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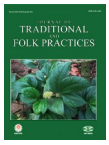

Journal of Traditional and Folk Practices

Ethnobotanical study on plant species used by the *Nyishi* tribe of Arunachal Pradesh, India

Pratibha Bisht[*], Naveen Chandra Joshi[2] and Suneel Pandey[1]

[1]Department of Energy and Environment, TERI School of Advanced Studies, New Delhi - 110 070, India
[2]Wildlife Institute of India, Chandrabani, Dehradun, Uttarakhand - 248 001, India.

[*]pratibharawat83@gmail.com

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Abstract

The *Nyishi* tribe is one of the largest tribal groups in Arunachal Pradesh and has played a significant role in the culture and economy of this region. They have accrued rich ethnobotanical knowledge through socio-cultural practice and experience in their long-term association with the natural environment. However, their traditional knowledge of plant species is endangered due to a lack of written records and rapid economic development. A total of 239 informants were consulted through semi-structured interviews, field observations, group discussions and guided field walks. A total of 54 plant species belonging to 41 families were recorded during the investigation. Among the documented species, 28 were herbs (51.86% of total species), followed by trees (14 species, 25.93%), shrubs (9 species, 16.67%) and climbers (3 species, 5.56% each). The highest Relative Frequency Citation value (RFC=0.63) was recorded for *Musa paradisiaca* L. which was also the culturally most significant plant (Cultural Significance Index = 1.13), followed by *Melastoma malabathricum* L. (Relative Frequency Citation =1.17) and *Oxyspora paniculata* DC. (RFC=0.92). *Nyishi* people are also aware of the diversified uses of plants influencing their lifestyle and socio-economic conditions, which are further managed by their inherent traditional beliefs, customs, taboos and environmental principles. However, their traditional knowledge and associated plant species are significantly threatened by rapid lucrative development for various reasons, including modernization and urbanization. The community is changing in the socio-economic and political realms and traditional beliefs and practices**.** Thus, policies and practices for conserving traditional plant species and the associated traditional knowledge are necessary.

Keywords: Ethnobotanical knowledge, *Nyishi* tribe, Socio-cultural practices, Traditional knowledge

1. Introduction

The religious, cultural and economic practices of the tribal people depend on plant species (Beltran, 2000). It's the most life-supporting system and plays a vital role in their economy (Gantayat, 1997). The majority of the tribal inhabitants of mountains, hills and forests practice their unique socio-political structure and religious system, which revolves around the surrounding natural environment (Joshi *et al*. 2021). Tribal people are the ecosystem folks that sleep consonant with the character and maintain a specific link between man and the environment (Sajem and Gosai, 2006). Plants guide the livelihood of tribal communities and they are mainly enthusiastic about the forests, which have built up their socio-economic and cultural life (Hooker, 1854; Shroff, 1997; Khisa, 1998; Pei, 2001). As plants continue to provide the tribal communities with a wide range of social and economic benefits, they are important and key to their livelihood (FAO, 2006). Further, studies have argued that traditional products are environment-friendly and can be used in designing modern-day equipment (Karthikeyan *et al*., 2009).

The Himalaya isn't only rich in biodiversity and is also home to many tribal communities (Samant and Dhar, 1997). They used plant species for various purposes, from food to fiber, medicine to shelter and livestock care to fuelwood collection. The major requirements of tribal communities are generally met from the forests (Salerno *et al*., 2005; Das and Nag, 2006; Uniyal *et al*., 2006; Santayana *et al*., 2007; Nedelcheva *et al*., 2011; Kang *et al*., 2017). Gradually, they use the natural forest produce, i.e., wood, branches, logs, fibers, etc., for developing products such as tools, storage items, handicrafts, beverages etc., that were useful in daily life (Nedelcheva *et al*., 2011; Sundaramari *et al*., 2011; Roberts *et al*., 2014). Hence, it is evident that tribal communities have a vast knowledge of plants' utilization that they have gained over generations through trial-and-error methods. However, this traditional knowledge is fast declining (Gavali and Sharma, 2004; Vandebroek and Balick, 2012; Joshi *et al.* 2021). The oral transmission of traditional knowledge from the older to the younger generation is not always assured (Anyinam, 1995; Rao, 1996); thus, the knowledge's documentation becomes important (Cox, 2000; Santayana and Macia, 2015; Ulian *et al*., 2016; Sujarwo and Keim, 2017).

The Arunachal Pradesh in India is home 26 major tribes and 110 sub-tribes (Srivastava and *Nyishi* community 2010). *Nyishi* tribal community (earlier known as *Dafla* tribe) is the largest tribe of Arunachal Pradesh (Hina 2013), with around three lakh population (Census, 2011). They are spread across six districts of Arunachal Pradesh viz. Papumpare, Kurung Kumey, East Kameng, Kra Daadi, Lower Subansiri and Upper Subansiri district and few *Nyishi* tribals also live in some parts of Sonitpur and North Lakhimpur districts of Assam (Tada 2016; Ramya and Ramjuk 2018). Their traditional language '*Nyi*' which refers to "a human" and the word shi denotes "a being", which together refers to a human being. *Nyokum-Yullu* and *Sirom-Molo-Sichum* are their major annual fetivals which are celebrated during December and are related to future prosperity (Deb *et al.* 2009).

The present study was conducted in Papumpare district, situated in Arunachal Pradesh. The *Nyishi* tribals represents the highly knowledgeable tribe of the district as they use diverse plant resources in socio-cultural life. The study explored the data on traditional knowledge of locally available plant species used in socio-cultural practices by the region's *Nyishi* tribal community. The community uses surrounding plants for their daily necessities and primary healthcare based on traditional knowledge and unique cultural heritage. But unfortunately, the traditional knowledge of the *Nyishi* community remains less-documented and is handed down orally (Ramya and Ramjuk 2018). The younger generation has different ambitions due to changing circumstances and therefore, traditional knowledge is feared to get lost. Thus, the present study was undertaken to document and provide in-depth information on plant species used by the *Nyishi* community in various socio-cultural practices. We recorded their ethnobotanical knowledge associated with socio-cultural practices. We hypothesized that socio-cultural factors are essential in shaping knowledge.

2. Materials and methods

2.1. Study area

Arunachal Pradesh is known as the "Land of Rising Sun" (FSI, 2019). Based on species rarity and endemism Arunachal Pradesh in the Eastern Himalaya is a part of Hotspot and among the 200 globally important ecoregions (Paul *et al*. 2005). China surrounds it in the North, Bhutan in the West, Myanmar in the East, and Nagaland and Assam in the South (Joshi 2010). Papumpare district is situated between 26°55′ to 28°40′ N and 92°40′ to 94°21′ E. The elevation varies from 45 to 1200 m above sea level. The tribal people rely on subsistence agriculture. *Jhum* (shifting) cultivation on steep slopes and wet rice cultivation in low- lying areas are generally practiced. The study area falls under mid tropical hill zone. Monsoon season starts May and continues to September/ October every year. The average annual rainfall of the Papumpare district is 3200 mm (CGWB 2013). The climate varies from wet and humid in the southern part of the district to extreme cold, with the temperature falling below freezing point at many places in the North. Almost 75% of the district is covered by thick forest, which has sub-tropical, humid, and deciduous type of vegetation

Like all other traditional communities, the *Nyishi* community has tremendous traditional knowledge, essential for their survival (livelihood), including biodiversity conservation and development. However, socio-cultural practices using plant species of this community were not well documented in the past. Therefore, this study's primary aim was to document this community's socio-cultural practices and associated plant species. Based on the traditional *Nyishi* settlements' characteristics and their proximate geographical locations, nine villages, viz. Tarajuli Forest Camp, Tani Hapa, Balijan *Nyishi*, Model, Ganga Market, Chimpu, Chimi, Dat, and Dami Hapa were selected as the investigation sites (Fig. 1).

