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Full Length Research Paper

Preliminary studies on *Luffa cylindrica*: Comparative phytochemical and antimicrobial screening of the fresh and dried aerial parts

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The Nigerian climate favours a wide variety of plants with vast antimicrobial and medicinal potentials, some of which have been used traditionally for decades. The fresh and dried aerial parts (leaves, flowers and stem) of *Luffa cylindrica* were extracted with water, chloroform and methanol and screened for secondary metabolites. Extracts were found to contain alkaloids, saponins and tannins. The extracts also showed antimicrobial activity against *Staphylococcus aureus* and *Candida albicans*. The zones of inhibition ranged between 18.00 and 27.00 mm. *L. cylindrica* extract showed a greater zone of inhibition on *C. albicans* ranging from 20.00 to 27.00 mm. The fresh plant extract was shown to be more active than the dried plant extract. The inhibitory potentials of this plant can be attributed to its phytochemical contents. With the increasing rate of candidiasis infection worsened by the high rate of HIV/AIDS infection, this plant holds great promise for development into phytomedicine for the treatment of candidiasis in the near future.

Key words: *Luffa cylindrica*, aerial parts, secondary metabolites, candidiasis, antimicrobial.

INTRODUCTION

The Nigerian climate favours a wide variety of plants with vast antimicrobial and medicinal potentials, some of which have been used traditionally for decades without any reference to their phytochemical constituents. Smooth luffa syn. Dishrag gourd (*Luffa cylindrica* L. syn. *Luffa acgyptica*) is a family of Cucurbitaceae. It is a tropical running vine with rounded leaves and yellow flowers, which thrives commonly with twinning tendrils. *L. cylindrica* produces berry like fruit whose colour at tender stage is green and yellow at maturity. The fruits are smooth and cylindrical shaped with white flesh. The length of the fruit is one to two feet. In Nigeria, *L. cylindrica* plant grows in the wild and on abandoned building structures and fenced walls in towns and villages (Olaofe et al., 2008). The fresh leaves have been used for skin disease and orchitis, while the leaf juice is used for amenorrhea. Infusion of seeds or an alcoholic emulsion is a drastic purgative and antihelminthic. Maud et al. (2007) carried out a study to validate the uses of *Bidens pilosa* and *L. cylindrica* in inducing labour in Western Uganda. Results showed the aqueous leafy extracts to be oxytocic, increasing rat uterine motility. Its bioactivity supports its therapeutic use as herbal remedies in childbirth. The seed extracts of *L. cylindrica* have been shown to contain alkaloids, saponins and cardiac glycosides with antimicrobial activities against *Escherichia coli*, *Staphylococcus aureus*, *Salmonella typhi*

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and *Bacillus subtilis* (Oyetayo et al*., 2007)*.

Furthermore, a study of the aqueous extracts of seeds and fruits of *L. cylindrica* for its activity as drinking water disinfectant showed highly variable and dose-dependent inactivation of both faecal coliforms and total coliforms, the seed extract achieving higher coliform inactivation than the fruit extracts. Although the antimicrobial potential of fruits and seeds was demonstrated, the disinfection performance was less than required to be considered a reliable disinfectant for drinking water (Ameer et al., 2009). *L. cylindrica* has been reported to posses both medicinal and nutritional properties. Its seeds have been used in the treatment of asthma, sinusitis and fever (Sashikala et al., 2009).

Traditionally, the leaves as well as juice from the stem and leaves of *L. cylindrica* are used fresh for the treatment of candidiasis. This study was therefore designed to compare the phytochemical profile and antimicrobial properties of the fresh and dried aerial parts (leaves, flowers and stems) of the plant, so as to provide a scientific basis for the traditional practice of using fresh aerial part of *L. cylindrica* for the treatment of candidiasis.

MATERIALS AND METHODS

The fresh aerial parts (leaves, flowers and stems) of *L. cylindrica* were collected from Abuja, Nigeria and authenticated at the herbarium of the Department of Medicinal Plant Research and Traditional medicine of the National Institute for Pharmaceutical Research and Development (NIPRD), Abuja. Some of the plant materials were air dried under shade for one week, powdered and used immediately for extraction.

Preparation of plant extract

Six hundred and fifty grams of the fresh aerial parts of *L. cylindrica* was rinsed in water to remove dirt, blended with 1 L of distilled water and then the juice was extracted, filtered with Whatman No. 1 filter paper and filtrate evaporated to dryness on a boiling water bath. Next, 98 g of dark brown extract was obtained coded LCA1. The marc was macerated with 200 ml of methanol at room temperature for 24 h, filtered, concentrated with rotavapor and evaporated to dryness on a boiling water bath. This yielded 6.7 g of brownish green extract coded LCD1. 75 g of LCA1 was partitioned in water and extracted with chloroform (200 ml × 4) using a 500 ml separating funnel. The combined chloroform portion was dried with anhydrous sodium sulphate, concentrated to dryness under vacuum with rotavapor to yield 8.0g of dark green extract coded LCB1. The aqueous layer was evaporated to dryness on a boiling water bath and yielded 2.7 g extract coded LCC1.

