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Proximate Composition, Mineral and Lipid Profile of Malaysian Artemisia Argyi

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Abstract: The present study aims to appraise the proximate composition, mineral and lipid profile of the leaves of Artemisia argyi, a local functional plant. Proximate analysis was done following the protocols stated by International Joint and Council AOAC. Vitamin C was determined using spectrophotometry, mineral content was elucidated using inductively Coupled Plasma Mass Spectrophotometer (ICP – MS) and lipid profile was appraised using Gas Chromatography Flame Ionization Detection (GC – FID). The leaves contained 9.92 % of moisture, 6.68 % of ash, 2.66 % of fats, 2.55 % of protein, 21.09 % of fiber and 57.10 % of carbohydrate. Vitamin C was present at 7.40 ± 1.95 mg per 100 g of sample. Magnesium, Calcium and Potassium were predominantly present at 1817 ± 0.17 mg, 1590 ± 0.09 mg and 1142 ± 0.05 mg per 100 g of dry leaves respectively followed by sodium and phosphorus at 340.4 ± 0.04 mg and 309.6 ± 0.01 mg respectively. The following were the trace minerals present: aluminum, iron, manganese, copper barium lithium, nickel, cobalt, zinc and chromium. In all, six long chain fatty acids namely C6:0, C10:0, C14:0, C16:0, C18:0 and C18:1 were elucidated. The total saturated fatty acids amounted to 841.61 mg/100 g and mono unsaturated fatty acid was estimated to be159 mg /100 g. In conclusion, A. argyi leaves possess rich nutrient composition and functional properties. Hence it can be considered as a source of functional food nutraceutical.

Keywords: Artemisia Argyi, Proximate Analysis, AOAC, Vitamin C, Minerals, Fatty Acids.

I. INTRODUCTION

The popularity of using plants as a source of medical treatment have been steadily increasing around the world as they are more affordable and obtainable [11]. These plants are limited for medicinal purpose as there are some who gain supplements and herbs as secondary food source for better general well-being, in accordance to physical appearance as well as health [13]. An artemisia family plant was one of the major contributors to the modern medical drug, derived from plant.

A. Background of Artemisia Argyi

Figure 1: Artemisia Argyi Leaves

The genus, Artemisia belongs to the Asteraceae family and is the largest of the flowering plants. Artemisia species are aromatic or fragrant plants which contain essential oil. Artemisia argyi also known as Chinese mugwort, is native to Japan, Korea and far-eastern Siberia. However, the species is also found in South Asia as well as in Kota Kinabalu, Sabah. It is used as a traditional herbal medicine to treat lower abdomen pain, menstrual disorders, microbial infections, inflammatory diseases, hepatitis, diarrhea, cancer, malaria, and circulatory system and metabolism disorders.

Flavonoids, volatile oil, anti-oxidative molecule and other attractive functional molecules found in these plants makes it to be a valuable functional food and worth to be studied upon [6]. Nutritional studies on the Korean variety of Artemisia argyi by Kim et al., (2015) [12] revealed that A. argyi contains high levels of essential amino acids, polyunsaturated fatty acid, volatile compound and high Vitamin C and exhibited high total phenolic contents and strong free radical scavenging activity. Malaysians have been incorporating A. argyi leaves in their meal for a very long time and yet, the nutritional information of A. argyi remains unexplored. Thus, this study

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was done to appraise the proximate composition, minerals, vitamin C and lipid profile of A. argyi. The profiling will provide more information on this medicinal plant and the recommended dosage for a safer food and health supplement for consumers while avoiding food poisoning.

II. METHOD AND MATERIALS

A. Plant Preparation

The plant (Artemisia argyi) was obtained from the morning market located at Kampar. The plant sample was authenticated by Prof. Dr. Ong Hean Chooi from Institute of Biological Science department of University of Malaya, Malaysia. The leaves of A. argyi was collected and rinsed under constant flow of tap water. The clean leaves were dried in an incubator at 37ºC for 2 hours and grinded to powder before storing in clean bags under low moisture conditions.

B. Proximate Analysis

The proximate composition of dried A. argyi leaves were determined using standard AOAC (1995, 2006) method. The moisture and ash content was determined by weight difference method. Fat content was estimated by extraction and boiling using soxtherm method (Elliott, Davis and Elliott, 2014). Crude protein was determined by calculating the amount of nitrogen present using Khjedahl method (Cunniff, 1995). Fiber content was estimated through acid – base extraction followed by gentle heating to incineration. The total content of crude carbohydrate was calculated using formula given by Fao.org (2016). All measurements were carried out in triplicates and results are presented in terms of percentage (except for carbohydrates).

C. Ascorbic Acid Content

The ascorbic acid of leaf was extracted by mixing 2 g of leaf samples (powder + moxa) with 25 ml of extract (3% MPA + 8% acetic acid). The mixture was homogenized manually by mortar and pestle and sent for centrifugation at 9000 rcf for 20 minutes. The extraction was repeated twice and the supernatant was mixed together. One ml of the extract was added to PR in centrifuge tubes and left to stand at room temperature for 30 minutes. The mixture was then centrifuged in 7000 rcf for 10 minutes and the supernatant was collected for spectrophotometer detection at 700 nm. 50 mM oxalic acid was used as a blank and the standard used was 56.8 ppm ascorbic acid.

