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Effect of Organic and Inorganic Priming on Seed Yield Parameters of Chickpea

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A B S T R A C T

The present investigation was carried out at Field Experimentation Centre and, Department of Genetics and Plant Breeding, Naini Agriculture Institute, SHUATS, Allahabad during *Rabi*, 2016 to 17 evaluate the "Effect of organic and inorganic priming on seed yield parameters of chickpea (*Cicer arietinum* L.)". Five treatments gave the significant results. T1 (*Trichoderma harzianum*) showed significant performance for field emergence (85.83), plant height (77.8), number of plants per plot (24.5), number of primary branches (3.25), number of pods per plant (45), seed weight per plant (17.61) and seed yield per plot (135.89) in organic priming followed by T4 (Carbendazim) in inorganic priming compared to untreated control.

Introduction

The word *Cicer* is a derivative from the Greek word kiros referring to a well known roman family Cicero. *Arietinum* is derived from the latin word arise meaning ram which refers to the ram's head shape of the chickpea (Singh, 1985).

Chickpea (*Cicer arietinum* L.) is known by different names in various countries such as gram, chana, bengalgram, kadleetc. Chickpea is an important Rabi season legume having extensive geographical distribution. Chickpea is a diploid species with a chromosome number 2n = 16. It is a self-pollinated crop and it belongs to sub family *Papilionoideae* and tribe, *Cicereae* of the family leguminaceae. Later on, *Cicer* was considered to belong to tribe, *Viceae Alef.* Chickpea is the third most important pulse crop in the world after beans and peas. It is cultivated on an area of 12 million hectares with 8.9 million tones of annual production. Chickpea plays an important role to improve soil fertility by fixing atmospheric nitrogen with the help of root nodules (Anabessa *et al.*, 2006). Chickpea is native of south-eastern Turkey and Syria (Saxena and Singh, 1987).

Seed priming is one of the methods of increasing yield in different crops including legume. This priming may be conducted by using water or some chemical substances; increasing seed quality and germination. High germination percentage and simultaneous germination are two desired traits in mechanized agriculture. Complementary seed priming is a water balance dependent process which is conducted by soaking seeds in water for a certain time to accelerate their germination. The complementary seed priming stimulates many metabolic processes related to seed germination (Rastin, 2013).

Rapid germination and emergence is an important factor of successful establishment. It is reported that seed priming is one of the most important developments to help rapid and uniform germination and emergence of seeds and to increase seed tolerance to adverse environmental conditions Heydecker *et al.*, (1973), Harris *et al.*, (2001). Seed priming has presented promising, and even surprising results, for many seeds including the legume seeds (Bradford, 1986). Seed treatment is the concept of the management practices for invigorating seed viability and vigor throughout the production cycle of the seed. Seed priming is an age old practice, practiced million years ago by Greeks. The word was coined by Heydecker (1973) for soaking, drying seed treatments. Priming coupled with biopriming agents or growth promoters in low doses can help check certain diseases. Bio-priming seed treatment is also potentially prominent technique to induce profound changes in plant characteristics and to encourage more uniform seed germination and plant growth after seed coating with certain fungi and bacteria *(Entesari et al., 2013).*

Materials and Methods

In the present investigation, GNG-1581 variety of chickpea were grown in the *Rabi* season of 2016 at the field experimentation center of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences (Formerly Allahabad Agricultural Institute), Allahabad (U.P) in the year 2016 rabi with 5 treatments 4 replications using RBD technique.

Treatment Description

Treament	Description
T1	*Trichoderma harzianum* @ 0.6%
T2	*Pseudomonas fluorescens* @ 0.6%
T3	Carbendazim 25% WS @ 0.2% + Mancozeb 50%
T4	Carbendazim @0.2%
T5	Control

Details of method of priming

Chickpea 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 above and shade dried overnight by spreading on ground at room temperature. The statistical analysis and variance due to different sources was worked out according to Panse and Sukhatme (1967).

Results and Discussion

The analysis of variance showed significant differences among different characters. This indicates the presence of variability among the treatments (Fig. 1–8; Table 1 and 2).

