The Pharma Innovation Journal 2022; 11(10): 528-535

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(10): 528-535

www.thepharmajournal.com
Received: 01-06-2022
Accepted: 05-08-2022

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Functional bread fortified with foxnut flour and amaranth flour

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Abstract
One of the primary topics in the food sector is product development and innovation. Bread continues to be the foundation of our daily diet because it is a food rich in flavors and nutrients. The nutritional content and quality of bread can be improved by fortifying it with functional food groups. Functional bread is fortified using foxnut flour and amaranth flour. Micronutrients are abundant in them, and calcium, zinc, iron, and potassium are high in amaranth. Iron and calcium are high in foxnuts. So, to develop nutrient bread, calcium and potassium are needed. In which to study the history of seeds, properties, importance, composition, and health benefits. To make more nutritious bread, for human beings. Foxnut (*Euryale ferox*) is a type of dry fruit, which is an aquatic plant grown in water like in a pond, lake, or tank. It is whitish in color and black, brown dots are seen on the surface of it. Fox nuts (*Euryale ferox*) or gorgon nuts, also known as Makhana, have long been a staple of traditional cuisine. It aids in the treatment of certain health conditions linked to blood sugar and has a low glycemic index. The Amaranths evaluate the effect of the popped amaranth flour on the rheology, chemical composition, protein digestibility, and physical properties. The addition led to improved crust color and flavor, a denser crumb structure, and more uniform porosity. The purpose of this review is to explain how functional bread, a common staple food, may give people the nutrients they require.

Keywords: Functional bread, foxnut flour, amaranth flour, fortification

Introduction
Bread is baked in the whole world. Different grains and cereals are added to bread to improve its nutritional value and quality of bread [3]. Baked food products are consumed globally. Among them, bread contributes to a large sector [74]. The sensory qualities of the bread-taste, flavor, color, aroma (smell), and texture-determine it is quality. These are the crucial qualities of bread [7]. In daily living, bread is an overriding food item. The creation of functional foods has a significant impact on human health since it increases food's nutritional content. In order for functional foods to become increasingly popular, primarily in baked goods made with cereal flours like foxnut and amaranth flour. It has increased the nutritional content of all foods and bakery goods (bread) while maintaining health [55].
Different names for foxnut seeds are 'Gorgon nut' and 'Phool Makhana'. The scientific name of foxnut is "*Euryale ferox"*. For fermented food, these are employed [84]. Foxnut is a type of aquatic flowering plant that is raised in water [5]. Foxnut belongs to the Nymphaeaceae family. Some scientists have referred to foxnuts as "Black Diamonds" and "Black Gems of Wetlands" due to the blackness of the outer seed coat. Cereals are particularly nutrient-dense. Owing to its low glycemic index [54]. The main attraction of the *Euryale ferox* plant is its delicious seeds, which are transformed into white puffed nuts. Based on their high Essential Amino Acid Index (EAAI) of 89-93%, these nuts are considered a superb dietary item in the dry fruit category and are very nutritious [42]. Foxnut has extremely nutrient-dense seeds, a low-fat content, exceptional levels of vital amino acids, and no cholesterol [67]. They become an incredible source of necessary amino acids, which cannot be produced by the human body and must be obtained through diet.
The genus and family of amaranth seeds are Amaranthaceae. Because amaranth is not a grain plant, its seeds are employed in various culinary products or for human consumption, making amaranth flour a pseudo seed. It is a seed that contains a lot of protein, including albumin, globulin, and a tiny amount of prolamins. They are abundant in carbs, proteins, fats, fiber, and ash, and their moisture content is low. Amaranth seeds include the amino acids lysine, tryptophan, and methionine. Leucine and threonine are the amino acids with the lowest concentration [3]. Amaranth flour provides beneficial nutritional qualities.

These grains are highly beneficial for treating numerous illnesses, including Anemia, Constipation, and Kidney problems [68]. Because they possess antioxidant capabilities, they enhance the qualities of baked goods like bread, cookies, etc. They also possess antitumor properties. It contains polyphenols, anthocyanins, tocopherols, and flavonoids, among other beneficial substances [4]. Amaranth flour is easily digestible and high in protein, which supplies a sufficient amount of amino acids. Both nutritional and nutraceutical benefits can be derived from amaranth flour [19]. Amaranth flour has enhanced the qualities of bread and other baked goods [78]. Squalene, a metabolic precursor to sterols and an oily liquid hydrocarbon, is contained in these seeds. Additionally, squalene works to improve the body's supply of oxygen. They provide other advantages for people, including decreasing blood cholesterol, boosting immunity, and preventing cancer [83, 36].

