

Title Rhizosphere of pepper (*Piper nigrum*) and their antifungal activities
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Abstract

The purpose of this study was to isolate and select indigenous soil *Bacillus* bacteria capable of developing multiple mechanisms of action related to the biocontrol of phytopathogenic fungi affecting pepper vines (*Piper nigrum*). The screening procedure consisted of antagonism tests against a panel of phytopathogenic fungi, *in vitro* detection of the antifungal products, and root colonization assays. Four isolates, identified and designated as *Bacillus amyloliquefaciens* (WW6), *Bacillus atrophaeus* (MPB), *Bacillus subtilis* (CBF) and *Bacillus vallismortis* (WW14), were selected for further studies. All bacterial isolates were effective for the *in vitro* control of growth of phytopathogenic fungi, where the control mechanisms used by the bacteria involve the secretion of protease and cellulase enzyme that are responsible for fungal cell wall hydrolysis. The bacteria also produced volatile as well as diffusible substances. Malformation of hyphae occurred in the presence of both bacteria. Hyphae were thickened, vacuolar and many swellings occurred in them or at the tips of hyphal strand. On the other hand, all bacteria grew well in conditions similar to those that can be found at the field level (considering pH, salinity, and temperature) and showed a good capacity of pepper root colonization. These results suggest that all the bacterial isolates studied have an excellent potential to be used as biocontrol agents for controlling phytopathogenic fungi in greenhouses and at the field level.