

Effect of Fortification with Shingada, Sabudana, and Rajgira Flour on Quality of Fasting Biscuits

Karad K. A.¹, Thorat A. V.², Karad V. A.³

^{1,3}Research Scholar, ²Assistant Professor, Department of Food Science and Technology, K. K. Wagh College of Food Technology, Nashik, Maharashtra, India

Abstract: The fasting biscuit is prepared by using Shingada, sabudana, rajgira flour. Sabudana flour contains some amount of calorie, carbohydrate, fat and proteins. It also provide large amount of starch, low amount of minerals, vitamins. 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. Shingada is a good and inexpensive source of carbohydrates are considered as a foodstuff of high nutritional value and one of the most economical sources of energy. By making the combination of these flour became nutritionally advantageous. In this experiment, Shingada (40, 45 & 35), sabudana (20, 10 & 30) and rajgira (40, 45 & 35) flour in the various proportion to prepare three 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, flavour, texture and overall acceptability. The biscuits were analyzed for analytical and chemical analysis, which includes moisture content, fat content, total ash content, protein content, sugar content and carbohydrate content. On the basis of sensory evaluation, biscuit containing Shingada, sabudana, rajgira flour in (35, 30 & 35) proportion scored high score for overall acceptability i.e. 7.8. From the result of proximate analysis of biscuits, the fat content of Sample C is very low i.e. 17.9%, which is beneficial for health. So according to quality evaluation and sensory evaluation, preparation of biscuits from Shingada, sabudana and rajgira flour blend in proportion of (35, 30 & 35) is recommended.

Keywords: Fortification, sensory evaluation, Fasting biscuits, Sabudana, Shingada, Rajgira

1. Introduction

Biscuit belong to the flour confectionery. It is flat crisp and may be sweetened or unsweetened according to preference. Biscuit can be made from hard dough e.g. crackers, hard sweet dough e.g. rich tea and short or soft dough e.g. short bread and short cake. It is produced by mixing various ingredients like flour, fat, sweeteners and water to form dough. The dough formed unlike bread is not allowed to ferment, and then it is baked in the oven [1].

Biscuits may be regarded as a form of confectionery dried to very low moisture content. [2]. Biscuit for fasting purpose is made from the combination of Rajgira flour, Sabudana flour and potato flour, which are full of nutrition. The nutritional content however varies with the type of flour used [3].

Rajgira is also called Ramdana, Amaranth or Nachni. Its botanical name is *Amaranthus Paniculatus* and it belongs to family Amaranthaceae. The useful part of rajgira is mostly seed, now a day's available in the form of Rajgira flour and Rajgira grain. *Amaranthus paniculatus* is a species of annua flowering plants. Many parts of the plants, including the leaves and seeds are edible, and are frequently used as a source of food in India and South America. Amaranth grain/flour are a good source of vitamin A, vitamin C, and folate; they are also a complementing source of other vitamins such as thiamine, niacin, and riboflavin, plus some dietary minerals including calcium, iron, potassium, zinc, copper and manganese -comparable to common grains such as wheat germ, oats and others[4].

Sabudana is also called as sago, Tapioca Pearl, Pearl Sago, its botanical name is *Manihot Esculenta Crantz Syn. Utilissima*, belongs to family Euphorbaceae. Sabudana is a vegetarian processed food. Commonly known as Sago in India, Sabudana is made from the starch extracted from Tapioca root (tuber). Commercial product of Sabudana is in the shape of small pearls. Sabudana is high carbohydrate, low fat food used across states in India. In India, sabudana is the first food item (apart from milk) most Indians feed to new-born and is also consumed by most to break their fast during festivals. Sabudana is preferred over other food items because it is full of starch and does not contain any artificial sweeteners or chemicals. Sabudana or Sago is also used as a health food for sick as it gives quick energy and is easy to digest. It is a well-known fact that sabudana has cooling effect on our system and hence sabudana-gruel is given to people who have excess bile. The 100 grams of sabudana contains 351 kcal, 87 grams carbohydrate, 0.2 gram fat and 0.2 gram protein. Sabudana provides just a large quantity of starch, with low amount of minerals, vitamins, calcium, iron and fiber, however lack of these nutrition's are made up by adding other ingredients such as milk, vegetables and peanuts [5]. The similar work for fasting biscuits was conducted using sago, peanut, banana, potato, foxtail millet, barnyard millet in different proportions [6].

