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Effect of organic and inorganic seed priming on seed quality parameters in Lentil (*Lens culinaris* M.)” seeds

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Abstract

The experiment was conducted in Field Department of Genetic and Plant Breeding SHUATS Allahabad UP during 2017, in order to standardize the best method of priming specific to Lentil. Seed priming using various methods like that viz., organic and inorganic were evaluated by screening a range of duration and concentration viz., inorganic-T₁: carbendazim @ 0.2% T₂: Mancozeb 50% + Carbendazim 25% WS @ 0.2%, organic- T₃: *Trichoderma harzianum* @ 0.6% T₄: *Pseudomonas fluorescens* @ 0.6%, Unprimed Control, for 12 hours. It was found that all the priming methods showed significant differences with the control and the highest field emergence percent, Number of pods per plant, Seed weight per plant (g), 100 Seed weight (g), Number of plants per plot, Seed yield per plot (g), Plant height (cm), Number of primary branches per plant were observed for *Trichoderma harzianum* @ 0.6% priming for 12 hours. Seed priming, its simplicity and no requirement for expensive equipment and chemicals could be used as a simple method for overcoming related to a poor germination and seedling establishment and helps in sustaining agriculture.

Keywords: Lentil, method of priming, duration. Carbendazim, *Trichoderma harzianum*, Mancozeb

Introduction

Pulses are an important source of vegetable protein. Pulses are the second most important source of human food. These plants fix nitrogen, and improve soil fertility, prevent soil erosion and play an important role in the sustainability of agricultural systems (Parsa and Bagheri, 2009) [7]. In countries that are faced with meat shortage or meat consumption or animal products are used less because of religious or economic reasons, pulses such as beans and lentils which are rich in protein, provide a cheap price source of nutrients (Majnoon Hosseini, 1994) [4]. Lentil (*Lens culinaris* Medic.) is one of the oldest annual grain legumes consumed and cultivated in the world. Originating from South western Asia as early as 6000 B.C., lentil is rich in proteins and contains high concentrations of essential amino acids like isoleucine and lysine, as well as other nutrients like dietary fiber, folate, vitamin B1, and minerals (Rozaan *et al.*, 2001) [8]. Being a leguminous crop, lentil can make use of atmospheric N₂ to fulfill its N requirements through biological nitrogen fixation (Badarneh, 1995) [1].

Phosphorus (P) and nitrogen (N) play specific roles in symbiotic N₂-fixation through their effects on nodulation and N₂-fixation process (O' Hara *et al.*, 2002) [6]. Under wet conditions with sufficient availability of soil moisture, indeterminacy is further aggravated with high N availability (Gan *et al.*, 2009). Due to the presence of more protein, calcium and phosphorus it is preferred fodder for animals compared to wheat straw (Gupta *et al.* 2013) [2]. Earlier maturity due to late season N deficiency reduces lentil biomass, harvest index and seed yield (Whitehead *et al.*, 2000) [9]. In indeterminate crops, N remobilization from shoots and roots to seeds is low (Munier-Jolain *et al.*, 1996) [5], therefore, yield may suffer from late season N deficiency (Whitehead *et al.*, 2000) [9].

Materials and methods

The experiment was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, (Naini Agricultural Institute,) Sam Higginbottom University of Agriculture, Technology & Sciences, Allahabad (UP) during Rabi-2016. The details of experimental materials are as follows.

Lentil seeds were presoaked for 8 hours in water. Then all seeds were treated with rhizobium culture @ 10g/kg seeds using natural gum. After that seeds were treated with bioagents or fungicides as per the treatments given below and shade dried overnight by spreading on ground at room temperature.

Treatments; T₀: control T₁: carbendazim@0.2% T₂: Mancozeb 50% + Carbendazim 25% WS @ 0.2% T₃: *Trichoderma harzianum*@ 0.6% T₄: *Pseudomonas fluorescens*@ 0.6%

Preparation of solution

Weigh 0.2gms of carbendazim and Mancozeb 50% + Carbendazim 25% WS and also weigh 0.6gms of *Trichoderma harzianum* and *Pseudomonas fluorescens*. Pour in to a volumetric flask containing about 80 ml of water. Once added constituents are dissolved completely, add water to bring the volume up to the final 100ml. After that 100 weighed seeds are kept in solution pre-soaked for 8hrs. Analysis of variance will be carried out according to the procedure of Randomized Block Design (RBD) for each character as per methodology advocated by Panse and Sukhatme.