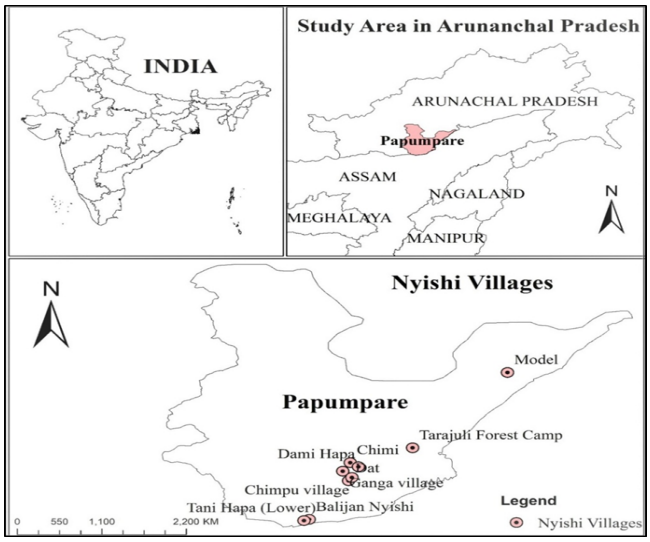

Fig. 1. Map of the study area

2.2. Ethnobotanical data collection

A total of 239 informants (119 males and 120 females) were interviewed in the study area. The informants were local inhabitants aged between 18 and 70 years old. Various sections of participants (e.g., traditional healers, farmers, village leaders,etc.) were interviewed. Ethnobotanical data were collected from April 2017 to February 2019. Information about plants' socio-cultural use was collected through semi-structured interviews, observations, field visits, and group discussions in the investigation area (Martin, 1995; Bernard, 2006; Hong *et al*., 2015; Wang and Wang, 2017). All the Interviews and discussions were performed based on questionnaires. The local names of plants, parts used, the form of the plant material used, etc., were carefully recorded during the informants' interviews. Personal and socio-economic information, including the informants' names, ages, occupations and education levels, etc., were also collected. Identification of plants was made in consultation with the Botanical Survey of India, Itanagar circle, Arunachal Pradesh, Wildlife Institute of India Dehradun, and local scientific agencies. Literature and other valuable information's" were also collected from Arunachal ForestDepartment and regional Universities and research centers.

2.3. Ethical consideration

As mandated by the National Biodiversity Authority, India, aPrior Informed Consent (PIC) was obtained to participate in this research before collecting information from the informant. A formal letter from the head of the village, "*Goan Burah*" was also taken to maintain respect for human dignity and privacy and conduct the risk or benefit assessment throughout the study. The participants were assured that their information and participation would not be used against them in any way and that they were free from exploitation. The participants were voluntarily informed that they had the right to decide whether to participate in the study. A full description of the nature of the study wasprovided to every participant. In order to achieve the principle of justice, participants were treated fairly and equally before, during, and after the study.

2.4. Data analysis

Data analysis was carried out by using ethnobotanical investigation and descriptive statistical methods, such as use value (UV), the relative frequency of citation (RFC), cultural value (CV), and the cultural significance index (CSI) to evaluate the importance of the plant species mentioned in the study area. Based on their use, the same were classified into four categories: fishing and hunting, beverages, religious and miscellaneous (Table 1).

Table 1. Categorization of products and their description

Sl. No.	Categories	Description
1	Fishing and Hunting	Products designed and used for performing specialized tasks or activities
2	Beverages	Local drinks used in social gatherings
3	Religious	Products that are used in rituals and taboos
4	Miscellaneous	Items made for decorative purposes or daily use

2.4.1. Use value index (UV)

The use-value (UV) indicates the relative importance of plants known locally. It is estimated by using the following equation (Gazzaneo *et al*., 2005).

$$UV = \sum \frac{U_i}{N}$$

Where U_i is the number of uses cited by each respondent for a given species and N is the total number of respondents in the survey.

2.4.2. Relative Frequency of Citation (RFC)

The relative frequency of citation (RFC) index was acquired by dividing the number of respondents mentioning a useful species (FC or Frequency of Citation) by the total number of respondents in the survey (N). RFC value varies from 0(when nobody refers to a plant as a useful one) to 1(when all the informants mentioned it as useful) (Tardio and Pardo-de Santayana, 2008).

$$RFC_S = \frac{FC_S}{N} = \frac{\sum_{i=i_1}^{iN} UR_i}{N}$$

2.4.3. Cultural Value Index (CV)

This Cultural Value Index (Reyes-Garcia *et al*. 2006) was calculated by using the following formula:

$$CV_S = \left[\frac{NU_S}{NC}\right] X \left[\frac{FC_S}{N}\right] X \left[\frac{UR_{ui}}{UR_{ui}}\right] X \left[\sum_{u=u1}^{uNC} \sum_{i=i1}^{iN} UR_{ui}/_N\right]$$

Where the first factor is the relationship between the number of different uses reported for the species and the total number of use categories considered in the study (NU_s divided by NC). The second factor is the sum of all the UR for the species, i.e., the sum of the number of participants who mentioned each use of the species, divided by N. These three factors are then multiplied together.

2.4.4. Cultural Significance Index (CSI)

This index was given by Turner (1988) and modified by Stoffle *et al*. (1990) and Silva *et al*. (2006). Turner refers to scores on a five-point scale according to the quality and intensity of variables use and selects a score of 2, 1, or 0.5 for the individuality or preference of use. To scale down the subjectiveness of this index, Silva *et al*. (2006) changed the CSI with a two-point scale for the variables of species management (2 = managed, 1= not managed), preferred (2 = preferred for a given use, 1 = not the preferred species for a given use) and use frequency (2 = species completely used for a given use, 1 = species rarely cited for a given use). They have also included a correction factor (CF) to reduce this method's sensitivity to sampling intensity.

$$CSI = (i * e * c) * CF$$

Comparison among indices was based on the evaluation of useful plants using four quantitative indices and rankingof the first 20 species following the CSI index and plant ranking based on each index. The order was based on the frequency of citation of the plant species. If the maximum informants recognized the diversity of plant species and the multiplicity of uses mentioned by the informants in each category, it was given a ranking value of 1. In contrast, the least-effective plant would be given a lower value of 20. All plant species were given a ranking based on their total score. The comparison exercise's total ranking was obtained by summing the number of informants who participated (Pan *et al*., 2011).

3. Results and discussion

3.1. Socio-economic characteristics of the informants

A total of 239 informants (119 male and 120 female informants) from the Papumpare district agreed to participate in this study. The distribution of informants by age, gender and education level is shown in (Table 2). The age of the informants ranged from 18 to above 60 years old. Among them, 29.71% of informants were between 31-40 years old, 78.24% were married, 28.94% had only primary education, and 17.99% were illiterate. 26.36% of informants were self-employed (Table 2).

Table 2 Demographic characteristics of *Nyishi* tribe

Variable	Category	Male	Female	Total	Percentage (%)
	Total Participants	119	120	239	100.00
Age	Below 20 years (Above 18)	7	11	18	7.53
	21-30 years	32	31	63	26.36
	31-40 years	33	38	71	29.71
	41-50 years	26	28	54	22.59
	51-60 years	14	9	23	9.62
	Above 61 years	7	3	10	4.18
Marital Status	Married	94	93	187	78.24
	Un-married	25	21	46	19.25
	Widow	-	6	6	2.51
Education	Graduate	28	10	38	15.90
	Middle Secondary	25	19	44	18.41
	Higher Secondary	35	17	52	21.76
	Primary	20	42	62	25.94
	Illiterate	11	32	43	17.99
Occupation	Govt. Service	20	5	25	10.46
	Private Service	28	2	30	12.55
	Farmer	24	5	29	12.13
	Self Employed	19	44	63	26.36
	Daily wages	2	4	6	2.51
	House maker	1	28	29	12.13
	Student	21	19	40	16.74
	Unemployed	4	13	17	7.11

3.2. Ethno-botanical plant species recorded

From the study sites, a total of 54 plant species belonging to 41 families were reported by the *Nyishi* respondents. Information for each species, including its scientific name, family, local name, habit, plant parts used and their uses, are presented in Table 3. Some of the cultivated species were also recorded which are used for making ornaments and beverages.

