عنوان مقاله:

Enhancement of bacterial wilt resistance and rhizosphere health in tomato using bionanocomposites

محل انتشار:

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خلاصه مقاله:

Biological control agents are useful components in the enhancement of plant disease resistance and improvement of soil properties. Effect of biological control agents (BCAs) as a disease control method in plants is hampered by their vulnerability to environmental and edaphic conditions. This study entailed the use of chitosan-silica nanocomposites for delivery of BCAs. Effect of BCAs-nanocomposite complexes (bionanocomposites) on resistance of tomato plants to bacterial wilt, mycorrhizal root colonization and rhizosphere soil properties were investigated. Replacement of mesoporous silica nanoparticles (MSN) in the nanocomposite with nano synthesized clay was also assessed on disease resistance. Tomato seeds and seedlings were pre-treated using bionanocomposites and then inoculated by Ralstonia solanacearum isolated from infected tomato plants in a greenhouse. Bionanocomposites treatment of tomato plants caused a significant increase ($P \leq 0.05$) in the level of pathogenesis-related biochemicals such as chitinase and glucanase. Furthermore, beneficial microbial colonization was significantly ($P \leq 0.05$) induced in roots treated with the bionanocomposites. Wilting incidence and symptoms were reduced by over 50% when bionanocomposites were used. There was no significant effect ($P \leq 0.05$) on induced host plant resistance when mesoporous silica nanoparticles (MSN) were substituted with nanoclay particles. Therefore, due to ease of availability with no significant ($P \leq 0.05$) difference in efficacy between the nanoparticles, replacement of MSN with nanoclay in synthesis of the bionanocomposites is recommended. We argue that substitution of nanoclay with MSN makes the process of synthesizing the bionanocomposites sustainable.

کلمات کلیدی:

AMF colonization, host plant resistance, mycorrhiza-helper micro-organisms, nanoclay, resistance elicitors