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Traditional Knowledge of Wild Edible Plants in Southern Shan State, Myanmar

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မြန်မာနိုင်ငံ၊ ရှမ်းပြည်နယ်တောင်ပိုင်းရှိ စားသုံးနိုင်သော သဘာဝသီးပင်စားပင်များနှင့်ပတ်သက်သည့် ဒေသရိုးရာဗဟုသုတများလေ့လာခြင်းစာတမ်း

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စာတမ်းအကျဉ်း

နောက်ခံအခြေအနေ - မြန်မာနိုင်ငံသည် ဇီဝမျိုးစုံမျိုးကွဲကြွယ်ဝသည့်နိုင်ငံများတွင် တစ်ခုအပါအဝင်ဖြစ်ပြီး လျင်မြန်စွာ တိုးတက်နေသော ဖွံ့ဖြိုးဆဲတိုင်းပြည်တစ်ခုဖြစ်ပါသည်။ မြန်မာနိုင်ငံ၏ အပင်မျိုးစိတ်များဆိုင်ရာ သုတေသနများမှာ အရေးတကြီးဆောင်ရွက်ရန် လိုအပ်နေသဖြင့် စားသုံးနိုင်သော သဘာဝသီးပင်စားပင်အပင်များအား သယံဇာတစာရင်း ကောက်ယူခြင်းဖြင့် သဘာဝ အပင်အရင်းအမြစ်များနှင့် ပတ်သက်သည့် သတင်းအချက် အလက်အသစ်များ ရရှိနိုင်မည် ဖြစ်ပါသည်။

သုတေသနနည်းလမ်း - အပင်နှင့် ဒေသရိုးရာဗဟုသုတများဆိုင်ရာ သတင်းအချက်အလက် များအား နောက်ခံအခြေအနေမတူညီသည့် ကျေးရွာ (၃) ရွာတွင် ၂၀၁၅ ခုနှစ်မှ ၂၀၁၇ ခုနှစ်အထိ စာရင်းကောက်ယူခဲ့ပါသည်။ သတင်းအချက်အလက်များ ပေးနိုင်သည့် အဓိက ပုဂ္ဂိုလ် (၁၇) ဦးအား အင်တာဗျူးဆောင်ရွက်ခြင်းနှင့် ကျေးရွာပြည်သူလူထု၏ ပူးပေါင်းပါဝင်မှုဖြင့် အပင်များ၏ နမူနာ များအား ကွင်းဆင်းကောက်ယူစုဆောင်းခြင်းကို ဆောင်ရွက်ခဲ့ပါသည်။ ပထမ ခရီးစဉ်အတွင်း အပင်နမူနာပေါင်း ၈၇၅ ပင်အား ကောက်ယူစုဆောင်း နိုင်ခဲ့ပါသည်။ ၎င်းအပင်များထဲမှ ၁၅၃ ပင်မှာ စားသုံးနိုင်သော တောရိုင်းအပင်များ ဖြစ်ကြောင်း တွေ့ရှိရပါသည်။ Molecular Analysis ဆောင်ရွက်ရန်အတွက် ထိန်းသိမ်း စီမံထားသည့် အပင်အရွက်အစိတ်အပိုင်းများအား Basic Local Alignment Search Tool (BLAST) အား အသုံးပြုပြီး DNA barcode များအဖြစ် ခွဲခြားခဲ့ ပါသည်။ အပင်မျိုးစိတ်ခွဲခြားခြင်းအား ပန်းပုံစံပြတိုက်ရှိ အပင်နမူနာများနှင့် တိုက်ဆိုင် စစ်ဆေး ခြင်း၊ တရုတ်နှင့်ထိုင်းနိုင်ငံတို့မှ အပင်မျိုးစိတ်ဖော်ပြချက်များနှင့် တိုက်ဆိုင်စစ်ဆေးကာ အတည်ပြု ချက်ရယူခဲ့ပါသည်။

ရလဒ်များ- ပန်းပွင့်သောအပင်မျိုးရင်း ၄၄ မျိုးမှ အပင်မျိုးစိတ် ၈၃ မျိုးအား စားသုံးနိုင်သော သဘာဝသီးပင်စားပင်များအဖြစ် မှတ်တမ်းတင်နိုင်ခဲ့ပါသည်။ Araceae၊ Leguminosae နှင့် Moraceae မျိုးရင်းများမှာ အဓိကလွှမ်းမိုးသော အုပ်စုများဖြစ်ပြီး မျိုးရင်းတစ်ခုစီတွင် မျိုးစိတ် ၅ မျိုးခန့် ပါ ဝင်ပါသည်။ အပင်မျိုးစိတ်အများစု (၄၇ မျိုးခန့်) မှာ အရွက်အနေဖြင့် စားသုံးနိုင်ပြီး အချို့မျိုးစိတ်များ (၃၁ မျိုးခန့်) မှာ အသီးကိုစားသုံးနိုင်သော မျိုးစိတ်များ ဖြစ်ကြောင်းတွေ့ရှိရ ပါသည်။

နိဂုံး - စားသုံးနိုင်သော တောရိုင်းပင်များသည် ဒေသခံပြည်သူလူထု၏ စားဝတ်နေရေး အတွက် အရေးကြီးသော အခန်းကဏ္ဍမှ ပါဝင်နေပါသည်။ လေ့လာခဲ့သောဒေသတွင် အဆိုပါ အပင်များနှင့် ပတ်သက်သည့် ရိုးရာဗဟုသုတများအား ထင်ထင်ရှားရှား တွေ့ရှိရပါသည်။ ထိုအပင်များသည် ဒေသရိုးရာစားသုံးရန်အတွက် မျိုးရိုးဗီဇကွဲပြားခြင်းအား တိုးမြှင့်စေသကဲ့သို့ အစားအစာရှားပါးမှု ပြဿနာကို ဖြေရှင်းနိုင်ရန် အထောက်အကူပေးနိုင်ကြောင်း တွေ့ရှိရပါသည်။ စားသုံးနိုင်သော တောရိုင်းပင်များ၏ အရေးပါမှုများကို ပြည်သူလူထုအတွင်း ပိုမိုသိရှိနားလည်လာစေရန် ဆောင်ရွက် ခြင်းဖြင့် ဒေသခံပြည်သူလူထု၏ ရိုးရာဗဟုသုတများ ကို ထိန်းသိမ်းထားနိုင်ရန် တွန်းအားပေး ခြင်းလည်း ဖြစ်လာမည်ဖြစ်ပါသည်။

Traditional Knowledge of Wild Edible Plants in Southern Shan State, Myanmar

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Abstracts

Background: Myanmar is one of the hot spots of biodiversity and rapidly developing country. Floral research of Myanmar is urgent issues, and inventory of wild edible plants (WEPs) provides us new information on natural plant resources.

Method: Ethnobotanical data were collected in three villages with different historical background from 2015 to 2017. Total of 17 key informants were interviewed and specimens were collected in the fields with participation of villagers. 875 plant samples were collected in the first trip. Among them, 153 plants were used as WEPs. The leaf fragments preserved for molecular analysis were identified with chloroplast DNA region (*rbcl*) as DNA barcode using *Basic Local Alignment Search Tool* (BLAST). The species identification is confirmed by comparing with already identified voucher specimens in herbarium and descriptions in Flora of China and Flora of Thailand

Results: Total of 83 species from 44 families of angiosperms was documented as wild edible plants. Araceae, leguminosae and Moraceae are dominant families with 5 WEPs species in each family. Most of the species are used as wild vegetables (47 species) followed by the fruits (31 species).

