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Phytochemical Constituents and Antimicrobial Activities of Ethanolic Extract of *Luffa Cylindrica* Seed

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Abstract

Diseases and infections are two of the most notable health challenges that humans are facing today, these have led to different health impairments, death and other economic damages. To combat these menaces, seeds of *Luffa cylindrica* plant have been noted for their medicinal properties. *L. cylindrica* seed was collected in Ogbomoso. Exactly 500 g of leaf was soaked in 4000 mL of ethanol, agitated for 1 hour at room temperature (27 ℃) in ultrasonic sonicator. The extracts were then decanted, filtered and concentrated using Rotary Evaporator at 40 ℃. The Fourier transform infrared (FT-IR) spectra and ultraviolet-visible (UV-VIS) spectrophotometer were obtained on a Perkin Elmer Spectrum and Varian Cary ultraviolet-visible. Phytochemical screening showed the presence of various phyto-constituents which could be attributed to the presence of plant secondary metabolites. UV-VIS of the pure compounds showed a maximum absorbance ranging from 242 to 424 nm which could be attributed to organic compounds such as R-OH, R-O-R, R_2C- CR_2, R_2CO and RCOOR. The FT-IR spectra revealed the presence of hydroxyl, ester, and ketones with prominent peaks at 3378.15 cm^{-1}, 1731.04 cm^{-1} and 1716.16 cm^{-1} respectively. Antimicrobial analysis showed effectiveness against tested fungi and bacteria with diameters zones of inhibition ranging from 20± 1.0 *mm* to 30± 4.3 mm compared to Clinical Laboratory Standard Institute (CLSI) of antibiotics drug. The results of tested organisms are: *Escherichia coli* 26±4.3, *Klebsiella pneumoniae* 21±2.2, *Staphylococcus aureus* 20±1.0, *Pseudomonas aeruginosa* 25±2.9 and *Candida albicans.* 28±1.5.The results of in-vitro anti-inflammatory test showed that, *L. Cylindrica* had maximum inhibition of 89.6 % at 500 µg/ ml, as compared to Exupirin (Analgesic Drug) with maximum inhibitory concentration of 85.9 % as standard. This study concluded that the extracts of *Luffa cylindrica* seed contain bioactive compounds of high medicinal values and anti-inflammatory properties. Therefore, they can serve as potential candidates for the treatment of infections caused by fungi and bacteria used in this study.

Keywords: Phytochemical constituents, antimicrobial activity, anti- inflammatory and *Luffa cylindrica.*

1. Introduction

Medicinal plants are the stronghold of some countries economy. About 80 % of the global populace, mainly in urban and undeveloped countries relies on them for primary health care because of better compatibility, cultural acceptability, with fewer side effects in the human body (Sen *et al.*, 2009).

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The chemical compositions contained in herbal medicine are part of the physiological functions of living plant life and hence they are believed to have better matching with human body. Natural products from medicinal plants are widely used by the world to cure various diseases because they are very rich in bioactive constituents. The application of bioactive compounds derived from the medicinal plants is increasing tremendously, because the main pre-occupation with the use of artificial drugs is the adverse effect which can even be more hazardous to human wellbeing than the diseases they claim to cure (Ramchoun *et al.,* 2009). In disparity, medicinal plants mainly used for medicines are based upon the fact that they contain natural substances that can abridge illness, promote good health and prove to be safe, have a good lenience with patient, globally competitive and relatively less. So, in respect to the curative power of medicinal plants, and revert to a natural remedy is a total obligation of our era (Kamboj, 2009). In disparity, medicinal plants mainly used for medicines are based upon the fact that they contain natural substances that can abridge illness, promote good health and prove to be safe, have a good lenience with patient, globally competitive and relatively less (Kamboj, 2009).

The medicinal values of these plants depends on the secondary metabolites they produced (Edeoga *et al.,* 2005). These chemical constituents are referred to as phytochemicals. Phytochemicals are plant secondary metabolites which are chemically bioactive. The word 'phyto-' is a derivative from a Greek word which refers to plant. They confer plants with plant secondary metabolites such as tannins, quinines, alkaloids and terpenoids (Mallikharjuna *et al.,* 2007). These bioactive parts of the medicinal plant that are said to be responsible for the antimicrobial effects of plant extracts are classified as carbohydrates, glycosides, saponins, flavonoids, alkaloids, tannins, terpenoids and steroids (Tang *et al.,* 2010).

