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Medicinal Potential of *Leptadenia hastata*: A Review

[1]Yaro, R.S.*; [2]Deeni, Y.Y.; [3]Abdullahi, M.; [4]I. Bala and [5]Kawo, A.H.

[1]Department of Pharmaceutical Microbiology and Biotechnology,
Faculty of Pharmaceutical Sciences,

[4&5]Department of Microbiology,
Faculty of Life Sciences,
College of Pharmaceutical and Natural Sciences,
Bayero University,
Kano, Nigeria.

[2&3]Department of Microbiology and Biotechnology,
Faculty of Sciences,
Federal University,
Dutse, Jigawa, Nigeria.

E-mail: rilwanuyaro5@gmail.com

Abstract
Leptadenia. hastata is a climbing shrub produces many flexible latex that become woody at the bottom. Research studies confirmed that L. hastata Medicinal Properties as source of medical potential remedies for thousands of years. Investigations show that until now more than 80% of African populaton use single or combine plant extracts for their everyday health care needs. This is not due to poverty only, but the richness of African plant species that have healing properties known throughout the ages. L. hastata is useful tropical plant and an African plant, found evenly distributed in Kano and Jigawa States, Nigeria, which is used as nutriment as well as for medical purposes due to its health promoting properties. Traditional healers use L. hastata to treat many diseases as hypertension, sexual impotence, trypanosomiasis, acute rhinopharyngitis in quantitative and qualitative terms, the leaves of L. hastata can be in biomedical research. In vivo studies showed the antifertility effect of L. hastata leaves extracts which can be useful for hormonal therapy replacement. Herein, the ecology, traditional medicinal uses, phyto-chemistry, toxicity and pharmacology of L. hastata in consideration of its antifertility activity are reviewed.

Keywords: *Leptadenia hastata,* potential, secondary metabolites, traditional, remedies.

INTRODUCTION
Leptadenia. hastata is a shrub of climbing character that produces several soft stems wooden at the base. It thrives well under harsh and dry, and poor soil conditions. Established plants are tolerant to drought according to American Journal of Drug Discovery and Development (AJDDD.; 2018). It is useful tropical plant and an African plant, found evenly distributed in both Kano and Jigawa States, Nigeria, which is used as nutriment as well as for medical

*Author for Correspondence

purposes due to its health promoting properties (Bayala *et al.,* 2012).

Plate 1: *L. hastata* Climbing Shrub

L. hastata belongs to the family of Asclepiadaceae that has been classified as follows:

Range : Plantae
Sous-range : Tracheobiota
Division : Magnohophyta
Class : Magnohopsda
Sous class : Asteridae
Order : Gentianales
Family : Apocynaceac
Genera : Leptedema
Plant genus : LeptedeniaFamily : Asclepiadaceae (Ishaac *et al.,* 2018).

Leptadenia hastata is edible non-domesticated vegetable and it is collected in wild throughout Africa. *L. hastata* is a valuable herb with creeping latex stems, glaben-scent leaves, glomerulus and recemus flowers as well as folicle fruits. It is typically grown in tropical dry lands in sandy soil (Thomas, et al, 2012). Wild food like *L. hastata* provide food security during seasonal changes and are used medicinally in many areas. Vernacular names for *L. hastata* include: hagalhadjar (Arabic) in Chad, yadiya (Hausa) Nigeria and Niger, hayla (Kusume) Ethiopia, ekamango (Turkana) in Kenya, lulongo (Moore) in Burkina Faso, tarhat or darhat (wolof), busumbaamata (Jola) in Senegal, and nzogne (Bambara) in Mali (Steven *et al.,* 2012).
This review highlighted: Some of the phytochemical components of *L. hastata,* enumerated some of the pharmacological properties; antimicrobial, anti-bacterial, anti-androgenic, anti-inflammatory and anti-diabetic as well as wound healing activities of *L. hastata,* stated some of the Cytotoxicity and safety profile of *L. hastata* among others.

MEDICINAL PROPERTIES OF *L. hastata* (YADIYA)

Leptadenia hastata has been used widely for treatment and controlling of different diseases (Ishaac *et al*., 2018). Medicinal properties as source of potential remedies exist for thousands

of years used in developing countries for health care needs (WHO, 2008). This is not only due to poverty, but the richness of African plant species that have healing properties known throughout the ages (Tamboura *et al.,* 2005). The treatment of diseases and control are usually done using the medicinal plants available in the rural areas, which will continue to play important roles medically as per developing countries (Ekundayo *et al.,* 2011).

