International Journal of Advances in Scientific Research
ISSN: 2395-3616 (Online)
Journal DOI: 10.7439/ijasr
Research Article

Ethnobotanical studies of spice and condiment plants used by some communities of Assam

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***Article History:**
Received: 01/01/2017
Accepted: 21/01/2017
DOI: https://dx.doi.org/10.7439/ijasr.v3i1.3843

Abstract

Objective: The aims of the present study were to document spice and condiment plants, to identify the most culturally important spice and condiment plants and to evaluate market potential of some spices and condiments used by some ethnic communities of Assam.

Methods: The ethnobotanical study was conducted for four ethnic communities namely Ahom, Deori, Mishing, Sonowal-kachari from Lakhimpur and Dhemaji districts of Assam. The information was collected from 120 informants from each community through semi-structured questionnaire.

Results: A total of 51 species belonging to 42 genera and 26 families used as spices and condiments by the ethnic communities of Assam were documented in the present study. Maximum number of spices and condiments were used by Ahom and had maximum similarity with Mishing, Sonowal-kachari and Deori. Maximum number of the spice and condiment plants belonged to families Amaryllidaceae and Zingiberaceae. Majority of the plants used by ethnic communities were under cultivation. Among all communities, herbs were used as spices and condiments. However, trees, shrubs and climbers were also used as spices and condiments. The study also revealed that fresh leafy herbaceous species were mostly used as spices and condiments by the communities of Assam. Flavouring was the most preferred category. The cultural important index of *Allium cepa* was highest among all selected communities of Assam. *Piper nigrum* showed the highest market potential.

Conclusion: The present study revealed that spice and condiment plants were culturally more important in each ethnic community.

Keywords: Assam, Cultural importance index, Ethnic community, Ethnobotany, Spices and condiments.

1. Introduction

The North East India comprising of states of Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland Tripura and Sikkim is unique in bioresources richness. The different ethnic communities use various types of plants to flavour and season their foods which reflect uniqueness of Northeast India in its ethnic foods. Assam is the homeland of large number of diverse ethnic communities including 23 tribal communities [1][2]. Major tribal communities of this state are Deori, Hojai, Sonowal-kachari, Lalung, Mech, Miri, Rabha, Dimasa, Hajong, Singhpho, Khampti, Garo etc. The ethnic people mostly depend on natural resources from the nearby forest for their food, livelihood and ailments. They are repository of indigenous knowledge system belonging to agriculture, food, medicine etc. [3]. The ethnic cuisines of Assam are very simple to cook, delicious to consume and have nutritional value. Most of the ethnic communities take vegetables, fish, meat, crab or edible insects in boiled form and add local spices and condiments to increase the aroma, colour and delicacy.

A very limited literature is available on spice and condiment plants of NE India.38 species of spices were used by 30 ethnic groups of Manipur of which 42% species were used in daily kitchen food[4]. 14 species belonging to 12 families were reported as spices and condiments from

Sikkim and leaves were the most used part [5]. 30 species were recorded as spices and condiments used by Tangkhul community in Manipur and most of the species were from family Zingiberaceae [6]. *Allium* species were used as dried condiment and spices among different ethnic groups of Arunachal Pradesh due to edible value of their leaves, bulbs and root parts[7]. 10 species of spices namely *Acronychia pedunculata, Amomum subulatum, Anisomeles indica, Capparis viscose, Cinnamomum tamala, Eryngium foetidum, Murraya koenigii, Plectranthus amboinicus, Zanthoxylum limonella, Zingiber zerumbet* were used as spices in Tripura [8]. There is lack of information on ethnobotanical studies of spices and condiments used by communities of Assam. The aims of the present study are a) to document spice and condiment plants used by ethnic communities of Assam b) to identify the most culturally important spice and condiment plants used and c) to evaluate market potential of some spices and condiments used by ethnic communities of Assam.

2. Materials and Methods

2.1. Study area

Assam is located between 20°51′ to 27°58′N latitude and 89°49′ to 97°26′E longitude and covers 78,438 sq. km geographical area of the country [9]. Assam is bordered by the Kingdom of Bhutan and Arunachal Pradesh in the North and East, Nagaland, Manipur and Mizoram in South, and Bangladesh to West. Ethnic communities namely Ahom, Deori, Mishing and Sonowal-kachari were selected from Lakhimpur and Dhemaji districts for the present study (Fig.1). These ethnic communities were dominant in selected districts.