Table.1 Mean performance of quantitative characters in chickpea

S.NO	Treatments	Field emergence	Plant height (cm)	Number of plants	Days to 50% flowering	Primary branches	Number of pods per plants	Seed weight per plot	Seed yield
1	T1	85.83	77.80	24.50	90.75	3.25	45	17.61	135.89
2	T2	66.67	53.60	18.75	100.75	2.5	28.75	10.36	70.97
3	T3	74.16	68.15	21	98.50	2.75	33.25	11.95	91.4
4	T4	80	75.80	22.25	95.75	3	38.25	13.97	103.67
5	T5	60	40.60	11.75	101.25	1.75	21.5	6.79	43.23
Mean		73.33*	63.19*	19.65*	97.4*	2.65*	33.35*	12.17*	89.03*
Range	**Max.**	85.83	77.80	24.50	101.25	3.25	45	17.61	135.89
	Min.	60	40.60	11.75	90.75	1.75	21.5	6.79	43.23
CD 5%		12.27	10.88	3.84	1.95	1.37	5.7	3.83	27
SE (m)		3.94	3.49	1.23	0.62	0.39	1.83	1.23	8.67

T0=control, T1=*Trichoderma harzianum*@ 0.6%, T2= *Pseudomonas fluorescens*@ 0.6%, T3= Carbendazim 25% WS @ 0.2% + Mancozeb 50%, T4= Carbendazim @0.2%.

Table.2 Analysis of variance characters

S.NO	Characters	Mean sum of squares		
		Treatment(d.f. =4)	Replication(d.f. =3)	Error(d.f.=12)
1	Field emergence	1694.53*	115.43	745.57
2	Number of plants	381.30*	18.15	73.10
3	Plant height (cm)	3997.35*	106.12	586.22
4	Days to 50% flowering	296.80*	11.20	18.80
5	Primary branches	5.30*	1.75	7.50
6	Number of pods per plot	1285.30*	54.55	160.70
7	Seed weight (gm)	260.58*	9.53	72.71
8	Seed yield	19359.43*	509.92	3614.05

* Significant at 5 % level of significance

Fig.1 Histogram depicting mean performance for Field emergence

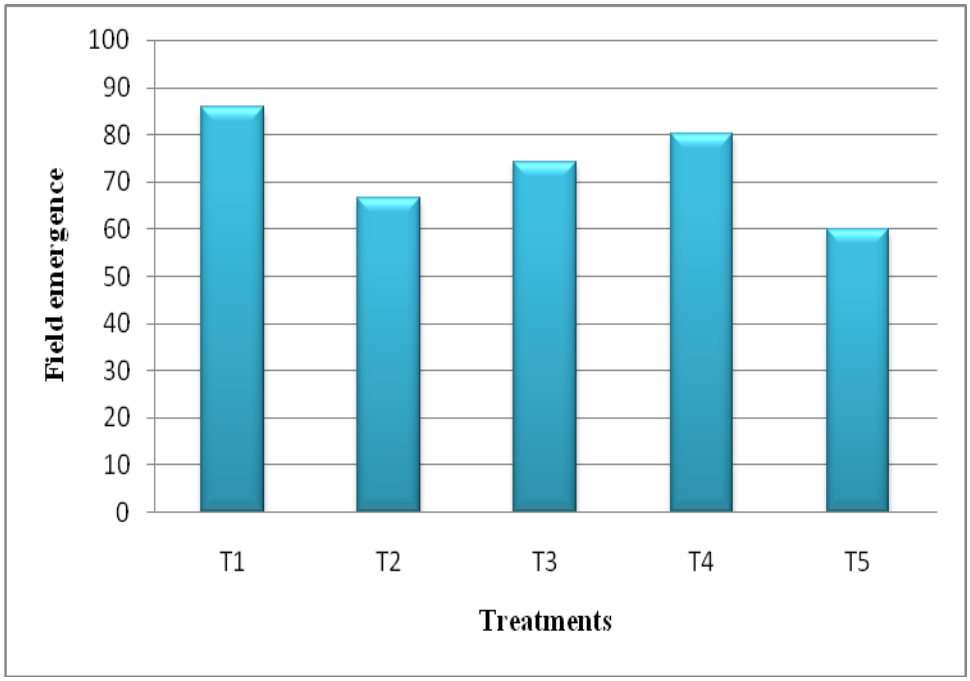
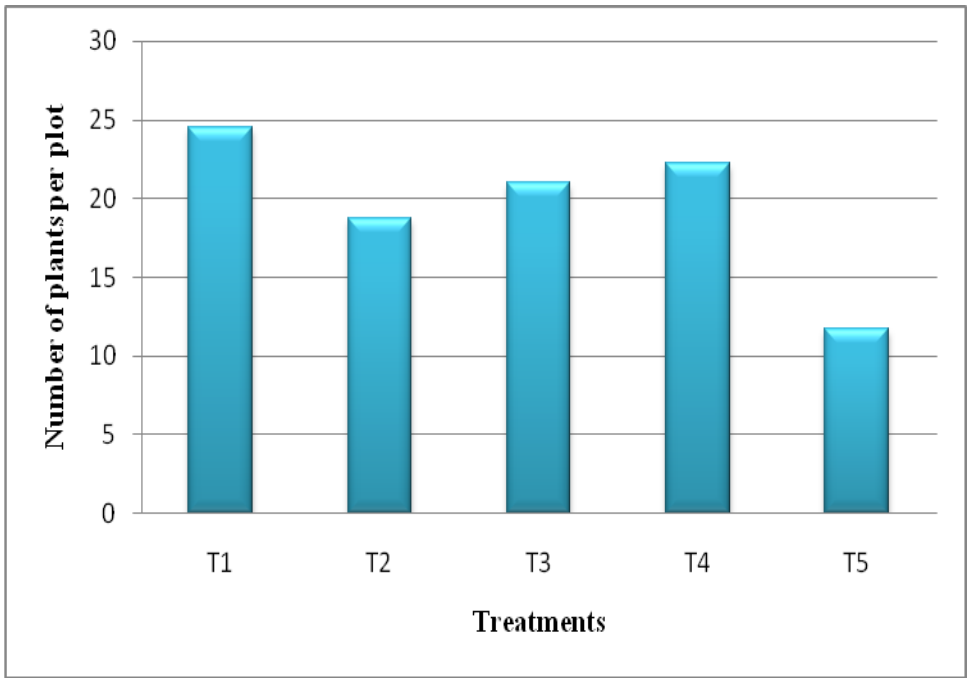


