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Traditional knowledge for using plant resources as tooth brushing stick (datun) by the indigenous communities of Assam, India

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Abstract
A study was conducted to survey and document the plant resources as tooth brushing stick (datun) traditionally by the indigenous communities of Assam, India with an objective to explore the potential plant species for dental product formulation in future. The study was conducted in 65 villages and collected information from 21 indigenous communities on traditional tooth brush of plant resources. The study identified 83 plant species belonging to 37 angiosperm families for brushing teeth to maintain oral health and hygiene by these communities. Many of the traditional practices are now in danger as they are considered as obsolete and importance these traditional plant resources observed to decrease gradually even among the remote population. Inheritance of this traditional knowledge among the younger generation of all the communities is very meager. The study will be helpful for the researchers, pharmacologists to locate natural distribution and resource availability of the potential plant species for the promotion of modern dental care products in future by isolating the bioactive ingredients from these recorded plant species.

Keywords: Traditional knowledge, indigenous communities, plant resources, tooth brushing stick

1. Introduction
People use to clean their teeth since ancient times. It is assumed that in early human civilization did not know to clean teeth. But with time as remedial measures of teeth and oral discomforts, our predecessors could undertake certain trials with their own experience. As a result, the knowledge of this area of human health was coming up as a tradition among the communities of different countries of the world. There is no such accurate information when, where and how people use to learn to clean their teeth. Most of the story depicted that people in past use to rub with a rough cloth, salt and chalk ash etc and water for cleaning teeth of ancient civilizations [1]. Early kinds of toothpaste mostly constituted of different formulations of ash, honey, crushed eggshells, and ground ox's hooves. The world's oldest protocol for toothpaste was reported from Egypt in 400 AD [2]. Later, progress had been made with the inclusion of mint, salt, grains of pepper and dried iris flower for better flavour and feel by Chinese and iris. It is also said that the people in China, Rome, and India were the countries, where the people first used toothpaste around 500BC [3]. Literatures also available on the use of chew stick (twig of the plant) for brushing their teeth by the Egyptians and Mesopotamians around 3500-3000 BC [4, 5]. The use of tooth brushing twigs of *Salvadora persica* was reported to practice by Babylonians in almost 7000 years ago[6]. Thereafter, it was spread among the Greeks and Romanians for cleaning teeth and also become popular in several African and Arabian countries [7, 8]. This tradition is still present amongst many of the African and Southern Asian communities as well as in isolated areas of tropical America and the southern United States [9, 10, 11]. William Addis of England in 1780, was credited to innovate modern toothbrush of similar design had since been discovered in China from 1400 [12].
The ancient Indian civilizations were reported to use Neem twigs (*Azadirachta indica*) for brushing their teeth using the edge of the twig chewed for soften to form bristles to brush to clean teeth [13]. The traditional use of the plant twigs as toothbrush is still found to practice in many counties including India [14, 15, 16]. However, due to materialization of new advanced methods many of the traditional practices are not remain as a part of everyday life even are fast disappearing [17]. In India, documentation of traditional knowledge on dental health and hygiene are insufficient except a few random works [18-24].
Northeast India lies under the mega biodiversity hotspots. The area also is a habitat of more than 136 different communities of people of which Assam is the shelter of 56 major tribes [25, 26].

The traditional knowledge of these indigenous people of this part of the country is unique and gathered over the time with their various activities to survive, manage their natural resources and the ecosystems surrounding them like animals, plants, rivers, seas, natural environment, and economic, cultural and political organization. People of Assam before the invention of modern toothpaste and toothbrush were brushing teeth using splitting branches/ tender twigs of locally available plant species. Some of such plant species are sarua (*Streblus asper*), bhot era (*Jatropa gossipiifolia*), Mahaneem (*Azadirachta indica*) etc. along mustard oil mixed with powdered salt was also used for brushing teeth [27]. The oral hygienic plants are very popular especially as toothbrush, for gargling or others used frequently by the common people of Nalbari and Barpeta district of Assam [28].

As the time passes the numbers of elderly people are also being decreased because of death with age. Moreover the young generations are not interested with the traditional knowledge of their forefathers. This phenomenon obviously indicates that the traditional knowledge bases are going to be dying along with the older ones. As such, the need for documentation of traditional knowledge of indigenous people of Assam is essential. Therefore this study attempts to documents the traditional tooth brushing plants of indigenous communities of Assam.

2. Materials and Methods

2.1. The study area

Geographically Assam is located in the middle of the North-eastern part of India. The state covers a total of 78,438 km² area which constitutes 2.39% of the country's total geographical area. Assam lies between the latitude of 24°07'N and 28°00'N and the longitude of 89°42'E and 96°02'E. The population density of the state is 397 persons per km² with total population 31,169,272. The forest cover of the state is 27,673 km², which are almost 35.3% of its total area.

The study was conducted during 2007- 2012 with extensive field trips to remote rural areas inhabited by different communities in 17 districts i.e. Tinsukia, Dibrugarh, Sivasagar, Jorhat, Golaghat, Majuli, Nagaon, Marigaon, Karbi Anglong, Dima Hasao, Cachar, Kamrup(Rural), Nalbari, Chirang, Baksa, Goalpara and Bongaigaon districts of Assam. A total 21 communities out of 90 different ethnic groups of Assam i.e. Bodo(Bo), Rabha (Ra), Koch Rajbongshi(KR), Dimasa Kacharis (DK),Sonowal Kachari (SK), Tengal Kacharies(TH), Tiwa/Lalung(L), Karbi(Ka), Hmar(Hm), Garo (Ga), Kuki(K), Tai-Phake(Ti), Konyak(Ko), Jogi/Nath (Jo), Koibatraya(Koi), Deori(De),Chutiya(Ch), Mishing(M), Moran(Mo), Matak(Ma) and Meitai Monipuri (MM) were selected for the study.

The information regarding the plant species and parts using as tooth brushing sticks by previous generations or at present traditionally by these community people were collected from 65 villages of 17 districts through interviews. The location map of survey villages is presented in fig 1. Information were collected from the people of three age groups i.e. 10-30, 31-50 and above 50 years. At least 5 to 9 the persons of each age group including old women of a community from a village were interviewed. Data recorded on use of plant species parts as the toothbrush, traditional knowledge on brushing teeth by a particular plant part etc. Photography was taken for plant species, plant parts, users and moment of interviews etc.

Identification of the plants was done with the help of following books [29, 30, 31]. Apart from primary data collection during the study period consulted secondary data such as published material, policy documents, and grey literature on the subject.

