

## **Development And Standardization Of High Fibre And Gluten-Free Coconut Flour Cookie Ice Cream Sandwich**

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### **Abstract**

The research objective of this study is to develop and standardize high fibre and gluten-free coconut flour cookie ice cream sandwich. It was developed considering that there should be no waste discarded from the coconut as well as the product should be rich in essential fats, gluten-free, fibre rich and fewer sugars. The ingredients used in this product are coconut flour, honey, olive oil and coconut cream respectively. The milk is extracted from the coconut and freezes overnight and extracted the layered cream on the top of coconut milk. The cream was blended with honey, which was used as ice cream between two cookies. The pulp which was remained after extraction of milk from the coconut was used for cookie flour. The pulp was dehydrated using a dehydrator for 3 hours under 250<sup>0</sup>C. The dehydrated pulp is then powdered which is called 'Coconut Flour,' from which the cookies have prepared.

There was no waste discarded from the coconut. Hence the whole coconut is utilized for the preparation of the product. The product was done in two variations to observe the overall acceptance. The acceptance of variation-2 is more compared to variation-1 as in 1<sup>st</sup> variation 20 g of all purpose flour (maida) is added which resulted in increase of the gluten content. In order to reduce the gluten and increase the fibre, all purpose flour is omitted. Hence variation-2 was finalised.

**Keywords:** Coconut flour cookie, coconut cream, ice cream sandwich, gluten-free.

### **INTRODUCTION**

Coconut (*cocos nucifera* L.) is monocotyledon palm from Palmaceae family (Ohler, 1999). Coconut milk is generally extracted from grated coconut meat after pressing or squeezing with or without the addition of water. Coconut milk has been used as a major

ingredient for several cuisines such as curries and desserts (Tansakul & Chaisawang, 2006). Coconut milk emulsion stability is generally governed by some proteins in the aqueous phase (Peamprasrat & Chiewchan, 2006). The difference in the water; coconut meat ratio, ranging from 1:1 to 20:1, had no effect on oil and protein extraction into coconut milk (Dendy & Timmins, 1973). Thungkao (1988) also documented that protein contents were not affected by temperatures (30<sup>0</sup>C, 55<sup>0</sup>C and 80<sup>0</sup>C were not significantly different. Coconut milk extraction from fresh coconut is the most important step in wet or aqueous processing (Seow & Gwee, 1997).

Coconut flour is considered as a palatable product for gluten allergic people. It is used as a substitute for wheat flour and all purpose flour to make various dishes. It bolsters a surprising list of nourishing benefits like lowering cholesterol levels, protects heart health, balances blood sugar and increases insulin sensitivity. Coconut flour contain equal amount of protein to all purpose flour minus the gluten present in all purpose flour (Article History: Received 10<sup>th</sup> February, 2016; Received in revised form 18<sup>th</sup> March, 2016; Accepted 14<sup>th</sup> April, 2016; Published 30<sup>th</sup> May, 2016).

Coconut cream is Lactose and grain-free. It lowers blood pressure and improves endurance. Helps in weight loss, rich in electrolytes, vitamins and minerals and is a boon for Irritable Bowel Syndrome (IBS). Coconut cream has a estimated Glycemic Index of 45 to 50 which is low and hence do not spike glucose level as they are absorbed slowly. Thus it is great for Diabetes and Cardiovascular Diseases.

Therefore the present study was aimed to develop a product which is suitable for the people with Diabetes and CVD. As they are restricted to eat sugars and fats, coconut flour cookie ice cream sandwich is the best alternative for them to consume because it contains all the nutrients which are required for them as per their RDA.

## **OBJECTIVE**

The main objective of the study is to develop and standardize a product using coconut residue, which is gluten-free, fibre rich cookies and to develop lactose free ice-cream.

## **RESEARCH METHODOLOGY**

### **1. Procurement of raw materials:**

The basic ingredients required for Coconut flour cookie ice cream sandwich are Coconuts, honey, olive oil, baking powder, yeast and essence. All the ingredients were purchased from the nearest locally available super market, Tirupati.

## **2. Standardization of ingredients:**

The product has been standardized by the repeated trails in the laboratory and by checking the Organoleptic characteristics through semi trained panel members. The final product was prepared by incorporation changes suggested by the panel members.

## **3. Preparation of Coconut Flour and coconut cream:**

Coconuts are broken and the water is extracted. Brown skin of the coconut is removed and cut into pieces. These pieces are grinded by adding hot water to it to form a thick paste. Coconut milk is extracted by using muslin cloth and milk is kept aside for further process. The extracted pulp is dehydrated under dehydrator for 3 hours (under 250<sup>0</sup>Celsius) and made into a fine powder.