D. Mineral Profile

The sample was added to a mixture of HNO_3 and HCl in a ratio of 4:1 and 2 ml of H_2O in a 100 ml Schott bottle. Then heating was done at 90o C for 2 hours, until a clear solution was obtained. The clear solution was subjected to multiple dilutions (10x, 100x, 1000x and 2000x) with 5% of HNO_3 The prepared dilutions was sent to ICP-MS (PerkinElmer Co., Waltham, Massachusetts, United States.) for trace elements detection. The different standards of (Al, Ba, Ca, Cd, Cr, Co, Cu, Fe, Li, P, K, Mg, Mn, Ni, Na and Zn) was prepared by using Perkin Elmer standard that was diluted with 5% of HNO_3.

E. Fatty Acid Profile

Gas Chromatography – Flame Ionization Detector (GC – FID)

The FAME sample was analyzed using Shimadzu GC system (Shimadzu Co., Kyoto, Japan, model GC2010) coupled with FID detector for analysis of fatty acid. The chromatography separation was done on BPX 70 capillary column (60 m x 0.25 mm ID 0.25 µm film thickness; SGE Analytical Science Co.).

III. RESULTS AND DISCUSSION

A. Proximate Composition of A. argyi

The studies showed that A. argyi contained high amount of carbohydrate followed by fiber and the other macronutrient as shown in Table 1. The percent moisture content of A. argyi was 9.92 ± 0.35 for dry leaves and 87.13 ± 0.40 for fresh wet leaves. The difference in moisture content was high between fresh and dry sample due to the high humidity level in Malaysia. Besides, the level of moisture content is within the suitable range for turning A. argyi into one of the plant based drugs which is 6 – 15 %. On the other hand, 6.69 ± 0.25 of Ash was found after the removal of other major composition through incineration. Ash could act as a standard for quantitative determination of minerals present in A. argyi. Fats and protein were present at 2.66 ± 0.29 g and 2.54 ± 0.03 g respectively showing relatively low concentrations in A. argyi. These fat and protein can be used as essential nutrient as herbal product [9]. The total carbohydrate acquired from the dry leaves was 78.17 ± 1.42 g, where 21.09 ± 0.50 g was crude fiber The moderately high values of carbohydrate could be a good source of energy for oral consumption as it could provide about 17% of the energy needed by normal Malaysian adult in about 2200 kcal per day as recommended in RNI Malaysia (2005). Furthermore, A. argyi with its high fiber content could be a potential nutritive food with good value, as it is essential in the daily diets of each individual.

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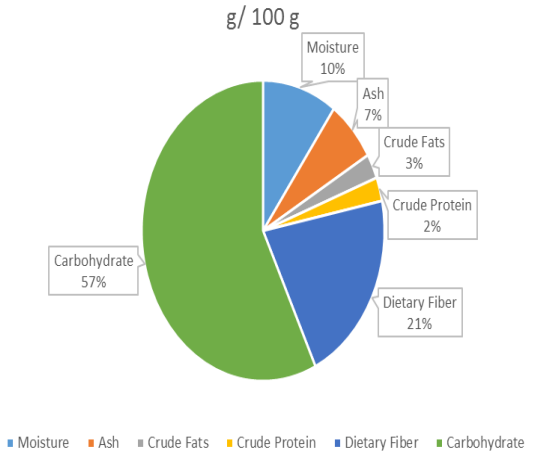

Figure 1: Proximate Composition of A. Argyi Determined Per 100 G.

Vitamin C was considered as the most crucial vitamins for human dietary intake from plant and fruit sources. Ascorbic acid is a natural antioxidant that is recommended to be taken daily in 65 – 70 mg in adult following the standards from RNI Malaysia (2005) [1]. L – Ascorbic acid was used as the standard as it is the most prevalent form of ascorbic acid [2]. The concentration of ascorbic acid was found to be 7.40 ± 1.95 mg per 100 g which is of lower dosage than that of recommended.

However, Kim et al. (2015) [12] reported that the Korean variety of A. argyi possessed higher amount of Vitamin C, than the local Malaysian variety where the difference could be from abiotic stress of the environment for the same plant.

