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

ANTIBACTERIAL ACTIVITY OF LEAF EXTRACTS OF *TAMARINDUS INDICA* AGAINST *XANTHOMONAS CAMPESTRIS* PV. *MANGIFERAEINDICAE*

B.T. PAWAR AND G.M. WAGHMARE
Research Center in Botany, Shri Muktanand College, Gangapur – 431 109, Dist. Aurangabad (M.S.) INDIA.

KEYWORDS:

Antibacterial activity, *Xanthomonas campestris* pv. *mangiferaeindicae*, *Tamarindus indica*.

For Correspondence:

B.T. PAWAR*
Address:
Research Center in Botany, Shri Muktanand College, Gangapur – 431 109, Dist. Aurangabad (M.S.) INDIA.

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 *Tamarindus indica* showed good antibacterial activity. Hence, leaf extracts of *T. indica* 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 cup-plate method to examine the activity. Fresh leaf extracts of *T. indica* plants were screened against 25 strains of *Xcmi*. The maximum activity was recorded against *Xcmi*.14 (Mean activity zone – 17.77 mm) followed by *Xcmi*.10 (Mean activity zone – 17.69 mm) and minimum against *Xcmi*.01 (Mean activity zone – 14.46 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 (Naik, 1998; Suhaila *et al*., 1996; Kirtikar and Basu, 1991). 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. Plants produce a good deal of secondary metabolites which have benefited mankind in various ways, including treatment of diseases (Elaine *et al.,* 2002).

T. indica (Caesalpiniaceae) is widely used in traditional medicine for treatment of a variety of diseases (Abdel-Gadir *et al*, 2007). Some bacteria are resistant to many antibiotics; they are called as multi-drug resistant (MDR) bacteria (Chowdhury *et al*, 2013). Djeussi *et al*, (2013) reported antibacterial activities of selected edible plant extracts including fruit extract of Tamarind against gram-negative, multidrug-resistant (MDR) bacteria. Ethanolic seed extract of *Tamarindus indica*, were screened for phytochemical constituents and antibacterial activity (Ara and Islam, 2009). Traditionally used medicinal plants produce a variety of compounds of known therapeutic properties (Iyengar, 1985; Chopra *et al*, 1992; Harborne and Baxter, 1995) Tamarind leaves contains good levels of protein, fat, fiber, and some vitamins such as thiamine, riboflavin, niacin, ascorbic acid and B-carotene (El-Siddig *et al*, 2006). Gumgumjee *et al*, (2012) tested antibacterial activity of ethanol leaf extracts of *T. indica* against three Gram negative bacteria *viz. E. coli* (ATCC8739), *K. pneumoniae* (ATCC700603) and *P. aeruginosa* (ATCC27853). The results showed a strong activity against *K. pneumoniae* followed by *E. coli* and *P. aeruginosa*.

However, during this research work antibacterial activity of leaf extract of *T. indica* 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 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^{o}C at the 11000 rpm Pawar and Pandit (2014). This leaf extract was used for the further study.

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 and 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 *T. indica* showed antibacterial activity against all 25 strains of *Xcmi* under investigation. The maximum activity was recorded against *Xcmi*.14 (Mean activity zone – 17.77 mm) followed by *Xcmi*.10 (Mean activity zone – 17.69 mm) and comparatively minimum activity was recorded against *Xcmi*.01 (Mean activity zone – 14.46 mm) strain under investigation. Average activity of leaf extract of *T. indica* against all *Xcmi* strains was 16.29 mm. Activity ranges between 14 to 18 mm (Fig. 01). Fourteen *Xcmi* strains (*Xcmi*.2, *Xcmi*.4, *Xcmi*.6, *Xcmi*.8, *Xcmi*.10, *Xcmi*.11, *Xcmi*.13, *Xcmi*.14, *Xcmi*.16, *Xcmi*.17, *Xcmi*.19, *Xcmi*.21, *Xcmi*.24 and *Xcmi*.25) have showed more activity than average activity of all strains i.e. 16.29 mm; while 11 *Xcmi* strains (*Xcmi.1*, *Xcmi*.3, *Xcmi*.5, *Xcmi*.7, *Xcmi*.9, *Xcmi*.12, *Xcmi*.15, *Xcmi*.18, *Xcmi*.20, *Xcmi*.22 and *Xcmi*.23) showed less activity than average activity.

Similar results were recorded by Escalona-Arranz *et al*, (2010). They tested antimicrobial activity of leaf extracts of *T. indica*. Das *et al*, (2011) performed an experiment to reveal the anthelmintic activity of the leaf and bark extract of *T. indica* and they suggested the usage as an antiparasitic agent. Doughari (2006) concluded that *T. indica* has broad spectrum antibacterial activity and a potential source of new classes of antibiotics that could be useful for infectious disease chemotherapy and control.

