Quality Assessment of Candy Produced with Date (*Phoenix dactylifera L.*) and Coconut (*Cocos nucifera L.*)

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Abstract

The study was aimed at evaluating the quality of candy produced with date and supplemented with coconut. Soft chewy caramel candies were prepared from refined sugar, date and coconut pastes in the ratios of 100:0:0, 50:30:20, 30:50:20, 20:50:30 and 0:100:0% for sample A, B, C, D and E, respectively. Standard analytical methods were used in the analysis of physicochemical, proximate composition, energy value, mineral and sensory properties of the candies. pH, and total soluble solids ranged respectively, from 4.73-4.79, and 10.0-30.0 °Brix. The proximate composition varied from 3.00-17.93, 14.24-30.18, 0.34-4.50, 0.15-1.30, and 46.39.81.57% for moisture, fat, crude fibre, ash, crude protein and carbohydrate, respectively. The energy value ranged from 455.42-510.30 Kcal/100g, while the mineral content ranged from 24.05-35.01, 1.65-8.22, 0.00-0.029 mg/100g for potassium, calcium and manganese, respectively. The degree of likeness for sensory properties ranged from 5.90-8.05, 6.25-8.20, 5.40-8.35, 5.75-8.40, 5.80-8.50, 6.00-8.15 and 5.85-8.28, respectively, for appearance, colour, mouthfeel, taste (sweetness), aftertaste, aroma, and overall acceptability. The result in comparison with the standard sugar candies indicated that date and coconut pastes can be used to replace refined sugar in the production of acceptable candy of high nutritional quality. Date and coconut supplemented candies will be significant in reducing the health challenges associated with excess consumption of refined sugar in candies.

Keywords: *Candy, date, coconut paste, proximate composition, mineral, sensory properties.*

INTRODUCTION

Candy, also called sweet and lollies in some parts of the world (Chandrasekaran, 2015) is a confection, a sweet kind of food made usually from sugar and water, with flavours and some other ingredients like nuts, milk or butter added (Edwards, 2018). Its principal ingredient is sugar from sugar beet or sugarcane (Eagleton *et al.*, 2017; Edwards, 2018). It can be found in almost any store and is consumed by many people despite its low nutritional benefits (Edwards, 2018). It comes in different flavours, sizes and shapes and apart from having a sweet taste, it can be spicy too. Candy also encompasses sweet confections like chocolate, caramel, chewing gum and sugar candy as well as vegetables, fruits or nuts which have been glazed and coated with sugar. Generally, candies are rich in artificial sweeteners which are low in nutrients but rich in calories. They are mostly consumed by children (Bailey *et al.*, 2018).

Refined sugar is the chief ingredient in candies (Edwards, 2018), which makes candies of little or no nutritional value beyond food energy and as such is considered a source of empty calories (Slavin, 2012). Apart from this, there is a potential effect of candy consumption on health risk factors in children and adults which includes obesity, risk of blood cholesterol, high blood pressure, dental caries and blood glucose (Arshad *et al.,* 2022). There is also an increased risk of tooth decay due to the consumption of high-sugar foods especially lollipops and other sugar-based candies which stay in the mouth for a long time (Chow, 2019). Weight gain, obesity, tiredness, and acne are also some of the health challenges associated with the consumption of too many sweets (DiNicolantonio *et al.,* 2016). There is a need to reduce or eliminate the intake of refined sugar as well as a reduction in their addition to foods as it has been stated by the WHO directives that sugar should not represent more than 10% of the daily caloric intake (Rehan *et al.,* 2017). Studies have shown that there are natural sweeteners that can be employed in the production of foods including candies as these natural sweeteners are associated with a healthier lifestyle, high nutritional values and favourable customer perceptions (Castro-Munoz *et al.,* 2022). Natural sweeteners like dates fruit, maple syrup, stevia, coconut sugar and honey, can be used to either replace or eliminate refined sugar in foods (Castro-Muñoz *et al.,* 2021). Natural sweeteners in candy production will greatly reduce the health challenges posed by refined sugar as well as make healthy candies for consumption (Kurt *et al.,* 2022)