Luffa cylindrica belongs to the *Cucurbitaceae* family are which commonly called sponge gourds plant (Reynoids *et al.,* 1996; Lis-Balchin and Deans, 1997). The fruits of the plant have a network of fibers which are surrounded with a large number of flat blackish seeds which originated from countries like Nigeria, African and India (Stephen, 2003). It possess both nutritional and medicinal values, which has been used in the cure of sinusitis, asthma, and fever (Naga *et al.,* 1991). It possesses both nutritional and medicinal values, which have been used in the cure of sinusitis, asthma, and fever (Naga *et al.,* 1991). It is also reported that its potential as a therapeutic agent for AIDS contains abortifacient proteins (Ng *et al.,* 1987) such as luffaculin which contains ribosome-inhibiting properties on the duplication of

HIV contaminate phagocyte and lymphocyte cells (Mc Grath *et al.,* 1989). It is also established that the extract from the stem has been used in the curing of respiratory disorders and the seed contains emetic action (Bailey *et al.,* 1989).

2. Materials and Methods

2.1. Plant Materials

The seeds of *Luffa cylindrica* seed were collected in Ogbomoso, Oyo State, South West Nigeria and identified at the medicinal plant section of Forestry Research institute of Nigeria (FRIN) Jericho, Ibadan, Oyo State; and authenticated in the Herbarium section of the same institute with herbarium number 387.

2.2. Preparation of seeds extract:

The seeds of the plant were washed with distilled water to remove any preservative sticking onto the surface and air dried at room temperature for two months. Dried seeds were then crushed using electric blender into fine powder. The powder was homogenized in cold conditions and stored at 4^{o}C prior to further investigation.

2.3. Extraction

Extraction was carried out by soaking exactly 500g of the sample in 4000ml of ethanol for one week to extracts both polar and non-polar compound that may present. The extract was then decanted, filtered and concentrated using rotary evaporator at 40^{0}C.

2.4. Collection and maintenance of microbes

Three (3) Gram negative and one Gram positive (1) bacteria with one fungus namely: *Klebsiella pneumoniae, Escherichia coli, Pseudomonas aeruginosa, Staphylococcus aureus*, and *Candida albicans* were used in this research. The test microbes were obtained from stock cultures in the Department of Microbiology, LAUTECH Teaching Hospital, Ogbomoso, Oyo State, Nigeria. The organisms were maintained on agar slant on Mc Cartrey bottles and kept in the refrigerator prior to sub culturing at 4 ℃.

2.5. Preparation of inoculums:

All the cultures were revived on selective media broth and were given the required incubation conditions specific of each culture. Then these cultures were used for antimicrobial assay.

2.6. Qualitative Phytochemical screening

Phytochemical analysis was carried out on the ethanol extracts of *Luffa cylindrical* seed using standardized method as described by Sofowora (1983), Harbone (1984) and Trease (1989) to screen them for the presence of different classes of plant secondary metabolites.

Alkaloids

Two (2) ml of the test extracts was acidified with 1% aqueous hydrochloric acid (HCl) on steam bath. Then, 1ml of the acidified solution was treated with few drops of Meyer's reagent separately in different test tubes. A creamy white precipitate confirmed the presence of alkaloids. This was confirmed by Wagner's reagents (orange precipitate) as shown in Table 1

Tannins

Five drops of ferric chloride ($FeCl_3$) were added to 2 ml of each extracts solution, dirty green precipitate was observed which confirmed the presence of tannins (Table 1).

Anthraquinones

Five (5) ml of the extracts was separately boiled with 10% hydrochloric acid (HCl) for 10 minutes in water bath at 100^{o}C. The solution was then allowed to cool, equal amount of trichloromethane ($CHCl_3$) was mixed with the filtrate and 10% of ammonia (NH_3) solution was also added to the mixture and heated. Then the formation of rose-pink colour from the solution confirmed the presence of anthraquinones (Table 1).

Glycosides

Five (5) ml of 50% sulfuric acid was mixed with each test extract in a separate test tube. The mixture was heated in boiling water for 15 minutes. 2 drops of Fehling's solution was added and the resulting mixture was then heated to boil. A brick-red precipitate confirmed the presence of glycosides (Table 1).

Reducing Sugars

Distilled water was added separately to the extracts in test tube and then shaken vigorously before filter. The filtrate was then boiled with 2 drops of Fehling's solution A and B for 10

minutes. Orange-red precipitate was observed, which confirmed the presence of reducing sugars (Table 1).

Saponins

Five (5) ml of distilled water was added to 2ml of the extracts, shaken vigorously and heated to boil. Occurrence of frothing (appearance of creamy mixed with small bubbles) showed the presence of saponins (Table 1).

Flavonoids

Four (4) ml of aqueous Sodium Hydroxide (NaOH) was added to 2ml of each extracts in separate test tubes. A yellow solution that turned colourless on addition of hydrochloric acid (HCl) confirmed the presence of flavonoids (Table 1).

Phlobatanins

Five (5) ml of extracts was dissolved in distilled water and then filtered. The filtrate was then boiled with 2% of hydrochloric solution (HCl) solution. There was a confirmation of red precipitate which showed the presence of phlobatanins (Table 1).

