



UNIVERSITI PUTRA MALAYSIA

***IDENTIFICATION OF COLOURING PLANT USED AMONG
THE ORANG ULU ETHNICS IN ASAP KOYAN BELAGA***

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**IDENTIFICATION OF COLOURING PLANT USED AMONG THE ORANG
ULU ETHNICS IN ASAP KOYAN BELAGA**

By

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**A Project Report Submitted in Partial Fulfillment of the Requirement for
Degree of Bachelor of Science Bioindustry in the
Faculty of Agriculture and Food Sciences
Universiti Putra Malaysia Bintulu Sarawak Campus**

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*Dedicated to my wonderful parent, family, friends,
and all the people of Orang Ulu ethnics in Apsap
Koyan Belaga. With Love...*

ABSTRACT

Orang Ulu consist of several ethnic that are very rich in culture life and artistic in society include used plant as a colouring. To know the specialty and unique of Orang Ulu society, one research have been done in two stages that include interview and survey to identify plant used. The interview and survey was conducted during the month of October, November and December 2008. Survey continued again on month of January, February, and March 2009 for about 5 days for every month. Information that has been record includes the plant scientific name, vernacular name, parts of plants used and distribution status of the plant. From the research, 51 species and 43 genus from 30 families and 7 colour that often used as a colouring plant by the Orang Ulu that live in Asap Koyan, Belaga are record. The most family that contribute colour are the Euphorbiaceae family. According to the research, findings that only the old groups still recognize this colouring plant. The old group state their anxious that the used of this natural colour will extinct in the future.

ABSTRAK

Orang Ulu terdiri daripada pelbagai etnik yang kaya dengan budaya hidup dan setiap daripada mereka turut memiliki keistimewaan menggunakan tumbuhan dalam menghasilkan warna. Bagi mengetahui keistimewaan dan keunikan masyarakat Orang Ulu ini, satu kajian dijalankan dalam dua peringkat iaitu temu ramah dan survei untuk pengecaman tumbuhan yang digunakan. Temu ramah dan survei dijalankan sepanjang bulan Oktober, November dan Disember 2008 dan seterusnya pada Januari, Februari dan Mac 2009 dengan mengambil tempoh masa selama 5 hari dalam setiap bulan. Data yang dikumpul meliputi nama saintifik tumbuhan, bahagian tumbuhan yang digunakan, nama tempatan dan status taburan tumbuhan tersebut. Hasil kajian mendapati terdapat 51 spesis dan 43 genus daripada 30 famili tumbuhan dengan 7 jenis warna direkodkan sebagai tumbuhan pewarna yang kerap digunakan oleh Orang Ulu di Asap Koyan, Belaga. Famili Euphorbiaceae merupakan famili tumbuhan yang paling banyak menyumbang kepada penghasilan warna. Hasil kajian turut mendapati bahawa hanya golongan tua yang mengenali tumbuhan pewarna ini. Kebimbangan juga telah diutarakan oleh golongan tua ini bahawa kemungkinan penggunaan warna semulajadi ini akan pupus pada masa akan datang.

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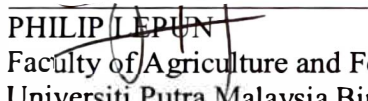
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Finally, I owe special gratitude to my family for continuous and unconditional support of all my undertakings, scholastic and otherwise. Last but not least, thank you for everything. I love you with all with all of my heart.

APPROVAL

I certify that this research project report entitled 'Identification of colouring plant used among the Orang Ulu ethnics in Asap Koyan Belaga' has been examined and approved as a partial fulfillment of the requirement for the degree of Bachelor Science Bioindustry in the Faculty of Agriculture and Food Sciences, Universiti Putra Malaysia Bintulu Sarawak Campus.


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LIST OF ABBREVIATIONS

Term	Explanation
cm	Centimetre
°C	Degree Celsius
DBH	Diameter at breast height
ft	Feet
km	Kilometre
m	Metre
mm	Millimetre
spp.	Species
sq	Square
WWF	World Wildlife Fund
%	Percent

CHAPTER I

INTRODUCTION

1.1 Background

Borneo that is the third largest island in the world, of which Sabah and Sarawak are parts, has been frequently acknowledged as one of the important centers of plant diversity in the world. The island, which occupies a total land area of approximately 740,000 sq. km, is conservatively estimated to harbour 10,000 - 12,000 species of flowering plants, representing about 5 - 6% of the world total. Of these, 40 - 50% is endemic to the island, and up to 80% of the endemic species in Borneo occur in Sabah and Sarawak (Thang, 1991).

Sarawak is rich in biodiversity. It belongs to one of the twelve world mega biodiversity regions. Its rainforest houses many species of flora and fauna. However, virtually all forest has been logged over at least once, and only around 5% or so is still primary forest. But such primary forest has an amazing biological diversity. Typically, one sq mile of such forest has more different tree species than all the species in Europe or North America (Eliot, 1999).

Many of the plants in the Sarawak rainforest are also highly valued for their medicinal properties. Plants and plant communities or the place where a variety of plants live together are very important to humans and their environment. Plants have great aesthetic value which means they add to the beauty of the places that humans live. Native grasses and wildflowers provide use with a link to human history (Eliot, 2000).

Throughout history plants have been of great importance to medicine. Eight percent of all medicinal drugs originated from wild plants. In spite of all the medicinal advances, only two percent of the world's plant species have been tested for their medicinal potential. The forest play a vital role in maintaining environment stability and quality; protecting soil and water resources; conserving biological diversity; and preserving cultural, recreational and other intrinsic values with enhance people's quality of life. Although some 3,000 species of plants have been used as food by humans, 90% of the world's food comes from only 20 plant species (Eliot, 1999).

Colours have been played an important purpose and role in a society life. Colouring plants can produce substances for used as dye or tanning. Orang Ulu ethnics in Sarawak have been used the colouring plant from earlist times for many purposes in their life. Orang Ulu ethnics extract the colour from the variety of plant sources. The Orang Ulu uses the colouring plant for many purposes such as dye especially for handicraft colour and culture such as textile, handicraft, bodypainting or tattoo.

The types of colour have their own meaning and purpose in the Orang Ulu culture. The Orang Ulu ethnics extract the colour from plant because it has a great meaning. For example is blackening the teeth using colouring plant. For this purpose, wood - tar from variety colouring plant of species are used (Lemmens and Wuljarni-Socjipto, 1992).

Other cultures that need them to using the colour are the tradition of bodypainting or tattoo. Most people in Sarawak were elaborately decorated with boldly designed tattoos depicting the story of their life experiences. The colours symbolize grandeur

and have been greatly appreciate of young people to the well - developed culture of their country.

The colouring plant is also important for handicraft colour. To make the handicraft product to be more beautiful and attractive, they use to colour their handicraft using the natural colouring plants (Junaidi Payne *et al*, 1992).

The Orang Ulu has traditionally made use of a large number of plants to produce a wide range of rich beautiful dyes. It is the dyers' ingenuity in making creative use of the different botanical resources available in their environment that has made Orang Ulu weavers renowned in this part of the world (Parrott, 1973).

1.2 Problem statement

Orang Ulu especially in Asap Koyan Belaga recipient many of physical and culture development parallel to the government approaches. The peoples in the area mostly depending on the fast materials available surround them.

1.3 Objective

1. To identify the colouring plants species used among the Orang Ulu ethnics in Asap Koyan Belaga.
2. To document the usage of the part of the colouring plant.

CHAPTER 2

LITERATURE REVIEW

2.1 Tropical Forest of Malaysia

Malaysia is well - endowed renewable natural tropical forest resources. The forests play a vital role in maintaining environmental stability and quality, protecting soil and water resources, conserving biodiversity, and preserving cultural, recreational and other intrinsic values which enhance people's quality of life (Backer *et al.*, 1963).

Malaysia has abundant plant life its coastal mangrove forest; in lowland tropical forest; and, at elevations over 3, 900 ft in mossy or montane oak forest. The country harbors an estimated 8, 000 species of flowering plants, including 2, 500 species. The country has estimated 8, 000 species of flowering plants, including 2, 500 species of tree. The lowland forest contains some of the most important commercial timber species, including mahogany and teak. Where forested areas are cleared, the ground is rapidly taken over by a coarse grass called *Imperata cylindrica*, an invasive weed that displaces over vegetation (Wong, 1998).

It has been acknowledged that Borneo is one of the most important centres of plant diversity in the world. The flora of Borneo is conservatively estimated to harbour between 12, 000 and 15, 000 species of vascular plants, that is, about 5 - 6% of the world total. Of these, 40 - 50% are endemic species in Borneo occur in Sabah and Sarawak. The vascular plant of Sarawak comprises more than 8, 000 species. Over than 2, 000 tree species have been enumerated whereas orchids would number more

than 1000 species each, ferns account for 757 species and palms make up another 260 species. New species continue to be collected and recognized (Wong, 1998).

The complex soil and terrain, together with altitudinal sequence, give rise a wide range of habitats for plants in Sarawak. Each of the forest types is distinctly different in morphological characteristics and species complexities. Floristically, the mixed dipterocarp forest and the old secondary forest are among the richest (Browne, 1955).

In recent years, logging of the rain forests has contributed to severe destruction of the natural landscape and habitat. Demand for palm oil in the western world is also a major contributor to the substantial deforestation of the island. Borneo is now the third highest nation in the world as a source of damaging greenhouse gases due to the deliberate burning of forests and land cleared for new oil palm plantations (Eliot, 2000).

2.2 Data Comparative

Table 1: Comparative Data on Treated Plant Species in Flora Malesiana.

Site	Area	Treated no. of species 2002
Java	140	1696
Sulawesi	185	1765
Sumatra	475	3098
Borneo	740	4211
New Guinea	866	4040
Malesia	3040	12, 000

Source: Wong, 1998.

The table one showing the total of treated plant species in Malesiana. All sites of Malesia, New Guinea, and Sumatra having many treated of plant species. According to the table, site of Malesia are the most treated plant species compared to the other. It's followed by Borneo that is about 4, 211 treated plant in 740 area.

In the last 50 years, about 2% or about 170 of the estimated 8, 500 species of flowering plants in Peninsular become extinct. If the present rate of rainforest felling continues, the extinction rate could rise to 20% or more .And there is reason to worry that is in the 1960s, 73% of out total land area, 24 million hectares was forested. By the 1990s, it already dropped to 58% or 19 million hectare (Wong, 1998).

Over the past few decades much of Borneo's lowland forest cover have been fragmented and cleared for timber and to create plantations for the production of

Over the past few decades much of Borneo's lowland forest cover have been fragmented and cleared for timber and to create plantations for the production of palm oil and paper pulp. National and international demand for agricultural commodities and wood products mean land continues to be cleared at a frightening rate. Forest destruction is compounded by road and infrastructure development (WWF, 2009).

Between 1980 and 2000, it is estimated that more timber was harvested from Borneo than was exported from the Amazon and Congo basins combined. As a result, Borneo now has only 50% of its original forest left. At current rates, it is predicted that in Kalimantan, part of Borneo, there will be no lowland forests left outside protected areas by 2010 (WWF, 2009).

Former Universiti Malaya ecology department head Professor Dr E. Soepadmo states that only 40% of the peninsular natural forest covers still exist and the proportion is even lower in Sabah and Sarawak. This is most because the Malaysian rainforest especially lowland rainforest is incredibly where rich in biodiversity and that is where the greatest amount of deforestation has taken place.