Almost all food products are fortified to boost the value of the micronutrients. Fortification aims to prevent and treat deficiencies, which are a lack of certain micronutrients in the body [13]. Add a certain quantity of micronutrients, such as vitamins and minerals, when using the fortification method. Amaranth flour can be used to strengthen bread. Because of its balanced nutritional value, it is considered a superfood. Protein content ranges from 13% to 19%, and it is also nutrient- and fiber-rich [55]. Food fortification may be required by laws and regulations or it may be optional, or at the manufacturer's discretion [55]. Not all nutrients are consumed regularly or in sufficient amounts, necessitating the need for fortified meals. These micronutrients may be included in product upgrades and raw material substitutions [12]. Amaranth flour is rich in micronutrients such as calcium-272.03 mg/100g, zinc-5.81mg/g, iron-329.87 mg/g and potassium-3.16 mg/g [40].

The Bread

One of the common foods by people worldwide is bread in all of its varieties. Traditionally, wheat flour is used in cereal bread. It is possible to mill a variety of other cereals, pulses, and even legumes to create "flour." Many people believe that bread is among the oldest 'processed' foods, if not the oldest. It is unlikely that we will ever be able to pinpoint the exact moment when bread was "found," although it seems likely that it happened in the Middle East, where cereal farming has its roots in ancient times [28]. There are now very few nations, where bread and other fermented foods are not produced and consumed. Bread products have developed into different varieties of texture, each based on highly distinct and varied qualities. Our traditional bread varieties have been developed over time by professional bakers from around the world who have discovered how to use the available raw ingredients as efficiently as possible to produce the necessary bread quality. The development of fermented wheat-based products over thousands of years has culminated in the food that we now refer to as bread. Similar to the majority, if not all, of the products of modern life, bread-making skills have improved more in the past 70 years than in all the centuries before. However, because bread is "that most ancient of consumables," it continues to arouse the most fervent debates regarding quality, flavor, and cost-effectiveness [64].

Evaluation of Bread Quality

Because it is challenging to analyze some extremely 'personal' characteristics of bread objectively, the method by which bread quality is determined to still heavily relies on expert subjective judgment. Due to the wide range of preferences among consumers, the attributes connected to flavor and eating quality are the most apparent instances of the assessment issues. However, we must have a foundation upon which to base our quality judgments if we as bakers, technologists, and scientists are to be in a position to evaluate the effects of new ingredients and processing techniques, to more closely match bread quality with consumer requirements, to reduce product variability, and to limit quality defects. It is insufficient to merely claim that a particular formulation change has "enhanced" bread quality in order for others to evaluate our efforts or for us to make longer-term projections. Therefore, we require objective standards, and when this is not possible, we must standardize as much as we can the processes we employ for our subjective evaluations. Numerous grading techniques are frequently employed to try and standardize subjective assessment. Exams and standards are frequently compared by the observer using pictures or diagrams that include attribute scores. By doing this, rating consistency is improved and "drifts" in the impression of quality over time can be minimized. External and internal categories are frequently employed in approaches to assess bread quality [38].

External Quality of Bread

Product dimensions, volume, appearance, color, and crust development are some of the traits we evaluate most frequently in this area. For the majority of bread, length and height are more important than breadth, which is of less significance. Many different types of bread are distinguished by their length. The product's outside is frequently a key element in catching the consumer's attention. The exterior qualities of bread were scored on a scale of 1 to 10, with 10 being the best and 1 being the worst. The loaf's appearance and dimensions are examples of its exterior qualities. The symmetry of the loaves and the break and shred of the crust are typically given a lot of attention. The geographic areas being served have a significant impact on the preferences for the color of the crust [75]. The many different characteristics under external quality are Colour- Brown, Dimension- length, breadth, and height, Volume, Texture, Aroma, and Flavour. It is usual practice to evaluate crust color using descriptive methods. Based on comparison with common color charts, such as the Munsell system, objective techniques [6]. The ideal crust texture varies depending on the product and is typically judged subjectively. Instrumental approaches based on snapping or puncturing are possible but less frequently employed because the measurements they yield will be significantly influenced by the intricate product architectures [71, 73].

