Development of Cookies Using Fruit Waste Peel Powder

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Abstract

The main objective of the investigation was to prepare peel powder from pineapple, banana & watermelon fruit and prepare cookies by using its different compositions. The recipe for cookies was formulated and studied by keeping all the other ingredients same except varying compositions of cornific and fruit peels powder. All ingredients were weighed according to different compositions, in which milk powder (4%), custard powder (4%), sugar flour (25%), ghee (23%), baking powder (0.5%), milk (4%) and salt (0.5%) were kept constant for all the compositions. Three compositions of fruit peel powder (pineapple, banana and watermelon) in 1:1:1 proportion were (9%), (15%) and (21%) respectively. The cookies were evaluated for sensory qualities and the most acceptable cookies were selected for nutritional analysis. Results of sensory evaluation showed that sample with pineapple, banana and watermelon peel powder as 9% in 1:1:1 proportion was most accepted. Nutritional analysis reported that cookies with cornific only contains energy (258 Kcal), protein (1.93 g), fat (16.21 g) and crude fiber (0.08 %) whereas most accepted sample contains energy (290 Kcal), protein (2.85 g), fat (19.11 g) and crude fiber (0.11 %).

Keywords: Fruit peel, Sensory qualities, Statistical analysis, nutritional analysis

Introduction

Now a day's people are becoming more and more aware about their health. The changing lifestyle and changing mindsets of people are making them to turn towards eating nutritious as well as healthy food. Cookies are widely consumed which are generally rich in carbohydrates, fats, calories but low in fiber, vitamins and minerals. Currently, fortification of cookies has evolved to improve its nutritional and functional quality.

Pineapple (*Ananas Comosus*) is one of the most important tropical fruit which contains considerable amount of calcium, potassium, vitamin C, carbohydrates, crude fiber, water and different minerals which are good for digestive system and helps in maintaining ideal weight and balanced nutrition. Handling of fruits and exposure to adverse environmental conditions during transportation and storage can cause up to 55% of product waste. Fruit residues may cause serious environmental problems, since it accumulates in agro-industrial yards without having any significant and commercial value. Peel, stems, crowns and pineapple cores are considered waste by the fruit pulp industry and stand out for their high sugar content particularly by having pectin which is an insoluble fiber, besides high contents of crude fiber and proteins. The amount of discarded waste (25% of the fruit) is a source of potential nutrients for diet supplementation, due to its nutritional character and low cost. The pineapple peel is hard and irregular but can be used for various culinary purposes as teas, juices and even cookies

preparation. Pineapple peel is rich in Vitamin A, C, B complex, calcium, iron, potassium and fibers containing significant amount of insoluble fibers.

India is larger producer of banana (*Musa Paradisiacal Linn*). Banana peel represents about 40% of total weight of the fresh fruit and is generated as waste. Banana peel are thick ropey-textured with skin color varying from green to yellow. This byproduct is also known to cause and environmental problem, it contains large quantities of nitrogen and phosphorous. Besides the high water content in it, makes it susceptible to attack by microorganism. At present these peels are not used for any other use but discarded and dumped. It is reported that banana peel is rich source of crude protein, ash, crude fibre and carbohydrates (Romelle *et al*., 2016). It also comprises of polyunsaturated fatty acids and essential amino acids. Factories where there is lot of banana peel, lead to environmental problem such as bad odor and source of disease. One way of reducing this problem is to find a way to turn the banana peel into a valuable product.

Watermelon (*Citrullus Lanatus*) is the largest produced fruit in World. The watermelon skin is smooth, with dark green rind or sometimes pale green stripes that turn yellowish green when ripe. It is a very rich source of vitamins and also serves as a good source of phytochemicals (Romelle *et al*., 2016). Rind contributes 30% of the total weight, it is essential to find out the way of using watermelon rinds for the formulation of different food products. The benefits of watermelon peel are to reduce the blood pressure. Watermelon rinds are edible and contain many hidden nutrients, but most people avoid eating them due to their unappealing flavor. They are sometimes used as a vegetable.

Cookies are most popular and loved fast snack product in present situation for every age group since they are easy to carry, tasty to eat, cholesterol free and reasonable at cost. Cornific is not good for health as during processing of cornific from wheat, endosperm is removed from wheat germ and bran. All the necessary nutrients are lost during processing of cornific from wheat. Eating cornific raises bad cholesterol resulting in many health issues like weight gain and high blood pressure. Fruit peels are nutritious, waste and easily available. In view of minimizing the quantity of cornific in cookies by replacing it with fruit peel powder may improve the nutritional profile of cookies from health point of view. Hence the study was undertaken with the objectives to prepare cookies using different compositions of pineapple, banana watermelon peel powder and to determine its nutritional quality.

Methods

Initially Pineapple peel, Banana peel and Watermelon peels were collected from local juice vendors, processing industries and its moisture content (% dry basis) was determined by hot air oven method AOAC (2000). Then the peel powder from Pineapple, Banana and Watermelon was prepared as shown in the Fig. 1 below. The nutritional composition of prepared peel powder was determined by standard method (AOAC, 2000).

The composite peel powder (T1 = 9%, T2 = 15% and T3 = 21%) was then prepared by mixing these three peel powders in the ratio 1:1:1. Then cookies were prepared by taking composite peel powder, cornific and other ingredients as shown in the Fig. 2. Other ingredients used for preparation of cookies were milk powder (4%), custard powder (4%), sugar flour (25%), ghee (23%), baking powder (0.5%), milk (4%) and salt (0.5%). Acceptance test of prepared cookies was carried out using a nine point hedonic scale. Also nutritional analysis of control sample and most accepted sample was carried out by procedure given in AOAC (2000).