Result and discussion

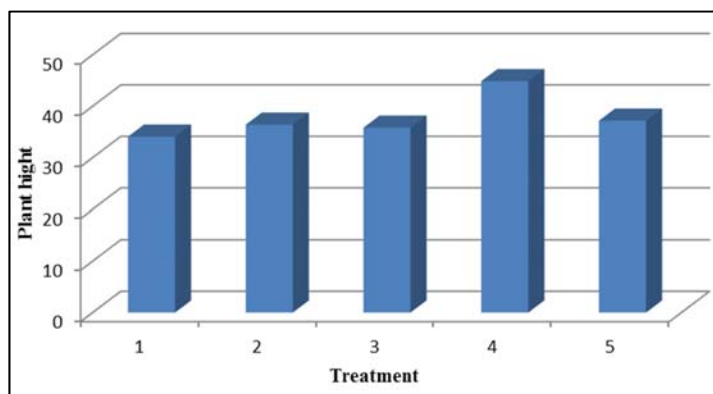
Field emergence percentage of lentil.

The mean performance of field emergence percentage ranged

from 97.10 to 77.33 with mean value of 86.74. Maximum field emergence percentage T₃ (97.10) was recorded by with application of [*Trichoderma harzianum* @ 0.6%] and it was followed by T₄ (92.00) with application of [*Pseudomonas fluorescens* @ 0.6%]. and T₂ (84.73) with application of [Mancozeb 50% + Carbendazim 25% WS @ 0.2%] and T₁ (82.06) with application of [carbendazim @ 0.2%]. Minimum germination percentage was recorded by T₀ (77.33) with Control.

Plant height of 90 DAS (cm)

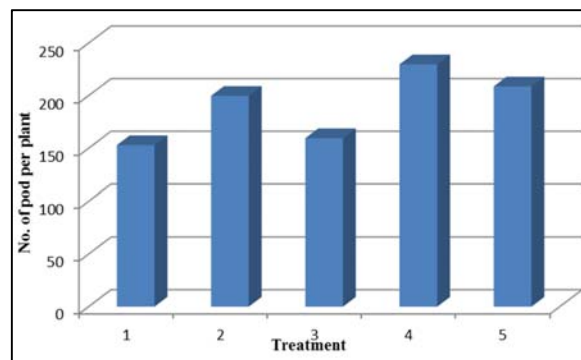
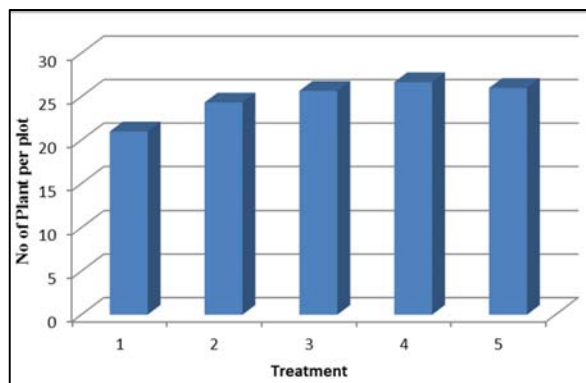
The mean performance of plant height at 90 days after sowing ranged from 44.85 cm to 34.07 cm with mean value of 37.67. Maximum plant height (44.85cm) was recorded by T₃ with application of [*Trichoderma harzianum* @ 0.6%] and it was followed by T₄ (37.18cm) with application of [*Pseudomonas fluorescens* @ 0.6%]. and T₂ (36.59 cm) with application of [Mancozeb 50% + Carbendazim 25% WS @ 0.2%]. and T₁ (36.40cm) with application of [carbendazim @ 0.2%]. Minimum plant height was recorded by T₀ (35.83) with control.



Number of plant per plot of lentil.

