Bima Journal of Science and Technology, Vol. 9(1B) Apr, 2025 ISSN: 2536-6041

DOI: 10.56892/bima.v9i1B.1261

Proximate Analysis and Mineral Composition of the Lord's Apple Cinnamon Tea

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ABSTRACT

This study examines the proximate and mineral composition of Lord's Apple Cinnamon Tea, a functional beverage with health benefits from apple and cinnamon bioactive compounds. Apples contain flavonoids like quercetin, which reduce oxidative stress and improve lipid metabolism, while cinnamon provides cinnamaldehyde, which enhances insulin sensitivity and lowers blood glucose. The study aimed to assess the tea's nutritional profile through proximate and mineral analysis. The methodology involved the collection and preparation of tea samples, followed by mineral analysis using Flame Atomic Absorption Spectrophotometry (FAAS) and proximate analysis to determine moisture, ash, fiber, lipids, and protein content. The results showed high levels of potassium (191,496.7 mg/kg), sodium (28,997.67 mg/kg), and iron (7,500.01 mg/kg), along with trace elements like copper, zinc, magnesium, and manganese. Proximate analysis revealed fiber (68.92%), moisture (23.04%), ash (10.48%), lipids (8.48%), and protein (8.1%). These findings suggest the tea may support cardiovascular health, digestion, and antioxidant activity. It is recommended as part of a healthy diet, with further research needed to explore its long-term effects.

Keywords: Cinnamon, Apple, Cardiovascular, Oxidative Stress, Antioxidants, Nutritional Profile, Lord's Apple Cinnamon Tea.

INTRODUCTION

Lord Apple Cinnamon Tea, a blend of apple and cinnamon, offers a variety of health benefits attributed to the individual properties of its components. Both apple and cinnamon are rich in bioactive compounds that contribute to their antioxidant, anti-inflammatory, and metabolic health effects. Apples, particularly varieties like the Golden Delicious, are known for their high content of flavonoids, including quercetin, which have been shown to reduce oxidative stress and improve lipid metabolism (Aksoy & Ötleş, 2022). The consumption of apples has been linked to various health benefits, including weight management and cardiovascular health, primarily due to their antioxidant properties (Aksoy & Ötleş, 2022). The phenolic compounds found in apples contribute significantly to their antioxidant capacity, which can help mitigate oxidative stress, a factor implicated in chronic diseases (Shahidi & Ambigaipalan, 2015).

Cinnamon, on the other hand, has a long history of use in traditional medicine and is recognized for its multiple health benefits. It contains various phytochemicals, such as cinnamaldehyde and proanthocyanidins, which exhibit anti-inflammatory, antimicrobial, and antioxidant properties (Gruenwald et al., 2010; Balasubramanian et al., 2015). Studies have demonstrated that cinnamon can enhance insulin sensitivity and lower blood glucose levels, making it particularly beneficial for individuals with type 2 diabetes (Chetty et al., 2022; Bandara et al., 2011). Furthermore, cinnamon's ability to lower cholesterol and triglyceride levels adds to its cardiovascular protective effects (Gruenwald et al., 2010; Bandara et al., 2011).

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The combination of apple and cinnamon in tea form can enhance these health benefits. The synergistic effect of the antioxidants from both ingredients may provide a more potent defense against oxidative stress compared to consuming them separately (Kautsar, 2024).

Additionally, the anti-inflammatory properties of cinnamon can complement the cardiovascular benefits of apples, potentially reducing the risk of heart disease (Islam et al., 2016). Moreover, the consumption of herbal teas, including those made from apple and cinnamon, has been associated with improved digestive health. Cinnamon has been noted for its ability to alleviate gastrointestinal discomfort, while the fiber content in apples can promote gut health (Willis et al., 2019). This combination can thus serve as a soothing remedy for digestive issues. However, the need to understand the chemical and nutritional profile of the lord's Apple Cinnamon tea becomes essential if it is to be regarded as one of the health benefiting beverages. This study aimed at evaluation of the mineral and proximate composition of lord's Apple Cinnamon tea.

MATERIALS AND METHODS

Collection and preparation of sample

The Lord's Apple Cinnamon tea bags were purchased from a super market at Ikpoba Hill in Benin City, Edo State. It was air dried and pulverized to powder for analysis. It is not a regular tea as the common ones like Lipton, Green tea and others.