According to Soepadmo, there are an estimated 12, 000 to 15, 000 plant species in Malaysia compared to 5, 000 in the whole Europe, a land 20 times bigger. It's means that Malaysia stand to lose a much greater number of plant species compared to equivalent area of forest in Europe (Soepadmo, 1991).

2.3 The important of colouring plant for the Orang Ulu ethnics

The indigenous people of Malaysia such as Orang Ulu and Iban use various plant sources of dye to make face and body paint. They obtain their materials mostly from jungle fruits. The community of the Orang Ulu ethnics uses the colouring plant for many purposes such as for dye, handicraft colour and for a tradition of their culture. Many types of product can be coloured include textile dye, handicraft colouring, bodypainting or tattoo and many more. Colourings in Orang Ulu culture are very important in their social life (Junaidi Payne *et al*, 1992).

Tattooing must be the ultimate form of personal ornamentation. Through rarely seen among younger Borneans, it was the custom in the past for both men and women to decorate their bodies in this way. They had to undergo many painful hours as the tattooist used needles to punch ink, usually made from a mixture of soot and dammar. The patterns to symbolize bravery or enhance beauty, varied from tribe to tribe and in some cases, a person's social standing had to recognize before tattooing was allowed (Parrott, 1973).

The art of tattooing is highly developed among the Orang Ulu ethnics. The Orang Ulu, particularly the Kenyah women of aristocratic status is finely tattooed on their arms, fingers, feet, and thighs. Designs are first incised on wooden block and printed on the skin to be finely pricked with needle and dye (Eliot, 1999). The most elaborate body tattoos are from Kayan tribe. The dog design figures very prominently in Kayan art, and the fact that the dog is regarded by these people and also by the Kenyah with a certain degree of veneration may account for its general representation. In Kayan, women tattooing contributes to a series of complicated

process. Red, black, and white are the most common colours. Lines, dots, curves, geometrical shapes and even sketches are drawn on the face, chest and back. Designs can run from the back of hand to thighs, below the knees and on the kneecaps (Junaidi Payne, 1992).

Tattooing in women can begin early as witnessed at the age of ten the girl will probably have had her fingers and the upper part of her feet tattooed. About a year hiatus, her forearms should have been completed; the thighs the following year and by the fourth year, the tattoos should be completed. Women can only tattoo until she is pregnant, as it is considered inappropriate to tattoo them after becoming a mother. The Kayan women believe that the tattoos are the torches to the next life and that without these to light them they would remain forever in total darkness (Eliot, 1999).

The Orang Ulu has traditionally made use of a large number of plants to produce a wide range of rich beautiful dyes. It is the dyers' ingenuity in making creative use of the different botanical resources available in their environment that has made Orang Ulu weavers renowned in this part of the world (Junaidi Payne, 1992).

2.4 Dyes in plants

Dyes are colouring agents originating from plants. They are extracted by fermentation, boiling, or chemical treatment from small quantities of certain chemical substances present in plant tissues. Sometimes the colour of the dye is already visible in the living plant. For example saffron is extracted from the orange-coloured stigmas of *Crocus sativus* L. Some important plant dyes originate from plant components which are not coloured in their original state or which are hidden in the plant (Parrott, 1973).

Substances are coloured because they absorb light that humans can see between about 400 and 800 nm wavelength. Most colours can be obtained from plant for instance blue from *Indigofera* spp. and *Haematoxylum campechianum*, yellow from *Crocus sativus*, red from *Rubia cordifolia*, brown from *Peltophorum pterocarpum*, and black from *Macaranga tanarius*, green is usually obtain by mixing blue and yellow dyes (Backer, and van Sloothen, 1924).

Dyes can be found in many different parts of the plant roots such as red dye from *Rubia cordifolia*, orange - yellow dye from *Curcuma longa*, the yellow dye from *Garcinia hanburyi* gum resin and the purplish-black dye from *Terminalia bellirica* wood, leaves, seeds, flowers and stigmas (Lemmens and Wuljarni-Soetjipto, 1992).

CHAPTER 3

MATERIALS AND METHOD

3.1 Site Background

The research study conducted at Asap Koyan Belaga, Kapit Sarawak. Belaga is the capital of the Belaga District that is about 19, 403.2 sq kilometers in the Kapit Division of Sarawak in east Malaysia. It is located on the upper reaches of the Rajang River, some 120 kilometers northeast of Kapit as the crow flies but considerably further on the river and slightly less than 100 kilometers from the South China Sea coast near Bintulu.

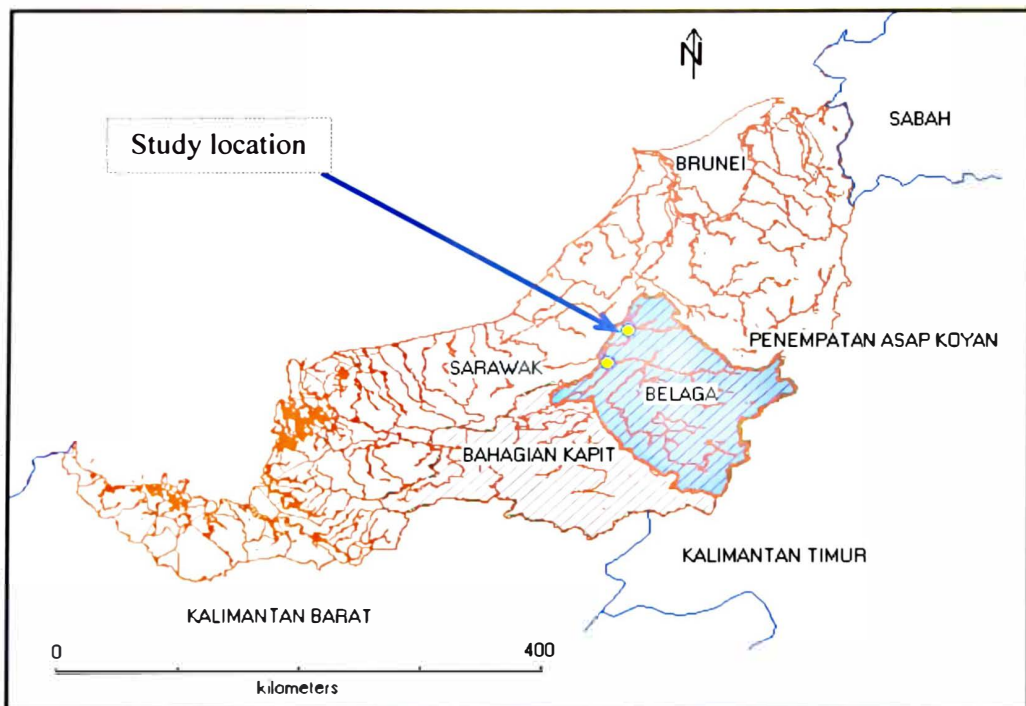


Figure 1: Location of the study area

3.2 Data collection

All the information gets from the interview, survey and data collection form. The survey form contain all the important information include the species of colouring plant using by the Orang Ulu ethnics, part of plant need to harvest for extraction, and the colour gets from the extraction.

3.3 Interview

All the data and information are getting through the interview with knowledgeable person (Figure 2). The person knows about the plant and routinely depends on the colouring plant. The information that is very important to find during the interview is data about the species of the colouring plant using by the Orang Ulu ethnics and types of colour getting from extracting the colouring plant.



Figure 2: An interview with old lady of Orang Ulu ethnics.

Face to face interviews have been dominant interview technique in the field of research. Several of communication possibilities have been used to interview informants as well as face to face interviews. First stage to start the interview is getting the respondents to involved as soon as possible. The facts that have been asking are question based on the intersperse fact. The last questions allow respondents to provide any other information they prefer to add the facts. All the information was compiled by the direct interview as well as rapid appraisal method using questionnaires. A method of interview is very effective methods.

3.4 Survey

Transect survey conducted in surround area to validate all the information that has been obtained from the interview (Figure 3). Also using the survey form for fill by the Orang Ulu to get all the information about the colouring plant that are using among the Orang Ulu ethnics in Asap Koyan Belaga. During the survey, the colouring plant species have been taken. A specimen of plant that have been collected then preserve as a herbarium.

Specimen of the colouring plant is also been collected for herbarium collection. A herbarium is a repository of preserved and labeled plant specimens. The specimens are typically in the form of herbarium sheets together with a data label. The label describes useful information includes the plant scientific name, the origin of collection, the date of collection, and the name of the collector. This process will help for plant information storage and identification purposes.



Figure 3: Ethnobotanical survey of colouring plant.

An ethnobotanical survey of Asap Koyan Belaga district was conducted during of the month of October, November and December 2008. An ethnobotanical survey continued again on month of January, February, and March 2009 for about 5 days for every month. Orang Ulu people from Orang Ulu ethnics tribe from every villages of different parts of the district were personally interviewed.

Each interviewee was brought to the nearby forest and garden to collect plant. Interviews were conducted for periods varying from 1 hour to 1 day. The property of each species was recorded. The people interviewed were active and cooperative. Their age averaged is between 27 to 120 years.

CHAPTER 4

RESULTS

4.1 Introduction

From the research, 51 plant species from 30 families have been identified and documented using as a colouring plant by the Orang Ulu ethnics in Asap Koyan Belaga (Table 2). These plants are represented by 20% species from family of Euphorbiaceae and Palmaceae, 16% species from family Leguminosae, 12% species from family Guttiferae and Moraceae, 7% species from family Anacardiaceae, Rhizophoraceae, and Melastomaceae and only 4% species from every Family of Acanthaceae, Balsaminaceae, Bixaceae, Convolvulaceae, Dipterocarpaceae, Fagaceae, Dipterocarpaceae, Fagaceae, Graminae, Lythraceae, Malvaceae, Menispermaceae, Meliaceae, Myrtaceae, Oleaceae, Pandanaceae, Piperaceae, Rubiaceae, Sapindaceae, Solanaceae, Simaboraceae, Theaceae, Verbenaceae, and Zingiberaceae.

13	<i>Malvaceae</i>	32	<i>Hibiscus rosa sinensis</i>	Bunga Raya	Red
14	<i>Balsaminaceae</i>	33	<i>Impatiens balsima</i>	Bungatabo	Red
15	<i>Meliaceae</i>	34	<i>Lansium domesticum</i>	Langsat	Black
16	<i>Graminae</i>	35	<i>Saccharum officinarum</i>	Tebu	Black
17	<i>Verbenaceae</i>	36	<i>Tectona grandis</i>	Jati	Red
18	<i>Dipterocarpaceae</i>	37	<i>Shorea javanica</i>	Meranti Putih	Black
19	<i>Myrtaceae</i>	38	<i>Syzygium cuminii</i>	Jambolan	Brown
20	<i>Rubiaceae</i>	39	<i>Anthocephalus chinensis</i>	Selimpuh	Yellow
		40	<i>Morinda citrifolia</i>	Mengkudu	Red
		41	<i>Uncaria gambir</i>	Gambir	Black
21	<i>Sapindaceae</i>	42	<i>Nephelium</i>	Rambutan	Black
22	<i>Oleaceae</i>	43	<i>Nyctanthes arbor-tristis</i>	Seri Gading	Yellow
23	<i>Piperaceae</i>	44	<i>Piper betle</i>	Sireh	Red
24	<i>Solanaceae</i>	45	<i>Nicotiana tabacum</i>	Tembakau	Red
25	<i>Pandanaceae</i>	46	<i>Pandanus odoratissimus</i>	Pandan	Green
26	<i>Acanthaceae</i>	47	<i>Peristrophe bivalves</i>	Noja	Purple
27	<i>Lythraceae</i>	48	<i>Lawsonia inermis</i>	Inai	Red
28	<i>Fagaceae</i>	49	<i>Lithocarpus rossa</i>	Mempening	Blue
29	<i>Theacea</i>	50	<i>Gordonia scortechnii</i>	Kadeng	Red
30	<i>Convolvulaceae</i>	51	<i>Ipomea batatas</i>	Keledek	Blue

4.2 Detailed of plant species used by the Orang Ulu as the colour sources.

Table 2: Plant species used as colour sources.

