



## Traditional Usages of Taro (*Colocasia* spp.) by Ethnic Communities in Borneo

✉ Linda Oktavianingsih<sup>1</sup>, E. Suharyanto<sup>3</sup>, Budi Setiadi Daryono<sup>2</sup>, Purnomo<sup>4</sup>

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<sup>1</sup>Postgraduate, Faculty of Biology, Gadjah Mada University, Indonesia

<sup>2</sup>Laboratory of Genetics and Breeding, Faculty of Biology, Gadjah Mada University, Indonesia

<sup>3</sup>Laboratory of Plant Structure and Development, Faculty of Biology, Gadjah Mada University, Indonesia

<sup>4</sup>Laboratory of Plant Systematics, Faculty of Biology, Gadjah Mada University, Indonesia

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### Abstract

Borneo has a wealth of various flora, including the Aroids (Araceae). Taro is one of the Aroids that cultivated and used as food crop since a long time ago by the people in Borneo. This study aimed to determine the utilization of Taros traditionally by several ethnic communities in Borneo. The research used Survey Explorative Method with Direct Interview Technique in the field. Taro samples were taken from various habitats of Banjar, Dayak, Kutai, Malay, Bugis, Toraja and China ethnic. The results showed that Taro species widely used are : *Colocasia esculenta* var. *esculenta* and var. *antiquorum*, *Colocasia affinis* and wild of *Colocasia esculenta*. *C. esculenta* var. *esculenta* and var. *antiquorum* is used as subsistence food crop and vegetables. Besides, it is used as medicine such as high blood pressure lowering and for consumption of diabetics. Parts of the plants consumed include leaves, petiole, corm and stolon. *C. affinis* is used as ornamental plants of the home garden, while wild *C. esculenta* is used as animal fodder. Taro in Borneo have a considerable variation of traditional cultivars and vernacular names. Fifty eight traditional cultivars from 5 different habitat to be used by some ethnics.

### How to Cite

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✉ Correspondence Author:

Jl. Teknik Selatan, Sekip Utara, Sinduadi, Mlati, Sleman, Yogyakarta 55281

E-mail: [oktavianingsihlinda@yahoo.com](mailto:oktavianingsihlinda@yahoo.com)

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## INTRODUCTION

Borneo or Kalimantan is one of the largest archipelagos in the Asia Pacific region. Borneo Island is divided into 3 countries namely Brunei, Malaysia and Indonesia. The largest part of the Island belongs to Indonesia and is commonly known as Kalimantan (Galapphatie et al., 2014). Borneo Island is inhabited by three native ethnic communities: Dayak, Kutai and Banjar. These people have used resources sustainably based on their traditions and knowledge. In addition, Borneo also has ethnic immigrant people such as Bugis, Toraja, Malay and other ethnicities.

The Island of Borneo has the richest Aroids in the world (Boyce et al., 2010). One of the Aroid (Araceae) groups that is useful as an important food crops of the world is Taro. *Colocasia spp* especially *Colocasia esculenta* (L.) Schott is one of the many widely cultivated Taros in the tropics and sub tropics (Nath et al., 2015 ; Naidoo et al., 2015). In Southeast Asia, Taro was previously a plant widely grown in areas that are currently dominated by rice (Blench, 2012). According to Rao et al., (2010) Southeast Asia region is considered as a place of Taro domestication for the first time.

The highest Taro diversity in the world is presumably found in Indonesia (Lebot & Aradhya, 1991 ; Kreike et al., 2004 ; Prana, 2007) because Indonesia is one of the areas of Taro origin. This diversity can be seen in areas where Taro is widely cultivated as in Java, Sumatra, Sulawesi and Borneo (Prana & Kuswara, 2002). However, the large diversity of Taro has not been supported by the availability of complete information about the utilization by the local community.

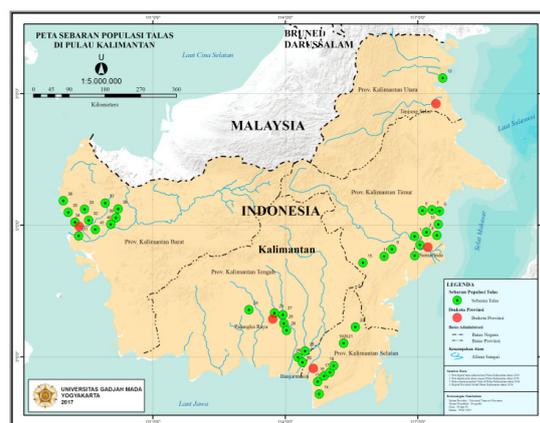
There are only few recorded ways of planting and utilizing Taros. Information about the genetic diversity of Taros and their use by farmers in an area is very important to be preserved and necessary for the management of genetic diversity of Taros (Jianchu et al., 2001). According to Liu et al., (2014) the traditional knowledge about Aroid plant groups is getting less. The documentation on traditional knowledge and use of Aroid plants including Taro is a very important value.

Knowledge of the plant group of Aroid (Araceae) is still needed by community. Although the cultivation of *C. esculenta* has been going on for more than 1700 years, the use of this plant as medicine has not been widely known and limited to some areas (Liu et al., 2014). In Borneo, although traditional Taro cultivation has existed for a long time, the information about Taro utilization is still very limited. In an effort to realize

food security and food crop diversification program, Taro is definitely one of the plants to be reckoned with (Prana & Kuswara, 2002). The utilization of Taros is sometimes also closely related to the culture of the population of a region, so this plant is very important for communities life (Walujo, 2011). As stated by Iskandar & Iskandar (2017), it has strong relation between socio-cultural aspects, the local community and managing and maintaining biodiversity. In the case of a crop like Taro, how farmers use and manage diversity is important for the conservation of its genetic resources. Based on this, it is necessary to do a research to find out the traditional utilization of Taros by some ethnic societies in Borneo.

