PROXIMATE COMPOSITION AND ANTIOXIDANT ACTIVITY OF BANANA BLOSSOM OF THREE CULTIVARS IN MALAYSIA

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Abstract. The aim of this project was to study the physicochemical properties and antioxidant activity of the banana blossoms from different cultivars namely pisang Nipah, pisang Nangka and pisang Lemak Manis. Physicochemical analyses covered the proximate composition and acidity analyses (pH and total titratable acidity) while antioxidant activity carried out were DPPH assay and total phenolic compounds. Results showed that banana blossom of pisang Lemak Manis contained the highest fibre (46.76g/100g) and protein (37.42g/100g) followed by banana blossom of pisang Nangka and pisang Nipah. However, banana blossom of Lemak Manis had the lowest ash (1.21 g/kg) and fat (4.87 g/kg) contents among all the samples. The antioxidant activity for banana blossom of pisang Lemak Manis banana blossom was found to be the superior as compared to banana blossom of pisang Nangka and pisang Nipah. pH value showed that banana blossom acidic in pH (pH 5.00 – 5.47) and the titratable acidity of pisang Nangka recorded as most acidic (1.12%) as compare to banana blossom of Pisang Lemak Manis and pisang Nipah.

Key word: Banana blossom; physicochemical properties, proximate composition; antioxidant activity; pH Value; Titratable Acidity.

Introduction

Bananas are widely consumed fruits in the world because of its taste, nutritional value and potential health benefits. It is ranked fourth among the world's food crops in monetary value. (Singh et al, 2017) Despite having high nutritional values, these flowers have only been used as organic materials and bio-fertilizer in plantation rather than becoming a good source of nutrients that can be put in a food formulation or becoming a food substitute. (Arya et al., 2016)

Problem Statement

The problem statement of this research is banana blossom is underutilized products, but as stated by Arya (2016) banana blossom is known to have a high nutritional value. Not many food applications have been done so far especially if the banana blossom is from the variant that has bitter off taste. Therefore, comparison of nutritional values and antioxidant activity of different cultivars of banana blossoms will be done to compare the banana blossom from common banana blossom variant (*Musa paradisiaca "Pisang Nipah")* and banana blossom variant that has off bitter taste (*" Musa Eumusa" Pisang Nangka"*and *Musa acuminate "Pisang Lemak Manis)*.

Objective

The aim of this research was to study the nutritional value, antioxidant activity and acidity of the different cultivars of banana blossom especially from Malaysia.

Material and methods.

Sample Preparation

Materials are banana blossoms from 3 type of cultivar *Musa paradisiaca "Pisang Nipah", Musa Eumusa "Pisang Nangka"*and *Musa acuminate "Pisang Lemak Manis.* The banana blossom will be prepared into banana blossom flakes which will be used for proximate analysis and from the flakes, banana blossom extract will be extract as describe by Nayak et al (2011) which will be used for measurement of antioxidant activity.

Proximate Analysis
Tests of banana blossom had been examined for proximate composition (moisture, protein, fat, ash and total dietary fiber) adhering the standard methods published by Association of Official Analytical Chemists (AOAC, 1990). Firstly, moisture content was assessed by gravimetric measurement of weight reduction subsequent to drying sample in an oven at 105°C until constant weight was obtained. After that, protein was determined by Kjeldahl method (Kjeldahl, 1883), and thereafter a conversion factor of 6.25 was utilized to compute the total nitrogen to crude protein. rude fat will be analyzed by the Soxhlet extraction method. Further, content of ash was measured by gravimetric measurement of the sample in the furnace at 550°C until the constant weight achieved. Lastly, crude fiber will be determined according to the AOAC enzymatic gravimetric method (1990).

Measurement of Antioxidant Activity
DPPH assay was followed as described by Nayak et. AL. (2011). A solution of DPPH (6x10-5 mol/L) was prepared in methanol. Aliquots of 0.1 ml of samples that had been diluted in methanol with the ratio of 1:50 was transferred to the test tubes and 2.9 ml of DPPH solutions as prepared before added. The solution was then incubated at room temperature (25 ± 1°C) in the dark condition for 90 min. The absorbance is measured at 517 nm using UV-1800 spectrophotometer. As for the blank sample, methanol is used for the calibration of the equipment. Results was expressed in mm of Trolox g-1 of sample from a standard curve prepared with Trolox.