Furthermore, 50 g of the powdered sample was extracted with distilled water by maceration for 24 h at room temperature and filtered with Whatman No. 1 filter paper. The filtrate was evaporated to dryness over a boiling water bath. Yield of the extract was determined to be 12.32 g and coded LCA2. The marc was extracted with 300 ml of methanol by maceration for 24 h at room temperature and filtered with Whatman No. 1 filter paper. The filtrate was evaporated to dryness over a boiling water bath, which yielded 2.3 g extract coded LCD2. A portion of LCA2 accurately weighed as 6.85 g was partitioned with water and extracted with chloroform (100 ml × 4). The combined chloroform portion was dried with anhydrous sodium sulphate, concentrated to dryness under vacuum with rotavapor to yield 0.16 g extract coded LCB2. The aqueous layer was evaporated to dryness on a boiling water bath and yielded 6.3 g extract coded LCC2.

Phytochemical screening of *L. cylindrica*

The phytochemical screening for the presence or absence of secondary metabolites in *L. cylindrica* crude extracts of the fresh aerial part and dried aerial part was performed using the methods described by Harborne (1998), Evans (2002) and Sofowora (2008). The following secondary metabolites were ascertained: alkaloids, tannins, saponins, cardiac glycosides, anthraquinones, phlobatannins, terpenes, sterols, resins, balsams, flavonoids, phenols and volatile oil. The methods used by Herbone (1998) were used to determine the presence of alkaloids, cardiac glycosides and phlobatannins. The presence of saponins was detected using the method of Sofowora (2008), while tannins and anthraquinones were screened for using the method of Trease and Evans (2000).

Antimicrobial assay of extracts of *L. cylindrica*

Microorganisms used

The microorganisms used were clinical isolates from The Dept. of Microbiology and Biotechnology, NIPRD, Abuja. These include *E. coli*, *S. aureus*, *Pseudomonas aeruginosa* and *Candida albicans* (clinical strain).

Antimicrobial assay

Antibacterial and antifungal activities of the plant extract were tested using well diffusion method (Gandhiraja et al., 2009). 0.1 ml of the overnight culture of the selected strains of bacteria were seeded into molten Muller Hinton media (Difco) and potato dextrose agar for fungi using pour plate method. Wells were made on the agar surface with a 6-mm cork borer. The extracts were poured into the well using sterile syringe. The plates were incubated at 37 ± 2℃ for 24 h for bacterial and 25 ± 2℃ for 48 h for fu ngal activity. The plates were observed for the zone clearance around the wells. The extracts were prepared by dissolving 2 g of the concentrates obtained from the different solvents and made up to 10 ml with distilled water to give a concentration of 200 mg ml^{-1} (Oyetayo et al., 2007).

RESULTS AND DISCUSSION

There has been a rising interest in the research for natural products from plants for the discovery of new antimicrobial and antioxidant agents in the last three decades and in recent times (Sashikala et al., 2009). In this study, the result of phytochemical screening of the fresh and dried water, chloroform and methanolic extracts of the aerial parts of *L. cylindrica* are shown in Table 1. The antimicrobial activity of the water, chloroform and methanolic extract of fresh and dried aerial part of *L. cylindrica* (L) was studied against some bacteria and fungal isolates. The zones of inhibition of the fresh and dried extracts are shown in Table 2.

According to our results, all the extracts were found to

Table 1. Phytochemical constituents of the fresh and dried extracts of the aerial parts of *Luffa cylindrica*.

Secondary metabolites	LCA1	LCA2	LCB1	LCB2	LCC1	LCC2	LCD1	LCD2
Carbohydrates	+	+	-	-	+	+	-	-
Terpenes	+	-	+	-	-	-	+	+
Sterols	+	-	+	-	-	-	+	+
Saponins	+	+	-	-	+	+	+	+
Tannins	+	+	-	-	+	+	+	+
Anthraquinones	+	-	+	-	+	-	-	-
Balsams	-	-	-	-	-	-	-	-
Resins	-	-	-	-	-	-	-	-
Alkaloids	+	+	+	+	-	-	+	+
Phlobatannin	-	-	-	-	-	-	-	-
Flavonoids	+	-	-	-	-	-	+	+
Phenols	+	-	+	-	-	-	+	+
Volatile oil	-	-	-	-	-	-	+	+

+: Present; -: absent. LCA1, Water extract of fresh plant; LCA2, water extract of dried plant; LCB1, chloroform fraction of LCA1; LCB2, chloroform fraction of LCA2; LCC1, aqueous layer of chloroform partition of fresh plant; LCC2, aqueous layer of chloroform partition of fresh plant; LCD1, methanol extract of marc of fresh plant previously extracted with water; LCB2, methanol extract of marc of dried plant previously extracted with water.

Table 2. Zones inhibition (mm) of indicator bacteria by extracts of *Luffa cylindrica* at 200 mg ml^{-1} concentration.

