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Determination of Antibacterial Activity of Datura Inoxia 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. Leaf extract of D. inoxia was 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. All experiments were repeated for four times (Experiment A, B, C & D). The maximum activity was recorded against Xcmi.15 (Mean activity zone – 19.69 mm) followed by Xcmi.09 (Mean activity zone – 19.65 mm) and comparatively minimum activity was recorded against Xcmi.02 (Mean activity zone – 16.56 mm). 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 activity, Xanthomonas campestris pv. mangiferaeindicae, Datura inoxia

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). Burt (2004) reported that the antibacterial activity of the essential oils is not carried out by one specific mechanism but acts over several specific targets in the cell. 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).

D. inoxia (Solanaceae) is an important medicinal plant as it is a well known source of different phytochemicals (Secondary Metabolites), it is distributed throughout most of the part of the world (Roddick, 1991). Al-Sarai *et al,* (2011) showed that *E. coli* was more sensitive than *S. aureus* to ethanolic extract of *D. inoxia*; when he studied *in-vitro* antibacterial activity. Kumaran *et al*, (2003) reported fungitoxic effects of root extracts of 18 herbaceous plants species, including *D. inoxia*, on *Colletotrichum capsici* causing anthracnose in *Capsicum annuum*. Reddy (2009) reported antimicrobial activity of alcoholic extract of *D. stramonium* and *Tylophora indica* against the majority of microorganisms, such as *Staphylococcus aureus, Proteus vulgaris, Pseudomonas aeruginosa, Escherichia coli, Aspergillus niger* and *Fusarium* species.

However, during this research work antibacterial activity of leaf extract of *D. inoxia* 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, leaf extract was used. They 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 (2014).

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 (2010).

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 *D. inoxia* showed antibacterial activity against all 25 strains of *Xcmi* under investigation. The maximum activity was recorded against *Xcmi*.15 (Mean activity zone – 19.69 mm) followed by *Xcmi*.09 (Mean activity zone – 19.65 mm) and comparatively minimum activity was recorded against *Xcmi*.02 (Mean activity zone – 16.56 mm) strain under investigation. Average activity of leaf extract of *D. inoxia* against all *Xcmi* strains was 18.14 mm. Activity ranges between 16 to 20 mm (Fig.01). Fifteen *Xcmi* strains (*Xcmi*.1, *Xcmi*.4, *Xcmi*.5, *Xcmi*.6, *Xcmi*.9, *Xcmi*.10, *Xcmi*.13, *Xcmi*.14, *Xcmi*.15, *Xcmi*.16, *Xcmi*.19, *Xcmi*.20, *Xcmi*.22, *Xcmi*.24 and *Xcmi*.25) have showed more activity than average activity of all strains i.e. 18.14 mm; while 10 *Xcmi* strains (*Xcmi.2, Xcmi*.3, *Xcmi*.7, *Xcmi*.8, *Xcmi*.11, *Xcmi*.12, *Xcmi*.17, *Xcmi*.18, *Xcmi*.21 and *Xcmi*.23) showed less activity than average activity.

Similar results were recorded by Gachande and Khillare (2013). They recorded antibacterial activity aqueous and ethanolic leaf extracts of *Datura* plant species *viz. D.ferox, D.inoxia, D.metal* and *D.stramonium* against pathogenic bacteria such as *Bacillus subtilis*-2699, *Escherichia coli*-2803, *Staphylococcus aureus*-2602, *Proteus vulgaris*-2027, *Salmonella typhi*-2501. Eftekhar *et al.* (2005) reported antibacterial activity of *D. innoxia* and *D. stramonium* against *Escherichia coli* and *Pseudomonas aeruginosa*. Kaushik and Goyal (2008)