## METHODS

The study was conducted from February 2016 to June 2016. Taro samples were taken from various habitats of Banjar, Dayak, Kutai, Malay, Bugis, Toraja and Chinese ethnic (Figure 1). Those areas include province of North, East, South, Middle and West Borneo.



**Figure 1.** The location of Taro sampling in Borneo island.

The research used Explorative Survey Method with Direct Interview Technique in field (Walujo, 2004). This method was used to inventory the known biodiversity of the community where the research was conducted. The interviews were conducted involving 75 respondents. The response was consisting of 20 peoples of Banjar, 24 peoples of Dayak, 6 peoples of Kutai, 2 peoples of Bugis, 2 peoples of Toraja, 2 peoples of Java, 15 peoples of Malay, 2 peoples of Madura, and 2 Chinese peoples. Two of the respondents were farmers of Taro and 73 were local communities.

Field notes were made along the way con-

taining habitat, location using GPS (Global Positioning Satellite), vernacular names, species or traditional cultivar and uses of Taro as well as picture for documentation. Note of the locations used GPS conducted in places where there was a Taro population. All data such as latitude, longitude and altitude were recorded with Garmin 62 Sc. Data analysis was done descriptively based on the field interview result with tables and pictures. Quantitative analysis was done by calculating the percentage of utilization of Taro plant parts.

## RESULTS AND DISCUSSION

The spreading of Taro in Borneo is quite wide and is found in most of the province in Borneo. Taros grow in swamp areas, the margin of paddy fields and ditches, home garden, orchard, the edges of the highways and other natural habitats. The condition of Borneo Island located in the tropics allows Taros to grow and develop well. According to Lebot & Legendre (2015) Taros can grow well throughout the wet tropics.

Taros belong to a group of tuber crops that have been known and cultivated for a long time by people living in Borneo. According to MacKinnon (2000) the people of Borneo have known Taro plants since they discovered and could processed iron ore. With tools made from ore, the forest has become easier to be opened, so the people have been able to grow rice and Taros on the land. Tuber cultivation along with the cultivation of fruit crops is considered the oldest form of cultivated plant in Borneo.

Based on the field interviews both men or women have same knowledge about Taro plants. The respondents consisted of 39 woman, 36 man and generally aged 30-60 years. There were housewife, employees, private and farmers.

The people of Kalimantan consume Taro as a subsistence food crops, vegetable crops, medicine or used for other purposes. In Indonesia the presence and expansion of cultivated and food crops such as maize and tubers have been pushing the existence of Taros as a food crop in some areas. This causes Taros currently only to be a subsistence food crop. Chotimah et al., (2011) has stated that a Taro in Borneo is one of indigenous vegetable crops. Indigenous vegetables are often referred to as local vegetables, which are native vegetables of the region and have long adapted and are known by people in a particular location. In many countries according to Matthews et al., (2012) Taro leaves are used as one of the vegetables consumed by the community.

Taro species that widely used in Borneo

are *Colocasia esculenta* both variety of *esculenta* and *antiquorum*. *C.esculenta var. esculenta* is the most widely found. According to Purseglove (1972) and Prana (2007) *C. esculenta var. esculenta* is a variety of Taros that commonly found in Indonesia and tropical region, while *var. antiquorum* is a Taro derived and cultivated in temperate climates such as China and Japan. The tropical cultivars produce large central corms with relatively few side corms, and the temperate cultivars produce many small side corms from a small central corm. The variation of the varieties owned by each type of plants is a priceless source of germplasm for the benefits of development of local food resources and for the development of science (Waluyo, 2011).

Taros in Borneo have a large number of traditional cultivars and vernacular names. In this research fifty eight cultivars from 5 different habitat are used to be by some ethnics (Table 1). According to Lebot et al., (2004) in the worldwide there are thousands of Taro cultivars growing from *C. esculenta var. esculenta* and *var. antiquorum*. The diversity of Taro cultivars can be seen based on variations of morphological characters such as corms, stolons, leaves, and flowers.

In some areas such as in Hulu Sungai Utara and Kapuas Region species of *Colocasia affinis* is found. This Taro is used as ornamental plant in home garden by the Banjar and Dayak ethnic in the provinces of South Borneo and Central Borneo (Figure 2a). According to Matthews & Medhi (2014) *C. affinis* is the result of hybridization of other Taro species. The characteristics of this Taro is a black spot on leaf surface. The wild of *Colocasia esculenta* have been found in Samarinda and Muara Badak (East Borneo), Landak and Sanggau regencies (West Borneo). The parts used are leaves and petioles as animal fodder especially pigs by Toraja and Dayak ethnic (Figure 2b). It is processed by boiling first before mixed with other feed ingredients. The purpose of the boiling process is to reduce the acidity. As state by Bradbury & Nixon (1998) the edible aroids and other genera of Araceae contain needle-like calcium oxalate raphides which have been implicated as a cause of acidity.

