

## Activities Of Aqueous Leaf Extracts Of *Senna alata* Linn On Fungal Rot Microbes

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**Abstract:** Effects of aqueous leaf extracts of *Senna alata* was assessed using different concentrations. The extracts were antagonistic on the mycelia growth of *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus glaucus* and *Botryodiplodia theobromae*. The inhibitory effects of hot and cold water leaf extracts of *S. alata* on the fungal rot organisms differed significantly ( $p < 0.05$ ) from the untreated control and standard. The efficacy of both cold and hot water leaf extracts of *S. alata* on the rot organisms increased with the increase in concentration. Hot water extracts of *S. alata* at 10g/100ml exhibited the least inhibitory effect of 13.33% on *A. glaucus* while hot water extract was completely (100%) fungicidal on *A. flavus* at 50g/100ml. Similarly, cold water extracts of *S. alata* at 30-50g/100ml also completely inhibited *A. glaucus* and *A. flavus*.

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### Introduction

In Nigeria, *S. alata* is useful in curing diseases/health challenges like ringworm, parasitic skin diseases, venereal diseases (syphilis and gonorrhoea), stomach problems, fever, asthma, heart failure, oedema, convulsion, snake bite as purgative and abdominal pains (Sule *et al.*, 2011).

### Materials and Methods

#### Collection of infected and healthy yam isolates.

Rotten yam tubers with signs of softness were randomly procured locally from Oja-Oba market in Ado-Ekiti. Five samples were collected from each selling point, placed and conveyed to the laboratory for isolation.

#### Isolation of fungi

Diseased portions of the yam tubers were cut under aseptic condition into small bits into a sterile dish with the aid of sterile scissors (Fawole and Oso, 2004). The cut diseased and sterilized bits placed on solidified PDA. The plates were then incubated at room temperature ( $28 \pm 20^\circ\text{C}$ ) in the dark for 72 hours. The emerged fungal colonies were sub-cultured into fresh medium until pure culture was obtained. Little portion of the hyphae containing spores was placed on sterile glass slide stained with lactophenol-cotton-blue and examined under the microscope for fungal structures. The morphology and cultural characteristics observed were compared with structures in (Snowdon, 1990).

#### Pathogenicity Test

Disease-free yam tubers were surface sterilized with 0.1M of mercuric chloride ( $\text{HgCl}_2$ ) for 5 minute and washed in three changes of distilled water. A 5ml

cork borer was punched to a depth of 4mm into the uninfected yam tubers and the bored tissues were removed. A five

(5) mm diameter disc of pure culture was cut and replaced back. The wound was covered with paraffin wax (Fawole and Oso, 2004). In control, sterile agar disc replaced the inoculums. The inoculated yam tubers were placed in four (4) replications at room temperature ( $28 \pm 20^\circ\text{C}$ ) under sterile condition.

#### Preparation of plant extracts.

*S. alata* (leaves) were air dried and ground separately. Thirty grams of each sample was added to 15ml of distilled water in separate flasks. This was vigorously stirred in an orbital shaker and left to stand for 24 hrs. The sample was filtered with Whatman filter paper (No 1) and the filtrate used as extract.

#### Effect of plant extract on fungal growth.

Varied percentages of extract solutions were poured into separate flask containing sterilized potato dextrose broth. Different fungi were inoculated into separate flasks and incubated at room temperature ( $28 \pm 20^\circ\text{C}$ ) for seven (5) days. Mycelia from broths were taken onto pre-weighed filter paper, oven dried at 85% and reweighed until a constant weight was obtained. For the control, no plant extract was added to the broth. The effect of extract on mycelia extension of the fungi was determined by placing one disc (3mm diameter) of 5-days-old culture of the pathogens in each of five Petri dishes (1cm diameter) with 170ml of PDA medium and 3ml of leaf extract (Amadioha and Obi, 1999). The control experiments were set up with 3ml of sterile distilled water. Five replication plates of leaf extract agar per isolate were incubated at room temperature ( $28 \pm 2^\circ\text{C}$ ) for 7 days.

