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Leptadenia hastate Leaves Elicit Medicinal Properties

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Abstract Herbaceous plants produce and contain a variety of substances that act upon the body. The objective of this research is to screen for some phytochemicals and mineral elements of the aqueous extract of *Leptadenia hastata* leaves using standard methods. The phytochemical screening revealed the presence of tannins, saponins, flavonoids, alkaloids, phenols and steroids, while anthraquinones, glycosides and terpenes were not detected. The elemental analysis revealed the presence of the following in order of increase in relative concentrations: Cu > Pb> Ni> Fe> Co> Mn> Zn> Na> Ca> K> Mg. The combination of which supports its use as a nutritious and medicinal plant.

Keywords Herbs, *Leptadenia hastata*, Mineral elements, Phytochemicals

Introduction

It is clear that plants contain many compounds that play a significant role in maintaining human health, enhancing our well-being, protecting us from chronic degenerative diseases and generally improving the quality of human life. They have no doubt served humans well as valuable component of medicines, seasonings, beverages, cosmetics, dyes, etc. [1].

Leptadenia hastata is a common edible, non-domesticated wild plant found in Saharan and sub-Saharan African [2]. The leaves, which are the most widely used part of the plant, are more abundant and fresher during the rainy season [3]. It is often part of remedies in African therapies for the treatment of a variety of human and animal diseases [4]. It belongs to the family *Asclepiadaceae* and has about 150 species. It is a multi-stemmed climber with a corky bark on the older stems and has well developed alternate acuminate leaves with a thick greenish sap [5]. Young shoots spread into the air with long internodes. The leaves are up to 10cm long mostly ovate, light green. The flowers are cream or yellowish green, while the fruits have two-valves, conical and dehisce to release cottony winged seeds, when crushed the plant exudes sticky sap [6]. *Leptadenia hastata* is propagated by seeds and prostrates in open area and climbs on bushes in altitudes ranging from 500 -1500m. It grows in dry savannah and riverine bush land regions of Africa, extending from Senegal, Nigeria and western Cameroun to Ethiopia, Kenya and Uganda. Vernacular names for *L. hastata* include: hagalhadjar (Arabic) in Chad, yadiya (Hausa) in Nigeria and Niger, hayla (Kusume)

Ethiopia, ekamongo (Turkana) in Kenya, lolongo (Moore) in Burkina Faso, tarhat or darhat (Wolof), busumba amata (Jola) in Senegal, and nzongnè (Bambara) in Mali [7]. The poor and destitute grow the plant as their homestead fence, which they rely upon it as food. It is usually preserved using open air sun drying [8]. Traditionally, plant extracts are mostly prepared with water as infusions, decoctions and poultices and the local healers generally address major signs observed instead of addressing a specific etiological problem. It is used in traditional medicine to treat milk drying, sexual impotence, trypasonomiasis, asthma, stomach ulcer, snake bites, skin inflammation, constipation, stomach upset, wounds, placental retention, weakness, gonorrhea, etc [3, 9, 10].

Leptadenia hastata was the subject of many studies which showed its potential use as an anti- mycotic [11], anti-inflammatory and anti- tumor agent [12]. Literature survey and ethno – botanic investigations with traditional healers claimed it has a hypoglycaemic and anti- fertility effect [10], this androgenic effect was confirmed by the result of a research work carried out in 2010. Recent studies conducted on *L. hastata* leaves indicate the presence of phenolic glycosides, tannins, flavonoids, proanthocyanidins, alkaloids and saponins. The total phenolic, total flavonoid and proanthocyanidin contents were in the ranges of 17-38, 10-16 and 4-10 mg/g, respectively, depending on the extraction solvent. *L. hastata* was also found to be a rich source of copper, calcium, and phosphorus [7, 13].

Materials and Methods

Sample Collection

The fresh leaves of *Leptadenia hastata* were obtained from a natural population around Minjibir Local Government Area of Kano State in the month of September, 2010. It was identified and authenticated at the species level at the herbarium unit of the Biological Sciences Department, Faculty of Science, Bayero University, Kano. The leaves of *Leptadenia hastata* were washed thoroughly and then air dried at room temperature, away from direct sunlight for 14 days to a constant weight. The dried leaves were pulverized into fine powder using a mortar and pestle. It was then stored in a dry air tight container.

Sample Preparation

The powdered leaves weighing 50g was poured into a 500cm^3 volumetric flask, the flask was made to the mark with distilled water. The mixture was kept for 12 hours with constant agitation using a mechanical shaker. It was allowed to stand for 24 hours and then filtered using What man's No. 1 (11cm) filter paper. The filtrate was evaporated to dryness in an oven set at 45^{o}C and further dried to a constant weight at the same temperature. The dried extract (concentrate) was stored in an air tight container inside a refrigerator at - 4^{o}C until required for further use.