Wild Taros are also consumed by the community but with a special treatment to relieve acidity. According to Matthews (2010) wild Taros in Asia and the Pacific have relatively little carbohydrate content, long stolons and acid. In Indonesia wild Taros have long and many stolon characteristics, relatively small corm and high flowering ability (Prana & Kuswara, 2002). According to Matthews et al., (1992) ; Jianchu et al., (2001) Matthews & Naing (2005) ; the use of wild

**Tabel 1.** Traditional Taro cultivars and their utilization in Borneo

Ethnicity	Species	Traditional Cultivar	Habitats	Utilization/Part use	
Banjar	<i>C. esculenta</i>	Keladi Gunung	Orchard	Corm and leaves are consumed (sayur asam)	
		Keladi Sulur	Orchard	Stolon are consumed (sayur oseng)	
		Keladi Lais	Orchard	Corm are consumed	
		Keladi Akar	Orchard	Corm are consumed	
		Keladi	Margin	Stolon are consumed	
		Keladi	Margin	Corm, leaves, petiole and stolon are consumed	
		Keladi Liar	Swamp	Stolon are consumed	
		Keladi Putih	Margin	Corm, leaves, petiole and stolon are consumed	
		Keladi Liar	Margin	Corm, leaves, petiole and stolon are consumed	
		Keladi Telur	Orchard Orchard	Corm, leaves, petiole and stolon are consumed	
		Keladi	Orchard Orchard	Petiole and stolon are consumed	
		Keladi Hitam Ke-	Margin	Corm are consumed	
		ladi Putih Keladi	Home Garden	Corm are consumed	
		Hitam	Orchard swamp	Corm are consumed and used for diabetics	
		Keladi Hitam	Home Garden	Corm are consumed (sayur santan)	
		<i>C. antiquorum</i> <i>C. affinis</i>	Keladi Hutan	Swamp	Cormel, stolon are consumed
			Keladi Hias	Margin	Ornamental
Keladi Liar	Margin		Ornamental		
Kutai	<i>C. esculenta</i>	Talas Sayur	Orchard	Corm, leaves, petiole and stolon are consumed	
		Talas Hitam	Orchard	Corm are consumed (sayur asam)	
Dayak Pampang	<i>C. esculenta</i>	Keladi Putih	Home Garden	Corm are consumed	
		Talas Malaysia	Home Garden	Corm, leaves, petiole and stolon are consumed	
Dayak Benuaq	<i>C. esculenta</i>	Keladi	Orchard	Corm are consumed	
Dayak Malinau	<i>C. antiquorum</i>	Keladi Gunung	Margin	Corm, leaves, petiole and stolon are consumed	
		Talas Ungu	Margin	Corm are consumed	
Dayak	<i>C. esculenta</i>	Talas	Margin	Corm, leaves, petiole and stolon are consumed	
		Talas Putih	Margin	Corm and leaves are consumed	
		Talas Liar	Orchard	Animal fodder	
		Keladi Hias	Orchard	Ornamental	
		Talas Sayur	Orchard	Corm, leaves, petiole and stolon are consumed	
Dayak Katingan	<i>C. esculenta</i>	Kujang Bawa'	Orchard	Corm, leaves, petiole and stolon are consumed	
		Kujang Enyuh	Home Garden	Corm, leaves, petiole and stolon are consumed	
Dayak Kahayan	<i>C. esculenta</i>	Kujang Gahuri	Margin	Corm are consumed	
		Keladi Habang	Orchard	Corm, leaves, petiole and stolon are consumed	
Dayak Kalteng	<i>C. esculenta</i>	Keladi Hitam	Orchard	Animal fodder	
		Talas Malaysia	Orchard	Corm, leaves, petiole are consumed	
Dayak Aje	<i>C. esculenta</i>	Keladi Cina	Orchard	Corm, leaves, petiole and stolon are consumed	
		Keladi Mei	Swamp	Corm, leaves, petiole and stolon are consumed	
Dayak Kenelas	<i>C. esculenta</i>	Keladi Mei Hitam	Orchard	Animal fodder	
		Keladi Madura	Swamp	Corm are consumed	
Dayak Ahe	<i>C. esculenta</i>	Keladi Sayur	Swamp	Corm, leaves, petiole and stolon are consumed	
		Keladi Tikus	Swamp	Animal fodder	
Melayu	<i>C. esculenta</i>	Keladi Cina	Orchard	Corm, leaves, petiole and stolon are consumed	
			Margin	Petiole for blood pressure (medicine)	
		Talas Manis	Margin	Corm, leaves, petiole and stolon are consumed	
		Keladi Liar		Corm and stolon are consumed	
		Keladi Bangkok	Orchard	Corm, leaves, petiole and stolon are consumed	
			Orchard	Petiole for blood pressure (medicine)	
		Talas Merah	Orchard	Corm are consumed	
		Talas Putih	Home Garden	Corm, leaves, petiole and stolon are consumed	
		Keladi Minyak	Margin	Corm, leaves, petiole and stolon are consumed	
		Keladi Udang	Margin	Corm and leaves are consumed	
		Keladi Liar		Animal fodder	
		Bugis	<i>C. esculenta</i>	Keladi Hitam	Margin
	Cultivation			Corm for diabetics	
Madura	<i>C. esculenta</i>	Talas Malaysia	Cultivation	Corm are consumed	
		Talas Hitam	Home Garden	Corm, leaves, petiole and stolon are consumed	
Jawa	<i>C. esculenta</i>	Talas Kelapa	Margin	Corm are consumed	
		Talas Bentul		Corm, leaves, petiole and stolon are consumed	
Cina	<i>C. esculenta</i>	Talas Liar		Corm, leaves, petiole and stolon are consumed	
		Talas Hutan/		Animal fodder	
Toraja	<i>C. esculenta</i>	Manis	Orchard	Corm, leaves, petiole and stolon are consumed	
		Keladi	Orchard	Corm, leaves, petiole and stolon are consumed	
		Keladi	Margin	Animal fodder	

Taros as foodstuff and fodder spreads throughout Southeast Asia and East Asia.

