



Research Note

Efficacy of *Trichoderma harzianum* and *Verticillium lecanii* against stem rot, collar rot and foliar fungal diseases of groundnut

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ABSTRACT: A field experiment was conducted to find the efficacy of *Trichoderma harzianum* isolate DGR T-170 and *V. lecanii* isolate DGR V-1 for the management of soil borne diseases (stem rot, collar rot and afla rot) and foliar diseases (early leaf spot, late leaf rot and rust) of groundnut during Kharif season for two consecutive years (2009 to 2010). Per cent incidence of soil borne diseases was found highly suppressed in the treatment that included foliar spray of *T. harzianum* spore suspension @ 1.5×10^6 cfu/ml as 3 sprays starting from 1st appearance of disease and subsequent spray at 15 days interval (1.75, 2.59 and 1.03 respectively) and in another treatment that included foliar application of *T. harzianum* culture filtrate diluted as 50% (2.63, 2.50 and 0.66 respectively) compared to control (5.12, 5.03 and 5.38, respectively). The disease severity of foliar diseases was recorded lowest in the treatment that included foliar application of *Trichoderma* culture filtrate diluted as 50% (5.33, 4.22 and 3.56 respectively), and in another treatment that included foliar application of culture filtrate of *V. lecanii* diluted as 50% in two sprays at 15 days interval, 1st spray at appearance of diseases and 2nd spray after 15 days of 1st spray (5.44, 3.89 and 3.67 respectively) followed by the treatment that included soil application of castor cake @ 500kg/ha + foliar application of culture filtrate of *V. lecanii* at 50% dilution (5.44, 4.00 and 3.22 respectively) compared to control (8.00, 7.49 and 6.56 respectively).

KEY WORDS: Groundnut, Soil borne Diseases, Foliar disease *Trichoderma harzianum*, *V. lecanii*.

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INTRODUCTION

Groundnut (*Arachis hypogaea* L.) is an important oil seed crop in India and cultivated as *kharif* and *rabi*-summer crop. Major groundnut growing states in India are Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Rajasthan, and Maharashtra. The average yield of *rabi*-groundnut is around 1600 kg/ha, whereas *kharif*-groundnut is around 1000 kg/ha which is lower than major groundnut growing countries. This may be attributed to the rainfed-cultivation of the crop coupled with attack by a variety of diseases and insect pests (Ghewande *et al.*, 2002).

Major diseases of groundnut are stem rot, collar rot, dry root rot, afla-root, leaf spots (early and late), rust and bud necrosis which affect the groundnut production both at *kharif* and *rabi*-summer seasons (Ghewande *et al.*, 2002 and Rangaswami, 1996). However, the incidence or severity of these diseases may vary from season to season. In general, diseases reduce the pod yield of groundnut and also fodder quality of haulm. Among foliar fungal diseases, leaf spots (early and late) and rust are

economically important which are widely distributed and can cause yield losses to the extent of 70%. Of the soil borne diseases, collar rot, stem rot, afla-root and dry root rot are major importance. These can cause severe seedling mortality resulting in 'patchy' crop stand in sandy loam soils and reduction of pod yields from 25 to 40% (Ghewande *et al.*, 2002 and Singh, 2005).

Among the several methods of disease control strategies, biological control of plant diseases is a potential, eco-friendly and cost effective method than application of fungicides for disease management. In the present study, two potential bio-agents, *Trichoderma harzianum* and *V. lecanii* were used for the management of soil borne and foliar fungal diseases in groundnut.

The experiment was conducted in a randomized block design with four replications at DGR, Junagadh during the season of *kharif* 2009 and 2010. Bioagents, *T. harzianum* (isolate DGR T-170) and *V. lecanii* (isolate DGR V-1) maintained at plant pathology section of DGR were used in the experiment. For soil borne diseases, sick