Date palm (*Phoenix dactylifera L.*) is the most popular fruit in the Middle East and North Africa (EL-Mously *et al.,* 2023). It is consumed widely and serves as an inexpensive source of nutrients (Hussain *et al.,* 2020). The fruits are nutrient-rich, containing dietary fibres, sugar, protein, vitamins, minerals, flavonoids, and phenolic compounds (Hussain *et al.,* 2020), and are therefore excellent materials for producing refined sugar, concentrated juice, confectionery paste and fermented products (Al-Alawi *et al.,* 2017). Due to the presence of phenolic compounds, date palm fruits are antioxidant-rich with potent bioactivities against several bacterial pathogens (Hussain *et al.,* 2020). According to Alsarayrah *et al.* (2023), dates are otherwise called “nature's candy” due to their sweet taste which is attributed to their high sugar content. When processed, date palm fruits are consumed as paste, syrup, pickles, jams and jellies, they are also used in many bakery or confectionery products together with chocolate, coconut, honey, vinegar and others (Iliyasu *et al.,* 2021). Studies have shown that date palm fruits as a rich source of carbohydrates contain mostly fructose and glucose at a percentage of 88.02%. It also contains dietary fibre up to 16.95%. They are low on protein with a protein content of 3.30% and fat content of up to 0.56%. The mineral content of date palm fruit is up to 6.20% (Benmeziane-Derradji, 2019). Date palm fruits being rich in vitamins and up to 15 minerals which include Calcium, Phosphorus, Magnesium, Manganese, Potassium, Iron, Sodium and Zinc have been reported to provide several health benefits (Benmeziane-Derradji, 2019).

Coconut belongs to the palm family of order palmae and family, *Arecaceae* (Yang *et al.,* 2018). It is a monocotyledon and a single existing species of the genus *Cocos* (Foale *et al.,* 2020). Coconut (*Cocos nucifera L.*) is of high nutritional value; it is rich in fibre and medium-chain triglycerides (MCTs), and it is also high in fat and calories but low in protein and carbohydrates (Pham, 2016). The consumption of coconut also enhances weight loss by producing the feeling of fullness, calorie burning and fat burning due to the MCTs present in the coconut (Watanabe and Tsujino, 2022). Coconut also boosts digestive health with its high fibre content which supports easy bowel movement, allowing a healthy digestive system. Due to the high fat

content, coconut oil helps the body absorb fat-soluble vitamins like Vitamins A, D, E and K (Nikooei *et al.*, 2021).

MATERIALS AND METHODS

Dry date palm fruits (*Phoenix dactylifera L.*), Medjool variety, matured coconut fruit, commercial refined sugar, evaporated milk, salted butter and vanilla flavour were purchased from Mile 3 market in Port Harcourt, Rivers State, Nigeria. All chemicals and reagents were of analytical grade and were obtained from the Department of Food Science and Technology Laboratory, Rivers State University.

Processing of date paste

The flow diagram for the preparation of date paste is shown in Fig. 1.0. Preparation of date paste was carried out using the method of (Haneen, 2019) with slight modification. Date fruits were sorted to get rid of unwanted particles and defective date fruits. The date palm fruits were washed with warm water at 40°C to remove dust and macroscopic contamination. The date fruits were pitted (broken open with a knife) to remove the seeds. The pitted date fruits were scalded at 100°C (1:1 water/fruit) for 3 min. The scalded date flesh was blended in an electric blender until a smooth homogenous date paste was obtained. The date paste was stored in a jar for further processing.

