Proximate Analysis of Polyalthia Longifolia Seeds

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***Abstract*— Proximate analysis of seeds of Polyalthia longifolia was carried out using gravimetric, volumetric and atomic absorption spectrometry. The analysis revealed that percentage moisture, crude oil, crude protein, crude fiber and total carbohydrate were 5.0, 7.5, 14.0, 7.3 and 65.3g/100g of sample respectively. The mineral content as determined by Atomic Absorption Spectrophotometer (AAS) were potassium (269.37), magnesium (23.80), calcium (16.02), iron (12.19), sodium (6.03), manganese (4.86), copper (3.11), zinc (1.79), nickel (0.47), cobalt (0.18), lead (0.07) and chromium (0.05) µg/g of sample. The results showed that the seed cake could be a rich source of macro and micro nutrients. It implied that the seed could be used in the pharmaceutical and food industries for production of dietary supplements. The oil could be useful in the cosmetic industries for the production of a wide variety of cosmetics products.**

***Index Terms*— Polyalthia longifoli, seeds, proximate analysis, elemental analysis, industrial uses.**

I. INTRODUCTION

Human population seems to be on the increase at an astronomical rate. There is need to meet the food needs of this teeming population as well as provide for the health and other needs of this populace. Vegetable material is easily the cheapest and readily available source from which these diverse needs can be met (Amy Muldoon, 2010; Martin, 2011; Annarita Poli *et.*al, 2011).

Polyalthia longifolia known locally in Nigeria as the "Masquerade Tree" is a lofty evergreen tree, native to India (http://en.wikipedia.org/wiki/polyalthialongifolia),
commonly planted due to its effectiveness in alleviating noise pollution. It is mainly used for landscaping purposes because of the exquisite beauty of its leave arrangement and the unique height of the plant itself. Its common names include Green Champa, Indian Mast Tree, False Ashoka and Indian Fir Tree. It was introduced to gardens in many tropical countries around the world including Nigeria. The fruits are borne in clusters of 10 -20 which are initially green, but turn purple or black when ripe. These are loved by birds which feed on them discarding the seeds. The seeds therefore lie around the on the soil close to the tree or are sometimes carried some distance away from the tree by the birds before being discarded. The plant's seed does not appear to have been used for any industrial process as of today and the plant is only used mainly for its aesthetic and protective properties.

Major uses recorded about *Polyalthia longifolia* has been of medicinal nature and a typical example is of the bark extract which is used in some part of the west coast of Africa in particular Cote d'ivoire to treat haemorrhoids and febrile pains (Burkill, 1995). There is a claim of the presence of sesquiterpenes in the essential oils of *Polyalthia longifolia* leaf (Ogunbinu *et al*., 2007). The leaf oil has been demonstrated to exclusively compose of sesquiterpene derivatives while the leaf is used in Nigeria and elsewhere for treatment of skin diseases, fever, diabetes and hypertension (Goyal and Achla, 1987; Faizi *et al*., 2003; Saleem *et al*. 2005; Nair *et al.*, 2007). The antimicrobial activity of clerodane diterpenoids from *Polyalthia longifolia* seeds had been reported (Murthy *et al*., 2005). However there seems to be insufficient scientific reports on the proximate analysis and ethno-medicinal uses of *Polyalthia longifolia*.

Presently in most places where this tree is grown, the seed appears to be regarded as wastes except for its use in some instance for propagation of new plants. As the seeds of this plant are usually discarded, if they turn out to be useful then they would apart from serving as useful source of carbohydrates and lipids serve as an example of a waste to wealth situation, which is currently encouraged by the world at large (Knowlton, 2007; Egun, 2012; Sridhar and Adeoye, 2003).

It is in pursuance of such a possibility that this study was conducted with the specific aim of discovering through proximate analysis of seed of *Polyalthia longifolia*, its possible industrial uses. This study is a continuation of the studies on *Polyalthia longifolia* (Oyedeji *et al*., 2011)

II. MATERIAL AND METHODS

Materials

Seeds of *Polyalthia longifolia* were collected over a period of (2) two months from the garden of a private residence in Orogun Village, Ibadan, Oyo State of Nigeria. The seeds were de-coated manually, sundried for one week, and followed by granulation into coarse particles using a laboratory grinder. All determinations were then carried out in triplicates using standard methods of analysis (Pearson, 1976).

Methods

Proximate Analysis of Seeds

Proximate analysis of the pulverized seed was carried out in the Wood Extraction and Industrial Laboratories, Department of Chemistry, University of Ibadan, Ibadan Nigeria. Evaluation of percentage moisture, crude protein, crude fiber and total carbohydrate contents was carried out using earlier reported methods (Pearson, 1976).

