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Agriculture is the backbone of Indian economy. The continuous increases in population, per capita food requirement and inputs of food production have imposed a great threat to the existence of farmers. Horticulture crops comprise about 40% in the agriculture and widely grown in most of the states in India.

Fruits are consumed as one of the component in the diet, because of high resources of energy, fibrous, minerals, vitamins and antioxidants. Fruits are known to be medically important since they regulate the degenerative diseases related to cancer, inflammation, arthritis, immune system decline, brain dysfunction and heart diseases etc.

Mango is the ‘King of fruits’, fifth largest and important fruit of tropical world belongs to the family Anacardiaceae. India produces 70% of the world’s Mango production. The soil and climatic conditions of India are highly suitable for Mango cultivation. The fruit is large, fleshy, drupe containing a laterally compressed stone, housing the seed. Mango cultivars vary considerably in fruit size, colour, shape, flavour, texture and taste.

India is the home of about 1,000 varieties. Most of them are the result of open pollination arisen as chance seedlings. However, only a few varieties are commercially cultivated throughout India.

Bacteria seem to be the most primitive living organisms. It is speculated that they originated on the earth when there was no vegetation. As with fungal plant pathogens, however bacterial diseases in plants are slow, diagnosis of a bacterial disease and identification of the causal bacterium is based on the symptoms of the disease, the constant presence of large numbers of bacteria in the affected area, and the absence of any other pathogens.
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*Xanthomonas* is a genus of Proteobacteria, many of which cause plant diseases. *Xanthomonas* can infect a wide variety of species, *Xanthomonas campestris pv. mangiferaeindicae*, the causal agent of mango bacterial black spot disease, was found as an epiphyte on mango buds in naturally infested orchards.

Bacterial black spot diseases of mango casual organism is *Xanthomonas campestris pv. mangiferaeindicae*, the mango leaves, stems and fruits are all susceptible to infection. On leaves it produce angular, water soaked spots, (Fig. 4.8 & 4.9) which delimited by the veins. Stem lesions appear as blackened cankers that form longitudinal cracks with bacterial exude. Fruit drop occurs especially when infection start on young fruits or when stalks become fruit infected. The disease attacks through natural openings such as stomata, wax and oil glands, leaf and fruit abrasions, leaf scars and at the apex of branches in the panicle, in young trees the diseases can cause dieback of branches.

Reports are available on disease nature, detection, transmission of bacterial diseases in mango crop, but reports are scanty on the systematic survey, documentation, characterization, detection, race and biovar identification, genetic variations and control measures of the mango bacterial black spot pathogen *Xanthomonas campestris pv. mangiferaeindicae* in mango crop.

Mango growing districts of Karnataka were identified from the data of Agriculture Crop Statistics Data 2009, Department of Statistics, Lalbagh, Bangalore. Study area was selected ten major mango production districts in Karnataka are Kolar, Tumkur, Chitradurga, Belgaum, Dharwad, Koppala, Chikkamagalur, Chikkaballapura, Mysore and Bangalore Rural. An extensive survey was undertaken in the Mango growing districts of Karnataka during 2009-2011 during which the number of orchards infected to the number of orchards surveyed, climatic
conditions, cultivars / varieties grown was recorded. If the orchard was infected then the probable mode of infection, transmission, the type of infection, symptomatology, the probable time of the first appearance of the disease in that particular orchard, probable disease status, agricultural practices followed, disease incidence, severity and physiological growth status of the plants were recorded, correlation of the symptoms with the climatic parameters was done.

Plants with the disease symptoms were collected randomly from fields and parts such as leaves, fruits and stem, brought to the laboratory and screened for the target pathogen *Xanthomonas campestris pv. mangiferaeindicae* by direct plating, liquid assay methods.

Identified the isolates from the diseased leaves, stem and fruits of Mango on the basis of morphological, cultural, biochemical and pathogenicity tests as per the standard microbiological procedures and results were compared with the authentic culture.

