Quality Evaluation of Fasting Biscuit Prepared from Rajgira and Sabudana


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Abstract

The fasting biscuit is prepared using Rajgira flour and Sabudana (sago balls) flour for the preparation of fasting biscuits. The Rajgira flour and Sabudana flour (pearl sabudana, nylon sabudana) were brought from the local market at Jalgaon (Jamod), Maharashtra in India. Rajgira flour contains less amount of protein but good source of vitamin-A, vitamin-C, and also complementing source of some other vitamins, also contain some dietary minerals including calcium, iron, zinc, copper-comparable to common grains such as wheat germ, oats and other. Sabudana flour contains some amount of calorie, carbohydrate, fat and proteins, it also provide large amount of starch, low amount of minerals, vitamins however lack of these nutrition are made up by making the combination with Rajgira flour so it became nutritionally advantageous. In this experiment, Rajgira flour was blended with the Sabudana flour in the ratio of 3:1, 3:2, 1:1, 2:3 and 1:3 proportion to prepare 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 physico-chemical analysis and sensory evaluation was done to know the acceptability of fasting biscuit. These were evaluated for sensory analysis that included colour, taste, flavor and overall acceptability. The biscuits were analyzed for analytical and chemical analysis, which includes moisture content, fat content and total ash content. On the basis of sensory evaluation, biscuit containing Rajgira flour and Sabudana in 3:2 proportion scored high score for overall acceptability i.e 7.8. From the result of proximate analysis of biscuits, the fat content of 3:2 proportion of Rajgira and Sabudana flour is very low i.e 26.4%, which is beneficial for health. So according to quality evaluation and sensory evaluation, preparation of biscuits from rajgira and sabudana flour blend in proportion of 3:2 is recommended.

Keywords: Fasting biscuit, Rajgira, Sabudana, Sago flour, Overall acceptability.

1. Introduction

Biscuits may be regarded as a form of confectionery dried to very low moisture content. According to Fayemi (1981), biscuits may be defined as a small thin crisp cake made from unleavened dough. According to Okaka (1997), biscuit is a mixture of flour and water but may contain fat, sugar and other ingredients mix together into dough which is rested for a period and then passed between rollers to make a sheet. Biscuit may be classified either by the degree of enrichment and processing or by the method adopted in shaping them. Based on enrichment criterion, biscuit may be produced from hard dough, soft dough or from batters (Fayemi, 1981). Biscuits are popular food stuff consumed by a wide range of population due to their varied taste, long shelf life and relatively low cost. Because of competition in the market and increased demand for healthy, natural and functional products, attempts are being made to improve the nutritive value of biscuit and functionality by modifying their nutritive composition. Gayas et al. (2012) found the mean overall sensory acceptability scores of more than 8.50 for biscuit samples upto 5% carrot pomace powder, indicating the commercial scope for manufacturing.
This study was aimed to make biscuit from blend of sabudana and rajgira flour and to examine its performance in biscuit production in terms of proximate composition and sensory evaluation.

2. Material and Methods

The experimental studies were carried out in laboratories of Collage of Agricultural Engineering and Technology, Jalgaon (Buldana). The methodology adopted has been described as given below.

2.1 Procurement of Raw Material

Good quality of Rajgira and Sabudana flour and other major ingredients, i.e., sugar, baking powder were purchased from local market of Jalgaon Jamod.

2.2 Experimental Plan

The experimental plan used for the present research was as given Table 1 and 2. Fig 1 shows the flow chart for preparation of biscuits (Srivastava et al., 2012). Table 2 shows the different combinations of rajgira and sabudana flour for biscuit.

