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# Develop Healthy Fiber Rich Sweet from Different Combinations of Ingredients

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## Abstract

**Objective:** Dietary fiber or Roughage is a plant material that cannot be digested but that helps you to digest other food. A high-fiber diet has many benefits, which include normalizing bowel movements, lowering cholesterol levels, controlling blood sugar levels. Oranges are one of the most popular fruits, but very few consume the peel, which is arguably the healthiest part of the whole fruit. Orange peels are rich in flavonoids, like hesperidin and polymethoxyflavones (PMFs), and other phytochemicals, which contribute to health benefits. Thus present work aimed at the development of fiber rich product.

**Methods:** The present study was designed to prepare a fiber rich snack product and standardize the developed product. Orange peel, sesame seeds, semolina and sugar were the main ingredients used for the preparation of products with three formulations, i.e., T1 (100:25:20:120), T2 (65:50:50:100), T3 (100:50:50:65).

**Results:** Acceptability of the product was determined by sensory evaluation. As the mean is high and standard deviation is low for the products prepared, all the three products are statistically significant. But as the sample T1 scored high mean  $\pm$  standard deviation comparing with T2 and T3 it is considered the best product among the three. Coefficient of variance of the product is also low which emphasizes the product is statistically significant. Physico-chemical composition of raw materials and experimental product were also determined. The sample T1 was subjected to nutritional composition which showed a protein (11.0%), carbohydrate (49.03%), fat (4.5%) and crude fiber (14.37%).

**Conclusion:** Orange peel is a very good source of dietary fiber. Thus this laddu prepared from fiber rich orange peel could be a beneficial and healthy fiber snack for kids and adults.

## Introduction

### Dietary fiber or Roughage

Fiber is a part of plant food. Dietary fiber or Roughage is a plant material that cannot be digested but that helps you to digest other food [1-3]. It has two main components: Soluble fiber and insoluble fiber. Top sources of fiber are beans (all kinds), peas, chickpeas, black-eyed peas, artichokes, whole wheat flour, barley, bulgur, bran, raspberries, blackberries, and prunes [4,5]. Good sources of fiber include: lettuce, dark leafy greens, broccoli, okra, cauliflower, sweet potatoes, carrots, pumpkin, potatoes with the skin, corn, snap beans, asparagus, cabbage, whole wheat pasta, oats, popcorn, nuts, raisins, pears, strawberries, oranges, bananas, blueberries, mangoes, and apple [6,7]. A high-fiber diet has many benefits [8,9]. It helps in lowering the overall calorie intake, thereby aiding weight loss. It also exerts anti-obesity effects by suppressing weight gain by the body and formation of adipose tissue. It relieves respiratory problems and prevents digestive complications. It Normalizes bowel movements. It lowers cholesterol levels [10] and helps in controlling blood sugar levels. The Institute of Medicine, which provides science-based advice on matters of medicine and health, gives the daily fiber recommendations for adults as 38g for men and 25 g for women.

Orange peels are rich in flavonoids, like hesperidin and polymethoxyflavones (PMFs), and other phytochemicals, which contribute many of their health benefits. Flavonoids are antioxidant compounds [11-13] found in certain fruits, vegetables, herbs, and spices known for their role in helping to prevent chronic diseases like heart disease and cancer [14]. In addition, orange peel contains higher amounts of certain nutrients than its flesh. For instance, 3.5 ounces of orange peel provides 136 milligrams (mg) of vitamin C, while the flesh contains about 71 mg. Orange peel also contains considerable amounts of calcium, copper, magnesium, vitamin A, folate and other B vitamins and dietary fiber. Several studies have shown that increased consumption of orange peel in the diet lowers the risk of human cancers, namely skin, breast and colon cancer [15,16]. Orange peel offers protection against colon cancer by binding to the toxic chemicals in the food, thereby hindering their exposure to the intestinal mucus membrane [15]. Orange peel contains nobiletin, a type of polymethoxylated flavones (PMFs), compounds which are found to exert positive effect on the heart.