Table 3. List of plant species used in socio-cultural traditional practices and belief systems by the *Nyishi* tribal community of Arunachal Pradesh

Sl.No	Scientific name	Family	Local name	Habit	Plant part used	Use
1	*Aconitum ferox* Wall. ex Ser.	Ranunculaceae	*Omli, Omyu*	Herb	Root, Tuber	Arrow poisoning by local hunters
2	*Acorus calamus* L.	Acoraceae	*Wok-kak-hing, Talyo*	Herb	Leaf, Stem, Root, Flower	Making perfume
3	*Alpinia nigra* (Gaertn.) Burtt	Zingiberaceae	*Bugbii-talli, Doyak*	Herb	Rhizome, Fruit, Leaf	Local beer preparation
4	*Amaranthus cruentus* L.	Amaranthaceae	*Amaranth*	Herb	Shoot, Root	Dyes and ornamental plant
5	*Arisaema consanguineum* Schott	Araceae	*Biram sing*	Herb	Rhizome	Arrow poisoning for hunting
6	*Arundina graminifolia* (D.Don) Hochr.	Orchidaceae	*Longbom*	Herb	Whole Plant	Decoration during festivals
7	*Aspidopterys indica* (Willd.) W. Theob.	Malpighiaceae	*Tasa*	Herb	Whole Plant	Catching birds
8	*Asplenium phyllitidis* D. Don	Aspleniaceae	*Patalak*	Herb	Leaf	Decoration in the local festival
9	*Balanophora dioica* R. Br. ex Royle	Balanophoracae	*Poyou*	Herb	Root	Catching birds
10	*Berberis wallichiana* DC.	Berberidaceae	*Tipetere, Madrak*	Shrub	Fruit, Root, Bark	Tattooing on chin and forehead
11	*Calamus floribundus* Griff.	Arecaceae	*Taneso*	Tree	Fruit, Stem	Making basket and Hat
12	*Capsicum annuum* L.	Solanaceae	*Yaluk, Nyamdak/ pichak*	Herb	Fruit	Ornamental purposes
13	*Chenopodium album* L.	Amaranthaceae	*Taye, Teya Ao*	Herb	Leaf, Seed, Shoot, Flower	Local beer and Toothache
14	*Chromolaena odorata* (L.) R.M.King & H.Rob.	Asteraceae	*Gocham Nemi, Telimbabo, Badnas, Dactin*	Shrub	Root, Leaf, Flower	Fish poison

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15	*Coix lacryma-jobi* L.	Poaceae	*Tatang*	Herb	Seed	Preparing necklaces
16	*Alsophila spinulosa* (Wall. ex Hook.) R.M.Tryon	Cyatheaceae	*Tachi- tani*	Shrub	Stem, Leaf	Rituals
17	*Dendrobium hookerianum* Lindl.	Orchidaceae	*Tachee*	Tree	Flower	Textile dye
18	*Dicranopteris linearis* (Burm. fil.) Underw.	Gleicheniaceae	*Tapiu*	Ferns	Stem, Rhizome	Protection against arrow
19	*Dryopteris sparsa* (D. Don) Kuntze	Polypodiaceae	*Kaja Habo*	Tree	Shoot, Whole Plant	Religious ceremony
20	*Engelhardia spicata* Lechen ex Blume	Juglandaceae	*Hill-Miri: Ripekam*	Tree	Root, Bark, Leaf	Fish poisoning
21	*Eurya acuminata* DC.	Pentaphylacaceae	*Turku*	Herb	Leaf	Permanent dye
22	*Ficus elastica* Roxb. ex Hornem.	Moraceae	*Sangri, Sherak*	Tree	Fruit	Catching fish
23	*Hedychium coccineum* Buch. -Ham. ex Sm.	Zingiberaceae	*Uii-telli, Aemmi Pekchi*	Herb	Whole Plant, Rhizome	Ornamental purposes
24	*Hedychium gardnerianum* Sheppard ex Ker Gawl.	Zingiberaceae	*Oyoulangoom*	Tree	Flower	Decoration in festivals
25	*Dimetia scandens* (Roxb.) R.J.Wang	Rubiaceae	*Taja hoor, Hylibi Reekhing*	Climber	Stem	Toothbrush
26	*Cucumis melo* L.	Cucurbitaceae	*Hey, Luffa*	Climber	Fruit, Leaf	Natural scrubber and washing sponge
27	*Macaranga denticulata* (Blume) Müll.Arg.	Euphorbiaceae	*Hara, Yaduk*	Tree	Leaf, Whole Plant	Religious and marriage ceremonies
28	*Mastersia assamica* Benth.	Fabaceae	*Rading, Rem*	Shrub	Stem	Making ropes and thread for fishing net

29	*Melastoma malabathricum* L.	Melastomataceae	*Di-sengn, Dai-Hitae, Nyamiktu, Doy Oppu Yuppa Bo*	Shrub	Fruit, Stem, Twig, Flower	Toothbrush and offered to God for better yield of paddy
30	*Thelypteris gracilescens* (Blume) Ching	Aspleniaceae	*Radak, Nipiati*	Ferns	Leaf	Preparation of local drink
31	*Mikania scandens* (L.) Willd.	Asteraceae	*Tare Nemi, Chakpan*	Herb	Leaf, Flower	Ornamental purposes
32	*Millettia pachycarpa* Benth.	Fabaceae	*Tomu, Shumlu, Hapuling*	Shrub	Root	Fish poisoning
33	*Musa paradisiaca* L.	Musaceae	*Nyoro- kopa, Kol, Kola*	Herb	Fruit, Leaf, Stem, Flower	Festivals and local beer preparation
34	*Nelumbo nucifera* Gaertn.	Nalumbonaceae	*Thambal*	Herb	Leaf, Root	Worship
35	*Nephrolepis cordifolia* (L.) C.Presl	Nephrolepidaceae	*Tapion*	Ferns	Whole Plant	Trap for catching birds in the paddy fields
36	*Oreocnide integrifolia* (Gaudich.) Miq.	Urticaceae	*Boree, Pokeerjali*	Tree	Bark, Stem	Rope and thread for preparing fishing net
37	*Oxyspora paniculata* DC.	Melastomataceae	*Dasa, Porkijale*	Shrub	Stem, Leaf, Whole plant	Toothbrush and offered to deities to get a better yield of paddy
38	*Phrynium pubinerve* Blume	Marantaceae	*Ekkam, Khokam*	Herb	Leaf	Wrapping and packaging materials, preparation of traditional drinks
39	*Piper nigrum* L.	Piperaceae	*Jaluk*	Shrub	Fruit	Aromatic
40	*Persicaria acuminata* (Kunth) M.Gómez	Polygonaceae	-	Herb	Root	Fish poison for stupefying fish
41	*Prunus persica* (L.) Batsch	Rosaceae	*Makan, Makum, Chekom*	Tree	Leaf, Fruit	Prepare local drink *Apong*
42	*Rhamnus napalensis* (Wall.) M.A.Lawson	Rhamnaceae	*Biringa schein*	Tree	Fruit	The devil eats plant (taboo)

