World Academy of Science, Engineering and Technology
International Journal of Bioengineering and Life Sciences
Vol:17, No:04, 2023

Bacillus thuringiensis CHGP12 Uses a Multifaceted Strategy to Suppress Fusarium Wilt of Chickpea and to Enhance the Total Biomass of Chickpea Plants

Authors : Muhammad Naveed Aslam, Rida Fatima, Anam Moosa, Muhammad Taimoor Shakeel

Abstract : Bacillus strains produce antifungal secondary metabolites making them potential candidates for suppressing Fusarium wilt of chickpea disease. In this study, eighteen Bacillus strains were evaluated for their antagonistic effect against Fusarium oxysporum f. sp. ciceris causing Fusarium wilt of chickpea disease. In a direct antifungal assay, thirteen strains showed significant inhibition zones while the remaining five strains did not produce inhibition zones of FOC. Bacillus thuringiensis CHGP12 was the most promising strain exhibiting the highest inhibition of FOC. Antifungal lipopeptides were extracted from CHGP12 strain which showed significant inhibition of the pathogen. Liquid chromatography mass spectrometry (LCMS) analysis revealed that CHGP12 was positive for the presence of iturin, fengycin, surfactin, bacillaene, bacillibactin, plantazolicin, and bacilysin. CHGP12 was tested for biochemical determinants in an in vitro qualitative test where it showed the ability to produce lipase, amylase, cellulase, protease, siderophores, and indole 3-acetic acid (IAA). Furthermore, in a greenhouse experiment CHGP12 also showed a significant decrease in the disease severity in treated plants compared to control. Moreover, CHGP12 also exhibited a significant increase in plant growth parameters viz, root and shoot growth parameters, stomatal conductance, and photosynthesis rate. Conclusively, our findings present the promising potential of Bacillus strain CHGP12 to suppress Fusarium wilt of chickpea and to promote plant growth.

Keywords : liquid chromatography mass spectrometry, growth promotion, antagonism, hydrolytic enzymes, inhibition, lipopeptides.
Conference Title : ICFMPP 2023 : International Conference on Forest Microbiology and Plant Pathology
Conference Location : Paris, France
Conference Dates : April 13-14, 2023