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PRODUCTION AND QUALITY EVALUATION OF ICE CREAM WITH INCLUSIVE OF SOURSOP

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Abstract

Soursop (Annona muricata L) is one of underutilized fruit in which, commercial utilization is uncommon. The effect of soursop (Annona muricata) on the quality of ice cream was investigated. Ice cream was produced from the blends of soursop pulp and milk in the proportion of 60:40, 55:45 and 100% milk (control), respectively. Ice cream samples were evaluated for physicochemical, proximate, microbiological and sensory properties. There was significant difference in the physicochemical properties of soursop ice cream produced. Results of the proximate analysis evaluated ranged from 55.43 -67.32%, 6.42 -8.93 %, 7.43 -9.63 %, 4.93 -6.42 %, 3.92 – 6.26 %, and 10.03 -13.49 %, for moisture, protein, fat, ash, fiber and carbohydrate, respectively. Results obtained for The total viable counts (TVC) and yeast counts of the ice cream produced with inclusive of soursop were less than 1.0 × 10^5 cfu/mL which is the total plate count level permitted in food according to the Codex Alimentarius Commission (CAC). All the ice cream produced with inclusive of soursop were rated almost alike in overall acceptability It is evident from this study that soursop could be used successfully to produce acceptable nutritional ice cream, thus it could be expanding its utilization in the country.

KEYWORDS:
Soursop, Ice cream, underutilized fruit, Proximate Composition, physicochemical

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INTRODUCTION

Ice cream is a frozen dessert made by mixing different ingredients including milk, cream, milk solids nonfat (MSNF), sugar, stabilizers and emulsifiers, in addition to flavors and colorants. (Arbuckle, 2003) Usually cow's milk is used to produce ice cream, but other type of milks was used including goat, buffalo, and camel, Fresh, frozen, canned or preserved fruits and fruit are usually used in ice cream mixes plus (Pandya et al., 2007; McGhee *et al*.,2015).

Soursop commonly known as A. muricata L, is a member of the Annonaceae family comprising approximately 130 genera and 2300 species (Minhas *et al*., 2000). A. muricata is native to the warmest tropical areas in South and North America and is now widely distributed throughout tropical and subtropical parts of the world, including India, Malaysia and Nigeria (Ahmed and Zubair, 2015).Soursop fruits contains a lot of nutrients and vitamin that are essential for human beings such as Vitamins C, B1 and B12, also rich in carbohydrate and has may therapeutic properties, antibacterial, anticancerous, astrighent, sedative properties (Abo *et al* .2006)

Materials and Methods

Sources of Raw materials

Mature soursop (Annona muricata L.) fruits, Powder milk (Dano), sugar, egg, flavor and other ingredients were obtained from Ajegunle market Saki Oyo State

Preparation of raw material

The matured Soursop fruits were sorted from a selection of several matured fruits, which were determined by their dark green skin with smooth numerous fleshy spines. Fully mature were allowed to ripe at room temperature for two days. The soursop drink was prepared according to the method described by Ndife *et al* (2014) with slight modification whereby, ripened soursops fruits were hand peeled, the seeds were removed from the adhering pulp. and liquefied with 400ml of water to make the soursop drink. The prepared soursop drink was bottled, pasteurized at 95 °C for 5 min, cooled and stored at 4 °C prior to analyses

Preparation of ice cream

The pre- weighed ingredients powder milk, nonfat solid, Stabilize, vanilla, eggs, sugar and emulsifier are blended thoroughly. The sour sop pulp was added and blended together, homogenized and pasteurized packaged in air tight container. The soursop ice cream produced was placed in freezer for further used (analysis)

Analysis

Determination of Physicochemical Properties of the ice cream with inclusive of soursop

pH was measured using a standardized pH meter The amount of total soluble solids (TSS) was determined using a bench type Abbé refractometer and expressed as °Brix.The ascorbic acid content was determined according to AOAC (2000) with slight modification The total titrable acidity (TTA) was determined, as described in AOAC (2012). An aliquot (10 mL) of the sample was pipette into a test tube and two drops of phenolphthalein indicator was added and thoroughly shaken. The mixture was titrated against 0.1 M NaOH until a change in colour was observed, and then, acidity was calculated.