Steroids

To 1 ml of each test extracts solution and 5 drops of concentrated sulphuric acid (H_2SO_4). A - brownish – red colour was observed which confirmed the presence of steroids (Table 1).

Terpenoids (Salkowski test)

Two (2) ml of chloroform ($CHCl_3$) and 3 ml of concentrated sulphuric acid (H_2S0_4) was carefully added to 2 ml of each extracts to form a layer. A reddish brown colouration of interface was formed which confirmed the presence of terpenoids (Table 1).

Phenolic

Four drops of Ferric chloride solution was added to 5ml of the extracts. Formation of bluish - black colour confirmed the presence of phenols (Table 1).

2.7. Quantitative Phytochemical analysis

Alkaloids

Five **(**5) grams of each sample was weighed into a 250 ml erlmayer flask, 200 ml of 20% acetic acid in ethanol was added, and the solution was agitated for 20minutes in ultrasound sonicator. It was filtered and the extract was concentrated on a water bath to one quarter (¼) of the original volume. Concentrated ammonia solution was added by drop wise to the extract

until the precipitation was completed. The whole solution was allowed to settle and the precipitate was collected by filtration. The residue was the alkaloid, which was dried and weighed as shown in Table 2.

Flavonoids

Ten (10) grams of plant sample was repeatedly extracted with 100ml of 80% aqueous methanol and agitated for 20minutes in ultrasound sonicator at room temperature. The mixture was filtered through a Whatman No 42 (125mm) filter paper into a pre-weighed 250 ml flask. The filtrate was then transferred into a water bath and allowed to evaporate to dryness then the residue was weighed (Table 2).

Total Phenols

The fat free sample was prepared by soaking 2grams of each sample in 100 ml n - hexane, it was then agitated for 20minutes at room temperature in ultrasound sonicator. The filtrate was discarded and the residue was extracted in 50 ml diethyl-ether. It was then filtered into a separating funnel and about 50ml of the 10% sodium hydroxide (NaOH) solution was added. The mixture was shaken vigorously to separate the aqueous layer from the organic layer, 25ml of distilled water was added. The total aqueous layer was acidified to pH 4.0 by adding 10% hydrochloric acid (HCl) solution and 50% dichloromethane (DCM). The organic layer was then collected, dried and then weighed (Table 2).

Tannins

Five **(**5) grams of each of the grinded sample was weighed into a conical flask and 100 ml of 2M hydrochloric acid (HCl) added. The content was boiled on a water bath for 30minutes. The filtrate was then taken up twice in 40ml of diethyl-ether, the ether extract was heated to dryness and weighed (Table 2).

Saponins

Five (5) grams of each sample was weighed and dispersed in 100ml of 20% ethanol. The suspension was heated over a hot water bath for 4 hours with continuous stirring at about 55℃ the sample mixture was filtered by using Whitman No 1 filter paper and the residue was re- extracted with another 100ml of 20% ethanol. The combined extracts were reduced to 40ml over a water bath at about 90℃ the concentrate was transferred into a 250ml separating funnel and 20ml of diethylether was added and shaken vigorously. The aqueous layer was recovered while the ether layer was discarded. The purification process was repeated and

about 30 ml of n- butanol was added. The combined n- butanol extracts were washed twice with 10ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath. After evaporation, the sample was dried in the oven to a constant weight and the saponin content was calculated (Table 2).

2.9. Antimicrobial Activity of Extracts against Selected Microorganisms

Receptiveness analyses were carried out using modified agar well diffusion method (Garrod *et al.,* 1981; Trease and Evans, 1989) to investigate the antimicrobial activities of the extracts. The medium used was diagnostic sensitivity agar. The cultures were prepared in triplicates and incubated at 37 °C for 24 hours. Exactly 0.2 mL of the broth culture of the test bacteria and fungus was kept in a sterile Petri-dish and 18 mL of the sterile molten diagnostic sensitivity agar was added. Holes were bored into the medium using sterile cork-borer, while 50 µL of ethanol was added. These extracts were dissolved in the solvent used for extraction. Streptomycin was used as standard agent at a concentration of 1 mg ml^{-1}. The plates were incubated at 37 °C for 18 - 24 hours and the diameters of the zones of inhibition of microbial growth were measured on the plates in millimetre. The Minimum Inhibitory Concentration (MIC) of each of the extracts was determined.