Fig.2 Histogram depicting mean performance for Number of Plants per plot



T0=control, T1=*Trichoderma harzianum*@ 0.6%, T2= *Pseudomonas fluorescens* @ 0.6%, T3= Carbendazim 25% WS @ 0.2% + Mancozeb 50%, T4= Carbendazim @0.2%.

Fig.3 Histogram depicting mean performance for Plant height

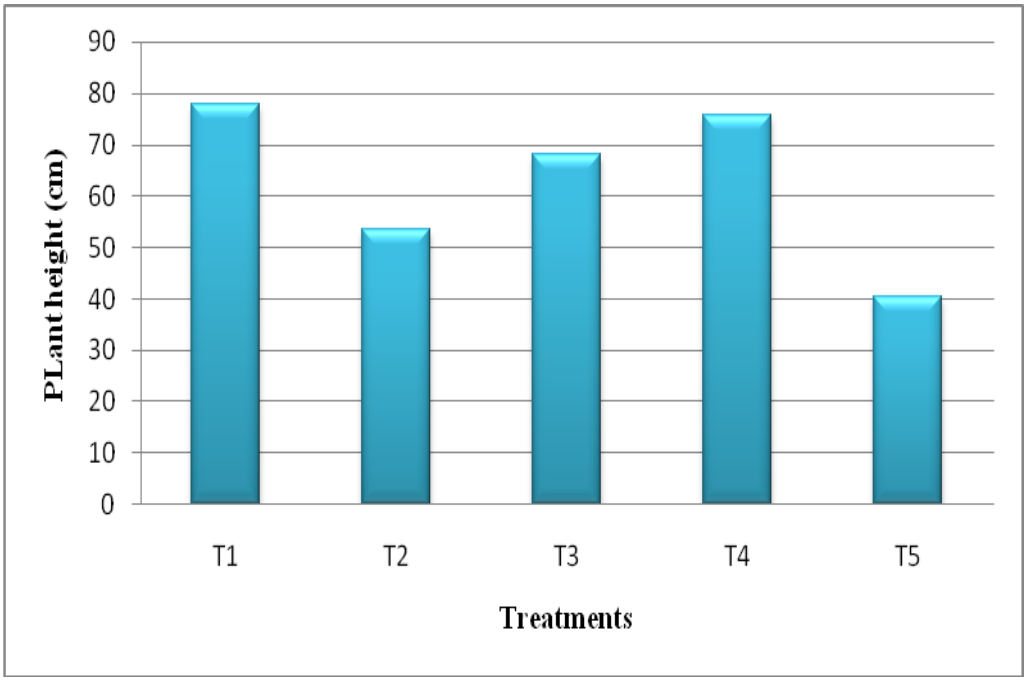
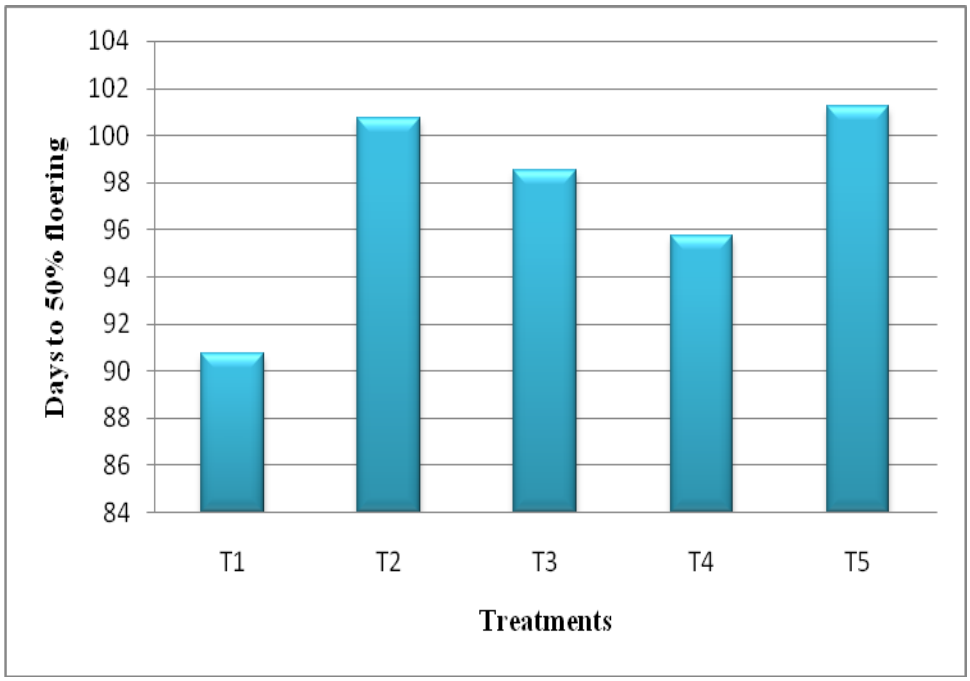