The obtained coconut milk has to be freezed overnight for 8 hours under refrigerator. The cream settles on the top and the water remains down. The water has to be discarded.

## **4. Preparation of coconut flour cookie ice cream sandwich:**

Mix the standardized ingredients (coconut flour, olive oil, honey) in a bowl. Knead the dough and form into small portions. Make them into a cookie shape. Bake the cookies at 175<sup>0</sup>C for 8 to 12 minutes and cool them in a room temperature. For ice cream preparation, combine coconut cream and honey in a bowl. Mix it with a beater until the ingredients mix well. Refrigerate for 2 hours until ice cream consistency has got. Apply ice cream in between two cookies. Pack them in a zipper bag and store them in a refrigerator.

## **5. Packaging and Labeling:**

The product is packed in a zipper bag to prevent from the contamination, to extend the shelf life of the product and to protect it from any physical damage. Labeling is done to provide the detailed information of the product such as name, volume, manufacturing details, shelf life, and nutritional information, storage conditions of the product and directions of use.

## **RESULTS**

**1. Sensory evaluation of the product:** There are several steps involved in new product development among which Taste panel stage is the one among them (Baker et al., 1998). In taste panel stage, various attributes of the product like appearance, colour, flavour, texture and taste are judged by panel members. The attributes evaluated by the panel members for coconut flour cookie ice cream sandwich using Hedonic (5 Point) Rating Scale include:

- 5- Like extremely
- 4- Like very much
- 3- Like moderately
- 2- Neither like nor dislike
- 1-Dislike extremely

**Table-1: Sensory evaluation of coconut flour cookie sandwich ice cream:**

|           | <b>Attributes</b>            | <b>Score</b> | <b>Coconut flour cookie sandwich ice cream</b> |
|-----------|------------------------------|--------------|--|
| <b>1.</b> | <b>Appearance</b>            | 5.00± 0.00   | 4.17±0.38                                      |
| <b>2.</b> | <b>Colour</b>                | 5.00± 0.00   | 4.50±0.67                                      |
| <b>3.</b> | <b>Taste</b>                 | 5.00± 0.00   | 4.42±0.66                                      |
| <b>4.</b> | <b>Texture</b>               | 5.00± 0.00   | 4.32±0.52                                      |
| <b>5.</b> | <b>Flavour</b>               | 5.00± 0.00   | 4.17±0.71                                      |
| <b>6.</b> | <b>Overall acceptability</b> | 5.00± 0.00   | 4.67±0.49                                      |

The above table shows the Mean and SD values of coconut flour cookie sandwich.

The product was prepared and subjected to sensory evaluation by the panel members. Proximate and microbial analysis has been done in the laboratory and the values were recorded. Sensory evaluations for the attributes of the product of Variation- 1 are followed. For appearance 4.75, colour 4.58, taste 4.45, texture 4.52, flavour 4.50 and the overall

acceptance is 4.83. The methods used for sensory analysis is ANOVA and the mean and standard deviation values are obtained for different attributes.

## **2. Nutrient composition:**

**Table-2: Nutrient composition of coconut flour cookie ice cream sandwich:**

| <b>Sl No</b> | <b>Ingredients</b> | <b>Amount</b> | <b>Energy (Kcal)</b> | <b>CHO (g)</b> | <b>Protein (g)</b> | <b>Fat (g)</b> | <b>Fiber (g)</b> | <b>Iron (mg)</b> | <b>Calcium (mg)</b> | <b>Vit- C (mg)</b> |
|--------------|--------------------|---------------|----------------------|----------------|--------------------|----------------|------------------|------------------|---------------------|--------------------|
| <b>1.</b>    | Coconut flour      | 50 g          | 60                   | 9              | 2.5                | 2              | 5                | -                | -                   | -                  |
| <b>2.</b>    | Honey              | 20 ml         | 50.8                 | 16.4           | 0.06               | -              | 0.04             | 0.08             | 1.2                 | 0.1                |
| <b>3.</b>    | Olive oil          | 10 ml         | 88.4                 | -              | -                  | 10             | -                | 0.06             | 0.1                 | -                  |
| <b>4.</b>    | Coconut cream      | 60 ml         | 46                   | 1.2            | 0.46               | 4.8            | 0.44             | 0.32             | 3.2                 | 0.56               |
|              |                    | <b>Total</b>  | 255.2                | 26.6           | 3.02               | 16.8           | 5.48             | 0.46             | 4.5                 | 0.66               |

The above table shows the nutrient composition of coconut flour cookie ice cream sandwich. The chemical analysis of the product includes the analysis of CHO, Protein, Fat, Fiber, Iron, and Calcium, Vitamin- C. (It comprises of Energy (255.2), Carbohydrates (26.6), Protein (3.02), Fat (16.8), Fiber (5.48), Iron (0.46), Calcium (4.5), and Vitamin- C (0.66)

## **3. Microbial Analysis:**

A microbiological limit in food aims to prevent food-borne illness from food containing unsafe levels of microorganisms. The result obtained when the microbial analysis was performed on the standardized coconut flour cookie sandwich (less than 10 CFU per gram) which is quite acceptable. The maximum permissible limit is 10 CFU per gram.

