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Ethnobotanical significance of Zingiberales: a case study in the Malaipandaram tribe of Southern western Ghats of Kerala

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The knowledge on the use of plants of the order Zingiberales by the Malaipandaram tribe inhabited in South India was documented. The data was recorded through questionnaires after proper consultation with the traditional healers and others. The informant consensus factor and use value were analysed. Taxonomic studies were carried out and herbarium specimens were preserved at Catholic Volege Herbarius (CATH) herbarium and live specimens were conserved in the Catholicate College Botanical Garden. A total of 17 ethnobotanically important species were identified in Zingiberales distributed under 5 families, viz., Zingiberaceae, Costaceae, Musaceae, Marantaceae and Cannaceae. The plants were listed with scientific name, local name, family, parts used, preparation methods and use. The commonly used taxa was *Curcuma longa* with 52 use reports and highest use value of 1.62. In the investigation, endocrinal disorders and tooth pain reported highest F_{ic} of 1. The information collected will be the baseline data for future phytochemical and pharmacological research to develop new drugs and service.

Keywords: Ethnobotany, India, Kerala, Malaipandaram, Zingiberales
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Malaipandaram tribes settled in the forest mountains near to Sabarimala pilgrimage place in Kerala. The Malaipandaram are usually treated with dislike by the people of plains, who deplore their forest economy, food and nomadic life style[1,2,3,4]. The Zingiberales consists of many important taxa, from Musaceae (bananas), Strelitziaceae (birds of Paradise), Heliconiacae (Heliconias) and Zingiberaceae (Gingers)[5]. The order Zingiberales include 8 families under the monophyletic clade and they are distributed to the tropics[6]. The investigation was aimed to study the diversity of ethnobotanically important species in the order, Zingiberales and collection of valuable traditional information from the Malaipandaram tribe inhabited in Pathanamthitta, Kollam and Idukki Districts of Kerala. Several ethnobotanical studies have been done in various parts of Kerala pointed out the necessity of documentation of traditional knowledge that has been disappearing[7,8,9,10]. Preservation of traditional knowledge by ethnobotanical studies is needed for the conservation of many important species and their justifiable exploitation.

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Methodology

Study area

The ethnobotanical investigation was conducted in the Laha-Perunadu (district Pathanamthitta), Achenkovil, Aryankavu, Kulathupuzha (district Kollam) and Vandiperiyar (district Idukki) of Kerala (Fig. 1).

Sampling informants

45 informants were chosen at random during filed surveys. The age class was taken into consideration: 18 were from 30 to 50 years of old and 27 were ≥51 years of old, 28 were female and 17 were male. It includes traditional healers, housewives and others.

Data collection

The field trips were conducted during September 2016-September 2017. The ethnobotanical information was gathered from direct interviews/conversation after getting proper consent. Information collected from the traditional healers and others on the species name, useful parts for the treatment, mode of preparation of drug, use of other ingredients, the direction of use, information on plants used as food, religious activities, etc.

Taxonomic studies

The specimens were studied; photographed and detailed descriptions were prepared. The species were

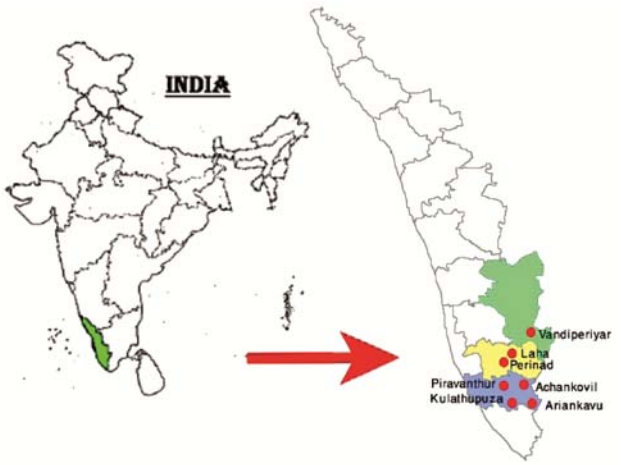

Fig. 1 — Area of Study

identified with the help of literature[11,12,13]. The herbarium specimens were prepared and deposited at CATH for further analysis.