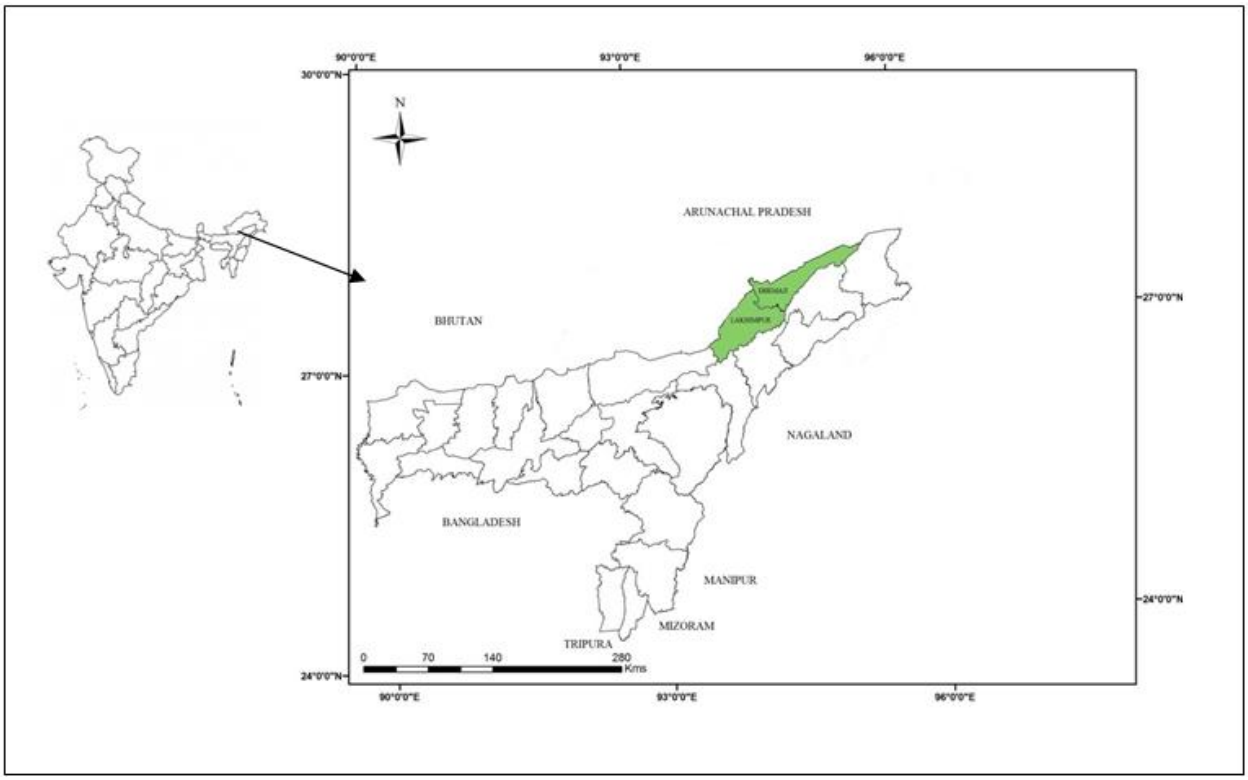


Fig 1: Map of study area

2.1 Data collection

Ethnobotanical surveys were conducted to collect data for three years from 2012 to 2015.For each ethnic community 5 villages were selected. Thus, a total of 20 villages were selected for the present investigation. Interviews were taken from 120 villagers from each ethnic community. Specimens were mostly collected from the forest areas on the basis of information given by the local guides, informants and common uses. Periodic visits covering all the seasons were made to collect specimens of some wild spices and condiment plants. Identification of these plants was done by visiting the herbaria of BSI (Itanagar), BSI (Kolkata) and also through consultation of taxonomic literature and Floras. The voucher specimens were deposited in the Department of Forestry, NERIST, Nirjuli, Arunachal Pradesh.

The collected spices and condiments plant species were divided into four categories i.e. flavouring, seasoning, colouring and preservation on the basis of ethnobotanical knowledge of selected communities. Cultural importance index was determined to estimate the cultural significance of species by following the formula [10].

$$\mathbf{CI} = \sum_{i=1}^{i=NU} \frac{URi}{N}$$

Where, UR refers every use category and N refers the number of informants in the survey.

Mean cultural importance index (mCI) of the species was used to evaluate CI difference among selected communities.

3. Results

Ethnic communities of Assam used different plant species as spice and condiments in their foods. A total of 51 species belonging to 26 families and 42 genera were recorded in the present study (Table 1). The photographs of few plants were given in Plate1.Maximum number of plants were used as spices and condiments by Ahom (32 spp.) followed by Mishing (26 spp.), Sonowal-kachari (22 spp.) and Deori (20 spp.) (Fig. 2).

Plate 1: Spice and condiment plants used by ethnic communities of Assam (a-i): *Cinnamomum tamala* (a); *Homalomena aromatica* (b); *Hydrocotyle sibthorpioides* (c); *Curcuma longa* (d); *Lippia alba* (e); *Kaempferia galanga* (f); *Paederia foetida* (g); *Piper nigrum* (h);*Ocimum basilicum (i).*

Table 1: Plant species used as spices and condiments by ethnic communities of Assam