Conclusion: WEPs play important role in the livelihood of local communities. Traditional knowledge on the wild edible plants is noticeable in the study area. WEPs could help to increase genetic diversity of local food consumption and addressing the demand of food scarcity. Increasing awareness on the importance of WEPs will encourage the conservation of traditional knowledge of indigenous population.

Keywords: Wild Edible Plants, DNA barcode, Basic local Alignment Search Tool, Myanmar

Traditional Knowledge of Wild Edible Plants in Southern Shan State, Myanmar

Background

Wild edible plants (WEPs) are defined as plant species collected in the wild to be consumed as food or drink (Reyes-garcia et. al 2015). Wild edible plants have been part of the main diet since time immemorial and it is argued that past societies made more use of the wild plants (Leonti et.al 2006 and Luczaj et.al 2013). Due to their remarkable nutrient values as well as being excellent source of minerals, fiber, vitamins and fatty acids that add flavour and colour to the diet, WEPs play a key role in complementing staple food (Ahmad and Pieroni, 2016). WEPs are especially important during the time of conflict and famine when normal food supply was disrupted (Balemie and Kebebew, 2006 and Ong and Jeong, 2016). The study of WEPs is important not only for identifying potential sources of alternative but also for selecting promising type for domestication Das. G et.al 2017). In recent centuries, humans have focused on relatively few plant species for food. 80% of total dietary energy intake, globally, is obtained from twelve domesticated species (Grivetti et.al 2000). Some of the WEPs are crop wild relatives and could provide useful genes for crop improvement which may have potential for global food security (Zhou et.al 2013). WEPs have potential for development of new crop through domestication (Ali-Shtayeh et.al 2008).

The modernization of rural societies was characterized by a shift from subsistence farming to a market oriented economy and considerable improvement in healthcare resulted in a major change of attitude in the local population (Abbet et.al 2014). Serious impact to decreasing use of traditional food has been the loss of cultural identity and cultural pride (Turner, 2008). However, the cultural association of plant and people is rarely studied, recorded or poorly understood and appreciated (Jain, 2000). It would be tragic if in the rush to become 'modern', humans lost the ability to identify and use wild species available to them (Grivetti et.al 2000).

Myanmar is one of the hotspots of biodiversity and rapidly developing country (Myer et.al 2000). Floral research of Myanmar is urgent issues. Inventory of useful plants will provide us new information on natural plant resources. 135 ethnic groups are officially recognized in Myanmar (Ministry of Immigration and Population, 2014). Because groups of indigenous people regard natural resources as essential to their culture and well-being (FAO 2010), they should be given particular attention in any kind of conservation programs. However the reliance of rural people on ecosystems is rarely examined and thus typically overlooked in national politics and economics, resulting in inappropriate strategies that do not take into account the role of the environment Uzuki and No, 2013). Native populations can play an important role for the environment, maintaining or even increasing its biodiversity (Hanazaki and Tamashiro, 2000). In Myanmar, quite a few researches have been carried out on ethnobotany mostly emphasizing on medicinal and financial value (Uzuki and No, 2013: Thaung Naing Oo et.al 2011).

Study Area

The Shan plateau to the east rises abruptly from the central basin of Myanmar, often in a single step of 600 m. occupying eastern half of the country, the Shan plateau is deeply dissected with average elevation of about 900 m (Reyes-garcia et. al 2015). Northward, the plateau merges into northern mountains, and southward it continues into the Dawna Range and to the Peninsular Tenasserim Mountains. The Shan plateau, because of its elevation, receives between 1900 mm and 2000 mm of precipitation annually with average daily temperature of 22 ^{o}C (Reyes-garcia et. al 2015). The present study was based on ethnobotanical analysis of WEPs in western part of Shan plateau. We conducted field researches in three villages with different historical background, namely Edin, Myin Ka, and Pin-sein-pin. The ethnic groups residing in the study area *are Danu, Taung-yoe, Shan, Bamar, Pao, Kayan* and *Kayin.* Majority in Myin Ka and Pin-sein-pin Village are *Danu* and *Taung-yoe*. Major ethnic group in Edin village is *Kayan*. According to the folklore of the villagers, old Myin Ka village was established in *Bagan* Era (9^{th} -13^{th} century) one mile away from current place. In late 19 centuries, the old villages was destroyed because of ethnic conflicts in area and moved to the current place. Pin-sien-pin village was established in early 19^{th} century. Edin village was established in 1990. The villagers of Edin village migrated from Kaya State because of civil war in their former area. So, Myin Ka village is older than other two villages in study area (Annex 1).

This study focused on the local communities of southern Shan State to document their traditional knowledge and practices on WEPs. The specific aims of this study are to document traditional knowledge of WEPs in study area and to compile a checklist of plants used by local communities as WEPs. In the present study, DNA barcoding technique was used to facilitate species identification. DNA barcoding is an aid to taxonomic identification using a short, standard DNA region that is universally present in the target lineages and has sufficient sequence variation to identify species and assign unidentified individuals to their correct species Kress and Erickson, 2007 and Hebert et.al 2003). The chloroplast *rbc*L gene was selected because it is useful for surveying the flora of a region where flora is poorly known (Hiroshi et.al 2010). We have documented 83 species from 44 families of angiosperm as wild edible plants. The indigenous societies, who were living in an area for a long time, could have much more traditional knowledge of WEPs.

Table 1. Basic data and information about Studied Villages

Particulars	Pin-sein-pin	Myin Ka	Edin
Establishment	Early 19^{th} Century	Late 19^{th} Century	1990
Above Sea Level (m)	1736	1422	353
Forest Type	Eveeergreen Forest	Evergreen Forest	Deciduous Forest, Semi-evergreen Forest
Linear distance to nearest town	5 miles to Pindaya	6 miles to Kalaw	25 miles to Tatkon
Population/household	535/127	563/140	410/68
Ethnic Group	Majority: Danu, Minority: Bamar, Pao	Majority: Taung-yoe, Danu, Minority: Bamar, shan	Majority: Kayan, Minority Kayin, Bamar
Religion	Buddhism	Buddhism	Christian and Buddhism
Home Garden Product	Tea leaves, Allium, Pea, Cabbage, Potato	Ginger, cabbage, Cauliflower, Eggplant, Tomato, Chili, Chayote, Carrot, Orange,	Mango, Banana, Jack fruit

		Avocado, pear	
Main Subsistence	Tea leaf Plantation, Vegetables	Orange Plantation, Cabbage, Cauliflowers	Turmeric , Banana Plantation
Live Stock	Cow, Chicken	Buffalo, Cow, Chicken, Pig	Pig, Chicken
Drinking Water	Rain Water	Natural Spring	Natural Spring
Electricity	No Electric Supply	Supply from National Grid	Small hydropower generator on the stream

Methods

We made interviews with a number of villagers about traditional use of WEPs, such as wild vegetable, edible fruits and nuts, spices and condiments, vegetable oil and fat. First, we organized group meetings with villagers and explained the objectives of our research. Consent was taken before carrying out ethnobotanical survey. The ethical guidelines of the international society of ethnobiology were strictly obeyed (Leonti et.al 2006). Total of 19 key informants were selected for interviews and fieldwork. Ages of informants ranged from 30 to 57 years with only one female informant. Although there are numerous dimensions to make assessment of knowledge about plant uses, the following two indices are significant to these purposes ((luczaj et.al 2006). The average number of species recognized as useful by a sample of informants is an effective mean to measure overall community knowledge. The total number of informants that recognized each species as useful is another effective measure because it measured amount of share knowledge among informants and it assigns relative important of each species.