The mean performance of number of plant per plot ranged from 21 to 26.67 with mean value of 24.73. Maximum number of seeds per pod (26.67) was recorded by T₃ with application of [*Trichoderma harzianum*@ 0.6%] and it was followed by T₄ (26.00) with application of [*Pseudomonas fluorescens*@ 0.6%] and T₂ (25.67) with application of [Mancozeb 50% + Carbendazim 25% WS @ 0.2%]. and T₁ (24.33) Minimum number of plant per plot was recorded by T₀ (21.00) with control.

from 152.99 to 229.73 with mean value of 190.19. Maximum number of pods per plant (229.73) was recorded by T₃ with application of [*Trichoderma harzianum*@ 0.6%] and it was followed by T₄ (208.80) with application of [*Pseudomonas fluorescens*@ 0.6%] and T₁ (199.83) with application of [carbendazim@0.2%] and T₂ (159.57) with application of [Mancozeb 50% + Carbendazim 25% WS @ 0.2%] Minimum number of pods per plant was recorded by T₀ (155.79) with control.



Number of pods per plant of lentil.

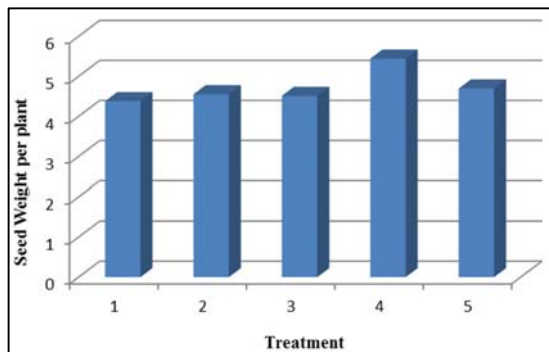
The mean performance of number of pods per plant ranged

Seed weight per plant of lentil (g)

The data on number of Seed weight per plant (g) are presented below in table 4.6.

The mean performance of Seed weight per plant (g) ranged

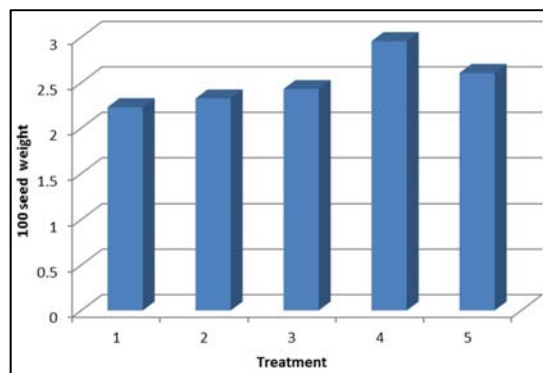
from 4.48 to 5.44 with mean value of 4.72. Maximum Seed weight per plant (5.44) was recorded by T₃ with application of [*Trichoderma harzianum*@ 0.6%] and it was followed by T₄ (4.70) with application of [*Pseudomonas fluorescens*@ 0.6%] and T₁ (4.55) with application of [carbendazim@0.2%]. and T₂ (4.51) with application [Mancozeb 50% + Carbendazim 25% WS @ 0.2%] Minimum Seed weight per plant (g) was recorded by T₀ (4.48) with control.



100 Seed weight of lentil. (g)

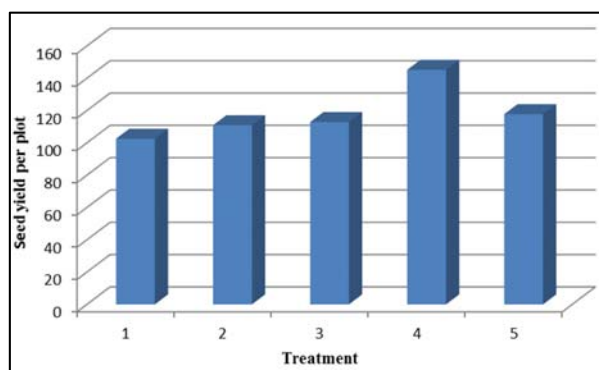
The mean performance of 100 seed weight (g) ranged from 2.23 to 2.96 with mean value of 2.48 Maximum 100 Seed weight (2.96) was recorded by T₃ with application of [*Trichoderma harzianum*@ 0.6%] and it was followed by T₄ (2.61) with application of [*Pseudomonas fluorescens*@ 0.6%] and T₂ (2.43) with application [Mancozeb 50% + Carbendazim 25% WS @ 0.2%] and T₁ (2.33) with

application of [carbendazim@0.2%]. and Minimum 100 seed weight per plant (g) was recorded by T₀ (2.23) with control.



