

Effect of aqueous leaf extracts on a spot fungus (*Fusarium sp*) isolated from cowpea

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ABSTRACT

Aqueous leaf extracts were obtained from the matured leaves of three medicinal plants: namely, bitter leaf (*Vernonia amygdalina*), *Senna alata*, and lemon grass (*Cymbopogon citratus*). They were evaluated for their antifungal activity over *Fusarium sp*, a pathogenic spot fungus of many economic crops. Vegetative growth values for *Fusarium sp* at 1.5%, 2.0%, 2.5%, 3.0% and 3.5 % concentrations were generally low compared with the control; complete inhibition of fungal mycelial growth was exhibited with 3.0% and 3.5% concentrations of *Senna alata* extract. A statistical evaluation of variance showed a significant difference between mycelial radial growths values recorded on the various plant extracts concentrations used compared with the control. Plant extracts readily available and affordable and environmentally friendly in the control of *Fusarium sp*. Plant extracts could serve as a reference material in further studies involving other pathogens of economic crops.

INTRODUCTION

Fusarium is a pathogenic fungus responsible for a number of spot diseases of numerous staple crops (Agrios, 1988). Ogundana *et al* (1970) reported *Fusarium moniliforme* and *F. pupae* as one of the fungi responsible for rot of stored yam tuber. *Fusarium* was also reported by Suleiman and Odebode (2003), as one of the fungi responsible for an outbreak of spot diseases of some ornamental plants at university of Ibadan in 1994.

Hill and Waller (1999), reported *Fusarium solani*, a soil – borne fungus, as responsible for a root rot and wilt of coffee growing under poor conditions. The ability of *Fusarium* to survive a wide range of environmental condition as *Conidia* on plant debris in the soil or on treated seed was reported as the reason for its wide tropical, subtropical and warm temperate biogeography distribution (Zillinsky, 1983).

Bitter leaf (*Vernonia amygdalina*), *Senna alata* and lemon grass (*Cymbopogon citratus*) in the families Asteraceae, Fabaceae and Poaceae respectively are widely grown and used in different parts of Nigeria mainly for food, ornamental plants and in traditional health care services (Oliver – Bever, 1986; Sofowora, 1982, Iwu, 1993).

Senna alata was known by Egyptians and Saudi Arabia for the dry leaves and pods used for constipation. Leaves, root, bark, fruit and seeds of bitter leaf were used for stomach tonic and are known in Africans and British countries (Encyclopedia of Medicinal Plants vol. 1, 2002).

Recent reports shows that there is increase in the use of plants parts (leaf, root, stem and bark) in the control of fungal disease contrary to their ancient use in healing ailments by traditional medicine practitioners in Nigeria and other African countries (Akinpelu, 1999; Bilgram *et al*, 1979; Trease and Evan, 1989; Wee Yeow Chin, 1992). Just as the divine nature is wonderful so are *Senna alata*, bitter leaf and lemon grass. When processed into lotion for skin, soap, syrups, drugs and there seems or no doubt that in raw or well-prepared states, those plants can work wonders Lewington (1990).

According to Ria Tan (2001), leaves, seeds and fruits are used to treat fungal infection such as ringworms, eczema and various plant diseases. However, Wee Yeow Chin (1992) stated that those plants have effective broad-spectrum anti-fungal activities in laboratory studies over the years. The effectiveness has been confirmed by modern scientific studies.

Due to identifiable problems (e.g. chemical residues, biodegradation, phytotoxicity, pollution, etc) associated with chemical control strategies; alternative control methods are employed. Also, since *Fusarium* survives adverse environmental conditions and develops adaptive resistance to fungicides which are used for its control. It is also attempts do find cheaper, environment friendly means of controlling the rot fungus using some medicinal plants. The result could add to methods of control used by farmers, thereby reducing reliance on fungicides that are reported to predicate long term harmful consequences on environment, man and other wildlife.

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MATERIALS AND METHODS

Based on previous biological activities, Bitter leaf (*Vernonia amygdalina*), lemon grass (*Cymbopogon citratus*) and *Senna alata* were harvested from Anyigba and Dekina towns for this study. The fungus (*Fusarium*) was isolated from infected leaves of cowpea from a garden at Dekina Avenue, Kogi State University, Anyigba.