Determination of Mineral Content

The mineral content of the seed were determined using a Perkin Elmer Atomic Absorption Spectrometer (AAS) installed with the following lamps Mg, Na, Ca, K, Fe, Mn, Zn, Cu, Ni, Co, Cr, and Pb. The analysis was carried out at the Analytical Services Laboratory, International Institute of Tropical Agriculture (IITA), Ibadan, Oyo State, Nigeria. The micro nutrients were expressed as (µg/g) of the sample.

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III. RESULTS AND DISCUSSION

Proximate analysis

The proximate analysis of the *Polyalthia longifolia* seed revealed that it is a very good source of macronutrients (Table 1). The results showed that it contains a very high percentage of carbohydrate (65.3%), which implies that it could be a very useful source of energy yielding material. The seed cake may therefore be used in the production of food supplements for farm animals by the agro-related industries, blends of baby weaning foods and adult flour meals when its toxicity has been ascertained by the food industries.

The seed also contains high protein content (14.0%) which if bioavailable could be used in the development of protein concentrates. Proteins promote human growth, tissue repairs and immune function and are involved in the synthesis of essential hormones and enzymes. The crude fat content of the seed is not very high (7.5%), but comparable to that of Sorghum (Oyedeji and Oderinde, 2006) and higher than that of maize and some other cereals (Kapseu and Parmentier, 1997), that are used for production of specialty table oils (salad dressing) and pharmaceutical or cosmetic oils. Fat is necessary for normal growth and development and is the most concentrated source of energy. It is necessary for absorbing certain vitamins (A, D, E and K) and carotenoids. It provides a cushioning for the organs maintains cell membrane, fluidity, tastes, consistency and stability in foods. The moisture level of the seed makes it very suitable for industrial production. It is quite low (5.0%) and will be of immense importance in its storage.

The dry matter (95%) represents the material left after the determination of percentage moisture. In theory, this sum should be the sum total of the other components present in the seed. In practice however as can be seen in this instance, the dry matter value calculated after the determination of moisture level does not total to the other components. There is a shortfall of about 0.9g/g. This loss is probably indicative of both human error involved in transfer of sample and error of the experimental model chosen and also total loss due to gravimetric procedures. The crude fiber level (7.3%) is high enough to encourage use in agro-related and food industries as it aids proper digestion, encourages bowel movements and thereby reduces the risk of constipation. They also aid in the treatment and management of hemorrhoids, heart, obesity, lowers cholesterol levels and maintains normal blood glucose level.

Mineral Composition

In Table 2.0 is the summary of mineral contents of the seed of *Polyalthia longifolia.* The ash content content of *Polyalthia longifolia* seed is very rich in micronutrients, Potassium (269.37µg/g) being the largest. Potassium is used to produce lye for soft soap production and in cosmetic industries (Schumann and Siekmann, 2005; David Fisher, 2013). It is important for chemical reactions within the cells, and regulates the transfer of nutrients to the cells (ref). Potassium regulates water and electrolyte balance in the body, distribution of intra and extra-cellular fluids. Potassium is absorbed through the intestines, stored in the cells and kidneys and necessary for adrenal glands. Moreover, potassium is important for proper muscle contraction, normal blood pressure, growth, nerve impulses, healthy skin, cell metabolism and enzyme reactions. It increases metabolism and is helpful in stroke prevention, it is an antidepressant, antihypertensive and antispasmodic. This shows that *Polyalthia longifolia* seeds can be a good material for the pharmaceutical industries for the production of mineral supplements.

Calcium (16.02 µg/g) also present in *Polyalthia longifolia* seed cake is needed for so many functions in the body, from bones to blood clotting, muscles, the formation and maintenance of bones, the development of teeth and healthy gums. It stabilizes so many body functions and is thought to assist in bowel cancer. Calcium has a natural calming and tranquilizing effect and is necessary for maintaining a regular heart beat and transmission of nerve impulses. It helps to lower cholesterol, muscular growth, prevents muscle cramps and helps with protein structuring on DNA and RNA. It provides energy, breaks down fats, maintaining proper cell membrane permeability and aids in neuromuscular activity and helps to keep the skin healthy. Calcium also stops lead from being absorbed into the bone.

Iron (12.19µg/g) plays an important role in the production of haemoglobin with protein and copper and oxygenation of red blood cells and lymphocytes. Iron improves the function of enzymes in protein metabolism and enhances the functions of calcium and copper. It is absorbed in the small intestine and stored in the liver, spleen, bone marrow and blood. Iron is needed to metabolize B vitamins. The level at which it is present in the seed cake of *Polyalthia longifolia* indicates that the seed cake is likely to be useful in food formulations for pregnant and lactating women as a prevention for anemia in the food and pharmaceutical industries.