Traditional healers use *Leptadenia hastata* to treat many diseases as hypertension, sexual impotence, trypanosomiasis, acute rhinopharyngitis in quantitative and qualitative terms, the leaves of *L. hastata* contain significant quantities of secondary metabolites, as triterpens, total flavanoids, tannins, which can be in biomedical research. In vivo studies showed the antifertility effect of *L. hastata* leaves extracts which can be useful for hormonal therapy replacement (Yaro *et al.,* 2022). In view of its constituents such as steroidal glycosides, triterpens and polyoxypregnane derivatives *L. hastata* found to be one of the best medicinal plants to treat diseases and has been noted that consumers of *L, hastata* and *Moringa oleifera* presented best fasting blood glucose value than consumers of other plants like *Datarium microcarpum* among others (Mbrawa *et al.,* 2017). Further investigation on the effect of *L. hastata* on other hormonal end points like hormones dependent cancers appears promising (Yinger &Yehlawa, 2007). *L. hastata* is widely used as vegetable, traditionally in management of *Diabetes, millitus,* treatment of wounds and stomach ache. It is reported that *L. hastata* has rich polyphenols and possess significant alpha-glucosidase inhibition potential which may be a source of lead compounds used in the management of *Diabetes mellitus* and/or other diseases that may be caused by oxidative stress (Bello *etal.*, 2011). *L. hastata* is often used traditionally for management of hypertension, catarrh, skin diseases, wound-healing and in the management of *Diabetes mellitus* among others and the finding shows that *L. hastata* fractions exhibited antidiabetic effects thus validating the traditional claim of the plant (Angela *et al.,* 2015).

Many reviews of *Leptadenia hastata* described its traditional applications in terms of several diseases treatment like skin diseases, catarrh, hypertension, wound-healing, prostate complaints and as an aphrodisiac (Thomas *et al.,* 2012). Different parts of the plant are used in traditional medicine system including the leaves, latex, roots and even whole plant. Decoction of the leaves of *L. hastata* with bark of *Erythrina senegalensis*is either taken orally or used as medicinal bath to treat O*nchocercosis* in Mali (Togola *et al.,* 2008). In Chad, the roots are used to treat scabies (Betti *et al.*, 2011). This plant is commonly used in Hausa-speaking communities in Nigeria as a spice and used in sauces (Ibrahim *et al.*, 2012). Also in Nigeria, local healers use the plant for hypertension, catarrh and skin diseases (Dambatta *et al.*, 2011). In Burkina Faso, locally it is used for sexual potency (chewing leaves), trypanosomiasis (decoction leaves), skin diseases and wound-healing (application of latex) (Tamboura *et al.*, 2005). In Senegal, the leaves have been reportedly used for lactation and as a purgative (Arbonnia *et al.,* 2000; Kerarho *et al.,*1974). Senegalense healers also use the *L. hastata* for prostate and rheumatism complaints (Methieu *et al.*, 2007). Traditionally, the Plant parts are medicinally used in many countries as source of many powerful and potent drugs (Rekha *et al.*, 2013).

Antimicrobial activities of *L. hastata*

The extract showed higher significant antifungal activity *Aspergillus niger* and *Aspergillus flavus* at different concentration over the other pathogens (Isaac *et al.,* 2018). The plant has been widely employed for controlling various disease like antifungal, antibacterial/antimicrobial among others (Isaac et al., 2018), the *L. hastata* extracts were evaluated for potential antifungal and antimicrobial properties, as the stem-bark was extracted with five solvents of various

polarity for antimicrobial activity against *Escherichia coli, Salmonella typhi, Staphylococcus aureus* and *Klebsiella pneumoniae* (Bacteria) and *Aspergillus niger, Aspergillus flavus, Candida tropicalis* and *Fusarium oxysporium* (Fungi).

Phytochemicals of *L. hastata*

The phytochemical screening conducted by Bello *et al.* (2012) on *L. hastata* leaves indicate the presence of phenolic glycosides, tannins, flavanoids, proanthocyanidins, alkaloids and saponins which agrees with findings of (Aliero *et al*., 2011)**.** Investigation on the total phenolic, total flavonoid and proanthocyanidin depending on the extraction solvents showed that acetone extracts had highest content of total phenol (35.77 mg/g) than the methanolic and aqueous extracts respectively. The flavonoid content of methanol fraction (15.85mg/g) is higher than that of acetone and water extracts (Aliero *et al*., 2011). Methanol extracts (9.69 mg/g) had highest content of proanthocyanidin compared to water and acetone extracts, Aquino *et al*., (2011) and have reveal that the chloroform extracts of *L. hastata* bark contain mixture of polyoxypregnane ester derivative, including six novel ester, as well as the known ester 12-0 acetylsarcostin.

