



Incorporation of Coconut flour in Bakery Products

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Introduction

Bakery industry in India is the largest of the food industries with an annual turnover of about Rs.3000 crores. India is the second largest producer of biscuits after USA. Bread and biscuits form the major baked foods accounting to over 80 percent of total bakery products produced in the country. Bakery products once considered as sick man's diet have now become an essential food item of a vast majority of population. Nearly 55 percent of the biscuits are consumed by the rural sectors. (Small Industries Service Institute, 2000).

A key recommendation is to choose whole grain products to be incorporated in bakery products to increase the fibre content as a dietary guideline for many conditions.

Many foods are very rich in dietary fiber; one among them is the coconut which is also rich in other nutrients like fats, proteins and carbohydrates. During the extraction of coconut for oil and milk some of these macro nutrients are removed and the remaining material is left with plenty of fiber. The by products of coconut are the 'sapal' from coconut meal, taken after extraction of the coconut milk. The sapal is made into coconut flours containing dietary fiber (Trinidad et al., 2001).

Thus the coconut 'sapal' which is a waste after extraction of milk from coconut in many industries or which is used only as an animal food, can be processed and effectively utilized to produce value added products for humans which will maximize the profit of such industries.

Materials and Methods

Preparation of Coconut Flour

Coconut flour is prepared from coconut residue called "sapal" which is the meal usually discarded after milk extraction (Trinidad *et al.*, 2002). Medium sized coconuts are selected and grated for extraction of milk. Milk is extracted from grated coconuts by grinding them. The remaining meal called the "sapal" is smashed in hot water to reduce the oil content. Ragavendra *et al.* (2004) had said that the fat content of the residue left after milk extraction was reduced from 62 percent by treatment with boiling water to 40 percent. The residue was then sun dried for 48 hours and ground. The flour obtained was stored at room temperature and used for further analysis.

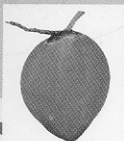
Preparation of Bakery Products Using Coconut Flour

Five bakery products namely bread, bun, cake, biscuit and rusk

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were formulated using coconut flour. In all the five products, the major cereal namely maida flour was substituted by coconut flour in different proportions. According to Thampan & Markose (1990), coconut flour can prove to be a useful ingredient in the preparation of bread, biscuit etc.

Three different proportions of bakery products were prepared by blending 90 parts, 80 parts and 70 parts of the maida flour with coconut flour as shown in the Figure 1. A control sample of the bakery products was also prepared for comparison. All the products were evaluated using a five point Hedonic Scale score card by a panel of 10 semi-trained members.

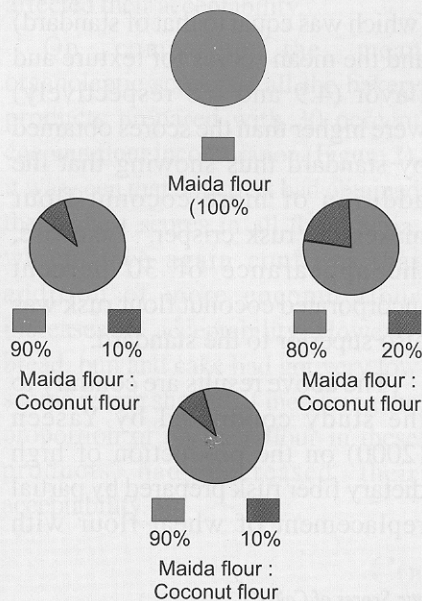


Fig. 1.

Results and Discussion

Organoleptic Scores of Bread

The mean scores of organoleptic evaluation for bread prepared with varying levels of coconut flour are presented in Table I.

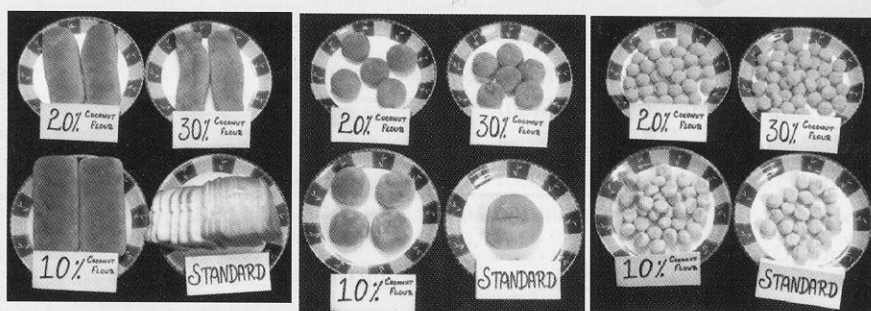


Plate 1 - Bread

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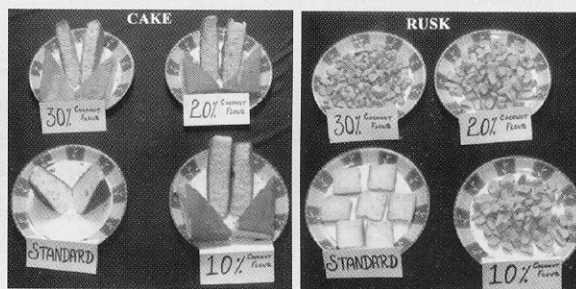


Plate 4- Cake

Plate 5- Rusk

Plates 1, 2, 3, 4 and 5 show the bakery products prepared.

