

Effect of Drying Duration on Production of Sabah Snake Grass (*Clinachantus Nutans*) Botanical Drink

Zaleha Ismail, Siti Nasiroh Ismail, Norehan Aziz

Abstract: This study was carried out to investigate the effect of drying duration of Sabah Snake Grass (*Clinachantus Nutans*) botanical drinks on sensory properties, total phenolic content (TPC) and free radical scavenging activity (FRSA). Three types of drinks samples were produced using a Sabah Snake Grass leaves which dried by oven method at temperature 45°C for 2 days for Formulation 1 (F1), 5 days for Formulation 2 (F2) and without drying (FS). Sensory analysis is performed to determine the level of panel acceptance of attribute such as color, taste, aroma and overall acceptance of Sabah Snake Grass drinks. Next, all samples were analyzed to determine total phenolic content and antioxidant effect via 2, 2-diphenyl-2-picrylhydrazil (DPPH) scavenging activity. For sensory analysis, F2 resulted highest acceptance level by panelist compared to F1 and FS for all attributes and overall acceptance. Based on the result, F2 also showed highest total phenolic content (0.78 ppm) and highest percentage of inhibition compared to other samples. The results showed drying process could increase the acceptance level of panelist, phenolic content and scavenging activity of the Sabah Snake Grass drinks.

Keywords : Antioxidant activity, Phenolic content, Sabah Snake Grass, Sensory analysis

I. INTRODUCTION

Sabah snake grass/ Belalai Gajah (*Clinacanthus nutans*) is a herbal species that grow in tropical climate. The plant originates in the tropics of Southeast Asia, especially Thailand and Malaysia, and also grows in southern China [1]. The plant is grows to a height of 1-3 m and the leaves are shaped like a blade, long and narrow and the size is about 0.5-4 cm wide and 2.5-13 cm long [2]. Sabah snake grass is used to treat some of health problems such as cancer, high blood pressure, high uric acid, diabetes and reduce the risk of clogged blood vessels. Due to less consumption by community in Malaysia, various varieties of commercialized products from Sabah Snake Grass such as teas and drinks have been introduced in order to get benefit from this plant. According to Malaysia Food Act 1983 and Regulations (Regulation 356), it state that botanical beverages mix should be a preparation made from edible or extractable plants or herbs, with or without sweeteners and other foods.

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When botanical beverages mix is produced in ready-to-drink form it shall be construed as botanical beverages (Food Act 1983 and Regulations). Drying process is considered to be the best way to protect the phytochemical efficiency in herbal plants [3]. It also has the advantage of reducing the cost of the final product and the most frequently used operations to expand the shelf life of food [4]. This study focused on the effects of drying time of *C. nutans* leaves on sensory properties, total phenolic content and antioxidant properties of drinks.

II. METHODOLOGY

A. Materials

Fresh leaves of Sabah Snake Grass were collected from Sultan Haji Ahmad Shah Agricultural Park, Kuantan, Pahang. The leaves were washed with water and cut into small size with a clean scissor. The other materials used in making Sabah snake Grass drink were sugar, filtered water and citric acid. Folin-Ciocalteu, Na₂CO₃, deionised water, methanol, and DPPH. The tools used were gas stove (Niko), stainless steel pan, infrared thermometer (Krisbow), blender (Philips), refrigerator (Panasonic), UV-Vis spectrophotometer (UV-1800 Shimadzu), drying oven (Binder) and measuring pipettes (Pyrex).

B. Drying process

The leaves samples were labeled and subjected immediately to drying. The leaves were dried using the following methods: (1) oven drying 45°C for 2 days (2) oven drying 45°C for 5 days. Fresh sample is used as a control (C).



