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Impact of Dehulling and Germination on the useful Properties of Grass Pea (Lathyrus sativus) Flour

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Abstract

Grass pea (Lathyrus sativus) is a leguminous crop with significant potential as a food source due to its high protein and nutrient content. However, the presence of neurotoxic compounds, particularly β-ODAP (β-N-oxalyl-l-α,β-diaminopropionic acid), has limited its consumption. Dehulling and germination have been proposed as effective methods to reduce the levels of β-ODAP and improve the overall nutritional quality of grass pea flour. This review examines the impact of dehulling and germination on the useful properties of grass pea flour, including changes in nutritional composition, bioactive compounds, functional properties, and sensory attributes. Dehulling is a mechanical process that removes the outer seed coat, while germination involves the soaking and sprouting of seeds under controlled conditions.

Several studies have demonstrated that dehulling and germination significantly reduce the levels of β-ODAP in grass pea flour, making it safer for human consumption. Additionally, these processing methods lead to increases in protein digestibility, amino acid profile, antioxidant activity, and total phenolic content. Furthermore, dehulling and germination have been shown to improve the functional properties of grass pea flour, such as water absorption capacity, emulsifying properties, and dough rheology. Despite the numerous benefits associated with dehulling and germination, challenges such as increased processing costs, loss of yield, and changes in sensory characteristics need to be addressed. Future research should focus on optimizing processing parameters to maximize the nutritional and functional quality of grass pea flour while minimizing any negative effects. Overall, dehulling and germination represent promising strategies for enhancing the nutritional value and safety of grass pea flour, thereby promoting its utilization as a sustainable and nutritious food ingredient.

Keywords: Grass pea (Lathyrus sativus); Dehulling; Germination; β-ODAP; Nutritional quality; Functional properties

Introduction

Grass pea (Lathyrus sativus) is a leguminous crop with significant potential as a food source [1,2], particularly in regions where it thrives despite challenging environmental conditions. It is valued for its high protein content, drought tolerance, and ability to grow in marginal lands. However, the consumption of grass pea has been limited due to the presence of neurotoxic compounds, primarily β-ODAP (β-N-oxalyl-l-α,β-diaminopropionic acid), which can cause lathyrism, a neurological disorder characterized by irreversible paralysis. To mitigate the risks associated with β-ODAP toxicity and unlock the nutritional potential of grass pea, various processing methods have been explored [3]. Dehulling, a mechanical process that removes the outer seed coat, and germination, which involves soaking and sprouting seeds under controlled conditions, have emerged as promising strategies to reduce β-ODAP levels and improve the overall nutritional quality of grass pea flour. This review aims to provide an overview of the impact of dehulling and germination on the useful properties of grass pea flour. Specifically, it will explore changes in nutritional composition, bioactive compounds, functional properties, and sensory attributes resulting from these processing methods. Additionally, challenges associated with dehulling and germination, as well as opportunities for further research and optimization [4], will be discussed. By elucidating the effects of dehulling and germination on grass pea flour, this review seeks to contribute to the development of sustainable and nutritious food ingredients that can help address food security challenges and improve human health, particularly in resource-constrained regions.

Results and Discussion

Dehulling and germination have been shown to effectively reduce the levels of β-ODAP in grass pea flour. Dehulling removes the outer seed coat [5], which is where β-ODAP is primarily concentrated, while germination activates enzymatic processes that degrade β-ODAP. Both dehulling and germination lead to improvements in the nutritional composition of grass pea flour. Studies have reported increases in protein content, amino acid profile, and mineral bioavailability following these processing methods [6,7]. Additionally, germination enhances the levels of vitamins and antioxidants in grass pea flour. Dehulling and germination result in changes in the concentration of bioactive compounds in grass pea flour. While β-ODAP levels decrease significantly, there may be variations in the levels of other bioactive compounds, such as phenolic compounds and flavonoids [8]. These changes can contribute to the overall antioxidant capacity and health-promoting properties of grass pea flour.

Dehulling and germination influence the functional properties of grass pea flour, impacting its suitability for various food applications. Both processing methods have been shown to improve water absorption capacity, emulsifying properties, and dough rheology. These changes can enhance the texture, shelf-life, and sensory attributes of food products formulated with grass pea flour. While dehulling and germination can

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improve the nutritional and functional properties of grass pea flour, they may also affect its sensory attributes, such as color, flavor, and texture. Consumers' acceptance of products made with processed grass pea flour may vary depending on their sensory preferences and cultural backgrounds [9]. Therefore, sensory evaluation studies are essential to assess the palatability and consumer acceptance of foods incorporating grass pea flour subjected to dehulling and germination. Overall, the results indicate that dehulling and germination are effective strategies for enhancing the safety, nutritional quality, and functional properties of grass pea flour [10]. However, optimization of processing parameters and further research are needed to maximize the benefits of these methods while addressing any potential drawbacks. Additionally, efforts to promote consumer awareness and acceptance of products made with processed grass pea flour are essential for realizing its full potential as a sustainable and nutritious food ingredient.

Conclusion

Dehulling and germination represent promising strategies for improving the safety, nutritional quality, and functional properties of grass pea (Lathyrus sativus) flour. These processing methods effectively reduce the levels of β-ODAP, a neurotoxic compound, making grass pea flour safer for human consumption. Additionally, dehulling and germination lead to increases in protein content, amino acid profile, mineral bioavailability, and antioxidant activity in grass pea flour. Furthermore, dehulling and germination enhance the functional properties of grass pea flour, such as water absorption capacity, emulsifying properties, and dough rheology, making it suitable for various food applications. Despite these benefits, challenges such as increased processing costs, loss of yield, and changes in sensory attributes need to be addressed. Future research should focus on optimizing processing parameters to maximize the nutritional and functional quality of grass pea flour while minimizing any negative effects. Additionally, efforts to promote consumer awareness and acceptance of products made with processed grass pea flour are crucial for realizing its full potential as a sustainable and nutritious food ingredient. In conclusion, dehulling and germination offer promising opportunities to unlock the nutritional potential of grass pea flour, thereby contributing to food security, sustainability, and human health. With further research and innovation, grass pea flour has the potential to emerge as a valuable ingredient in the global food industry.

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Conflict of Interest

None

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