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Utilization of Medicinal Plants to Control Seed Borne Pathogens of Selected Seeds

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ABSTRACT

The aqueous, alcoholic and ethyl acetate extracts of bark of five Terminalia species *(T. alata, T. arjuna, T. bellerica, T. catappa and T. chebula) were tested against five plant pathogenic fungi like Aspergillus flavus, Aspergillus niger, Alternaria brassicicola, Alternaria alternata and Helminthosporium tetramera).* The antifungal activities of all these extracts were determined by paper disc method. Nearly all the extracts were found effective against these fungi. The positive results so obtained were compared with that of the reference standard fungicide (Carbendazim). It was found that most of the extracts were more effective against fungi than the control fungicide.

INTRODUCTION

Many plant extracts and essential oils isolated from plants have been shown to possess biological activity *in vitro* and *in vivo*, which justifies research on plant based medicine focused on the characterization of antimicrobial activity of these plants[1-2]. The presence of antifungal compounds, in higher plants, has long been recognized as an important factor in disease resistance [3]. Such compounds, being biodegradable and selective in their toxicity are considered valuable for controlling some plant diseases e.g., *Sclerotium rolfsii* root rot on barley[4]. Thus the use of medicinal plants in disease treatment and prevention can also be seen as prehistoric and their present use can be supported by the traditional optimization of their application in disease control. These plant extracts are a source of many potent and powerful drugs [5-6]. The antimicrobial activity of medicinal plants evaluated against enteric food borne pathogen[7]. Antibacterial activity of some medicinal plants observed [8].

Almost, all the cultivated crops are infected by one or more seed borne pathogens causing economic losses. The majority of the diseases are caused by fungi. Apart from cultural methods of disease management, chemical control methods are widely used to control the diseases caused by these pathogens.

More use of bactericides and fungicides like organomercurical, carbamates etc, has posed serious problems to human and environmental health[9]. So search for natural bio-degradable source of bactericides and fungicides have always been quest for the researchers for control of bacterial and fungal diseases of plants. Because of the present day public perception on pesticide contamination of foods especially the edible fruits, seeds, vegetables and oils, there is need for development of alternative economical and eco-friendly approaches for bacterial and fungal disease management. We tried to explore the potential of locally available plants against bacteria and fungi causing diseases of plants.

Looking into the wealth of plants in Nanded region , it was thought proper to explore the available plant wealth for their efficacy of their antimicrobial potential. This could provide an alternative to the present day pollution problem of air, soil, water and residual effects of synthetic pesticides. With this view, the present investigation was undertaken to select plant extracts that could be effective in the development of new tools for the control of diseases caused by bacteria and fungi to the plants of economic importance.

MATERIALS AND METHODS

Collection of plant materials

The fruits of *Terminalia alata, T. arjuna, T. bellerica, T. catappa and T. chebula* were collected from Nanded and Parbhani district. The fruits were separated and dried at room temperature. The dried plant parts were milled to a fine powder and stored at room temperature.

Source of microorganisms

The fungi used were *Alternaria brassicicola*, *A. alternata*, *Helminthosporium tetramera*, *Aspergillus flavus* and *A. niger*. These were most common and important disease causing fungi of plants of the region. All these fungi were isolated from their respective host seeds of like jowar, wheat, maize etc, and brought in to pure cultures and maintained on PDA (Potato Dextrose Agar).

Extract preparation

For testing efficacy of plant extracts; aqueous, alcoholic and ethyl acetate extracts of this plant part was prepared. 5 ml of the alcoholic and ethyl acetate extracts were evaporated on water bath under hood and slowly sterile distilled water was added to make up the volume of 5 ml.

Antifungal activity of plant extracts

The paper disc method was used for testing antifungal activity[10]. The medium (25 ml) inoculated with spore suspension of experimental organism was poured into sterilized Petri dishes and left to get at room temperature. Whatman's No. 1 filter paper discs (6 mm dia) were soaked in 0.5 ml aqueous, alcoholic and ethyl acetate extracts as well as a 10 ppm solution of carbendazim (Standard fungicide). The filter paper discs were placed equidistantly on inoculated media. Plates were incubated at room temperature for 72 hours. Three plates were employed per treatment and the average zone of inhibition was recorded.

Statistical analysis

The data were statistically analysed by method suggested by Panse and Sukhatme [11]. All the experiments were done in three replicates.