![Fig 1: Process flow chart of Biscuit preparation](image)

2.3 Proximate Analysis

2.3.1 Moisture Content

The moisture content of the developed biscuit was determined by the method describe in AACC (2000).
Table 1: Experimental plan

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Parameter</th>
<th>Level</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Major Ingredients Proportions of Rajgira flour: Sabudana flour</td>
<td>5</td>
<td>T-1 (3:1), T-2 (3:2), T-3 (1:1), T-4 (2:3) and T-5 (1:3)</td>
</tr>
<tr>
<td>2.</td>
<td>Packaging material</td>
<td>1</td>
<td>LDPE</td>
</tr>
<tr>
<td>3.</td>
<td>Storage condition</td>
<td>1</td>
<td>Ambient Temperature</td>
</tr>
</tbody>
</table>

Table 2: Different combinations of sabudana and rajgira flour for biscuit

<table>
<thead>
<tr>
<th>Treatments</th>
<th>Proportion of Rajgira flour: Sabudana flour</th>
<th>Rajgira flour (%)</th>
<th>Sabudana flour (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>3:1</td>
<td>75</td>
<td>25</td>
</tr>
<tr>
<td>T2</td>
<td>3:2</td>
<td>60</td>
<td>40</td>
</tr>
<tr>
<td>T3</td>
<td>1:1</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>T4</td>
<td>2:3</td>
<td>40</td>
<td>60</td>
</tr>
<tr>
<td>T5</td>
<td>1:3</td>
<td>25</td>
<td>75</td>
</tr>
</tbody>
</table>

**Moisture (%) (w. b.)**

\[
\text{Moisture} = \left(\frac{W_1 - W_2}{W_1} \right) \times 100 \tag{1}
\]

Where,
- \( W \) = weight in gram of the moisture dish.
- \( W_1 \) = weight in gram of the moisture dish with the material before drying.
- \( W_2 \) = weight in gram of the moisture dish with the material after drying

**2.3.2 Ash Content**

Ash content was determined as per the method given by AOAC (1965).

\[
\text{Total ash} = \left(\frac{\text{Final weight}}{\text{Initial weight}}\right) \times 100 \tag{2}
\]

**2.3.3 Fat Content**

The fat content was determined by the method describe in AACC (2000), method no. 30-25.

\[
\text{Fat} = \left(\frac{W_2 - W_1}{S}\right) \times 100 \tag{3}
\]

Where,
- \( S \) = weight of sample (gm)

**2.4 Physical Parameters**

**2.4.1 Spread Ratio**

Three rows of five well-formed biscuits were made and the height measured. The biscuits were arranged horizontally edge to edge and the sum of the diameter measured with the height. The spread ratio was calculated by using formula.

\[
\text{Spread ratio} = \frac{\text{Diameter (mm)}}{\text{Thickness (mm)}} \tag{4}
\]

**2.4.2 Thickness**

The thickness was measured in mm using Vernier caliper (Muto Toyo Make, Japan).

**2.4.3 Volume**

Volume of biscuit is defined as the area of the biscuit multiplied by the thickness.

\[
\text{Volume} = \frac{d^2 \pi T}{4} \tag{5}
\]

Where,
- \( T \) = average thickness of biscuit (mm)
- \( d \) = diameter of biscuit in (mm)

**2.4.4 Density**

After calculating volume, density was obtained by ratio of weight of volume (AACC, 1983).

\[
\text{Density} = \frac{\text{mass of sample (g)}}{\text{volume of sample (cm}^3)} \tag{6}
\]

**2.4.5 Sensory Evaluation**

Sensory characteristics of biscuits were evaluated for the different sensory attributes like colour, flavour, texture, taste and overall acceptability by a untrained panel of judges in the College of Agricultural Engineering and Technology, Jalgaon, Jamod. The 9 point hedonic scale was used for evaluation for assigning the numerical values for different quality attributes of biscuits.
3. Results and Discussion

3.1 Physical Parameters of Prepared Biscuit

Table 3 shows that there was a significant increase in the diameter of biscuit with the addition of Sabudana flour, i.e., 3.22 cm to 4.0 cm. With addition of Sabudana flour, the thickness, spread ratio and density remains constants for different treatments like T1, T2, T3, T4 and T5 with the value of 0.69 cm, 5.82, 0.74 g/cm³, respectively. The result was in conformity with Fig 2, which shows the effect of treatments on weight, diameter, thickness, spread ratio, volume, and density.

