



# Traditional Knowledge and Usage of Edible Plants among Temuan Community in Gunung Ledang Johor National Park, Malaysia

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**Abstract:** Edible plants are important for their nutrient values as part of human diet and as food resources that are essential in times of food shortage. Due to the lower utilization of edible plants, loss of traditional knowledge and food security issues have caused the urgent need to document and safeguard the edibles knowledge especially among indigenous people. The objectives of this study were to document edible plant species used by Temuans in Gunung Ledang Johor National Park and to determine the relative value of different edible plants usage, and cultural importance. The data were collected through a semi-structured interview and free listing technique that were applied to all 85 informants from Tanah Gembur village. Frequency Citation (FC), Utilization of Frequency (f), Cultural Importance Index (CI), and Cultural Food Significance Index (CFSI) were used to evaluate the relative importance of the different edible plants. A total of 43 edible plant species belonging to 22 families and 33 genera were recorded in the study. Based on the result, *Manihot esculenta* Crantz scored the highest FC and CFSI while *Carica papaya* had the highest CI value. These crucial knowledges suggest a potential approach toward conserving the vast traditional knowledge from Temuan community.

**Keywords:** Ethnobotany, edible plants, conservation, Temuan, Johor

## 1. Introduction

Wild edible plants (WEPs) are refer to spontaneously growing or naturalized species and species that are both cultivated and thrive in the wild with or without any management, which their whole or certain part of the plants are edible (Pawera et al. 2017). The role of edible plants are important in times of food shortages because of their functions as a vital nutritional supplements and support food requirements for different communities. Edible plants show greater potential as functional foods or nutraceuticals, and their role in the prevention of cancer and age related disease (Menendez-Baceta et al. 2012). Lower utilization of WEPs in human diet and replacement by food products from intensive farming crops and industrialized processing have caused the role and potential of wild edible plants remain unnoticeable. Consequently, this situation could lead to the loss of traditional knowledge about these resources and will be a big hindrance in many aspects of environmental conservation (do Nascimento et al. 2013).

This study focuses on the uses of edible plants utilized by Temuan community. This community belongs to Proto-Malay group, which is one of the three main ethnics in Malaysia. They were well-known for their knowledges and usage of wide variety of WEPs. This study was restricted to Temuan community villages located at Gunung Ledang Johor National Park on their edible plants varieties. Three important ethnobotanical indices will be used in this study which are the Utilization Frequency (f) to quantify the frequency used of the certain edible plants species, the Cultural

Importance Index (CI) to determine diversity of uses and consensus of informants, and the Cultural Food Significance Index (CFSI) to evaluate the cultural significance of edible plants.

This study is important for the purpose of documentation of traditional knowledge and to conserve the edible plants biodiversity. This study provides greater contribution by providing a list of the useful plants from the study area including the quantitative data about the importance of the species. This study aims to contribute in conservation purpose of the local knowledge for future generation, and to make it accessible for the future references. The objectives of this ethnobotanical research were i) to document the edible plants used by the Temuans in Gunung Ledang Johor National Park and ii) to determine the relative value of edible plants used by the Temuans in Gunung Ledang Johor National Park using quantitative indices.

## 2. Materials and Methods

### 2.1 Study area

The study was conducted in Temuan's villages at Gunung Ledang named Tanah Gembur. This village consists of more than 400 individuals with at least 80 families. Temuan communities usually collected their daily resources from Gunung Ledang, which is the highest mountain in southern Peninsular of Malaysia with height of 1,276 metres. Based on government report on 2015, there were more than thousand of plant species recorded in Gunung ledang that has been commercialized for medicine and cosmetic purposes. Gunung Ledang is located in the district of Ledang, Johor and has been gazetted as Johor National Park on 3 October 2005. The size of the park is estimated around 8,611 hectares with latitude 2° 22' 16.19" N and longitude 102° 36' 16.79" E, as shown in Fig. 1 below.



**Fig. 1 - Location of Gunung Ledang Johor National Park , Malaysia indicating the sampling sites for the ethnobotanical documentation of Temuans (2° 22' 16.19" N, 102° 36' 16.79" E)**

### 2.2 Ethnobotanical Documentation

The data were collected through semi-structured interview in order to gain information about edible plants based on questionnaire given. It includes the local name of the plants they gathered, culinary uses, plant parts used and modes of preparation and consumption. A consent was obtained before begins the interview sessions with each of the respondents. The technique of free listing was applied to all male and female heads of families and all the plants mentioned were listed on the field notebook. During the interview sessions, the videos or voices were recorded using digital camera, video camera or video recorder as additional tool to support this ethnobotanical knowledge documentation. After the interview, informants were asked to show particular plants in the surrounding environment to be collected for the preparation of voucher specimens. The informants also showed the right techniques in collecting

plant parts to make sure the information given were right and the researchers were able to describe the method in a clear and right ways. Plant specimens were collected in triplicates according to the standard botanical and ethnobotanical protocols (Martin 2014). If there were specimens that cannot be collected due to limited sources, photographs of the specimens were taken for identification. The plant specimens were pressed as soon as possible after collection to prevent wilt and shrivelling before developed into herbarium specimens for identification.

