Standardization of beet root fortified Ragi biscuits

Rathod Maya S, Patharkar Swapnil R and Rathod Balasaheb M

Abstract

The present investigation was carried out to assess the suitability of different ingredients in development of bakery product and to observe the effect of different ingredients on the sensorial and nutritional properties of prepared food product. The studies were focused on standardizing the concentration of different ingredients to a level of acceptable quality. The popular bakery product was prepared by adding refined wheat flour (200g), fat (250g), sugar (250g), ragi flour (250g) and beetroot powder (50g). The results revealed that the bakery product prepared from composite ingredients was found to be more acceptable with respect to mentioned sensorial quality parameters and incorporation of beetroot and ragi flour in the bakery product increased its nutritional value.

Keywords: Bakery product, ragi flour, beetroot

Introduction

Millets are nutritionally rich and occupy an important place in the diet of people in many regions of the world (R.V. Jaybhaye et al. 2014). Millets are considered as crop of food security because of their sustainability in adverse agro-climatic conditions (Ushakumari et al., 2004) [20]. These crops have substantive potential in broadening the genetic diversity in the food basket and ensuring improved food and nutrition security (Mal et al., 2010) [13]. Along with nutrition millets offer health benefits in daily diet and help in the management of disorders like diabetes mellitus, obesity, hyperlipidemia, etc. (Veena, 2003) [22]. Millets offer unique advantage for health being rich in micronutrients, particularly minerals and B vitamins as well as nutraceuticals. Ragi grain is exceptionally rich in calcium (300 - 400 mg), which is approximately 10 times more than what is present in most cereals including rice and wheat. It is also a good source of many other micronutrients such as iron, magnesium, zinc, chromium, iodine and thiamine. Because of high mineral contents, the millet food is considered as cool food, and this probably helps in maintaining the acid base balance in the human system. As a result the persons on consumption of millet food withstand dehydration and tolerate thirst better than persons consuming other foods. Millet is a gluten-free and low-cost cereal (approximately 40% lower than the price of corn), which is resistant to drought and nutrient-poor soils (Gomes et al., 2008) [19]. In 2011, the millet production was about 27.5 million tons (Food and Agriculture Organization, 2015). The total annual production of all millets worldwide is approximately 4.5-5 million tons, with India alone producing about 2.5 million tons and some countries in Africa accounting for about 2 million tons of the grains (Mathur, 2012) [14]. India is thus reported to be the largest producer of FM (Wankhede et al., 1979; Pandhre et al., 2011) [24, 16], contributing a total of 60% of the global production (Gull et al., 2014) [8]. High blood pressure (BP) or hypertension (BP of >140/90 mmHg) is a major public health burden. Worldwide, in 2001, 13.5% of all premature deaths were attributed to high BP (Lawes 2008) [10]. Moreover, hypertension is a major risk factor for the progression of CVD (Lewington, S et al. 2002, Mac Mahon, S et al. 1990, Vasan R S et al. 2001) [11, 12, 21]. Increased fruit and vegetable consumption protects against CVD and hypertension (Appel et al. 1997, Zhang X et al. (2011) [1, 20]. These cardioprotective effects have previously been attributed to several different nutrients found in vegetables such as antioxidant vitamins and flavonoids. However, clinical trials fail to ascertain the beneficial effects (Vivekananthan et al. 2003, Habauzit, V & Morand, C 2011) [23, 8]. In addition, beetroot is particularly rich in betalains, a group of nitrogen-containing colour compounds that are not commonly represented among edible plants. Betalains can be divided into two subclasses: the red/purple betacyanins which are responsible for the colour of red beetroot or the yellow/orange betaxanthins that contribute to the colour of yellow beetroot. White beetroot is deficient in betacyanins, but no other differences between beetroot varieties have been reported in the literature. Betalains have been shown to act as antioxidants, by the donation of electrons.
(Wettasinghe, M. et al. 2002 Kanner J 2001) [25], and inhibit lipid peroxidation and haem decomposition in vitro (Kanner J 2001), suggesting a role of these compounds in protection against certain oxidative stress-related diseases, such as hypertension and CVD.

Materials and Methods
The present investigation was carried out in Department of Food Science and Technology, College of Food Technology, VNMKV, Parbhani. The ingredients such as refined wheat flour, ragi flour, fat, sugar, beetroot, baking soda, etc. were purchased from local market of Parbhani. Chemicals used in this investigation were of analytical grade. The beetroot powder was prepared by using convective heat dryer at 55 °C and grinding by mixer grinder (Sheetal G et al. 2013) [19].

Composite flour formulation for preparation of extruded snack
The Control flour was prepared by using refined wheat flour (200g), fat (250g), sugar (250g), ragi flour (250g) as standard (Guria, 2006) [7]. For the levels of ragi and beetroot powder, different preliminary trials were carried out followed by informal sensorial evaluation of product to optimize the maximum suitable concentration of ragi and beetroot incorporation. It was observed that if the concentration of ragi flour incorporation is reduced beyond 50 per cent then the overall quality of prepared product is being drastically reduced as product is becoming brittle while minimum concentration of ragi flour required to prepare product should be 10 per cent otherwise the product is becoming hard. Hence, on the basis of preliminary trials, the recipes were finalized for experimentation from Table-1.

