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Short communication

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Inhibitory effect of plant extracts on the management of bacterial leaf spot pathogen (X*anthomonas axonopodis pv. vesicatoria*) infecting *Capsicum frutescens* L.

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Abstract

Objective: To evaluate the inhibitory effect of plant extracts on the management of bacterial leaf spot pathogen. Materials and method: Aqueous and alcoholic extracts of different parts of twenty plants including some medicinal plants were screened against the leaf spot bacteria, *Xanthomonas axonopodis pv. vesicatoria* infecting *Capsicum frutescens.* Extracts from different plant parts like leaf, bark, flower, fruit and seeds were prepared and used in three different concentrations of 500, 1000 and 2000 ppm, respectively. Results and conclusion: Extracts of *Bixa orellana* followed by *Clerodendron inerme, Murraya konigii, Azadirachta indica, Melia azardirach* and *Parthenium hysterophorus* were significantly superior to other extracts on growth inhibition of the pathogen. The inhibition was more at 2000 ppm compared to 1000 and 500 ppm concentration.

Key words : *Xanthomonas axonopodis pv. vesicatoria, Capsicum frutescens,* plant extracts, antibacterial activity, *Bixa orellana, Clerodendron inerme, Murraya konigii, Azadirachta indica, Melia azadirach, Parthenium hysterophorus.*

1. Introduction

Chilli is an important cash crop grown in India for the home market and for export. Leaf spot is one of the most important bacterial diseases affecting chilli. The presence of naturally occurring substances in plant species has been shown to play a major role in defense mechanism as well as plant products. The antibacterial activity of some plant extracts had already been reported earlier by Choudhury [1]. Antibacterial and antifungal substances from higher plants are insufficiently explored, probably due to the narrow concept that antibiotics can be obtained

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only from microbial origin. The apparently disease free plants or their parts suggest the possible presence of some substances in them which offer production from the pathogens. As higher plants are exhibiting antimicrobial activity, some of the research was focused on the use of medicinal plant extracts against plant pathogens. This led to the present study to find out the potential extracts of plants which can inhibit the growth of the pathogen, *Xanthomonas axonopodis pv. vesicatoria.*

2. Materials and method

2.1 Source of the pathogen

Infected leaf samples of chillies showing typical leaf spot symptoms were collected from chilli growing fields. The cultures obtained by isolation were identified as *Xanthomonas axonopodis pv. vesicatoria* and tested for their pathogenicity. The virulent isolate Xav5 obtained was thus maintained by reisolation once in a month.

2.2 Source of the plant material

Extracts from different parts like leaf, bark, flower, fruit and seeds of twenty different plants growing in S. V. University Campus were prepared by using hot water and alcohol treatments. For control, sterile distilled water was used. The inhibitory effects of different plants of which alcoholic and aqueous extracts were studied by double layered agar paper disc method [2].

2.3 Method

Nutrient agar medium (20 ml) was poured into sterilized petriplates and after the agar layer has set, the plates were held in upside down position for two days at 28°C in culture room, so as to dry off the surface films of water. The pathogen was subcultured in nutrient broth medium by suspending one loopful of the culture into the medium.

This suspension was mixed with 0.6 % nutrient agar medium and poured into solidified nutrient agar medium containing petriplates. The whatman filter paper (No. 1) was made into discs and was suspended in extracts prepared from different plants at different concentrations of 500, 1000 and 2000 ppm respectively. The suspended filter paper discs were overseeded on the nutrient agar medium containing petriplates and incubated for two to three days. The inhibitory effects were calculated in terms of area of inhibition zone by using the formula :

Area of inhibition zone $A = \pi (R + r) (R - r)$ $\pi = 3.142$; R = Radius of the inhibition zone (D / 2) ; r = Radius of the paper disc

3. Results

Effects of extracts of 20 plants on growth inhibition of *Xanthomonas asonopodis pv. vesicatoria* are presented in Table.1. Out of 20 plants selected , other than *Alangium salvifolium, Catharanthus roseus, Eugenia jambolana, Lawsonia inermis, Nerium oleander, Quisqualis indica* and *Santalum album* all other plant extracts showed inhibition zones.

4. Discussion

Study of plant bacteria, fungi and virus inhibitors in juices extracted from different plant species has formed the subject of research of considerable importance. Few of the substances have been identified, purified and characterized phytochemotherapeutically [3 - 4]. Preformed inhibitory substances of one kind or other occur in plant parts and are most quite active and occur in concentrations of many times the amount required to inhibit many species of potential pathogens completely [5].