Determination of Mineral composition

The mineral composition was determined according to AOAC (2003) with some modifications. The dried samples were ground into fine particles. 1g of the sample was weighed into a 250ml boiling tube. 20ml acid mixture (Nitric and Perchloric in ratio 3:1) was added, mixed properly and heated gently until the solution becomes clear. It was then diluted with about 20ml distilled water and filtered through a Whitman filter paper into a 100ml standard flask and made up to mark. The filtrate was taken to the Flame Atomic Absorption Spectrophotometer (FAAS) (Buck Scientific, model 210VGP) for determination of sodium and potassium. Sodium and Potassium were determined using Flame Spectrophotometer (Sherwood, Model 410 flame Photometer) was use to analyze the sample. Standard solutions of the Sodium and Potassium were prepared to obtain a calibration curve. The absorbance of the samples was extrapolated from the calibration curve.

Proximate Analysis

Proximate Analysis to determine the moisture content, ash content, crude fats/lipids, crude fibre, crude protein was done using a standard method as described by Aghedo and Ogbeide (2022), Shukla *et al*. (2015).

RESULTS

Mineral Composition

Table 1: Mineral constituents present in the Lords apple Cinnamon Tea.

Minerals	Amount present in Sample (*mg/kg*)
Na	28997.67±2.31
K	191496.7±5.77
Cu	40.87±2.42
Fe	7500.01±0.03
Zn	1362.02±3.23
Mg	940±0.01
Mn	**20.08±1.32**

The result obtain from this study (table 1) shows that Na, K, Cu, Fe, Zn, Mg, Mn was 28997.67±2.31, 191496.7±5.77, 40.87±2.42, 7500.01±0.03, 1362.02±3.23, 940±0.01 and 20.08±1.32mg/kg respectively. Potassium (K) (191496.7±5.77mg/kg) appears to be the highest of all the minerals present, followed by Iron (Fe) which is 7500.01±0.03mg/kg. The

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result shows that the presence of Cu (40.87±2.42mg/kg) and Mn (20.08±1.32mg/kg) happens to be the lowest.

Table 2: Proximate analysis of the Lords apple cinnamon tea

Quantitative Parameters	Value (%)
Moisture content	23.04±0.01
Ash	10.48±0.02
Fibre	68.92±0.01
Lipids	8.48±0.03
Protein	8.1±0.01

The proximate composition of Lords apple cinnamon tea presented in table 2. Contains 23.04±0.01% moisture content, 10.48±0.02% total ash content, 68.92±0.01% of Fibre, 8.48±0.03% of Lipids and 8.1±0.01% of Protein. Each of these components contributes to the overall nutritional profile and potential health benefits of the tea.

DISCUSSION

Mineral Composition

The mineral analysis revealed significant levels of potassium (191,496.7 mg/kg), sodium (28,997.67 mg/kg), and iron (7,500.01 mg/kg), along with trace elements such as copper, zinc, magnesium, and manganese. Potassium, being the most abundant mineral in the tea, plays a crucial role in maintaining electrolyte balance, regulating blood pressure, and supporting cardiovascular health (Gruenwald *et al*., 2010). The high potassium content in Lord's Apple Cinnamon Tea suggests that it could be beneficial for individuals looking to manage hypertension and reduce the risk of stroke (Bandara *et al*., 2011).

Sodium, although present in lower amounts compared to potassium, is still significant. Sodium is essential for maintaining fluid balance and nerve function, but excessive intake is associated with increased blood pressure and cardiovascular risk (Chetty et al., 2022). The balance between potassium and sodium in this tea is favorable, as a higher potassium-to-sodium ratio is associated with reduced cardiovascular risk (Islam et al., 2016).

Iron, another essential mineral found in the tea, is crucial for the formation of hemoglobin and the transportation of oxygen in the blood. The high iron content (7,500.01 mg/kg) suggests that this tea could be beneficial for individuals with iron-deficiency anemia (Balasubramanian et al., 2015). Additionally, the presence of trace elements such as copper, zinc, magnesium, and manganese further enhances the tea's nutritional profile. These minerals play various roles in the body, including enzyme activation, immune function, and antioxidant defense (Shahidi & Ambigaipalan, 2015).