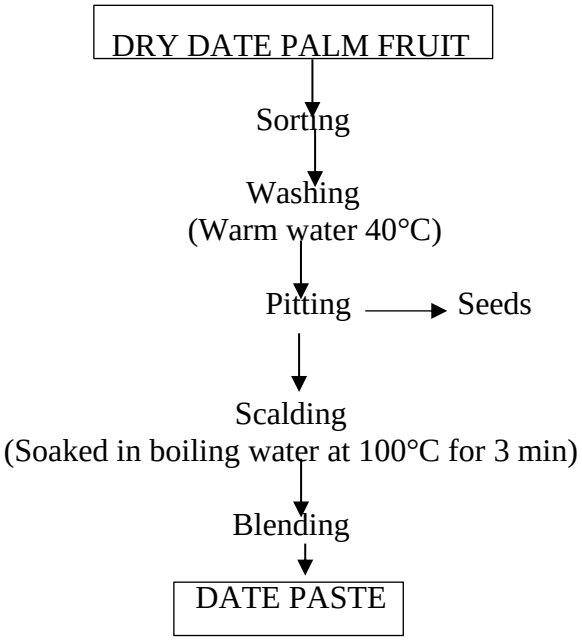

Fig 1.0 Preparation of date paste
Source: Haneen (2019)

Processing of Coconut paste

The flow diagram for the processing of coconut paste is shown in Fig. 2.0 The fresh coconut paste was prepared using the method described by Okafor and Usman (2013) with slight

modification. Medium sized matured coconut fruits were inspected physically to ensure they are in good condition. The coconuts were husked and cracked manually with a hammer and the coconut meat carefully detached from the endocarp with a kitchen knife. The coconut meat was scrapped manually to remove the thin brown coating on it. It was then washed and blended with an electric blender to obtain a smooth fresh coconut paste. The coconut paste was stored in a jar for further processing.

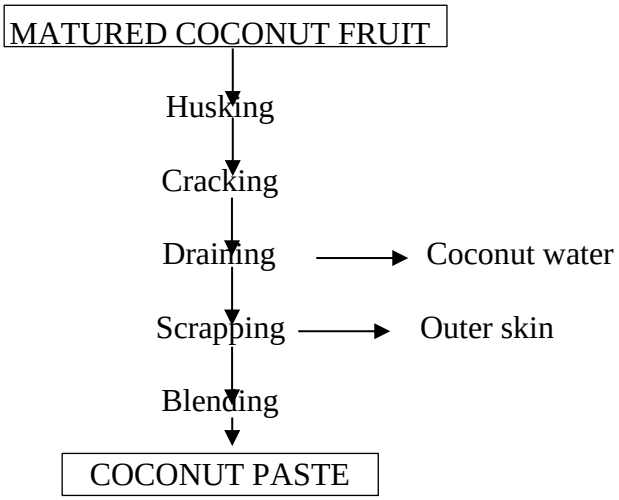

Fig 2.0 Preparation of Coconut paste
Source: Okafor and Usman (2013)

Sample Formulation

The sample formulation ratio for the production of candies produced with date and coconut paste is shown in Table 1.0.

Table 1.0 Sample formulation ratio

Sample	Refined sugar (%)	Date paste (%)	Coconut paste (%)
A	100	0	0
B	50	30	20
C	30	50	20
D	20	50	30
E	0	100	0

Production of date candy supplemented with coconut

The flow diagram for the production of date candy is shown in Fig 3.0. As described by Turansky (2023), with slight modification, a 5-inch square loaf pan was prepared by smearing it with melted butter and lining it with parchment paper and kept aside. In a clean saucepan, milk, salted butter, date paste and coconut paste were mixed until the butter melted, the mixture was set aside. In another clean heavy saucepan, granulated sugar and water was added and stirred gently without allowing the mixture to boil before the sugar melted. Once the sugar

melted, the mixture was allowed to boil without stirring until caramelized at a temperature of 171°C. The heat was lowered while the milk, butter, date paste and coconut paste mixture was poured in gently, the mixture was boiled till it was brown and thick, at a temperature of 120°C. The caramel was removed from heat then vanilla extract was added and stirred gently to homogenize. The caramel was poured into the already prepared pan lined with parchment paper and allowed to cool overnight. The soft chewy date caramel candy was cut into desired sizes, packaged and stored in an airtight container.