Fig.4 Histogram depicting mean performance for Days to 50% flowering



T0=control, T1=*Trichoderma harzianum*@ 0.6%, T2= *Pseudomonas fluorescens*@ 0.6%, T3= Carbendazim 25% WS @ 0.2% + Mancozeb 50%, T4= Carbendazim @0.2%.

Fig.5 Histogram depicting mean performance for primary branches/plant

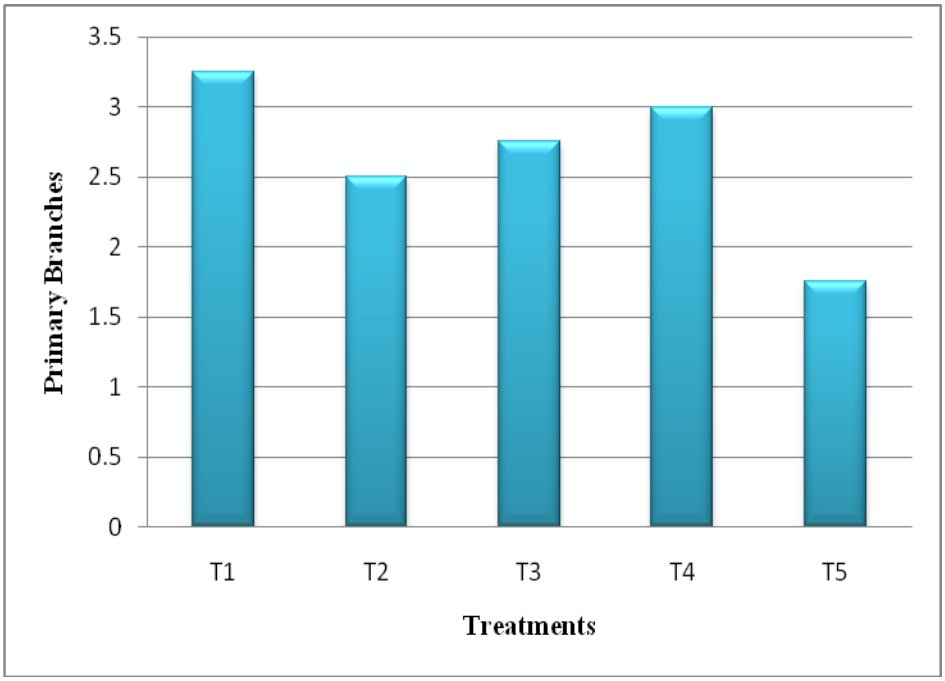
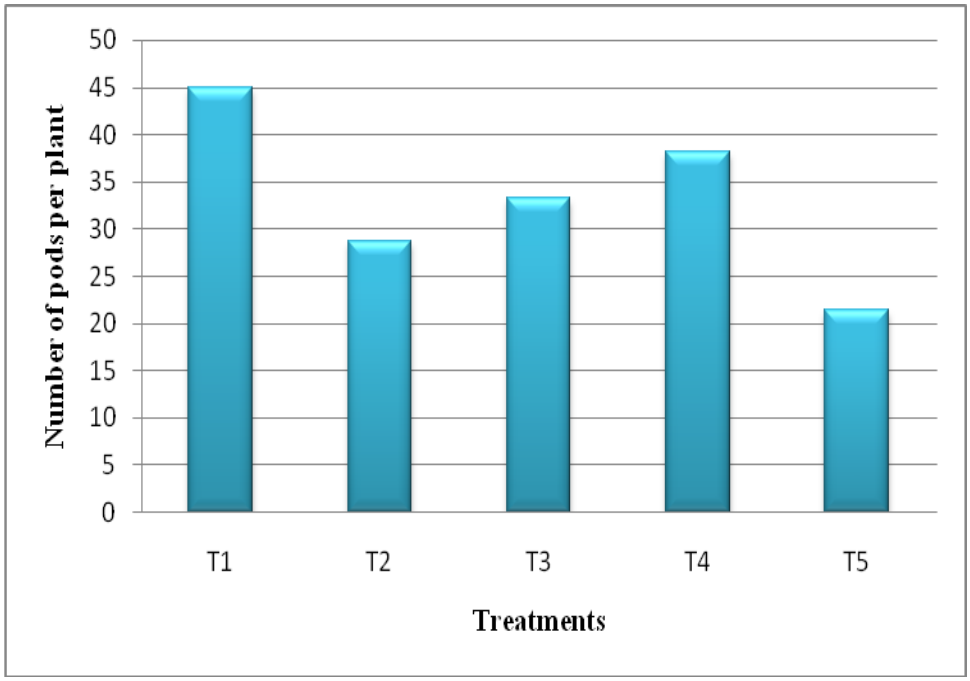