Bread made with 10 percent coconut flour had got the maximum mean scores in all the criteria (except appearance) compared to the bread made with 20 and 30 percent incorporation. However, the scores in all the criteria were lower than standard, thus showing that incorporation of coconut flour even at 10 percent level had a deleterious effect on the quality of bread. This may be due to the presence of dietary fiber in coconut flour that has diluted the gluten and affected the stretching characteristics of gluten, thereby lowering the loaf volume.

From Table II, it is seen that buns made with 10 percent coconut flour incorporation had got the maximum mean scores in all the criteria compared to other levels of incorporation. The mean scores of 4.3 ± 0.67 obtained for appearance and 4.2 ± 0.63 for texture were closer to the scores obtained by standard bun. However, the mean scores obtained for taste and overall acceptability of 10 percent coconut flour incorporated buns were much lower than the standard and those made with 20 and 30 percent incorporation of coconut flour were

Table I. Mean Organoleptic Scores of Bread

Variations	Appearance	Texture	Scores Flavor	Taste	Overall Acceptability	
Standard	4.50	0.53	4.3 ± 0.45	3.9 ± 0.88	4.4 ± 0.52	4.2 ± 0.63
10 percent Coconut Flour Incorporation	2.50 ± 0.53	3.0 ± 0.82	2.9 ± 0.72	2.8 ± 0.79	3.0 ± 0.82	3.0 ± 0.82
20 percent Coconut Flour Incorporation	3.60 ± 0.70	2.5 ± 0.53	2.7 ± 0.53	1.9 ± 0.88	2.4 ± 0.97	2.4 ± 0.97
30 percent Coconut Flour Incorporation	2.70 ± 1.34	1.6 ± 0.70	2.3 ± 0.95	1.9 ± 0.88	2.3 ± 1.16	2.3 ± 1.16

Organoleptic Scores of Bun

Table 2. Mean Organoleptic Scores of Bun

Variations	Appearance		Texture	Scores		Overall Acceptability
				Flavor	Taste	
Standard	4.50	0.53	4.7 ± 0.48	3.9 ± 0.74	4.8 ± 0.42	4.6 ± 0.52
10 percent Coconut Flour Incorporation	4.3 ± 0.67		4.2 ± 0.63	3.1 ± 0.74	2.8 ± 0.63	2.9 ± 0.88
20 percent Coconut Flour Incorporation	3.7 ± 1.25		2.0 ± 0.82	2.0 ± 1.26	2.4 ± 1.26	2.4 ± 0.97
30 percent Coconut Flour Incorporation	3.6 ± 0.84		2.1 ± 0.88	1.6 ± 0.7	1.6 ± 0.7	1.7 ± 0.82

less than 50 percent of the scores obtained by the standard.

Mean Organoleptic scores of biscuits are presented in Table III.

Biscuits made with 10 percent coconut flour incorporation had the maximum mean scores compared to other levels of incorporation. The scores obtained for appearance by both the standard and 10 percent coconut flour incorporated biscuits

Organoleptic Scores of Biscuits

Table 3. Mean Organoleptic Scores of Biscuits

Variations	Appearance		Texture	Scores		Overall Acceptability
				Flavor	Taste	
Standard	5.0 ± 0.0		4.4 ± 0.52	4.7 ± 0.48	4.6 ± 0.52	4.6 ± 0.52
10 percent Coconut Flour Incorporation	5.0 ± 0.0		4.1 ± 0.74	4.0 ± 0.67	4.5 ± 0.53	4.5 ± 0.53
20 percent Coconut Flour Incorporation	4.1 ± 0.88		3.5 ± 1.18	4.0 ± 0.82	4.4 ± 0.52	4.0 ± 0.47
30 percent Coconut Flour Incorporation	3.9 ± 0.88		3.5 ± 0.53	3.9 ± 0.88	3.9 ± 0.74	3.8 ± 0.42

were the same (5.0 ± 0.0), thus showing that adding coconut flour at 10 percent level did not show any difference in appearance. All the other criteria except flavor were nearer to the scores of standard, which indicates that no substantial change was observed by the addition of coconut flour at 10 percent level in biscuits. The mean organoleptic scores obtained by the incorporation of 20 and 30 percent coconut flour

were less than that of the standard. Yet, the panel of judges observed that biscuits being a crisp product, addition of coconut flour up to 30 percent level was acceptable (unlike bread, bun and cakes).

