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Research Article

Ethnobotanical uses of spices and condiments by four ethnic groups in Tripura, India

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Abstract

Spices and condiments are mainly used for enhancing the flavour, aroma and colour of food. Ethnic groups having their unique cultures and traditions in the utilisation of various plants show the rich diversity of Tripura. The objective of the study is to document the ethnobotanical uses of spices and condiments and to determine the most culturally important spices and condiments used by these ethnic groups. The present study was carried out on four ethnic groups namely - Debbarma, Jamatia, Kalai and Noatia. The data was collected from 102 informants randomly selected households from 31 villages for each ethnic group. A total of 75 plant species belonging to 62 genera and 33 families used as spices and condiments were reported. Leaves (33%) were the most used part followed by fruits (19%), stems (12%), rhizomes (10%), flowers (4%) young shoots (8%), bulbs (2%), seeds (8%), buds (2%), inflorescence (1%) and pseudostems (1%), barks (1%). *Zingiberaceae* was the most dominant family followed by *Apiaceae* and *Fabaceae.* Flavouring was the most used category followed by seasoning, preservation and colouring. Habitwise, herbs were represented by the maximum number (38) followed by trees (15), shrubs (12), aquatic (4), climbers (3) and grass (2). Debbarma used the maximum number of plants (54 spp.) as spices and condiments followed by Jamatia (33 spp.), Kalai (30 spp.) and Noatia (41 spp.). *Trachyspermum roxburghianum* was the most culturally important plant with a mean cultural index 1.37 followed by *Curcuma longa* (1.34), *Ocimum americanum* (1.30), *Allium sativum* (1.20) and *Zingiber officinale* (1.19).

Keywords: Spices, Condiments, Cultural importance index, Debbarma, Jamatia, Kalai, Noatia

Introduction

Northeast India is considered one of the biodiversity hotspots in the world. The region supports 50% of the total number of plant species in India accounting for about 7,500 flowering plants, 700 orchids, 63 bamboos, 64 citrus, 28 conifers, 500 mosses, 700 ferns and 728 lichen species (Chakravarty *et al.,* 2012). It is also home to approximately 225 tribes in India. Northeast India comprises eight Indian states namely Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim. Diversity in various ethnic groups with their unique cultures and traditions has resulted in the utilisation of various herbs and plants to flavour and season their ethnic food. Tripura, a landlocked hilly state in Northeastern India, is also rich in plant diversity. The state is home to 19th different ethnic tribal communities, viz., Tripuri, Jamatia, Reang, Noatia, Uchoi, Chakma, Mog, Lushai, Kuki, Halam, Munda, Kaur, Orang, Santal, Bhil, Bhutia, Chaimal, Garo and Lepcha (Sharma *et al.,* 2014). Debbarma is the major ethnic groups of the state and is also known as "Old Tripuris". Jamatia is the third largest ethnic group of the state and known as the "Royal army" of the Tripura kingdom, Noatias are known as 'newcomers' and Kalais are considered as one of the sub- tribes of the Halam community (Debbarma & Kaipeng, 2022). These ethnic groups use different kinds of spices and condiments for flavouring, seasoning and colouring their ethnic cuisines and delicacies. They mostly prefer boiled food with locally available spices and condiments from the forest for flavor, aroma and color. They are mostly dependent on natural resources in the nearby forest for their daily life. The majority of them are engaged in subsistence agriculture, jhum cultivation, piggery, fishery and hunting.

A few studies have been carried out on spices and condiments of Northeast India. 38 species of spices and condiments belonging to 24 genera and 11 families were reported by Singh and Sundriyal (2003) to be used by the ethnic groups of Manipur. Some of the spices were *Allium odorum*, *Allium porrum*, *Anisochilus carnosus*, *Citrus latipes*, *Knoxia sumatrensis*, *Litsea citrata*, *Ocimum canum*, *Zingiber alatum*, etc. Gudade *et al.* (2015) investigated 14 spices and condiments belonging to 12 families used by tribal communities of Sikkim. Bharali *et al.* (2017a, b) documented spices and condiments used by four ethnic communities of Assam i.e., Ahom, Deori, Mishing and Sonowal-Kachari and selected tribes of Arunachal Pradesh namely - Adi, Apatani, Galo and Nyishi tribes. Guha *et al.* (2018) reported 27 species of spices belonging to 14 families by Manipuri community of Tripura. Apart from this, there is no record of other communities on spices and condiments. Since there is lack of information on spices and condiments of the selected tribes of Tripura. Therefore the present study was carried out to document spices and condiments used by the Debbarma, Kalai, Jamatia and Noatia ethnic groups.

Materials and Methods

Study area

Tripura is located between 22°56' N to 24°32' N latitude and 90°09' E to 92°20' E longitude. The state covers an area of 10,49,169 sq. km geographical area of the country. It shares an international border with Bangladesh on three sides, while Assam and Mizoram border on the east. The state has 3 distinct physiographic zones viz., hill ranges, undulating plateau land and low-lying alluvial soil. The hill ranges across the state from the north-south and continues

southward into the Chittagong Hill Tract. The ethnic groups, namely Debbarma, Kalai, Noatia and Jamatia, were selected for the present study. These communities were dominant in West Tripura, Sepahijala, Khowai, South and Gomati districts (Figure 1). The households were randomly selected from every 10 blocks namely-Belbari, Champaknagar, Teliamura, Ompi, Mungiakami, Bagafa, Jampuijala, Mohanbhog, Killa and Karbook.

Ethnobotanical survey

Periodic visits were made during every season to collect the specimens of some wild spices and condiment plants. Questionnaire surveys and personal interviews were carried out in all the ethnic groups. The study was carried out in 31 villages. Data was collected through oral interviews, a directed questionnaire method and personal interaction with village heads and adults (both male and female) above the age of 18 years. The data was collected from 102 informants from randomly selected households of each community. Various indigenous festivals, ceremonies and rituals were closely observed to gather information on the use of spices and condiments. Identification of plants was carried out through documented herbariums and consultation of various existing taxonomic literatures. Some specimens of important species of spices and condiments were collected and the herbarium was prepared as per Jain and Rao (1976).

Data analysis

Cultural importance index was determined as given by Tardío and Pardo-de-Santayana (2008).

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

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

The mean cultural importance index of the species was used to evaluate the CI difference among the selected ethnic communities.

