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Navathaniyam Biscuits: Redefining Food

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Navathaniyam Biscuits: Redefining Food

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Abstract: The modernization of food and food production techniques resulted in a major decline in the nutritional profile of food products. Fortification and enrichment are the modern solutions to consider. But to what extent will it help? Traditional food products and food production methods flourish with vital nutrients. The current study restructures the conventional approach to biscuit making, intended to prepare and evaluate the whole nutritious food made from Navathaniyam, a blend of nine grains. From the organoleptic evaluation, the combination of flours employed in trial 2 was more preferred. Incorporating the blend of nine diverse varieties of cereals and pulses will be a novel food product.

Keywords: Biscuits; Navathaniyam; cereals; pulses.

Introduction:

Human lives on earth are made possible by a major element called food. The evolution of mankind, from primitive caves to exploration of Mars, all came along with the evolution of food and food products. Changes in eating habits, westernization, industrialization, and even many other such factors through the centuries have depleted the quality of the food that we consume. There is no one to blame; humans in the race of colonization forget to feed on healthy food. Intensive use of synthetic fertilizers and pesticides further causes a reduction in the nutritional composition of agricultural goods. Turning back to our traditional roots might be the wiser decision to make. Organic farming methods and lifestyle changes are the key aspects to be considered. On this node, Navathaniyam, the term describes nine grains as per Ayurveda. In ancient Hindu philosophical teachings, these nine grains are vital for daily nutritional supply, and they are also associated with some mythological beliefs. The nine grains include wheat, rice, chickpeas, moong dal, black gram, toor dal, horse gram, black sesame, and broad beans [1].

It is a combination of cereals, pulses, and oil seeds. They serve as good sources of carbohydrates, protein, fat, fiber, vitamins, and minerals. Food made from navathaniyam is often considered a complete food, which offers good nutritional absorption and assimilation [2]. Wheat is a stable crop around the world; it is used in the manufacture of many food products. Wheat as a whole grain is rich in a sufficient amount of starch and energy; apart from that, it also has a great amount of dietary fiber, B-complex vitamins, and phytochemicals [3]. Wheat consumption reduces the risk of cardiovascular diseases, type 2 diabetes, obesity, and even certain types of cancer [4]. Refined wheat flour with bran and germ removed is deficient in vital nutrients; hence, it is advised to consume whole wheat flour. Inversely refined flour increases the risk of coronary artery disease, type 2 diabetes, cardiovascular diseases, and hypertension [5]. Another important thing to remember while consuming wheat is that it is rich in gluten; people who are allergic to gluten should take more precautions towards it. Consuming wheat may trigger celiac disease, wheat allergy, and non-celiac gluten sensitivity. Irritable bowel syndrome and Crohn's disease are the most common symptoms of gluten intolerance [6].

Rice is the most common stable cereal in Asian countries. Rice is often referred to as a grain of life and a food from Asia. Rice is rich in carbohydrates, fat, and protein, including four different fractions such as prolamin, glutelin, globulin, and albumin [7]. The bran, which is the outer layer, contains B vitamins, minerals, bioactive phytochemicals, phytosterols, and carotenoids. The germ layer is rich in lipids, antioxidants, vitamin B and E, and phytochemicals [8]. Rice with high protein,

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low fat, low cholesterol, and heavy metals aids in muscle recovery; the absence of gluten also prevents gluten intolerance and increases easy digestibility [9]. Rice also possesses anti-cancer and anti-inflammatory properties [10], suppresses hyperglycemia [11], and reduces cholesterol levels [12]. Chicken pea is another widely grown and consumed pulse variety around the world. Mostly consumed for its higher protein content, which is higher than cereal grains, it also has an adequate amount of dietary fiber, beneficial unsaturated fatty acids, and micronutrients [13]. Chicken pea has a higher fat content than any other pulse [14], which adds to the desirable texture, flavor, aroma, and shelf life of chickpea-based food products [15]. Chickpeas help to maintain weight [16], have a low glycemic index [17], significantly improve insulin resistance and prevent postprandial hyperglycemia and hyperinsulinemia [18], significantly reduce serum total cholesterol and low-density lipoprotein cholesterol [19], and eliminate the risk of cardiovascular disease [20].

