Nutritional prospect of an aphrodisiac Microdermis keayana

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Nutritional prospect of an aphrodisiac *Microdermis keayana*

Omolola Selina Odesanmi¹*, Sikiru Abiola Ojokuku², Akinkunmi Apena², O. Ewenodere Bikomo² and Ridwan Abiodun Lawal¹

¹Department of Biochemistry, College of Medicine, University of Lagos P. M. B. 12003, Lagos, Nigeria.
²Department of Chemical Science, School of Science, Yaba College of Technology P. M. B. 2011, Yaba, Lagos, Nigeria.

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*Microdermis keayana* (MK) (Pandacene) is ubiquitous to Southern Nigeria. It is used as aphrodisiac, to boost libido, induce erection, increase sperm counts and as fertility–enhancing agent. This study investigated the proximate, phytochemical and mineral compositions of MK root. The sample was obtained from Mushin herbal market in Lagos. It was identified and authenticated and cut into small pieces, sun dried for 7 days and ground to powder using Marlex Exceller grinder and stored in an airtight container. Proximate, phytochemical and mineral compositions were determined using standard protocols. Data were analyzed using student T test and were reported as means ± SEM of three determinations. The phytochemicals identified include alkaloids, cardiac glycosides, saponins, tannins, flavonoids, phlobatannins, terpenoids and sterols. Proximate analysis gave an energy value of 282 ± 0.74 g calorie, 40.84 ± 0.95% carbohydrates, 20.66 ± 0.05% proteins, 27.59 ± 0.97% fiber and 4.36 ± 0.06% fats. The root contains 458.8 ± 5.44 ppm of Magnesium, 216.52 ± 1.21 ppm of potassium, and 41.4 ± 0.99 ppm of calcium. Values for iron and zinc were 5.62 ± 0.48 and 28.29 ± 0.09 ppm, respectively. Lead and cadmium were not detected, an indication of safety from contamination. The high content of nutrient may account in part for the associated aphrodisiac property.

**Key words:** *Microdermis keayana*, aphrodisiac, phytochemicals, micronutrients, macronutrients.

**INTRODUCTION**

Some medicinal plants are extensively used as aphrodisiacs to relieve sexual dysfunction, or as fertility–enhancing agents. They provide a boost of nutritional value thereby improving sexual performance and libido (Yakubu et al., 2007; Sumalatha et al., 2010). This improvement in general health can lead to a burst of energy which translates into increased sexual appetite, in addition to increased blood flow, intensity of ejaculation flow and have anabolic and growth hormone stimulating properties (Smith et al., 2002; Tajuddin et al., 2003; Yakubu et al., 2007). These plants contain inherent active ingredients and other nutrients for their actions (Okiigbo et al., 2008). Some of these bioactive include flavonoids, tannins, alkaloids, saponins, sterol, protein, carbohydrate and minerals (Olowokudejo et al., 2008). Sexual dysfunction is a serious medical and social symptom that occurs in 10 to 52% of men and 25 to 63% of women (Porst, 2004). The repeated inability to achieve normal sexual intercourse, male impotence or erectile dysfunction may contribute to infertility (Yakubu et al., 2003). Some organic causes of erectile dysfunction include hypogonadism, hyperprolactinemia and neurological disorders (Sumalatha et al., 2010). *Microdermis keayana* (MK) belongs to the family Pandacene. It is known as ‘idi apata’ in South Western part of Nigeria and as ‘akpalataa’ in South Eastern Nigeria. It is used in the form of decoction by the local populace. It is used to boost libido, induce erection in man and improve sperm counts (Muanya and Odukoya, 2008). It also has hypotensive and vasorelaxing properties (Zamble et al., 2006). There is a dearth of information in the literature on the chemical and phytochemical composition as well as the pharmacological and metabolic effects of this plant.
material. This study as a preliminary investigation was designed to determine the proximate, minerals, and phytochemical compositions of the plant part which may justify the ethnopharmacological use of this plant part.

MATERIALS AND METHODS

Collection of sample

The root of MK was obtained from Alasalatu, Mushin market in Lagos in July 2010. The sample was identified and authenticated in the Department of Botany and Microbiology of University of Lagos. A voucher specimen (BTN501) was deposited in the herbarium.

Preparation of sample

The clean root sample was cut into small pieces and sun dried for 5 days and then ground to powder using Marlex Exceller grinder (Mumbai, India) and stored in an airtight container for further analysis.

Phytochemical analysis

The presence of saponins, tannins, alkaloids, cardiac glycoside, flavonoids, phlobatannins terpenoids and sterols were detected using qualitative methods of Trease and Evans (1989) and Sofowora (1993).

