

## Nutritional Value of the Concoction of *Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza* and *Curcuma longa* Used for Herbs Rice

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Received 24 April 2014

Accepted 2 July 2014

Available online 8 October 2014

### Keywords:

*Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza*, *Curcuma longa*, calcium, magnesium, potassium, sodium, fat

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### Abstract

Old folks especially in Kelantan, Malaysia like to consume specially prepared herbal rice or what is gastronomically known as “Nasi Kerabu”. In this preparation, white rice is soaked with the concoction of some local herbal plants for a few minutes and cooked without having the knowledge of the nutritional values of the herbal plants used. Without knowing the nutritional contents of the herbal plants used may lead to nutrient imbalance in the body and this was believed to be the root of other illnesses. So, the study was carried out with the objective of identifying the nutritional values of the concoction of *Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza* and *Curcuma longa*. The methods used for sample analysis and extraction were simple water extraction to extract plants sample, Nitric Acid Digestion to digest extracted samples, extraction procedure which was published by Behr Labor-Technik to analyze the fat content and sample analysis using Atomic Absorption Spectrophotometer (AAS). The results shows that, concoction of 20 ml of *Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza* and *Curcuma longa* consists of 0.2 g of fat, 2 mg of Calcium, 5 mg of Magnesium, 50 mg of Potassium and 3 mg of Sodium. The fat, macronutrients (potassium and sodium) and minerals (calcium and magnesium) in the concoction are considered to be sufficient to meet the requirements of Recommended Daily Intake (RDI) used by Food and Drug Administration (FDA) especially when cooked with white rice.

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## 1. Introduction

Biological diversity is a global valuable asset to current and future generations (Biotechnology Center of Excellence Corporation, 2003) through the utilization of plants and animals for their health and wealth. The unparalleled range of natural health products on the market such as food supplements, health foods and herbal remedies is constantly

expanding to respond to the challenges of creating new and innovative products for human wellness. The utilization of plant based ingredients in the extensive range of natural health products has increased considerably over the last few years. It is fervently believed that the synthetic products derived from these plants can contribute to allergic reactions such as asthma while some others are believed to be carcinogenic (Brian Krans, 2013) or even responsible

for defects in unborn babies. The utilization of plant based ingredients not only concentrated on the natural health product alone but it was also widely used in food preparation especially “nasi kerabu” the famous Kelantanese cuisine. Nasi kerabu is actually, white rice which was soaked with the concoction of some local herbal plants for a few minutes and cooked and this rice normally served with fried grated coconut, fish sauce, fish floss, lemon grass, long bean, cucumber and black pepper (My Kitchen Snippets, 2013).

Therefore, a lot of studies have been done by the researchers all over the world to determine the active bio-component in plant, as an alternative for natural products. For instances, several researches had been conducted to determine the antimicrobial and anthelmintic effects of natural plant extracts from *Punica granatum* (Chaitra et. al., 2012), coconut shell (Verma et. al., 2012) and *Carica papaya* (Shazly and Goyal, 2012). Many other researchers also embarked on the study to identify the possibility of using plant components to solve human health problems (Kanife et. al., 2012; Bobade and Khyade, 2012; Khyade et. al., 2012 and Jeetendra and Dilip Kumar, 2012). Apart from that, a lot of studies were undertaken by the researcher to extract plant materials and isolate plant constituents as a solution for the environmental pollution, for example Mthusamy et. al., (2012) have embarked on a study to utilize maize cob to remove heavy metals in industrial wastewater. Meanwhile, study by Aweng et. al. (2012) showed that, *Cassia alata* has a potential to be used as a coagulant in water treatment. Similarly with the finding from Mangale et. al. (2012), where they found that, *Moringa oleifera* could be used as a natural absorbent and antimicrobial agent in water treatment.