Studies also suggest chickpeas maintain healthy bowel movements [21]. Moong Dal is native to the Indian Subcontinent. Moong beans are a high source of manganese, potassium, magnesium, folate, zinc, B-complex vitamins, and copper. It is rich in fiber and controls appetite, thus having a fuller effect. Health benefits include aiding in weight loss, maintaining heart health, preventing diabetes, improving digestion, and even boosting blood circulation [22]. Black grams are widely grown in South Asia and used in Indian cuisine. [23] Black gram is rich in protein, minerals (calcium, magnesium, phosphorus, zinc, and iron), carbohydrate, vitamins, fat, phytic acid, and also contains antinutritional factors such as α-amylase inhibitors, trypsin and chymotrypsin inhibitors, and tannins, which induce flatulence. Several processing techniques, like soaking, roasting, sprouting, fermentation, and heating, can reduce anti-nutritional factors in the grain [24]. Toor dal, an important pulse crop grown in India, is consumed for its protein content. Several research findings suggest toor dal has anti-diabetic and hypolipidemic properties [25], promotes liver health, shows antimicrobial activity [26], and has antioxidant properties [27]. Horse gram is a legume grown in the southern Asian region; it is considered a super food. It is well known for its distinct taste and texture.

Horse gram has a higher nutritional content and has many therapeutic properties and bioactive substances such as phytic acid, fiber, phenolic acid, enzymatic, and proteinase inhibitors. It is used to treat degenerative and autoimmune diseases, obesity, and fever [28]. Sesame belongs to the genus Flax, which is an oil seed used in the production of gingelly oil. Black sesame provides various health benefits; it prevents the development of atherosclerosis [29], lowers cholesterol levels [30], exhibits anti-inflammatory [31], and has anti-cancer properties [32]. Broad bean, known as fava bean, is extensively grown in tropical to temperate regions for its higher protein content, balanced amino acid profile, and deficiency in methionine and cysteine. Broad beans boost immune defense [33] and have antidiabetic, antihypertensive, anti-inflammatory, and cholesterol-lowering effects [34]. Among baked food products, biscuits and cookies are the most commonly consumed. Biscuits commercially available are made from refined flour, which is nutritionally deficient. To address this issue, a blend of nine grains would be a wiser choice. The current work focuses on the production of navathaniyam biscuits and assessing their organoleptic profile.

MATERIAL AND METHODS

Materials: Navathaniyam (wheat, rice, chickpeas, moong dal, black gram, toor dal, horse gram, black sesame, broad beans), palm jaggery, milk powder, butter, baking powder, salt, and vanilla essence.

For delectability and based on the functional and physicochemical properties of the flours, those were classified into three classes.

Table 1. Grouping of flours.

Group	Flours
A	Wheat
B	Rice, Chickpeas, Moong dal, Black gram
C	Toor dal, Horse gram, Black sesame, Broad beans

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Formulation and Preparation of Biscuits: All the ingredients were added to the compositions as shown in Tables 2 and 3. For better insight, the composition of biscuits was noted down in separate tables.

Table 2 Navathaniyam flour composition.

Table 3 All baking ingredients.

Biscuit were baked at 180°C for 20 min in the oven. Baked biscuits were cooled and stored in optimum conditions for further analysis.

Table 2. Treatment used in formulation of blend of the Navathaniyam flours.

