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A Review on Gluten Free Rice Bread

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Abstract- As more people look to eat gluten-free products, it is becoming increasingly common for the general public to use gluten-free rice bread as an alternative for individuals with celiac disease or intolerance to gluten. The purpose of this review is to investigate ingredients and formulation, the quality characteristics, and the nutritional value of typical wheat-free rice bread. An extensive literature review has indicated that there are specific parameters that have to be considered while formulating rice bread in order for the ingredients (rice flour, starches, and hydrocolloids) to be optimal for texture and structure. This review will deal with the positive influence of additives as individuals such as gums stabilizers and enzymes on bread quality and shelf-life. Bread characteristics and processing conditions (mixing, fermentation, baking) effects Also highlight the positive/negative aspects of gluten-free rice bread nutritional wise, specifically GI and protein & mineral profile. This review will help food industries, researchers, and healthcare experts with the perspectives to make improved high-quality gluten-free rice bread products. The review also points to the need for further research and development to overcome the bottlenecks and hurdles in the production of gluten-free rice bread. Also, it underlines the sensory evaluation/consumer acceptability must be performed to validate gluten-free rice bread as a real diet option. So this review gives an extensive overview of the present market scenario, products in gluten free rice bread and narrows down certain areas of research (and development) реж. Solutions to overcoming the obstacles and boundaries of gluten-free rice bread can guide manufacturers in producing better quality goods that address the demand of gluten intolerant, celiac people.

Keywords- Gluten Free Rice Bread, Micronutrients, Functional Ingredients

I. INTRODUCTION

Bread is an essential cereal product for human nutrition and is part of the balanced diet food pyramid. The quality of flour is determined by its kind, properties, and additives. Consumers need bread with a flavor that appeals to them along with a pleasing color, texture, and shelf life. Quality authentication is one of the main problems the bread industry is now experiencing.

To meet this growing demand, the food sector is concentrating on producing gluten-free goods. Bread has a unique niche among the manufactured gluten-free goods. Traditional wheat bread, as well as bread prepared with other cereals including rice, rye, barley, and oats, is a staple that most people have on their tables every day. Giving up bread is a significant restriction for anyone on a gluten-free diet. Therefore, a significant problem for the baking

sector is producing tasty and high-quality gluten-free bread [1].

Numerous products have been utilized for fortification in order to make up for the deficiency of these important fatty acids, and their effects on the sensory quality, textural/thermal/physicochemical characteristics, and other features of food items have been examined. For the benefit of individuals of all ages, ω-3 fatty acids have been added to bakery goods, eggs, meat, infant meals, cereal bars, chocolates, milk, and milk products (curd, cheese, yogurt, ice cream, and butter). The health advantages of fortification are numerous and include preventing obesity and renal disease, reducing cardiovascular illnesses, reducing atherosclerosis, promoting brain development, having anti-tumor characteristics, and exhibiting anti-inflammatory, antipyretic, and analgesic qualities [2].

Enriching meals for health promotion and disease prevention has been done with whole flaxseed flour, which is a good source of omega-3 fatty acid and photochemical with great nutritional and functional properties. Nonetheless, a number of restrictions and modern difficulties continue to hinder the worldwide market growth of whole flaxseed (flour)-enriched goods. Examples of these include naturally existing antinutritional elements and nutrient entrapment within food matrix. Different kinds of whole flaxseed flour have the potential to modify the techno functional performance of food matrices, which in turn might impact the fortified food items' edible attributes [3].

II. LITERATURE REVIEW

Properties of Rice Flour on Bread Quality

Due to its abundance of anthocyanins, black rice is a favorite among customers who are concerned about their health. Because black rice contains a lot of polyphenols, it is very important to the food sector. Because of its strong antioxidant capacity, which is mostly attributed to its anthocyanins, phenols, and flavonoids, black rice is regarded as a very important natural product. Particle size of 180 μm is found in the black rice flour fraction that contains the highest concentration of physiologically active chemicals [4].

When extruded black rice flour was used, the rheological characteristics of the dough and bread improved compared to when raw black rice flour was used instead. Increased water absorption capacity in the dough was made possible by the use of extruded black rice flour; the more extruded the flour, the less time the dough may need to develop. The primary consequence of replacing black rice flour was a depletion of protein. Extruded black rice flour significantly alters the attributes of starch gelatinization, starch weakening, starch gel stability, and starch retrogradation, all of which affect the qualities of bread and dough [5].

Regarding the historical background, chemical makeup, nutritional value, and functional characteristics of black rice, it is evident that this grain has a long history of use as a meal and a potent medication. Black rice contains bioactive molecules called anthocyanins that have been shown to have strong antioxidant properties. These substances may also be used as preventative measures against a number of ailments, including cancer(Ito., et al 2019). Both the water solubility index and swelling potential progressively increased as the particle size of black rice flour decreased [5].

