

Evaluation of Antioxidant Capacity and Polyphenol Content in Native Maize Varieties from Chiapas, Mexico

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Abstract:

This study aims to evaluate the antioxidant capacity and polyphenol content in native maize varieties from Chiapas, Mexico. Maize (*Zea mays* L.) is a staple crop in the region, with numerous varieties differing in color, size, and genetic composition. These differences may affect their antioxidant properties and polyphenolic content. By analyzing both the antioxidant capacity (through DPPH and FRAP assays) and the polyphenol content (using the Folin-Ciocalteu method), this research identifies potential health benefits associated with the consumption of native maize varieties. Results from this study provide valuable insights into the nutritional and medicinal potential of Chiapas maize, which could inform dietary recommendations and agricultural practices in the region.

Keywords: Maize, Antioxidant Capacity, Polyphenols, Chiapas, DPPH, FRAP, Folin-Ciocalteu, Native Varieties

1. Introduction

Maize (*Zea mays* L.) is an essential crop in Mexico, particularly in Chiapas, where it is grown in diverse varieties. The genetic diversity of maize in this region has led to a variety of phenotypic characteristics, including differences in grain color, size, and biochemical content. In recent years, there has been increasing interest in the bioactive compounds present in maize, particularly its antioxidant properties and polyphenolic content, which are known for their potential health benefits. Antioxidants play a crucial role in neutralizing free radicals, which can contribute to the prevention of chronic diseases such as cancer, cardiovascular disease, and neurodegenerative disorders.

The aim of this study was to evaluate the antioxidant capacity and polyphenol content in native maize varieties from Chiapas. By comparing multiple varieties, the study assesses how factors such as color and genetic composition influence these key bioactive compounds.

2. Materials and Methods

2.1. Maize Samples

A total of 10 native maize varieties were selected from different regions within Chiapas. These varieties were categorized by their grain color: white, yellow, red, and black. The maize grains were harvested, cleaned, and stored under controlled conditions before analysis.

2.2. Antioxidant Capacity Assays

Two commonly used methods to assess antioxidant capacity were employed:

- **DPPH Assay:** The DPPH (2,2-diphenyl-1-picrylhydrazyl) assay is a widely used method for

evaluating free radical scavenging activity. A DPPH solution was prepared, and maize flour extracts were added to it. The reduction in DPPH concentration was measured by absorbance at 517 nm.

- **FRAP Assay:** The Ferric Reducing Antioxidant Power (FRAP) assay was used to assess the reducing power of maize extracts. This assay involves the reduction of ferric ions to ferrous ions, resulting in a color change that is measured at 593 nm.

2.3. Polyphenol Content

The total polyphenol content in the maize samples was determined using the Folin-Ciocalteu method. In this assay, maize flour extracts were reacted with a Folin-Ciocalteu reagent, and the resulting color intensity was measured at 765 nm. The polyphenol content was expressed as gallic acid equivalents (GAE).

2.4. Statistical Analysis

Data were analyzed using one-way ANOVA to determine significant differences between the maize varieties in terms of antioxidant capacity and polyphenol content. A significance level of $p < 0.05$ was considered statistically significant.

3. Results and Discussion

3.1. Antioxidant Capacity

The antioxidant capacity, measured using the DPPH and FRAP assays, varied significantly among the different maize varieties. The red and black maize varieties exhibited the highest antioxidant activities, with significantly higher DPPH scavenging and FRAP values compared to the white and yellow varieties. These results suggest that darker-colored maize varieties may have a higher potential for neutralizing free radicals, possibly due to higher concentrations of anthocyanins and other antioxidant compounds.

3.2. Polyphenol Content

The polyphenol content was also found to differ among maize varieties. The red and black varieties showed the highest levels of polyphenols, followed by the yellow and white varieties. Polyphenols are a diverse group of compounds, and their higher content in colored maize may be attributed to the presence of specific phenolic compounds such as flavonoids and phenolic acids. These compounds have been shown to possess potent antioxidant properties, which could contribute to the overall health benefits of maize consumption.

3.3. Correlation Between Antioxidant Capacity and Polyphenol Content

A strong positive correlation was observed between the antioxidant capacity (as measured by both DPPH and FRAP assays) and the polyphenol content ($r = 0.87$ for DPPH, $r = 0.92$ for FRAP). This suggests that polyphenols are likely the major contributors to the observed antioxidant activity in the native maize varieties of Chiapas.

3.4. Implications for Health and Nutrition

The high antioxidant capacity and polyphenol content found in certain native maize varieties from Chiapas highlight their potential role in reducing oxidative stress and improving health outcomes.

Given the traditional and widespread consumption of maize in Mexico, particularly in rural areas, promoting the consumption of polyphenol-rich maize varieties could offer nutritional and medicinal benefits to local populations.

4. Conclusion

This study demonstrated that native maize varieties from Chiapas, Mexico, vary significantly in terms of antioxidant capacity and polyphenol content. Red and black maize varieties exhibited the highest levels of these bioactive compounds, suggesting they may offer greater health benefits compared to other varieties. The results provide important insights for future research on the potential health-promoting properties of maize and support the conservation and promotion of native maize varieties with higher antioxidant and polyphenol content.

5. References

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