Internal Quality of Bread

The interior crumb qualities, such as texture, grain and cell wall structure, color, and softness, were assessed on a scale of 1 to 10, with 10 being the best. A delicate, creamy white crumb is ideal in white bread. However, in other areas, bright white to an off-white tinge is desired. Thin cell walls and symmetrical, elongated cells are preferred to thick cell walls and spherical cells. Open grain has larger cells than closed grain, which has microscopic cells [75]. The sizes, numbers, and distribution of cells in the crumb (crumb grain), the color

of the crumb, and any significant quality flaws that are noticeable in a cross-section of the product are typically our main concerns with internal character. There is no single standard that can be applied to all products because each has unique cell structure needs. Because of this, using some kind of common reference material, such as pictures, the subjective evaluation of product crumb cell structure is still the most widely used technique. A measurement of the thickness of the cell wall material, or the crumb structure between the air cells, may also be part of the assessment of crumb cell structure. The data is frequently recorded on a scoring sheet of some kind, and there are numerous examples in the literature [72, 77]. Internal characteristics of Bread are the following: Colour, Quality defects- unwanted wholes, dense patches, visible in a cross-section of the product, Sheen, Texture, Crumb clarity, elasticity, and Moistness [72, 77].

Types of bread

In this investigation, three different types of bread were evaluated, and each was baked, cooled, and frozen in accordance with a standardized process at Idun Industries. The bread's physical attributes, including its color, the stiffness of the crust, its precise volume, and its sensory qualities, were kept as consistent as possible. The producer gave and used calculations to determine the number of accessible carbs, total starch, and dietary fiber in the product.

Following is a list of some of the bread:

- Bread makes using wheat flour
- Wheat replaced with zero content gluten flour
- Fruit bread
- Quickbread
- Yeast bread
- Sourdough bread
- Brioche

History of Foxnut seeds

Foxnut is also referred to as *Euryale ferox*, Makhana, and Gorgon nut. It is a flowering plant that is raised submerged [5]. It predates both tropical and subtropical climates, with temperatures ranging from 20 to 35 degrees Celsius, humidity levels of 50 to 90 percent, and precipitation levels of 100 to 250 cm [62]. In North Bihar, it is eaten as roasted foxnuts, whereas in Manipur, the stalks and leaves of the foxnut plant are eaten as vegetables. In West Bengal, Manipur, Orissa, Assam, and Kashmir, foxnuts are grown. Foxnut is also being harvested in Bangladesh, Nepal, China, Japan, Korea, Russia, and North America [52]. Over 80% of the nation's Foxnut production comes from the state of Bihar. Fox nut is mostly produced in the districts of Darbhanga, Madhubani, Saharsa, Katihar, Purnea, Supaul, Kishanganj Araria, and Sitamari. These districts have a 15000ha area under cultivation for fox nuts. By implementing the field-based fox nut cultivation method, the State Government aims to increase fox nut cultivation to 20,000 ha by the year 2020. The most crucial element of fox nut cultivation and post-harvest processing is the extensive utilization of labor. Fox nut farming, harvesting, popping, and product retailing directly affect five lakh families. The state government estimates that fox nuts are grown across an area of around 15,000 hectares. The overall yield was estimated to be between 7500 and 10,000 tonnes of popped fox nuts and roughly 22,500 tonnes of fox nut seed, which together bring in between 187 and 250 crores of rupees. Furthermore, the fact that only India pops fox nuts, while other nations only cultivate them, is a luxury. There, it is cultivated as an invasive aquatic weed for ornamental and therapeutic purposes [84].