**Table-3:**

| <b>Test Parameters</b> | <b>Results</b> | <b>Units</b> |
|------------------------|----------------|--------------|
| Aerobic Plate Count    | 555            | CGU/g        |
| Yeast and Mould Count  | < 10           | CFU/g        |

After performing the microbial analysis, the result obtained was less than 10 CFU per gram which is below the maximum permissible limit.

## **DISCUSSION**

### **1. Comparison of coconut flour with all purpose flour in terms of Baking and Nutrition:**

Coconut flour has potential application in baking products and human nutrition. It is sweet by itself because of the natural sugars present in the coconut which means there is no need to sweeten it as much. Increasing concentrations of dietary fibre from coconut flour do not affect the mineral availability. Coconut flour is particularly absorbent, and very small amount of flour will absorb a very large amount of liquid. It also tends to have drying effect on baked goods.

The Glycemic Index of all purpose flour is very high, about 71, which means it contains double the amount of calories when compared to coconut flour. All purpose flour can congest the digestive system as it lacks fibre. Certain chemicals (Alloxan, Benzoyl peroxide, benzoic acid, sodium meta bi sulphate etc.) are added to preserve all purpose flour which are detrimental to human body.

An ingredient formula was standardized to make acceptable coconut flour substituted cookies. It was observed that coconut fibre could be substituted to the level of 10% to prepare cookies with overall acceptability. The residue or press cake from coconut used in animal feed to a limited extent. But this residue contains high protein (Chakraborty, 1985) and fibre contents (Trinidad et al., 2001), which can be used in the preparation of various foods.

### **2. Comparison of coconut cream and milk cream in terms of health and nutrition:**

Coconut cream has long been a staple ingredient in Asian cuisines and is used to prepare creamy and delicious dishes. It is a perfect addition of keto diet and gives rich and exotic flavor. Coconut cream is packed with nutritional perks and health boosting benefits. It is satisfying and satiating, can manage cancer and cholesterol. A study conducted in 2018 shows that Lauric acid which is present in coconut cream works synergistically with cancer cell- specific chemo agent selenite. It also increases the HDL levels. It is used as a dairy-free alternative because of its versatility and enrichment to dishes.

Milk cream has been linked to an increased risk of developing prostate cancer. The Lactose present in the cream can be difficult for people to digest, resulting in nausea, cramps, bloating etc. Difficulty in dairy consumption can result in progressively worsening symptoms. A single serving of cream can contain as much as 24 mg of heart harming cholesterol. A Swedish study showed that women who consumed four or more servings each day were twice as likely to develop serious ovarian cancer. Milk cream is high in saturated fat and sodium.

Dendy & Timmins (1973), elucidated that coconut cream can be prepared at home from grated meat by squeezing with hand, whereas industrial or commercial scale employs the screw press or hydraulic to extract the milk. Basically, coconut cream is an oil-in-water emulsion, in which continuous phase is water and oil is dispersed phase. The oil droplets in coconut cream emulsion are surrounded by a film of interfacial active protein and emulsion stability is depending on these proteins.

Patil et al. (2017), carried out a comparative study to evaluate the physicochemical properties and emulsion stability of coconut cream obtained from the coconut at three different maturity stages. Stability of coconut cream emulsion depended on intrinsic factors, mainly pH and protein content. pH can affect the net charge of proteins surrounding the oil droplets. At pI, net charge on the protein is zero. Therefore, repulsion of protein film surrounding the oil droplets is lower. As a result, emulsion stability of coconut cream is decreased. High protein content can lead to efficient localization of protein films at the oil–water interphase.

## **CONCLUSION**

Coconut flour cookie ice cream sandwich is a perfect snack for children as well as for adults. The first bite is crunchy and the cream in between the two sandwiches is soft and sweet and goes well into the mouth with a nice coconut flavour. It contains high amount of energy and one can be satisfied after eating two cookie sandwiches. These are also recommended for the people with DM and CVD as they are high in fibre; no sugar and gluten are added to the product. They are rich in antioxidants and contain abundant amount of flavanoids and tannins as well. Hence the present study concludes that these coconut flour cookie sandwiches are healthy and tasty snacks. Patients with DM and CVD can incorporate these cookie sandwiches in their diet without any restriction but should be consumed in a less quantity.

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