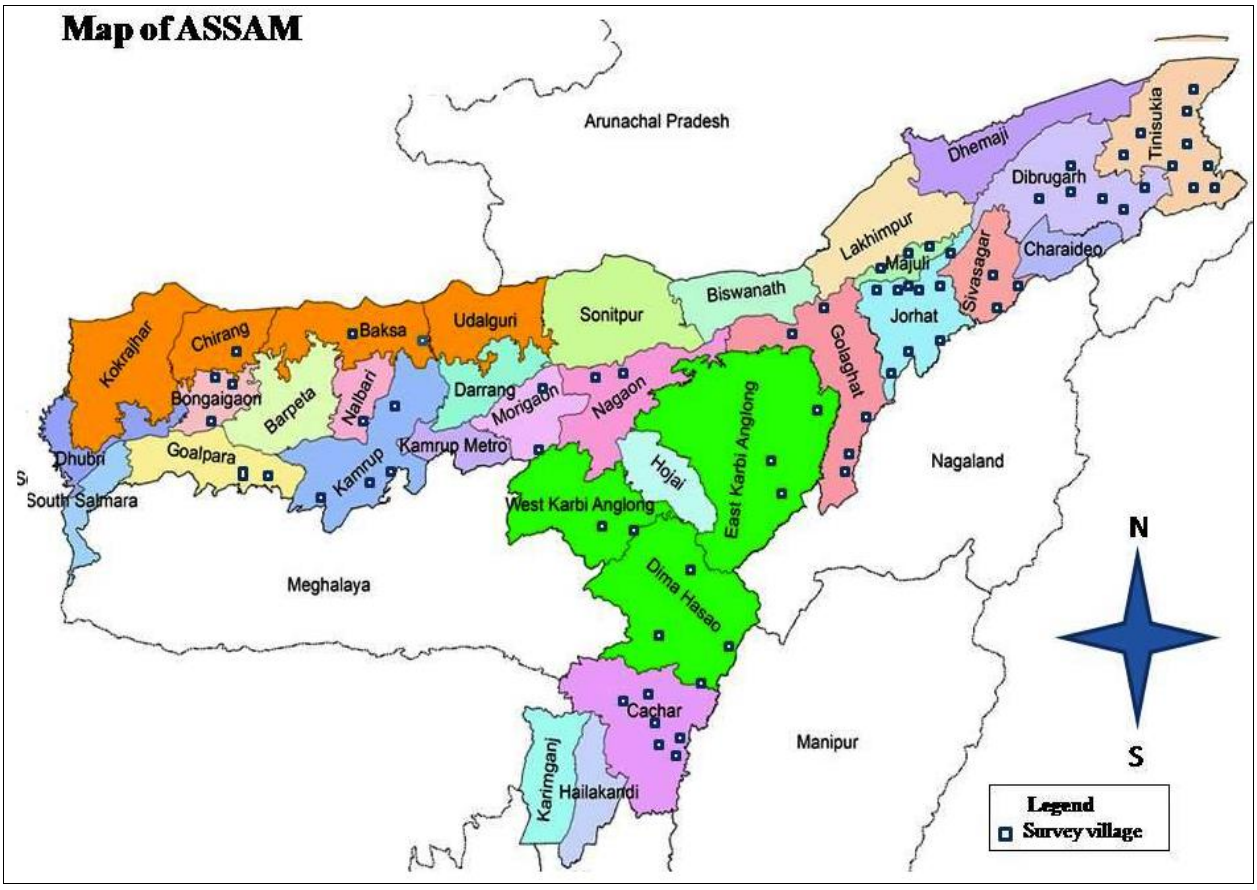

Fig 1: Location map of survey villages distributed in different districts of Assam

3. Results

List of indigenous communities dwell in survey villages and vernacular name of plant species recorded during interview for traditional use of toothbrush (datum) from 17 districts of Assam are presented in table-1. A maximum of 29 plant species were recorded to use by Bodo community followed by Karbis with 25 plant species. Other communities such as Mishing tribe were recorded to use 24 plant species. Likewise, Sonowal Kacharis were using 19 plant species, Dimasa Kachari were using 17 plant species, by Chutiyas 16 plant species, Deoris 15 plant species, 14 plant species by Koibatraya, 13 plant species were recorded to use by Hmar and Matak community each,11 plant species by Thengal Kacharies, 10 plant species by Tiwa and Morans each, 9 plant species were used by Garo and Nath (Jogi) community each, 8 plant species each were recorded to use by Rabha and Tai Phakes each, 6 plant species by Kukis and 5 plant species by Meitei Manipuri and Konyak Naga each (Table-1). Photographs of a few moments of the people using plant parts of different plant species, a few moments of interviews and some plants use by the communities are presented in figure 2, 3 4 and 5.

Datas on plant species, family, part used by the communities used for brushing teeth are presented in the table-2. A total of 83 plant species were recorded to use traditionally for tooth brushing by 21 indigenous communities of Assam during the study. These plant species with their natural distribution in Assam are belonging to 37 families of angiosperms. Members of family Rutaceae with maximum of 10 plant species placed first among 36 families that were used by the indigenous people of Assam for brushing teeth. Five (5) plant species of each of the families of Moraceae, Fabaceae, Guttiferae and Mytraceae were recorded to use as tooth brush. Likewise, Lauraceae and Combretaceae with 4 plant species stood in 3rd place in the traditional use of tooth brushing practices. And families such as Caesalpinaceae, Euphorbiaceae and Verbenaceae have 3 member plant species that were recorded to utilize for tooth brushing. The study also revealed that 7 families i.e. Malvaceae, Meliaceae, Miomsaceae, Poaceae, Rubiaceae, Smilaceace and Theaceae contribute 2 plant species for the utilization as tooth brushing plant of this vicinity. Similarly, 20 families i.e. Acanthaceae, Alangiaceae, Amaranthaceae, Anacardiaceae, Annonaceae, Apocyanaceae, Asclepidaceae, Capparidaceae, Ebenaceae, Elaeocarpaceae, Flacourtiaceae, Magnoliaceae, Melastomeaceae, Oleaceae, Onagraceae, Ranunculaceae, Rhamnaceae, Sapotaceae, Solanaceae and Tiliaceae contribute single plant species each (Table-2). Moreover, the study also reveals that various plant parts such as tender shoot, stem, twigs and roots were used as datum. Of 83 plant species, roots of 7 plant species, twigs of 19 plant species and tender stem/branches of 57 plant species were recorded to use as datum by these communities (Table-2).

Apart from this, information collected from the communities on the use of plant parts as datun by different age groups indicated that people of old age group (above 50) were very familiar with the use of plant parts as tooth brush (Table-3). In contrary to people under the young age group (10 to 30 years) were unaccustomed or merely familiar with this practice irrespective of community concern. There is a general trend of decreasing the tradition of using plant parts as datum among all the age groups. The trend is very prominent among the people of middle age group (31 to 50 years) and recorded severely diminish among the young age group irrespective of community (Table 3). Among the communities of Karbi people this tradition was recorded to practice more in number followed by Bodo tribes (Table 3). However, within the community the tradition of use of plant parts as datum among the young age group presently become redundant except a few cases recorded for Karbi people (4) and Bodo (3), Hmar (2), Konayak naga (2), Rabha (2), Garu(1) and Kuki (1) in past(Table 3).

Data from the table 3 also reveals that among the old age group of different communities except a few such as Hmar, Karbi, Konyak Naga, Kuki, Tiwa, Meitei Manipuri, Mishing and Rabha the people of all the other communities the rate of using datum from plant species reduced by 2 to 3 folds. Data on the present user's trend of modern tooth brushing practices among the three age groups of different communities is presented in table 3. The modern practices could replace the traditional practice of using plant parts as datum among the young age group irrespective of the communities. Similar trend was also very active among the people of the middle age group. However, the trend of inculcating is prolonged among the old age group irrespective of the communities.