Sl. No	Scientific name	Local name	Family	Part use	Use category
1.	*Acmella paniculata* (Wall. ex DC.) R. K. Jansen	Maisang (M)	Asteraceae	L, Ys & In	F
2.	*Allium ascalonicum* L.	Asomia piyaj (A), Ponaru (Sk)	Amaryllidaceae	L, R	F,S
3.	*Allium cepa* L.	Piyaj (D,Sk), Plu-muo (A)	Amaryllidaceae	L, R	F,S
4.	*Allium sativum*L.	Plu-ching (A), Phuru nahoru (D), Naharu (Sk), Kumpum talap (M)	Amaryllidaceae	L, R	F
5.	*Alpinia nigra* (Gaertn.) B. L. Burtt	Tora (A), Dudum (D), Talayang akhan (M)	Zingiberaceae	L, Ys, Se	F
6.	*Brassica nigra* (L.) K. Koch	Soriyoh (A), Hiyo (D)	Brassicaceae	Se	F,P
7.	*Capsicum annum* L.	Mak-feet (A), Panso (D), Kon jolokia (Sk), Mirsi/mosish (M)	Solanaceae	Fr	F,S
8.	*Capsicum chinense* Jacq.	Bhut jolokia (Sk)	Solanaceae	Fr	FC
9.	*Cinnamomum bejolghota* (Buch.-Ham.) Sweet	Jongli tezpat (M), Nagadalchini (D)	Lauraceae	L, R	F
10.	*Cinnamomum tamala* (Buch.-Ham.) T. Nees & Eberm.	Tejpat (A and M), Tez siya (D)	Lauraceae	L	F
11.	*Cinnamomum verum* J. Presl	Dalchini (A and M)	Lauraceae	L, R	F, S
12.	*Coriandrum sativum* L.	Piki (A), Memedhu (D)	Apiaceae	L, S	F, S
13.	*Cuminum cyminum* L.	Jira (A), Mashala (M)	Apiaceae	Se	F, P
14.	*Curcuma amada* Roxb.	Aam ada (A)	Zingiberaceae	R	F
15.	*Curcuma longa* L.	Khao-ming (A), Halodhi (Sk), Alodi (M)	Zingiberaceae	R	C, P
16.	*Dendrocalamus hamiltonii* Nees & Arnott ex Munro	Kako (M)	Poaceae	Ys	F
17.	*Eryngium foetidum*L.	Pi-ki-khai (A), Bangali memedhu (D), Yumrang-Ori (M), Jongli Dhaniya (N).	Apiaceae.	L	F,S
18.	*Etlingera linguiformis* (Roxb.) R. M. Sm.	Korphul, korpur (A), Gandhi tora (M)	Zingiberaceae	R	F
19.	*Foeniculum vulgare* Mill.	Soaf (A)	Apiaceae	L, Se	F,P,S
20.	*Garcinia morella* (Gaertn.) Desr.	Kuji-thekera (A, Kachari)	Clusiaceae	Fr	F
21.	*Garcinia pedunculata* Roxb. ex Buch.-Ham.	Bor thekera (A), Thisa (D)	Clusiaceae	Fr	F
22.	*Hibiscus sabdariffa*L.	Leaves and fruits	Malvaceae	L, Fr	F
23.	*Homalomena aromatica* (Spreng.) Schott	Gondh kochu (Sk)	Araceae	R	F
24.	*Houttuynia cordata* Thunb.	Masandary (D, Sk, M).	Saururaceae	L, R	F
25.	*Hydrocotyle sibthorpioides* Lamk.	Horumani-muni (A, Sk), Borma manimuni/Ajone mani-muni (M).	Apiaceae	L	F
26.	*Illicium griffithii* Hook. f. & Thomson	Lissi (A)	Schisandraceae	Fr	F
27.	*Kaempferia galanga* L.	Tuktinpar, Bhumi champa (M)	Zingiberaceae	R	F
28.	*Lippia alba* (Mill.) N.E.Br. ex Britton	Naga tulsi (D), Onthai bajap (Sk)	Verbenaceae	L	F, S
29.	*Magnolia champaca* (L.) Baill. Ex Pierre	Serjo-asing/ Tita champa (M)	Magnoliaceae	Fr	F
30.	*Mentha arvensis* L.	Podina (Galo, D, Sk, M), Pache-lun (A)	Lamiaceae	L, Ys	F
31.	*Murraya koenigii* (L.) Spreng.	Narasingha (Sk and D), Phailang/phifang (A), Nor-hing (M)	Rutaceae	L	C, F
32.	*Myristica fragrans* Houtt.	Jaiphal (A)	Myristicaceae	Fr	F
33.	*Neocinnamomum caudatum* (Nees) Merr.	Sasing jola (Sk)	Lauraceae	B	F
34.	*Nigella sativa* L.	Kala jira (A)	Ranunculaceae	Se	F
35.	*Ocimum basilicum* L.	Tulsi(Sk), Tulosi (M)	Lamiaceae	L	F, S
36.	*Paederia foetida* L.	Bhadailata (Sk), Bungkirupug (M)	Rubiaceae	L	F
37.	*Pandanus amaryllifolius* Rox.	Joha pat (A)	Pandanaceae	L	F
38.	*Pandanus tectorius Parkinson* ex Du Roi	Ketaki (Sk)	Pandanaceae	In	F
39.	*Peperomia pellucida* (L.) Kunth	Pono - noa (A, Sk)	Piperaceae	Ys	F
40.	*Perilla frutescens* (L.) Britton	Ram tulsi (D).	Lamiaceae	Se	F,P
41.	*Piper nigrum* L.	Jaluk (D, Sk), Mip - hit - loom (A), Bonoria jaluk (M)	Piperaceae	Fr	F, S
42.	*Sesamum indicum* L.	Til (M)	Pedaliaceae	Se	F
43.	*Sinapis alba* L.	Boga - soriyah (A, Sk)	Brassicaceae	Se, L	F, S
44.	*Spilanthes acmella* (L.) L.	Maisang (M)	Asteraceae	Ys, In	F
45.	*Syzygium aromaticum* (L.) Merr. & L. M. Perry	Long (A, Sk)	Myrtaceae	In	F
46.	*Tamarindus indica* L.	Teteli (M)	Caesalpiniaceae	Fr	F
47.	*Trachyspermum ammi* (L.) Sprague	Joni (A).	Apiaceae	Se	F, P
48.	*Trigonella foenum - graecum*L.	Methi (A, D)	Fabaceae	Se	F,P
49.	*Zanthoxylum oxyphyllum* Edgeworth	Tesmoi (D), Mezenga/ Onger (M)	Rutaceae	Ys, L & Fr	F, S, C
50.	*Zingiber montanum* (J. Koenig) Link ex A. Dietr	Moran thing (A)	Zingiberceae	R	F
51.	*Zingiber officinale* Roscoe.	Thing (A), Yang (D), Ada (Sk), Take (M)	Zingiberaceae	R, L	F

A=Ahom, D=Deori, Sk-Sonowal-kachari, M=Mishing, L=Leaves, R=Root, Se=Seed, Fr=Fruit, In= Inflorescence, Ys= Young shoots, F= Flavouring, C= Colouring, S=Seasoning, P= Preservation.

