



Physicochemical Properties and Sensory Analysis of Cashew Apple (*Anacardium occidentale* L.) - Mango (*Mangifera indica*) Blends Jam

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Abstract

The study was conducted to evaluate the physicochemical and sensory properties of cashew apple-mango blends jam. Different ratios of cashew apple: mango purees (100:0, 70:30, and 50:50 and level of citric acid 0.1, 0.2, and 0.3 percent) were used to determine the physicochemical properties and sensory analysis of jams. Results of statistical analyses revealed that except for moisture content (MC) and water activity (Aw), significant differences exist among samples in terms of physicochemical and antioxidant properties. The MC of samples ranged from 26.35-30.20%; Aw, 0.80-0.84; pH, 3.73-4.50; titratable acidity, 0.56-0.84%; total soluble solids, 63.30 to 67.43 °Brix; total sugar, 51.02 to 58.71%; reducing sugar, 10.38-12.52%; vitamin C content, 45.66 to 72.76 mg/100g; and total phenolic content, 1.95 to 2.47mgGAE/mL. Microorganisms were not detected in the samples after processing. However, the natural acid content of cashew apple was found not enough to provide suitable acid taste in the jam, hence, addition of citric acid was done to enhance the taste of the final products. Sensory evaluation revealed that high proportion of cashew apple in the formulations was commented by most panelists to have acrid taste and objectionable odor resulting in low scores particularly for overall acceptability. Results show that T6 where the ratio of cashew apple: mango (50:50) received the highest consumer preference among treatments in terms of color, sourness, sweetness, texture, taste, and general acceptability. Utilization of cashew apple into high valued products like jams or other

similar products will not only help in the reduction of wastage of these fruits, but it will also serve as additional source of income for the local farmers and the country as a whole. Future studies should be conducted in the production of processed products using local raw materials, including optimization of processing parameters and development of proper packaging to be more competitive in the international markets.

Introduction

Cashew apples are highly nutritious compared to many other tropical fruits besides possessing obvious health merits [1]. It is also reported to have anti-bacterial, antioxidant and anti-mutagenic properties. It is quite unfortunate that the country is wasting such an excellent fruit, causing economic loss to the farmers and the country. Hence, an attempt was made to produce certain value enhanced products from cashew apple such as cashew apple juice, cashew apple jelly and cashew apple jam employing certain processing technologies paving way for the availability of the products all year round, reducing postharvest losses and better remunerative returns to the farmers. The fresh ripe cashew apples are wasted since it quickly spoiled under the tree due to the fast enzymatic and microbial reactions in the fruits due to its nutritive values similar to other kinds of fruits which are commonly high in vitamins and minerals. In terms of pectin content there is somewhat conflicting claims among previous studies. Throgpanich et al. (1990) [2] reported that jam from cashew apple contained high pectin content while Emelike and Akusu (2019) [3] reported otherwise. Their study revealed that lemon

has high pectin strength, mango and guava have medium while cashew apple, pineapple, and sour-sop have weak pectin strength. Throghanich et al. (1990) [2] also conducted the organoleptic test and results revealed that the jam was quite acceptable in terms of texture, color and taste. However, the odor was acceptable only to panelists who are accustomed to its strong natural unique odor. Besides production of the cashew apple jam in its pure form having distinctive odor, the combination of cashew apple with other local fruits especially those that contain low or no pectin would enhance the sensory qualities of the final products. For example, ripe mango known to have relatively low pectin might pair well with other fruits high in pectin like cashew apple. The blending of cashew apple with mango puree will result in higher acidity or lower pH that enhances gel properties, and likewise improves the sensory attributes (e.g. color, taste, texture, among others) than the control. This might provide advantages to the food industries and the local farmers as well. Firstly, this will provide maximum utilization of harvested cashew apple; secondly, to produce milder odor of cashew apple jams acceptable to majority of people; and lastly, to reduce the added pectin in the mixed fruit jam.

Thus, this study aimed to determine the suitable proportion of ripe cashew apple and mango that will give the best quality product(s) through evaluation of their physicochemical properties, microbial load and sensory qualities.

Materials and Methods

Materials

The raw materials (Figure 1) used in the study consist of red cashew apple (M23) from Kosal Farm, Preasvihear province. On the other hand, ripe mangoes were purchased from the local market. Freshly-harvested ripe cashew apples

were placed in coolers and immediately transported to the laboratory for analysis. Other samples were kept in the freezer (-18°C) for future studies.



Figure 1: The cashew apple (red) and mango varieties used in the study.

