

BIOEFFICACY OF PLANT EXTRACTS ON *FUSARIUM OXYSPORUM* F.SP.CUBENSE CAUSING PANAMA WILT OF BANANA

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ABSTRACT

Wilt is an important disease of banana causing significant reduction in yield. In present study, the pathogenic fungus was isolated from pseudo stem of infected plants of banana. The in vitro efficacy of different plant extracts viz., *Azardiachta indica*, *Artemessia annua*, *Eucalyptus globulus*, and *Ocimum sanctum* were tested to manage panama wilt of banana. Different concentrations 5, 10, 15 and 20% of plant extracts were used in the study. All the plant extracts showed significant reduction in the growth of pathogen. Among the different extracts 20% of *Azardiachta indica* was found most effective followed by *Eucalyptus globulus*, *Artemessia annua* and *Ocimum sanctum*.

KEY WORDS

Plant extract, panama wilt, *Musa indica*.

INTRODUCTION

Banana (*Musa indica*) is widely grown in India with great socio-economic significance, interwoven in the heritage of the country. It is fourth important food crop in terms of gross value exceeded only by paddy, wheat and milk products. It is also a desert fruit for millions apart from a staple food owing to its rich and easily digestible carbohydrates with a calorific value of 67-137/100 g fruit. India is the largest producer of banana in the world. In India, banana contributes to 37.30 % of the total fruit production. Besides this banana plantation suffers from many serious diseases but among that *Fusarium* wilt or panama wilt disease is very serious. Effective and efficient management of crop disease is generally achieved by the use of synthetic pesticides [2]. Due to increased awareness about the risks involved in use of pesticides, much attention is being focused on the alternative methods of pathogen control. The continuous use of chemical fungicides causes residual effects and develops resistant races to the chemical fungicides. So now it is

necessary to pay attention for the methods which are ecologically, friendly, safe and specific for pathogens. The chemical fungicides have posed a serious threat to human health and some of them already been proved to be either mutagenic, carcinogenic or tetratogenic. Keeping in view the drawback of chemical management of plant diseases, the use of plant extracts in the management of plant diseases is gaining importance. So in the present investigation different plant extracts viz., *Azardiachta indica*, *Artemessia annua*, *Eucalyptus globulus*, and *Ocimum sanctum* were tested to manage panama wilt of banana. Considering the severe wilting of banana observed in and around Gaganbawada Taluka, objectives of this research were made to evaluate locally available plant extracts to control Panama Wilt of Banana caused by *Fusarium oxysporum* f.sp. *cubense*.

MATERIALS AND METHODS

The pseudo stems were collected from infected plants showing characteristic symptoms of wilt, from the field from Tisangi, Taluka: Gaganbawada. The infected plant parts were cut in to pieces (2-3 mm), surface sterilized with 0.1% mercuric chloride solution for 30 seconds. The isolation was made from pseudo stems of wilted banana plants. The infected portion from xylem region showing brick red to brown colour is washed three times with sterilized distilled water and then were transferred aseptically on Czapek Dox Agar (CDA) media. The inoculated plates were incubated at room temperature ($27\pm 2^\circ\text{C}$) and observations were made daily for emergence of culture.

Plants used in the present study are, *Azardiachta indica* which belongs to the family Meliaceae commonly known as "neem". The plant is found throughout India and its derivatives are of great use in agriculture, health, medicines, cosmetics and many more. The leaves, bark, seed and flowers are bitter, astringent, acrid, depurative, refrigerant, demulcent, insecticidal, expectorant liver tonic etc. *Ocimum sanctum*, commonly known as "tulsi" belongs to the family Lamiaceae found throughout India. The plant is much erect, branched, and softly pubescent undershrub, 30-60 cm high with red or purple sub-quadrangular branches, leaves simple, opposite, elliptic, whole plant is used as medicine for various diseases. Tulsi leaves contain a bright yellow volatile oil, which is reported to posses antibacterial properties and acts as an insecticide. *Eucalyptus globules* commonly known as "eucalyptus", which belongs to the family Myrtaceae, one of the reputed fast growing trees of the world. Its oil is acrid, bitter, astringent and insect repellent. *Artemisia annua* belonging to family Astereceae is a small herbaceous plant and commonly called as Wormwood. It is used against diabetes and to destroy the eggs of *Ascaris*. The plant has got insecticidal and antifungal properties.