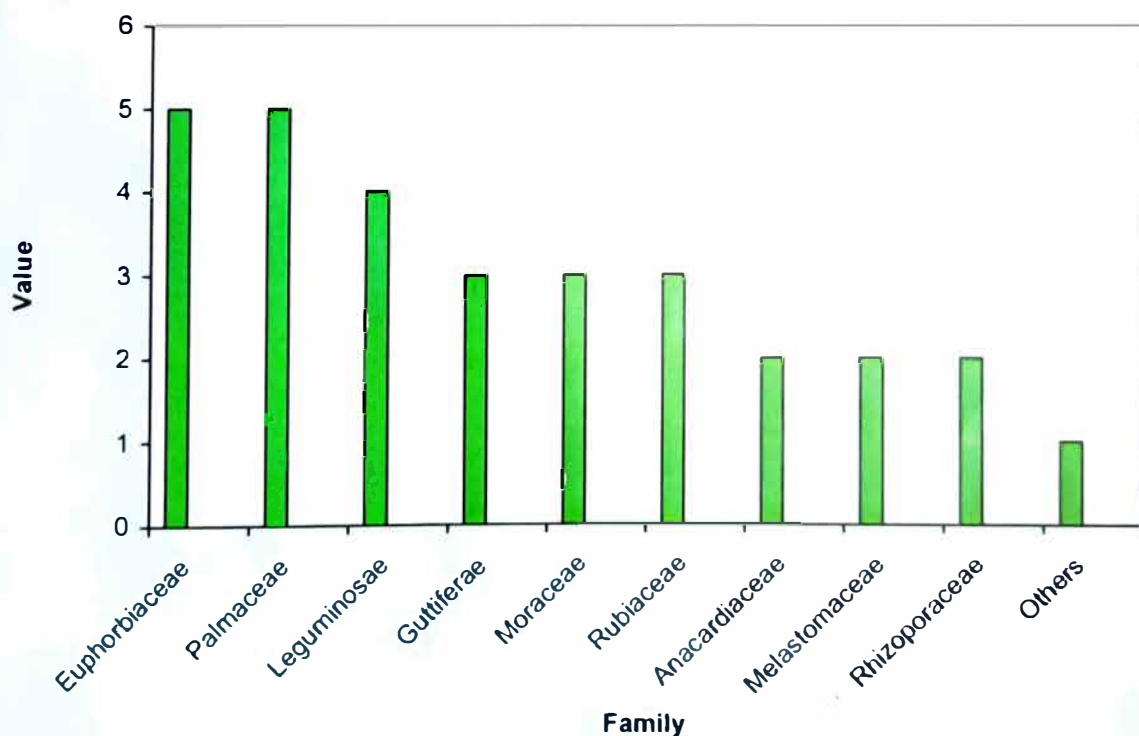
No	Family		Species	Vernacular name	Colour
1	<i>Anacardiaceae</i>	1	<i>Anacardium occidentale</i>	Jambu Irong	Black
		2	<i>Mangifera indica</i>	Mangga	Yellow
2	<i>Euphorbiaceae</i>	3	<i>Baccaurea motylena</i>	Rambai	Black
		4	<i>Macaranga tanarius</i>	Mahang Putih	Black
		5	<i>Baccaurea javanica</i>	Setambun	Black
		6	<i>Excoecaria indica</i>	Buta-buta	Green
		7	<i>Glochidion superbum</i>	Tebangau	Red
3	<i>Palmaceae</i>	8	<i>Arecha catechu</i>	Pinang	Red
		9	<i>Cocos nucifera</i>	Kelapa	Black
		10	<i>Daemonorops didymophylla</i>	Udat	Red
		11	<i>Daemonorops micracanta</i>	Wi jerenang	Red
		12	<i>Daemonorops sabut Beccari</i>	Wi Lepoh	Red
4	<i>Leguminosae</i>	13	<i>Pterocarpus indicus</i>	Narra	Red
		14	<i>Flemingia macrophylla</i>	Serengan Jantan	Purple
		15	<i>Indigofera suffruticosa</i>	Tarom	Purple
		16	<i>Clitoria ternatea</i>	Bunga biru	Purple
5	<i>Guttiferae</i>	17	<i>Garcinia mangostana</i>	Manggis	Purple
		18	<i>Garcinia dulcis</i>	Mundu	Brown
		19	<i>Garcinia atroviridis</i>	Asam Gelugor	Brown
6	<i>Moraceae</i>	20	<i>Maclura cochinnensis</i>	Kederang	Yellow
		21	<i>Artocarpus heterophyllus</i>	Nangka	Orange
		22	<i>Artocarpus integer</i>	Cempedak	Orange
7	<i>Rhizophoraceae</i>	23	<i>Cerios decandra</i>	Landing-landing	Black
		24	<i>Bruguiera gymnorhiza</i>	Putut	Black
8	<i>Melastomaceae</i>	26	<i>Melastoma sanguiem</i>	Red melastome	Purple
		27	<i>Melastoma malabathricum</i>	Senduduk	Purple
9	<i>Menispermaceae</i>	28	<i>Archagelisia flava</i>	Mengkunyit	Yellow
10	<i>Bixaceae</i>	29	<i>Bixa orellana</i>	Kesumba	Yellow

11	<i>Zingiberaceae</i>	30	<i>Curcuma domestica</i>	Kunyit	Yellow
12	<i>Simaboraceae</i>	31	<i>Eurycoma longifolia</i>	Tongkat Ali	Black
13	<i>Malvaceae</i>	32	<i>Hibiscus rosa sinensis</i>	Bunga Raya	Red
14	<i>Balsaminaceae</i>	33	<i>Impatiens balsima</i>	Bungatabo	Red
15	<i>Meliaceae</i>	34	<i>Lansium domesticum</i>	Langsat	Black
16	<i>Graminae</i>	35	<i>Saccharum officinarum</i>	Tebu	Black
17	<i>Verbenaceae</i>	36	<i>Tectona grandis</i>	Jati	Red
18	<i>Dipterocarpaceae</i>	37	<i>Shorea javanica</i>	Meranti Putih	Black
19	<i>Myrtaceae</i>	38	<i>Syzygium cuminii</i>	Jambolan	Brown
20	<i>Rubiaceae</i>	39	<i>Anthocephalus chinensis</i>	Selimpuh	Yellow
		40	<i>Morinda citrifolia</i>	Mengkudu	Red
		41	<i>Uncaria gambir</i>	Gambir	Black
21	<i>Sapindaceae</i>	42	<i>Nephelium</i>	Rambutan	Black
22	<i>Oleaceae</i>	43	<i>Nyctanthes arbor-tristis</i>	Seri Gading	Yellow
23	<i>Piperaceae</i>	44	<i>Piper belle</i>	Sireh	Red
24	<i>Solanaceae</i>	45	<i>Nicotiana tabacum</i>	Tembakau	Red
25	<i>Pandanaceae</i>	46	<i>Pandanus odoratissimus</i>	Pandan	Green
26	<i>Acanthaceae</i>	47	<i>Peristrophe bivalves</i>	Noja	Purple
27	<i>Lythraceae</i>	48	<i>Lawsonia inermis</i>	Inai	Red
28	<i>Fagaceae</i>	49	<i>Lithocarpus rossa</i>	Mempening	Blue
29	<i>Theacea</i>	50	<i>Gordonia scortechnii</i>	Kadeng	Red
30	<i>Convolvulaceae</i>	51	<i>Ipomea batatas</i>	Keledek	Blue

4.3 Total of plant species by family

There are 51 plant species from 30 families that have been identified and documented using as a colouring plant by the Orang Ulu ethnics in Asap Koyan Belaga. These plants are represented by 5 species from family of Euphorbiaceae and Palmaceae, 4 species from Leguminosae, 3 species from Guttiferae, Moraceae and Rubiaceae, 2 species from Anacardiaceae, Rhizoporaceae, and Melastomaceae and only 1 species from every family of Anacardiaceae, Acanthaceae, Balsaminaceae, Bixaceae, Convolvulaceae, Dipterocarpaceae, Fagaceae, Graminae, Lythraceae, Malvaceae, Menispermaceae, Meliaceae, Myrtaceae, Oleaceae, Pandanaceae, Piperaceae, Sapindaceae, Solanaceae, Simaboraceae, Theaceae, Verbenaceae, and Zingiberaceae (Figure 4).

Figure 4. Total of plant species by family.



4.4 Percentage of colour and number of plant species

According to the chart below, 28% plant species are using for extracted red colour getting from 15 species of plant. The second are the black colour that is about 26% extracted from 12 plant species, 14% of purple and yellow colour altogether extracted from 7 species of plant, 6% brown colour extracted from 3 species of plant and only about 4% of green, orange, and blue colour extracted from two type of plant species of each colour (Figure 5).

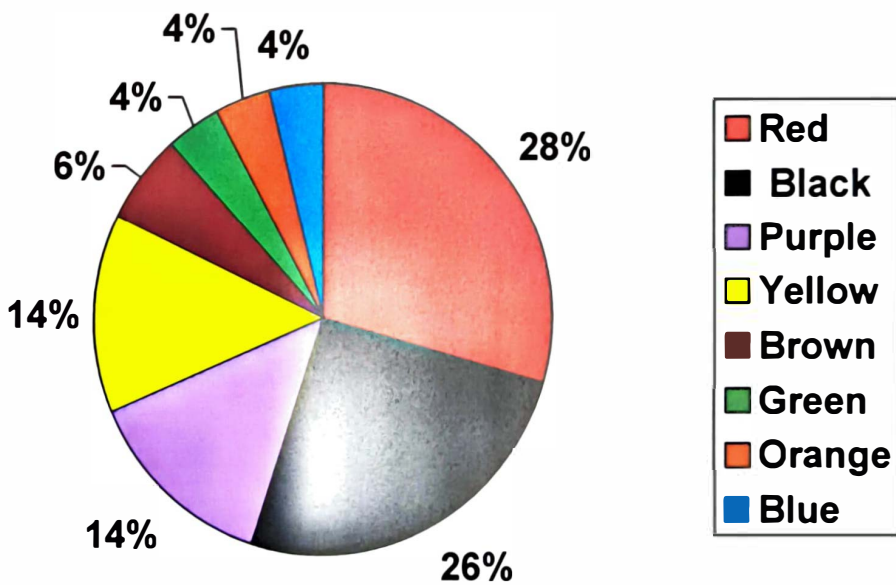


Figure 5: Percentage of colour and number of plant species.

4.5 Part of plant used for colour extraction

There are many part of plant used to extracting colour for dye using by the Orang Ulu ethnics in Asap Koyan Belaga. There extracted colors from dregs flowers, fruit skin, fruit stalk, leaves, roots, resinous, bark the outer and inner bark of trees as well as their heartwood (Table 3).

