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Physicochemical and sensory properties of MKP incorporated sponge cakes

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ABSTRACT

The mango plays an important part in the diet and cuisine of many diverse cultures. During the processing of ripe mango, the waste (peel and seed) is a problem. As seed kernel is not currently utilized for any commercial purposes, it is discarded as a waste and becomes a source of pollution. This waste should be treated as a specialized residue due to the high levels of phenol compounds and stable fat rich in saturated fatty acids. Hence the investigator incorporated MKP in sponge cakes in order to utilize the health benefits from it. The physico chemical properties were comparatively favorable than the unincorporated sponge cakes, which may favour extension of shelf life in sponge cakes. The sensory scores for acceptability of incorporated sponge cake were found higher with MKP upto 20g than the other incorporations.

Introduction

The mango plays an important part in the diet and cuisine of many diverse cultures. Mango is famous for its excellent flavour, attractive fragrance and nutritional value. Mango plays an important role in balancing the diet of human being by providing about 64-86 calories energy (Habib *et al*., 2007). During the processing of ripe mango, the waste (peel and seed) is a problem for canning factories. Its disposal may appreciably increase environmental pollution due to its rapid decay, thus becoming a good source of house fly multiplication (Sompong *et al*., 2009). Kernels take up about 17-22% of the fruit. As seed kernel is not currently utilized for any commercial purposes, it is discarded as a waste and becomes a source of pollution. This waste should be treated as a specialized residue due to the high levels of phenol compounds and stable fat rich in saturated fatty acids. Recently, industry has been increasing investment in waste treatment to utilize these kernels as a good source of natural antioxidants and lipids (Maisuthisakul, 2008). The climatic conditions and nature of soil have considerable influence on the chemical composition of mango fruits and its seed (Muhammad aslam, 2001). Mature mango seeds have high moisture content and cannot withstand desiccation. (Francoise *et al*., 1986). Seed kernels are used medicinally in various ailments. Seeds are used as potent astringent, also used in asthma, dysentery, diarrhea, hemorrhoids, leucorrhoea and other complaints. Seeds powder is a good anthelmintic and internally given against roundworm affection and also orally given in urinary abnormalities and in gonorrhea, for uterine inflammation. The kernels are powdered and fried and the same is given in pregnant female in case of diarrhea and dysentery with curd or suitably juice is recommended as a snuff or nasal drops in condition of bleeding nose. (Shah *et al*., 2010)

A sponge cake is a popular dessert in Asia. Sponge cake production is a typical use of weak gluten flour, cake is one of air-leavened product. Which is the most consumed bakery item in the world. Some of the reasons for such wide popularity are their ready to eat nature, affordable cost, good nutritional quality; low ash content, availability in different tastes and weak gluten characteristics makes good quality (www.tarladalal.com). Hence the investigator incorporated MKP in sponge cakes in order to utilize the health benefits from it.

Methods And Materials

Selection and procurement of ingredients

Mango, a seasonally available fruit and mango process industries are widely situated in krishnagiri which is hub for mango processing industries in Tamilnadu. Alphonso variety of mango *(Mangifera indica l.)* was selected, Because, Alphonso is a popular variety among organic growers, in view of its better varietal characteristics and better market. A freshly selected Alphonso mango *(Mangifera indica l.)* seed was bought from the kabini- agro foods India private ltd, krishnagiri, Tamil Nadu, India, Maida flour, fat replacer, sugar, egg, baking powder and vanilla essence were procured from local market of krishnagiri, Tamil Nadu, India

Processing of mango seeds / kernel powder

Mango kernel was also shown to be a good source of physico-chemical characters (Habib, 2007), mango seed is rich in variety of nutrients (Fowomola, 2010). Mango kernel extracts was reported to possess antidiabetic effect and hypoglycaemic effect (Ramesh petchi, 2011) mango seed kernel has potent antioxidant activity with relatively high phenolic contents (Ashoush and gadallah, 2011). Thus, the seeds were washed and sun dried for three days and the kernels were removed manually from the seeds for further study. The dried material was kept at room temperature at 28^0C (Pitchaon, 2011). Weight of fresh mango seed to kernel powder is given in Table-1.

Development of sponge cake

In bakery industry, cake is one type of air-leavened product. The quality of cakes depends on many factors such as the ingredients used for batter preparation (Busarawan chaiya, 2011). Sponge cake was developed using standard procedure of Thangam E phillip, (2003). Briefly sugar, egg, fat replacer, were mixed together to achieve a foamy batter with a consistent viscosity, maida flour and MKP were folded into the batter and poured into a round cake pan with a paper liner. The cake was baked at 180^0C for 30 minutes and cooled. The MKP was incorporated in sponge cakes at varied proportions like 20g, 40g and 60g.

