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RESEARCH ARTICLE

The antimicrobial activity of some medicinal plants from Mahur forest checked by paper disc method

Saheb L Shinde

[1]Department of Botany and Horticulture, Yeshwant Mahavidyalaya, Nanded (M.S.) India.
E-mail: sahebshinde4@gmail.com

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Abstract

The aqueous, alcoholic and ethyl acetate extracts of different parts of some plant species collected from Mahur forest were tested against two plant pathogens like *Alternaria brassicicola,* and *Xanthomonas campestris* pv. citri. The antibacterial and antifungal activities of all these extracts were determined by zone of Inhibition and paper disc method. Most of the extracts were found effective against these pathogens. The results so obtained were compared with that of the reference standard fungicide (Carbendazim) and bactericide (Streptomycin). It was found that most of the extracts were more effective against pathogens than the fungicide and bactericide.

Key words: Antifungal activity, Alternaria, Xanthomonas, Carbendazim and Streptomycin.

INTRODUCTION

Plants have been used in developing countries as alternative treatments to cure diseases. 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]. 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. Medicinal uses of plants range from the administration of the roots, barks, stems, leaves and seeds to the use of extracts from the plants [2, 3]. These plant extracts are a source of many potent and powerful drugs. Brazil, Cuba and India are examples of countries that have a diverse flora and rich tradition in the use of medicinal plants both as antibacterial and antifungal applications [4].

More use of bactericides and fungicides like organomercurical, carbamates etc. has posed serious problems to human and environmental health, so search for natural biodegradable source of bactericides and fungicides have always been quest for the researchers for control of bacterial and fungal diseases of plants. However, the need for repeated application of fungicides to manage disease discourages the extensive adoption of chemical control by most poor farmers [5, 6, 7]. 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 bacterial and fungal diseases of plants. Looking into the wealth of plants in Marathwada region especially in Nanded, 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 [1, 8, 9].

MATERIAL AND METHODS

Collection of plant materials:

The plants were collected from Mahur forest. The leaves, stem, bark, fruits, roots and rhizomes were separated and dried at room temperature. The dried plants were milled to a fine powder and stored at room temperature in close containers in the dark until used.

Source of microorganisms:

The pathogens used were *Xanthomonas campestris* pv. *citri* and *Alternaria brassicicola*. These are the most common and important disease causing pant pathogens of plants. The pathogens were isolated from their respective hosts.

Extract preparation:

For testing efficacy of plant extracts aqueous, alcoholic and ethyl acetate extracts of these plant parts were 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. The media (25 ml) inoculated with suspension of experimental organisms 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. The filter paper discs were placed equidistantly on inoculated media and diffusion of solution was allowed to occur for 30 minutes at room temperature. Plates were incubated at 37°C for 72 hours. Three plates were employed per treatment and the average zone of inhibition was recorded.

RESULTS AND DISCUSSION

The experiments were conducted to assess efficacy of some medicinal plants as antibacterial and antifungal agents against plant pathogens. In the present study twenty plants belonging to different families were preliminary screened to test their antimicrobial efficacy. The two plant pathogen selected for this studies i.e. test bacterium *Xanthomonas campestris* pv. *citri* and a test fungal plant pathogen i.e. *Alternaria brassicicola*.

The root, rhizome, stem, bark, leaves and fruits extracts of the commonly found medicinal plants were used in this study. The dried powders of these plant parts were extracted in alcohol, ethyl acetate and distilled cold water and were used in the preliminary screening. The effect of extracts of all plants for antibacterial and antifungal activities against selected plant pathogens *in vitro* was undertaken. It was clear that, most of the plants possessed antimicrobial activity with few exceptions [8,9,10].

Table 1. Antimicrobial activity of alcoholic extracts of some plant species.

