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Unripe Areca (*Areca catechu*. L) Nut Syrup as a functional drinks with addition of powdered Cassia Vera extract

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Abstract—This study aims to determine the effects of addition of powdered Cassia Vera extract on chemical composition and organoleptic value of unripe areca nut syrup. This research used Completely Randomized Design (CRD) consisting of four treatments and three replications. However, chemical, physical, and microbiological testing takes two of the most preferred products and one control product. Observational data were analysed by using a statistical program 8, followed by Tukey test at 5% level. The treatments in this study were the addition of cassia vera extract into unripe areca nut syrup: A (0% addition as control), B (2% addition), C (4% addition), and D (6% addition). The observations were the analysis of raw materials unripe areca nut including moisture, ash, fat, protein, antioxidants activity, alkaloids measurement, tannins and carbohydrates. In addition, chemical analysis of areca nut syrup includes moisture content, ash, sugar, antioxidants, and tannins while viscosity test for physical analysis. For microbiological analysis such as total plate count and organoleptic test includes taste, odor, and color preference had chosen by the preference test methods. The results of this study indicates that the addition of powdered cassia vera extract into areca nut syrup significantly had different influence on ash content, water content, sugar content, antioxidant level, viscosity and tannin level. The total plate count and alkaloids measurement also had a significant effect on areca nut syrup processing. The results of organoleptic test showed that the product C was the most preferred product by the percentage of panelists who chose like-really like level at 95%-100%. Product C as the most preferred product, has an average 42,347% of water content, 0,061% ash content, 71,333% sugar, 15,273% antioxidant level, 7,21% tannin content, viscosity 0,933 dPa.S, alkaloids measurement (+), and total plate count $4,0 \times 10^2$.

Keywords—syrup, areca nut, cassia vera, tannin, and antioxidant.

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INTRODUCTION

Areca (*Areca catechu* L.) is a plant belonging to the type of Palma. These plants grow naturally and even if it was not intentionally planted, another barrier is only used as a garden plant, so the utilization is still limited. Besides, betel nut is also used as a food with a mixture of betel leaf in traditional ceremonies. In Indonesia, there are a lot of nut crop area of Sumatra (Aceh, North Sumatra and West Sumatra), Borneo (South Kalimantan and West Kalimantan), Sulawesi (North Sulawesi and South Sulawesi), Nusa Tenggara (Nusa Tenggara and East Nusa Tenggara) (Ferry, 1992). Based on observations in the field, unripe areca nut has utilized some circles to be made into juice. Unripe areca nut juice can be made by adding unripe areca nut with water and then blended. Unripe areca nut juice can also be added with sugar and sweetened condensed milk to improve its flavor.

Areca nut contains tannin, alkaloids, fats, oils, sugar and water which acts as an anti-cancer. Besides, areca nut can also be used as drugs such as mouthwash, medicine against worm infection, and used as beverages preservative. Areca nut contains phenolic compounds that can neutralize senobiotik compounds that can cause cancer. Fresh riped

areca nut contains about 50% more alkaloids than the processed one. Besides, it contains about 15% tannin, resin and 14% fat composed of palmitic acid, oleic, stearic, caproic, caprylic, lauric and myristic. Nonaka (1989) said that areca nut contains proanthocyanidin, which is a condensed tannins included in the class of flavonoids. Proanthocyanidin has antibacterial, antiviral, anticarcinogenic, anti-inflammatory, anti-allergic, and vasodilation function (Fine, 2000).

One of the product developments of areca nut is areca syrup manufacture. Viscous liquid syrup that is served with the addition of water, has a longer shelf life than unripe areca juice, which underlies the processing of unripe areca nut. Unripe areca nut is used to produce the syrup as the chemical contents of unripe nuts is more easily extracted than the ripe one, making it easier to be processed.

Cassia vera powder is used as a flavoring agent in this syrup. According to Azima *et al.*, (2004), powdered Cassia vera contains a lot of tannin compounds, flavonoids and others which are believed to act as an antioxidant. These compounds are able to protect the body from oxidation caused by free radicals. Moreover, one of them is capable to help prevent atherosclerosis. Unripe areca nut syrup was made from areca juice with the addition of water, then the

juice extract is combined with powdered cassia vera extract and mixed with some sugar.

MATERIALS AND METHODS

This research has been done in the Laboratory of Technology and Process Engineering of Agricultural Products, Chemical Laboratory, Agricultural Biochemistry and Nutrition, and Technology Laboratory of Agricultural Microbiology Andalas University

The material used in this study were unripe areca nut with criteria that are still green, has smooth fibrous skin and soft flesh wrapping shell. The indicator of the softness inner of unripe areca nuts is, it became watery when squeezed. Seeds were obtained from the local area *Padangsidempuan*, North Sumatera. *Gulaku* brand white sugar, Cassia vera powder obtained from Andalas University campus garden, by taking the central part of the stem, salting and whitening from Traditional Market in Bandar Buat.

