



MINERAL COMPOSITION - RICE VS. WHEAT

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Abstract: In the last decade, globalization and accelerated consumption have led to a worrying increase in lifestyle-related diseases, among the most serious being diabetes and heart disease. Thus, numerous studies have been developed on reducing the incidence and severity of lifestyle-related diseases with a focus on the mineral content, antioxidant potential and glycemic index of foods. In this context, a number of cereal grains may show promise as medicinal and health foods.

Rice and wheat are some of the most important plants in the human diet. They are rich in carbohydrates, protein, minerals (K, Mg, Zn, P and Fe), vitamins (riboflavin, thiamin, niacin and alpha-tocopherol) and dietary fiber.

The paper makes a comparative study between data obtained by XRF analysis and average values from different databases on the mineral content of two cereal species: wheat and rice.

• Introduction

Common wheat (*Triticum aestivum* L.), also known as bread wheat, is the most widespread species of wheat and accounts for about 95% of the wheat grown. It is considered a key commodity in world trade and is widely used in the food industry due to its significant nutritional contribution to the human diet. As well as being a major source of starch and energy, wheat also provides large quantities of a number of essential or health-promoting components, notably protein, vitamins (especially B vitamins), dietary fibre and minerals (potassium, calcium, zinc, copper, iron, manganese).

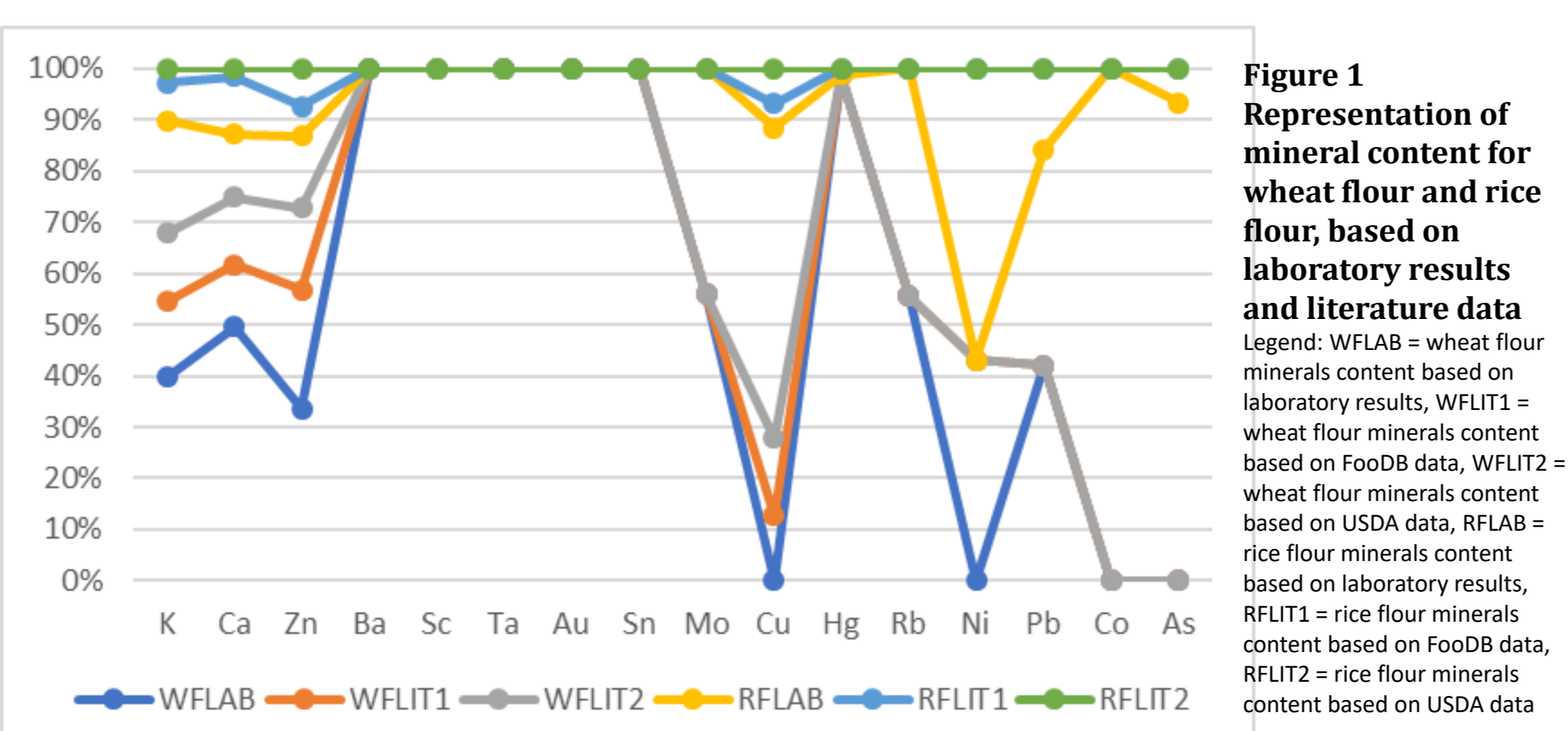
Rice (*Oryza sativa* L.) is considered the most important staple food in most countries and is an important cereal crop that feeds more than half of the world's population. Considered a good substitute for wheat flour, rice flour is consumed in a variety of forms, including pasta, noodles, cakes and bread. Rice is a very important source of carbohydrates as well as vitamins (riboflavin, thiamin, niacin) and minerals (potassium, calcium, zinc, manganese, magnesium).

• Material and method

The study was conducted on samples of wheat flour and rice flour available on the Romanian market. The analyses of the samples were performed using X-MET8000 - X-Ray Fluorescence Analyzer, factory calibrated. The evaluation of the results was also based on the nutritional tables corresponding to wheat and rice flours present in different databases. The methods used were mathematical modelling and statistical analysis of the data.