Table 1: List of indigenous communities, survey villages and vernacular name of plant species recorded for traditional use of toothbrush from different district of Assam.

Sl No.	Community	Place of interview	District	No. Plant species	Vernacular name of plant species
1	Bodo	Dakhin Kuchi Village, Subarnkhata, Dhamdama (363 fam),	Baksa	29	Samfer ulta, Bahel fithai, Balam, Dawdai Thou-Thouwa, Haggravendi, Nisinda, Bajruli, Haggravendi, Selekha, Soima, Jaseb, Sila assugur bendwng, Sophari, Safali, Thai kunsap, Thaiju, Anda, Mairong rondoi, Gidir thaikha, Dhob, Amlai, Undurmala, Nareng, Asi Sa–belai, Agandobongphang, Khokling, Auwa burka and Kharmang
		Uttar Golbera Village, Nagrijuli, Tamulpur (406 fam)	Baksa		
		Hatisar Forest Village, Sidli (1,074 fam)	Chirang		
		Kacharipara Village, Darangiri, Dudhnai (214 fam)	Goalpara		
2	Chutiya	Kachamari Bongaon Forest Villege, Gamariguri, Merapani (177 fam)	Golaghat	16	Asoka, Koros, Nara-singha, Mahaneem, Ghora neem, Phutukola, Boga bahok, Bongali era, Bogi-jamuk, Josthamaddu, Borhomothuri, Modhuriam, Soura Goch, Kutahi Jamun, Dighloti and Tezmui
		Banmukh Chutia village (206 fam)	Sivasagar		
		2 No. Purani Motapug Gaon, Digboi (253 fam)	Tinsukia		
		Changelijan Gaon, kakopathar (197 fam)	Tinsukia		
3.	Deori	Udaipur Deuri Gaon, Sadiya (167 families)	Tinsukia	15	Torua kadom, Babool, Yatiju, Tizu, Gumade yuwa, Jati yuwa, Mach Kotta, Patihanda, Seta chiti, Belphoi, Arena, Bakul, Chikuru kusiri,
		Major Deuri Gaon, Cherpai (281	Majuli		

		fam)			Bhumura chiti and Kabega.
		10 No. Deuripam Gaon, Sriram (64 fam)	Majuli		
		Nam Deuri Village,Uttar Baligaon Parbatia (228 fam)	Jorhat		
4.	Garo	Garobasti, Chungajan, (31 fam)	Golaghat	9	Bhenda, Bol-thibrong, Sempri, Snaru, Jongchia, Banglagash, Tekatchu, Chirore and Kangkil
		Senabor Village,Sonapur (110 fam)	Kamrup		
5.	Dimasa Kachari	Lodi Kachari Villege, Mahur (19 fam)	Dima Hasao	17	Jaram, Bakul, Khusim, Radaokhlong, Susruthai, Profand, Bangkangkrai, Kimbomg, Reba, Thaisamicri, Mukut phang, Majonthi, Khauklim, Suthaibiding, Khusmai, Sermuli and Singju
		Retzol Village, Haflong (151 fam)	Dima Hasao		
6.	Hmar	Digor Fulertal Village, Lakhipur (506 fam)	Cachar	13	Zongleilon, Betlineng, Akanhna, Serhna hring, Invetpar, Sunhlu, Theithot, Reibalsen, Mutmaleng, Theihai kung, Hmurkuong, Kawlthuizik and Thaebufa.
		Marchakhal Village, Lakhipur (89 fam)	Cachar		
		Hmar (Dimasa) Gaon (36 fam)	Kabi Anglong		
7.	Karbi	Delen Watiling Basti,Maibang (27 fam)	Dima Hasao	25	Chiri theso, Mir krem, Sparmsla, Nim-ke-ik, Bik- bik, Dieng- sophangkhlien, Toh-phaileng, Longle pharche, Bong der so, Pran-pri, Pranso arong, Thengpi kundu, Thebo, Thelu, Theng, Koreng, Dido, Mirbarun, Tume han thar, La-pynriang, Akado, Arhi, Dampijuk, Jungthang and Thepli
		Hemari Timung village, Diphu (27 fam)	Kabi Anglong		
		Borlai Hanse wai Terang Gaon(39 fam)	Kabi Anglong		
		Jeng Bey – Village, Diphu (43 fam)	Kabi Anglong		
8.	Konyak Naga	Hahchara Adrasa Naga Goan, Haripara Road (100 fam)	Sivasagar	5	N'rui pichai ria/N'rui teso ria, Phang, Ishou, safali and Jakshik
9.	Kochrajbongshi	Odlaguri Village, Manikpur, Bijni (482 fam)	Bongaigaon	12	Babool, Bhaluka Banh, Dalim, Jati Banh Ngairong, Basoka tita, Tauri, kalai, Phum, Notko, Holdu Sopa,
		Bogulamari village,Sidli (59 fam)	Bongaigaon		
		Dompara Village, Bijni (491 fam)	Bongaigaon		
		Naherbari, Nijdhamdhama, Ghagrapar, (446 fam)	Nalbari		
10.	Koibatraya	Dihing Kaibatra Gaon,Khowang(74 fam)	Dibrugarh	14	Kalajam, Nara-sinha, Mahaneem, Saura, Bhut Era, Bongali era, Joba phul, Tepor, Borgosh, Joldubuli, Kendu, Dalcheni, Arahar and Jati Banh.
		Bolama Koiborta Gaon (161 fam)	Sivasagar		
		Khutia Pota Kaibatra Gaon (374 fam)	Jorhat		
		Deubali Gaon, Raha (156 fam)	Nagaon		
11	Kuki	Lodi Kuki, Mahur (22 fam)	Dima Hasao	6	Xopolik, Arahar, Mandol, Ngairong, Boroi and Haritaki
		Kukipunji Village, Lakhipur (23 fam)	Cachar		
12	Lalung (Tiwa)	*Bhalukaguri* Gaon, Ghagua, Mayong (376 fam)	Morigaon	10	Kon Silikha, Kalajam, Vodora, Bongali era, Joba phul, Kendu, Sunaru, Arahar, Mahaneem and Kharua
		Balichora Doloni, Raha (142 fam)	Nagaon		
13	Meitei Manipuri	Natun Dayapur, Rongpur *Udharbond* (43 fam)	Cachar	5	Heibong, Angouba, Singarei, Poongto and Kamphoi
		Joypur KamrangaVillage, *Udharbond* (69 fam)	Cachar		
		Monipuri Basti, Balijan, Bokajan (22 fam)	Kabi Anglong		
14	Mishing	1 No. Pathori Miri Gaon, Dusutimukh, Khumtai (164 fam)	Golaghat	24	Arahar, Selu, Rapi esing, Patihanda, Kajinemu, Singkin, Takpiyang/Taksek, Tabing esing, Pumi Aye, Bokayan, Bakul, Nor-hing, Gorap-Soi, Karanj, Safari, Anar, Yori,t Soura Goch, Tepet Jamu, Arjun, Lokyo, Nilakantha, Ri'kom, Bogori,
		Morongial Doital Gaon, Badulipar (132 fam)	Golaghat		
		Miri Gaon, Teok (115 fam)	Jorhat		
		Ratanpur Miri Gaon (947 fam)	Majuli		
		Bahfalla Mising Gaon (371)	Jorhat		
15	Nath (Jogi)	Rojamayong Gaon (429 fam)	Morigaon	9	Bogori, Kutahi Jamun, Kalajamu, Modhuriam, Nara-sinha, Tepor, Arahar, Joba phul and Bongali era
		Jogi Gaon, Rangasanhi (128 fam)	Majuli		
16	Matak	Naohalia, Tengakhat, 2 No.(476 fam)	Dibrugarh	13	Bogori, Tez-Moi, Asomia sah, Tikani-borua, Jobaphul, Jestamaddu, Chauldhua, Tepor, Kendu, Gunmola, Leteku, Haldhi Sopa and Bonsodh
		Madhabpur Gaon, Doom Dooma(188 families)	Tinsukia		
		Gorumara Koibatra Gaon, (452 fam)	Jorhat		
17	Moran	Kachijan Gaon, 1 No, Doomdooma (105 fam)	Tinsukia	10	Bonsodh, Haldhi Sopa, Polas, Arahar, Tepor, Tolothapoka, Jestamaddu, Jobaphul, Tezmui and Bhut Era
		Matapung Gaon, Barekuri, Makum	Tinsukia		