Morphology

Foxnut is a plant that grows best in tropical and subtropical climates (*Euryale ferox* Salisb). The ideal air temperature range for it to grow and develop is 200 °C to 350 °C, relative humidity of 50% to 90%, and yearly precipitation of 100 cm to 250 cm. It can also reach naturally aquatic bodies with less than 50% water transparency [62]. A significant aquatic herb, prickly water plant, with enormous floating nature leaves of a size of 1-2 m, born on 0.90 to 1.5 m foot long petioles, primarily nerved and reticulated-veined beneath, green in upper and purple on below side, thorny on both sides of leaves even in the complete plant [44]. With a thick rhizomatous stem that is deeply entrenched in cluster form in the sediment, it thrives in stagnant water that is between 0.2 and 2 meters deep. Since the Fox nut crop's growth cycle in the pond system typically ranges between nine and ten months, producers are unable to produce more than one harvest per year. Additionally, only 1.1 to 1.6 t/ha of fox nuts may be produced under pond conditions [61]. The growth period of foxnuts is only four months. Throughout its growth stage, the fox nut also needs water that is between 0.30 and 0.60 meters deep. Every year, it is grown between the months of July and November. The enhanced strain of fox nuts produced between 2.6 and 3.0 t/ha in field conditions [43].

Composition

Foxnut flour has nutrient-rich seeds. They have Good in Protein, Carbohydrates, and Fats.

Table 1: Parameters foxnut and Percentage

Sr. No.	Parameters (podded foxnut)	Percentage
1.	Calories	358 Kcal/gm
2.	Moisture	12.8%
3.	Protein	9.7%
4.	Fat	0.4%
5.	Crude fiber	0.2%
6.	Amylose	18.2%
7.	Phosphorous	53.2 mg/100 g
8.	Iron	1.4 mg/100 g

***Source*:** [45].

Foxnuts have excellent hygroscopic and physical characteristics. Both raw and processed (fried) foxnuts offer a commendable number of amino acids, yet neither contains any cholesterol. Foxnut is a storehouse of nutrition because it is rich in macronutrients and micronutrients [67].

Benefits of Foxnut

The white, starchy Gorgan nut is a highly nutritious seed that can be eaten. Because of its potent antioxidant properties, it is useful in medicinal applications such as the prevention of proteinuria or diabetic nephropathy [69]. It has been prescribed to treat illnesses affecting the respiratory, circulatory, digestive, excretory, and reproductive systems of people [81]. For E. forex, foxnut is regarded as a potent stimulant. E. ferox feeding stimulated humoral responses and suggested its application in postpartum mothers. Additionally, it is used to treat early ejaculation, male impotence, and postpartum weakness in women. Additionally, illnesses affecting the

reproductive, pulmonary, circulatory, and excretory systems are treated [84]. Foxnuts have a lot of antioxidant activity, which could be utilized to treat diabetic neuropathy and proteinuria. It effectively neutralizes DPPH radicals and inhibits lipid peroxidation [21]. Dr. David Jenkins (1981) first proposed the idea of the Glycemic Index (GI) of foods, which may be employed as a modifiable element in the prevention of chronic diseases, as one of the coping mechanisms. Low GI foods are shown to increase insulin sensitivity, fasting triglyceride levels, healthy body weight maintenance, and a significant reduction in health risk factors [33]. Because they have a low GI, fox nuts completely meet the requirements for various non-communicable diseases. These nuts have a low Glycemic Index due to their complex carbohydrate content, which makes them a fantastic snack for people with NCDs. The Canadian Diabetes Association has recommended low glycemic index foods as part of nutrition therapy for diabetes patients [49]. Foxnuts are undoubtedly a handy and delicious snack, and eating one serving a day helps avoid chronic illnesses like high blood pressure, cancer, type II diabetes, cardiovascular disorders, and neurological diseases [66].

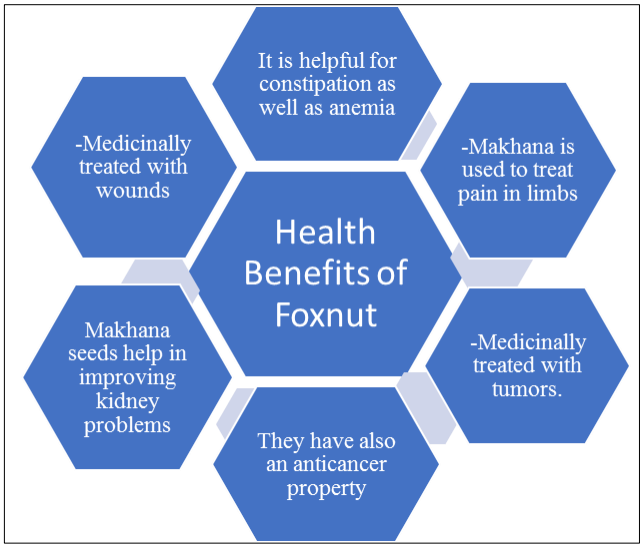

Diagram: Health benefits of Foxnut. Source [68].