Among the traditional tropical herbs which have been used either for medications or culinary purposes by the old folks especially in Malaysia are *Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza* and *Curcuma longa*. *Clitoria ternatea* (Figure 1:a) which originated in the tropics including Malaysia and also found in some parts of temperate areas has its uses with the flowers

often as a food dye or dipped in batter and deep-fried. Its roots, used in ayurvedic Indian medicine, is said to improve retention and spatial learning performance in the brain of treated rat (Rai et. al., 2001).

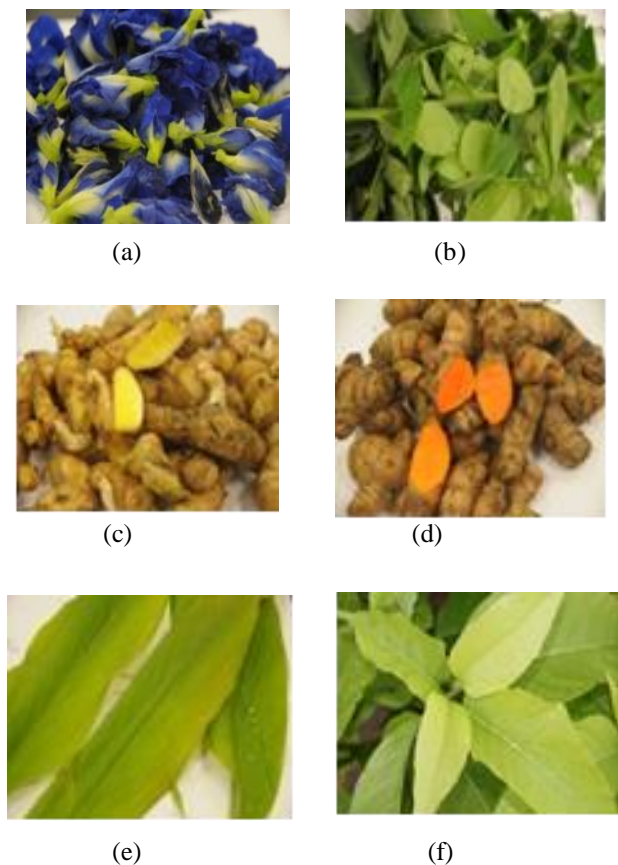
The second type of common herbal plant which was used by the old folks is *Sauropus androgynus* whose shoot tips are sold as tropical asparagus (Figure 1:b). Soups are also prepared when it is cooked together with crab meat, minced pork or dried shrimp especially by Vietnamese folks. The other way of using this herb is to stir-fry with egg or dried anchovies as is practiced in Malaysia while the Indonesians make use of the leaves to make infusion which is believed to improve the flow of breast milk for breastfeeding mothers. The herb contains some good nutrients and is a source of vitamin K and has high level of provita-min A carotenoids, especially in freshly picked leaves. High levels of vitamins B and C, protein and minerals are also found (Padmavathi et. al., 1990) and the more mature leaves, the higher nutrient content.

Another common herbal plants which was used by the old folks is *Curcuma zanthorrhiza* (Figure 1:c) and is used as a medicinal plant. Basically the underground rhizome part is utilized as it contains ethereal oil (5ml per kg) and is primarily of Sesquiterpenes. Apart from that, curcumin (at least 1%, Ph. Eur.) and starch are also present and is used for dyspepsia and as a spice too (Bettina, 2009).

*Curcuma longa* (Figure 1:d& e) is also one of the popular herbal plants and is found growing wild in its forests habitat of South and Southeast Asia. It is one of the key ingredients in many Asian dishes. In Indian ayurvedic medicine *Curcuma longa* is recommended in food for its potential medicinal value as the phytochemicals found in the herbal plant have some potential effects in treating diabetes through preliminary investigation already conducted (Boaz et. al., 2011). Some basic research work has also reported that *Curcuma longa* reduced the severity of pancreatitis-associated lung injury in mice, while others have shown that compounds in *Curcuma longa*

possess anti-fungal and anti-bacterial properties (Seo et. al., 2011).