The chemicals used for the analysis were DPPH, indigocarmine solution, $KMnO_4$, gelatin solution, Methanol, Ammonia, Chloroform, HCl, salts, kaolin powder, sulfuric acid, BRUCIN, PCA, distilled water and others.

The tools used in this study were analytical balance, stove, pot, glass cup, and a thermometer. While the tools used to analyse were ovens, desiccators, furnaces, test tubes, Erlenmeyer, measuring cup, glass cup, pipette, volumetric flask, filter paper, burettes, funnels, porcelain cup, stopwatch, water bath, viscometer, a refractometer and others.

This research used Completely Randomized Design (CRD) with four treatments and three replications. However, chemical, physical and microbiological analysis took two of the most preferred product and one control products. Observational data were analysed using a statistical program 8, followed by Tukey test at 5% level. Treatments in this study were the addition of cassia vera extract into unripe areca nut syrup :

Treatment A : 0% addition

Treatment B : 2% addition

RESULTS AND DISCUSSION

Table 1. The Chemical Composition of Unripe Areca Nut

Content	Levels (%)
Fat	2,38
Protein	5,54
Water	70,49
Ash	0,51
Carbohydrate	21,08
Tannin	8,70
Alkaloids	+
Antioxidant activity	53,52

From the results of analysis of the raw materials, it is known that the fat content of unripe areca nut was 2.38 %, while for the ripe areca nut, the fat content was 13.90 % (Deptan, 1992) . For the protein content, the results shown that the protein content of areca nut was 5.54 %, while for the ripe nut, protein content was 3.00 % (Deptan, 1992). In the analysis of moisture content of unripe areca nut, the water content of ripe nut is 70.49 %, whereas the moisture content of the ripe nut has the water content of 12.5% (Meiyanto, 2008). The differences in the water content of unripe areca nut and ripe areca nut is caused by the condition of unripe nut that is still fresh and juicy. Ash content in unripe areca nut obtained was 0.51 % , when compared with the ash content according to data from the Deptan was equal to 1.64 %, a sizable difference was due to differences in the type and the age of areca nuts. And also alleged differences between the ash content of ripe areca nut

and unripe areca nuts are due to differences in their mineral content contained in each of them.

In analysis of unripe areca nuts, it is known that the tannin level is 8.70 % and when compared with the data by the DEPTAN tannin levels was approximately 26.60 %.Tannin levels were very much different due to the different types of areca nuts that used in the study. Analysis of alkaloid levels in unripe areca nut showed that unripe areca nut had positive value on alkaloids. This had been strongly expected since some references from researchers generally stated that there was a very high value of alkaloids in unripe areca nuts, while alkaloid content of ripe areca nuts, according to research data Deptan also expressed (+) containing approximately 0.51 % of alkaloids. In research trials of antioxidant activity of unripe areca nut, the result obtained is 53.52 % while for total carbohydrate in unripe areca nut was equal to 21.08 %.

Table 2. The percentage of panelists who expressed like and really like of Unripe Areca Nut Syrup

Treatments	Taste (%)	Color (%)	Odor (%)
A. 0% addition	70	55	40
B. 2% addition	70	55	10
C. 4% addition	100	95	100
D. 6% addition	80	60	70

Taste

Based on the data in Table 2, it can be seen that the taste of unripe areca nut syrup relatively acceptable by the panelists. From the 4 treatments above with the addition of powdered Cassia vera extract and without the addition of powdered Cassia vera extract, panelists concluded that the acceptance rate of unripe areca nut flavor syrup was quite high. However, for the analysis of chemical, microbiological and physical, only two products with the highest value and product control to be tested. So from table above it can be seen that the two products with the highest percentage of taste was the product with 4 % addition of Cassia vera extract was 100 % and the product with 6 % addition of powdered Cassia vera extract by 80 % which was calculated by summing the levels of like and really-like of product test results. The addition of powdered Cassia vera extract in unripe areca nut syrup provided a variety of assessment by panelists. Concentrations of Cassia vera extract powder which continued to be further improved to make this syrup tasted spicy. The main chemical component in cinnamon flavor wassinamaldehyd which ranged between 70 % -75 % are not included in the phenols. Minor flavor components are eugenol, safrole, coumarinaceteugenol and group-containing phenol and it was important to give a distinctive taste natural flavor of cinnamon.

