

Efficacy of buffalo dung inhabiting bacteria in biocontrol of vascular wilt and gummosis for luxuriant growth of *Foeniculum vulgare* Mill.

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Abstract

In present research, three plant growth-promoting (PGP) non-pathogenic bacterial strains *Proteus mirabilis* BUFF12, *Pseudomonas aeruginosa* BUFF14 and *Enterobacter xiangfangensis* BUFF38 inhabiting buffalo dung identified and studied for antifungal activity. Among three, *P. mirabilis* showed broad spectrum antifungal activity against *Fusarium oxysporum* (62.7%) and *Rhizoctonia solani* (71.7%). FTIR spectral analysis of crude ethyl acetate extract of *P. mirabilis* showed the presence of O-H, N-H, O=C=O, C=O, C=N, CH₂, C-O, C-H, PO₂-, and C-C functional groups. GCMS spectral analysis displayed the presence of eleven bioactive metabolites and the major compounds were 2-cyclopenten-1-one, 3-(acetyloxy) (23.87%) followed by Glutarimide, N-(4-ethylphenyl)- (19.34%); 4-methyl-2-oxopentenenitrile (14.49%); 2,3-Cyclododecenopyridine (13.40%). The purified compounds also established multifarious PGP activity in test crop plants during pot study for disease management. 2-cyclopenten-1-one,3-(acetyloxy) recorded significant inhibitory activity against *F. oxysporum* (62.7%), followed by *R. solani* (71.7%). Pot trial studies with this strain significantly reduced disease severity in fennel plants challenged with *F. oxysporum* and *R. solani* infection. Our findings provide new insights into the antifungal activity of *P. mirabilis*, and suggest this species may a promising candidate as a biocontrol agent to confer resistance to gummosis and foot rot and other phytopathogens in fennel crop.

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