## Objective

- To develop a healthy fiber rich sweet.
- To determine the acceptability of the sweet among the people (100 members) by using 9-point hedonic scale.
- Analysis of physico-chemical composition of raw materials and developed fiber rich sweet.

## Methodology

### Procurement and pre-processing of raw-material

For the present investigation, orange peel, semolina and sugar were procured from a Reliance super market in Nellore, Andhra Pradesh. Sesame seeds were procured from the same super market washed under running water to remove any adhering particles of dirt, and then dried in shade powdered, sieved and stored in airtight containers in a refrigerator till standardization of products and analysis for various parameters was carried out at a later date.

### Product development

Different combinations of the sweet were tried using the same ingredients. In product T1 priority was given to taste, more sugar was used to mask bitter taste of orange peel. In product T2 equal priority was given to taste and health in selecting the combinations of ingredients. In product T3 priority was given to health and not the taste (Table 1).

### Sensory evaluation

The three products developed were subjected to Organoleptic evaluation (Colour, flavour, texture, taste and overall acceptability) by fifteen (15) trained taste panel members (They were the adults who were experts in sorting variety of tastes and they were also made aware of rules relating to sensory evaluation). A score card with nine point hedonic scale was used for the purpose (Appendix given at the end of manuscript along with reference) [17].

### Physico-chemical analysis

All the raw materials and experimental best product were subjected for physico-chemical analysis by using standard AOAC methods. (Appendix given at the end of manuscript along with reference) [17].

### Determination of various parameters of food supplement

Various parameters like Shelf life, Calorie, Protein, Fat, Carbohydrate, Trans fat, Cholesterol etc. of the developed product were determined (Appendix given at the end of manuscript along with reference) [18].

**Table 1:** Different trials and combinations carried out for product development.

Ingredients (g)	Experimental products		
	T1	T2	T3
Orange peel	100	65	100
Sesame seeds	25	50	50
Semolina	20	50	50
Sugar	120	100	65

## Orange peel laddu

### Ingredients

- Orange peel – 100 g
- Sesame seeds – 25 g
- Semolina – 20 g
- Sugar – 120 g

### Procedure

A routine preparation method was selected from the various recipes available for making ladoos but emphasis was made to select ingredients that would be healthy.

- First wash the orange peel and cut the peel in to pieces.
- Boil the orange peel in water for 5 to 6 minutes and drain the water.
- Now boil the orange peel in sugar syrup(10 brix) for 20 to 30 minutes
- Then add roasted semolina (they were fried at 45°C for 10 minutes) and sesame seeds to the orange peel and make them in to balls.

## Results

Score card for sensory evaluation was prepared using 9 point hedonic scale keeping in view, the quality characteristics of products and numerical scores were assigned for each attribute. The people including kids and adults were required to evaluate the samples for appearance, taste, texture and overall acceptability. In Hedonic scale 1 means dislike the product extremely and 9 means like the product extremely.

### Organoleptic evaluation

The mean value or score of a certain set of data is equal to the sum of all the values in the data set divided by the total number of values. A mean is the same as an average. Standard deviation is a statistical measurement of the variation in a set of data. Standard deviation indicates how much the values of a certain data set differ from the mean on average. In probability theory and statistics, the coefficient of variation (CV), also known as relative standard deviation (RSD), is a standardized measure of dispersion of a probability distribution or frequency distribution. As the mean is high and standard deviation is low for the products prepared, all the three products are statistically significant. But as the sample T1 scored high mean  $\pm$  standard deviation comparing with T2 and T3 it is considered the best product among the three. Coefficient of variance of the product is also low which emphasizes the product is statistically significant (Tables 2 and 3).