The last herbal plant in the concoction for preparation of the herbal rice is the use of the leaves of *Morinda citrifolia* (Figure 1f). Traditionally in Polynesian culture, the green fruit, leaves and root/rhizomes are used to treat menstrual cramps, bowel irregularities, diabetes, liver diseases and urinary tract infections (Wang et. al., 2002).



**Figure 1:** (a) *Clitoria ternatea*, (b) *Sauropus androgynus*, (c) *Curcuma zanthorrhiza*, (d) *Curcuma longa* rhizome, (e) *Curcuma longa* leaf and (f) *Morinda citrifolia*

Since currently the nutritional values of concoction of several herbal plants used in herbal rice preparation was not being studied in details, therefore this study was proposed. The purpose of this study is to screen the nutritional contents in the concoction of

*Clitoria ternatea*, *Sauropus androgynus*, *Curcuma zanthorrhiza*, *Curcuma longa* (rhizome), *Curcuma longa* (leaf) and *Morinda citrifolia*.

## 2. Material and Methods

### 2.1 Sample Extraction

Five types of tropical herbs namely *Clitoria ternatea*, *Sauropus androgynus*, *Curcuma zanthorrhiza*, *Curcuma longa* rhizome, *Curcuma longa* leaf and *Morinda citrifolia* were extracted using simple water extraction method. The herbs sample was prepared according to the ratio with 30 g of *Clitoria ternatea*, 5 g each one of *Curcuma longa* rhizome and *Curcuma zanthorrhiza* and 0.5 g each one of *Morinda citrifolia*, *Curcuma longa* leaf and *Sauropus androgynus*. The herbs were chopped into small pieces and blended with 150ml distilled water for 20 to 30 minutes using food grade blender. Later, the blended sample was filtered to get the extraction.

### 2.2 Digestion of Extracted Sample

Nitric Acid Digestion (APHA, 1992) was used to digest all extracted samples to solubilize the solid matter and to remove the organics by oxidation and volatilization. First, 50 ml of the extract was measured and poured into the 250 ml beaker followed by adding 2 ml of concentrated nitric acid and heated on a hot plate until the sample remains 10 to 20 ml in the beaker. After that, the sample was filtered and transferred to 100 ml volumetric flask. The beaker was rinsed with 2 portion of 5 ml deionised water. Finally, the sample was cooled and bulked to 100 ml with deionised water in a volumetric flask.

### 2.3 Fat Analysis

Method which was published by Behr Labor-Technik, (2013) was used to analyze the fat in the concoction of *Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza* and *Curcuma longa*. First step was to place 3 or 4 boiling chips into the solvent vessel and dried the solvent vessel in a drying oven to constant weight (about 1 hour) at  $103 \pm 2^\circ\text{C}$ . The silica gel was filled into the dessicator and the solvent vessel was inserted and allowed it to cool to room temperature (about 30

minutes). The solvent vessel containing the boiling chips was weighted to an accuracy of + 1 mg and after that, the sample was mixed homogeneously. Next step was 20ml of the liquid sample was weighted into an evaporating dish and mixed the liquid sample with sand and anhydrous sodium sulfate. A cotton swab, moistened with extraction solvent, to wipe the sample into the extraction thimble. The extraction thimble was closed with a fat-free cotton wad and inserted the thimble into the soxhlet extractor. Next step was filling the solvent (petroleum ether) into the solvent vessel. Extraction was done at a temperature of 110 to 130°C for 20 to 30 extraction cycles (4 to 6 hours). After that, the solvent was drained into a suitable container by opening the spigot. The vessel containing fat residue was placed in a drying oven at 103+ 2°C and heated to constant weight for 30 minutes and the vessel containing the boiling chip and fat residue was weighted again. The fat content was computed according to the following formula:

$$F[\%] = \frac{m_2 - m_1}{E} \times 100$$

Where;

$m_1$  = weight of the dry empty vessel, in grams, including the boiling chips

$m_2$  = weight of the vessel, in grams, containing the boiling chips and fat residue after evaporating of the solvent

E = sample weight in grams

#### 2.4 Analysis using Atomic Absorption Spectrophotometer (AAS)

The digested herbs extraction samples were then analyzed by Flame Atomic Absorption (Kazuyoshi and Yuuko, 1992). This method is basically used for high level screening when the atomic emission or absorption (depending on method employed) corresponding to each element was measured. All reagents used were analytical reagent grade and the elements that have been measured were fat, calcium, magnesium, potassium and sodium.