We made field visits to the study area in June-July 2015, February-March 2016 and November-January 2016. We collected the plant samples in the fields with the participation of the villagers and collected totally 875 specimens in the first trip. Voucher specimens were deposited in the herbaria of Makino Botanical Garden, Japan, and Forest Research Institute, Myanmar.

DNA extraction

DNA was extracted from dried leaf sample with 2 x CTAB Method [4]. Approximately 20 mg of dried leaf samples are pulverized by using TissueLyser from QUAGEN. 650µl 2 x CTAB and 50µl 20% DTT were mixed and added into the tube of DNA sample. The mixture was incubated at 65°C in water bulb for 30 min and stirred thoroughly for every 5 min. After adding 650µl of Chloroform (CIA 24:1), the mixture is placed into shaker at rate of 30 min^{-1} for 30 min. And then, the mixture was centrifuged for 10 min at 3000 rpm. 500 µl of supernatant was transfer to 1.5ml microcentrifuge tube and mixed with 1000 µl of Ethanol 99.9%. The tube was then stored at -20°C for 20 min. The mixture is centrifuged again at 12000 rpm for 15 min. The upper aqueous layer is completely discarded and DNA is deposited at the bottom of centrifuge tube. 100 µl of TE buffer is added to the visible sample and 50 µl of TE buffer is added to invisible sample.

DNA sequencing for specific chloroplast region

Amplification of *rbcl* region was performed by Polymerase Chain Reaction (PCR) (Balemie and Kebebew, 2006) using the following program: 95°C for 5 min, 30 cycles of 95°C for 30 sec, 55°C, 72°C for 1 min, final extension 72°C for 5 min and hold at 4°C. PCR is performed with a volume of 20 µl which contain 10 µl of Go Taq, 2 µl *rbcl* forward primer, 2

µl *rbcl* backward primer, 5 µl of H_2O, 1 µl of genomic DNA. Success of PCR amplification is checked by electrophoresis with 1% agarose gel using 3 µl of PCR product.

The excess Go Taq and primers, the PCR products were purified with Wizard®SV Gel and PCR Clean-up System according to manufacturer instruction (Promega, USA). Equal volume of Membrane Binding Solution was added the PCR product and then transfer to minicolumn inserted into the collection tube. After the incubation at room temperature for 1 min, the assembly was centrifuged at 16000 g, for 1 min. The liquid flowed through into the collection tube was discarded and the minicolumn was reinserted. 700 µl of Membrane Wash Solution was added again and the assembly was centrifuged at 16000 g for 1 min. The liquid flowed through into collection was discarded and minicolumn was reinserted. The last step was repeated with 500 µl of Membrane Wash Solution. After discarding the liquid flowed through into the collection tube, the assembly was centrifuged again for 1 min. Minicolumn was then transfer to 1.5 ml microcentrifuge tube. After adding 50 µl of Nuclease-Free Water to minicolumn, it was allowed to incubate at room temperature for 1 min. The assembly was then centrifuged 16000 g for 1 min. PCR was then quantified with Nano Drop (HD 1000, V 38.1) by using 2 µl purified PCR product.

Cycle sequencing was performed by using BigDye® Terminator Cycle Sequencing Kit (Applied Biosystem) as follow: 96°C for 1 min, 30 cycles of 96°C 10 sec, 50 °C for 5 sec, 60 °C for 4 min and final hold at 16 °C. Cycle sequencing was performed with 10.5 µl which contained ABI Dye Terminator Ready-Re action Sequencing Premix 1 µl, 1.5 µl of 5× sequencing buffer, 5.4 µl of H_2O, 1 µl of 20 ng purified PCR product.

To remove the excess dye terminators, PCR products were transferred to new 1.5 ml tube. 2.5 µl of 125 ml EDTA and 30 µl of 100% EtOH were added. The mixture was centrifuged at 4 °C, 15000 rpm for 15 min. The supernatant was carefully removed with pipette. 80 µl of 70% EtOH was added and centrifuged again at 4 °C, 15000 rpm for 10 min. The supernatant was removed carefully with pipette. 15 µl of Hi-Di™ and loaded into Applied Biosystem Hitachi (Model 3130 ×1) Gene Analyzer according to the manufacturer instruction.

Identification by comparing nucleotide sequence and Voucher Specimens

Sequence Scanner Software 2 (Applied Biosystem) was used for editing sequence. The Basic Local Alignment Search (Blast) program was used as a tool for searching for the similar DNA sequence from the data base of National Center for Biotechnological Information (NCBI) for sequence similarities (ong and Jeong, 2016). Among the compared sequences, the species with most similar sequences were used for the species identification. Identification of specimens was confirmed by comparing with specimens from the herbarium of Makino Botanical Garden, online Herbarium catalog of Kew Royal Botanic Garden and also with the descriptions in the Flora of China and Flora of Thailand. The species names are assigned in accordance with Plant List (Das et.al 2016).

Results and Discussion

Total of 153 samples were collected from plants that the villagers used as WEPs. We have successfully sequenced 122 WEP samples and identified 115 samples to the species level. 24 samples, which had no DNA sequences, were identified based on the morphological characters. Altogether, 139 (91%) of WEPs samples had been identified. Ethnobotanical data such as vernacular names, places of collection, folk food uses, parts used and mode of consumption are listed in Table 2.

Table 2. WEPs Species were collected from study area

Item	**Number of collected Specimen**	**Number of Idendified specimens**	**%**
Sequenced specimen	122	115	94%
Specimens with no DNA sequence	31	24	77%
Total	153	139	91%

Diversity of Wild Edible Plants

We have recorded 83 species from 44 families of angiosperm as wild edible plants. Araceae, leguminosae and Moraceae are the dominant families with largest number of WEPs species (5 species). Zingiberaceae, Compositae, Myrtaceae and Rutaceae are second dominant families with 4 WEPs species from each family, whereas 26 families contain only one WEP species in each Figure 1 and Annex 1 (Table 1).

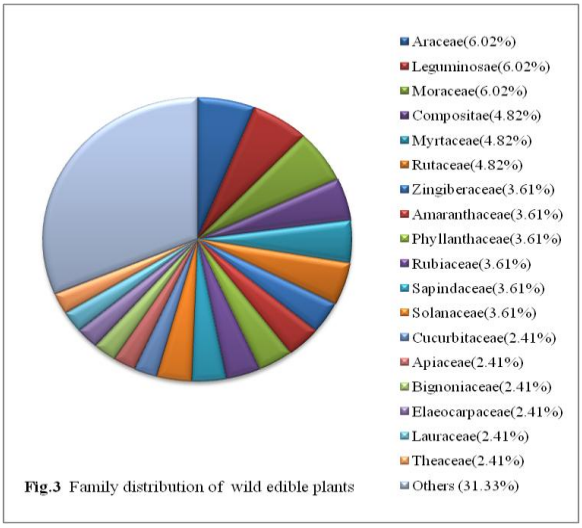

Fig.3 Family distribution of wild edible plants

Type of Food	**No. of Species**
Wild Vegetables	47
Edible Fruits and Nuts	31
Spices and condiments	4
Vegetable oil and fat	1
Snack for children	1
	83

Figure 1. 83 species from 44 families of angiosperms used as WEPs

Different parts of plants are used for wild food for various purposes. Fruits, seeds and leaves are most consumed as food. Villagers collected WEPs mostly for their own consumption. Some species such as *Lasia spinosa* and *Cheilocostus speciosus* were also collected for selling at local market.