**Table 2:** Mean score obtained for experimental products to different variables.

S. No.	Variable	T1	T2	T3
1.	Colour	8.66 $\pm$ 0.487	7.6 $\pm$ 0.9	6.93 $\pm$ 1.437
2.	Flavour	8.53 $\pm$ 0.639	7.73 $\pm$ 1.03	6.8 $\pm$ 1.146
3.	Texture	8.6 $\pm$ 0.507	8 $\pm$ 0.755	7.13 $\pm$ 1.060
4.	Taste	8.46 $\pm$ 0.639	7 $\pm$ 1.069	6.93 $\pm$ 1.334
5.	Overall acceptability	8.73 $\pm$ 0.457	7.4 $\pm$ 0.736	6.93 $\pm$ 1.099

**Note:** Values are expressed in mean  $\pm$  SD (Nine point Hedonic scale)

**Table 3:** The nutrient content of dried Sesame seeds, Orange peel, Semolina and sugar.

S. No.	Nutrient per 100 g	Sesame seeds	Orange peel	Semolina	Sugar
1.	Moisture (g)	3.8	72.5	12.67	0.03
2.	Protein (g)	17.7	1.5	12.68	0
3.	Fat (g)	49.7	0.02	1.05	0
4.	Dietary fiber (g)	18	10.6	3.9	0
4.	Vitamin-c (mg)	-	126	-	-
5.	Total carotenes(IU)	6	120	-	-
6.	Iron (mg)	14.6	0.8	1.23	1.91
7.	Calcium (mg)	959	161	17	85
8.	Zinc (µg)	7.75	0.25	1.05	0.18

**Table 4:** Nutritional composition of product T1.

S. No.	Variables	Product T1
1.	Protein	11%
2.	Carbohydrate	49.03%
3.	Fat	4.5%
4.	Crude fiber	14.37%

The nutrient content of orange peel, sesame seeds and semolina is presented in table 3. The sample T1 was subjected to nutritional composition which showed a protein (11%), carbohydrate (49.03%), fat (4.5%) and crude fiber (14.37%). Hence it is considered to be the best among the three products evaluated (Table 4).

## Discussion

The principal advantage of a diet high in fiber is in improving the health of the digestive system. Since fiber is relatively indigestible, it adds bulk to the faeces. Soluble fiber soaks up water like a sponge, which helps to bulk out the faeces and allows it to pass through the gut more easily. It acts to slow down the rate of digestion. This slowing down effect is usually overridden by insoluble fiber, which does not absorb water and speeds up the time that food passes through the gut. Fiber is even more important for older people. The digestive system slows down with age, so a high-fiber diet becomes even more important. Soluble fiber lowers blood cholesterol by binding bile acids (which are made from cholesterol to digest dietary fats) and then excreting them. Increasing dietary fiber and wholegrain intake is likely to reduce the risk of cardiovascular disease, type 2 diabetes, weight gain and obesity, and possible overall mortality. For people with diabetes, eating a diet high in fiber slows glucose absorption from the small intestine into the blood. This reduces the possibility of a surge of insulin, the hormone produced by the pancreas to stabilize blood glucose levels.

Keeping in view the health benefits of fiber rich food, Simple suggestions for increasing one's daily fiber intake include:

- Eat breakfast cereals that contain barley, wheat or oats.
- Switch to wholemeal or multigrain breads and brown rice.
- Add an extra vegetable to every evening meal.
- Snack on fruit, dried fruit, nuts or wholemeal crackers.

A daily intake of more than 30 g can be easily achieved if you eat wholegrain cereal products, more fruit, vegetables and legumes and, instead of low-fiber cakes and biscuits, have nuts or seeds as a snack or use in meals.

## Conclusion

A fiber rich snack product was developed. The results indicated that the sample T1 scored high for overall acceptability with respect to mean  $\pm$  standard deviation thus statistically significant. The sample T1 was subjected to nutritional composition which showed a protein (11.0%), carbohydrate (49.03%), fat (4.5%) and crude fiber (14.37%). Hence it could be a beneficial fiber snack.

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