Mineral	mg/ 100 g
Aluminum	2.11 ± 0.14
Barium	1.04 ± 0.08
Calcium	3.98 ± 0.09
Cobalt	0.01 ± 0.00
Chromium	1.00 ± 0.07
Copper	1.83 ± 0.10
Iron	1.72 ± 0.03
Lithium	0.016 ± 0.00
Potassium	2.86 ± 0.05
Magnesium	4.54 ± 0.17
Manganese	3.01 ± 0.26
Sodium	1.70 ± 0.04
Nickel	0.25 ± 0.02
Phosphorus	1.55 ± 0.01
Zinc	1.73 ± 0.04

Table 1: Minerals composition in 100 g of A. argyi

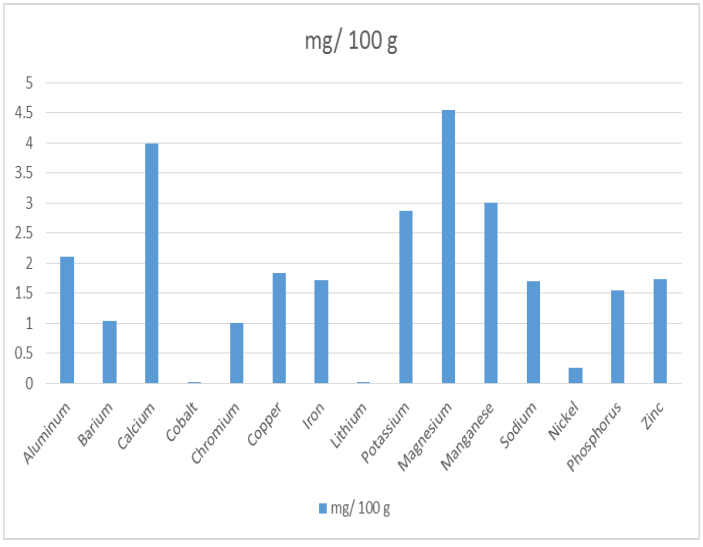

Figure 2: Minerals composition in 100 g of A. argyi

Calcium and phosphorus met the recommended dietary intake by RNI Malaysia [1] while magnesium, was higher than the recommended amounts and is also one of the most predominant minerals present in the A. argyi leaves. Potassium and Sodium were within the safe range for consumption. The iron content is very high while Zn showed a low concentration of 0.5 mg ± 0.04 in A. argyi. Both iron as well as zinc are prominent minerals, where iron is needed for heme formation in assisting the transfer of oxygen throughout the systemic circulation, and particularly important in pregnant woman as they will need larger quantities of blood than average people. Lithium and Cobalt were detected in minimal amount with less than 1 mg per 100 g, and both are required in very tiny amounts to reduce neurological defects. Chromium, out of the two heavy metals, was the only element that was detectable while Cadmium was not detected by the ICP-MS as the concentration may be very little even in ppb.

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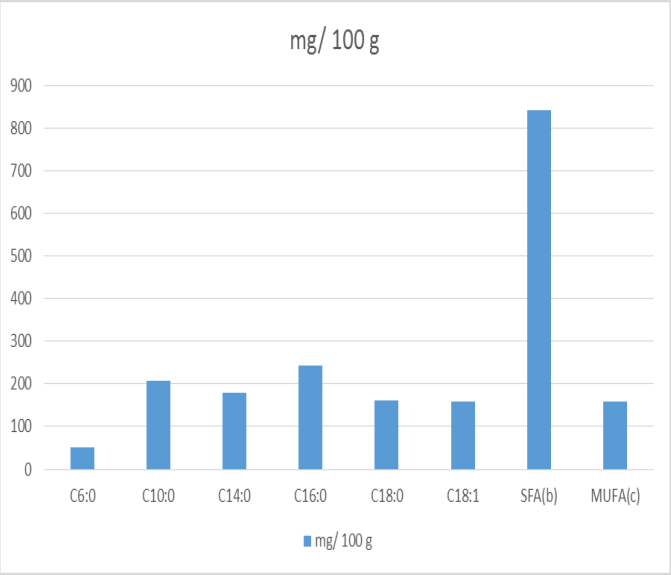

Figure 3: Fatty acids elucidated in 100 g of A. argyi

Six different fatty acids were identified from A. argyi leaves, out of which 5 were saturated fatty acid, which includes hexanoic acid decanoic acid myristic acid, palmitic acid, stearic acid and a monounsaturated fatty acid, oleic acid. The total saturated fatty acid found in the A. argyi leaves are in 1.78 % based on the total kcal provided by the leaves. All the fatty acid identified have different potential in increasing the cholesterol in our body. Monounsaturated fatty acid on the other hand was more neutral in effecting the body lipid metabolism but should be optimized since they have the ability to remove harmful fatty acids. In this research however, MUFA intake, specifically oleic acid should be of minimal amount as studies revealed that it could be a precursor for lung diseases and homeostasis [4].

IV. CONCLUSION

This research unveils the nutritional composition of A. argyi leaves. The results suggested that the leaves of A. argyi possess a fairly large amount of carbohydrate and fiber and moderate amounts of protein a host of minerals and vitamin C. The plant leaves were also found to have five saturated fatty acids and a monounsaturated fatty acid. Since A. argyi are found in abundance in Malaysia, and has the potential to be a functional food and nutraceutical compound further research could be done to explore the complete nutritional profile and phytonutrient profile to establish itself as a wholesome functional and nutraceutical food source.

V. ACKNOWLEDGEMENT

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