Documentation of plants as natural colorants by Temuan community in Taman Negara Johor Gunung Ledang

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Abstract. This research is about the ethnobotanical studies of the natural color used by Temuan community in three different villages around Taman Negara Johor Gunung Ledang which are Kampung Sungai Air Tawas, Kampung Tanah Gembur, and Kampung Sungai Mersing. This study aims to document the information about plants used by the aboriginal community which act as natural colorants for future references. Semi-structured questionnaires were given to the community during the interview. The plants used by them as natural colorants were recorded. The plant sample was taken during the interview with Temuan community for the preparation of herbarium specimen. It was found that Curcuma longa is the most used plant for natural yellow color by the community. Besides that, Pandanus amaryllifolius and Lawsonia inermis have high citation frequency for the most used plant for natural green and orange color. This concludes that our environment is equipped with natural resources that are beneficial to human respectively and this traditional knowledge of natural colors must be preserved but also should be disseminated to other people for greater appreciation.

1. Introduction

Natural dyes or colours are mostly come from plants, animal, or mineral [1]. The history of natural dye that came from plant started from the ancient time [2]. This natural dye can be traced back from the Neolithic era [2]. Then, this revolution starts to develop in 1856 when William Henry Perkin, an English chemist, synthesized the artificial dye called ‘mauveine’ [3]. He was being able to do this because of the oxidation of the mixture of aniline base to produce a violet cationic dye [4]. This was the perk of developing of the natural dye [5]. The public start to take interest about the natural colour product in last decade of twentieth century due to environmental issues [6]. They start to switch from synthetic colour to natural colour because natural colours are renewable and biodegradable [1]. Nowadays, the demands for natural colorants are increase due to the fact that it causes fewer side effects compare to synthetic colorants but they can also provide properties such as UV protection, skin moisturizing and anti-aging [7].

In human civilization, natural colour mostly come from plants as their uses are no limited to food, fibre, fuel clothes and shelters but also dyes for design, painting and dying cloths [8]. The focus of this study is to document the traditional knowledge about Temuan community in using the plants as their natural colour. The purpose of this study is to preserve the knowledge of indigenous community
regarding the plants based natural colorants used through questionnaires for future references. Using this information in documentation of plants by indigenous community, hopefully the younger generation will care about their natural heritage and culture that become part of their identity.

2. Materials and methods

2.1. Permit authorization
The permit authorizations were obtained from Jabatan Kemajuan Orang Asli (JAKOA) and Perbadanan Taman Negara Johor (PTNJ). The permits obtained to prevent any biopiracy issues between researcher and the villagers. Access and benefit sharing (ABS) form was also given to the Temuan communities during the interview session. Under the Convention on Biological Diversity (CBD), countries have unrestricted rights over the genetic resources within their boundaries and that agreements governing access to genetic resources and sharing of benefits arising from their use should be established between the parties involved [9].

2.2. Field data collection
Semi structured question have been used during the interview with the Temuan community that have ethnobotanical knowledge on plants as natural colorants. The questions include the communities demography, types of plant used, methods used to extract the plant colour, and any taboos during the process [10]. All the information data from the interview were recorded in the notebook and audio recorder.

2.3. Sampling collection
The plant sample for herbarium collection was collected around the villages and Taman Negara Johor Gunung Ledang. The plant samples have been recorded in notebook and tagged.

2.4. Herbarium specimen curation
The plant samples have been cut according to the standard size of herbarium mounting sheet 11½ X 16½ inches. Then, the plant was pressed using the newspaper and each plant was pressed by using separated newspaper. This to prevent the plant from overlapped with each other. The plant sample leaf, flower and fruit have been arranged properly and not overlapped. The plant was kept tight using the wooden press to prevent the leaf and the flower wrinkles during drying process. The temperature in the oven was being set at 35ºC - 45ºC. The drying process took about 1-2 days. After dry, all the plant parts of the plant specimen such as stem, leaves, flower and fruits have been mounted in the herbarium sheet. The leaves or flower that have been rotten, not in the perfect shape or darkened must be pluck out from the plant specimen. The leaves and stem can have been glued to the herbarium sheet before mount using white glue. As for the large seeds or fruits, it have been attached in the small envelope and are glued together at the upper side of the herbarium sheet altogether with plant specimen that has already been mounted on the herbarium sheet.

