Meetings International SciTechnol

International Conference on
CLINICAL PHARMACY
&
International Conference on
BIOCONTROL, BIOSTIMULANTS & MICROBIOME
September 06-07, 2018 | Zurich, Switzerland

Vector Biol J 2018, Volume: 2
DOI: 10.4172/2473-4810-C1-003

Biocontrol of stem rust disease of wheat using Arbuscular mycorrhizal fungi and *Trichoderma* spp.

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Control of stem rust disease of wheat was investigated using different combinations of *Trichoderma* spp. and arbuscular mycorrhizal (AM) fungi. Impact of the application of *T. harzianum* HL1 and *T. viride* HL5, singly or in combination, on the uredospores germination of Puccinia graminis Pers. f. sp. *tritici* was assessed in vitro. The combined spore suspension of both isolates showed the superiority over the others in this regard. Observations of the scanning electron microscopy confirmed this result. Using a GC-MS system, the chemical constitution of the culture filtrates of *T. harzianum* HL1 and T. viride HL5 was identified. Under the natural conditions, application of AM fungi and *Trichoderma* spp. significantly reduced the disease measures, induced the peroxidase and polyphenol oxidase enzymes, increased the total phenol content and improved the tested growth and yield parameters. Based on their efficiency and eco-safety, we can recommend the use of this combination in controlling stem rust disease of wheat.

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