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ORIGINAL ARTICLE

Antibacterial activity of leaf extracts of *Tridax procumbens* against *Xanthomonas campestris pv. mangiferaeindicae*

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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 various plants were tested against Xcmi; out of them, antibacterial activity of leaf extract of Tridax procumbens was studied against 25 strains of Xcmi collected from different parts of Marathwada region of Maharashtra. The in vitro studies have been performed by using cup-plate method to examine the activity. Fresh leaf extracts of T. procumbens plants was used for the antibacterial assay. The maximum activity was recorded against Xcmi.15 (Mean activity zone – 22.09 mm) followed by Xcmi.16 (Mean activity zone – 21.68 mm) and minimum against Xcmi.07 (Mean activity zone – 18.04 mm) 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: *Antibacterial, Xanthomonas campestris pv. mangiferaeindicae, Tridax procumbens*

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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 cause severe loss to the crop. Fruit cracking due to the disease 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 chemotherapeutants and can provide valuable sources of natural pesticides [1,2]. Medicinal properties of leaf extracts have been reported by many workers [3]. The medicinal properties of leaf extracts have also been mentioned by Kirtikar and Basu [4]. Antibacterial activity of various medicinal plants were assessed against *Xcmi* strains and observed that activity of *T. procumbens* exhibited promising results. *T. procumbens* belonging to Asteraceae family is known for several potential therapeutic activities like antibacterial [5], antifungal [6], antiviral [7], wound healing activity [8], analgesic and anti-inflammatory activity [9]. Some reports from tribal areas in India state that the leaf juice can be used to cure fresh wounds it helps for clotting of blood; it is also used as a hair tonic [10]. *T. procumbens* is traditionally used in the treatment of fever, typhoid fever, cough, asthma, epilepsy and diarrhea [11]. Dhasarathan *et al.,*[12]studied *in vitro* antimicrobial activity of leaf extracts of *T. procumbens* against a wide range of microbes. However, during this research work antibacterial activity of leaf extract of *T. procumbens* 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 Marathwada region of Maharashtra. Diseased Mango samples were collected from various districts *viz.* Aurangabad, Jalna, Beed, Osmanabad, Latur, Parbhani, Hingoli and Nanded of Marathwada region and brought to the laboratory for further

investigation. Studies were performed using these samples and maintained various 20 *Xcmi* strains on Nutrient Agar (NA) medium.

a) Preparation of leaf extract: The leaves of the plants were collected, thoroughly washed with tap water and then rinsed with sterile distilled water. For the study, leaf extract was used. They were dried in shade until all 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 [13].

b) 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 [14].

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 1 that *T. procumbens* showed antibacterial activity against all 25 strains of *Xcmi* under investigation. The maximum activity was recorded against *Xcmi*.15 (Mean activity zone – 22.09 mm) followed by *Xcmi*.16 (Mean activity zone – 21.68 mm) and minimum against *Xcmi.07* (Mean activity zone – 18.04 mm) strains under investigation. Average activity of all *Xcmi* strains was 20.18 mm. Activity of *T. procumbens* ranges between 18 to 23 mm. (Fig. 01). Eleven *Xcmi* strains (*Xcmi.3, Xcmi*.4, *Xcmi*.6, *Xcmi*.8, *Xcmi*.9, *Xcmi*.12, *Xcmi*.15, *Xcmi*.16, *Xcmi*.18, *Xcmi*.20, *Xcmi.*22) have showed more activity than average activity of all strains; while Fourteen *Xcmi* strains (*Xcmi*.1, *Xcmi*.2, *Xcmi*.5, *Xcmi*.7, *Xcmi*.10, *Xcmi*.11, *Xcmi*.13, *Xcmi*.14, *Xcmi*.17, *Xcmi*.19, *Xcmi*.21, *Xcmi*.23, *Xcmi*.24, *Xcmi*.25) showed less activity than average activity of all strains.

Similar results were reported by Thirumalesh *et al.,* [15] they reported antibacterial activity of some plant crude extracts, by using solvents like petroleum ether, chloroform, methanol and water were tested for eight plants *viz. Sapindus laurifolia, Asclepias curassavica*, *Helicteres isora*, *Piper betel*, *Tamarindus indica*, *T. procumbens* and *Azadirachta indica* exhibited greater antibacterial activities in Nutrient agar medium with MIC ranging from 3.0% to 12.0%. Bharathi *et al.,* [16] studied antibacterial activity of *T. procumbens* against various bacteria *viz. Escherichia coli,, Klebsiella pneumoniae,Salmonella typhi, Bacillus cereus* and *Staphylococcus aureus.* Tejaswini *et al.,*[17] evaluated antimicrobial activity of the bio active compound obtained by crude extract and the column chromatography. Pai *et al.,*[18] concluded that leaves of *Tridax* may be useful for successful therapy against multidrug resistant pathogens like *Pseudomonas aeruginosa.*

