Proceedings: International e-Conference on Biomedical, Env't & Nutritional Health Sciences 2008. Vol. 1: 32 - 34; ID.123
http://www.e-conference.elewa.org/biomedical

Biological control of *Phytophthora capsici* root rot of pepper (*Capsicum annuum*) using *Burkholderia cepacia* and *Trichoderma harzianum*

[1]EZZIYYANI Mohammed, [1]REQUENA Maria Emilia, [2]GILABERT Catalina Egea, [3]HAMDACHE Ahlem, [3]LAMARTI Ahmed and [1]CANDELA Maria Emilia

[1]Department of Plant Biology, Faculty of Biology, University of Murcia, Campus de Espinardo, 30100 Espinardo (Murcia), Spain. mcandela@um.es; [2]Department of Science and Agrarian Technology. ETS Ingeniería Agronómica. Université Polytechnique de Cartagena. Paseo Alfonso XIII, 48. 30203 Cartagena, Spain; [3]Faculté des Sciences, Département de Biologie, Equipe de Biotechnologies Végétales. M'hannech II, BP. 2121. 93002 Tétouan (Maroc).

Corresponding author email: mcandela@um.es

ABSTRACT

Objective: To control *P. capsici* using a combination of two independently effective and compatible microorganisms, *Trichoderma harzianum* and *Burkholderia cepacia.*

Methodology and results: A combination of two compatible microorganisms, *Trichoderma harzianum* and *Burkholderia cepacia*, both antagonistic to the pathogen *Phytophthora capsici*, was used to control root rot in pepper. The population of the pathogen in soil was

reduced by 71% as a result. Vegetative growth of the mycelium of *P. capsici* was inhibited in vitro on the second day after *P. capsici* and *T. harzianum* were placed on the opposite sides of the same Petri plate. *T. harzianum* was capable of not only arresting the spread of the pathogen from a distance but also, after invading the whole surface of the pathogen colony, sporulating over it. Scanning electron microscopy showed the hyphae of *P. capsici* surrounded by those of *T. harzianum*, their subsequent disintegration, and the eventual suppression of the pathogen's growth. *Burkholderia cepacia* produced a zone of inhibition, from which was obtained a compound with anti-oomycete property secreted by the bacteria. When purified by high-pressure liquid chromatography, this compound was identified as pyrrolnitrin which seems to be one of the principal compounds involved in the antagonism. Finally, a strategy was tested for increasing the level of the hydrolytic enzyme β-1,3-glucanase and chitinase in the antagonism test of *P. capsici* versus *T. harzianum* on PDA medium enriched with laminarin: glucose (3:1, v/v). Chitinolytic activity was evaluated using culture filtrates from isolates grown on chitin and the *Agaricus bisporus* mushroom as the release of p-nitrophenol from p-nitrophyenyl N, N´-diacetylchitobiose and as the formation of clearing zones on chitin agar. A formulation was prepared that maintained the compound's capacity to inhibit growth of the pathogen for up to two years when stored at room temperature in the laboratory on a mixture of plantation soil and vermiculite. The two antagonists, added as a compound formulation, were effective at pH from 3.5 to 5.6 at 23 to 30 °C. The optimal dose of the antagonists in the compound formulation was 3.5×10^8 spores/ml of *T. harzianum* and 10^9 cfu/ml of *Burkholderia cepacia*.

Conclusion and application: This is the first report of a compound biocontrol formulation of these two antagonists with a potential to control root rot caused by *P. capsici*.

Key words: Biocontrol, *Capsicum annuum*, *Phytophthora capsici*, *Burkholderia cepacia*, *Trichoderma harzianum*