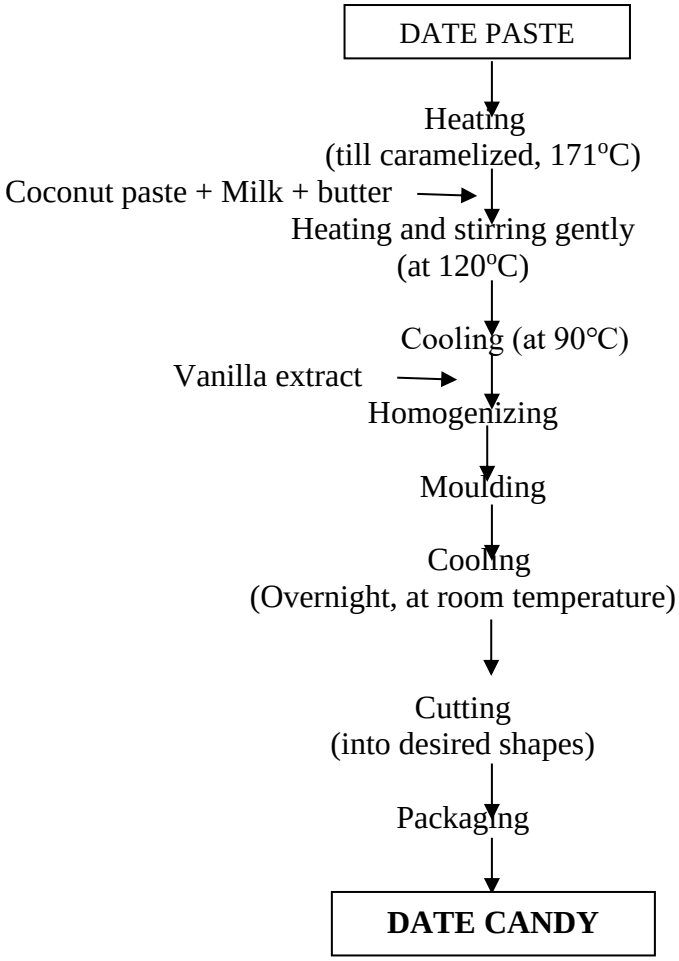

Fig 3.4 Production of Date candy
Source: Turansky (2023) with modification

Table 2.0 Recipe for soft chewy candy production

	Sample Code				
Ingredients	**A**	**B**	**C**	**D**	**E**
Refined sugar (g)	400	200	120	80	-
Date paste (g)	-	120	200	200	400
Coconut paste (g)	-	80	80	120	-
Evaporated milk (ml)	140	140	140	140	140
Butter (g)	100	100	100	100	100
Vanilla extract (tsp)	1	1	1	1	1
Water (ml)	120	120	120	120	120

Key:
A= 100% refined sugar
B= 50% refined sugar, 30% date paste, 20% coconut paste
C= 30% refined sugar, 50% date paste, 30% coconut paste
D= 20% refined sugar, 50% date paste, 30% coconut paste
E= 100% date paste

Determination of the Physicochemical properties of the candies

pH and total soluble solid (TSS) was determined using the Association of Official Analytical Chemists (AOAC, 2012) standard method. The samples (2 g) were homogenized in 20 mL of distilled water and filtered into a beaker. The pH meter (Jenco 6177) after calibration and stabilization with standard buffer of pH 4.0 and 7.0, was used to determine the sample pH. Total soluble solids content was determined at 29±2^{o}C using Abbe hand refractometer. The sugar content percentage (soluble sugar) was read from the scale of the refractometer when held close to the eye.

Determination of the proximate composition and energy value of the candies

The moisture, protein, crude fibre, fat and ash contents of samples were analysed using the standard analytical method described by AOAC (2012). Moisture was obtained gravimetrically after drying to a constant weight at 70^{o}C in a hot air oven (DHG 9140A). Fat was determined using soxhlet extraction method with ethyl ether. Kjeldahl method and a nitrogen conversion factor of 6.25 was used for crude protein determination. Ash content was determined gravimetrically after the incineration of the samples in a muffle Furnace (Model SXL) at 550^{o}C for 2 h. Enzymatic gravimetric method was utilized in the determination of crude fibre. Carbohydrate was calculated by difference {100 - (Crude protein + crude fibre + ash + fat)}. Energy values were obtained using Atwater factor of 4 Kcal/g for protein and carbohydrate and 9 Kcal/g for fat as described by Obinna-Echem *et al.* (2024).