Sodium (12.19µg/g) is necessary for proper water balance in the body, transition of fluids across cell walls and proper blood pH. It is easily absorbed in the small intestine and stomach and transported through the kidneys where it is filtered out of the body. It is important for digestion in the stomach, nerve function and muscle contractions, helps to keep the blood soluble and aids the cleansing process of carbon IV oxide from the body.

Manganese (4.86µg/g) is a cofactor in many enzyme systems including those involved in bone formation, energy production, and metabolism of protein, carbohydrate and fat. It is essential for the utilization of choline, thiamine, biotin, and vitamins C and E. It is absorbed in the small intestine and is stored in the bones, liver, kidney, pituitary gland, and pancreas. Manganese is required for choline acetyl choline transfer, enhances smooth muscle relaxation; promotes normal growth and development and cell function. Manganese helps produce muco-polysaccharides and stimulates the production of cholesterol (CIHFI, 2013).

Copper which is also present in *Polyalthia longifolia* is absorbed into the intestine and quickly moves into the blood stream. It is stored in the liver, kidney, heart, brain, muscles and bones where it aids the formation of bones, conversion of iron into heamoglobin. It also works with zinc and vitamin C for the production of elastin. Copper is necessary for the production of RNA, phospholipids, protein metabolism and Adenosine triphosphate (ATP). Copper helps converts tyrosine into a pigment that colors the skin and hair. It is involved in the healing process, taste, healthy nerves and the

formation of collagen. Copper imbalance raises cholesterol by destroying proper HDL to LDL balance. Copper also helps in the formation of red cells.

Zinc (1.79µg/g) is important for absorption and action of B-complex vitamins. It is required for protein synthesis, collagen formation, healthy immune system, and the ability of the body to heal wounds. Zinc is absorbed in the small intestine and is stored in the liver, eyes, kidneys, pancreas, bones, muscles, prosterate gland, sperm, nails, skin, hair and white blood cells. Zinc inhibits %alpha reductase from converting testosterone into dihydro testosterone (DHT) a form of testosterone that promotes prostrate growth. Zinc is involved in protein synthesis, muscle contraction, formation of insulin, maintenance of acid-base balance, synthesis of DNA and brain functions.

Cobalt is also present in *Polyalthia longifolia* at trace level. Cobalt is important in the formation of cobalamin or vitamin B_{12}. It is not easily assimilated in the body and is stored in red blood cells, liver, plasma, spleen, kidney and pancreas. It promotes red blood cells formation, activates enzymes and replaces zinc in some enzymes.

Chromium also present at trace level stimulates enzymes involve in glucose metabolism, and improves the effectiveness of insulin and its relationship with glucose. It competes with iron to transport protein to the blood and is involved in RNA-protein binding ability. Chromium is poorly absorbed (5% bioavailability). It is stored in the spleen, testicles, kidneys, pancreas, heart, lungs and brain. It helps to stabilize nucleic acids (DNA and RNA) against structural changes. It also helps to stimulate the synthesis of fatty acids and cholesterol in the liver.

The level of lead and iron cannot be regarded as toxic because the Nigeria standard for level of micro element in edible vegetable oils stipulates 0.1oppm for lead and 15ppm for iron. This should encourage the food, pharmaceuticals and related industries to use both the seed cake and flour of *Polyalthia longifolia.*

IV. CONCLUSION

Polyalthia longifolia seed appears to be a wholesome source of possible adult/infant energy giving and body building meals, antihypertensive, substances. The seed cake has been shown to contain high levels of carbohydrate and protein if bioavalaible. The carbohydrates could be further processed once toxicity testing has taken place to rule the presence of harmful substances at toxic level to produce baby weaning foods or even flour for adult consumption. In conclusion, the seed of *Polyalthia longifolia* will likely be useful in the pharmaceutical, cosmetic and food industries

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Table 1: Proximate analysis of *Polyalthia longifolia* seed

Parameter	Percentage (%)
Moisture	5.0 ± 0.20
Dry matter	95.0 ± 0.10
Crude fat	7.5 ± 0.20
Protein	14.0 ± 0.30
Crude fiber	7.3 ± 0.30
Total carbohydrate	65.3 ± 0.20

Each value represents the mean± SD 3 determinations
Dry matter value was calculated after moisture determination

Table 2: Mineral composition of *Polyalthia longifolia* seed

Mineral	Level (µg/g)
Potassium	**259.37 ± 0.05**
Magnesium	**23.08 ± 0.02**
Calcium	**16.02 ± 0.01**
Iron	**12.19 ± 0.05**
Sodium	**6.03 ± 0.02**
Manganese	**4.86 ± 0.01**
Copper	**3.11 ± 0.01**
Zinc	**1.79 ± 0.01**
Nickel	**0.47 ± 0.02**
Cobalt	**0.018 ± 0.02**
Lead	**0.07 ± 0.00**
Chromium	**0.05 ± 0.00**

Each reading is a mean ± SD 3 determinations

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