

Original Research Article

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## Biopriming of Chickpea Seeds with Biocontrol Agents for Enhanced Seedling Vigour and Reduced Seed Borne Diseases

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### ABSTRACT

#### Keywords

Biopriming, Chickpea, Seedling vigour, Seed borne diseases

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Chickpea seed were bioprimed with vermiculite and later with biocontrol agents for their efficacy on seed borne infections and seedling vigour of the plant. Among the seven treatments tested, the treatment *P. fluorescens* @ 0.8 % + *T. harzianum*@ 0.8 % + Vermiculite shown the least seed infection of 13.00 per cent, highest seed germination of 91.00 per cent and vigour index of 1753.13 which was statistically superior over other treatments The difference in results was observed may be due to the presence of vermiculite which holds the moisture and provides when seed needs and also biocontrol agent may multiply substantially on seed during biopriming reducing the seed borne infections.

### Introduction

Chickpea is (*Cicer arietinum* L.) is one of the most important and oldest pulse crop after beans and peas. To increase the production of chickpea qualitatively and quantitatively farmers requires healthy and quality seeds, with high percentage of germination and purity.

The adverse effect of seed-borne pathogens is that it will contaminate the areas which were disease free previously and decrease in yield. So, it necessary to eradicate the seed-borne inoculum through various seed treatment procedures. Hence, it is imperative that seeds

must be treated with best seed treatment method before they are sown in the field.

Seed - borne diseases of chickpea are important aspects which need more attention. The chickpea crop is attacked by 172 pathogens (67 fungi, 22 viruses, 3 bacteria, 80 nematodes and phytoplasma) from all over the world (Nene *et al.*, 1996).

Many of them infects seed and infected seed can provide primary inoculums for infestation of new crop and seed borne pathogens may be dispersed for long distances with it. However, information on best seed treatment combinations of bioagents and biopriming is

lacking hence the present investigation is carried on Biopriming of chickpea seeds.

Seed treatment with bio-control agents along with priming agents may serve as an important means of managing many of the soil and seed-borne diseases, the process often known as 'bio-priming'. Bio-priming is the seed treatment that integrates the biological and physiological aspects of disease control, is recently used as alternative method for controlling many seed and soil borne pathogens (Begum *et al.*, 2010). It is an environmentally eco-friendly seed treatment which can be used as a substitute of chemical fungicides seed treatment. The present study aimed to study effect of biopriming along with bioagents to evaluate the integration between biological and physiological seed treatments into system termed bio priming in controlling seed borne pathogens.

## Materials and Methods

### Experimental site

The laboratory experiment was carried out at Department of Plant Pathology, College of Agriculture, Vijayapura, Karnataka.

### *In vitro* evaluation of biocontrol agents along with priming agent

In the present investigation, hundred grams of Chickpea seeds were treated with bio-control agent *Trichoderma harzianum* Rifai., *Trichoderma viride* Pers., *Pseudomonas fluorescens* Migula., *Bacillus subtilis* Cohn along with priming agent like vermiculite. Positive control included seed treatment with biocontrol agents and negative control included naturally infected seeds.

After pre-soaking of seeds in sterile distilled water, seeds were coated with powder formulations of biocontrol agents at 0.8 %

concentration along with moist vermiculite in the proportion of 2:1 (2 parts of vermiculite and 1 part of seed) and mixed thoroughly to give uniform coating. These seeds were dried in shade and stored at 25± 2°C for 24 hr in a self-sealing plastic bags. The treated seeds were tested for germination in 4 replications of 100 seeds each by employing paper towel method. For the experiment, the completely randomized design was be used.

## Results and Discussion

Among the seven treatments tested for their efficacy in the management of seed-borne infection of chickpea seeds of variety JG - 11, the treatment *P. fluorescens* @ 0.8 % + *T. harzianum*@ 0.8 % + Vermiculite shown the least per cent seed infection of 13.00, highest per cent seed germination of 91.00 and vigour index of 1753.13 which was statistically superior over other treatments (Table 1).

The treatment *T. harzianum* @ 0.8 % + vermiculite shown better results with per cent germination of 85.50, per cent seed infection of 20.00 and seedling vigour index of 1546.42 as compared to *T. harzianum* @ 0.8 % alone with the per cent germination of 76.50, per cent seed infection of 25.00 and seedling vigour index of 1321.81.

