Synergistic Effect of Ethanol Leaf Extract of *Senna alata* and Antimicrobial Drugs on Some Pathogenic Microbes

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ABSTRACT

The antimicrobial activities of ethanolic leaf extract of *Senna alata* against five bacteria (*Staphylococcus aureus*, *Staphylococcus albus*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa* and *Proteus mirabilis*) and six fungi (*Rhizopus spp*, *Penicillum oxalicum*, *Aspergillus tamari*, *Aspergillus niger*, *Fusarium oxysporum* and *Fusarium vacillis*) were examined using agar diffusion method. The result revealed that the ethanolic leaf extract had high inhibitory activity against *S. albus*, *P. mirabilis* and all the fungi tested. The eight antibacterial drugs produced varied reactions on the microbes with streptomycin having the highest inhibitory activity against all the bacteria. All the antifungal drugs used also produced high inhibitory activity against the fungi. The synergism between the extract and synthetic drugs produced higher inhibitory activity against the organisms. The photochemical screening of the plant revealed the presence of alkaloids, cardenolides, saponins, tannins and anthraquinones.

Key words: *Senna alata*, antimicrobial drugs, synergism, phytochemicals.

Introduction

Plants have been in use since time immemorial to cure various ailments and thus lessening human suffering without the actual knowledge of the active ingredients which give relief and the organisms they fight against. It is on this basis that researchers keep on working on medicine and plants in order to produce/develop the best medicines for physiological uses. [19].

*Senna alata* belongs to the family Fabaceae and is a shrub of 3 – 4 m at all. It is commonly called candle bush, ringworm plant, craw-craw plant, candle stick *Senna* amongst others. The leaves have been selected and recommended for the treatment of dermatomycotic infections [17]. In Nigeria, the plant is used in the treatment of several infections, which include ringworm, parasitic skin diseases [7,16]. The leaves are reported to be useful in the treatment of convulsion, urinary diseases, gonorrhea, heart failure and purgative [13]. The leaves of the plant is a strong laxative, reduces inflammation, relieves pain, increases urination, perspiration, aids digestion, repels insects, kills bacteria, fungi, candela, parasites and lower blood sugar [7,16,13,10,3,4,15].

Research on synergism is very limited and few studies have been reported [11,1]. Thus in this study the invitro synergism between extract of *S. alata* and anti microbial drugs against the five bacteria and five fungi was studied.

Materials and methods

Extraction of Plant Material:

*Senna alata* leaf was collected from Ago-Iwoye and identified at the Herbarium of the Department of Plant Science and Applied Zoology, Olabisi
Onabanjo University, Ago-Iwoye. The leaves of the plant were air dried and triturated in a mechanical mill. Soxhlet apparatus was used for extraction. One litre of 70% ethanol was used to extract 250g of the plant material at 78°C. The filtrate was concentrated on a rotary evaporator at 45°C and the extract was then kept in sterile bottle under refrigerated conditions at 4°C until use.

**Phytochemical Screening:**

Photochemical screening for major constituents was undertaken using quantititative methods as described by Odebiyi and Sofowora [12]. The plant material was screened for the presence of Alkaloids, Tannins, Cardenolides, Anthraquinones, and Saponins.

**Microbiological strains:**

Pure culture of *Staphylococcus aureus*, *Staphylococcus albus*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Penicillium oxalicum*, *Aspergillus tamari*, *Aspergillus niger*, *Fusarium oxysporum* and *Fusarium vacitilus* were obtained from the Department of Medical Microbiology, Ogun State University Teaching Hospital, Sagamu. They were kept in McCartney bottles with slant preparation of nutrients and potato dextrose agar respectively to maintain their growth.

**Antimicrobial Susceptibility Assays:**

Nutrient agar and nutrient broth (Oxoid) were prepared according to the manufactures’ recommendations. The agar-well diffusion method was used for the inoculation of the bacteria. Plates containing 15ml of sterile nutrient agar on 9mm Petri dish each were inoculated with standardized innocula (1.5 x 10^8 cells/ml) [14] using sterile Pasteur pipette. Wells of 5mm diameter were made with cork borer at the centre of each plate and 0.15ml of the plant extract was dispensed into each well.

The extract was allowed to diffuse into the medium for 1 hour at room temperature. This was then incubated for 24 hours at 37°C and after which the zones of growth inhibition were measured and recorded in millimeter. The control was set up in a similar manner with ethanol and commercial antibiotics respectively.