Saponin

About two grams of ground sample of MK were measured into a conical flask, twenty millilitres of water were added and the mixture shaken and filtered into a clean boiling tube. Two millilitres of the filtrate were measured to another test tube and 10 ml of distilled water added. The mixture was shaken vigorously for over a minute. Frothing which persisted on warming was observed.

Tannins

About 2.5 g of the powdered sample of MK were weighed into a conical flask and mixed with 50 ml of water, then boiled in a water bath for 5 min. The mixture was filtered hot using a filter paper and filtrate collected in a beaker. Two millilitres of the filtrate were mixed with 10 ml of distilled water added. The mixture was shaken vigorously for over a minute. Frothing which persisted on warming was observed.

Flavonoids

Five millilitres of dilute ammonia were added to a portion of the aqueous filtrate of MK followed by the addition of 1 ml concentrated sulphuric acid and 2 ml of potassium hydroxide solution and allowed to mix. Then into the acid base mixture, a small quantity of aqueous filtrate of the sample was added and observed for colour change.

Alkaloids

Extraction of 5 g of the powdered root sample was carried out by boiling in 50 ml of distilled water bath for 30 min. The mixture was filtered into a test tube. The filtrate was tested with alkaloids reagent, Wagner's and Mayer's reagent and the results compared to blank. Turbidity or precipitation was observed.

Sterol (Liebermann Buchard Test)

A root sample of MK was dissolved in chloroform and a few drops of cold acetic anhydride were added followed by a few drop of conc. sulphuric acids from the side of the test tube and observed for the formation of blue to blood red coloured ring.

Terpenoids (Salkowski Test)

To about 0.5 g of the plant material 2 ml of chloroform was added followed by careful addition of 3 ml of concentrated sulphuric acid to form a layer. A reddish brown colour formed at the interface indicated the presence of terpenoid.

Proximate analysis

The percentage moisture of the dry samples were obtained in oven dehydration using hot air oven (SD 93114624, Gallenkamp, United Kingdom) at 105°C to a constant weight after 3 h while ash content determined using muffle furnace at 550°C for 5 h using official methods 950.46 and 920.153 (AOAC, 2005), respectively. Crude fiber content was determined by Weende methods (AOAC, 2005). The total nitrogen content was determined using Micro-Kjeldahl methods and the value obtained was multiplied by 6.25 to obtain the amount of crude protein according to the official method 992.15 (AOAC, 2005). The total carbohydrate content (%) was estimated using the formula: (100 - (%ash + %CF + %CP + %crude fat)) while the gross foods energy (nutritive value) was estimated using the equation: FE (in grams calorie) = (%CP × 4) + (%crude fat × 9) + (%CHO × 4) where FE = food energy, CP = crude protein, CHO= carbohydrates, CF = crude fiber (Indrayan et al., 2005).

Determination of mineral elements composition (AAS Method)

The ash solution of the plant root sample was prepared by weighing 5 g of the powdered plant sample. This was ashed at 550°C in muffle furnace for 5 h, and the residue dissolved in 100 ml of deionized water. Standard solutions of the minerals (Sodium, Magnesium, Potassium, Calcium, Manganese, Iron, Zinc, lead and cadmium) to be analyzed were prepared. The atomic absorption spectrophotometer (model 200-A, Buck Scientific) was set with power on for ten minutes to stabilize. The standard minerals solutions were injected to calibrate the AAS using acetylene gas at specific wavelengths. Aliquots of ash solution were injected and the concentrations obtained from the standard curve.

STATISTICAL ANALYSIS

Data were analyzed using student t-test and ANOVA.

RESULTS

Phytochemical analysis of MK root indicated the presence of flavonoids, tannins, cardiac glycosides, phlobatannins, saponins, terpenoids and sterols (Table 1). The results of percentage composition on dry weight basis as presented in (Table 2) indicated that MK
Table 1. Phytochemical composition of Microdermis keayana.

<table>
<thead>
<tr>
<th>Phytochemical</th>
<th>Composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkaloid</td>
<td>+</td>
</tr>
<tr>
<td>Flavonoids</td>
<td>+</td>
</tr>
<tr>
<td>Tannins</td>
<td>+</td>
</tr>
<tr>
<td>Cardiac glycoside</td>
<td>+</td>
</tr>
<tr>
<td>Phlobatannins</td>
<td>+</td>
</tr>
<tr>
<td>Saponins</td>
<td>+</td>
</tr>
<tr>
<td>Terpenoids</td>
<td>+</td>
</tr>
<tr>
<td>Sterols</td>
<td>+</td>
</tr>
</tbody>
</table>

+ Present, - Absent.

