

Proximate Composition and Sensory Evaluation of Imitation Coffee Made from Date Palm Seeds

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Abstract

Date palm seeds are considered as waste products from date processing industries/factories that produce dates sweeteners, syrup, powder and date confectioneries, which triggers the need for the utilization of excess seeds obtained after consumption and processing. This study assessed the imitation coffee produced from this by products for its sensory attributes and proximate composition. This article aimed at producing imitation coffee drink from date palm seeds for value addition and new product developments. The samples were analyzed for sensory evaluation which includes: appearance, aroma, taste, mouthfeel and overall acceptability and the proximate composition analyzed includes; moisture content, ash, crude fibre, crude fat, crude protein and carbohydrate content. The results obtained shows that appearance had average mean score from the lowest to the highest in sample C to A (7.30 – 8.80), aroma from sample B to A (6.80 – 7.25); taste from sample B to A (7.20 – 8.49), mouthfeel ranged from sample B to sample A (7.20 – 7.40) and the overall acceptability ranged from sample C to A (6.38 – 7.94) respectively. This revealed that the control sample A were most preferred followed by sample C produced from date palm seed sieved with 100 µm sieve. While, the proximate composition of the sample shows that moisture content ranged from (13.55 – 14.36 %), ash (4.27 – 5.35 %), fibre (0.97 – 1.21 %), crude fat (0.18 – 1.25 %), crude protein (1.44 – 2.05 %) and carbohydrate content ranged from (77.20 – 78.34 %). This article exploits the potential viability of date seed as an alternative source of imitation coffee drink with high sensorial acceptability, rich in ash content which is an expression of its mineral content, and low moisture. This article highlights the high chance of it utilizing date seeds as an alternative substitute to coffee, Hence, further studies are required to assess and compare the physiochemical, and antinutritional factors of the samples.

Keywords:

Date Seeds, Imitation Coffee, Roasting, Milling, Sensory and Proximate Composition.

Introduction

Dates (*Phoenix dactylifera*, L) are widely consumed in the Middle East and North Africa, where they play an important role in the nutrition and socio-economic activities of the people as described by Chaira, (2007). Dates is considered as staple food in some Arab countries, followed by Africans because of religious beliefs or because of its nutritional composition, include fleshy peel (85-90 %) and seeds (10 - 15 %) according to Al-Farsi *et al.*, (2008).

The utilization of dates and their waste is very important for date palm cultivation and increasing the income rate of this industry (Guendez, 2005). Date seeds are considered waste products from many date processing factories that produce dates, date syrup and date confectionery. Currently, seeds are mainly used as animal feed by the cattle, sheep, camel and poultry feed formulation (Al-Fars and Lee, 2008b).

Roasted and powdered date seeds are used as a coffee substitute by some rural communities and coffee-like product made from toasted date palm seeds are available in Arab markets e.g. Kingdom of Saudi Arabia. Saudi Arabia (KSA) and United Arab Emirates (UAE) (Satoh, *et al.*, 2005). Since coffee drinks are considered one of the most common drink same as tea in the Arab region, where dates are widely grown, it is thought that processing date seeds into a coffee-like beverage could be an alternative to those who want to enjoy the unique flavor and aroma of coffee like drink without altering the desired coffee flavor with zero caffeine content (Clarke *et al.* 2003).

Coffee is a major dietary source of polyphenols and phenolic acids due to its high polyphenol and phenolic acid content (Jeszka-Skowron *et al.*, 2016). These coffee components are well correlated with high antioxidant properties (Babova *et al.*, 2016; Jeszka, *et al.*, 2016), weight loss, improved mood, and increased vigilance to its effectiveness against hypertension and anti-cancer properties (Glei *et al.*, 2006). Additionally, it has the potential to be used as a source of polyphenols and natural antioxidants in functional foods (Dziki *et al.*, 2015). Therefore, this article aimed at producing an imitation coffee drink from date palm seeds for value addition.

Materials and Methods

Materials

The materials used in this research includes; dates seeds.

Sample collection and pre-treatment

The date palm seed were purchased from Dawa'nau market in Kano state. The samples were transported in polythene bags to the Food Technology Laboratory, Federal College of Agricultural Produce Technology, (FCAPT), pre-treated by cleaning, sorting, washing and dried before storage for further processing.

Experimental Site

The experiment was conducted in Food Processing Laboratory of the Department of Food Science and Technology, Federal College of Agricultural Produce Technology, (FCAPT) Kano, plot 54-56 CBN Quarters, Tarauni Local Government of Kano state, while the proximate composition and sensory evaluation were conducted in Department of Science Laboratory Technology, in the same Institute.