**Antifungal assay:**

Antifungal activity of the extract was tested using the agar dilution method described by Collins *et al* [6]. 250 mg/ml of the extract was prepared and incorporated into potato dextrose agar. The plates were incubated at 25°C for 48 hours and inhibition of growth was noted. The control was set up in a similar manner with ethanol and commercial antifungal drugs respectively.

**Synergism Between Plant Extract and Drugs:**

The broth of cultured bacteria and fungi were spread on nutrient and potato dextrose agar using flooding method. A well sterilized cork borer (5mm) was used to make ‘wells’ in the media. The mixture of different antibiotics (0.4mg/ml) /antifungal drugs (0.4mg/ml) and plant extract were poured into the punched wells. The plates were incubated for 24-36 hours at 37°C and the zones of inhibition were measured and recorded.

**Results and discussion**

Table 1 is the result of the phytochemical screening of *Senna alata*. The plant tested positive to the tests carried out.

Table 2 is the antibacterial activity of ethanolic leaf extract of *S. alata* on some human pathogenic organisms. The result revealed that the inhibitory activity of the extract on *P. mirabilis* was higher than that of the antibiotics used. Ampicillin only had inhibitory effect on *S. aureus* while Streptomycin was active against all the organisms used.

Synergism between the plant and the antibiotic drugs produced higher inhibitory activity on the organism used in this study.

Table 3 is the antifungal activity of *Senna alata* on rome fungi. The result shows that the plant extract and antifungal drugs used had similar inhibitory activity. However, synergism between the plant extract and drugs produced higher inhibitory activity.

**Discussion:**

The ethanol leaf extract of the plant had inhibitory activity against the tested organisms and this supports earlier work of researchers and also justify the use of the plant in treating urinary tract infection caused by *P. mirabilis*, *K. pneumonia*, *P. aeruginosa* and *S. aureus* [15,8,5]. The result also corroborate the use of the plants in treating pimples, boils, ringworm and other skin diseases [17,5]. The result of this work is in agreement with Ibrahim and Osman [10] who showed that the ethanolic extract of *C. alata* leaves exhibited high activity against dermatophytic fungi. Hence supporting the use of the plant in treating dermatophytic diseases caused by *S. aureus*.

The study of the antibiotics on the organisms revealed that the protein synthesis inhibitory drugs (Gentamycin, Erythromycin, Tetracycline, Chloramphenicol and Streptomycin) were more active on the tested organized than the two other classes of...
Table 1: Phytochemical Screening of Senna alata

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<tr>
<th></th>
<th>Alkaloid</th>
<th>Cardenolides</th>
<th>Anthraquinones</th>
<th>Saponins</th>
<th>Tannins</th>
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<td>Senna alata</td>
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Table 2: Antibacterial activity of Ethanol Leaf Extract of Senna alata on Some pathogenic organisms

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<tr>
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<th>S. aureus</th>
<th>S. albus</th>
<th>K. pneumonia</th>
<th>P. aeruginosa</th>
<th>Proteus mirabilis</th>
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<tr>
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<td>Gentamycin</td>
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<td>Streptomycin</td>
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<td>Extract + Gentamycin</td>
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<td>Extract + Erythromycin</td>
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<td>Extract + Streptomycin</td>
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Table 3: Antifungal activity of Senna alata on some fungi

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<tr>
<th></th>
<th>R. oryzae</th>
<th>P. oxalicum</th>
<th>A. tarnarii</th>
<th>A. niger</th>
<th>F. oxysporum</th>
<th>E. vacitilus</th>
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<td>Senna alata</td>
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<td>Flagyl</td>
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<td>Extract + Ciposil</td>
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<td>Extract + Flagyl</td>
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Low inhibition (+), Moderate inhibition (++), High inhibition (+++), Very high inhibition (++++)

antibiotics (cell wall inhibitor and nucleic acid inhibitor). The synergism effect of plant extracts and antibiotics drugs from this study supports the use of drug combinations in treating diseases because some organism are now known to be resistance to antibiotics [2].

The result of the phytochemical screening of the plant showed the presence of alkaloids, cardenolides, saponins, tannins and anthraquinones. Ogunti et al [13] reported that Senna alata has anthraquinones which is the principal laxative constituent hence justifies its ethnomedical use as a purgative plant. Rio tan [18] also reported that the plant has tannins with some other contents which make the plant to be nearly as potent as standard antibiotics. The presence of tannins and cardenolides in plants are known to show curative activity against several pathogens and therefore could explain its use traditionally for the treatment of wide array of illnesses [9,19].

This work has justified the ethnomedical uses of this plant due to its chemical constituents and also encourages the combination of drugs since synergism in this study produced higher inhibitory effect on the organisms tested.

References