Conservation of taxa

Different accessions of ethnobotanically important gingers were collected along with the rhizome and conserved in the Ginger House of Catholicate College Botanical Garden, Pathanamthitta.

Ailment and other categories

The data collected from the traditional healers were classified into 10 ailment categories and 3 other categories, viz., endocrinal disorders (ED), respiratory system disorder (RSD), gastro-intestinal ailments (GIA), ear infection (EAI), dermatological infections/disorders (DID), eye Infection (EYI), poisonous bites (PB), genito urinary ailments (GUA), tooth pain (TP), kidney stone (KS), food (FP), spice (SP), others (OT).

Analysis of data

Informant consensus factor (F_{ic})

The F_{ic} was used to understand if there was an agreement in the use of members understudy in the categories between the users. The value of F_{ic} was determined by the following formula[14]:

F_{ic}=Nur-Nt/ (Nur–1).

where,
Nur = number of use-reports for a specific
Nt = number of species used for a specific category by all informants

Use value (UV)

The relative importance of each species used is reported as the UV and it was determined using the formula[15]:

UV=$\Sigma U/$n.

where,
U = number of use reports quoted by each informant for a taxon
n = total number of informants interviewed for a taxon

Results and discussion

Taxonomy

A total of 17 ethnobotanically significat ant species belonging to 5 families such as Cannaceae, Costaceae, Marantaceae, Musaceae and Zingiberaceae were recorded. Of which, 10 species belonging to Zingiberaceae (*C. amada* Roxb., *C. longa* L., *C. zanthorrhiza* Roxb., *Curcuma aromatica* Salisb., *Zingiber of Ficinale* Roscoe., *Elettaria cardamomum* (L.) Maton, *Kaempferia galanga* L., *Alpinia calcarata* Rosc., *Alpinia galanga* (L.) Sw., *Hedychium coronarium* Koenig.), 2 species each from Costaceae (*Costus pictus* D Don. and *Cheilocostus speciosus* (J Konig) C Specht, 1 species from Marantaceae (*Indianthus virgatus* (Roxb.) Suksathan & Borchs, and *Maranta arundinacea* L.), 2 species from Musaceae (*Ensete superbum*, Roxb. and *Musa kattuvazhana* KC Jacob) and 1 species from Cannaceae (*Canna edulis* Gawl.). The herbarium specimens were prepared and kept at CATH and live specimens were conserved in the ginger house of Catholicate College Botanical Garden.

Indigenous ethnobotanical knowledge documentation

The present study revealed that 17 species of Zingiberales were used as a herbal remedy for the treatment of several diseases and also as spice or food (Table 1).

Data analysis

Informant consensus factor (F_{ic})

A high-value F_{ic} designates the agreement of choice of species among informants and a low value designates disagreement[56]. The F_{ic} value is varies on the accessibility of the taxa in the area of study[57]. The F_{ic} values in the present study are represented in (Fig. 2) ranges from 0.33 to 1, Where dermatological infections/diseases with 47 use reports from 5 species and gastrointestinal ailments with 40 use reports from

Table 1 — Details of plant uses reported from Malaipandaram tribe — (*Contd.*)

