



# Quality Characteristic of Development Defatted Soya Flour and *Aloe vera* Based Functional Biscuits

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## Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript.

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## ABSTRACT

Biscuits are one of the world's most consumed foods and are highly demanded. On this basis, for its functional properties, attempts were made to develop biscuits incorporating *Aloe-vera* gel. For the making of the composite flour, defatted soya flour and rice bran were blended with refined wheat flour (Maida) in various proportions before being fortified with *Aloe vera* gel at amounts ranging from 5 to 20%. The possibility of fortified the *Aloe-vera* gel to formulate the functional biscuit which have the ability to improve the quality of food product due to different functional attributes. The study's main objective was to characterise the nutritional and sensory qualities of *Aloe-vera*-based biscuits. The immediate structure and sensory evaluation of biscuits with 10%,20%and 30% *Aloe-vera* were studied to determine the optimal formulation. It has been found that biscuits containing 20% *Aloe-vera* gel are the superior to biscuits containing 20% and 30% *Aloe-vera*. Protein enrichment of biscuit satisfies the demand for a higher content of the nutrient, as these product tend to have lower content of protein (7-10%). Due to their useful features,It would be helpful to provide more specific details about the functional attributes of *Aloe vera* gel and how it

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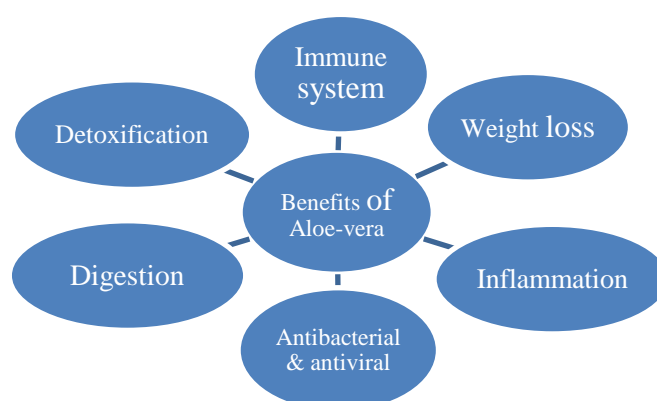
contributes to the improvement of the quality of the food product. The biscuits based on *Aloe vera* can also be beneficial to the most vulnerable population in poor countries. Biscuits are popular and convenient food product due to ready to eat nature.

**Keywords:** *Aloe-vera gel*; *quality attribute*; *functional biscuit*; *natural product*; *health benefit*.

## 1. INTRODUCTION

According to the well-known saying, a physical heal this a strong mind. A healthy diet can lead to a healthy life, if you eat a well-balanced diet that includes all of the important nutrients your body requires. The significance of essential nutrients and components cannot be overstated, as they are critical to living a healthy and happy life [1]. *Aloe-vera* gel is helpful for ulcerative colitis and pressure ulcers. *Aloe vera* gel has traditionally been used topically (to heal wounds, mild burns, and skin irritations) and orally to treat constipation, coughs, ulcers, diabetes, migraines, arthritis, and immune-system problems [2]. *Aloe vera* is a traditional herbal plant connection to the Liliaceae family. Aloe comes from the Arabic term "alloe", that means "bitter" [3]. The *Aloe vera* plant and its related products have been used in medicine and health care since the 4th century B.C., when ancient Greek doctors got aloe from the Indian Ocean island of Socotra. There are also many romantic stories about it, such as how Egyptian Queens Nefertiti (1353 BCE) sold herself as "the most gorgeous woman who ever lived" and Queen Cleopatra VII (69-30 BCE) used it as part of their daily beauty strategies and medications [4]. *Aloe vera*, a semi-tropical tree, has a long and illustrious history dates back to historical times. It has been described repeatedly in historical accounts and is regarded as an excellent all-purpose herbal plant. Recently, an extract of *Aloe barbadensis* Miller (1768), commonly known as "*Aloe vera*,"