Results

The present study reported a total number of 75 plant species belonging to 62 genera and 33 families used as spices and condiments by the Debbarma, Kalai, Jamatia and Noatia communities of Tripura and presented in Table 1 with their scientific and vernacular names, family, habitat, parts used, used category and mode of utilization. Some of the important spices and condiment plants used by selected ethnic groups are given in Figures 2 and 3. Debbarma used the maximum number of spices and condiments followed by Noatia, Jamatia and Kalai (Figure 4). Apiaceae was the dominant family with maximum number of spices and condiments followed by Zingiberaceae and Fabaceae (Figure 5). The result showed that leaves (33%) were the most used part followed by fruits (19%), stems (12%), rhizomes (10%), flowers (4%) young shoots (8%), bulbs (2%), seeds (8%), buds (2%), inflorescence (1%), pseudostems (1%) and barks (1%) (Figure 6). Habit wise, the highest number of species used as spices and condiments were herbs followed by trees, shrubs, aquatic, climber and woody grass (Figure 7). Flavouring was the most used category followed by seasoning, preservation and colouring (Figure 8). All the selected ethnic groups preferred mostly fresh forms of spices and condiments. The maximum number of spices and condiments in both fresh and dried forms were used by Debbarma > Noatia >Kalai > Jamatia (Figure 9). There were 16 common plants among all selected communities (Figure 10). The results given in Table 2 showed that in Debbarma community, *Ocimum americanum* had the highest cultural index. *Curcuma longa* had the highest cultural index for Jamatia and Kalai communities whereas *Trachyspermum roxburghianum* showed the maximum cultural index for Naotia community. Among

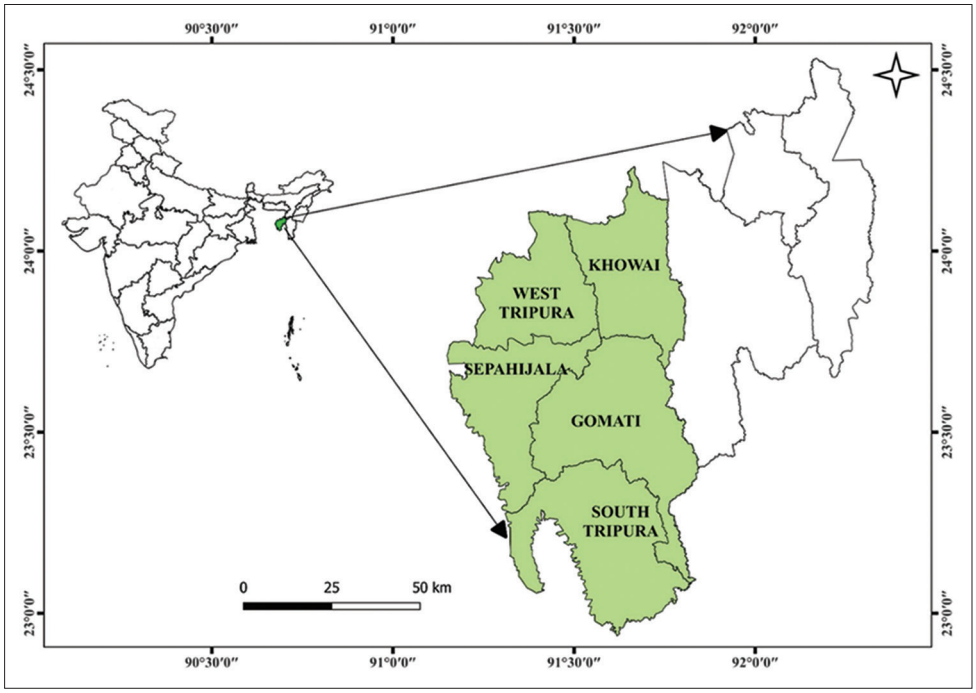

Figure 1: Map of study area

Table 1: List of spices and condiments with their mode of utilization by selected ethnic groups

S. No.	Scientific name	Vernacular name	Family	Habit	Parts used	Use category	Mode of utilization
1	*Acmella paniculata* (Wall. ex DC.) R.K. Jansen	Uswndwi (D), (N) Wuswndwi (K), (J)	Asteraceae	Herb	Leaves and young shoots	F, S	Leaves are used in flavouring boil dish with chillies and fermented fish and raw young shoots are used in seasoning chutney.
2	*Allium ascalonicum* L.	Bolong piyaz (K), (N)	Amaryllidaceae	Herb	Leaves, bulbs	F, S	Leaves and bulbs are used in flavouring and seasoning different ethnic dish, chutneys etc.
2	*Allium cepa* L.	Piyaz (D), Piyajw (K), (J), (N)	Amaryllidaceae	Herb	Leaves, Bulbs	F, S	Leaves and bulbs are used in flavouring and seasoning different ethnic dish like godwk, berma bwtwi, moswdeng etc.
3	*Allium sativum* L.	Risoom (D), (J), Risun (K), (N)	Amaryllidaceae	Herb	Bulbs	F, S, P	Bulbs are used in preparing a traditional dish' Chakthwi kwthwng' which is made of natural soda and roasted chillies and fermented fish in and also for flavouring other ethnic dishes, fries etc.
4	*Alpinia nigra* (Gaertn.) Burtt	Thorai (D), (K), (N), (J)	Zingiberaceae	Herb	Stems and rhizomes	F	Stems and rhizomes are used for preparation of boil dish, sometimes also cooked with fish and meat
5	*Alocasia macrorrhizos* (L.) G. Don	Manai (D), (K), (J), (N)	Araceae	Herb	Stems and rhizomes	F	Stems and rhizomes are fried/ boiled with garlic, salt, chillies and fermented fish along with tamarind paste. Also eaten as salad by pounding with *Citrus macroptera* fruits, chillies and garlics etc.
6	*Amomum dealbatum* Roxb.	Biring (D), (K), (N)	Zingiberaceae	Herb	Fruits	F	Fruits are used in preparing boil dishes with rice powder and dried fish.
7	*Amorphophallus bulbifer* (Roxb.) Blume	Batima (D), (N), (K), (J)	Araceae	Herb	Rhizome, Stem	F, P	A cake shaped-bun is prepared from the rhizome and can be stored for many days, it is considered as a famous delicacy used in different ethnic dish awandru (any dish prepare with rice powder), mosdeng (usually a chutney with burnt chillies and fermented fish), chakhwi, etc
8	*Acacia nilotica* Lam.	Gadanarshing (D)	Fabaceae	Tree	Pods (Fruits)	F	For preparing chutney, salads, with fermented fish, garlic and chillies
9	*Apium graveolens* L.	Panch puran (D)	Apiaceae	Herb	Seeds	F, P, S	For seasoning and flavouring fries, dal and pickles
10	*Blumea aromatica*	Muihan	Asteraceae	Shrub	Leaves	F, S	For seasoning and flavouring chutneys/moswdeng, godwk.
11	*Brassaiopsis griffithi C.B. Clarke*	Chapok (D), (K), (N)	Araliaceae	Shrub	Fruit	F	For preparing different ethnic dish like godwk, moswdeng
12	*Brassica juncea* L.	Horwa (D), Hoiro (K), (J)	Brassicaceae	Herb	Seed, Leaves	F, P, C	Seeds are pounded and cooked with fish and leaves are eaten boil/fry. Also used for flavouring pickles
13	*Bursera serrata* Wall. ex Colebr.	Thaichrem (D), Thaisrem (R)	Burseraceae	Tree	Fruits	F	Fresh fruits are pounded with chillies to make side dish chutney/ moswdeng
14	*Capsicum frustescens* L.	Mwso bilati (D), (K)	Solanaceae	Shrub	Fruits	C, F, S, P	For flavouring different traditional dishes, boil dishes etc., Also used in pickles.
15	*Capsicum annum* L.	Mwso (D), (K), (N), (J)	Solanaceae	Shrub	Fruits	F, S, P, C	For flavouring chutneys, colouring curries, salads etc., Also used in pickles.
16	*Canavalia gladiata* (Jacq.) DC.	Baikang (D), (K), Kosoi baikang (J)	Fabaceae	Climber	Pods (Fruits)	F	For preparing mosdeng made with pounded roasted chillies and fermented fish and godwk, which is a pounded vegetable boil dish