Sl. No	Botanical name, family & voucher specimen	Use reports	Mode of application	Properties and use reports, references
1.	*C. longa* L. Zingiberaceae 10016 (CATH)	Spider poison, snake bite, cuts and wounds, skin nourishment, pooja purposes, nail infection, pimble.	1. The fresh rhizome crushed along with *kodasheri*. It is making in to a paste for applying in the bite area. 2. Fresh rhizome crushed along with *Lawsonia* leaves and neem leaves and applied to the infected nail.3. The rhizome is used as a pooja material on the first day of Malayalam month. They worship their God 'Mala Divangal' by *Koppam Kodukkal*). 4. Rhizome paste applied on pimples and to improve skin color and for skin nourishment. 5. Rhizome powder is mixed with oil and applied to cuts and wounds for healing. 6. Fresh turmeric along with neem juice is applied to the insect bite area. 7. Rhizome paste against snake bite and also used to remove snake teeth.	Wounds, boils, bruises, blistering, ulcers, eczema, insect bites, parasitic infections, hemorrhages and skin diseases[16]; Anti-inflammatory, Antispasmodic activity[17]; anti-HIV, antioxidant, anti-tumour, antivenom; inflammatory swelling, spice, coloring agent[18]; flavoring as a spice[19].
2.	*Curcuma amada* Roxb. Zingiberaceae 10012 (CATH)	Used to make pickle	1. For pickle, rhizome cut in to small pieces and prepared along with green chillies, vinegar, salt, etc and stored in an air tight container.	Anti-inflammatory[20]; cholesterol lowering activity[21]; antioxidant and antibacterial[22]; Carminative, Bronchilytic and vulnerary[23]; Pickles, preservatives, candies, sauces and curries salad[24].
3.	*Curcuma zanthorrhiza* Roxb. Zingiberaceae 10117 (CATH)	Food, baby food, improves body immunity, controlling blood pressure, diabetics. Rhizome juice used as a coloring agent	1. Rhizome is washed well and scrubbed on a perforated metal sheet. The powder obtained kept in water for a whole night and filtered through a clean cloth and allowed to settle down. The sediments are dried under sunlight for further use. 2. The powder is mixed with milk and consumed by diabetic and blood pressure patients. 3. The rhizome is used for the extraction of yellow color and is employed for colouring cotton fabrics. 4. The rhizome powder is used for the preparation of food items.	Menstrual disorders, dyspepsia, stomachic, vomiting and cancer[25]; vomiting[26]; blood purifier, cough antiseptic, indigestion, wound healing, toothache, leucoderma, tuberculosis, enlargement of spleen and for promoting menstruation[23]. Traditional herbal medicine[27]
4.	*Curcuma aromatica* Salisb. Zingiberaceae 10116 (CATH)	Skin irritation, pimple.	Rhizome freshly applies to the skin irritated part and also for pimples.	Stomachic, carminative[28]; bronchitis, cough, leucoderma and skin eruptions[29]; carminative, antidote to snake bite, astringent and used for bruises, corns and sprains, kills intestinal worms[23].

(*Contd.*)

6 species. In the present investigation, endocrinal

Table 1 — Details of plant uses reported from Malaipandaram tribe — (*Contd.*)

Sl. No	Botanical name, family & voucher specimen	Use reports	Mode of application	Properties and use reports, references
5.	*Zingiber ofFicinale* Roscoe Zingiberaceae 10037 (CATH)	Stomach pain, body immunization, fever, cough, chest pain, dental problems, heat rashes, toothache, gum pain, wound, and respiratory problems, spice.	1. The fresh rhizome is crushed with lemon juice, *Kaempferia galanga*, *Coleus aromaticus* and the juice is consumed in an empty stomach for curing stomach pain. 2. The fresh rhizome crushed with lemon juice, *Kaempferia galanga*, *Allium sativum*, and *Myristica fragrans* and made into a juice and consumed in the early morning in empty stomach for improving body immunity. 3. For curing fever, the fresh rhizome is crushed with karipetti (jaggerry), *Ocimum* leaves, *Piper nigrum* and onion and is mixed with water and boiled. The vapour is inhaled for a few minutes and the decoction is consumed for curing fever. 4. The rhizome is powdered along with salt, *Piper nigrum* and sugar (karipetti) used for tooth cleaning. 5. Rhizome is used in curries, juices for aromatic taste. 6. Juice obtained from the fresh rhizome is mixed with *Elettaria cardamomum* (cardamom) and *Allium sativum* (Garlic) paste used for curing stomach pain.	Arthritis, cramps, rheumatism, sprains, sore throats, muscular aches, pains, constipation, vomiting, hypertension, indigestion, dementia, fever and infectious diseases[30]; arthritis, heart diseases and lungs diseases[31]; cough, cold and throat infection[32]; rheumatism and inflammation of liver[33,34]. Ingredient of Indukantamkashaya, Suranadilehya, Talisapatravataka, Visvamrta etc.[35], promotes digestive power, cleanses the throat and tongue, dispels cardiac disorders and cures vomiting, ascites, cough, dyspnoea, anorexia, fever, anaemia, flatulence, colic, constipation, swelling, elephantiasis and dysuria[23].
6.	*Elettaria cardamomum* (L.) Maton Zingiberaceae 10038 (CATH)	Spice, vomiting, urinary problems.	1. The dried seed is used in food as. a flavouring agent. 2. For curing vomiting, seeds are powdered and consumed along with honey .3. Seed are powdered and mixed with coconut water and used for curing urinary problems. 4. Dried seeds are used for the preparation of Cardamom tea.	Food, medicines and perfumes[36]; bronchitis, hemorrhoids, stangury, renal and vesical calculi, anorexia, dyspepsia, gastropathy and vitiated condition of vata[37]; eye inflammation, kidney and urinary disorder, congestion of lung and pulmonary tuberculosis, asthma, heart disease, digestive disorder, cold, snake bite, scorpion bite, masticatory[23].
7.	*Kaempferia galanga* L. Zingiberaceae 10121 (CATH)	Stomach pain, fever and worm disease, respiratory problems, vomiting, cough, fever teeth pain, wounds	1. Eating fresh rhizome for curing respiratory problems. 2. Powder of dried rhizome is mixed with honey for curing vomiting. 3. Rhizome is powdered and mixed with thulsi leaves and betel leaves, and consumed for curing cough. 4. Fresh rhizome crushed in water and is used for curing vomiting. 5. The fresh rhizome juice is mixed with leaf juice of *Coleus aromaticus* and consumed to cure fever. 6. Rhizome is grinded and applied for toothache.7. Fresh rhizome juice is sprayed around house for preventing the entry of snakes.	Dyspepsia, leprosy, skin diseases, rheumatism, asthma, cough, bronchitis, wounds, ulcers, helminthiasis, fever, nasal obstruction and hemorrhoids[38]; larvicidal activity[39]; inhibits activity of Epstein–Barr virus[40]; kills larvae of the mosquito[41]; treating indigestion, cold, pectoral and abdominal pains, headache, carminative and toothache, menstrual pain, insecticidal. Effective for dandruff or scabs on the head[23].

