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MAGNESIUM CONTENT IN WHEAT GRAIN

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ABSTRACT This paper explores the role of magnesium in wheat and its impact on health. Magnesium is linked to reduced risks of diseases like diabetes and depression. Stress affects magnesium levels, and the study emphasizes supplementation. It discusses cereal composition and milling processes, showing how they impact magnesium content. Insights from multiple studies connect magnesium in whole grains to improved insulin sensitivity and heart health. Low magnesium levels are linked to issues like stroke and high blood pressure. The research found that refined white flours contain about 17% soluble magnesium. Using specific wheat types, like Moma wheat, could produce more magnesium-rich products. Studies affirm that magnesium is crucial for bodily functions, including muscle contraction and heart health. Overall, it suggests prioritizing magnesium-rich diets to prevent health problems from magnesium deficiency.

Keywords: *Magnesium; Chronic disease; Cereal grains; Deficiency, Wheat*

INTRODUCTION

Cereals are a major source of magnesium in our diets. Some studies suggest a link between a reduced risk of diabetes and eating foods that are rich in magnesium (Jiang et al., 2002). It's been discovered that magnesium has been effective in treating depression since the early 1900s (Weston, 1922) cker's research demonstrated that a diet lacking in magnesium could lead to various neuromuscular symptoms. However, these symptoms could be prevented by taking magnesium supplements. In today's fast-paced world, where stress is a constant companion, it's crucial to consider taking magnesium supplements. Cernak's research showed that long-term stress can actually decrease the levels of free and total plasma ionized magnesium in our bodies (Cernak et al., 2000).

It turns out that phytic acid in cereal grains can bind to minerals, forming compounds called phytates. These phytates are then consumed through our diet. According to Simpson and Wise, the solubility of these salts actually changes based on how strongly the metal is connected to the phosphate groups. It's really interesting how these factors can influence the properties of these compounds. The milling process plays a significant role in determining the amount of essential mineral elements in wheat-based foods. One of the main objectives of milling is to separate the wheat germ and bran from the endosperm by removing as much bran and germ as possible. This means that refined or white flour will have lower levels of mineral elements since the aleurone layer, which contains around 60% of the total mineral content of the wheat kernel, is removed (Meziani et al., 2021).

Pomeranz's research showed that the mineral concentration can vary between the inner and outer parts of the wheat endosperm. The geometry of the kernels, which can differ based on the specific type of wheat, also influences the mineral content of the final product, such as flour. It's amazing how these factors can impact the nutritional composition of wheat-based foods (Khalid et al., 2023).

Profiling: After treating the flour samples with concentrated HNO_3 and H_2O_2, a technique called optical emission spectroscopy was used to measure the total magnesium content. To ensure accuracy, the comparison of results with reference materials demonstrated high recovery and accuracy rates. The study utilized a sensitivity level adequate for analysis, including the limit of quantification and the limit of detection. The methodology was based on Guttieri's work but was adjusted as needed (Guttieri et al., 2015). A specific procedure was followed to extract soluble minerals from various parts of the flour, such as shorts, bran, and whole grain. They used a Tris-HCl buffer and gently shook the samples for 22 hours at room temperature. After centrifuging the samples, an aliquot of the supernatant was taken and stored at a low temperature. Before analysis, the supernatants were diluted and filtered. These samples were filtered again before detection, and ICP-OES was used to determine the amount of soluble magnesium present. Duplicates of the total and soluble magnesium samples were prepared, and

the standard deviation between the replicates ranged from 0.45% to 9.31% of the measured values. Analysis of variance and the InfoStat software program was used to process the data and perform statistical analyses. The research found that refined white flours contain around 17% soluble magnesium. When milling different types of wheat, Moma wheat showed a higher extraction rate of 26.50% for dark flour compared to Todorka, which had about 7% less. Using Moma wheat in large-scale milling can produce approximately 6.6 tons more magnesium-rich dark flour compared to Todorka. This dark flour, especially from Moma wheat, used for making bread, could significantly contribute to increasing the magnesium content in wheat-based products (Fišteš and Tanović, 2014).

Benefits of Magnesium: Pereira and his team did a study comparing whole grain and refined grain diets for obese people with high insulin levels. They found that the whole grain diet, which had more magnesium, improved insulin sensitivity (Li et al., 2022, Pereira et al., 2002) idea is supported by many studies that have shown a connection between magnesium intake and various health conditions. These include insulin sensitivity, type 2 diabetes, heart disease, and more. Magnesium may also have benefits for reducing inflammation and improving cardiovascular health (Dalton et al., 2012). Additionally, studies on large groups of people have shown that consuming enough magnesium daily is linked to a lower risk of developing Type 2 diabetes. Not getting enough magnesium can lead to diabetes indicators because magnesium is lost through urine. Magnesium has been shown to have potential in improving glucose metabolism, which is important for managing diabetes and obesity (Hwang et al., 2009).

Deficiency: These findings can be explained by the negative effects of low magnesium on cells in our blood vessels, which can lead to problems with how the cells function. Low magnesium levels have been associated with stroke, traumatic brain injury, spinal cord injury, Parkinson's disease, high blood pressure, and weakened bones. Magnesium plays a role in maintaining healthy cells and supporting bone formation (Meziani et al., 2021).

Importance on human health: Magnesium is super important for our bodies! It acts as a helper for over 300 enzymes that control important functions like muscle contraction, nerve signals, blood sugar control, heart contractions, and blood pressure. Magnesium also plays a big role in making energy, moving other ions across cell membranes, making stuff for our cells, and building strong bones (Al Alawi et al., 2018).

CONCLUSION

This study shows just how important magnesium is in our diet, especially from cereals, for preventing chronic diseases like type 2 diabetes and heart problems. The evidence confirms that magnesium is essential for keeping our metabolism and insulin sensitivity in check. It also points out that refined cereals lose a lot of magnesium, so it's better to go for whole grains to get enough magnesium. The study also validates the methods used to measure magnesium in wheat products. Overall, it suggests that dietary guidelines should prioritize foods rich in magnesium to avoid health issues caused by magnesium deficiency.

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