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# NON-GLUTEN PROTEINS IN WHEAT GRAIN

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**ABSTRACT** Wheat, a fundamental staple in global grain crops, plays a crucial role in providing sustenance for both humans and livestock. The increasing prevalence of celiac disease (CD), affecting around 1% of the population, has generated a growing demand for gluten-free products. This article explores the intricate domain of non-gluten proteins in grains, centering on wheat, examining their functions, advantages, and implications for human health. The profiling of wheat grain proteins, such as albumins, globulins, gliadins, and glutenins, is pivotal for diverse food products. Notably, gliadins and glutenins, prevalent in wheat endosperm, contribute essential viscoelastic properties crucial for the production of items like bread, pasta, and noodles. While gluten-free diets offer benefits for individuals with gluten-related diseases like CD, they may introduce nutritional deficiencies. This article delves into the impact of non-gluten proteins on human health, illuminating potential advantages such as antioxidant activity. The discussion also encompasses challenges linked to adopting a gluten-free diet, including the risk of nutrient imbalances and the imperative of lifelong adherence for those with gluten-related sensitivities. The article provides insights into the future outlook, offering a glimpse into potential advancements in managing gluten-related diseases and improved methods for measuring complex protein groups in foods for individuals with gluten-sensitive enteropathy.

***Keywords:*** *Non-gluten; proteins; Gluten-free; Diet; Gliadins; Glutenins*

## INTRODUCTION

Wheat occupies a crucial role among global grain crops, serving as a vital resource for both human sustenance and livestock feed (Dong et al., 2012). Celiac disease (CD) is a persistent intestinal disorder affecting approximately 1% of the global population (Vici et al., 2016). The diagnosis rate for coeliac disease has been increasing, with both incidence and prevalence doubling between 2000 and 2003. Consequently, there is a growing demand for gluten-free products (Lee et al., 2007).

On a global scale, wheat is a major agricultural commodity, with a total production ranging from 600 to 700 million tons, of which approximately 100 million tons are traded internationally, and the rest is consumed domestically. The international wheat trade is facilitated by classifying grain samples into categories tailored for specific purposes, such as bread making, noodles, and animal feed. While the traditional classification focused on technological attributes like texture (hard vs. soft) and grain protein content, there is now an increasing recognition of the nutritional aspect of cereal-based foods, particularly wheat. In the past, the classification of wheat centered primarily on technological qualities. However, as the nutritional importance of cereal-based foods, including wheat, becomes more evident in addressing diet-related ailments like obesity, cardiovascular diseases, and type 2 diabetes, there is a growing necessity to include measures of nutritional quality in wheat's end-use. It is becoming increasingly clear that the health benefits associated with the consumption of whole grain cereal products are linked to higher intake of micronutrients, phytochemicals, and dietary fiber (Shewry et al., 2012).

**Profiling:** Wheat grain proteins, including albumins, globulins, gliadins, and glutenins, play crucial roles in various food products. Gliadins and glutenins, predominant in wheat endosperm, contribute to the viscoelastic properties essential for bread, pasta, and noodles. Albumins and globulins, soluble proteins rich in essential amino acids, support plant growth (Dong et al., 2012). Module 2 of the HEALTHGRAIN program aimed to assess composition variation in bread wheat lines and identify heritable traits for plant breeding, focusing on starch composition mutations (Shewry et al., 2012).

**Benefits of Gluten-free diet:** Gluten avoidance may benefit individuals with gastrointestinal symptoms. Lifelong adherence is crucial for gluten-related diseases. Gluten-free options like bread, pasta, cookies, crackers, and beverages offer diverse health benefits, including antioxidant activity, blood pressure reduction, and improved glucose levels. However, gluten-free

diets may lack essential nutrients, leading to nutritional deficiencies (Khairuddin and Lasekan, 2021). Adopting a gluten-free diet aids in alleviating symptoms such as: Reduction of bloating, relief from abdominal pain • The gluten-free (GF) diet proves beneficial in improving various aspects, including social interactions, cognition, communication, stereotypical behaviors, attention, and emotional well-being. Implementation of a GF diet may enhance energy levels and alleviate feelings of tiredness and sluggishness.