Fig. 1. Fresh Sabah Snake Grass (a) and after drying (b)

C. Production of drink samples



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The dried leaves were then added with water at ratio (1:60) and boiled for 15 minutes. The fresh sample without drying process is directly boiled in water to obtain its extract. After cooling process the leaves extract were filtered using filter cloth to obtain clear liquid. Then, the extract was mixed with sugar and heated to 90°C. Citric acid was added to the mixture and left for 5 minutes. The drinks was cooled and stored for further analysis. The formulation of drink is shown as below:

Table- I: Formulation of Sabah Snake Grass Drink

Ingredients	Percentage (%)
Leaves extracts	45
Filtered water	44.9
Sugar	10
Citric acid	0.1

D. Sensory analysis

A fifty member untrained panelists were used to evaluate the various sensory parameters (aroma, color, taste and overall acceptability) and the scores were based on a 7 points hedonic scale. The samples were assessed using 7 point hedonic scale ranging between 7 (like very much) to 1 (dislike very much). Data obtained from analysis were evaluated statistically using a variance analysis (One Way ANOVA).

E. Total Phenolic Content (TPC) Determination

Total phenolic content of juices was determined spectrophotometrically according to Folin-Ciocalteu method with slight modification [5]. An amount of 0.4 mL sample or standard solution was added into 10 mL volumetric flask, containing 3.6 mL of distilled water. Folin-Ciocalteu reagent (0.4 mL) was added into the mixture. About 4 mL of 7% sodium carbonate was also added following 5 min. The solution was made up to 10 mL with distilled water, mixed thoroughly and allowed to stand at room temperature for 90 min. The absorbance was measured at 765 nm using UV-visual spectrophotometer (UV- 1800 Shimadzu) against distilled water as blank. Calibration curve was plotted using gallic acid standard solution of 0 – 100ppm.

F. Total Antioxidant Activity Determination

A modified method was used for estimating free radical scavenging activity [6]. 4.0 ml of DPPH was mixed with 0.4 ml drink sample (diluted 10:40 with ethanol). The mixture was allowed to stand for 30 min at room temperature (25OC) after which its absorbance was measured at 517 nm using a spectrophotometer (UV- 1800 Shimadzu), against ethanol as blank. The free radical scavenging activity (FRSA) of the tested sample was evaluated by comparing its absorbance with the control. The free radical-scavenging activity was measured by using this formula:

$$\text{Inhibition (\%)} = \frac{(AC - AS)}{AC} \times 100\% \quad (1)$$

where AC = absorbance of control and AS = absorbance of tested sample.

III. RESULTS AND DISCUSSIONS

A. Sensory properties

Sensory characteristic of Sabah Snake Grass drinks on different formulation which include aroma, color, taste, and overall acceptability are presented in Table 2.

▪ Aroma

The mean scores for aroma of drink samples were 5.00 (like) for F2 and 4.17 (neither like nor dislike) for F1 and 3.13

(dislike) for FS respectively (Table 2). It was believed that their aroma were coming only from the samples themselves because no other flavors were added to the sample production. Results show that variation score for aroma acceptability of drink obtained from different drying duration. Increase drying duration of leaves resulted more acceptability of panelist. This result has been previously shown by previous research that longer drying duration of tea leaves caused the increasing the aroma [7].

▪ Color

Mean scores showed significant difference between FS samples for color (Table 2) compared to F1 and F2 samples. It was observed that the control sample (FS) scored the lowest (2.83) than F1 (4.37) and F2 (5.12) for color. The result indicate that increase the drying duration caused the acceptability of color by panelist. According to During drying process, the loss of moisture could affect organoleptic parameters, such as color and taste [3]. The higher color acceptance by panelist ($P < 0.05$) for F1 and F2 was due to drying process of the leaves. During drying the chlorophylls were degraded to pheophytin which resulted the less dark green color of drink sample [8].

▪ Taste

Panelist responses on taste acceptability showed that drink sample F2 (drying duration 5 days) was better than sample FS and F1. F2 was showed no significant result compared to F1 but it showed significant result while compared to FS. The result showed that longer the drying duration increase the acceptability of drink. This might due to production of flavor during drying process.

▪ Overall acceptance

Results show that drink sample using leaves that drying for 5 days had the highest mean score in overall acceptability (5.42) as shown in Table 2. This was expected as it was the most preferred product in color (5.12), aroma (5.00), and in taste (4.69). This indicate that the product which were most accepted by the panelist with respect to their color, aroma, and taste. However, fresh samples without drying process showed lowest score for all attributes.