DPPH radical scavenging was monitored according to the method of Yen and Chen (1995) with minor modification. Various concentrations of flower extracts (1 ml) were mixed with 4 ml of 70% ethanol solution containing DPPH radicals (40 g / ml). The mixture was shaken vigorously and left to stand for 15 min in the dark (until stable absorbance values were obtained). The reduction of the DPPH radical was determined by reading the absorbance at 517 nm. The radical-scavenging activity (RSA) was calculated as a percentage of DPPH discoloration, using the equation.
% RSA = [(A control - AS) / A control] × 100
Where, A control was the absorbance of the control (solution to which no antioxidant was added) and AS was the absorbance of the extract solution. The extract concentration providing 50% of free radical scavenging activity (EC50) was calculated from the graph of radical scavenging activity (RSA) percentage against extract concentration. Gallic acid was used as standards.

Total phenolic compound determination is followed as described by Rumboao et. al. (2008) with slight changes. Aliquots of 0.2 ml of the sample was mixed with 1.4 ml distilled water and 100 µl of Folin-Ciocalteu reagent. After at least 30 seconds but not exceeding 8 minute, 300 µL of 20% $NaCO_3$ solution was added and the mixture was allowed to stand for 2 hours. The absorbance is measured at 765 nm using UV-Vis Spectrophotometer. Standard solutions of gallic acid (10-100 ppm) are similarly treated to prepare the calibration curve. Results are expressed as mg of gallic acid equivalent / 100 g dry sample and per 100 g fresh sample.

Total Titratable Acidity and pH Analysis
Total titratable acidity (TTA) was samples analyzed in the procedure as the mixture of pulp: water was in the ratio of 1:2 (w/v). Total titratable acidity was determined by titrating the mixture with standard 0.1N NaOH solution and expressed as percent citric acid. The pH of the banana blossom extract was determined by using pH meter Mettler Toledo to get the pH reading by the same mixture of pulp: water ratio of 1:2 (w/v).

Statistical Analysis
Triplicate and duplicate analyses were conducted for each sample. The experimental data were expressed as mean ± standard deviations of three separate determinations. One-way analysis of variance (ANOVA) was carried out on the experimental results using flowers species as an independent variable. The significance of differences between means was compared by Tukey's multiple tests at $p < 0.05$. All calculations were performed using an ANOVA package, IBM SPSS version 21.0 from statistical analysis systems (Anis Jauharah et al 2014)

Results and discussions

Proximate Analysis of Three Banana Blossom Variants

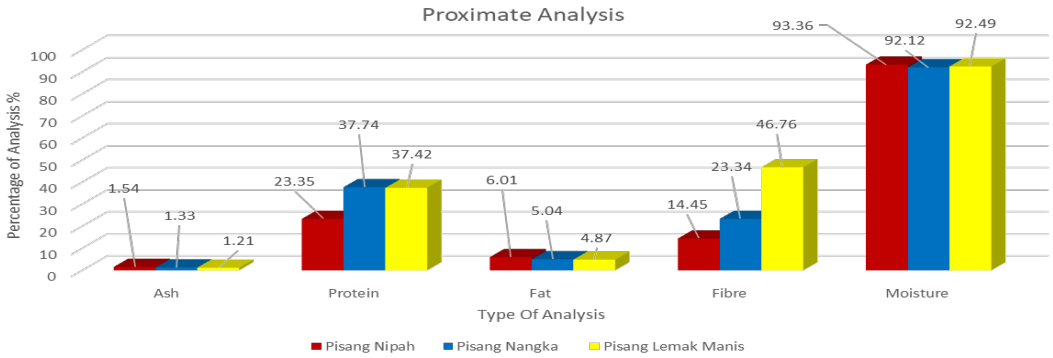

Figure 1. Proximate Analysis of Three Variant of Banana Blossom

Thus referring to figure 1, from the finding of Generally, there are no significant differences among the three cultivars for ash, fat, and moisture contents. However for protein, pisang nangka and pisang lemak manis were found to significantly higher as compared to pisang nipah. While pisang lemak manis exhibited the highest value in fibre content.