Color

Based on organoleptic test of the color of unripe areca nut syrup, it is concluded that the acceptance rate of the young betel nut syrup color was relatively high. From the table 2 it can be seen that the two products with the highest color percentage was a product with 4% addition of powdered Cassia vera extract by 95% and 6% addition of powdered Cassia vera extract by 60%.The addition of powdered Cassia vera extract gave some effects to the color of unripe areca nut syrup, the higher the concentrations of Cassia vera extract powder give it the darker color to the products. Color density at a rate of 6% concentration addition can basically be accepted or preferred by the panelists, but the addition of this concentration of 6%, the color of the product was as likely the color of tea, whereas addition of Cassia vera to level at a concentration of 4% was quite acceptable because the color density is considered so dense and not pale.The color of this product was strongly influenced by the content of compounds in Cassia vera. Marliyati (1995), suggests that cinnamon contains tannin which was quite high (over 10%) than the compounds of other spices. Tannins are known to act as a tanner and adhesive material. It also serves as a coloring agent. The presence of tannins in cassia vera content was believed to give a brownish red color in product processing.

Odor

From the Table 2. it can be seen that the two products with the highest percentage of odor was the product with 4 % addition of powdered Cassia vera extract preferred by 100 % of panelist and products with 6 % addition of powdered Cassia vera extract by 70 %. According to Azima (2004), cinnamon bark oil contains 70-90 % of sinalmadehid, small amounts of terpenes, cinnamic esters, salsilat acid, benzoic acid, coumarin, and cinnamic acid. Sinalmadehid usually

used as a flavor in food, plant aroma on soft drinks and perfumes. Coumarin had a distinctive odor that was thought to affect the aroma of syrup. A chemical compound provided on the scent of cinnamon was linalool compound which gave a slightly floral scent sharp. Other substances such as eugenol and anetholecinnamylacetate were also the creator of a unique aroma and taste of cinnamon. The contents only exist in some plants such as nutmeg, cloves and hemp (Ratu, 2011).

Table 3. Results of Chemical Analysis Of Unripe Areca Syrup

Treatment	water (%)	ash (%)	sugar(°Brix)	tanin(%)	antioxidant act (%)	alkaloids
A 0% addition	40,083 c	0,0333 c	74,333a	6,9867c	9,093 c	+
C 4% addition	42,347 b	0,0610 b	71,333b	7,2167b	15,273 b	+
D 6% addition	42,863 a	0,0720 a	70,000c	7,8533a	19,063 a	+

The figures in the same column followed by the same lowercase letter do not differ significant at 5% level according to Tukey HSD All-Pairwise Comparisons.

In Table 3 it can be seen that the water content of unripe areca nut syrup ranges between 40.083% - 42.863 %. The more addition of powdered Cassia vera extract increased the moisture content of the product. The increasing water content was caused by the moisture content of powdered Cassia vera extract that was relatively high. According to the data of Thorpe and Whiteley (1930) citKetaren (1985) that the moisture content of cinnamon or types of cassia was 6.50% -11.90%. Researchers also conducted an analysis of the water content of cassia vera powder and water content results obtained at 13.79%. When referring to SNI about Cassia vera number 01-3714-1955 stating that maximum moisture content of powdered cassia vera was 12%, this means that the water content in the material was quite high and gave effect to the increase in the water content of the product which was added by powdered Cassia vera extract. The higher rate of addition of powdered Cassia vera extract concentration, the higher the ash content in product. Ash that contained in unripe areca syrup was believed to originate from the contents of minerals that exist in Cassia vera or unripe areca nut.

Sugar of unripe areca nut syrup that obtained were ranged between 70.00 ° Brix - 74.33 ° Brix. Treatment D (addition 6% of powdered Cassia vera extract) had a number of the lowest sugar content than the other two products, a decrease in sugar content in this product was caused by the addition of powdered Cassia vera extract in syrup which risen the water levels in syrup. The higher of addition of powdered Cassia vera extract, the water level was increased. Water had possibility to bind to the sugar of syrup since it has the ability to bind with other components, thus allegedly causing sugar levels to decline after the sugar dissolved in water.

Antioxidant activity of unripe areca nut syrup ranged between 9.093% - 19.063%. The higher rate of addition of powdered Cassia vera extract in syrup, the more it increased its antioxidant activity. Areca nuts had the potential to be developed as a cytotoxic agent that can be combined with chemotherapy agents, so as to increase the sensitivity of cancer cells. Areca nut plants is a potential anti-cancer because it had antioxidant and antimutagenic effects in the form of content of tannins (Meiyanto *et al.*, 2008). King (2000) cit Ferdiana (2004) added, cinnamon may act as an antioxidant compounds that contained tannins and eugenol. The existence of antioxidant content affects the compounds on unripe areca nut and Cassia vera powder that allegedly led to the antioxidant activity of unripe areca nut syrup.

