Quality characteristics of biscuits produced from composite flour of wheat, maize and sesame seed

Bhole Shankar Rai, Sangeeta Shukla, Kaushal Kishor, Himanshu Singh and Swarnima Dey

Abstract
The study was conducted development and quality characteristics of biscuit produced from composite flour of wheat flour, maize flour and sesame seed and the changes in physic chemical, sensory characteristics. Biscuit were prepared from blends of different levels of wheat flour, maize flour and sesame seed i.e. T1 (70:20:10), T2 (65:20:15) T3 (60:20:20) respectively. Flour treatment combination were used in the study and replicated five times. The product were analyzed for organoleptic attributes like (Flavour and taste, Body and texture, Colour and appearance, and Overall acceptability) by trained panelised using 9-point hedonic Scale, physic chemical characteristics (Moisture, Fat, Total Solids, Ash, Carbohydrates, Protein) and Microbiological Standard plates count ,Yeast and Mould and Coliform. The treatment T3 (60:20:20) was found best for biscuit making in comparison to other treatment in organoleptic characteristics. Thus as far, product judged by organoleptic evaluation value in concern, the treatment can be rated is T3> T2>T1.

Keywords: Biscuit Chemical, Maize Flour, Sesame Seed, Sensory, Wheat Flour

Introduction
Biscuits are nutritive snacks produced from unpalatable dough that is transformed into appetizing product through the application of heat in an oven (Kure et al., 1998) [7]. They are ready-to-eat, convenient and inexpensive food product, containing digestive and dietary principles of vital importance (Kulkarni, 1997) [6]. The principal ingredients are flour, fat, sugar and water; while other ingredients include milk, salt, flouring agent and aerating agent (Wade, 1988) [10]. Biscuits are a rich source of fat and carbohydrate, hence are energy giving food and they are also a good source of protein and minerals (Kure et al., 1998) [7]. Biscuits represent a fast growing segment of food because of consumer demands for convenient and nutritious food products. The consumers demand has increased for the quality food products with taste, safety, convenience and nutrition (Lubna Masoodi et al., 2012) [8]. Biscuit is a processed convenience food ever produced. It is one of the few universal staples, which is complete in it and requires no additional preparation. Thus, for many, biscuit becomes an important source of high molecular carbohydrates, vegetable proteins and some vitamins and minerals (Ahmad and Ahmed, 2014) [3]. Biscuit have relatively high energy density compared with other baked goods. Another type of biscuit is cracker. It is thin dry biscuit, probably named because of the familiar cracking noise it makes when eaten. Humans have consumed bakery product for hundreds of years. Among the different bakery products, biscuit consists the most popular group. Biscuits are confectionery dried to very low moisture content (Fayemi, 1981) [4]. The unique bread making properties of wheat flour are due to its gluten protein that, when hydrates, forms strong, cohesive douse that retains gas and produces a light, aerated baked product (Hoseney, 1998) [5]. Wheat flour constitutes the basic ingredients for biscuit production because of its gluten protein, which are not present in the flour of other cereals. Wheat flour is a powder made from the grinding of wheat used for human consumption. More wheat flour is produced than any other flour. Wheat varieties are called soft or weak if gluten content is low and are called hard or strong if they have high gluten content. Maize (Zea mays) a major source of carbohydrates, protein vitamin B, vitamin A (Yellow maize) and minerals. Corn starch (maize flour) is a major ingredient in home cooking and in many industrialized food products. Corn contain vitamin B-complex such as B1 (thiamine), B2 (niacin), B3 (riboflavin), B5 (pantothenic acid) and B6 that makes it commendable for hair,
skin, digestion, heart and brain. It contains vitamin C, A and K together with large amount of betacarotene and fair amount of selenium that helps to improve thyroid gland and play important role in proper functioning of immune system. Maize is highly rich in carbohydrates. Many people would prefer maize to other energy foods to supply with energy. Being a starchy food, it releases energy slowly in the blood stream ensuring that you stay energized whole day. It is a potent antioxidant that guards body from harming by free radicals responsible for cellular damage and/or cancer. It has the potential to alleviate pain and possess analgesic activity as well (Nayer, M.N. 1970) [9].

Sesame seeds are an excellent source of copper, a very good source of manganese, and a good source of magnesium, copper, vitamin E, thiamine, calcium, phosphorus, iron, zinc, molybdenum, phytosterols and selenium. By weight, about half the seed is fat—mostly unsaturated. An ounce (3 tablespoons) has about 160 calories, 14 grams of fat, 5 grams of protein, and 4 grams of fiber. Sesame seeds are beneficial for lowering cholesterol, for reducing blood pressure.

