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Assessment of Micronutrients Content of Some Locally Consumed Tea samples in Kano

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Abstract

Micronutrients are nutrients required for the normal metabolism of all life forms. Micronutrient content (Fe, Zn, Vitamin A and Vitamin C) of some locally consumed tea samples (Black tea, green tea, cinnamon tea, *Moringa* tea and mint tea) was investigated. Atomic absorption spectroscopy and spectrophotometric techniques were used in the analysis of the respective micronutrients. Descriptive statistics was used for analysis of results and showed that the aforementioned micronutrients are contained in the sampled teas except mint tea which does not contain Zn at all. Vitamin A was found to be within the range of0.21±.01 – 0.83±.01 ppb; vitamin C (0.83±0.01 – 6.82±0.05 ppm); Fe (1.99±.01 – 9.99±0.14 ppm) and Zn (0.00 – 2.10±0.10 ppm). It can therefore be concluded that some of aforementioned locally consumed tea samples contain micronutrient levels which fall within the range of the recommended daily need by humans while others fall short of the range and therefore could be explored as part of the strategies to be considered in designing how to tackle micronutrient deficiency disorders.

Key words: micronutrients, locally consumed tea, micronutrient deficiency disorders.

INTRODUCTION

Micronutrients play vital role in metabolic processes and are essential for the general well-being of humans. The deficiency or excess of the micronutrients could cause diseases and/or be deleterious to human health (O'Dell, *et al.,* 1997; Bolaji et al., 2008). Minerals (inorganic substances) serve variety of functions including the formation of bones and teeth; as essential constituents of body fluids and tissues, components of enzyme systems, nerve function among others. For minerals like Fe and Zn, the needed daily intake for the body metabolism is less than 100 mg while for macronutrients it is higher. Vitamins are either fat- or water-soluble and are involved in the body's metabolism, cell production, tissue repair, and other vital processes. Tea can generally be divided into categories based on the way it is being processed. Some varieties include yellow, green, black (called red tea in China) and post-fermented tea (or black tea for the Chinese). Green and black teas are the most popular types of tea. Green tea is produced by drying and steaming the leaves, whereas black tea is obtained after a fermentation process (Powell *et al.,*1998). The chemical composition of tea leaves and manufactured tea consists of tannins, flavonols, proteins, amino acids, enzymes, aroma forming substances, vitamins, minerals and other micro elements (Kumar *et al.,* 2005). Some of the beneficial effects of drinking tea are prevention of chronic and cardiovascular disease, cancer, anti-oxidative detoxification thus slowing progression of diseases (Lee *et al.,*1995). Most of these activities have been attributed to tea polyphenols, some micronutrients are also been reported to manage some ailments.Micronutrients deficiency continues to cause malnutrition especially in the northern part of Nigeria (NDHS, 2013).

More so, information on the micronutrient level/content of locally available food products eg teas which could be useful in ameliorating the deficiencies are scarce. It becomes imperative therefore to carry out studies on this one of the most frequently consumed food material, in order to provide information on the micronutrients such as Iron (Fe), Zinc (Zn), Vitamins A and C that are present in them with view to finding out whether they could be servedas rich sources of the micronutrient or be used as an approach to bring a lasting solution to micronutrient deficiency disorders.

MATERIALS AND METHODS

CHEMICALS AND REAGENTS

All chemicals and reagents used in this study were analytical grade and were purchased from Sigma Chemical Company Ilinois, USA.

METHODS

Sample Collection: Samples of various tea samples, namely: Black tea, green tea, cinnamon, *Moringa*tea and mint tea were purchased randomly from various marketswithin Kano metropolis.

Sample preparation: The composite dried tea samples were ground using an electronic blender, sieved using 250 µm sieve and stored in a clean plastic bottle until needed for use. For mineral element analysis, the samples wereprepared by digestion in acid mixture and heating until white fumes were observed signifying end of digestion

Determination of Vitamin C Concentration: This was determined as described by Jones and Hughes (1983). Briefly, five millilitres(5ml) of 2 mg/100 ml test sample was put into a boiling tube and 1ml of glacial acetic acid added, this was then titrated against a dye solution prepared in sodium hydroxide until a faint permanent pink color was seen. The titration was repeated with 5ml of water for the blank (B) and 5ml of ascorbic acid for the standard solution(S). The amount of Vitamin C was then calculated in the test sample using a formula. Vitamin C concentration of test (mg/100ml) =T/S × Conc. of Standard.

Determination of vitamin A: The vitamin A content was analyzed by weighing 10g of the prepared sample into the conical flask and adding 50ml of ethanol. This was followed by heating for 2 to 3mins and filtration. After filtering, 30ml of petroleum ether was added and then analyzed as described by AOAC (1995).

Determination of Mineral Elements: The mineral content were estimated by ashing 5g of dried powdered of each samples in a muffle furnace.The ash content obtained was dissolved in 5ml of HNO_3 nitric acid and analyzed using Atomic Absorption Spectrophotometer (AAS Buck Scientific, Version 210 VGP).

RESULTS

Vitamin C content of the five different local varieties of tea commonly consumed in Kano is presented in Table 4.1. From the table it is clear thatCinnamon tea *and Moringa* teacontained the highest content of vitamin C (6.82±0.05 ppm) and (6.81±0.06 ppm) respectively in both. Black teahad a concentration of (5.46±0.01ppm), green tea (0.83±0.01 ppm) and mint tea(4.06±0.08 ppm).

