

# EFFECTS OF *BACILLUS THURINGIENSIS* CRYIA(C) $\delta$ -ENDOTOXIN ON ARBUSCULAR MYCORRHIZAL COLONIZATION IN SORGHUM AND SPORE GERMINATION *IN VITRO*.

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## Abstract

With the imminent introduction of genetically modified (GM) crops into Africa (*Bt* maize and *Bt* cotton), there is increasing concern about their potential short and long term ecological effects on the environment. Although insertion of *Bacillus thuringiensis* (*Bt*)  $\delta$ -endotoxin genes into crop plants to confer resistance to insect pests is considered fundamental, not many studies about their potential effects on beneficial soil microorganisms such as arbuscular mycorrhizal (AM) fungi have been done.

The aim of this project was to examine the effect of *Bt* endotoxin, when present in the soil on the symbiosis between AM and sorghum, and the direct effects on the viability of AM spores. In this study, CryIA(c) $\delta$ -endotoxin from a local *Bt* isolate (ICIPE L1-2) active against *Chilo partellus* was used. The sorghum seedlings inoculated with a mixed culture of arbuscular mycorrhizal fungi, were grown in Black Cotton soil (Vertisols) containing 0.01, 0.1, and 50 $\mu$ g *Bt* toxin per gram of soil. The plants were grown in the green house with sampling done at 2,4,6 weeks and the final one at 12 weeks. The results showed a progressive increase in percent mycorrhizal colonization right from the first harvest (2 weeks) to the final harvest (12 weeks) in all the treatments. In addition to this the total root length, fresh shoot and root weights did not differ significantly among the treatments. The abundance and species composition of spores extracted from the soil after the final harvest did not differ significantly between the treatments. The effects of the *Bt* toxin on germination of *Gigaspora margarita* spores was also investigated *in vitro*. The toxin was applied at concentrations 0.01, 0.1, 1.0, 10 and 100 $\mu$ g/ml water agar. The lower concentrations; 0.01, 0.1, 1.0 and 10 $\mu$ g/ml did not affect both germination and the radius of hyphal spread. However the highest concentration, 100 $\mu$ g/ml reduced the number of germinating spores by 53% and also limited the radius of hyphal spread to 3.6 mm, compared the control 11.82mm at seven days. Un-germinated spores previously exposed to 1.0 $\mu$ g, and 100 $\mu$ g/ml and transferred to water agar without *Bt* toxin had both their percent germination and radii of hyphal spread increased. Consequently the presence of the *Bt* toxin in soil does not seem to interfere with the symbiotic

potential of plants but high concentrations of *Bt* toxins may affect the viability of arbuscular mycorrhizal spores.