Sr. No.	Name of the plants	Inhibition zone diameter (mm) of *Xanthomonas campestris* pv. *citri*						Per cent inhibition of spore germination of *Alternaria brassicicola*					
		Plant parts used						Plant parts used					
		R	Ri	S	B	L	F	R	Ri	S	B	L	F
1.	*Merremia emarginata*	-	-	-	04	05	-	-	-	-	02	09	-
2.	*Morus alba*	-	-	-	00	00	-	-	-	-	02	00	-
3.	*Ocimum basilicum*	03	-	04	-	05	-	07	-	05	-	08	-
4.	*Ocimum gratissimum*	04	-	05	-	05	-	08	-	07	-	08	-
5.	*Ocimum tenuiflorum*	03	-	08	-	04	-	07	-	05	-	09	-
6.	*Ocimum americanum*	04	-	05	-	05	-	06	-	07	-	09	-
7.	*Plumbago zeylanica*	05	-	05	-	06	06	07	-	05	-	10	10
8.	*Pongamia pinnata*	-	-	-	06	04	06	-	-	-	03	11	10
9.	*Quisqualis indica*	-	-	-	07	06	-	-	-	-	04	08	-
10.	*Santalum album*	-	-	-	09	03	-	-	-	-	05	08	-
11.	*Semecarpus anacardium*	-	-	-	07	07	-	-	-	-	04	09	-
12.	*Syzygium cumini*	-	-	-	10	06	04	-	-	-	07	10	10
13.	*Terminalia alata*	-	-	-	09	06	07	-	-	-	08	09	07
14.	*Terminalia arjuna*	-	-	-	13	07	08	-	-	-	12	12	08
15.	*Terminalia bellerica*	-	-	-	12	09	08	-	-	-	13	09	08
16.	*Terminalia catappa*	-	-	-	12	08	10	-	-	-	12	08	10
17.	*Terminalia chebula*	-	-	-	13	09	12	-	-	-	11	09	13
18.	*Tamarindus indica*	-	-	-	12	13	12	-	-	-	13	13	14
19.	*Withania sominifera*	-	-	-	-	08	-	-	-	-	-	08	-
20.	*Zingiber officinale*	-	12	-	-	-	-	-	11	-	-	-	-
21.	Control Carbendazim and Streptomycin	03						04					

Used extracts were extracted in cold water. R = Root, Ri = Rhizome, S = Stem, B = Bark, L = Leaf, F = Fruit, - = Not attempted, 00=Activity absent.

The result presented in table 1. showed the effect of alcoholic extracts of all plants against test pathogens. Antimicrobial activity of ethyl acetate extracts of plant species were not much effective as compare to the alcoholic extracts used.

The extract of *Terminalia arjuna, Terminalia bellerica, Terminalia catappa, Terminalia chebula, Terminalia chebula* and *Zingiber officinale* showed the maximum zone of inhibition (09 to 13 mm) against *Xanthomonas campestris* pv. *citri* and against *A. brassicicola.* It is followed by aqueous and ethyl acetate extracts Earlier, Baby *et al*. [7] Shinde *et al*. [10]; Khandare and Vasait [11] reported antifungal activity of aqueous plant extract against *A. brassicicola.*

Table 2. Antimicrobial activity of ethyl acetate extracts of some plant species.

Sr. No.	Name of the plants	Inhibition zone diameter (mm) of *Xanthomonas campestris* pv. *citri*						Per cent inhibition of spore germination of *Alternaria brassicicola*					
		Plant parts used						Plant parts used					
		R	Ri	S	B	L	F	R	Ri	S	B	L	F
1.	*Merremia emarginata*	-	-	-	02	04	-	-	-	-	03	04	-
2.	*Morus alba*	-	-	-	00	02	-	-	-	-	00	02	-
3.	*Ocimum basilicum*	03	-	02	-	03	-	03	-	04	-	03	-
4.	*Ocimum gratissimum*	04	-	03	-	04	-	05	-	03	-	04	-
5.	*Ocimum tenuiflorum*	04	-	04	-	03	-	04	-	04	-	03	-
6.	*Ocimum americanum*	03	-	03	-	04	-	03	-	03	-	04	-
7.	*Plumbago zeylanica*	02	-	04	-	06	05	04	-	04	-	04	03
8.	*Pongamia pinnata*	-	-	-	04	04	04	-	-	-	04	03	04
9.	*Quisqualis indica*	-	-	-	03	05	-	-	-	-	05	04	-
10.	*Santalum album*	-	-	-	05	03	-	-	-	-	06	04	-
11.	*Semecarpus anacardium*	-	-	-	05	05	-	-	-	-	05	05	-
12.	*Syzygium cumini*	-	-	-	03	05	06	-	-	-	04	03	04
13.	*Terminalia alata*	-	-	-	0	04	04	-	-	-	04	04	04
14.	*Terminalia arjuna*	-	-	-	07	09	05	-	-	-	12	10	08
15.	*Terminalia bellerica*	-	-	-	08	09	07	-	-	-	11	09	07
16.	*Terminalia catappa*	-	-	-	08	07	08	-	-	-	08	09	10
17.	*Terminalia chebula*	-	-	-	11	09	13	-	-	-	10	09	09
18.	*Tamarindus indica*	-	-	-	11	11	12	-	-	-	12	11	12
19.	*Withania sominifera*	-	-	-	-	05	-	-	-	-	-	03	-
20.	*Zingiber officinale*	-	09	-	-	-	-	-	05	-	-	-	-
21.	Control Carbendazim and Streptomycin	03						04					