Determination of the mineral composition of the candies

As described by Adelekan *et al.* (2014), 1 g of each sample was digested with 10% HNO_3 after ashing. The sample was filtered after digestion and the filtrate was made up to 100 mL of distilled deionized water. Atomic absorption spectrophotometer (Buck scientific, model 210) was used to determine the potassium, calcium and manganese content of the samples.

Sensory analysis

Twenty panelists consisting of students of Rivers State University Community, Port Harcourt, Nigeria were selected for the sensory evaluation. Criteria for selection of the panelists was that the panelists must be above 15 years of age and regular consumers of candies. They were neither sick nor allergic to any of the ingredients. The candies were evaluated for; aroma, appearance, colour, taste (sweetness), mouthfeel, aftertaste and overall acceptability. The samples were scored for each sensory parameter using a 9-point hedonic scale (9 = liked extremely, 8 = liked very much, 7 = liked moderately, 6 = liked slightly, 5 = neither liked nor disliked, 4 = disliked slightly, 3 = disliked moderately, 2 = disliked very much and 1 = disliked extremely) as described by Iwe (2010).

Statistical analysis

All the analysis were carried out in duplicate. Data obtained were subjected to Analysis of Variance (ANOVA). Difference between means were evaluated using Tukey's multiple comparison tests with 95% confidence level. The statistical package SPSS software version 26 was used.

RESULTS AND DISCUSSION

Physicochemical properties of candy produced with date and supplemented with coconut

The physicochemical properties of the candies are shown in Table 3.0.

The TSS of the samples ranged from 10.00 ºBrix (samples D and E) to 30.00 ºBrix (sample C). The high soluble sugar recorded in Samples C, Sample A, and sample B could make them consumer's choice because of their sweetness. Although candies with high soluble sugar would be good sources of energy (Slavin, 2012), Sample D and Sample E would be better choices for people that require food with low sugar content. The soluble sugar value recorded for all the candies is lower than that of beetroot candy (66.50 °Brix) as recorded by Kaur *et al*. (2022). Statistical analysis showed a significant difference ($P<0.05$) in the soluble sugar.

The pH of the samples ranged from 4.76 (samples A and E) to 4.79 (sample C). This low value recorded in sample B may be due to the low percentage of date palm in sample B. The pH of the candies are slightly acidic making the candy a good quality candy with moderate acidity. The pH value recorded for all the candies are higher than that of starch-based candy supplemented with date and tamarind (2.80-3.00) as recorded by Oluwasina *et al.* (2020). Statistical analysis showed a significant difference ($P<0.05$) in the pH values.

Table 3.0 Physicochemical properties of candy produced with date and supplemented with coconut

Sample	TSS (°Brix)	pH
A	20.00^{b}±0.00	4.76^{a}±0.00
B	20.00^{b}±0.00	4.73^{a}±0.01
C	30.00^{a}±0.00	4.79^{a}±0.00
D	10.00^{c}±0.00	4.78^{a}±0.04
E	10.00^{c}±0.00	4.76^{a}±0.01

Values are means ± Standard Deviation of duplicate determinations. Means in the same column with different superscript are significantly different at $p<0.05$

Sample Keys:
A = 100% Refined sugar
B = 50% Refined sugar, 30% Date paste and 20% Coconut paste
C = 30% Refined sugar, 50% Date paste and 20% Coconut paste
D = 20% Refined sugar, 50% Date paste and 30% Coconut paste
E = 100% Date paste

Proximate composition and Energy value of candy produced with date and supplemented with coconut

The proximate composition and energy value of candy produced with date and supplemented with coconut is shown in Table 4.0.