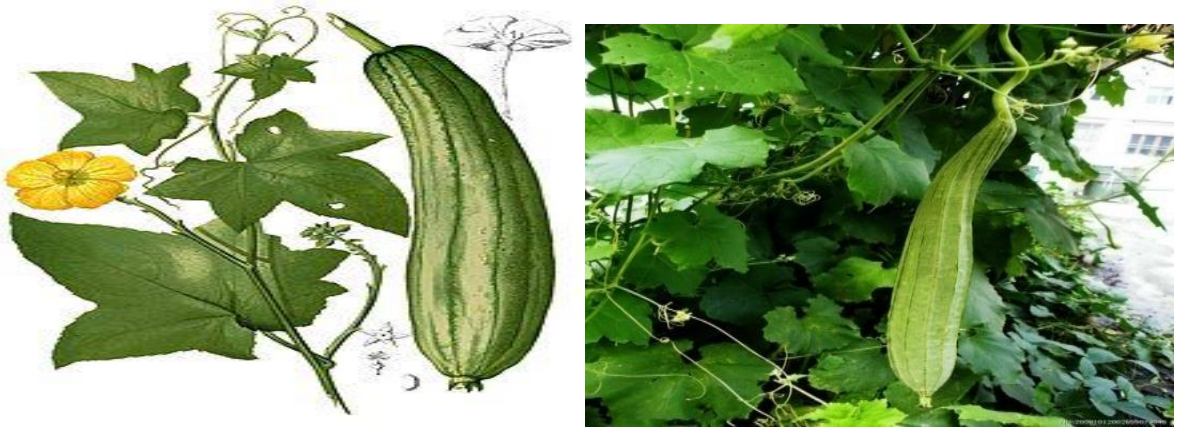


Plate 1: Pictorial image of *Luffa Cylindrica.*

3. Results and Discussion

Phytochemical constituents, quantitative and qualitative activities of *L. cylindrica* seed were carried out using ethanol as solvent to determine the percentage yields of the extracts presents in the samples. From the ethanol extract of *L. cylindrica* seed, alkaloids, glycoside, terpenoids, flavonoids, tannins, phenol, anthraquinones, saponins, steriods, were present

while reducing sugar and phlobatanin were absent. This result shows that, this plant possesses medicinal values, which could be attributed to the presence of plant secondary metabolites and this is in excellent agreement with literature (Traore-Keita *et al.,* 2000). Quantitative estimation was also conducted to reveal the amount of plant secondary metabolites and the percentage yields extracts present in the plant was74.00%. The quantities of phyto constituents present in the extracts were alkaloids (1.030 mg/g$\pm$0.01), flavonoids (0.9533$mg/g \pm 0.32$), phenol (0.4133$mg/g \pm 0.03$), tannins (0.160$mg/g \pm 0.03$) and saponins (0.233$mg/g \pm 0.04$) respectively. These results show that the plant under study is abundantly reach in phyto-constituents. Antimicrobial test revealed the activities of the tested microorganisms at different concentrations against the crude extracts of the plant with ethanol as solvent.

It was observed that, the results showed more potent inhibition effects against all the tested microbes, at concentration of 50 mg/ml, this inhibitory zone of 28 mm, 25 mm, 26 mm, 20 mm and 21 mm was recorded against plant ;*C. albicans, P. aeruginosa, E. coli, S. Aureus* and *K. pneumonia* respectively. *C. albicans* was found to be more effective against all the tested microbes for the plant with the inhibition zone of 28 mm. It was clear from the results that, ethanol extracts exhibited pronounced activities against tested microorganism compare to other solvents from the literatures. These results show that the active ingredients of these plant parts are better extracted with ethanol than other solvents from the study. According to (Okemo, 1996) and (Hedberg *et al.,* 1983), the ethanol extracts contain alkaloids, coumarins and tannins, the presence of coumarins and tannins have antibacterial and antifungal properties. Also (Eloff, 1998) and (Cowan, 1999) found that ethanol as a solvent was more efficient and effective than any other solvents in extracting phytochemical constituents from plant materials. This shows that ethanol is the most suitable in extracting phyto-constituents from plant materials because of its polar nature. From the results, Inhibitory concentration (IC) for bacteria and fungi ranges between 0.10 to 0.23 $mg/$ ml when tested with ethanol extracts of the studied plants.

According to (Irobi *et al.,* 1992), (Bamba *et al.,* 1993) and (Caceres *et al.,* 1995) various investigations demonstrated that the extracts of the leaves of *C. odorata* at low concentrations (from 0.1 to 5 mg/ml) inhibit the growth of *Pseudomonas aeruginosa, E. coli, S. aureus* and *Neisseria gonorrhea*. Almas (1999) and Kraus (1995) established the effect of some microorganisms on plant extracts, and their antimicrobial effect was confirmed due to the occurrence of triterpenoids, phenolic compounds, caroteniods, steroids, valavinoids, ketones,

tetratriterpenoids and azadirachtin. Hopper *et al*. (1990), Sharma & Bhutani (1998) and Kanchan (1975) established the minimum inhibitory concentration of *E. coli* which is known for its anti-malaria, anti-amoebic and allelopathic properties. Therefore, the antimicrobial activity of ethanol extracts of this plants suggested its efficiency and usage in the treatment of various infectious diseases which could be caused by fungi and bacteria like *Candidiasis, Taeniasis, Aspergillosis, Cryptococcus Neoformans, Blastormycosis* and *Sporotricosis* also, *Syphilis, Gonorrhea, Peptic Ulcer, Impetigo, Meningitis, Urinary Tract Infection, Tetanus, Botulism, Cholera, Samonellosis, Chlamydia, Influenza, Conjunctivitis* and *Shigellosis.*