Table 3: Part of plant used for colour extraction.

no	Plant Species	Family	Part of plant used
1	<i>Anacardium occidenta</i> (Jambu Irong)	<i>Anacardiaceae</i>	Bark and fruit
2	<i>Anthocephalus chinensis</i> (Selimpuh)	<i>Rubiaceae</i>	Roots
3	<i>Artocarpus heterophyllus</i> (Nangka)	<i>Moraceae</i>	Heartwood
4	<i>Artocarpus integer</i> (Cempedak)	<i>Moraceae</i>	Heartwood
5	<i>Areca catechu</i> (Pinang)	<i>Palmaceae</i>	Fruits
6	<i>Archagelisia flava</i> (Mengkunyit)	<i>Meniperiaceae</i>	Woody stem
7	<i>Baccaurea javanica</i> (Setambun)	<i>Euphorbiaceae</i>	Bark
8	<i>Baccaurea motleyana</i> (Rambai)	<i>Euphorbiaceae</i>	Fruit skin
9	<i>Bixa orellana</i> (Kesumba)	<i>Bixaceae</i>	Fruits
10	<i>Brugueiera gymnorhiza</i> (Putut)	<i>Rhizophoraceae</i>	Bark
11	<i>Cerriops decandra</i> (Landing-landing)	<i>Rhizophoraceae</i>	Bark and leaves
12	<i>Cocos nucifera</i> (Kelapa)	<i>Palmaceae</i>	Fruit-stalk
13	<i>Clitoria ternatea</i> (Bunga biru)	<i>Leguminosae</i>	Flowers
14	<i>Curcuma domestica</i> (Kunyit)	<i>Zingiberaceae</i>	Fruits
15	<i>Daemonorops micracanta</i> (Wi jerenang)	<i>Palmaceae</i>	Fruits
16	<i>Daemonorops didymophylla</i> (Udat)	<i>Palmaceae</i>	Fruits
17	<i>Daemonorops sabut</i> Beccari (Wi Lepoh)	<i>Palmaceae</i>	Fruits
18	<i>Eurycoma longifolia</i> (Tongkat Ali)	<i>Simaroubaceae</i>	Leaves
19	<i>Excoecaria indica</i> (Buta-buta)	<i>Euphorbiaceae</i>	Leaves
20	<i>Flemingia macrophylla</i> (Serengan Jantan)	<i>Leguminosae</i>	Fruits
21	<i>Garcinia mangostana</i> (Manggis)	<i>Guttiferae</i>	Fruit skin
22	<i>Garcinia atrovides</i> (Asam gelugor)	<i>Guttiferae</i>	Fruit
23	<i>Garcinia dulcis</i> (Mundu)	<i>Guttiferae</i>	Fruit

24	<i>Glochidion superbum</i> (Tebangau)	<i>Euphorbiaceae</i>	Leaves
25	<i>Gordonia scortechnii</i> (Tebangau)	<i>Theaceae</i>	Fruit skin
26	<i>Hibiscus rosa-sinensis</i> (Bunga raya)	<i>Malvaceae</i>	Flower
28	<i>Ipomea batatas</i> (Keledek)	<i>Convolvulaceae</i>	Leaves
29	<i>Indigofera suffruticosa</i> (Tarom)	<i>Leguminosae</i>	All part of plant
30	<i>Lansium domesticum</i> (Langsat)	<i>Meliaceae</i>	Fruit skin
31	<i>Lawsonia inermis</i> (Inai)	<i>Lythraceae</i>	Leaves
32	<i>Lithocarpus rossa</i> (Mempening)	<i>Fagaceae</i>	Leaves
33	<i>Maclura cochinnensis</i> (Kederang)	<i>Moraceae</i>	Heartwood
34	<i>Macaranga tanarius</i> (Mahang Putih)	<i>Euphorbiaceae</i>	Leaves
35	<i>Mangifera indica</i> (Mangga)	<i>Anacardiaceae</i>	Bark
36	<i>Melastoma malabathricum</i> (Senduduk)	<i>Melastomaceae</i>	Flower
37	<i>Melastoma sanguinolum</i> (Red melastome)	<i>Melastomaceae</i>	Flower
38	<i>Morinda citrifolia</i> (Mengkudu)	<i>Rubiaceae</i>	Root bark
39	<i>Nephelium lappaceum</i> (Rambutan)	<i>Sapindaceae</i>	Shoots, leaves
40	<i>Nicotiana tabacum</i> (Tembakau)	<i>Solanaceae</i>	Leaves
41	<i>Nyctanthes arbor-tristis</i> (Seri Gading)	<i>Oleaceae</i>	Flower
42	<i>Pandanus odoratissimus</i> (Pandan)	<i>Pandanaceae</i>	Leaves
43	<i>Piper betle</i> (Sireh)	<i>Piperaceae</i>	Leaves
44	<i>Peristrophe bivalves</i> (Noja)	<i>Acanthaceae</i>	Twigs and leaves
45	<i>Pterocarpus indicus</i> (Narra)	<i>Leguminosae</i>	Wood
46	<i>Psidium guajava</i> (Jambu batu)	<i>Myrtaceae</i>	Leaves and bark
47	<i>Saccharum officinarum</i> (Tebu)	<i>Gramineae</i>	Dregs
48	<i>Shorea javanica</i> (Meranti Putih)	<i>Dipterocarpaceae</i>	Stem
49	<i>Syzygium cuminii</i> (Jambolan)	<i>Myrtaceae</i>	Bark
50	<i>Tectona grandis</i> (Jati)	<i>Verbenaceae</i>	Bark, roots, leaves
51	<i>Uncaria gambir</i> (Gambir)	<i>Rubiaceae</i>	Resinous from leaf

4.6 Checklist and Descriptions of Plant Species

Black colour

Anacardium occidentale L.

Family: Anacardiaceae

Synonyms: *Acajuba occidentalis*, *Cassuvium pomiferrum*

Genus: *Anacardium*

Vernacular names: Jambu irong.

General Descriptions: Evergreen tree, up to 12 m high, with a wide dome-shaped crown. Leaves are alternate, obovate to oblong. Flowers usually with 9 short and 1 long stamen; long stamens produce viable pollen; style simple, 12 mm long, exerted from corolla to same length as long stamens. Fruit a kidney shaped nut, with grey-brown, resinous hard pericarp; pedicel much enlarged and swollen, forming the fruit like cashew apple, pear - shaped, broad, shiny, red to yellow, soft and juicy.

Anacardium occidentale requires high temperatures; frost is deleterious. Of importance is the distribution of rainfall; the quantity is less important. It well if rains are not abundant during flowering; and nuts mature in a dry period; the late assures good keeping quality. The tree can adapt to very dry conditions as long as its extensive root system has access to soil moisture (Sospadma, 1991).

Part of plant for colour extraction: Bark and fruit used for colouring hair black.

***Baccaurea motleyana* Mull, Arg**

Family: Euphorbiaceae

Genus: *Baccaurea*

Synonyms: *Baccaurea pubescens*

Vernacular names: Rambai

General Descriptions: The slow - growing tree, ordinarily to 30 or 40 ft (9 - 12 m) up to 60 ft (18 m), has a short, thick trunk, broad, dense, rounded crown and silky-hairy new branchlets. The leaves are evergreen, spiralled, wide, dark - green, glossy with conspicuously intended veins on the upper surface; greenish brown and hairy below. The fruits, is showy strands dangling from the older branches and trunk, are oval (Walker, 1976).

The ecology of rambai is in disturbed sites in mixed dipterocarp forest or open scrub - vegetation up to 200 m altitude. Mostly on alluvial sites, but also on hillsides. On sandy to clay soils. The rambai is native and commonly cultivated in the lowlands in Asap Koyan Belaga village. It also grows wild in forest.

Part of plant for colour extraction: Fruit skin is use for extracting black colour for handicraft colouring.

***Ceriops decandra* (Griff.) Ding Hou**

Family: Rhizophoraceae

Genus: *Ceriops*

Vernacular names: Landing-landing.

General Descriptions: Shrub to small tree to 15 m tall, 30 cm diameter. Leaves obovate, elliptic, and oblong. Flower petals white, fringed with many long narrow processes at apex; stamens 1 mm long, anthers ovoid, more than half the length of the filaments; stigma capitate. Fruits ovoid, conical. *C. decandra* is most common in tidal forest in high rainfall regions, where characteristically, it grows in the middle to lowland parts of the mangrove swamp. It develops best immediately behind the forest strip lining rivers, and on the slightly higher muddy tidal flats behind, between rivers and creeks. In these sites fresh water is in regular supply and salinity never exceeds that of normal seawater (Ferreira *et al*, 2004).

Locally this species is gregarious, forming a slender pole forest, but it is most often associated with species of *Avicennia*, *Bruguiera* and *Rhizophora*. However, its station is not constant, and it occurs on the landward fringes of some mangrove swamps (Sudibyo *et al* 1988).

Part of plant for colour extraction: The sap of the bark yields a black dye used for handicraft colouring (Hou, 1958).



***Cocos nucifera* L.**

Family: Palmae

Genus: *Cocos*

Vernacular names: Kelapa

General Description: Coconut palm can grow up to a height of about 30 m, dwarf forms up to 10 m. Leaves spirally arranged, pinnate. Fruit a globose to ovoid drupe with 3 sides separated by 3 ridges. Seed with thick endosperm, with a large cavity in the centre partially filled with coconut water. Coconut is essentially a crop of the humid tropics. Coconut palms can be found in almost in many areas and place in Asap Koyan village. The coconut palm thrives on a wide range of soils, from coarse sand to clay provided the soils have adequate drainage and aeration.

Part of plant for colour extraction: Fruit-stalk used for colouring teeth black.

***Bruguiera gymnorhiza* Lour.**

Family: Rhizophoraceae

Genus: *Bruguiera*

Synonyms: *Bruguiera rheedii*, *Bruguiera cylindrical*, *Bruguiera conjugate*.

Vernacular names: Tumu, bakau besar (Peninsular), Putut (Sarawak).

General Descriptions: A moderate sized, evergreen tree up to 36 m tall; bole 40 - 65 cm in diameter, buttressed and with knee pneumatophores. Black mangrove is characteristic of the landward side of mangroves, usually growing on somewhat dry, well-aerated soil. It often ascends tidal parts of rivers. It is associated with *Rhizophora* species, especially *R. apiculata*, but also *Ceriops tagal* and *Xylocarpus moluccensis*. Bark is grey to almost black, roughly fissured, usually with large corky lenticels on buttresses and base of stem. Branching is mostly sympodial. Leaves decussately opposite, simple and entire, coriaceous, elliptic and oblong. Fruit is a campanulate berry enclosed by the calyx tube.

Part of plant for colour extraction: A colouring matter from the bark is used as dye for black or dark-brown colour.



***Lansium domesticum* Corr.**

Family: Meliaceae

Genus: *Lansium*

Vernacular name: Langsat, duku, duku - langsat

General Description: *Lansium domesticum* is a medium - sized, single trunked tree that usually grows from ten to fifteen meters tall. The plant has pinnately compound leaves. Each fully - grown leaf has five to seven slightly - leathery. The flowers having both stamen and pistil structures in the same flower. Fruit are ovoid. Each round fruit is covered by yellowish, thick, leathery skin. It grows best in humid conditions with plentiful water year - round. It is not adapted to climates with long dry seasons.

Part of plant for colour extraction: The fruit skin can use as a black dye for colouring the Orang Ulu ethnics handicraft.



***Macaranga tanarius* (L.) Mull. Arg**

Family: Euphorbiaceae

Genus: *Macaranga*

Vernacular names: Kundoh, mahang puteh, tampu.

