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Formulation, standardisation, proximate composition and shelf life analysis of palm date seeds (*Phoenix dactylifera*) coffee powder

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Abstract

Background: Prevalence of coffee addiction is increasing among the people in day to day life. The caffeine content in the coffee will help the people to wake up quicker but not healthier. Over consumption of coffee will also cause some health effects like increased blood pressure, insomnia, etc. Thus, in order to provide a healthy alternative, coffee beans have been replaced with palm date (*Phoenix dactylifera* L.) and some flavouring ingredients are also added for enhancing its Flavour and aroma. Date seed coffee powder contains high level of phenols and it is caffeine free which would be a healthy alternative for the daily consumption.

Methodology: The current coffee powder has been replaced with date seed powder and some other ingredients like plantain leaves, mint, ashwagandha and cardamom has been added. All the ingredients were dried and powdered in three variations. And it was organoleptically evaluated by 20 panel members. Based on the high acceptability, one of the variations was chosen and it was assessed for proximate composition and shelf life of the product. Then it was statistically analysed by using Analysis of Variance (ANOVA).

Results: The sensory scores revealed that variation III has higher mean score and was highly acceptable. The nutritional analysis of the product provided that it was caffeine free and has all the other essential nutrients like carbohydrate, energy, protein, fat, phenols, tryptophan and caffeine. The product has good shelf life of about 11 months from the date of manufacturing.

Conclusion: Date seeds proved to be a healthy alternative for regular coffee which is caffeine free. Date seed coffee is a healthy nutrient rich coffee which could be suitable for daily consumption.

Keywords: coffee, date seed, insomnia, caffeine, ashwagandha, polyphenols

1. Introduction

Food industries have an interest within the economic utilization of refuse as valuable resources for other potential uses. Date pits are generally utilized as poultry and animal feed, encompassing high levels of dietary fibres which makes them suitable for preparing fibre based foods. Moreover, date pit oil has proved to be a superb biofuel source and date pits are used as soil fertilizer, further novel utilization includes roasting date pits for preparing a caffeine-free beverage to be used as coffee substitute. Coffee is the most vital food commodity worldwide and ranks second, after rock oil, among all commodities. Caffeine content in coffee will help the people to wake up quicker but will also cause some health effects like increased blood pressure, insomnia, etc. Caffeine could be a drug that induces temporary alertness and offers energy to the central systema nervosum (Rogers, 2012).

Dates are considered to be a nutritional component of the diet and a staple food source in most geographic area and geographical area regions. Peeled date seed powder is being employed within the Arabian region for preparation of another brew to coffee. It avoids negative health impacts, like raising pressure level, panic attacks, hypertension, gout, insomnia, indigestion, infertility, and inhibition of collagen creation within the skin (Venkatachalam, 2016) ^[14].

Date seed coffee powder would be a healthy substitute for everyday use because it is free of caffeine and contains high levels of phenols. Most vital health benefits of herbal medicines include cost effectiveness, system strengthen, less side effects, and affordability. Mint belongs

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to the *Lamiaceae* family, which may be a rich source of polyphenols. Rutin may be a flavonol glycoside which exhibits multiple biological activities. Rutin has the property to decrease glycemia, improve insulin secretion and inhibits α -glucosidase (Pereira *et al.*, 2011). This is often the primary report of the presence of rutin within the leaves of *M. x paradisiaca*. Cardamom is recognized because the "queen of spices" for its pleasant aroma and taste. The plant *Withania somnifera*, commonly referred to as "Ashwagandha" is well-known for its therapeutic use within the ayurvedic system of traditional medicine. It's been used as an antibacterial, antioxidant, adaptogen, aphrodisiac, liver tonic, anti-inflammatory agent (Mehrotra *et al.*, 2011)^[7].

2. Objectives

The main aim of the present study is to formulate a new coffee powder made from date seeds incorporated with mint