#### Utilization of Taros by the Banjar ethnic

Taro among the Banjar ethnic is known by the name of *Keladi*. Some traditional cultivars of

Taro utilized : Keladi Gunung, Keladi Sulur, Keladi Lais, Keladi Akar, Keladi Hitam, and Keladi Telur. The corm of Keladi Gunung, Keladi Akar and Keladi Lais are consumed as vegetables that cooked as Sayur Asam and Sayur Santan. Besides, Keladi sulur consumed for the stolon that

spread for vegetable food “oseng sulur” while the corms are not eaten because rather itchy (Figure 3a and 3b). A bunch of Keladi Sulur is sold five thousands rupiah in traditional markets known as the night market. This market activity usually occurs at night (Figure 4d). According to Matthews (2010) stolon, in China and Southeast Asia, is generally consumed but only used on a small scale. Keladi Gunung, Lais, Sulur and Akar are cultivated by people in shaded orchard and swamp.

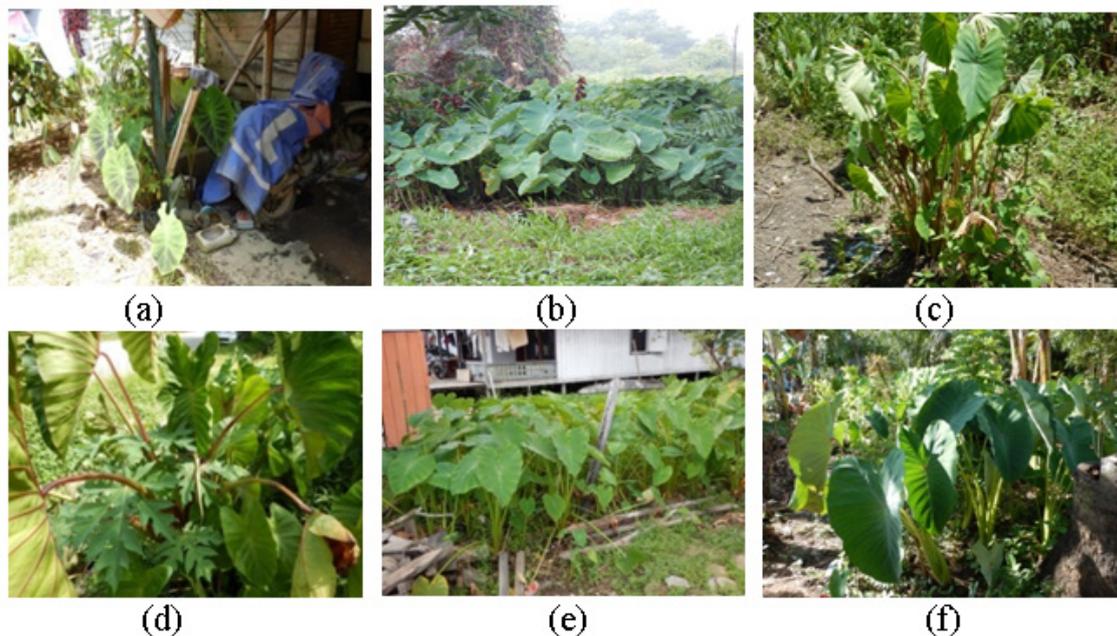
The cultivar of Keladi Gunung is sometimes referred to as “red Taro” because it has pink tuber flesh by Banjar ethnic in Central Borneo. It is usually processed into “sayur asam” mixed with other vegetables (Figure 3c). The vegetable is popular among Banjar ethnic communities in this region and it is usually available everyday at Banjar traditional food stalls in Borneo. In Tambak Anyar Hilir village, the cultivar part of talas Hutan consumed is cormel along with stolons. While the cultivar of Keladi Putih has a characteristic white corm that consumed, Keladi Telur cultivar has a leaf shape like eggs (Figure 2f). All parts of this Taro - corm, leaves, petioles, and stolon can be consumed.

Banjar ethnic communities have traditional cultivar of Talas Hitam used for consumption of diabetics. The used a white tuber for carbohydrate sources. According to Aprianita (2014) Indonesia has many traditional tuber plants that contain carbohydrates and are potentially used in diets to reduce the risk of obesity, heart attack and diabetes.

### Utilization of Taros by Kutai ethnic

Kutai communities know Taros as a vegetable food ingredient. Taro is generally processed into Sayur Kuning using a mixture of coconut milk (Figure 3f) and Sayur Talas is mixed with pineapple (Figure 3e). Plant parts used are corm and petioles. Taro cultivars consumed and utilized are Keladi Putih, Keladi Hitam and Talas Sayur. The corms, leaves and petioles of Taro are used as a vegetable and considered as a rich source of carbohydrates, proteins, minerals and vitamins (Sharma, 2008). According to the Kutai ethnic community in the Perian village of West Kutai regency, the corm of Talas Putih has a soft texture and are single corm. In addition to the use of coconut milk, this vegetable is mixed with other vegetables such as eggplants, sour and others (Figure 3d). According to Brennan (2000) along the Pacific Islands, Taro are processed using coconut milk and other spices.