(Contd...)

Table 1: *(Continued)*

S. No.	Scientific name	Vernacular name	Family	Habit	Parts used	Use category	Mode of utilization
17	*Citrus aurantifolia* (Christm.) Swingle	Kawji (K), Kawji (J), (N)	Rutaceae	Shrub	Fruits and leaves	F, S	For flavouring and seasoning traditional dish called chakhwi cooked with soda, bamboo shoots and pork innards
18	*Citrus limon* (L.) Osbeck	Lebo (D), (N)	Rutaceae	Shrub	Fruits and leaves	F, S	For flavouring and seasoning traditional dishes like "chakhwi' and 'chattang', chattang is a dish made with dried vegies (bamboo shoots alocasia stems, dried radish, meat and soda, ginger leaves, lemon leaves and solanum, etc)
19	*Citrus macroptera* Montr.	Sadukora (K)	Rutaceae	Tree	Fruits	F	Cover of the fruit is used in preparing chakhwi and fruit is used in preparing salad with *Alocasia* stems
20	*Cinnamomum tamala* T.nees & Eberm.	Tejpata (D), (K), (N), (J)	Lauraceae	Tree	Leaves	F, S	Leaves are used for flavouring, seasoning dal, tea and a dish called labra (mixed fried vegetable dish with pulses), murikonthw- a dish cooked with bottle gourd and fish-heads, also used for flavouring tea, dal & curries, etc.
21	*Cinnamomum burmannii* (Nees &T.nees) Blume	Masala blai (D)	Lauraceae	Tree	Leaves	F	Fresh leaves are pounded and paste are used for flavouring meat, fish curries
22	*Cinnamomum verum* J. Presl	Dalchini (D), (K), (J), (N)	Lauraceae	Herb	Leaves and barks	F, S	For flavouring meat, fish curries , teas
23	*Colocasia esculenta* (L.) Schott	Manai bokong (K), (N)	Araceae	Herb	Stem	F, P	Fried and eaten with dried shrimps, fermented fish and chillies also dried and preserved which are used in a tradtional dish called chattang
24	*Coriandrum sativum* L.	Dhania (D), Dhoina (K), (J), (N)	Apiaceae	Herb	Leaves and stem	F, S	Fresh leaves and stems used for seasoning, flavouring different boil dishes, fries, salads, chutneys, etc
25	*Colocasia antiquorum* Schott	Muito (K), (N), (J)	Araceae	Herb	Stems, Leaves, Flowers	F.	For flavouring a fried dish along with fermented fish and seasoned with salt, chillies and tamarind paste
26	*Colocasia gigantean* (Blume).Hook.f.	Khama (K)	Araceae	Herb	Stems, Rhizome	F, P	Stems are cooked with dried prawns and fermented fish & rhizomes are boiled and smashed and then cooked with dried fish. Also dried and preserve
27	*Curcuma longa* L.	Sutwi, Sotwi (K), (D), (J), (N)	Zingiberaceae	Herb	Rhizomes, Flowers, Stems	F, C, P	Rhizomes are mostly used for colouring, flavouring different dishes, curries, but also roasted and fresh rhizomes used in preparing 'Mosdeng' a traditional chutney with pounded chillies and fermented fish) and Chattang (a traditional dish made of dried bamboo shoots, dried Colocasia stems and sodium bicarbonate and dried fish)
28	*Cuminum cyminum* L.	Jeera (D), (K), (J), (N)	Apiaceae	Herb	Seeds	F, S, P	Seeds are used in flavouring fish, meat curries, sometimes used in seasoning dal. Also used in tamarind and ber pickles.
29	*Curcuma amada*	Swtwi kobor (D)	Zingiberaceae	Herb	Rhizomes	F, C	Rhizomes are burnt and used for flavouring moswdeng and colouring some boil dish.
29	*Curcuma aromatica* Salisb.	Bolong swtwi (N),(K)	Zingiberaceae	Herb	Leaves, Inflorescence	F	Leaves are used for wrapping fish which is siteamed along with chillies, slices of Allium cepa, salt, garlic etc., Inflorescences are used in boil dish.

(Contd...)