Glycemic Index

In an observational study meta-analysis in 2008, Barclay *et al.* [10]. Discovered that postprandial hyperglycemia causes chronic illness regardless of whether a person has diabetes. In relation to chronic diseases in general [23] and CVD [1], diabetes, and obesity [2, 51] in particular, the benefits of lowering PPG levels have been shown. Therefore, avoiding prolonged hyperglycemic episodes and significant blood glucose swings over the day seems to be especially important. The postprandial period is when blood glucose levels are at their maximum, hence maintaining glycaemic control during this time is crucial, especially after consuming high-glycemic foods (e.g., certain types of bread). The amount of carbohydrates in the meal has a significant impact on postprandial blood glucose, suggesting that low glycemic load diets are helpful in regulating postmeal plasma glucose [24]. The term glycemic Index has been introduced and defined as the duration of the incremental postprandial blood glucose response divided by the blood glucose incremental peak (min/mM) [39]. There are two paths of low Glycemic Index food consumption such as reducing the amount consumed and/or the meal's Glycemic Index. Consuming foods high in fiber can help, it is an example of it [24]. The Glycemic Index provides information about the carbs in food and assesses how well blood glucose functions. In food products glycemic index has present in different amounts, therefore it is classified into Low glycemic index, medium glycemic index, and high glycemic index. The range of the low glycemic index is less than or equal to 55, the range of the medium glycemic index is between 56 to 69 and the range of the high glycemic index is 70 to 100 [15, 17].

History of Amaranth Flour

The scientific name of the Amaranth seed is Amaranthus L. and which is categorized as Amaranthus. It is not a grain but its seeds are used by natives to call it a Pseudo-grain. The family of Amaranth seeds is Amaranthaceae and the genus Amaranthus. There are 60 species of Amaranth seeds. But few species are useful for consumption as well as farming and other remaining weeds with indigestible seeds and leaves are used in the ornamental plant. Amaranth flour is a good source of bread, it is a great nutritional value such as protein. Making bread gluten-free involves using amaranth flour. Amaranth flour's composition does not contain any gluten. There is a very small amount of albumin and globulin protein. The protein in prolamins depends on the type of seed [22, 48, 4]. Due to the absence of gluten protein, amaranth flour is gluten-free flour. It is easy to mix with other flours to increase the bread's nutritional value. Amaranth flour contains the following amounts of moisture: 7.94, ash: 2.83, Protein: 13.85, crude fiber: 4.60, and crude fat: 6.53 [70]. Amaranth flour is a non-bread grain, but because it is nutrient-dense, it is added to bread and other baked goods. They add proteins, polyunsaturated fatty acids, vitamins, and minerals to bread as supplements. Because of its allegedly unique seed content, grain amaranth has the capacity to provide additional non-wheat material to composite flours used to generate fortified foods. According to the Codex Alimentarius, fortification is the "addition of one or more essential nutrients to a food, whether or not they are normally contained in the food, for the purpose of preventing or correcting a demonstrated deficiency of one or more nutrients in the population or specific population groups, whether it be general or specific population groups" [11]. The reviewed authors suggest using 10 to 15% amaranth flour or 1 to 3% amaranth albumin isolates of wheat flour for bread that has the necessary baking properties. Amaranth is suitable for the diets of people with celiac disease because it has been confirmed to be gluten-free. [80].

Morphology

According to Sauer's taxonomic key (1967), three main species of the South American-born genus Amaranthus are taken into consideration for grain production:

A. hypochondriacus L. (sin. A. leucocarpus S. Watts, A. frumentaceous) - prince's feather A. cruentus L. sin. A. paniculatus L. - bush greens, red amaranth and A. caudatus L. of two subspecies: subsp and caudatus.