Antioxidant Activity of Three Banana Blossom Variants

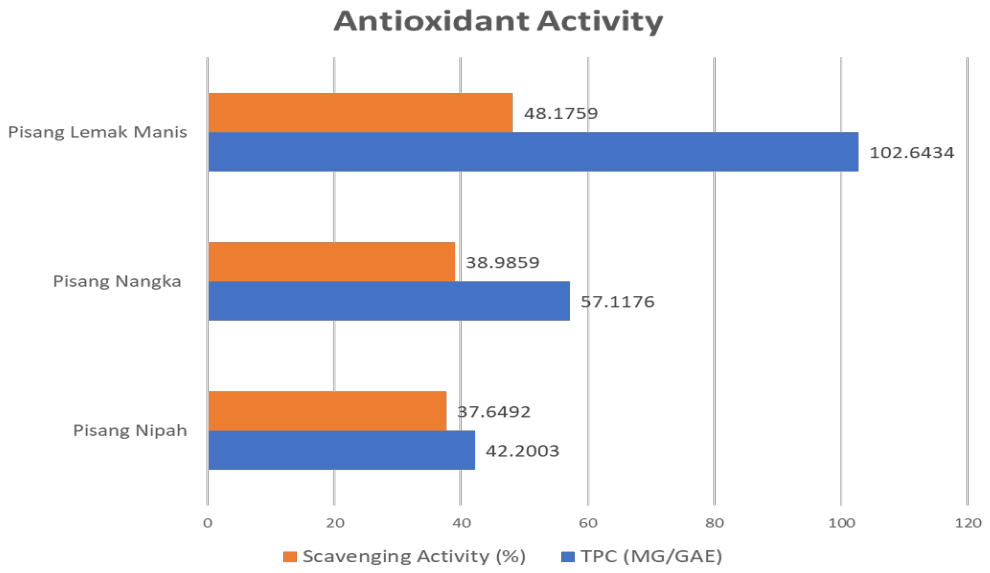

Figure 2. Antioxidant Activity of Three Variant of Banana Blossom

Referring to figure 2, Pisang lemak manis showed significantly highest in total phenolic compounds (TPC) as compared to pisang nangka and pisang nipah. DPPH is a stable organic nitrogen radical and free radical compound with a purple colour which change into a stable yellow compound on reacting with an antioxidant. Pisang lemak manis also found to have the highest scavenging activity with significant difference, followed by pisang nangka and pisang nipah.

Acidity of Three Banana Blossom Variants

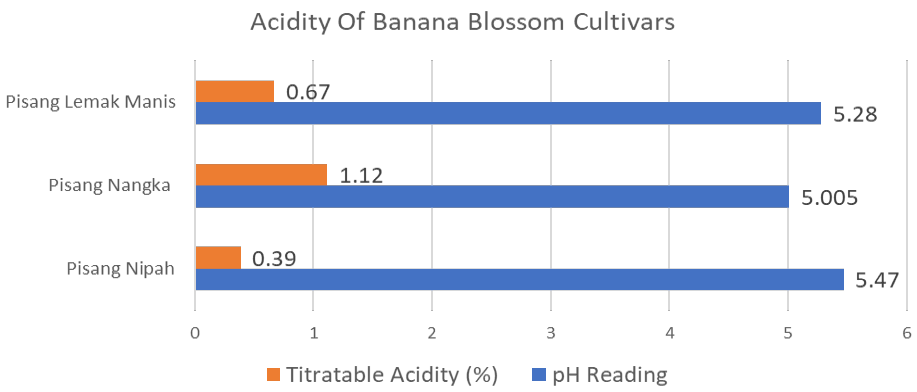

Figure 3. Acidity of Three Variant of Banana Blossom

Banana blossom from pisang nangka exhibited the highest titratable acidity (1.12) while pisang nipah showed the highest in pH value (5.47). Generally, all the banana blossom showed acidic properties.

Conclusion

Banana blossom from pisang lemak manis can be a good source of fibre and protein as compared to those from pisang nangka and pisang nipah. In antioxidant properties, banana blossom from pisang lemak manis also showed the highest values.With pH below 7, all the banana blossoms exhibited acidic properties. As a conclusion, banana blossom from pisang lemak manis can be further exploited in product development to diversify their application in food products.

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