Preparation of Samples

The fully ripe fresh cashew apples were washed, cored, cut into small pieces and blended with water at the proportion of 1 part fruit to 0.85 part water (1:0.85). Ripe mangoes, on the other hand, were cut into halves and flesh was scooped out with spoon and blended to produce the puree. Then the cashew apple purees were mixed with mango purees at different ratios and mixed with refined sugar as shown in Table 1. Pectin was added last during cooking in order to check the level of pectin from cashew apple for jam making. The citric acid was added also at different levels as shown in Table 1. Heating of mixtures from different treatments were done with constant stirring until the total soluble solids obtained were not less than 65°Brix. Then the jams were aseptically packed in 200-gram capacity preserving bottles for further analysis and sensory evaluation.

Treatment	Ingredients (%)				
	Ripe Cashew apple puree (RCAP)	Ripe mango puree (RMP)	Citric acid (CA)	Pectin (PT)	Refined Sugar (RS)
T0	100	-	-	1	50
T1	70	30	0.1		
T2			0.2		
T3			0.3		
T4	50	50	0.1		
T5			0.2		
T6			0.3		

Table 1: Cashew apple-mango jam formulations.

Physicochemical Properties Analysis

Determination of pH

The pH of jam samples was determined using a pH meter (pH meter C861, Consort, bio block, Belgium) according to the AOAC (1995) [4] method. The instrument was calibrated

using two buffer solutions (pH 7.0 and 4.0) before pH of the samples were measured. The measurement was made by immersing the electrode in 10g of sample and the reading was repeated three times.

Determination of Total Soluble Solids (TSS)

The TSS of samples was determined as described by Soyer et al. (2003) [5] using a hand refract meter (Model Pal-BX/RI) equipped with a digital display.

Determination of Titratable Acidity

The titratable acidity (TA, expressed as % citric acid) was determined by placing samples in a beaker and titrating with standardized 0.1 N sodium hydroxide solution to pH 8.2 ± 0.1 (AOAC, 2000) [6].

Determination of Moisture Content

The moisture content of the jam samples was analyzed using MB series moisture analyzer (Model OHAUS M23).

Determination of Water Activity

The water activity (Aw) of the jam samples was determined using Smart water activity meter (Model Pawkit Aqualab).

Determination of Reducing Sugar and Total Sugar

The concentration of D-glucose in the jam samples was determined before and after hydrolysis of sucrose by β-fructosidase (invertase) [7]. The content of D-fructose from cashew apple-mangojam was determined subsequent to the determination of D- glucose, after isomerization of the D- glucose by phospho-glucose isomerase [8]. The concentration of D-sucrose was determined by the method of Outlaw and Mitchell (1988) [9]. The total sugars were assayed by the phenol sulfuric acid method [10].

Antioxidant Analysis

Vitamin C Analysis

Vitamin C of the samples was determined by iodine titration [6, 11]. To 25 mL of sample in a 150 mL beaker was added 35 mL starch-sulfuric acid solution. The resulting solution was titrated with standardized 0.1 M iodine solution (covered from light), while stirring until the first stable blue color appeared. For the blank, samples were replaced with distilled water. Ascorbic acid (mg/100 mL) was calculated from the formula:

$$\text{Ascorbic acid (mg/100mL)} = \frac{\text{Net mL titrant}}{\text{mL sample}} \times 880.6$$

Determination of Total Phenolic Content

The total phenolic content of samples was determined by Folin-Ciocalteu method following the procedure of Teresa Escribano-Bailón et al. (2002). The jam was diluted with 97% of ethanol and then 0.5 mL of the samples, 2.5 mL of Folin-Ciocalteu's phenol reagent (Sigma-Aldrich) and 2.5ml of 7.5% Na₂CO₃ were added. After standing for 20 mins, the

absorbance readings were measured at 760 nm (Shimadzu UV-1601 spectrophotometer) with water plus reagent as blank samples. Total phenolic content was computed in a standard curve with gallic acid as reference phenol. The results were expressed as gallic acid equivalents (mgGAE/100ml).