Similarly the treatment *P. fluorescens* @ 0.8 % + vermiculite shown better results with per cent germination of 83.00%, per cent seed infection of 26.00 and seedling vigour index of 1394.02 as compared to *P. fluorescens* @ 0.8 % alone with the per cent germination of 70.00, per cent seed infection of 31.00 and seedling vigour index of 1176.63.

This difference is due to the vermiculite holds the moisture and provides when seed needs it during biopriming and also biocontrol agent may multiply substantially on seed during biopriming (Callan *et al.*, 1990).

**Table.1** Effect of biopriming on per cent germination, per cent infection and seedling vigour index on chickpea

Sl. No.	Bioagents	Per cent Germination	Per cent seed Infection	Seedling vigour index
1	<i>Pseudomonas fluorescens</i> @ 0.8 % alone	70.00 (58.69)**	31.00 (33.83)	1211.66
2	<i>Trichoderma harzianum</i> @ 0.8 % alone	76.50 (61.00)	25.00 (30.00)	1321.81
3	<i>Pseudomonas fluorescens</i> @ 0.8 % + Vermiculite*	83.00 (65.65)	26.00 (30.66)	1394.02
4	<i>Trichoderma harzianum</i> @ 0.8 % + Vermiculite	85.50 (67.62)	20.00 (26.57)	1546.42
5	Vermiculite	72.50 (58.37)	33.50 (35.37)	1176.63
6	<i>P. fluorescens</i> @ 0.8 % + <i>T. harzianum</i> @ 0.8 % + Vermiculite	91.00 (72.54)	13.00 (21.13)	1753.13
7	Control	59.00 (50.18)	38.50 (38.35)	858.33
	<b>S. Em. ±</b>	1.04	0.83	22.74
	<b>C.D. at 1%</b>	3.06	2.44	66.88

\* Vermiculite (2 parts of vermiculite and 1 part of seed)

\*\*Figures in the parenthesis indicates the angular transformed values.

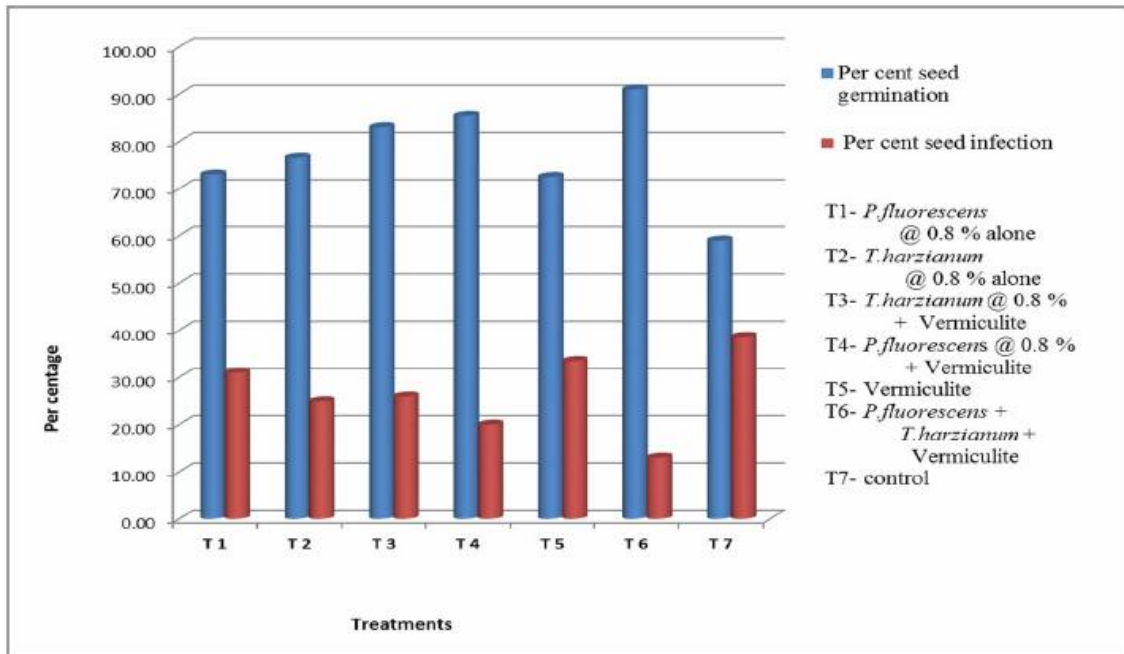


Fig . 8. Effect of bioprimering on Per cent seed germination and per cent Seed infection of chickpea by Paper towel method

