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Research Article

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Panchagavya, An Organic Amendment for Inhibiting Damping-Off Causing *Fusarium solani* and *Sclerotium rolfsii* under *In-vitro* Conditions

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ABSTRACT

Damping-off is a serious fungal disease affecting seeds and seedlings in both nursery and field conditions. In this experiment, effectiveness of panchagavya in inhibiting the growth of two damping-off pathogens viz., Fusarium solani and Sclerotium rolfsii were evaluated under in-vitro conditions. Panchagavya has resulted in the inhibition up to 66.7% and 83.3% in Fusarium solani and up to 100% and 100% inhibition in Sclerotium rolfsii at 5% and 10% of panchagavya amended potato dextrose agar (PDA) plates, respectively.

Keywords: *Damping-off, In-vitro, Panchagavya, Inhibition and PDA.*

INTRODUCTION

Damping-off is a serious disease affecting seeds and seedlings under nursery and field conditions. Fungi *viz.*, *Fusarium* spp., *Pythium* spp., *Rhizoctonia* spp. and *Sclerotium* spp. affect the seeds and seedlings and cause pre- and post emergent damping-off. Post-emergent damping-off disease affected seedlings are weakened first, and later killed. Where as in pre-emergent damping-off, infected seeds fail to emerge under severe infestation (Koenning, 2001).

Fusarium solani (Mart.) Sacc. (Current name: *Neocosmospora solani* (Mart.) L. Lombard and Crous), *Sclerotium rolfsii* Sacc (Current name: *Athalia rolfsii* (Curzi) C.C. Tu and Kimbr.) are also known to cause damping-off. Controlling soil borne disease in general and damping-off disease in particular is often a difficult task.

Fungicides are known to effectively control soil borne disease in general and damping-off in particular but their indiscriminate usage has led to the development of resistant strains of plant pathogens, destroyed natural predators and parasites (Corke, 1980), induced environmental pollution and health hazards (Okigbo & Ogbonnaya, 2006, Brimmer & Boland, 2003). There is a need to develop and adopt an alternate and environment friendly plant protection solutions, like use of organic amendments and animal bi-products such as panchgavya, cow urine, fermented butter milk, verminwash and biosol. The exploitation of conventional organic inputs have already been described in vedas, puranas and Arthashastra (Nene, 2003).

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Various organic bi-products have shown antifungal activity against several soil borne and foliar pathogens. Panchagavya is an organic product used as medicines by human beings since ancient times to cure various diseases and is regarded as an integral part of ayurveda. Panchagavya consists of mixture of five important products given by cow *viz.*, milk, curd, ghee, urine and dung.

Panchagavya resulted in the mycelial growth inhibition of *R. solani* up to 40-100% under *in- vitro* and *in- vivo*, disease suppression up to 78-82% in *R. solani* infected cauliflower nursery beds (Sugha, 2004). Panchagavya amended treatments under *in-vitro* inhibited the mycelia growth (86.3%) and spore germination (95.9%) of *Curvularia lunata* a potential grain discoloring plant pathogen. Panchagavya also known to exhibit plant growth promotional activity. Seed treatment with panchagavya enhanced the seed germination up to 90.7% (Sumangala & Patil, 2007). Panchagavya foliar spray enhanced the physical quality of grain such as grain size, test weight, milling and cooking quality (Yadav & Christopher Lourduraj, 2006). Crude aqueous extracts from vermicompost and organic compost inhibited the mycelial growth of *Sclerotinia sclerotiorum*, *Rhizoctonia solani*, *Botrytis cinerea*, *Sclerotium rolfsii and Fusarium oxysporum* under *in-vitro* conditions (Nakasone, et al., 1999).

Panchagavya is effective in curing many diseases in human beings. Effectiveness of panchagavya in controlling plant pathogenic diseases are least exploited. Thus, in present experiment efforts have been made to know the effectiveness of panchagavya in controlling the growth of two important soil borne damping-off causing pathogens *Fusarium soalni* and *Sclerotium rolfsii* under *in-vitro* conditions.