General Descriptions: A small medium size dioecious tree up to 20 m tall, usually much shorter, branches rather thick, glaucous, pubescent when young. Leaves alternate, blade peltate, suborbicular. Flowers in axillary. Seeds are globose, about 5 mm in diameter. *M. tanarius* is often very common in secondary forest, especially in logging areas. It is also found in thickets, brushwoods and village groves. It occurs on clayey, loamy and sandy soils, usually in the lowlands (Corner, 1988).

Part of plant for colour extraction: The leaves have been using to dye matting black, like other species of Euphorbiaceae do.



***Nephelium lappaceum* L.**

Family: Sapindaceae

Genus: *Nephelium*

Vernacular names: Rambutan

General Descriptions: Evergreen, dioecious or sometimes monoecious, small to fairly large trees up to 35 m tall, rarely shrubs. Leaves arranged spirally. Flowers in an axillary or terminal. Seed almost entirely covered by a sarcotesta. Species of *Nephelium* are generally found as middle storey trees in evergreen, lowland or sometimes secondary rain forest on hills and ridges. Most are found in well-drained locations on sandy to loamy or clayey soils or on limestone (Chin, 1975).

Part of plant for colour extraction: An inferior black dye has been prepared from the shoots and the leaves.

***Psidium guajava* L.**

Family: Myrtaceae

Genus: *Psidium*

Vernacular name: Guava, Jambu batu

General Description: A small tree to 33 ft high, with spreading branches, the guava is easy to recognize because of its smooth, thin, copper-colored bark that flakes off, showing the greenish layer beneath; and also because of the attractive, 'bony' aspect of its trunk which may in time attain a diameter of 10 inches. The leaves, aromatic when crushed, are evergreen, opposite, short - petiole, oval or oblong elliptic. The fruit, exuding a strong, sweet, musky odor when ripe, may be round, ovoid, or pear shaped. Actual seed counts have ranged from 112 to 535 but some guavas are seedless or nearly so. The guava thrives in both humid and dry climates. The guava always found near the Orang Ulu long house and also in garden (Crevost, 1941).

Part of plant for colour extraction: The leaves using with other plant materials to make a black dye.



***Saccharum officinarum* L.**

Family: Poaceae

Genus: *Saccharum*

Vernacular names: Tebu

General Description: A large, perennial grass up to 6 m tall. Stem robust, profusely tillering at base, 2 - 5 cm in diameter, and divided into 10 - 40 internodes. Leaves borne at nodes, alternate in two rows on either side of the stem. Fruit a small caryopsis, about 1 mm long. They have stout, jointed, fibrous stalks that are rich in sugar. It needs high temperatures. The optimum temperatures are 26 - 33°C for vegetative growth (Howes, 1962).

Part of plant for colour extraction: The dregs burn to make get black colour.

***Uncaria gambir* Roxb.**

Family: Rubiaceae

Genus: *Uncaria*

Vernacular name: Gambir, gambier, kancu.

General Descriptions: A liana often cultivated as a stragling shrub, with square young stems and erects main stems bearing horizontal branches with recurved hooks. Leaves opposite, subcoriaceous, and entire, ovate to elliptic. Flowers in heads on horizontal plagiotrophic branches. Gambier can be cultivated in areas with high rainfall throughout the year. The plant does not tolerate water logging

Gambier has no special soil requirements, but it is usually cultivated on soils with a rich humus layer, or containing much clay. Wild gambier is most commonly found in secondary forest. It does not occur in dry regions or at higher altitudes. Gambier trees grow near rivers and forest.

Part of plant for colour extraction: Uses as a dye in traditional cloth and for dyeing black.

Red colour

***Baccaurea javanica* (Blume) Mull.Arg**

Family: Euphorbiaceae

Genus: *Baccaurea*

Synonyms: *Baccaurea acuminata*, *Baccaurea leucodermis*

Vernacular names: Setambun

General Descriptions: Evergreen, dioecious; small to medium-sized trees up to 30(-40) m tall; bole straight to rather poorly shaped. Leaves arranged spirally, often crowded towards the end of twigs, simple, entire; petiole often long and kned at the top; stipules early caduceus. Flowers unisexual, small; sepals 4-5 petals absent. Fruit variably fleshy and indehiscent or sometimes dry and dehiscent. Seed often enclosed in a juicy, brightly coloured outer layer (Backer *et al*, 1963).

Baccaurea species are generally uncommon, but may locally occur as an important element of the lower storey of primary lowland rain forest. They are found in well - drained as well as swampy locations on a wide range of soils in primary and secondary evergreen rain forest, kerangas and peat-swamp forest (Backer, 1924).

Part of plant for colour extraction: The bark used, along with other ingredient, to colour red.

***Daemonorops sabot* Beccari**

Family: Palmaceae

Genus: *Daemonorops*

Vernacular names: Rotan sabot, Wi Lepoh (Sarawak)

General Description: Clustering, dioecious rattan of moderate size, to 40 m or more in length. Stem without leaf-sheaths 15 mm in diameter; internodes to 10 cm long. Leaf cirrate, leaf-sheath dark green, densely armed with collars of black and brown horse-hair-like spines. Mature fruit rounded to ovoid; very short beaked, vertical rows of yellowish reflexed scales. Seed densely pitted. Characteristics for *D. sabot* are the tunnels of the leaf - sheaths. Many species in the genus, in fact, have spines forming such tunnels.

They are usually occupied by ferocious ants, which make specimen collection unpleasant. *D. sabot* is very characteristics of alluvial or freshwater swamp, mostly in lowlands, but also up to 400 m altitude. The cane is small in diameter (1.5 cm), durable, and considered one of the best materials for making local baskets.

Part of plant for colour extraction: A natural red dye can be prepared from its fruit.

***Daemonorops didymophylla* Beccari**

Family: Palmaceae

Genus: *Daemonorops*

Vernacular names: Uwi jergang, udat (Penan, Sarawak).

General Description: A moderate size, clustering rattan with the fruit scales covered with red resin. Stem without leaf - sheaths to 12 mm in diameter, with sheaths to 30 mm in diameter. Very common from altitude of 1000 m, especially common in valleys and on lower slopes of hill dipterocarp forest.

Part of plant for colour extraction: The fruit produces red resin used for red dye.

***Daemonorops micracanta* Griffith (Beccari)**

Family: Palmaceae

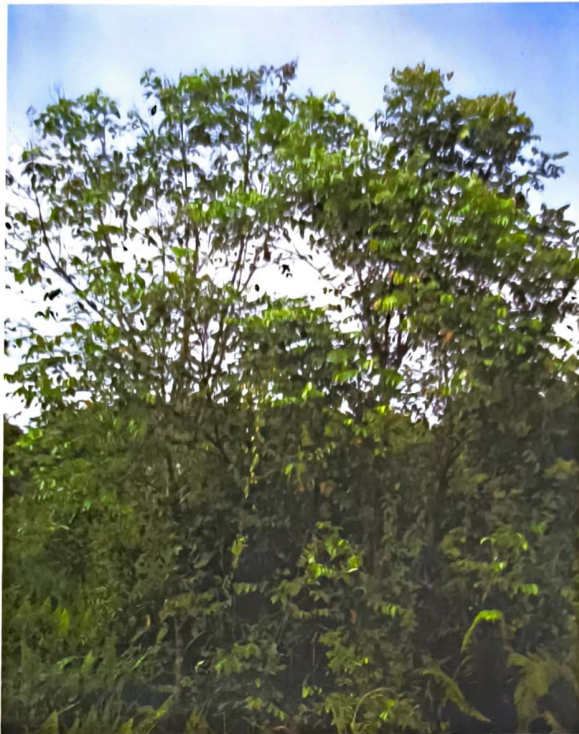
Genus: *Daemonorops*

Synonyms: *D. draconcella*

Vernacular names: Malaysia: rotan (wi) jer(e)nang (in most localities, including Sarawak), Lempinit landang (Sandakan).

General Description: Clustering climber to 40 m tall or more. Stem without leaf-sheaths 12 mm in diameter, with sheaths 25 mm in diameter. Leaves cirrate to 2 m including cirrus to 80 cm long. *D. micracantha* is immediately recognized by its low ridges bearing minute black spicules interspersed with golden spines to 15 mm on the leaf - sheaths.

Part of plant for colour extraction: Ripe fruits as a source of natural red dye.



***Glochidion superbum* Baill.**

Family: Euphorbiaceae

Genus: *Glochidion*

Synonyms: *Phyllanthus superbus*

Vernacular name: Mayam, Nyam, Tebangau.

General Description: Sub-canopy tree up to 23 m tall and 28 cm dbh. Leaves alternate, simple, penni-veined, densely hairy below, base strongly (unequal) cordate. Flower green whitish, placed in short stalked axillary bundles. Fruits white pink purple, dehiscent capsules (Faridah Hanum *et al* 1999).

Part of plant for colour extraction: The young leaf is use to extract red colour.



Hibiscus rosa sinensis L.

Family: Malvaceae

Genus: *Hibiscus*

Vernacular names: Bunga Raya

General Description: An evergreen shrub growing to 2.5 m. It is frost tender. It is in leaf all year. The flowers are hermaphrodite that have both male and female organs and are pollinated by insects. The plant prefers light (sandy), medium (loamy) and heavy (clay) soils and requires well - drained soil. The plant prefers acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It requires moist soil. Its habitat is in hedge, woodland, sunny edge, and dappled shade.

Part of plant for colour extraction: The flowers, leaves and root are used to extract red and colour.



***Impatiens balsamina* L.**

Family: Balsaminaceae

Genus: *Impatiens*

Vernacular names: Bungatabo, inai ayer, laka kecil.

General Descriptions: An annual herb. Stems erect, simple or sparsely branched, with swollen joints, glabrous, or pubescent when young. Leaves arranged spirally, but lower leaves occasionally opposite, lanceolate to narrowly elliptic. Flowers are 1 - 3 together in leaf-axils, red, purple, white or variegated, variable in size. Garden balsam is a very variable species, particularly in the size of leaves and flowers (Wilson, 1985).

Part of plant for colour extraction: The flowers are used to prepare a red dye for finger nails.



***Lawsonia inermis* L.**

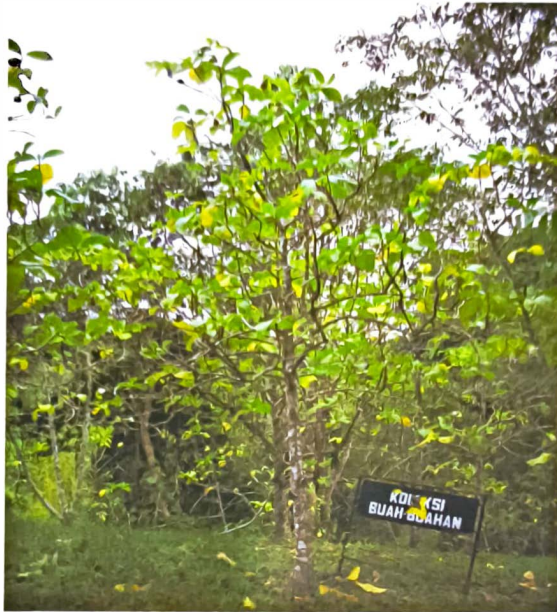
Family: Lythraceae

Genus: *Lawsonia*

Vernacular names: Pacar kuku, inai, henna.

General Description: A much branched, glabrous shrub or small tree, 2 - 6 m tall, with grayish-brown bark, unarmed when young, older plants with spine-tipped branchlets. Young branches quadrangular. Leaves opposite, entire and subsessile, elliptic to broadly lanceolate, acuminal cymes and fragrant. Fruit a globose capsule, many seeded, opening irregularly. Seed are angular, with thick seed - coat.

