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## **Preparation of Fasting Biscuits by using Chestnut Flour**

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ABSTRACT: Nowadays people are health conscious, they like value added product as a part of their everyday meal or as well as the foods they eat for pleasure. The composite flour was based on fasting ingredients. In this experiment, water chestnut (50, 60 & 70), sweet potato (35, 25 & 15) and amaranth (15, 15 & 15) flour in the various proportions to prepare three blended flour samples, from which fasting biscuits were prepared. These samples were subjected to analysis of their functional properties. The proximate composition of the various flour blends used for the preparation of fasting biscuits were determined using standard methods. The Physio-chemical analysis and Texture evaluation was done to know the acceptability of fasting biscuits. These were evaluated for sensory analysis that included Colour, taste, flavour, texture and overall acceptability. The biscuits were analysed for analytical and chemical analysis, which includes moisture content, fat content, total ash content, protein content, minerals content and carbohydrate content. On the basis of sensory evaluation, biscuits containing water chestnut, sweet potato, and amaranth flour in (70, 15 & 15) proportion scored high score for overall acceptability i.e., 7. From the result of proximate analysis of biscuits, the fat content of Sample C is very low i.e., 24.18%, which is beneficial for health. So according to quality evaluation and sensory evaluation, preparation of cookies from water chestnut, sweet potato and amaranth flour blend in proportion of (70, 15 & 15) is recommended. This review summarized the compositional, thermal, and rheological properties and food applications of chestnut (Castanea spp.) flour systems. The compositional, structural, and physicochemical properties of chestnut starch, which is a major determinant for product quality, were also reviewed. Future research directions on how to better utilizes chestnut flour and starch for food product developments were suggested. Chestnuts are important food items for many people around the world. The world production of chestnuts has kept increasing during the last decade. There has been growing interest to utilizes chestnut flour for various food applications (e.g. gluten-free food products). The major component of chestnut is starch which amounts to over 50% of the dry weight of the fruit.

KEYWORDS: Chestnut flour Biscuits, Materials and Methods, Analysis of product, sensory evaluation.

#### I. INTRODUCTION

The bakery industry in India is more populated is all the branches of the biggest in food industry. Bakery is a long established activity and occupies an important place in food processing industry. Bakery products are like breads, biscuits, muffin and cakes are consumed by 96% of the population in the United Kingdom (Foster et al., 2006) [9]. Bakery product have become in India since the earlier times. Among the different bakery product, biscuits constitute the most popular group. Biscuits were first invented s a food for Nelson' Navy (1980). Biscuits are chemically leavened bakery products containing high percentage of fat and sugar. India is known to be a second largest manufacturer of biscuits, products the first being USA. Biscuits cover 70% of the total production of bakery industry. Indian Biscuits industry came into limelight and started gaining a sound status in the bakery industry in the later part of the 20th century when the urbanized society call for readymade food products at a tenable cost. Fasting is also seen as way to give the body a much needed break from the regular dietary routine. The explains the choice of food items that are light on stomach, easy to digestion but are full of nutrients. So making fasting biscuits means ready to eat food without any physical work you can consume with full energy dense without any extra fat which dangerous to our body. Therefore, few food items like water chestnut, sweet potato, and amaranth go into making a variety of flour, which could easily fill in the space created by the absence of refined flour or wheat flour biscuits. Because of water chestnut is gluten free at the same is extremely nutritious. Water chestnut is rich in carbohydrate, fibre, vitamins and minerals. Enrichment of foods is the addition of one or more nutrition items that are insufficient or absent and is to improve the properties. Research for the investigation of functional, nutritious and sensory quality of properties is increasing day by