The antimicrobial properties of the plants of study were tested against five clinical bacteria isolates: *Escherichia coli, Klebsiella pneumoniae, Staphylococcus aureus, Pseudomonas* spp. and *Serratia marcescens,* using the modified liquid culture method. The bacteria isolates were inoculated and incubated at 37 ^{0}C for 24 hours. Then, they were adjusted with 0.5 Mc Farland standards and observed at 600 nm in a UV-Vis Spectrophotometer. The ethanol extract of the plant (1ml each of gradient concentration from 0.25 µg / ml, 0.50µg / ml, 0.75µg / ml and 1.00µg / ml) was added into test tubes containing 5 ml of peptone water medium. An aliquot of 1ml of the five test bacterial suspensions was separately inoculated into each tube and incubated at 37^{0}C for 24hours. Positive control experiment contained 1ml of each bacteria suspension without adding the cactus ethanol extract. The negative control contains the 5 ml of peptone water and 1ml of each gradient concentration of the extracts and the absorbance were obtained. The growths of the bacterial isolates were measured as optical density (OD) at 600nm using UV-Visible spectrophotometer. The percentage growth inhibition of reduction was estimated. It was observed that, at 1.00 µg/ml all the plant extracts of *E. coli* was inhibited at 49%, *K. pneumoniae*; 69% *S. aureus* ; 78% *Pseudomonas* spp.*;* 55% and *S. marcescens* ; 76%. In the results above, the activities of antimicrobial properties of the extracts tested against five clinical isolates were active at 1.00µg/ml and more potent against the microorganisms compare to the value of the standard antibiotic used.

The results of estimation of the in-vitro anti-inflammatory activities through the inhibition of protein albumin denaturation of *L. cylindrica* seed that was studied using inhibition of albumin denaturation (Sakat *et al.,* 2010) and (Leelaprakash & Mohan, 2010). The reaction mixture consisted of test extracts and 1% aqueous solution of bovine albumin fraction, pH of the reaction mixture was adjusted using small amount of 1N hydrochloric acid (HCl). The sample extracts were incubated at 37 ºC for 20 minutes before heated to 51 º C for 20 minutes. After cooling the samples the turbidity was measured at 660nm (UV/ Visible

Spectrophotometer Jenway 6305m model). The experiment was performed in triplicate. The Percentage inhibition of protein denaturation was calculated as follows:

$$Percentage\ inhibition\ = \frac{Absorbane\ of\ Control\ -Absorbance\ of\ Sample}{Absorbance\ of\ Control} \times 100\%.$$

From the results, the extract shows maximum inhibition of 89.6 % at 500 µg / ml. A standard anti-inflammation drug exupirin (Analgesic Drug) shows maximum inhibitory concentrations of 85.9 % 500 µg / ml compared with standard. The results above indicate that the ethanol extracts of the plants of studies possess anti-inflammatory properties, these activities may be due to the presences of secondary metabolite compounds such as alkaloids, flavonoids, tannins, steroids, and phenols. The extracts fractions from the plant of study may serve as free radical inhibitors or scavenger or acting possibly as primary oxidants and inhibited the heat induced albumin denaturation.

This study gives on idea that the compounds of the plant of study could be used as pilot compound for reaction scheme to synthesis a potent anti-inflammatory drug which can be used to cure of various diseases such as inflammation, cancer, aging and neurological disorder**.** The FT-IR absorption spectrums were carried out through chromatographic separation to recognize the functional groups in pure compounds which can assist the structural and identification of novel compound, and the possible ones responsible for medicinal properties of the plant under study. The FTIR spectrum (Fig. 7) showed peaks at 3378.13, 3056.26, 2929.99, 1711.94, 1613.50, 1395.66, 1354.03, 1264.61, 1095.28, 896.02, 732.75, and 704.16 cm^{-1}.The major peaks at 3378.13, 2929.99, 1613.50, 1264.16, and 732.75 cm^{-1} correspond to N–H of amines or O–H stretch of carboxylic acid, C=C stretch of alkenes or C=O stretch of amides, C-H stretch aliphatic, C=C-C stretch of alkanes / benzene ring, C-O stretch of phenol and C-H bending vibration of aromatic respectively (Emeka *et al.* 2014; Shankar *et al.* 2014). From the UV-visible, the isolated compounds show a maximum absorbance ranging from 242 nm to 424 nm which could be trace to organic compounds such as: R-OH, R-O-R, R_2C-CR_2, R_2CO and RCOOR.