		(210 fam)			
18	Rabha	Hatimura Pt-I Village, Matia (134 fam)	Goalpara	8	Lamthe, Lalanju, Lamaku, Kaghzi lebu, Pochun fung, Belkel phang, Kubronten and Bauraiphang
		Rajapara Gaon, Polasbari (320 fam)	Kamrup		
		Mouman Gaon, Boko (393 fam)	Kamrup		
		Hashi Gaon, Boko (142 fam)	Kamrup		
19.	Sonowal Kachari	Dangari Village, Saikhowa (100 fam)	Tinsukia	19	Medaloa, Kalajam, Soura Goch, Dalim, Modhuriam, Gorap-Soi, Dighloti, Bhut Era, Bongali era, Bor– thekera, Jalphai, Joratenga, Asom nemu, Tejpat, Sah goss, Aakn, Arahar, Nak Kati lewa, Leteku
		Kachari Maithong Gaon, Kakapathar (218 fam)	Tinsukia		
		Kolai Khowa Gajal Gaon, Borbaruah (200 fam)	Dibrugarh		
		Kapahua Gaon,Tegakhat (231 fam)	Dibrugarh		
		Jokai Kachari Gaon (166 fam)	Dibrugarh		
20.	Tai Phake	Bor-Phake(Man Phake Neu), Lekhapani, Margherita (30)	Tinsukia	8	Tun-pau, Bongali era,Ya-phi-ko, Tikani-borua, Khow-paiii, Asomia sah, Ya-pan and Zabrang
		Namphake Village, Naharkotia (80)	Dibrugarh		
21.	Thegal Kachari	Thengal Gaon, Khumtai (350 fam)	Golaghat	11	Bhumura, Mejankori, Tepor tenga, Sochopa tenga, Rupahi-thekera, Poniyal, Asom nemu, Dalcheni, Polas, Sikamorolia and Saura
		Balijan gaon (No. 1), Jalukoni (254 fam)	Jorhat		
		Borsoikata Thengal Gaon,Jalukoni (490 fam)	Jorhat		

Table 2: Traditional tooth brushing plant recorded from indigenous communities of different district of Assam with their Traditional knowledge on health benefit.

S. No	Scientific name of plant species and Family	Local Name	Benefits/Disease /ailment	Plant parts use as Toothbrush	Name of the community that use as toothbrush
1.	*Acacia farnesiana* (L) Willd Mimosaceae	Torua kadom (As & De)	*Whitening teeth*, cure pyorrhea and strengthen gums	Tender twigs	Common, Deori, Garo
2.	*Acacia nilotica* (L.) Delile Mimosaceae	Babool (As, De)	Tooth brushing for curing toothache	Twig	Bodo, Koch-rajbongshi
3.	*Achyranthes aspera* L Amaranthaceae	Bonsodh (As) Samfer ulta (Bd), Singju (Dk)	*Brushing teeth* cures pyorrhea and toothache	Roots	Matak, Bodo, Moran, Dimasa kachari,
4.	*Aegle marmelos* (L.)Corr. Rutaceae	Bel(As), Bahel fithai (Bd), Belthei (Hm), Sermuli(Dk), Thepli (Ka), Sempri(Ga)	*Whitening teeth* and tooth pain	Tender branch	Bodo, Hmar, Dimasa kachari
5.	*Alangium chinense* (Lour.) Harms Alangiaceae	Sikamorolia(As), Belkel phang (Ra)	*Whitening teeth and stop tooth decay*	Fresh young twigs	Rabha, Thengal Kachari, Matak
6.	*Annona squamosa* L Annonaceae	Aatoi phol(As,M) Yatiju(De), Balam (Bd), Sitaphal(M)	Clean teeth and relief gum ache	Tender stem	Bodo, Deori, Mishing,
7.	*Anthocephalus cadamba* (Roxb.) Miq Rubiaceae	Kadam/Raghu(As), Yi'pong Be'lang (M)	Brushing for healthy teeth and tooth pain	Twigs	Karbi, Sonowal Kachari, Mishing
8.	*Artocarpus heterophyllus* Lam. Moraceae	Kothal (As), Bilangaai (M), Tizu (De), Dawa bifang (Bd), Jungthang (Ka), Pochun fung(Ra)	Ulcer in teeth gum	Young branch	Deori, Mishing, Bodo, Karbi, Rabha
9.	*Azadirechta indica* A. Juss. Meliaceae	Mahaneem(As, Ch, M) Kabasi chiya (De), Gwkha (Bd)	Teeth infection and bleeding of Clean teeth and	Twigs /Tender stem	Bodo-Hajong, Common to all
10.	*Baccaurea sapinda* (Roxb.) Müll.-Arg Euphorbiaceae	Leteku(As), Dampijuk(Ka), Khusmai(Dk), Buri a:ye (M)) Lerkho (Bd) Notko (KR) Xopolik(K)	Clean teeth and relief from toothache	Twigs	Kachari, Dimasa, Matak, Kuki, Koch Rajbangshi
11.	*Bambusa balcooa* Roxb. Poaceae	Bhaluka Banh(As, M), Gumade yuwa(De) Auwa burka (Bd.)	Antiseptic, clean teeth	Tender stem	Jogi, Koch Rajbangshi, Mishing
12.	*Bambusa tulda* Roxb. Poaceae	Jati Banh(As,M), Jati yuwa(De) Auwa gubwi (Bd.)	Whitening and clean teeth	Tender stem	Kaibatra, Koch, Mishing
13.	*Bauhinia vahlii* Wight & Arn. Fabaceae	Nak Kati lewa(As), Phum(Koch) Suthaibiding (Dk), Zongleilon (Hm), N'rui pichai ria/N'rui teso ria (Ko), Kharmang (Bd.)	Clean teeth and healthy gums	Root	Chutia, karbi, Sonowal Kachari, Dimasa kachari, Konyaks, Hmar, Bodo
14.	*Butea monosperma* (Lam.)	Polas(As, Mo, Ma, TK)	Clean teeth and	Tender stem	Moran, Thegal