Villagers also used WEPs other than food such as construction (12 species) and medical plants (14 species). The ripe fruits of *Syzygium pycnanthum* were edible and its trunk was also used for construction timber. *Rotheca serrata* and *Phyllanthus emblica* are most common species for medicinal uses.

Wild Edible Plant used in each village

In total, 26, 48 and 27 species are documented as WEPs in Edin, Myin Ka and Pin-sein-pin Villages, respectively. We observed differences in use of WEPs between the communities of 3 villages. Myin Ka village used comparatively large number of WEPs than other two villages. Villagers from Myin Ka village reported more WEPs species by single informant (average of 11 species) than Edin and Pin-sien-pin village (average of 5 specicies each).

Although *Danu* people are major ethnic groups in both of Myin Ka and Pin-sein-pin Villages, only 7 common species of WEPs are used in both of the villages. Historical backgrounds and land use system may contribute such kind of difference. Myin Ka village has 120 hectares common land for watershed conservation, whilst most of land areas around Pin-sein-pin village are privately own. In case of Myin Ka village, all villagers are accessible to common land for collection of WEPs. So, Land use and Land ownership system could have effects on the variation of uses of WEPs. These two villages also have different historical backgrounds. Myin Ka Villages established earlier than Pin-sein-pin village. The indigenous society, who were living in an area for a long time could have much more traditional knowledge of WEPs.

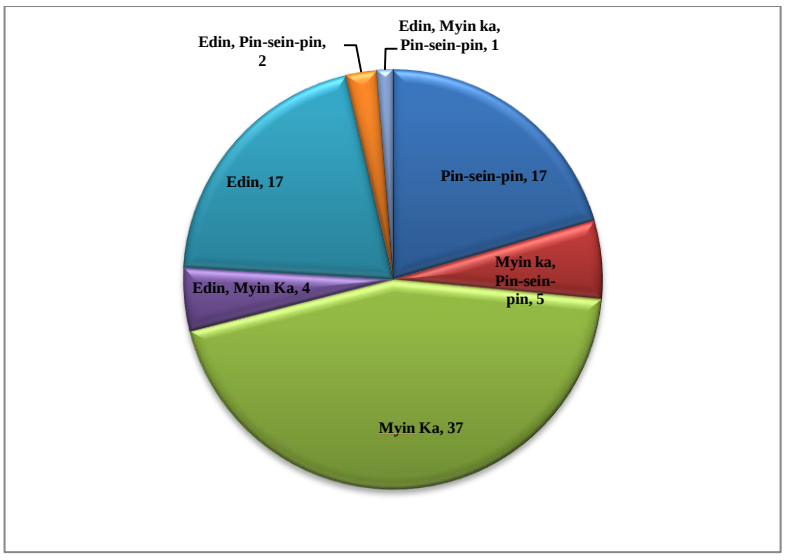

Figure 2. WEPs Used in Each Village

We also observed difference in number of informants that report each species as WEPs. Myin Ka Village reported more WEPs species which were reorganized by 2 or more informants than other two villages. The average number of informants per species for Edin, Myin Ka and Pin-sei-pin villages are 1.04, 1.50, 1.41 respectively. This result indicates more share knowledge within community of Myinka Village. In case of Edin Village, majority of WEPs species are reported from single informant. So, share knowledge becomes deteriorated within migrated community.

Edin village still have practicing shifting cultivation for banana plantation. Shifting cultivation may have detrimental effects on the environment and uses of WEPs. The surrounding flora of Edin village is also different to other two villages and it may also contribute to the variation on the uses of WEPs.

Variation of knowledge was also observed among different groups of age classes in the study area. The ages of 31-40 year report more species of WEPs per informant. It indicated that people from the age class of 31-40 may be taking more responsibilities in collection and processing of WEPs

Only two species, *Ficus semicordata* Buch.-Ham. ex Sm. And *Phyllanthus emblica* L., were used in all three villages. The villagers also planted *Phyllanthus emblica* L., in their home garden for their own consumption.

Wild Vegetables

This group was the largest group of WEPs with 47 species from 25 families. Araceae was largest family with 5 species as wild vegetable. Compositae and leguminosae contributed 4 species from each as wild vegetables. Amaranthaceae and Phyllanthaceae contributed 3 species as wild vegetables. According to the inverviews with villagers, the most common species used as wild vegetables were *Docynia indica*, *Rotheca serrata*, *Phyllanthus emblica*.

Fruits extracts of Docynia indica can reduce body weight and blood lipid concentration such as cholesterol [8]. Pharmacological studies had provided scientific evidence for the traditional usages of *Rotheca serrata* in asthma, inflammatory and infectious disorders ((Patel et.al 2014). *Phyllanthus emblica* was used as an ingredient of several medicines of indigenous Ayuverdic system. It was also used as medicinal plant in Indonesia, Thailand, Malaysia. *Lasia spinosa* and *Cheilocostus speciosus* were important seasonal foods for the cash income of the local people. The villagers seasonally collected and from the wild and sold in the local market. The rhizome of *Lasia spinosa* is a valuable functional food from the viewpoint of its antioxidant and dietary fiber content (Shefana and Ekanayake, 2009). Rhizome, Stem and leaf of *Cheilocostus speciosus* is used as vegetable and also as traditional medicine in India (Phangchopi and Teron, 2015).

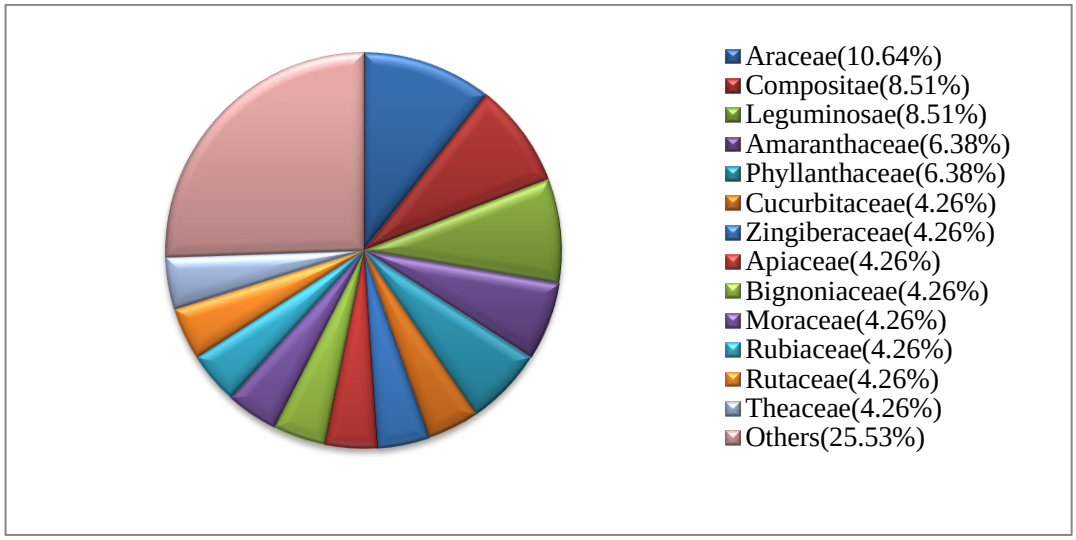

Figure 3. Wild vegetables

Edible Fruits and Nuts

This group is second largest group of WEPs with 31 species from 23 families. Myrtaceae was the largest family contributing 4 plant species for fruits. Moraceae and Sapindaceae were second largest families with 3 species from each as fruit plants. The most common fruit plants are Docynia indica, *Ficus semicordata*, *Ficus auriculata*, *Myrica esculenta* and *Archidendron jiringa*. The small scale plantation of *Docynia indica* was observed not only for fruits but also for the fuel wood.

