ABSTRACT

Three indigenous bacteria isolated from pepper rhizosphere and a non-rhizosphere bacterium *Psuedomonas putida* strain NCMIB-9571 were evaluated for their ability to improve growth, fruit yield and to suppress potyvirus disease in pepper *Capiscum chinense* (Jacq.) cv. Scotch Bonnet. The three bacteria isolates UWI-2, UWI-3 and UWI-4 were identified as *Serratia marcescens*, *Bacillus sp.* and *Bacillus* sp., respectively. In screening experiments growth parameters evaluated were shoot length, shoot dry weight up to eight weeks in a plant growth chamber with diurnal conditions set at 16 h light, 8 h dark at 28°C and 24°C, respectively. Two isolates, *P. putida* NCIMB-9571 and *Bacillus* sp. strain UWI-3 significantly increased shoot length by 29% and 30%, respectively (P=0.05). Four isolates, *P. putida* NCIMB-9571, *Serratia marcescens* strain UWI-2, and *Bacillus* sp. strain UWI-3 increased shoot dry weight by 46%, 17% and 77%, respectively (P=0.05). *Pseudomonas putida* NCIMB-9571 and *Bacillus* sp. strain UWI-3 were tested under gnotobiotic conditions for their ability to promote root elongation. Root growth in both *P. putida* NCIMB-9571 and *Bacillus* sp. strain UWI-3 treated seeds occurred at a much faster rate and was significantly longer than the control. *Pseudomonas putida* NCIMB-9571 and *Bacillus* sp. strain UWI-3 were also tested for their ability to utilize 1-aminocyclopropane-1-carboxylate (ACC) as the sole nitrogen source and for the production of the enzyme ACC deaminase. Both *P. putida* NCIMB-9571 and *Bacillus* sp. strain UWI-3 grew well on DF salts minimal media with ACC as the only nitrogen source and produced ACC deaminase activity of 78 nmole/mg of protein/min and 42

nmoles/mg of protein/min, respectively. *Pseudomonas putida* - 9571 Rif ^{r} successfully colonize the roots of scotch bonnet pepper. However, *Bacillus sp.* – UWI-3 Rif^{r} was unable to survive in the pepper rhizosphere.

Plants bacterized with *P. putida* NCMIB-9571 and *Bacillus* sp. strain UWI-3 were more tolerant to potyvirus infection than the non-bacterized plants. Bacterized plants had delayed symptom development and greater plant growth compared to the non-bacterized and potyvirus inoculated control plants. Pepper seedlings bacterized with *P. putida* NCMIB-9571 and *Bacillus* sp. strain UWI-3 significantly increased shoot length, shoot and root dry weight. Of the two strains, *Bacillus* sp. UWI-3 had greater disease control and successfully induced resistance to tobacco etch (TEV) in both greenhouse and field evaluations. Evaluation of the nitrogen, phosphorus and potassium levels of greenhouse grown bacterized and nonbacterized potyvirus infected plants showed significant differences in phosphorus and potassium levels. Bacterization of healthy pepper seedlings with *P. putida* NCMIB-9571 significantly increased phosphorus and potassium shoot levels in green house grown plants at the eighth week.

Pseudomonas putida NCIMB-9571 and *Bacillus sp.* strain UWI-3 along with two levels of soil fertility were used to determine whether these bacterial isolates could act as a biocontrol agent in reducing potyvirus disease and to increase the yield of pepper fruits in the field grown pepper plants. Parameters examined included shoot length, tobacco etch virus (TEV) and potato virus Y (PVY) severity, shoot and root dry weight, shoot NPK and fruit yield. Bacterization with *P. putida* NCMIB-9571 significantly increase shoot length.

Both shoot and root dry weights were significantly higher when *P. putida* NCMIB-9571 was used as the inoculant at the farm fertility at ten weeks after transplant. *Bacillus sp.* strain UWI-3 along with NPK application significantly reduced the severity of TEV compared to the controls and *P. putida* NCMIB-9571. Overall, none of the treatments had any significant effect on the severity of PVY. *Pseudomonas putida* NCMIB-9571 along with NPK produced significantly higher (44%) marketable and unmarketable yields of fresh pepper after the first crop over all the other treatments.

Both *P. putida* NCMIB-9571 and *Bacillus* sp. strain UWI-3 can be classified as plant growth promoting bacteria. The results also demonstrated that *P. putida* NCMIB-9571 used as a bacterial inoculant enhances the growth and yield of scotch bonnet peppers. However, *Bacillus sp.* strain UWI-3 was more effective as a biocontrol agent in reducing TEV infection. A combination of both *P. putida* NCMIB-9571 and *Bacillus sp.* strain UWI-3 as an inoculum could prove to be highly beneficial.