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Selva Rani N
Research Scholar,
Department of Food Science and Nutrition, St. Mother Theresa Women's University,
Kodaikanal, Tamil Nadu, India

Raja M
Assistant Professor & Research supervisor, Centre for Insect Molecular Studies and Environmental Research (CIMSER), P.G & Research Department of Advanced Zoology and Biotechnology,
Loyola College, Tamil Nadu,
Chennai, India

M Suresh
Research scholar,
Loyola Institute of Frontier Energy (LIFE), P.G & Research Department of Advanced zoology and Biotechnology,
Loyola college, Tamil nadu,
Chennai, India

Correspondence
Selva Rani N
Research Scholar,
Department of Food Science and Nutrition, St. Mother Theresa Women's University,
Kodaikanal, Tamil Nadu, India

Quality evaluation of musk melon seeds flour and jackfruit seeds flour for bakery products development

Selva Rani N, Raja M and M Suresh

Abstract
Bakery products are influenced by many factors including the ingredients used and the processing environment. The Musk melon and Jackfruits seed were separated and grinded. The analysis of musk melon flour, jackfruit flour and wheat flour gave the proximate composition and the results obtained. Jack fruit and musk melon seed flour cake was prepared and analysed with chemical (moisture, crude fibre, ash, protein, fat and carbohydrate contents) and sensory evaluation (manually with colour, flavour and overall acceptability) showed that jackfruit seed flour composite cake is very good and everybody like it.

Keywords: Musk melon seed flour, jackfruit seed flour, sensory evaluation, bakery product

Introduction
The ripe fruits are eaten or processed into snacks and canned products. Seeds make up around 10 to 15% of the total fruit weight and have high carbohydrate and protein contents (Ocloo *et al*., 2010) [11]. The seeds are discarded as waste, except sometimes they are boiled or roasted for consumption. The Muskmelon (*Cucumis melo*) is a species of melon, including varieties such as Crenshaw, Casaba and Honeydew which have smooth skin, and Cantaloupe, Santa Claus or Christmas Melon and Persian melon which have netted skin. Cantaloupe melons are an excellent source of Vitamin A, Vitamin C, Potassium and Magnesium. It has been shown to possess useful medicinal properties such as analgesic, anti-inflammatory, anti-oxidant, anti-ulcer, anti-cancer, anti-microbial, diuretic, anti-diabetic, and anti-fertility activity (Parle and Singh, 2011) [13].
India is the second biggest producer of the fruit in the world and is considered as the motherland of jackfruit (*Artocarpus heterophyllus* Lam.) a member of the family Moraceae is the largest tree-borne fruit in the world. The jackfruit is native to parts of South and Southeast Asia and is believed to have originated in the rainforests of Western Ghats of India and is cultivated throughout the low lands. Major jackfruit producing countries are Bangladesh, India, Myanmar, Nepal, Thailand, Vietnam, China, the Philippines, Indonesia, Malaysia and Sri Lanka. There are 100-500 seeds in a single fruit (Sidhu, 2012). The jackfruit seeds are high protein, fibre and carbohydrate contents (Ocloo *et al*., 2010) [11]. The seeds are also marketed in canned as in boiled form like the beans, in brine and in tomato sauce (Morton, 1987). Therefore a study was designed to utilize low cost jackfruit seed and musk melon seed flour to develop a value added bakery products and to determine its nutrient composition.

Materials and methods
Purchase of raw materials
The sugar, salt, soya bean oil, baking powder and egg were procured from the local market of Madurai and brought to the laboratory for baking cake. High density polythene bags were used for packaging and storage of samples. Other minor ingredients were used from laboratory stocks. Double distilled water was used in this study. Commercial whole meal wheat flour of "Asheervad" a brand of city group (12-13% moisture) collected from local market was used for baking cake.

Preparation of Musk melon seed and Jackfruit seed flour
The Musk melon and Jackfruits purchased from local market and brought to the laboratory for separation of seeds. The seeds were separated from Musk melon fruit and Jackfruit was cleaned manually and jackfruits seed covered with white arils (seed coat) were manually

peeled off. The peeled seeds were soaked in 3 per cent sodium hydroxide solution for 3-5 minutes to remove the thin brown spermoderm which covered the cotyledons. The spermoderm layer was removed by rubbing the seeds within the hands and washing thoroughly under running water. The seeds were sliced into thin chips separately and tray dried at 50 to 60 °C to constant moisture. The seeds were grinded with electric blender for few minutes and seed flour was packaged and stored (at -18 °C) for further studies (Blessing, 2018) [2].

