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Research article

Parthenium hysterophorus: Antibacterial Potential of Leaf Extract

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ABSTRACT: Mango bacterial canker disease (MBCD) caused by *Xanthomonas campestris* pv. *mangiferaeindicae* (*Xcmi*) is one of the important diseases of mango affecting a number of commercial cultivars. The pathogen affects different plant parts like leaf, stem and fruit. Favorable environmental conditions cause severe loss to the crop. Leaf extract of 37 plants were tested against *Xcmi*, out of them, leaf extract of *Parthenium hysterophorus* showed good antibacterial activity. Hence, leaf extracts of *P. hysterophorus* tested for its antibacterial activity against 25 strains of *Xcmi* collected from different parts of Maharashtra state. *In-vitro* studies have been performed by using Fresh leaf extracts during all the experiments. Cup-plate method was employed for examining the activity. The maximum activity was recorded against *Xcmi*. 4 (Mean activity zone – 20.98 mm) followed by *Xcmi*.19 (Mean activity zone – 20.79 mm) and minimum against *Xcmi*.16 (Mean activity zone–17.60mm) strain under investigation. The ultimate aim of the research work was to develop economically and technically viable field formulations for the farmers, which will be Bio-ecologically compatible for management of plant bacterial diseases.

KEYWORDS: *Parthenium hysterophorus*; Leaf extract; Antibacterial potential; *Xanthomonas campestris* pv. *Mangiferaeindicae*.

INTRODUCTION

Bacterial diseases of fruit plants are known to cause great damages all over the world. Mango (*Mangifera indica* L.) is the most ancient among the tropical fruits. Among the bacterial diseases, bacterial canker is the most severe disease on Mango, which is caused by *Xanthomonas campestris* pv. *mangiferaeindicae* (*Xcmi*). The pathogen affects different plant parts like leaf, stem and fruit. Favorable environmental conditions for the disease cause severe loss to the crop. Fruit cracking observed during heavy infection causes extensive loss to the cultivator.

For the management plant diseases, various chemicals are used since last several years, the world over. They tend to accumulate in animal tissues posing threat to human health. Green plants represent a reservoir of effective chemo-therapeutants and can provide valuable sources of natural pesticides[2,5]. Medicinal properties of leaf extracts have been reported by many workers[12,7]. *Parthenium hysterophorus* L. (*Asteraceae*) is labeled as serious weed in the agricultural crops. It can grow anywhere and invade all types of pasture lands and cause substantive losses in the yield of agriculture[1,6,8].

The major constituents of *Parthenium hysterophorus* are parthenin, phenolic acids such as caffeic acid, vanillic acid, anisic acid, chlorogenic acid and parahydroxy benzoic acid[3]. Krishnavignesh et al.,(2013)[9] studied the phytochemical screening and antimicrobial activity of *P. hysterophorus* leaf extract. He reported antimicrobial activity against clinical isolates of bacterial and fungal cultures. Bacterial culture includes both gram positive and gram negative bacterium. Kumar et al., (2013)[10] experimented the antimicrobial potential of *P. hysterophorus* plant extracts against three bacterial strains such as

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Staphylococcus aureus MTCC 3160, *Bacillus cereus* MTCC 1272, *Escherichia coli* MTCC 43.
However, during this research work antibacterial activity of leaf extract of *P. hysterophorus* has been assessed against 25 strains of *Xcmi* to observe the behavior of these strains.

MATERIALS AND METHODS

The strains of causal organism of MBCD i.e. *Xcmi* were collected from various districts of Maharashtra. Diseased Mango leaves were collected and brought to the laboratory for further investigation. Studies were performed using these samples and maintained various 25 *Xcmi* strains on Nutrient Agar (NA) medium.

PREPARATION OF LEAF EXTRACT

The leaves of the plant were collected, thoroughly washed with tap water and then rinsed with sterile distilled water. Leaves were dried in shade until moisture evaporated. These leaves were powdered by using electric grinder and packed into polythene bags. One gm of the powder was taken and added to 10 ml of sterile distilled water. Then it was subjected to ultracentrifuge for 20 min at –4°C at the 11000 rpm (Pawar and Pandit, 2014)[14]. This leaf extract was used for the further study.