Part of plant for colour extraction: Henna leaves are used to colour the finger nails red and orange colour to paint or decorate the palms of the hands and the soles of the feet.



***Morinda citrifolia* L.**

Family: Rubiaceae

Genus: *Morinda*

Vernacular names: Mengkudu.

General Description: Evergreen shrub or small crooked tree with a conical crown, 3-8 (-10) m high, with a deep tap root. Leaves simple, elliptic, lanceolate. Fruit an ovoid syncarp of red-brown. Seeds black, with hard albumen and distinct air chamber. The plant grows well on sandy or rocky shores. Apart from saline conditions, the plant also can withstand drought and grows in secondary soils. Thus the plant can be seen in clearings, volcanic terrain, and lava - sterwn coasts and on limestone outcrops.

Part of plant for colour extraction: The red dye from the root bark of Indian mulberry.

***Tectona grandis* L.f**

Family: Verbenaceae

Genus: *Tectona*

Synonyms: *Tectona theka*

Vernacular names: Jati

General Descriptions: Small to large deciduous trees up to 50 m tall; bole generally straight and branch. Leaves deciduous, ternate, simple, the blade ovate-lanceolate to broadly ovate, cuneate at base, margin entire, softly hairy on both surfaces, petiolate. Flowers bisexual. Fruit drupaceous, subglobose or slightly tetragonal, woody, with a thin, subcarneous exocarp and thick, bony, 4 - celled endocarp.

Teak occurs naturally in various types of tropical deciduous forest. It is often dominant member of mixed deciduous forest, where its main associates are *Xylia* spp, *Azelia xylocarpa*, *Terminalia* spp. and *Lagerstromia* spp.

Part of plant for colour extraction: Both the bark of the roots and the young leaves produce a yellowish-brown or reddish dye which is used for cloth dye.

***Gordonia scortechinii* King.**

Family:Theaceae

Genus: *Gordonia*

Vernacular names: Kadeng (Kenyah)

General Description: They are evergreen trees, growing to 10 - 20 m tall. The bark is thick and deeply fissured. The leaves are alternately arranged and simple. The flowers are large and conspicuous, 4-15 cm diameter. The fruit is a dry five - valved capsule, with 1 - 4 seeds in each section. Seeds globose, semiglobose, compresses oblong, ovoid, or wingless. The species are adapted to acidic soils, and do not grow well on chalk or other calcium rich - soil. They also have a high rainfall requirement and will not tolerate drought.

Part of plant for colour extraction: Fruit skin is extract to get red colour.

Nicotiana tabacum L.

Family: Solanaceae

Genus: *Nicotiana*

Vernacular name: Tembakau

General Description: Annual growing to 1.2 m. It is hardy to zone 8 and is frost tender. It is in flower from July to September, and the seeds ripen from August to October. The plant prefers light (sandy), medium (loamy), and heavy (clay) soils and requires well drained soil. The plant prefers acid, neutral and basic (alkaline) soils. It cannot grow in the shade. It requires moist soil. The tobacco is one of the most important commercial nonfood crops grown in the world today. Mature tobacco plants produce between 10 and 20 broad leaves. These are dried, cured, and use to produce cigarettes, cigars and pipe chewing tobacco.

Part of plant for colour extraction: A leaves of *Nicotiana tabacum* use for extract red colour.



***Areca catechu* L.**

Family: Palmae

Genus: *Areca*

Vernacular name: Pinang

General Description: *Areca catechu* is a medium-sized and graceful palm tree growing straight to 20 m tall, with a trunk. *Arecanut* is an erect, unbranched palm depending upon the environmental conditions. The leaves are long, pinnate, with numerous, crowded leaflets. Fruit a monolocular, one - seeded berry, smooth orange when ripe, with a fibrous outer layer. *Arecanut* almost always exist in cultivation; therefore, conditions of its natural habitat are difficult to assess. Being a shade-loving species, *arecanut* always does well when grown as a mixed crop with fruit trees.

Part of plant for colour extraction: Fruit of *Areca catechu* use for extract red colour.

***Pterocarpus indicus* Willd.**

Family: Leguminosae

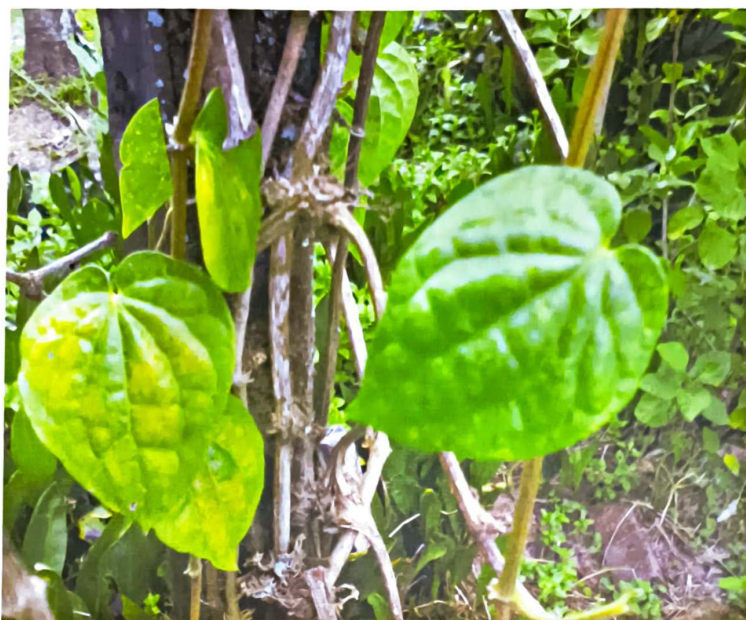
Genus: *Pterocarpus*

Vernacular name: Padauk, Narra

General Description: *Pterocarpus indicus* is a big tree, growing to 33 m in height and 2 m diameter. The crowns are large and bear many long branches that are first ascending, but eventually arch over and sometimes droop at the ends. Trees with long willowy, drooping branches are particularly conspicuous and attractive. The leaves have 5 - 11 leaflets usually ovate to lanceolate.

The fragrant flower, have yellow or orange - yellow petals, and the suborbicular fruits. It has been planted as a shade tree for at least 200 years. A widespread tree found in lowland primary and some secondary forest, mainly along tidal creeks and rocky shores (Smith, 1985).

Part of plant for colour extraction: Wood of *Pterocarpus indicus* are used to extract red colour.



***Piper betle* L.**

Family: Piperaceae

Genus: *Piper*

Vernacular name: Sireh

General Description: The *Piper betle* is an evergreen, an perennial creeper, slender, aromatic creeper, rooting at nodes. The branches of this plant are swollen at the nodes. The branches of this plant are swollen at the nodes. They have alternate, with heart-shaped leaves and white catkin, smooth, shining and long-stalked leaves, with pointed apex. It has five to seven ribs arising from the base, minute flowers and one-seeded spherical small berries.

Part of plant for colour extraction: Leaves of *Piper betle* are used to extract red colour.

Purple colour

***Flemingia macrophylla* (Willd.) Kuntze ex Merr**

Family: Leguminosae

Genus: *Flemingia*

Vernacular names: Serengan jantan, beringan.

General Description: Woody, deep - rooting, tussock-forming shrub, 1 - 4 m high. Leaves digitately trifoliate; petioles narrowly winged, papery, veins covered with silky hairs. Seeds are globular, shiny, and black. Roots are often nodulated. Its natural habitat is along watercourses, both on clay and lateritic soils, as well as under drier conditions such as in fields infested with *Imperata* sp. The plant tolerates shade and poor soils (M.S.M. Sosef, 1997).

Part of plant for colour extraction: *F. macrophylla* is one of the sources of dye which is colour purple or orange - brown coarse powder, consisting of the glandular hairs rubbed from dry *Flemingia* fruits, capable of dying.

***Peristrophe tinctoria* Nees.**

Family: Acanthaceae

Genus: *Peristrophe*

Synonyms: *Peristrophe Bivalves*, *Peristrophe roxburghiana*

General Description: It is an herbaceous perennial plant growing to 50 - 100 cm tall. The leaves are lanceolate to ovoid-acute, 2 - 7.5 cm long and 1 - 3.5 cm wide. The flowers are two - lobed, the long axis up to 5 cm long; they are magenta to reddish - violet (Perry, 1980).

Part of plant for colour extraction: The twigs and leaves give a purplish or dye.

***Garcinia mangostana* L.**

Family: Guttiferae/Clusiaceae

Genus: *Garcinia*

Synonyms: *Mangostana garcinia*

Vernacular name: Manggis

General Descriptions: Medium tree, to 9-18 m tall, with a straight trunk and a rounded, dense crown. All parts of the plant exude yellow latex when wounded. The thick leaves are opposite, elliptical and bright green. The flowers are solitary or in pairs at the branch apex, with 4 pinkish white petals and 4 persistent sepals. The fruit is round, with a thick purple rind surrounding 4 - 8 fruit segments (L.J.G. van der Maesan and Sadikin Somaatmadja 1997).

Mangosteen is a crop of the humid tropics, often found in association with the durian. It thrives in conditions of high temperature, high humidity, a short dry season to stimulate flowering and an uninterrupted water supply.

Part of plant for colour extraction: The fruit rind contains tannin and purple dye.

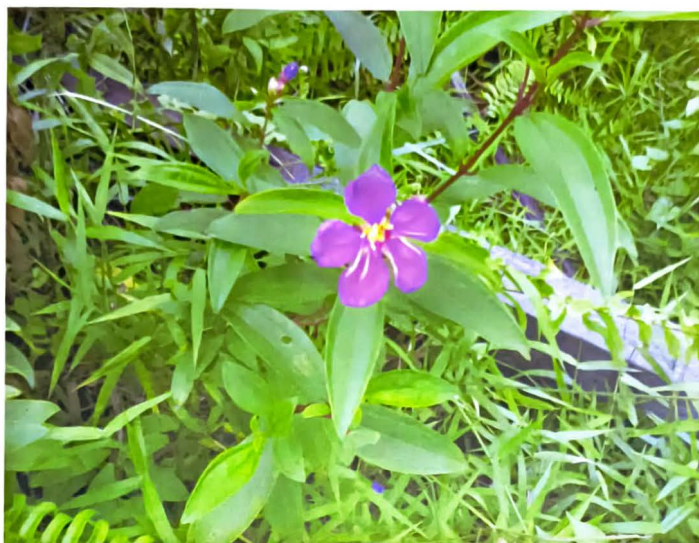
***Melastoma sanguineum* Sims.**

Family: Melastomaceae

Genus: *Melastoma*

General Description: Shrubs or small trees up to 10 m high. The leaves are lanceolate or elliptic. Flowers solitary with occasionally 6 or 7 merous. Fruits campanulate, fleshy campanulate, fleshy capsules, rupturing irregularly longitudinally at maturity, exposing the solid, yellow pulp with orange seeds. Seeds minute, cochleate. The plant is a widespread species with considerable morphological variation. The ecology of *Melastoma sanguineum* is in disturbed forests, along streams and roads and in open places and savannas at elevation up to 2300 m (Burkhill, 1966).

Part of plant for colour extraction: A flower petal use for extract purple colour.



Melastoma malabathricum L.