A thin gel was created by the brown rice flour. The brown rice flour had non-Newtonian shear-thinning behavior, according to steady-shear data, and the Herschel-Bulkley model could adequately explain the flow curves [6]. Brown rice flour's crystallinity declined, its damaged starch content increased and its particle size reduced. At the dough level, as the size of the brown rice flour particles reduced, the dough's cohesiveness and adhesiveness got higher, its water fluidity decreased, and its structure became more compact. However, the thorough analysis of the crumb structure, particular volume, and texture factors indicated that the moderately ground brown rice flour was superior for making gluten-free bread [8].

Fortification Properties by Flaxseed Powder on Bread Quality

Whole or milled flaxseed has been used as a functional supplement to several staple items to boost the nutritional content of the food products. However, the incorporation of flaxseed can have a substantial impact on the chemical and physical characteristics of food items, including texture and sensory aspects [9].

Rich in oil and protein, flaxseed has favorable physicochemical characteristics that may be used in food formulation and nutrition. Additionally, flaxseed has beneficial functional qualities that might be helpful in food systems where they can fulfill a variety of functional tasks. Flaxseed flour's propensity to absorb both water and oil makes it a valuable ingredient for a variety of goods that need to maintain both for their textural integrity. For example, oil retention keeps taste and improves mouthfeel. Therefore, flaxseed may be added to commercial flours that are low in protein to create composite flour that can be used to make baked goods like breads, muffins, biscuits, buns, and cookies. Eating meals prepared or enhanced with flaxseed flours would be a significant step toward reducing protein deficiency [10].

Press cakes made from flaxseed are an excellent source of protein and may enhance the nutritional content and functioning of many different food items. The concentrated form of cyanogenic glycosides found in press cakes, however, makes it difficult to employ them in food items since it is simple for adults to achieve acute hazardous levels and children may be at increased risk [11].

The effects of the traditional gluten-free flour mix and xanthan gum have been compared with the effects of this flax seed powder. When compared to the control and even the cupcakes with xanthan gum added, the specific volume and porosity of the cupcakes were enhanced by the addition of flax seed powder, particularly at 2%. The cake with 2% flax seed powder had the lowest hardness and chewiness rankings, and a microstructure that resembled that of commercial gluten-free flour combination. Therefore, flax seed powder can effectively substitute xanthan gum or any other commercial gum in order to provide the appropriate structure in the finished gluten-free product [12].

By adding oilseeds, bread's nutritional profile is enhanced, resulting in higher levels of protein, fiber, vitamins, minerals, vital fatty acids, and bioactive substances. Oilseed mucilages have also been effectively employed in place of fat to make higher-quality, healthier loaves. Thus, it is really interesting to see these molecules used in baked goods, both wheat-based and gluten-free. But keep in mind that depending on how it's prepared (flour or seeds, prehydration or not), and how much of it is used, this addition changes the dough's rheology. On the basis of this, issues may lead to modifications in the final bread properties. Consumer acceptance must be taken into account in order to guarantee the economic success of these inclusions; this can vary based on the type and proportion of inclusion. Generally speaking, though, it appears that seed levels as high as 15% may be achieved with reasonable acceptance [13].

Adding roasted flaxseed to traditional wheat-based bread can enhance its nutritional and functional qualities. An ideal addition level for this type of bread is 10 grams per 100 grams. The sensory acceptability of breads containing flaxseed was enhanced by roasting the seeds. Roasted flaxseed was used, improving its nutritional and maybe functional qualities [14].

The water in the gluten-free bread recipe can be effectively replaced with flax seed oil cake extract (FOCE), which will improve the baked product's quality. Because FOCE was used, the bread's nutritional value increased and it became more loaded with protein and minerals, particularly K and Mg. The bread's technical characteristics improved when FOCE was used in place of water, particularly in samples where the ratio of FOCE to water was high. The enhancement of sensory quality was impacted by all these positive adjustments brought about by the use of FOCE. Furthermore, it should be noted that FOCE greatly increased the gluten-free bread's capacity for antioxidants [15].

The cookies made with flaxseed cake and roasted flaxseed cake exhibited a considerable increase in total phenols, total flavonoids, and antioxidant capacity. The amount of flaxseed fortification considerably raised the levels of total phenols and flavonoids, with bread containing 8% flaxseed exhibiting the greatest levels. The final products' composition of fatty acids changed as a result of the inclusion of flaxseed cake. The whole wheat bread enhanced with 4% ground flaxseed, 8% whole flaxseed, and 5% flaxseed oil had the greatest PUFA to SFA ratio. The significant rise in the proportion of alpha-linolenic acid (n-3) in the fatty acid pool was also observed in bread, including gluten-free bread cooked with a 10%–13% ground flaxseed addition [16].

When compared to flax seed gum made at a lower extraction temperature, the higher temperature allowed for a larger production of flaxseed gum with superior emulsification capabilities and enhanced emulsion durability. Regretfully, compared to the product recovered at the lower temperature, the product acquired at the higher temperature was darker. These findings suggested that more research was necessary to enhance the extraction parameters that might increase the output and quality of flax seed gum, as well as to explore the possibility of using flaxseed gum in food items [17].