It was found that, after addition of sabudana flour, diameter of biscuit prepared increases with the decrease in its thickness. According to Balijeet et al. (2010), these two parameters always move in opposite directions. Spread ratio, the ratio between the diameter and the thickness of biscuits, is the most important parameter to assess the quality of biscuits (Bose and Shams–Ud-Din, 2010). The spread ratio was highest in case of treatment T2. Biscuits with high values of spread ratio are best (Eissa et al., 2007).

3.2 Proximate Analysis

Ash content of the biscuits ranges from 0.5 to 2%. Significant differences exist on the ash content of the biscuits. Ash is a non-organic compound containing mineral content of food and nutritionally it aids in the metabolism of the other organic compound such as fat and carbohydrate. Biscuit produce from 3:2 rajgira and sabudana flour had the highest value i.e., 2%. Biscuit produced from 1:3 rajgira and sabudana flour had the smallest value i.e., 0.5% and value of the other proportion i.e., 3:1, 1:1 and 2:3 was 1%.

Fat plays a significant role in the shelf life of a food products and such relatively high fat content could be undesirable in baked food product this is because fat can promote rancidity in food, leading to development of unpleasant and odorous compound. The fat content of biscuit ranged from 26.4% to 35.3%. Significant differences exist on the fat content of various biscuits. The fat is energy source of for biscuits (Olaoye et al., 2007). It contributes to the appearance of biscuits, improves the flavor and gives a good feeling in mouth (Pareyt and Delcour, 2008; Odoemelam, 2005). The increase in fat content of biscuit could be due to the application of fat during biscuit production in which 1:1 of rajgira and sabudana flour had the largest fat content i.e., 35.3% and 3:2 of rajgira and sabudana flour had the smallest value of fat content i.e. 26.4%.

Moisture content of the biscuits was found to be optimum. Moisture content of biscuits increased and ash content decreased with increasing the incorporation percent of rajgira flour. The moisture content of the biscuit ranges from 1% to 4.5%. Significant difference exists on the moisture content of the biscuit. The moisture content of the different biscuit varies according to the type of biscuit produced. The highest moisture content of the biscuit i.e., 4.5% was observed in the proportion such as 3:2 and 1:1 of rajgira and sabudana.

3.3 Organoleptic Quality Evaluation of Biscuit

The result of sensory evaluation is shown in Table 5. From the result, texture of biscuit samples was fairly good. Based on texture, the sample with 60% rajgira flour and 40% sabudana flour (T2 with 3:2 proportion of rajgira and sabudana flour) ranked highest with a mean value of 8. This was very close to treatment T3 (1:3 proportion of rajgira and sabudana flour) and to treatment T4 (2:3 proportion of rajgira and sabudana flour) substitution which was mean value 6.4 and 6.5. For treatment T1 (3:1 proportion of rajgira and sabudana flour) sensory scores were fairly high i.e., a score of 6.2.

Based on flavor there was no significant difference upto the 1:3 substitution of rajgira and sabudana. Also there was no significant difference...
from 2:3 (6.8 score) substitution upto 1:1 (score 6.3) the product where like slightly. Since flavour is determining factor in consumer acceptance of biscuit it can deduct that the biscuit is accepted up to 2:3 substitution with sabudana flour, i.e, the mean value 7.6.

Table 3: Physical characteristics of biscuits

<table>
<thead>
<tr>
<th>Sample Code</th>
<th>Weight (g)</th>
<th>Diameter (cm)</th>
<th>Thickness (cm)</th>
<th>Spread Ratio</th>
<th>Volume (cm³)</th>
<th>Density (g/cm³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>6.79±0.19</td>
<td>3.22±0.82</td>
<td>0.69±0.04</td>
<td>5.82±0.35</td>
<td>8.12±0.67</td>
<td>0.74±0.02</td>
</tr>
<tr>
<td>T2</td>
<td>6.47±0.44</td>
<td>3.93±0.04</td>
<td>0.67±0.04</td>
<td>5.93±0.42</td>
<td>9.14±0.21</td>
<td>0.79±0.07</td>
</tr>
<tr>
<td>T3</td>
<td>6.69±0.34</td>
<td>4.09±0.04</td>
<td>0.69±0.04</td>
<td>5.88±0.31</td>
<td>9.06±0.04</td>
<td>0.76±0.04</td>
</tr>
<tr>
<td>T4</td>
<td>6.83±0.30</td>
<td>4.0±0.06</td>
<td>0.69±0.04</td>
<td>5.64±0.08</td>
<td>8.96±0.28</td>
<td>0.75±0.02</td>
</tr>
<tr>
<td>T5</td>
<td>6.41±0.39</td>
<td>4.05±0.04</td>
<td>0.69±0.04</td>
<td>5.87±0.35</td>
<td>8.88±0.63</td>
<td>0.72±0.03</td>
</tr>
</tbody>
</table>