Furthermore, Phytochemical analysis and nutritional value of *L. hastata* that showed the phenolic glycosides, tannins, flavanoids, proanthocyanidins, alkaloids and saponins among others are pharmacologically very essential.

The report of Steve *et al*., (2012) shows that *L. hastata* extracts contain alkaloids, saponins, phenolic glycosides, tannins, flavanoids, proanthocyanidines and triterpenes (Steve *et al*., 2012). Research of Fasihuddin *et al*., (2018) showed that qualitative phytochemical analysis of the extract confirmed the presence of various phytochemicals like sterols, terpenoids, alkaloids, flavanoids, phenols, carbohydrates, tannins, proanthocyanidins and glycosides in the n-hexane extract, whereas saponins was found to be absent (Fasihuddin *et al*., 2018).

PHARMACOLOGICAL AND ANTIMICROBIAL ACTIVITIES OF *L. hastata*

The findings of Aliero and wara (20011) investigated the effect of *L. hastata* leaf extracts on *Bacillus metagarium*, *Staphylococcus aureus* and *Pseudomonas aeruginosa* **(**Wara*et al*., 2011**).** Aqueous extracts markedly inhibited the growth of *S. paratyphi*and *E. coil* at 30mg/ml and *P. aeruginosa* at 60mg/ml. The activity exhibited by the methanol extracts was generally low and acetone extracts did not show any activity against the tested organisms.

Aliero and Wara (2009), also examined in the same study the antifungal activity of *L. hastata* extracts with *Aspergillus niger* and *fusarium oxysporum*. The result of their assay showed that methanol with inhibition percentages ranging from 58.89 to 73.30%. The activity of acetone extract was lower with 40 and 50% inhibition respectively on the growth of *A. niger* and *F. oxysporum.* The Pharmacological and antimicrobial activity of *L. hastata* have also shown on both Bacteria and Fungi as confirmed in the study.

ANTI-BACTERIAL ACTIVITIES OF *L. hastata*

The research of Yaro *et al.,* (2022) shows that activity was observed at all the methanolic leaf, stem and root extracts concentrations, which was directly proportional to the concentrations against Methicillin Resistant *Staphylococcus, aureus* (MRSA) respectively. The research shows that the *Leptadenia hastata* methanolic extracts are biochemically effective against the clinical Methicillin Resistant *Staphylococcus aureus* (MRSA) (Yaro *et al.,* 2022). Therefore, the study shows the significance and mean difference of *L. hastata* methanolic extracts (leave, stem and root) against the clinical Methicillin Resistant *Staphylococcus aureus. L. hastata* as remedy to clinical Methicillin Resistant *Staphylococcus aureus* (MRSA), will be easily accessible, affordable

and highly contributable to the Public Health development, more especially to the Africans as the plant is evenly distributed all over African countries (Yaro *et al.*,2022). The methanolic extracts of *L. hastata* (Leaf, Stem and Root) have reasonable inhibitory activity on Clinical Multi Drug Resistant *S. aureus, K. pneumonia*, *E. coli* and *P. auruginosa* (Yaro *et al.,* 2022).

ANTI-ANDROGENIC ACTIVITY OF *L. hastata*

Bayala (2012), demonstrated a competitive effect of the aqueous extracts of *L. hastata* leaf, stem and root to the testosterone propionate (TP) on castrated immature wistar rat (Rubio *et al.,* 2011). They found that the Anti-androgenic effect of the extracts of *L. hastata* is expressed when the TP amount are weak. Concentration of TP ranged from 0.04 -1,000ug/kg of TP. At low dose of TP, *L. hastata* (at 200 mg/kg) inhibited TP effect, whereas at high dose of TP, *L. hastata* extracts potentiated TP effect. Then further evaluated the competition between TP and *L. hastata* extracts, a demonstrated competitive effect of the aqueous extracts of *L. hastata* leaf, stem and root for the testosterone propionate (TP) on castrated immature wistar rat (Rubio *et al.,* 2011). A follow-up study was conducted, that shows significant reduction of androgen-dependent weight (Rubio *et al.,* 2011). In this 2012 experiment, *L. hastata* aqueous extracts reduced significantly the weight of androgen-dependent sex gland.