43	*Rhaphidophora glauca* (Wall.) Schott	Araceae	*Chulu*	Tree	Fruit	People avoid burning the plant as they are afraid of the sound produced by it
44	*Brucea javanica* (L.) Merr.	Simaroubaceae	*Tamo*	Shrub	Leaf	Funeral ceremony
45	*Rubia manjith* Roxb.	Rubiaceae	*Tamin*	Climber	Root, Fruit, Leaf, Whole Plant	Textile dye
46	*Balakata baccata* (Roxb.) Esser	Euphorbiaceae	*Shigum*	Tree	Leaf, Stem	Fish poisoning
47	*Setaria italica* (L.) P.Beauv.	Poaceae	*Tayak*	Herb	Leaf, Seed	Prepare local drink
48	*Setaria pumila* (Poir.) Roem. & Schult.	Poaceae	*Taya*	Herb	Seed	Prepare local drink
49	*Bruinsmia polysperma* (C.B.Clarke) Steenis	Styraceae	*Tugu*	Tree	Fruit	Textile dye
50	*Tacca integrifolia* Ker Gawl.	Dioscoraceae	*Tagoon, Kanjok, Pisir, Paser*	Herb	Rhizome, Tuber	Poison arrowheads
51	*Themeda villosa* (Lam.) A.Camus	Poaceae	*Pkabar*	Herb	Whole Plant	Thatching houses
52	*Urena lobata* L.	Malvaceae	*Borival, Sitoyorik, Boriyal*	Herb	Root	Toothbrush
53	*Viburnum foetidum* Wall.	Viburnaceae	-	Tree	Fruit	Textile dye
54	*Zea mays* L.	Poaceae	-	Herb	Seed	Prepare local drink

3.3. Habit and plant parts used

The results showed that *Nyishi* use mostly trees (25.93%) followed by herbs (46.30%), shrubs (16.67%), climbers and ferns (5.55% each) in socio-cultural practices (Fig. 2). The plant parts analysis of the traditional plants showed that the families that contributed more species were Poaceae (5), followed by Zingiberaceae (3) and Araceae, Orchidaceae, Asteraceae, Rubiaceae, Euphorbiaceae, Fabaceae and Melastomataceae (2 each). The remaining 32 families were represented by one species, each (Table 3).

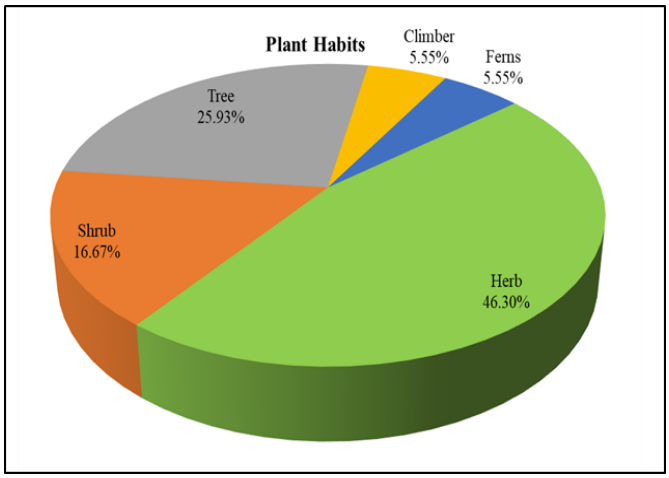

Fig 2. Habits of plant species used in socio-cultural practices by the *Nyishi* community

Nyishi people use different plant parts in socio-cultural practices (e.g., Leaf, stem, root, seed, bark, flower and fruit). Among these Leaf contributed 22.11%, fruits 14.74%, Root 12.63%, stems 11.58%, whole plants 9.47%, flowers 8.42%, rhizomes 5.26%, shoots and bark 3.16% each, tubers 2.11% and Twigs and Trunk 1.05% each (Fig 3).

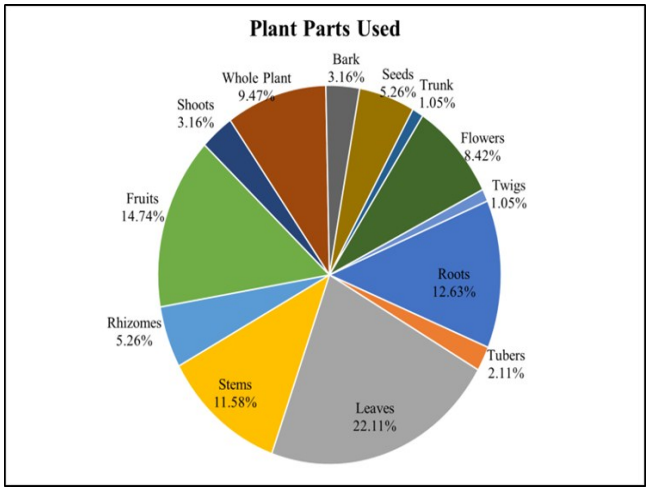

Fig 3. Plant parts used in socio-cultural practices among the *Nyishi*

3.4. Fishing and hunting

Nyishi community is highly dependent on fishing and hunting for their livelihood, and it is a tremendous economic activity and agriculture. The study revealed a wealth of traditional knowledge of ethnobotanical plant species related to poison fishing with the aid of poisonous plants. Out of a total of 54 documented plant species, 15 species (Table 4), were used to make tools for carrying out specific tasks and activities such as arrow poisoning by local hunters, catching birds, the fish poison, poison for arrowheads, making ropes and thread for fishing net, etc. Among all fishing and hunting plant species, *Ficus elastica* Roxb. ex Hornem. (RFC=0.47) recorded the highest RFC values, followed by *Aconitum ferox* Wall. ex Ser., *Mastersia assamica* Benth. and *Oreocnide integrifolia* (Gaudich.) Miq. (RFC=0.37) with similar values. It means the community is familiar with these fishing and hunting plant species. The lowest RFC values were recorded for *Engelhardia spicata Lechen* ex Blume (RFC=0.17) and *Persicaria acuminata* (Kunth) M.Gómez (RFC=0.18), which clearly shows that community people are less familiar with these plant species and rarely use them for fishing and hunting purposes.

3.5. Beverages

Since time immemorial, the traditional consumption of a variety of alcoholic beverages is still an integral part of different tribal communities in the north-eastern region of India. Popular traditional beer, locally known as "*Apong*", was prepared from rice and finger millet. This local alcoholic beverage is consumed during festivals, marriage ceremonies, and other social gatherings. A diverse knowledge system exists among *Nyishi* women to prepare nutritionally rich foods and fermented beverages, which play an essential role in their day-to-day socio-cultural and spiritual occasions. A *Nyishi* woman uses some of the wild plants as anti- microbial, and they believe that these plants are liable for the healthy growth of yeast during fermentation. During the field study, we documented nine plant species used in the preparation of the local drink "*Apong*" (Table 4). Among all the recorded plant species, *Musa paradisiaca* L. had a maximum RFC value (0.63), which shows that most of the community recognized this plant species and used it for beverages. Similarly, the minimum RFC value *was recorded for Setaria pumila* (Poir.) Roem. & Schult. (RFC=0.19). It shows that few people from the community recognize this plant species and do not frequently use it for beverage purposes. They believed that the consumption of rice beer is good for health and is a remedy for various ailments that may be attributed to the medicinal properties of the herbs used in preparing starter cultures.