Table 4: Proximate compositions of biscuit samples

<table>
<thead>
<tr>
<th>Biscuit Samples</th>
<th>Ether extract (%)</th>
<th>Ash content (%)</th>
<th>Moisture content (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>27.2</td>
<td>1.0</td>
<td>2.5</td>
</tr>
<tr>
<td>T2</td>
<td>26.4</td>
<td>2.0</td>
<td>4.5</td>
</tr>
<tr>
<td>T3</td>
<td>35.3</td>
<td>1.0</td>
<td>4.5</td>
</tr>
<tr>
<td>T4</td>
<td>26.6</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>T5</td>
<td>31.9</td>
<td>0.5</td>
<td>3.0</td>
</tr>
</tbody>
</table>

Table 5: Mean values of the sensory scores for biscuits made from the flour composites.

<table>
<thead>
<tr>
<th>Sample code</th>
<th>Color</th>
<th>Taste</th>
<th>Flavor</th>
<th>Texture</th>
<th>Overall Acceptability</th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>7.3 (±1.10)*</td>
<td>6.7 (±0.78)</td>
<td>6.2 (±0.74)</td>
<td>6.55 (±0.63)</td>
<td></td>
</tr>
<tr>
<td>T2</td>
<td>7.9 (±0.83)</td>
<td>8.1 (±0.94)</td>
<td>6.7 (±0.91)</td>
<td>7.80 (±0.73)</td>
<td></td>
</tr>
<tr>
<td>T3</td>
<td>7.3 (±0.78)</td>
<td>6.8 (±0.87)</td>
<td>6.3 (±1.18)</td>
<td>6.52 (±0.74)</td>
<td></td>
</tr>
<tr>
<td>T4</td>
<td>7.0 (±1.09)</td>
<td>6.7 (±0.90)</td>
<td>6.8 (±0.87)</td>
<td>6.77 (±0.73)</td>
<td></td>
</tr>
<tr>
<td>T5</td>
<td>7.2 (±0.87)</td>
<td>6.9 (±0.94)</td>
<td>6.7 (±0.78)</td>
<td>7.77 (±0.63)</td>
<td></td>
</tr>
</tbody>
</table>

Fig 3: Physical characteristics of Biscuits
The colors of the Moisture content (%), found to be the most important parameter to correctly assess the baked biscuits (Hussain et al., 2006). The colors of the product were fairly accepted (slightly liked) 1:1 and 3:1 proportion (i.e., rajgira and sabudana) with same mean score of 7.3. There was no significant difference in colour upto 1:3 proportion. From the result 3:2 proportion of rajgira and sabudana flour could be accepted by the panellists with the mean score of 7.9.

4. Conclusion  
Incorporation of rajgira flour with sabudana flour in 3:2 proportions was found to be the most acceptable combination in biscuit making with respect to nutritional, textural and organoleptic qualities of biscuits. Biscuits with incorporation of rajgira flour with sabudana in 3:1 proportion were found to be nutritionally superior but not well accepted with respect to sensory qualities. Incorporation with rajgira flour enriched the energy content of biscuits. As the fat content of biscuits prepared from rajgira flour and sabudana flour in 3:2 proportion, was less i.e. 26.4% and thus it was beneficial for health. So according to quality evaluation and sensory evaluation the biscuits prepared from rajgira flour with sabudana flour in 3:2 proportions were giving comparatively higher quality.

References