Pre-Preparations for the Product

Date Seed Powder

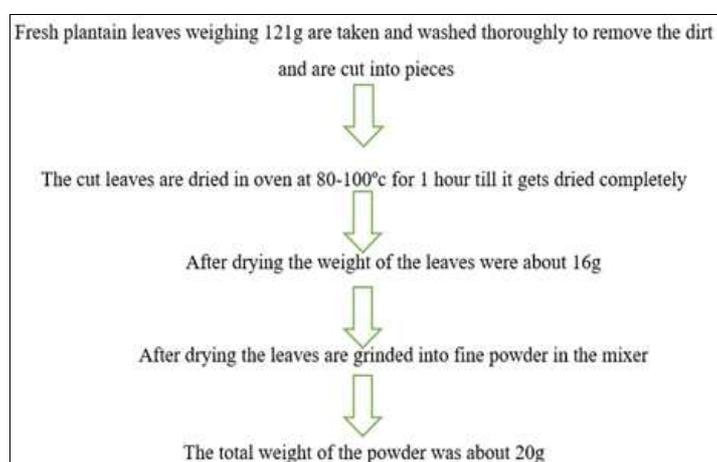


Fig 1: Date Seed Powder

Plantain Leaf Powder

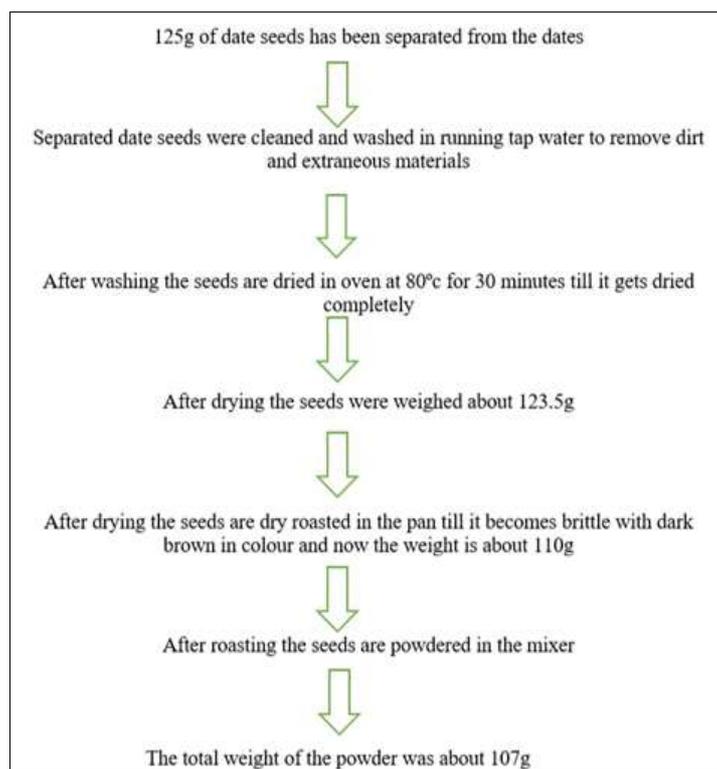


Fig 2: Plantain Leaf Powder

leaves, cardamom, plantain leaves and ashwagandha with the following objectives:

- To formulate and standardise healthy coffee powder.
- To evaluate the organoleptic qualities and assess the proximate composition.
- To find the shelf life of the formulated product.

3. Materials and Methods: Selection of Ingredients

The ingredients selected for formulating the product includes date seeds, Ashwagandha, Plantain leaves, Mint and Cardamom.

Procurement of Ingredients

Dates and cardamom were procured from the local super market and Ashwagandha powder has been procured from the nearby *naatu marundhu kadai* and Mint leaves & Plantain leaves were procured from the farm.

Mint Powder

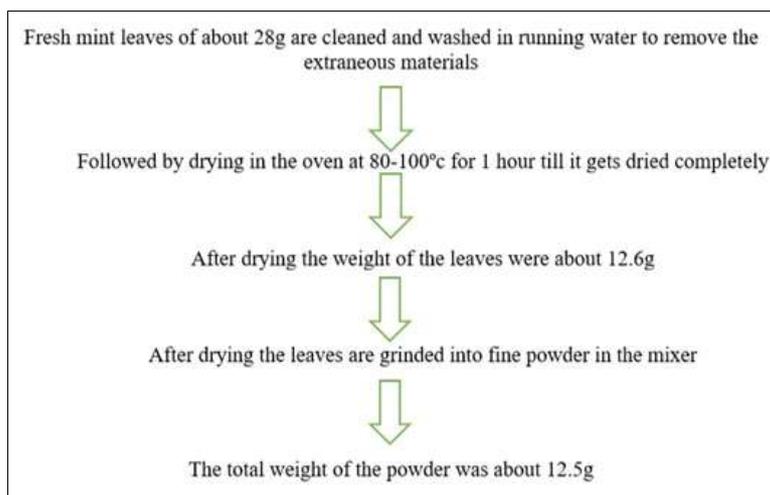


Fig 3: Mint Powder

Cardamom Powder:

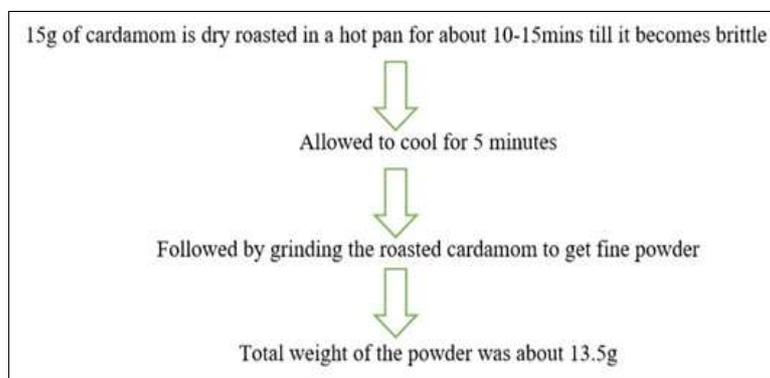


Fig 4: Cardamom Powder

Formulation of the Product

The formulation of date seed coffee powder starts with the selection of the ingredients which has high nutritional value and high bio availability. They were prepared by partially incorporating the processed date seed powder, plantain leaf powder, mint powder, ashwagandha and cardamom powder. Variations were brought about in the product by partially incorporating the selected mixes which includes (date seed powder, plantain leaf powder, mint powder, ashwagandha and cardamom powder) at different proportions.

Standardisation of the Product

The product formulated has been standardised for 50g in order to make it desirable in terms of taste, flavour, and acceptability. A control was prepared with plain date seed powder without an addition of any other ingredients.

Organoleptic Evaluation of the Product

Sensory evaluation of the product was done by a panel consisting of twenty members using nine-point hedonic scale. Each panellist was given a score card and asked to evaluate the samples for different attributes *viz.* fragrance, aroma,

flavour, strength, taste, and overall acceptability for both control and sample variations. The variation which was most acceptable among the variations was selected and used for further analysis.

Proximate Composition of the Product

Nutrient analysis was done for the variation which had the greatest organoleptic scores. The nutrients like caffeine, energy, protein, fat, dietary fibre, polyphenols and amino acids were analysed per 100g of the standardised and organoleptically well accepted variation.

Statistical Analysis of the Product

Statistical analysis and interpretation are giving meaning to the collected information by comparing them with the existing information (Thanulingam, 2003). After the collection of data, scores obtained from the organoleptic evaluation were statistically analysed with ANOVA and standard formulas.

4. Results and Discussion

Comparison of organoleptic scores of control and variations in coffee powder

Table 1: Comparison of organoleptic scores of control and variations in coffee powder

Criteria	Control	Variation i	Variation ii	Variation iii
Fragrance	8.95±0.22	8.05±0.82	8.1±0.55	8.6±0.59
Aroma	8.9±0.30	8.05±0.94	8.3±0.73	8.65±0.58
Taste	8.8±0.41	7.65±0.74	7.3±0.57	8.3±0.65

Flavour	8.8±0.41	8.05±0.60	7.8±0.69	8.4±0.50
Strength	8.5±0.51	7.6±0.68	7.5±0.76	8.15±0.81
Overall acceptability	8.9±0.30	7.8±0.76	7.5±0.60	8.65±0.48

The above Table 1 clearly depicts that the fragrance of variation III was high of about 8.6±0.59 when compared to the variation I of about 8.05±0.82 and variation II of about 8.1±0.55 and the aroma of variation III was high of about 8.65±0.58 when compared to the variation I of about 8.05±0.94 and variation II of about 8.3±0.73 and the taste of variation III was high of about 8.3±0.65 when compared to the variation I of about 7.65±0.74 and variation II of about 7.3±0.57 and the flavour of variation III was high of about 8.4±0.50 when compared to the variation I of about 8.05±0.60 and variation II of about 7.8±0.69 and the strength of variation III was high of about 8.15±0.81 when compared to the variation I of about 7.6±0.68 and variation II of about 7.5±0.76 and the overall acceptability of variation III was high of about 8.65±0.48 when compared to the variation I of about 7.8±0.76 and variation II of about 7.5±0.60

This shows that variation III had a good organoleptic quality

Table 3: Analysis of Proximate Composition

Parameters	Test method	Result (/100g)
Caffeine content	IS 3077:1992	BDL (0.01g)
Moisture	IS 3077:1992	3.26g
Total ash	IS 3077:1992	8.83g
Fat	AOAC 950.4	0.31g
Total Protein	IS 7219	11.6g
Carbohydrate	IS 1657	76g
Energy	EFLT/SOP/03/05	359kcal
Tryptophan	Methods in molecular biology: vol 159	31.3mg
Total Phenols	Springer manual: May 2019	26.4mg

The proximate analysis has proved that the date seed coffee powder has all the basic essential nutrients like energy, carbohydrate, protein and fat.

Moisture content: It was found that 100g of coffee powder contains 3.26g of moisture. Total ash: It was found that 100g of coffee powder contains 8.83g of total ash. Energy: It was found that 100g of coffee powder provides 359kcal of energy. Carbohydrate: It was found that 100g of coffee powder contains 76g of carbohydrate. Total protein: It was found that 100g of coffee powder contains 11.6g of protein.