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day. Main purpose of the production of food is to provide people with healthy and happy lives delivering safe and high nutrition value foods. Recent adaptation of people for a healthy and balanced life style and increased awareness have added strength to improvements in functional food market. Therefore, there are studies going on for development of alternative flour additives and for usage of them in foods. Beyond supplying needs of basic nutrition items in the body, foods or food components that provide additional benefits to human physiology and metabolic functions and that are more affective in succeeding a healthier life should be produced. In the food industry, many studies have been carried out, especially on production of cereal-based functional foods. In this review, chestnut flour, limited in production and used for product development, and studies for its usage are were discussed. Water chestnut starch is used in many food dishes to enhance the textural properties of foods, such as for stabilizing sauces and soups. There is a unique property of water chestnut starch, that is when it is heated during canning or cooking, it achieves very dense and crunchy texture. his property discriminates it from other starches like potato and rice starch Water chestnut starch has been used to develop edible coatings for the fruits According to Mei et al, water chestnut starch flams have potential to increase the shelf life of fruits through their antimicrobial properties. Water chestnut is very beneficial for heart diseases, blood pressure, cancer prevention, weight loss and digestive health Whereas, the antioxidants present in water chestnut decreases the risk of developing cancer, because the antioxidants slow down the growth of cancerous cells. Water chestnuts are also low in calories due to low fat and high starch contents. Although water chestnut has lot of applications in food industry but its use in edible coatings is very limited, whereas functional properties of its powder are attractive enough to be utilized to coat fresh commodities. Some previous studies as mentioned earlier, were found to be using water chestnut starch to develop coatings, whereas, rare studies used heated water chestnut powder with fine particle size, to develop edible coatings. Therefore, this present study has been aimed to develop water chestnut powder- based edible coating to process and preserve apples, and to study the effect of these edible coatings on the physicochemical quality and shelf life of the apples. For this purpose, pretreated water chestnuts were dried to develop powder, which was heated and used in two different concentrations to develop coatings, which were further compared with guar gum coated and uncoated apples, during 80 days of storage. The effect of chestnut flour on biscuits has been investigated in gluten (Dokic, Nikolic, Soronja-Simovic, Pajin & Juul, 2014; Hegazy, Kamil, Hussein & Bareh, 2015) or low fat (In kaya, Goc men, Ozturk & Koksel, 2009) products. Until now, only Demir kesen (2016) added chestnut flour at different levels to gluten-free rice- based biscuits, by analysing the rheological properties of the doughs and the quality of the final products and finding in the 200 g/kg chestnut flour replacement the best formulation. Storage evaluation on chestnut biscuits was not conducted. To extend the knowledge in this field and evaluate the main changes occurring on biscuits during the first part of their shelf-life, different percentages of chestnut flour were supplemented to a gluten-free commercial mix to measure the physic-chemical properties of flours, doughs and biscuits during 60 days of storage. The water chestnut refers to the plant that is found in water bodies including lakes, ponds, and rivers. This hydrophyte is considered as a dependable food source for the flood prone areas due to its starch producing nature. It is abundant in nutrients and minerals. According to Ismail et al., water chestnut provides abundant fat, amino acids, sugar, minerals, water- and fat-soluble vitamins, fibers, and antioxidants like flavonoids and phenols. It is known for its antidiabetic, anti-inflammatory, suppressing pain and bactericidal properties. It is widely used in bakery and sweets products. Biscuit are typically enjoyed as a snack item and are the ideal delivery system for dietary supplements. They are the major segment of the confections and bakery which potentially contributes to environment through the utilization of major byproducts including clarified butter residues and whey. With non- wheat flours including buckwheat, cassava, quinoa, etc., gluten free biscuit have been prepared previously by several researchers using different raw materials like quinoa flour, rice flour, coconut flour, sweet potato flour, and cassava-based composite flour. There is a need to create gluten-free biscuit employing ingredients with functional properties to cater to those with gluten sensitivity while also providing extra health advantages. Gluten content, which enables air cell expansion and provides stiffness after baking, enables it to carry out these duties. Patients with celiac disease, however, must cut out gluten from their diets. Gul et al. report that 26 to 49% of children who come to tertiary care facilities in India with chronic diarrhea are later found to have celiac disease. As per Mehta et al. studies the instances of celiac disease are dependent on the people's consumption patterns of wheat (gluten), which were higher in northern (1.23%) and lower in the southern (0.10%) Indian region. Gliadin can rapidly and transiently boost the porosity of the epithelial cells of the intestine. Although the mucosa of the small intestine is thick, it is coiled up into many folds and finger-like projections known as villi. Due to the small intestine's injured mucosa's decreased ability to absorb nutrients from food, nutritional deficiencies develop. As per the reports sector biscuits would be 44.01 billion USD by 2025, with CAGR of 5.3%, where Asian Pacific is projected to have the most spontaneous growth (6.8%). The main factors contributing to this growth include urbanization, modern way of living and elevated incomes. Chestnut and foxnut flour play a critical role in delivering the nutritional benefits to the biscuit. However, the scarcity of literature that delves into these flours' effects on sensory quality and consumer acceptability pushed the need for this study. The objective of this study was to





