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Formulation and standardization of cookies integrated with fruit peels and seeds

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Abstract

This study presents an innovative approach to develop nutritious and flavourful wheat-based cookies by integrating orange and avocado peel, along with jackfruit and muskmelon seeds. The cookies were formulated, baked, and subjected to sensory evaluation to assess their taste, texture, and aroma. The results revealed that the integration of orange and avocado peel extracts positively influenced the cookies flavor, aroma, and texture. Furthermore, the enriched cookies exhibited improved heart and bone health, anti-inflammatory properties, and antioxidant activity, possibly providing functional benefits to the traditional wheat-based product. It is also a great source of protein, carbohydrates, fat and phenolic components such as terpenoids, saponin, and flavonoids including anthocyanin. The findings of this study demonstrate a promising combination of wheat-based cookies enriched with various plant based ingredients, offering a delicious and nutrient-rich snacking option for health-conscious consumers who are looking forward for maintaining their weight. The successful development of these cookies suggests a promising approach to reducing food waste while promoting sustainability and enhancing the nutritional value of baked goods.

Keywords: Food fortification, orange peel, avocado peel, vitamin c, jack fruit seeds, musk melon seeds, anti-inflammatory flavonoids, anthocyanin

Introduction

One of the major segments of food processing in India is baking industry. Baked goods are very popular due to their easy availability, convenience and long lifespan. Cookie is the most common snack used by children and adults. Consumers are increasingly aware of the ingredients that have an impact health in both positive and negative aspects. The number of these health-conscious consumers is growing rapidly is growing, as is the health food industry. New foods with new health claims are flooding in market to meet the diverse needs of consumers. However, there are still many opportunities to enhance the nutritional value of biscuits in both quantity and quality. In this regard, there are some food ingredients that have special nutritional properties. Added value to existing foods containing those ingredients is a simple and feasible way to improve the nutritional value of food and thus improve health ^[1]. Their growing demand also enlarges the reach of their production, fortifications and other nutritional improvement. The goal of enrichment is primarily to maintain the nutritional quality of the products, to maintain adequate levels of nutrients in order to correct or prevent specific nutritional deficiencies in the population from certain deficiencies, to increase the added nutritional value of a product from orange peel, avocado peel, jack fruit and muskmelon seeds ^[2]. Orange peel powder is a rich source of crude fiber, phenolic compounds, β carotene ^[3]. Avocado fruit has great nutritional significance as a source of carbohydrate, protein, and fiber and the avocado contains essential micronutrients for human consumption such as vitamins, minerals, and polyphenols ^[4]. Jackfruit seed can be converted into flour and to be used as a protein and carbohydrate supplement in diets or can also use as a functioning agent in a variety of formulated foods in bakery product ^[5]. Muskmelon is an excellent cause of naturally active compounds for people due to the good taste and rich chemical composition. Glucose and fructose, vitamin A, D, C, K, E, and some vitamins from group B are present in muskmelon ^[6].

Materials and Methods

Preparation of cookies

Step 1: Selection of raw materials wheat flour 40g, Maida 15g, orange peel powder 5g, avocado peel powder 4g, jackfruit seed powder 3g, muskmelon seed powder 2g, cocoa powder 1g, cashew 4 pieces, almond 3 pieces, pista 3 pieces, jaggery 35g, butter 26g, milk 15ml, baking soda 0.5 g.

Step 2: Cleaning: Wash the orange and avocado thoroughly under running water to remove any dirt or residue, Pat them dry with a clean towel. For the jackfruit seeds, remove them from the fruit and rinse them to remove any pulp or debris

Step 3: Peeling: Remove the orange peel, carefully cut away the outer layer using a knife or peeler, being careful not to cut through the bitter white pith. Cut the peel into small pieces. Using a knife carefully cut the avocado peel. Gently remove the thin outer skin from the jackfruit seeds.

Step 4: Drying: Preheat the hot air oven to 40 °C, spread out the orange peel, avocado peel, jackfruit seeds and muskmelon seed on the plate in a single layer, separately and Let them dry at temperature 40 °C as mentioned in Table 1.1, until they become completely dry and brittle, observe carefully to prevent over-drying or burning. After

drying remove the orange, avocado peel, jackfruit, and muskmelon seeds.

Table 1: Drying of samples using Hot air oven

Sl. No.	Sample	Time
1	Orange peel	4 hrs.
2	Avocado peel	2 hrs.
3	Jackfruit seed	6 hrs.
4	Muskmelon seed	2 hrs.

Step 5: Mixing: In a mixing bowl, combine above all measured ingredients with butter and mix by hand until smooth, gradually add milk and knead the mixture into smooth dough. Adjust the amount of liquid as needed to achieve the right consistency.