Preparation of imitation coffee from date seeds

The date palm seeds obtained were sorted to remove extraneous matter, cleaned and washed thoroughly using clean water followed by sun-drying as described by (Jeszka-Skowron *et al.*, 2016). The dried sample were roasted at temperature of 105 °C for 2 hours in an open pan, allowed to cooled down then milled into fine powdered flour using hammer milling machine, the fine powder were sieved using 80 and 100 µm mesh sieve then packaged in a zip lock polythene bags and labeled ready for analysis (Guizani, *et al.*, 2014).

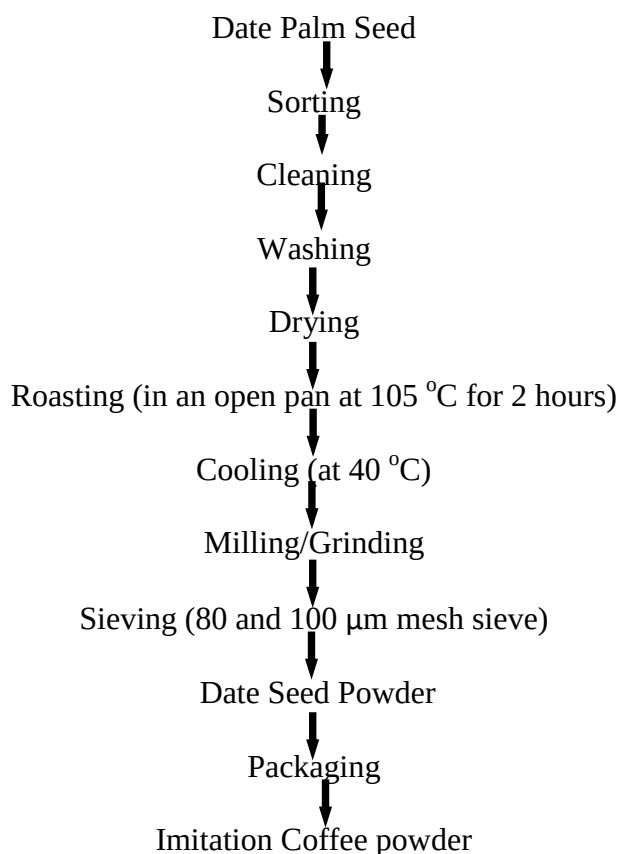


Figure 1: Flowchart for the processing of Imitation Coffee Drink from Date Seeds.

Source: (Jeszka-Skowron *et al.*, 2016).

Method of Analysis

Sensory Evaluation of the samples

Sensory evaluation of the samples were performed on the imitation coffee samples produced from date palm seeds compared with Nescafe coffee as control. The samples were prepared in same manner, by boiling a top tea, sweetened with specific amount of sugar were added and allowed to dissolve before the sensory evaluation commenced then served as corded A, B and C (coffee and imitation coffee). A group of fifteen (15) semi trained panelists consisting of Male and Female from the Department of Food Science and Technology, Federal College of Agricultural Produce Technology (FCAPT) Kano, were selected, pre-trained based on the sample to be examined prior to the evaluation. A nine point Hedonic scale ranging from nine (9) to one (1) from like extremely to dislike extremely were used and the Samples were evaluated for: appearance, aroma, taste, mouth feel and general acceptability as described by (Onwuka, 20018).

Proximate Composition of Imitation Coffee Samples Produced from Date Seeds

The proximate composition of imitation coffee samples were determined following a standard method of analysis described by AOAC, (2000) and Onwuka, (2018). Where the ash contents were analyzed using crucible of known weight containing the samples and transferred to the muffle furnace set at a temperature of 550 °C for 3 hours $\pm$ 30 minutes, after which it was removed to desiccator to cool down and reweighed. Moisture content were determined using hot air oven set at temperature of 105 °C for 4 hour described by (Onwuka, 2018). Protein contents were determined in three stages such as; digestion, distillation and titration as described by AOAC (2000). The fat contents were analyzed using Soxhlet extraction method described by AOAC, (2007) using N-Hexane solvent until it reflux

for 4-6 hours and the fibre contents were determined according to Onwuka, (2018). Carbohydrate content of imitation coffee samples were determined by difference as described by Onwuka, (2018), using the formulae below:

$$\text{Carbohydrate (\%)} = 100 - (\% \text{ Fiber} + \% \text{ Protein} + \% \text{ Moisture} + \% \text{ Fat} + \% \text{ Ash})$$

Statistical Analysis

All the results of the proximate composition were obtained in triplicate measurements, while fifteen panelists were employed to evaluate the samples for sensory attributes. The results obtained were analyzed statistically using Minitab (version 21) software Package for analysis of variance (ANOVA), the results were analyzed using one-way analysis of variances using turkeys test and mean difference were separated using least significantly difference method (LCD), following a method described by (Onwuka, 2018).

