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Investigation into the Chemical Composition of the Dry Fruit of *Tetrapleura tetraptera* (Ubukirihu)

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Abstract: The proximate, mineral and phytochemical composition of *tetrapleura tetraptera* were investigated using standard methods. The result of the phytochemical analysis showed the presence of alkoloids (1%), flavonoids (2.5%) saponins (20%) and tannins (0.12%). The proximate analysis grave ash (9%), fibre (45%) oil (4%), moisture (3%) crude protein (5.6), while the mineral analysis revealed in mg 100 g^{-1} ca (1.68), Fe (12.02), K (7.74), Zn (10.69), Na (4.74), Mg (2.4), P (1.3), Cd (BDL) Pb (BDL). The relevance of these constituents to the native use of this fruit was discussed.

Key words: Investigation, chemical composition, dry fruit, *tetrapleura tetraptera*, grave ash, alkoloids

INTRODUCTION

Tetrapleura tetraptera locally known as (uhiokiriho) in South Eastern Nigeria belongs to the mimosaceae family. The plant is found in most deciduous forest type and has a very distinctive four winged fruit in loope. The shinny glabrous dark, brown fruit hangs persistently at the ends of branches on sprout stalks. The plant is hard with heavy wood which is used for firewood, building poles pestle, tool handle and carvings. The fruit is used extensively in traditional medicine for the management of an array of human ailment including arthritis, astherma, diabetics mellitus hypertension, epilepsy, schistosmiases etc. John *et al*. (2004). It is claimed to be therapeutically useful in the treatment of leprosy and rheumatoid pains (Daiziel, 1984),. The dry fruit has a characteristic pleasant aroma which makes it a popular seasoning spice in southern and Eastern Nigeria (Essien *et al*., 1994; Adesina, 1982; Okwu, 2004) while Ghanaians use it as vitamin. It is used extensively in soups of nursing mothers to prevent post partum contractions (Nwawu and Alah, 1986) and gastro-intestinal disorders especially stomach ulceration (Noamesi *et al*., 1992). In cold whether it is used to prepare peper soup and the aroma is believed to drive away snakes. The dry powdered fruit has been formulated into soap to increase the antimicrobial activity and improve the foaming and hardness of soaps (Adebayo *et al*., 2000). The fruit is said to contain caffeic acid (Adesina, 1982) which is reported to have antitumor activity, anti inflammatory properties and also inhibit. HIV replication. The flavouring property of the fruit has been used to improve the flavour of cassava fufu by eliminating the pungent odour and inhibiting fungal growth (Okwu, 2004). Although much research has been done on this plant *tetrapleura tetraptera* (Adewunmi *et al*., 1989, 1991; Daiziel, 1984; Millard *et al*., 1989) (Adebayo *et al*., 2000; Aka and Nwabie, 1993; Salak *et at*., 1990; Adesina, 1982) but little has been reported on the fruit and its metallic and chemical contents. This research examines specifically the metal content of the dry fruit and their correlation with the potential trado-medical uses so far reported.

MATERIALS AND METHODS

The fruits of *tetrapleura tetraptera* were bought from different markets in Abia state of Nigeria and identified by a taxonomist at the botany department of Michael Okpara University of Agriculture Umudike Nigeria. The dry fruits were manually washed with distilled water and residual moisture was dried in an oven at temperature of 60°C. The dried fruits were ground into fine powder using mortar and pestle and sieved through 20 mesh sieve and stored in air tight bottles.

Mineral analysis: Two gram of the ground powder was digested with concentrated nitric acid. The resulting solution was evaporated to dryness and redissoved in 100 mL deionised water. The solution was analysed for the minerals K, Fe, Zn, Ca, Na, Pb and Cd using atomic absorption spectrophotometer. Phosphorus was analysed colorimetrically using phosphor-vanadomolybitate method, sodium content was determined using flame photometer while magnesium was analyzed complexo-metrically (AOAC, 1980).

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Proximate analysis: The ash, oil, moisture, fibre and crude protein contents were determined by standard method (AOAC, 1980). Ash content was determined by incineration of 2 g of the sample power placed in a muffle furnace maintained at 600°C for 8 h. The % residue weighed was expressed as ash content. Oil was determined by exhaustively extracting 2 g sample with petroleum ether using the soxhlet method. Moisture was determined by drying 2 g sample in an oven at 105°C for 24 h. The difference in wt gave the moisture content. Nitrogen was determined using the kjeidahl method and crude protein was calculated by multiplying the percentage nitrogen content by the conversion factor of 6.25 (AOAC, 1980).

Phytochemicals: The phytochemicals were assayed using standard methods. Flavonoids and alkaloids were determined using the method of Trease and Evans (1989). Saponins and tanins were analysed by the method of Herborne (1978).