Preparation of cake

The cakes were prepared by replacing wheat flour with different levels of Musk melon seed flour and jackfruit seed flour in the basic formulation of cake (Table 1& 2) as per the methods of Rajchel *et al*. (1975). The wheat flour, jackfruit seed flourand other ingredients for each cake were weighed accurately. The sugar and butter were mixed in a mixing machine for 20 minutes to produce a cream. In later stages, oil, egg and other ingredients and, finally, the flour were mixed using a mixer at low speed (145 rpm) for 10 minutes to ensure even distribution of the components. The bowl was scrapped and batter was mixed for an additional two minutes at medium speed (250 rpm). After the bowl was scrapped, the batter was mixed for an additional two minutes at medium speed. Portion of batter, weighing 150 g, was scaled into progressed cake pan. All cakes were baked in convection oven for 40 minutes at 170 °C.

Table 1: Formulation of jackfruit seed flour composite cake

Ingredients	Quantity (g)				
	Control	T1	T2	T3	T4
Powdered sugar	70	70	70	70	70
Oil	40	40	40	40	40
Baking powder	3.5	3.5	3.5	3.5	3.5
Egg	50	50	50	50	50
Wheat flour	100	90	80	70	60
Jackfruit flower	0	10	20	30	40

Table 2: Formulation of Musk melon seed flour composite cake

Ingredients	Quantity (g)				
	Control	T1	T2	T3	T4
Powdered sugar	70	70	70	70	70
Oil	40	40	40	40	40
Baking powder	3.5	3.5	3.5	3.5	3.5
Egg	50	50	50	50	50
Wheat flour	100	90	80	70	60
Jackfruit flower	0	10	20	30	40

Chemical Analysis

The musk melon seed flour, jackfruit seed flour and wheat flour cake was prepared. The different flour cake were analyzed with moisture, crude fibre (AOAC, 2012) [1], ash, protein, fat (Ranganna (2005) [15], and carbohydrate contents (Pearson, 1976) [14].

Sensory evaluation of cake

The cakes were evaluated manually with colour, flavour and overall acceptability. The 20 members was selected randomly in our college campus and briefed on procedure before evaluation. The taste panelists were asked to rate the sample for colour, flavour and overall acceptability on a 1- 9 point scale, where 9 = Excellent…..2Bad; 1 = neither like nor dislike.

Statistical analysis

The collected data were generated and analysed with suitable statistical tools using statistical software (SPSS version 2.7).

Results and discussion

The chemical analysis of musk melon seed flour, jackfruit seed flour and wheat flour gave the proximate composition and the results obtained are presented in Table 3. The wheat flour (control) contained 12.81% moisture, 10.79% protein and 72.46% total carbohydrate content, respectively. The musk melon and jackfruit seed flour contain highest 13.06% protein, 6.39% moisture, 1.38 Fat, 74.02 % total carbohydrates in jackfruit seed flour and 3.19% crude fibre, 2.89% ash in Musk melon seed flour.

Table 3: Chemical analysis of wheat flour, musk melon seed flour and jackfruit seed flour

Composition	Wheat flour (%)	Musk melon seed flour (%)	Jack fruit seed flour (%)
Total carbohydrates	72.46	73.29	74.02
Moisture	12.81	6.34	6.39
Protein	10.79	12.96	13.06
Fat	1.33	1.33	1.38
Crude fibre	1.39	3.19	2.86
Ash	1.22	2.89	2.29

Sensory evaluation of cake

The sensory evaluation of musk melon fruit seed flour and jack fruit seed flour was evaluated with panel members like colour, flavour, taste, texture and overall acceptability with a nine point hedonic scale where 9 represented like excellent and 1nor like or dislike as showed in table 4 and 5.

Table 4: Sensory evaluation of developed Wheat flour cake with Musk melon seed flour composite cake.

