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MINERAL COMPOSITION OF SOME SPICES CONSUMED IN KANO STATE – NIGERIA

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ABSTRACT
The mineral composition of seven different spices samples viz: Ajwain (Carium Capticum), Black pepper (Capsium nigrum), Cinnamon (Cinnamonum Zylaicum), Cardamon (Elliteria Cardamomum), Cumin (Cuminum cyminum), Cloves (Eugenia Caryophillis or Syzguim aromaticum), Coriander (Coriandium sativum), consumed in Kano State were analysed. The mineral elements analyzed are K, N_a^+, Ca, Mg, Fe, Zn, Cu, Pb and Cd. The results revealed that, the spices also appears to contain relatively high mineral contents K (443.73-7364.01µg/g), Na (138.15-895.35µg/g), Mg (199.55-651.51µg/g), Ca (129.71-291.07µg/g), Fe (155.44-279.53µg/g), Zn (71.9-299.76µg/g), Cu(7.72µg/g), except for toxic metal Pb and Cd that were not detected. The nutritional contribution of these spices apart from flavouring, medicinal agents is also discussed.

Keywords: Kano, Minerals, Nigeria, Spices

INTRODUCTION

Spices are dried parts of a plant which are used as diet component often to improve color, aroma, palatability and acceptability of food. They consist of rhizomes, barks, leaves, fruits, seeds and other parts of the plant (Wahid *et al.*, 1989). Most of these are fragnant, aromatic and pungent. The bulk of the dry material of spices contains carbohydrate and organic compounds having diverse functional group.

Until recently, spices are thought to have little or no nutritive values (Kochlar, 1989). The few studies carried out on spices have been mostly on their flavour and aroma (Agooha, 1981; Iwu, 1986). There are also other studies on the medicinal values (Mitchell, 1982; Irvine 1961) as well as in drinks and beverages and in the production of perfumes (Aldelamy and Barakat, 1970, Freeman and Mossagleh 1971; Ifon and Bashir,1978). Also several studies were done to determine the concentration of heavy metals in spices dry fruits and plant nuts (Wahid *et al.*, 1989; Gilbert 1984; Husain *et al.*, 1995), and to study their toxic effects.

The nutritional value of food that we eat greatly governs our health and therefore, most of the activities that we do in our life .Our food is the only source of energy, minerals and vitamins for our body and is responsible for the efficient metabolism of the same. It is true that spices are not the major sources of macronutrients (carbohydrates, proteins and lipids) but they can be potential sources of micronutrients (Ifon and Bashir, 1978; Ranjith and Rossbachi, 1993).

Many studies have recognized the role of essential and toxic elements in human metabolism. Essential trace elements, e.g. Fe, Zn, Mn, Ca, are vitally important for certain biochemical systems whereas toxic elements, e.g., As, Pb, Cd, if present in relatively high amounts, adversely affect these systems (Miyamoto, 2000). The concentration of essential, non-essential and toxic-elements in human body are affected by a number of factors such as nutrition, sex, age, retention, chemical form of the trace elements and bending sites available to them. The intake of these elements is related to our environment; however, food is the main source. It is thus significant to access the adequacy and safety of the diet by monitoring the concentration of essential and toxic trace element in various food articles and integrated human diets (Miyamoto, 2000).

The aims and objectives of this research work are to asses and compare the mineral content of some spices sold in Kano. This analysis will provide information on the elemental composition of the spices which will serve as a base on further researches into their nutritional and anti nutritional compositions.

MATERIALS AND METHOD

Chemical of analytical grade purity and distilled water were used. Glass and plastic wares were cleaned with detergent, rinsed with tap water and finally with distilled water and dried in the oven at 105^0C. All weighing were carried out on analytical weighing balance. Seven different spices samples used in the study were obtained from Yankaba, Muhammad Abubakar Rimi, and Rimi markets in Kano metropolis. The samples were sorted, cleaned and ground using a stainless steel mill to obtain a fine powder. The ground samples were stored in dry tight plastic for analysis.

Analytical Procedure

Ground oven dried sample (10g) was weighed into crucible, placed in a muffle furnace and the temperature was set at 550^0C until constant weight grayish ash was obtained after cooling. The ash obtained was then dissolved in $10cm^3$ of 0.1M HNO_3 and made up to $100cm^3$ with distilled water for all the samples.

The elements Ca, Mg, K, Fe, Zn, Cu, Pb, and Cd were determined in an atomic absorption spectrophotometer (AAS) while Na and K were determined in a flame absorption spectrophotometer. The concentrations (ppm) of the elements in the sample were determined from the standard calibration curve of each of the element by interpolation(Ibitoye,2005).