Microorganisms	LCA1	LCA2	LCB1	LCB2	LCC1	LCC2	LCD1	LCD2
Staphylococcus aureus	18 ± 0	-	19.33 ± 1.0	-	18 ± 1.0	-	19.67 ± 0.58	-
Pseudomonas aeruginosa	-	-	-	-	-	-	-	-
Klebsiella sp.	-	-	-	-	-	-	-	-
Candida albicans	24.0 ± 0	20.67 ± 2.5	-	-	24 ± 0	18 ± 0	27 ± 1.0	23 ± 0

-; No activity.

contain alkaloids. The presence of alkaloids in plant has been attributed to antimicrobial activity of the plant. Alkaloids are said to inhibit microbial growth by interfering with cell division (Cowan, 1991). Saponins were present in all but the chloroform extract, while volatile oils were only present in the methanol extract. However, cardiac glycoside, resins, balsams and phlobatannins were absent in all the extracts. LCA1, LCA2, LCC1, LCC2, LCD1 and LCD2 had a strong inhibitory effect on *C. albicans* with a zone of inhibition ranging from 18.0 to 27.0 mm. LCB1 and LCB2 had no inhibitory effect on *C. albicans*. Sashikala et al. (2009) reported that the ethanolic extract of the seeds to have a strong antifungal activity against *C. albicans.* Hence, with the increasing rate of candidiasis infection worsened by the high rate of HIV/ AIDS infection, this plant holds great promise for development into phytomedicine for the treatment of candidiasis in the near future.

The result also showed that the fresh solvent extracts of *L. cylindrica* (LCA1, LCB1, LCC1 and LCD1) possessed an inhibitory effect on *S. aureus*, with a zone of inhibition ranging from 18.0 to 19.67 mm. However, the dried solvent extracts had no inhibitory effect on the organism. It can thus be deduced that the fresh plant is more active against *S. aureus* than the dried plant. Oyetayo et al. (2007) reported that the methanol, ethanol and chloroform extracts of the leaves and seeds of the plant had inhibitory effect on *S. aureus.* The petroleum ether and chloroform extract of the whole plant have also been reported to have inhibitory activity on *S. aureus* (Kumar et al., 2011). Moreover, all the solvent extracts of both the fresh and dried plant had no inhibitory effect on *E. coli* and *P. aeruginosa*.

In conclusion, extracts of *L. cylindrica* when used alone or in combination with other antimicrobial agent may be an answer to the question of drug resistance. The fresh plant was shown to possess greater antimicrobial activity than the dried plant. However further study like bioassay guided fractionation of the active crude extract is needed to isolate lead compounds responsible for its antimicrobial activity.

REFERENCES

Ameer S, Michael RT, Robert LM, Sabitri KT, Kiran B (2009). Disinfection of waterborne coliform bacteria using *Luffa cylindrica* fruit and seed extracts. Environ. Technol., 30(13):1435-1440.

Cowan MM, (1999). Plant products as antimicrobial agents. Clin. Microbiol. Rev., 12(4): 564–582.

Evans WC (2002). Trease and Evans Pharmacognosy, 15th edition, W.B. Sanders London, pp. 214–314.
Gandhiraja N, Sriram S, Meenaa V, Kavitha SJ, Sasikumar C, Rajeswari R (2009). Phytochemical screening and antimicrobial activity of the plant extracts of *Mimos pudica* L. against selected microbes. Ethnobotanical Leaflets, 13:618-24
Harborne JB (1998). Phytochemical Method, A Guide to Modern Technique of Plant Analysis. 3rd Edition Chapman and Hall. New York, pp. 1-198.
Kumar DS, Indumathy R, Pallavi K, Sashikala GD (2011). Antimicrobial activity of whole plant of *Luffa cylindrica* (Linn) against some common pathogenic micro-organisms. Int. J. Pharm. Sci. Drug Res., 3(1): 29-31.
Maud KM, Dominic WM, Hannington OO, Olwa O, Joseph N (2007). The oxytocic properties of *Luffa cylindrica* (L.) M. Roem. and *Bidens pilosa* L., traditionally used medicinal plants from western Uganda. Afr. J. Ecol., 45(3): 88–93.
Olaofe OB, Okiribiti Y, Aremu MO (2008). Chemical evaluation of the nutritive value of Smooth Luffa (*Luffa cylindrica)* seed's Kernel. Proceedings of International Conference of Chemical Society of Nigeria.
Oyetayo FL, Oyetayo VO, Ajewole V (2007). Phytochemical profile and antibacterial properties of the seed and leaf of the Luffa plant (*Luffa cylindrica*). J. Pharmacol. Toxicol., 2(6): 586-589.
Sashikala GD, Kottai AM, Satheesh DK, Rekha S, Indhumathy, Nandhini R. (2009). Studies on the antibacterial and antifungal activities of the ethanolic extracts of *Luffa cylindrica* (Linn) fruit. Int. J. Drug Dev. Res., 1(1):105-109.
Sofowora A (2008). Medicinal Plants and Traditional Medicine in Africa. Third edition, published by Spectrum Books Limited, Ibadan, Nigeria, pp. 199-202.