Microbiological Analyses

Microbial analysis of the processed cashew apple-mangoblends jam samples was conducted simultaneously with physicochemical analysis. Ten (10) g of the samples was aseptically transferred to 90mL sterile 0.1% peptone water, as diluent. Decimal dilutions in diluents solution were prepared and standard pour plating technique was carried out in appropriate agar media [12]. After the required incubation time and temperature, enumeration of different kinds of microorganisms was performed. The Total Viable Count (TVC) was enumerated following the method by Maturin and Peeler (2001), Marotz et al. (2001), and Mortor (2001); and yeast and mold counts using the method of Touma et al. (2001); and Beuchat and Cousin (2001) [13-17]. The coliforms and *E. coli* were enumerated as described by Feng et al. (2001); and Kornacki and Johnson (2001) [18, 19]. Pathogenic bacteria such as *Staphylococcus*, *Salmonella* spp., were determined following the methods described by Andrews et al. (2001) [20].

Sensory Analysis of Cashew Apple-Mango Blends Jam

The sensory evaluation of the organoleptic characteristics of cashew apple-mango blends jam samples was carried out at the Faculty of Agro-Industry, Royal University of Agriculture, Dongkor District, Phnom Penh, Cambodia. A hedonic test on a linear 9-point scale (Table 2) assessed the degree of appreciation of organoleptic characteristics using the method described by Stone and Sidel (1992) [21]. It was applied more specifically to cashew apple jam by Talasila et al. (2011) [22].



Figure 2: The red cashew apple-mango blends jam from different treatments.

T0 = 100% RCAP, 1% PT, 50% RS; T1 = 70% RCAP, 30% RMP, 0.1% CA, 1% PT, 50% RS; T2 = 70% RCAP, 30% RMP, 0.2% CA, 1% PT, 50% RS; T3 = 70% RCAP, 30% RMP, 0.3% CA, 1% PT, 50% RS; T4 = 50% RCAP, 50% RMP, 0.1% CA, 1% PT, 50% RS; T5 = 50% RCAP, 50%

RMP, 0.2% CA, 1% PT, 50% RS; T6 = 50% RCAP, 50% RMP, 0.3% CA, 1% PT, 50% RS

Color								
Extremely discolored	Very discolored	Discolored	Rather (quite) discolored	Neither discolored nor colored	Rather colored	Colored	Very colored	Extremely colored
1	2	3	4	5	6	7	8	9
Taste								
Extremely bitter	Very bitter	Bitter	Rather (quite) bitter	Neither bitter nor sweet	Rather sweet	Sweet	Very sweet	Extremely sweet
1	2	3	4	5	6	7	8	9
Odor								
Extremely unpleasant	Very unpleasant	Unpleasant	Rather (quite) unpleasant	Neither unpleasant nor pleasant	Rather pleasant	Pleasant	Very pleasant	Extremely pleasant
1	2	3	4	5	6	7	8	9
Sourness								
Extremely unpleasant	Very unpleasant	Unpleasant	Rather (quite) unpleasant	Neither unpleasant nor pleasant	Rather pleasant	Pleasant	Very pleasant	Extremely pleasant
1	2	3	4	5	6	7	8	9
Sweetness								
Extremely unpleasant	Very unpleasant	Unpleasant	Rather (quite) unpleasant	Neither unpleasant nor pleasant	Rather pleasant	Pleasant	Very pleasant	Extremely pleasant
1	2	3	4	5	6	7	8	9
Texture								
Extremely unpleasant	Very unpleasant	Unpleasant	Rather (quite) unpleasant	Neither unpleasant nor pleasant	Rather pleasant	Pleasant	Very pleasant	Extremely pleasant
1	2	3	4	5	6	7	8	9
Overall acceptability								
Extremely unpleasant	Very unpleasant	Unpleasant	Rather (quite) unpleasant	Neither unpleasant nor pleasant	Rather pleasant	Pleasant	Very pleasant	Extremely pleasant
1	2	3	4	5	6	7	8	9

Table 2: The 9-point hedonic scale.

Taste Panelists: Thirty (30) individuals were chosen at random as panelists. The panel was composed of individuals who have not been trained in the chosen organoleptic characteristics for a particular product.

Scorecard Sheet: The assessment of cashew apple-mango blends jam samples was based on color, taste, odor, sourness, sweetness, texture and overall acceptability using a linear hedonic scale (Table 2). This 9-point scale ranged from “extremely poor” (points 1) to “extremely good” (points 9) [22, 23]. The range of scores for color varied from “extremely discolored light yellow-brown” to “extremely colored, yellow-brown”. For the taste, the range was from “extremely bitter” to “extremely sweet”. As to the odor, sourness, sweetness,

texture and overall acceptability the range of scores varied from “extremely unpleasant” to “extremely pleasant”.

