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Trace Elements and Major Minerals of *Persea Americana, Mangifera Indica, and Cocos Nucifera* Shell Charcoal

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ABSTRACT [ENGLISH/ANGLAIS]

This study investigated the trace elements and major mineral contents of three different medicinal plants charcoal obtained from a farmland located at Owo-bale, Egbeda Local Government Area of Oyo State, Nigeria. The trace elements analysis was done using Atomic Absorption Spectrophotometric analysis method while mineral content analysis was done using Flame photometric analysis method.The mineral analysis revealed that calcium had the highest concentrations in all the samples and the order of concentration of the mineral elements was Ca<P<K<Na<Mg. The trace elements analysis showed that iron had the highest concentrations in all the samples and the order of concentration of the trace elements was Fe<Mn<Zn<Cu. The results obtained from the analysis showed that the three plants charcoal are medicinal and could be good source of drugs for anaemia because of the high contents of iron and calcium.

Keywords: Persea americana, Cocos nucifera shell, Mangifera indica, charcoal, therapeutic

RÉSUMÉ [FRANÇAIS/FRENCH]

Cette étude a examiné les oligo-éléments et la teneur en minéraux majeurs des trois espèces de plantes médicinales de charbon de bois obtenu à partir d'une terre agricole située à Owo-balles, zone Egbeda gouvernement local de l'Etat d'Oyo, trace Nigeria.The éléments d'analyse a été effectuée à l'aide atomique méthode d'analyse d'absorption spectrophotométrique tout minérale analyse de contenu a été effectuée à l'aide de la flamme analyse photométrique minérale analyse a révélé que le calcium method.The eu les plus fortes concentrations dans tous les échantillons et l'ordre de la concentration des éléments minéraux a été Ca <P <K <Na <Mg.The oligo-éléments d'analyse ont montré que de fer a eu les plus fortes concentrations dans tous les échantillons et l'ordre de la concentration des oligo-éléments a été Fe <Mn <Zn <résultats Cu.The obtenues par l'analyse a montré que le charbon de bois trois usines sont médicinales et pourrait être une bonne source de médicaments pour l'anémie en raison des teneurs élevées en fer et de calcium.

Mots-clés: Persea americana, Cocos nucifera coquille, Mangifera indica, charbon de bois,thérapeutique

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INTRODUCTION

Charcoal is the world's greatest antidote and can be produced from a number of different materials such as, Soft wood, Mango tree, Corn cobs, Coconut shells, Orange, Guava, Neem, Mahogany, Bamboo and Eucalyptus tree [1]. Charcoal is an amazing substance, it adsorbs more poisons than any other substances known to mankind, it can adsorb lead acetate, DDT and many drugs such as; cocaine, iodine, penicillin, aspirin, Phenobarbital and inorganic substances such as; Chlorine, lead and mercury [2]. It can adsorb thousands of times its own weight in gases, heavy metals, poisons and other chemicals; thus renders them ineffective and harmless. [2, 3]. Charcoal can adsorb intestinal gas and deodorizes foul smelling gases of various kinds. Charcoal reduces the amount of gas produced by eating beans and other gas forming foods. It adsorbs the excess gas, along with the bacteria which form the gas. Charcoal for adsorption of gases and vapours is usually made from *Cocos nucifera* shell .This charcoal has high adsorption power and resists powdering in the adsorption equipment [4]. It helps eliminate bad breath because it cleanses both the mouth and the digestive tract [5]. It also helps to purify the blood [6, 7].It relieves symptoms of

nervous diarrhoea, indigestion, peptic ulcers [8]. It is one of the best substances in poultices for mushroom poisoning, insect stings, spider bites, black widow bites, jaundice of the new born, poison oak, ivy reactions, various types of snake bites and many other illnesses [9-11]. Charcoal is not absorbed, adsorbed, neutralized, nor metabolized by the body [12]. Some medicinal preparations from charcoal had been reported to be effective for children in the treatment of ulcer, stroke, hypertension and other degenerating diseases. These preparations are : Poultice + water mixed with charcoal powder to make or form a paste to be smear on the surface of the skin for diseases such as boils, liver, kidney problems. Drink charcoal water (mix powdered charcoal with water; sieve or strain with a neat material and drink it whole [black]). Slurry(mix more charcoal powder in about a gallon of water let it stay overnight, collect the part; strain it to remove every particle; put in a clean gallon and to be drunk as water, half glassful several times a day [1]. All researchers show charcoal to be harmless when accidentally inhaled, swallowed, or in contact with the skin (but if enough is swallowed, it can cause mild constipation).No allergies to it have been reported [2, 5].Medicinal drugs are chemical compounds, they are all poisons to a greater or lesser degree, because of this, if charcoal is taken with them, or soon afterward, it will tend to adsorb and inactivate the drugs. Therefore, physicians recommend that you only take charcoal 2hr before or 2hr after taking a medicinal drug [2]. The objective of this study is to evaluate the trace elements and major minerals present in the three different plants charcoal so as to give recommendation on the amount to consume by an individual for medicinal purposes and the type of plant charcoal that could be effectively used as a source of drug formulation or medicine in South-West, Nigeria.

MATERIALS AND METHODS

Sample Collection

Persea americana and *Mangifera indica* tree bark were collected freshly using plastic knife from matured trees of the plants situated in a farmland located at Owo-bale, Egbeda local government of Oyo state. Matured *Cocos nucifera* were bought at Bodija market, Ibadan, Oyo state, Nigeria.

Sample preparation

The plant samples were cut into small chips and rinsed with distilled water and spread on a white cardboard paper under the sun for 7 days in order to obtain fresh and fully dried samples.