In East Kutai Regency, the people of Kutai ethnic used Talas Sayur that is generally consumed by community if this Taro is available and sold in traditional market. According to information from the community, the leaves, petiole, corm, and stolon can be consumed. As state by Matthews (2004) different cultivars are used in different ways and preserving culinary knowledge is important for preserving genetic diversity in Taro. This Taro grows on the margin of the ditches and on the sides of the highways. Although not cultivated clearly, Taro are widely found and some Taro types are particularly well adapted to difficult land and soil. According to Quero-garcia



**Figure 2.** Some species and cultivars of Taro (a). *C. affinis* (b). *C. esculenta* wild (c). Keladi Gunung (d). Keladi Udang (e). Talas Malaysia (f). Keladi Telur

(2010) Aroid plant group includes minor crop plants but are a staple food in tropical developing countries. Taros are cultivated as a home garden plants or simple farming system with few results.

**Utilization of Taros by Dayak ethnic**

Among Dayak Kahayan ethnic located in Central Borneo, Taro are known as Kujang. The traditional cultivars that are used by this ethnic include Kujang Bawa ‘/ Buah, Kujang Enyuh and Kujang Gahuri.

Talas “Malaysia” according to ethnic Dayak Pampang in East Borneo comes from Malaysia brought and cultivated by their ancestors in Borneo decades ago (Figure 2e). In Sanggau regency of West Borneo, Talas Malaysia cultivars was brought by workers returning from Malaysia and then planted by residents around the orchard. Ethnic Dayak Aje utilizes Malaysia Taros as “sayur asam pedas”. All the parts of Taro can be consumed except stolons and corm have a sweet taste.

Keladi Gunung cultivars used by Dayak Benuaq ethnic morphologically are different from those used by Banjar ethnic (Figure 2c). Keladi Gunung of The Dayak ethnic have a reddish petiole with many corms (*C. esculenta* var. *antiquorum*), whereas those of Banjar ethnic have green petiole and single corm (*C. esculenta* var. *esculenta*). In addition, there is also a cultivar Keladi that can be consumed and grown under the house of Dayak people (Figure 4b).

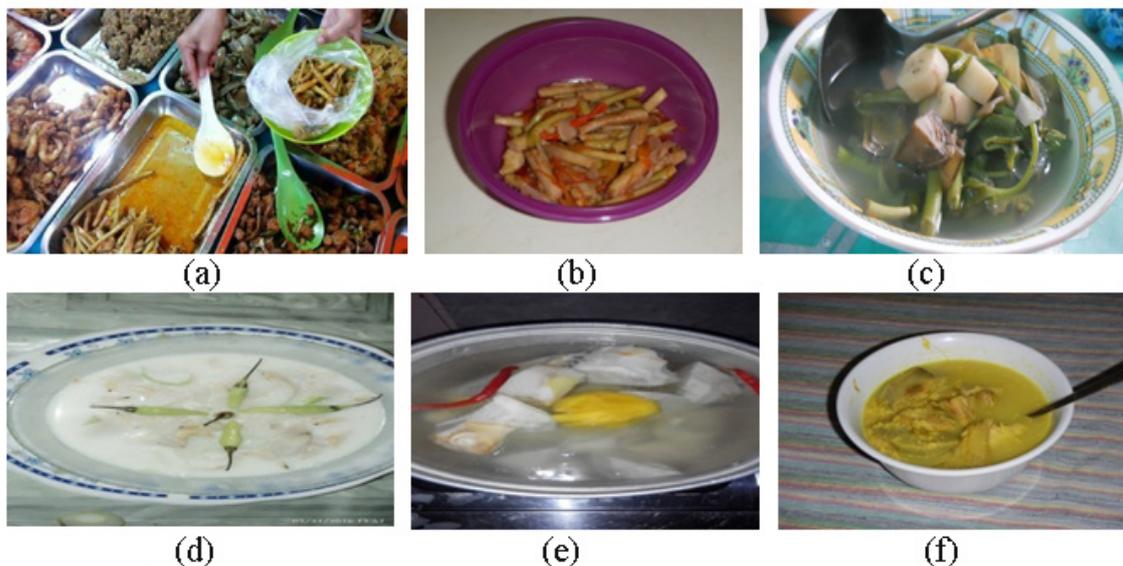
In Central Borneo Dayak Katingan utilizes Talas Sayur cultivar for consumption and stolon is the most delicious part of this cultivar. Meanwhile, Dayak Kahayan knows traditional cultivars

of Kujang Bawa ‘, Kujang Enyuh and Kujang Gahuri. Within one community or country, the two kinds of diversity are not necessarily correlated. A single cultivar can be used in many different ways, and more than one cultivar can be used in the same way (Matthews, 2004). Kujang Gahuri usually consumed during the dry season because the corms are not too watery and taste better. To reduce the acidity that arises when consuming Taros, the people of Dayak Kahayan process it by boiling and the boiling water should first be discarded. According to FAO (1990) the acidity that arises at the time of consuming Taro can be removed by boiling Taros first.