MATERIALS AND METHODS

Collection and Isolation of fungi

Studies were carried out at the Department of Botany, Faculty of Science, B. N University, Udaipur district of Rajasthan. Around 40-50, damping-off diseases affected onion seedling samples were randomly collected from nursery and the adjoining field from Udaipur region. The diseased plants were collected in the polythene bags and were transported to the laboratory for the purpose of isolating damping-off pathogens from the infected root bits. Infected root bits of samples were gently washed under tap water for about a minute to remove any dirt and soil particles. The root pieces (0.5cm) were dipped in 0.01% $HgCl_2$ for about 15 seconds and then passed from three washes of distilled sterile water for 2-3 minutes each to remove the traces of $HgCl_2$. The treated root pieces were dried completely in the aseptic condition and then transferred to Petri plates containing sterilized potato-dextrose agar (PDA) medium at the rate of 5-6 pieces/ Petri plate. All the Petri plates were kept at 25 ± 2^{o}C for 7 days. The colonies which were showing distinct mycelial growth habit were segregated by hyphal tips and transferred on to the fresh potato dextrose agar (PDA) medium. The purified fungus cultures were maintained on PDA slants in test tubes for further studies. The growth is sub-cultured/multiplied whenever needed during the entire study. Isolated pure fungal cultures were sent to Agharkar Research Institute, Pune for the purpose of fungal identification.

Panchagavya preparation

An organic, panchagavya was prepared based on the method given by Ashlesha et al. (2009). Ingredients *viz.*, Ghee 2gm, milk 5ml, curd 5gm, urine 48ml and cow dung 40gm were collected in a container and mixed well and allowed to stand for about one month and carried out intermittent stirring. Panchagavya was filtered through muslin cloth and resultant product was considered as 100%.

Poisoned food technique

Autoclave sterilized PDA media were prepared bearing 5% and 10% panchagavya in it and poured 20 ml in the sterilized disposable Petri plates of 90mm. PDA plates without panchagavya served as control. Each of the plates were inoculated with 5mm mycelial disc of freshly grown 7 days old pure culture of test pathogens and bio-control agent (*Trichoderma*

harzianum) and incubated at 25 ± 2°C for 7 days. Observation were recorded and percent inhibition of test fungus and *Trichoderma harzianum* by panchagavya under *in- vitro* was calculated using the following formula.

% FG = Dc-Dt/Dc x100

Where: % FG = % inhibition of fungi growth

Dc = diameter of control

Dr = diameter of test

RESULTS AND DISCUSSION

Test fungi were identified by Agharkar Research Institute, Pune as *Fusarium solani* (Mart.) Sacc. (Current name: *Neocosmospora solani* (Mart.) L. Lombard and Crous), *Sclerotium rolfsii* Sacc. (Current name: *Athalia rolfsii* (Curzi) C.C. Tu and Kimbr.) Panchagavya has resulted in the inhibition up to 66.7% and 83.3% in *Fusarium solani* and 100% and 100% inhibition in *Sclerotium rolfsii* at 5% and 10% of panchagavya amended potato dextrose agar (PDA) plates (Plate.1). Similar report involving, antifungal potential of panchgavya against mycelial bits of *R. solani*, *S. sclerotiorum and Phytophthora colocasiae* dipped for 6 h in panchgavya caused complete suppression of mycelial growth in the range of 82-100%[6]. Mycelial bits of *Fusarium solani* dipped in panchagavya for 12 h resulted in 90% inhibition (Dogra, 2006). Cow urine and dung can effectively control *Fusarium oxysporum* wilt in cucumber plants (Basak & Lee, 2005). Mycelial growth inhibition of *R. solani* up to 40-100% under *in- vitro* was observed under the influence of panchagavya treatment (Sugha, 2004). Panchagavya amended treatments under *in-vitro* inhibited the mycelia growth (86.3%) and spore germination (95.9%) of *Curvularia lunata* a potential grain discoloring plant pathogen (Sumangala & Patil, 2007).