Genetic variation was identified by the PolymeraseChain Reaction- RandomAmplified Polymorphic DNA (PCR-RAPD), *Xanthomonas campestris pv. mangiferaeindicae* isolates selected from different district and regions of Karnataka, DNA was isolated usingHimedia laboratory genomic DNA isolation kit, amplified ten primers with PCR, then the product was run through agarose gel electrophoresis. The RAPD analysis Band statistics and cultivar similarity of RAPD markers further confirmed polymorphism among the studied 15 *Xcm* accessions. Ten RAPD primers generated 106 loci and among which 101 loci (95.28%) were polymorphic and 5 (4.71%) were monomorphic. An average of about 10.6 bands was generated per primer, which is the fragment size varied from 0.2 - 1.5 kb. The number of bands per
primer ranged from 8 to 15 with a mean of 10.6 bands per primer. The extent of polymorphism per primer varied from 80.0% to 100% with a mean of 95.28%.

Population analysis dendrogram generated based on the UPGMA analysis from the 15 bacterial genotypes data clearly grouped into two broad clusters at 80.6% dissimilarity. The group 1 contains 8 strains (KUM, DAS, PAV, GOB, PER, BET, MUT, RAYL) and remaining group contains 7 strains (MLK, TVG, BELG, YAR, KRC, BIS, LIN) formed a cluster. The PER and BET strains shared very low variability and formed cluster at 30.6% dissimilarity.

In order to control the growth of *Xanthomonas campestris* pv. *mangiferaeindicae* pathogen in vitro conditions by Antagonistic organisms, Antibiotics, commercial formulates and macro fungus and plant extracts using different solvents like pet ether, chloroform, methanol and water.

Disease management by organisms, *In vitro* antagonistic activity of *Trichoderma* sp. culture filtrates by Well diffusion method, present investigation *Trichoderma* sp. inhibit the target pathogen and also investigated *In vitro* antagonistic activity of *Lactobacillus* sp. by Dual culture method but, *Xanthomonas campestris* pv. *mangiferaeindicae* shows resistance.

Antibiotics like Fluconazole and Penicillin fails to inhibit the growth of the target organism Bacitracin, Gentamici and Vancomycin shows inhibition zone, Amoxycillin, Tetracycline, Kanamycin, Ciproflaxacin, and Chloramphenicol shows very good results against target pathogen performed by disc diffusion method.

Then Commercial formulates like Copper sulphate, Copper oxychloride, Streptocycline, Bactrinashak, Mancozeb and Bavistin shows positive result against *Xanthomonas campestris* pv. *mangiferaeindicae* performed by well diffusion
method when used alone and mixed concentrations, significantly reduced the growth of the bacteria, whereas bavistin alone was not effective when compared to other formulations.

Bactericides were sprayed to mango leaves, out of six bactericides five were reduce symptoms caused by *Xanthomonas campestris pv. mangiferaeindicae* was evaluated in plants sprayed with the pathogen. *Xanthomonas campestris pv. mangiferaeindicae* was not easily isolated more than 70% of inoculated plants in samples obtained from symptomatic leaves and black spots, which was treated with copper oxychloride + copper sulphate; streptocycline + bactrinashak; mancozeb + copper oxychloride, mancozeb + bavistin and bavistin + bactrinashak treatment in two independent experiments.

Some plant and macro fungal crude extracts of *Xylaria* sp, leaf extracts of *Helicteres isora, Piper betel, Asclepias curassavica, Tamarindus indica, Tridax procumbens, Azadirachta indica, Coffee leaf* and fruit extract of *Sapindus laurifolia*, also shows positive result to control the *Xanthomonas campestris pv. mangiferaeindicae* performed by well diffusion method.

Among the selected eight plant extracts, *Sapindus laurifolia*, exhibited the highest bactericidal activity against *Xanthomonas campestris pv. mangiferaeindicae*. In addition, *Asclepias curassavica, Azadirachta indica* and *Helicteres isora*, displayed strong bactericidal effect on *Xanthomonas campestris pv. mangiferaeindicae* under the same conditions. *Piper betel, Tamarindus indica, Tridax procumbens, and Xylaria* sp, had a moderate and specific response in bacterial lethality, resulting in reductions in growth of *Xanthomonas campestris pv. mangiferaeindicae*. 
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Among all the control methods, commercial formulations are very effective to control the *Xanthomonas campestris* pv. *Mangiferaeindicce* followed by the other control methods.