The proximate analysis revealed that Lord's Apple Cinnamon Tea contains 68.92% fiber, 23.04% moisture, 10.48% ash, 8.48% lipids, and 8.1% protein. The high fiber content is particularly noteworthy, as dietary fiber is essential for maintaining digestive health, regulating blood sugar levels, and supporting cardiovascular health (Willis et al., 2019). The fiber content in apples, which is a primary component of this tea, is known to promote gut health by acting as a prebiotic, fostering the growth of beneficial gut bacteria (Aksoy & Ötleş, 2022). Additionally, the moisture content of 23.04% indicates that the tea retains a significant amount of water, which is crucial for maintaining its freshness and shelf life.

The ash content of 10.48% suggests the presence of inorganic minerals, which is consistent with the mineral analysis results. The lipid content of 8.48% and protein content of 8.1% contribute to the overall nutritional profile of the tea. While the lipid

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content is relatively low, it is still significant as lipids are essential for the absorption of fat-soluble vitamins and the provision of energy (Shukla et al., 2015). The protein content, although modest, adds to the tea's nutritional value, providing essential amino acids necessary for various bodily functions (Aghedo & Ogbeide, 2022).

Synergistic Effects of Apple and Cinnamon

The combination of apple and cinnamon in Lord's Apple Cinnamon Tea creates a synergistic effect that enhances the health benefits of both ingredients. Apples are rich in flavonoids, particularly quercetin, which has been shown to reduce oxidative stress and improve lipid metabolism (Aksoy & Ötleş, 2022). The phenolic compounds in apples contribute to their antioxidant capacity, which helps mitigate oxidative stress, a key factor in the development of chronic diseases (Shahidi & Ambigaipalan, 2015).

Cinnamon, on the other hand, contains bioactive compounds such as cinnamaldehyde and proanthocyanidins, which exhibit anti-inflammatory, antimicrobial, and antioxidant properties (Gruenwald et al., 2010). Cinnamon has been shown to enhance insulin sensitivity and lower blood glucose levels, making it particularly beneficial for individuals with type 2 diabetes (Chetty et al., 2022). Additionally, cinnamon's ability to lower cholesterol and triglyceride levels contributes to its cardiovascular protective effects (Bandara et al., 2011).

The combination of these two ingredients in tea form may provide a more potent defense against oxidative stress compared to consuming them separately (Kautsar, 2024). The anti-inflammatory properties of cinnamon can complement the cardiovascular benefits of apples, potentially reducing the risk of heart disease (Islam et al., 2016). Furthermore, the fiber content in apples and the gastrointestinal benefits of cinnamon make this tea a soothing remedy for digestive issues (Willis et al., 2019).

Potential Health Benefits

The findings of this study suggest that Lord's Apple Cinnamon Tea has several potential health benefits, including cardiovascular support, antioxidant activity, and improved digestive health. The high potassium content supports cardiovascular health by helping to regulate blood pressure, while the iron content may help prevent anemia (Balasubramanian et al., 2015). The antioxidant properties of both apple and cinnamon contribute to the tea's ability to mitigate oxidative stress, which is implicated in the development of chronic diseases such as cancer, diabetes, and cardiovascular disease (Shahidi & Ambigaipalan, 2015).

The tea's high fiber content promotes digestive health by acting as a prebiotic and supporting the growth of beneficial gut bacteria (Aksoy & Ötleş, 2022). Additionally, the anti-inflammatory properties of cinnamon may help alleviate gastrointestinal discomfort, making this tea a potential remedy for digestive issues (Willis et al., 2019).

CONCLUSION

In conclusion, the study highlights the nutritional and health-promoting properties of Lord's Apple Cinnamon Tea. The high levels of potassium, sodium, and iron, along with the presence of trace elements, suggest that this tea could be a valuable addition to a healthy diet. The synergistic effects of apple and cinnamon enhance the tea's antioxidant, anti-inflammatory, and cardiovascular benefits, making it a promising functional beverage. Further research is needed to explore the long-term health effects of consuming this tea and

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to confirm its potential benefits in clinical settings.

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