The leaves of *Ficus auriculata* are used as folder and trees are planted as host for lac-insects in India. Ripe fruits of *Myrica esculenta* were consumed by locals. Its bark is major source of tannin in China and India. Boiled seed of *Archidendron jiringa* was a traditional food in the area and it was also a source of income for the villagers. Although the boiled seed is consumed widely in tropic, it was also found to have some toxicological effects on heart, kidney, liver and pancreas. Removal of djenkolic acid through traditional methods could probably reduce the toxicity and be beneficial for the management of diabetes (Shukri et.al 2011).

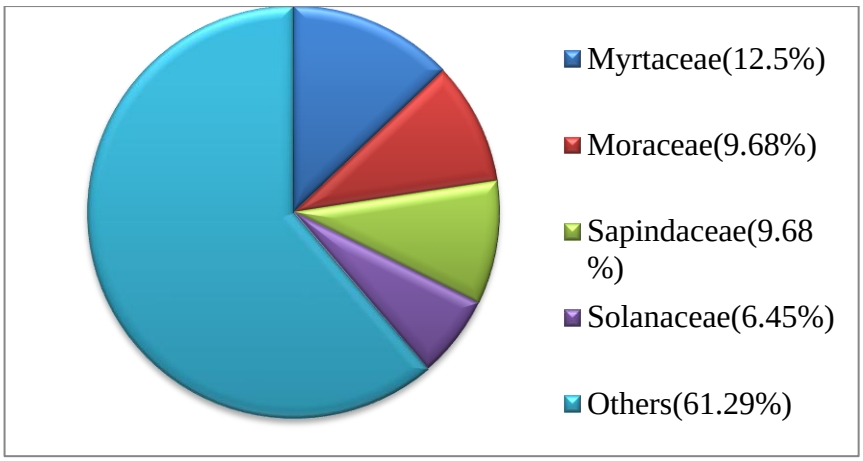

Figure 4. 31 species from 23 families used for fruits and nuts

Spices and condiments

Four plants species from 3 families were used as spices and condiments in traditional curry. The rhizome of *Curcuma* cf. *amada* was sliced, dried and made into powder. That powder was used in various traditional dishes. Freshly pounded rhizome was also used as spice. An array of phytochemicals of *Curcuma* cf. *amada* like phenolics, terpenoids, and other bioactive constituents were recognized for various biological activities such as antimicrobial, antioxidant, anticancer, anti-inflammatory, antidepressant, antitubercular and platelet aggregation inhibitory activities (Policegoudra et.al 2011).

Leaves of *Cinnamomum tamala*, *Laurus* cf. *nobilis* and *Zanthoxylum armatum* were also used in traditional curry for flavour. *Zanthoxylum armatum* was also used as spice in Yunnan, nearest Province of China to Myanmar (Geng et.al 2016).

Vegetable Oil and fat

The seed of *Elaeocarpus floribundus* Blume is used to extract vegetable oil. This plant was only wild species for the extraction of vegetable oil in the study area. It was used locally and was not produced for commercial scale. Extract of leaves of *Elaeocarpus floribundus* Blume showed significant activities against CEM-SS cancer cells (Zhou et.al 2013).

Snack for Children

Oxalis latifolia was eaten by the children as snack in Myin Ka Village. The whole plant was edible. The plant was growing naturally in home compounds. It is a unique perennial weed and its origin is from Central and South America (Holm et.al 1997). The other two villages did not report any species as children snack.

Conclusion

The rich diversity and traditional knowledge useful wild plants as a source of as a source of vegetable and fruits have been documented in this study. This study indicates that WEPs play important role in the livelihood of local communities. Historical background, Land use systems, surrounding flora could have effects on the variation on the traditional uses of WEPs. The indigenous society maintained more traditional knowledge on the wild edible plants. In addition to the food value, supplementary qualities of WEPs, such as medicinal uses and uses in construction, make them more important in the livelihood of local people. WEPs care not only important for subsistence of local communities, but also for the income generation for them. WEPs could help to increase genetic diversity of local food consumption and addressing the demand of food scarcity. Further investigation should be carried out on the nutrition value of WEPs species. Increasing awareness on the importance of WEPs will encourage the conservation of traditional knowledge of indigenous population.

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References

Abbet C. , Mayor R., Roguet D., Spichiger R, Hamburger M., and Potterat O., "Ethnobotanical survey on wild alpine food plants in Lower and Central Valais (Switzerland)," J. Ethnopharmacol., vol. 151, no. 1, pp. 624–634, 2014.

Ahmad K. and Pieroni A., "Folk knowledge of wild food plants among the tribal communities of Thakht-," J. Ethnobiol. Ethnomed., 2016.

Ali-Shtayeh M. S., Jamous R. M., Al-Shafie' J. H., Elgharabah W. A., Kherfan F. A.,. Qarariah K. H,. Khdair I. S, Soos I. M., Musleh A. A.,. Isa B. A, Herzallah H. M., Khlaif R. B., Aiash S. M., Swaiti G. M., Abuzahra M. A.,. Haj-Ali M. M, Saifi N. A., Azem H. K., and Nasrallah H. A., "Traditional knowledge of wild edible plants used in Palestine (Northern West Bank): a comparative study.," J. Ethnobiol. Ethnomed., vol. 4, no. 1, p. 13, 2008.

Altschul S. F., Madden T. L., Schäffer A. A., Zhang J., Zhang Z., Miller W., and Lipman D. J., "Gapped BLAST and PSI-BLAST: A new generation of protein database search programs," Nucleic Acids Res., vol. 25, no. 17, pp. 3389–3402, 1997.

Balemie K. and Kebebew F., "Ethnobotanical study of wild edible plants in Derashe and Kucha Districts, South Ethiopia.," J. Ethnobiol. Ethnomed., vol. 2, no. 1, p. 53, 2006

Das G., Patra J.K, and Singdevsachan S.K., "Diversity of traditional and fermented foods of the Seven Sister states of India and their nutritional and nutraceutical potential : a review," vol. 3769, no. March 2017, 2016.

FAO, "Global Forest Resources Assessment 2010. Progress Towards Sustainable Forest Management. FAO Forestry Paper 163," For. Pap., vol. 163, p. 350 pp., 2010.

FAO, Mapping the vulnerability of mountain peoples to food insecurity. 2015.

Geng Y., Zhang Y., Ranjitkar S., Huai H., and Wang Y., "Traditional knowledge and its transmission of wild edibles used by the Naxi in Baidi Village , northwest Yunnan province," J. Ethnobiol. Ethnomed., 2016.