Table 1: *(Continued)*

S. No.	Scientific name	Vernacular name	Family	Habit	Parts used	Use category	Mode of utilization
30	*Curcuma caesia*	Swtwi kosom (D)	Zingiberaceae	Herb	Rhizome	F	Rhiomes are used for flavouring
30	*Dendocalamus longispathus*	Wamlik (N), (J), (K)	Poaceae	Grass	Young shoots	F, P	Young shoots are used for flavouring different ethnic dish both in raw and dried form.
31	*Dendrocalamus strictus* Nees	Wathwi muya (D), (K), (N), (J)	Poaceae	Grass	Young shoots	F, P	Young shoots are eaten boil with rice powder and fermented fish and also dried shoots are cooked in different traditional dishes like chattang, chakhwi etc
32	*Dillenia indica* L.	Thaiplok (K), (J), (N)	Dileniaceae	Tree	Fruits	F, P	Flesh of fruits are used in flavouring moswdeng, dal, fish, pickles, etc.
33	*Diplazium esculentum* (Retz.) Sw.	Mikhunchwk (K), (N)	Athyriaceae	Herb	Young shoots	F	For flavouring chutneys, fried/boil dish with fish
34	*Elettaria cardamomum* (L.) Maton	Elaichi (J), (D), (K), (N)	Zingiberaceae	Herb	Seeds	F	For flavouring teas, meat, fish curries, etc
35	*Eryngium foetidum* L.	Kashing masala (D), Sikkam masala (K), (J), Bakhor (N)	Apiaceae	Herb	Leaves	F, S	For flavouring, and seasoning different boil dish, chutneys, meat curries, fish etc.
36	*Euryle ferox* Salisb.	Thangjing (D), (K)	Nymphaeaceae	Aquatic	Seeds	F	Raw seeds are used for flavouring chutneys (Moswdeng)
37	*Enhydra fluctuans* Lour.	Elengcha (D), (J), Alencha (K)	Asteraceae	Aquatic	Leaves and young shoots	F	Usually fried with fish and seasoned with garlic and chillies
38	*Elsholtzia ciliata* (Thunb.) Hyl.	Bolong banta (N)	Lamiaceae	Herb	Flowers, Leaves	F, S	For flavouring and seasoning and boil dish
39	*Foeniculum vulgare* Mill.	Panch puran (D), (K)	Apiaceae	Herb	Seed	F, S, P	For flavouring, seasoning dal and curries. Also used in pickles.
40	*Glinus oppositifollius* (L) Aug. DC	Bwkhate (D), (J), (K)	Molluginaceae	Herb	Leaves and stems	F	Wrapped inside a turmeric leaves and cooked or simply steamed with chillies and fermented fish
41	*Hibiscus safdariffa* L.	Mwkhwi daspa (N), Mwkhwi pat (D), (K), (N)	Malvaceae	Herb	Leaves, bud	F, C	For flavouring and colouring boil dish along with other vegetables. Also in flavouring teas.
42	*Homalomena aromatica* Schott	Gandhiri (D), (K), (J)	Araceae	Herb	Stems, Rhizomes	F	Stems are roasted with fermented fish and prepared chutneys with chillies also fried and cooked
43	*Ipomea aquatica* Forssk.	Komli ha bosok (D), (K), (N)	Convolvulaceae	Aquatic	Stems and leaves	F	Flavouring stir fried recipe with salt, chillies and dry fish also boiled with salt, chillies, fermented fish and garnished with garlic
44	*Lasia spinosa* (L.) Thwaites	Pachol kwlwi (D), (J)	Araceae	Herb	Young shoots, rhizome	F	For preparing boil dish along with fish & rhizomes are eaten chutney with roasted chillies and garlic
45	*Leucaena leucocephala* (Lam) de Wit	Kelkodom (D), (K), (J)	Fabaceae	Tree	Pods	F	Seeds are used in flavouring moswdeng, godwk made with roasted chillies, garlic, and fermented fish
46	*Leucas aspera* (Willd.)	Dongkolsw (D), (K)	Lamiaceae	Herb	Leaves	F	For flavouring chutneys and also steamed
47	*Mangifera indica* L.	Thaichok (K), (N), (D)	Anacardiaceae	Tree	Fruits	F, P	Dried pulp are used for flavouring curries, made pickles.
48	*Mentha spicata* L.	Pudina (J), (N), (K), (D)	Lamiaceae	Herb	Leaves	F, S	For flavouring and seasoning chutneys, salads etc.,
49	*Moringa oleifera* Lam.	Sejna (D), (K), (J)	Moringaceae	Tree	Leaves, Fruits	F	Leaves are simply boiled or fried with fish and pods are used in making different traditional dishes called chattang, awandru, young pods are used for godwk
50	*Monochoria vaginalis* (Burm.f) C. Presl ex kunth	Chichiri (J), (D), chichri (K)	Pontederiaceae	Herb	Young shoots and leaves	F	For flavouring boil dish along with fish

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Table 1: *(Continued)*

S. No.	Scientific name	Vernacular name	Family	Habit	Parts used	Use category	Mode of utilization
51	*Muraya koenigii* (L.) Spreng	Mui blai (K), Curry patta (D)	Rutaceae	Tree	Leaves	F, S	For flavouring, seasoning dal and also made pakora along with red lentils
52	*Musa balbisiana* Wurdack	Mikhum, Laiphang (D), Thalik bubar (J)	Musaceae	Herb	Influorescence, pseudostem	F	For flavouring different traditional dishes (Godwk, mosdeng) and curries with fish. Natural chakhwi (soda) is made from the stem ashes.
53	*Neptunia prostrata* (Lam.) Baill.	Thorai ha (K), (D), (J)	Fabaceae	Aquatic	Young shoots, stems	F	For flavouring chutneys (moswdeng) either raw or in steam form
54	*Nigella sativa* L.	Panch puran (D, K)	Ranunculaceae	Herb	Seeds	S, P, F	For flavouring and seasoning pickles, dal
55	*Ocimum americanum* L.	Banta (D), (K), (J), (N)	Lamiaceae	Herb	Leaves	F, S, P	For seasoning and flavouring boil traditional dish in both communities and also used in preparing mosdeng
56	*Oroxyllum indicum* (L.) Benth. ex Kurz	Baifang (D), (J), Tokharwng (N)	Bignoniaceae	Tree	Fruits (Pods)	F	Pods are roasted and used in flavouring chutneys
57	*Paederia foetida*	Dorkhopui (N)	Rubiaceae	Climber	Leaves	F	For flavouring boil dish for its pungent smell also for chutney and boil dish.
58	*Pandanus amaryllifolius* Roxb.	Payas blai (N)	Pandanaceae	Shrub	Leaves	F, S	For flavouring sticky rice, payas (a sweet rice pudding), tea because of its fragrant aroma.
59	*Parkia timoriana* (DC.) Merr	Wakere (D), (K), Wakre (J), Yongchak (N)	Fabaceae	Tree	Pods	F	Pods are roasted and inner fleshy parts and seeds are used in making chutneys (mosdeng) also prepared raw.
60	*Premna esculenta* Roxb.	Orai blai (D), (K), (N)	Lamiaceae	Shrub	Leaves	F	For flavouring fry dish and also steamed dish.
61	*Phlogacanthus thyrsiflorus* Nees	Khumkwkha (D), (K)	Acanthaceae	Herb	Flowers, Leaves	F	Flowers are used in flavouring boil dish called 'Godwk'
62	*Piper nigrum* L.	Golmorich (J), (K), (N)	Piperaceae	Climber	Fruits	F	For seasoning and flavouring meats curries.
63	*Senegalia pennata* subsp. Kerrii (I.C. Nielsen) Maslin	Hamuk (D), Hamook (K)	Fabaceae	Shrub	Young shoots	F, S	For flavouring and seasoning traditional dishes like mosdeng, godwk and omelettes.
64	*Sesamum indicum* L.	Siping (J), (K)	Pedaliaceae	Herb	Seeds	F, S	For seasoning meat dish and preparing ladoos, grinded powder for flavouring "Chakhwi, a traditional dish
65	*Solanum anguivi* Lam.	Khamka kwkha (J)	Solanaceae	Shrub	Fruits	F	For flavouring boil dish with fish and also fried with garlic and chillies and fermented fish
66	*Solanum betaceum* Cav.	Phantok kwkhwi (K)	Solanaceae	Tree	Fruits	F	Fruits are roasted and made chutney with chillies, garlic and onions
67	*Sygyzium aromaticum* L. Merr. & L.M. Perry	Lwng (K), (D)	Myrtaceae	Tree	Bud	F, P	For flavouring meat and fish curries sometimes for flavouring tea
68	*Tamarindus indica* L.	Thentwrwi (J), (D), (K)	Fabaceae	Tree	Fruits, leaves	F, P	For flavouring a dish made with *Colocasia* sp. and also for making pickles
69	*Trachyspermum roxburghianum* (DC.) H. Wolff	Khundropui (J), (D), (K), (N)	Apiaceae	Herb	Leaves and stem	F, S	For seasoning and flavouring boil dish (berma bwtwi -any vegetable boil with fermented fish, awandru-Bamboo shoot or other vegetables boil with rice powder) and for mosdeng
70	*Trigonella foenum-graecum* L.	Methi blai (D, K)	Fabaceae	Herb	Seeds, Leaves	F, S, P	Seeds are used for seasoning dal and curries and leaves are fried as vegetable.
71	*Zanthoxylum armatum* DC	Moiching (D), (K), (J)	Rutaceae	Shrub	Leaves, Fruits	F, S, P	For flavouring and seasoning different tradtional dishes like godwk etc., & raw leaves are made chutney with roasted chillies, salt, garlic and fermented fish

