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Evaluation of Seed Bio-priming against Chilli (*Capsicum frutescence* L.) cv. GVC 111 *in vitro*

Rinkal Chauhan and PR Patel

Abstract
An experiment was to know the efficacy of various seed bio-priming against chilli *in vitro*. Chilli (*Capsicum frutescence* L.) seeds were subjected to biopriming with *Trichoderma viride, T. harzianum, Pseudomonas fluorescens, Bacillus subtilis* and *Paecilomyces lilacinus* applied at imbibition and after imbibition. Seed bio-priming of chilli seeds *in vitro* revealed seed biopriming with *P. fluorescens* @10gm/kg seed recorded maximum seed germination 86.70% than the other treatment tested but it was statistically at par with *T. harzianum* applied at imbibition and minimum per cent infected seeds with *P. fluorescens* applied at imbibition 21.3%.

Keywords: Seed, bio-priming, chilli, *Capsicum frutescence*, GVC 111, *in vitro*

Introduction
Chilli (*Capsicum frutescens* L.) is most widely cultivated vegetable crop in the world. It is a solanaceous fruit vegetable mainly cultivated for its vegetable green fruits and for dry chilli as the spice of commerce. It is a rich source of Vitamin C, A and B. In India, it is an important cash crop, which is grown for the both domestic and export market.

Chilli is affected by number of seed borne diseases *viz.,* damping off (*Pythium* sp.), anthracnose or fruit rot (*Colletotrichum capsici*), fusarium wilt (*Fusarium* sp.), phytophthora fruit rot (*Phytophthora* sp.) and stem rot (*Sclerotium rolfsii*) which cause Sudden Death Syndrome (SDS) is the most important and serious that eventually leads to quick and rapid death of plants.

Seed biopriming is a technique of seed treatment that integrates biological (inoculation of seed with beneficial organism to protect seed) and physiological aspects (seed hydration) of disease control. It is an ecological approach using selected fungal antagonists against the soil and seed borne pathogen. Biological seed treatment may provide an alternative to chemical control. Seed biopriming were used commercially in many horticulture crops, as a tool to increase speed and uniformity of germination and improve final stand. Biopriming has great promise for enhancing the efficacy, shelf life, and consistent performance of biological control agents (Callan *et al*., 1997).

Material and Methods
Chilli cv. GVC 111 seeds were subjected to the following bio-agents by two methods, biopriming applied at imbibition and after imbibition.

Seed bio-priming applied at imbibition
Seed bio-priming is treating seed with bio-agents and incubating under warm and moist condition until just prior to radical emergence. One gram of chilli seeds of variety GVC 111 were bio-primed with inoculum produced by using talcum powder as carrier. Ten gram of talc formulation of the bio-agents along with 0.1g gum arabic used as adhesive and mixed in 25 ml of water. Pre-treated chilli seeds (surface sterilized with 0.1 % $HgCl_2$ for one min followed by three washings with sterile water) soaked in the slurry at room temperature for 24 hours and then transferred on sterilized blotter paper in Petri plate in laboratory condition.

Seed bio-priming after imbibition
Seeds of chilli were imbibed in aerated water (50 g seeds per 500 ml water) and then dried at room temperature. Formulation of the bio-agent in talc along with 0.1 g gum arabic was dusted on seed (0.01 g per gram of seed) after seed was imbibed and dried on filter paper. These bioprimed seeds were transferred on blotter paper in Petri plate in laboratory condition. Developing fungal growth on each of the seed was observed regularly and identified by microscopic observations.

Isolation was carried out by inoculating the detected fungus by standard agar plate method. The experiment was carried out with following details *in vitro.*

The observation on different parameters was recorded as total numbers of normal seeds were at 10 days after plotting and per cent germination was calculated by using formula (Elwakil and Ghoneem, 1991).

Per cent germination of seeds

Germinated and ungerminated seeds were counted from each of the treatments. Emergence of seedlings from the seed was considered as successful germination. Three repetitions were maintained for each of the treatments. The germination was expressed as percentage of the ratio of number of normal seedlings to the sum of the normal, abnormal and ungerminated seeds, *i.e.*, total sown seeds. (Khare and Bhale, 2000).

$$\text{Germination Percentage (\%)} = \frac{\text{Total no. of germinated seeds}}{\text{Total no. of seeds sown}} \text{ X } 100$$

Per cent infection

The per cent disease incidence of different diseases by each of differentiated pathogens from *in vitro* experiment was calculated by following formula.

$$\text{Per cent infection (\%)} = \frac{\text{No. of infected seeds}}{\text{Total Number of seeds}} \text{ X } 100$$

Results and Discussion

The study was conducted to check out the efficacy of chilli seed bio-priming applied at imbibition and after imbibition on per cent seed germination and per cent infected seeds by controlling the seed mycoflora was carried out by standard blotter paper method. The data presented in table 1 and fig. 1 revealed that per cent seeds germination was significantly increased and associations of pathogens with seeds were decreased in all the treatment tested over control.