Step 6: Baking and cooling: Preheat the Micro oven to the temperature at 180 °C. Roll out the cookie dough on a lightly floured surface to your desired thickness, Use cookie cutters to cut out shapes, approximately eight pieces of cookies are prepared, Place the shaped cookies on a baking sheet lined with tray, Place the tray in the preheated oven for the specified time or until they turn golden brown. This typically takes about 15-20 minutes (Fig 1). Remove the cookies from the oven and let them cool and once completely cooled and sensory evaluation was done by different panel.



Fig 1: Cookies were baked in micro oven

Determination of pigments and phenolic compounds in a jackfruit and muskmelon seeds

Estimation of total anthocyanin in avocado peel: Blend the avocado peel the usage of blender, Weigh correctly 0.5 of avocado peel powder right into a beaker, Add 20 ml of ethanol Hcl and maintain apart the content material for 10 minutes, Then clear out out via sintered funnel, wash the residue with ethanol Hcl until it will become colorless, Transfer the filtrate to a volumetric flask after which made on top of things with ethanol Hcl and Shake properly study the absorbance the use of colorimeter at 535 nm ^[7].

Extraction of jackfruit seed powder: The dried seed of the jackfruit became pulverized into powdered form. After that, jackfruit seed powder (5 g) became macerated the use of methanol for 24 hrs. The solvent was replaced every 24 hrs. The extract that turns into acquired from maceration emerge as centered using a rotary evaporator in an effort to accumulate methanol extract.

a) Terpenoids test: The extract of jackfruit seed became inserted one by one into 1 ml check tubes and delivered with 0.5 mL of acetic acid anhydride and 2ml of sulfuric acid. The formation of green, bluish, and brown solutions indicated the Terpenoids presence ^[8].

b) Flavonoid test: Separately, the jackfruit seed extract was added to test 1-milliliter tubes along with 0.2 grams of powdered magnesium and two milliliters of concentrated Hcl. The presence of flavonoids was indicated by the formation of red, orange, and green solutions ^[9].

Extraction of muskmelon seed powder: The muskmelon seed was dried and ground into a powder. Next, add 10ml of ethanol to a conical flask containing 2g of powdered muskmelon seed. Stir thoroughly. Put a rubber stopper on it and shake the conical flask at 140 rpm for 48 hours. Next,

remove the shaker and use Whatman filter paper to extract the sample.

a) **Saponin test:** Separately, the extract and fractions of muskmelon seed were added to 1 ml test tubes along with 2 ml of hot water. The tubes were then cooled and shaken for 10 seconds. It was declared positive for Saponin if the fume generated stabilized in less than 10 mins ^[10].

b) **Flavonoid test:** Transfer 1 milliliter of muskmelon seed extract into a test tube. Make a 10% sodium hydroxide solution separately, and then add 1 milliliter of it to the extract. The formation of yellow color indicates the presence of flavonoid ^[11].

Results and Discussion

The cookies are fortified ingredients like orange peel; avocado peel, muskmelon seeds, and jackfruit seeds can add unique flavors and nutritional benefits.

Trials for making cookies

Trial 1: wheat flour 65 g, Maida 25 g, orange peel powder 5g, avocado peel powder 4 g, jackfruit seed powder 3 g, muskmelon seed powder 2 g, cocoa powder 1.5 g, cashew 4 pieces, almond 3 pieces, pista 3 pieces, jaggery 35 g, butter 50 g, milk 40ml, baking soda 0.5 gm.

Trial 2: wheat flour 60 g, Maida 20 g, orange peel powder 5g, avocado peel powder 4g, jackfruit seed powder 3g, muskmelon seed powder 2 g, cocoa powder 1g, cashew 4 pieces, almond 3 pieces, pista 3 pieces, jaggery 40g, butter 35g, milk 45ml, baking soda 0.5 gm.

Final trial: wheat flour 40 g, Maida 15 g, orange peel powder 5 g, avocado peel powder 4 g, jackfruit seed powder 3 g, muskmelon seed powder 2 g, cocoa powder 1g, cashew 4 pieces, almond 3 pieces, pista 3 pieces, jaggery 35 g, butter 26 g, milk 15ml, baking soda 0.5 g. (Fig 2) And the proximate analysis of cookies were analyzed finally.



Fig 2: Baked Cookies

Table 1: Proximate analysis of final product Cookies

Sl. No	Parameters	Units	Protocol	Results
1	Moisture	g/100 g	IS:16072	4.80
2	Protein	g/100 g	IS:7219	9.69
3	Fat	g/100 g	IS:7874	24.84
4	Total Ash	g/100 g	IS:14433	1.83
5	Carbohydrates	g/100 g	IS:1656	58.84
6	Energy	K. Cal/100g	By calculation	498.00

Sensory evaluation: The students from the department of food and nutrition at Padmashree Institution of management and sciences, Bangalore, Karnataka, assessed the cookies sensory qualities. To determine how much people, enjoy the cookies, the sensory analysis employed the nine-point hedonic scale. The participants were given instructions to rank the coded samples according to their level of liking for each sensory attribute, including color, appearance, aroma, texture, taste, and overall acceptability. (Fig 3)