CUP PLATE METHOD

It is a method of testing antibacterial activity. For this, the bacterial suspension was prepared by adding 10 ml sterile distilled water to 2 days old NA slope culture. Five drops of bacterial cell suspension were poured in sterilized petridishes (9 cm diameter) onto which 20 ml of nutrient agar was poured and thoroughly mixed. It was allowed to solidify (Pawar, 2014)[13].

In the centre of the medium, a cup cavity of 8 mm diameter was made with sterilized No. 4 cork borer. This cup was filled with 0.1 ml of the leaf extract. The petridishes were incubated for 24 hrs at 25±2°C and the observations were recorded as diameter of inhibitory zone in mm. Diameter of the activity zone was measured in 3-4 angles and mean was considered for accuracy. Cup cavity filled with sterile distilled water was used as control in all the experiments. All experiments were repeated for four times (Experiment. A, B, C & D).

RESULT AND DISCUSSION

It is observed from table 01 that leaf extract of *P. hysterophorus* showed antibacterial activity against all 25 strains of *Xcmi* under investigation. The maximum activity was recorded against *Xcmi*..04 (Mean activity zone – 20.98 mm) followed by *Xcmi*..19 (Mean activity zone – 20.79 mm) and comparatively minimum activity was recorded against Xcmi.16 (Mean activity zone – 17.60 mm) strain under investigation. Average activity of leaf extract of *P. hysterophorus* against all *Xcmi.* strains was 19.27 mm. Activity ranges between 17 to 21 mm (Fig.1). Fourteen *Xcmi.* strains (*Xcmi*..2, *Xcmi*..3, *Xcmi*..4, *Xcmi*..5, *Xcmi*..8, *Xcmi*..9, *Xcmi*..10, *Xcmi*..11, *Xcmi*..17, *Xcmi*..18, *Xcmi*..19, *Xcmi*..20, *Xcmi*..21 and *Xcmi*..24) have showed more activity than average activity of all strains i.e. 19.27 mm; while 11 Xcmi strains (*Xcmi*..1, *Xcmi*..6, *Xcmi*..7, *Xcmi*..12, *Xcmi*..13, *Xcmi*..14, *Xcmi*..15, *Xcmi*..16, *Xcmi*..22, *Xcmi*..23 and *Xcmi*.24) showed less activity than average activity.

Table 1. Antibacterial Activity of Leaf extract of *Parthenium hysterophorus* against *Xcmi* strains.

Sr. No.	Name of the Strain	Zone of Inhibition (in mm)					Remark
		Exp. A	Exp. B	Exp. C	Exp. D	Mean	
1	*Xcmi*.01	17.50	17.25	18.00	17.75	**17.63**	-
2	*Xcmi*.02	19.66	19.33	19.00	19.25	**19.31**	-
3	*Xcmi*.03	19.25	20.00	19.00	19.66	**19.48**	-
4	*Xcmi*.04	21.00	21.75	20.66	20.50	**20.98**	**Max.**
5	*Xcmi*.05	20.50	20.66	20.33	20.75	**20.56**	-
6	*Xcmi*.06	18.00	18.00	17.75	17.66	**17.85**	-
7	*Xcmi-07*	18.33	18.50	18.66	19.00	**18.62**	-
8	*Xcmi*.08	19.33	19.66	19.75	20.00	**19.69**	-
9	*Xcmi*.09	20.75	20.00	20.66	21.00	**20.60**	-