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Table 4. Plants used by *Nyishi* tribals grouped by category of usability

Fishing and hunting	Beverage	Religious	Miscellaneous
Aconitum ferox Wall. ex Ser.	*Alpinia nigra* (Gaertn.) Burtt	*Arundina graminifolia* (D.Don) Hochr.	*Acorus calamus* L.
Arisaema consanguineum Schott	*Chenopodium album* L.	*Asplenium phyllitidis* D. Don	*Amaranthus cruentus* L.
Aspidopterys indica (Willd.) W.Theob.	*Thelypteris gracilescens* (Blume) Ching	*Alsophila spinulosa* (Wall. ex Hook.) R.M.Tryon	*Berberis wallichiana* DC.
Balanophora dioica R. Br. ex Royle	*Musa paradisiaca* L.	*Dryopteris sparsa* (D. Don) Kuntze	*Calamus floribundus* Griff.
Chromolaena odorata (L.) R.M.King & H.Rob.	*Phrynium pubinerve* Blume	*Hedychium gardnerianum* Sheppard ex Ker Gawl.	*Capsicum annuum* L.
Dicranopteris linearis (Burm. fil.) Underw.	*Prunus persica* (L.) Batsch	*Macaranga denticulata* (Blume) Müll.Arg.	*Chenopodium album* L.
Engelhardia spicata Lechen ex Blume	*Setaria italica* (L.) P.Beauv.	*Melastoma malabathricum* L.	*Coix lacryma-jobi* L.
Ficus elastica Roxb. ex Hornem.	*Setaria pumila* (Poir.) Roem. & Schult.	*Musa paradisiaca* L.	*Dendrobium hookerianum* Lindl.
Mastersia assamica Benth.	*Zea mays* L.	*Nelumbo nucifera* Gaertn.	*Eurya acuminata* DC.
Millettia pachycarpa Benth.		*Oxyspora paniculata* DC.	*Hedychium coccineum* Buch. -Ham. ex Sm.
Nephrolepis cordifolia (L.) C.Presl		*Rhamnus napalensis* (Wall.) M.A.Lawson	*Dimetia scandens* (Roxb.) R.J.Wang
Oreocnide integrifolia (Gaudich.) Miq.		*Rhaphidophora glauca* (Wall.) Schott	*Cucumis melo* L.
Persicaria acuminata (Kunth) M.Gómez		*Brucea javanica* (L.) Merr.	*Melastoma malabathricum* (L.)
Balakata baccata (Roxb.) Esser			*Mikania scandens* (Linn.) Willd.
Tacca integrifolia Ker Gawl.			*Oxyspora paniculata* DC.
			Phrynium pubinerve Blume
			Piper nigrum L.
			Rubia manjith Roxb.
			Bruinsmia polysperma (C.B.Clarke) Steenis
			Themeda villosa (Lam.) A.Camus
			Urena lobata L.
			Viburnum foetidum Wall.

3.6. Religious

The *Nyishi* community in the eastern Himalayan province of Arunachal Pradesh follows *Donyi* (Sun) *Polo* (Moon) religion. Stems and leaf of *Alsophila spinulosa* (Wall. ex Hook.) R.M.Tryon and *Dryopteris sparsa* (D. Don) Kuntze remains an integral component of daily rituals in the *Nyishi* community's religious life as they are considered sacred plants that protect them against the evil spirit. It was a common belief that on burning of *Rhamnus napalensis* (Wall.) M.A. Lawson and *Rhaphidophora glauca* (Wall.) Schott, the devil, eats the plants and creates bad results. Sometimes, fruit, stem, twig, and flowers of *Melastoma malabathricum* are offered to God for better yield of paddy. A total of 13 plant species were used in religious activities such as decoration in festivals, marriages, and funeral ,and a few plant species are also used in religious taboos (Table 4). Out of all the religious plant species, the maximum RFC values were recorded for *Musa paradisiaca* (RFC=0.63), followed by *Melastoma malabathricum* (RFC= 0.59) *and Oxyspora paniculata* (RFC=0.55). It shows that community people are more familiar with these plant species for religious purposes. The minimum RFC values were recorded for *Rhaphidophora glauca* (RFC=0.16), *Hedychium gardnerianum* Sheppard ex Ker Gawl., and *Rhamnus nepalensis* (RFC=0.18 each) .It means that people from the community recognized these plant species but rarely used them in religious activities.

3.7. Miscellaneous

Nyishi tribals use 22 plant species to make various items, including textile dyes, perfumes, ornaments, toothbrushes,natural scrubbers, wrapping and packing, washing sponges, thatching houses, etc. (Table 4). Out of all the recorded plant species, *Melastoma malabathricum* recorded the highest RFC value (0.59), which means that most community people recognized this plant species. Similarly, *Hedychium coccineum* Buch. -Ham. ex Sm. (RFC=0.49), *Cucumis melo* L. (RFC=0.49) and *Piper nigrum* L. (RFC=0.49) showed relatively equal values, as the people from the community are much familiar with and use these ethnobotanical plant species for making several items for various purposes.*Coix lacryma-jobi* L. (RFC=0.20) and *Viburnum foetidum* Wall. (RFC=0.21) were recorded as the lowest RFC value, which shows that very few people in the community are familiar with this plant species.

3.8. Biodiversity conservation using traditional knowledge

Respondents from the *Nyishi* community described a robust traditional customs/law to protect forests, which was performed and guided by the "*Gaon Buras*" ' active involvement. *Gaon Bura*s are the most important village-level functionary, authorized by the local governments and responsible for all the village's developmental, law and order related duties (Handbook for Gaon-Buras and Panchayati Raj Leaders, 2007) and priests of the community. For instance,

i) During the death of a person in the village, the villagers follow prohibitions like avoiding any work on agricultural fields or going to the forest to collect forest produce, killing any animal, etc., until the burial of the dead body. However, prohibitions go up to one month for the affected family.

ii) The man who first lifts the dead body of a person killed in an accident must follow strict taboos. The priest and man following the taboos cannot feed on wild meat, roots of any bamboo tree, pumpkin, beans, soybean potato, and first-grown cucumber until completing all the rituals. It is believed that if these rules are not followed, God will curse the whole community and thus, the person breaking the rules is punished by the village head.

iii) At the time of the annual festival "*Nyokum Yullo*", the cutting of trees, woods, bamboo, wild banana, fishing, hunting, etc., were prohibited for up to one month, but now it is followed for only one day. If these taboos are not maintained strictly, the defaulters are punished by imposing fines, as decided by the priest.

iv) A *Nyishi* tribal is restricted from killing and taking owls' meat because this bird is considered an evil spirit. According to *Nyishi* folks, two brothers went to a deep forest for hunting and while returning from the forest, they forgot their path Ultimately, with the setting of the sun, they climbed over a tree to halt at night. Since they were hungry and sleepy, the younger brother accidentally fell from the tree and died. Today, *Nyishi* believes that the younger brothers soul turned into the bird (locally known as *Pup Mila*), an owl. Thus, owl meat is prohibited in the community.

v) The community's religious ceremony aims to protect good fate and prosperity so that nobody would dare cut trees and kill animals. In older days, prohibitions remain for three months or one month depending on the coming new moon after performing the ritual or defaulter type. The main aim is to avoid offering the spirit of the particular area where the practice has been offered for protection and prosperity.

vi) According to the *Nyishi* people, plants and animals which are traditionally considered cultural taboo (never cut down or touched and killed) due to affection and beliefs towards nature. Some examples are:

a) When the baby is in the mother's womb, its relatives are restricted from cutting plants and leaves (traditionally locally named as *Khokham okh*, *Kulung* and *Papi*). It is believed that by doing so, the baby will have big naval and massive bleeding may occur during delivery.

b) The new born baby's father is restricted from cutting big trees or plants like banana trees and killing animals to save the baby from the curse.

c) Some of the plant species are not harvested due to local beliefs and are thus conserved. People avoid burning the *Rhaphidophora glauca* plant (locally known as *Chulu*) because they fear its sound during burning. People do not cut the *Rhamnus napalensis* (Wall.) M.A.Lawson plant (locally named *Biringa schein*)) as they believe that the devil eats it.

d) Moreover, people used to consider cutting trees from the burial area as taboos because they are considered "sacred areas" where the spirit of ancestor's rest. Furthermore, community leaders can give proactive, protective orders to the community to maintain and protect forests, grasses and wildlife.

e) Some of the restricted plants and leaves (locally named *Tagay*, *Taan*, *Baylam*, *Sheray* and *Shaylo*, etc.) in rituals are not used to maintain the community's peace, prosperity and happiness.