Table 1: Qualitative phytochemical screening for phytoconstituents

Phytochemical Test	Inference (Ethanol)
Wagner's Test for Alkaloids	++
Glycoside	++
Flavonoids	++
Tannins	++
Saponins	++
Terpenoids	++
Phenol	++
Steriods	++
Anthraquinones	++
Reducing Sugar	-
Phlobatanins	-

++ (Abundant) + (Moderate) - (Absent).

The quantities of phyto constituents present in the ethanol extracts of *luffa cylindrica* were alkaloids (1.030 mg/g$\pm$0.01), flavonoids (0.9533mg/g$\pm$0.32), phenol (0.4133 mg/g$\pm$0.03), tannins (0.160 mg/g$\pm$0.03) and saponins (0.233 mg/g$\pm$0.04) respectively.These results show that the plant under study is abundantly rich in phytoconstituents.

Table 2. Percentage yield of the extracts of *L .cylindrica* seed.

Plant	**Extract Coding**	**Solvent Used**	**% yields**
Luffa cylindrical	LCS	Ethanol	74.00

Table 3: Zone of inhibitory activity (in millimeter) of the ethanol plant extracts of *L. cylindrica* seed against some selected bacteria and fungi.

Source	Extract	*C. albicans*	*P. aeruginosa*	*E. coli*	*S. aureus*	*K. pneumoniae*
L.cylindrica	Ethanol	28$\pm$1.5mm	25$\pm$2.9mm	26$\pm$4.3mm	20$\pm$1.0	21$\pm$2.2mm

Values are the average of at least three determinations

Table 4: Inhibitory Concentrations (IC) of *Luffa cylindrica* for antimicrobial activity

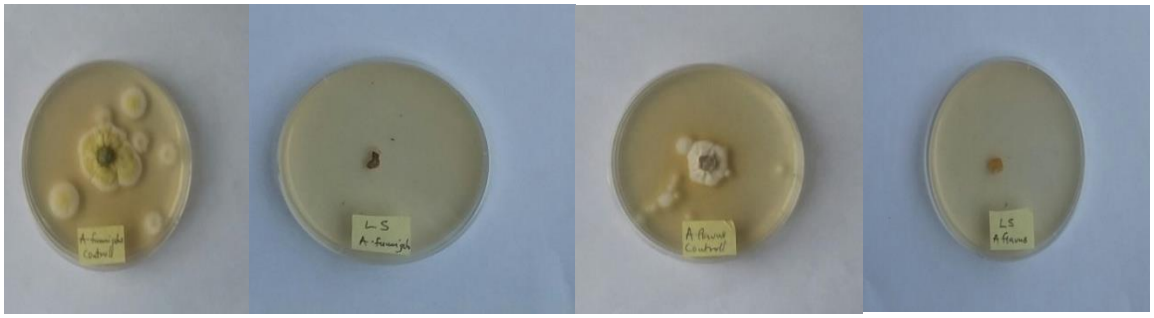
Source	Extract	Zone of Inhibition (@ 0.1 mg/ml)				
		C. albicans	*P.aeruginosa*	*E. coli*	*S. aureus*	*K. pneumoniae*
L. cylindrical	Ethanol	0.16$\pm$0.01	0.15$\pm$0.03	0.18$\pm$0.03	0.21$\pm$0.01	0.15$\pm$0.02

Values are the average of three determinations

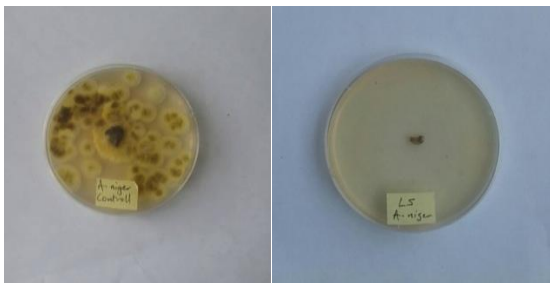
Table 5: Percentage Inhibition of ethanol extracts of *Luffa cylindrica* seed at a different concentration against tested organisms

Organisms **Conc** $\mu g/ml$	***E. coli***	***K. pneumoniae***	***S. aureus***	***Pseudomonas* spp**	***S.marcescens***
0.25	12	20	13	19	19
0.50	24	28	25	27	37
0.75	36	45	46	44	56
1.00	49	69	78	55	76

F.Solani (control) *C.albican* (control)



A.fumigatus (control) *A.flavus* (control)



A.niger (control)

Figure 1: Antimicrobial activities of *Luffa cylindrica* seed extracts tested against some selected fungi.