Family: Melastomataceae

Genus: *Melastoma*

Vernacular name: Senduduk

General Description: *Melastoma malabathricum* is an evergreen shrub, up to 2 m tall. Fruit a berry-like capsule with numerous seeds coated with red, sweet astringent pulp. Seeds dimorphic, with and without embryo. Surface glistening, dense with minute papillae. Leaves are simple, narrow with 3 prominent longitudinal veins. Flowers have 5 petals; dark purple to pinkish; on rare occasions, white. Fruits contain many tiny seeds. It grows all over the country in waste places. Moist tropics; a weed in abandoned clearings, waste ground, disturbed sites associated with plantation crops.

Part of plant for colour extraction: A flower petal use for extract purple colour.

***Indigofera suffruticosa anil* Mill.**

Family: Fabaceae

Genus: *Indigofera*

Vernacular name: Tarom, sekcbak

General Description: *Indigofera* is a large genus of about 700 species of flowering plants belonging to the family fabaceae. The species are mostly shrubs, through some are herbaceous, and a few can become small trees up to 5 - 6 m tall. Most are dry-season or winter deciduous. The leaves are pinnate and the terminal leaflet present. Leaf size varies from 3 - 25 cm. The flowers are small and produced on racemes. Seeds globular, mottled brown or shiny black (Walker, 1976).

Occasional to common on roadsides, bush fallow and other disturbed places.

Naturalizes primarily in dry, highly disturbed areas.

Part of plant for colour extraction: The *Indigofera suffruticosa* are used to produce the indigo dye.

Yellow colour

***Anthocephalus chinensis* (Roxb.) Miq**

Family: Rubiaceae

Genus: *Anthocephalus*

Synonyms: *Nauclea cadamba*, *Anthocephalus cadamba*

Vernacular names: Kelempayan, laran, selimpuh, sempayan (Sarawak).

General Description: A moderate to large tree, up to 45 m high. Bole straight and cylindrical. Leaves opposite, ovate to elliptic, flowers in terminal. Fruitlets numerous, trigonal or irregularly - shaped. Selimpuh is very common in secondary forests and sometimes large individuals can be found in primary rainforests. It grows on a variety of soils but it is more abundant and dominant on fertile soils with good aeration. It is a pioneer species on river banks and in the transitory zone between swampy, permanently flooded areas and the drier loams, in areas which are flooded periodically.

Part of plant for colour extraction: A yellow dye can be obtained from the root bark.

Archagelisia flava

Family: Menispermaceae

Genus: *Archagelisia*

Synonyms: *Arcangelisia lemmiscata*

Vernacular names: Mengkunyit.

General Description: A large, woody, glabrous liana, up to 20 m long. Leaves usually ovate, coriaceous; petiols, swollen at both ends and blade palmately 5 - nerved at the base. Drupes slightly laterally compressed, transversely subovoid, 2 - 3 cm in diameter, yellow; endocarp woody, covered with a dense mat of radially arranged fibres. *Arcangelisia flava* has yellow wood and is used predominantly as a dye colour by the Orang Ulu ethnics in Asap Koyan Belaga. *A. flava* occurs in forests at altitudes up to 1000 m, sometimes near riverbanks (Parry and Richard Lloyd, 2001).

Part of plant for colour extraction: Yellow dye is extracted from the woody stem.

Bixa orellana L.

Family: Bixaceae

Genus: *Bixa*

Vernacular names: Kesumba

General Descriptions: An evergreen shrub or small tree. *Bixa orellana* can be found on almost all types of soils with a preference for neutral and slightly alkaline soils. It grows into a larger tree when planted in deeper and more fertile soil, rich in organic matter. Branches greenish and densely rusty - scaly when young, later becoming dark brown, ringed at nodes (Rajendran, 1989).

Leaves spirally arranged, simple, herbaceous, stipulate and ovate. Fruit spherical, green, greenish brown or red when mature, many seeded. A seed is obovoid and angular with bright orange-red fleshy seed coat (Hart, 1964). This plant can easily be found in Asap Koyan area. It's almost available in the garden, near the long house and can be found everywhere in Asap Koyan area. They cultivated this plant at many places for their use (Backer, 1951).

Part of plant for colour extraction: The main product obtained from the tree is an organic dye present in the fruits. The dye is used to paint the body as a decoration. It has also been used for dyeing cotton giving an orange-red colour. Formerly, bamboo matting and rattans were dyed with it (Anand, 1983).



Curcuma domestica L.

Family: Zingiberaceae

Genus: *Curcuma*

Vernacular names: Kunyit

General Description: Turmeric is perennial herb, growing to a height of about 1 m. The leaves are borne in a tuft, alternately arranged; light green in color and rather flaccid. The leaves are glabrous, elliptical lanceolate in shape with an entire margin. The leaf apice is acuminate and the base sheating. The rhizomes are aromatic, orange-brown in colour on outside and bright orange in the inside. The plant grows well in mill shade but produces larger and better rhizomes when grown in open and exposed to full sunlight (Brown, 1954).

Part of plant for colour extraction: It has been use as yellow dye.



***Mangifera indica* L.**

Family: Anacardiaceae

Genus: *Mangifera*

Vernacular name: Mangga

General Description: Tree is medium to large, evergreen with symmetrical, rounded canopy ranging from low and dense to upright and open. Bark is usually dark grey-brown to black, rather smooth. Leaves are simple, stipulate. The leaves are simple. Leaves are variable shaped like oval - lanceolate, oblong, linear-oblong, ovate, or roundish oblong. The fruit is a more or less compressed, fleshy drupe. It varies considerably in size, shape and colour (Sastrapradga, 1978).

Part of plant for colour extraction: Bark of the *Mangifera indica* for yellow colour extraction.

Nyctanthes arbor-tristis L.

Family: Oleaceae

Genus: *Nyctanthes*

Synonyms: *Nyctanthes dentata*

Vernacular name: Seri Gading

General Description: A large shrub or small tree up to 10 m tall. The wood is fairly heavy, averaging about 880 kg/m³. Branches spreading, rough and scabrous. Leaves decussately opposite, ovate to subcordate at base, very scabrous above with bulbous-based hairs, pubescent beneath, shortly petiolate. Flowers in axillary or terminal. It is native area night jasmine is found on rocky ground in dry hillsides (Soerianegara, 1996).

Part of plant for colour extraction: A flowers of *Nyctanthes arbor-tristis* for yellow colour extraction.

***Maclura cochinnensis* L.**

Family: Moraceae

Genus: *Maclura*

Synonyms: *Maclura javanica*

Vernacular name: Kederang

General Description: A branch thorny shrub, scrambling. Leaves spirally arranged, elliptic to oblong. Fruiting heads composed of accrescent fleshy perianth and bracts forming a capitate syncarp. Seeds rounded brown. A densely hairy form of this variable species has been named *var pubescens*. *Maclura cochinnensis* species grows in lowland forest. It also can be found in thickets and brushwood. Locally is common (Sequin and Margareta, 1981).

Part of plant for colour extraction: The heartwood, particularly of the larger roots and stem to extract yellow dye (Bhatnagar, 1948).

Green Colour

***Excoecaria indica* Willd. (Mull.Arg)**

Family: Euphorbiaceae

Genus: *Excoecaria*

Vernacular name: Buta-buta, bebuta, kayu mati buta.

General Description: A small tree up to 18 m tall, usually less than 10 m, glabrous and containing latex; trunk short, not buttressed, with grayish, shallowly fissured bark; crown bluish, usually with upright branches and more or less drooping twigs. Leaves elliptic or lanceolate. Flowers in terminal. Fruit a globose, woody capsule, dark grey-brown to almost black, 3 - seeded. In habit and in the leaves, this species resembles a willow. The latex, copious in unripe fruits and less abundant in other parts of the plant, is reported poisonous. Aesculetin, a substance poisonous to fish, has been isolated from the fruit. In the seeds 50 - 60 % of greenish-yellow oil is present (De Vogel, 1980).

Part of plant for colour extraction: The leaves can be used to prepare a dye, which give yarn a greenish - yellow colour or a dark colour for rattan. The dyed yarn will gain a black colour when buried in the mud.



***Pandanus odoratissimus* Roxb.**

Family: Pandanaceae

Genus : *Pandanus*

Vernacular names: Pandan

General Descriptions: A small, slender, branching tree with a flexuous trunk supported by brace roots. Medium height plant. The leaves are rosettes of long-pointed, stiffly leathery, spiny, bluish green leaves. Leaves spirally arranged, straplike, green. A fragrant leaves and very fragrant flowers.

Part of plant for colour extraction: The green colour can get from Pandan leaves for temporary dye colour.

***Shorea javanica* (Koord. & Valetton)**

Family: Dipterocarpaceae

Genus: *Shorea*

Vernacular name: Meranti pa'ang, Meranti Putih, temak (Peninsular), raruk, melapi (Sarawak).

General Descriptions: Medium-sized to very large trees up to 60 m tall; bole straight, cylindrical. Leaves alternate, simple, entire, glabrous or with stellate hairs, pinnately veined with scalariform tertiary venation and obscure midrib. Flowers second or distichous, bisexual. Fruit usually shortly stalked, subglobose to ovate, sharply pointed. *Shorea* species are confined to tropical climates with a mean annual rainfall exceeding 1600 mm and with a dry season of less than 6 months.

The largest numbers of species and of individuals are found on deep, well-drained yellow or red soils in the lowland. In general, white meranti is more abundant in seasonal than in a seasonal forests. White meranti is a lightweight hardwood. The heartwood is yellowish-white and indistinct from the sapwood when freshly cut, but gradually becomes yellowish-brown or light brown and slightly more distinct from the sapwood on exposure (Sastri, 1959).

Part of plant for colour extraction: Stem of the tree is burn as charcoal for mix with other colouring plant to making tattoo.

Blue colour



***Ipomea batatas* (L.) Lam**

Family: Convolvulaceae

Genus: *Ipomea*

Vernacular name: Keledek

General Description: *Ipomea batatas* is an herbaceous perennial vine, bearing alternate heart-shaped or palmately lobed leaves and medium-sized sympetalous flowers. The edible tuberous root is long and tapered, with a smooth skin whose color ranges between red, purple, brown and white. Its flesh ranges from white through yellow, orange and purple.

Part of plant for colour extraction: The leaf of *Ipomea batatas* extracted to get blue colour.

***Lithocarpus cratephora* Fischer**

Family: Fagaceae

Genus: *Lithocarpus*

Vernacular names: Mempening, Kenyah: Paning-paning, Melayu Sarawak: Brangan Gasing.

General Description: Mid-canopy tree up to 34 m tall. Leaves alternate, simple, penni-veined and glabrous to hairy below. Flowers yellow placed in racemes. Fruit green-grey-brown. Its habitat in undisturbed to slightly disturbed mixed dipterocarp and sub-montane forests up to 1700 m altitude. Mostly on hillsides and ridges and also along rivers in Asap Koyan Belaga. Mostly on sandy soils, but also found on limestone. In secondary forest it is usually present as a pre-disturbance remnant tree (Brink, 2003).

Part of plant for colour extraction: The leaves of *Lithocarpus rossa* are use to extract a blue dye.

Orange colour



***Artocarpus heterophyllus* Lam.**

Family: Moraceae

Genus: *Artocarpus*

Vernacular name: Nangka

General Description: *Artocarpus heterophyllus* is a species of tree of the mulberry family. It is well suited to tropical lowlands. Jackfruit is the largest tree - borne in the world. The exterior of the compound fruit is green or yellow when ripe. The leaves are oblong to obovate, entire, glossy above and acute. The habitat and ecology of the plant is in the evergreen or at semi evergreen forests. Well suited to tropical lowlands.

Part of plant for colour extraction: Heartwood of *Artocarpus heterophyllus* for orange colour extraction.