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Physico-chemical characters of sponge cake

The developed sponge cakes were evaluated for its physico-chemical parameters like diameter, raising ability, pore size moisture, P^H, titrable acidity, total ash, crude fibre were found using standard procedures given by sadhasivam and manickam, (2003).

Sensory evaluation of unincorporated sponge cake and incorporated sponge cake

Sensory evaluation of sponge cake containing different MKP proportion was performed using score card with the help of 10 panelists. Each panelist was presented with individual cake samples with and without MKP that had been baked within the previous 12 h and were placed on a tray and served in a randomized order. During the panel session, water was provided to panelists to minimize any residual effect before testing a new sample. Each panelist was oriented about the attributes and rating scale and then asked to rate the degree of liking of quality attributes according to chewiness, colour, flavour, hardness, taste and overall acceptability of each sample using a 9-point hedonic scale (1 = dislike extremely, 5 = neither dislike nor like, and 9 = like extremely) (Busarawan Chaiya, 2011).

Results and Discussion

Physico chemical profile of sponge cake

The effect of incorporating 20g (sample I), 40g (sample II) and 60g (sample III) of MKP with sponge cake on physical properties was studied and the data are presented in Table-III. The results showed that the diameter was found lengthier in sample II with 135.1±1.46 mm. Incorporation of 20g and 60g MKP in sponge cake gave less diameter value. Function of diameter is based on the baking time of cake (Edward and olszewski, 2006). The highest raising ability 42.4±0.51 mm was recorded by MKP at 40% incorporated sponge cake. The decrease in diameter and raising ability of sponge cake with addition of 20g and 60g may be due to dilution of gluten. This observation is synchronised with the result obtained by Ashoush and Gadallah (2011). With regard to pore size, it was observed that incorporation of 60% MKP in sponge cake recorded the highest value 0.64±0.02 cm when compared to sample II 0.25±0.10 cm and Sample II 0.34±0.24cm.

Physico chemical composition like, moisture, P^H, total ash, and crude fibre contents of unincorporated and MKP incorporated sponge cakes sample were shown in (Table-VI). The moisture content in unincorporated sponge cake found higher as 36.9±2.02 and lower moisture content was observed in MKP 9.18±1.13 this value is related to Olawale, (2010). While, compared to MKP incorporated sponge cake has increased in their moisture content. The increase in moisture content of sponge cake may be due to increased water absorption of dietary fibre present in sponge cake. Regarding the P^H unincorporated sponge cake value is slightly higher 7.64±0.04 than the MKP (4.12±0.08) and incorporated sponge cake 6.98±0.02. MKP is an alkaline sample and so the incorporated samples also. Ash content of incorporated sponge cake was higher 2.5±0.57 than unincorporated sponge cake 1.5±0.88 and MKP was 1.9±0.23. This indicate that intake of incorporated sponge cake provide more minerals since ash represent the total mineral content in food (Muhammad Ibrahim, 2010). Crude fibre content of incorporated sponge cake value was found higher 0.04±1.6 than the unincorporated sponge cake 0.02±1.6 but lower than MKP 0.08±1.8.

Sensory profile of sponge cakes

Sensory analysis (or sensory evaluation) is a scientific discipline that applies principles of experimental design and statistical analysis to the use of human senses (sight, smell, taste, touch and hearing) for the purposes of evaluating consumer products. The discipline requires panels of human assessors, on whom the products are tested, and recording the responses made by them. By applying statistical techniques to the results it is possible to make inferences and insights about the products under test.