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Refined wheat flour</td>
<td>100</td>
<td>30</td>
<td>40</td>
<td>60</td>
<td>70</td>
</tr>
<tr>
<td>Ragi flour</td>
<td>0</td>
<td>70</td>
<td>60</td>
<td>40</td>
<td>30</td>
</tr>
<tr>
<td>Beetroot powder</td>
<td>0</td>
<td>10</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
</tbody>
</table>

Table 1: Different proportions of ingredients used for standardization

Method of Preparation of Biscuits

Table 2: Chemical properties of Beet root fortified ragi biscuits

Table 3: Nutritional information of refined wheat flour per 100g

Table 4: Nutritional information of ragi flour per 100g

It can be clearly seen from Table-2 AND Table-3 that the great variation exists in various constituents among the flours to be used in making the beetroot incorporated biscuits. With

Nutritional analysis
Nutritional analysis for moisture content, crude protein content, crude fat, ash were determined by standard procedure given by AOAC (2002) [2], while total carbohydrate was determined by standard procedure using phenol and sulphuric acid AOAC (1990) [1].

Sensory evaluation of product
The sensory assessments was carried out by panel of 25 members consisted of staff and post graduate students of the College of Food Technology, VNMKV, Parbhani. Sensorial evaluation was done by using 9-point hedonic scale (Meilgaard, et al. 1999) [15].

Results and Discussion
The present investigation entitled was carried to explore the possibilities of enhancing the nutritional value of product using ragi flour and beetroot powder and to observe its effect on sensory and nutritional properties. The results obtained during present investigation are presented under different suitable headings.

Proximate composition of beetroot incorporated biscuit product ingredients
Proximate composition generally represents the nutritional quality of different flours. It is necessary to observe the proximate composition of various flours to be used in beetroot incorporated biscuits preparation to judge its effect on final product quality. The proximate composition of major ingredients viz. refined wheat flour, ragi flour is represented under suitable headings.
respect to protein, the protein content of ragi flour, refined wheat flour was found to be 9.4 and 7.3% respectively. The results pertaining to protein content revealed that incorporation of ragi may increase overall protein of ragi and beetroot incorporated biscuits product. The results with respect to the composition of soybean flour are comparable with the earlier reported values (Pollock and Geddes, 1960) [17].

Spread ratio determination 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 (Gomeaz et al., 1997) [18] was calculated as diameter/height.

Physical properties of Beet Root Fortified Ragi Biscuits

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Weight (g)</th>
<th>Diameter (mm)</th>
<th>Thickness (mm)</th>
<th>Spread ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tc</td>
<td>6.88</td>
<td>40.93</td>
<td>4.15</td>
<td>9.86</td>
</tr>
<tr>
<td>T1</td>
<td>7.01</td>
<td>41.01</td>
<td>4.76</td>
<td>8.61</td>
</tr>
<tr>
<td>T2</td>
<td>6.90</td>
<td>40.38</td>
<td>4.21</td>
<td>9.5</td>
</tr>
<tr>
<td>T3</td>
<td>6.59</td>
<td>40.59</td>
<td>4.56</td>
<td>8.9</td>
</tr>
<tr>
<td>T4</td>
<td>7.13</td>
<td>41.03</td>
<td>4.83</td>
<td>8.49</td>
</tr>
<tr>
<td>Mean</td>
<td>6.90</td>
<td>40.78</td>
<td>4.52</td>
<td>9.07</td>
</tr>
</tbody>
</table>

Sensory evaluation of extruded products
The panel of semi-trained judges consisting of 25 members was given the extruded snack food samples for evaluation of organoleptic characteristics viz. color, taste, flavor, texture and overall acceptability. It was served to judges on the day of preparation. The average sensorial score recorded by judges on hedonic scale was depicted in Table-4 and discussed under suitable quality attributes.

Table 6: Sensory evaluation of ragi and beetroot incorporated biscuits product

<table>
<thead>
<tr>
<th>Sample</th>
<th>T0</th>
<th>T1</th>
<th>T2</th>
<th>T3</th>
<th>T4</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>9</td>
<td>6</td>
<td>8</td>
<td>8</td>
<td>9</td>
</tr>
<tr>
<td>Texture</td>
<td>9</td>
<td>8</td>
<td>9</td>
<td>7</td>
<td>8</td>
</tr>
<tr>
<td>Taste</td>
<td>8</td>
<td>7</td>
<td>7</td>
<td>9</td>
<td>8</td>
</tr>
<tr>
<td>Mouth feel</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>After taste</td>
<td>9</td>
<td>8</td>
<td>7</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Overall acceptability</td>
<td>8.6</td>
<td>7</td>
<td>7.8</td>
<td>8.4</td>
<td>7.8</td>
</tr>
</tbody>
</table>

Conclusion
Ragi has the highest amount of calcium (344 mg/100 g) and potassium (480mg/100g). It has higher dietary fibers, antioxidants properties, phytochemicals, mineral and Sulphur containing amino acid. Beetroot is rich source of betalains (a phytochemicals and antioxidant), calcium, magnesium, copper, phosphorous, sodium and iron. Because of betalains it is used as natural colorant. These two ingredients are sources of many nutrients but are consumed at very low quantity, so we have used them in biscuits, popular bakery product. After standardizing the recipe, the final composition of product is selected on the basis of sensory score. The product was having good nutritional value and sensory attributes. This product is economically feasible.

References