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assess the impact of chestnut and foxnut flour composition upon physical, nutritional, and sensory properties of glutenfree biscuit. The study utilized the Response Surface Methodology to choose the optimal blend of these flours to develop cookies with better consumer acceptability. For an individual with a celiac disease, the consumption of gluten should be avoided. In addition to those with celiac disease, those who observe religious fasts abstain from wheat and wheat-derived items. Religious fasting, often described as a fasting regimen carried out for spiritual or religious reasons, is a dietary pattern characterized by varying degrees of calorie restriction and abstention from particular foods. In order to make gluten-free biscuit for fasting, water chestnut flour, foxnuts, and peanuts were combined with cardamom and clove as flavoring agent. The experimental planning and analysis were performed using the Response Surface Methodology. Two independent variables, specifically the foxnut powder and chestnut flour were selected and the Central Composite Design was applied. Altogether, thirteen experimental formulations were used for producing cookies. Along with sensory evaluation, the biscuits moisture, ash, fat, and protein contents were examined. For general acceptance, 25–30 semi-trained panelists were chosen to conduct the sensory analysis based on a numerical scoring test. The sample (S12; 60% chestnut and 5% foxnut flour) had the greatest overall acceptance score. The chemical components of S12, namely moisture, ash, fat, and protein, were 3.84%, 3.51%, 18.52%, and 6.92%, respectively. Compared to the control sample, this sample was preferred.

#### **II. HEALTH BENEFITS OF CHESTNUT FLOUR**

Gluten-free: A good alternative to wheat flour for people with gluten sensitivities or celiac disease.

High in fibre: Helps with digestion, feeds gut bacteria, and can help with weight management.

Antioxidants: Contains antioxidants that can help prevent cancer and heart disease.

**Blood sugar control:** The carbohydrates in chestnut flour provide a steady release of energy that can help control blood sugar levels.

Resistant starch: A type of prebiotic fibre that helps develop probiotic bacteria, which can improve digestive health .

Vitamin B: Helps with brain function, nervous system recovery, and stress relief.

**Bone Health:** Chestnuts contain magnesium and copper, which can help increase bone mineral density and keep bones healthy.

Chestnut flour is also known for its laxative, diuretic, and blood circulation- enhancing properties. In traditional medicine, chestnuts were used to treat constipation, difficulty urinating, menstrual cycles, fever, coughs, and asthma.

#### **III. MATERIAL AND METHODOLOGY**

- 1. Chestnut Flour
- 2. Butter
- 3. Milk
- 4. Sugar Powder

#### 1. Chestnut Flour

Chestnut flour, also called sweet flour, is a flour made by grinding chestnuts. It has a hazelnut-like color and a sweet flavour. It is mainly made in Italian mountain regions, which is between 450 to 900 meters above sea level, where the sweet chestnut can be found.

Chestnut flour is a versatile, gluten-free flour with a slightly sweet flavour that is popular in Tuscan cuisine and can be used as a replacement for wheat flour. It is high in carbohydrates but low in fat and can be used in both sweet and savoury baking.

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#### 2.Butter

This review article shows that more than 230 volatile compounds have been identified in butter, however, only a small number of them can be considered as key odorants of butter aroma. Gas chromatography olfactometry was used to determine the character impact odorants of different kinds of butter.