Vitamin A concentration of the five local varieties of tea ispresented in Table 4.1. It shows that green tea had the highest concentration of vitamin A with a value of (0.83±0.01ppb) followed by *Moringa* tea with a value of from (0.66 ±0.014 ppb) and thencinnamon tea (0.53±0.02 ppb), black teahad a value of (0.31± 0.01 ppb) while minttea had(0.21± 0.01 ppb) respectively.

The result of mineral element (Fe and Zn) analysis of five locally consumed tea samples is presented in Table 4.2. The result revealed that zinc concentration ranged from(0.00 to 2.10 ±0.01), for black tea, green tea *and*cinnamon teahad values of 9.90±0.14, 8.00±0.01 and 5.95±0.07 respectively.

For *Moringa* teaandmint tea, the concentrations of Zn in them were 3.98±0.04 and 1.99±0.01 respectively. Fe concentrations of black tea and green tea were 2.10±0.01ppm and 1.00±0.01 ppm respectively. For cinnamon tea, *Moringa* tea and mint tea tea, the values for Fe were 4.86±0.02 ppm, 0.10±0.00 ppm and 0.00±0.00 ppm respectively.

Table 4.1: Concentration of Vitamin C and A in Various Tea Samples Locally Consumed In Kano

Tea Type	Vitamin C Content (ppm)	Vitamin A Content (ppb)
Black Tea	5.46 +0.01	0.31±0.01
Green Tea	0.83±0.01	0.83±0.01
Cinnamon	6.81±0.06	0.53±0.02
Moringa Tea	6.82±0.05	0.66±0.01
Mint Tea	4.06±0.08	0.21±0.01

Table 4.2: Concentration of Mineral Elements in Tea Samples Locally Consumed In Kano.

Tea Type	Fe (ppm)	Zn (ppm)
Black Tea	9.90±0.14	2.10±0.01
Green Tea	8.00±0.01	1.00±0.01
Cinnamon Tea	5.95±0.07	0.49±0.02
Moringa Tea	3.98±0.04	0.10±0.00
Mint Tea	1.99±0.01	0.00±0.00

DISCUSSION

Finding alternative sources of micronutrients from locally available food materials could be one of the sustainable ways of addressing and hopefully reducing micronutrient deficiency disorders. Results obtained from this study have clearly indicated that most of the tea samples we consume with specific reference to the sampled teas in this study, contain appreciable quantities some of the most significant micronutrients (Fe, vitamin A and Zn) which are presently among the rate limiting nutrients in fight against micronutrient deficiency disorders. This work has therefore revealed the various micronutrients in the locally consumed tea samples which hitherto has not been brought up bearing in mind the concept of biodiversity that could make similar plants grown in different location differ with respect to their micronutrients due to geographical variation in different parts of the world. Considering Table 4.1 which describes values for ascorbic acid, vitamin C has been identified as an antioxidant vitamin, it aids in collagen formation and helps in the prevention of common cold and infection (Sharon *et al.,* 2006). One would say that the values depicted in the table for all the tea samples is by far lower than the recommended daily intake (RDI) of 45 mg for the micronutrient. However, the levels could add up to the other sources of vitamin C as a composite in meeting up with the daily requirement for the vitamin as such consumption of any of the tea samples will not be a waste. More so, relatively lower values for vitamin C does not mean a disregard for the tea samples with respect to micronutrient since other micronutrient are contained in the samples and could be beneficial. The vitamin A concentration in the tea samples as presented in Table 4.1 also shows appreciable concentration presence in them although lower than RDI for vitamin A which is equivalence of 1000 IU for adults. Vitamin A is also an antioxidant biomolecule that aids in the protection of body against diseases (Habwe and Walingo, 2008).

The presence of vitamin A in the analysed tea samples would mean that their consumption would help furnish the body with some the benefits conferred by the vitamin eg general growth, brain development and vision improvement. Iron (Fe) deficiency is one of the most prevalent micronutrient deficiencies, affecting over 1 billion people worldwide (Mohammed and Shariff, 2011). Considering the RDI of Fe by adults being 8mg to 16 mg, one would say the concentrations of Fe in Table 4.2 for black tea and green tea meet the daily need of their consumers. This information is not only novel but of great value looking into the teaming population of pregnant mothers suffering from Iron deficiency aneamia in northwestern part of Nigeria and beyond. That consumption of tea could furnish one with some quantity of much needed micronutrient like Fe calls for reorientation in types of food consumed in the light of locally available sources of much needed micronutrients.Zn is an essential mineral which is vital for growth and immune function (Black, 2003). Zn deficiency results from inadequate dietary intake and is of growing concern in the developing world (Korkmaz *et al.,* 2010). In addition, Zn plays an important role in prevention of diarrhea. The presence of this important mineral as part of the constituents of commonly consumed locally available tea samples calls for the need for stake holders in nutrition and public health sector to extend the findings of this study beyond proof on concept tothe level that the possibility of the inclusion of tea consumption as part of the design of strategies that could be used in tackling micronutrient deficiency disorders.

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