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10	*Xcmi*.10	21.00	20.75	20.66	20.33	**20.69**	-
11	*Xcmi*.11	21.00	20.75	20.66	20.00	**20.60**	-
12	*Xcmi*.12	18.33	17.75	17.66	17.33	**17.77**	-
13	*Xcmi*.13	18.00	18.50	18.25	18.66	**18.35**	-
14	*Xcmi*.14	18.33	18.66	18.75	18.00	**18.44**	-
15	*Xcmi*.15	18.66	18.00	19.00	19.66	**18.83**	-
16	*Xcmi*.16	17.00	17.75	17.66	18.00	**17.60**	**Min.**
17	*Xcmi*.17	19.00	19.33	19.66	19.75	**19.44**	-
18	*Xcmi*.18	19.33	19.75	19.66	19.50	**19.56**	-
19	*Xcmi*.19	20.75	21.00	20.75	20.66	**20.79**	**Max.- II**
20	*Xcmi*.20	21.00	20.75	20.66	20.50	**20.73**	-
21	*Xcmi*.21	21.00	20.33	20.33	20.75	**20.60**	-
22	*Xcmi*.22	17.50	17.75	18.50	18.00	**17.94**	-
23	*Xcmi*.23	18.75	18.33	18.66	18.25	**18.50**	-
24	*Xcmi*.24	19.66	20.00	19.33	19.25	**19.56**	-
25	*Xcmi*.25	18.00	17.75	18.00	17.66	**17.85**	-
Total		**480.63**	**481.63**	**482.30**	**482.00**	**481.87**	-
Average		**19.23**	**19.27**	**19.29**	**19.28**	**19.27**	-

Similar results were recorded by Malarkodi and Manoharan(2013)[11]. They studied the antibacterial activity of *P. hysterophorus* against, *Pseudomonas aeruginosa, Micrococcus luteus* and *Bacillus cereus*. The extract residue of *P. hysterophorus* recorded activity against *Micrococcus luteus* and *Pseudomonas aeruginosa* 76.90 to 53.80%. Yadav and Khan (2012)[17] studied the antibacterial activity of some ethnomedicinal plants against certain pathogenic bacterial strains. The aqueous extract of *P. hysterophorus* inhibited the growth of seven strains among the 12 bacterial strains studied. It showed maximum activity against *P. aeruginosa*.

Sukanya et al., (2009)[16] reported the antibacterial activity of leaf extract of *P. hysterophorus* and found good inhibition against *Escherichia coli*. Fajal et al., (2011)[4] recorded antibacterial activity of *P. hysterophorus* against *E. coli, P. aeruginosa, Klebsiella pneumoniae, B. subtilis, Enterococcus spp*., and *Staphylococcus aureus* bacteria than the standard antibiotics used, indicating that this plants is a good source of antibiotics for their treatment of certain bacterial diseases.

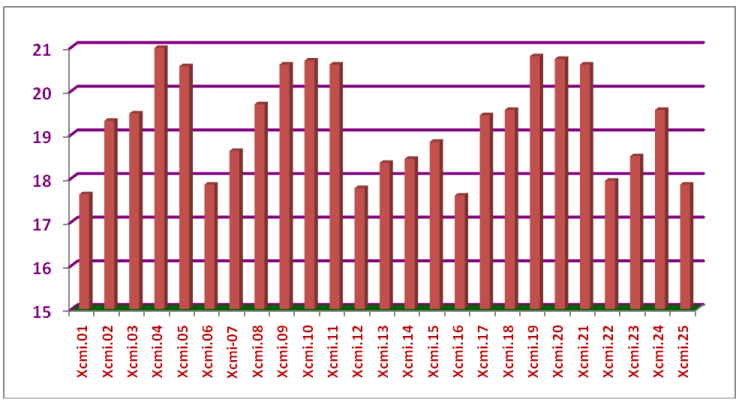

Figure 1. Antibacterial activity of leaf extract of *P. Hysterophorus against Xcmi.*

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CONCLUSION

It was observed from the research work, that leaf extract of *P. hysterophorus* is effective against all 25 strains of *Xcmi* under investigation. The leaf extract is eco-friendly, economic and technically viable field formulation, which will be Bio-ecologically compatible for management of various strains of *Xcmi*.

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