Shingada (Trapaceae) it is a free-floating plant grown in shallow water fields, ponds, or swampy lands in tropical and sub-tropical countries. The interesting features of the water caltrop are the colour and shape of the outer pericarp where the kernel is encased. The water caltrop is one of the most popular vegetables in Southeast Asian countries, due to its unique taste and medical functions [7]. Epidemiological studies have shown that consumption of fruits and

vegetables imparts health benefits, such as reduced risk of coronary heart disease, stroke and certain types of cancer. Apart from dietary fibre, these health benefits are mainly attributed to organic micronutrients, such as carotenoids, polyphenolics, tocopherols and vitamin C [8]. Dietary fiber is not only desirable for its nutritional properties, but also for its functional and technological properties [9]. In this regard, fiber has been successful in improving cooking yield, reducing formulation cost and enhancing texture [10]. Water chestnut (*Trapanatans*) locally called as “Singhara” in India [11]. Used as a substitute for cereals in Indian subcontinent during fasting days, can be a good replacement for wheat flour (WF) with respect to Celiac diseases caused by indigestion of gluten (wheat protein) [12]. Cassava (*Manihotesculenta*) also called “yucca” or “manioc” serves as the third most important food source in the tropics after cereal crops such as rice and maize. Cassava roots are good and inexpensive source of carbohydrates are considered as a foodstuff of high nutritional value and one of the most economical sources of energy, since the carbohydrate yield is 40% greater than in rice and 20% greater than in corn[13]. Different fasting foods available in market are potato chips, banana chips generally prepared using oil and hence not health friendly. However, baked products like biscuits are not harmful to human health. At present there is no ready option for fried snacks during fasting days. Moreover, in transit period, easily caring and safe for consumption, the best alternative is the biscuits [6].

2. Materials and Methods

2.1. Procurement of raw material

Good quality of *Shingada*, *sabudana* and *rajgira* flour and other major ingredients that is butter, sugar, baking powder, milk was purchased from local market of Nashik.

2.2 Preparation of biscuit

Sieved *Shingada*, *sabudana*, *rajgira* flour and baking powder were mixed together. Powder sugar was mix with butter and then flour added together in desired quantities. The uniform mixture was obtained by adding milk to form dough. The dough was rolled and formed in to a uniform shape of biscuit and baked to a temperature of 140-180°c for 15-20 minute for uniform baking.

Table 1: Standardized procedure for fasting biscuit (per 100 gm)

Sr. No.	Ingredient	Amount (gm)
1	Shingada flour	35
2	Sabudana flour	30
3	Rajgira flour	35
4	Sugar	50
5	Butter	50
6	Baking powder	3

Table 2: Formulation of raw material per 100 gm

Sample	Shingada flour (Water Caltrop flour) (gm)	Sabudana flour (Sago flour) (gm)	Rajgira flour(Amaranth flour) (gm)
A	40	20	40
B	45	10	45
C	35	30	35

2.3 Experimental Plan

Figure shows the flow chart for the preparation of Fasting biscuits [14].

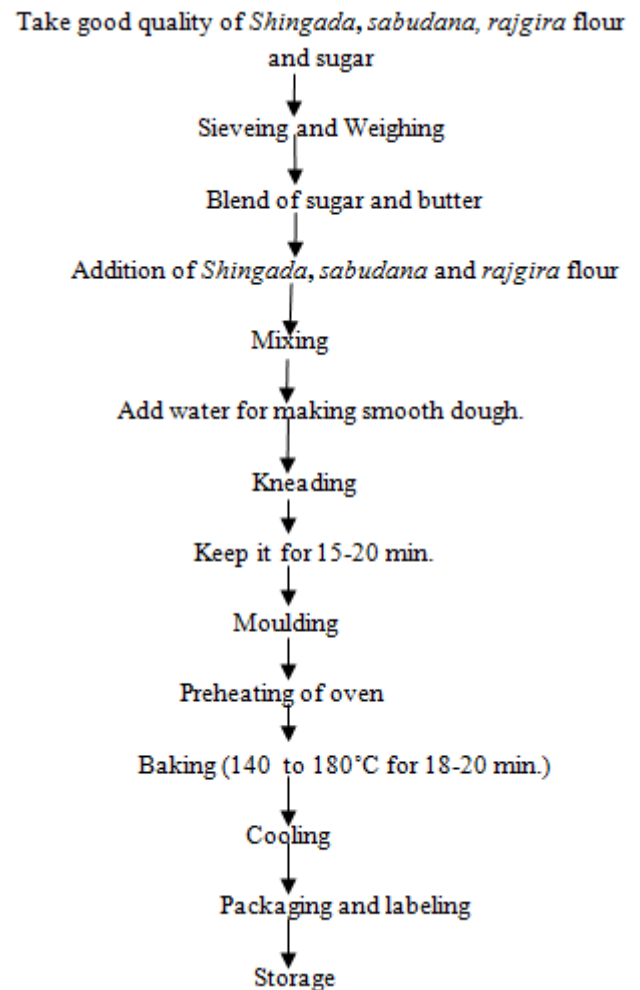


Figure 1: Process flow chart of Biscuit

2.4. Proximate Analysis

The moisture content of the developed biscuit was determined by the method described in [15]. 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. Ash content was determined as per the method given by [16]. 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 is energy source of for biscuits [17]. It contributes to the appearance of biscuits, improves the flavor and gives a good feeling in mouth [18]. The fat content was determined by the method described in [15]. , Method no.

30- 25. The total carbohydrate content was estimated using method of [19]. The estimation of nitrogen was done by kjeldahl method whereas the protein content is obtained by multiplying the nitrogen value with 6.25 [19].

2.5 Sensory Evaluation

Sensory evaluation of biscuit samples from various flour blends was conducted using a 25 member untrained panelists drawn from the general public. The test was conducted while the samples were still fresh. The panelists were required to observe the sample, taste and score. Then rinse their mouth with water before tasting another sample/product. The products were analyzed based on the following parameters of appearance, texture, crispness, flavour and overall quality using a nine-point hedonic scale of 9 = liked extremely down to 1 = disliked extremely.

3. Results and Discussion

3.1 Proximate Analysis

The result of the Proximate Analysis is shown in Table 3. Ash content of the biscuits ranges from 0.8 to 0.5 %. Significant differences exist on the ash content of the biscuits. Biscuit produced from *Shingada, sabudana and rajgira flour* (35, 30, 35) had the highest value i.e., 5%. Fat content of the biscuit ranges from 18.5 to 17.9%. Biscuit produced from *Shingada, sabudana and rajgira flour* (35, 30, 35) had the lowest fat contain . Moisture content of the biscuit ranges from 4.9 to 4%. The protein content of biscuit ranges from 4.8 to 5%. The highest protein content of the biscuit i.e., 5% was observed in the proportion such as (35, 30, 35). The carbohydrate content of biscuit ranges from 62 to 71.9%. The sugar content of the biscuit ranges from 19 to 23.4% (Fig 2).

Table 3: Proximate composition of fasting biscuit (%)

Particulars	Sample A	Sample B	Sample C
Crude Protein	4.8±0.25	4±0.22	5± 0.23
Crude Fat	18.5±0.15	18±0.17	17.9± 0.19
Carbohydrate	62±0.08	65±0.10	71.9± 0.12
Sugar	19±0.06	20±0.07	23.4 ± 0.09
Moisture content	4.9±0.32	4.2±0.32	4± 0.33
Ash	0.8±0.11	0.6±0.07	0.5 ± 0.09