Proximate composition of the ice cream with inclusive of soursop

The proximate composition: moisture, crude protein, fat, ash and crude fiber were determined according to the method of AOAC (2002). Carbohydrate was determined by the difference of (100 - % moisture, % protein, %fat, %ash and % crude fiber)

Microbiological Analysis

Serial dilution, pour plating, spread plating and colony count method as described by Uzuegbu an Eke (2001) were used in the microbial evaluation bacterial count and moulds count using Nutrient Agar (NA)and Potatoe Dextrose Agar (PDA)

Sensory Evaluation

The cookies samples were subjected to acceptability test: colour, taste, texture, aroma, crispness and overall acceptability by 20 semi- trained

panelists, using a 9-point hedonic scale with 1= dislike extremely and 9= like extremely (Iwe, 2001)

Statistical Analysis

Data obtained were analysed using analysis of variance (ANOVA) and the significant difference observed among various treatment at $p < 0.05$ was separated with Duncan's Multiple Range Test using the Statistical Package for Social Statistics (SPSS) version 20 (Iwe, 2002)

Results and Discussion

Physicochemical Properties of the ice cream with inclusive of soursop

The result of the physicochemical properties of the ice cream with inclusive of soursop is shown in Table 1. The pH values of ice cream with inclusive of soursop ranged from 2.9 1 to 4.61. ice cream produced from substitution level of 60 % soursop and 40 milk had the highest pH value (2.91). The addition of milk to soursop pulp caused an increase in ph. This could be due to the alkalinity of milk which caused the observed reduction in the acidity of the ice cream produced with soursop. The obtained values 2.9 1 to 4.61 was slightly lower than 3.0–5.0 reported by Akusu *et al*. 2016). A low pH is favorable for microbial stability in juices; moreover, low pH values have been reported to inhibit bacterial growth in fresh, unpasteurized fruit juices (Nwachukwu, and Ezeigbo 2013)

The total titratable acidity (TTA) ranged from 0.65 to 0.81%. Sample ABO had lowest TTA, while highest values were recorded for sample ABM. There was significant difference between the samples. The values 0.65 to 0.81% was higher than the value of 0.19% reported by Othman et al. (2014). The brix value ranged from 14.21 to 16.73° Brix. The highest brix was recorded in ABM 60 % soursop and 40 milk). The high brix level may be a result of the high total solid content of milk. The total soluble solids obtained 14.21 to 16.73° was higher than 4.9 % reported for soy milk from sprouted beans by Nsofor *et al*., (1997)

Also, from the Table 1. The viscosity ranged from 0.51 to 0. 62.. Sample ABO had least viscosity while Higher viscosities were observed in ABM (60 % soursop and 40 milk). The higher viscosity obtained in sample ABM could be due to the addition of milk. The incorporation of milk to the soursop ice-cream formulation may have caused a reduction in the free

flow of the products and consequently, increased viscosity. The values 0.51 to 0.62 was lower than the value 22.6 mg/100 reported by Waston,and Preedy (2009) for soursop pulp. The ascorbic acid levels of ice cream with inclusive of soursop varied from 40.23 to 55.72 mg/100 mL with ABM having the highest ascorbic acid content. Padayatty (2003) The high amount of ascorbic acid showed that the fruit is a good source of ascorbic acid as it could meet over 50% of the recommended daily intake of ascorbic acid for both adults (65 mg/day) and children (25 mg/day) (NIHODS, 2018)

Table 1: Physicochemical Properties of the ice cream with inclusive of soursop

Samples	pH	TTA	BRIX	Viscuosity	Ascorbic acid
ABM	$2.91^{a}\pm0.01$	$0.81^{a}\pm0.01$	$16.73^{a}\pm0.01$	$0.62^{a}\pm0.01$	$55.72^{a}\pm0.01$
ABN	$3.51^{b}\pm0.01$	$0.71^{b}\pm0.01$	$16.52^{b}\pm0.01$	$0.53^{b}\pm0.01$	$54.30^{b}\pm0.01$
ABO	$4.61^{c}\pm0.01$	$0.65^{c}\pm0.01$	$14.21^{c}\pm0.01$	$0.51^{c}\pm0.01$	$40.23^{c}\pm0.01$

Proximate Composition of the ice cream with inclusive of soursop

The proximate compositions of the ice cream with inclusive of soursop are presented in Table 2 The moisture contents of the ice cream with inclusive of soursop varied from 55.43 – 67.32 %. ABO (100 % ice cream) had a lower moisture content (755.43%) while ABM (60 % soursop and 40 milk) recorded the highest. The higher moisture content observed in this sample may be attributed to the fact that the product samples are majorly water-based,

The protein content of the ice cream with inclusive of soursop varied from 6.42 – 8.93 %. ABO (100 % ice cream) had higher protein content (8.93 %) while content ABM (60 % soursop and 40 milk) had least value (6.42%). This implies that the nutrient composition of the soursop ice cream was significantly enhanced by the addition of milk as fruit juice is generally a poor source of protein Emelike (2015)

The fat content ranged from 7.43 – 9.63 %. ABO had the highest fat content while ABM had lowest value. The high fat recorded is due to the incorporation of milk to the samples. There was significant difference between the samples.