was found to be genotoxic in both bacterial and mammalian systems [5]. *Aloe vera*, also known as "Heaven's blessing," has been used since time immemorial to successfully treat a variety of skin, respiratory, and gastrointestinal infections. When an adult *Aloe vera* plant is 3-4 years old and mature, it can grow up to 30 inches long and have up to 21 leaves. The *Aloe vera* plant are a spherical cactus-like xerophytes that grow in warm tropical and subtropical climates even in the face of constant drought. The mature plant can grow to be up to 4 feet long. The plant produces 12-16 basal leaves per plant and has thick fibrous roots. Succulent leaves are the plant's economic parts. A mature leaf can weigh up to 1.5 kg. The *Aloe vera* plant has a life span of about 12 years and matures in 4 years. Each plant can have three to four leaves removed, and it can be harvested every 6-8 weeks. *Aloe vera* gel is the gelatinous substance derived by the inner parenchymal cells of leaves. Since the 1950s, *Aloe vera* gel has been widely used as a base for nutritional drinks, moisturizer, and a healing agent in drugs and cosmetics [6]. It also works well as a hair styling gel, especially for curly or fuzzy hair. It is also used in the production of cosmetics, moisturisers, soaps, sunscreens, shampoos, and creams. *Aloe vera* gel is beneficial for dry skin diseases such as eczema around the eyes and sensitive face skin [7]. Because *Aloe vera* is high in nutrients, some of its most significant benefits are listed in Fig. 1 (Mikoajczak and Sport, 2018).



**Fig. 1. Benefits of *Aloe vera***

It is also believed that aloe vera gel is the most effective natural anti-*H. pylori* agent for preventing gastric ulcers and infection. *Aloe vera* is used in functional food and as a component of various other foods. The essential nutrients and micronutrient of *aloe vera* increase the nutritional content of food product and make the body for more powerful [3]. *Aloe vera* juice is widely utilised in food items such as ready-to-drink beverages, soft drinks, laxative beverages, health drinks, and energy drinks. *Aloe vera* concentrates of varied consistency are used to make jams, jellies, and squashes. The concentrates can also be blended with water, juice, or tea. Aloe powder can be consumed in ice cream, "lassi" (yoghurt drink), biscuits, yoghurt, *Aloe vera* "laddu" (local sweet), and other foodstuffs. Aloe gel fillet is used to make aloe vitamin, sweets, chewing gum, fast *Aloe vera* tea granules, and Aloe gum for painful or bleeding gums [6]. Functional food was first used in 1980 in Japan to describe foods containing specific ingredients that are goods for human active growth. Food availability may help improve overall body conditions or reduce the prevention of specific illness. The demand for nutritional foods is increasing day by day [1]. The goal of the current investigation was to find the optimal ratio of *Aloe vera* rind, mint leaves, and cinnamon to produce herbal teas with desirable properties and panellist approval [8]. Consumers prefer foods that simultaneously provide healthy and health advantages; the dairy farming is more developed in functional food terms than the world's bakery industry. The baking industry is still in its infancy. However, Bakery company products provide a perfect matrix for delivering functions as acceptable foods to the end consumer. Worldwide, the baking business is recognised to be the main food producing industry, and the baking industry's items offer an ideal matrix for providing functionality to the final buyer as accepted food. Around the world, the baking industry is recognised to be the main food processing sector. Due to their accessibility and extended shelf life, baked foods like cookies and biscuits are very popular. The majority of biscuits are bad to eat since they are low in vitamins and minerals and heavy in fat and carbohydrates. A new recent trend in biscuits is the addition of plant based extracts, natural fruit juices, and peel flour of different fruits, veggies, and plants [3]. A number of its therapeutic qualities *Aloe vera* has been employed in a variety of industrial uses including pharmaceuticals, cosmetics, and food companies [9].

## 1.1 Chemistry of *Aloe vera*

*Aloe vera* leaflets are divided into two sections: The outer green skin and the inner colourless pulp. This pulp or parenchyma tissue contains 98.5% water in the form of a viscous gel, cell walls, and organelles. The gel is 99.5% water [6]. 80% of the remaining water soluble components or 0.5-0.6% of solid portion, is made up of nutrients like polysaccharides, vitamins, enzymes, amino acids, minerals, and trace elements. Phyto-sterols, phenolic compounds, organic acids, and other compounds are examples of nonnutritive compounds. Seasonal factors influence the proportions of various chemical components of the gel. The synergistic action of *Aloe vera* gel is credited with its beneficial properties of this heterogeneous chemical composition rather than any individual active ingredient. The chemical composition of *Aloe vera* gel is complex, resembling a who's who of chemical ingredients. Vogler and Ernst's 1999 review list was adapted from a larger list of ingredients reported by other studies and includes 75 possibly active components such as amino acids, carbohydrates, lignin, saponins, salicylic acids, vitamins, enzymes, and minerals (Sujatha et al. 2014).