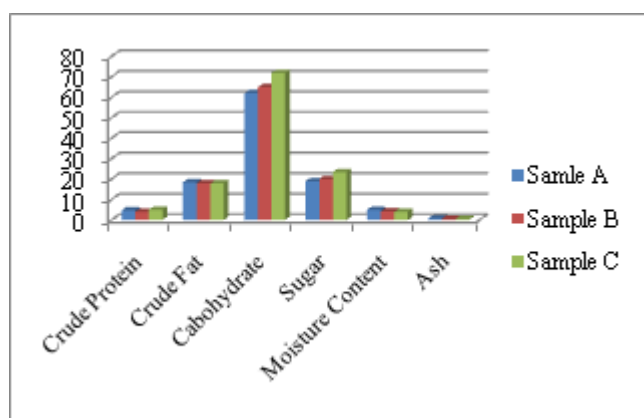


Figure 2: Proximate analysis of fasting biscuit

3.2 Sensory Evaluation

The result of the sensory evaluation is shown in Table 4. Colour is an important sensory attribute of any food because of its influence on acceptability. The old age that the eye accepts the food before the mouth is very true. The brown colour resulting from Maillard reaction is always associated with baked goods. The biscuit scored between 7 to 7.1 on the 9 point-hedonic scale indicating that the biscuit were at least like moderately. There were significant differences among the biscuit samples. Fig 3 shows that, the colour of the sample A was superior to other sample.

The taste result shows that the biscuits made from *Shingada, sabudana and rajgira flour* (35, 30, 35) had the highest mean score of 7.1 and this was closely followed by that *Shingada, sabudana and rajgira* (40, 20, 40) and *Shingada, sabudana and rajgira* (45, 10, 45) with mean score of 7 and 6.8 respectively and there was no significant difference between them. Based on flavour the result shows that the biscuits made from *Shingada, sabudana and rajgira flour* (35, 30, 35) had the highest mean score of 7.9 and this was closely followed by that *Shingada, sabudana, rajgira* (45, 10, 45) and *Shingada, sabudana, rajgira* (40, 20, 40) with mean score of 7.2 and 6.4 respectively. Based on texture sample C which contain *Shingada, sabudana and rajgira* (35, 30, 35) had the highest mean score of 7.1 and sample A contain *Shingada, sabudana and rajgira* (40, 20, 40) had lowest score of (6.9). Based on appearance the biscuits made from *Shingada, sabudana and rajgira flour* (35, 30, 35) had the highest mean score of 6.8. Based on overall acceptability the sample c was selected which contains *Shingada, sabudana and rajgira flour* (35, 30, 35).

Table 4: Average of Sensory analysis Data

Samples	A	B	C
Colour	7	6.8	6.9
Taste	6.4	7.2	7.9
Flavor	6.6	7.3	7.6
Texture	6.9	7.8	7.9
Appearance	6.7	6.7	6.8
OAA	6.8	7.4	7.8

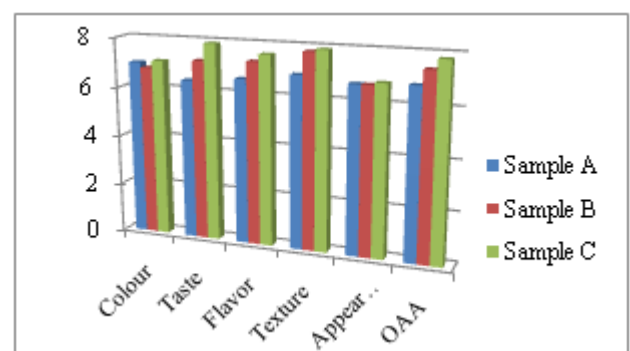


Figure 3: Effect of fortification on sensory evaluation of fasting biscuits



Figure 4: Sample C:
Shingada(35):Sabudana(30):Rajgira(35)

4. Conclusion

Incorporation of *Shingada*, *sabudana* and *rajgira* flour in (35, 30, 35) proportions was found to be the most acceptable combination in biscuit making with respect to nutritional, textural and organoleptic qualities of biscuits (Fig. 4). Biscuits with incorporation of *Shingada*, *sabudana* and *rajgira* flour in (45, 10, 45) proportion were found to be nutritionally superior but not well accepted with respect to sensory qualities. As the fat content of biscuits prepared from *Shingada*, *sabudana* and *rajgira* flour in (35, 30, 35) proportion, was i.e. 17.9% and thus it was beneficial for health. So according to quality evaluation and sensory evaluation the biscuit prepared from *Shingada*, *sabudana* and *rajgira* flour in (35, 30, 35) proportions were giving comparatively higher quality.

5. Acknowledgement

The authors are grateful to Principal, K. K. Wagh College of Food Technology, Nashik for granted permission to conduct this project and providing the expert and technical assistance.

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