### 2.3 Quantitative Indices

The prepared herbarium specimens were identified with aided of available specimens in collection room, taxonomic key and online references such as The Plant List Database, GlobinMed Database and other related publications. After identification, each of the herbariums was labelled and deposited to UTHM Repository Room for future reference. The data were analysed qualitatively and quantitatively by using descriptive statistical method and utilization frequency (f) index, respectively (Pieroni, 2001). The f was calculated as:

$$f = \frac{Nm}{Ni}$$

In this formula, f represents the utilization frequency, while Nm refers to the number of informants mentioned certain species and Ni refers to the total number of informants. Higher value of f indicates higher frequent of the plant used.

To determine the diversity of uses and consensus of informants, we used Cultural Importance Index (CI), which can be mathematically expressed as:

$$CI = \frac{\sum_{u=1}^{NC} \sum_{i=1}^{Ni} \frac{UR_{ui}}{N}}{N}$$

N is the total number of informants and NC is the total number of use categories. Therefore, the CI is the sum of the proportion of informants that mention each of the use categories for a given species. This index indicates the spread of the use (number of informants) of each species, as well as the diversity of its uses. Every additional use category is a measure of the relative importance of each plant use (Geng 2016). Therefore, multiple uses of a species is an indicator of higher CI value.

Besides, the Cultural Food Significance Index (CFSI) was calculated to evaluate the cultural significance of edibles plants using following formula given by Pieroni (2001):

$$CFSI = QI \times AI \times FUI \times PUI \times MFFI \times TSAI \times FMRI \times 10^{-2}$$

This index takes into consideration a wide variety of factors in the evaluation of a specific edible plants. The CFSI included frequency of quotation index (QI), availability index (AI), parts used index (PUI), frequency of utilization index (FUI), multifunctional food use index (MFFI), taste score appreciation index (TSAI) and food-medicinal role index (FMRI). The use of this index allowed for exploring the potential of WEPs.

## 3. Results

### 3.1 Documentation of Wild Edible Plants (WEPs)

There were 85 respondents with 35 females and 50 males involved in the interview sessions. The ages ranged between 15 to 80 years old and most of them were married. Based on data collected, the total of edible plants used by Temuans at Gunung Ledang Johor National Park were 43 species belonging to 22 families. Moraceae and Arecaceae were the biggest family with 6 edible plants for both, followed by Euphorbiaceae and Zingiberaceae with same number of species, which were 5 species. Whereas, 15 families contain only one edible plant species such as Lamiaceae, Rutaceae, Malvaceae and Opiliaceae.

About 33% of 43 edible plants were included in more than one food category and the highest food categories were fruits with 23 edible plant species from 14 families. Most of the plants were collected around the village and some inside the Gunung Ledang Johor National Park. Commonly, Temuan community likes to do a small-scale cultivation of edible plants in the home gardens and small spaces around local residents. Therefore, some of edible plants were collected from their surrounding. Different plant parts were used as the source of food in Temuan community, but the most used parts were fruits with 22 species recorded and mostly were eaten raw as snacks. The highest growth form of edible plants were in tree form with 20 species and most of them were wild plants.

### 3.2 Quantitative Indices

The table shows 17 edible plants species selected using four quantitative indices which were FC, f, CI, and CFSI. Table 1 shows the evaluation of selected 17 species based on four indices used. The ranking were also included in the table which shown the highest and the lowest ranking based on each indices used.