The reports of Isaac, *et al*., (2018); Fasihuddin *et al.,* (2018) among others show that anti-androgenic activities of *L. hastata* were also determined and confirmed from the plant (*L. hastata*) different parts Isaac, *et al*., (2018); Fasihuddin *et al.,* (2018) among others.

ANTI-INFLAMMATORY ACTIVITY OF *L. hastata*

Nikiema (2011), examined triterpenes isolated from *L. hastata* latex for their anti-inflammatory activity. Lupeol, lupeol acetate and Lupeol palmitate were found to be the main anti-inflammatory constituents in the crouton oil-induced ear oedema test (Bello *et al.,* 2011).
All the triterpenes test at a dose of 0.42 µmol/ear induced significant reduction of oedema. Lupeol exhibited 80% inhibition of oedema and was found to be more active than indomethacin (73%). Nikiema also found that lupeolhemisuccinate, a synthetic derivative of lupeol exhibited a higher activity than lupeol in the oedema test.

ANTI-DIABETIC ACTIVITY OF *L. hastata*

The results of Bello (2011), Study demonstrated the potential activity of *L. hastata* extracts in *Diabetes mellitus* management (Aliero, *et al.,* 2011). Their study, evaluated the hypoglycemic and hypoglycaemia effect of water and methanol extracts of the fresh leaves of *L. hastata* in normal and allowance-induced diabetic rat model. Rats were given 300mg/kg body weight of plant extract per day in morning hours for seven days. Oral administration of methanol and water extracts show a significant decrease the blood glucose, while increasing liver and muscle glycogen levels. *L. hastata* extracts also reduce of serum triglyceride, very low density lipoprotein (VLDL) chlosterol level and increased high density lipoprotein (HDL) chlosterol levels. Another indication of *L. hastata,* therapeutic effects is glycosides inhibitory properties. Bello's results show that both methanol and water extracts of *L. hastata* leaf are significantly inhibited the activity of a glucosidase (Aliero, *et al.,* 2011).

WOUND-HEALING OF *L. hastata*

The result of Nikiema (Bello *et al.,* 2011), Study verify the topical use of *L. hastata* latex in hours for seven days, oral administration of methanol and water extracts show a significant decrease of the blood glucose, while increasing liver and muscle glycogen levels. *L. hastata* extracts also reduce of serum triglyceride, very low density lipoprotein (VLDL), cholesterol level and increased high density lipoprotein (HDl), cholestrol levels. Another indication of *L. hastata*,

therapeutic effects were its glycosides inhibitory properties. Bello's results show that both the methanol and water extracts of *L. hastata* leaf were significantly inhibited the activity of a glucosidase (Bello *et al.,* 2011).

CYTOTOXICITY OF *L. hastata*

While, the research of Aquino *et al.,* (2011), tested isolated compounds obtained from the bark chloroform-methanol fractions for their cytotoxic activity on Raji cell (a human lymphoblastoid cell line from Burkitt's lymphoma). However, their results show no cytotoxic activity at concentrations evaluated (0.5 and 1.0 µg/ ml) after six hours of incubation (Aquino *et al.,* 2011).

TOXICITY AND SAFETY OF *L. hastata*

The Tamboura *et al.,* 2005, conducted their experiments by the means of male albino mice using concentrations 1000-2000 mg/kg body weight of *L. hastata* aqueous extracts (leaves and stems). The mice were injected with the extracts of intraperitoneally and were observed during 48 to 72 hours. According to Tamboura *et al.,* 2005, *L. hastata* is considered safe to use due to its high LD quotient value of 0.78 (Tamboura *et al.,* 2005).

CONCLUSION

Conclusively, the reports show that anti-androgenic, wound-healing, anti-bacterial, anti-diabetic activities and cytotoxicity, toxicity & safety of *L. hastata* were determined and confirmed from the plant (*L. hastata*) different parts. *L. hastata* is a plant of choice as per medicinal plants concern and as source of medical potential remedies, it would be effectively accessible and affordable as well contributable to the Public Health Development, more especially to Kano, Jigawa states, Nigeria, African countries and globally in general as it is distributed everywhere in the tropical countries and almost everywhere in the world.

Further study should be done to determine the most effective bioactive components of *Leptadenia hastata* parts in order to yield the effective drug development against some medical conditions.

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