



Study of the nematocidal properties of the culture filtrate of *Paecilomyces lilacinus* containing Titanium (IV) chloride and its effect on pepper fruit quality

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ABSTRACT

Introduction and objective: *Meloidogyne incognita* and *Heterodera avenae* are a parasite that infects the roots and attacks a great number of plants worldwide, causing significant economic damages, especially where agriculture is of intensive, e.g. in greenhouses. Traditionally, application of chemical pesticides has been effective in managing and control of crop pests and pathogens. However, with the prohibition of the most effective nematocide (methyl bromide), the remaining compounds are not effective and do not give the required results. This has made it necessary to develop other strategies

that are effective against soil borne pathogens, and which do not damage the environment and human health. The objective of this study was to test for increasing the level of the toxin in the antagonism test in vivo of *M. incognita* and *H. avenae* versus *P. lilacinus* on PDB medium enriched with Titanium.

Methodology and results: *Capsicum annum* L. plants (cv. California wonder) were treated with Titanium (IV) chloride (Ti) in combination with culture filtrates of *Paecilomyces lilacinus*, all applied via soil. Discs 3 mm in diameter cut from the edge of a colony of *P. lilacinus* actively growing on PDA were added to 500-ml Erlenmeyer flasks containing 250 ml of sterilized Malt broth by adding oats extract, phosphite and Ti. The fungi mycelia thus obtained was separated from the medium and culture filtrates transferred to 1000-ml Erlenmeyer flasks containing n-octanol. All flasks were incubated at 21 °C for 3 weeks with the cultures being shaken at 120 rpm. The culture filtrates of nematophagous fungus *P. lilacinus* grown on different liquid media and under various conditions showed inconsistent effects on the *Heteroderidae* family (*Meloidogyne*, *Heterodera*). When tested on four mediums, the best nematocidal activity and effect on pepper fruit quality was obtained on Ezziyani medium [salts+ oats extract + phosphite +Ti + n-octanol, (pH 5.5)] with motionless aerated cultures. Light had no effect on toxin production de *P. lilacinus* but it affected Ti. Although it was only generated at pH 5.5, the toxin had an activity dependent relationship to the pH (the low pH with time of incubation: when the fungi mycelia of *P. lilacinus* were separated from the medium and the pH of culture filtrates is 4.5. the pH drops has 4.5. Before the treatments one must adjust the pH 5.5. The activity of the toxic metabolite was very

specific and was only efficient against *M. incognita* and *H. avenae*.

On the pepper plant, Titanium stimulated biomass production, nutrient absorption, several enzymatic system activities (catalase, peroxidase, lipoygenase and nitrate reductase), malic acid, leaf chlorophyll, fruit carotenoids and ascorbic acid contents, but caused a decrease in plant starch concentration. In addition to these effects, it has been demonstrated that Ti mainly accumulates in the cytoplasm and chloroplasts of the leaf cells of treated plants, and that increases the concentrations of Fe²⁺ in leaves, fruits, leaf chloroplasts and fruit chromoplasts. The increase in iron is probably responsible for the stimulatory effects observed with Ti applications. The oats contain flavonoids which have been reported to have nematocidal activity.

Conclusion and application of findings: Addition of culture filtrates of *P. lilacinus* enriched with Titanium has double effect because Ti is a beneficial element which enhances both growth and the red colour of pepper plant and, culture filtrates of the fungus has a high nematocidal effect.

Key words: Pepper, Titanium (IV) chloride, nematode, culture filtrates, *Paecilomyces lilacinus*.