***Artocarpus integer* (Thunb. Merr)**

Family: Moraceae

Genus: *Artocarpus*

Vernacular name: Cempedak

General Description: *Artocarpus integer* is a large tree with a dense crown, reaching a height of 15 m or more; the cylindrical stem is rounded at the ends. Leaves obovate to elliptic. Fruits cylindrical, globose, yellowish or brown to orange-green. *Artocarpus integer* is extensively grown in Asap Koyan Belaga for its fruit. The natural habitat of *A. integer* is an under storey tree to commonly found growing in secondary and primary forests in lowland tropical forest where there is no distinct dry season (Buisson, 1986).

Part of plant for colour extraction: Heartwood of *Artocarpus integer* for orange colour.

***Syzygium cuminii* (L.) Skeels**

Family: Myrtaceae

Genus: *Syzygium*

Vernacular name: Jambolan, Jambulana, Jiwat, Obah.

General Description: *Syzygium* is a medium-sized tree 10 - 30 m high, with a straight to crooked, short, stout trunk. Crown is irregular or globular with many branches. Leaves are entire with narrow transparent margin. Fruit are ovoid-oblong or elliptical berries, numerous, crowded in clusters, almost stalkless along twigs at the back of leaves, often curved. The seed in each berry is strongly astringent and slightly bitter and sometimes angular. Shaped seeds are compressed together into a mass resembling a single seed. Cotyledons are pale green (De Vogel, 1980).

Part of plant for colour extraction: The extracts of the *Syzygium cuminii* bark can give durable brown colored.



***Garcinia atroviridis* Griff. Ex T. Anderson**

Family: Guttiferae

Genus: *Garcinia*

Vernacular name: Asam gelugor

General Description: The *Garcinia atroviridis* tree grows to a height of 20 m and has long trunk, smooth grey bark and drooping branch. The leaves are dark green, shiny, long narrow with a pointed tip and upturned. The flowers are dark and the round yellow to orange fruits are borne singly on twig ends and are 7 - 10 cm in diameter. They are heavy, longitudinally grooved by 12 to 16 and are flattened at the apex (Sastri, 1962).

Part of plant for colour extraction: Fruit used as mordant to extract brown colour for dyeing traditional cloth of Orang Kenyah ethnics.

***Garcinia dulcis* (Roxb.) Kurz**

Family: *Guttiferae*

Genus: *Garcinia*

Vernacular name: Mundu

General Description: A medium-size tree with an upright growth habit and a cone-shaped canopy. The leaves are shiny green, reddish when young, and make a lovely ornamental. The fruit is yellow, thin-skinned and smooth. The soft yellow flesh has a butter-like consistency and pleasant acid flavor. The natural habitat of *Garcinia dulcis* is commonly found in tropical forest.

Part of plant for colour extraction: Fruit use to extract brown colour for dyeing traditional cloth of Orang Kenyah ethnics.

CHAPTER 5

DISCUSSION

5.1 Introduction

Fifty one plant species belonging to 30 families have been recorded in the present work. Euphorbiaceae and Palmaceae is found to be dominant with 5 species followed by Leguminosae with 4 species, Guttiferae and Moraceae 3 species, Anacardiaceae, Melastomaceae and Rhizophoraceae, 2 species and only 1 species from every family of Anardiaceae, Acanthaceae, Balsaminaceae, Bixaceae, Convolvulaceae, Dipterocarpaceae, Fagaceae, Graminae, Lythraceae, Malvaceae, Menispermaceae, Meliaceae, Myrtaceae, Oleaceae, Pandanaceae, Piperaceae, Rubiaceae, Sapindaceae, Solanaceae, Simaboraceae, Theaceae, Verbenaceae, and Zingiberaceae.

According to the research, plant from family *Euphorbiaceae* and family *Palmae* are the dominant plant species that are using by the Orang Ulu ethnics in Asap Koyan Belaga for colour extracting. The most of colour get from plant extraction are red and black colour that is about 28% followed by purple and yellow colour 14 %, brown colour 6%, and 4% for green, orange and blue colour.

5.2 Part of Plant for Dye Extraction

Various plant parts are used for extracting dye from plant. The classification of natural dye - yielding plant sources is associated with plant parts such as leaves, barks, roots and fruits. Normally, lighter colors are derived from leaves and fruits while darker colours are derived from bark and roots.

According to the result, various plant parts used for colour extraction include extraction the fruits of (*Arecha catechu*, *Bixa orellana*, *Baccaurea motylena*, *Curcuma domestica*, *Daemonorops micracanta*, *Daemonorops didymophylla*, *Daemonorops sabut Beccari*, *Flemingia macrophylla*, *Garcinia mangostana*, *Garcinia atrovides*, *Garcinia dulcis*, *Gordonia scothecni* and *Lansium domesticum*).

Flowers of the plant used as part for colour extraction (*Clitoria ternatea*, *Melastoma malabathricum*, *Melastoma sanguiem* and *Nyctanthes arbor-tristis*). Heartwood of (*Artorcarpus heteropyhllus*, *Artorcarpus integer*), woody stem (*Archagelisia flava*), leaves of (*Eurycoma longifolia*, *Excoecaria indica*, *Glochidion superbum*, *Ipomea batatas*, *Macaranga tanarius*, *Pandanus odoratissimus*, *Piper betle*), and bark of (*Baccaurea javanica*, *Bruguiera gymnorhiza*, *Mangifera indica*, and *Syzigium cuminii*).

Roots of *Morinda citrifolia* are important part for colour extraction. Other part used are shoot and leaves (*Nephelium*), twigs and leaves (*Peristophe bivalves*), wood (*Peristophe indicus*), leaves and bark (*Psidium guajava*), dregs (*Saccharum officinarum*), stem (*Shorea javanica*) and resinous from leaf (*Uncaria gambir*).

Dyes extracted from these plant parts have more subtle or pastel colours compared to the vibrant feature obtained from commercial or synthetic dyes. The selection of mature and fresh raw dye materials contributes to the purity and quality of dyes during colour extraction and processing. Raw material sources are colour dependent in relation to maturity and source condition. Healthy plant parts ensure better and more desirable colours (Lipiphan, 1983).

5.3 Indigenous Knowledge of the Orang Ulu Ethnics

The ethnic group inhabiting different areas of the state has indigenous knowledge for utilizing the plant resources that are available in their area. Floral diversity is the main source of raw materials being used traditionally by the indigenous people in Asap Koyan Belaga. Their knowledge in utilizing these resources is characteristics and differs from tribe to tribe. The best about the natural dyes is it is environment friendly. The variety of natural dye - yielding plant sources with their varying derived colours dictate the dyes to be extracted (Davis *et al*, 1995).

The Orang Ulu ethnics were found to be employed traditionally by the ethnics community of the districts covered under the study for extracting dyes utilizing indigenous extraction technique . The Orang Ulu community in the districts has traditionally been using variety of plant for preparing natural dyes.

With the emergence of modern dyeing technologies, the natural dye weaving was not affected in terms of authenticity and originality. This is also supported by the creativity and artistry expressed in the Orang Ulu ethnics finishing product. Futhermore, it became the bases for the social, economic and boosting their cultural integrity and dignity.

CHAPTER 6

CONCLUSION

From the research, the families of plant that can produced or get more colour from extracting are the Euphorbiaceae family and Palmae family. The most colour that can be get from the colouring plant are the red and black colour. People of the Orang Ulu ethnics use the dye for many purpose in their life like coloured their handicraft, blacken teeth, tattooing and many more in their culture and social life.

The place and the main source of the colouring plant mostly are found in the primary forest, secondary forest, and the Orang Ulu ethnic's home garden. The type of colouring plant now is still available in the Asap Koyan Belaga forest, but, the activity of logging and timber harvested are highly occurs in the forest and this activity have destructed the existence of the colouring plant. Good management and forest conservation have to been done to make this plant will be available until the next generation.

A documentation of identification of colouring plant used by the Orang Ulu ethnics in Asap Koyan Belaga has been done. Having this research and documentation, hoping that it's can attract people to use this type of natural dye colour extracted from plant.

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APPENDICES

APPENDIX A: Survey Form

**‘IDENTIFICATION OF COLOURING PLANT USED AMONG THE ORANG
ULU ETHNICS IN ASAP KOYAN BELAGA’.**

Vernacular name: _____

Scientific name: _____

Family: _____

Ecology: _____

Part of the plant need to harvest for extraction

Purposes of the colour

Colour get from the extraction

Information gets from:

Name: _____

Ethnic: _____

Age: _____

APPENDIX B: Respondents of the interview

No	Name	Ethnics	Age
1	Angun	Kenyah	54
2	Anthony	Kenyah	40
3	Aren Anye	Kenyah	68
4	Aren Sulan	Kenyah	85
5	Aren Uda	Kenyah	70
6	Bawek Auu	Kenyah	85
7	Bin Uleh	Kenyah	53
8	Buwak Uda	Kenyah	62
9	Denny Anye	Kenyah	67
10	Empu Anye	Kenyah	70
11	Enton Ngau	Kenyah	60
12	Imang	Kayan	83
13	Jelawat	Kayan	61
14	Judin	Kenyah	56
15	Josh	Kenyah	76
16	Franchis	Kenyah	43
17	Liling	Kayan	69
18	Mary Anye	Kenyah	34
19	Magdeline	Kayan	32
20	Jaman	Kayan	67
21	Ngang Erung	Kenyah	66
22	Florence	Kenyah	34
23	Larong Ajan	Kenyah	97
24	Alan Uda	Kenyah	60
25	Luak Jok	Kenyah	100
26	Jasat	Kayan	78
27	Peluat	Kenyah	45
28	Rambu	Kayan	57
29	Sam	Kenyah	44
30	Tipong Anyek	Kayan	60
31	Upok Nyang	Kenyah	78
32	Stanly	Kenyah	74
33	Tiban Lubin	Kayan	55
34	Agnes	Kenyah	49
35	Wan	Kenyah	70
36	Lumui	Kayan	89
37	Jessapa	Kenyah	57
38	Tapan	Kayan	80
39	Josephine	Kenyah	70
40	Pasat	Kayan	85
41	George	Kenyah	52
42	Sipun	Kayan	58
43	Lawrence	Kayan	77
44	Anthony	Kenyah	78

45	Norina Ngang	Kenyah	25
46	Okang	Kenyah	46
47	Buroi	Kenyah	52
48	Madang Juan	Kenyah	46
49	Paulsta	Kayan	58
50	Lungi	Kayan	97
51	Sarah	Kenyah	36
52	Monica	Kenyah	31
53	Elizabeth	Kenyah	29
54	Lisa	Kayan	39
55	Patrick	Kenyah	33

APPENDIX C: Picture of Research Work



Luat Jok, 100 old ladie from Lebu Kulit longhouse during an interview.



Interview the people of Orang Ulu ethnics in group.



Ethnobotanical survey of colouring plants.



Explanation on types of colouring plants by Uncle Alan Udau.



Tradition and culture of the Orang Ulu ethnics.



Excellent working and supporting with best friend, Nor Azizah Jamil.

PUBLICATION OF THE PROJECT UNDERTAKING

This is to certify that I have no objection to publish the project entitled "Identification of colouring plant used by the Orang Ulu ethnics in Asap Koyan Belaga" by the supervisor in a joint authorship. However, it has to be evaluated by the Faculty of Agriculture and Food Sciences, Universiti Putra Malaysia Bintulu Sarawak Campus and published in the form approved by the Faculty.

NORAINI BINTI ROSLI

Date: