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## Recent developments in dough based bakery products: A mini review

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### Abstract

Bakery products are consumed by peoples of all age and economic group. The fortified, fiber enriched multigrain bakery products are gaining much popularity in market as compared to the traditional ones. The entire bakery products can be divided into different segments such as breads, cakes, biscuits, pizza, pastries, muffins, buns etc. Cereals are the cheapest source to satisfy the hunger and wheat is a popular staple food grain. Bakery products are mainly prepared by refined wheat flour. 25% of the total production of wheat is used in the manufacturing of bakery products, which are rich in fats, starch, and energy but lacks in fiber and protein. Bakery products can be enriched with fiber and protein by preparing them using different types of coarse grain flour and legumes such as whole wheat, rice, oats, maize, black gram, buckwheat, barley, rye, finger millet, pearl millet, sorghum, chick peas etc. which provides antioxidants, dietary fibers and other essential nutrients. It is challenging to achieve the rheological property of dough and sensory property of the final baked good with total or partial substitution of the refined wheat flour by gluten free, fiber and protein rich composite flours. Incidence of obesity, diabetes, and other chronic diseases are increasing globally and to combat such types of diseases, there are demands for fiber and protein rich foods with less carbohydrate. This review focused on the application of protein and fiber rich flours in the manufacturing baked goods. Composite flour highly increases the nutritional value of bakery products.

**Keywords:** Bakery, cereals, chronic diseases, fortification

### Introduction

Bakery industry is one of the large growing food industries in the world. Bakery products such as bread, biscuits, and cookies are most popular bakery item <sup>[1]</sup>. These products are important food snacks for children and adults. Majorly bakery products are prepared from refined wheat flour. But the raising health issues like constipation, obesity and other chronic diseases demand for the food rich in dietary fiber and protein other than the major carbohydrates. Bakery products such as pizza, cookies, and biscuits are consumed in large quantities worldwide which are low in protein and fiber. For this reasons interest in research has been developed in increasing fiber and protein content in diet. Production of bakery products holds an important place in food industry. As the production of bakery products is increasing with wide range consumers now have variety of option in bakery products. As there is wide range of baked goods in bakery industry, consumer are getting newer option thus the industry have a reason to fortify and invention in bakery products to satisfy health conscious customers.

In global level the incidence of diabetes and obesity are increases exponentially due to food habits, and to overcome them, a raise in demand for food containing complex carbohydrate with higher levels of dietary fiber and beneficial phytochemicals, low glycemic and calorie food has been in demand. Cereals based products are consumed daily by the majority of population, Bakery products are consumed food of all time. Therefore now food industry has focused on increasing the nutritional value of these products. The current trend is to create bakery products that are beneficial for health. Nowadays dietary fiber is considered a very important ingredient in bakery products. It helps in reducing gastrointestinal pain; reduce the risk of various cancers, fat absorption from the digestive tract. In the past few decades food industry has gone through many changes, mostly due to the development and implementation of new technology to meet growing consumer demands for convenience products. Legume flours are more in application for manufacturing of protein rich bakery products. The proteins in legume are containing balance amino acid composition and provide nutritional benefits. Therefore are ideal ingredients to improve the nutritional characteristics of bakery products <sup>[2]</sup>.

## Cookies

Cookies are one of the bakery products which are consumed by all age group people. These are usually prepared from refined wheat flour which tends to have less essential nutrients but are good source of fat, carbohydrate. The nutritional value can be enriched by using multigrain flours, which add protein, fiber and minerals. The protein content of cookies can be increased by using Soybean. It is one of the important oil and protein crop in the world. It contains 45% of protein with all the indispensable amino acid. Soybean is cheapest source of protein and these proteins are unique among plant protein because of its high biological value and presence of essential amino acid such as lysine which is limiting amino acid in most of the cereals.

Protein rich and low calorie cookies were prepared by substituting refined wheat flour and sugar with different levels of defatted soy flour and stevia leaves powder respectively. Substitution of both ingredients in a maximum of 20% gives a better overall acceptability for cookies. On increasing the amount of defatted soya flour, increased thickness and hardness with a decreased weight, diameter, and spread ratio and spread factor of cookies were obtained. However it gives increase in ash, crude fiber and protein content and decrease in fat and carbohydrate contents [3]. High protein and sugar-free fortified cookies were prepared by using different levels of pea flour, soya bean flour and oat flakes with sucralose in place of sucrose. It gives nutrient enriched moistened cookies with higher protein, crude fat, dietary fiber, ash content and lower carbohydrate. However, the energy value is higher as compared to the control. Pea flour and soya bean in a proportion of 5% to 10% gives a highest scored for Sensory evaluation [4]. Cookies were prepared by using composite flour of sweet potato and quinoa flour (1:1) by partial replacement of wheat flour (20-60%). The nutritional profile of the cookies increased with the increased level of composite flour; however the spread ratio and the thickness of the cookies reduced [5].

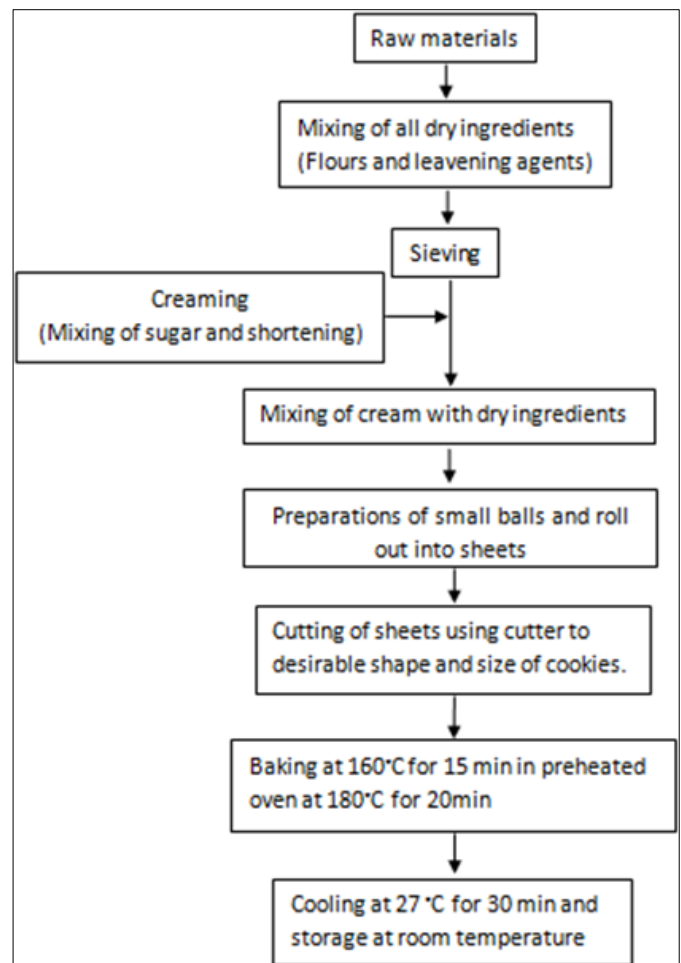
Chickpea is another affordable source of protein, carbohydrate, minerals, vitamins, dietary fiber. It has also good antioxidant property. Chickpea is useful in lowering the risk of cardiovascular disease, obesity, cancer and diabetes. Addition of mung bean and chick pea flour (14.8 %) with wheat flour (21.2 %) and corn flour (6.5%) in making of cookies does not affects the functional properties of the cookies but is increased the protein and resistant starch content with its overall acceptability. Chickpea cookies had the best flavour, crispiness and acceptability as compared to the mung bean [6].

Wheat flour is the basic structural component of most batter and dough products. It is able to perform the necessary textural functions because of gluten content, which allows expansion of air cells and provide rigidity after baking. However, wheat protein is deficient in some indispensable essential amino acids and it has lower protein in comparison to oilseeds and pulses [7].

## Bread

Bread is a staple food full of flavor and nutrients. It is an important part of human diet but for many people it is much more than just providing nutrients. Since bread is the basic

food of the daily human nutrition, various attempts have been made to innovation in it for nutrient enrichment. Wheat flour is the major ingredients used in the preparation of various bakery products. White flour is nutritionally poor and must be enriched with fiber, protein, vitamin and mineral to overcome the malnutrition problem. White bread prepared from white flour is rich source of energy, and carbohydrate but lacks in protein, vitamins, minerals and fiber. Breads which are prepared by whole grain are rich in fiber content, which enhances the digestive system action. Rye is a good source of dietary fiber and a bread prepared from rye is low in glycemic content compared to the wheat products, making them suitable for diabetics [8]. Bread can be prepared by using variety of such flours which are good source of fiber such as barley which is good source of dietary fiber and contain essential amino acid. Barley b-Glucans are helpful in reducing the blood cholesterol and glycemic content. Finger millet is another good source of fiber, calcium, minerals and good quality protein along with essential amino acid, vitamin A and B and phosphorus [9]. The bakery industry is also focusing on the use of minor millets as a source of dietary fiber and bioactive compounds. On incorporation of germinated horse gram flour (6%) with wheat flour in manufacturing of bread by straight dough method enhances the antioxidant and polyphenol content along with minerals like calcium and iron in the final product [10].



**Fig 1:** Process flow chart for making of cookies

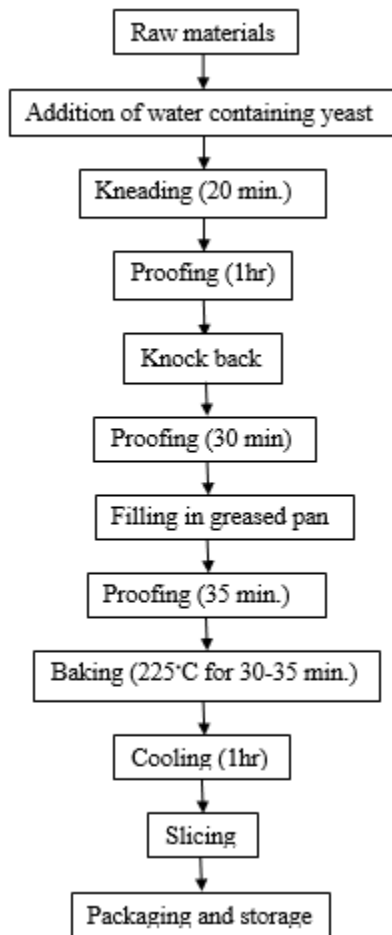


Fig 2: Process flow chart for general bread making

### Biscuits

Biscuits are one of the oldest bakery item consumed by all age group people. It is a quick hunger satisfying food, usually prepared by using refined flour and is high in calorie, fat, energy and poor in nutritional value. Its nutritional value can be increased by using multigrain flour such as buckwheat, which is a highly nutritious cereal and rich in fiber and protein content with favorable amino acid and vitamins [11]. Buckwheat have various health benefits such as helpful in reducing high blood pressure, controlling blood sugar, lower blood cholesterol, prevent accumulation of fat and constipation. Barley is again a highest source of dietary fiber and also contain beta-glucan, B-complex vitamins, tocotrienol and antioxidant [12]. Number of experiment have shown that barley can be successfully incorporated in vast variety of bakery products such as different types of bread, biscuits, cookies, asain noodles, bars, muffins [13]. Because of changing lifestyle, there is a huge demand for ready to cook and ready to serve foods. Biscuits possess many attractive features among ready to eat snack due to its longer shelf life. It makes massive production and distribution globally. Uses of multigrain flour (Buck wheat and Barley) maximize nutritional, functional and sensory properties of biscuits. Protein rich biscuits were prepared by fortification of soya flour [14]. Wheat flour is substituted with Soya flour in a proportion of 0-30%. Biscuits fortified with 30% soy flour were providing highest nutrition as compared to the whole wheat flour biscuits. However biscuit prepared with 10% soy flour give a better acceptability in sensory evaluation [14]. Biscuits prepared from Pearled sorghum flour on substitution of wheat flour and fortified with 5% defatted soya flour affect

sensory, textural as well as the nutritional characteristics of biscuit. On increasing the amount of sorghum flour the spread ratio, dough strength and L\* value decreases and increases in hardness toughness, average breaking force, average breaking energy and a\* value of biscuits takes place. It is responsible for darkening of biscuits. A biscuits with acceptable quality can be prepared by using a maximum of 50% sorghum flour fortified with 5% defatted soya flour. However biscuit prepared from partial substitution of wheat flour with 10% pearled sorghum flour give best sensory attributes [15].

### Cake

Cakes are popular and are associated in the consumers' minds with a delicious sponge product with desired organoleptic characteristics. Quality of cake is determined by three major factors, appropriates proportion of ingredients for specific type cake being made a properly balanced formula and the optimum mixing and baking process. Legumes flours are the ideal ingredients for improving the nutritional value of bakery products because of its amino acid and fiber content. Legumes are also known as a poor man's meat. Daily consumption of legume in diet provides carbohydrate, fiber, vitamins and minerals and has low glycemic index [16]. The addition of legume to cereal based bakery products could be a good alternative for increasing the intake of legume. Legume protein are rich in lysine but lacks in sulphur containing amino acid whereas cereal protein lacks in lysine and contain amino acids [17]. Therefore combination of grain with legume protein will provide better overall amino acid balance which is helpful in preventing malnutrition problem [18]. Cake is prepared by replacing wheat flour with mixed of legume flour (beans, chickpea and lentil) using canola oil and olive oil as a shortening to improve its nutritive value. Corn flour, green gram, oats, peanuts and soybeans powdered are used for fortification of cupcake to make it protein and nutrient rich. Cupcake made up of by using 100% of soyabean and peanut are more nutritious however the taste and texture is maintained in the cupcake made by corn and oats powdered [19]. On partial substitution of wheat flour by lentil flour significantly affect the physical characteristics of the dough development time and water activity of the cake. The fortified cake gives increased extensibility and decrease in tenacity, swelling index and deformation energy of dough with the increase of lentil flour levels in formulations. The density of the cake increased whereas water activity, and crumb color values decreased. Increasing levels of lentil flour caused increases in total sensory scores. The overall acceptability rate showed that 15 and 20% lentil flour can be incorporated to prepare acceptable quality cakes [2].

### Pizza

Pizza, one of the most commonly purchased bakery item in food stores has maintained its market share through the changing nature of the food industries and even growing popularity. It is a value added item made from flour. The invention of Pizza is credited to Naples [20]. It is a very common and popular fast food item, which is very high in calorie and thus make it unhealthy food item. Therefore it is promising challenge to reduce the calorie of pizza by enhancing the fiber quantity. The basic formulation of the dough includes flour, water, salt, sugar, and baker's yeast. Pizza appearance, texture, and taste are important attributes for its acceptance by consumers and identification [21] Pizza is regarded as one of the popular snack food due to its

palatability, hunger satisfying food, which is easy to make and easy to consume. It contains high level of refined sugar, flour, polyunsaturated fats, salts and numerous food additives but is lacks in protein, fiber, and vitamins which make it unhealthy. On using whole wheat or multi- grain flour to develop pizza base increase the fiber content of the pizza significantly [22]. Raw seeds have limited digestibility, chickpea contain many ant nutritional factors [23]. It is also a cheap source of legume protein [24]. Whole wheat flour is heavier than regular white flour. In order to produce baked goods with a similar texture to white flour, a less whole wheat flour can be used along with the all-purpose flour. One of the primary nutritional differences between whole-wheat and white flour is the foods fiber content Dietary fiber plays an important role in bakery products and offering protection against diabetes and heart disease. Millets and grains have antimicrobial and antioxidant property food which are high in fiber, protein and phytochemical has been in demand. Pizza base prepared from multi grain flour using finger millet, oats, buck wheat and pearl millet contain 5-8% protein, 1-2% ether extractives, 65-75% carbohydrates, 15-20% dietary fiber and 2.5-3.5% minerals. It has the highest calcium level (344 mg / 100mg) it also contain phytates (0.48%), polyphenols, tannins (0.61%), trypsin inhibitory factor and dietary fiber which is considered as anti-nutrients because of metal chelating and enzyme inhibition activities [25]. The proximate compositions of developed pizza base were 23.23 g moisture, 10.23g fiber, 19.47g protein, 7.38g fat, 108.32 carbohydrates and 501.33 kcal energy. Millets and grains have antimicrobial and antioxidant property. Verities of pizza available in market however pizza base rich in protein or omega3 still lacks in market. Pizza base was developed using tuna meal [26]. Several health benefits have attributed to n-3 fatty acids such as prevention of heart disease, hypertension, neurological disease and prevention of various type of cancer [27]. The development of new products in the research field is increasing with growing consumer demands for food rich in nutritional value and functional characteristics. Soybean is a food used in several studies of new food formulation [28]. Soybean is rich in fiber, flavoinds, and bioactive peptides. It contain lipoxygenase, which is responsible for lipid oxidation and causes beany flavour and thus restricts the consumption of legumes and to overcome this lipoxygenase-free cultivars with improved flavour are being used [29]. Pizza is a traditional bakery product with pleasant aroma and flavour just like bread pizza dough low in nutrients and bioactive compounds since they are prepared from refined wheat flour. Studies have been used low percentage of soybean flour to replace wheat flour at bakery products (Wang *et al.*, 2005). The addition of soybean flour in the pizza base add good amount of antioxidant minerals (zinc, magnesium and copper) protein, fiber.

### Conclusion

Bakery products such as biscuits, cookies, cake, bread eaten in balanced quantities provides the body with essential nutrients for its good function. Addition of multigrain flour into various bakery products has considerable effects on nutritional value of bakery products. It can play an important role in helping consumers to achieve and maintain the objective of intake of specific calories daily. The underutilized grains like sorghum, millets are frequently in application in the manufacturing of mineral and fiber rich, healthy baked goods for the fulfillment of the consumer

demand. Legumes like lentil, peas, and chickpeas are used to enrich the protein content in the products like biscuits and cookies. Such innovation in bakery industry helps in combat different chronic diseases successfully.

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