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Formulation of ragi and whole wheat flour supplemented Nutri cookies

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Abstract

Bakery products are gaining popularity day by day. Among all bakery products cookies have high consumer acceptance. India presently consumes the most biscuits in the world. Refined wheat flour is commonly used for making cookies whose nutritive value is comparatively low where on other hand consumers demand for nutritionally enriched food products is growing. Keeping these facts in view, the present investigations was carried out to formulate ragi and whole wheat flour supplemented cookies along with favourite cardamom natural essence in three different proportions. Type I, Type II and Type III formulations were prepared which contain refined wheat flour, ragi flour and whole wheat flour in different levels. From above three formulations Type II was selected according to 10 semi trained panelist members by using 9 point hedonic scale. It was found that organoleptic evaluation of Type II formulation had scored highest in body and texture (7.81), overall acceptability (7.82), taste (7.52). The most acceptable formulation was selected for their nutritional composition. Nutritional properties showed that Type II formulation had maximum crude protein (9.46%), carbohydrates (59.90%), and crude fat (17.12%). The iron and calcium content was found to be 9.6 and 150 mg per 100 g of product. As ragi is rich source of calcium, iron and whole wheat is good source of iron there supplementation significantly improved the iron and calcium content of cookies. Thus, it may be concluded that good quality cookies could be prepared by using refined wheat flour: ragi flour: whole wheat flour as 40:30:30 which helps to improve the nutritional status of consumer.

Keywords: Bakery products, refined wheat flour, nutritional status, iron, calcium

1. Introduction

The bakery products are occupying an important place in food industry. The annual growth of bakery industry is about 10% and the demand of bakery products are increasing among all sections of people. Bread, biscuits and cookies are major part of bakery industry and covers around 80% of total bakery products in India (Goswami *et al.*, 2020)^[6]. Among various bakery products cookies are one of the most popular bakery products (Yousaf *et al.*, 2013)^[17]. Commonly consumed processed bakery food items in India, cookies are ready to eat, practical, affordable, and widely available.

Currently, India is the country that consumes the most cookies worldwide. A cookie is a chemically leavened product also known as biscuits which is baked or cooked good that is small, flat and sweet. It contains flour, sugar and some type of oil or fat (Anitha & Prabhavathydevi, 2018)^[2]. They are ideal for nutrient availability, palatability, compactness and convenience. They are in low moisture content as compare to other products which offer resistant for microbial spoilage thus having longer shelf life product (Bhoite *et al.*, 2018)^[3]. The per capita consumption of cookies in India is reported to be 8 kg per annum as against 15 kg per annum in developed countries (Shukla and Shilpa, 2000)^[15]. It is a rich source of protein, fat and carbohydrates but limiting in minerals and dietary fibers (Kokani *et al.*, 2018)^[9]. As cookies are widely consumed product they serves as a vehicle for nutrition improvement of population at low cost and without much convincing. Cookies are having wider consumption base, relatively long shelf-life, more convenience and good palatability which make it attractive for mineral fortification and other nutritional improvements.

Finger millet (*Eleusine coracana*) also known as ragi is important millet crop in dry hill area of India. Ragi is predominantly used in India and Africa. It is rich in protein, calcium, phosphorus, iron, fibre and vitamin content. The calcium content is higher than all cereals and iodine content is considered to be highest among all the food grains. In addition to having the highest quality protein, ragi also contains phosphorus, vitamin A, vitamin B, and vital amino acids (Gopalan *et al.*, 2004)^[4].

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Due to the larger amount of dietary fibre and non-starchy polysaccharides in finger millet, it has a number of physiological and nutritional advantages (Rai, 2000)^[10]. Ragi seed coat in particular, contain several phytochemicals that may have multiple health benefits (Takawale *et al.*, 2021)^[166]. Ragi contains Moisture (13.10 g), Protein (7.30 g), Carbohydrate (7.00 g), Fat (1.30 g), and Energy (328.00 Kcal) (Gopalan *et al.* 2004)^[4]. As we have seen Ragi is rich in calcium and iron other than all food grains its utilization in cookies makes them nutritious. Ragi has the highest concentration of calcium, anti-oxidant qualities, and phytochemicals, making it easily and gradually digested. Thus, it provides highly effective blood glucose management for diabetic individuals. The bulkiness of the fibres and the slower digestion rate makes us feel fuller on, fewer calories and therefore may help to prevent us from eating excess calories. Therefore, ragi is considered to be ideal food for diabetic individuals due to its low sugar content and slow release of glucose/sugar in the body (Kokani *et al.*, 2018)^[9]. Another ingredient used is whole wheat flour. Wheat (*Triticum spp.*) is the important and staple crop of the people in India and around the globe because of fundamental source of calories and nutrients mainly used for milling and baking (Adeyanju *et al.*, 2021)^[11]. It contains moisture 12.8%, protein 11.8%, fat 1.5%, minerals 1.5%, crude fibre 1.2%, carbohydrates 71.2%, energy value 346 Kcal, calcium 41 mg/100 g, phosphorus 306 mg/100 g and iron 5.3 mg/100 g respectively (Gopalan *et al.*, 2000)^[5] and (Rana, 2020). While whole grains contain three components bran, germ, and endosperm, refined flour is made from grain that has been processed to remove the bran and germ, leaving behind the starchy endosperm, which is pulverized into flour. As refined grain is mostly starch (Joel *et al.*, 2014)^[8] and because of lack of fibre due to the removal of bran and germ produce a rapid increase in blood sugar when consumed. Thus it is beneficial to use whole wheat grain flour instead of refined wheat flour, here we have added 30% whole wheat flour.

Now a days human being suffer from many health problem because of lower nutritive food like malnutrition, anemia etc. Each person needs best nutritive food to avoid health nutritional value as compared to other food grains. Cookies are usually made up of refined wheat flour and production of cookies from refined wheat flour is deficient in several nutrients including some vitamins, mineral elements, proteins as well as dietary fibres (Hemanth Kumar, C. V. 2020)^[7]. Because of lack of various nutrient content commercially available cookies do not form complete balanced diet which is against the ethics of present day health conscious consumers. As a result, it appears that the only way to satisfy the demand of health conscious consumers in terms of product aesthetics and nutritional quality is to fortify cookies with natural ingredients (Goswami *et al.*, 2020)^[6]. According to Rana *et al.*, 2021 cookies are predominantly based on refined wheat flour (RWF) and the blending of RWF with oilseeds and pulses such as soybean, moth bean and chickpea can upgrade the nutritional quality. Taking into consideration the consumer's current demand for nutritionally enriched food products present work was carried out to formulate cookies by substituting refined wheat flour with ragi and whole wheat flour in different proportions. We have added ragi and whole wheat flour which is beneficial for growing children, teenagers, and also for old people as it contains calcium, iron, and protein.

2. Materials and Methods

The present research was carried out at Department of Food Science and Technology, Shivaji University, Kolhapur.

2.1 Materials

2.1.1 Raw Materials and Ingredients

Refined wheat flour, ragi flour, whole wheat flour, sugar, vegetable fat, baking powder, ammonium bicarbonate, sodium metabisulphite (SMBS), salt and cardamom essence were brought from local Kolhapur stores.

2.1.2 Chemicals

Chemicals of analytical grade were made available in the laboratories of Department of Food Science and Technology, Shivaji University, Kolhapur.

2.1.3 Processing Equipment

The analytical equipment's like hot air oven, kjeldahl, soxtron, muffle furnace were made available in the laboratories of Department of Food Science and Technology, Shivaji University, Kolhapur.

2.2 Methods

2.2.1 Formulation of Cookies

Three different formulations of cookies coded as Type I, Type II and Type III were prepared according to the composition given below-

Table 1: Different formulations of cookies

Sr. No.	Ingredient's	Formulations		
		Type I	Type II	Type III
1	Refined wheat flour 'g'	30	40	50
2	Ragi flour 'g'	50	30	40
3	Whole wheat flour 'g'	20	30	10
4	Sugar 'g'	60	60	60
5	Fat 'g'	60	60	60
6	Baking powder 'g'	0.5	0.5	0.5
7	Salt 'g'	0.3	0.3	0.3
8	Ammonium bicarbonate 'g'	0.25	0.25	0.25
9	sodium metabisulphite 'g'	1	1	1
10	Cardamom essence	7 drops	7 drops	7 drops

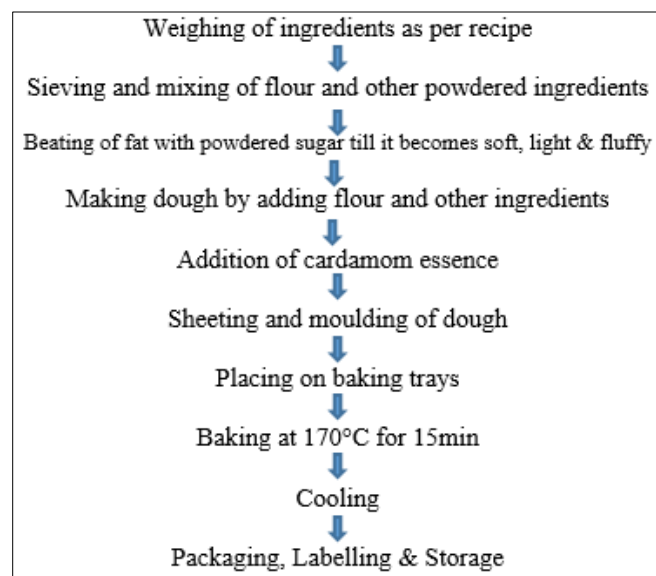


Fig 1: Process flow sheet

2.2.2 Preparation of Cookies

Ragi and whole wheat flour supplemented nutri cookies were prepared as per procedure given in Figure 1. The vegetable fat was beaten along with powdered sugar. Then the mixture of refined wheat flour, ragi flour, whole wheat flour, baking powder, salt, ammonium bicarbonate, sodium metabisulphite was added and followed by addition cardamom essence. Knead the mixture until get dough of desired consistency. Then sheets were formed. It was then moulded and placed on the baking trays and allow to bake at 170°C for 15 min. After baking the trays were taken out, cooled and cookies were packed.

2.2.3 Proximate Analysis of Cookies

Moisture content, crude protein content, crude fat content, ash content, and total carbohydrate content was determined using different procedures. The moisture content was determined using hot air oven method, crude protein content was by using micro-kjeldahl method, crude fat was estimated using soxhlet fat extraction system and ash content was by muffle furnace while carbohydrate was by difference. Iron and calcium content was determined using the standard method mentioned in Ranganna (2009).

2.2.4 Sensory Evaluation of Cookies

The recipe was finalized on the basis of sensory evaluation. Sensory evaluation was carried out by 10 semi trained panel members by using 9 point hedonic scale as per procedure given by Ranganna (2009).

3. Result and Discussion

3.1 Proximate Analysis of Prepared Cookies

Proximate analysis of selected Type II formulation cookies showed the following results as per Table 2. The moisture content of cookies was 12.28%, the crude protein content was 9.46%, crude fat was 17.12%, the ash content was 1.24%, and carbohydrate content was about 59.90%. Among the minerals iron and calcium content was found to be 9.6 and 150 mg per 100 g of product respectively. The data shown that supplementation of cookies with ragi flour (30 g) and whole wheat flour (30 g) resulted in increase of calcium and iron content as both are rich sources of calcium and iron. Similar findings have been supported by Bhoite *et al.*, (2018) [3] in finger millet cookies formulation.

Table 2: Proximate analysis of prepared cookies each value is average of three determinations

Sr. No.	Parameter	%
1	Moisture	12.28
2	Crude protein	9.46
3	Crude fat	17.12
4	Ash	1.24
5	Carbohydrate	59.90

3.2 Sensory Evaluation of Prepared Cookies

Sensory evaluation of the cookies was done by using 9 point hedonic scale, 10 semi trained panel members were employed for this sensory evaluation. The product was evaluated on the basis of its parameters like colour, flavour, texture, taste and overall acceptability. According to results among three different formulations the maximum overall acceptability score was found in Type II formulation 7.69 whereas minimum overall acceptability score was found in Type I

formulation 5.76 which might be due to increase in ragi flour content in Type I formulation. Obtained result supports the findings of other works on sprouted ragi flour (SRF) supplemented cookies by Rana *et al.*, (2021). Hence, the cookies with 40% proportion of refined wheat flour, 30% of ragi flour and 30% of whole wheat flour was found to be more acceptable. Table 3 shows the sensory scores for the samples prepared.

Table 3: Sensory evaluation of prepared cookies

Formulation	Colour	Flavour	Texture	Taste	OA
Type I	5.23	6.26	6.39	5.16	5.76
Type II	7.77	7.35	7.81	7.84	7.69
Type III	5.54	6.48	6.78	6.06	6.22

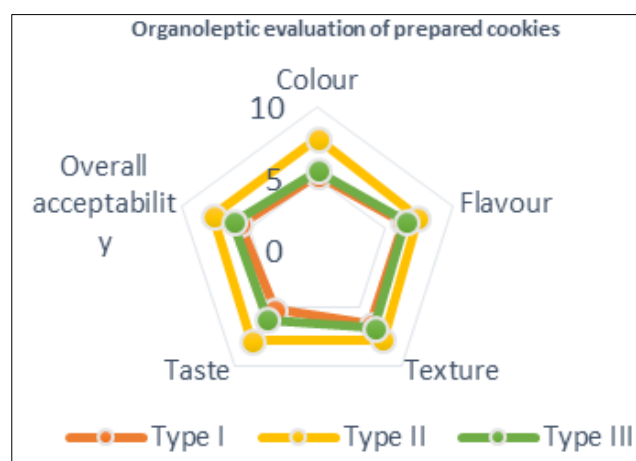


Fig 2: Sensory evaluation of prepared cookies



Fig 3: Ragi and whole wheat flour supplemented nutri cookies

4. Conclusion

The results of this study indicates that, nutri cookies were formulated by substituting refined wheat flour with ragi and whole wheat flour at combination of 40:30:30 respectively was more acceptable. It may be concluded that ragi and whole wheat flour 30% each can be successfully incorporated in the refined wheat flour to yield cookies with acceptable sensory attributes. As ragi and whole wheat flour are rich source of calcium and iron their utilization significantly improved the iron and calcium content of cookies. Hence the utilization of ragi in cookies will helps to improve the nutritional status of consumer.

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