Antibacterial Activity of Ethanol, Crude and Water Extract of *Chromolaena Odorata* Leaves on *S Typhi* and *E Coli*

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**ABSTRACT**

Antimicrobials from plant have enormous therapeutic potentials which have been established a long time ago. The leaves of *Chromolaena odorata* (commonly called Siam weed), which is an ancient remedy for the treatment of wounds and many ailments was tested for its antimicrobial activities on *S. Typhi* and *Escherichia coli*. The agar pour plate method was used to test for its antimicrobial activity on the test isolate, the extracts of *Chromolaena odorata* was introduced directly into the wells of the two tested organism. Laboratory study shows that *Chromolaena odorata* has antimicrobial action against these organisms. However, result after a 72hr incubation showed that ethanol extract had the highest zone of inhibition for *S. Typhi* (37.7mm) and water extract on *E coli* (32.3mm) and also mean value of leaf extracts of *Chromolaena odorata* were found to exhibit a significant antibacterial activity against *S. Typhi* as compared to *E. coli*, revealing that the extract of *Chromolaena odorata* is more effective on *S. Typhi* than *E. coli*. This research work establishes a good support to the use of these plants in herbal Remedies and as base for development of new drugs against typhoid fever and *E. coli* related diseases.

**Keywords:** Antimicrobials, *Chromolaena odorata*, Drug discovery, *E coli*, Medicinal plant, *Salmonella Typhi*.

**INTRODUCTION**

Plants for decades have been a valuable source of natural products for maintaining human health, especially with in-depth investigation for their natural therapeutic potentials. According to World Health Organization (Santos et al., 1995) several varieties of drugs can be derived from medicinal plants. There is a continuous and urgent need to discover new antimicrobial compounds with diverse mechanisms of action and chemical structures that can be used against novel and re-emerging infectious diseases (Rojas et al., 2003). The abundance of plants on the earth’s surfaces has led to an increasing interest in the investigation of different extracts obtained from traditional plant as potential sources of new antimicrobial agents (Bonjor et al., 2004). Therefore, researchers are increasingly turning their attention to complementary medicine looking for new ways to develop better drugs against microbial infections (Benkebia, 2004). Many plants have been used because of their antimicrobial traits, which are due to compounds synthesized as secondary metabolites of plant. These products are known by their active substances, for example, the phenoic compounds which are a part of the essential oils (Jansen et al., 1987) as well as tanin (Saxena et al., 1994). Medicinal values of plants lie in their component phytochemicals such as alkaloids, tannins, flavonoids and other phenolic compounds, which produce a definite physiological action on the human body (Daniel, 1999).

Secondary metabolites (also called specialized metabolites) is a term for pathways and small molecule products of metabolism that are not absolutely required for the survival of the organism, many of which are antibiotics and pigments. Plants synthesize varieties of phytochemicals such as alkaloids, phenolics, terpenoids, glycosides etc.

*Chromolaena odorata* King and Rob. (Syn. *Eupatorium odoratum* Linn.) plant are used by traditional medicine practitioners for treatment of burns, wound healing, skin infections, post-natal wounds, and antimalarial (Nurul et al., 2004). This weed has been in Nigeria for over 50 years and found along road-sides, waste and fallow lands. (Kigigha and Zige, 2013). *Chromolaena odorata* is a known toxic weed that is widespread over many parts of the world including Nigeria especially in the southern part of Nigeria. This common plant called Siam weed is known among the Ibo of the South-Eastern Nigeria as: ‘Elizabeth’, ‘Independence leaf’, ‘Enugu plantation weed’ and ‘bienqua’ or ‘inenghiqua’ among the Ijaws in south-south. Traditionally, fresh leaves or a decoction of *C. odorata* have been used throughout many tropical countries for the treatment of leech bite, soft
tissue wounds, burn wounds, skin infection and liver diseases (Alisi et al., 2011). Although synthetic and semi-synthetic antimicrobial drugs abound in various markets today, there is a need for continuous search for new ones to cope with the increased evolution of multiple antimicrobial resistant strains of organisms (Hart and Kariuki, 1998).

This objective of this study is to investigate and compare the efficacy of water, crude and ethanol extracts of leaves of Chromolaena odorata exposed to clinical isolates of pure cultures of S. Typhi and E. coli.

MATERIALS AND METHODS

Collection of sample

Fresh leaves of C. odorata were collected in Niger Delta University premises, Amassoma community. The collected plants were washed with running tap water, air dried, homogenized to a fine powder and stored in air-tight bottles at 4°C.

Preparation of extracts

Crude extracts

Fresh leaves of C. odorata was macerated in a mortar and pestle and then expressed by means of pressure to obtain 50ml of the undiluted crude juice. This juice was later filtered with a membrane filter of pore size 0.45ul to obtain a sterile juice and stored in an air-tight bottles at 4°C.

Water Extracts

Precisely 100 grams of the fine powdered C. odorata was weighed using a weighing balance. The weighed sample was soaked in 200mls of distilled water contained in a conical flask and swirled. After 48hours, with interval stirring, the mixture was filtered using Whatman No.1 filter paper (Azoro, 2000) into a clean beaker and concentrated to dryness using a water bath at 70°C over 24h. Extracts obtained was filtered with a membrane filter of pore size 0.45ul to obtain a sterile extract and stored in an air-tight bottle at 4°C.

Ethanol extract

Exactly 100 grams of the fine powdered C. odorata was weighed using a weighing balance. The weighed sample was soaked in 200mls of ethanol contained in a conical flask and swirled. After 24hours, with interval stirring, the mixture was filtered using Whatman no.1 filter paper (Azoro, 2000) into a clean beaker and concentrated to dryness using a water bath at 65°C for 24h. Extract obtained was filtered with a membrane filter of pore size 0.45ul to obtain sterile extract and stored in an air-tight bottle at 4°C.