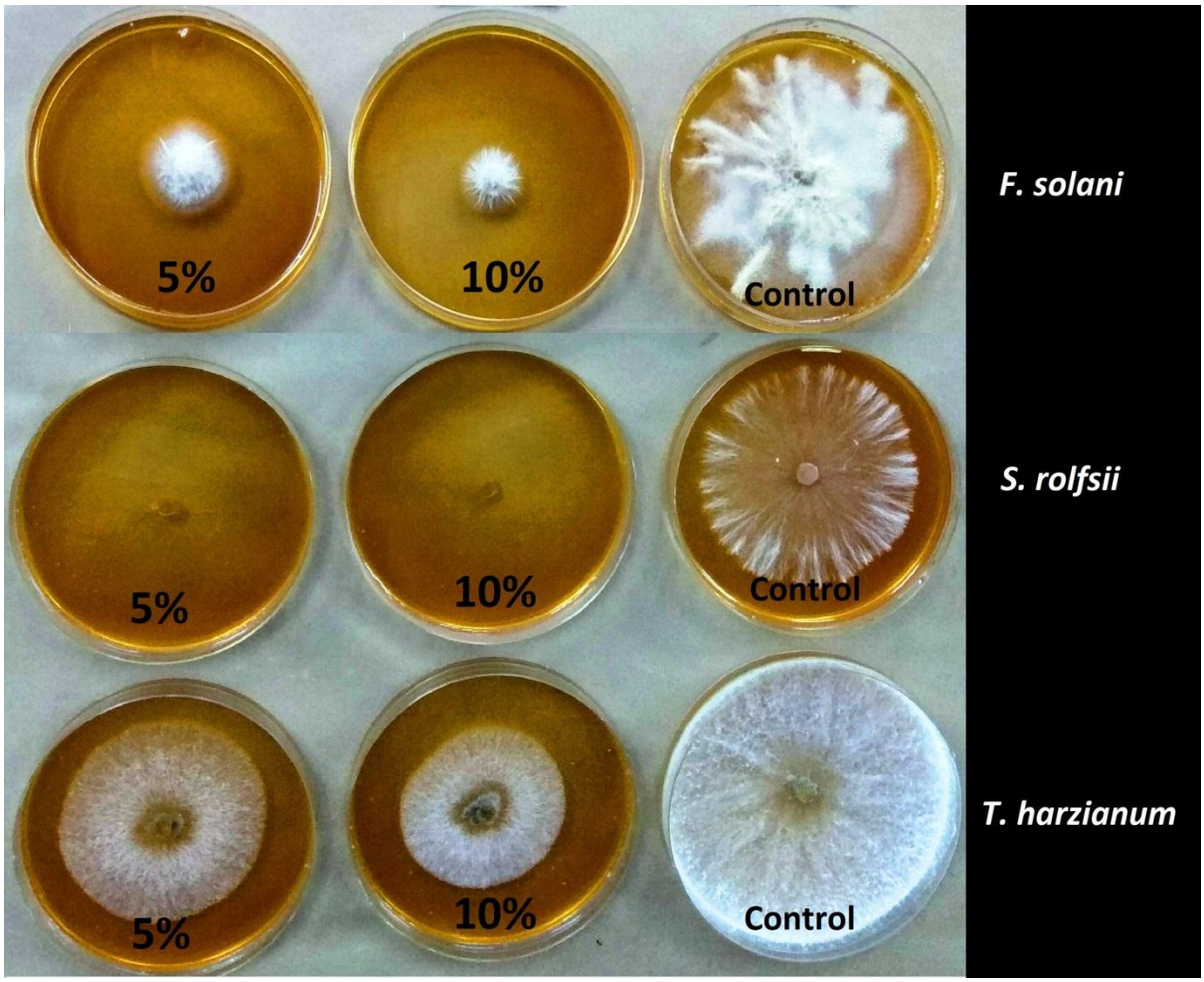

Plate.1. Effect of panchagavya on test fungus at 5% and 10% concentration

CONCLUSION

Panchagavya is an organic creation can be effectively used to control *Fusarium solani* and *Sclerotium rolfsii* induced damping-off disease. There is a wide scope to find the spectrum of panchagavya in inhibiting the several soil borne and seed borne fungal plant pathogens. The previous research provides evidence about panchagavya as soil fertility agent, insect repellant and plant growth promoting agent. These distinguished features of panchagavya can make itself best suitable for integrated pest, disease management and integrated nutrient management program.

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