	Taub. Fabaceae		relief from toothache		Kocharis
15.	*Cajanus cajan* (L.) Millsp. Fabaceae	Arahar(As,M,), Tauri kalai (Koch), Betlineng (Hm), Oral/Khauklim (Dk), Khokling (Bd) Jehu(Garo)	Clean teeth and strengthen gums	Tender stem	Common
16.	*Calicarpa arborea* Roxb. Verbenaceae	Gunmola (As), Selu (M) Majonthi (DK) Mach Kotta(De) Arhi(Ka), Mandol(K)	Brushing for healthy teeth	Tender stem	Mishing,Matak, Deori Dimasa, Karbi, Kuki
17.	*Calotropis gigantea* (L) Dryand Asclepidaceae	Aakn (As), Akanhna (Hm), Agandobongphang(Bd), Mukut phang (Dk), Akado (Ka) Tun-pau(Ti)	Cure toothache and strengthen gums	Tender stem	Sonowal Kachari, Dimasa kachari, Hmar, Bodo, Karbi, Tai Pkake
18.	*Camellia chinensis* (Sims) Kuntze Theaceae	Sah goss (As)Sk	Clean teeth and strengthen gums	Tender stem	Sonowal Kachari
19.	*Camellia sinensis* var. *assamica* (J.W.Mast.) Kitam. Theaceae	Asomia sah(As, Ma, Mo, TK)	Clean teeth and whitening	Twig	Matak, Tai-Phake, Syam
20.	*Cassia fistula* L Caesalpiniaceae	Sunaru(As Ga,),	Brushing for healthy teeth	Tender stem	Tiwa, Garo
21.	*Cinnamomum tamala* (Buch-Ham) Nees & Eberm Lauraceae	Patcheni, Sa – belai (Bd), Rapi esing (M), La-pynriang (Ka)	Cure pyorrhea and gum inflammation	Young branch	Karbi, Bodo, Mishing
22.	*Cinnamomum verum* J.Presl Lauraceae	Dalcheni(As, Koi, Ma, Tk)	Brushing for healthy teeth	Tender stem	Koibatra, Thengal Kachari, Mattak
23.	*Cinnamomun bejolghota* var. *jarainum* Baruah & S.C.Nath Lauraceae	Tejpat (As), Patihanda(M), Patihanda(De)	Clean and whitening teeth	Young stem	Sonowal Kachari
24.	*Citrus acida* Pers. Rutaceae	Kajinemu(As, M), Seta chiti(De), Kaghzi lebu(Ra)	Brushing for healthy teeth	Young stem	Deori, Mishing
25.	*Citrus assamensis* Dutta et Bhattacharya Rutaceae	Asom nemu (As, Tk, Sk)	Clean and whitening teeth	Young stem	Sonowal kachari, Thengal Kachari
26.	*Citrus aurantifolia* (Christm) Sringle Rutaceae	Gol nemu (As), Serhna hring (Hm), Thaisamicri(Dk)	Clean and whitening teeth	Young stem, Root	Hmar, Dimasa kachari
27.	*Citrus maxima* (Burm.) Merr. Rutaceae	Bortenga (As), Reba(DK)	Brushing for healthy teeth	Young stem	Dimasa kachari.
28.	*Citrus medica* L. Rutaceae	Joratenga (As), Tume han thar (Ka), Singkin (M), Nareng Asi (Bd)	Clean and whitening teeth	Young stem	Sonowal Kachari, Karbi, Mishing, Bodo
29.	*Crateva nurvala* Buch-Ham Capparidaceae	Barun(As), Mirbarun(Ka) Jongchia(Ga)	Brushing for healthy teeth and relief toothache	Tender stem	Karbi, Garo
30.	*Datura innoxia* Mill. Solanaceae	Dotura(As) Kimbomg (Dk) Invetpar (Hm) Dido (Ka), Khimbang(Dk)	Clean and whitening teeth, reduce toothache	Roots	Garo, Dimasa, Hmar, Karbi
31.	*Diospyros montana* Roxb. Ebenaceae	Kendu(As Tk, Sk,),	Curing tooth ache and tooth decay	Fresh stem branches	Common
32.	*Elaeocarpus floribundus* Blume. Elaeocarpaceae	Jalphai (As) Belphoi(De), Bangkangkrai (Dk), Theng Koreng (Ka) Undurmala(Bd)	Brushing for healthy teeth and relief toothache	Young branch	Deori, Sonowal Kachari, Dimasa Kachari, Karbi
33.	*Ficus benghalensis* L. Moraceae	Borgosh (As), Dok fang (Ra), Profand (Dk) Dhob(Bd)	Cure bleeding and swelling of gums	Tender aerial roots	Rabha, Dimasa Kachari common
34.	*Ficus glomerata* Roxb. Moraceae	Dimoru(As, L), Takpiyang/Taksek (M), Thebo(Ka), Heibong (MM), Theithot (Hm)	Clean and whitening teeth, reduce gum ache	young stem	Meitai Monipuri, Mishing, Dimasa kachari, Rabha, Hmar
35.	*Flacourtia jangomas* (Lour.) Raeusch**.** Salicaceae	Poniyal(As, L), Thengpi kundu(Ka)	Brushing for healthy teeth	tender branch	Thengal Kachari, Tiwa
36.	*Garcinia lanceifolia* Roxb. Guttiferae	Rupahi-thekera (As), Susruthai (Dk), Pranso arong (Ka)	Clean teeth and relief toothache	Twig	Dimasa Kachari, Karbi, Thengal Kachari
37.	*Garcinia oxyphylla* Miq. Guttiferae	Tepor (As, Ma, Mo, Kai, Jo)	Clean teeth and reduce tooth decay	Young branches	Kaibatra,Moran, Matak, Jogi
38.	*Garcinia pedunculata* Roxb.	Bor – thekera(As), Thaikha	Clean and	Young	Sonowal Kachari,

