one of the largest concentrations of forest in the state. About 55% of the total geographical area of the district is under reserved forest. The Bhutan hills are the source of a number of rivers that flow through the district and act as tributaries of the mighty Brahmaputra that flows from east to west far from the southern boundary of Kokrajhar district [4].

Dotma village in Kokrajhar district of Assam was selected for the survey for ethnomedicinal documentation. It is located about 17 km towards North from District head quarters Kokrajhar, 188 km from State capital Dispur towards East. Dotma is bounded by Kokrajhar town towards East, Kachugaon towards west, Rupshi towards west, Chapor-Salkocha towards west. Kokrajhar, Bilasipara, Bongaigaon, Gauripur are the nearby towns to Dotma [12].

3. Documentation of medicinal plants in the surveyed areas

Plants surveyed in Dibrugarh region were documented on the basis of interview and questionnaire with the traditional healers with emphasis on the part of the plants and their applications in treating different diseases and disorders (**Table 1**).

Plants in the surveyed areas of Golaghat district were subjected to documentation on the basis of interview and questionnaire with the traditional healers with

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Dibrugarh	<i>Asparagus racemosus</i>	Sotmul	Root	Kidney stone
	<i>Averrhoa carambola</i>	Kordoi	Leaves, Fruit	Jaundice
	<i>Bonnaya brachiata</i>	Horu Kasidoria	Leaves	Wound healing
	<i>Cassia fistula</i>	Sonaru	Bark	Fever, Deworming
	<i>Caesalpinia bonducella</i>	Letaguti	Seed	Wound healing
	<i>Cassia tora</i>	Bilokhoni	Leaves	Skin infection, Snake bite, Joint pain
	<i>Centella asiatica</i>	Barmanimuni	Whole plant	Wound healing, Well being
	<i>Cleodendrum viscosum</i>	Dhapat tita	Leaves, Root	Malaria, Diabetes, Jaundice, Skin infection
	<i>Costus speciosus</i>	Jomlakhuti	Rhizome	Jaundice
	<i>Coscorus olitorius</i>	Meetha Pat	Leaves	Body pain, dysentery, piles, fever
	<i>Cucumis sativus</i>	Tiyanh	Leaves, Fruit	Bleeding nose, Diabetes
	<i>Dillenia indica</i>	Ow tenga	Fruit	Constipation, Stomach trouble
	<i>Drymaria cordata</i>	Laijabori	Aerial part	Fever, stomach ache
	<i>Eupatorium cannabinum</i>	Tongloti	Root	Tooth ache
	<i>Euphorbia nerifolia</i>	Hiju	Latex	Asthma
	<i>Hiptage benghalensis</i>	Madhoi maloti	Root	Asthma
	<i>Houttuynia cordata</i>	Mosonduri	Leaves	Constipation
	<i>Leucas aspera</i>	Durum bon	Aerial parts	Cough, Fever
	<i>Momordica dioica</i>	Bhat kerela	Root	Urinary problems
	<i>Murrya koenigii</i>	Narashinha	Leaves, Tender aerial parts	Stomachic
	<i>Naravelia zylenica</i>	Gorob choi	Aerial parts	Tooth ache, Skin infection
	<i>Paederia foetida</i>	Bhedai lota	Aerial parts	Stomach problem, Constipation, Joint pain
	<i>Physalis peruviana</i>	Kopalphoota	Aerial parts	Jaundice
	<i>Polygonum chinense</i>	Modhuhuleng	Aerial parts	Stomach trouble, Dysentery
	<i>Rosa centifolia</i>	Tezi gulap	Flower	Eye infection
	<i>Sapindus mukorossi</i>	Monisal	Fruit	Tonsillitis
	<i>Sarcochlamys pulcherrima</i>	Mesaki	Leaves	Infection, Diarrhea, Dysentery
	<i>Spondias pinnata</i>	Omora	Fruit	Acidity, Stomach trouble
	<i>Stereospermum chelonoides</i>	Paroli	Leaves	Skin infection
	<i>Stephania hernandifolia</i>	Tubuki lota	Leaves	Wound healing
	<i>Syzygium jambolanum</i>	Kola jamuk	Seed	Diabetes, Stomach trouble
	<i>Sida rhombifolia</i>	Hunbarial	Leaves	Body pain, Joint pain
	<i>Vitex negundo</i>	Pochotia	Leaves	Fever, Cough

Table 1.
Some of the medicinal plants used in Dibrugarh district and their allied applications.

emphasis on the part of the plants and their applications in treating different diseases and disorders. Some of the plants are listed in **Table 2**.