Fat: It was found that 100g of coffee powder contains 0.31g of fat.

Table 4: Analysis of Amino Acid

Parameters	Test method	Result (/100g)
Tryptophan	Methods in molecular biology: vol 159	31.3mg

Fukushige *et al.* (2014) [4] reported that increasing tryptophan in the diet can improve sleep by increasing Melatonin. Thus, tryptophan content was alone analysed among other amino acids. The amino acid (tryptophan) content of the product was done by High Pressure Liquid Chromatography (HPLC) method. The report revealed that 100g of coffee powder contains tryptophan content of about 31.3mg. Hence, from this it can be concluded that the formulated coffee powder can help to improve sleeping quality.

in all attributes when compared to variation I and variation

Nutrient Analysis of the product

Organoleptically highly accepted variation -III has been chosen and was analysed for its nutritional composition.

Table 2: Analysis of Caffeine Content

Parameters	Test method	Result (/100g)
Caffeine content	Is 3077:1992	Bdl (0.01g)

The result of the product has revealed that the date seed coffee powder has no caffeine in it.

Thus, it can be a healthy one to consume. Venkatachalapathy (2016) reported that normal coffee bean powder contains 20-40% caffeine but roasted date seed coffee powder is caffeine free that makes it healthy to consume

Table 5: Analysis of Antioxidant-Phenols

Parameters	Test method	Result (/100g)
Total Phenols	Springer manual: May 2019	26.4mg

The antioxidant analysis of the product was done by spectrophotometric method. The result proved that 100g of coffee powder contains 26.4 mg of phenols. Natella *et al.* (2007) [8] stated that Phenolic compounds in the coffee will remain in plasma after consumption and they are able to decrease the susceptibility of LDL to oxidation. Krol *et al.* (2019) stated that organic coffee beans showed a higher content of total phenolic content (8.95 mg) than the conventional one.

Table 6: Shelf Life Analysis of Formulated Coffee Powder

S. No.	Parameters	Test method	Unit	Result
1.	Shelf Life	EFLT/SOP/03/169	Months	11

The shelf life analysis of the product was done by EFLT/SOP/03/169 method using shelf life analyser. The result showed that the product can be stored for about 11 months in room temperature. Clarke (2003) stated that coffee products need to be packed in jars also with no more than 4% in-pack oxygen content and preferably less, so that the shelf life to acceptable quality is maintained up to 18 months. Thus, the keeping quality of the formulated product may be improved by the designing of compatible packaging material.

Statistical Analysis

Table 7: Anova for sensory attributes of date seed coffee powder anova

		Sum of Squares	df	Mean Square	F	Sig.
Fragrance	Between Groups	11.050	3	3.683	10.564	.000
	Within Groups	26.500	76	.349		
	Total	37.550	79			
Aroma	Between Groups	8.450	3	2.817	6.030	.001
	Within Groups	35.500	76	.467		
	Total	43.950	79			
Taste	Between Groups	26.838	3	8.946	24.152	.000
	Within Groups	28.150	76	.370		
	Total	54.988	79			
Flavour	Between Groups	11.338	3	3.779	11.893	.000
	Within Groups	24.150	76	.318		
	Total	35.488	79			
Strength	Between Groups	13.338	3	4.446	9.046	.000
	Within Groups	37.350	76	.491		
	Total	50.688	79			
Overall Acceptability	Between Groups	26.838	3	8.946	27.694	0.00
	Within Groups	24.50	76	.323		
	Total	51.388	79			

Highly accepted variation-III has been statistically analysed by the scores obtained in organoleptic evaluation and it was analysed using Analysis of Variance (ANOVA).

The statistical analysis revealed that the p value is <0.05 for all the sensory attributes, the null hypothesis is rejected so there is a significant difference among all the sensory characteristics of the coffee powder.

Widayat *et al.* (2022) ^[12] reported that hedonic test assessment was carried out on mixed Aceh's Robusta coffee- cocoa products which covered four aspects: aroma, taste, colour and texture and the result of the study was observed. Statistically, ANOVA did not show a significant difference ($p>0.05$) among the sensory aspects of flavour, taste, colour and texture among the three variations of formulated coffee powder.

5. Conclusion

From the study it is clearly understood that the date seed coffee powder would be a healthy version of regular coffee powder as it is completely caffeine free. It is also found that the date seed coffee powder has all the essential nutrients and good amount of tryptophan which can also be consumed at night time which will improve the sleeping quality. The shelf life of the product is good which will be suitable for marketing.

6. Conflict of interest

The author declare that they have no conflict of interest.

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