Preparation and Presentation of Jam Samples: The evaluation tests of jam samples were conducted in a ventilated room, free of odors and other disruptions that could affect the panel's perception. Acceptability tests were conducted under white light. The jam samples were placed in white transparent plastic cups and separately served to every taster. A score sheet was provided to each panelist including a glass of water used to wash the mouth in between tasting the samples.

Statistical Analysis

The data generated in the study were statistically processed in duplicate with the SPSS 11.19 statistical software. The significance of the parameters was assessed by the Duncan's test at 5% threshold. The analysis of variance (ANOVA) allowed to process data from the evaluation of physicochemical, antioxidant and sensory properties of the jam samples. Although significant differences ($\alpha < 0.05$) was obtained, the ANOVA test is supplemented by Turkey's post ANOVA test to identify the variable(s) with very significant differences from the control values.

Results and Discussion

Physiochemical Properties and Antioxidant Analysis of Cashew Apple-Mango Jam

Physicochemical Properties

The results of analysis on the physicochemical and antioxidant properties of cashew apple-mango blends jam (Table 3) showed that except for moisture content (%) and water activity highly significant differences ($P < 0.5$) exists among samples.

The moisture content (MC) and water activity (A_w) of samples ranged from 26.35-30.20% and 0.80 - 0.84, respectively. These values confirmed that jam is classified as intermediate moisture food (IMF) or semi-moist food with MC ranging from 15-40% and A_w of 0.60-0.84. IMFs are shelf-stable food products and are edible without rehydration. Further, the proportion of cashew apple and mango purees and amount of citric acid added in the formulation did not affect the MC and A_w of the products.

The pH varied from 3.73 to 4.50, with the highest value obtained from control sample (T0 = pH 4.50) due to the absence of citric acid and the pH of pure cashew apple is

inherently high. In treatments with higher amount of citric acid added and with higher proportion of mango the pH values were significantly lower ranging from 3.73 to 3.8 in T3, T5 and T6 samples, respectively. It is important to note that the fresh cashew apple puree has higher pH value (pH 4.50) than mango puree (pH 3.60). According to Codex Alimentarius, the pH < 3.35 is most suitable for good quality jam. The pH level is an important factor for optimum gel condition of jam [24]. The jam samples in this study though showed pH values above the recommended level but are within the acidic pH range and thus, are desirable for the inhibition of bacterial growth.

In the case of titratable acidity (TA), values obtained ranged from 0.56 to 0.84%. The TA (expressed as % citric acid) showed the organic acid present in the samples. In general, the organic acids are intermediates of metabolic processes; it affects the growth of microorganisms and enhanced the preservation quality of jam products. Acids also contribute to the sensory quality properties of food samples [25]. Ellouz et al. (2011) [26] reported that the TA in sour orange jam sample was 49.921/g. In pure cashew apple jam, Emelike and Akusu (2019) [3] obtained 3.30% TA. The TA is usually provided by the fruit which contains citric acid and tartaric acid [27] and related to the type and species of the fruits.

The total soluble solids (TSS) are made up of sugars which can be monosaccharide, disaccharides and oligosaccharides. Aside from acid, the TSS helps increase the consistency and mass to the product and also promotes gelling [28]. A jam should have a TSS of at least 65% to produce a satisfactory gel. The TSS ($^{\circ}$ Brix) level of cashew apple-mango blend jams after cooking obtained values that ranged from 63.30 to 67.43 $^{\circ}$ Brix which fall in general to the acceptable values of good quality jam.

Treatment	Physicochemical properties							Antioxidant properties	
	Moisture Content (%) ^{ns}	A_w ^{ns}	pH	TSS ($^{\circ}$ Brix)	TA (%)	TS (%)	RS (%)	Vit.C (mg/100g)	TPC (mgGAE/ml)
T0	28.15	0.84	4.50 ^a	65.90 ^{a,b}	0.63 ^{a,b}	57.36 ^a	12.52 ^a	72.76 ^a	2.46 ^a
T1	26.35	0.81	4.10 ^b	66.70 ^{a,b}	0.56 ^b	58.71 ^a	10.38 ^c	61.19 ^{b,c}	2.13 ^c
T2	26.35	0.83	4.03 ^{a,b}	67.33 ^a	0.63 ^{a,b}	56.89 ^a	11.96 ^b	54.79 ^{c,d}	2.21 ^b
T3	28.15	0.82	3.73 ^c	65.60 ^{a,b}	0.65 ^{a,b}	56.59 ^a	11.49 ^b	67.58 ^{a,b}	2.47 ^a
T4	27.95	0.80	4.00 ^b	67.43 ^a	0.70 ^{a,b}	55.21 ^{a,b}	11.41 ^b	45.66 ^d	2.06 ^d
T5	30.20	0.83	3.80 ^c	63.30 ^b	0.63 ^{a,b}	51.83 ^b	11.60 ^b	66.67 ^{a,b}	2.00 ^e
T6	28.15	0.84	3.80 ^c	63.90 ^{a,b}	0.84 ^{a,b}	51.02 ^b	11.66 ^b	47.49 ^d	1.95 ^e

Table 3: Physicochemical and antioxidant properties of cashew apple-mango jams from different treatments.