Table 1: Mineral content of tetraptera of tetrapleura tetraptera

Mineral	Concentration in mg 100 g^{-1}
Calcium	0.0168
Iron	0.1202
Sodium	0.0474
Magnesium	0.0024
Lead	BDL
Potassium	0.774
Zinc	0.1069
Cadmium	BDL
Phosphorus	0.13

Table 2: Phytochemical contents of tetrapleura tetraptera

Phytochemical	% determined
Alkaloid	1
Saponis	20
Flavonoid	2.5
Tannins	0.12

Table 3: Proximate composition of tetrapleura tetraptera

Constituent	% determined
Ash	9
Fibre	45
Oil	4
Moisture	3
Crude protein	5.6

RESULTS AND DISCUSSION

Results of the analysis is as presented in Table 1-3. Table 1 shows the mineral content, Table 2 is the phytochemicals while Tproximate analysis. Table 1 shows the presence of mineral elements that are essential in human nutrition. Iron which tops the list with a concentration of 410 mg 100 g^{-1} sample performs functions of vital importance in the body. It is found in the blood being part of the hemoglobin, which is responsible for the red colour and allows the transportation of oxygen from the heart to all the cells. It is essential for the oxidation of carbohydrates, proteins and fats (Adeyeye and Otokiti, 1999). From the result *tetrapluera tetraptera* fruit has higher iron content than some dry fruits pepper, garlic, fig, chenut with concentration in mg 100 g^{-1} sample of 1.2, 1.7, 2.23, 1.01, respectively (George *et al*., 2004). Its iron content is however lower than those of some herbal plant found in Nigeria (30-59) mg 100 g^{-1} (Isong and Idiong, 1997). Despite the effect of antinutritional factors against bioavailability of iron (Ladian *et al*., 1996) this amount of iron is more than adequate since the human body requires only about 1.00 mg per day of iron to balance intake and excretion (Bothwell *et al*., 1989). This high concentration of iron in *tetrapleura tetraptera* fruit is probably the reason for its use by lactating mothers to regenerate lost blood. Another element of high concentration is zinc (10.5 mg 100 g^{-1}). Zn is a very useful medicinal trace element in human body. It provides a natural protective mechanism against virus especially those causing respiratory track infections (Rowland, 2004). It is used extensively in the war against HIV and is believed to have a way in which it delays the integration of the HIV virus in the blood. Mochegiari *et al*. (1995), Sadler (2004) and Raynolds (2003). This reinforces the belief of traditional healers in using the fruit of terapleura tetraptera to cure HIV, cold, etc Zn plays an important role in the development and functioning of the pituitary gland, the gonards and the reproductive organs (George, 2004). This is in agreement with the use of the fruit for nursing mothers and pregnant ones. The deficiency of Zn causes diarrhea, apathy immunosensitivty and mental depression (Strausel and Saltman, 2000; WHO, 1996). This supports the native use of the fruit to treat diarrhea and mental fatigue. The element mangnesuim present with a concentration of 2.4 mg 100 g^{-1} is another important trace element involved in calcium metabolism in bones and management of circulatory disease like Ischemic heart disease Magnesuim serves as a catalyst in energy producing reactions within the cells and facilitates, muscles relaxation (George *et al*., 2004). The concentration of mg is lower than that in some fruits-orange (10 mg), banana (29), apricot (8 mg), fig (17 mg), apple (7 mg) but higher than those reported for some medicinal plants (1.152-1.824) mg 100 g^{-1} (Edeoga *et al*., 2006). The presence of mg reinforces the use of the fruit to treat heart disease. Calcium present with a concentration of 1.68 mg 100 g^{-1} fall within the range reported for some medicinal plants (1.034-1.946) mg 100 g^{-1}. (Edeogu *et al*., 2006) but lower than those of some fruits-orange 40 mg 100 g^{-1}, cabbage. (George *et al*., 2004). Calcium together with

phosphorus are involved in bone and teeth formation, blood clothing and transmission of nerve muscles. Phosphorus with a concentration of 1.13 mg 100 g^{-1} is used in the maintenance of healthy bones and teeth, energy metabolism and acid base balance in the body (George *et al*., 2004). In cold whether the use of this fruit to prepare hot pepper soup, which invigorates and activates the muscles and bones is not unconnected with the presence of mg, Ca and P. The absence of lead and cadmium in *T. tetraptera* make it very good for human consumption.

Phytochemicals: Table 2 shows the phytochemical analysis showing high concentration of saponins (20%), followed by flavonoids 2.5% and low Alkaloid 1% while tannin is 0.12%. The presence of phytochemical which are antioxidants partly explains the preventive and healing action of the fruit. Saponins can foam and can also homolyse red blood cells (Hill, 1952). Flavonoids protect the heart and arteries (Rimm *et al*., 1996). They prevent stroke and other vascular accidents (Keli *et al*., 1996). These supports the tradomedical use of the fruit to manage heart related diseases, Alkaloids are involved in growth regulation with dramatic physiological activities hence their wide use in medicine (Harbone, 1973) (Wattenberg, 1990).

Proximate analysis: The proximate analysis result in table 111 shows fibre 45%, ash 9%, crude protein, 5.6% moisture 3% and fat 4%. The R.D.A of fibre for children, adult and pregnant woman are 19-25, 21-38 and 78%, respectively. Thus the fruit could be a good source of dietary firbre.

The RDA of fibre for children, adult and pregnant women are 19-25, 21-38 and 28%. Thus this T.T could be a good source of dietary fibre. The ash content, which signifies the index of mineral content in biota, agrees with the high mineral contents observed. The research has shown that the fruit of *tetrapleura tetraptera* is a reservoir of medicinal constituents with a wide range of application potential. It should be used as a raw material in formulating drugs and cosmetics. A study of the antinutritional and toxicological factors is however, necessary.

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