## 1.2 Application of *Aloe vera* in foods

The medicinal, functional, and nutritional benefits of *Aloe vera* gel can be enhanced by adding it to food. *Aloe vera* is also used as a dietary enhancement. The following section elaborates on the use of *Aloe vera* in different food section [5]; (Sujatha et al. 2014).

Novel *Aloe vera* components and their health benefits in the Fig. 2 [10].

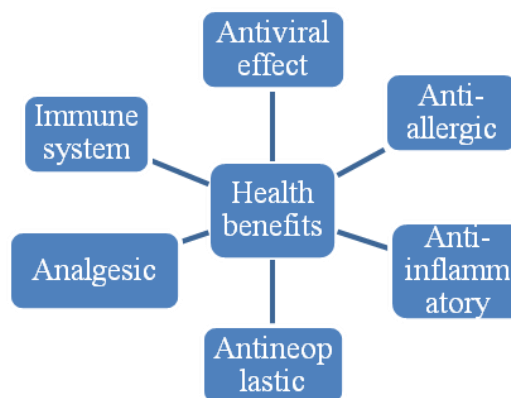


Fig. 2. Health benefit of *Aloe vera*

## 2. MATERIALS AND METHODS

### 2.1 Preparation of Extraction of *Aloe vera* Gel

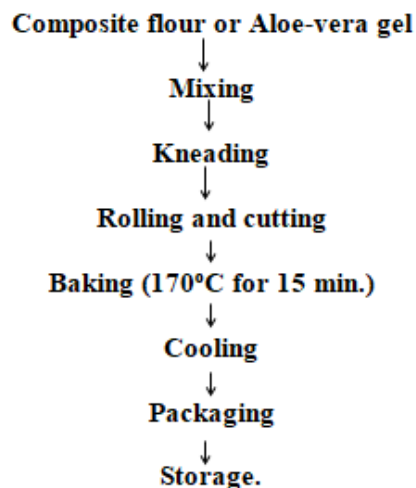
To remove any dirt or unwanted materials, the *Aloe vera* leaves were thoroughly clean. They were then peeled and the *Aloe vera* gel was manually removed. The extracted gel was kept in the container until it was ready to be mixed into the fortified biscuit mixture. Fig. 3 depicts the entire *Aloe vera* gel removal process.

### 2.2 Preparation of *Aloe vera* Gel Based Biscuit

To prepare the composite flour defatted soya flour, rice bran has been incorporated with refined wheat flour (Maida) in different proportion and then it was fortified with *Aloe vera* gel at levels from 5 to 20% each. The *Aloe vera* paste was mixed in wheat or defatted soya flour at the rate of 0, 10%, 20% and 30% in T0, T1, T2, and T3. In each treatment, the same amount of 5% sugar and ghee was used. The same 1% concentration of baking soda and table salt was also used [1]. The dough mixing machine received the 58% wheat flour together with the ghee and sugar. With the use of a cutter and moulds, the biscuit dough was sheeted and cut into biscuit. The biscuits might now be processed further. The lab scale baking oven was used to bake the biscuits. In a baking oven, bake at 170 degrees Celsius for 12 to 15 minutes. The

biscuits were stored in airtight zip bags after baking for further analysis [10].

### 2.3 Flow diagram of making Biscuits [11,12]



### 2.4 Physical Characteristics of Biscuits

The physical features of the biscuit were studied employing standard procedures [13]. A vernier caliper was used to measure the width (W) and thickness (T) of the biscuits. A Mettler digital top loading balance was used to determine weights (Mettler, PC 400, Switzerland). Spread ratio (SR) was calculated by the method of Ordorica-Falomir and Paredes – Lopez [14] as  $SR = W/T$  [15].

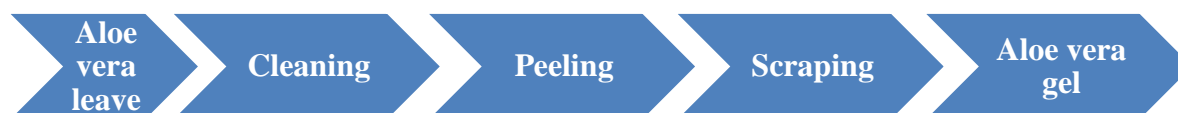


Fig. 3. Flow chart for the production of *Aloe vera* gel

### 2.5 Microbiological Analysis

The microbial quality of the products (coliforms, mesophilic aerobic bacteria, yeasts and mold counts) was determined using the procedure specific in the compilation of techniques for the microbial analysis of food products (AMPH, 1992), with minor changes [16,17]. The microbiological analysis of the fortified biscuit samples of different treatments, including standard plate count, coliform and yeast and mold tests, was performed using the standard procedure outlined in I.S. 1947 PART III. All of the studies were conducted in triple, and mean values were estimated [18].

