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BIO SCIENCES **RESEARCH ARTICLE……!!!**

ANTIBACTERIAL ACTIVITY OF LEAF EXTRACT OF *ALOE VERA* L. AGAINST *XANTHOMONAS CAMPESTRIS* PV. *MANGIFERAEINDICAE*

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KEYWORDS:

Antibacterial, *Xanthomonas campestris* pv. *mangiferaeindicae*, *Aloe vera.*

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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 *Aloe vera* L. gave promising results. Hence, fresh leaf extracts of *A. vera* were screened for its antibacterial activity against 25 strains of *Xcmi* collected from different parts of Maharashtra. The *in vitro* studies have been performed by using cup-plate method to examine the activity. The maximum activity was recorded against *Xcmi*.23 (Mean activity zone – 20.77 mm) followed by *Xcmi*.09 (Mean activity zone – 20.69 mm) and comparatively minimum activity was recorded against *Xcmi*.08 (Mean activity zone – 18.44 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.

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 chemo-therapeutants and can provide valuable sources of natural pesticides (Balandrin *et al*, 1985; Hostettmann and Wolfender, 1997). Medicinal properties of leaf extracts have been reported by many workers (Mishra, 1996; Naik, 1998; Suhaila *et al*., 1996). The medicinal properties of leaf extracts have also been mentioned by Kirtikar and Basu (1991). Antibacterial activity of 37 medicinal plants were assessed against *Xcmi* strains and observed that activity of *A. vera* (Korpad) showed better activity.

Kumar *et al*, (2012) performed preliminary phytochemical analysis of *A. vera* and showed that the extracts contain flavonoids, terpenoids, tannins, saponins, reducing sugars and anthraquinones. They investigated antibacterial activity of aqueous and methanolic extracts of the roots of *A. vera* against *Bacillus cereus*, *Escherichia coli*, *Pseudomonas aerugenosa* and *Enterobacter aerogens* using the agar diffusion method. Irshad *et al*, (2011) evaluated the antibacterial activity of *Aloe barbadensis Miller* (*A. vera*) by using agar diffusion assay and gel filtration chromatography. The research work revealed the plausibility of the presence of some bioactive components in *A. vera*. Renisheya *et al*, (2012) examined the antibacterial and antifungal potential of DMSO crude extracts of *A. barbadensis* Miller (*A. vera*) gel against the selected bacterial and fungal pathogens. Babaei *et al*, (2013) reported that the acetone extract of *A. vera* can be used as an effective antifungal agent to inhibit the growth of *Aspergillus flavus*. However, during this research work antibacterial activity of leaf extract of *A. aspera* 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 samples 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.

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, fleshy part of the leaves was used. Juice of the leaves was made with the help of electric grinder and packed into polythene bags. Then the juice was subjected to ultracentrifuge for 20 min at –4^{o}C at the 11000 rpm (Pawar & Papdiwal, 2010).

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 (Pawar & Papdiwal, 2012).

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 *A. vera* showed antibacterial activity against all 25 strains of *Xcmi* under investigation. The maximum activity was recorded against *Xcmi*.23 (Mean activity zone – 20.77 mm) followed by *Xcmi*.09 (Mean activity zone – 20.69 mm) and minimum against *Xcmi*.08 (Mean activity zone – 18.44 mm) strain under investigation.

Average activity of all *Xcmi* strains was 19.61 mm. Activity of *A. vera* ranges between 18 to 21 mm (Fig.01). Ten *Xcmi* strains (*Xcmi*.4, *Xcmi*.5, *Xcmi*.6, *Xcmi*.7, *Xcmi*.9, *Xcmi*.10, *Xcmi*.15, *Xcmi*.19, *Xcmi*.22, and *Xcmi*.23) have showed more activity than average activity of all strains i.e. 19.05 mm; while 15 *Xcmi* strains (*Xcmi*.1, *Xcmi*.2, *Xcmi*.3, *Xcmi*.8, *Xcmi*.11, *Xcmi*.12, *Xcmi*.13, *Xcmi*.14, *Xcmi*.16, *Xcmi*.17, *Xcmi*.18, *Xcmi*.20, *Xcmi*.21, *Xcmi*.24 and *Xcmi*.25) showed less activity.

Similar results were recorded by Shrinu *et al*, (2012), they reported antibacterial activity of methanolic and aqueous extracts of plants *Withania somnifera* and *A. vera* against *P. aeroginosa*,

B. cereus, E. coli, S. typhi, S. aureus and *K. pneumoneae*. Sethi *et al*, (2013) evaluated plant methanolic extracts of eight plants including *A. vera* against food borne bacterial pathogens and found weak antibacterial activity against the tested bacterial strains. Khaing (2011) evaluated antifungal and antioxidant activities of the leaf extract of *A. vera* (*A. barbadensis* Miller) and concluded the significant antioxidant activity by the DPPH radical scavenging method. He also reported the potential of extract to treat plant fungal infections. Antimicrobial activity of ethanolic activity of A. vera against some bacterial and fungal species has been reported by Prashar *et al*, (2011).