The respondents also agree that the remaining plants and animals should be protected. This community still practices most of its taboos and belief system, and almost all the respondents wanted to preserve their culture and protect biodiversity. These community-based management systems were very effective in maintaining the local ecosystem. Hence, these taboos and traditional practices should be promoted and encouraged in the study area.

3.9 Comparison study

Utilizing this traditional knowledge of ethnobotanical plant species helps conserve cultural traditions and biodiversity and community healthcare and development. Literature review shows that many plants and their parts are used as edible, local beverage (beer) production, dying clothes, veterinary health care, handicrafts, rituals, seasonal fishing, and hunting in the Indian Himalayan Region (Murtem, 2000, Sarmah *et al.,* 2000, Tag and Das, 2004). Srivastava *et al*. (2010) reported 106 plant species used in food, medicine, hunting, culture, and handicrafts by the *Apatani* tribe, in Arunachal Pradesh. Deb *et al*. (2009) reported many traditional crops grown in the agroforestry of the *Nyishi* tribal community, Arunachal Pradesh, as they provide a greater diversity of food and represent a good source of commercial outlets in addition to valuable consumption for the farmer's household. They also reported the importance of plant species like bamboo, *Areca catechu* L. and *Livistonia jenkinsiana* Griff. useful for fencing, craft making, house construction, and value for traditional worship as they are associated with ancestral sacrifices. Tag and Das (2004) documented 28 plant species, mainly used as food, medicine, rituals, and other ethnobotanical importance of the Hills Miri tribe of Arunachal Pradesh. Kala (2007) reported 32 medicinal, 16 horticultural, 22 fodder, and 20 timber-yielding plant species used by the local people of Pithoragarh, Chamoli, and Pauri of Uttarakhand. The traditional knowledge-based medicinal system is still the most available and affordable form of therapy in many low-income countries (Ravishankar and Shukla 2007; Jugli *et al.* 2020), and most medicines used in the Indian traditional system of medicine are extracted from Himalaya (Joshi *et al*. 2018). authors have carried out studies on ethnomedicinal plants used by tribals of Arunachal Pradesh (Gangwar and Ramakrishnan 1990; Das 2003; Khongsai *et* al. 2011; Murtem and Chaudhry 2016). Similar studies have also been done in other Himalayan regions of India (Rao 1981; Goswami *et al*. 2009; Namsa *et al.* 2011; Singh *et al.* 2014; Singh *et* al. 2020; Bhat *et al*. 2021).

3.10. Ethnobotanical indices

3.10.1. Relative Frequency Citation (RFC)

The RFC indicates each plant species' local usefulness based on the number of informants who cited these plant species' uses (Vitalini *et al*., 2013). Regarding using different species for the four identified use categories of plant species, most interviewees mentioned the uses in festivals for decorations and local beer preparation. The maximum RFC was recorded for *Musa paradisiaca* (0.63), followed by *Melastoma malabathricum* (0.59), *Oxyspora paniculata* (0.55), *Hedychium coccineum*, *Cucumis melo* and *Piper nigrum* (0.49, each) and *Alpinia nigra* (Gaertn.) Burtt (0.47). Hence, the community is eminently familiar with a wide range of plant species used for various purposes (Fig.4).

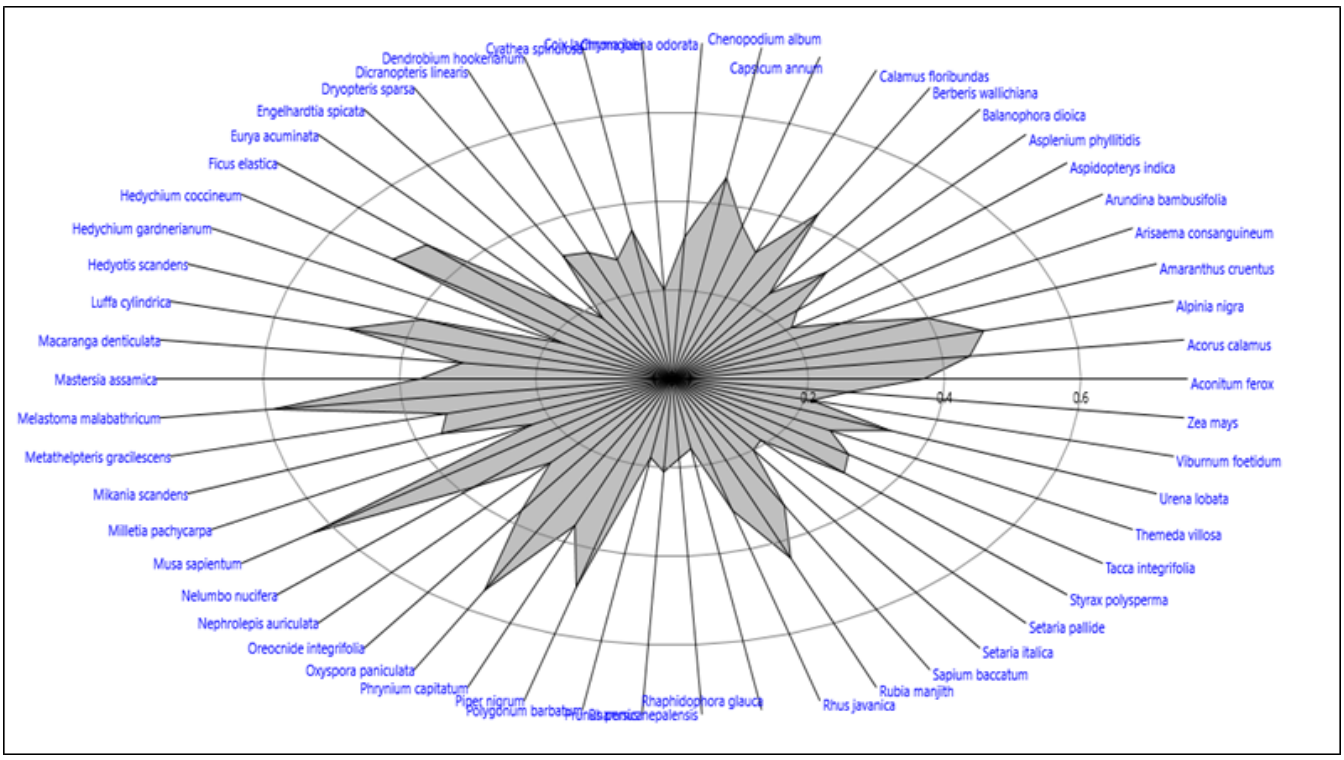

Fig.4. Plant species with the highest frequency of citation used in socio-cultural practices

3.10.2. Use Value

The use-value (UV) indicates the relative importance of plants known locally. It shows the number of uses mentioned by the informants for a specific plant species. For different species, the UV ranged from 1.67 to 0.16 (Fig 5). The highest use value was recorded for *Musa paradisiaca* (1.67), as the maximum number of people reported this species to be useful followed by *Melastoma malabathricum*(1.32), *Oxyspora paniculata* (1.18), *Alpinia nigra* and *Cucumis melo* (0.94, each) and *Hedychium coccineum* Buch. -Ham. ex Sm. (0.90) (Table 5).