S. No	Parameters	Control	Treatments (Musk melon seed flour)			
			T1(10%)	T2(20%)	T3(30%)	T4(40%)
1	Colour	8.0	7.8	7.9	7.8	7.9
2	Flavour	7.8	7.8	7.7	7.9	7.8
3	Taste	7.5	7.6	7.7	7.5	7.4
4	Texture	7.9	8.0	7.9	7.8	7.2
5	Overall acceptability	7.6	7.6	7.8	7.9	7.5

Table 5: Sensory evaluation of developed Wheat flour with Jackfruit seed flour composite cake.

S. No	Parameters	Control	Treatments (Jackfruit seed flour)			
			T1(10%)	T2(20%)	T3(30%)	T4(40%)
1	Colour	8.0	7.9	7.9	7.8	7.9
2	Flavour	7.8	7.8	7.8	7.9	7.8
3	Taste	7.5	7.5	7.7	7.5	7.4
4	Texture	7.9	7.7	8.0	8.0	7.2
5	Overall acceptability	7.5	7.7	7.7	7.8	7.3

The analysis of musk melon flour, jackfruit flour and wheat flour gave the proximate composition and the results obtained are presented in Table 3. The wheat flower contained 12.86% moisture, 10.76% protein and 72.46% total carbohydrate content, respectively. The composition of wheat flour under study was near about Mollik (2006) [10], who reported the nutrient content of wheat flour as follows: moisture 13.63%, ash 1.15%, protein 11.44%, fat 0.88%, and total carbohydrate 72.9%.The moisture, protein and total carbohydrate content of JSF were 6.29%, 13.23% and 73.42%, respectively. These results were similar with the results obtained by Ocloo *et al*. (2010) [11] who found 6.09% moisture, 79.34% carbohydrate, 13.50% protein, 1.27% fat, 3.19% crude fibre and 2.70% ash in jackfruit seed powder. The differences observed in these compositions may be due to varietal differences, agro-ecological condition, fertilizer use, methods of analysis etc.

Musk-melon or cantaloupe (*Cucumis melo* L. var. Reticulates Naud.) and honeydew melon (*Cucumis melo* L. var. Inodorus Naud.) types. Melons are naturally low in fat and sodium, have no cholesterol, and provide many essential nutrients such as potassium, in addition to being a rich source of beta-carotene and vitamin C. Although melons are an excellent source of some nutrients, they are low in others, like vitamin E, folic acid, iron, and calcium (Lester Gene, 1997) [9]. Musk melon is a beautiful, juicy, tasty fruit of the cucurbitaceae family, which includes 825 species in India and Africa. The cucurbitaceae family include cucumber, pumpkin, musk melon and water melon. The musk melon have highly nutritional and medicinal value. Musk melon rich in carbohydrates, amino acid, fatty acid, glycolipids volatile components and various minerals. The phytoconstituents rich in the fruit pulp include beta-carotene, ascorbic acid, flavonoids, terpenoids. Cucumismelo has been shown to possess useful medicinal properties anti-inflammatory, anti-oxidant, anti-ulcer, anti-cancer, anti-microbial activity, anti-diabetic and anti-fertility activity. Thus it is evident that musk melon fruit possess a wide range of medicinal properties, which can be exploited clinically.

Deping Hua *et al*. (2019) [3] reported that Rock melon seeds contain 50% fat, 28% protein, 2-7% fibre, 3.6% ash and 8.2% carbohydrate Cucurbitacin-β, Li and Zn are predominant compounds in rock melon which give function in preventing cancers, fighting depression, dandruff, ulcers and stim-ulating the immune system. Rockmelon contain Vitamin C which functions as a water soluble antioxidant in the human body, keeping the immune system healthy by reducing cold, prevent from bacterial infections and protect the human body from free radical damage.

Jackfruit seed contains lignans, isoflavones, saponins, all phytonutrients and their health benefits are wide-ranging from anticancer to antihypertensive, antiaging, antioxidant, antiulcer, and so on (Omale and Friday 2010) [12]. Seeds contain two lectins namely jacalin and artocarpin. Jacalin has been proved to be useful for the evaluation of the immune status of patients infected with human immunodeficiency virus 1 (Haq, 2006) [4].

Conclusion

The study on development of nutritional valued cake prepared from Musk melon fruit seed flour and Jack fruit seed flour cake was prepared and analysed with chemical and sensory evaluation showed that jackfruit seed flour composite cake is very good and everybody like it. The further study will be identifying the nutritional value among the jackfruit seed flour.

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