(Contd...)

Table 1: *(Continued)*

S. No.	Scientific name	Vernacular name	Family	Habit	Parts used	Use category	Mode of utilization
72	*Zanthoxylum rhetsa* (Roxb.) DC	Moiching soi (J), (N)	Rutaceae	Tree	Leaves	F, C	For flavouring boil dishes and chutneys
73	*Zingiber officinale* L. Roscoe	Haching, Haiching (D), (J), (N) (K)	Zingiberaceae	Herb	Leaves, Rhizomes, flower	F, S, P	Rhizomes are used for flavouring, meats, chutneys, fish and also used in cooking 'Chattang', a traditional delicacy made with dried bamboo shoots, dried elephant yam stems, coconut, solanum berries and smoked meat
74	*Zingiber zerumbet* L. Roscoe ex Sm.	Bolong haching (D), (N)	Zingiberaceae	Herb	Rhizomes, Inflorescence	F, S	Inflorescence and rhizomes are used in preparing boil dish such as godwk, chakhwthwi kwthwng.
75	*Zizyphus jujuba* Mill	Boroi (K), Borai (J), (N)	Rhamnaceae	Tree	Fruits	F	Fruit are used in flavouring different ethnic dish specially made with oColocasia stems and also used in making pickles

F - Flavouring, S - Seasoning, C - Colouring, P - Preservation, D - Debbarma, K - Kalai, J - Jamatia, N - Noatia

Figure 2: Spices and condiments used by ethnic groups of Tripura: a) *Senegalia pennata*, b) *Lasia spinosa*, c) *Trachyspermum roxbhurghianum*, d) *Pandanus amaryfollius*, e) *Phlogocanthus thyrsiflorus*, f) *Mentha spicata*, g) *Ocimum americanum*, h) *Amomum dealbatum*, and j) *Cinnamomum verum*

Figure 3: Spices and condiments used by ethnic communities of Tripura: a) *Brassaiopsis griffithi*, b) *Citrus macroptera*, c) *Neptunia prostrate*, d) *Leucas aspera*, e) *Oroxyllum indicum*, f) *Premna esculenta*, g) *Citrus limon, h) Paederia foetida* and i) *Acmella paniculata*

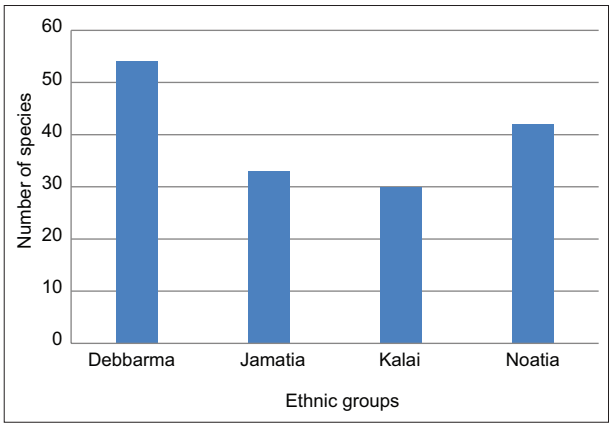

Figure 4: Number of spices and condiments used by ethnic groups

all ethanic communities, the highest mCI was observed for *Trachyspermum roxburghianum* (1.37) followed by *Curcuma longa* (1.34), *Ocimum americanum* (1.30), *Allium sativum* (1.20) and *Zingiber officinale* (1.19).