	Ex Buch- Ham Guttiferae	(Bd), Tabing esing (M) Ampri Arong/Pran-pri(Ka)	whitening teeth	branches	Bodo, Karbi
39.	*Garcinia sopsopia* (Buch-Ham) Mabb. Guttiferae	Sochopa tenga(As), Gidir thaikha (Bd)	Clean teeth and cure pyorrhoea	Young branches	Karbi, Thengal Kachari
40.	*Garcinia xanthochymus* Hook. f Guttiferae	Tepor tenga(As), Thechanpreng (Ka)	Clean and whitening teeth	Young branches	Karbi, Thengal Kachari
41.	*Glycosmis pentaphylla* (Retz) DC Rutaceae	Chauldhua/ Tolothapoka (As), Praudettod/ Theng lokso (Ka) Mairong rondoi (Bd)	Brushing for healthy teeth and gum	Young branches	Common, Deori, Moran, Matak, Mishing, Karbi
42.	*Glycyrrhiza glabra* L. Fabaceae	Jestamaddu (As, Ch, Mo, Ma)	Clean teeth and tooth ache	Root	Chutiya, Matak, Moran
43.	*Grewa sapida* Roxb. Tiliaceae	Thouraguti (As), Lamaku(Ra) Bong der so (Ka) Pumi Aye (M)	Clean and whitening teeth	Stem	Mishing, Matak, Chutiya, Karbi
44.	*Haldina cordifolia* (Roeb) Ridsdale. Rubiaceae	Haldhi Sopa(As, Mo, Ma, Jogi) Holdu Sopa (Koch)	*Whitening teeth*	Twigs	Rabha, Moran, Rajbonshi, Matak, Jogi
45.	*Hibiscus rosa sinensis* L, Malvaceae	Jobaphul (As), Joba bibar(Bd), Reibalsen (Hm), Juba kusoom(MM)	Clean and whitening teeth	Tender stem	Common
46.	*Jatropha curcas* L. Euphorbiaceae	Bongali era (As, Ch), Bhenda (Ga), Anda (Bd), Lalanju (Ra), Mutmaleng (Hm), Arena(De), awa-kege (MM), Radaokhlong (Dk)	Clean teeth and latex cures toothache and gum infection	Young stem	Mishing, Hmar, Bodo,Garo, Rabha and Tai- phake & Sonowal kachari also common to other tribes
47.	*Jatropha gossypiifolia* L. Euphorbiaceae	Bhut Era(As), Longle pharche (Ka), Vodora (T), Banglagash(Ga)	Latex cures toothache and gum infection	Young stem	Garo tribe in Dimoria, plain tribes of Golaghat district, Tiwa, Common
48.	*Justicia adhatoda* L. Acanthaceae	Boga bahok(As Ch), Basoka tita (Koch), Basikho Jola/ Basigi gufur (Bd.) Bokai baskai (Ra) Toh-phaileng(Ka)	Tooth brushing cure pyorrhea, get rid of rotten breath.	Tender stem	Bodo, Rabha, Karbi, Chutiya
49.	*Lantana camara* L Verbenaceae	Gu-phul(As), Dieng-sophangkhlien (ka)	Brushing for healthy teeth	Stem	Karbi, Mishing
50.	*Litsea citrata* Blume Lauraceae	Mejankori(As, Tk), Ngairong (K), Ishou(Ko)	Cure pyorrhea and gum infection	Tender stem	Thengal Kachari, Kuki, Konyakes
51.	*Litsea salcifolia* (Roxb ex. Nees) Hook.f. Lauraceae	Dighloti (As,Ch, Sk)	Brushing for healthy teeth	Tender stem	Sonowal Kachari, Chutiya
52.	*Magnolia hodgsonii* (Hook.f & Thomson) H.Keng *Magnoliaceae*	Borhomthuri sopa (As), Thou-Thouwa (Bd)	Clean teeth and toothache	Young branch	Dimasa kachari, Bodo
53.	*Mangifera indica* L. Anacardiaceae	Am (Mango), Kedi (M), Thaiju (Bd), Theihai kung(Hm), Tharve/ (Ka), Tekatchu(Ga)	Clean teeth and cure toothache	Twigs	Deori, Mishing, Garo, Hmar
54.	*Melastoma malabathricum* L Melastomeaceae	Phutukola(As), Beyo (M), Hmurkuong(Hm), Dieng-kharungai /Bik- bik(Ka), Khusim(Dk) Thung khu (Bd)	Clean teeth and cure tooth and gum diseases	Young Stem	Among plain tribes of Golaghat, Chutiya, Konyak, Karbi, Hmar, Bodo
55.	*Melia azedarach* L Meliaceae	Ghora neem(As) Bokayan (M), Nim-ke-ik (Ka)	Clean teeth and cure toothache	Twigs	Chutiya, Kachari and teagarden community Karbi
56.	*Mimusops elengi* L. Sapotaceae	Bakul(As, M, Ka, De, DK)	Clean teeth and cure swollen gums	Tender stem/ bark	Tribes of Golaghat district, Dimasa, Kocharis, Deori
57.	*Morus alba* L Moraceae	Nuni(As) Thai kunsap (Bd), Angouba(MM)	Clean teeth and whitening		Meitai monipuri, Bodo
58.	*Murraya koenigii* (L.) Spreng Rutaceae	Nara-sinha (As), Nor-hing (M) Narasingha belai(Bd), Thengsakso/ Dengjir(Ka) Ya-phi-ko(Ti)	Clean teeth and cure toothache	Young branch	Common, Chutiya, Tai phake
59.	*Naravelia zeylanica* (L.) DC. Ranunculaceae	Gorap-Soi (As,M, Bd) Kubronten (Ra)	Strengthen tooth and gum	Tender shoot	Sonowal Kacharies, Maran, Mishing, Rabha
60.	*Nyctanthes arbor-tristis* L. Oleaceae	Sewali(As), Singarei(MM), Theching (K), Safali (Ko, Bd)	Clean teeth and cure swollen gums	Twigs	Deori, Mishing, Garo, Koch, Meitai Monipuri