Peels
↓
Washing under tap water
↓
Cutting into small pieces (appro. 2 cm size)
↓
Blanching at 70-100^{0}C for 2 minutes
↓
Cabinet tray drying at 55-60^{0}C for 24 hours (for pineapple & watermelon peel)
Sun drying for 2 days (for banana peel)
↓
Grinding
↓
Peel Powder
↓
Sieve analysis
↓
Packaging in polythene bag (50 microns)

Fig. 1 Flow chart for preparation of peel powder

Weighing of cornific, composite peel powders and other ingredients
↓
Mixing of ingredients in dough mixture for 3 minutes
↓
Dough
↓
Proofing for 15 minutes
↓
Sheeting
↓
Shaping with help of cutter
↓
Baking in Oven (180^{0}C for 15 minutes)
↓
Cooling at ambient temperature
↓
Packaging in polythene bag (50 microns)

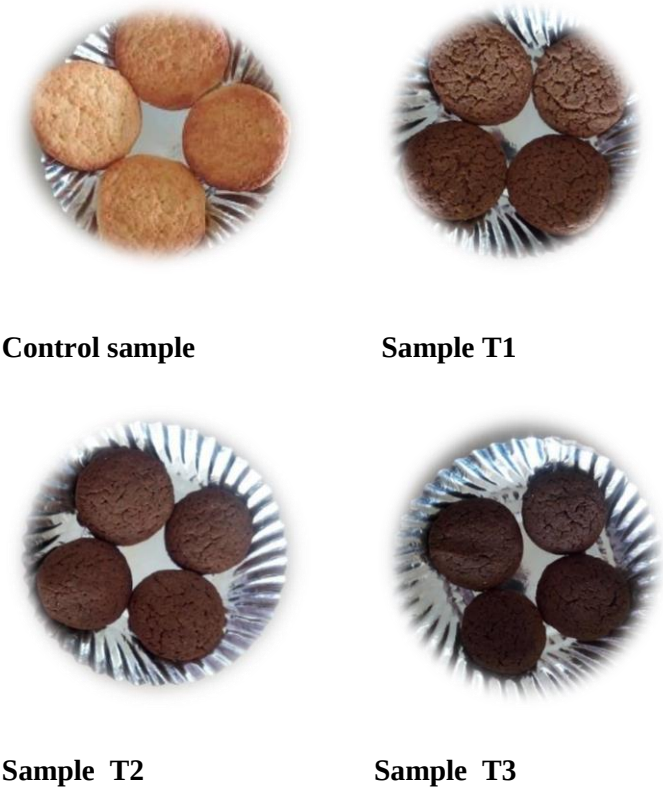
Fig 2 Flow chart for preparation of cookies

Results

Moisture content (% dry basis) of pineapple, banana and watermelon peel was observed to be in the range of 90.1% to 94.8%., whereas nutritional analysis of different fruit peel powders used for the experimentation was given in Table 1. Average particle size of pineapple peel powder, banana peel powder and watermelon peel powder was observed as 0.543 mm, 0.572 mm and 0.564 mm respectively.

Table 1. Nutritional composition of fruit peel powders

Sr. No.	Type of Powder	Moisture (% wet basis)	Carbohydrate (%)	Protein (%)	Fat (%)	Fibre (%)	Ash (%)
1	Pineapple peel powders	6.08	72.53	5.73	1.37	9.42	4.37
2	Banana peel powder	6.11	60.36	4.01	1.54	16.46	11.04
3	Watermelon rind powder	10.61	46.02	11.17	2.44	16.41	13.09



Control sample **Sample T1**

Sample T2 **Sample T3**

Fig. 3 Cookies prepared with different proportion of composite peel powder

Result of sensory evaluation showed that the sample T1 having 9% composite peel powder was the most accepted sample by the panel. Table 2 shows comparison of nutritional analysis of control sample and most sensory accepted sample (paired t-test), which says that there was a positive correlation relationship between the two variables that is when ingredient proportion decreased, results of nutritional analysis also decreased in proportion and vice versa.

Table 2 Nutritional analysis of control & most accepted sample

Sr. No.	Nutritional Parameter	Control Sample	Most Accepted Sample
1	Energy (Kcal)	258	290
2	Protein (gm)	1.93	2.85
3	Fat (gm)	16.21	19.11
4	Crude fiber (%)	0.08	0.11
	mean	6.861*	7.759*
	variance	1.242	0.988
	d.f	26	
	t- value	3.264	
	P (T<=t) two-tail	0.003	
	t (calculated) (5%)	2.056	

*indicates mean of two samples are significantly different.

Sample	T0	T1
T0	1	
T1	0.084	1

Conclusions

1) Peel powders from pineapple and watermelon can be made by drying these peels at 55-60^{0}C for 24 hours, whereas banana peel powder can be made by drying it in sun drying for 2 days to attain its moisture between 6.08 to 10.61% (wet basis) with average particle size between 0.543 mm to 0.572 mm.
2) Nutritional cookies can be made by replacing cornific in traditional cookies with a composite powder of pineapple, banana and watermelon peel (1:1:1 ratio)
3) Nutritional cookies made with 9% replacement of cornific give most accepted rate as well as 47.7% increase in protein content and 37.5% increase in fibre content than the traditional cookies made with cornific only.
4) Thus pineapple, banana and watermelon fruit peel powder may be a good alternative as a raw material to produce nutritional cookies.

5) Also preparation of cookies using pineapple, banana and watermelon peel powder reduces the production cost by 11-12%.

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