Mycelia extension of the cultured isolates was determined by measuring culture along two diameters. Mycelia growth inhibition was taken as growth of the fungus on the leaf extract agar expressed in percentage.

## Results

### Effects of aqueous leaf extracts (hot and cold) of *S. alata* on mycelial growth of fungal rot organisms

The antimycotic effects of both cold and hot water extracts of *S. alata* on the fungal pathogens are presented in Table 1. Hot water leaf extracts of *S. alata* at 10-50g/100ml was inhibitive on *B. theobromae* ranging between 56.67% and 94.30% Hot water leaf extract of *S. alata* reduced radial growth of *B. theobromae* at 50g/100ml by 64.87%, followed by antimycotic effects of 88.56%, 82.87% and 57.00% at 40g, 30g and 20g/100ml on *B. theobromae* respectively. Cold water leaf extract of *S. alata* at 10-50g/100ml had the antifungal effects on *B. theobromae* that ranged from 60.00% to 99.70%. The radial growth of *B. theobromae* (99.70%) was most reduced by cold water leaf extract of *S. alata* at 50g/100ml. Also, cold water leaf extracts of *S. alata* at 40g and 30g/100ml reduced the mycelial growth of *B. theobromae* by 91.83% and 89.40% respectively, followed by cold water leaf extract of *S. alata* at 20g/100ml, with biocidal effect of 85.70% on *B. theobromae*.

Hot water leaf extracts of *S. alata* at 10-50g/100ml showed profound antifungal effects on *A. flavus* ranging between 64.87% and 100% Hot water leaf extract of *S. alata* at 50g/100ml was most antimicrobial on *A. flavus* (100%), followed by antifungal effects of 96.67%, 93.33% and 87.67% by hot water leaf extracts of *S. alata* at 40g, 30g and 20g/100ml. Cold water leaf extracts of *S. alata* at 10-50g/100ml had antimycotic effects on the fungal pathogens that ranged from 90.40% to 100%. Cold water leaf extracts of *S. alata* at 30-50g/100ml were

most fungitoxic on *A. flavus*, evoking absolute value of 100%, followed by cold water leaf extract of *S. alata* at 20g/100ml, eliciting 90.97% inhibition on *A. flavus*, while antimycotic effect of 90.40% was exhibited by cold water extract of *S. alata* at 10g/100ml on *A. flavus*.

Hot water leaf extracts of *S. alata* at 10-50g/100ml exhibited high microbecidal effects on *A. glaucus* ranging from 13.33% to 90.00%. The most phytotoxic effect of 90.00% was recorded against *A. glaucus* by hot water leaf extract of *S. alata* at 50g/100ml, followed by antimycelial effects of 89.10% and 80.77% as exhibited by hot water leaf extracts of *S. alata* at 40g and 30g/100ml on *A. glaucus* respectively, while hot water leaf extract of *S. alata* at 20g/100ml induced inhibitory effect on *A. glaucus* (63.90%). Cold water leaf extracts of *S. alata* at 10-50g /100ml elicited high fungitoxic effects on *A. glaucus* ranging from 77.13% to 100%. Antifungal activities of cold water extracts of *S. alata* at 30-50g/100ml was highest on *A. glaucus* (100%), followed by exhibition of inhibition value of 85.70% by cold water leaf extract of *S. alata* at 20g/100ml against *A. glaucus*. Hot water leaf extracts of *S. alata* at 10-50g /100ml had antimycotic effects on *A. niger* ranging between 52.50% and 97.50%. Hot water leaf extract of *S. alata* at 50g/100ml had biocidal capacity of 97.50% on *A. niger*, followed by hot water leaf extracts of *S. alata* at 40g, 30g and 20g/100ml, inducing antimicrobial effects of 90.37%, 82.93% and 73.83% on *A. niger*. Cold water leaf extract of *S. alata* at 10-50g/100ml had high fungicidal effects on *A. niger* ranging from 76.70% to 95.77%. Cold water leaf extract of *S. alata* at 50g/100ml caused highest antimycelial effect of 95.77% on *A. niger*. Cold water leaf extracts of *S. alata* at both 40g and 30g/100ml were inhibitive on *A. niger* by 92.7 70% and 91.70% respectively, followed by exhibition of antimicrobial effect of 89.20% by cold water leaf extract of *S. alata* at 20g/100ml on *A. niger*.