RESULTS AND DISCUSSION

The mineral contents of the samples analyzed followed the same distribution pattern of Recommended Dietary Allowance that is K>Na> Mg> Fe> Zn> Cu(www.en.wikipedia.org/wiki/Dietary-Reference-Intake). Minerals are required in small quantities for the role they play in the normal body. For instance, potassium intake is about 4g per day all supplied by the food we eat. Potassium has the highest concentration in all the samples analyzed as shown in Figure 1 with a unimodal pattern skewed towards high frequency of 1979. 7 μgg^{-1} mean value and ranged between 443.73μgg^{-1} - 2321 μgg^{-1} with coefficient of variation 1.23%. Calcium is one of the basic constituents of the body in which 99% is present in the skeleton (bones) and teeth and the other 1% is present in blood cells and soft tissues. (Ingaski, 2006). Calcium is also the most active metal element in the human body. It plays a very important role in physiological processes such as neuromuscular reflexes, blood regulation, cell adhesion, nerve impulse transmission and heart rhythm regulation (Ingaski 2006). The data reported in the Figure 1 showed a bimodal pattern skewed towards low frequency with a value range of 129.71 μgg^{-1} to 291.07 μgg^{-1} , mean value of 228.88 μgg^{-1} and coefficient of variation 0.22%.

The distribution of sodium as presented in Figure 1 showed a bimodal pattern skewed to left (negatively skewed) with a mean of 507.68 μgg^{-1}, ranged 138.15 μgg^{-1} to 895.35 μgg^{-1} and coefficient of variation 0.57%. Sodium classified as a major nutrient is a major extra cellular cations essential to human health. Mitchell (1982) reported that sodium is necessary for absorption of glucose and normal functioning of nerves and muscles.

The level of magnesium in the samples ranged between 199.55μgg^{-1} to 651.51 μgg^{-1} with mean value of 510.43 μgg^{-1} and coefficient of variation 0.79% as shown in the figure.The frequency distribution pattern is unimodal and the results showed that the micro nutrient was within the low range as compared to other works but high range compared to some indigenous spices studied (Nwachukwu and Ijoh, 2000).Magnesium deficiency causes uncontrollable twisting of muscles leading to convulsion, a condition that can cause death (Hegarty, 1988).

Figure 1 showed a bimodal frequency distribution pattern for iron which skewed to the left (positively skewed) with a mean of 218.30 μgg^{-1}, ranges 155.14μgg^{-1} to 279.55 μgg^{-1} and coefficient of variation 0.23%. The results compares favorably with those reported by (Ozkuthi *et al.*, 2002).Anemia as reported by Black (2003) is responsible for fifth of early neonatal mortality and tenth of maternal mortality. Secondly, it causes poor learning and decrease cognitive development(FAO, 1997).All these ailments are caused as a result of iron deficiency.

Zinc level in the samples is presented in figure 1 with range value 3.21 μgg^{-1}, to 299.76 μgg^{-1}, with mean value of 124.5 μgg^{-1} and coefficient of variation 0.78%.The frequency distribution pattern is bimodal skewed positively and is in accord with the work of other researchers (Ababacar, 2005; Abou-Arab and Abou Donla, 2000).

Copper was only detected in cinnamon with a value of 7.72 μgg^{-1} (figure). The value obtained is within the limit of recommended dietary allowance. Lead and Cadmium were not detected in the samples analyzed. This may be due to their too low concentration that is below detection limit.