Table 2. Proximate composition of the root of Microdermis keayana.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Percentage composition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moisture</td>
<td>4.43 ± 0.22</td>
</tr>
<tr>
<td>Ash content</td>
<td>2.54 ± 0.01</td>
</tr>
<tr>
<td>Crude fats and oil</td>
<td>4.36 ± 0.06</td>
</tr>
<tr>
<td>Crude protein</td>
<td>20.66 ± 0.05</td>
</tr>
<tr>
<td>Crude fiber</td>
<td>27.59 ± 0.97</td>
</tr>
<tr>
<td>Carbohydrates</td>
<td>40.84 ± 0.95</td>
</tr>
<tr>
<td>Energy value</td>
<td>282.0 ± 0.74</td>
</tr>
</tbody>
</table>

Values represent Mean ± SEM of 3 determinations on dry weight basis.

Table 3. Minerals composition of the root of Microdermis keayana in ppm.

<table>
<thead>
<tr>
<th>Mineral</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Potassium</td>
<td>216.52 ± 1.21</td>
</tr>
<tr>
<td>Calcium</td>
<td>41.4 ± 0.99</td>
</tr>
<tr>
<td>Sodium</td>
<td>5.68 ± 0.25</td>
</tr>
<tr>
<td>Magnesium</td>
<td>458.8 ± 5.44</td>
</tr>
<tr>
<td>Iron</td>
<td>5.62 ± 0.48</td>
</tr>
<tr>
<td>Zinc</td>
<td>28.29 ± 0.09</td>
</tr>
<tr>
<td>Manganese</td>
<td>7.36 ± 0.06</td>
</tr>
<tr>
<td>Lead</td>
<td>Not detected</td>
</tr>
<tr>
<td>Cadmium</td>
<td>Not detected</td>
</tr>
</tbody>
</table>

Values represent Mean ± SEM of 3 determinations on dry weight basis.

DISCUSSION

The presence of alkaloids, flavonoids, sterols and saponins in this plant may account for its use as aphrodisiac. Phytochemicals have been reported to enhance erection and prolong ejaculatory latency in male albino rats (Yakubu et al., 2005; Muanya and Odukoya, 2008; Sumalatha et al., 2010). Report by Muanya and Odukoya (2008) indicated that MK inhibits lipid peroxidation of mammalian spermatozoa cell as a result of its antioxidant properties. Lipid peroxidation plays a significant role in the etiology of defective sperm-function. (Dandekar et al., 2002). The presence of tannins in this plant is equally important. Tannins participate in oxidation –reduction reaction of ascorbic acid. Flavonoids function as protective agents against allergies, inflammations, platelet aggregation, microbes, ulcer, vineses and tumor (Okwu and Okwu, 2004).

The carbohydrate content in this plant part could serve as source of energy for various cellular activities including penis erection, before or during or after sexual intercourse when metabolized in the body. The crude protein in MK could be a source of amino acids such as arginine which are closely related to enhance activities of most aphrodisiac medicinal plants (Sumalatha et al., 2010). Micronutrients play essential roles in metabolism and serves as co-factors and co-enzymes for enzymatic reactions. The plant part is very rich in magnesium (458.8 ± 5.44 ppm), a co-factor for many biochemical reactions in the body which include synthesis of sex hormones such as androgens, estrogens and neurotransmitters from the brain that modulate sex drive such as dopamine and norepinephrine. The concentration of potassium (216.62 ± 1.21 ppm) in the root sample of MK is higher than of Blighia sapida root (20 ± 0.01 ppm) a useful plant in African traditional medicine which has been qualified with nutritional potentials (Abolaji et al., 2007). Potassium is very important as the major cation of the intracellular fluid and helps to maintain the elect rode potential, regulate the aldosterone concentration and consequently the permeability of the cell membrane. (Kaplan, 1991; Robert et al., 2003). The level of calcium in MK is lower than that of B. sapida root (3480 ppm). Calcium performs two categories of physiological functions; one category involves provision of the structural integrity of the skeleton. The second category depends on the calcium ion in cellular and intracellulare fluids. Calcium ion serves as the coupling factor linking excitation and contraction in skeletal and cardiac muscles. Intracellular calcium ion is also required in control of key enzymes regulating intermediary metabolism and so may play a role in providing energy for contraction (Breslau, 1991). Calcium also play role in the permeability and excitability of plasma membrane, It has been implicated as an important coupling factor in neurotransmitter release, exocrine secretion (for example, amylase) and endocrine secretion, such as the case of insulin. Zinc in this plant apart from boosting the
immune system is also required for the production of testosterone (the male sexual hormone) and help to ward off male infertility. Deficiency in any of this micronutrient could lead to muscle weakness and general fatigue (Davis, 1998; Yakubu et al., 2005).

Conclusion

This research work has provided some preliminary information on the phytochemicals and nutrients composition of the root of MK which may explain the basis for its ethnomedical usage. Further work is being undertaken to ascertain the safety of oral administration of this plant as a food supplement to Wister rats.

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REFERENCES