Values in the same column having different superscript are significantly different at 5% level of probability ($p \leq 0.05$).

Note:-

TSS : Total soluble solids;
 TA : Titratable acidity (expressed as citric acid);
 TS : Total sugar;
 A_w : Water activity

RS : Reducing sugar;
TPC : Total phenolic content

pH of fresh cashew apple puree = 4.5; pH of fresh mango puree = 3.60

T0 = 100% RCAP, 1% PT, 50% RS; T1 = 70% RCAP, 30% RMP, 0.1% CA, 1% PT, 50% RS; T2 = 70% RCAP, 30% RMP, 0.2% CA, 1% PT, 50% RS; T3 = 70% RCAP, 30% RMP, 0.3% CA, 1% PT, 50% RS; T4 = 50% RCAP, 50% RMP, 0.1% CA, 1% PT, 50% RS; T5 = 50% RCAP, 50% RMP, 0.2% CA, 1% PT, 50% RS; T6 = 50% RCAP, 50% RMP, 0.3% CA, 1% PT, 50% RS

The total sugars (TS) include sugars inherent in foods and beverages as well as added sugars. The results of TS analysis revealed that the jam samples contained 51.02 to 58.71%. Aisou (2013) [29] recorded a level of 68g/100g for a jam-based orange, lemon, and grapefruit pulp. The recordable differences could be caused by the sugar addition during the jam-making process [30]. The sugar attracts water molecules, which concentrates the pectin molecules and promotes gelling [28]. The sugar addition is necessary in order to preserve the jams satisfactorily.

Reducing sugars are carbohydrates containing a terminal aldehyde or ketone group which can undergo oxidation reactions. The reducing sugar (RS) content of the jam samples ranged from 10.38% -12.52 % with the control (T0) indicated significantly higher value than the rest of the samples. According to May and Stains by (1986) [31] the acidity associated with a high temperature causes the inversion of 30-50% of added sucrose. The inversion of sucrose has its consequences: i) increased sweetness: fructose is sweeter than sucrose; and ii) obtaining a solution containing more dry matter: fructose and glucose which are more soluble than sucrose.

Antioxidant Properties

The vitamin C content of jams in different treatments differs significantly which ranged from 45.66 to 72.76 mg/100g. Cashew apple juice has been found to have high levels of vitamin C at 203.5 mg/100 mL which was more than four times higher than the juices of orange (54.7 mg/100 mL), grape (45.0 mg/100 mL), lemon (33.7 mg/100 mL), mango (30.9 mg/100 mL), and pineapple (14.7 mg/100 mL) [32]. In general, the results show that the higher the amount of cashew apple puree, the higher is the vitamin C content of the jam samples with T0 having the highest value. The tremendous decrease in vitamin C content in jam can be attributed to the application of heat treatment in the desamerization of processing and probably is mainly due to oxidation of vitamin C. According to Dupaigne (1969) [33], degradation of naringine during desamerization is accompanied by loss of vitamin C. The variability of the ascorbic acid content of the fruits is also influenced by the

seasonal and annual variations in the degree of sunshine and humidity, the variety of the fruit, the position of the fruits on the tree, and their degrees of ripeness [34]. Other factors may also be involved such as the sensitivity of ascorbic acid to oxidation by air and in an aqueous medium. Quantification is also influenced by the assay method, which is itself dependent on the complexity of the plant material [35].

The total phenolic content of jam samples also differs significantly among samples which ranged from 1.95 to 2.47mgGAE/ml. Klopotek et al. (2005) [36] reported that treating strawberry at 80°C for 15 minutes causes a 30% loss of phenolic compounds. Water is a source of degradation of phenolic compounds; in the presence of water, an enzymatic activity may quickly cause irreversible changes in antioxidants, such as oxidation which leads to their decomposition or polymerization [37].