Fresh matured leaves from each of the plants were plucked, thoroughly rinsed in running tap water before they were air-dried in the laboratory and pounded in a mortar to facilitate extraction.

Hot water extraction was obtained by infusing 1.5, 2.0, 2.5, 3.0 and 3.5g each of bitter leaf, *Senna alata* and lemon grass powder separately in 100 ml of sterile distilled water; using a 250 ml Erlenmeyer's flask in a water bath set at 100°C for 30 minutes. This was allowed to cool and the crude extract obtained from the infusion by filtration through four folds of sterile Cheese cloth, to give concentrations of 1.5% 2.0%, 2.5% 3.0% and 3.5% respectively.

Each of the extract concentrations was kept aseptically in 150 ml conical flasks. The contents in the flasks were exposed to U/V light for further sterilization.

Thirty-nine grams (39g) of Potato Dextrose agar was dissolved in 1liter of distilled water and the medium was autoclaved at 1.02 kg /

cm³ pressure for 15 minutes. Six millilitre (0.1%) of streptomycin was added to the 1 litre of the sterilized media just, before pouring into Petri-dishes, to prevent the growth of bacteria and allowed to cool and solidify, The fungicidal properties of each plant extract were tested on the mycelia growth of the isolated fungus by growing it on the PDA medium containing 1 ml of 1.5% 2.0%, 2.5% 3.0% and 3.5% of each plant extract separately spread on the surface of the solidified PDA Petri-dishes. A disc of 4 mm diameter (using a sterile cork-borer) of each pure culture of the isolated fungi was placed on the thin film formed on the PDA just at point of intersection of two lines at the bottom of each Petri-dish. Three plates were treated with extract of each plant. The control experiments had distilled water in place of plant extracts respectively; the treatments and control were incubated for five days at room temperature (27 + 2⁰c).

RESULTS

The three plant extracts showed fungicidal properties, with *S. alata* extracts completely suppressing, fungal mycelial growth at 3.0 and 3.5% concentrations(0.00±1.32 and 0.00±1.32) respectively; more than the bitter leaf extract (1.34±1.85 , 1.06±1.50) and the lime leaf extract (2.14±2.35 , 1.92±2.85) respectively.

Table 1. Inhibitory effect of aqueous leaf extracts from bitter leaf, *Senna alata* and lemon grass on the mycelia growth of *Fusarium* sp at various concentrations

Concentration. (%)	BLEM* (mm)	SLEM* (mm)	LLEM* (mm)
1.5	4.06 ± 3.33	3.70 ± 2.97	4.42 ± 3.38
2.0	3.00 ± 2.82	3.06 ± 3.14	3.52 ± 2.83
2.5	1.78 ± 2.27	1.26 ± 1.74	2.36 ± 2.34
3.0	1.34 ± 1.85	0.00 ± 1.32	2.14 ± 2.35
3.5	1.06 ± 1.50	0.00 ± 1.32	1.92 ± 2.85
Control (0.0)	45	45	45

Key: BLEM – Bitter leaf extract media

SLEM – *Senna alata* leaf extract media

LLEM – Lime leaf extract media

* – Significant at 5% and 1%

From the results, it was observed that all the aqueous leaf extracts used for the study recorded retardation or inhibition of mycelial growth of *Fusarium* *in vitro*. Akinpelu (1999), reported the water-soluble antifungal principles in the plants as being responsible for the anti-fungal activities; also, Olufolaji. (1999) used aqueous plant extracts in the control of wet rot of *Amaranthus* sp. caused by *Choanephora cocurbitarium*

Looking at the table 1, there is substantial variation in the level of radial mycelial growth values of *Fusarium* in lemon grass extract and that of *Senna alata* at 3.0% and 3.5% concentrations. There was a significant difference in statistical test at (p < 0.05) between mycelial radial growths values recorded on the various plant extracts concentrations used compared with the control. This suggest that there is difference in the water soluble antifungal element in the respective leaves extracts as reported by Olivers-Bever (1988) Akinpelu, (1999); and Sofowora, (1982). From the foregoing, bitter leaf, *Senna alata* and lemon grass possess antifungal elements that inhibit *Fusarium* mycelial growth using 3.0% and 3.5% plant extract concentrations.

In view of this remarkable report, one could confidently suggest that *Senna alata*, bitter leaf and lemon grass used as medicinal herb in the controlling of certain microbial causative agents.

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