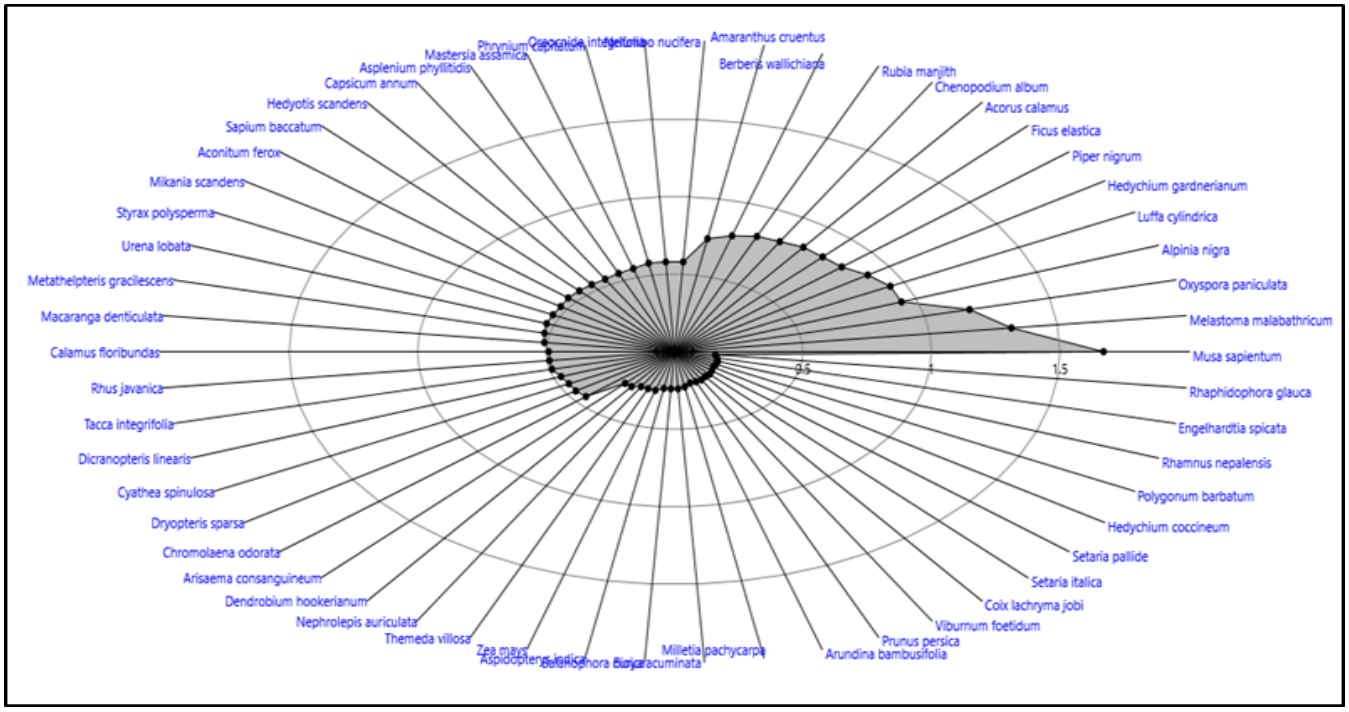

Fig. 5. Use value of some of the important plant species in socio-cultural practices among the study community

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Table 5. List of most useful plants of *Nyishi* people based on four quantitative indices

Scientific name	Basic values			Indices				Ranking			
	FC	UR	NU	CSI	RFC	UV	CV	CSI	RFC	UV	CV
Musa paradisiaca L.	151	399	5	1.67	0.63	1.67	0.66	1	1	1	1
Melastoma malabathricum L.	140	355	4	1.49	0.59	1.32	0.44	2	2	2	2
Oxyspora paniculata DC.	132	284	4	1.19	0.55	1.18	0.33	3	3	3	3
Cucumis melo L.	116	224	3	0.94	0.49	0.94	0.17	4	6	4	4
Alpinia nigra (Gaertn.) Burtt	113	224	3	0.94	0.47	0.94	0.17	5	7	5	5
Ficus elastic	113	200	3	0.84	0.47	0.84	0.15	6	8	6	6
Acorus calamus L.	105	200	3	0.84	0.44	0.84	0.14	7	11	9	9
Chenopodium album L.	110	196	3	0.82	0.46	0.82	0.14	8	9	7	7
Rubia manjith Roxb.	106	194	3	0.81	0.44	0.81	0.14	9	10	8	8
Berberis wallichiana DC.	102	186	3	0.78	0.43	0.78	0.12	10	12	10	12
Amaranthus cruentus L.	96	180	3	0.75	0.40	0.74	0.11	11	13	11	13
Hedychium coccineum Buch. -Ham. ex Sm.	116	176	3	0.74	0.49	0.90	0.13	12	5	12	10
Piper nigrum L.	118	152	3	0.64	0.49	0.85	0.12	13	4	13	11
*Nelumbo nucifera*Gaertn.	91	138	2	0.58	0.38	0.58	0.05	14	15	14	15
Oreocnide integrifolia (Gaudich.) Miq.	89	138	2	0.58	0.37	0.58	0.05	15	18	15	18
Mastersia assamica Benth.	89	133	2	0.56	0.37	0.56	0.05	16	17	16	17
Dimetia scandens (Roxb.) R.J.Wang	93	128	2	0.54	0.39	0.54	0.05	17	14	17	14
Aconitum ferox Wall. ex Ser.	89	129	2	0.54	0.37	0.54	0.05	18	16	18	16
Capsicum annuum Linn.	86	128	2	0.54	0.36	0.54	0.05	19	19	19	19
Mikania scandens (Linn.) Willd.	86	128	2	0.54	0.36	0.53	0.05	20	20	20	20

CSI = cultural significance index; RFC = relative frequency of citation; UV = use-value; CV = cultural value; FC = frequency of citation; UR = number of use-reports; NU = number of uses

3.10.3. Cultural Significance Index

Table 6 shows each use-category contribution to the total Cultural Significance Index (CSI) of the 54 plant species of the study area. The results reveal that out of the entire 54 species, *Musa paradisiaca (*1.67) followed by *Melastoma malabathricum* (1.49) and *Oxyspora paniculata* (1.19) reported the overall highest CSI. In comparison, the lowest was reported for *Rhaphidophora glauca* (0.16). With reference to different use categories, reported maximum CSI in the religious category (0.63), while for the miscellaneous category, the maximum CSI value was recorded for *Melastoma malabathricum* (0.59). In beverages, *Musa paradisiaca* (0.49) and for fishing and hunting category, *Ficus elastica* had the highest CSI value (0.47).

Table 6. Component wise values of each use category and overall Cultural Significance Index (CSI)of the plant species used by the study community

Scientific name	Fishing and hunting	Beverages	Religious	Miscellaneous	CSI
Aconitum ferox Wall. ex Ser.	0.37	-	-	-	0.4
Acorus calamus L.	-	-	-	0.44	0.4
Alpinia nigra (Gaertn.) Burtt	-	0.48	-	-	0.5
Amaranthus cruentus L.	-	-	-	0.4	0.4
Arisaema consanguineum Schott	0.28	-	-	-	0.3
Arundina graminifolia (D.Don) Hochr.	-	-	0.21	-	0.2
Aspidopterys indica (Willd.) W. Theob.	0.24	-	-	-	0.2
Asplenium phyllitidis D. Don	-	-	0.33	-	0.3
Balanophora dioica R. Br. ex Royle	0.24	-	-	-	0.2
Berberis wallichiana DC.	-	-	-	0.43	0.4
Calamus floribundus Griff.	-	-	-	0.31	0.3
Capsicum annuum Linn.	-	-	-	0.36	0.4
Chenopodium album L.	-	0.46	-	-	0.5
Chromolaena odorata (L.) R.M.King & H.Rob.	0.32	-	-	-	0.3
Coix lacryma-jobi L.	-	-	-	0.2	0.2
Alsophila spinulosa (Wall. ex Hook.) R.M.Tryon	-	-	0.34	-	0.3
Dendrobium hookerianum Lindl.	-	-	-	0.28	0.3
Dicranopteris linearis (Burm. fil.) Underw.	0.31	-	-	-	0.3
Dryopteris sparsa (D. Don) Kuntze	-	-	0.32	-	0.3

