

## Original Research Article

### CHEMICAL AND BIOLOGICAL PROFILING OF THE FLORAL METHANOLIC EXTRACT OF *COSTUS LUCANISIANUS*

#### ABSTRACT

The chemical and biological profiling of the methanolic extract of the floral part of *Costus lucanisianus* have been carried out. The floral part was collected from Ogbia Local Government Area of Bayelsa State. The floral part was air dried, grinded and extracted at room temperature in methanol. The methanol extract mixture was then concentrated under pressure. The concentrated extract, MCL was subjected to quantitative phytochemical screening, antioxidant and antimicrobial profiling. The result of the quantitative analysis showed the presence of phenols ( $14.853 \pm 0.350$ ), tannins ( $6.638 \pm 0.051$ ), alkaloids ( $3.72 \pm 0.02$ ), flavonoids ( $59.444 \pm 0.000$ ) and saponins ( $2.93 \pm 0.06$ ). The antioxidant activity increases as the concentration of MCL increases. Biologically, the floral part has shown activities against the following strains of microbes: *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Candida albican*, *Klebsiela pneumonia*, and *Fusarium spp.* with the highest activity observed against *Staphylococcus aureus*. The least antimicrobial activity was observed for *Escherichia coli*.

**Keywords:** *Costus lucanisianus*, Phytochemical, Antioxidant, Antimicrobial

#### INTRODUCTION

The biodiversity of phytochemicals in the plant kingdom has been of immersed blessing to mankind and his living counterparts. The spread and wide range of applications have heightened research and development towards reproducing what nature has endowed the ecosystem with. One of such nature depots of secondary metabolites of therapeutic significant is the plant kingdom.

*Costus lucanisianus* is an herb perennial plant belonging to the family Costaceae and one out of the eleven (11) species commonly found in the coaster region of Southern part of Nigeria. It is locally used in the treatment of prolapsed rectum, cough, stomach upset, infections of the eyes and headaches [1]. It is also known as remedy for jaundice, stillbirth, discharge of the urethral and oedema [2], diarrhea, pyrexia, pain and dysmenorrheal [3]. These sets of ethnomedicinal claims of *Costus lucanisianus* can only be justified via its activities which are often the metabolic functions of the phytoconstitution presence. Thus, this present study is designed to probe both the chemical and biological characteristics of *Costus lucanisianus*.

## **MATERIALS AND METHODS**

### **Chemicals and Reagents**

Chemicals and reagents employed in the course of this work were of standard quality and products of Sigma-Aldrich. Some of the chemicals and reagents used include: methanol, 2, 2-Diphenyl-1-picrylhydrazine (DPPH), distilled water and dimethyl sulfoxide (DMSO).

### **Collection of Plant Material**

The floral part of the plant material was collected from Ogbia Local Government Area of Bayelsa State, Nigeria. The complete plant material was identified by a botanist with the Department of Biology, Federal University Otuoke, Bayelsa State, Nigeria.

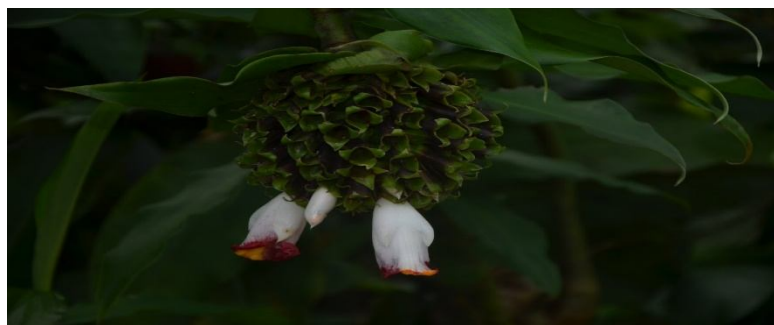


Plate 1. *Costus lucanisianus*

### **Extraction of Plant Material**

The dried floral part of the plant material was subjected to extraction at room temperature for 72 hrs, decanted and the solvent mixture concentrated under pressure using the rotatory evaporator equipment to yield methanolic extract, MCL.

### **Quantitative Phytochemical screening of MCL**

The quantitative Phytochemical screening on MCL was carried out using the Folin-Ciocalteu methods as described by earlier researchers [4,5,6].

### Antioxidant analysis of MCL

The antioxidant analysis of MCL was done using the 2,2-Diphenyl-1-picrylhydrazine, DPPH free radical technique with the wavelength of absorbance read at 517 nm using ascorbic acid as an organic standard as reported in earlier studies [7,8].

