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EVALUATION OF SOME MINERAL ELEMENTS IN GINGER ZINGIBER OFFICINALE PLANT

[1]A. E. ORUK*, [1]E. ABAI, [2]A. E. OWEN
[1]Department of Science Technology, Akwa Ibom State Polytechnic, Ikot Osurua, Nigeria
[2]Department of Chemistry, Akwa Ibom State University, Ikot Akpaden, Nigeria

ABSTRACT
Some micro and macro elements were evaluated in ginger plant using standard analytical methods. The results were expressed with standard deviation as follows. Among the macro elements, sodium (Na) recorded a higher concentration of 82.23 ± 0.09 mg/100g followed by magnesium (Mg) 48.28 ± 0.12 mg/100g, potassium (K) 36.35 ± 0.22 mg/100g phosphorus (P) 18.32 ± 0.3 mg/100g, while calcium (Ca) showed the least concentration of 12.30 ± 0.28 mg/100g. Micro elements determined were manganese (Mn) which had the highest concentration of 7.12 ± 0.00 mg/100g followed by iron (Fe) 4.03 ± 0.03 mg/100g, copper (Cu) 2.08 ± 0.11 mg/100g and zinc (Zn) with the least concentration of 1.94 ± 0.01 mg/100g. Base on the results of the analysis, it shows that the essential minerals needed in the body for proper metabolism is within the limit of the recommendation made by world health organization (WHO) this also confirmed that ginger plant should be included in the daily dietary pattern of human since it can boost up mineral deficiency and improved the immune system of the body as recommended by some authors.
KEY WORDS: Mineral elements, Ginger, Plant.

INTRODUCTION
Zingiber officinale plant is also known as ginger is a rhizome or ginger root. It is commonly used as cooking spice throughout the world. It belongs to the rhizome perennial plantain it belongs to the family of *zingiberaceae*. The plant was cultivated by Chinese people and then spread to India, southern Asia, West Africa and the Caribbean.

It is herbaceous perennial plant which grows green leaves and yellow flowers. Ginger plant originated in the tropical rainforest in southern Asia, the plants grown in India shows the largest amount of genetic variation (Thompson *et al*., 2002). Ginger was exported to Europe via Indians in the first century AD as a result of the lucrative spice tares and was used extensively by the Romans. It is also an important cash crop of Chittagong hill tract region (Alsawan, *et al*., 2002).

Spicer kike ginger is an integral part daily culinary preparation for it aromatic pungency scent and tasty flavor. In the traditional Korean kimchi ginger is either finely fined or gust juiced to avoid the fibrous texture added to the ingredient of the spicy paste just before the fermenting process (Furhman *et al.*, 2000).

In Indian cuisine ginger is a key ingredient especially in thicker gravies as well as other4 dishes and also in vegetarian and meat based it also has a role in traditional Ayurvedic in medicine the Indians take it traditional as drink either as cold or hot.

Fresh ginger is one of the main spices used for making pulse for making pulse and lentil curries and other vegetable preparation. Fresh ginger together with peeled garlic cloves is crushed or ground to form ginger garlic masala (Med-Grzqnna *et al*., 2005).fresh as well as dried ginger is used to spice tea and coffee especially in winter ginger power is used in food preparation intended primarily for pregnant or nursing women, the most popular one being katlu, which is a mixture of gum resin ghee nuts sugar. Ginger is also consumed in candid and pickled form. In Burma it is consumed as a salad dish called gyin-thot which consists of shredded ginger preserved in oil with a variety of nuts and seeds (Yang, 2004).

Thailand used ginger garlic paste in cooking Greece a traditional drink called made during the Christmas while Jamaicans make ginger bear both as a carbonate beverage and also fresh in their homes ginger has

been used as a medicine in Arabic, Asian and Indian herbal tradition since ancient time (Furhman *et al.*, 2005).

Uses of Ginger

Ginger produces a hot, fragrance kitchen spice (Yamahara *et al.*, 1988). Young ginger rhizomes are juice, and fleshy with a mild taste. They are often pickled in vinegar or sherry as a snack or sherry as a snack or cooked as an ingredient in many dishes. Mature ginger rhizomes are fibrous and nearly dry of food and fluids through the gastrointestinal (GI) tract

Nausea, chewing raw ginger or drinking ginger tea is a common home remedy for nausea during cancer treatment. Ginger tea can help relieve nausea and aid cold recovery. Pregnant women experiencing morning sickness can safely use to ginger to relieve nausea and vomiting.