Fig. 2. Sabah Snake Grass Drink

Table- II: Results of sensory analysis for Sabah Snake Grass drinks

Attributes	Formulation (Sample)		
	FS	F1	F2
Colour	2.83 ^a ± 0.23	4.37 ^b ± 0.57	5.12 ^b ± 1.18
Aroma	3.13 ^a ± 0.17	4.17 ^b ± 0.51	5.00 ^b ± 1.96
Taste	2.80 ^a ± 0.21	4.37 ^b ± 0.40	4.69 ^b ± 1.22
Overall Acceptance	2.83 ^a ± 0.26	4.43 ^b ± 1.10	5.42 ^c ± 1.11

*Means within row with different letters indicate significantly different values (P<0.05).

B. Total phenolic content in drinks samples

The effect of different time of drying (2 days, 5 days and fresh leaves) of Sabah Snake Grass were investigated in this study. From Fig. 3, it can be seen that the trend of TPC for all samples, where F2 recorded the highest value (0.78ppm) than F1 (0.662ppm) and FS gave the lowest (0.612ppm) value of total phenolic content in Sabah Snake Grass drinks samples. This result might be due to the effect of drying process on leaves samples. Drying process could increase the rate of release of phenolic compounds from the food matrix as it can break down cellular constituents in leaf samples [9]. Similar to the present study, oven drying method showed the highest amount of phenolic compounds compared to fresh leaves because destructive enzymes were inactivated in dried leaves thus high levels of phenolic compounds remained in the extract [4], [10].

C. Total Antioxidant Activity

The effects of drying duration on Sabah Snake Grass drink sample on antioxidant activity are shown in Fig. 4. Drying of Sabah Snake Grass leaves in oven for 5 days showed the highest total antioxidant activity (62.56%) compared to F2 (41.41%) and fresh drinks samples, FS (33.63%). The result showed total antioxidant activity (inhibition percentage) increase when the duration of drying was increased. Similar result also comply with previous research reported that the antioxidant activity was elevated using oven drying treatments [11]. The high total phenolic content might contribute to the high antioxidant activity by drying treatment [12]. It can be concluded that the antioxidant activity of Sabah Snake Grass drink does correlate with the total phenolic content.

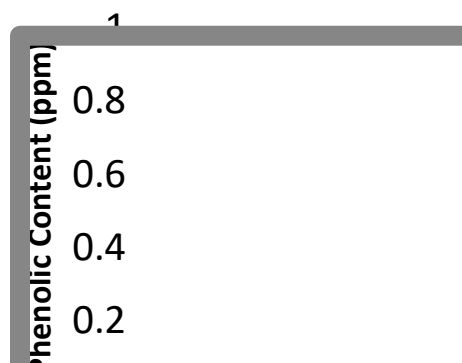


Fig. 3. Total phenolic content in different formulation of Sabah Snake Grass drinks

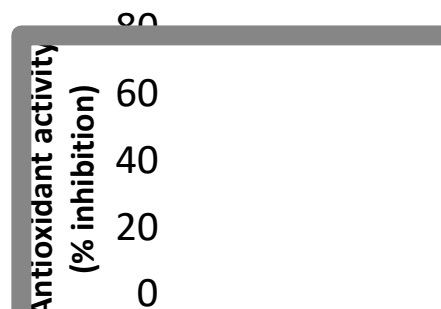


Fig. 4. Total Antioxidant Activity in different formulation of Sabah Snake Grass drinks

IV. CONCLUSIONS

The study investigated the effect of drying on sensory attributes, phenolic content and antioxidant activity of Sabah Snake Grass drinks. Results showed that the sensory properties of drink samples differ with respect to the drying duration used. Drink samples dried by oven at 45°C for 5 days (F2) was the most favored in color, aroma, taste and overall acceptability. Oven drying at 45°C for 5 days was found to be most reasonable time for drying of Sabah Snake Grass leaves in order to increase appreciable sensory attributes. For total phenolic content, the longer drying duration of Sabah Snake Grass leaves led to more phenolic content in drink sample. F2 also showed the highest percentage of inhibition compared to other samples for antioxidant activity. The results from this study will be used as a guide to produce Sabah Snake Grass drink in improving the phenolic content and antioxidant activity of the drink products.

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