(*Contd.*)

Table 1 — Details of plant uses reported from Malaipandaram tribe — (*Contd.*)

Sl. No	Botanical name, family & voucher specimen	Use reports	Mode of application	Properties and use reports, references
8.	*Alpinia galanga* (L.) Sw. Zingiberaceae 10119 (CATH)	Fever, cough, body immunity, house cleaning, removing pests from domestic animals, curing skin irritation of domestic animals, fishing, spice	1. The fresh rhizome is crushed with *Piper nigrum* (Pepper) and leaves of *Cymbopogon flexuosum*, and is used to cover the body for curing cough and fever. 2. For curing digestive problems, fresh rhizome is crushed with *Aristolochia indica, Piper nigrum*, *Coriandrum sativum*, *Allium cepa* (onion) and is mixed well and consumed the juice in empty stomach. 3. The rhizome juice along with *Cymbopogon flexuosum*is applied to the premises of house ward off insect from domestic birds. 4. The fresh rhizome juice is applied to the irritated skin of animals. 5. It is used as a spice.	Carminative, digestive tonic, anti-emetic[42]; carminative, irritant action, whooping cough in children, bronchitis, anti-asthma, dyspepsia, fever and diabetes mellitus[43].
9.	*Alpinia calcarata* Roscoe. Zingiberaceae 10044 (CATH)	Cough	Dried rhizome is powdered and mixed with honey and taken internally for the treatment of cough.	Inflammatory diseases, cough and respiratory problems[44].
10.	*Hedychium coronarium* Koenig. Zingiberaceae 10101 (CATH)	Religious use, Pooja, skin diseases, swelling	1. The flowers are used in the temples for religious purpose and also used for the preparation garlands. 2. The juice obtained from the rhizome is applied for swelling on the skin.	Fever, arthritis and eye disease[45].
11.	*Ensete superbum* Roxb. Musaceae 10122 (CATH)	Menstrual disease, kidney stone.	1. For curing menstrual diseases, the seeds are powdered and is mixed with milk and consumed in empty stomach.2.The seed was powdered and mixed with water and taken internally for kidney stone problems. 3. For kidney stone and urinary problems, the sap obtained from the roots is consumed.	Appendicitis, cancer, diabetes, dog bite, dysuria, kidney stone, leucoderma, leucorrhoea, measles, psychosomatic disorder, stomach ache, venereal diseases and used as vegetable[46].
12.	*Musa kattuvazhana* K.C. Jacob 10199 (CATH)	Baby food	1. Powder obtained from the dried banana is used as a baby food.	The fruit has a mild laxative property used as a remedy of constipation in children, forms the part of diets of children suffering from malnutrition[47].
13.	*Canna edulis* Gawl. Cannaceae 10056 (CATH)	Food	The fresh rhizome cooked and eaten.	Source of natural antioxidants and polyphenolic compounds[48].