studied *in-vitro* antibacterial activity of various parts of *Datura innoxia* against *E. coli* and *S. typhi*; gram-positive bacteria i.e. *Bacillus cereus*, *B. subtilis* and *Staphylococcus aureus*. Sharma *et al.* (2009) evaluated antibacterial and antifungal activities of some common plants and weeds. Jamdhade *et al,* (2010) investigated the antibacterial activity of extracts of different parts of four *Datura* spp. viz. *D. inoxia*, *D. ferox*, *D. metel* and *D. stramonium* against the bacterial pathogens *B. megaterium, B. cereus, E. coli, S. typhi* and *S. aureus*. Khalighi-Sigaroodi *et al*, (2012) reported cytotoxicity activities of the extracts of *D. innoxia* and *D. stramonium*. Antibacterial activity and quantitative determination of protein from leaf of *D. stramonium* and *Piper betle* plants was reported by Kumar *et al*, (2010).

It was observed from the research work, that leaf extract of *D. inoxia* 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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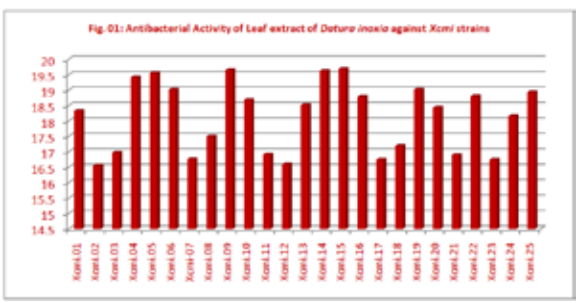

Table 01: Antibacterial Activity of Leaf extract of *Datura inoxia* against *Xcmi* strains

Sr. No.	Name of the Strain	Zone of Inhibition (in mm)					Remark
		Exp. A	Exp. B	Exp. C	Exp. D	Mean	
1	*Xcmi*.01	18.75	18.00	18.33	18.25	18.33	-
2	*Xcmi*.02	16.00	16.75	17.00	16.50	16.56	Min.
3	*Xcmi*.03	17.25	17.50	16.66	16.50	16.98	-
4	*Xcmi*.04	19.75	19.25	19.00	19.66	19.42	-
5	*Xcmi*.05	20.00	19.66	19.25	19.33	19.56	-
6	*Xcmi*.06	18.50	19.25	19.00	19.33	19.02	-
7	Xcmi-07	16.33	17.25	17.00	16.50	16.77	-
8	*Xcmi*.08	17.66	17.75	17.25	17.33	17.50	-
9	*Xcmi*.09	20.00	19.50	19.75	19.33	19.65	Max. II
10	*Xcmi*.10	19.00	18.33	18.75	18.66	18.69	-
11	*Xcmi*.11	16.66	17.00	17.25	16.75	16.92	-
12	*Xcmi*.12	17.00	16.00	16.66	16.75	16.60	-
13	*Xcmi*.13	18.25	19.00	18.33	18.50	18.52	-
14	*Xcmi*.14	19.75	19.50	19.25	20.00	19.63	-
15	*Xcmi*.15	20.00	19.66	19.75	19.33	19.69	Max.
16	*Xcmi*.16	18.50	18.33	19.33	19.00	18.79	-
17	*Xcmi*.17	16.00	17.00	17.00	17.00	16.75	-
18	*Xcmi*.18	17.66	17.33	17.00	16.75	17.19	-
19	*Xcmi*.19	19.00	19.25	19.33	18.50	19.02	-
20	*Xcmi*.20	18.33	18.66	18.00	18.75	18.44	-
21	*Xcmi*.21	16.75	16.50	17.33	17.00	16.90	-
22	*Xcmi*.22	18.66	18.25	19.00	19.33	18.81	-
23	*Xcmi*.23	16.50	16.75	16.75	17.00	16.75	-
24	*Xcmi*.24	18.66	17.66	18.00	18.33	18.16	-
25	*Xcmi*.25	19.50	18.75	18.50	19.00	18.94	-
Total		454.46	452.88	453.47	453.38	453.55	-
Average		18.18	18.12	18.14	18.14	18.14	-

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