Plants in Tinsukia district, surveyed areas were documented on the basis of interview and questionnaire with the traditional healers with emphasis on the part of the plants and their applications in treating different diseases and disorders (**Table 3**).

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Golaghat	<i>Achasma loroglossum</i>	Kor Phool	Rhizome	Tooth ache
	<i>Aegle mermelos</i>	Bel	Leaves, Fruit	Kidney problem, Dysentery
	<i>Adiantum capillus</i>	Chuli dhekia	Aerial part	Wounds, Infection, Tooth ache
	<i>Averrhoa carambola</i>	Kordoi	Fruit	Jaundice, Diarrhea, Dysentery
	<i>Ageratum conyzoides</i>	Gandhalibon	Leaves	Cuts and wound
	<i>Alpinia allughos</i>	Tora	Rhizome	Stomach trouble, Joint pain
	<i>Alternanthera sessilis</i>	Mati Kanduri	Aerial part	Constipation
	<i>Baccaarea sapida</i>	Leteku	Fruit	Stomach problem
	<i>Borreria hispda</i>	Dolicha Bon	Leaves	Tooth ache, Gum swelling
	<i>Bryophyllum calycinum</i>	Dupor tenga	Leaves	Leaves Kidney stone
	<i>Cissus repens</i>	Bogi tenga	Leaves	Menstrual discomfort
	<i>Clenogyne dichotoma</i>	Patidoi	Stem	Support in fracture
	<i>Costus speciosus</i>	Jomlakhuti	Rhizome	Jaundice, Diabetes
	<i>Costus pictus</i>	Leteki	Aerial parts	Diabetes
	<i>Cinnamomum bejalghota</i>	Patihunda	Leaves	Asthma, Cough
	<i>Clitoria ternatea</i>	Aparijita	Root, Flower	Fever, Snake bite, Infection of skin
	<i>Croton bonplandianum</i>	Bonoria jaifal	Seed	Laxative
	<i>Cissampelos pareira</i>	Tubuki lota	Leaves	Diabetes
	<i>Eclipta alba</i>	Kehraj sesu	Leaves	Blood clotting
	<i>Heydichium coronarium</i>	Pakhila phool	Rhizome	Joint pain
	<i>Hydrocotyl sibthropioides</i>	Horu manimuni	Whole plant	Fever, Stomach problem
	<i>Leucas aspera Durun</i>	Durun Bon	Leaves	Snake bite, Sinusitis
	<i>Litsea salicifolia</i>	Dighloti	Leaves	Insect repellent
	<i>Phyllanthus niririi</i>	Bon Amlokhi	Shoot	Stomach trouble, Urinary problem
	<i>Polygonum chinense</i>	Madhu huleng	Aerial parts	Diarrhea
	<i>Sarochlamys pulcherrima</i>	Mesaki	Aerial parts	Tapeworm infection
	<i>Sida rhombifolia</i>	Hunbariol	Root	Helps in child birth for pregnant women
	<i>Smilax perfoliata</i>	Tikoni barua	Leaves, Root	Wound healing
	<i>Styrex serulatum</i>	Lota madhuri	Shoot	Anti infective
	<i>Triumfetta rhomboidea</i>	Bon Agora	Aerial parts	Insect repellent
	<i>Xanthozylum nitidum</i>	Tejmuri	Stem	Fractured bone

Table 2.
Some of the medicinal plants used in Golaghat district and their allied applications.