(*Contd.*)

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Sl. No	Botanical name, family & voucher specimen	Use reports	Mode of application	Properties and use reports, references
14.	Cheilocostus *speciosus*(J. Konig) C. Specht Costaceae 10014 (CATH)	Eye disease (chenkkanu), ear irritation, preparation of dishes.	1. For eye disease, the stem juice is directly transferred to the eye. 2. The tender leaves are chopped in to small pieces and cooked along with dhal, green gram and coconut for the preparation of dishes. 3. Stem juice is used to cure infected ear.	Eye and ear infections, cardiotonic, hydrochloretic, diuretic and CNS depressant activities, for small pox[49]; Food and medicine[50]; Asthma, fever, bronchitis[51]; cough, cuts, wounds, scabies, antidote for snake bite, jaundice, arthritis[52].
15.	*Costus pictus* D. Don Costaceae 10046 (CATH)	Diabetes	The fresh leaf is used for lowering blood sugar level.	Food for the treatment of diabetes[53, 54].
16.	*Maranta arundinacea* L. Marantaceae 10063 (CATH)	Food	1. Fresh rhizome cut in to small pieces, dried and powdered. The powder is very well for making food products.	Traditional food for infant and convalescent food[55].
17.	*Indianthus virgatus* (Roxb.) Suksathan & Borchs. Marantaceae 10110 (CATH)	Pooja material, leaves used to serve food, rhizome is edible	1. The leaf is used for the collection of honey and also used for food serving in temples. 2. In temples, the leaf is used for pooja purposes. 3. The rhizome powder is used to make appam and prasadam in ancient days.	

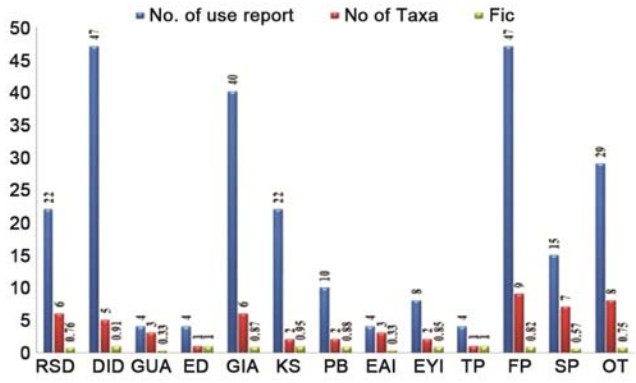

Fig. 2 — Informant consensus factor (F_{ic})

disorders and tooth pain showed the highest F_{ic} of 1; jaundice and diabetes had the maximum F_{ic} of 1.00 reported from the Irulas in the Tanjore district[58]. The least agreement between the informants was reported in Genito Urinary Ailments and ear infection with a F_{ic} of 0.33.

Use value (UV)

The most commonly used taxa was *C. longa* with 52 use reports from 32 informants having the maximum use value of 1.62 (Fig. 3). *C. longa* is used in the treatment of several illnesses and identified by all informants as the taxon having the lot of medicinal

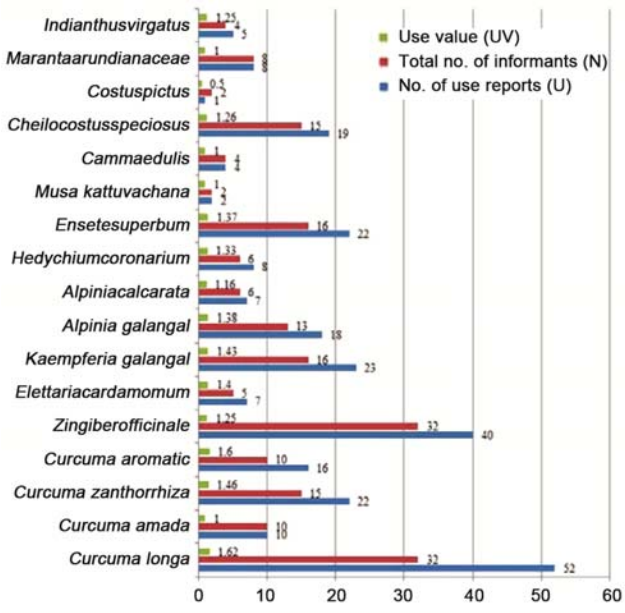

Fig. 3 — Use Value (UV)