Impact of Hydrocolloids in Gluten Free Rice Bread

A key component for increasing bread's shelf life and improving storage stability is xanthan gum. Xanthan gum is a hydrocolloid with remarkable rheological qualities that enhance the texture and structure of bread. Its use has been demonstrated to increase bread freshness by preventing mold development, reducing moisture loss, and delaying staling. By preventing moisture migration and maintaining bread crumb texture, xanthan gum's capacity to build a robust network structure reduces the possibility of bread going stale or soggy while being stored. Additionally, the antibacterial qualities of xanthan gum help to improve bread safety by preventing the growth of bacteria that cause spoiling. Together, these advantages result in a notable increase in bread shelf life, which makes xanthan gum a vital ingredient in the baking sector.

Xanthan gum increased the dough's texture and sensory qualities while also strengthening the gluten network's capacity to withstand freeze-thaw cycles. Through electrostatic interactions, xanthan gum and gluten created more compact complexes that finally relieved the tendency of gluten's α-helices and β-turns converting into β-sheets during the freeze-thaw storage process, increasing the α-helix content to 28.98%. An increasing proportion of Xanthan Gum with distinct strong rod-like shapes is incorporated into the gluten network during many freeze-thaw storage cycles. Thus, compared to bread without xanthan gum, bread made from frozen dough containing xanthan gum and stored under freeze-thaw conditions for 0 to 90 days had better color, volume, and visible pore proportion [18].

Emulsifier addition decreased the stiffness of the crumb but had no discernible impact on the weight, moisture content, or density [19]. Higher xanthan gum concentrations can hold onto more water in gluten-free bread made with a blend of rice, maize, and quinoa flours. However, at a fixed water level, these concentrations result in less sticky batters with higher firmness, viscosity index, and consistency, which bakes into loaves with a lower specific volume and a less springy crumb texture [20].

Larger water content, on the other hand, results in stickier, less viscous batters that lose some of their stiffness and consistency. Batters eventually settle into baked loaves with a larger specific volume and a softer crumb texture that are more cohesive and springy. Loaves with a high specific volume, low hardness, high springiness, low mean cell density, poor cell size uniformity, high void fraction, high mean cell aspect ratio, and low mean cell compactness were created with the greatest water content of 110% and Xanthan Gum between 1.5 and 2.5%. [20].

While the physical characteristics of gluten-free breads give information about their particular

volume, color of crust and crumb, texture, water activity, and shelf stability, the chemical content of the breads is crucial for consumers in terms of nutrition and health benefits. The optimal mix of 2% xanthan gum and 0% guar gum is found in the formulation [21].

The smoothest texture and softest crumb were achieved with the addition of 1.5% guar gum and 1.0 and 1.5% xanthan. One might achieve high-quality pan bread by including xanthan gum at a ratio of 1.0-1.5% or guar gum at a level of 1.5% [22].

Physical and Sensory Properties Of Gluten Free Rice Bread

The physical and sensory characteristics of gluten-free rice bread are different from those of its gluten-containing others: the lack of gluten results in a bread with less elasticity, more crumb density, and a different texture profile; gluten-free rice bread frequently has a shorter shelf life, is more prone to staling, and loses moisture more readily; a sensory evaluation shows different levels of acceptability, with an an overview that vary from dense and dry to soft and tender; the color, texture, and aroma of the crust also differs significantly; these issues can be mitigated by using alternative ingredients and processing methods, improving bread quality and acceptability. Selective ingredient selection and processing changes have also improved sensory qualities including taste, texture, and overall likes.

Compared to Thai jasmine rice flour, Thai black rice has greater levels of total anthocyanins and polyphenols as well as antioxidant activity. Thai black rice was found to have a lower amylose level and greater particle size. Furthermore, when compared to Thai jasmine rice flour, Thai black rice flour showed reduced peak, trough, and breakdown viscosities. Additionally, compared to Thai jasmine rice flour, Thai black rice flour showed a higher solubility and a lower swelling power. Compared to the bread made with Thai jasmine rice flour, the bread made with Thai black rice flour was less cohesive, sticky, and springy, and it had higher values for hardness and chewiness [23].

Rice flour can be prepared cost-effectively by dry milling since its grains with round-shaped starch granules are relatively soft compared to other grains with angular-shaped starch granules. Rice grain is a good candidate for production of high quality gluten-free rice bread [24]

III. CONCLUSION

An innovative and promising approach for celiac or gluten sensitive individuals are fortified gluten-free rice bread that is healthy yet satisfying product. Although significant strides have been taken in fortification and hydrocolloids to enhance the nutritional content of this bread, more research is necessary for overcoming the rest of these hurdles. Prospective studies include the design of new hydrocolloids combinations, fortification alternatives, or process optimization for the improvement in sensorial quality and synthesis of gluten-free rice bread fortified. This would allow for creation of a product that is nutritionally nutritional to people with gluten related disorders and broadly acceptable.

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