

The Effect of Sugar and Agar-agar Concentration on Nypa Fruit Slice Jam

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Abstract— *Nypa fruticans* or known as nypa produces considerable amount of fruit with high content of carbohydrate. The mesocarp of the mature fruit is a potential source of energy but underutilised. This research was conducted to study the production of nypa slice jam by focussing on the effect of sugar and agar-agar concentration on the physical, chemical and sensory properties of nypa slice jam. Sugar and agar-agar concentration affect rendemen, crude fibre content, total soluble solid, water content, colour, texture, taste, flavour and overall acceptance of slice jam from nypa fruit.

Keywords— Nypa fruticans; slice jam; young fruit

I. INTRODUCTION

Nypa fruticans is classified as palm. It is a native plant of Asia. According to report from FAO [1], native distribution and habitat of nypa are the South and Southeast Asia, in tropical rain forest at brackish water swamps of tidal rivers. Furthermore, FAO has declared nypa fruticans as non-threatened palm in South East Asia hence available in considerable amount to be utilised. Nypa thrives in mangroves areas in Jambi Province but underutilised. Several parts of nypa tree have been utilised such as leaves for thatching or roofing and nypa sap for making sugar. The other parts such as the the frond and the fruits have not been utilised yet. The fruit itself consist of husk, shell and the mesocarp. While the husk and shell are promising biomass resource for biofuel and chemical [2], the mesocarp is promising to be exploited as food [3].

Mesocarp of nypa palm contains different amount of carbohydrate, protein, fat and ash depend on the growth location and the maturity of the fruit [4]. Young fruit contains high amount of water (up to 80%) and this decreases as maturity of fruit increases. The mature fruit contains considerable amount of carbohydrate (51.89%) and very low fat content (0.48% to 1.16%) and low protein content (0.7% to 2.4%). The chemical composition of nypa mesocarp offers the potential of nypa mesocarp to be processed into flour. The flour of nypa mesocarp has previously been used for extender in board processing [5]. Nypa flour has also been used for human consumption [6], in which it is used for biscuits. The biscuit was produced using 37.5% nypa flour and 62.5% wheat flour was compared well in nutritive value with 100% wheat biscuit. This research was conducted to study the production of slice jam from mesocarp of young nypa fruit obtained in mangrove

area in Jambi Province. The study was focussed on the effect of sugar and agar-agar concentration on the chemical and sensory properties of slice jam.

II. MATERIAL AND METHODS

A. Material

Nypa fruits were obtained from Tungkal Ilir District, West Tanjung Jabung, Jambi Province. The fruits were harvested unripe which can be described to have dark brown skin colour on top of fruit, light brown skin colour on the bottom of fruit and the endosperm has not completely filled in (**Fig. 1**). Sugar, citric acid, agar-agar and margarine were purchased from local store. Natrium metabisulfit, H₂SO₄, NaOH, H₂BO₃, and HCl were Sigma grade.

B. Methods

The research was undergone in 2 steps. First step was done to obtain a correct amount of nypa pulp which was done by trial and error. This resulted of slice jam formulation was 65% nypa pulp, 25-45% sugar, 2.5-3.5% agar-agar, 0.5% citric acid, and 5% margarine. The percentage was calculate from the total of batter (200 gram). Nypa pulp was made by homogenising 250 gram nypa endosperm and 70 ml of water using commercial blender.

Second step was carried out to produce slice jam using completely randomised block design with two factors (concentration of sugar and agar-agar) and 3 repetition.

Nypa slice jam was made by homogenising nypa pulp, agar, sugar and margarine. The batter was heated up to 95°C for 5 minutes. Citric acid was added and the batter was further mixed.

III. RESULT AND DISCUSSION

Please take note of the following items when proofreading spelling and grammar:

A. Rendemen

Sugar and agar-agar concentration affected rendemen of slice jam ($p \leq 0.010$). There was interaction of sugar and agar-agar concentration on the rendemen of slice jam. Rendemen of slice jam made by using 9 combination of sugar and agar-agar concentration is presented in Table 1.

TABLE I
RENDEMEN FOR SLICE JAM

Sugar Concentration (%)	Agar Concentration (%)		
	2.5	3.0	3.5
25	67.90 B c	74.29 B b	81.58 A a
35	73.75 A c	78.87 A b	80.40 B a
45	73.26 A c	78.61 A b	80.56 B a

B. Physical Properties

Sugar and agar-agar concentration affected crude fibre content, total soluble solid and water content of slice jam. There was no interaction of sugar and agar-agar concentration on the crude fibre content of slice jam but there was interaction of sugar and agar-agar concentration on the total soluble solid and water content of slice jam. Crude fibre content, total soluble solid and water content of slice jam made by using 9 combination of sugar and agar-agar concentration is presented in Table 2-4.

TABLE II
CRUDE FIBRE CONTENT OF SLICE JAM

Sugar Concentration (%)	Average (%)
25	0.21a
35	0.22a
45	0.23ab
	Average

TABLE V
SENSORY PROPERTIES OF SLICE JAM

[sugar]%	[agar]%	colour	Texture	Taste	Flavour	Overall Acceptance
25	2.5	3.40 bcd	3.40 bcd	3.80a	3.80a	3.00d
25	3.0	3.00 de	3.00 de	3.85a	3.85a	3.30cd
25	3.5	2.80 e	2.80 e	3.70a	4.00a	2.20f
35	2.5	3.25 bc	3.25 bc	3.90a	3.70a	3.75ab
35	3.0	3.50 abc	3.50 abc	3.75a	3.35ab	4.05a
35	3.5	3.10 cde	3.10 cde	3.50a	2.95c	2.60g
45	2.5	3.95 a	3.95 a	2.95b	3.65ab	3.40bc
45	3.0	3.80 ab	3.80 ab	2.30c	2.30d	3.65bc
45	3.5	3.55 abc	3.55 abc	2.20c	2.20d	2.25ef

Agar Concentration (%)	(%)
2.5	0.20a
3.0	0.22ab
3.5	0.24bc

TABLE III
TOTAL SOLUBLE SOLID OF SLICE JAM

Sugar Concentration (%)	Agar Concentration (%)		
	2.5	3.0	3.5
25	60.67 C a	58.33 C ab	54.00 C b
35	62.67 B a	62.00 B a	61.00 B b
45	70.33 A a	67.00 A b	66.00 A b

TABLE IV
WATER CONTENT OF SLICE JAM

Sugar Concentration (%)	Agar Concentration (%)		
	2.5	3.0	3.5
25	45.27 A b	46.29 A Ab	48.02 A a
35	33.55 B b	42.38 B a	42.53 B a
45	33.49 B b	34.44 C b	37.82 C a

C. Sensory Properties

Sugar and agar-agar concentration affected all parameters in sensory properties as shown in Table 5. The higher the sugar concentration tended to increase all parameters of sensory properties except for taste and flavour of slice jam. However there wasn't any tendencies in increasing the concentration of agar-agar. Concentration of sugar 35% and agar-agar 3 % produced the best slice jam with brownish yellow, chewy, sweet and good overall acceptance.

IV. CONCLUSION

Sugar and agar-agar concentration affect rendemen, crude fibre content, total soluble solid, water content, colour, texture, taste, flavour and overall acceptance of slice jam from nypa fruit.

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