Discussion

The present study revealed that the maximum number of spices and condiment plants belonged to the families *Zingiberaceae*, *Apiaceae* and *Fabaceae*. *Zingiber officinale*, *Trachyspermum roxburghianum* and *Parkia timorina* were the plants used by all communities. The maximum number of plants used as spices and condiments from these families may be due to presence of more aroma and flavour. The present study confirms the findings of Wu *et al.* (2012),

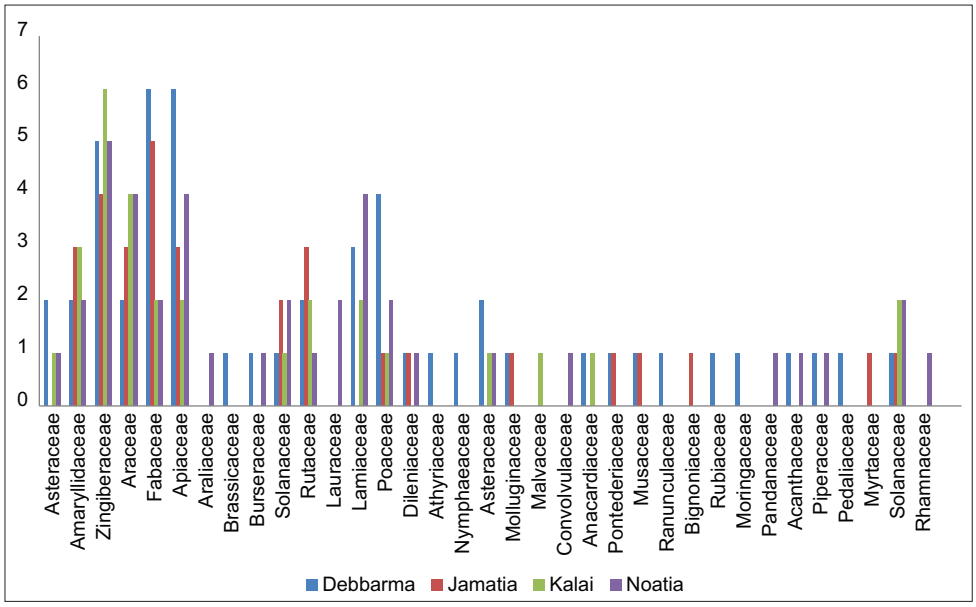

Figure 5: Number of spices and condiments plants used family wise by ethnic groups

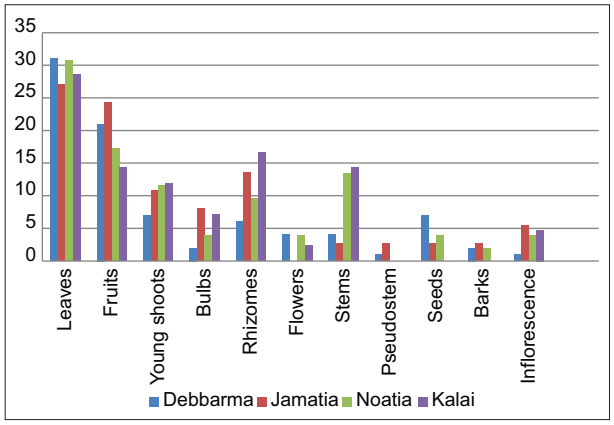

Figure 6: Plant parts used as spices and condiments by ethnic groups

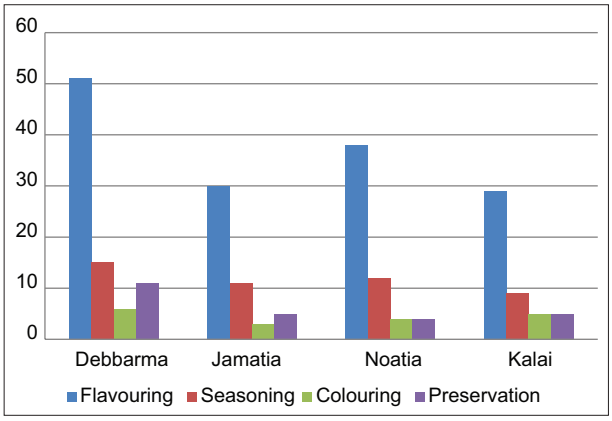

Figure 8: Use categories of plants used as spices and condiments by ethnic groups

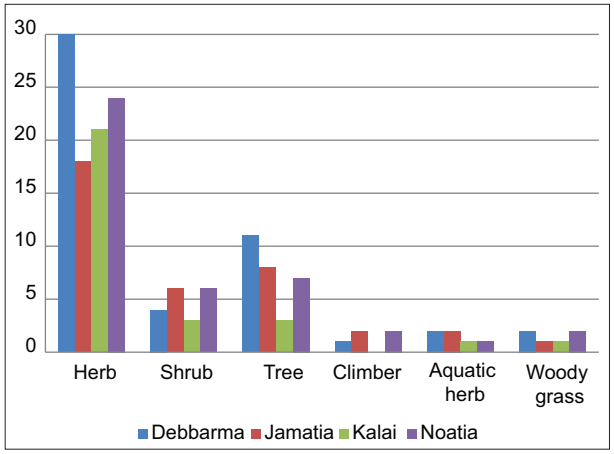

Figure 7: Habits of the spices and condiments used by ethnic groups

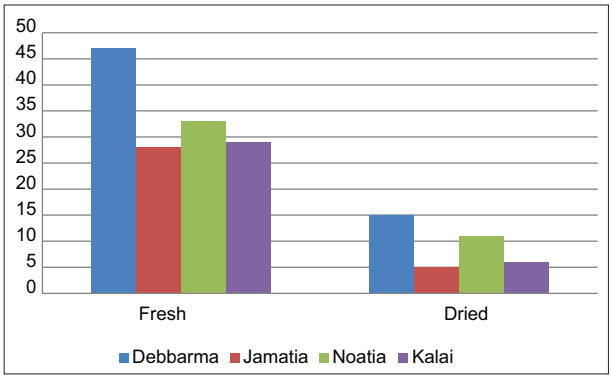

Figure 9: Use form of spices and condiments used by ethnic groups

Salam and Jamir (2016), Erheni *et al.* (2016), Navia *et al.* (2020), Wendimu and Tekalign (2022) and Ahirwar *et al.* (2024). All the communities used maximum herbs as spices and condiments than trees and shrubs. Since the herbs are easy to harvest, easily accessible for instant use as spices and condiments, may be the reason for their maximum utilization and is in agreement with the findings of Agize (2014), Bharali *et al.* (2017 a, b) and Wendimu and Tekalign (2022). The leaves were the most used parts as spices and condiments among Debbarma, Jamatia and Naotia communities and agrees with the findings of Wu *et al.* (2012). whereas the fruits were the most used plant parts as spices and condiments by Kalai and corroborates the

Table 2: Cultural importance index of 10 most important spices and condiments used by selected ethnic groups