Results and Discussion

Table 1, shows the results of sensory evaluation of the imitation coffee samples produced from date palm seeds sieved using 80 and 100 μm sieve compared with commercial coffee sample. The sample produced were prepared with top tea before evaluating for appearance, aroma, taste, mouth feel and the overall acceptability. The results shows that there was a significant difference among the samples compared with the control sample at ($P < 0.05$) level of significance. Where the appearance had a mean score value ranged from 7.30 – 8.80, where the control sample had the highest mean score value, followed by sample B sieved with 80 μm sieved and C sieved with 100 μm respectively. The results of aroma showed that there were no significant difference at ($p < 0.05$) between the two imitation coffee sample B and C (6.80 and 6.90) while significantly different from the control sample A (7.25) and the highest. The rest of taste attribute of the imitation coffee drink ranged from (7.15 – 8.49) where the control sample A were significantly different at ($P < 0.05$) and A had the highest mean value. While sample B and C were significant. The imitation coffee samples were rated for mouth feel showed that sample B and C (7.20 and 7.29) were significant while the control sample A (7.40) were significantly different at ($P < 0.05$) as evaluated based on the panelists preference. The result of overall acceptability of the imitation coffee samples ranged from (7.9 – 6.52) in sample C to A respectively. The result showed that there was a significant difference among the overall acceptability of the samples at ($P < 0.05$) where the control sample were most preferred by the panelist, followed by sample B to the least preferred in sample C respectively.

Sensory attributes of coffee samples are very strong measure of their acceptability and the appearance brings out the appeal of the coffee sample to the sense of sight (Amany *et al.*, 2012). The imitation coffee drink produced from date seeds were able to compete favorably with established and well renowned commercial coffee product in terms of their physical appearance. Possibly the new product might have significantly better rating than the control if they were subjected to same automation process in the course of production as the imitation coffee was processed manually.

The aroma appeal to the sense of smell using olfactory perception which stimulate appetite and create desire or craving for to eat (Amany *et al.*, 2012). The imitation coffee were able to rank along with the established product in the market due to the roasting effects as agreed with (Satoh *et al.*, 2005). Coffee drink is known for its strong appealing aroma which breeds addiction to it in some individuals. Therefore, the ranking obtained from the panelists on drink from date seed is commendable for reconstituting the product with date powder where the coffee is out of reach to individuals or could not afford to buy the commercial coffee, this could also boast the utilization of the unwanted date seeds (Amany *et al.*, 2012).

The slight bitter taste in imitation coffee were differently from the commercial samples due to the lack of fermentation which the commercial coffee passed through creating that desirable taste and stimulating effect as reported by (Baiano and Terracone, 2011). The sensorial attributes of coffee drinks is also employed by the type of sweetener applied such as sugar, honey or any other form of sweetening. The output of his study points out the fact that drink from date seed could replace these renowned drinks conveniently with less caffeine and antioxidants compound present in coffee beans could not be assessed all from the date seeds imitation coffee drink (Amany *et al.*, 2012).

The mouth feel of any drink / food creates a lasting impression in the consumer's minds whether it is harsh, smooth, yummy, peppering or slimy. The imitation coffee samples were rate appropriately by

the panelist and found to be acceptable when compared with commercial coffee and tea drink. This is to say that this study has been able to bring out an acceptable product from date seeds that are ordinarily discarded after the fruits are consumed creating value to the seeds in preparation of new product thereby creating a value chain (Babova *et al.*, 2016).

Table 1: Sensory Attributes of Imitation Coffee Produced from Date palm Seeds

Attributes	A	B	C
Appearance	8.80 ^a ±0.08	7.54 ^b ±0.01	7.30 ^c ±0.09
Aroma	7.25 ^a ±0.03	6.80 ^b ±0.07	6.90 ^b ±0.10
Taste	8.49 ^a ±0.05	7.15 ^b ±0.11	7.45 ^b ±0.03
Mouth feel	7.40 ^a ±0.05	7.20 ^{ab} ±0.08	7.29 ^{ab} ±0.12
General Acceptability	7.94 ^a ±0.07	6.52 ^b ±0.01	6.38 ^c ±0.06

Values are mean standard deviation (Means ± SD) of triplicate measurement. Value with different superscript across the row are significantly different at (p<0.05) level of probability.

