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The antimicrobial activity of some medicinal plant species from Nanded, MS, India

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ABSTRACT

During the present studies, different solvent extracts i.e. aqueous, alcoholic and ethyl acetate extracts of different parts of some plant species 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 positive results so obtained were compared with that of the reference standard fungicide (Carbendazim) and bactericide (Streptomycin). It was found that some extracts were more effective against pathogens than the fungicide and bactericide.

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

INTRODUCTION

Plants are widely used by the people as folk remedies from ancient times and are still widely practiced in India, Shrianka and other countries of Asia (Nivedheedha and Shivasubranniyam, 2017). Susruta Sanhita, Charak Sanhita, the oldest treatises of Ayurveda list about 350 plants and their products for use in health management. Nighantu Granthas have extended the list to 600 species of plants. Many plant extracts and essential oils isolated from plants have been shown to posses biological activity *in vitro* and *in vivo*, which justifies research on plant based medicine focused on the characterization of antimicrobial activity of these plants (Deshmukh, 2017). 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. 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. 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 (Rajarajan and Rao, 2004; Chaudhari and Mengi, 2006; Baby *et al.,2006*; Vasait and Khandare, 2017). 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 (Saheb *et al.,* 2010; Saheb *et al.,* 2011; Saheb and Wadje, 2011; Alane and Swami, (2016).

METHODOLOGY

Collection of plant materials:
The plants were collected from Nanded district. 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^{o}C for 72 hours. Three plates were employed per treatment and the average zone of inhibition was recorded.

RESULTS AND DISCUSSION

In this study, the extracts of twenty medicinal plants were tested for antimicrobial activity against a test bacterial plant pathogen i.e. *Xanthomonas campestris* pv. *citri* and a test fungal plant pathogen i.e. *Alternaria brassicicola*.

In the preliminary screening, the root, rhizome, stem, bark, leaves and fruits extracts of the commonly found medicinal plants were used. 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. However, there was a slight variation in the activity of the plant extracts. It was clear from the preliminary screening that *Acacia catechu, Acacia chundra, Acacia nilotica, Aloe vera, Adhatoda zeylanica, Albizia procera, Caesalpinia bonduc and Azadirachta indica* extracts exhibited maximum antimicrobial activity against selected test bacterium and fungus (Shinde *et al*.,2011; Khandare and Vasait, (2017).

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 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. The result presented in table no1. showed

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.	*Abrus precatorius*	-	-	-	08	00	00	-	-	-	07	05	06
2.	*A. squamosa*	-	-	-	09	09	07	-	-	-	06	07	06
3.	*Acacia catechu*	-	-	-	09	10	00	-	-	-	08	05	06
4.	*Acacia chundra*	-	-	-	10	00	00	-	-	-	07	07	05
5.	*Acacia nilotica*	-	-	-	10	08	07	-	-	-	06	06	06
6.	*Adhatoda zeylanica*	08	-	-	08	00	-	07	-	-	07	06	-
7.	*Aegle marmelos*	-	-	-	09	00	10	-	-	-	05	06	07
8.	*Albizia procera*	-	-	-	00	00	-	-	-	-	05	05	-
9.	*Aloe vera*	-	-	-	-	08	-	-	-	-	-	07	-
10.	*Andrographis paniculata*	-	-	-	00	00	-	-	-	-	04	04	-
11.	*Annona reticulata*	-	-	-	04	08	09	-	-	-	07	07	06
12.	*Argyreia nervosa*	-	-	-	00	00	-	-	-	-	05	05	-
13.	*Azadirachta indica*	-	-	-	11	12	12	-	-	-	04	06	06
14.	*Bauhinia purpurea*	-	-	-	08	09	-	-	-	-	03	06	-
15.	*Butea monosperma*	-	-	-	08	07	-	-	-	-	05	05	-
16.	*Butea superba*	-	-	-	00	00	-	-	-	-	06	05	-
17.	*Caesalpinia bonduc*	-	-	-	00	00	-	-	-	-	00	00	-
18.	*Caesalpinia pulcherrima*	-	-	08	-	07	00	-	-	06	-	06	05
19.	*Combretum albidum*	-	-	-	09	07	-	-	-	-	05	05	-
20.	*Cyperus bulbosus*	-	05	-	-	00	00	-	04	-	-	04	04
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.