plots developed in plant pathology section were used. The treatments were, T1 – Soil application of castor cake @ 100 kg/ha enriched with *T. harzianum* (*T. harzianum* was multiplied in 5 kg sorghum grain is mixed with 100 kg castor cake and incubated for 10 days before application); T2 – Soil application of castor cake @ 500kg/ha; T3 – Foliar application of culture filtrate of *V. lecanii* diluted as 50% in two sprays at 15 days interval, 1st spray at appearance of diseases; 2nd spray after 15 days of 1st spray; T4 – Foliar application of *T. harzianum* culture filtrate (50% dilution) as 3 sprays starting from 1st appearance of disease at 15 days interval; T5 – Foliar spray of *T. harzianum* spore suspension @ 1.5×10^6 CFU/ml as 3 sprays starting from 1st appearance of disease at 15 days interval; T6 – T1 + T3; T7 – T2 + T3; T8 – T1+ T4; T9 – T2 + T4; T10 – T1+T5 and T11 – Control. Observations on foliar fungal diseases were recorded by adopting a 1-9 modified scale (Singh and Oswalt, 1992) and in case of soil borne diseases, per cent disease incidence was recorded.

Per cent incidence of soil borne diseases (stem rot, collar rot and aflaroot) was found highly suppressed in treatments, T5 (1.75, 2.59 and 1.03 respectively) and T4 (2.63, 2.50 and 0.66 respectively) compared to control (5.12, 5.03 and 5.38, respectively) (Table 1). Foliar application of *T. harzianum* spore suspension @ 1.5×10^6 cfu/ml or *T. harzianum* culture filtrate (50% dilution) as 3 sprays starting from 1st appearance of disease and at 15 days interval effectively reduced the incidence of soil borne diseases. Karthikeyan *et al.* (2006) indicated effective reduction in stem rot incidence (3.75%) as influenced by the combination of *T. viride* with either mahua or neem cake. In another experiment, oilcakes and biocontrol agents were used separately to manage stem rot incidence in groundnut (Karthikeyan, 1996). The lowest disease incidence was observed with soil application of *T. viride*, while among the organic amendments, neem cake and farmyard manure were effective. Kulkarni *et al.* (1995) observed reduction in pre-and post-emergence mortality of groundnut seedlings caused by *S. rolfsii* in the pots where safflower and sunhemp oilcakes were applied along with *Trichoderma* which enhanced the activity of antagonistic micro-organisms. Meena *et al.* (2001) reported that soil application of talc formulation of *Pseudomonas fluorescens* (Pf1) was effective in reducing the root rot incidence in groundnut. Senthilraja *et al.*, (2010) reported, application of the talc-based formulation of *Beauveria bassiana* (B2 and B4) and *P. fluorescens* (TDK1 and Pf1) strains and its mixture amended with and without chitin through seed, soil and foliar spray effectively reduced the incidence of leafminer and collar rot in groundnut compared to

individual bioformulation and control treatments both under glasshouse and field conditions.

Mathivanan *et al.* (2000) reported that *T. viride* was equally effective as that of fungicides in controlling early, late leaf spots and rust in groundnut. In our experiment, the disease severity of foliar fungal diseases (early leaf spot, late leaf spot and rust) was recorded lowest in the treatments (5.33, 4.22 and 3.56 respectively) compared to control (8.00, 7.49 and 6.56 respectively). Foliar application of culture filtrate (50% dilution) of *Trichoderma* or *V. lecanii* or soil application of castor cake @ 500kg/ha + foliar application of culture filtrate of *V. lecanii* were effective to reduce the severity of foliar diseases. The present investigation is in line with these reports. Regarding pod yield, foliar spray of *T. harzianum* spore suspension @ 1.5×10^6 CFU/ml as 3 sprays starting from 1st appearance of disease at 15 days interval recorded highest (962 kg/ha) followed by T9 (928 kg/ha) and T8 (917 kg/ha), whereas, lowest was recorded in control (578 kg/ha).

T. harzianum and *V. lecanii* have the capability to induce systemic resistance by eliciting defence related enzymes have been reported in groundnut and other crops (Sreedevi *et al.*, 2011; Ahmed *et al.*, 2000; Hanson and Howell, 2004). Foliar application of culture filtrate either *T. harzianum* or *V. lecanii* or soil application of castor cake + foliar application of culture filtrate of *V. lecanii* were effective for management of foliar fungal diseases in groundnut. This is the first report for the management of major diseases (both foliar and soil borne) of groundnut using bio-agents.

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