Treatment	Wheat (g)	Rice (g)	Chickpeas (g)	Moong dal (g)	Black gram (g)	Toor dal (g)	Horse gram (g)	Black sesame (g)	Broad beans (g)
T0	100	0	0	0	0	0	0	0	0
T1	50	10	10	10	10	2.5	2.5	2.5	2.5
T2	50	7.5	7.5	7.5	7.5	5	5	5	5
T3	50	6.25	6.25	6.25	6.25	6.25	6.25	6.25	6.25

T0 – control biscuits with 100% wheat flour and 0% of all other group flours.T1– 50% of wheat flour, 10% of group B flours and 2.5% of group C flours.T2– 50% of wheat flour, 7.5% of group B flours and 5% of group C flours.T3– 50% of wheat flour, 6.25% of group B flours and group C flours.

Table 3. Treatment used in formulation of blend of other ingredients.

Treatment	Palm jaggery (g)	Butter (g)	Milk powder (g)	Salt (g)	Baking powder (g)	Vanilla essence (drops)
T0	60	20	5	1	.5	2
T1	60	20	5	1	.5	2
T2	60	20	5	1	.5	2
T3	60	20	5	1	.5	2

Sensory analysis: Sensory analysis was carried out based on hedonic rating by ten trained panellist. The panellists assessed the biscuits for its colour, taste, texture, flavour, and overall acceptability. Each sensory attribute was rated on a 9 point hedonic scale: extremely liked – 9, very much liked – 8, moderately liked – 7, slightly liked – 6, neither liked nor disliked – 5, slightly disliked – 4, moderately disliked – 3, very much disliked – 2 and extremely disliked – 1.

Result and Discussion:

Sensory evaluation of formulated biscuits: The outcomes of the sensory evaluations are marked in Table 4. The overall acceptability of the formulated biscuits followed the order of T2>T1>T0>T3.

The trial T2 has the maximum score for colour (8.3); the colour was more appealing in the tone of light to dark brownish shade. The study revealed that increase in the volume of the composite flour increases the darker shades of the biscuits. The desired colour of the biscuits were obtained at T2 is mainly due to the combination of various flours at correct proportions and the maillard reactions that occurs during baking of biscuits. Caramelization and millard browning produce brown colour during baking [35–37]. Furthermore the T3 has the lowest score (7.01), the biscuits were darker in shade. This is majorly due to the functional properties of the group C flours, the floured black sesame imparts black colour to the flour and upon baking and the onset of maillard reactions, and the colour darkens much more resulting in biscuits with charred tone. Studies also found that sesame seed separately forms maillard reaction products which are predominantly responsible for the colour of biscuits [38]. Additionally the seed coat of the black gram darkens the colour of the biscuits. The

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colour changes during baking is further influenced by factors such as water activity, pH, baking time and temperature, moisture content, batter consistency, volume of sugar added, and flour ratio [39,40].

The texture of the biscuits was smooth, and the crust was crunchy in T2 (8.54), whereas in T3, the texture was crumbly and grainy. This may be due to the notable dry, hard texture of the horse gram used. [41] Studies also showed a similar textural effect on the increase in horse gram flour. When the concentration of sesame increases (2.5 to 5%), the texture becomes smooth and buttery, which is more desirable, but when it is higher than the stated level, the texture is not desirable. This is due to the release of oil from sesame during high-temperature baking. A study conducted on oil extraction from sesame shows roasting facilitates an increased extraction rate [42]. The same effect can be observed here. The black gram offers a creamy texture to the biscuits.

The taste profile of T2 was more appealing, with the combination of various pulses and cereals making the right proportion for a delightful taste. At T2, the wheat and rice flour provide a nutty flavor; chicken pea imparts a strong earthy flavor, but at an optimal level in T2, but at T1 (10%) concentration, the earthy taste is dominant. The taste was more unappealing in T3. The taste was a combination of nutty, bitter, savory, and astringent. Higher volumes of sesame impart a bitter taste, which is its characteristic property. Horse gram is responsible for the astringent taste.

Table 4. Sensory evaluation of formulated biscuits.