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Tinsukia	<i>Abroma augusta</i>	Gorokhia korai	Root	Urinary disorders
	<i>Abrus precatorius</i>	Latumoni	Root	Urinary disorders
	<i>Achyranthes aspera</i>	Bionihakuta	Leaves, Root	Wound, Sore throat, Cough and Cold
	<i>Acorus calamus</i>	Bosh	Rhizome	Acidity
	<i>Amaranthus spinosus</i>	Hatikhutura	Root, Aerial parts	Diarrhea, Increases milk output in lactating mother
	<i>Amaranthus tricolor</i>	Bishalya karani	Leaves	Wound healing
	<i>Alternanthera sessilis</i>	Mati kanduri	Aerial parts	Dysentery, Stomach trouble
	<i>Caesalpinia bonduc</i>	Letaguti	Seed	Fever, Body pain
	<i>Caryota urens</i>	Sewa	Root	Increases milk output in lactating mother
	<i>Cascabela thevetia</i>	Karabi	Seed, Bark, Latex	Anti-infective, Diabetes, Fever
	<i>Celtis tetrandra</i>	Hukuta	Tender Aerial parts	Relieves pain after child birth
	<i>Centalla asiatica</i>	Bormanimuni	Whole plant	Health tonic, Memory enhancer
	<i>Cinnamomum bejolghata</i>	Patihonda	Leaves	Diabetes
	<i>Ipomoea aquatic</i>	Kolmou	Leaves	Diabetes
	<i>Cissus quadriangularis</i>	Harjura lota	Stem, Tendrils	Wound, Fracture
	<i>Citrus grandis</i>	Robab tenga	Fruit	Jaundice, Deworming
	<i>Clerodendron colebrookianum</i>	Nephafu	Leaves	Hypertension
	<i>Costus pictus</i>	Leteki	Leaves	Diabetes, Blood purification
	<i>Costus speciosus</i>	Jomlakhuti	Rhizome, Leaves	Jaundice, snake bite
	<i>Croton joufra</i>	Gochmahudi	Leaves	Menstrual discomfort
	<i>Curanga amada</i>	Bhui tita	Leaves	Fever, Malaria
	<i>Curcuma amada</i>	Aam ada	Rhizome	Diarrhea, Dysentery
	<i>Cuscuta reflexa</i>	Akashi lota	Stem	Jaundice, Wound healing
	<i>Garcinia cowa</i>	Kuji thekera	Fruit	Diarrhea, Dysentery
	<i>Garcinia lancifolia</i>	Rupahi thekera	Fruit	Gastric discomfort, Diarrhea
	<i>Hibiscus sabdarifolia</i>	Tengamora	Aerial parts	Diarrhea, Dysentery
	<i>Houttuynia cordata</i>	Mosondori	Leaves, Tender shoot	Flatulence, Diarrhea, Dysentery
	<i>Lasia spinosa</i>	Sengmora	Rhizome, Aerial parts	Menstrual discomfort
	<i>Lindernia pursilla</i>	Gakhiroti bon	Whole plant	Increases milk output in lactating mother
	<i>Lygodium flexuosum</i>	Kopou dhekia	Leaves	Fungal infection
	<i>Malastoma malabathricum</i>	Phutuki	Leaves	Wound healing
	<i>Mussandra roxburghii</i>	Hukloti	Aerial parts	Stomach problems
	<i>Vetivera zizanoides</i>	Birina	Root	Rheumatic pain

Table 3.
Some of the medicinal plants used in Tinsukia district and their allied applications.

Plants in Dhemaji district selected areas were documented on the basis of interview and questionnaire with the traditional healers with emphasis on the part of the plants and applications in treating different diseases and disorders (**Table 4**).

Documentation of plants in Karbi Anglong district, surveyed areas was then done on the basis of interview and questionnaire with the traditional healers with emphasis on the part of the plants and their applications in treating different diseases and disorders (**Table 5**).

Documentation of plants in the surveyed region of Goalpara district was initiated on the basis of interview and questionnaire with the traditional healers with

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Dhemaji	<i>Abroma augusta</i>	Ui-sipak	Leaves	Cuts and wound healing
	<i>Ageratum conyzoides</i>	Namnyin/ Gunduabon	Aerial parts	Aids blood clotting, Wound healing
	<i>Alternanthera sessilis</i>	Patang oying	Aerial parts	Jaundice, Body ache
	<i>Bombax ceiba</i>	Singgi	Leaves	Wound healing
	<i>Catharanthus roseus</i>	Sada Bahar	Leaves	Diabetes
	<i>Calotropis gigantean</i>	Akon	Leaves, Latex	Wound healing, Body ache
	<i>Caesalpinia cucullatum</i>	Tezmuri	Leaves	Tooth ache, Fever
	<i>Chromolaena odorata</i>	Jarmanibon	Leaves, Root	Snake bite, Anti infective
	<i>Cissus quadrangularis</i>	Gomset sori	Aerial parts, Tendrils	Tendrils Joining of fractured bone
	<i>Costus scaber</i>	Keuri	Leaves	Snake bite, wounds
	<i>Costus speciosus</i>	Peki jigjig	Rhizome	Jaundice, UTI
	<i>Cyclosorus extensus</i>	Rukji	Leaves	Increases milk output in lactating mother
	<i>Desmodium laxiflorum</i>	Bhuter chira	Aerial parts	Infection, Menstrual discomfort
	<i>Eryngium foetidum</i>	Bormang ori	Leaves	Appetizer, stomach problems
	<i>Ficus hispida</i>	Takpi	Fruit	Jaundice
	<i>Garcinia lanceifolia</i>	Rupohi tehekera	Fruit	Jaundice, Diarrhea
	<i>Houttuynia cordata</i>	Musondri	Leaves	Optimizes stomach function
	<i>Ipomoea aquatic</i>	Mou	Leaves	Jaundice, Diabetes
	<i>Mentha arvensis</i>	Takemare	Leaves	Stomach trouble
	<i>Mimosa pudica</i>	Yuptap	Root	Deworming
	<i>Musa velutina</i>	Doge kopak	Flower	Diarrhea, Dysentery
	<i>Litsea citrata</i>	Mezangkori	Bark	Asthma, Cough
	<i>Solanum nigrum</i>	Loshkosi	Leaves	Jaundice
	<i>Tylophora asthamatica</i>	Jangli pikran	Leaves, Roots	Purify blood, Stops white vaginal discharge
	<i>Oxalis corniculata</i>	Tengsi	Leaves	Hypertension, Diabetes, Stomach upset
	<i>Zanthoxylum nitidum</i>	Rikom	Aerial parts	Anti infective