**Material and Methods**

The experimental work was carried out in the research laboratory of department of Dairy, Technology, Warner college of Dairy Technology, Sam Higginbottom University of Agriculture, Technology and Sciences, Allahabad. Wheat flour, maize flour and sesame seed were obtained from the local market of Allahabad city. Mixed cereal flour based biscuit prepared by Wheat flour, maize flour and sesame seed and butter, skim milk powder and sugar. There were total four combinations. Each was prepared in five replications. The potential to alleviate pain and possess analgesic activity as well (Nayer, M.N. 1970) [9].

Sesame seeds are an excellent source of copper, a very good source of manganese, and a good source of magnesium, copper, vitamin E, thiamine, calcium, phosphorus, iron, zinc, molybdenum, phytosterols and selenium. By weight, about half the seed is fat—mostly unsaturated. An ounce (3 tablespoons) has about 160 calories, 14 grams of fat, 5 grams of protein, and 4 grams of fiber. Sesame seeds are beneficial for lowering cholesterol, for reducing blood pressure.

**Physico-chemical analysis**

**Determination of total solids**

The total solids content was estimated by the standard gravimetric method as described in IS;SP;18(part xi),1981 (Model 60 E/N, England).

**Determination of moisture**

Moisture content of the cheese was estimated gravimetrically using Marnier test. A representative sample (2–3gm) was weighed into a total solids dish with acid washed sand, glass rod and dried at 105°C for 2 to 3 hours to a constant weight the percent moisture was calculated as follows Percentage moisture = loss in weight X100/weight of sample

**Determination of fat** Percentage of product sample was estimated by Soxhlet method by AOAC.1991 method

**Carbohydrates (by difference method)**

The per cent carbohydrates were calculated by subtracting the sum of moisture, protein, fat, and ash content in per- cent from 100.

**Determination of Protein**

Percentage of the product sample was estimated by Kjeldahl method by AOAC, 1984 method.

**Determination of Ash**

Percentage of product sample was estimated by Muffle Furnace method as given in SP: 18 (PART-11)- 1981. The results obtained from the analysis are present in this chapter under the following heading Physico chemical characteristics Microbial characteristics Organoleptic characteristics The mean values of organoleptic characteristics and physic chemical characteristics analysis data were presented in the table 1, table 2 and table 3.

**Sensory Characteristics of Biscuit**

The organoleptic characteristics of biscuit were determined using a taste panel consisting member drawn from the Teachers/ staff of the School of Food and Dairy Technology. The panelists were asked to evaluate the various samples for different sensory attributes namely colour of crust, colour of crumb, texture, flavor and overall acceptability. Following 9 point Hedonic scale was used for sensory evaluation of bread.

**Statistical Analysis**

All determinations were replicated five times; mean values and standard deviation were reported. Analysis of variance (ANOVA) was performed. When the difference in ANOVA among the scores of samples was significant, pair comparison of samples were analyzed using studentised range test.

**Results and Discussions**

**Physico-Chemical Characteristics**

**Percentage Moisture in Biscuit**

The data regarding moisture present in biscuit sample to different treatment are presented in table Average score of moisture % in control and experimental biscuit samples T₀, T₁, T₂, T₃ which were 3.00, 3.65, 3.98 and 4.60 respectively.

**Percentage Total Solids in Biscuit**

The data regarding total solids present in biscuit sample to different treatment are presented in table 1. Total solids present in control and experimental biscuit samples T₀, T₁, T₂, and T₃ which were 97.00, 96.35, 96.02, and 96.40 respectively.
Percentage Ash in Biscuit
The data regarding total solids present in biscuit sample to different treatment are presented in Table 1. Ash present in control and experimental biscuit samples T0, T1, T2, and T3 which were 1.76, 2.04, 2.29, and 2.53 respectively.

Percentage Fat in Biscuit
The data regarding total solids present in biscuit sample to different treatment are presented in Table 1. Fat % in control and experimental biscuit samples T0, T1, T2, and T3 which were 15.34, 19.00, 21.28, and 21.99 respectively.

Percentage Protein in Biscuit
The data regarding protein present in biscuit sample to different treatment are presented in Table 1. Protein present in control and experimental biscuit samples T0, T1, T2, and T3 which were 9.01, 9.99, 10.94, and 11.07 respectively.

Percentage Carbohydrate in Biscuit
The data regarding carbohydrate present in biscuit sample to different treatment are presented in Table 1. Carbohydrate % in control and experimental biscuit samples T0, T1, T2, and T3 which were 70.89, 65.33, 61.71, and 59.81 respectively.