Charcoal Preparation

Each plant sample was heated in a mould pot with fire wood under a prepared stone triple stand without the addition of kerosene or petrol. The heated sample, after the low red heat, was allowed to cool and transferred with foil paper into a ceramic mortal and each was marshed with pestle into powder and sieved with plastic sieving bowl, then stored in airtight bottles prior to use for analysis.

Physico-chemical Analysis

The mineral composition and trace elements were determined by wet acid digestion according to the method described by [4]. Small quantity (0.5g) of each sample was placed in a beaker, adding to it 10ml concentrated HNO_3 acid covering it with a watch glass for the initial reaction to subside (1hr). It was then placed in a fume cupboard for three days. Thereafter, the three covered flasks with the contents were heated on a hot plate for 4 hours. Conc. HNO_3 was added intermittently as the content reduced until the sample solutions turned colourless. They were cooled and transferred into 50ml volumetric flask and made up to mark with distilled water. The solutions were filtered and transferred into an analytical bottle, corked, and labelled, kept for ASS and flame photometric analysis.

RESULTS AND DISCUSSION

The plants charcoal used for this study are among the most commonly available plants in South Western Nigeria. They are used for cooking as wood by the populace. Most of the users see charcoal as affordable fuel nothing more, but our forefathers used charcoal in the treatment of many diseases in the years past [1].

Table 1 shows the mineral composition of the three medicinal plants charcoal. Mineral contents showed varied values between the samples. Calcium recorded the highest concentration values in all samples, followed by phosphorus, potassium, sodium and magnesium. Meanwhile, Calcium is important for the coagulation of blood, proper functioning of the heart and nervous system, normal contraction of muscles and aiding the formation of bones and teeth [13]. Magnesium serves a key role in most reactions involving phosphate transfer, structural stability of nucleic acid and intestinal absorption of nutrients [9]. Potassium and sodium

contents of the *Cocos nucifera* shell charcoal are remarkably higher than the other plants charcoal of study. Potassium and sodium are closely related in the body fluids. Sodium remains one of the major electrolytes in the blood, without sodium the body cannot be hydrated, it would dry off at the point where some vital processes are taking place sodium is not needed, too much will cause the cell to breakdown [2].Phosphorus content is highest in the *Cocos nucifera* shell charcoal followed by the *Mangifera indica* and *Persea americana* plants charcoal. Phosphorus is useful to the bone. It is mineral pair of calcium, the two of them go hand in hand. They are bound together in the bone, teeth and ligament of the body. It is very important for nerves and it will produce the same bone diseases like calcium, it is required in small quantity [2, 14]. Minerals are required in doses in excess of 100mg per day [4].

Table 2 shows the trace elements composition of the three plants charcoal. All the trace elements were present in all the samples except chromium which was not detected at all in all the samples. Copper was not detected in *Persea americana* and *Mangifera indica* but was present in *Cocos nucifera.* From the table *Cocos nucifera* shell charcoal contained the highest concentration of Iron followed by *Persea americana* and *Mangifera indica* plant charcoal. Iron is important for the building up of red blood cells and for the formation of haemoglobin. Iron is used against anaemia, tuberculosis and disorder of growth [2]. Iron is an energizer but excess can cause fatigue but we hardly have excess if taken from natural source [2]. Zinc content was highest in the *Cocos nucifera* shell charcoal while in *Persea americana* and *Mangifera indica* are almost the same. Zinc is very important for nerve function and male fertility. It is important for normal sexual development especially for the development of testes and ovaries, it is also essential for reproduction. It stimulates the activity of vitamins, formation of red and white corpuscle.Also for healthy functioning of the heart and normal growth [13, 14]. Copper element was only present in the *Cocos nucifera* shell charcoal and was not detected in other plants charcoal of study. Copper is important for cellular defence and protection of the mucous membranes, antianaemic and essential for the formation of iron and haemoglobin [2]. Trace elements are required in doses of 1 to 3mg per day [4].

CONCLUSION

This present study has shown the major minerals composition and trace elements present in the three medicinal plants charcoal, these are; *Persea americana, Mangifera indica and Cocos nucifera*. This partly shows the uses of these charcoals in traditional and orthodox medicine as a rich source of minerals and beneficial trace elements and can be seen as potential sources of useful drugs, especially *Cocos nucifera* charcoal. The finding from this work suggest a possible use of *Cocos nucifera* shell charcoal, having higher values of iron and copper, as antianaemic agent.

Table 1: This table shows mineral composition of the charcoal of the three medicinal plants on a dry weight basis expressed in mg/kg.

Mineral	*Persea americana*(mg/kg)	*Mangifera indica* (mg/kg)	*Cocos nucifera* shell(mg/kg)
Calcium (Ca)	3175.00	2650.00	2288.00
Magnesium (Mg)	16.10	26.30	14.95
Potassium (K)	624.00	1365.00	1404.00
Sodium (Na)	526.50	931.50	1377.00
Phosphorus(P)	696.00	1022.25	3110.25

Results are mean of three determinations

Table 2: This table shows trace elements composition of the charcoal of the three medicinal plants on a dry weight basis expressed in mg/kg

Elements	*Persea Americana* (mg/kg)	*Mangifera indica* (mg/kg)	*Cocos nucifera shell*(mg/kg)
Iron(Fe)	119.50	152.50	266.50
Zinc(Zn)	4.75	4.15	7.50
Copper(Cu)	nd	nd	3.00
Manganese(Mn)	16.50	8.00	7.50
Chromium(Cr)	nd	nd	nd

Results are mean of three determinations; nd= not detected

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CONFLICT OF INTEREST

No conflicts of interests were declared by authors.