Table 4.
Some of the medicinal plants used in Dhemaji district and their allied applications.

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Karbi Anglong	<i>Acmella paniculata</i>	Bapchuki	Leaves, Flower	Stomach ache, Acidity
	<i>Abelmoschus moschatus</i>	Arnam hanserong	Leaves, Fruit	Snake bite
	<i>Abrus precatorius</i>	Chuselok	Leaves	Fever, Asthma, Joint pain
	<i>Abutilon indicum</i>	Mir-at	Leaves, Flower	Snake bite, Insect bite
	<i>Acacia pennata</i>	Themra/Khemra	Leaves, Bark	Snake bite
	<i>Alpinia galangal</i>	Phrikan gnek	Leaves, Rhizome	Stomach ache, Improves digestion
	<i>Alternanthera sessilis</i>	Raeaba	Aerial parts	Fever, Infection
	<i>Amorphophalus bulbifer</i>	Hen salku	Leaves, Flower	Piles, Irregular bowel movement
	<i>Arisaema tortuosum</i>	Chamua	Leaves, Tuber	Piles, Irregular bowel movement
	<i>Calamus rotang</i>	Pri	Aerial parts	Snake bite
	<i>Cassia tora</i>	Bapduli	Leaves, Flower	Joint pain, Improves bowel movement
	<i>Costus pictus</i>	Tui	Leaves	Diabetes, Jaundice
	<i>Costus speciosus</i>	Ai-upo	Leaves, Rhizome	Jaundice, Snake bite
	<i>Cycas pectinata</i>	Or-oh	Aerial parts	Acidity, Heart burn
	<i>Lasia spinosa</i>	Chusot	Aerial parts	Piles, Irregular bowel movement
	<i>Laportea cremulata</i>	Bap kangsam	Fruit, Flower	Scorpion bite
	<i>Murraya koenigii</i>	Thengsakso	Leaves	Acidity, Fever
	<i>Olax acuminata</i>	Hanboka	Leaves	Wound healing
	<i>Oroxylum indicum</i>	Nopak ban	Leaves, Flower	Intestinal worm, Stomach ache
	<i>Paederia foetida</i>	Rekang nemthu	Leaves	Acidity
	<i>Physalis peruviana</i>	Thebongkang	Leaves, Fruit	Stomach ache, Deworming
	<i>Phlogocanthus thyriflorus</i>	Titaful	Flower	Fever, Jaundice
	<i>Solanum torvum</i>	Bhekuri tita	Leaves, Fruit	Anti infective
	<i>Spondias pinnata</i>	Siming	Leaves, Flower	Acidity, Diarrhea
	<i>Tagetes erecta</i>	Mir kadomphui	Leaves, Flower	Anti infective, Wound healing, Improves digestion
	<i>Vitex negundo</i>	Vorke abap	Leaves, Flower	Fever, Ache, Malaria

Table 5.
Some of the medicinal plants used in Karbi Anglong district and their allied applications.

