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Antagonistic potential of bacteria from a rubber plantation in Konkan region of Maharashtra against major pathogens of rubber

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INTRODUCTION

Hevea brasiliensis, the Para rubber tree is the most important source of natural rubber. Due to the growing demand for natural rubber in India and limited scope for further expansion of area in the traditional regions, rubber cultivation has been extended to the non traditional areas. One of the major contraints to rubber cultivation is the diseases affecting growth and yield of rubber. Abnormal leaf fall , shoot rot, patch canker, barkrot *etc* caused by *Phytophthora* spp., pink disease caused by *Corticium salmonicolor*, root disease by *Phellinus noxious*, leaf diseases by *Corynespora cassiicola* and *Colletotrichum* spp. are the major fungal pathogens affecting in India. Depchari, locted in Konkan region of Maharashtra, is a non-traditional rubber growing area. Severe incidences of the various diseases of rubber are not reported from this area. But during July 2011, 17% of the polybag plants of the clone RRIM 600 at the Regional Research Station were lost due to shoot rot and in mature plantation 40-50% leaf fall was observed due to *Phytophthora* (Joseph *et al.*, 2011). A change in meteorological conditions conducive for the disease development was reported which led to the occurrence of the Phytophthora diseases. This shows the chances for the occurrence of other diseases also. Repeated use of chemical fungicides for managing these diseases is also not desirable due to various adverse impacts, such as development of resistance in pathogen, decline in beneficial nontarget organisms in soil and environmental and human impacts. In general, biological control has been considered as an alternative or a supplementing way of reducing use of chemicals in agriculture. Antagonistic soil bacteria are an important group of beneficial bacteria efficient for the control of soilborne pathogens.

The present study was aimed to evaluate the antagonistic potential of bacteria isolated from Depchari soil, in the Konkan region of Maharashtra against the major pathogens of *H. brasiliensis*.

MATERIALS AND METHODS

In this study 100 morphologically different bacterial colonies were collected from soil cultivated with rubber from RRS Depchari, Maharashtra and were purified by repeated culturing. The five major fungal pathogens of rubber *viz., P. meadii, C. salmonicolor, C.cassiicola, Colletotrichum acutatum, C.gleosporoides* and *P. noxius* were taken from the cultural collection of RRII. The antagonistic potential of the bacterial isolates against the pathogens were studied by dual culturing. The bacteria were streaked to one side of a potato dextrose agar plate and a 5mm disc of the pathogen was placed in the opposite end and incubated. Control plates with pathogen alone were also maintained. After 5 days the zones of pathogen growth inhibition, if any, by the isolates were measured and antagonists against each pathogens were short listed based on growth inhibition zone. Each test was repeated three times and the results were recorded as the mean inhibition growth.

RESULTS AND DISCUSSION

The degree of antagonism varied among the bacterial isolates and with the pathogens. Out of the 100 isolates tested 46 showed growth inhibition of any of the pathogens, of which 23 were antagonistic to more than one pathogen. Fourteen isolates showed growth inhibition to *P.meadii* with a range of 13mm-35mm. Isolate Dep.29 showed highest zone of inhibition. Fourteen isolates were antagonists to *C. salmonicolor* with a range of 10mm-28mm. The highest zone of antagonism was recorded by isolate Dep.2. This isolate was also antagonistic to *P.meadii* (14mm zone), *C. cassiicola* (28mm zone), *C. accutatum* (27mm zone) and *P. noxious* (27mm zone). Thirteen isolates were antagonistic to *C.cassiicola*, with a range of 6mm-28mm. Among the antagonists Dep.2 was the best antagonist of this pathogen. The isolates also showed variation in their antagonism against the two species of *Colletotricum*. Twelve isolates were antagonists to *C. acutatum* with a range of 10mm-35mm. Thirteen isolates were antagonists to *C. gloeosporioides* with a range of 15mm-33mm. Only three isolates inhibited the growth of both the pathogens. The isolate Dep 30 with more inhibition of *C. acutatum* was also antagonizing *P.noxious* (25mmzone), *C.cassiicola* (22mmzone) and *C. salmonicolor* (27mm zone). Isolate Dep 10, having the highest antagonism against *C. gleosporioides* was also antagonistic to *P.meadii* (22mm zone) and P. noxious(15mm). Seventeen isolates were inhibiting the growth of *P. noxious* with a range of 5mm-27mm.

One of the widely recognized mechanisms of bio control mediated by bacteria is the production of inhibitory allelochemicals. The formation of inhibition zone by the antagonists suggests the involvement of antibiosis possibility due to production of different antifungal chemicals by the antagonists. The varying response of the antagonists in inhibition of the pathogens tested may be due to the difference in the quantity and activity of the metabolites produced by them. Several bacterial studies have been successfully reported in control of damping off and root disease of several crops (Hass and Defago, 2008). An effective bio control agent must be adapted to a certain environment. The endemic bacterial pool of a region may be more efficient and is likely to perform better than the exotic strain because of their better adaptability to that region. There is no previous research done on the antagonists of rubber from this region. In this study endemic antagonists of various pathogens were identified. The potential of these antagonists can be exploited for the bio control of various diseases that may occur in this region.

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