Seed yield per plot of lentil. (g)

The mean performance of Seed yield per plot of lentil (g) ranged from 98.53 to 145.25 with mean value of 117.86. Maximum Seed yield per plot (145.20) was recorded by T₃ with application of [*Trichoderma harzianum*@ 0.6%] and it was followed by T₄ (117.76) with application of [*Pseudomonas fluorescens*@ 0.6%] and T₂ (112.85) with application [Mancozeb 50% + Carbendazim 25% WS @ 0.2%] and T₁ (98.59) with application of [carbendazim@0.2%]. and Minimum Seed yield per plot (g) was recorded by T₀ (98.59) with control.



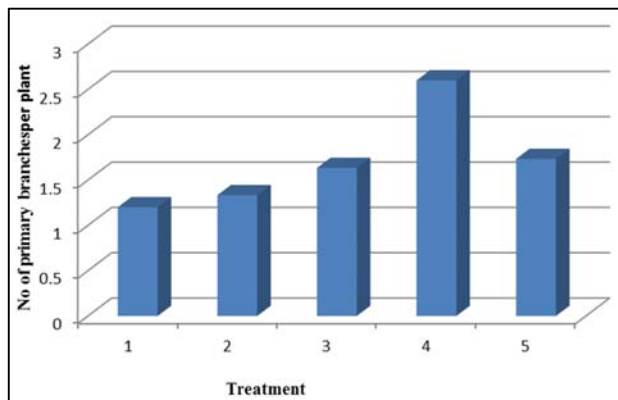
Number of primary branches per plant of 90 DAS

The mean performance of number of primary branches per plant at 90 days after sowing ranged from 1.12 to 2.60 with mean value of 1.70. Maximum number of primary branches per plant (2.60) was recorded by T₃ with application of [*Trichoderma harzianum* @ 0.6%] and it was followed by T₄

(1.73) with application of [*Pseudomonas fluorescens*@ 0.6%] and T₁ (1.13) with application of [carbendazim@0.2%] and T₂ (1.63) with application of [Mancozeb 50% + Carbendazim 25% WS @ 0.2%]. Minimum number of primary branches per plant was recorded by T₀ (1.12) with control.

Table 1: Mean Comparison of Seed Quality parameters Traits in Lentil.

Treatment	Field emergence %	Number of pods per plant	Seed weight per plant(g)	100 Seed weight(g)	Number of plant per plot	Seed yield per plot(g)	Plant height (cm)	Number of primary branches per plant
T ₀	77.33	152.99	4.48	2.23	21.00	98.59	34.07	1.12
T ₁	82.06	199.83	4.55	2.33	24.33	110.90	36.40	1.33
T ₂	84.73	159.57	4.51	2.43	25.60	112.85	35.83	1.63
T ₃	97.10	229.73	5.44	2.96	26.67	145.20	44.85	2.60
T ₄	92.00	208.80	4.70	2.61	26.00	117.76	37.80	1.73
G mean	86.64	190.19	4.72	2.48	24.73	117.86	37.67	1.70
SEd+	3.41	22.56	0.23	0.11	1.36	7.58	1.85	0.12
CD@5%	7.87	52.03	0.54	0.25	3.14	17.49	4.26	0.28
F test	S	S	S	S	S	S	S	S



Conclusion

It is concluded that the present investigation treatment T₃ [*Trichoderma harzianum* @ 0.6%] exhibited high mean value for Field emergence (97.10%), Number of pods per plant (229.73), Seed weight per plant (5.44g), 100 Seed weight (2.96g), Number of plant per plot (26.67), Seed yield per plot (145.20g), Plant height (44.85cm), Number of primary branches per plant (2.60) in compared with other treatments. Soaking of seed with *Trichoderma harzianum* @ 0.6% solution is advantageous to obtain healthy seedlings. The followed by option for with *Pseudomonas fluorescens*. The priming with *Trichoderma harzianum* is ecofriendly.

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