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Goalpara	<i>Abroma augusta</i>	Dadhubedang	Leaves	Stomach ache, Ringworm infestation
	<i>Acalypha indica</i>	Muktaborcha	Leaves	Asthma, Bronchitis
	<i>Calamus rotang</i>	Batbelai	Leaves	Eye infection
	<i>Clerodendrum bracteatum</i>	Vate gakha	Leaves	Memory tonic
	<i>Calotropis gigantia</i>	Aakon	Leaves, Bark	Snake bite, Asthma
	<i>Deeringia amaranthoides</i>	Matak tuka	Leaves	Wound, Sore
	<i>Euphorbia hirta</i>	Dudh bon	Shoot, Latex	Infection
	<i>Ficus hispida</i>	Domuru	Leaves	Jaundice
	<i>Murraya koenigii</i>	Narasinghabelai	Leaves, Tender aerial parts	Fever, Stomach upset
	<i>Nelumbo nucifera</i>	Podum	Rhizome	Menstrual discomfort
	<i>Ocimum sanctum</i>	Dhulungshi	Leaves	Cough, Fever
	<i>Paederia foetida</i>	Bhadalilewa	Leaves	Diarrhea, Dysentery
	<i>Polyalthia longifolia</i>	Debbaru	Bark	Menstrual discomfort
	<i>Solanum integrifolium</i>	Tita Bhekri	Fruit	Malaria, Fever, Jaundice, Diabetes
	<i>Terminalia tomentosa</i>	Amra	Fruit	Diabetes, Stomach upset
	<i>Vitex negundo</i>	Pasatia	Leaves	Body pain, Wound, Fever

Table 6.
Some of the medicinal plants used in Goalpara district and their allied applications.

District	Plant name		Part used	Use/applications
	Botanical name	Local name		
Kokrajhar	<i>Benincasa hispida</i>	Kumbra	Fruit, Leaves	Diabetes, Acidity
	<i>Canarium bengalensis</i>	Dhuna	Leaves,	Bark Joint pain
	<i>Chromolaena odorata</i>	Bangrilewa	Leaves	Stomache ache, dysentery
	<i>Chrystella parasitica</i>	Daokhumwi	Young aerial part	Wound healing
	<i>Clerodendrum infortunatum</i>	Lwkwna	Leaves	Jaundice, Wound healing
	<i>Clitonia ternatea</i>	Nilkantha	Leaves	Fever, antiseptic
	<i>Costus speciosus</i>	Buritokon	Rhizomes, Leaves	Jaundice, Snake bite
	<i>Corchorus capsularis</i>	Patw	Leaves, Root	Fever, Diarrhea
	<i>Datura stramonium</i>	Datura	Leaves, Fruits	Tooth ache, Heartburn, Asthma
	<i>Embllica officinalis</i>	Amla	Fruit	Tonic, Stomachic
	<i>Laportea crenulata</i>	Koma	Leaves, Root	Heartburn, Fever, Cuts and Wound
	<i>Leucas plukenetii</i>	Khangsinsa	Leaves	Sinusitis, Pain
	<i>Nyctanthes arbortristis</i>	Sephali	Leaves, Flower	Antihelmintic
	<i>Ocimum sanctum</i>	Tulsi	Leaves	Cough relief, Asthma
	<i>Paederia foetida</i>	Bhedalilewa	Leaves	Diarrhea, Constipation
	<i>Scoparia dulcis</i>	Bongpang rakeb	Whole plant	Kidney stone, Diarrhea, Fever
	<i>Xanthium strumarium</i>	Agara	Root, Leaves	Fever, Joint pain

Table 7.
Some of the medicinal plants used in Kokrajhar district and their allied applications.

emphasis on the part of the plants and their applications in treating different diseases and disorders (**Table 6**).

Plants in surveyed areas of Kokrajhar district were documented on the basis of interview and questionnaire with the traditional healers with emphasis on the part of the plants and their applications in treating different diseases and disorders (**Table 7**).

4. Profiles of *Costus* species used predominantly in traditional medicine in the surveyed areas

The ethnomedicinal survey conducted in the different areas revealed the prominent use of the species belonging to the genus *Costus*. The species were *Costus speciosus*, *Costus scaber* and *Costus pictus*. Therefore botanical and pharmacognostic profiling of the said species were done accordingly.