**Table 1 - The evaluation of edible plants using four indices**

Scientific name	Vernacular name	Indices				Ranking			
		FC	f	CI	CFSI	FC	f	CI	CFSI
<i>Artocarpus lanceifolius</i>	Keledang	47	0.553	0.059	19.036	5	5	3	14
<i>Artocarpus rigidus</i> Blume.	Tempunik	25	0.294	0.059	13.500	10	10	3	16
<i>Carica papaya</i>	Pokok Betik	64	0.753	0.176	2240.000	3	3	1	3
<i>Champereia manillana</i> (Blume) Merr.	Cemperai	27	0.318	0.059	64.800	9	9	3	11
<i>Diplazium esculentum</i>	Paku pakis	80	0.941	0.059	960.000	2	2	3	5
<i>Durio zibethinus</i> L.	Durian	41	0.482	0.059	147.600	6	6	3	8
<i>Elettariopsis curtisii</i> Baker.	Semomok	37	0.435	0.059	79.920	8	8	3	10
<i>Garcinia mangostana</i>	Manggis	20	0.235	0.059	16.200	13	3	3	15
<i>Ipomea batatas</i>	Keledek	55	0.647	0.059	2695.0	4	4	3	2
<i>Manihot esculenta</i> Crantz	Ubi Kayu	85	1	0.059	4165.0	1	1	3	1
<i>Musa acuminata x balbisiana</i> cv. Awak	Pisang saba	20	0.235	0.059	145.800	13	13	3	9
<i>Musa</i> sp.	Pisang Boyan	20	0.235	0.118	360.000	13	13	2	7
<i>Nephelium cuspidatum</i> Blume var. <i>eripetalum</i> (Miq.) Leenh.	Motan gabang	23	0.271	0.059	20.700	12	12	3	13
<i>Ocimum tenuiflorum</i> L.	Kemangi (Holy Basil)	24	0.282	0.118	38.610	11	11	2	12
<i>Pytirogramma calomelanos</i> L.	Paku perak	80	0.941	0.059	864.000	2	2	3	6
<i>Stenochlaena palustris</i> (Burm.f.) Bedd.	Paku merah	80	0.941	0.059	1280.000	2	2	3	4

Note: \*FC=Frequency of citation, f=utilization frequency, CI=Cultural importance index, CFSI=Cultural food significance index

### 4. Discussion and Conclusion

Based on the number of informants that were interviewed in Tanah Gembur village, it shows that *Manihot esculenta* Crantz was the most utilized plants according to the value of utilization frequency index, where all of the 85 respondents mentioned this plant. Ubi kayu or cassava was the most utilized edible plant in Temuans' diet because it was much tastier than other plants. Compared to wild type, domesticated cassava will be harvested early before reaching mature stage. Usually, this pre-harvesting method can negatively impacts the taste, which make the wild cassava more testier than the cultivated (Van Oirschot et al., 2000). Moreover, cassava plants can survived well in tropical region, which make they highly accessible as they can be found at the roadside and surrounding of Temuans houses.

From Table 1, the edible plant with high CI value was *Carica papaya* with 0.176. Based on the interview sessions, *Carica papaya* or betik mosly used as vegetable, where the young and tender leaves were picked and cooked as their daily food. In addition, due to its accessibility most of the villagers used this plant not only in their diet but also as one of the cultural importance value for their community. Moreover, *Carica papaya* has been used as functional food due to its high vitamins and medicinal property for good health system. Temuan community believed that the leave of *Carica papaya* can be used to treat Malaria fever (Ong et al., 2011).

Edible plants with high CFSI values had different ranks from those with high CI values based on Table 4.3. The highest CFSI value among the edible plants was *Manihot esculenta* Crantz. with 4165 value of CFSI, which means the

species were the most preferable by the villagers in all aspects of its attributes such as its availability, the multiple use of this plants and also the taste appreciation of this species.

Most of the respondents agreed that they were preferred to consume wild edible plants rather than cultivated species. The community also agreed that their younger generation also preferred to eat the wild edibles instead of the cultivated ones. These was because for them wild edible plants were much tastier than cultivated species. However, there were wild edible plant species which hard to be accessed and have its own seasons. Therefore, for those edible plants that have limited availability were not being able to be consumed such as *Champereia manillana* (Blume) Merr. In addition, there were also some of the traditional ways of cooking edible plants have not been practicing anymore in this modern era because of its difficulty to be practiced like *Artocarpus lanceifolius*. Our results indicated that the younger generation of Temuans does not really know much about wild edible plant species instead they were more preferred to buy cultivated species compared to the olders who were much prefer collecting the wild edibles species.

Temuan community in Gunung Ledang Johor National Park which specifically at Tanah Gembur village still preserving their traditional knowledges about edible plants in both cultivated and wild plants, even though there were rapidly changes of culture as local traditions competed with modern lifestyles. Ethnobotanical knowledges that were recorded in this study suggested a potential approach towards conserving the vast knowledges of Temuans community regarding the uses of edibles plants. Moreover, edibles plants that were recorded from this study can be domesticated for the preparation of the future outbreak and food security issues.

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