Tables- V gives the sensory scores secured by the unincorporated sponge cake and MKP incorporated sponge cakes, sample I, sample II and sample III for the sensory attributes like chewiness, colour, flavour, hardness, taste and overall acceptability using 9-point hedonic scale. The scores obtained for chewiness of sample I was 7.5 ± 3.15 whereas sample II was 6.8±0.74 and sample III was 4.1±1.37. As the proportion of MKP increases in sponge cake, the scores of acceptability decreased the chewiness of the finished product. Among the three prepared samples, sample I with 20% incorporation of MKP was found to be highly accepted. On the basis of colour attribute, unincorporated sponge cake was (7.9±1.37) found acceptable, whereas the sample I has 6.6±0.91, sample II has 5.8±0.87 and sample III has 4.7±1.18 scores. Among them, Sample I with 20g incorporation was highly acceptable when compared to other two samples, because MKP flour imparts a dark brown colour due to presence of tannin in MKP enhanced the sponge cake colour and thus affect their likings as reported by Ashoush and Gadallah (2011). Regard to flavour attributes, unincorporated sponge cake scored 8.1±1.13, sample I has 6.5±1.13, sample II has 5.7±0.78 and sample III has 4.8±1.4. Similarly, high incorporation of MKP gave raw flavour of MKP which reduced the scores simultaneously when the proportion increased. On the basis of hardness attribute, unincorporated sponge cake secured 4.9±0.3, sample I- 6.2±0.97, sample II - 4.9±0.3 and sample III-3.6±1.02. MKP doesn't contain any gluten like content and hence it reduced the pore size thereby increased the hardness of the sponge cake. So this makes sample I as highly acceptable among the incorporated sponge cakes. The taste and flavour of sponge cakes were found improved with incorporation of MKP brought a typical pleasant mango flavour. Scores of acceptability showed that unincorporated has 8.4±0.8, sample I has 7.2±0.7, sample II has 5.4±0.3 and sample III has 3.3±1.0 scores. However, at the level of 40g and 60g of MKP the sponge cake had a slight bitter taste which may be due to high polyphenols content these data are in agreement with Ashoush and Gadallah (2011). Regarding the overall acceptability, it was observed that sponge cake incorporation with MKP up to 20g remarked higher scores compared to the other levels. The results show that the lower scores when compared with unincorporated sponge cake which may be attributed to unattractive colour and the unusual taste produced by the MKP. Among the attributes, chewiness, colour, flavour, hardness and taste results reveals that statistically there is no significant difference between the unincorporated as well as other MKP incorporated samples with varied proportion. Critical difference assay also infers that there is no significant difference between the samples as well as the attributes too.

Conclusion

It is evident from the results that MKP incorporation in sponge cake was acceptable by the consumers. However, the level of incorporation influences the physical dimensions, physico chemical, nutritional and sensory properties too. Perhaps, the nutritional and other medicinal values of MKP made the sponge cake a good value added food.

Table I. Gradient weight during processing of seed to Mango Kernel Powder (MKP)

Criteria	Weight
Weight of the fresh mango seed	25 kg
Weight of the whole kernel selected	2.500 kg
Weight after dehydration	1.350 kg
Weight after powdering	1.250kg

Table II. Level of Incorporation of MKP and Proportion of Ingredients

Ingredients	Level of Incorporation		
	20g Incorporation	40g Incorporation	60g Incorporation
Maida flour	100g	80g	60g
Mango kernel powder	20g	40g	60g
Sugar	100g	100g	100g
Eggs	3'nos	3'nos	3'nos
Refined oil	80ml	80ml	80ml
Baking powder	1 pinch	1 pinch	1 pinch
Flavorings Essence	1table spoon	1table spoon	1table spoon

Table III. Mean physical dimensions of unincorporated and incorporated sponge cake

Criteria	Diameter (mm)	Raising ability (mm)	Pore Size(cm)
Unincorporated Sponge cake	128.0±2.57	71.4±0.65	0.27±0.14
Sample –I	131.1±0.55	42.3±0.55	0.25±0.10
Sample-II	135.1±1.46	42.4±0.51	0.34±0.24
Sample-III	131.0±0.49	41.9±0.97	0.64±0.02

Table VI. Mean Physico Chemical Properties of MKP and Sponge Cake

Criteria	Moisture (%)	P^H	Ash (%)	Crude Fibre (%)
MKP	9.18±1.13	4.12±0.08	1.9±0.23	0.08±0
Unincorporated sponge cake	36.33±2.02	7.64±0.04	1.5±0.88	0.02±0.05
Incorporated sponge cake	20.70±0.54	6.98±0.02	2.5±0.57	0.03±0.05

Table V. Mean sensory scores of unincorporated and incorporated sponge cake

Sensory evaluation of unincorporated And incorporated Sponge Cake								
Items	Chewiness	Colour	Flavour	Hardness	Taste	Overall Acceptability	F-value	CD value
Unincorporated Sponge cake	8.5±1.28	7.9±1.37	8.1±1.13	7.9±1.37	8.4±0.8	8.1±1.19	NS	NS
Sample –I	7.5±3.15	6.6±0.91	6.5±1.13	6.2±0.97	7.2±0.7	6.8±1.3		NS
Sample-II	6.8±0.74	5.8±0.87	5.7±0.78	4.9±0.3	5.4±0.3	5.4±1.11		NS
Sample-III	4.1±1.37	4.7±1.18	4.8±1.4	3.6±1.01	3.3±1.0	4.1±1.2		NS
F-value	62.09*(S)							

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