Sweet cream butter is characterised by lactones with fruity and creamy notes and by Sulphur compounds, having corn-like and garlic odors. The key odor compounds of sour cream butter are diacetyl (buttery-like), butanoic acid (cheesy) and 5-decalactone (peach), mainly due to lactic acid bacteria fermentation. The aroma of butter oil is characterised by aldehydes, such as (E)- and (Z)-2-nonenal and (E,E)-2,4-decadienal, conferring green and oily notes. Olfactometric studies of heated butter showed the formation of new aroma compounds during heating, such as 3-methylbutanoic acid (cheesy), methional (potato-like) and 2,5-dimethyl-4-hydroxy-3- (2H)-furanone (caramel- like). High temperature treatment of butter can also induce off- flavour development.

#### 3.Milk

Milk is a nutrient liquid produced by the mammary glands of mammals. Milk is an emulsion or colloid of butterfat globules within a water-based fluid that contains dissolved carbohydrates and protein. Milk is an excellent source of the nutrients your body relies on to properly absorb calcium, including vitamin D, vitamin K, phosphorus and magnesium. Adding milk and dairy products to your diet may prevent bone diseases like osteoporosis.

Humans have used the milk of other species in their diets for about 8000 years, and a major industry has developed around the processing of milk of a few species, especially cattle, buffalo, sheep, and goats, for human foods. Milk processing, which exploits certain physicochemical properties of milk, is practiced worldwide, especially in Europe and North America. Milk is a very flexible raw material, from which a wide range of different products, including about 1000 varieties of cheese, are produced.

#### 4.Sugar Powder

Powdered Sugar is the finest commercially available confectioner sugar. Specially formulated for the baking trade, it is cane sugar micro pulverized to twice the fineness of ordinary powdered sugar.

Powdered sugar, also called confectioners' sugar, or icing sugar, is a finely ground sugar produced by milling granulated sugar into a powdered state. It usually contains between 2% and 5% of an anti-caking agent - such as corn starch, potato starch or tricalcium phosphate - to absorb moisture, prevent clumping, and improve flow.

#### **Flowsheet For Preparation of Fasting Biscuits**



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Baking (150 to 180° C for 15-20 minutes) ↓ Packaging and labelling ↓ Storage at ambient temperature

**PREPARATION PROCESS OF BISCUITS**: The biscuits were prepared as shown in Fig1. The unit operations involved were as below.

**Mixing:** In this process all ingredients like flour, fat, sugar etc. are put together in the right proportion for dough formation. The ingredients are fed into the mixers, where they are mixed properly to prepare the dough. Here the dough temperature and mixing time play an important role in the manufacturing of biscuits. Normally mixing time is between 10-15 min, but it usually depends upon flour characteristics.

Adding: Baking powder, baking soda, color, essences were used as additives.

**Moulding:** Mixing is followed by moulding, in which the dough is laminated into sheets and is passed down to gauge rollers and appropriate sheet thickness is achieved for cutting. It is here that biscuits are given a variety of shapes and sizes using cutter or moulder. The speed of Moulding or the cutting depends on the variety of the biscuit.

**Baking:** It is the third stage in biscuit making process, where the moulded biscuits are put into the baking oven on required temperatures. There are various baking options with different kinds of ovens available like direct fired, indirect fired and hybrid ovens, which is used as per temperature requirement, convenience and cost. Various methods of heating like conduction, convection and radiation are used in the ovens. Generally, the ovens are classified as zones. Temperature in this will maintained at 180-200°C. In this process, biscuits are put in the aluminium tray and inserted into oven for a certain period of time upto complete baking is done.

**Cooling:** After baking biscuits, natural cooling prior to packing. The temperature is brought down to room temperature. Natural cooling is preferred over the forced cooling as it maintains the texture quality of biscuit. Cooling time will be 15 min.

#### **IV. RESULT AND DISCUSSION**

#### **Determination of Moisture**:

The moisture content of Cookies was determined according to the method given in (Ranganna,1995 a). 5g of crushed sample was taken in tarred crucible and dried in a hot air oven at  $100 \pm 5$  °C till to a constant weight. The moisture content was calculated by the formula given below.