Test bacterial isolates:

The strains used in this study were isolated from patients who presented with abdominal distress and fever. The organism were grown overnight at 37°C in selective media including Eosine Methylene Blue (EMB) agar for E. coli while for S. Typhi, selenite F broth and Salmonella-Shigella (SS) agar. Organisms were further identified using Kigler Iron Agar (KIA), Motility, Indole and Urea (MIU) test and interpreted according to Cheesebrough (2000) and WHO (2003) Cultures were purified on nutrient agar before testing for susceptibility to extracts.

Antibacterial Activity

Sensitivity of the pure culture of bacteria isolates to crude, water and ethanol extract was determined using the well diffusion method. Oxoid sensitest agar plates were swabbed with cells from the bacteria stock solution, already adjusted to the 0.5 McFarland’s turbidity standard. About 1ml of the extract were thereafter, carefully pippeted on the holes that was bored with a sterile borer of 8mm in diameter and observed for sensitivity after a 24h, 48h and 72h incubated at 37°C and zones of inhibition was measured in millimeter (mm) together with well.

Statistical Analysis

SPSS statistical package version 18 was used for descriptive analysis.
RESULT

All three extracts showed good activity against the test isolates using the well diffusion method. The anti-bacterial activity of various extracts using crude, ethanol, and water extracts of *C. odorata* leaf were tested against *S. Typhi* and *E. coli*. The three test extracts were found to possess significant antibacterial activity against the bacterial pathogens tested (Table 1 and Figure 1). The mean value of extract after 72hrs incubation reveals ethanol extract has the highest zone of inhibition for *S. Typhi* (37.7mm) and water extract on *E. coli* (32.3mm), however growth of test organism decreased with time with the exception of ethanol extract on *E. coli* that stops after 24hrs.

<table>
<thead>
<tr>
<th>Organism</th>
<th>Plant Extract</th>
<th>Time of Incubation</th>
<th>Mean</th>
<th>Std Error</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>S. Typhi</em></td>
<td>Crude Extract of <em>C. odorata</em></td>
<td>30mm 25mm 23mm</td>
<td>26.3mm</td>
<td>2.03</td>
</tr>
<tr>
<td></td>
<td>Ethanol extract of <em>C. odorata</em></td>
<td>42mm 36mm 35mm</td>
<td>37.7mm</td>
<td>2.19</td>
</tr>
<tr>
<td></td>
<td>Water Extract of <em>C. odorata</em></td>
<td>42mm 32mm 29mm</td>
<td>34.3mm</td>
<td>3.9</td>
</tr>
<tr>
<td><em>E. coli</em></td>
<td>Crude Extract of <em>C. odorata</em></td>
<td>28mm 24mm 19mm</td>
<td>23.7mm</td>
<td>2.6</td>
</tr>
<tr>
<td></td>
<td>Ethanol extract of <em>C. odorata</em></td>
<td>33mm 31mm 31mm</td>
<td>31.7mm</td>
<td>4.37</td>
</tr>
<tr>
<td></td>
<td>Water Extract of <em>C. odorata</em></td>
<td>34mm 34mm 29mm</td>
<td>32.3mm</td>
<td>0</td>
</tr>
</tbody>
</table>

The mean value of leaf extracts of *C. odorata* were found to exhibit a significant antibacterial activity against *S. Typhi* as compared to *E. coli*, revealing the extract of *C. odorata* is more effective on *S. Typhi* than *E. coli* (Figure 1).

![Figure 1: Mean values of activity of extracts against S. Typhi and E. coli](image)

DISCUSSION/CONCLUSION

*C. odorata* is found to be a highly efficacious medicinal herb according to the indigenous and complementary remedial systems. The same is proved by its pharmacological evaluation performed by scientific community globally. *Chromolaena odorata* is a diffuse rapidly growing and strongly scenting perennial shrub (Phan et al., 2001). It grows widely in Nigeria especially in the south and west. Likewise in other parts of West Africa, the plant is used by traditional medicine practitioners in the treatment of various ailments (Gill, 1992). The present investigations on Medicinal plant *C. odorata* shows it’s considerably effective against clinical isolate of *S. Typhi* and *E. coli* and is in agreement with the findings of Sukanya et al. (2011); Nurul et al. (2004); Irobi (1992); Bamba et al. (1993); and Caceres et al. (1995). The findings also correlate with the observation of previous workers that the plants contain substances that are antimicrobial (Olukoya, 1986). However recent findings by Kigigha and Zige (2013) correspond with this finding on the antibacterial efficacy of *C. odorata* against *E. coli*. Thus the study reveals the potency of this plant in the control of typhoid fever and *E. coli* associated diarrhoeal diseases. The use of plant extracts to treat diseases has stood the test of time (Anwannil and Atta, 2006). According to Suck (1989), more than 75% pure compounds derived from higher plants are used in modern medicine and *C. odorata* is well known in complementary medical practice in treatment of several ailments. But for an antibiotic agent to be considered as safe for humans, it must have the ability to destroy pathogen, while relatively non-toxic, chemically stable and be able to reach the part of host organism in which infection persists.
This study however concludes that further investigation on the use of this plant should be carried out to test against pathogens of worldwide burden as well as the relative side effects and mechanism of action.

**RECOMMENDATION**

The present investigations on Medicinal plant *C. odorata* is considered as a clinically effective antimicrobial agent against *S. Typhi* and *E. coli*. Hence it is recommended as an alternative to synthetic antibiotics for the control of typhoid fever and diseases of *E. coli* origin such as diarrhoea, urinary tract infection (UTI) etc. The screenings of this medicinal plant reveals it as a source of antimicrobial agents.

**REFERENCES**