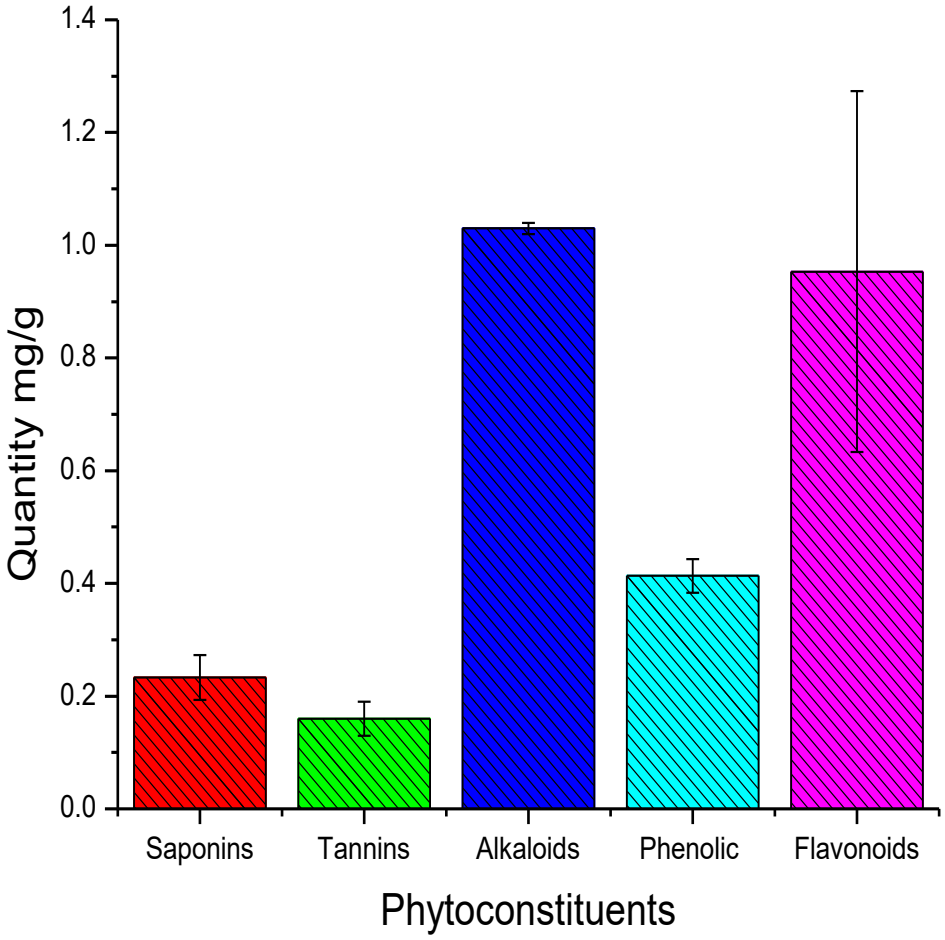


Figure 2: Quantity of phytochemical compound in seed of *luffa cylindrica* seed selected fungi by disk diffusion method.

Table 6: Investigation of invitro anti-inflammatory activities through inhibition of albumin denaturation of *Luffa cylindrica* seed (LSC)

Treatment(s)	**Concentration ($\mu g/ml$)**	**Absorbance at 660nm**	**% inhibition of protein denaturation**
Control	-	0.299 ± 0.002	Nil
LSC	100	0.044 ± 0.001	85.3
LSC	200	0.040 ± 0.001	86.6
LSC	300	0.037 ± 0.001	87.6
LSC	400	0.036 ± 0.002	88.1
LSC	500	0.031 ± 0.001	89.6
Exuprin	100	0.042 ± 0.001	85.9

