Title Mitigating post harvest losses caused by anthracnose disease in mango by using bio-agents, botanicals and induced systemic resistance

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Abstract

Mango *(Mangifera indica L.)* is one of the world's most important and esteemed fruit of the tropical and subtropical countries and is cultivated extensively as a commercial fruit crop in India. Various biotic and abiotic stresses cause immense loss to mango crop throughout the world. Among biotic stresses, anthracnose disease caused by *Colletotrichum gloeosporioides* (Penz). Penz.&Sacc.in Penz is the most important and destructive disease of mango. It causes leaf spot and pre harvest blossom blight in mango resulting in fruit set reduction and the quiescent infection leads to post harvest losses up to 84 %. The farmers and exporters are using high doses of fungicides for control of anthracnose in pre and post harvest conditions, which leads to the resurgence of resistance in pathogens not only that it leads to environmental pollution and health problems in human being. Hence, in search of the alternate methods like the use of bio-control agents, botanicals, induced systemic resistance (ISR) by chemicals and their combination were tried to minimize the fungicides usage in mango production. The different fungal, bacterial and yeast isolates which were isolated from plant canopy were screened against *Cgloeosporioides in vitro* and the potential native bioagent *Trichoderma viride* (Tv1) has recorded maximum mycelial growth reduction of C *gloeosporioides* and showed compatibility with commonly used fungicides in mango such as copper oxychloride, mancozeb and propineb. However, all the biocontrol agents were highly incompatible with systemic fungicides carbendazim and hexaconazole even at low concentration of 1 ppm and were more compatible with systemic insecticides such as imidachloprid (0.3 ml l^{-1} acetamiprid (1 g l^{-1}) and monocrotophos (1.6 ml l^{-1}) compared to non-systemic insecticides carbaryl (3g l^{-1}), dichlorovas (1 ml l^{-1}) and endosulphan (2 ml l^{-1}). In the group of botanicals highly significant differences in the per cent growth inhibition of *C. gloeosporioides* were observed with eucalyptus oil at 1 % and 0.5 %(100%) and neem oil 5% (80.0%) followed by henna leaf extract (67.4%) treatments. Systemic resistance inducing chemicals (ISR) such as Potassium dihydrogen orthophosphate, Potassium hydrogen orthophosphate, Potassium silicate, Polyacrylic acid, Potassium nitrate at 10% and Salicylic acid (100 ppm) were tried as pre harvest spray on mango trees for the control of post harvest anthracnose disease in fruits. Among these, spraying of salicylic acid (100 ppm) showed maximum (68.3%) disease reduction over control followed by Potassium

silicate (62.9%). Finally the different combinations of biocontrol agent, botanicals and systemic resistance induced chemicals were tried to manage the post harvest anthracnose incidence and the combination of *Trichoderma viride* (2%), eucalyptus oil (1%) and salicylic acid (100 ppm), recorded maximum reduction of anthracnose followed by combination of salicylic acid and eucalyptus oil treatment. All other treatments were on par with each other and they significantly controlled post harvest anthracnose than untreated control in which the PDI was 80% at 15 days after inoculation.