Grivetti L. E. and Ogle B. M., "Value of traditional foods in meeting macro- and micronutrient needs: the wild plant connection.," Nutr. Res. Rev., vol. 13, no. 1, pp. 31–46, 2000.

Hadden R. L., "The Geology of Burma(Myanmar): An Annotated Bibliogarphy of Burma's Geology, Geography and Earth Science.," no. September, pp. 1–312, 2008.

Hanazaki N. and Tamashiro J. Y., “Diversity of plant uses in two Caiçara communities from the Atlantic Forest coast , Brazil,” Biodivers. Conserv., vol. 9, no. Begossi 1995, pp. 597–615, 2000.

Hebert P. D. N., Cywinska A., Ball S. L., and deWaard J. R., “Biological identifications through DNA barcodes.,” Proc. Biol. Sci., vol. 270, no. 1512, pp. 313–21, 2003.

Hills W., Glenn T., R. Saiki K., and Scharf S. J., “4683195 Process for amplifying, detecting, and/or-cloning nucleic acid sequences,” Biotechnol. Adv., vol. 5, no. 2, p. 313, 1987.

Hiroshi T., Wataru S., Nanda U., Harry W., Deden G., Kazuo O., Hiroshi A., Toru T., Eri K., Masumi K., and Motomi I., “Plant Diversity on Lombok Island, Indonesia: An Approach at Identification Using DNA Barcodes ,” Acta Phytotaxon. Geobot., vol. 61, no. 2, pp. 93–108, 2010.

Holm L., Doll,. Holm J, E, Pancho J., and Herberer J., World Weeds: Natural Histories and Distribution. New York, USA: John Wilsey & Sons Inc, 1997.

http://proseanet.org/prosea/eprosea.php.

Ihantsin K., Aye S. S., and Win K. T., “Pharmaceutical Ethnobotany Survey ofAnticancer Plant Resources from The Hlawgar Wildlife Park , Yangon Region , Myanmar,” pp. 103–110.

International Society of Ethnobiology (2006).International Society of Ethnobiology Code of Ethics (with 2008 additions, 2006).

Jain S. K., “Human aspects of plant diversity,” Econ. Bot., vol. 54, no. 4, pp. 459–470, 2000.

Ju Y., Zhuo J., Liu B., and Long C., “Eating from the wild: diversity of wild edible plants used by Tibetans in Shangri-la region, Yunnan, China.,” J. Ethnobiol. Ethnomed., vol. 9, p. 28, 2013.

Judd W., Campbell C., Kellogg E., and Stevens P., Plant Systematics: A Phylogentic Approach. Sunderland, USA: Sinauer Associates, Inc, 1999.

Kress W. J. and Erickson D. L., “A Two-Locus Global DNA Barcode for Land Plants: The Coding rbcL Gene Complements the Non-Coding trnH-psbA Spacer Region,” PLoS One, vol. 2, no. 6, 2007.

Leonti M., Nebel S., Rivera D., Heinrich M., and Leonti M., “Wild gathered food plants in the European Mediterranean: a comparative analysis,” Econ. Bot., vol. 60, no. 2, pp. 130–142, 2006.

Lien D.N., Quynh N.T, Quang N. H., Van Phuc D., Thi N., and Ngan T., “Anti-Obesity and Body Weight Reducing Effect of Fortunella japonica Peel Extract Fractions in Experimentally Obese Mice,” vol. 37, pp. 96–104, 2009.

Luczaj L., Koehler P., Piroznikow E., Graniszewska M., Pieroni A., and Gervasi T., “Wild edible plants of Belarus: from Rostafinski’s questionnaire of 1883 to the present,” J. Ethnobiol. Ethnomed., vol. 9, 2013.

Ministry of Immigration and Population, “The 2014 Population and Housing Census of Myanmar Frequently Asked Questions and Answers Ministry of Immigration and Population with technical support from UNFPA,” no. November 2013, 2014.

Matsuo Y. and Yamazaki T., “Nucleic Acids Research,” Nucleic Acids Res., vol. 17, no. 1, pp. 1–2, 1989

Myers N., Mittermeier R. A., Mittermeier C. G., Fonseca G. A. B., and Kent J., “Biodiversity hotspots for conservation priorities,” vol. 403, no. February, pp. 853–858, 2000.

No K. O. and Uzuki K. S., “Assessment of Subsistence Plant Resource of the Mangrove

Forest in the Ayeyarwady Delta , Myanmar," no. 1, pp. 223–232, 2013.
Ong H. G., and Jeong J. C. H., "Ethnobotany of the wild edible plants gathered in Ulleung Island , South Korea," Genet. Resour. Crop Evol., vol. 63, no. 3, pp. 409–421, 2016.
Patel J. J., Acharya S. R., and Acharya N. S., "Clerodendrum serratum (L.) Moon. - A review on traditional uses, phytochemistry and pharmacological activities," J. Ethnopharmacol., vol. 154, no. 2, pp. 268–285, 2014.
Phangchopi U., Teron R., and Tamuli A. K., "Diversity of wild edible plants in Marat Longri Wildlife Sanctuary , Assam," vol. 6, no. December, pp. 305–313, 2015.
Policegoudra R. S., AradhyS. M. a, and Singh L., "Mango ginger (Curcuma amada Roxb.) - A promising spice for phytochemicals and biological activities," J. Biosci., vol. 36, no. 4, pp. 739–748, 2011.
Reyes-garcía V., Menendez-baceta G., Aceituno-mata L., Calvet-mir L., Domínguez P., Garnatje T., Gómez-baggethun Molina-bustamante E., Molina M., Rodríguez-franco M., Serrasolses R., G., Vallès J., and Pardo-de-santayana M., "From famine foods to delicatessen : Interpreting trends in the use of wild edible plants through cultural ecosystem services," Ecol. Econ., vol. 120, pp. 303–311, 2015.
Shefana G., and Ekanayake S., "Some nutritional aspects of Lasia spinosa (kohila)," Vidodaya J. Sci., vol. 14, pp. 59–64, 2009.
Shukri R., Mohamed S., Mustapha N. M., and Hamid A. A., "Evaluating the toxic and beneficial effects of jering beans (Archidendron jiringa) in normal and diabetic rats," J. Sci. Food Agric., vol. 91, no. 14, pp. 2697–2706, 2011.
Thaung Naing oo, Park Y. D., Woo S. Y., Phonguodume C., and Lee K., "Contributions of Community Forestry to the Rural livelihoods and Watershed Conservation : A Case Study in Ywa Ngan Township , Shan State , Myanmar," 2011.
The Plant List." [Online]. Available: http://www.theplantlist.org/.
Turner N. J. and Turner, K. L. "'Where our women used to get the food': cumulative effects and loss of ethnobotanical knowledge and practice; case study from coastal British Columbia," Botany, vol. 86, pp. 103–115, 2008.
Utami R., Khalid N., Sukari M. A., Rahmani M., and Abdul A. B., "Phenolic contents , antioxidant and cytotoxic activities of Elaeocarpus floribundus Blume," pp. 245–250, 2006.

Annex 1.