• Results and discussions

The follow figure shows that the highest used database FoodB and USDA lack on informations regarding mineral content in different assortments of flour, in special wheat and rice flour and that the using the XRF analyzer we can improve the information regarding the wheat and rice flours available on the Romanian market.



As we observe both flours show high content of potassium, calcium and zinc, wheat flour presenting 2-3 times more potassium and calcium compared to rice flour, which recommends that in the case of using rice flour for different food products to add materials which are able to supplement potassium and calcium, in special when preparing gluten free products based on rice flour.

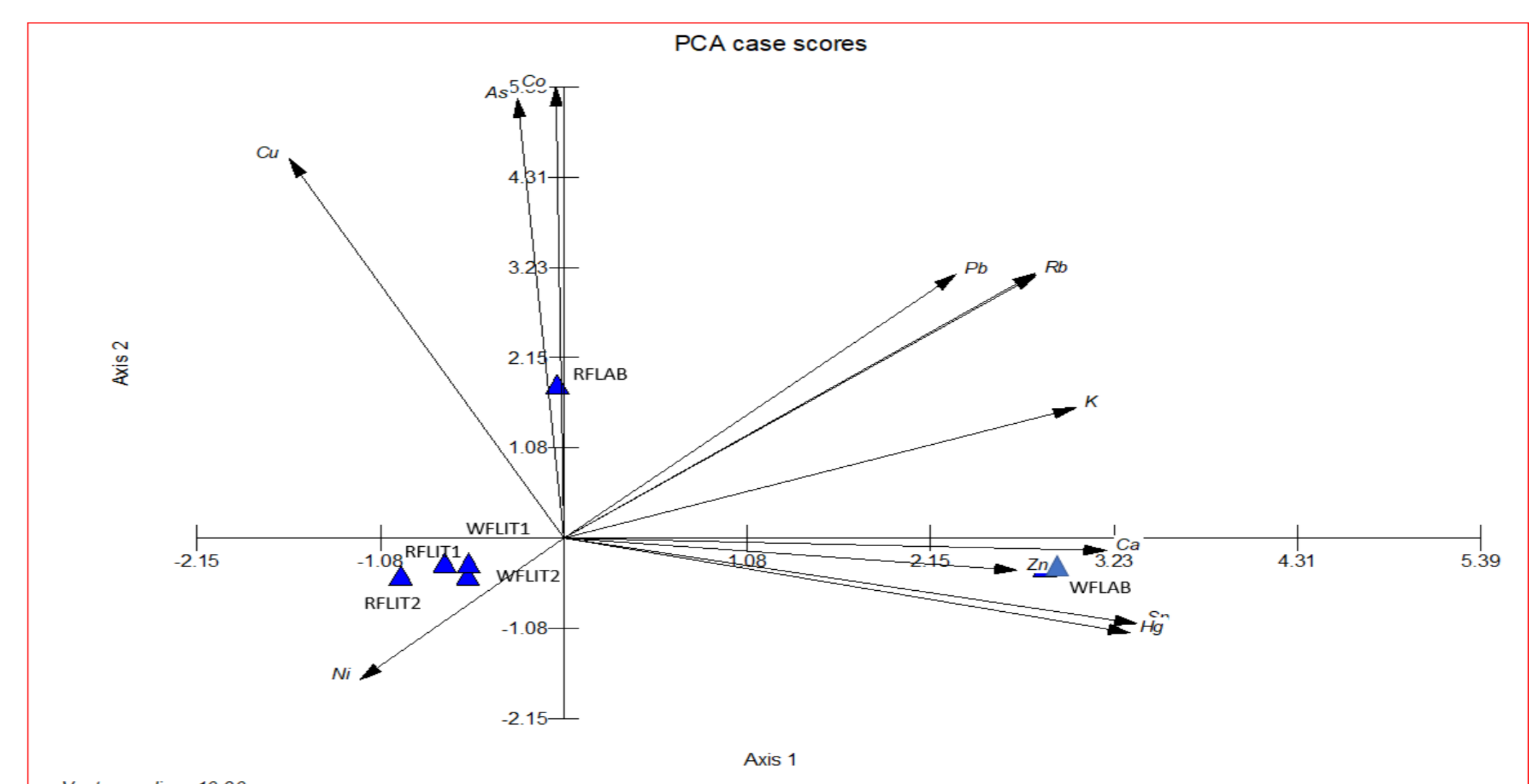


Figure 2 Graphical representation of Principal Component Analysis

Trace Elements Analysis

Barium (Ba), Scandium (Sc), Tantalum (Ta), Gold (Au), Tin (Sn), and Molybdenum (Mo), these trace elements are detected in wheat flour but not in rice flour, according to the lab results. The presence of these elements could indicate specific environmental or processing factors affecting the wheat flour. Copper was not detected in the lab analysis of wheat flour but was present in literature values. In contrast, rice flour shows a much higher copper concentration in lab results compared to literature values. Mercury was detected in wheat flour but not in rice flour. Lead is present in both but higher in rice flour lab results compared to FoodB values. Arsenic is detected in rice flour lab results but is significantly higher than the FoodB value.

• Conclusions

Lab results often show higher concentrations of elements compared to literature values. This may suggest differences in sample origin, environmental factors, or analytical methods. Unique elements like barium, scandium, tantalum, gold, tin, and molybdenum are present in wheat flour but not in rice flour. Mercury is found in wheat flour but not in rice flour. Lead and arsenic levels in rice flour are concerning and warrant further investigation. This analysis highlights significant differences and similarities in elemental composition between wheat and rice flour from lab and literature sources.