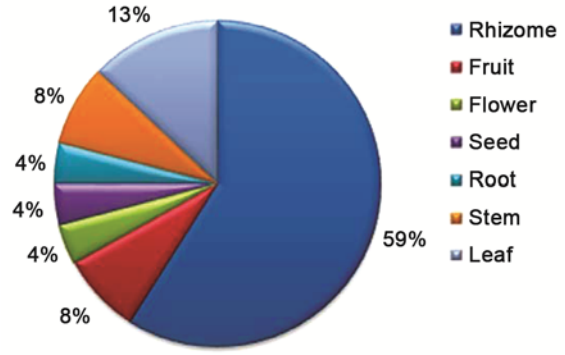

Fig. 4 — Statistics of Plant parts used

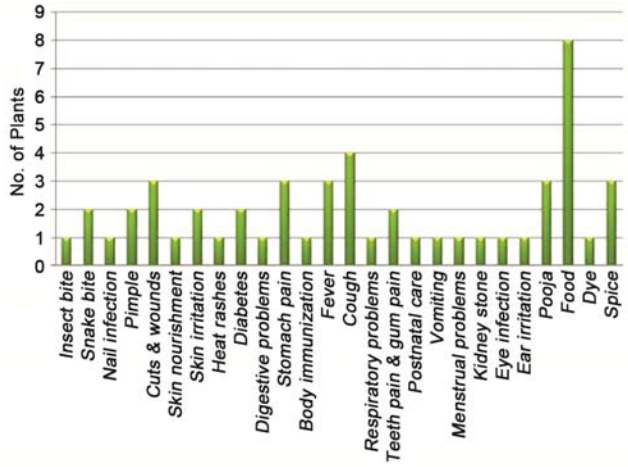

Fig. 5 — Plants used for treating various diseases, food, spice and others

properties. Other taxa with a high use value were *Curcuma aromatic* (1.6), *Curcuma zanthorrhiza* (1.46) and *Kaempferia galanga* (1.43).

Plant parts used

Malaipandaram has a long history of the ethnobotanical use of various species. Ethnomedicine is still followed in the area; it is now vanishing due to arrival of modern medicine. The plant parts are usually consumed in the fresh or dried state. It is seen that rhizome crude drug preparations are mostly suggested as ethnomedicine followed by fruits, flowers, leaves, seeds, roots and stem (Fig. 4). The most regularly used preparations were juice, raw, paste and powder. (Fig. 5) shows the number of taxa used for various diseases. Some remedies contain a particular species but more species are reported to use in several preparations.

Preparation method and mode of use

The exploitation and preparation of plant parts were classified into four classes (Fig. 6). The most

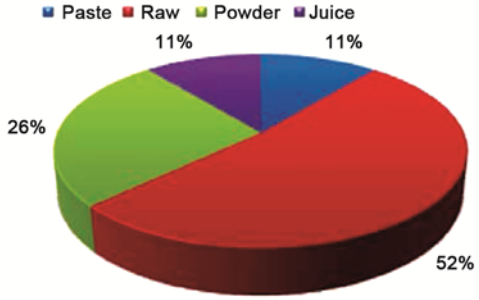

Fig. 6 — Mode of utilization for the preparation of medicine, food, spice

frequently used system of preparation was taken as raw (as such) other parts like rhizome, leaves, fruits, etc. followed by powder. Some of these raw materials are dried for long time storage.

Conclusion

Many Tribal people in the area depend on several medicinal species for the treatment of kidney stone, urinary infection, eye diseases, etc., even though the allopathic medicines are available through community health centres. The documentation of such knowledge and conservation of these valuable plants are very important to protect the traditional knowledge.

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