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Antagonistic effect of bacteria and fungi on Fusarium wilts pathogen

Cenek Novotny, Andrea Palyzova, Katerina Svobodova, Lucie Sokolova and Jiri Novak
Institute of Microbiology of the CAS, Czech Republic

Biocontrol agents represent an alternative to chemicals in the management of fungal crop diseases. A wide range of microorganisms can be used as biocontrol agents, mainly bacterial and fungal isolates and the biological control results from many types of interactions between organisms. In our study, Fusarium oxysporum f.sp. conglutinans was confronted with three different biocontrol agents, Trichoderma harzianum, Bacillus amyloliquefaciens and Pseudomonas aeruginosa in dual cultures. Bioassays and metabolites produced in the microbial interactions were screened by a Matrix-Assisted, Laser Desorption/Ionization (MALDI) mass spectrometry. T. harzianum exhibited the strongest inhibition of mycelial growth of F. oxysporum by overgrowing the pathogen in the later stages of co-cultivation. The metabolite profiles obtained in the case of T. harzianum and B. amyloliquefaciens were the result of an attack on the F. oxysporum mycelium by the antagonists by means of membrane-attacking peptaibols and a number of antimicrobial lipopeptides and siderophores, respectively. The biocontrol activity of T. harzianum and B. amyloliquefaciens consisted in their ability to suppress the production of mycotoxin beauvericin by F. oxysporum. In the case of P. aeruginosa, siderophores pyoverdine E/D and two rhamnolipids were produced as major bacterial metabolites. Under the conditions of a co-culture with F. oxysporum the production of rhamnolipides by the bacterium was blocked by the action of the fungal phytopathogen. The biocontrol of F. oxysporum by P. aeruginosa was weaker that those by T. harzianum and B. amyloliquefaciens. Fusarium wilt disease caused by Fusarium oxysporum f sp. Cubennse (Foc) is a major disease on Banana plant which lost production more than 50 %. This patogen is a soilborn disease and persistence until five years in the soil. Biological control is one of stratetegic diseases control need to applied to inhibit development of Fusarium wilt disease of Banana. The purposes of this study are (a).to isolate antagonistic bacteria from banana plant rhizosphere which has a good potensial to inhibit Foc growth by in vitro;(b)to know antagonistic mechanisms of selected bacteria by secondary metabolite production by in vitro. This study was carried out in Biology Laboratory Universitas Negeri Makassar with method as follows:(a).Isolation and purification of antagonistic bacteria from Banana plant rhizoaphere;(2).Test of dual culture; (3) Test of secondary metabolite substance. The result of this study showed that (a) there are four selected bacteria which have a good potential in inhibiting Foc growth by in vitro such as : Isolate B6, B8, B2 and B1 with inhibitor capacity 80.47%, 80.17%, 78.78% and 77.74%, respectively. (b) Inhibitor capacity of selected bacteria by chitinaze enzyme, pectinase and high antibiotic substance. This research was conducted at Biology Laboratory State University of Makassar. Dilution soil samples from the rhizosphere of banana plants made from 10-1 to 10-6, the next was sample 10-6 dripped on the NA media as much 10-1ml. The ability of some bacteria in inhibiting pathogenic in vitro by using dual culture method direct opposition between bacteria of the rizosphere against pathogenic fungi Foc in PDA media. R1: Colonial diameter of fusarium (treatment) (cm) R2 : Colonial diameter of fungi (control) (cm) d : Percentage of growth inhibition (%) Figure 1. Percentage of microbial inhibition test was calculated using the formula plant growth Pathogenic growth was observed in 24 hours interval which started one day after application until ten days. Observation was stopped when the growth of pathogen closed to the edge of petri dish (control). The result of dual culture used in vitro technique will be obtained antagonistic isolates which have a good potential to control the growth of Foc. To understand mode of action of antagonistic bacteria were carried out by enzymatic and antibiotic tests. By qualitative analysis, It will be found out bacterial isolates which have a high potential in controlling Foc fungus. Pure cultures of antagonistic bacterial isolates were identified based on [6], method namely. Their features were physiological and biochemical characteristics. Selected bacteria were quantitatively evaluated their potency in secreting extracellular enzymes. Qualitative analysis of enzymes were carried out on Czapek Dox Agar media (CDA) added with Commassssie Briliant Blue (CBB) with cellulose, chitin, and pectin substrates (0.1- 0.15 %) and pH 5.5. After inoculation of inoculum on CDA media. All inoculated petri dishes covered with paper then incubated for three days. Zone of color change on media occurred after 2- 3 days cultivation. Enzymatic activity levels were measured based on the change of color on media.