Phytochemical Screening

Approximately 5g of the dried extract was defatted with 250cm^3 of diethyl ether using a Soxhlet apparatus for two hours after which the presence of tannins, flavonoids, glycosides, phenols, terpenes, steroids and saponins were determined according to the methods of Bayala *et al* [14]. Alkaloids were determined according to the method of Harborne [15] while anthraquinones were determined by method of O'Connor [16].

Elemental Analysis

Approximately 3g of the dried powdered sample was ashed according to the methods described by Felgis [17] and AOAC [18]. The sample digestion was conducted as described by APHA [19] Flame photometry as described by the AOAC [18] was used to assess the concentrations of sodium (Na), potassium (K) calcium (Ca) at the following wavelengths 598nm, 758nm and 422nm, respectively. Atomic absorption spectrophotometric technique was used to assess the concentrations of zinc (Zn), lead (Pb), nickel (Ni), cobalt (Co), iron (Fe), copper (Cu), manganese (Mn), magnesium (Mg) and chromium (Cr) in the dried sample using methods outlined by APHA [19].

Results

Table one shows the phytochemicals qualitatively detected in the aqueous extract of *Leptadenia hastata* leaves, and out of the nine phytochemicals screened for, only three – anthraquinones, glycosides and terpenes, were not detected. A total of eleven mineral elements were tested for in the aqueous extract of *Leptadenia hastata* leaves, and their respective values are shown in Table 2, only copper was found to be below detection limit (BDL).

Table 1: Phytochemical screening of the aqueous extract of *Leptadenia hastata*

Phytochemicals	Result
Flavonoids	+
Saponins	+
Alkaloids	+
Tannins	+
Anthraquinones	-
Glycosides	-
Phenols	+
Terpenes	-
Steroids	+

Key: + = present, - = absent.

Table 2: Concentration of some mineral elements present in the aqueous extract of *Leptadenia hastata* leaves.

Element	Concentration (mg/100g)
Copper	BDL
Lead	0.52 ± 0.37^{a}
Nickel	0.67 ± 0.14^{a}
Iron	0.82 ± 0.03^{a}
Cobalt	0.83 ± 0.18^{a}
Manganese	0.93 ± 0.05^{a}
Zinc	1.44 ± 0.19^{b}
Sodium	3.12 ± 0.16^{c}
Calcium	4.04 ± 0.30^{d}
Potassium	20.81 ± 0.32^{e}
Magnesium	24.85 ± 0.03^{f}

Values are expressed as Mean±S.D of 3 replicates, values with different superscripts within same column are considered significantly different ($p < 0.05$).

Discussion

The qualitative analysis of phytochemical compounds in aqueous extract of *Leptadenia hastata* leaves showed the presence of tannins, saponins, flavonoids, alkaloids, phenols and steroids while anthraquinones, glycosides and terpenes were not detected. This result further confirms the findings of Hassan *et al.* [5], with respect to all but flavonoids, which he reported to be absent as one of the phytochemical constituents of *Leptadenia hastata*. These phytochemicals are known to show medicinal as well as physiological activity [12].

The presence of flavonoids which have been reported to increase capillary resistance and possess an anti-inflammatory activity [20], supports the use of the plant as an anti-inflammatory agent [14]. Tannins with their protein precipitating and vasoconstriction effect could be advantageous in preventing ulcer development [21]. Laxative purgatives promote intestinal evacuation because they are able to retain considerable amount of water, distend the colon and promote the expulsion of the stool, the presence and combined action of tannins and saponins supports this that supports the use of the plant in the treatment of constipation [9]. Steroids were found to be present in the extract, it should be noted that steroidal compounds are of importance and interest in pharmacy due to their relationship with such compounds as sex hormones, since steroidal structure could serve as potential starting material in the synthesis of sex hormones [22]. This may support the use of the plant as an aphrodisiac. The presence

of these phytochemicals further justifies its use as an anti- bacterial and anti-fungal agent [23] and confirms its anti-trypanosoidal activity [24].

Table 2 summarizes the elemental composition of elements tested for in the aqueous extract of *Leptadenia hastata* leaves, which are all within acceptable levels. Of the eleven mineral elements analyzed for, only one element - copper, was below detection limit. Magnesium, with a concentration of 24.85±0.03mg/100g had the highest concentration, following by potassium with a concentration of 20.81±0.32mg/100g, then calcium with a concentration of 4.04±0.03mg/100g followed, though by a large margin. This is inconsistent with the findings of Hassan *et al* [5], who obtained much lesser values (Mg= 1.49±0.49mg/100g; K=1.28±0.60 mg/100g; Ca= 0.10±0.02mg/100g; Na=1.26±0.16mg/100g). This difference in the value may be from the nature of the soil habitat where the plants were sampled from since the mineral elements found in plants are usually obtained through the roots and sometimes via their leaves [15].