Moisture (%) = 
$$W1 - W2 \times 100$$
  
W

Where,

W1=weight of sample after drying W2=weight of sample after end point W=weight of sample

The most reliable and less time-consuming method for moisture determination was the IR method. 3.5g to 5g of the crushed sample was taken in the aluminium tray and placed the tray inside the instrument and pressed the start button IR radiations started and a red light went on till the complete moisture content was found out, thereafter 30-40 minutes the readings were on the screen and blue light glows, at that time we consider the final moisture content of the sample is same as that on the screen.

Moisture: this was estimated as per the procedure given AOAC, 1999 method.

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Calculate Moisture (%)

Moisture (%) =  $W1-W2 \times 100$  W=38.24-38.00 × 100 5 = 4.8%

#### **Determination of Ash:**

The ash content was determined as a total inorganic matter by incineration of the samples at 600°C according to method given in (Berwal et al., 2006). Remaining inorganic materials are reduced to their most stable form, oxides or sulphates and are considered as "ash".

#### Procedure

Oven dried 3 g sample was taken in a pre-weighed crucible and charred on the burner. Then it was ignited in the muffle furnace at 550-600°C for 5-6hours or till constant weight of greyish ash was obtained. The ash of sample was calculated through following formula.

$$Ash (\%) = \frac{2 - W}{W1 - W} \times 100$$

Where,

W1= crucible with sample weight W2= ash weight

W= empty of weight of crucible

Ash: This was estimated by muffle furnace as per the procedure given Ranganna 2007. Calculated Ash (%)

Ash (%) = 
$$2-W \times 100$$
  
W1-W  
= 47.330-47.280 × 100  
50.280-47.280  
= 1.6%

#### **Determination of Fat :**

The crude oil content was determined by the ether extraction using Soxhlet's apparatus, according to the method given in (Ranganna,1995 b).

Reagent- Petroleum ether was used as a reagent and had a boiling point of 40-60°C.

#### **Procedure:**

About 5 g moisture-free sample was taken on filter paper and made a suitable size packet. The packet was placed in thimble and it was attached to the Soxhlet flask. Then pour the approximately 75 ml of petroleum ether. Then condenser was attached to the thimble and heated the Soxhlet flask at 600C. The extract contented in the Soxhlet flask was dried at 1000C for an hour. Cooled in desiccators and weight was taken. The increase in weight of the flask represented crude fat content. Percent fat content in the sample was calculated using a formula.

Fat (%) = (W2-W1) x <u>100</u>

Where,

W1=weight of round bottom flask W2= weight of fat sample S= weight of sample

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Fat: This was estimated by Soxhlet apparatus by AOAC 1999 method Calculated Fat (%)

Fat (%) = (W2-W1) x 100 = (174.52-174.071) × 100 5 = 8.98%

#### **Determination of Protein:**

The protein content of the samples was determined utilizing the Kjeldahl method. Initially, 2 grams of the sample underwent digestion with 5 grams of a digestion mixture, comprising 10 parts potassium sulphate and 1 part copper sulphate, along with 20 ml of concentrated sulfuric acid. This digestion process continued in a Kjeldahl flask until the contents achieved a state of being carbon-free. The resulting digested sample was then adjusted to a final volume of 100 ml. A 10 ml aliquot of the digested sample was subjected to distillation with 20 ml of 30 percent sodium hydroxide. The liberated ammonia from this process was collected in a solution containing 20 ml of2 percent boric acid, enriched with 2-3 drops of a mixed indicator. cresol green, dissolved in 95 percent ethyl alcohol, with a ratio of 1:5, respectively. The entrapped ammonia was subsequently titrated against 0.1N hydrochloric acid. The nitrogen content in the sample was then calculated using the following expression:

% Nitrogen =

14  $\times$  N of HCL  $\times$  Titre value (ml)  $\times$  Dilution factor  $\times$  100

Weight of  $sample(g) \times 1000$ 

#### Microbial Analysis:

**Nutrient Agar** - Bacteria present on this media were observed by Grams staining. Random colonies were picked and observed. Some colonies were found to contain Gram positive bacteria while some colonies were found to contain Grams Negative bacteria. (gram negative Bascilli) (Clostridium spp were found).

**MacConkey Agar-** Bacterial colonies found on these plates were observed by Gram's staining and found to be Gram positive (Coccus staphylococcus).