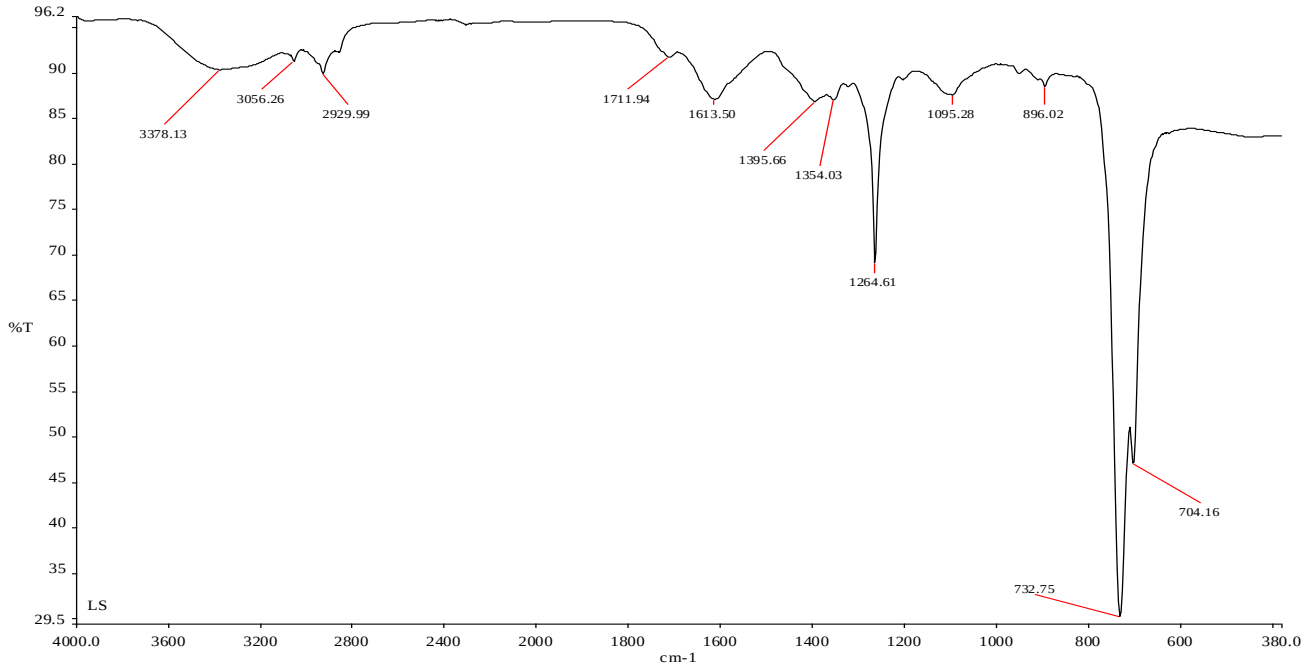


Figure 3: FTIR spectrums of pure compound from the plants of study.

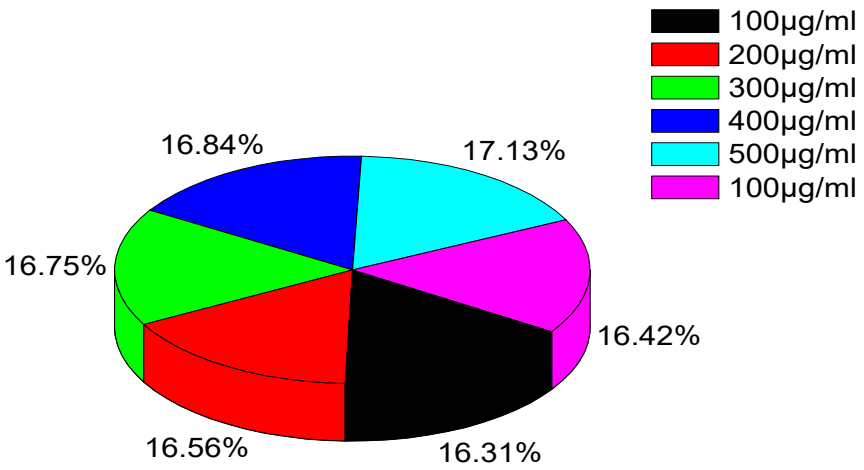


Figure 4: Investigation of invitro anti-inflammatory activities through inhibition of albumin denaturation of *Luffa cylindrica* seed.

4. Conclusion

Phytochemical results from the ethanol extracts of *L. Cylindrica* seed have revealed that the medicinal (antibacterial and antifungal) properties of this plants which depends on certain active ingredients such as Alkaloids, Glycosides, flavonoids, Terpenoids, Tannins, Saponins, Phenols, Steriods, Anthraquinones, Reducing Sugar and Phlobatanins have been known to be responsible for its medicinal, antimicrobial and antioxidant properties (Morebise *et al.,* 1989; Morebise *et al.,* 2002) and (Nwinyi *et al.,*2008) which account for its uses in traditional medicine for the treatment of different infections. Biological activities of the *L. Cylindrica* seed demonstrated a broad spectrum of antibacterial and antifungal activities which help to discover new chemical classes of antibiotic substances that could serve as selective agents for infectious disease, chemotherapy and control. The potency of these plants against certain microorganisms suggests their potential to be used as an alternative therapeutic agent in the face of antibiotic resistance.

In this study, ethanolic extracts of *L. Cylindrica* seed contain anti- inflammatory properties. These activities may be due to the presence of secondary metabolite compounds such as alkaloids, flavonoids, tannins, steroids phenol and terpenoids etc, which give an idea that the compound of the plant *L. Cylindrica* seed can be used as a lead compound for designing a potent anti-inflammatory drug which can be used for the treatment of various diseases such as cancer, neurological disorder, aging, inflammation, congestive heart failure, lowering of cholesterol levels in the blood, healing of wounds, endotoxemia etc. since they contain various phyto-constituents that are known to treat the above mentioned diseases.

Recommendation

It was established from this research that the plants of study L. *Cylindrica* seed were proved to possess bioactive compounds of medicinal and pharmacological importance. Therefore, they are recommended as potential candidates for the treatment of infectious diseases, drug design and development.

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