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Fig. 01: Antibacterial Activity of Leaf extract of *Aloe vera* against *Xcmi* strains

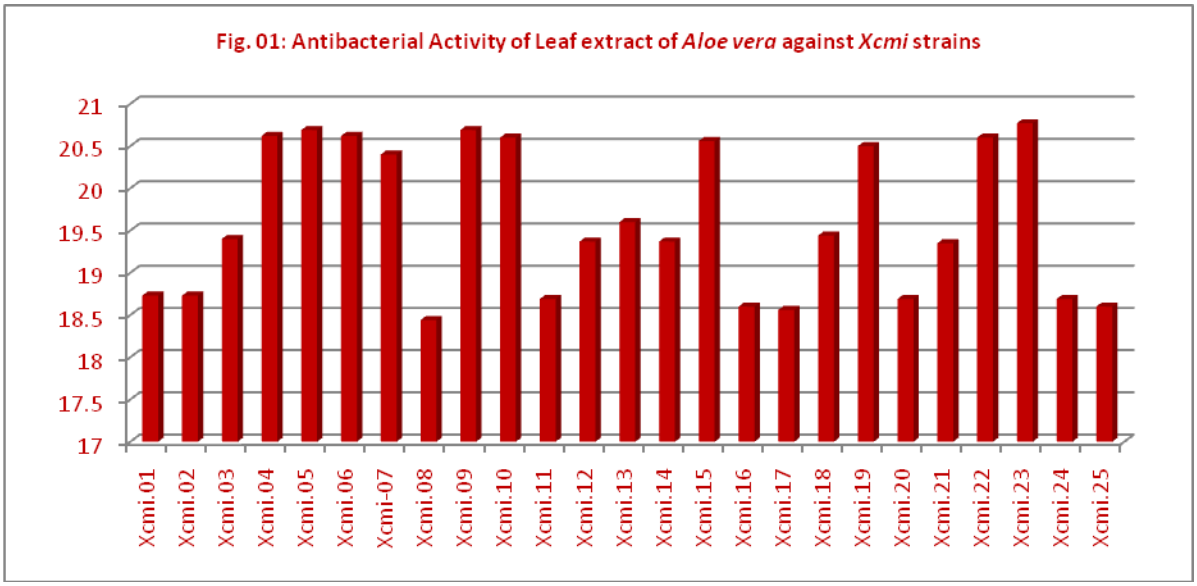

Table 01: Antibacterial Activity of Leaf extract of *Aloe vera* against *Xcmi* strains

Sr. No.	Name of the Strain	Zone of Inhibition (in mm)					
		Exp. A	Exp. B	Exp. C	Exp. D	Mean	Rank
1	*Xcmi*.01	18.50	19.00	18.75	18.66	**18.73**	-
2	*Xcmi*.02	18.75	19.00	18.66	18.50	**18.73**	-
3	*Xcmi*.03	19.00	19.25	20.00	19.33	**19.40**	-
4	*Xcmi*.04	20.33	20.66	21.00	20.50	**20.62**	-
5	*Xcmi*.05	21.00	20.75	20.66	20.33	**20.69**	-
6	*Xcmi*.06	21.00	20.66	20.50	20.33	**20.62**	-
7	*Xcmi-07*	20.33	20.75	20.50	20.00	**20.40**	-
8	*Xcmi*.08	18.00	18.75	18.33	18.66	**18.44**	**Min.**
9	*Xcmi*.09	21.00	20.75	20.66	20.33	**20.69**	**Max.-II**
10	*Xcmi*.10	21.00	20.00	20.75	20.66	**20.60**	-
11	*Xcmi*.11	18.33	18.75	18.66	19.00	**18.69**	-
12	*Xcmi*.12	19.00	19.33	19.50	19.66	**19.37**	-
13	*Xcmi*.13	19.75	20.00	19.00	19.66	**19.60**	-
14	*Xcmi*.14	19.00	19.50	19.66	19.33	**19.37**	-
15	*Xcmi*.15	20.33	20.50	20.66	20.75	**20.56**	-
16	*Xcmi*.16	18.00	19.00	18.75	18.66	**18.60**	-
17	*Xcmi*.17	18.75	18.50	18.66	18.33	**18.56**	-
18	*Xcmi*.18	19.00	19.75	19.66	19.33	**19.44**	-
19	*Xcmi*.19	20.00	21.00	21.00	20.00	**20.50**	-
20	*Xcmi*.20	18.75	18.00	19.00	19.00	**18.69**	-
21	*Xcmi*.21	19.00	19.75	19.66	19.00	**19.35**	-
22	*Xcmi*.22	20.00	21.00	20.66	20.75	**20.60**	-
23	*Xcmi*.23	21.00	20.66	20.75	20.66	**20.77**	**Max.**
24	*Xcmi*.24	18.00	19.00	19.00	18.75	**18.69**	-
25	*Xcmi*.25	19.00	18.00	18.66	18.75	**18.60**	-
Total		**486.82**	**492.31**	**493.09**	**488.93**	**490.29**	-
Average		**19.47**	**19.69**	**19.72**	**19.56**	**19.61**	-