Table 1: Effect of aqueous extract (hot and cold) of *S. alata* on the inhibition (%) of radial mycelial growth of fungal rot organisms

water extracts (g/100ml)	inhibition of radial mycelial growth (%)								
	<i>A. flavus</i>			<i>A. glaucus</i>			<i>A. niger</i>		
	hot	cold	hot	cold	hot	cold	hot	cold	<i>B. theobromae</i>
10	56.67 <sup>d</sup>	60.00 <sup>e</sup>	64.87 <sup>d</sup>	90.40 <sup>b</sup>	13.33 <sup>d</sup>	77.13 <sup>c</sup>	52.50 <sup>d</sup>	76.70 <sup>c</sup>	
20	57.00 <sup>d</sup>	85.70 <sup>d</sup>	87.67 <sup>c</sup>	90.97 <sup>b</sup>	63.90 <sup>c</sup>	85.70 <sup>b</sup>	73.83 <sup>c</sup>	89.20 <sup>b</sup>	
30	82.87 <sup>c</sup>	89.40 <sup>bc</sup>	93.33 <sup>b</sup>	100.00 <sup>a</sup>	80.77 <sup>b</sup>	100.00 <sup>a</sup>	82.93 <sup>b</sup>	91.70 <sup>ab</sup>	
40	88.56 <sup>b</sup>	91.83 <sup>b</sup>	96.67 <sup>ab</sup>	100.00 <sup>a</sup>	89.10 <sup>a</sup>	100.00 <sup>a</sup>	90.37 <sup>ab</sup>	92.70 <sup>ab</sup>	
50	94.30 <sup>a</sup>	99.70 <sup>a</sup>	100.00 <sup>a</sup>	100.00 <sup>a</sup>	90.00 <sup>a</sup>	100.00 <sup>a</sup>	97.50 <sup>a</sup>	95.77 <sup>a</sup>	
Standard	40.70 <sup>c</sup>	40.70 <sup>f</sup>	30.20 <sup>c</sup>	30.20 <sup>c</sup>	60.50 <sup>c</sup>	60.50 <sup>d</sup>	50.00 <sup>d</sup>	50.00 <sup>d</sup>	
Control	00.00 <sup>f</sup>	00.00 <sup>g</sup>	00.00 <sup>f</sup>	00.00 <sup>d</sup>	00.00 <sup>c</sup>	00.00 <sup>f</sup>	00.00 <sup>c</sup>	00.00 <sup>c</sup>	

Mean with the same letter(s) within a column are not significantly different ( $p < 0.05$ ) according to the Duncan Multiple Range

## Discussion

The antimicrobial effects of *S. alata* in this study was also significant to the report by Nwachukwu and Osuji (2008) on the use of *S. alata* as an antifungal agent against *Scelerotium rolfsii* that causes cocoyam (*Xanthosoma sagittifolium* L) rot cormel in storage, and that of Suleiman *et al.*, (2008) on the effect of *S. alata* on spot fungus (*Fusarium* sp) isolated from cowpea (*Vigna unguiculata*). This study showed that hot and cold water extract of *S. alata* were absolutely antifungal on *A. flavus*. Similarly, the phytotoxic effect of both cold water and ethanol extract of *S. alata* were absolute on *A. glaucus*. An important characteristic of plant extracts and their components is their hydrophobicity, which enable them to partition the lipids of the fungal cell membrane and mitochondria, disturbing the cell structures and rendering them more permeable (Joshi *et al.*, 2011). This might be the cause of antimycotic actions of both the aqueous extract of *S. alata* in this study. Also, the phytotoxicity of plants extracts in this study might also be against protein synthesis machinery or against an enzyme involved in nucleic acid synthesis of the rot pathogens.

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