### Antimicrobial Analysis of MCL

The antimicrobial analysis was carried out using the Agar diffusion method [9,10,11] Microbial strains of *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Candida albican*, *Klebsiela pneumonia*, and *Fusarium spp.* were cultured and probed for the antimicrobial efficacy of MCL.

## RESULTS AND DISCUSSION

### Quantitative Phytochemical screening of MCL

The presence of phenolics, tannins, alkaloids, flavonoids and have been identified and reported in table 1. The floral part of *Costus lucanisianus* is very rich in flavonoids and least in saponins. The phenolic class of phytochemicals with established therapeutical bioactivities such as the antioxidant, anticancer, antimutagenic and anti-inflammatory activities [12]. Tannins are known phytochemicals with wide range of activities such as antimicrobial, fasten blood clothing, lower blood pressure and regulate serum lipid level [13]. Alkaloids are known amines of natural products and have been implicated in the physiological functions such as anesthetics, cardioprotective and anti-inflammatory [14]. Flavonoids are polyhydroxylated aromatic compounds with proven antioxidant, anticancer, antiviral, anti-inflammatory, neuro- and cardio-protective activities [15]. Saponins are known for their characteristic foamy nature and have been explored in clinical science as inhibitor of tooth caries, platelet aggregation, acute lead poisoning and in the treatment of hypercalciuria [16].

**Table 1: Quantitative phytochemical screening of MCL**

| Phytochemical              | Concentration |
|----------------------------|---------------|
| Total Phenolics (mg/g GAE) | 14.853±0.350  |
| Tannin (m/g GAE)           | 6.638±0.051   |
| Alkaloid (mg/g)            | 3.72±0.02     |

|                     |              |
|---------------------|--------------|
| Flavonoid (mg/g RE) | 59.444±0.000 |
| Saponin             | 2.93±0.06    |

\*GAE- Gallic Acid Equivalent, RE- Rutin Equivalent

### Antioxidant and Antimicrobial analysis of MCL

The profiling carried out on the antioxidant activity of MCL (fig. 1.) shows that *Costus lucanisianus* floral has antioxidant potential. It is however, lowered when compared to those of Ascorbic acid. Thus, antioxidant activity of the floral part of *Costus lucanisianus* can be employed in the scavengers of free radicals that are associated with some endogenic metabolic activities within living systems. Free radicals are species with associated unpaired electrons and could be responsible for the oxidative modifications of macromolecules. Macromolecules such as the lipids, nucleic acids (DNA, RNA) and the proteins once interfered with could lead to clinical cases such as aging, diabetes, cancers and neuro-degenerative conditions in mankind [17].

Bacteria such as *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Candida albican* and *Klebsiela pneumonia* are single cell organism that are associated with day-to-day engagement. However, some are beneficial and others are pathogenic. Bacteria like *Staphylococcus aureus*, *Salmonella typhi* and *Escherichia coli* are known be causative agents of syphilis, typhoid, urinary tract infection, diarrhea [18]. The antimicrobial activity of MCL is reported in table 2. The highest antimicrobial activity was witnessed against *Staphylococcus aureus*. The least antimicrobial activity was observed for *Escherichia coli*. The antimicrobial activity of MCL generally decreases as the concentration decreases and vice versa. The antimicrobial activity of MCL was generally lowered than that of the standard, ciprofloxacin. *Fusarium spp* is a fungus with notable pathological relevance. It causes a wide range of infections such as keratitis, onychomycosis and both the invasive and disseminated ones [19], sinusitis [20] and mycotoxicosis [21]. Table 2, reveals the antimicrobial activity of *Fusarium spp* with an increasing inhibitory effect as the concentration of MCL increases. It was however, lowered when compared to that of the standard used, ketoconazole.