The moisture content of the candy ranged from 3.00% (Sample A) to 17.93% (Sample E). The low moisture content in sample A may be due to the absence of date and coconut paste in sample A in the formulation. Date and coconut paste have been reported to have a reasonable amount of moisture (Ibrahim *et al.*, 2021). The moisture contents recorded for some of the candies were higher than 12% recorded by Urooj (2021) for candy made from wood apple and passion fruit. Although high moisture content reduces the shelf life of foods Gaikwad *et al*. (2019), the high moisture content of these candies is desirable as it increases the chewiness of the candies. Statistical analysis revealed that there was no significant difference ($p > 0.05$) in the moisture values.

The fat content ranged from 14.24% (Sample A) to 33.44% (sample C). The low fat content in sample A may be due to the absence of date and coconut in sample A in the formulation. Coconut has been reported to have a reasonable amount of healthy fat according to Pham (2016). It can also be generally deduced from the results that both date palm and coconut contributed to the fat content of the candies, as those produced with their addition recorded higher fat content than that of sample A(control). The fat contents recorded for all the candies are higher than 1.94% recorded by Adeoye *et al*. (2019) for Hibiscus Sabdariffa candy. The fat present in coconut is MCT (medium chain triglycerides) which is a healthy fat as recorded by Pham (2016) making these candies suitable for consumption without the risk of cardiovascular

diseases as compared to candies with refined sugar which are recorded to cause health challenges like cardiovascular diseases (Malik and Hu, 2022). Statistical analysis indicated a significant difference ($p < 0.05$) in the fat content values of sample C and sample D, which shows the actual effect of coconut fat in the samples.

The crude fibre content of the candies ranged from 0.34% (Sample A) to 4.90% (sample D). The crude fibre contents of the samples increased with the addition of date and coconut pastes. Coconut and date have been reported to have a reasonable amount of crude fibre. Sativa *et al*. (2023) had reported crude fibre of 9.70%. The crude fibre contents recorded for all the candies are higher than 0.026% recorded by Adeoye et al, (2019) for Hibiscus Sabdariffa candy. The high crude fibre content of these candies is desirable for better human digestion. Suresh *et al*. (2024) noted that crude fibre-rich foods help to prevent constipation, piles, appendicitis, and cancer. Statistical analysis showed that there was no significant difference ($P > 0.05$) between the samples and the control.

The ash content ranged from 0.15% (Sample E) to 1.30% (Sample B). The low ash content of the 100% date candy (sample E) could be as a result of low ash content of date (1.13%) as reported by Razzaq *et al.* (2019). Inclusion of coconut paste however increased the ash content of the candies. The ash contents recorded for some of the candies are higher than 0.94% recorded by Adeoye *et al.* (2019) for Hibiscus Sabdariffa candy. The high ash content of these candies is desirable as it is a pointer to the mineral content. Minerals are important in the functioning of the body. There was no significant difference ($P > 0.05$) between the control and other samples.

The protein content ranged from 0.26% in Sample E to 0.86% in Sample. The crude protein content of the 100% date candy recorded the highest protein. Ibrahim *et al.* (2020) reported that date contained a reasonable amount of crude protein (2.50%). The crude protein contents recorded for all the candies are lower 1.4% - 2.34% recorded by Urooj (2021) for wood apple and passion fruit candy and also lower than 4.53% recorded by Adeoye *et al.* (2019) Hibiscus Sabdariffa candy. The high crude protein content of these candies is desirable for body building, growth and development in children. Protein-rich foods help in bodybuilding and repair of worn-out tissues. There was significant increase ($p < 0.05$) in the protein content of the candies, when compared with the control.