Table 1. 83 species from 44 families of angiosperms used as WEPs

Sr. No	Taxon	Family	Vernacular name	Location	Growth habbit	Uses	Parts used and Mode of consumption
1	*Amorphophallus purpurascens* Kurz ex Hook.f.	Araceae	Wa-u	Pin-sein-pin	Herb	Food	Stem and bulb as vegetables
2	*Amorphophallus (cf) muelleri* Blume	Araceae	Wa-u	Edin	Herb	Food	Stem and bulb as vegetables
3	*Arisaema erubescens* (Wall.) Schott	Araceae	Wa-u-pho	Myin Ka	Herb	Food, Medicine	Stem and bulb as vegetables
4	*Colocasia esculenta* (L.) Schott	Araceae	Pai	Myin Ka, Pin-sein-pin	Herb	Food	Petiole fermented; Petiole as vegetable; Petiole prepared soup with Kin-pun- chin, Sue-pote and Zayit
5	*Lasia spinosa* (L.) Thwaites	Araceae	Za-yit	Edin	Herb	Food	Tender shoot cooked as soup,; Cooked with fish; boiled shoot as salad with fish paste

6	*Cheilocostus speciosus* (J.Koenig) C.D.Specht	Costaceae	Pha-lan-taung-hwa	Edin, Myin Ka	Herb	Food	Shoot fried with vegetable oil and other ingredients
7	*Smilax gagnepainii* T.Koyama	Smilacaceae	Sue-yit	Pin-sein-pin	Climber	Food	Shoot as vegetable
8	*Alpinia nigra* (Gaertn.) Burtt	Zingiberaceae	Gon-min	Myin Ka	Herb	Food	Pit as vegetable
9	*Curcuma aromatica* Salisb.	Zingiberaceae	Mar-lar-pu	Myin Ka	Herb	food, Medicine	Buds as vegetable; rhizome for medicinal use
10	*Curcuma(cf) amada* Roxb	Zingiberaceae	Ba-thae-kaw	Myin Ka	Herb	Food, Medicine	Rhizome for knee ache, Pounded fresh rhizome as spice in traditional curry. Rhizome sliced and dry and made powder, used as spice in curry
11	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	She-ka-na-phot	Pin-sein-pin	Herb	Food	shoot for salad
12	*Amaranthus viridis* L.	Amaranthaceae	Hin-nu-nwe	Myin Ka	Herb	Food	Tender leaves as vegetable
13	*Bassia scoparia* (L.) A.J.Scott	Amaranthaceae	Ta-byat-se	Myin Ka	Herb	Food	Shoots and tender leaves as vegetable

14	*Mangifera sylvatica* Roxb.	Anacardiaceae	Taw-tha-yat	Edin	Tree	Construction, Food, Flooring	Fresh fruits pounded as salad with other ingredients, Sliced fresh fruits for sour taste
15	*Annona cherimola* Mill.	Annonaceae	Aw-le	Myin Ka	Tree	Food	fruits edible
16	*Centella asiatica* (L.) Urb.	Apiaceae	Myin-kwar	Myin Ka	herb	Food, Medicine	Tender leaves as salad
17	*Oenanthe* (cf) *javanica* (Blume) DC.	Apiaceae	Za-lae	Myin Ka	Herb	Food	Tender leaves as salad; cooked as traditional curry
18	*Telosma cordata* (Burm. f.) Merr.	Apocynaceae	Gwe-tauk	Myin Ka	Climber	Food	Tender leaves for soup
19	*Eleutherococcus*(cf) *nodiflorus* (Dunn) S.Y.Hu	Araliaceae	Tha-yat-kin, Ka-la-kin	Pin-sein-pin	Tree	Flooring, Food, Fuelwood,	Shoot as vegetable
20	*Markhamia stipulata* (Wall.) Seem.	Bignoniaceae	Ma-lwa	Edin	Tree	Construction, Food	Boiled flower as salad with fish paste; Fried as vegetable
21	*Oroxylum indicum* (L.) Kurz	Bignoniaceae	Kyaung-shar	Edin, Myin Ka	Tree	Food, Medicine	Flowers and fruits as vegetable; Fruits as salad; farmented fruit; boiled and pounded

							fruits as salad with other ingredients
22	*Protium serratum* (Wall. ex Colebr.) Engl.	Burseraceae	Kadi	Edin	Tree	Construction, Food	Fruits eaten fresh
23	*Celastrus paniculatus* Willd.	Celastraceae	Taung-bort-lu-lin	Myin Ka	Small Tree	Food, Medicine	Tender leaves prepared for soup
24	*Terminalia bellirica* (Gaertn.) Roxb.	Combretaceae	Thit-seint	Edin	Tree	Food	Seeds eaten fresh
25	*Bidens biternata* (Lour.) Merr. & Sherff	Compositae	Hlan-kwa	Pin-sein-pin	Herb	Food	Shoot as vegetable
26	*Crassocephalum rubens* (Juss. ex Jacq.) S.Moore	Compositae	Nu-su, Taw-bi-zat	Edin, Pin-sein-pin	Herb	Food	Shoot as vegetable. Tender leaves for salad
27	*Dichrocephala benthamii* C.B.Clarke	Compositae	Sein-zar-myat-lone	Myin Ka	Herb	food, Medicine	Shoots and tender leaves for soup
28	*Laggera alata* Nanth.	Compositae	La-thar-ba-pyin	Myin Ka	Herb	Food, Medicine	Shoots fried with eggs, good for swollen body
29	*Marah macrocarpa* (Greene) Greene	Cucurbitaceae	Kin-mon-tee	Myin Ka	Climber	Food	Fruits as vegetable
30	*Momordica subangulata* Blume	Cucurbitaceae	Taw-hin-khar	Myin Ka	Climber	Food, Medicine	Fruits and leaves as vegetable, Appetizer

31	*Diospyros kaki* L.f.	Ebenaceae	Tae	Myin Ka	Tree	food	Ripe fruits edible
32	*Elaeagnus griffithii* Servettaz,	Elaeagnaceae	Mat-lwat, Myat-lu	Pin-sein-pin	Tree	Food	Ripe fruits edible
33	*Elaeocarpus stipularis* var. *siamensis* (Craib) Coode.	Elaeocarpaceae	Sein-se-ba-lu	Myin Ka	Tree	Food	Ripe fruits edible
34	*Elaeocarpus floribundus* Blume	Elaeocarpaceae	Sein-sar-blue-pan	Myin Ka	Tree	Food, Fuelwood	Seeds used to extract edible oil
35	*Lithocarpus lindleyanus* (Wall. ex A. DC.) A.Camus	Fagaceae	Thit-al-sein	Myin Ka	Tree	Construction, Food	Roasted seed edible
36	*Rotheca serrata* (L.) Steane & Mabb.	Lamiaceae	Yin-byar, Hin-byar, Hin-khar	Myin Ka, Pin-sein-pin	Shrub	Food, Medicine	root for body swollen, , Abnominal ache Tender leaves and flowers as vegetable and Salad,
37	*Cinnamomum tamala* (Buch.-Ham.) T.Nees & Eberm.	Lauraceae	Thit-kya-poe	Pin-sein-pin	Tree	Food, Medicine	Leaf for spice in traditional curry
38	*Laurus* (cf) *nobilis* L.	Lauraceae	Lae-lu	Pin-sein-pin	Tree	Food	leaves for spices
39	*Acacia concinna* (Willd.) DC.	Leguminosae	Kin-mon-chin	Myin Ka	Climber	Food, Shampoo	Fruits for shampoo; Tender leaves prepared soup with bean; Prepared salad; Fried with fish paste