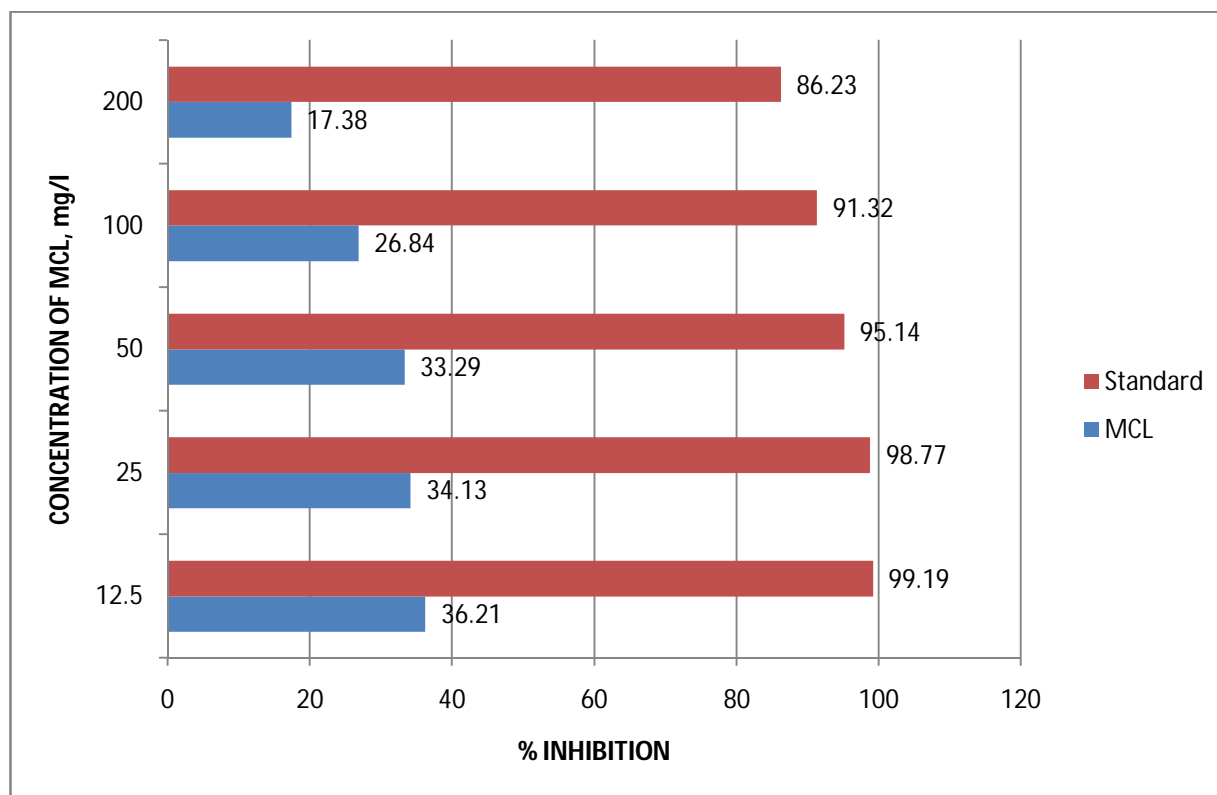


Figure 1: Antioxidant analysis of MCL

Table 2: Antimicrobial analysis of MCL

| Organisms | 100 | 50 | 25 | 12.5 | 6.25 | 10ng/ml Cipro | 1% Ket |
|-----------|-----|----|----|------|------|---------------|--------|
| S.a       | 22  | 18 | 16 | 14   | 12   | 28            | NA     |
| B.s       | 20  | 14 | 12 | 10   | 10   | 24            | NA     |
| E.c       | 14  | 12 | 10 | 0    | 0    | 20            | NA     |
| P.a       | 16  | 14 | 12 | 12   | 10   | 25            | NA     |
| S.t       | 18  | 12 | 10 | 8    | 6    | 18            | NA     |
| K.p       | 16  | 10 | 10 | 8    | 6    | 22            | NA     |
| C.a       | 16  | 14 | 10 | 10   | 8    | 0             | NA     |
| Fus       | 12  | 10 | 8  | 0    | 0    | NA            | 20     |

**S.a- Staphylococcus aureus, B.s- Bacillus subtilis, E.c- Escherichia coli, P.a- Pseudomonas aeruginosa, S.t- Salmonella typhi, C.a- Candida albican, K.p- Klebsiella pneumonia, Fus- Fusarium spp., Cipro-Ciprofloxacin, Ket-Ketoconazole**

## CONCLUSION

The methanolic extract of the floral part of *Costus lucanisianus* have been profiled for its chemical and biological activities. Phytochemically, the methanolic extract contains phenols, tannins, alkaloids, flavonoids and saponins as phytochemicals. The presence of these phytochemicals could account for its medicinal claims. The antioxidant activity increases as the concentration of the methanolic extract increases and vice versa. Biologically, the floral part has shown antimicrobial activities against the following strains of microbes: *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella typhi*, *Candida albican*, *Klebsiella pneumonia*, and *Fusarium spp.* with the highest activity observed against *Staphylococcus aureus*. The least antimicrobial activity was observed for *Escherichia coli*. The antimicrobial activity of MCL generally decreases as the concentration decreases and vice versa.

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