Percentage Carbohydrate in Biscuit

Table 1: Average data of chemical analysis of different treatments

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Treatments (Mean) value</th>
<th>C.D. Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T0</td>
<td>T1</td>
</tr>
<tr>
<td>1. Chemical analysis (in percent)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Carbohydrate</td>
<td>70.89</td>
<td>65.33</td>
</tr>
<tr>
<td>Protein</td>
<td>9.01</td>
<td>9.99</td>
</tr>
<tr>
<td>Fat</td>
<td>15.34</td>
<td>19.00</td>
</tr>
<tr>
<td>Ash</td>
<td>1.76</td>
<td>2.04</td>
</tr>
<tr>
<td>Total solids</td>
<td>97.00</td>
<td>96.35</td>
</tr>
<tr>
<td>Moisture</td>
<td>3.00</td>
<td>3.65</td>
</tr>
</tbody>
</table>

Microbiological Analysis of Different Treatments

Coliform Count in Biscuit –
Mean values of coliform for biscuit at was NIL. There was significant difference between among the treatments. None of the samples of the biscuit shows the presence of coliform. The entire sample, at all the stage, was coliform free, which indicates proper hygienic condition was maintained during the preparation and storage of the product.

SPC count in Biscuit –
The SPC (*10^3cfu/gm) was highest score in T3 (4.60) followed by T2 (3.98) T1 (3.65), T0 (3.00). There was significant difference between among the treatments.

Yeast and Mould count in Biscuit
Mean values of Yeast and mould for biscuit at was NIL. There was significant difference between among the treatments. None of the samples of the biscuit shows the presence of yeast and mould. The entire sample, at all the stage, was yeast and mould, which indicates proper hygienic condition were maintained during the preparation and storage of the product.
Table 2: Average data of microbiological analysis of different treatments

<table>
<thead>
<tr>
<th></th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coliform (* 10³/gm)</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
<tr>
<td>SPC (* 10³ cfu/gm)</td>
<td>2.00</td>
<td>2.20</td>
<td>2.60</td>
<td>1.40</td>
<td>0.857</td>
</tr>
<tr>
<td>Yeast and Mould</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
<td>NIL</td>
</tr>
</tbody>
</table>

Organoleptic Analysis of Different Treatments

Body and texture in Biscuit
Average score of body and texture in control and experimental biscuit samples T₀, T₁, T₂, T₃ which were 8.60, 8.12, 8.00 and 7.82 respectively.

Flavour and taste in Biscuit
Average score of Flavour and Taste in control and experimental biscuit samples T₀, T₁, T₂, T₃ which were 8.27, 8.36, 8.38 and 8.58 respectively.

Colour and appearance in Biscuit
Average score of colour and appearance in control and experimental biscuit samples T₀, T₁, T₂, T₃ which were 8.14, 8.26, 8.28 and 8.48 respectively.

Overall acceptability of biscuit
Average score of overall Acceptability of control and experimental biscuit samples T₀, T₁, T₂, T₃ which were 8.00, 7.82, 8.12 and 8.60 respectively.

Table 3: Average data of organoleptic analysis of different treatments

<table>
<thead>
<tr>
<th>Organeletic score (9 point hedonic Scale)</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Body and texture</td>
<td>8.60</td>
<td>8.12</td>
<td>8.00</td>
<td>7.82</td>
</tr>
<tr>
<td>Flavour and taste</td>
<td>8.27</td>
<td>8.36</td>
<td>8.38</td>
<td>8.58</td>
</tr>
<tr>
<td>Colour and appearance</td>
<td>8.14</td>
<td>8.26</td>
<td>8.28</td>
<td>8.48</td>
</tr>
<tr>
<td>Overall acceptability</td>
<td>8.00</td>
<td>7.82</td>
<td>8.12</td>
<td>8.60</td>
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</table>

Body of Product

80% wheat flour + 20% maize flour

Overall acceptability of control and experimental biscuit
Conclusion
Biscuit is very popular product commonly consumed to its own and also suitable for used in particular cereal based baked food. Biscuits are an important baked product in human diet and are usually eaten with tea and are also weaning food for infants.
Wheat flour as a common source of fiber and protein also good source of calcium, iron and other minerals like selenium and maize is as major source of starch. Corn starch (maize flour) corn contains vitamin B complex Such as B1 (thiamine), B2 (niacin), B3 (riboflavin), B5 (pantothenic acid) and B6 that makes it commendable for hair, skin, digestion, heart and brain. Maize contain vitamin C, A and K. Sesame seed are an excellent source of copper, a good source of manganese and a good source of magnesium, vitamin E, Thiamine, calcium, phosphorous, iron, zinc, molybdenum, phytosterols and selenium can be utilized to develop more value added products hence making its more economical and affordable for the developing countries without compromising the nutritional quality.
From the present investigation it is concluded that the biscuit prepared by wheat flour, maize flour and different level of sesame seed containing 60% wheat flour, 20% maize flour and 20% sesame seed. T3 was the best in organoleptic characteristics. T3 show significant difference in organoleptic characteristics (colour and appearance, body and texture, flavor and taste and overall acceptability) T3 was found to be more acceptable in term of sensory quality.

References