Key: A = Control sample, B = imitation coffee produced from date palm seed sieved with 80 µm sieve and C = imitation coffee produced from date palm seed sieved with 100 µm sieve.

Proximate Composition of the Imitation Coffee Samples

The result of proximate composition of imitation coffee produced from date seeds compared with commercial café brand as presented in Table 2 below. The result shows that the (date seeds powder) imitation coffee had an average moisture content of (14.36 and 14.18 %) which is significantly higher than that of commercial coffee sample (13.55 %). This implies that the date seeds when processed can be highly hygroscopic in nature which may also tends to encouraged microbial growth considering the moisture content present during storage, although the present moisture content obtained were within the acceptable level for good storage as similar findings on by (Anosiki and Oranusi, 2018) is in agreement with this findings. The results of ash content of between the commercial coffee and the imitation coffee samples, commercial sample were slightly high in ash which ranged from (4.27 – 5.35 %) which indicates that the commercial samples are more richer in mineral content compared with the imitation coffee, although the samples were all having a significant amount of ash content which is an expression of its mineral content (Anosiki and Oaranusi, 2011). The higher the ash content indicates high level of mineral contents while. This implies that the imitation coffee can be used in order to utilize its available mineral content present in the samples. The result of crude fibre content shows that the samples had a mean value of (0.97 – 1.21 %) which is significant with the control sample. although, coffee sample had a trace fibre content of (1.21 %) compared with the imitation coffee which indicates that application of this raw material in tea (5 g/100 ml) would help control indigestion and provide appetite and help in emptying bowls. The results of the fat content in contrast with control sample showed that the highest mean value in sample A (1.25 %), followed by sample B and C (0.18 and 0.19 %) respectively. The protein content of the imitation coffee was higher than that of the commercial samples with a mean value ranged from (1.44 – 2.05 %) were imitation coffee had the lowest mean value of (1.44 %) followed by B sample with a mean value of (1.94 %) while sample C had the highest mean value of (2.05 %) respectively.

The result of the protein content, fibre content and ash content of 3 samples of imitation coffee agreed with the findings of (Alan, *et al.*, 2011), on the quantity, while there was a significant difference among all the samples which gives a more detailed information on the proximate composition of the imitation coffee produced from date seeds compared with commercial samples. The carbohydrate content of the imitation coffee samples were significantly different as compared with the commercial sample, although there was no different exist between sample A and B as confirmed by (Amany *et al.*, 2012), the date seeds has a properties similar to that of most processed coffee but varies in their composition, quality and utilization, the exploitation of the full potential of date seeds would serve as a source of revenue, reduce waste and create value addition through processing.

Table 2: proximate composition of Imitation Coffee Produced from Date palm Seeds

Parameters	A	B	C
Moisture (%)	13.55 ^b ±0.00	14.36 ^a ±0.06	14.18 ^a ±0.03
Ash (%)	5.35 ^a ±0.11	4.61 ^b ±0.22	4.27 ^b ±0.43
Fibre (%)	1.21 ^a ±0.00	1.12 ^{ab} ±0.01	0.97 ^b ±0.02
Fat (%)	1.25 ^a ±0.05	0.18 ^b ±.00	0.19 ^b ±0.00
Protein (%)	1.44 ^c ±0.04	1.94 ^b ±0.09	2.05 ^a ±0.08
CHO (%)	77.20 ^c ±0.19	77.79 ^b ±0.45	78.34 ^a ±0.92

Values (Means ± SD) of triplicate measurement. Value with different superscript across the row are significantly different at (p<0.05) level of probability.

Key: A = Control sample, B = imitation coffee produced from date palm seed sieved with 80 µm sieve date palm seed sieved using 100 and C = imitation coffee produced from date palm seed sieved with 80 µm sieve.

Conclusion

This research article investigate the viability of date palm seed as an alternative source of imitation coffee drink which had a slightly unique sensorial acceptability and preferred by the panelist, although the control coffee sample were more preferred in terms of all the sensory attributes. The proximate composition of the imitation coffee revealed that it can serve as a good source of mineral content ash an expression of its ash content as well as providing slight crude fibre content. The nutritional properties and highlights the high chance of it utilization as a substitute for commercial coffee. In this study the sensory characteristics of date seeds drink have been compared with other drinks such as tea and café obtaining a higher acceptability rate by the panelists although, the test and flavor is not as good as that of café sample. The imitation café shows to be rich in minerals and dietary fibre content which will help in digestion and provides to the macro and micro mineral requirement. Reduce over dependence on cocoa seeds and exploits common seeds like date palm fruit seeds.

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