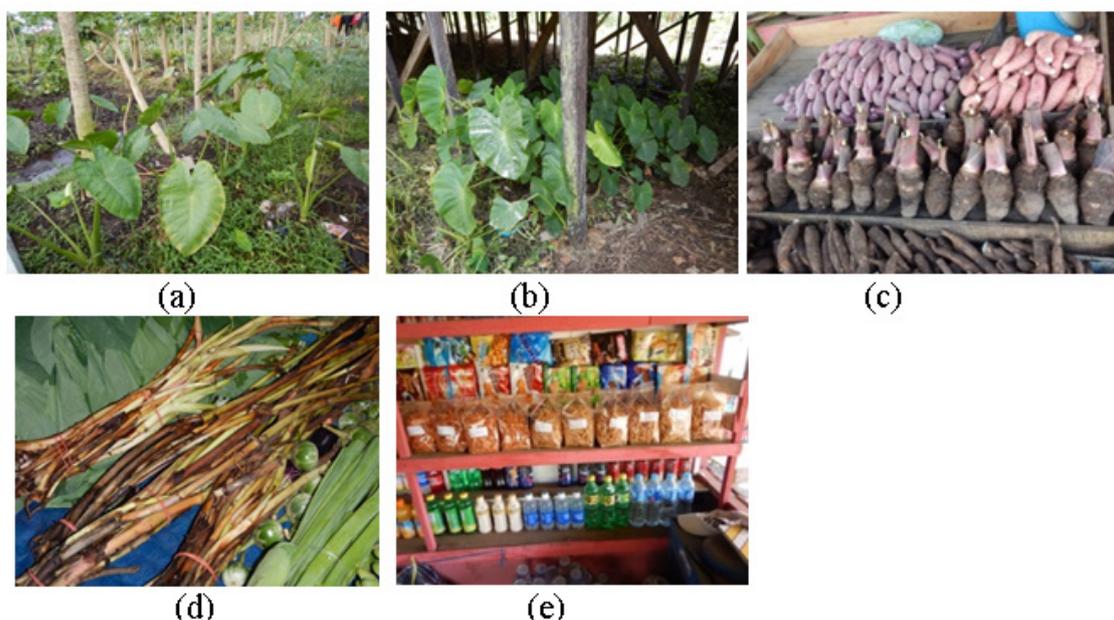
Talas Hitam is one of the traditional cultivars known by the Dayak Kenelas ethnic group (Figure 4f). This Taro can not be consumed and is only used for pig fodder which is kept around the community’s residence. According to Matthews (2010) the overall utility of Taros is sometimes unknown by the people who utilize this plant, even in areas where Taro cultivation has long been done. Besides, Dayak Kenelas also recognizes Keladi Cina and Keladi Mei cultivar that can be consumed.

**Utilization of Taros by the Bugis ethnic**

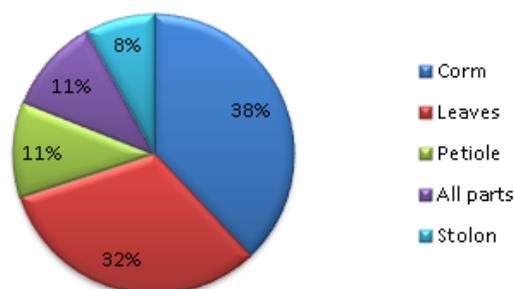
One of the traditional Taro cultivars utilized by the Bugis ethnic is Keladi Hitam. This Taro grows in the orchard, margin of the rice fields in a relatively dry area. All parts of plants such as leaves, petiole and corm are consumed. The most commonly used part is the corm and has a very tender flavor. The corms are usually consumed and used for diabetics similar to cultivars known by the Banjar ethnic group. The corms was boiled



**Figure 3.** Traditional vegetables food made of Taros (a) and (b). oseng sulur (c). sayur asam (d) sayur santan (e) sayur talas (f) sayur kuning



**Figure 4.** Cultivation, Taro products (a). Cultivation of Talas Kelapa (b). Taro under a house of ethnic Dayak Benuaq (c). Corm (d) stolon in night market (e) snack made from Taro.



**Figure 5.** Percentage of utilization of Taro parts by community

first and then consumed as substitute for rice. According to community intensive consumption is still not known for certain and just for substitute rice. Englberger (2013) state that Taro has a high carotene content, especially the yellow corms and beneficial to ward off chronic diseases such as cancer, heart attack and diabetes

In North Borneo province, Taro cultivars utilized by the Bugis community are Talas Malaysia. The part consumed is the corm while the other parts are underutilized. According to information obtained Talas Malaysia corms can be consumed if not stepped on by livestock. The corms that have been stepped by livestock are not consumed because they will be itchier.

#### Utilization of Taro by the Malay ethnic

Traditional Taro cultivars utilized by ethnic Malays include: Keladi Bangkok (Malaysia Taro), Talas Merah, Talas Putih, Talas Manis, Keladi Minyak, and Keladi Udang. The young

plants of Keladi Bangkok cultivars are all consumed, but old plants cannot be used because they can cause itching when consumed. According Akpan & Umoh (2004) Taro consumption often causes acidity causing irritation and burning on the skin and mouth. The acidity is thought to be due to the calcium oxalate crystals found on Taros directly in contact with skin (Kaushal, 2015). In addition to food, Keladi Bangkok cultivars can also be used as medicines especially petiole to lower blood pressure. Processing by way of the petiole boiled first and then consumed. In the province of Lampung, the part of Taro plants used as medicines is a leaf that serves as a wound medicine for the community (Utami & Asmaliyah, 2010).

Talas Merah cultivar corms are consumed more than unused petiole because they are rather itchy. This cultivar has morphologically pink tubers, roots, and stolons. The corms are better grown in a wet soil environment, whereas in dry

soil corms have a rather hard texture. Unlike Talas Merah cultivars, Talas Putih cultivars or Talas Cina have white tubers, stolons, and roots. Tubers and young petiole can be consumed. In addition, Keladi Minyak cultivar was discovered. This cultivar has a corm that is tenderer, not itchy and tastier. It is usually cooked by boiling and added coconut milk or made into Sayur Bening. According to Ghani (1982) the most economically important and widely grown variety in Malay Peninsula region is Keladi China, besides, the well-known Taros are Keladi Minyak and Keladi Udang. In Sanggau district, people give the name of Keladi Udang due to the red leaf bone and petiole like shrimp skin (Figure 2d).