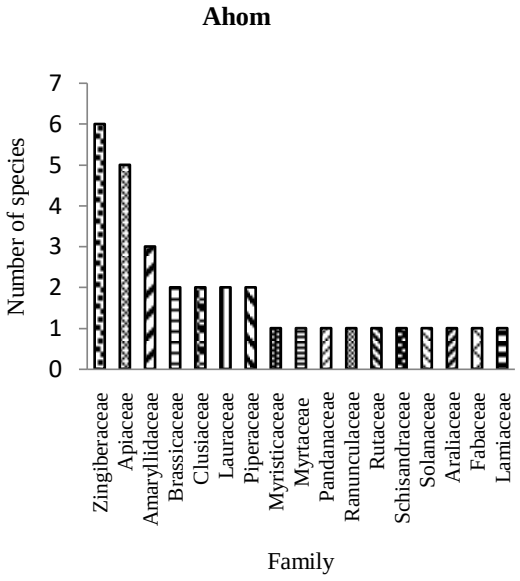
Fig. 2: Spices and condiments used by ethnic communities of Assam.

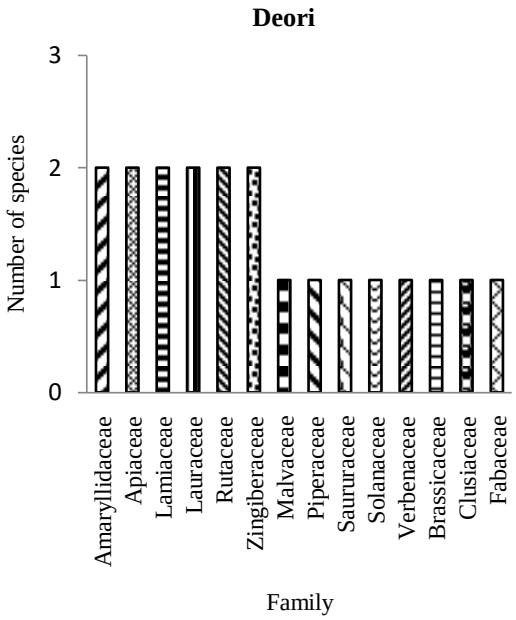
It was observed that out of 51 documented species, 6 species namely *Curcuma amada*, *Foeniculum vulgare*, *Myristica fragrans*, *Nigella sativa*, *Pandanus amaryllifolius* and *Trachyspermum ammi* were used by Ahom community. *Homalomena aromatica* and *Pandanus tectorius* were used by Sonowal-kachari and *Kaempferia galangal* and *Magnolia champaca* were used by Mishing community of Assam. The results presented in Table 2 shows that Ahom community had maximum similarity with Sonowal-kachari, Deori and Mishing (14 no. of species each).Deori community shared 12 species with Mishing and 9 species with Sonowal-kachari. On the other hand, Sonowal Kachari shared 11 species with Mishing. The comparison of all communities revealed that there were some specific plants used by two or more communities. *Cuminum cyminum* was used by Ahom and Mishing communities, *Brassica nigra* and *Trigonella foenum-graecum* were used by both Ahom and Deori communities, *Allium ascalonicum*, *Garcinia morella*, *Peperomia pellucida*, *Sinapis alba* and *Syzygium aromaticum* were used by Ahom and Sonowal-kachari, *Curcuma longa* was used by all selected communities except Deoris. Likewise, *Alpinia nigra* was used by all communities except Sonowal Kacharis.

Table 2: Similarity matrix of number of spices and condiments plants used by communities of Arunachal Pradesh and Assam

	Ahom	Deori	Sonowal-kachari	Mishing
Ahom	6	14	14	14
Deori		0	9	12
Sonowal-kachari			2	11
Mishing				2

The most dominant family was Zingiberaceae for Ahom and Mishing communities, Amaryllidaceae for Sonowal-kachari. While, Deoris used maximum number of species belonging to families Amaryllidaceae, Apiaceae, Lauraceae, Lamiaceae, Rutaceae and Zingiberaceae (Fig. 3).





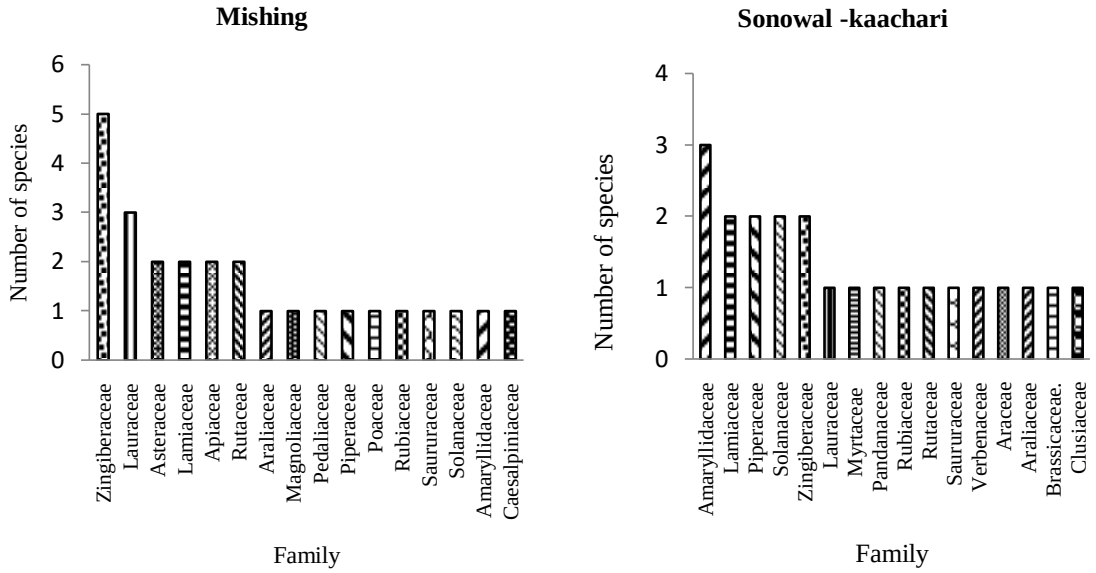


Fig. 3: Number of species family-wise used as spices and condiments by ethnic communities of Assam.