40	*Acacia pennata* subsp. *kerrii* I.C.Nielsen	Leguminosae	Sue-pote-kyi	Edin	Shrub	Food	Tender leaves cooked as soup: Cooked with fish
41	*Archidendron jiringa* (Jack) I.C. Nielsen	Leguminosae	Da-nyin	Edin	Tree	food	Boiled seeds
42	*Bauhinia purpurea* L.	Leguminosae	Kha-lat/Swe-daw	Edin, Pin-sein-pin	Tree	Food	Tender leaves as vegetable; Tender leaves as soup with potato
43	*Bauhinia variegata* L.	Leguminosae	Kha-la	Pin-sein-pin	Tree	Food, Fuelwood	Leaves as salad. Seed edible
44	*Duabanga grandiflora* (DC.) Walp.	Lythraceae	Ga-zaw	Edin	Tree	Construction, Food	Fruits edible
45	*Osbeckia nepalensis* Hook. f.	Melastomataceae	Shar-pyar-tee	Pin-sein-pin	Shrub	Food	Fruits edible
46	*Ficus auriculata* Lour.	Moraceae	Ka-ohn, Kaung-oat-tee, Tha-phan, Pha-owl	Myin Ka, Pin-sein-pin	Tree	Food	Ripe fruits edible
47	*Ficus semicordata* Buch.-Ham. ex Sm.	Moraceae	Ka-dut, Tha-phan	Pin-sein-pin	Tree	Food, Fuelwood	Ripe fruits edible
48	*Ficus* (cf) *lacor* Buch.-Ham.	Moraceae	Nyaung-chin	Myin Ka	Tree	Food	Leaves and Shoots for soup and salad
49	*Ficus racemosa* L.	Moraceae	Tha-phan	Myin Ka	Tree	Food	Ripe fruits edible

50	*Maclura fruticosa* (Roxb.) Corner	Moraceae	Sue-sein	Pin-sein-pin	Shrub	Food	Shoot as vegetable
51	*Myrica esculenta* Buch.-Ham. ex D. Don	Myricaceae	Kata-pho	Myin Ka	Tree	Food, Fuelwood	ripe fruits edible
52	*Psidium guajava* L.	Myrtaceae	Mar-la-kar	Edin	Tree	Food	Fruits eaten fresh
53	*Syzygium cumini* (L.) Skeels	Myrtaceae	Tha-pyay	Myin Ka	Tree	Construction, Food, Furniture	ripe fruits edible
54	*Syzygium oblatum* (Roxb.) Wall. ex A.M.Cowan & Cowan	Myrtaceae	Tha-pyay	Myin Ka	Tree	Construction, Food, Furniture	Ripe fruits edible
55	*Syzygium pycnanthum* Merr. & L.M. Perry	Myrtaceae	Tha-pyay	Myin Ka	Tree	Construction, Food, Fuelwood, Furniture	Ripe fruits edible
56	*Anacolosa clarkii* Pierre	Oleaceae	Tay-pin	Myin Ka	Tree	Food	fruits edible
57	*Oxalis latifolia* Kunth	Oxalidaceae	Mu-chin	Myin Ka	Herb	Food	Children eat all parts of plants
58	*Antidesma acidum* Retz.	Phyllanthaceae	Kim-ma-lin	Edin	Small Tree	Food	Fruits and leaves as vegetable
59	*Bischofia javanica* Blume	Phyllanthaceae	Yae-pa-done	Myin Ka	Tree	Food	Shoots for salad, young Leaves as

							vegetable
60	*Phyllanthus emblica* L.	Phyllanthaceae	Zepyu, Se-sar, Se-shar	Edin, Myin Ka, Pin-sein-pin	Tree	Food, Fuelwood, Medicine	Fruits pounded as salad, Bark for gum disease,
61	*Plantago major* L.	Plantaginaceae	A kyaw-baung-tha-thaung	Myin Ka	Herb	Food, Medicine	Tender leaf for salad,
62	*Embelia ribes* Burm.f.	Primulaceae	Kan-pa-lar	Myin Ka	Climber	Food	Leaves as salad and soup; Tender leaves and buds boiled and eaten with fish sauce
63	*Ziziphus incurva* Roxb.	Rhamnaceae	Sue-kauk	Pin-sein-pin	Tree	Food	Fruits edible
64	*Docynia indica* (Wall.) Decne.	Rosaceae	Pin-sein	Myin Ka, Pin-sein-pin	Tree	Food, Fuelwood	Fruits eaten fresh. Cooked as soup; Pounded with Chili as side dish
65	*Coffea arabica* L.	Rubiaceae	Coffee	Pin-sein-pin	Tree	Food	Roasted seed for coffee
66	*Wendlandia budleioides* Wall. ex Wight & Arn.	Rubiaceae	Thit-ne	Myin Ka	Tree	Construction, Food	Tender Leaf for salad
67	*Wendlandia tinctoria* (Roxb.) DC.	Rubiaceae	Thit-ni	Myin Ka	Tree	Food, Fuelwood	Buds as vegetable

68	*Casimiroa* (cf) *edulis* La Llave	Rutaceae	Tha-gyar-tee	Myin Ka	Tree	Food	Fruits edible
69	*Clausena excavata* Burm.f.	Rutaceae	Pyin-thaw-sein	Myin Ka	Small Tree	Food	Tender leaves as vegetable
70	*Murraya koenigii* (L.) Spreng.	Rutaceae	Pyin-taw-thein	Pin-sein-pin	Small Tree	Food	Tender leaves for salad
71	*Zanthoxylum armatum* DC.	Rutaceae	Mike-cup	Myin Ka	Herb	Food	Tender leaves ingredient to beef curry
72	*Casearia graveolens* Dalzell	Salicaceae	Phan-khar	Edin	Tree	Food, Construction	Posts; Fruits eaten fresh
73	*Choerospondias axillaris* (Roxb.) B.L.Burtt & A.W.Hill	Sapindaceae	Del-cline	Edin	Tree	Food	Fruits edible
74	*Dimocarpus fumatus* (Blume) Leenh.	Sapindaceae	Taw-kyat-mauk	Edin	Tree	Food	Ripe fruits edible
75	*Spondias pinnata* (L. f.) Kurz	Sapindaceae	Gwe	Edin	Tree	Food	Fruits eaten fresh
76	*Schoepfia fragrans* Wall.	Schoepfiaceae	Byauk-ole-kyi	Pin-sein-pin	Tree	food, fuelwood, Medicine,	fruits edible
77	*Physalis angulata* L.	Solanaceae	Unknown	Edin	Herb	Food	Fruits eaten fresh
78	*Physalis pubescens* L.	Solanaceae	Taw-kha-yan-chin	Pin-sein-pin	Climber	Food	Fruits eaten fresh
79	*Solanum torvum* Sw.	Solanaceae	Kha-yan-ka-zot	Edin, Myin	Herb	Food	Fruits vegetable

				Ka			
80	*Camellia taliensis* (W.W.Sm.) Melch.	Theaceae	Taw-la-phat	Myin Ka, Pin-sein-pin	Small Tree	Food	Tender leaves for salad
81	*Schima wallichii* Choisy	Theaceae	Thit-yar	Myin Ka	Tree	Construction, Food	Shoots as vegetable
82	*Dendrocnide basirotunda* (C.Y.Wu) Chew	Urticaceae	Tha-phan	Edin	Tree	Food	Ripe fruits edible
83	*Leea indica* (Burm. f.) Merr.	Vitaceae	Pait-chin	Edin, Myin Ka	Small Tree	Food	Shoot as vegetable