Pain reduction; A study involving 74 volunteers carried out at the University of Geogia found that daily ginger supplementation reduce exercise reduce muscle pain by 25%. Ginger has also been found to reduce symptoms of dysmenorrheal (severe pain during a menstrual cycle). In one of the studies, 83% of women taking ginger capsule reported improvements in pain symptoms compared to 47% of those on place placebo (Bhandari *el al.*, 1998).

Inflammation, ginger has been used for centuries to reduce inflammatory and treat inflammatory condition. A study Publisher in cancer research journal found that a ginger root supplement administered to volunteers reduced inflammation markers in the colon within a month. Ginger has also shown promise in clinical trials for treating inflammation associated with osteoarthritis (Aggarwal *et al.*, 2006).

Health benefits of Ginger

Ginger has a long traditional effect in alleviating symptoms of gastronintestinal distress while in herbal medicine, ginger is regarded as an excellent carminative (a substance which promote the elimination of intestinal gas) and intestinal Spasmolytic (A substance which relaxes and soothes the intestinal tract) (Aggarwal *et al., 2006*).

Modern scientific research has reveal that possesses numerous therapeutic properties, including antioxidant effect and the ability to inhibit the formation of inflammatory compound, direct anti-inflammatory effect studies shows that increase in consumption of ginger in food decrease the risk of obesity, diabetes, heart disease and overall mortality while promoting a healthy complexion and air increase energy.

The health benefits of ginger include:

a. Fight cancer, several studies has shown that adding ginger into your daily diet will help in fighting lung, postate, ovarian, colon, breast, skin and pancrease cancers (Shukla *et al.*, 2007).
b. Helps with irritable Bowel syndrome (IBS) is a common disorder that affects nearly 25- 45 million people in the world, and these symptoms include, cramps, bloating, gas, diarrhea, constipation, and mucus in the stool. This is because ginger can help to relax the intestines during a flair up.
c. Relive Gas, ginger tea is easy enough to make and has been proven effective at gas, drink a cup of ginger yea before sleeping and let it work its magic overnight while sleeping because, its act as a cleaner and it cleans digestive system.
d. Relieves Heartburn
   Heart burn is the main symptoms of acid reflux or gastro esophageal reflux disease (GERD). According to doctors, ginger has been found to have a gastro protective effect, it prevent the loosening of the Lower Esophageal Sphincter (LES) and blocks acid from regurgitation back in to the esophagus, it's also kills of harmful bacteria other health benefits includes strong evidence may ease osteoarthritics pain, it may also help other with.

i. Rheumatoid arthritis
ii. Muscle and joint pain
iii. Headache

Theoretically, it has been found out that ginger may help in

i. Lessen swelling
ii. Lower blood sugar
iii. Lower cholesterol
iv. Protect against Alzheimer disease
v. Prevent blood clothing (Janssen *et al.*, 1906).

Chemical constituents of ginger plant (*Zingiber officinale*) is the botanical name of ginger plants, and botanically it is refer to rhizome rather than a root pant

Ginger can be divided into four principle parts (i) taste or pungency (ii) essential oil or fragrance (iii) micro/macro nutrients and (iv) Synergistic (Wang, *el at.*, 2003). Within ginger plants, there are hundreds of ingredient, that are referred to as synergist, which make the plant powerful healer, this constituents interacting to create endless number of medic al benefits of the plant (Halter, *et al.*, 1983). The enzyme in the plant aid to the effect of digesting parasites and their eggs and is associated with anti-inflammatory activity.

MATERIALS AND METHODS

Sample collection and treatment

The plant was bought in Urua Mbakara in Ikot Ekpene Local Government Area, and brought to the Chemistry Laboratory of Department of Science Technology and the plant was identified by a Botanist. The sample plant was sliced and sun dried for three days and thereafter was ground into power. Ig of ground sample was weighted into digestion flask, 10ml of HCI acid was added to 20ml of Nitric acid (HNO_3), the mixture was heated with heating mantle until the cloud colour turned white, which the digestion was completed. The digested samples were subjected to various analyses using Atomic Absorption Spectrophotometer (A.A.S).