There are various grain types of races within each species of grain that are distinguished by shared morphological traits such as height, inflorescence size, and form, days to maturity, seed size and color, and branching patterns [20, 58, 26]. Amaranth is a dicotyledonous herbaceous plant with a large inflorescence and an upright stem. It is one of a select few C4

dicots and a member of the NAD-malic enzyme subclass of C4 metabolism. Amaranth's anatomical features and its C4-photosynthesis pathway boost the plant's ability to use CO_2 more effectively in situations with a wide temperature range (from 25 °C to 40 °C), more intense light, and moisture stress. All of these factors help the crop to be widely geographically adaptable to a variety of environmental circumstances [35]. In morphology seen the following parts of the Amaranth Plant:

Roots

Amaranth roots' shape, growth, development, and dispersion in the soil, together with their reactions to nutrition and water availability, have seldom ever been studied. With little competition, the root system of A. retrofleksus develops quickly, reaching virtually its maximum size after just 10 weeks of growth (2.4 m depth and 1.8 m spread). The competitive ability of grain amaranth may also be influenced by this rapid root formation [35].

Stem

0.5 m -3.5 m is the range of measures of the stem of Amaranth. It is depending on spices whether it is a simple form or a branched form, based mostly on plant density, species, genotype, and growth circumstances. Reducing plant height to less than 1.5 m and choosing genotypes with a lower degree of branching are two of the primary breeding goals for grain amaranth [20].

Leaves

The leaves can be elliptic, rhombic, ovate, lanceolate, or roommate-ovate in shape and can have acute, obtuse, or acuminate leaf tips that are green, red, or silver in color. There are plants that are totally red and plants with reddish or silver patches on the foliage due to anthocyanin (amaranthine) coloring [37].

Inflorescence

The inflorescence of grain amaranth is substantial and largely branching. A. cruentus' inflorescence is semi-erect, whilst A. hypochondriacs and A. caudatus' inflorescences are erect. A. caudatus' inflorescence is lax, long, and falling. With the exception of A. caudatus subsp. mantegazzianus, which has a determinate or club-shaped inflorescence, the growth of the inflorescence and its branches is indeterminate and can thus reach great lengths. Yellow, green, purple, orange, pink, violet, brown, and two-color inflorescence are only a few of the color options for inflorescence [37]. The plant amaranth is monoecious. The flowers have a pentamer from our company and are unisex. Each of the blooms is developed on branched flower clusters called glomerules, which are referred to as dichasial cymes. Each flower has a bract that is purple, orange, red, or gold in color. Each glomerulus has one staminate (male) flower that is followed by all pistillate flowers (female). Up to 90% of pollination occurs on the same crop, which is primarily anemophilous; but, under particular genotypes and situations, the incidence of cross-pollination can rise to 30%. Male flowers bloom in each glomerulus before female flowers do, therefore pollen from neighboring glomeruli is used to fertilize female flowers [35, 34].

Seed

Utricles used to carry amaranth seeds are either dehiscent, semi-dehiscent, or indehiscent types. The amaranth seed can be white, gold, brown, pink, or even black in hue. The seed is lenticular and tiny (0.9 to 1.7 mm diameter), weighing 0.6 to 1g per 1000 seeds [35]. Larger plants, larger inflorescences with more seed production, and mutant variants in which the regular black seed transformed into a better-flavored white or light-colored seed with superior nutritional quality were selected in the past. However, Indians did not enhance the size of seeds. Increased seed size is one of the breeding objectives for amaranth nowadays. Larger seeds would enhance popping, handling, and seedling vigor. If the increase in seed size only comes from the endosperm component, it can have a negative impact on the amount of protein in the seed. There are several breeding strategies to increase seed size: Crossing (wild species are a potential source of genes for larger seeds), artificial polyploidy, and seed selection (which was demonstrated to be unsuccessful). Tetraploids have 42% to 159% larger seeds and shorter, thicker stems than diploids. Some crop accessions and wild amaranth species exhibit dormancy in the seeds. The white-seeded grain amaranth in particular lacks dormancy and typically germinates in 3 to 4 days at 21 °C or higher [32, 26].

