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RESEARCH ARTICLE

PATHOLOGY

ANTIFUNGAL ACTIVITY OF MANGROVE BARK.

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ABSTRACT

In vitro antifungal potential of the methanolic extract of bark of seven mangroves was assayed by employing the food poisoning method against plant pathogenic fungi *Alternaria alternata* and *Fusarium moniliforme.* Among these barks the methanol extract of *Agiceras corniculatum* showed maximum inhibition (56%) of *Alternaria alternata* and extract of *Bruguiera gymnorrhiza* exhibited maximum inhibition (57%) of *Fusarium moniliforme.* The result of this study indicate that extract of mangrove bark have potent antifungal activity which is concentration dependent.

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KEYWORDS

Antifungal activity, Mangrove bark, *Alternaria alternata*, *Fusarium moniliforme.*

INTRODUCTION

For the quick and effective management of plant diseases and microbial contaminations in several agricultural commodities, synthetic pesticides and fungicides are commonly employed [1]. However uncontrolled application of these chemicals has caused health hazards in animals and humans due to their residual toxicity. It was found that hardly 0.1% of the Agrochemicals used in crop production reaches to target pest and leaving the remaining 99.9% to the environment to cause hazards to non target organisms including human being [2]. In India, every year near about 35,000-40,000 tons of hazardous chemicals are spread on the crops which cause cancer and some times death [3]. Recently a majority of synthetic pesticides have been banned in western countries due to their undesirable problems [4]. Inspite of use of all available means of plant protection, about 1/3 of the yearly harvest of the world is destroyed by pathogenic fungi and loss due to this is expected to be nearly $ 300 billion per year [5] . so there is an urgent need for the management of pathogenic microorganisms. Green plants posses the broad spectrum of synthetic activity and have been the source of many useful compounds [6]. Biopesticides have been suggested as an effective substitute for chemicals [7]. The screening and testing of efficacy of these mangrove plants' based sources has an alternative ecofriendly approach to control the phytopathogens such as *A. alternata* and *F. moniliformae*. *A. alternata* causes early blight of potato, moudy core in red apple, brown leaf spot disease in Croton, leaf blight in cucurbits and causes infections to seeds of sunflower also forms fever plump seeds plants. *F. moniliforme* causes Bakane disease of rice, head blight scab, root rot of wheat, cob and root rot of maize and twisted top of sugarcane. Thus these fungi reduce the yield and quality of many economically important plants. In the light of above observations an attempt has been made to evaluate antifungal property of mangrove bark extracts against *A. alternata* (Fr.) and *F. moniliforme* Sheldon.

MATERIAL AND METHOD

The bark samples of seven mangrove species *A. corniculatum* (Blanco), *Avicennia officinalis* (L), .*B. gymnorrhiza* (Lumk), *Cynometra iripa* (Kostel), *Lumnitzera racemosa* (Willd), *Sonneratia alba* (Smith) and *Rhizophora mucronata* (Pior) proproot were collected from esturies of Sindhudurga and Ratnagiri Districts of Maharashtra.

The materials were initially air dried under shade, then in oven and powdered. Twenty gram of dried powder was extracted with 200ml methanol in Soxhlet extractor and preserved at 5° C in air tight bottles. The cultures of *A. alternata* and *F. moniliforme* were collected form the Department of Botany, Shivaji University, Kolhapur. Antifungal activity of methanol extracts was analyzed by food poisoning method [8]. Czapek Dox agar medium plates were prepared containing different concentrations of 0.2, 0.4, 0.6, 0.8, 1.0 and 2.0 ml of methanol bark extract in a 30 ml marked beaker, and the final volume was made to 30 ml with autoclaved Czapek Dox agar.medium. The contents was mixed to homogenize mixture and poured into sterile Petri plates. Scooped out Discs of 8mm fungal culture from actively growing margins in

the plates of 8 days old culture. Disc was placed on the agar surface of prepared plates. Incubated these plates at 25 ± 2°C in incubators. Linear growth was measured at 24hr an interval in mm. percent inhibition was calculated by using formula of Alishataveh and Gdhrib [9].

$$\% \text{ inhibition} = \frac{C - T}{C} \times 100$$

.Where, C = Diameter of fungus colony in control
T = Diameter of Fungus colony in the given extract concentrations

RESULTS AND DISCUSSION

Table

Percent Inhition of Mycelial Growth of A. alternata and F. moniliforme at 2ml Concentration of Methanolic Extracts of Mangrove Bark