The selected communities of Assam used more number of cultivated plant species as spices and condiments than semi domesticated and wild. Ahom community used highest number of cultivated spices and condiment plants (17 spp.) followed by Deori, Sonowal-kachari and Mishing communities (Fig. 4).

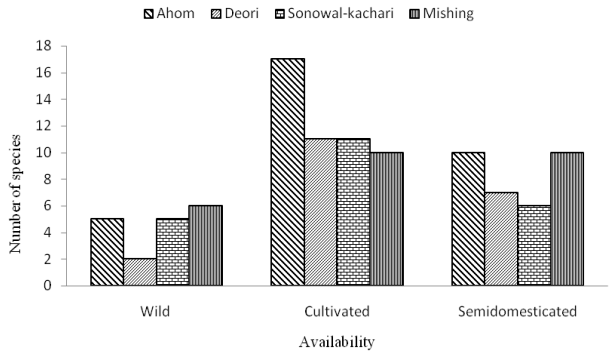


Fig. 4: Harvesting sources of spices and condiments used by ethnic communities of Assam.

The habitat wise grouping of the spices and condiments showed that herbs were mostly used by selected ethnic communities of Assam (Fig. 5). Ahom used maximum number of herbs as spices and condiments followed by Mishing, Sonowal-kachari and Deori.

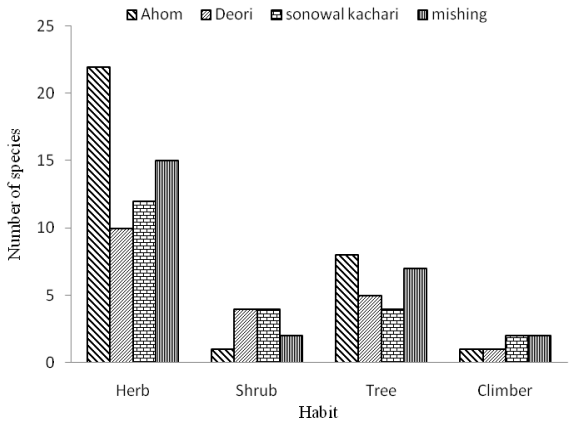


Fig. 5: Habits of the spice and condiment plants used by ethnic communities of Assam

Fresh form of spices and condiments were mostly preferred by the selected communities of Assam (Fig.6). Maximum plant species were used by Mishing followed by Ahom, Sonowal-kachari and Deori. All the selected communities preferred leaves than other plant parts (Fig. 7).