Gluten-free products are effective in addressing low blood glucose levels. Eliminating unhealthy and processed foods becomes more manageable with a gluten-free diet. By steering clear of common gluten-containing items like bread, desserts, and fried foods, individuals can explore healthier alternatives to satisfy similar cravings. The gluten-free dietary regimen incorporates abundant sources of dietary fiber, such as fruits, vegetables, beans, legumes, and specific gluten-free grains like buckwheat, quinoa, and millet (Jones, 2017, Quan et al., 2022). The significance of diet in influencing the composition and function of the gut microbiota is pivotal, impacting the overall health of the host through various pathways. The gut microbiota undergoes transformations from infancy to adulthood, displaying relative stability in adults. However, modifications can occur in response to shifts in diet, gastrointestinal conditions, and antibiotic treatment (Melini and Melini, 2019)**.**

**Toxicity:** The adoption of gluten-free diets could result in higher concentrations of heavy metals sourced from common foods like fish and rice. Individuals without celiac disease who follow gluten-free diets exhibited increased levels of arsenic, mercury, lead, and cadmium in their urine and blood. This underscores the importance of exercising caution when considering gluten-free diets as a popular trend (Patel and Lacy, 2018).

**Impact of Non-Gluten Protein:** Wheat, a significant source of nutrients on a global scale, provides phytochemicals, vitamins, and minerals. Non-gluten proteins offer health benefits, including antioxidant properties. While some individuals opt for non-gluten proteins due to perceived health advantages, lifelong adherence is crucial for those with gluten-related diseases. Although gluten-free diets may be beneficial for individuals with non-celiac gluten sensitivity, they can lead to nutrient imbalances. A gluten-free (GF) diet is widely recognized as the primary treatment for celiac disease. However, research has explored its potential as a remedy for various other medical conditions, such as dermatitis herpetiformis, irritable bowel syndrome, neurologic disorders, rheumatoid arthritis, and diabetes mellitus, although limited evidence currently supports these investigations (Khairuddin and Lasekan, 2021, Fasano et al., 2015, Niland and Cash, 2018, Khalid and Hameed, 2017, Miranda et al., 2014).The latest recommendations advocate for a strict gluten-free diet (GFD), emphasizing the complete avoidance of gluten-containing products and vigilance against cross-contaminations (Itzlinger et al., 2018). Gluten can manifest in various forms, such as ingredients, excipients, coatings, or capsules, primarily as contaminated starch or dextrin, which is especially significant when the drug or product is consumed over an extended period. Therefore, these products should be used with care (Bascunan et al., 2017). However, adherence to a gluten-free diet (GFD) raises concerns about expenses, the availability of gluten-free products, anxieties regarding gluten exposure, and the challenges of maintaining a GFD away from home. Even highly dedicated patients may encounter occasional issues with contamination. Some individuals are aware that they are not as strict as required. Additionally, some patients believe they adhere strictly to the diet but frequently make mistakes due to a lack of basic education and understanding of the dietary requirements (Mulder et al., 2013).

## CONCLUSION

In conclusion, the examination of non-gluten proteins in grains, with a specific emphasis on wheat, reveals a intricate interplay of nutritional, health, and societal elements. Wheat, a fundamental component of global agriculture, has traditionally been categorized based on technological attributes, giving priority to texture and grain protein content. However, the evolving comprehension of nutritional aspects, spurred by increasing awareness of diet-related ailments, advocates for a shift in wheat's classification. The advantages of embracing a gluten-free diet, especially for those with gluten-related conditions like celiac disease, are highlighted by enhancements in gastrointestinal symptoms and overall well-being. Nevertheless, potential drawbacks, such as nutrient deficiencies and heightened toxicity from heavy metals, warrant a careful approach to the widespread adoption of gluten-free diets as a trend. Nevertheless, the impact of non-gluten proteins on health cannot be overlooked. These proteins provide diverse health benefits, including antioxidant activity, creating opportunities for individuals seeking alternatives to gluten-containing products. While the gluten-free diet is crucial for managing celiac disease, its exploration for potential treatment of other medical conditions is ongoing, albeit with limited evidence.

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