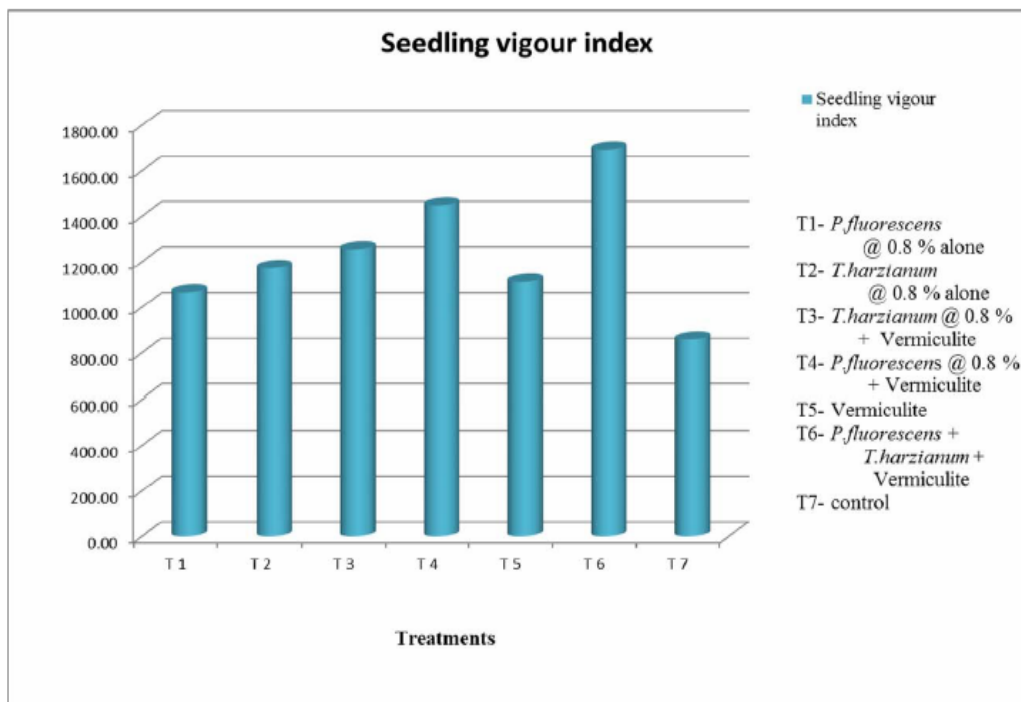


Fig . 9. Effect of bioprimering on seedling vigour index of chickpea by Paper towel method

The treatment vermiculite was superior with per cent germination of 72.50 over *P. fluorescens* @ 0.8 % alone with 70.00, but the vigour index of vermiculite was 1176.63 which was not superior over *P. fluorescens* @ 0.8 % alone with 1211.66 it is due to per cent seed infection was more in vermiculite only with 33.50 % as compared to *P. fluorescens* @ 0.8 % alone with 31.00 %. This may be due to absence of biocontrol agents in treatment vermiculite only lead to development of pathogens and caused seed rot, seedling blight, root browning and decay etc.

The present findings are in agreement with Harman *et al.*, (1989) reported that in field trial stands of peas were not significantly enhanced by seed treatment with *T. harzianum* strains in the absence of priming but were improved by *T. harzianum* + vermiculite. Similarly El-Mougy and Abdel-Kader (2008) evaluated the effect of bio-priming of faba bean seeds against root rot pathogens (*Rhizoctonia solani*, *Fusarium solani* and *Sclerotium rolfsii*). They noticed that bio-primed faba bean seeds showed a highly significant effect causing complete reduction of root rot incidence at both pre and post emergence stages of plant growth compared with the control treatment. Similarly Karthika and Vanangamudi (2013) studied bio-priming of green gram and maize hybrid COH (M) 5 seed with liquid bio-fertilizers which enhanced germination and vigour index.

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