61.	*Phyllanthua emblica* L. Phyllanthaceae	Amlokhi(As), Amlai (Bd), Sunhlu (Hm), Thelu (Ka), Heikru(MM) Phang(Ko)	Curing tooth ache and tooth decay.	Twigs	Karbi, Hmar, Bodo Konyaks
62.	*Pongamia pinnata* (L.) Pierre Ceasalpineaceae	Koros(As), Karanj(M)	Clean teeth and cure toothache	Stem branch	Golaghat, Chutiya
63.	*Psidium guajava* L. Myrtaceae	Modhuriam(As, Ch), Soprim/ Sparmsla /Menduram(Ka), Safari (M), Sophari (Bd), Poongto (MM), Lamthe (Ra), Kawlthuizik(Hm)	Clean teeth and relief from mouth blisters/scouring teeth	Young stem	Sonowal kacharies of Dibrugarh, Bodo, Rabha and common to other tribes
64.	*Punica granatum* L. Onagraceae	Dalim (As), Anar(M), Thaebufai (Hm), Kamphoi (MM)	Brushing for healthy teeth	Tender twig	Koch, Sonowal Kacharies, Hmar
65.	*Saraca indica* L. Caesalpinaceae	Asoka(As), Mir krem (Ka)	cleaning teeth and cure gum infection	Young stem	Karbi, Chutiya
66.	*Smilax zeylanica* L. Smilaceae	Tikoni borual, Kumarika(As), Yorit (M), Soima Jaseb (Bd)	Clean teeth and strengthen the gums	Stems	Bodo, Mishing
67.	*Smilax perfoliata* Lour, Smilaceae	Tikani-borua (As), Sila assugur bendwng(Bd.)	Clean teeth and strengthen the gums	Stems	Ti-phake, Matak
68.	*Solanum torvum* Sw. Solanaceae	Tita Bekuri (As,Ch, De) Bekuli guti (M)	Brushing teeth reliefs from toothache	Root	Deori, Mishing and Chutiyas
69.	*Streblus asper*, Lour Moraceae	Soura Goch (As,Ch,M), Chiri theso (Ka), Kharua (L)	Clean teeth and cure every tooth problem	Young stem	Karbi, Mishing, common, Lalung(Tiwa)
70.	*Syzygium balsameum* (Wight) Wall. Ex Walp. Myrtaceae.	Thilangni, Joldubuli,(As), Bol-thibrong, *(*Ga)	Clean teeth and strengthen gum	Young stem	Kaibatraya, Garo,
71.	*Syzygium cumini* (L.) Skeels. Myrtaceae	Kalajam(As), Jaram (Dk), Jangmi thepo (Ka)	Clean teeth and strengthen gum	Twig	Common
72.	*Syzygium fruticosum* DC. Myrtaceae	Kutahi Jamun(As, Ch), Tepet Jamu (M)	Clean teeth and strengthen gum	Twig	Mishing and Common
73.	*Syzygium jambos* (L) Alston. Myrtaceae	Bogi-jamuk (As, Ch)	Clean teeth and strengthen gum	Young branch	Rabha, Dimasa Kachari, Chutiya
74.	*Tabernaemontana divaricata* (L.) R.Br. ex Roem. & Schult Apocyanaceae	Kothana Phul(As), Nilakantha (M), Pararsi (Hm), Dawdai (Bd), Santu-jri-iong(Ka) Khow-paiii(Ti)	Brushing teeth reliefs from toothache	Tender tem/root	Jayantias of DimaHasao Deori, Mishing, Bodo, Karbi, Tai Phake
75.	*Tephrosia purpurea* (L)Pers. Fabaceae	Medaloa(As), Jabwsri (Bd.)	Teeth cleaning and whitening	Young stem	Sonowal Kachari,
76.	*Terminalia arjuna* Roxb. Combretaceae	Arjun(As, M), Chikuru kusiri(De)	Clean teeth and strengthen gum	Twig	Deori, Mishing, Common
77.	*Terminalia bellirica* (Gaertn) Roxb. Combretaceae	Bhumora (As), Bhumura chiti(De), Kuru (Ka), Lokyo (M) Bauraiphang (Ra), Chirore (Ga)	Clean teeth and strengthen gum	Twig	Rabha, Karbi, Deori, Thengal Kachari, Mishing
78.	*Terminalia chebula* Retz. Combretaceae	Shilikha(As), Kabega(De) Selekha(Bd), Haritaki (K), Artaki/ Hilika (Ka)	Clean teeth and strengthen gum	Twig	Kuki, Deori
79.	*Terminalia citrina* Roxb. ex Flem. Combretaceae	Kon Silikha (As) Ko, L	Tooth brush, mouth ulcer, rotten smell	Tender twig	Tiwa, Kaynake
80.	*Urena lobata* L. Malvaceae	Hunborolua(As) Haggravendi (Bd), That-thu (ka), Vawkpuihner-kawl(Hm)	Clean teeth and gum & toothache	Tender stem	Hmar,Garo, Bodo, Karbi
81	*Vitex negundo* L. Verbenaceae	Pochotia(As), Nisinda (Bd), Tingpir (Hm),Verkeabap (Ka) Ya-pan (Ti)	Clean teeth and reliefs from toothache	Tender stem	Mishing, Bodo, Hmar, Tai- Phake
82.	*Zanthoxylum hamiltonii* Wall ex DC. Rutaceae	Tez-Moi(As), Onger / Ri'kom (M), Jabrung/ Bajruli(Bd) Zabrang(Ti), Jakshik(Ko)	Clean teeth and reduce tooth bleeding (Pyorrhea) and toothache	Twig/ stem	Plain tribes i.e. Matak, Moran, Sonowal Kachari Deori, Mishing, Konyaks
83	*Zizyphus mauritiana* Lam. Rhamnaceae	Bogori(As,M), Thakri (Ka), Boroi (K), Kangkil (Ga)	Clean teeth and mouth freshener	Yong stem	Mishing, Kaibatra, Nath(Jogi), Matak, Karbi, Kuki

Table 3: Use of plants for tooth brushing by different age groups

S. No.	Community	Number of persons use plants for tooth brushing by Age Group (out of 30)						Number of persons use modern tooth brushing practice by Age Group (out of 30)					
		Young (10-30 yr)		Middle (31-50 yr)		Old (above 50 yr)		Young (10-30 yr)		Middle (31-50 yr)		Old (above 50 yr)	
		past	present	past	present	past	present	past	present	past	present	past	present
1	Bodo	03	00	15	00	30	11	27	30	15	30	00	18
2	Chutiya	00	00	07	00	22	05	30	30	23	30	00	23
3	Deori	00	00	09	02	28	06	30	30	21	28	00	27
4	Garo	01	00	03	01	29	27	29	30	27	30	00	23
5	Dimasa Kachari	00	00	04	01	30	08	30	30	26	30	00	28
6	Hmar	02	00	12	05	29	24	28	30	12	30	00	24
7	Karbi	04	00	23	09	30	21	26	30	23	30	00	21
8	Konyak Naga	02	00	09	06	24	20	28	30	09	30	00	20
9	Kochrajbongshi	00	00	04	01	29	08	30	30	04	30	00	28
10	Koibatraya	00	00	06	03	30	09	30	30	06	30	00	29
11	Kuki	01	00	07	03	22	21	29	30	27	29	00	21
12	Lalung (Tiwa)	00	00	05	01	26	05	30	30	25	30	00	25
13	Meitei Manipuri	00	00	08	03	23	10	30	30	28	27	00	20
14	Mishing	00	00	11	04	24	21	30	30	21	30	00	21
15	Matak	00	00	01	00	29	06	30	30	21	30	00	26
16	Moran	00	00	05	02	26	10	30	30	25	22	00	30
17	Nath (Jogi)	00	00	04	01	26	11	30	30	24	29	00	29
18	Rabha	02	00	09	04	27	15	28	30	29	30	00	25
19	Sonowal Kachari	00	00	02	00	28	12	30	30	22	30	00	29
20	Tai Phake	00	00	03	00	29	07	30	30	27	30	00	22
21	Thegal Kachari	00	00	01`	01	27	15	30	30	29	29	00	28

Fig 2: A few tooth brushing moments A] *Streblus asper* tender stem. B] *Azadirechta indica* twing, C] *Syzygium fruticosum* and D] *Litsea citrata*