The average value of Tannin levels of unripe areca nut syrup was ranged between 6.9867% - 7.8533%. Areca nut contained tannins, alkaloids, fats, essential oils, sugar and water which act as anti-cancer (Syamsuhidayat and Hutapea, 1991). The presence of unripe areca nut on this product indicated the availability of tannin in unripe areca nut syrup as one of the content of unripe areca nut was tannins. It also strengthened by the addition of concentrations of powdered Cassia vera extract that contained tannins.

In the table above it can be seen that all of unripe areca nut syrup products without addition Cassia vera extract nor with the addition of Cassia vera 4% and 6% contained alkaloid compounds. According Syamsuhidayat and Hutapea (1991), areca nuts contain tannins, alkaloids, fats, essential oils, sugar and water which act as anti-cancer, the chemical content of areca nut was a derivative alkaloid of yuridin named arecoline (arecaidine methyl ester) and guvokaline (guvacine methyl ester). In powdered cinnamon or cassia vera, alkaloids compounds is also found.

According to (Kasahara and Hemmi, 1986; Pery, 1980 citAzima, 2004) the chemical contents of cinnamon were alkaloids, flavonoids, tannins and volatile oil consisting of: camphor, safrole, eugenol, sinamaldehyd, sinamilasetat, terpenes, cineol, citral, citronellal, polyphenols and benzaldehyd

Table 4. Viscosity of Unripe Areca Nut Syrup

Treatment	Viscosity (dPa.S)
A 0% addition	0,5000 c
C 4% addition	0,9333 b
D 6% addition	1,0667 a
CV = 5,66 %	

The figures in the same column followed by the same lowercase letter do not differ significant at 5% level according to Tukey HSD All-Pairwise Comparisons.

In Table 4, it can be seen that the range of average viscosity value of unripe areca nut is 0.50 dPa.S - 1.0667 dPa.S. According to Bird (1987), the viscosity of syrup was caused by a number of hydrogen bonds between the hydroxyl group (OH) in sugar molecules dissolved by water molecules. For this unripe areca nut syrup, syrup consistency is suspected to cause the dissolution of sugar into the water during the heating process.

Beside, powdered Cassia vera extract formed an extract like oil, viscosity affects the viscosity of the syrup, so the higher the concentration of powdered Cassia vera extract, the viscosity of the syrup increased.

Result Of Microbiological Analysis of Unripe Areca Nut Syrup

Tabel 5. Total Plate Count Of Unripe Areca Nut Syrup

Treatment	Microbe
A 0% addition	$4,0 \times 10^2$
C 4% addition	$4,0 \times 10^2$
D 6% addition	$5,0 \times 10^2$

From the data in Table 5, it can be seen that the number of total plate product A (0% addition of powdered cassia vera extract) - D (6% addition of powdered cassia vera extract) ranged between 4.0×10^2 - 5.0×10^2 . Total plate count test results obtained showed that total plate count obtained does not exceed the

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maximum limit of microbial contamination in syrup in SNI. It influenced by powdered cassia vera extract in unripe areca nut syrup, because Cassia vera can act as antimicrobials and antioxidants. (Ho et al, 1992 cit Ferdiana, 2004). Overall, microbial contamination (total plate count) in the product increased, which was probably caused by microbial contamination in raw materials both found in powdered cassia vera, unripe areca nut and water that was used in the process of making syrup.

CONCLUSIONS

From the research that has been done, it can be concluded that: the addition of powdered Cassia vera extract for unripe areca nut syrup had significant effect on moisture content, ash content, sugar content, antioxidant level, alkaloids, Tannins level and the viscosity of product. The level of Cassia vera extract addition on unripe areca nut syrup organoleptically acceptable with the highest value of taste, color and odor were at level addition of powdered Cassia vera extract 4% and 6% and the most preferred was addition of 4%.

Based on analysis on the raw material that was unripe areca nuts, then known the results were: tannin content of 8.7%, fat 2.38%, ash content 0.51%, 5.54% protein content, water content of 70.49%, antioxidant activity of 53.52%, the content of alkaloids (+) and carbohydrate content of 21.08%. And the analysis result of the most preferred product with the addition 4% of Cassia vera was: 42.347% water, 0.061% ash, 71.333% sugar, antioxidant activity of 15.273%, 7.217% tannin, alkaloids (+), the viscosity of 0.933 dPa.S and total plate count of 5.0×10^2 . The higher the addition rate of powdered Cassia vera extract, the higher the viscosity level of unripe areca nut.

SUGGESTION

For further research recommended to observe the determination of the shelf life and health benefits of unripe areca nut syrup, and also observe the use of unripe areca nuts in making other product.

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