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"Resilience of agricultural systems against crises"

Entomopathogens as Endophytes, an Innovative Biological Control Strategy

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Abstract

Entomopathogenic fungi are reported as effective biological control agents against many insect pests of crop plants, some of these entomopathogens have already been commercialised as biological insecticides, thereafter many examples were reported using these mycoinsecticides under greenhouse and laboratory conditions, while the drawbacks of aerial applications under field conditions, showed limited control success. Because of these prevailing problems the idea of testing these Entomopathogenic fungi as endophytes came up. Bing and Lewis (1991) were the first to demonstrate the endophytism of *Beauveria bassiana* in maize plants and its effect on the European corn borer. Since then many other studies have been published testing the endophytic capacity of *Beauveria bassiana*. In contrast, only one paper has demonstrated that *Metarhyzium anisopliae* has an endophytic activity in tomato plants, at the same time promoting plant growth. It is likely that these entomopathogens have more than one mode of action operative in controlling plant pests and pathogens. One of these hypothesised modes of action relates to the production of secondary metabolites, acting as mycotoxins, such as Beauvericin from *Beauveria bassiana*, and Destruxin A, B, E and D known from *Metarhyzium anisopliae*.

In our research we present data on the effects of endophytic colonisation of two tomato cultivars (*Solanum lycopersicum*) by three strains of *Beauveria bassiana* and two strains of *Metarhyzium anisopliae* on greenhouse whitefly development (*Trialeurodes vaporariorum*). Culturing on fungal selective medium and Real-Time PCR proved successful endophytic colonisation of the selected fungi in both tomato cultivars, while HPLC analysis proved that the mycotoxins Beauvericin and Destruxin A were at the non-detectable levels. Moreover, we present in our results that endophytic colonisation of tomato plants with some of these entomopathogenic fungi strains can significantly enhance the growth of the plants. More evaluation for the field application of this biological control strategy is required; therefore, the detection of other possibly produced mycotoxins by *Beauveria bassiana* and *Metarhyzium anisopliae* and their possible synergic effect, the endophytism mechanism and the interaction mode with the host plant and its metabolites, as well as the interaction between the endophytic entomopathogen and the plants pathogens will be the aim of our coming research.

Keywords: Biological control, endophyte, entomopathogen, mycotoxin

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