Cakes prepared with 10 percent coconut flour had got the maximum mean scores (Table V) when compared to 20 percent and 30 percent coconut flour incorporated

Organoleptic Scores of Cake

Table 4. Mean Organoleptic Scores of Cakes

Variations	Appearance		Texture	Scores		Overall Acceptability
				Flavor	Taste	
Standard	4.8	0.42	4.9 ± 0.52	4.2 ± 0.63	4.9 ± 0.32	4.8 ± 0.42
10 percent Coconut Flour Incorporation	4.3 ± 0.48		4.0 ± 0.67	4.0 ± 0.67	3.6 ± 0.52	4.5 ± 0.53
20 percent Coconut Flour Incorporation	3.5 ± 0.71		3.0 ± 6.7	3.2 ± 0.79	2.6 ± 0.52	3.6 ± 0.84
30 percent Coconut Flour Incorporation	2.0 ± 0.82		1.4 ± 0.52	2.5 ± 0.53	1.3 ± 0.48	1.8 ± 0.79

ones. The mean scores obtained by cakes with 30 percent coconut flour incorporation were the least in all the criteria. The mean scores for overall acceptability of 10 percent incorporated cake were nearer to that of the standard.

A similar study was conducted by incorporating alkaline hydrogen peroxide treated wheat bran and untreated wheat bran in wheat flour. Results showed that wheat bran up to 20 percent replacement was acceptable with maximum acceptability of cake with chocolate flavor (Anjum et al., 2006).

As per Table VI rusk prepared with 30 percent coconut flour incorporation had obtained the maximum score of 5.0 for taste (which was equal to that of standard) and the mean scores for texture and flavor (4.9 and 4.8 respectively) were higher than the scores obtained by standard thus showing that the addition of more coconut flour makes the rusk crisper. Likewise, the appearance of 30 percent incorporated coconut flour rusk was also superior to the standard.

The above results are contrary to the study conducted by Yaseen (2000) on the production of high dietary fiber rusk prepared by partial replacement of wheat flour with

Organoleptic Scores of Rusk

Table 5. Mean Organoleptic Scores of Rusk

Variations	Appearance		Scores		Overall Acceptability
	Texture	Flavor	Taste		
Standard	4.7 ± 0.48	4.7 ± 0.48	4.7 ± 0.48	5.0 ± 0.0	4.8 ± 0.42
10 percent Coconut Flour Incorporation	4.9 ± 0.32	4.8 ± 0.42	3.8 ± 0.42	4.6 ± 0.52	4.6 ± 0.52
20 percent Coconut Flour Incorporation	4.5 ± 0.53	4.2 ± 0.63	3.9 ± 0.57	4.0 ± 0.47	4.0 ± 0.67
30 percent Coconut Flour Incorporation	4.9 ± 0.32	4.9 ± 0.32	4.8 ± 0.42	5.0 ± 0.0	4.7 ± 0.48

wheat bran, barley and maize flour which showed a lower loaf volume and higher loaf weight affecting the product acceptability.

ANOVA comparing mean scores of all bakery products obtained for overall acceptability shows that varying the levels of coconut flour significantly affected their acceptability.

On comparing the mean organoleptic scores of all the bakery products prepared with 30 percent coconut flour incorporation (Figure 2), it was seen that only rusk had obtained the highest scores in all the criteria, which once again confirms that addition of more coconut flour increases its acceptability. However bread, bun and cake had got very low scores which show that increasing the proportion of coconut flour in these products had decreased their acceptability.

Conclusion

Coconut flour is highly feasible for incorporation in rusk which has also increased its fiber content, thereby making it more suitable for people suffering from constipation, obesity, diabetes mellitus and cardiovascular diseases. Biscuits are the next best products suitable for coconut flour incorporation, while bread, bun and cakes are only partially suitable for coconut flour incorporation

The above results can serve as a guideline to assess various other food products supplemented by such rarely known food that has a beneficial effect. Coconut flour, a by-product that is usually discarded can be effectively used in therapeutic nutrition.

Recommendations

- The glycemic index of the formulated bakery products can be found out.

- Studies can be done with incorporation of coconut flour in many other recipes at different levels of commonly used Indian foods as a substitute for the major cereal of that recipe.

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Coconut water, the next health craze

PepsiCo has announced their latest product offering, new Naked Coconut Water. Launched under their Naked Juice label, the only ingredient in this new product is 100 percent coconut water. This 100 percent coconut water is all natural, fat free, cholesterol free and gluten free. As with all Naked Juice products, Naked Coconut Water contains no added sugars or preservatives. At 60 calories per package, and high in potassium, calcium and magnesium, Naked Coconut Water is being marketed towards health conscious and sporty customers. The company enthuses 'Naked Coconut Water helps power up your day with a refreshing beverage that helps you regain the electrolytes life takes out. Naked Coconut Water is a good source of potassium and low sodium so it is heart healthy too. PepsiCo is not the first to sell coconut water, with brands such as ZICO, Celebes, Vita Coco, Sunny Day and others also offering coconut water beverages. Naked Juice is arguably the most well known brand to offer coconut water, indicating that the popularity of this drink is on the rise. (<http://www.ausfoodnews.com.au>)

Source : The Cocommunity