RESULT

The results of the determination of micro and micro elements of the plant were obtained as shown in the tables below:

Table 1: Levels of macro elements in ginger

Macro Elements	Concentration (mg/100g)	FAO Dietary Allowance (mg/day)
Potassium (k)	36.35 ± 0.22	100-300mg/day
Magnesium (Mg)	48.28 ± 0.12	200-300mg/day
Calcium (Ca)	12.30 ± 0.28	200-300mg/day
Sodium (Na)	82.23 ± 0.09	300-350mg/day
Phosphorus (P)	18.32 ± 0.03	700 mg/day

Table 2: Level of micro element in ginger

Micro Elements	Concentration (mg/100g)	FAO Dietary Allowance (mg/kg)
Copper (Cu)	2.08 ± 0.11	2mg/kg
Zinc (Zn)	1.98 ± 0.01	15mg/kg
Manganese (Mn)	7.12 ± 0.00	4mg/kg
Iron (Fe)	4.03 ± 0.03	1mg/kg

DISCUSSION

The results obtained from the analysis as presented in table 1, indicate macro elements contents of the plant. Sodium (Na) has the highest content of 82.23 ± 0.09 mg/100g, is the main monovalent ion of extracellular fluids, its ions constituting 93% of the ion (base) found in the blood stream. Although the *principle* role of sodium in the animal is connected with the regulation of osmotic pressure and the maintenance of acid-base balance, sodium also play important role on the effect irritability and absorption of carbohydrate, with this sodium fall within the daily dietary allowance.

Magnesium (Mg) followed after sodium with 48.28 ± 0.12mg/100g. Magnesium supports the strength of the bone, men need more magnesium than the women since muscles cell uses. It's a balance between the amount of calcium and magnesium in the body, which occur due to some factors, since the result fall within the dietary daily allowance 400mg/day. Ginger is recommended for use as a food supplement for magnesium.

Potassium (k) content fall within the range of 36.35 ± 0.22 mg/100g, which keeps and maintain the correct water balance in the cells of nerves and muscles, it also helps the nerve to generate an impulse which signed the body movement, it also function in the heart organs, which the body could not contract and flex. The result of the analysis shows that the range is within the dietary daily allowance of 100-300mg/day.

Phosphorus (P) content in the plant sample was 18.32 ± 0.03mg/100g, it's also an essential component of bone cartilage and crustacean exoskeleton, phospholipids, nucleic acids, phosphorptein, high energy phosphate esters (ATP), hexose phosphates, creatine phostphat, and several key enzymes, is plays a central role in energy and cell metabolism, while inorganic phosphate serves as important buffers to regulate the normal acid base balance (ie pH) of animal body. By the result obtained, it indicates that, it does not exceed the recommended daily allowance of 300-350 mg/day. The organic form of phosphoric must first be hydrolyzed within the gastro-intestinal tract by the enzyme phytase to inositol and phosphoric acid before it can be utilized and absorbed by the body. Its deficiency, reduced growth, poor fed efficiency, bone demineralization, skeletal deformity.

Calcium (Ca) shows the range of 12.30 ± 0.28mg/100g, calcium help in the transmission of nerves impulses and as a structural component of bones and teeth and it is the most abundant mineral in the body. Its gives bone strength and density, the deficiency due to poor nutrition or illness can leads to osteoporosis, this a condition in which the bones become brittle and less dense, sequel to the result obtained, the range fall within the recommended intake of 200-100 mg/day respectively.

In table 2 of the micro elements, it was observed through analysis by using standard procedure that manganese (Mn) content the highest of 7.12 ± 0.00 mg/100g study shows that the activity of mitochrondrial superoxide dismutase is a function of dietary intake of manganese, enzymes such as decarboxylases, hydrolases, kinases and transferases are not specifically activated by manganese in vitro. The two known manganese metralloenzymes are pyruvate carboxylase and superoxide dismutase, both are located in mitochondria (Underwood, 1981). Signs of deficiency include poor productive performance, growth retardation, abnormal formation of bone and cartilage and impaired glucose tolerance (Hurley and keen, 1981). The recommended Daily Allowance (RDA) is the range of 2-10 mg/day and since the result shows less than 10mg, ginger should be taken daily.