In the present study out of 20 plant extracts of different parts of *Bixa orellana* followed by *Clerodendron inerme, Murraya konigii, Azadirachta indica, Melia azadirach* and

Table 1.
Effect of higher plant extracts at different concentrations on growth inhibition of the pathogen *(X.a.pv. vesicatoria)*

Sl. No.	Name of the plant extract	Area of inhibition zone in mm^2		
		500 ppm	1000 ppm	2000 ppm
1	Control (Distilled water)	-	-	-
2	*Alangium salvifolium* Wang.			
	a. Leaf (Aq) extract	-	-	-
	b. Bark (Aq) extract	-	-	-
3	*Azadirachta indica* A. Juss.			
	a. Leaf (Aq) extract	7.85	15.71	30.63
	b. Flower (Aq) extract	4.71	7.07	9.42
	c. Fruit (Aq) extract	11.78	11.78	14.14
	d. Neem oil	-	4.71	7.07
	e. Bark (Aq) extract	4.71	7.07	8.64
4	*Bixa orellana* L.			
	a. Leaf (Aq) extract	5.23	8.64	18.84
	b. Bark (Aq) extract	30.63	58.90	93.46
	c. Seed (Aq) extract	6.28	8.64	18.85
5	*Catharanthus roseus* L.			
	a. Leaf (Aq) extract	-	-	-
	b. Leaf (Al) extract	-	-	-
	c. Flower (Aq) extract	-	-	-
	d. Flower (Al) extract	-	-	-
6	*Clerodendron inerme* Gaertn			
	a. Leaf (Hexane) extract	6.28	7.07	7.85
	b. Leaf (Al) extract	8.64	30.63	58.90
7	*Eucalyptus regnans* L.			
	a. Leaf (Aq) extract	4.71	7.07	9.42
	b. Leaf (Al) extract	7.07	7.85	9.42
8	*Eugenia jambolana* L.			
	a. Leaf (Aq) extract	-	-	-
	b. Bark (Aq) extract	-	-	-
9	*Lawsonia inermis* L.			
	a. Leaf (Aq) extract	-	-	-
	b. Leaf (Al) extract	-	-	-
10	*Melia azadirach* L.			
	a. Leaf (Aq) extract	6.28	11.78	20.42
	b. Leaf (Al) extract	7.85	12.57	15.71
11	*Mentha spicata* L.			
	a. Leaf (Aq) extract	6.28	7.07	10.21
	b. Leaf (Al) extract	7.07	7.85	9.42
12	*Murraya konigii* Spreng.			
	a. Leaf (Aq) extract	12.57	18.85	43.98
	b. Bark (Aq) extract	12.57	18.85	30.63
13	*Nerium oleander* L.			
	a. Leaf (Aq) extract	-	-	-
	b. Leaf (Al) extract	-	-	-
14	*Parthenium hysterophorus* L.			
	a. Leaf (Al) extract	9.42	11.78	20.42
15	*Plectranthus incanus* Link.			
	a. Leaf (Aq) extract	6.28	7.07	11.78
	b. Leaf (Al) extract	7.85	12.57	15.71

Sl. No.	Name of the plant extract	Area of inhibition zone in mm^2		
		500 ppm	1000 ppm	2000 ppm
16	*Quisqualis indica* L.			
	a. Leaf (Aq) extract	-	-	-
	b. Leaf (Al) extract	-	-	-
17	*Santalum album* L.			
	a. Leaf (Aq) extract	-	-	-
	b. Leaf (Al) extract	-	-	-
18	*Vinca rosea* L.			
	a. Leaf (Aq) extract	3.142	4.71	6.28
	b. Flower (Aq) extract	6.28	7.85	8.64
19	*Pongamia glabra* Vent.			
	a. Fruit (Aq) extract	7.07	9.42	10.21
	b. Fruit (Al) extract	6.28	6.28	9.42
20	*Cassia fistula* L.			
	a. Fruit (Aq) Extract	-	-	-
	b. Fruit (Al) extract	5.49	7.07	7.85
	c. Leaves (Aq) extract	7.07	9.42	11.78
	d. Leaves (Al) extract	7.07	11.78	12.57
	e. Bark (Aq) extract	6.28	7.85	9.42
	f. Bark (Al) extract	9.42	11.78	11.78
21	*Capsicum frutescens* L.			
	a. Leaf (Aq) extract	3.142	6.28	7.07
	b. Leaf (Al) extract	6.28	7.07	7.07

Parthenium hysterophorus were found to be more inhibitory compared to other extracts. Extracts of *Cassia fistula, Pongamia glabra, Vinca rosea, Plectranthus incanus, Mentha spicata* and *Eucalyptus regnans* had minimum effect on the inhibition of test bacterium. These may be useful to control the bacterial leaf spot disease in chillies.

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