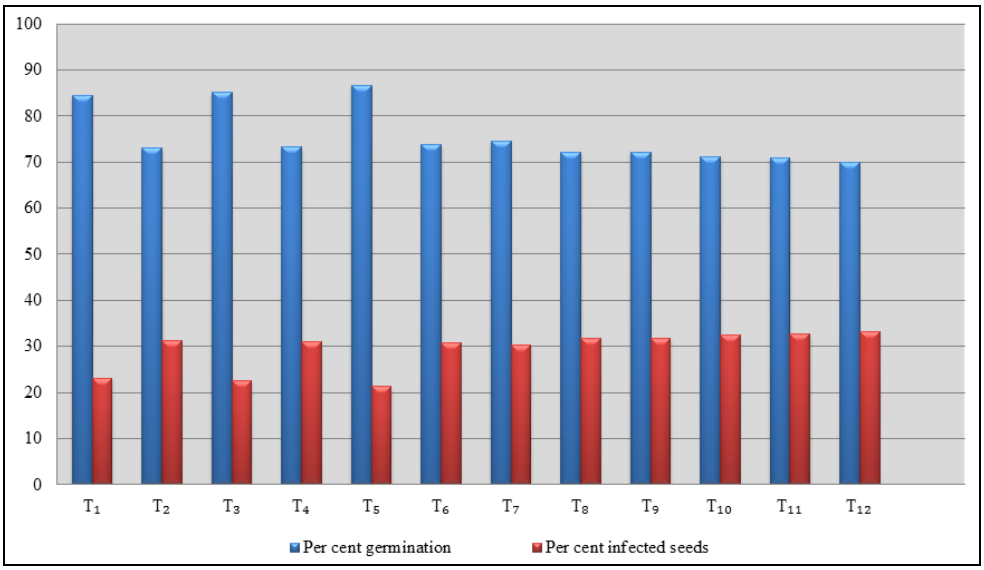

Fig 1: Effect of seed bio-priming on chilli seed germination and per cent infection *in vitro*

Table 1: Effect of seed bio-priming on chilli seed germination and per cent infection *in vitro*

S. No.	Treatment	Per cent germination	Per cent infected seeds
T_1	*Trichoderma viride* applied at imbibition	84.4	23.1* (15.53)**
T_2	*T. viride* applied after imbibition	73.0	31.2 (27.00)
T_3	*Trichoderma harzianum* applied at imbibition	85.1	22.6 (14.90)
T_4	*T. harzianum* applied after imbibition	73.3	31.0 (26.70)
T_5	*Pseudomonas fluorescens* applied at imbibition	86.7	21.3 (13.30)
T_6	*P. fluorescens* applied after imbibition	73.7	30.7 (26.23)
T_7	*Bacillus subtilis* applied at imbibition	74.5	30.3 (25.50)
T_8	*B. subtilis* applied after imbibition	72.0	31.8 (27.93)
T_9	*Paecilomyces lilacinus* applied at imbibition	72.1	31.8 (27.87)
T_{10}	*P. lilacinus* applied after imbibition	71.2	32.4 (28.80)
T_{11}	Hydro priming (Water only)	70.9	32.6 (29.07)
T_{12}	Control (Without any treatment)	69.9	33.2 (30.07)
	S.Em ±	0.64	0.43
	CD at 5%	1.86	1.27
	CV %	1.46	2.55

*Figures outside paranthesis are arc sine transformed values

** Figure indicate original values

Percentage germination of seeds

Per cent seed germination was significantly higher in the seed biopriming with *P. fluorescens* applied at imbibition (86.70%) followed by *T. harzianum* applied at imbibition (85.10%) and

lowest seed germination was observed in control (69.93%).

Per cent infection

Per cent infected seeds were significantly lower in the seed biopriming with *P. fluorescens* applied at imbibition (21.3%) followed by *T. harzianum* applied at imbibition (22.6%) and highest per cent infection was observed in control (33.2%).

It is evident from the present study that seed biopriming with *Trichoderma* sp., *P. fluorescens* and *B. subtilis* is the best treatment in the case of rhizosphere colonization and seed quality parameters. The improvement in seed germination was shown that some PGPR induced increase in seed emergence and in some cases achieving increase up to 100 per cent greater than control was observed. These findings may be due to the increased synthesis of hormones like IAA and the high lipid band could assume that it is related to the increase of the carbonyl bond, which would have triggered the activity of specific enzymes such as amylase, which promoted early germination and brought an increase in availability of starch assimilation. Sathya *et al.* (2016) observed that inoculated plants resulted in better germination and early development.

Our results are in confirmation with the results of Emanuele Junges *et al*. (2015), in which biopriming with *B. subtilis* in combination with polymer coating showed increase in germination by reduction of dead seeds, weak and abnormal seedlings in bean seed.

Seed bio-priming of chilli seed with *P. fluorescens* @10gm/kg seeds applied at imbibition found potential bio-agent to increased seed germination and decreased per cent infected seeds. In the present study, *P. fluorescens* was found potential bio agents for to bio-primed of chilli seeds and were found highly effective in increased seed germination and inhibiting the seed infection.

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