**Tryptone broth** - bacterial colonies found on these plates were observed by Gram's staining and found to be Gram positive. (Streptococcus) Fungi (Yeast and mold)- No growth were observed on Meat extract media that directly indicate the possibility of absence of

fungi (yeast and mold) - in given food sample. So no morphological analysis were performed for fungi.

**Result summary of microbial analysis** - given food sample were analysed for presence of different types of microorganisms by isolating and culturing of microorganisms on different media. Overall result of microbial analysis is

1. Given food sample contain different types of bacteria. Different Gram positive and Gram-Negative bacteria were present in given sample.

- 2. No fungi (Yeast and mold) were present in given food sample.
- 3. Lactose fermenter bacteria and Enteric bacteria were present in given food sample.
- 4. Different Indole producing bacteria were present in given food sample.
- 5. No Coliforms and Fecal Coliforms were present in given food sample.

#### Physical Analysis:

Weight: Sample's weights were assessed using a calibrated balance where values were taken spontaneously post tempering.





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**Diameter:** For diameter evaluation value for four cookies (kept edge to edge) were taken by using a measuring scale. Samples were pivoted perpendicularly for another set of reading. Both the values were averaged to determine the mean diameter.

**Thickness**: The cookies' thickness was evaluated using a Vernier Calliper (0.01 mm precision). Six biscuits were stacked randomly, and their height was measured. The average thickness of each individual biscuit was calculated.

**Sensory analysis:** Sensory analysis for appearance, flavor, chewability, and overall acceptability was analysed using the numerical scoring test. Numerical scoring was performed: excellent:9-10, good: 6-8, fair: 4-5, and poor: 1-3. Every panellist was asked to evaluate the sample on a 10-point scale.

Samples	1	2	3	4	5	6	7	8	9	10
Weight(g)	6.92	6.95	6.87	6.23	6.52	5.72	6.82	8.39	8.80	8.54
Thickness(mm)	3.69	1.85	2.09	1.67	1.77	1.97	2.02	4.03	4.20	3.70
Diameter(mm)	43	44	42.29	43.01	41.79	40.71	42.07	43.15	43.30	43.05

Average weight of Biscuit: -7.176g Average Thickness of Biscuit: - 2.699mm Average Diameter of Biscuit: - 42.637mm

#### **OBSERVATION:**

The biscuits were prepared as per the procedure as mentioned in the above method. The changes were observed after baking in regards of its appearance, color, surface roughness or smoothness etc. The quality was judged by sensory evaluation carried out by a panel of 5 judges (the academic staff of department of food technology) using 9-point hedonic scale.

#### Sensory evaluation prepared different formulation:

Attributes	Trial I	Trial II	Trial III
Colour	6.66±0.57	7.66±0.57	7.33±0.57
Mouthfeel	8.33±0.57	7.66±1.15	7.33±0.57
Aroma	8.33±0.57	7.33±1.15	8.66±0.57
Appearance	7.66±0.50	8.33±1.15	7.66±1.15
Overall acceptance	7.66±0.57	8.00±1.00	6.66±0.57

#### Analysis: -

Name of Test	Results
Moisture	4.8%
Ash	1.6%
Fat	8.98%
Microbial	Grams Negative Bacteria
Protein	11.76%
Fibre	3.61%





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Final Product:



**Fig. Chestnut Flour Biscuit** 

#### V. CONCLUSION

Biscuits have evolved into a vital component of our daily lives as a beloved snack relished by people of all ages. The Fasting Biscuits prepared out of 100g chestnut ,50g butter, 50 g sugar, and 10g milk powder attains good sensory and textural properties with maximum acceptance during sensory analysis. Fasting Biscuits was prepared to asses nutritional quality associated with different ingredients, which can be used during fasting days to give health benefits and dense energy to the body. Study was conducted on different samples based on different proportion of chestnut flour, butter, sugar and milk powder. Sample was the most acceptable and the best sample selected during sensory evaluation on the basis of above results revealed in the presented study it might be conclude that this formulation of fasting cookies was possible to satisfy consumer taste and preferences and will be accepted in the market as fasting purpose.

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