## 2.6 Sensory Analysis

25 panelists performed a sensory evaluation of the composite bread samples using a 9-point hedonic scale for a variety of factors, including colour, scent, texture, taste, crunchiness, and overall acceptability, as related by Iwe (2010) [16]. All of the panelists were regular biscuit consumers who were familiar with the sensory quality properties of biscuits. The samples were put in identical containers and labeled with three-digit random numbers. The panelists were given a questionnaire to fill out and potable water to rinse their mouths between tastings. Each sample was evaluated based on its flavour, appearance, texture, crispiness and overall acceptability [19]. Each parameter received a score from the panelist, with a maximum score of 9. All sensory quality was scored on a hedonic scale of 1 to 9, with 1 being the most dislike and 9 the most liking [18].

## 2.7 Statistical Analysis

The sensory evaluation data was statistically analysed using ANOVA and the Duncan Multiple range test, with a significance level of  $p < 0.05$  [16]. On triplicate data, a one-way analysis of variance (ANOVA) was performed using the SPSS statistical package version 18. (SPSS, Inc, Chicago, USA). To determine significant differences between means at  $p < 0.05$ , Duncan's Multiple Range Test (DMRT) was used [19-22].

## 3. RESULTS AND DISCUSSION

### 3.1 Nutritional Evaluation

The recommended formulation was used to evaluate the nutritional content of *Aloe vera* biscuits. When the biscuits were exposed, physical and chemical assessments were checked. The chemical and nutritional studies look at the biscuit's ash, moisture, fat, fibre, protein, carbohydrate, and calorie content [3].

### 3.2 Compositional Evaluation

The flour from wheat and *Aloe vera* gel had moisture contents (MC) of 11.85% and 98.6%, individually. The moisture content of flour of wheat was below the acceptable area. The moisture percentage of the *Aloe vera* biscuits was dramatically raised. Both the treated samples and the control samples showed varying moisture contents. Flour of wheat and *Aloe vera* gel had ash contents (AC) of 0.9 and 0.19

percent, respectively. The *Aloe vera* biscuits' ash value was very important. Ash content varied between the control sample and those that had been treated.

Both wheat flour and *Aloe vera* gel had protein contents (PC) of 10.840.2% and 0.120.01%, respectively. Wheat flour's protein content was lower but still adequate for making biscuits, The *Aloe vera* biscuits have a considerable amount of protein. Both the treated samples and the control samples showed different protein contents. Wheat flour had a crude fibre content (CFC) of 0.8% while *Aloe vera* gel had a CFC of 0.16. Both wheat flour and *Aloe vera* gel had crude fat contents (CFC) of 1.2 and 0.08, respectively, the *Aloe vera* biscuits' crude fat content was insignificant. Wheat or soya flour and *Aloe vera* gel both had carbohydrate contents (CC) of 0.77 and 0.1%, respectively, The *Aloe vera* biscuits have a sizable amount of carbohydrates. *Aloe vera* biscuits' ascorbic acid content was measured and found to increase as *Aloe vera* gel concentration. The *Aloe vera* biscuits' vitamin C content was very important. The control sample contained less beta-carotene, whereas the amounts in the use biscuits T1, T2, and T3 were 34.44.13 g/g, 63.06 g/g, and 80.16 g/g, respectively [1].

## 4. CONCLUSION

The experiment shows that biscuits can be made with up to 10% *Aloe-vera* gel substitution without affecting the sensory characteristics of the biscuit. This functional biscuit contains more nutrients than a whole wheat flour biscuit. Because biscuit is a popular bakery product in India, it can be used as a vehicle for protein fortification and other nutritional enhancements. Adding extra protein to biscuits, whether through the use of composite flours (which are increasingly prevalent) or protein isolates, concentrates, or hydrolysates, has a major impact on dough behaviour and the technological features of the final product. The difficulty of finding biscuits with a greater protein content and quality that also make this nutrient accessible to the human body is one of the nutritional strategies selected.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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