In West Borneo, there is a Taro intensive cultivation area on Jl. Soekarno-Hatta. The cultivated Taro is the Talas Kelapa and the Talas Hitam cultivar (Figure 4a). The crops are generally shipped out of areas such as Java and Jakarta. Taro corm commodity prices are relatively high at 15-20 thousand/kg (Figure 4c). The people process them into Taro snack that becomes typical souvenirs of West Borneo (Figure 4e). In the eastern part of Indonesia, the corms are used as a staple food, while the people in the rest of the country use the corms as a raw material for animal feed and snacks (Kumoro et al., 2013). Cultivation of Taro in this area is done by the immigrant community from the island of Java, especially Madurese who become migrant farmers in West Borneo. According to Rao (2010) Taro plants in cultivation are managed by farmers and their genetic resources are maintained under the control of local communities.

Species and utilization of Taro parts by ethnic communities in Borneo varies widely and differently (Figure 5). For species of Taro consumed, the community utilizes *C. esculenta* both var. *esculenta* and var. *antiquorum*. The most widely used parts are the corms of 38% and leaves 32%, while the petiole as well as all the Taro parts is as much as 11%. The least utilized part is stolons by 8%. Quero-Garcia (2010) state that Taro are mostly consumed for their corms and cormels but leaves and petioles can also be part of the diet.

## CONCLUSIONS

The Taros used by some ethnic communities consist of *C. esculenta* var. *esculenta* and var. *antiquorum*, *C. affinis* and wild of *C. esculenta*. *C. esculenta* var. *esculenta* and var. *antiquorum* is used as subsistence food crops and vegetables, *C. affinis* is used as ornamental plants, and wild *Colocasia esculenta* is used as animal fodder. There are fif-

ty eight traditional cultivars Taros used by some ethnic in Borneo. Keladi Hitam cultivars are used by diabetics as a source of carbohydrates and Keladi Putih and Keladi Bangkok are used as blood pressure-lowering drugs. The most widely used Taro parts are corm.

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## REFERENCES

- Akpan, E. J., & Umoh, I. B. (2004). Effect of heat and tetracycline treatments on the food quality and acidity factors in cocoyam [*Xanthosoma sagittifolium* (L.) Schott]. *Pakistan Journal of Nutrition*, 3(4), 240-243.
- Aprianita, A., Vasiljevic, T., Bannikova, A., & Kasapis, S. (2014). Physicochemical properties of flours and starches derived from traditional Indonesian tubers and roots. *Journal of food science and technology*, 51(12), 3669-3679.
- Blench, R. M. (2012). Irrigated Taro (*Colocasia esculenta*) in the Indo-Pacific Biological, Social and Historical Perspectives, Senri Ethnological Studies 78: *Vernacular Names for Taro in the Indo-Pacific Region: Implication for Centers of Diversification and Spread*. National Museum of Ethnology. Osaka.
- Boyce, P. C., Wong, S. Y., Ting, A. P. J., Low, S. E., Low, S. L., Ng, K. K & Ooi, I. H. (2010). The Araceae of Borneo-The Genera. *Aroideana*, (33), 3-73
- Bradbury, J. H., & Nixon, R. W. (1998). The acidity of raphides from the edible aroids. *Journal of the Science of Food and Agriculture*, 76(4), 608-616.
- Brennan, J. (2000). *Tradewinds & Coconuts: A Reminiscence & Recipes from the Pacific Islands*. Boston: Periplus.
- Chotimah, H. E. N., Kresnanita, S. & Miranda, Y. (2011). Seminar Nasional Reformasi Pertanian Terintegrasi menuju Kedaulatan Pangan: *Studi Etnobotani Sayuran Indigenus (Lokal) Kalimantan Tengah*. Madura: Fakultas Pertanian Universitas Trunojoyo
- Englberger, L., Schierle, J., Marks, G. C., & Fitzgerald, M. H. (2003). Micronesian banana, Taro, and other foods: newly recognized sources of provitamin A and other carotenoids. *Journal of Food Composition and Analysis*, 16(1), 3-19.
- Galappathie, S., Palombo, E. A., Yeo, T. C., Ley, D. L. S., Tu, C. L., Malherbe, F. M., & Mahon, P. J. (2014). Comparative antimicrobial activity of South East Asian plants used in Bornean folkloric medicine. *Journal of Herbal Medicine*, 4(2), 96-105.
- Ghani, F. D. (1982). The Status of Keladi China *Coloca-*