### 3. Results and Discussion

The concoction of 20 ml of *Sauropus androgynus*, *Morinda citrifolia*, *Clitoria ternatea*, *Curcuma zanthorrhiza* and *Curcuma longa* consists of 0.2 g of fat. According to the information retrieved from Fatsecret (2013), 250g of white rice contain about 0.25 g of fat and human body needed from 20 to 35% of fat from the daily calories (Live strong Foundation, 2013). However, fat content which are needed by human body is basically unsaturated fat which normally came from vegetables and fish and human body needed about 30 to 45 mL daily (Health Canada, 2013). The content of fat from this concoction is 2% and once it was cooked with the white rice, the fat content of the herbs rice was 26% (Table 1). Hence, the fat content in the herbs rice is considered to be sufficient to meet the requirements of Recommended Daily Intake (RDI) used by Food and Drug Administration (FDA). The highest concentration of macronutrient in the concoction was potassium, 50 mg and the cooked herbs rice contained the concoction indicated 108 mg of potassium. The concentration of potassium in herbs rice was 14% higher than ordinary white rice which contained only 15 mg (Table 1). Potassium is very important macronutrient for blood regulation. The second highest concentration of macronutrient in the concoction was denoted by sodium, 3 mg and the cooked 250 g white rice with concoction was found to have 56 mg of sodium (Table 1). According to the RDI, the daily allowance for sodium is between 1500-2400 mg. High intake of sodium is a major contributor to cardiovascular disease. The sodium content in herbs rice was far below the established maximums level. One of the major minerals needed in a healthy diet is magnesium. The magnesium is vital for body metabolism and maintaining healthy bones. A recent study published in American Journal of Epidemiology (2009) suggests that higher level of magnesium in blood can protect against stroke. The magnesium content in the concoction was recorded with 5 mg

**Table 1:** Comparison of nutritional contents in pure concoction, concoction cooked with white rice and pure white rice

	Nutritional Contents				
	Fat	Calcium (Ca)	Magnesium (Mg)	Potassium (K)	Sodium (Na)
Pure Concoction	2%	2 mg	5 mg	50 mg	3 mg
Concoction + White Rice (250 g)	26 %	30 mg	15 mg	108 mg	56 mg
Pure White Rice (250 g)	25 %	7.5 mg	-	15 mg	15 mg

whilst in the cooked herb rice 15 mg (Table 1). The second mineral that was evaluated in the concoction was calcium. The content in the concoction was 2 mg whilst in the herbs rice the calcium content increased up to 30 mg (Table 1). Based on RDI, the daily intake of calcium is 1000 mg. This indicates that by consuming herbs rice three times per day with average of 250 g herbs rice per meal will provide sufficient calcium to the body.

#### 4. Conclusion

The fat, macronutrients (potassium and sodium) and minerals (calcium and magnesium) in the concoction are considered to be sufficient to meet the requirements of Recommended Daily Intake (RDI) used by Food and Drug Administration (FDA) once the concoction is consumed with cooked white rice. Hence, consuming the herbs rice three times daily will provide an adequate nutrition supply as compared to plain white rice. The finding of this not only contributed to the local herbal database but also at least can be used as basic information for the Ministry of Health before any guideline can be drafted related to food safety and security.

#### Acknowledgements

The authors would like to extend its greatest appreciation to Universiti Malaysia Kelantan (UMK) for use of its laboratory facilities at the Jeli Campus and to the Faculty of Earth Science for kind permission to publish this article.

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