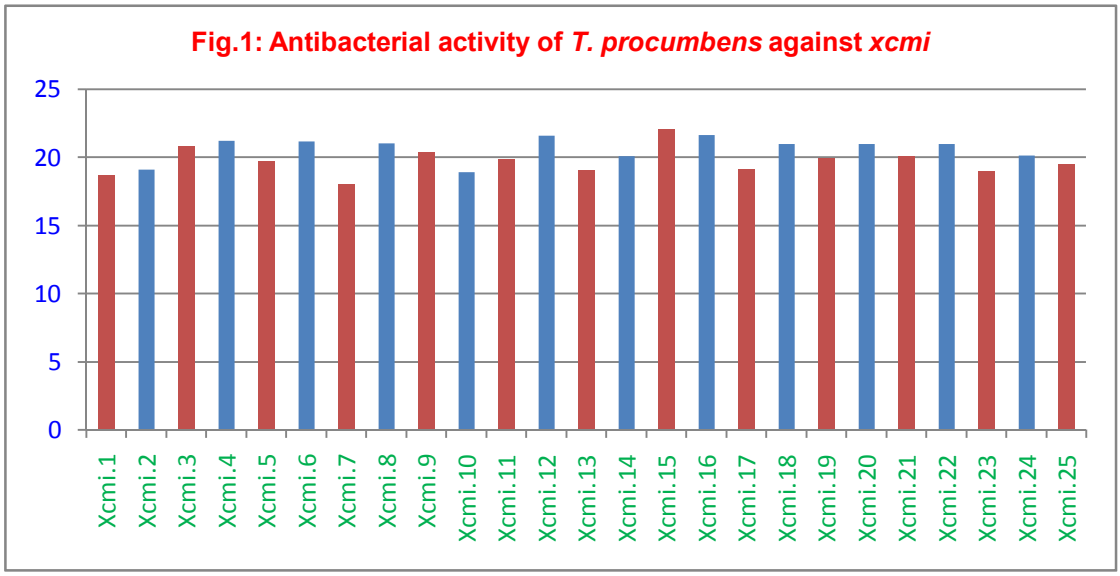

Table 01: Antibacterial Activity of *Tridax procumbens* against *Xcmi* strains

Sr. No	Name of the *Xcmi* strain	Antibacterial activity of *Tridax procumbens*: Mean Zone of Inhibition (in mm)				
		Exp. A	Exp. B	Exp. C	Exp. D	Mean
1.	*Xcmi.*1	18.90	18.54	19.02	18.34	18.70
2.	*Xcmi.*2	19.37	18.90	19.28	18.87	19.11
3.	*Xcmi.*3	20.40	21.04	21.12	20.82	20.85
4.	*Xcmi.*4	21.47	21.55	20.89	20.99	21.23
5.	*Xcmi.*5	19.42	19.74	20.11	19.81	19.77
6.	*Xcmi.*6	21.45	20.87	21.27	21.15	21.19
7.	***Xcmi.*7**	**18.25**	**17.63**	**18.40**	**17.90**	**18.04**
8.	*Xcmi.*8	21.46	21.04	21.00	20.75	21.06
9.	*Xcmi.*9	20.09	20.73	20.79	20.07	20.42
10.	*Xcmi.*10	18.99	18.62	19.08	18.95	18.91
11.	*Xcmi.*11	19.47	19.61	20.44	20.00	19.88
12.	*Xcmi.*12	21.20	22.00	21.73	21.55	21.62
13.	*Xcmi.*13	19.00	19.10	18.84	19.22	19.04
14.	*Xcmi.*14	20.28	19.83	20.35	19.90	20.09
15.	***Xcmi.*15**	**22.80**	**22.18**	**21.63**	**21.75**	**22.09**
16.	*Xcmi.*16	22.00	21.29	21.95	21.49	21.68
17.	*Xcmi.*17	19.35	19.54	18.77	18.86	19.13
18.	*Xcmi.*18	21.56	21.10	20.82	20.54	21.01
19.	*Xcmi.*19	20.31	19.55	19.83	20.03	19.93
20.	*Xcmi.*20	21.34	21.07	20.73	20.90	21.01
21.	*Xcmi.*21	19.93	20.55	19.90	20.00	20.10
22.	*Xcmi.*22	21.00	20.94	21.20	20.86	21.00
23.	*Xcmi.*23	18.75	19.26	18.97	19.10	19.02
24.	*Xcmi.*24	19.80	20.40	20.18	20.30	20.17
25.	*Xcmi.*25	19.67	19.55	19.80	19.10	19.53

CONCLUSION

It was observed from the research work, that leaf extract of *Tridax procumbens* is effective against all the strains of *Xcmi*. 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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