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.	*Abrus precatorius*	-	-	-	02	00	00	-	-	-	04	03	03
2.	*A. squamosa*	-	-	-	04	03	03	-	-	-	04	03	04
3.	*Acacia catechu*	-	-	-	03	00	00	-	-	-	03	03	03
4.	*Acacia chundra*	-	-	-	05	00	00	-	-	-	04	03	03
5.	*Acacia nilotica*	-	-	-	04	04	03	-	-	-	03	04	03
6.	*Adhatoda zeylanica*	03	-	-	06	06	-	04	-	-	03	05	-
7.	*Aegle marmelos*	-	-	-	03	00	04	-	-	-	05	03	03
8.	*Albizia procera*	-	-	-	00	00	-	-	-	-	02	04	-
9.	*Aloe vera*	-	-	-	-	04	-	-	-	-	-	04	-
10.	*Andrographis paniculata*	-	-	-	00	00	-	-	-	-	03	04	-
11.	*Annona reticulata*	-	-	-	04	03	06	-	-	-	02	03	03
12.	*Argyreia nervosa*	-	-	-	00	00	-	-	-	-	04	03	-

13.	*Azadirachta indica*	-	-	-	05	05	07	-	-	-	05	05	04
14.	*Bauhinia purpurea*	-	-	-	03	03	-	-	-	-	02	04	-
15.	*Butea monosperma*	-	-	-	04	05	-	-	-	-	04	02	-
16.	*Butea superba*	-	-	-	00	01	-	-	-	-	03	03	-
17.	*Caesalpinia bonduc*	-	-	-	00	03	-	-	-	-	02	00	-
18.	*Caesalpinia pulcherrima*	-	-	03	-	02	01	-	-	05	-	03	04
19.	*Combretum albidum*	-	-	-	02	04	-	-	-	-	02	02	-
20.	*Cyperus bulbosus*	-	03	-	-	00	00	-	04	-	-	00	04
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.

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
1.	*Abrus precatorius*	-	-	-	08	02	02	-	-	-	03	04	05
2.	*A. squamosa*	-	-	-	06	02	04	-	-	-	04	04	04
3.	*Acacia catechu*	-	-	-	06	03	02	-	-	-	04	02	04
4.	*Acacia chundra*	-	-	-	08	03	02	-	-	-	04	03	05
5.	*Acacia nilotica*	-	-	-	10	08	04	-	-	-	04	04	05
6.	*Adhatoda zeylanica*	04	-	-	04	02	-	05	-	-	04	04	-
7.	*Aegle marmelos*	-	-	-	03	00	03	-	-	-	03	04	04
8.	*Albizia procera*	-	-	-	02	00	-	-	-	-	04	04	-
9.	*Aloe vera*	-	-	-	-	03	-	-	-	-	-	04	-
10.	*Andrographis paniculata*	-	-	-	02	00	-	-	-	-	04	02	-
11.	*Annona reticulata*	-	-	-	03	04	05	-	-	-	07	08	02
12.	*Argyreia nervosa*	-	-	-	01	02	-	-	-	-	06	03	-
13.	*Azadirachta indica*	-	-	-	05	04	02	-	-	-	04	02	04
14.	*Bauhinia purpurea*	-	-	-	06	04	-	-	-	-	04	03	-
15.	*Butea monosperma*	-	-	-	03	03	-	-	-	-	04	02	-
16.	*Butea superba*	-	-	-	01	00	-	-	-	-	04	02	-
17.	*Caesalpinia bonduc*	-	-	-	00	01	-	-	-	-	00	01	-
18.	*Caesalpinia pulcherrima*	-	-	03	-	05	02	-	-	04	-	04	04
19.	*Combretum albidum*	-	-	-	04	05	-	-	-	-	03	04	-
20.	*Cyperus bulbosus*	-	01	-	-	00	00	-	03	-	-	00	00
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 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 *Azadirachta indica* showed the maximum zone of inhibition (11-12 mm) against *Xanthomonas campestris* pv. *citri.* The bark and leaves extracts of *Acacia catechu* showed the maximum percentage of inhibition against

A. brassicicola. It is followed by aqueous and ethyl acetate extracts reported antifungal activity of aqueous plant extract against *A. brassicicola.*

CONCLUSION

It is concluded that antibacterial and antifungal activity of leaves extracts of *Acacia catechu*, *Acacia chundra*, *Acacia nilotica*, *Aloe vera, Adhatoda zeylanica*, *Albizia procera, Caesalpinia bonduc* and *Azadirachta indica* and its active constituents would be helpful in treating various kinds of plant diseases and seed borne diseases. The very few 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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