It was observed from the research work, that leaf extract of *T. indica* 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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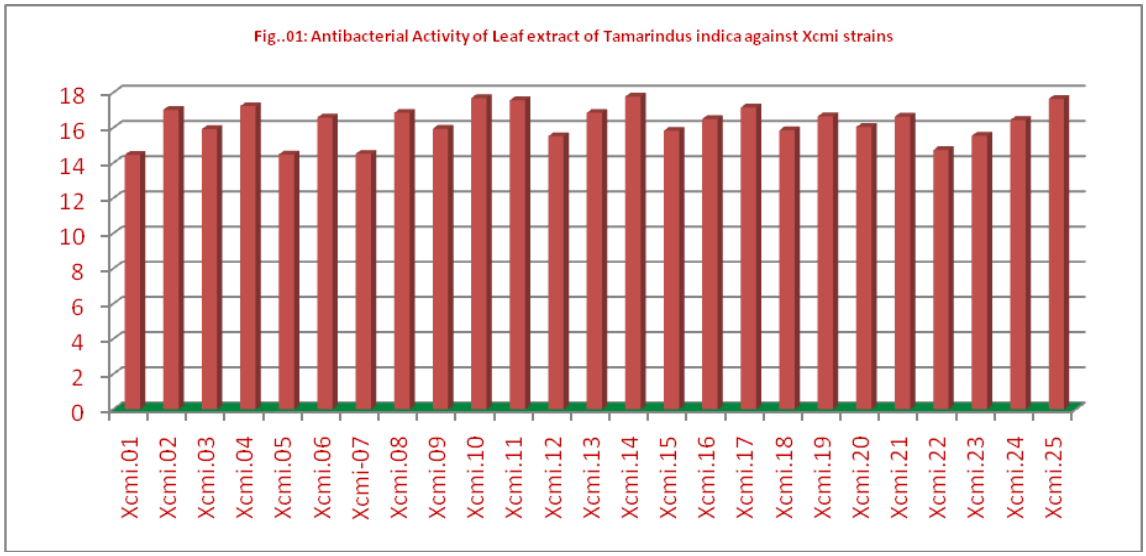

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Table.01: Antibacterial Activity of Leaf extract of *Tamarindus indica* against *Xcmi* strains

Sr. No.	Name of the Strain	Zone of Inhibition (in mm)					Remark
		Exp. A	Exp. B	Exp. C	Exp. D	Mean	
1	*Xcmi*.01	15.00	14.50	14.33	14.00	**14.46**	**Min.**
2	*Xcmi*.02	17.33	16.50	17.00	17.25	**17.02**	-
3	*Xcmi*.03	15.50	15.66	16.00	16.50	**15.92**	-
4	*Xcmi*.04	17.66	17.00	17.25	17.00	**17.23**	-
5	*Xcmi*.05	14.75	14.66	14.00	14.50	**14.48**	-
6	*Xcmi*.06	16.75	16.00	16.25	17.33	**16.58**	-
7	*Xcmi-07*	15.00	14.25	14.50	14.33	**14.52**	-
8	*Xcmi*.08	16.50	16.66	17.00	17.25	**16.85**	-
9	*Xcmi*.09	15.66	15.75	16.00	16.33	**15.94**	-
10	*Xcmi*.10	17.33	17.66	17.75	18.00	**17.69**	**Max.-II**
11	*Xcmi*.11	18.00	17.66	17.33	17.25	**17.56**	-
12	*Xcmi*.12	15.00	16.00	15.75	15.33	**15.52**	-
13	*Xcmi*.13	16.33	16.75	17.00	17.33	**16.85**	-
14	*Xcmi*.14	17.75	18.00	17.66	17.66	**17.77**	**Max.**
15	*Xcmi*.15	15.33	16.33	15.66	16.00	**15.83**	-
16	*Xcmi*.16	16.00	16.25	17.00	16.75	**16.50**	-
17	*Xcmi*.17	17.33	17.00	17.25	17.00	**17.15**	-
18	*Xcmi*.18	16.00	15.75	15.66	16.00	**15.85**	-
19	*Xcmi*.19	16.50	16.75	16.33	17.00	**16.65**	-
20	*Xcmi*.20	15.50	16.00	16.33	16.33	**16.04**	-
21	*Xcmi*.21	16.00	16.50	17.00	17.00	**16.63**	-
22	*Xcmi*.22	14.33	15.33	14.75	14.50	**14.73**	-
23	*Xcmi*.23	15.00	15.75	15.75	15.66	**15.54**	-
24	*Xcmi*.24	16.75	16.75	16.00	16.25	**16.44**	-
25	*Xcmi*.25	18.00	17.25	17.66	17.66	**17.64**	-
Total		**405.30**	**406.71**	**407.21**	**410.21**	**407.36**	-
Average		**16.21**	**16.27**	**16.29**	**16.41**	**16.29**	-