- sia Esculenta* (L.) Schott Cultivation in Peninsular Malaysia. *International Symposium on Tropical Root and Tuber Crops*. Philippine.
- Iskandar, J. & Iskandar, B. S. (2017). Various Plants of Traditional Rituals: Ethnobotanical Research Among The Baduy Community. *Biosaintifika: Journal of Biology & Biology Education*, 9(1), 114-125.
- Jianchu, X., Yongping, Y., Yingdong, P., Ayad, W. G., & Eyzaguirre, P. B. (2001). Genetic diversity in Taro (*Colocasia esculenta* Schott, Araceae) in China: An ethnobotanical and genetic approach. *Economic Botany*, 55(1), 14-31.
- Kaushal, P., Kumar, V., & Sharma, H. K. (2015). Utilization of Taro (*Colocasia esculenta*): a review. *Journal of Food Science and Technology*, 52(1), 27-40.
- Kreike, C. M., Van Eck, H. J., & Lebot, V. (2004). Genetic diversity of Taro, *Colocasia esculenta* (L.) Schott. in Southeast Asia and the Pacific. *Theoretical and applied genetics*, 109(4), 761-768
- Lebot, V. & Aradhya, K. M. (1991). Isozyme variation in Taro (*Colocasia esculenta* (L.) Schott.) from Asia and Oceania. *Euphytica*, 56(1), 55-66
- Lebot, V., Prana, M. S., Kreike, N., van Heck, H., Pardales, J., Okpul, T., Gendua, T., Thongjiem, M., Hue, H., & Yap, T. C. (2004). Characterisation of Taro (*Colocasia esculenta* (L.) Schott) genetic resources in Southeast Asia and Oceania. *Genetic Resources and Crop Evolution*, 51(4), 381-392.
- Lebot, V. & Legendre, L. (2015). HPTLC screening of Taro hybrids (*Colocasia Esculenta* (L.) Schott) with high flavonoids and antioxidants contents. *Plant Breeding*, 134(1), 129-134
- Liu, B., Liu, Y., Cao, W., Zhang, S., Liu, Z., Ni, Y & Li, F. (2014). Ethnobotany of Medicinal Aroids in Xishuangbanna, Yunnan Province, China. *Aroidiana*, 37(2), 69-78
- MacKinnon, K., Hatta, G., Halim, H. & Mangalik, A. (2000). *The ecology of Kalimantan. The ecology of Indonesia Series III*. Singapore: Periplus Editions (HK) Ltd.
- Matthews, P. J. (2004). Genetic Diversity in Taro and the Preservation of Culinary Knowledge. *Ethnobotany Research and Applications*, 2, 55-71
- Matthews, P. J. & Naing, K.W. (2005). Notes on the Provenance and Providence of Wildtype Taros (*Colocasia esculenta*) in Myanmar. *Bulletin of the National Museum of Ethnology*, 29(4), 587-615.
- Matthews P. J. (2010). Ethnobotany and global diversity of Taro. In Rao, V.R., Matthews, P. J., Eyzaguirre, P. B. and Hunter, D. (Eds). *The Global Diversity of Taro ; An introduction to the history of Taro as a food*. Biodiversity International. Rome
- Matthews, P. J., Agoo, E. M. G., Tandang, D. N & Maludid, D. A. (2012). Ethnobotany and Ecology of Ethnobotany and Ecology of Wild Taro (*Colocasia esculenta*) in the Philippines: Implications for Domestication and Dispersal. *Senri Ethnological Studies* 78, 307-340.
- Matthews, P. J & Medhi, D. (2014). Feasibility Study for Field Research: Ethnobotany and Ecology of Wild and Cultivated Aroid in Assam State, Northeast India. *AREIPGR*, 30, 159-183
- Naidoo, K., Amonsou, E. O., & Oyeyinka, S. A. (2015). In vitro digestibility and some physicochemical properties of starch from wild and cultivated amadumbe corms. *Carbohydrate Polymers*, 125, 9-15
- Nath, V. S., Hegde, V. M., Jeeva, M. L., Misra, R. S., Veena, S. S., Raj, M., & Sankar, D. S. (2015). Morphological, pathological and molecular characterization of *Phytophthora colocasiae* responsible for Taro leaf blight disease in India. *Phytoparasitica*, 43(1), 21-35.
- Prana, M. S. & Kuswara. (2002). *Budidaya Talas: Diversifikasi untuk Menunjang Ketahanan Pangan Nasional*. Bogor: Medikom Pustaka Mandiri.
- Prana M. S. (2007). Studi Biologi Pembungaan pada Talas (*Colocacia esculenta* (L.) Scott. *Biodiversitas*, 9(1), 63-66
- Purseglove, J. W. (1972). *Tropical Crops: Monocotyledons*. London: Longman.
- Quero-García, J. (2010). Taro and Cocoyam. In Bradshaw, J. E. (Ed). *Root and Tuber Crops*, Handbook of Plant Breeding 7. Springer Science+Business Media.
- Rao R. V., Matthews P. J., Eyzaguirre P. B., & Hunter D. (2010). Ethnobotany and global diversity of Taro. In Rao, V.R., Matthews, P. J., Eyzaguirre, P. B. and Hunter, D. (Eds). *The Global Diversity of Taro ; Ethnobotany and Conversation*. Biodiversity International. Rome
- Ridley, H. N. (1905). The Aroid of Borneo. *Journal of the Straits Branch of the Royal Asiatic Society*, 4, 169-188
- Sharma, K., Mishra, A. K., & Misra, R. J. (2008). The Genetic structure of Taro: a comparison of RAPD and isozyme markers. *Plant Biotechnology Reports*, 2(3), 191-198.
- Utami, S. & Asmaliah. (2010). *Potensi Pemanfaatan Tumbuhan Obat di Kabupaten Lampung Barat dan Kabupaten Tanggamus Propinsi Lampung*. Lampung: Balai Penelitian Kehutanan.
- Walujo, E. B. (2004). *Pedoman Pengumpulan Data Keanekaragaman Flora: Pengumpulan data Etnobotani*. Bogor: Pusat Penelitian Biologi Indonesia
- Walujo, E. B. (2011). *Keanekaragaman Hayati Untuk Pangan*. Herbarium Bogoriense Pusat Penelitian Biologi Lembaga Ilmu Pengetahuan Indonesia. Kongres Ilmu Pengetahuan Nasional X. Jakarta.