S.l. no.	Name of the plants	Debbarma					Jamatia					Kalai					Noatia					mCI
		C	S	F	P	CI	C	S	F	P	CI	C	S	F	P	CI	C	S	F	P	CI	
1.	*Allium cepa*	0	0.44	0.50	0	0.94	0	0.33	0.46	0	0.79	0	0.63	0.30	0	0.73	0	0.27	0.52	0	0.79	0.81
2.	*Allium sativum*	0	0.36	0.66	0	1.02	0	0.49	0.63	0	1.12	0	0.69	0.76	0	1.45	0	0.42	0.8	0	1.22	1.20
3.	*Capsicum frutescens*	0	0.23	0.56	0	0.79	0	0.33	0.60	0.07	1	0	0.45	0.45	0	0.9	0	0.45	0.52	0	0.97	0.91
4.	*Curcuma longa*	0.92	0	0.12	0.49	1.53	0.72	0	0	0.41	1.13	0.69	0	0	0.59	1.28	0.69	0	0.21	0.54	1.44	1.34
5.	*Eryngium foetidum*	0	0.77	0.4	0	1.17	0	0.68	0.45	0	1.13	0	0.79	0.39	0	1.18	0	0.61	0.42	0	1.03	1.12
6.	*Ocimum americanum*	0	0.89	0.97	0	1.86	0	0.72	0.36	0	1.08	0	0.57	0.66	0	1.23	0	0.8	0.23	0	1.03	1.3
7.	*Senegalia pennata*	0	0.79	0.21	0	1	0	0.44	0.35	0	0.79	0	0.62	0	0	0.62	0	0.25	0.32	0	0.57	0.74
8.	*Trachyspermum roxburghianum*	0	0.95	0.15	0	1.1	0	0.86	0.21	0	1.14	0	1.15	0	0	1.15	0	1.21	0.88	0	2.09	1.37
9.	*Zanthoxylum rhetsa*	0	0	0.42	0	0.42	0	0.36	0.46	0	0.82	0.12	0.36	0.56	0	1.04	0	0	0.89	0	0.89	0.79
10.	*Zingiber officinale*	0	0.79	0.47	0	1.26	0	0.5	0.41	0	0.91	0	0.66	0.78	0	1.44	0	0.47	0.7	0	1.17	1.19

C- Colouring, S- Seasoning, F- Flavouring, P- Preservation, CI- Cultural important index

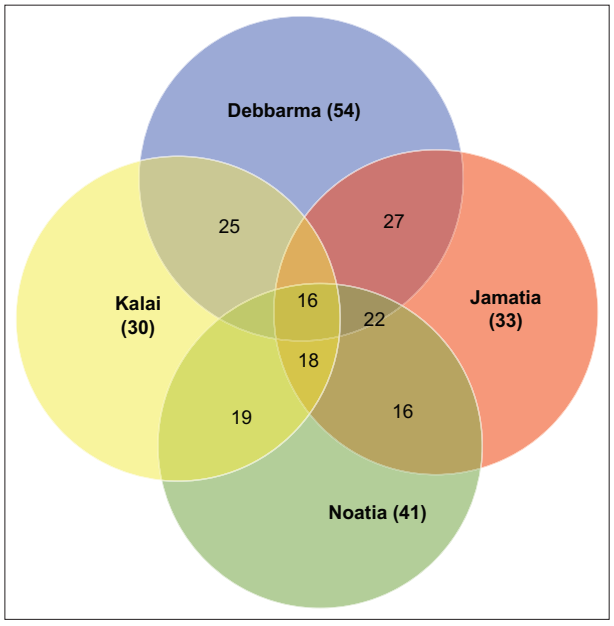

Figure 10: Venn diagram showing similarity and dissimilarity of spices and condiments among selected ethnic groups

results of Erheni *et al.* (2016) and Navia *et al.* (2020) who reported the similar findings in Taming tribe of Indonesia and Ubulu-uku community of Nigeria. It is observed during data collection that ethnic group Kalai likes tangier and spicier food than other communities and fruits of *Amomum dealbatum*, *Capsicum* and *Citrus* species are the most preferred.

The ethnic communities utilize various plant species in different ways to enhance the scrumptiousness, aroma, flavour and colour of food. Accordingly, the listed spices and condiments were divided into four categories namely colouring, flavouring, seasoning and preservation. Debbarma used maximum species for flavouring followed by Noatia Jamatia, Kalai. Bharali *et al*. (2017 a, b) and Navia *et al*. (2020) reported maximum utilization of plant species for flavouring. Whereas, Asowata-Ayodele *at al*. (2016) reported the use of maximum plants for seasoning than flavouring. The present investigation shows that in addition to leaves of *Citrus aurantifolia*, *Citrus limon*, *Citrus macroptera*, fruits of these were also used for flavouring by Debbarma, Jamatia, Kalai and Noatias which may be due to presence of oil glands in the rind of fruits. Similar findings have also been reported from other communities of Northeast India, Ethopia and Indonesia (Bharali *et al.,* 2017b; Wendimu & Tekalign, 2022; Rambey *et al.,* 2024). The most used species for seasoning were *Trachyspermum roxbughianum*, *Eryngium foetidum*, *Ocimum americanum*, *Coriandrum sativum*, *Nigella sativa*, *Neptunia prostrata*, *Curcuma* spp., *Elettaria cardamomum*, *Capsicum* spp., *Allium cepa*, *Allium sativum*, *Allium ascalonicum*, *Allium fistulosum*, *C. limon*, *C. aurantifolia*, *Blumea aromatica*, *Elsholtzia* spp., *Mentha* spp., *Trigonella foenum-graecum*, *Sygyzium aromaticum*, *Hauttoynia cordata*, *Pandanus amaryllifolius, Cinnamomum tamala*, *Zanthoxylum* spp. and *Zingiber* spp.

Curcuma longa, *Curcuma caessia*, *Curcuma aromatica*, *Capsicum annum*, *Capsicum frutescens*, *Hibiscus safdariffa*, *Musa acuminata*, *Musa balbisiana*, *Zanthoxyllum rhetsa*, *Zanthoxylum armatum*, *Sesamum indicum*, *Brassica juncea*, *Tamarindus indica* were used by all the communities for imparting colour to the boiled dishes. The use of *H. safdariffa* and *Musa* spp. for giving reddish colour, *Zanthoxylum* spp. to impart green colour and seeds of grinded *S. indicum* to impart blackish colour to ethnic cuisines reflect the use of good ethnobotanical knowledge and cooking skills of selected ethnic groups.