The carbohydrate content ranged from 46.39% in Sample E to 81.57% in Sample A. The high carbohydrate content (81.57%) of sample A could be because sample A had the highest quantity of refined sugar in its production. Refined sugar is stripped of other nutrients making it of low nutritional value according (Slavin, 2012; Edwards, 2018). It can also be generally deduced from the results that both fruits (date palm and coconut) led to a reduction in the carbohydrate content of the candies, as those produced with their addition recorded lower carbohydrate content than that of sample A (control). The carbohydrate contents recorded for all the candies are lower than 99.31% recorded by Sahlan *et al*. (2019) for honey candy. Since excess carbohydrate places a large metabolic load on the body and causes other health challenges (Arshad *et al.*, 2022). The low carbohydrate content of these candies is desirable for reduction in these health challenges caused by excess carbohydrate, challenges like weight gain, poor metabolic health and an increased risk of heart diseases.

The Energy value ranged from 455.42- 510.31 kcal/100g with sample A recording the lowest, and sample C recording the highest value. The high energy value of samples with date and coconut could be as a result of the high fat content of coconut (Watanabe and Tsujino, 2022). Coconut has been reported to be high in fat, and 1 g of fat provides the body with 9 kcal of energy while 1 g of carbohydrate provides the body with 4 Kcal of energy. The energy values recorded for all the candies are higher than 0.74 Kcal/g recorded by Adeoye *et al*. (2019) for Hibiscus Sabdariffa candy and also higher than 398.68 Kcal/100g recorded by Sahlan *et al*. (2019) for honey candy. The high energy values of these candies may be suitable for athletes who may need to boost their energy requirements from time to time.

Table 4.0 Proximate composition (%) and Energy value (Kcal/100g) of candy produced with date and supplemented with coconut

Sample	Moisture	Fat	Crude Fibre	Ash	Crude Protein	Carbohydrate	Energy Value
A	$3.00^{e}\pm0.16$	$14.24^{d}\pm0.13$	$0.34^{c}\pm0.14$	$0.60^{bc}\pm0.07$	$0.26^{d}\pm0.04$	$81.57^{a}\pm0.54$	$455.42^{d}\pm0.80$
B	$4.85^{d}\pm0.06$	$24.74^{c}\pm0.20$	$2.62^{b}\pm0.28$	$1.30^{a}\pm0.07$	$0.44^{c}\pm0.00$	$66.06^{b}\pm0.23$	$488.64^{c}\pm0.85$
C	$8.80^{c}\pm0.12$	$33.44^{a}\pm0.05$	$4.50^{a}\pm0.14$	$0.93^{ab}\pm0.25$	$0.54^{bc}\pm0.01$	$51.81^{c}\pm0.45$	$510.30^{a}\pm2.28$
D	$10.40^{b}\pm0.37$	$32.91^{a}\pm0.03$	$4.90^{a}\pm0.14$	$1.20^{a}\pm0.14$	$0.64^{b}\pm0.04$	$49.95^{c}\pm0.35$	$498.55^{b}\pm1.33$
E	$17.93^{a}\pm0.10$	$30.18^{b}\pm0.91$	$4.50^{a}\pm0.14$	$0.15^{c}\pm0.07$	$0.86^{a}\pm0.04$	$46.39^{d}\pm1.05$	$460.58^{d}\pm4.07$

Values are means ± Standard Deviation of duplicate determinations. Means in the same column with different superscript are significantly different at $p<0.05$

Mineral composition of candy produced with date and supplemented with coconut

The mineral composition of the candies is shown in Table 5.0.

The Potassium content of the samples ranged from 24.05 mg/100g (sample A) to 41.25 mg/100g (sample D). Potassium content of the samples increased with the addition of date paste. This might be as a result of date being rich in potassium (Siddeeg, 2019). Potassium helps to regulate blood pressure, nerve function, and muscle contraction.

The Calcium and Manganese content of the samples ranged from 1.65-8.22 mg/100g and 0.00-0.029 mg/100g respectively with sample A being the lowest, and E recording the highest value. Inclusion of date increased the calcium content of the candy. There was significant difference ($p<0.005$) between the control (refined sugar) and other samples. Since calcium is needed for strong bones and teeth the consumption of this candy can reduce dental caries which is a major health challenge associated with the consumption of candy made with refined sugar. The manganese value of sample E was higher than that of baby corn candy (0.17 mg/100g) as recorded by Kaur *et al*. (2023). Statistical analysis showed a significant difference ($P<0.05$) in the Manganese values.