3. Results and discussion

3.1. List of plants used as natural colorants
From the interview, it was found that there are twelve (12) species of plants that are currently being used by the Temuan community as a source of natural colour in their daily life. Based on Table 1, many plant species that were recorded are the cultivated plants as opposed to the wild plants. Besides, these plant species are also among the common ones for example Curcuma longa, Pandanus amaryllifolius and Lawsonia inermis. From the list, red colour can be easily obtained from several plant species for example Areca catechu, Artocarpus nitidus griffithii, Bixa Orellana L. and Piper betle. These show that the surrounding plants are very beneficial and serve as great potential for natural colours to substitute the synthetic colours.
Table 1. The plants that have been used by Temuan community as natural colour.

| No. | Scientific name                  | Local name     | Extraction colour | Preparation Method | Part used | Domestication | Taboo |
|-----|----------------------------------|----------------|-------------------|-------------------|-----------|---------------|-------|
| 1   | Pandanus amaryllifolius          | Pandan         | green             | Blend             | leaf      | cultivated    | none  |
| 2   | Curcuma longa                    | Kunyit         | yellow            | Blend             | rhizome   | cultivated    | none  |
| 3   | Lawsonia inermis                 | Inai           | orange            | Pound             | leaf      | cultivated    | none  |
| 4   | Piper betle                      | Sireh          | red               | Grind             | leaf      | cultivated    | none  |
| 5   | Areca catechu                    | Pinang         | red               | Grind             | fruit     | cultivated    | none  |
| 6   | Artocarpus nitidus griffithii    | Pokok tampang  | red               | Decoction         | fruit     | wild          | none  |
| 7   | Impatiens balsamina              | Keembung       | orange            | Pound             | leaf      | cultivated    | none  |
| 8   | Eurycoma longifolia              | Penawar pahit  | white             | Decoction         | rhizome   | wild          | none  |
| 9   | Polyalthia bullata               | Tongkat Ali    | black             | Decoction         | rhizome   | wild          | none  |
| 10  | Bixa Orellana L.                 | Buah inai / Kesumba | red          | Blend             | fruit     | cultivated    | none  |
| 11  | Clidemia hirta                   | Senduduk bulu  | purple            | Blend             | fruit     | wild          | none  |
| 12  | Clitoria ternatea                | Bunga telang   | blue              | Infusion          | flower    | cultivated    | none  |

3.2. Citation of plants used as natural colorants

The plants that have been recorded are presented in a graph to show which plant is mostly and rarely used by Temuan community. *Curcuma longa* (kunyit) received the highest citation frequency for its natural yellow colour followed by *Pandanus amaryllifolius* (pandan) and *Lawsonia inermis* (inai) for their natural green and orange colour, respectively. These plants were mentioned the highest due to the fact that the plants are cultivated near to the house and that the plants are accessible to them easily (Figure 1).

*Clidemia hirta* (senduduk bulu), *Polyalthia bullata* (tongkat ali), *Eurycoma longifolia* (penawar pahit) and *Artocarpus nitidus griffithii* (buah tampang) received the lowest citation frequency. This is because these plants are found in the wild which located in the lowland tropical forest. Therefore, permissible weather would be a favourable condition for them to get the plants. In addition, since the older generations are still practising this traditional knowledge more than the younger generation, health and physical factor comes into play too.
3.3. **Traditional knowledge erosion**

Based on the interview with Temuan community, the plants that are used as natural colour are very limited. It was claimed by the Temuan community that the younger generation among them have a very limited knowledge about the usage of plants as natural colour. Many of them now prefer to use the ready-made and synthetic colour as it is readily accessible.

4. **Conclusion**

It can be concluded that natural colours can be obtained easily from the natural resources. The traditional knowledge plays vital part in ensuring that the potential of all plants is maximized to serve a greater benefit to human. This study shows that there are several common plants that can be commercial towards substituting the synthetic colours in which the synthetic colours can pose slight side effects for long-term use. This traditional knowledge also needs to be disseminated to other people to ensure higher appreciation, to prevent the erosion of the knowledge and to educate people to start living a healthy lifestyle.

5. **Acknowledgement**

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