All the ethnic groups preferred fresh forms of spices and condiments as compared to dried form which may be due to presence of more aroma in fresh form of plants and their easy availability in surrounding areas. *A. cepa*, *A. sativum*, *Alpinia nigra*, *Alocasia macrorrhizos*, *Amorphophallus bulbifera*, *Capsicum frustescens*, *C. sativum*, *C. longa*, *Dendrocalamus strictus*, *Elletaria cardamomum*, *E. foetidum*, *Hibiscus sabadariffa*, *O. americanum*, *Mentha spicata*, *Parkia timoriana*, *T. roxburghianum*, *Zanthoxylum rhetsa*, *Z. officinale* were the common plants used as spices and condiments by all ethnic groups. All the selected ethnic

groups live in the same and adjacent districts which may be the probable reason for sharing of uniform ethnobotanical knowledge on spice and condiments.

T. roxburghianum was the most culturally important plant with mean cultural index (1.37) followed by *C. longa* (1.34), *O. americanum* (1.30), *A. sativum* (1.20) and *Z. officinale* (1.19). *T. roxburghianum* is the preferred for seasoning by Debbarma and Naotia ethnic communities. The use of *C. longa* for colouring, flavouring and preservation by Debbarma and Naotia communities may be the reason for high mean cultural index and corroborates the results of Bharali *et al.* (2017a, b).

Conclusions

The present study reveals that ethnic groups of Tripura have a very good knowledge of spices and condiments. They use several plant species to enhance the taste and flavour of food. There is also a need of an hour to conserve and manage wild germplasm of cultivated and wild spice and condiment plants to improve their quality which may help in the upliftment of these ethnic groups.

Author contributions

Joysree Debbarma: Investigation, Formal analysis and Writing – original draft. Chaman Lal Sharma, Madhubala Sharma: Methodology and Writing – review & editing.

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References

Agize, M. (2014). Ethnobotany of spice and condiment plants and the associated indigenous knowledge on management, utilization and conservation of them in and around home gardens in Loma and Gena Bose districts (Weredas) of Dawuro zone, Southern Ethiopia. *International Journal of Agriculture Innovations and Research, 4*(3), 426-442.

Ahirwar, R. K., Bhoi, D. K., & Jangde, R. (2024). The study of the variety of ethnobotanical plants and spices used in the cuisine of the Indian tribes of Bilaspur, Chhattisgarh. *Plant Science Today, 11*(3), 123-135. https://doi.org/10.14719/pst.3046

Asowata-Ayodele, A. M., Afolayan, A. J., & Otunola, G. A. (2016). Ethnobotanical survey of culinary herbs and spices used in the traditional medicinal system of Nkonkobe Municipality, Eastern Cape, South Africa. *South African Journal of Botany, 104*, 69-75. https://doi.org/10.1016/j.sajb.2016.01.001

Bharali, P., Sharma, C. L., Singh, B., & Sharma, M. (2017a). Ethnobotanical studies of spice and condiment plants used by some communities of Assam. *International Journal of Advances in Scientific Research, 3*(1), 1-11.

Bharali, P., Sharma, M., Sharma, C. L., & Singh, B. (2017b). Ethnobotanical survey of spices and condiments used by some tribes of Arunachal Pradesh. *Journal of Medicinal Plants studies, 5*(1), 101-109.

Chakravarty, S., Suresh, C. P., Puri, A., & Shukla, G. (2012). North-east India, the geographical gateway of India's phytodiversity. *The Indian Forester, 138*(8), 702-709.

Debbarma, B., & Kaipeng, R. (2022). Study on the folk festival of Tripura tribal with special reference to Debbarma, Reang and Jamatia. *International Journal of Creative Research Thoughts, 10*(5), 242-253.

Erheni, A. H., Lemy, E. E., & Ashibuogwu, C. C. (2016). Spices used in Ubulu-uku community of delta state. *International Journal of Herbal Medicine, 4*(3), 45-48.

Gudade, B. A., Babu, S., Deka, T. N., Vijayan, A. K., & Chhetri, P. (2015). Spices biodiversity and their ethnomedicinal uses by tribal community of Sikkim. *International Journal of Plant Research, 28*(1), 141-145. https://doi.org/10.5958/2229-4473.2015.00019.1

Guha, A., Chowdhury, S., Noatia, K., & Sen, D. (2018). Underutilised plants of Tripura used as spices and ethnomedicinal purpose by Manipuri community. *Indian Journal of Agriculture, Environment and Biotechnology, 11*(3), 459-467. https://doi.org/10.30954/0974-1712.06.2018.6

Jain, S. K., & Rao, R. R. (1976). *A handbook of field and herbarium methods*. Today and Tomorrow's Printers and Publishers.

Navia, Z. I., Audira, D., Afifah, N., Turnip, K., Nuraini, & Suwardi, A. B. (2020) Ethnobotanical investigation of spice and condiment plants used by the Taming tribe in Aceh, Indonesia. *Biodiversitas Journal of Biological Diversity, 21*(10), 4467-4473. https://doi.org/10.13057/biodiv/d211001

Rambey, R., Alwin, S., Witri, P., Yanri, Sari, Y. E., Kembaren, Y., Nelasufa, F., & Nainggolan, I. D. (2024). Ethnobotany of spice plants in Namo Rambe village, North Sumatra, Indonesia. IOP *Conference Series: Earth and Environmental Science, 1352*, 012107. https://doi.org/10.1088/1755-1315/1352/1/012107

Salam, S., & Jamir, N. S. (2016). Common spices plant used as medicine by the Tangkhul tribe of Ukhrul district, Manipur, India. *International Journal of Scientific and Research Publications, 6*(7), 22-25.

Sharma, M., Sharma, C. L., & Debbarma, J. (2014). Ethnobotanical studies of some plants used by Tripuri tribe of Tripura, NE India with special reference to magico religious beliefs. *International Journal of Plant, Animal and Environmental Sciences, 4*(3), 518-527.

Singh, H. B., & Sundriyal, R. C. (2003). Common spices and their use in traditional medicinal system of ethnic groups of Manipur state, North eastern India. *Indian Journal of Traditional Knowledge, 2*(2), 148-158.

Tardío, J., & Pardo-de-Santayana, M. (2008). Cultural importance indices: A comparative analysis based on useful wild plants of Southern Cantabria (Northern Spain). *Economic Botany, 62*, 24-39. https://doi.org/10.1007/s12231-007-9004-5

Wendimu, A., & Tekalign, W. (2022). Spice and condiment plants for the traditional beverages and food stuff preparation and utilization, Southern Ethiopia. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences, 92*, 239-247. https://doi.org/10.1007/s40011-021-01302-6

Wu, M. Guo, P., Tsui, S. W., Chen, H., & Zhao, Z. (2012). An ethnobotanical survey of medicinal spices used in Chinese hotpot. *Food Research International, 48*(1), 226-232. https://doi.org/10.1016/j.foodres.2012.03.010