The extracts are prepared from leaves, which are used as antifungal. Fresh leaves were washed through under tap water followed by sterilized water, the leaves were air dried and were grinded with the help of pestle and mortar by taking (1:1 w/v) one gram of

extract was added in 1 ml distilled water separately for each plant extract and filtered through Muslin cloth and 100% plant extract solution was prepared. The extracts were poured in the flasks plugged with cotton and heated at 100°C for 10 minutes to avoid contamination [4]. The plant extracts of *Azardiachta indica*, *Artemisia annua*, *Eucalyptus globules* and *Ocimum sanctum* were used by food poisoning technique [6]. Different concentrations of plant extracts (5, 10, 15, and 20%) were incorporated to Czapek Dox Agar medium for inoculation of the test pathogen in sterilized petridishes. The isolated pathogen was grown on CzapekDox Agar and a disk of 4 mm was taken with the help of cork borer and it was placed aseptically at the center of petridishes (keeping upside down) containing different concentration of the poisoned medium and incubated at $27\pm 2^\circ\text{C}$ for 6 days. Radial growth (cm) of fungus was measured after inoculation till 6 days at an interval of 24 h. The Data recorded during the course of investigation has been subjected to three-way classification. The conclusion was drawn on the basis of analysis of variance. The calculated value of F was compared with table value of F at 5% levels of significance for an appropriate degree of freedom.

RESULTS

The leaf extracts were prepared in distilled water at 5, 10, 15 and 20 % concentration and its effect was studied. Neem leaf extract inhibited the growth of fungus in all treatments within six days after inoculation (**Table 1**). The extracts at 20%, concentration were effective in reducing growth (1.45 cm) as compared to as compared to T_3 , T_2 , T_1 and control T_0 . *Adhathoda vasica* extract inhibited the fungal growth in all treatments and minimum growth was recorded in T_4 20% (1.51 cm) as compared untreated control. Results obtained with *Eucalyptus globulu* sleaf extract on radial growth of *Fusarium Oxysporum f.sp.cubense* indicated that it was effective in reducing growth of fungus (20%). *Artemisia annua* inhibited the growth of fungus in all concentration. The maximum mycelial growth was observed in control agents (untreated).

Table 1: Efficacy of plant extracts against *Fusarium oxysporum f.sp.cubense*.

Conc. of treatments	<i>Azardiachta indica</i>	<i>Eucalyptus globules</i>	<i>Artemisia annua</i>	<i>Ocimum sanctum</i>
T ₀ (control)	3.10	3.40	3.27	3.41
T ₁ (5%)	2.62	3.01	2.88	2.87
T ₂ (10%)	2.26	2.70	2.52	2.42
T ₃ (15%)	2.05	2.07	2.21	2.23
T ₄ (20%)	1.45	1.81	1.89	1.91
CD at 5%	0.23	0.12	0.15	0.17
SE	0.11	0.06	0.08	0.19

DISCUSSION

The inhibitory effect of the plant extracts might be attributed to the presence of antifungal compounds viz., Azadirachtin in *Azardiachta indica*, Artemessium in *Artemessia annua*, Carotenes in *Ocimum sanctum* and Eucalyptol in *Eucalyptus globulus*. Antifungal properties of *Lantana camara* and *Ocimum sanctum* against *Drechslera sorokiniana* were also reported [9]. However, extracts of *Ocimum sanctum*(20%) was found least effective in inhibition of growth (1.91 cm). *Fusarium* is one of the common soil inhabiting plant pathogenic fungus which causes evident diseases such as wilt of banana, pigeon pea, guava, gram, tomato etc. Several others species of this genus are responsible for huge loses to their respective host crop. Natural chemicals and their use for integrated protection is one of the focuses of research workers all over the world [2]. These results of the present investigation are clear indication for the potential of plant extracts to control fungal pathogens and these compounds can be used. It is evident from the results that all the plant extracts significantly inhibited the radial growth of isolated fungus. Amongst the plant extracts used *Azardiachta indica* was found most effective at 20% concentration followed by *Eucalyptus globulus*, *Artemessia annua* and *Ocimum sanctum*. Plant extracts belonging to twelve families [8] and *Prosopis juliflora*[7]were used to control *Fusarium*. An antifungal property of *Polyalthia longifolia* extracts against *Macrophomina phaseolina* has been reported [1]. Aqueous leaf extracts of *Allium sativum*, *Azadirchta indica*, *Eucalyptus globulus*, *Lowsonia inermis* and *Gungellylale* were effective against damping off of chilli(3). Among the alcoholic and aqueous leaf extracts of *Azadirachata indica*, *Polyalthia longifolia*, *Hyptis suaveolens*, *Mentha*

spicata, and *Ocimum sanctum*, the alcoholic and aqueous leaf extract of *Azadirachata indica* proves best in managing soybean rust caused by *Phakopsora pachyrhizi*(5).

Application of these plant extracts which are easily available for controlling Panama wilt of banana are non-pollutive, cost effective non hazardous and do not disturb ecological balance. Thus it can be recommended that the use of *Azardiachta indica*, *Eucalyptus globulus*, *Artemisia annua*, and *Ocimum sanctum* against *Fusarium oxysporumf.sp.cubense* to give better results as they are biologically based and environmental safe alternatives. It is from the reports that plant extracts and plant essential oils are effective antimicrobial agents for soil born fungi, food spoilage fungi, foliar pathogens and nematodes and do not produce any residual effects.

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