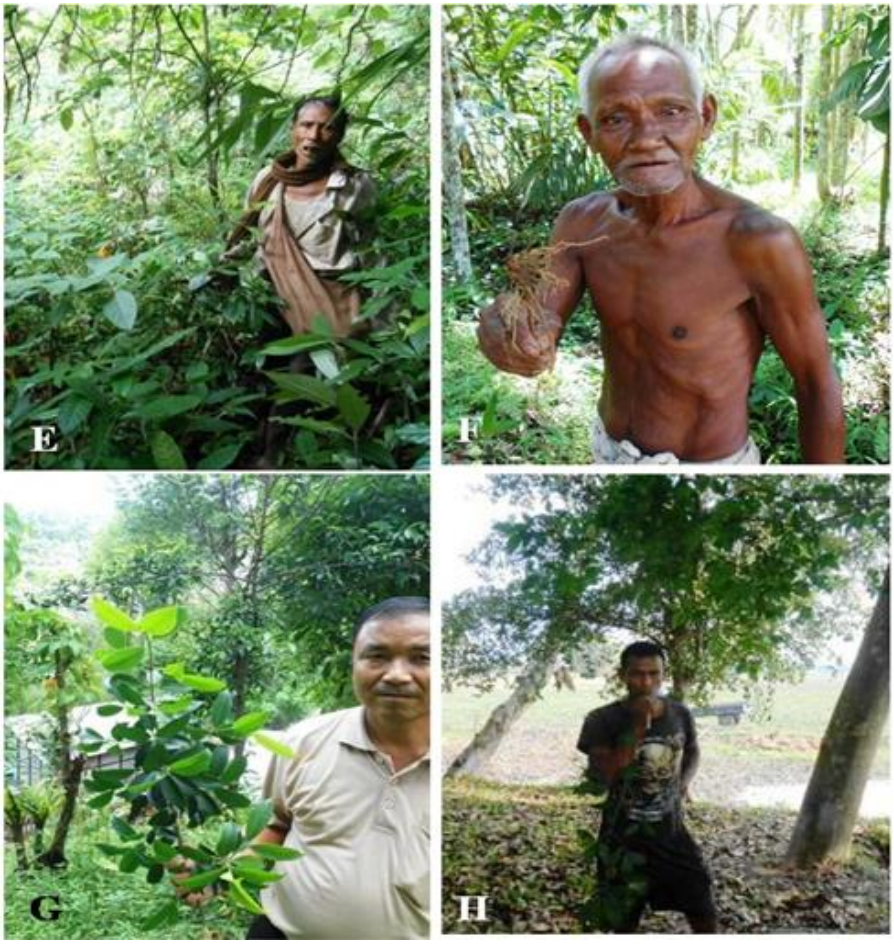

Fig 3: Collecting tender stem of E] *Garcinia lanceifiolia* for brushing teeth. F] roots of *Citrus aruntifolia* C] *Garcinia sopsopia* and D] Brushing *with Justicia adhatoda stem*

Fig 4: A few events during interview with the people

Fig 5: A few tooth brush plants O] *Glycosmis pentaphylla*, P] *Calotropis gigantea*, Q] *Murraya koenigii* R] *Calicarpa arborea*, S] *Melastoma malabathricum* and T] *Tabernaemontana divaricata*

4. Discussion

The resultant enormous traditional knowledge on plant based tooth brush used by the indigenous communities of Assam may be due to rich biodiversity of the region. An earlier study also supported about the popularity of use of plant for oral hygiene especially as tooth brush, gargling etc among the common people of Nalbari and Barpeta district of Assam [32]. They described 39 species of medicinal plants belonging to 38 genera of 29 families are commonly used for oral hygiene by the local people from Barpeta district, Assam. Another study reported 23 plant species of 15 families from Majuli also supported the use of plant parts for dental care and health hygiene by ethnic communities of this vicinity [33]. Fragmented study from other part of India also reported to use of twigs *Azadirachta indica* as toothbrush and the bark for healing gum disease [34]. The young twigs of *Azadirachta indica* (Mahaneem) and young stem of *Ficus benghalensis* L. (Alamaram) were reported to use as toothbrush to develop strong teeth by the rural communities of Kancheepuram district of Tamil Nadu[23], which were reported to use by Chutiyas, Mishing, Karbis, Rabhas, Dimasa Kacharis and Bodo tribes and also very coomon to other tribes of Assam. Scientific literature supported that use of Neem twigs as tooth brush could prevent dental caries [35]. Some communities of Assam including Khasi tribes reported to use peel of betel nut as tooth brush [27]. Stem and roots of *Achyranthes aspera* used by plain tribes of Majuli and Golaghat district of Assam such as Mishing, Deoris and Thengal Kacharies as toothbrush were reported to use by the tribes of Nandurbar District of Maharashtra and ethnic group Thottinaickkans of Semmali (Reserved forest), Thiruchirapalli district, Tamil Nadu [36, 37]. Stems of *Smilax zeylenica* that are used as toothbrush by Mishing and Bodo tribes of Assam for get relief from toothache was also reported to use by dwellers of Chilapatta Reserved Forest in West Bengal [38]. Twigs of *Thea assamica* (tea) traditionally used by Matak, Moran and Kacharies of Assam for cleaning teeth and whitening have been reported to prevent tooth decay and oral cancer due to presence of catechins and theaflavins, polyphenolic compounds [39]. Thus it indicated that traditional knowledge of this part of India is also having strong base in rest part of the county and the world communities as well. Apart from traditional tooth brushing practice using plant parts during the study could gained attention of the authors about the use of some herbs such as *Spilentus acmela* (Suhani bon), *Zinziber oficinalis* (Ada), *Olea europa* (Clove) etc for treatment of dental disease/ ailments by many tribes of Assam. Literature also available on the use of tooth paste prepared from ash of tobacco mixing with chalk and camphor. In past Assam few such formulations were reported to use for cleaning teeth and dental hygiene like ash of citronella plant alone and mixer of groundnut shell ash with Mahaneem and black pepper powder as tooth powder. The third formulation is prepared mixing with root powered of *Zizyphus jujuba* (bogari) and dried tea leaves powder for treatment of pyorrhea [27].

5. Conclusions

Remoteness habitat may be the vital cause for which availability of modern toothbrush and toothpaste is insufficient. The result of the study indicates that the use of plant parts as tooth brush among the communities dwell in the remote area were more than the communities living in nearby

suburban areas. The economic backwardness of the people may be another possibility of existence of traditional tooth brushing practices. However, the decrease in use of plant parts as datun among the communities of the study is due to the invasion of modern tooth bushing materials. Most importantly, the rich ethnic diversity of the people, their community level variations of socio-cultural and ritual heritage may be some unexplored cause of the use of plant wealth for dental health protection. A detailed study in these aspects is needed to ascertain the impact of the above mentioned factors. Over and above, the most important observation of the study is that communities are gradually detached with their beneficial traditional knowledge like tooth brushing practices with time. This may have caused negative impact on conservation of these plentiful biodiversity due to the lessening of importance and linkage because of increased popularity of modern tooth brushing practices. However, many entrepreneurs presently advocate the use of plant products for making of tooth brush and toothpaste again. They think that plant origin products will reduce the health risk by replacing micro-plastic based toothpaste and plastic tooth brush of modern era. This school of entrepreneurs might have needed sufficient information for suitable plant resources for formulation of plant based tooth paste and brush. This study may be helpful for such groups to provide sufficient information and scientific clue for their future herbal products.

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