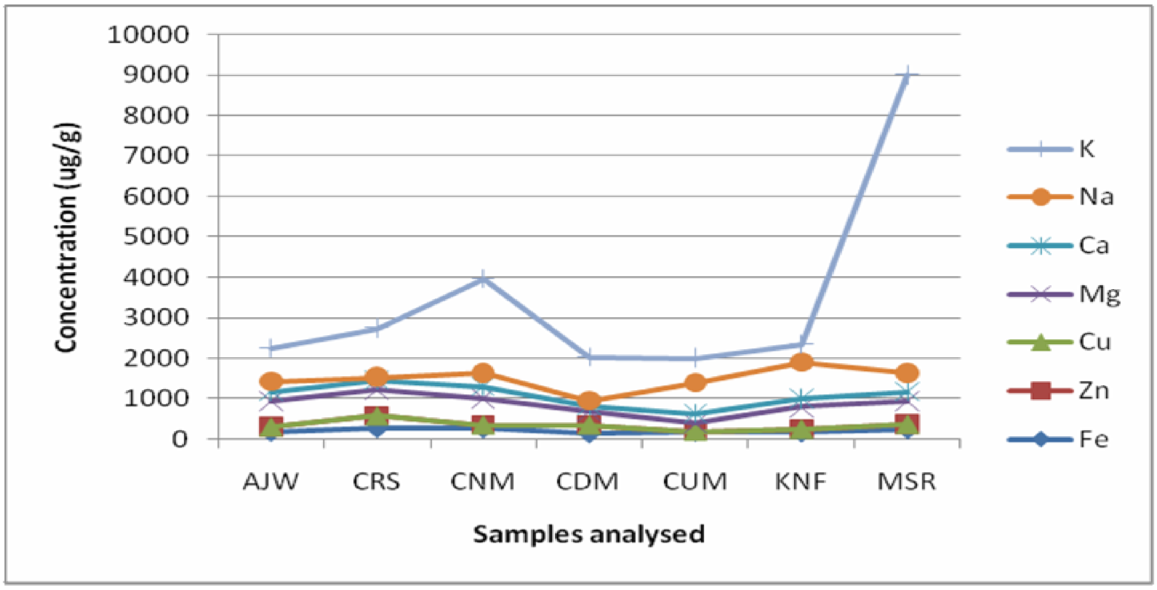

Figure 1: Concentration of the metals in the samples analysed

Key: AJW=AJWAIN, CRS=CORIANDER SEEDS, CNM=CINNAMON, CDM=CARDAMOM, CUM=CUMIN, KNF=CLOVES, MSR=BLACK PEPPER

CONCLUSION

In conclusion, the research has shown that the seven spices analyzed contain essential mineral elements (Na, K, Mg, Ca, Fe, Zn etc) that followed the same distribution pattern as Recommended Dietary Allowance and also the samples analyzed were free from hazardous metals (Lead and Cadmium).

REFERENCES

Ababacar M., Drissa, D., Ragner B., and Berit S. P. (2005). Determination of some toxic and essential metal ions in medicinal and edible plants from Mali. *J. Agric. Food Chem*. 53 (6): 2316 -2321

Abou-Arab A.A K and Abou Donla M.A (2000). Heavy metals in Egyptian spices and medicinal plants and the effect of processing on theirs levels *J. Agric Food Chemistry*, 48 (6) 2300 -2304

Agooha, R.G.(1981) Cited by Nwachukwu,, N. and Ikoha A.I "Proximate composition and Ant Nutritional Factors of same Nigeria spices" *Scientific Africana* 3 (2) PP 99-101

Aldelamy, K.S and Barakat, M.F (1970). Antimicrobial and Preservative activity of Agric on Fresh ground Camel meat. *J. Sci. Food. Agric* 22:96-98.

Black, R .(2003).. Micro Nutrient Deficiency an underlaying cause of morbidity and mortality. *Bulleting of World Health Organization* 8 (2): 79

FAO (1997). Human Nutrition in developing word. Food and Nutrition Series No. 29 Food and Agriculture Organization of United Nations Rome

Freeman, G.G. and Mossaglehi, N. (1971) Influence of sulphate nutrition on the flavor components of garlic and wild onion *J. food Sci. Agric* 22: 330-334.

Gilbert J. (1984). Analysis of food contamination Elsevier App. Sci. Pups. London:pp 1

Hegathy, V. (1988). Decision in nutrition. Fifth Edition Time Mirror Mosby, London PP 80.

Hussaini A. Z., Baroon, S., Al-khala Fawi T. Al- and Sawaya W.(1995). Heavy metal in Fruit and vegetables growing in Kuwait during the oil Welfares Arab Gulf *J. Sc. research* 13 (3): 535-542

http://www.en.wikipedia.org/wiki/Dietary-Reference-Intake. Retrieved December 12, 2009.

Ibitoye, A.A.(2005).Laboratory Manual on Basic Methods in Plants Analysis

Ifon, E.T. and Bashir, O. (1978). The Nutritive Value of some Nigerian Leafy green vegetables; vitamin and mineral contents. *Food Chem*. 4: 263-267.

Ingaski. M.M.A (2006) photochemical screening and proximate Analysis of *Cassia siamea* M. Sc. thesis (Unpublished) Usmanu Danfodio University, Sokoto. pp 30-41

Irvine, F. R (1961) In Nwachukwu, N. and Ukoha, A.I. Proximate Composition and Anti-nutritional factors of some Nigerian spices. *Scientific Africana* 3 (2) PP 99-101

Iwu, M.M. (1986). cited by Nwachukwu, N. and Ukoha, A.I. Proximate composition and Anti-nutritional Factors of same Nigeria spices" *Scientific Africana* 3 (2) PP 99-101

Kochlar, S.L. (1986). In Nwachukwu, N. and Ukoha, A. I. Proximate composition and Anti-nutritional factors of some Nigerian spices *scientific African* Vol. 3 (2) PP 99-101

Mitchell, H.H. (1982). Comparative nutritional analysis of man and domestic animals. Academic press : PP 80-83

Miyamoto, Y. Kajikawa, A., Zaudi J.H., Nakamshi, T, and S. (2000). Minor and Trace element determination of food spices and pulses of different origins by NAA and PAA *J.Radioanalytical and Nuclear Chem*. 243 (3) 747-765.

Nwachukwu N. and Ijoh I.I (2000) Nutrition value of some selected indigenous spices *Plant Prod. Res.* 5: 33-37

Ozkuthi, F., Kara, S. M. and Sekeroglu, N.(2002). Determination of mineral and trace element in some spices cultivated in Turkey ISHS *Acta Horticultures* 756

Ranjith J. And Rossbach M. (1995). Level of trace element in some spice Used in Sri Lanka *J. ASEAN food* 10:19-21

Wahid, M.;Sattar, A. and Durrain, K.(1989).Concentration of selected heavy metals in spices,dry fruits and plant nuts.*Plant Foods for Human Nutrition*.39(3):279-286