The ash content ranged from 4.93 to 5.23 %. There was significant difference between the samples. The crude fiber ranged from 3,92 – 4.53. There was significant difference between the samples. The carbohydrate content on the other hand ranged from 10.03 to 14.51 %, ABM had the lower value while higher value (14.51) was recorded for ABN. The carbohydrate obtained proved that the samples produced had low-calorie which are good potential functional drink for blood pressure management therapy Asgary *et al*., (2014)

Table 2: Proximate Composition of the ice cream with inclusive of soursop

Samples	Moisture	Protein	Fat	Ash	Fiber	Carbohydrate
ABM	67.32^{a}±0.01	6.42^{c}±0.01	7.43^{c}±0.01	4.93^{c}±0.01	3.92^{c}±0.01	10.03^{c}±0.01
ABN	60.62^{b}±0.01	7.53^{b}±0.01	7.53^{b}±0.01	5.23^{b}±0.01	4.53^{b}±0.01	14.51^{a}±0.01
ABO	55.43^{c}±0.01	8.93^{a}±0.01	9.63^{a}±0.01	6.42^{a}±0.01	6.16^{a}±0.01	13.49^{b}±0.01

Microbiological Assessment of the ice cream with inclusive of soursop

The microbiological assessment of the ice cream with inclusive of soursop are presented in Table 3. There was no visible growth of growth of microorganism in the first week of production for all the samples. In the second week of production, sample ABO had the highest total viable count of 1.3 × 10^3 cfu/Ml, and the least fungi 0.6 × 10^3 cfu/Ml. while the least microbial count observed in count obtained in sample ABM. However, a high pH favours yeast growth and this may be responsible for the highest microbial count in ABM AND ABN (1.1× 10^3 and 0.9 × 10^3sfu/mL), respectively. The total viable counts (TVC) of the ice cream with inclusive of soursop samples were less than 1.0 × 10^5 cfu/mL which is the total plate count level permitted in food according to the Codex Alimentarius Commission (CAC) of the Food and Agricultural Organization (2003).

Table 3: Microbiological assessment of the ice cream with inclusive of soursop

Storage period (week)	ABM (cfu/mL)	ABN (cfu/mL)	ABO (cfu/mL)
Total Viable Count			
Day 0	NVG	NVG	NVG
Week 1	1.10 × 10^3	1.14 × 10^3	1.30 × 10^3
Mould count			
Day 0	NVG	NVG	NVG
Week 1	1.1 × 10^3	0.9 × 10^3	0.6 × 10^3

Samples (week 2)	Total viable count	Mould count
ABM	1.10×10^3	2.0×10^3
ABN	1.30×10^3	2.1×10^3
ABO	2.30×10^3	2.3×10^3

Sensory Attributes of the ice cream with inclusive of soursop

The sensory properties of the ice cream with inclusive of soursop are presented in Table 4. There was significant difference in all the sensory parameters analyzed for the ice cream with inclusive of soursops. In terms of color and aroma ABM and ABN were the most acceptable to the panelists while ice cream with inclusive of soursop was the most acceptable to the judges in term of taste, mouthfeel, consistency and overall acceptability the acceptability of ABO may be attributed to higher percentage of milk (100%)

Table 4: Quality evaluation of the ice cream with inclusive of soursop

Samples		Colour	Aroma	Taste	Mouthfeel	Consisatency	Acceptability
ABM		$7.36^{b}\pm0.01$	$7.56^{b}\pm0.01$	$7.46^{b}\pm0.01$	$6.57^{c}\pm0.01$	$7.62^{c}\pm0.01$	$7.36^{c}\pm0.01$
ABN		$8.65^{a}\pm0.01$	$8.21^{a}\pm0.01$	$6.35^{c}\pm0.01$	$6.89^{b}\pm0.01$	$7.67^{b}\pm0.01$	$7.45^{b}\pm0.01$
ABO		$6.76^{c}\pm0.01$	$6.83^{c}\pm0.01$	$8.68^{a}\pm0.01$	$7.66^{a}\pm0.01$	$7.88^{a}\pm0.01$	$7.99^{a}\pm0.01$

Conclusion

Incorporation of soursop pulp to ice cream had positive impact on the physicochemical, proximate and sensory properties of ice cream. In addition, considering the nutritive value and health benefit of soursop which is underutilized fruits, its incorporation in ice cream could increase its utilization and health benefit derived from it.

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