

In-Vivo Study of Antibiotics Against Mango Bacterial Canker Disease (MBCD)



Botany

KEYWORDS : Antibiotics, Mango Bacterial Canker Disease (MBCD), *Xanthomonas campestris* pv. *mangiferaeindicae* (Xcmi)

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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. The in-vivo studies were performed on immature fruits of mango. An attempt was made for the management of Mango Bacterial Canker Disease (MBCD) using antibiotics. Fruits inoculated with Xcmi strains then antibiotics were applied on it. The fruits were incubated in laboratory at room temperature and the results were recorded after 7 days. Out of various antibiotics tested, four antibiotics viz. Chloramphenicol, Tetracycline, Gentamicin and Streptomycin were selected for in-vivo experiment. Tetracycline showed maximum activity against MBCD. The ultimate aim of the research work was to develop a compatible management of MBCD by using suitable antibiotic.

INTRODUCTION

A wide range of crops are susceptible to bacterial plant diseases. Various economically important fruit plants, vegetables and ornamental plants are found to be affected by bacteria. 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.

Bacterial diseases of plants are very difficult to manage and can lead to devastating losses to farmers (Strange and Scott, 2005). It has been well established that bacterial diseases can be controlled by using antibiotics and hence, antibiotics are essential for controlling of bacterial diseases of plants. Before infection of the pathogens, antibiotics provide a protective barrier on the surface of the plants to avoid the infection. Mandal et al, (2012) evaluated the antibacterial activity of *Ocimum sanctum* (O. sanctum) leaf extract, alone and in combination with Chloramphenicol (C) and Trimethoprim (Tm) against *Salmonella enterica* serovar typhi (S. typhi). Stockwell & Duffy (2012) gave detail report on use of antibiotics in plant agriculture. Velasco et al, (2013) studied in-vivo and in-vitro antibacterial effect of gluconapin, its isothiocyanate and the methanolic extracts of *B. rapa* against the type 4 of *Xanthomonas campestris* pv. *campestris* (Xcc).

For the management plant diseases, various chemicals are used since last several years, the world over. Various antibiotics are useful to control the bacterial diseases of plants. In the present investigation, 04 antibiotics viz. Chloramphenicol, Tetracycline, Gentamicin and Streptomycin were tested to develop a compatible management of MBCD by using suitable antibiotic.

MATERIALS AND METHODS

Various antibiotics were tested by using Octodisc method (Pawar, 2007) against 25 strains of Xcmi strains collected from Konkan region of Maharashtra. Of the antibiotics tested, 17 antibiotics showing inhibitory effect against Xcmi strains, Four antibiotics viz. Chloramphenicol, Tetracycline, Gentamicin and Streptomycin were randomly selected for this experiment.

The in-vivo studies were performed on immature fruits of mango, adopting the procedure used by Misra (1995). Healthy immature fruits of mango of local variety were brought to the laboratory and thoroughly washed with tap water. With the help of sterile needle, five pin pricks were made on each mango fruit

and then spread with cell suspension of strain Xcmi.09. Three days later these fruits were spread with 200 ppm suspension of the antibiotics viz. Chloramphenicol, Tetracycline, Gentamicin and Streptomycin separately. Three replicates of each treatment were kept. The fruits were incubated in laboratory at room temperature. Observations were recorded 7 days after the spray of antibiotics. Fruits inoculated with bacterial phytopathogen strain Xcmi.09, but without the treatment of any antibiotic were kept as control.

RESULT AND DISCUSSION

It was interesting to note that typical canker symptoms developed on fruits which were kept as control (Fig. 01). However, the fruits treated with antibiotics, three days after inoculation, exhibited very small lesions. First fruit was not treated with any antibiotic and kept as control in the experiment. Second fruit was treated with Chloramphenicol, third was treated with Tetracycline, fourth with Gentamicin and fifth with Streptomycin. First Mango fruit showed rotted appearance because of the bacterial pathogen which resembles the control conditions. While comparing second, third, fourth and fifth fruits; third fruit treated with the antibiotic Tetracycline was showing smallest spots on the fruits. This shows that Tetracycline is more effective than other three antibiotics tested during the experiment.