Microbial Load of Cashew Apple-Mango Blends Jam

The microbial analysis of jam samples revealed absence of any microorganisms tested (total viable count, yeast & mold, salmonella, coliform and *E. coli*) in final products. Jams are very stable products, given the low pH and the high sugar content. In addition, the water activity of the jams (0.80 - 0.84) in this study suggests that the products are below the minimum Aw for most bacteria however susceptible to some yeast and mold growth. The only categories that could cause spoilage are wild yeasts and fungi that can be easily taken care of with low air content in container. Gould (1989) [38] reported that food preservation is best achieved when the processor takes account of the type and concentration of antimicrobial agent, storage time and temperature, food pH and buffering capacity, integrity of food and presence of other agents for shelf life [39-44].

Sensory Analysis of Cashew Apple-Mangoblends Jam

Sensory evaluation was conducted to identify the most acceptable proportion of cashew apple: mango purees for jam making. Except for odor, all sensory attributes tested (color, sourness, sweetness, texture, taste and overall acceptability) were found significantly different among treatments (Table 4). The sensory scores for color ranged from 5.40 - 7.27 with pure RCAP (T0) as least preferred and T6 as most preferred. Sourness and sweetness of jam samples ranged from 5.13 - 7.53 and 5.67 - 7.13, respectively. Texture and taste were scored from 5.53 - 7.27 and 5.33 - 7.60, respectively. The overall acceptability was rated as 5.33 - 7.60 suggesting that T6 with blends of 50% cashew apple and 50% mango (50:50) with added citric acid (0.3%) rated the most acceptable for panelists. To sum up, the appropriate ratio of making jam was T6 as perceived by panelists in terms of color, sourness, sweetness texture, taste and overall acceptability of the final products. It is also important to note that increasing the level of mango puree in the formulation resulted in more yellowish color of the jams [45-47].

Treatment	Color	Odor ^{ns}	Sourness	Sweetness	Texture	Taste	Overall Acceptability
T0	5.40 ^c	5.60	5.13 ^c	5.67 ^b	5.53 ^b	5.33 ^b	5.33 ^c
T1	5.87 ^{b,c}	5.93	6.00 ^{b,c}	5.93 ^{b,c}	6.27 ^{a,b}	6.20 ^{a,b}	6.20 ^{b,c}
T2	6.00 ^{a,b,c}	5.60	6.13 ^{b,c}	6.20 ^{b,c}	6.40 ^{a,b}	6.47 ^{a,b}	6.47 ^b
T3	6.00 ^{a,b,c}	5.47	6.73 ^{a,b}	6.00 ^{a,b}	6.80 ^a	6.47 ^{a,b}	6.47 ^{a,b}
T4	6.53 ^{a,b,c}	6.00	5.53 ^{b,c}	5.73 ^b	6.40 ^{a,b}	5.93 ^b	5.93 ^{b,c}
T5	6.87 ^{a,b}	6.13	6.07 ^{b,c}	6.27 ^{a,b}	6.20 ^{a,b}	6.33 ^b	6.33 ^b
T6	7.27 ^a	6.53	7.53 ^a	7.13 ^a	7.27 ^a	7.60 ^a	7.60 ^a

Table 4: Sensory evaluation of cashew apple jam.

Values in the same column having different superscript are significantly different at 5% level of probability ($p \leq 0.05$)

T0 = 100% RCAP, 1% PT, 50% RS; T1 = 70% RCAP, 30% RMP, 0.1% CA, 1% PT, 50% RS; T2 = 70% RCAP, 30% RMP, 0.2% CA, 1% PT, 50% RS; T3 = 70% RCAP, 30% RMP, 0.3% CA, 1% PT, 50% RS; T4 = 50% RCAP, 50% RMP, 0.1% CA, 1% PT, 50% RS; T5 = 50% RCAP, 50% RMP, 0.2% CA, 1% PT, 50% RS; T6 = 50% RCAP, 50% RMP, 0.3% CA, 1% PT, 50% RS

Conclusion

This study revealed that acceptable jams can be produced from cashew apple blended with mango or other tropical fruits with relatively high antioxidant properties. The physicochemical and antioxidant properties were significantly different among samples. If properly processed, the jams undoubtedly will have long storage life due to low acid values coupled with high sugar content preventing growth of food microorganisms. The most acceptable treatment for cashew apple-mango blend jam was T6 (50:50). Addition of 0.3% citric acid in the formulation is necessary to enhance the sensory attributes of jams especially texture and taste. Utilization of cashew apple into high valued products like jams or other similar products will not only help in the reduction of wastage of these fruits, but it will also serve as additional source of income for the local farmers and the country as a whole.

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