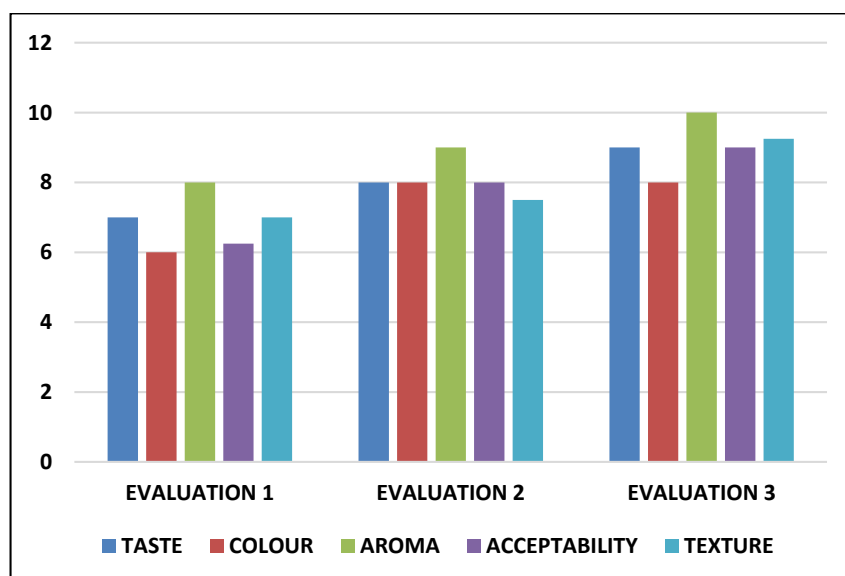


Fig 3: Sensory evaluation graph for cookies

The cookies contain orange peel in which the ascorbic acid about 0.254mg/ml. Vitamin C enhances the absorption of non-heme iron (the type of iron found in plant-based foods) from the diet, which is particularly important for individuals who follow a vegetarian or vegan diet. Avocado peel contains anthocyanin pigment, which has anti-oxidative and antibacterial properties and approximately 35.64 mg/g. It also protects against a number of non-communicable diseases and enhances neurological and visual health. Incorporation of Muskmelon and Jack fruit seeds in cookies which contains phenolic compounds which are important in determining the antioxidant activity of food items. Including flavonoids which have antioxidant properties, anti-inflammatory properties, helps in cardiovascular health by lowering blood pressure, improving blood vessel function, and lowering risk of heart disease. They are believed to improve cognitive function, memory, and protect against age-related cognitive decline. Terpenoids possess antitumor, anti-inflammatory, antibacterial, antiviral, antimalarial effects, promote transdermal absorption, prevent and treat cardiovascular diseases, and have hypoglycemic activities. Saponin decrease blood lipids, lower cancer risks, and lower blood glucose response. A high Saponin diet can be used in the inhibition of dental caries and platelet aggregation, in the treatment of Hypercalciuria in humans, and as an antidote against acute lead poisoning. Even small amounts of Nutraceuticals-rich foods, like cookies, can have a long-term positive impact on health and wellness. It could be a part of a well-balanced diet that has an emphasis on disease prevention and health maintenance. Nutraceuticals cookies might be advantageous, but it's important to keep in mind that the true health of these cookies primarily depends on the product's overall quality, the origin of its ingredients, and portion control.

Benefits of prepared cookies

The cookies contain a rich source of antioxidants, vitamins, phenolic compounds and anti-inflammatory sources. They help in weight management for those who are health conscious and looking forward to maintain their weight. They are also rich in antioxidants such as flavonoids and carotenoids. These compounds help neutralize harmful free radicals, reducing oxidative stress and potentially lowering the risk of chronic diseases. The cookies are rich in protein content. Proteins help in various bodily functions including muscle maintenance and repair, enzyme production and immune system support. It contains minerals like potassium phosphorus magnesium and iron. Muskmelon seeds are rich in essential minerals like magnesium, potassium, phosphorus, and iron. These minerals play vital roles in various bodily processes, such as maintaining electrolyte balance, supporting bone health, and carrying oxygen in the blood.

Conclusion

To create a unique and sustainable cookie recipe by incorporating unconventional ingredients such as orange peel, avocado peel, jackfruit seeds, muskmelon seeds, milk, butter, and jaggery. Through experimentation and innovation, we have successfully developed a delicious and nutritious cookie that not only tantalizes the taste buds but also promotes environmental sustainability by reducing food waste. The cookies are a testament to the power of creativity and resourcefulness in the culinary world. By using

ingredients that are often discarded, we have demonstrated that culinary excellence can go hand in hand with sustainability. The combination of wheat flour, jaggery, and these unique ingredients has resulted in a delightful blend of flavors and textures that is sure to please anyone seeking a wholesome and eco-friendly treat.

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