Similar results were recorded by Tao et al, (2011). They performed in-vitro and in-vivo studies for the potential of neomycin to suppress the development of economically important plant pathogenic bacteria viz. *Xanthomonas campestris* pv. *citri*, *Erwinia carotovora* subsp. *carotovora*, *Xanthomonas oryzae* pv. *oryzae* and *Ralstonia solanacearum*. Khan et al, (2012) tested six antibiotics i.e. Benzyl Penicillin, Ampicillin, Kanamycin, Streptomycin, Chloramphenicol and SinoBionic were selected to screen in-vitro against five Xoo isolates in vitro and zones of inhibitions were recorded as parameters of effectiveness. For streptomycin and terramycin, the two most commonly used antibiotics against bacterial plant diseases, the resistance is now extremely widespread (Rezzonico et al, 2009). In order to control BLB spraying copper-oxochloride and streptomycin solution completely inhibits the growth of bacterium (Tagami and Mizukami, 1962; Hori, 1973). In India streptomycin mixture was tested for disinfection of rice seeds and was found effective (Srivastava, 1972). Ceylan et al, (2008) isolated the soil *Streptomyces* as source antibiotics active against antibiotic-resistant bacteria.

CONCLUSION

It was observed from the research work, that antibiotics Chloramphenicol, Tetracycline, Gentamicin and Streptomycin are effective against the development of mango canker on fruits. But, comparatively Tetracycline was found more effective to control MBCD.

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REFERENCE

- Ceylan, O., G. Okmen and A. Ugur (2008) Isolation of soil Streptomyces as source antibiotics active against antibiotic-resistant bacteria. *Eur. Asian Journal of BioSciences*, 2: 73-82. | | Hori, M., (1973) *Nippon Shin - noyaku Mongatri*, Japan plant protection Association, Tokyo, Japan (Jpn). pp. 622. | | Khan, J.A., R. Siddiq, H.M.I. Arshad, H.S. Anwar, K. Saleem and F. F. Jamil (2012) Chemical control of bacterial leaf blight of rice caused by *Xanthomonas oryzae* pv. *oryzae*. *Pak. J. Phytopathol.*, 24(2): 97-100. | | Mandal, S., M.D. Mandal and N.K. Pal (2012) Enhancing chloramphenicol and trimethoprim in-vitro activity by *Ocimum sanctum* Linn. (Lamiaceae) leaf extract against *Salmonella enterica* serovar Typhi. *Asian Pacific Journal of Tropical Medicine*, 220-224. | | Misra, A.K. (1995) Control of bacterial canker of mango under suitable weather conditions. *Indian J. Mycol. Pl. Pathol.*, 25(3): 214-217. | | Pawar, B.T. (2007) Studies on the bacterial diseases of fruit plants from Aurangabad district. Ph.D. thesis, Dr. Babasaheb Ambedkar Marathwada University, Aurangabad. | | Rezzonico, F., V.O. Stockwell and B. Duffy (2009) Plant agricultural streptomycin formulations do not carry antibiotic resistance genes. *Antimicrob. Agents Chemother.*, 53(7): 3173-3177. | | Srivastava, D.N. (1972) Bacterial blight of rice. *Indian Phytopathology*, 25: 1-16. | | Stockwell, V.O. and B. Duffy (2012) Use of antibiotics in plant agriculture. *Rev. sci. tech. Off. int. Epiz.*, 31(1): 199-210. | | Strange, R.N. and P.R. Scott (2005) Plant disease: a threat to global food security. *Annu. Rev. Phytopathol.*, 43: 83-116. | | Tagami, Y. and T. Mizukami (1962) Historical review of the researches on bacterial leaf blight of rice caused by *Xanthomonas oryzae* (Uyeda et Ishiyama) Dowson. Special report of the plant diseases and insect pests forecasting service No. 10. Plant protection Division. Ministry of Agriculture and Forestry, Tokyo, Japan, pp. 112. | | Tao, K., J. Fan, G. Shi, X. Zhang, H. Zhao and T. Hou (2011) In-vivo and in-vitro antibacterial activity of Neomycin against plant pathogenic bacteria. *Scientific Research and Essays*, 6(34): 6829-6834. | | Velasco, P., M. Lema, M. Francisco, P. Soengas and M. E. Carrea (2013) In-vitro and in-Vitro effects of secondary metabolites against *Xanthomonas campestris* pv. *campestris*. *Molecules*, 18: 11131-11143. |