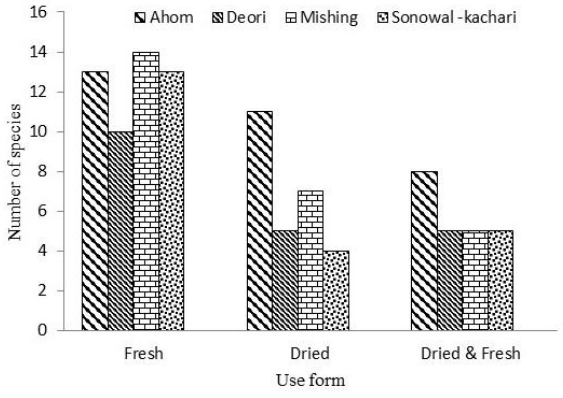


Fig. 6: Use form of spices and condiments by ethnic communities of Assam

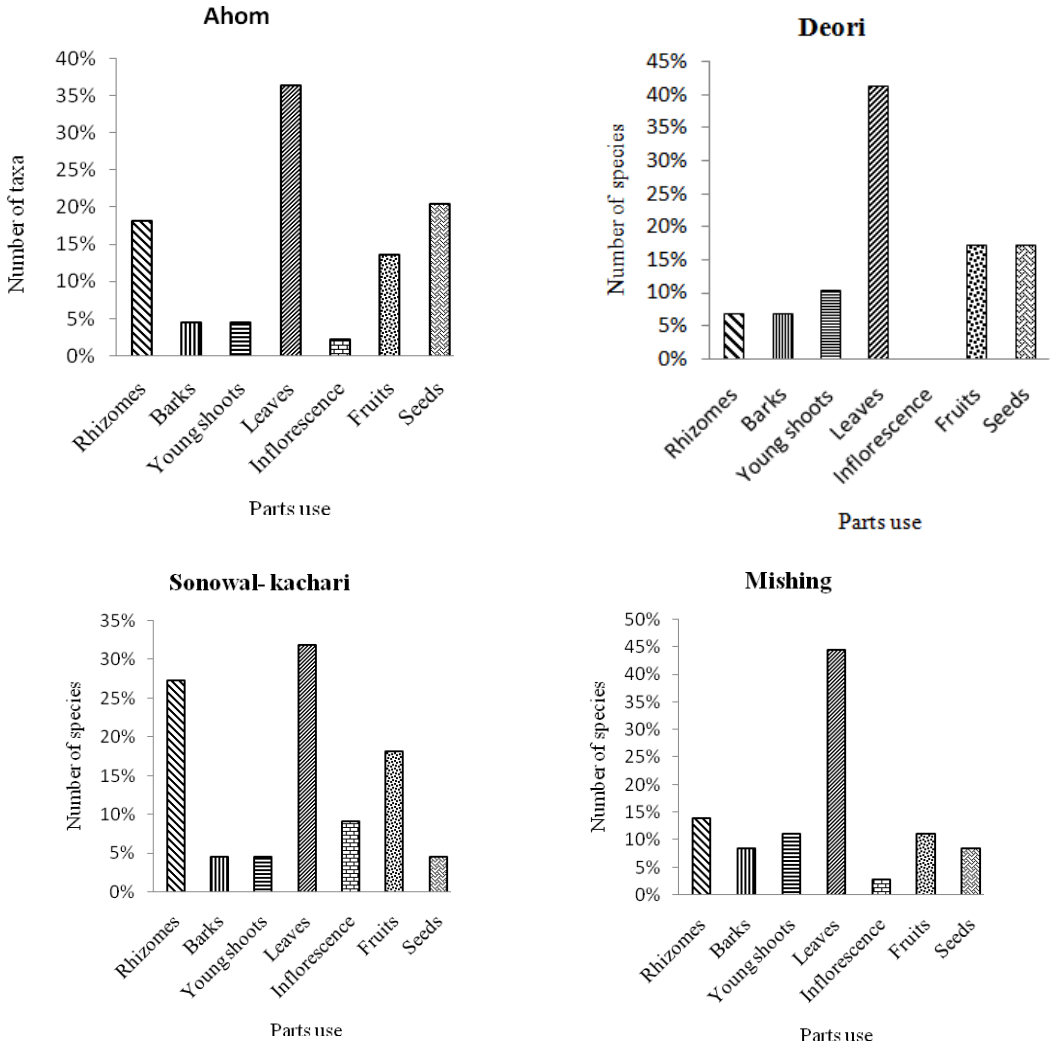


Fig. 7: Plant parts of spices and condiments used by ethnic communities of Assam

Based on ethnobotanical knowledge of selected ethnic communities, spice and condiment plants were further divided into four categories i.e. flavouring, seasoning, colouring and preservation. Flavouring was the most important category among all communities followed by seasoning, preservation and colouring (Fig.8).Out of the total recorded 51 species, there were some species which were used in more than one used categories. Accordingly 50 plant species in flavouring, 12 species for seasoning, 7 species for preservation and 4 species for colouring were used by the selected communities of Assam (Table 1).

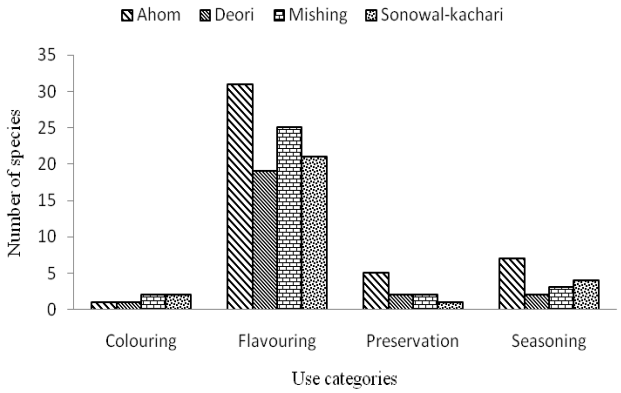


Fig. 8: Ethnobotanical categories of spices and condiments used by ethnic communities of Assam.

Cultural importance index was evaluated to study the cultural importance of plants among different communities. Since the data was grouped into four categories i.e. flavouring, seasoning, colouring and preservation, based on used reports by local communities, therefore, cultural importance (CI) and mean cultural importance (mCI) value were determined for 20 most culturally important species. The results given in Table 3 revealed that *Allium cepa* had maximum mean cultural importance followed by *Curcuma longa, Coriandrum sativum, Piper nigram, Zingiber officinale, Eryngium foetidum, Trigonella foenum-graecum, Capsicum annuum, Lippia alba, Murraya koenigii, Mentha arvensis, Cinnamomum tamala, Trachyspermum ammi, Houttuynia cordata, Cinnamomum verum, Syzygium aromaticum, Zanthoxylum oxyphyllum, Alpinia nigra, Ocimum basilicum.* Among twenty species, *Allium sativum, Piper nigrum, Zingiber officinale, Murraya koenigii* and *Mentha arvensis* were used by all four communities of Assam and rest of the species were used by either two or three communities. The cultural importance index of selected relevant species also differed community wise. Majority of the species showed highest CI in Ahom community (Fig. 9).