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Engelhardia spicata Lechen ex Blume	0.17	-	-	-	0.2
Eurya acuminata DC.	-	-	-	0.24	0.2
Ficus elastica Roxb. ex Hornem.	0.47	-	-	-	0.5
Hedychium coccineum Buch. -Ham. ex Sm.	-	-	-	0.32	0.2
Hedychium gardnerianum Sheppard ex Ker Gawl.	-	-	0.18	-	0.3
Dimetia scandens (Roxb.) R.J.Wang	-	-	-	0.39	0.4
Cucumis melo L.	-	-	-	0.49	0.5
Macaranga denticulata (Blume) Müll.Arg.	-	-	0.31	-	0.3
Mastersia assamica Benth.	-	-	-	0.37	0.4
Melastoma malabathricum L.	-	-	0.59	0.59	1.2
Thelypteris gracilescens (Blume) Ching	-	0.34	-	-	0.3
Mikania scandens (L.) Willd.	-	-	-	0.36	0.4
Millettia pachycarpa Benth.	0.23	-	-	-	0.2
Musa paradisiaca L.	-	0.49	0.63	-	1.1
Nelumbo nucifera Gaertn.	-	-	0.38	-	0.4
Nephrolepis cordifolia (L.) C.Presl	0.26	-	-	-	0.3
Oreocnide integrifolia (Gaudich.) Miq.	-	-	-	0.37	0.4

Oxyspora paniculata DC.	-	-	0.37	0.55	0.9
Phrynium pubinerve Blume	-	-	-	0.36	0.4
Piper nigrum L.	-	-	-	0.28	0.3
Persicaria acuminata (Kunth) M.Gómez	0.18	-	-	-	0.2
Prunus persica (L.) Batsch	-	0.21	-	-	0.2
Rhamnus napalensis (Wall.) M.A.Lawson	-	-	0.18	-	0.2
Rhaphidophora glauca (Wall.) Schott	-	-	0.16	-	0.2
Brucea javanica (L.) Merr.	-	-	0.31	-	0.3
Rubia manjith Roxb.	-	-	-	0.44	0.4
Balakata baccata (Roxb.) Esser	0.33	-	-	-	0.3
Setaria italica (L.) P.Beauv.	-	0.2	-	-	0.2
Setaria pumila (Poir.) Roem. & Schult.	-	0.19	-	-	0.2
Bruinsmia polysperma (C.B.Clarke) Steenis	-	-	-	0.33	0.3
Tacca integrifolia Ker Gawl.	0.31	-	-	-	0.3
Themeda villosa (Lam.) A.Camus	-	-	-	0.26	0.3
Urena lobata L.	-	-	-	0.34	0.3
Viburnum foetidum Wall.	-	-	-	0.21	0.2
Zea mays L.	-	0.26	-	-	0.3

3.9.4. Ranking and comparison among indices of traditional plant species

Qualitative ethnobotany methods such as in-depth and semi-structured interviews improve traditional assortments. Calculating various indices works better than ancient methods of free listing. The Cultural Significance Index (CSI) elucidates a valuable tool for featuring the species based on informant consensus that also recognizes the diversity of uses. Other indexes like RFC, UV, and CV also consider the variety of uses and the number of use informants in each use category. The different indices were calculated to determine the cultural significance of plant species from the study area (Table 5). The frequency of citation reveals that the respondents know useful plants, whereas the number of use reports suggests the diversity of use.

The results (Table 6) show that among all plant species in the study area, *Musa paradisiaca* ranks at the top due to the higher number of citations, use categories and diversity of uses, indicating that this plant species has higher ethnobotanical importance among the *Nyishi* in the study area. *Melastoma malabathricum*, *Oxyspora paniculata,* and *Cucumis melo* are other significant plant species for the *Nyishi* community. Some widely used species, such as *Piper nigrum* (cited by 118 informants) and *Hedychium coccineum* Buch. -Ham. ex Sm. (cited by 116 informants), had a higher relative frequency of citation but lower values for other indices (Table 5).

This research investigated different plant species used in socio-cultural practices by the *Nyishi* community of Papumpare, Arunachal Pradesh. These plant species have a vital role in their routine life, as they provide greater diversity in household consumption and act as a good source of commercial outlets. Plant resources have a wide range of biodiversity values in the life of hill communities, including many plant species from the forests used for food, fiber, shelter or medicine (Anthwal *et al*., 2006). Forest has been the primary source of bio-resources used as household materials by various people worldwide. In Bangladesh, farmers mainly plant trees in their home gardens to generate income and household consumption in the form of fruits, firewood, etc. (Leakey *et al*., 1996). In Italy, Salerno *et al*. (2005) noted the importance of plants in agriculture, domestic and handicraft sectors and reported many unique uses. Kang *et al*. (2017) have documented plants as the precursors of various products in China. About 80% of the worlds population depends on forest resources for medicine, shelter, rural architecture, and engineering for their survival (WHO, 2010).

Moreover, the value of biodiversity in traditional cultures and religious traditions enhances the emotional and spiritual well-being of tribal communities (Atkinson *et al*. 2012). Our study results reveal that among all other useful plants documented in the study area, *Amaranthus cruentus* L., *Calamus floribundus* Griff., *Chenopodium album* L., *Cucumis melo*, *Phrynium pubinerve* Blume, *Melastoma malabathricum, Musa paradisiaca, Oxyspora paniculata* and *Themeda villosa* (Lam.) A. Camus are the most important species for the *Nyishi* community as having more diverse uses. These plant species are used for various purposes such as textile dyes, ornaments, baskets, hats, wrapping and packing material, natural scrubbers, washing sponges, traditional local beer, toothbrushes, thatching houses, etc. These species valued in traditional worship are associated with ancestral sacrifices, and such beliefs help protect such species. The rhizomes, fruits, leaves, and seeds of *Alpinia nigra, Thelypteris gracilescens* (Blume) Ching, *Prunus persica* (L.) Batsch, *Setaria pumila* (Poir.) Roem. & Schult., *Setaria italica* (L.) P.Beauv. and *Zea mays* L. are used for the preparation of local wine, usually meant for female folk. The respect and consequent preservation of plant species for various purposes indicate that some traditional practices impact conservation.

4. Conclusion

The present documentation on the traditional ethnobotanical plants of the *Nyishi* tribes of Arunachal Pradesh emphasizes that the *Nyishi* communities have abundant traditional knowledge of ethnobotanical plant species, which is passed orally to the younger generation. Many of these plants used by the tribes are free-spirited and not known by the outside people. *Nyishi* community traditionally uses plant species that are commonly found in their surroundings in their socio- cultural life. Ethnobotanical plant species used by the *Nyishi* tribes are very diverse. Fifty-four plant species belonging to 41 families were documented based on our ethnobotanical surveys in nine villages. However, species richness and plant use have rapidly declined due to the migration of young people from rural to urban areas, significantly impacting biological diversity and traditional knowledge, skills, and practice. Therefore, it is thus urgent and necessary to prevent the further loss of the biodiversity, traditional knowledge, and culture of the *Nyishi* tribe. Documentation of traditional knowledge and practice-related utilization of plants is much needed before these are lost forever. Conserve biodiversity and traditional knowledge effectively, and the tribal communities need empowerment and recognition of their territories' knowledge. Imparting holistic and integrated knowledge systems, including traditional and modern knowledge (which should complement each other), to sustain biodiversity is the need of the hour.

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