Treatment	Colour	Texture	Taste	Flavour	Overall acceptability
T0	7.54	7.61	7.96	7.41	7.63
T1	7.56	8.21	8.11	7.98	7.96
T2	8.3	8.54	8.92	8.77	8.63
T3	7.01	6.89	6	5.98	6.47

T0 – control biscuits with 100% wheat flour and 0% of all other group flours.T1– 50% of wheat flour, 10% of group B flours and 2.5% of group C flours.T2– 50% of wheat flour, 7.5% of group B flours and 5% of group C flours.T3– 50% of wheat flour, 6.25% of group B flours and group C flours.

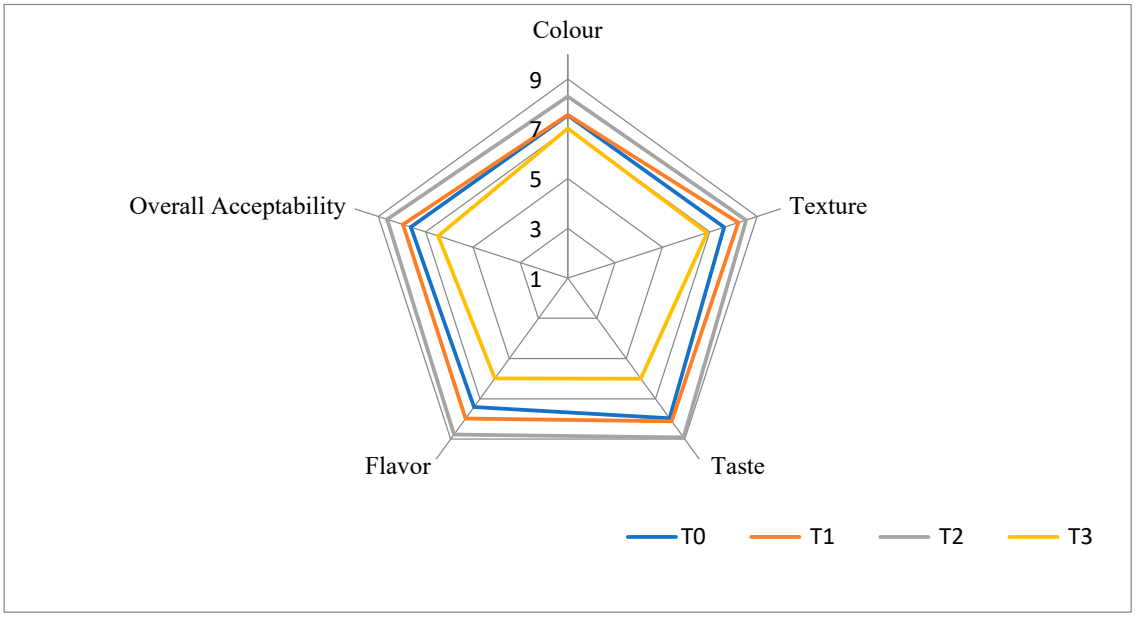

Figure 1. Sensory scores of formulated biscuits.

Conclusion:

The current work demonstrates the production and subjective sensory analysis of navathaniyam biscuits. The incorporation of nine different varieties of fundamental food elements might provide complete nourishment to the body. Hanging on to the market-hyped refined flour biscuits, which are loaded with tons of sweeteners and artificial preservatives, doesn't add value to health in the long run. Avoidance of refined products and goods is the need of the hour. Navathaniyam biscuits will serve as a source of natural dietary fiber and micronutrients, as these biscuits don't need a show-off step of fortification. From the organoleptic profiling, trail T2 [a combination of 50% wheat flour, 7.5% Group B flour, and 5% Group C flour] was more preferable, and it doesn't modify any physical structures, aroma, or taste that a biscuit typically has. But in trial T3, when the volume of Group C flour increased, the biscuits were undesirable. These findings suggest that the application of the navathaniyam grains as a base for making biscuits resulted in the discovery of an all-rounder biscuit that is loaded with micro and macro nutrients without any compromise in other parameters of the commercially available biscuits.

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