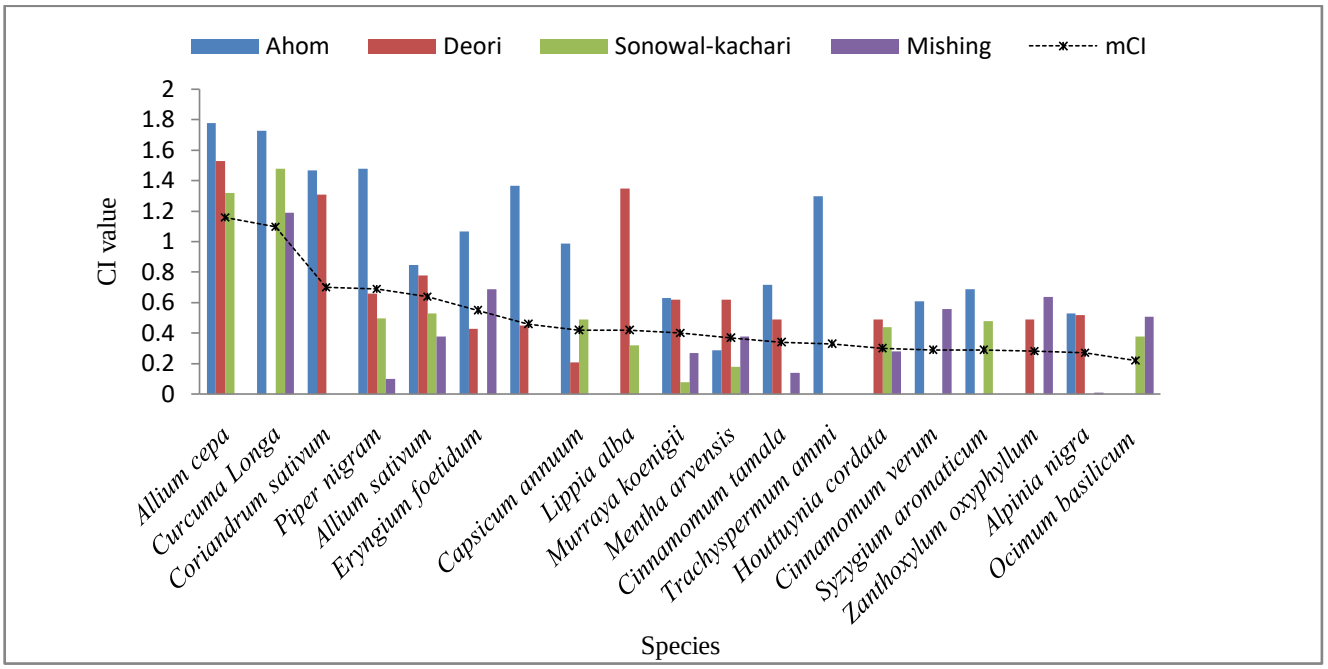


Fig. 9: Mean cultural importance index (mCI) of the 20 most relevant species.

Table 3: Evaluation of mean cultural importance index (mCI) of 20 most relevant species

Sl. No.	Scientific name	Ahom	Deori	Sonowal-kachari	Mishing	mCI
1.	*Allium cepa*	1.78	1.53	1.32	-	1.16
2.	*Curcuma longa*	1.74	-	1.48	1.19	1.10
3.	*Coriandrum sativum*	1.47	1.31	-	-	0.70
4.	*Piper nigram*	1.48	0.66	0.50	0.10	0.69
5.	*Allium sativum*	0.85	0.78	0.53	0.38	0.64
6.	*Zingiber officinale*	0.79	0.58	0.57	0.58	0.63
7.	*Eryngium foetidum*	1.07	0.43	-	0.69	0.55
8.	*Trigonella foenum-graecum*	1.37	0.45	-	-	0.46
9.	*Capsicum annum*	0.99	0.21	0.49	-	0.42
10.	*Lippia alba*	-	1.35	0.32	-	0.42
11.	*Murraya koenigii*	0.63	0.62	0.08	0.27	0.40
12.	*Mentha arvensis*	0.29	0.62	0.18	0.38	0.37
13.	*Cinnamomum tamala*	0.72	0.49	-	0.14	0.34
14.	*Trachyspermum ammi*	1.30	-	-	-	0.33
15.	*Houttuynia cordata*	-	0.49	0.44	0.28	0.30
16.	*Cinnamomum verum*	0.61	-	-	0.56	0.29
17.	*Syzygium aromaticum*	0.69	-	0.48	-	0.29
18.	*Zanthoxylum oxyphyllum*	-	0.49	-	0.64	0.28
19.	*Alpinia nigra*	0.53	0.52	-	0.08	0.28
20.	*Ocimum basilicum*	-	-	0.38	0.51	0.22

On the basis of ethnic diversity and consumers demand, 27 numbers of spices and condiments plants were recorded as market potential species and were listed in Table 4. The analysis of spices and condiments in terms of number of sellers and price in the market shows that *Piper nigrum* was highest market potential species with average estimated cost of Rs. 575/-per kg. and *Garcinia pedunculata* was lowest market potential species with average cost of Rs.20/-per kg.

Table 4: Estimated cost of spices and condiments available in different markets

Sl. No.	Name of the species	No. of sellers Range (Mean)	Estimated cost /Kg(Rs.) Range (Mean)
1.	*Piper nigrum*	4-7 (5.5)	500-600 (575)
2.	*Capsicum chinensis*	2-18 (12)	200-300 (247.5)
3.	*Cinnamomum verum*	2-5 (3.25)	200-300 (212.5)
4.	*Sesamum indicum*	1-6 (3.5)	150-200 (162.5)
5.	*Eryngium foetidum*	5-20 (10.75)	100-200 (155)
6.	*Houttuynia cordata*	5-20 (11)	80-200 (132.5)
7.	*Coriandrum sativum*	4-10 (6.75)	80-150 (107.5)
8.	*Allium sativum*	2-16 (7.75)	40-150 (102.5)
9.	*Trigonella foenum-graecum*	2-8 (5.25)	80-100 (90)
10.	*Zingiber officinale*	5-10 (8.5)	40-100 (80)
11.	*Brassica nigra*	1-5 (2.75)	80-100 (77.5)
12.	*Alpinia nigra*	1-7 (4)	80-100 (70)
13.	*Capsicum annum*	1-4 (2)	50-100 (67.5)
14.	*Trachyspermum ammi*	1-6 (2.5)	60-80 (65)
15.	*Zingiber montanum*	1-6 (3)	40-80 (60)
16.	*Allium cepa*	3-8 (5.5)	20-100 (52.5)
17.	*Murraya koenegii*	1-5 (2.5)	40-60 (50)
18.	*Curcuma longa*	1-6 (3.5)	30-60 (47.5)
19.	*Allium ascalonicum*	1-5 (2.25)	40-60 (45)
20.	*Cuminum cyminum*	1-4 (2.25)	40-50 (42.5)
21.	*Zanthoxylum oxyphyllum*	1-6 (4.75)	30-50 (42.5)
22.	*Garcinia morella*	1-3 (1.5)	30-40 (35)
23.	*Illicium griffithii*	1-5 (3.25)	20-40 (30)
24.	*Tamarindus indica*	1-7 (3.75)	25-40 (30)
25.	*Cinnamomum tamala*	5-10 (6.5)	20-40 (28.75)
26.	*Mentha arvensis*	1-7 (3.75)	20-30 (27.5)
27.	*Garcinia padunculata*	3-6 (3.75)	10-30(20)

4. Discussion

The ethnic groups were store house of indigenous knowledge [3]. They have their own culture, tradition and medicinal system of treatment. As other ethnic communities, the selected communities of Assam are also associated with forest resources to a great extent. The present study has been made to document spices and condiment plants and marketing potential of selected communities of Assam. A total of 51 species belonging to 26 families and 42 genera were used as spices and condiments by ethnic communities of Assam. Among ethnic communities of Assam maximum numbers of plants were used as spices and condiments by Ahom (32 spp.). It was further observed that among communities Assam, Ahom shares maximum 14 numbers of species with Deori, Solowal-kachari and Mishing and minimum 9 numbers of species were shared between Deori and Sonowal-kachari. The present study shows that there was more homogeneity in ethnobotanical knowledge of spices and condiments among communities of Assam.