Magnesium is a cofactor in many biochemical reactions- a component of chlorophyll and is involved in nerve transmission [19]. The various functions of these elements in combination with the phytochemicals found to be present in the aqueous extract confirm the assertions that it is a nutritious plant and its possible efficacy in the prevention and treatment of some ailments such as malnutrition, wound healing, constipation, ulcer, mouth dryness and as an aphrodisiac. Metals such as sodium, potassium, calcium and magnesium are extremely essential and are required by the body for its normal biochemical and physiological functions. According to Sena *et al* [25], chromium, cobalt, magnesium, copper, nickel and zinc are considered essential but have potential for toxicity at higher concentrations while lead is considered nonessential.

Conclusion

In conclusion, this study shows that the aqueous extract of *Leptadenia hastata* leaves contains beneficial phytochemical compounds such as flavonoids, alkaloids, steroids and phenols and adequate concentrations of some biochemically essential mineral elements- the combination of which may be the basis of its herbal potency.

There is no doubt that there are many benefits to be derived from the *Leptadenia hastata* plant, thus further research should be undertaken to quantify and elucidate the structures of the phytochemicals and validate their medicinal potency and mechanism of action. Based on which it can be used by the food and drug industry as a functional food, herbal remedy and for food fortification.

References

[1]. Caceres, A., Cabrera, O., Morales, O., Mollinedo, P. and Mendia, P. (1991) Pharmacological properties of *M.oleifera* I: Preliminary screening for antimicrobial activity. Journal of Ethno-pharmacology 133(3):213-216.

[2]. Tamboura HH, Bauyala B, Lompo M, Guissou IP, Sawadogo L (2005). Ecological distribution, morphological characteristics and acute toxicity of aqueous extracts of *Hollarhena floribunda* (G. Don) *Durandan Schinz*, *Leptadenia hastata* (Pers.) Decne and *Cassia sieberiana* (DC) used by veterinary healers in Burkina Fasso. *Afr. J. Trad*. CAM (2005) 2(1):13-24.

[3]. Aliero BL, Umar MA, Suberu HA, Abubakar A (2001). A hand Book of common plant in northern Western Nigeria, pp. 78.

[4]. Kasonia, K. (1998). Une reconnaissance des savoirs paysans: plantes médicinales et médecine vétérinaire traditionnelle d'afrique centrale. Thèse Doct ès Sci. Vét. Univ. Liège, Belgium.

[5]. Hassan A. O., Hassan R. O., Muhibi M. A. and Adebimpe W. O. (2012). A survey of *Enterobacteriaceae* in hospital and community acquired infections among adults in a tertiary health institution in Southwestern Nigeria. *African Journal of Microbiology Research* Vol. 6 (24), pp. 5162-5167, 2012

[6]. Allain P. (2000). Les médicaments. CdM Éditions; 3Pe'mp édition. 500p.

[7]. Thomas SD (2012). *Leptadenia hastata*: A Review of its Traditional uses and its Pharmacological Activity. *Med chem* 2:148-150.

[8]. Bello A, Aliero AA, Saidu Y, Muhammad S (2011) Hypoglycaemic and Hypolipidaemic Effects of Leptadenia hastata (Pers.) Decne in Alloxan Induced Diabetic Rats. Nigerian Journal of Basic and Applied Science 19: 187-192.
[9]. Arbonnier M (2000) Trees, shrubs and vines dry areas of West Africa.
[10]. Aliero AA, and Waraz SH (2009). Validating the medicinal potential of *Leptadenia hastata*. *Afr J Pharm Pharmacol* 3: 335-338.
[11]. Nikiéma JB, Vanhaelen-Fastré R, Vanhaelen M (1997) Triterpenoids from *Leptadenia hastata* latex. *Planta Med* 63: 486.
[12]. Bayala B, Pellicer-Rubio MT, Bassole IHN, Belemtougri R, Tamboura HH. (2011) Effects of aqueous extracts of *Leptadenia hastata* (pers.) decne. (asclepediaceae) on male reproductive functions using castrated immature rats. *Res J Med Plant* 5: 180–188.
[13]. Sofowora, A. (1993): Medicinal plants and traditional medicine in Africa. Spectrum books limited, Ibadan, Nigeria. Pp220-224.
[14]. Bayala B, Rubio-Pellicer MT, Zongo M, Malpaux B, Sawadogo L (2011). Anti- Androgenic activity of *Leptadenia hastata* (Pers.) Decne: competitive effect of the aqueous extracts of the plant and the testosterone propionate on castrated immature rats. *Biotechnol Agron Soc Environ* 15: 223-229.
[15]. Harborne, J. B. (1973). Phytochemical methods: *A guide to modern techniques of plant analysis*. Chapman and Hall Ltd, London; Pp. 279.
[16]. O'connor, S. (2008). Alkaloid Biosynthesis. 10.1002/9780470048672.wecb004.
[17]. Felgis, F. (1976). Spot tests in Organic analysis. Elsevier. Amsterdam. p356.
[18]. AOAC. (1999). Official methods of analysis, 16th edn. Association of Official Analytical Chemists, Washington.