Iron (Fe) was observed the second highest content with 4.03 ± 0.3mg/100g, iron is a constituent of hemoglobin, mgoylobin and a number of enzymes (Bothwell *et al*., 1979). 30% of the body iron is found in a storage form such as ferritin and hemosiderin (manly in the spleen, liver and bone marrow) and only small amount is needed wit blood transport protein transferring. The absorption of iron is influenced by body store (Bothwell *et al*., 1979; Cook *et al.*, 1974). When the dietary supply of absorbable iron is sufficient, the intestinal mucosa regulates iron absorption in a manner that tends to keep body iron content constant.

In iron deficiency, the efficiency of iron absorption increases (Finch and Cook, 1984). This response may not be sufficient to prevent anemia in subjects, whose intake of available iron is marginal at the same vein, intestinal regulation is not enough to prevent excessive body storage of iron in the presence of continued high levels of iron in the diet. RDA is 10-15mg/day in adult, 2-15mg/day in infant while 2-10mg/day by children and adolescent and the excessive intakes/toxicity is 25-75mg/day Finch and Monsen 1972; Bothwell *et al*., 1979).

Copper was observed to content 2.08 ± 0.11mg/100g in the plant sample copper is essential element for alln vertebrate and some lower animals, deficiency of copper causes anemia, skeletal defects, demyelination, degeneration of nervous system, defects in pigmentation, reproductive failure, myocardial degeneration, structure of hair and decreased arterial elasticity (Davis and Mertz, 1987). Thus other effects include the production of hypocupremia, while ceruloplasmin, a protein-copper complex, which strongly influenced by hormonal changes or inflammation in humans (Manson, 1979). Assessing copper status I humans is called erythrocyte superoxide dismutase (SOD) activity (Vaury *et al*., 1985).

However, copper deficiency has been observed in malnourished children, which its manifested in anemia, neutropenia and severe bone demineralization (Cordano *et al*., 1964). Elevated plasma cholesterol levels, impaired glucose tolerance and heart related abnormalities has been observed in some human subjects in consuming only 0.8 ± 10mg of copper per day (Klevay *et al*., 1984; Reiser *et al*., 1985).

RDA for adults is in the range of 2.0-2.6mg/day infants; 0.23-0.7mg/day while young people 1-2mg/day. Base on the above result in table 2 ginger is a good source of copper which be taken every day. Zinc contains the least with the concentration of 1.98 ± 0.01mg/100g on table 2. Zinc are found in enzymes which involved in most major metabolic pathways, it's a essential elements for plants, animals and humans (Hambidge *et al.*, 1986). Large amount of zinc are deposited in bone and muscle, but those stores are not in rapid equilibrium with the rest of the organism. The body pool of zinc available appears to be small and heave a rapid turnover rate, as shown by the prompt appearance of deficiency signs in laboratory animals No. single enzyme function has been identified that explain the rapid onset of physiological and biochemical chemical change that follow the induction of zinc deficiency, but the requirement of zinc by many enzymes which involved in gene expression (Chersters, 1982). Zinc status is subject to strong hemestatic regulation, small amount of zinc are more efficiency absorbed than large amount of zinc excreted, predominantly through the intestine, and is proportional to dietary intake and the zinc status of the person.

The composition of the diet has important effects on the bioavailability of dietary zinc interaction with other dietary components, such as protein, fiber, phytates and some mineral as also been recommended. Zinc deficiency, signs and symptoms in humans include loss of appetite, growth retardation, skin changes and immunological abnormalities. RDA for Adult is 10-12mg/day and infant is 2-7mg/day (Casey *et al.*, 1985). Excessive intake toxicity, an acute toxicity results in gastrointestinal irritation and vomiting (Prasad, 1976). The observation through the result form the sample shows that zinc fall with the recommendation of the dietary intakes.

CONCLUSION

Sequel to the result of the analysis in Table 1, the macro elements analyzed were all within the remanded dietary allowance and also the micro elements on table two were all within the remanded dietary allowance (RDA) which mean that ginger should be taken at all time or as everyday meal that will provide these essential elements to the humans body.

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