Used extracts were extracted in cold water. R = Root, Ri = Rhizome, S = Stem, B = Bark, L = Leaf, F = Fruit,- = Not attempted, 00=Activity absent.

The antifungal and antibacterial activities of most of all twenty plants tested were recordable with plant pathogenic fungi i.e. *A.brassicicola* and bacteria i.e. *Xanthomonas campestris* pv. *citri*. There plant pathogens were inhibited by the extracts of bark, stem, root, leaves and fruits extracts of all twenty plants. Antifungal activity of the extracts of *Zingiber officinale* was recorded higher.

Table 3. Antimicrobial activity of aqueous extracts of some plant species.

Sr. No.	Name of the plants	Inhibition zone diameter (mm) of *Xanthomonas campestris* pv. *citri*						Per cent inhibition of spore germination of *Alternaria brassicicola*					
		Plant parts used						Plant parts used					
		R	Ri	S	B	L	F	R	Ri	S	B	L	F
22.	*Merremia emarginata*	-	-	-	05	05	-	-	-	-	07	04	-
23.	*Morus alba*	-	-	-	00	00	-	-	-	-	00	00	-
24.	*Ocimum basilicum*	05	-	05	-	04	-	06	-	05	-	06	-
25.	*Ocimum gratissimum*	06	-	03	-	03	-	06	-	04	-	02	-
26.	*Ocimum tenuiflorum*	04	-	05	-	06	-	05	-	05	-	04	-
27.	*Ocimum americanum*	06	-	04	-	04	-	06	-	06	-	03	-
28.	*Plumbago zeylanica*	04	-	04	-	06	06	05	-	06	-	06	06
29.	*Pongamia pinnata*	-	-	-	05	06	06	-	-	-	06	04	05
30.	*Quisqualis indica*	-	-	-	04	06	-	-	-	-	05	06	-
31.	*Santalum album*	-	-	-	06	05	-	-	-	-	06	08	-
32.	*Semecarpus anacardium*	-	-	-	06	05	-	-	-	-	05	04	-
33.	*Syzygium cumini*	-	-	-	06	05	06	-	-	-	05	06	07
34.	*Terminalia alata*	-	-	-	05	05	05	-	-	-	04	05	05
35.	*Terminalia arjuna*	-	-	-	11	09	09	-	-	-	12	11	06
36.	*Terminalia bellerica*	-	-	-	11	11	08	-	-	-	11	07	08
37.	*Terminalia catappa*	-	-	-	10	08	03	-	-	-	10	09	11
38.	*Terminalia chebula*	-	-	-	11	07	12	-	-	-	11	09	11
39.	*Tamarindus indica*	-	-	-	12	13	13	-	-	-	11	10	13
40.	*Withania sominifera*	-	-	-	-	04	-	-	-	-	-	06	-
41.	*Zingiber officinale*	-	11	-	-	-	-	-	11	-	-	-	-
42.	Control Carbendazim and Streptomycin	03						04					

Used extracts were extracted in cold water. R = Root, Ri = Rhizome, S = Stem, B = Bark, L = Leaf, F = Fruit, - = Not attempted, 00=Activity absent.

The antifungal and antibacterial activities of the bark, stem, roots, leaves and fruits varied distinctly in twenty plants. Generally in all the plants the activity of fruits was relatively less than the activity of bark the plants while the leaves possessed the highest activity against most of the tested pathogens [3, 12]. Out of these solvents extracts used viz. aqueous, alcoholic and ethyl acetate extracts, alcoholic extracts showed more inhibition of bacterial and fungal growth by plants and their parts.

The aim of study was to find out efficient bio-pesticides against plant pathogens. In agriculture use of synthetic bactericides and fungicides are creating numerous problems of pollution and upsetting the ecosystem. Thus efforts are made in the direction of evolving a cheap source of bactericides and fungicides for the use of farmers.

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