RESULTS

Fruit extracts

Antifungal activity of aqueous fruit extract

The aqueous fruit extracts of five species of *Terminalia* were tested for their antifungal activity against five pathogenic fungi like *Alternaria brassicicola*, *Alternaria alternata*, *Helminthosporium tetramera*, *Aspergillus flavus* and *Aspergillus niger*. It was found that out of five species, *only T.chebula, T.arjuna* and *T.bellerica* showed antifungal activity but much less than the standard fungicide.

Table No.1: Antifungal activity of solvent aqueous fruit extracts of some species of Terminalia

Name of the plant	Diameter of inhibition zone (mm)				
	A. flavus	***A. niger***	***A.brassicicola***	***A.alternate***	***H.tetramera***
Solvent Aqueous extracts					
Terminalia alata	06	07	04	05	08
T. arjuna	07	08	08	06	07
T. bellerica	08	04	08	06	06
T. catappa	05	06	03	07	05
T. chebula	08	08	05	05	08
Control (Carbendazim)	20	21	19	18	20
SE ±	0.65	0.75	0.35	0.39	0.62
CD at 5%	1.99	2.31	1.11	1.22	1.95

Table No.2: Antifungal activity of solvent alcohol fruit extracts of some species of Terminalia

Name of the plant	Diameter of inhibition zone (mm)				
	A.flavus	***A.niger***	***A.brassicicola***	***A.brassicicola***	***H.tetramera***
Solvent Alcohol extracts					
Terminalia alata	13	13	13	12	10
T. arjuna	14	15	14	12	10
T. bellerica	10	12	13	10	11
T. catappa	12	12	13	10	12
T. chebula	10	11	11	10	11
Control (Carbendazim)	20	21	19	18	20
SE ±	0.94	0.65	0.36	0.67	0.82
CD at 5%	2.98	2.07	1.13	2.12	2.61

Table No.3: Antifungal activity of solvent ethyl acetate fruit extracts of some species of Terminalia

Name of the plant	Diameter of inhibition zone (mm)				
	A.flavus	*A.niger*	*A.brassicicola*	*A.brassicicola*	*H.tetramera*
Solvent Ethyl acetate extracts					
Terminalia alata	12	12	10	11	10
T. arjuna	14	13	14	13	12
T. bellerica	11	12	11	10	09
T. catappa	10	11	12	12	10
T. chebula	11	12	10	10	10
Control (Carbendazim)	20	21	19	18	20
SE ±	0.64	0.85	0.59	0.80	0.85
CD at 5%	2.03	2.68	1.87	2.53	2.69

Antifungal activity of alcoholic fruit extract

Alcoholic fruit extract of all *Terminalia* species showed antifungal activity against all test fungi. Maximum fungicidal activity was recorded by *T.arjuna.* Fruit extracts of all test plant showed less fungicidal activity than control fungicide used.

Antifungal activity of ethyl acetate fruit extract

Ethyl acetate fruit extracts of *T.arjuna* was shown 14 mm zone of inhibition against *A.brassicicola* and *A.flavus*. *T.alata*, *T.arjuna, T.bellerica*, *T.catappa* and *T.chebula* ethyl acetate fruit extract showed less but notable fungicidal activity than control fungicide for all test fungi.

DISCUSSION

Present results showed that antifungal activity of all five plants tested were recordable with plant pathogenic fungi (Table No.2.) i.e. *A.flavus, A.niger, A.brassicicola, A.alternata* and *H.tetramera.* There plant pathogens were inhibited by the extracts of fruits extracts of all five plants. Antifungal activity of the extracts of *T.arjuna* was recorded higher than other plants. Similar study was also recorded by [12].

The antifungal activities of the fruits varied distinctly in *T.alata*, *T.arjuna, T.bellerica, T.catappa* and *T.chebula* plants.

This study is agreement with the work of [13]. Generally in all the plants the activity of aqueous fruit extracts were relatively less than the activity of other solvent extracts. Earlier [14-16] reported antifungal activity of alcoholic plant extracts against fungal pathogens.

CONCLUSION

It is concluded that antifungal activity of fruit extracts of *T. alata*, *T. arjuna*, *T. bellerica*, *T. catappa* and *T. chebula* and its active constituents would be helpful in treating various kinds of plant diseases and seed borne diseases. The low number of papers that have appeared to work on screening of antifungal activity as compared to work on antibacterial activity. These results may contribute to a resolution of these difficulties.

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