Table 5.0 Mineral composition (mg/100g) of candy produced with date and supplemented with coconut

Sample	Potassium	Calcium	Manganese
A	24.05^{e}±0.07	1.65^{d}±0.01	0.00^{d}±0.00
B	32.10^{d}±0.14	8.23^{a}±0.01	0.011^{c}±0.00
C	41.25^{a}±0.21	7.01^{b}±0.01	0.010^{c}±0.00
D	36.42^{b}±0.03	4.73^{c}±0.04	0.014^{b}±0.00
E	35.01^{c}±0.01	8.22^{a}±0.00	0.029^{a}±0.00

Values are means ± Standard Deviation of duplicate determinations. Means in the same column with different superscript are significantly different at $p<0.05$

Sensory evaluation of candy produced with date and supplemented with coconut

The sensory evaluation of candy produced with date and supplemented with coconut is shown in Table 6.0. Sensory analysis as reported by Obinna-Echem (2023), is an important criterion for assessing quality in the development of new products and for meeting consumers requirements. The degree of likeness for appearance as evaluated by the panelists ranged from 5.90 (sample E) to 8.05 (sample B). Sample E (5.90) was neither liked nor disliked (Iwe, 2010), and this may be due to the absence of refined sugar in the formulation which has a distinct acceptable caramel appearance when heated. The degree of likeness for colour ranged from 6.25 (sample E) to 8.20 (sample B). The degree of likeness for mouthfeel, taste (sweetness), aftertaste, aroma and overall acceptability ranged from 5.40-8.35, 5.75-8.40, 5.80-8.50, 6.00-8.15, and 5.85-8.28, respectively with sample E recording the least degree of likeness, and sample B recording the best. Overall acceptability score shows that sample B (8.28) was liked very much, compared to sample A (7.87), which served as the control, and was liked moderately (Iwe, 2010). There was however no significant difference ($p<0.05$) between the control and the best liked (sample B) in their overall acceptability score.

Table 6.0 Sensory evaluation of candy produced with date and supplemented with coconut

Sample	Appearance	Colour	Mouthfeel	Taste (Sweetness)	Aftertaste	Aroma	Overall Acceptability
A	7.90^{ab}±1.12	7.90^{a}±0.85	7.75^{ab}±1.16	8.15^{ab}±0.93	8.05^{a}±0.83	7.45^{ab}±1.05	7.87^{ab}±0.80
B	8.05^{a}±0.94	8.20^{a}±1.01	8.35^{a}±0.81	8.40^{a}±0.88	8.50^{a}±0.83	8.15^{a}±0.75	8.28^{a}±0.60
C	7.15^{ab}±1.31	7.35^{ab}±0.93	7.20^{bc}±1.24	7.40^{bc}±0.94	7.45^{ab}±0.89	7.45^{ab}±0.76	7.33^{bc}±0.66
D	6.95^{bc}±1.05	6.90^{bc}±1.12	6.35^{cd}±1.46	7.10^{c}±1.21	6.80^{bc}±1.51	7.00^{bc}±1.52	6.85^{c}±0.99
E	5.90^{c}±1.52	6.25^{c}±1.14	5.40^{d}±1.60	5.75^{d}±1.45	5.80^{c}±1.70	6.00^{c}±1.72	5.85^{d}±1.32

Values are means ± Standard Deviation of duplicate determinations. Means in the same column with different superscript are significantly different at $p<0.05$

CONCLUSION AND RECOMMENDATION

This study showed that date and coconut added to refined sugar in candy production enhanced the proximate composition, mineral content and sensory properties of the candy, indicating a good quality candy. Sensory overall acceptability rating showed that sample B (50% refined sugar, 30% date, and 20% coconut paste) was liked very much (8.28), compared to the control and other samples.

Date candy supplemented with coconut should be recommended for children and adults with sweet tooth, in order to reduce the health challenges associated with excess consumption of refined sugar in candies.

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