Evaluation of Acacia stuhlmannii plant extracts for their efficacy on management of bacterial wilt of tomato caused by ralstonia solanacearum

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Abstract

Plant phytoactive compounds are antimicrobial against multidrug resistant bacteria. These compounds can be extracted from plants by use of solvents. The objective of this study was to extract and evaluate crude compounds from Acacia stuhlmannii root barks against Ralstonia solanacearum. Crude extracts was obtained by single solvent maceration. Polar (ethanol) moderately polar (ethyl acetate) and non-polar (hexane) solvents yielded 7.94, 4.90 and 3.27% respectively, from about 1 kg of powder. The extracts were tested against causative agent of bacteria wilt of tomato in the laboratory and in pots under a black shade net condition. Invitro assay was done by disc diffusion sensitivity test at incubation temperatures of 28°C and 35°C using cotrimozazole and 10% v/v Dimethyl Sulfoxide (DMSO) as positive and blank controls, respectively. Hexane extracts performed best at all incubation temperatures. Further assays were done to determine the minimum inhibition concentrations (MIC) of extracts using serial dilution method. Concentrations of 18.3, 19.3, and 25.7 mgml-1 w/v were determined as MIC for hexane, ethyl acetate and ethanol extracts, respectively. Findings indicated stability in activity of hexane, ethyl acetate and ethanol extracts against changes in temperatures, ultra violet (UV-B) band and pH. Invivo assays were done on two (2) weeks old tomato (Cal J variety) seedlings. Application of 20 ml of MIC extracts was done through soil drenching two (2) days before inoculation, at inoculation time and two (2) days after inoculation. About 15 ml of Ralstonia solanacearum suspension of 107 CFUml-1 was inoculated in each 500 ml plastic pot. Sets treated with sterile distilled were used as controls. All seedlings were pricked twice around the root region to enhance infection after inoculation and watered regularly. Diseases severity was scored on a six-pointed scale at an interval of three (3) days for 12 days. Recorded data was subjected to analysis of variance (ANOVA) and means separated at 95% confidence level. Hexane extracts reduced disease development by a maximum of 84.2%, ethyl acetate extracts by 52.7% and ethanol extract by 41.5% after twelve (12) days of incubation. Treatment done two days before and simultaneous with pathogen inoculation were not significantly different ($P>0.05$) at day 12. Further, hexane extracts were assessed for bioactivity at half MIC, full MIC and double MIC rates. The performances of full and double MIC were not statistically different at $P>0.05$. Hexane extracts were further evaluated for efficacy in pot trials. The disease severity indices and fruit production were assessed after 75 days from treatment. Treatments applied with hexane extracts simultaneously or before inoculation significantly suppressed disease occurrence compared to controls. However, there was no significant difference ($P>0.05$) in disease incidence and fruit yield for treatments where the extracts were introduced before or simultaneously with R. solanacearum inoculations. Treatments done two days after pathogen inoculation did not ($P<0.05$) suppress bacterial wilt disease. These findings

show that hexane extracts from A. stuhlmannii provide a promising biocontrol strategy in the control of R. solanacearum disease in tomatoes.

Key words: Biological control, bacterial wilt, disease suppression