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Effectiveness of Biological Control Agents for the Successful Management of Chickpea Wilt Caused by *Fusarium oxysporum* F. sp. *ciceris* (Padwick)

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Abstract

Chickpea wilt caused by *Fusarium oxysporum* f. sp. *ciceris* (Padwick) is a devastating disease of chickpea around the globe wherever this crop is grown. For the successful and environmentally friendly management six biological control agents were evaluated against the pathogen *in vitro* assay, glass house assay and in the field. Among the six biological control agents *Pseudomonas fluorescens* was proved to be very effective by inhibiting the mycelia growth of fungus up to 70.94 % inhibition over control on PDA medium. *Trichoderma harzianum* was proved to be second best followed by *Rhizobia* spp. and *Bacillus subtilis* with 63.95 %, 60.79 % and 57.68 % growth reduction over control, respectively. When seeds were treated with bio-control agents all the antagonists were effective in managing the disease. In this case *Pseudomonas fluorescens* proved to be most effective on a moderately resistant variety (Noor 91) and two susceptible varieties (Pb2000 and ICC131–21) and showed significant disease reduction percentage with mean 76.78 over inoculated control in glass house. While *Rhizobium* spp was proved to be second best followed by *Trichoderma harzianum* with means disease reduction percentages 69.44 and 57.73 respectively. *Bacillus subtilis* was least effective against the disease. The overall and individual effect of all treatments was highly significant on moderately resistant variety (Noor 91) as compared to other two and inoculated control. Field trail under sick plot condition showed that when chickpea seeds of four varieties were treated with *Pseudomonas fluorescens* it reduced the disease incidence up to 69.89 % over control. When seeds of chickpea were treated with *Rhizobium* sp., proved to be second best followed by *Trichoderma harzianum* with disease reduction percentage mean 66.76 and 57.17 respectively on all four chickpea varieties.

Keywords: Chickpea, chickpea wilt, *Pseudomonas fluorescens*, *Trichoderma harzianum*