Amaryllidaceae and Zingiberaceae families represented the maximum number of spices and condiments used by ethnic communities. Maximum number of families namely Amaryllidaceae, Apiaceae, Lamiaceae, Lauraceae and Rutaceae were used by Deori, while other communities used the members of families Amaryllidaceae and Zingiberaceae. The maximum utilization of members of these families by ethnic communities may be due to more aroma and flavour of spices and condiments as compared to other families. The present study is in agreement with the findings of other workers [5][6][8] who reported maximum number of spices from families Zingiberaceae, Lamiaceae, Lauraceae and Amaryllidaceae in other states of North East India.

During field survey, it was observed that ethnic communities of Assam cultivated these plants in their home

gardens regularly. These practices of harvesting sources show the attitude of ethnic people towards conservation of these plants and forest resources. The habit wise grouping of spices and condiments revealed that maximum number of herbs followed by trees, shrubs and climbers were used by ethnic communities of Assam. Since the herbs are mostly seasonal, easy growing and rich in aroma which may be the reason for their maximum use. It was also revealed that communities of Assam use majority of plants as spices and condiments in fresh form which indicates that the plants have more aroma in fresh form and are also easily available around the surroundings. The present investigation reveals that maximum percentages of leaves were used than other plant parts among selected communities of Assam. The use of leaves as spices and condiments are also reported in other ethnic communities of Sikkim, Manipur and Tripura [5][6][8]. The leaves were mainly used for flavouring and seasoning which may be due to presence of active secondary metabolites than other parts of the plants.

Spices and condiments were used in cuisines to improve colour, fragrance and taste. Colour, flavour, seasoning and preservation are the important features of ethnic cuisine. The present study reveals that maximum numbers of plants species were used for flavouring followed by seasoning, preservation and colouring. Ahom used maximum number of plant species (31spp.) followed by Mishing (25 spp.), Sonowal-kachari (21spp.) and Deori (13spp.). For seasoning, the maximum plants were used by Ahom (7 spp.), followed by Sonowal-kachari (4spp.), Mishing (3spp.) and Deori (2 spp.). *Allium sativum, Capsicum annum, Eryngium foetidum, Murraya koenigii, Piper nigrum* and *Zingiber officinale* were common plants for flavouring among ethnic communities of Assam. Mostly, *Curcuma longa* and *Capsicum chinense* were used for imparting colour to the food. *Curcuma longa* is mainly used for imparting colour to the food by all communities of Assam. In addition, leaves of *Murraya koenigii* are used for giving colour to non-vegetarian dishes by Deori community. It shows that the ethnic communities have innovative ideas to improve the aroma and colour of food.

Cultural important index is one of the most important ethnobotanical indices to identify the cultural role of plant species [11]. *Allium cepa* ranks 1stin position. Though it is used in two categories (flavouring and seasoning) but it has maximum used reports than other species which may be the cause of highest mean cultural value. Likewise, *Curcuma longa, Coriandrum sativum, Piper nigram, Allium sativum* score 3rd, 4th and 5th positions in mean cultural index (mCI). Cultural importance index (CI) and mean cultural importance index (mCI) were evaluated for the first time in spices and condiments plants. *Cinnamomum tamala* and *Alpinia nigra* are used by three ethnic communities but they have very low cultural importance index. It may be due to use of these plants in one or two categories by ethnic communities. Market potential of spices and condiments play an important role in socio-economic development of ethnic people. A lot of information is available on the market survey of wild edible plants [12][13], but there is limited information available on evaluation of market potential spices and condiments of Assam. During market survey it was observed that 27 spices and condiment plants show high market potential. There were about 8 number of species with estimated cost of more than Rs.100/-. Among them, *Piper nigrum* shows the maximum cost (Rs.575/-per kg). The present investigation is in agreement with the findings of other workers [4] who also reported the highest price of *Piper nigrum* and *Cinnamomum verum* in markets of Manipur. The cultivation of these species in home gardens may be beneficial for ethnic communities not only for their consumption but also to generate revenue by selling them in the markets.

5. Conclusions

The present study reveals the use of spice and condiment plants in traditional foods.51number of plant species belonging to 26 families and 42 genera were documented from four selected communities. Among them, Ahom community use maximum number of spices and condiments followed by Mishing, Sonowal-kachari and Deori. Ahom community showed maximum similarity with Deori, Sonowal-kachari and Mishing (14 spp.) and minimum similarity between Deori and Sonowal-kachari (9 spp.). Deori community used maximum number of species from families Amaryllidaceae, Apiaceae, Lamiaceae, Lauraceae and Rutaceae, while other communities used spices and condiments from families Amaryllidaceae and Zingiberaceae. Fresh leafy herbaceous species were most preferred as spices and condiments than trees and shrubs Spices and condiments were mostly used for flavouring category. *Piper nigrum* was highly market potential species. Most of the species were cultivated in their home gardens for consumption and income generation. Cultivation of spices and condiments might help in conservation and management of plant resources and also in sustainable rural livelihood development.

Acknowledgements

The authors are thankful to informants for sharing their valuable knowledge about spice and condiment plants.

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