Table 2: Composition: (A. cruentus)

Sr. No.	Parameters	Percentage	Reference
1.	Crude Protein	13.1-21%	[65]
2.	Crude Fat	5.6-10.9%	[65]
3.	Starch	48-69%	[65]
4.	Fiber	3.1-5%	[65]
5.	Lysine	4.9-7%	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14, 53]
6.	Carbohydrates	63.1-70%	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14, 53]
7.	Ash	3.0-3.8%	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14, 53]
8.	Squalene (% in oil)	2.2-6.9%	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14, 53]
9.	Albumin	40%	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14, 53]
10.	Globulin	20%	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14 and 53]
11.	Glutelin	25-30% with 2-3% Prolamin	[56, 8, 18, 16, 63, 30, 65, 27, 57, 41, 9, 46, 50, 14, 53]
12.	Calcium	272.03 mg/100 mg	[40]
13.	Zinc	5.81 mg/100 mg	[40]
14.	Iron	13.76 mg/100 mg	[40]
15.	Potassium	329.87 mg/100 mg	[40]

Health benefits

Amaranth has been determined to be gluten-free and is hence appropriate for celiac disease sufferers' diets [80]. Wheat gluten or closely comparable rye and barley proteins cause inflammatory damage to the small intestinal mucosa in susceptible individuals, which impairs the absorption of additional nutrients [60]. Therefore, the only cure is to follow a gluten-free diet for the rest of your life. Storage proteins can be found in grains like Kamut and triticale as well as in wheat, rye, and barley, however, they are not permitted in this diet. As a result, morbidity is avoided and the likelihood of gastrointestinal cancer is decreased [76]. Tocotrienols, rare forms of vitamin E that block a crucial enzyme involved in cholesterol formation, are present in high concentrations in amaranth oil [36]. Squalene improves the amount of oxygen delivered to bodily cells. It appears that this oxygen-carrying

activity is crucial for lowering blood levels of low-density lipoprotein cholesterol, boosting immunity, and even preventing cancer. Trypsin inhibitors and tannins, two examples of antinutrients, are present in such low amounts that they do not pose a nutritional risk [83, 36]. It has been noted that consuming phytic acid has positive effects, such as antioxidant activity, heart disease prevention, and anticarcinogen activity, which it accomplishes through its hydrolysis products [47, 82]. Because the majority of the energy in the typical western diet comes from items based on wheat, celiac disease patients, particularly youngsters on a strict gluten-free diet, frequently lack sufficient nutrition. Due to past malabsorption in cases of active celiac disease as well as the actual low level of micronutrients in the alternative flours used in gluten-free formulations, they also have a shortage in calcium and other minerals [79]. In many nations, amaranth is consumed regularly as a widespread practice for the primary prevention of iron deficiency in the general population [59].

Applications

A wide range of foods has included amaranth grain. Delicious soups, stews, sauces, porridges, and soufflés can be made from whole grains while boiling grains can be used to make rice and kus-kus. Amaranth grains' starch gelatinizes and leaches out when they are cooked. This results in the creation of prominent porridge structures and a thickening of the cooking water. During cooking, it frequently happens that the gelatinous perisperm that surrounds the embryo separates. Amaranth grain can also be fermented, malted to make beer, and sprouted to make sprouts. It can be used as a starchy ingredient in the production of spirits, and from the grain or green material, flours and protein concentrates can be made. In the method of making tortillas known as nixtamalization or lime cooking, amaranth grain may be a good high protein source to replace maize. Amaranth can also be popped without the use of fat using high, brief, and dry heat, just like maize and buckwheat. Granola bars and muesli can use predominantly rolled or popped amaranth grain. A variety of batters for pancakes, bread, muffins, dumplings, crackers, cookies, puddings, etc. can be made using ground grain as a flour ingredient [31, 25, 29].

Conclusion

Bread is produced and consumed all over the world. Bread has a long history of manufacturing across many countries, and new varieties are always being created to satisfy customer needs for more diverse and nutrient-dense diets. To satisfy consumer demand, bakers have created an almost unlimited variety of bread and production techniques. In reality, consumers have always used bread as a convenience product or as a component of one. Due to the variety of bread, there is no right or wrong product quality because each variety of bread needs a specific set of qualities to be authentic. The above review is on is about the creation of a useful bread enriched with Foxnut and Amaranth flour. Both flours have excellent nutritional properties of other grains that are used in bread, making them very healthy. Micronutrients including calcium, potassium, iron, and zinc are particularly valuable in them. A foxnut's glycemic index is low. They can help with renal issues, high blood pressure, diabetes, bone development, weight loss, blood loss management, protecting against skin damage, control of diarrhea, and more. Also, Amaranth has helped to prevent Celiac disease, gastrointestinal cancer is decreased, to maintain the oxygen level in the body. Foxnut and Amaranth are both very helpful for consumption.

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