Growth after days	% inhibition of Mycelial growth							
	Growth after days	*Aegiceras corniculatum*	*Avicennia officinalis*	*Bruguiera gymnorrhiza*	*Cynometra iripa*	*Lumnitzera racemosa*	*Sonneratia racemosa*	*Rhizophora mucronata*
1.	A	14.00 ± 5.19	11.00 ± 0.00	11.00 ± 0.00	11.00 ± 0.00	11.00 ± 0.00	11.00 ± 0.00	11.00 ± 0.00
	B	31.31 ± 3.50	31.31 ± 3.50	31.31 ± 3.50	31.31 ± 3.50	31.31 ± 3.50	26.26 ± 7.62	26.26 ± 7.62
2.	A	39.29 ± 7.33	39.56 ± 1.87	35.37 ± 2.09	43.60 ± 3.53	4.05 ± 3.51	24.66 ± 9.86	8.09 ± 7.01
	B	55.86 ± 1.14	61.78 ± 1.60	60.27 ± 1.02	51.48 ± 1.28	23.51 ± 2.81	48.55 ± 1.26	54.41 ± 2.18
3.	A	50.51± 5.78	45.94 ± 5.26	42.91 ± 4.28	44.64 ± 1.04	3.17 ± 5.50	38.06 ± 9.03	5.93 ± 5.14
	B	52.62 ± 0.87	66.19 ± 2.25	65.25 ± 0.64	55.81 ± 5.07	4.20 ± 1.78	51.56 ± 1.56	40.02 ± 2.28
4.	A	55.25 ± 4.61	50.48 ± 3.86	43.32 ± 1.33	48.10 ± 3.14	5.96 ± 1.84	32.66 ± 4.63	0.00 ± 0.00
	B	55.18 ± 1.78	29.19 ± 0.57	63.75 ± 4.18	57.60 ± 2.51	3.17 ±2.75	40.80 ± 0.57	39.97 ± 3.17
5.	A	58.08 ± 1.73	48.70 ± 5.48	45.62 ± 5.70	41.50 ± 7.07	2.91 ± 2.86	33.17 ± 9.76	0.00 ± 0.00
	B	55.47 ± 0.50	53.54 ± 0.52	62.40 ± 4.49	54.19 ± 2.01	0.00 ± 0.00	41.94 ± 1.41	41.28 ± 0.97
6.	A	59.52 ± 2.10	48.77 ± 6.73	47.95 ± 5.42	42.60 ± 7.48	0.81 ± 1.40	37.39 ± 6.26	0.00 ± 0.00
	B	55.10 ± 0.86	47.42 ± 0.86	64.57 ± 0.87	51.42 ± 2.76	0.00 ± 0.00	30.85 ± 0.31	29.71 ± 0.69
7.	A	56.59 ± 2.96	39.71 ± 5.37	44.00 ± 2.31	33.70 ± 3.90	0.00 ± 0.00	34.53 ± 0.83	0.00 ± 0.00
	B	55.77 ± 1.11	45.71 ± 3.42	56.79 ± 1.36	47.74 ± 1.28	0.00 ± 0.00	33.66 ± 0.57	27.62 ± 2.98

Data given are mean of three replicates, means are with standard deviation (SD) ±
A – ***Alternaria alternata***
B – ***Fusarium moniliforme***

From the table it is found that significant antifungal activity of methanolic extract at 2ml was observed against these pathogens. The plant pathogenic fungi *A. alternata* was highly susceptible to the methanolic extract of *A. Corniculatum* which exhibits near about 56% inhibition of linear growth. While *F. moniliforme* was highly susceptible to methanolic extract of *Bruguiera gymnorrhiza* recording the 57% inhibition of linear growth. Methanolic extract of mangrove barks contained high proportion of polyphenols, tannins, flavonoids and Saponins[10].

Crotton weed (*Eupatorium adenophorum* Spreng) is a invasive weed in China. *A. alternata* (Fr.) Keissler is a natural pathogenic fungus isolated from Crotton weed for the first time, which caused a brown diseased leaf spot and produced a secondary metabolite, *A. alternata* crotton-weed toxin (AAC-toxin) [11]. The capability of AAC toxin to kill the seedling of many mono and dicotyledonous weed even at low concentrations [12] makes it a possible candidate for the development of a biological herbicide. Virulence is an important feature of a successful biocontrol agent and optimization of mass production strives for maximum production of propagules with high inoculum potential [13] Solid substrate fermentation with agricultural products has been used to produce inoculum of several bioherbicides [13,14,15] and as demonstrated here, is also feasible for *A. alternata* solid substrates with relatively low protein content, such as seeds of sorghum, millet, maize, rice and maize stalks encouraged sporulation, with rice, wheat, sorghum and maize producing most conidia. The most important characteristics in a mycoherbicide are its ability to readily produce viable and virulent propagules [16].

From this study it is concluded that an increase in growth of *A. alternata* and *F. moniliformae* due to bark extracts of most of the mangroves tested.. This may be due to the presence of higher soluble sugars. This property may be utilized for large scale sporulation and production of *A. alternata* and *F. moniliforme* for the production of bioherbicides which will reduce the toxic residues from environment and also helps to strength the chemical -free organic pattern in India. Further the mangrove plant parts after completion of their life cycle or after senescence of their parts from esturine ecosystem can be utilized for the development of the bioactive compounds for the designing of drugs or sustainable development of the organic farming in near future.

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