4.1 *Costus speciosus* (J. Konig) Smith

Costus speciosus (**Figure 2**) is an erect plant, up to 2.7 meters high; root stock is tuberous; stem is sub-woody at the base. Leaves have an average dimensions of (15–30) cm × (5.7–7.5) cm and are sub sessile, oblong, spirally arranged with silky-pubescent base [13, 14]. The flowers are present in very dense spikes having ovate bracts that are mucronate and bright red in color. The corolla have short tube with lobes which are ovate-oblong subequal. Flower lips are white with yellow center with crisped, concave, disk with a tuft of hair at the base. Fruits are capsule, globose trigonus and are red in color. The seeds are black with white aril. Flowering time in Indian condition is August to October [13, 15].

It is a herb occurring in the moist and wet evergreen areas of the Indo-Malayan region and Sri Lanka along with Brazil, Bolivia, Colombia, Peru, Mexico etc. Within India it occurs from Central and Eastern Himalayas to Southern India [15, 16].

4.2 *Costus scaber*

Costus scaber (**Figure 3**) is an erect plant, up to 4 meters high; root stock is tuberous; stem is sub-woody at the base. Leaf shape is elliptical with entire margin and



Figure 2.
C. speciosus (J. Konig) Smith collected from Nagakhelia village, Dibrugarh.



Figure 3.
Costus scaber collected from Dhemaji (insert: flower specimen).

are spirally arranged around the stem. The primary bracts are borne on the inflorescence in spiral phyllotaxy. One flowered cincinni occur in the axils of these bracts. Each cincinnus consists of an axis bearing a terminal flower [17]. The floral organs are formed sequentially starting with calyx. Flowering time in Indian condition is October to December.

It is mainly distributed in the neo tropical regions. Within India its geographical distribution is in the sub-Himalayan tract from Kangra district of Himachal Pradesh eastwards to Arunachal Pradesh; and in the Western ghats in Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu.

4.3 *Costus pictus* D. Don

Costus pictus (**Figure 4**) is a plant that goes upto 3 meters in height; it has tuberous root with a nearly woody base. The leaf arrangement is spiral with an elliptical shape. Leaf bears rigid and rubbery morphology. Spiral phyllotaxy is observed in



Figure 4.
C. pictus D. Don collected from Naojan, Golaghat.

the primary bracts. The external appearance of the flowers as depicted in **Figure 4** is primarily are creamy colored along with pink stripes initiating from the base. The plant generally bears flower between the months of August and October.

This plant is mainly distributed in the neo tropical regions [18, 19]. In India it found in the sub-Himalayan tract from Himachal Pradesh to Arunachal Pradesh; and in the Western ghats in Goa, Kerala and Tamil Nadu.

5. Conclusion

The state of Assam, popularly known as the land of the red river and blue hills is home to a diverse array of flora and fauna. Assam falls in one of the great migration routes of mankind of different groups who over the centuries have come and settled down. Every community has its own traditional rituals, customs and herbal remedies which have been molded by the geographical location and the environmental factors where they reside. The abundant natural resources in encompassing location form the basis for the characteristic food habits and related medicinal practices of each community. By their experience, the knowledge of herbal remedies was transferred to generation after generation as folk medicine.

A study was conceived based on the aforesaid facts with intent to scientifically analyze different folkloric healing practices encompassing various medicinal plants. Subsequently an ethno medicinal survey was conducted across the state of Assam for compiling information with respect to traditional medicine. Thereafter, plants belonging to Costaceae family were selected for scientific validation studies owing to their predominant use among the traditional healers in the surveyed regions particularly in upper Assam for treating ailments like jaundice, diabetes etc.

Three plants belonging to the costus genus were identified viz. *Costus scaber*, *Costus speciosus* and *Costus pictus* for the study. *Costus speciosus* locally known as 'Jomlakhuti' in Dibrugarh, Golaghat and Tinsukia district; 'Peki jigjig' in Dhemaji; 'Ai-upo' in Karbi Anglong district and 'Buritokon' in Kokrajhar district, the rhizomes, leaves are primarily used for treating liver ailments, diabetes, UTI, snake bite respectively. *Costus scaber* locally known as 'Keuri' in Dhemaji district, the leaves are used in the treatment of snake bite and wound healing. *Costus pictus* locally known as 'Leteki' in Golaghat and Tinsukia district and 'Tui' in Karbi Anglong district, the aerial parts and leaves are used traditionally in the treatment of diabetes, for blood purification and jaundice respectively.

Therefore, it can be safely concluded that species belonging to this genus are traditionally used in the mitigation of various ailments particularly diabetes. Furthermore, *in vivo* and *in vitro* studies are warranted against these species so as to elucidate viable phyto components as a future prespective.

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Conflict of interest

“The authors declare no conflict of interest.”

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