Fig.6 Histogram depicting mean performance for pods/plant



T0=control, T1=*Trichoderma harzianum*@ 0.6%, T2= *Pseudomonas fluorescens*@ 0.6%, T3= Carbendazim 25% WS @ 0.2% + Mancozeb 50%, T4= Carbendazim @0.2%.

Fig.7 Histogram depicting mean performance for Seed weight/plant

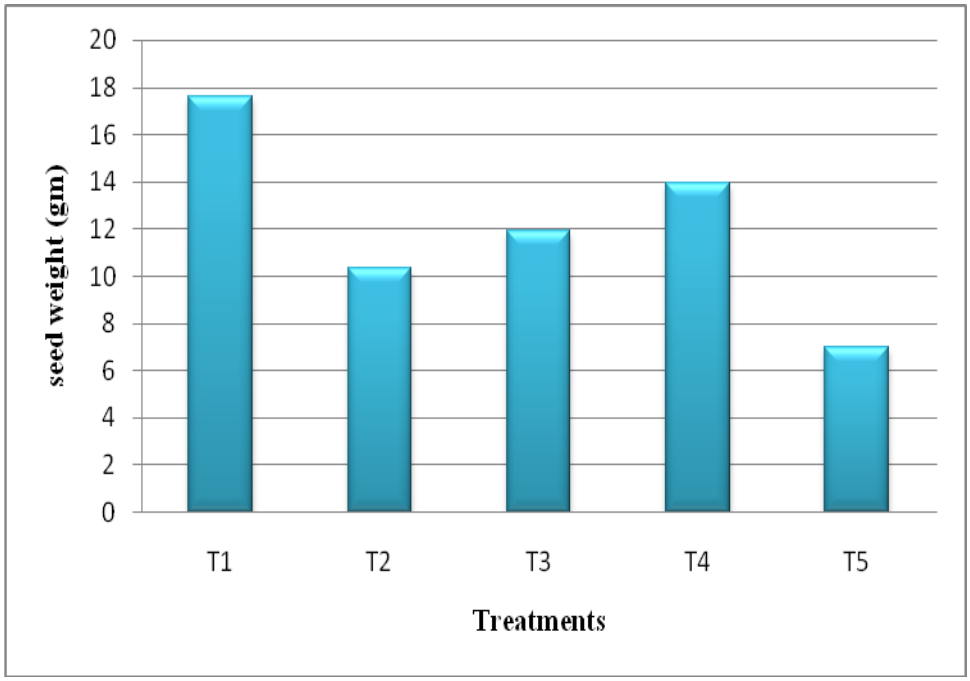
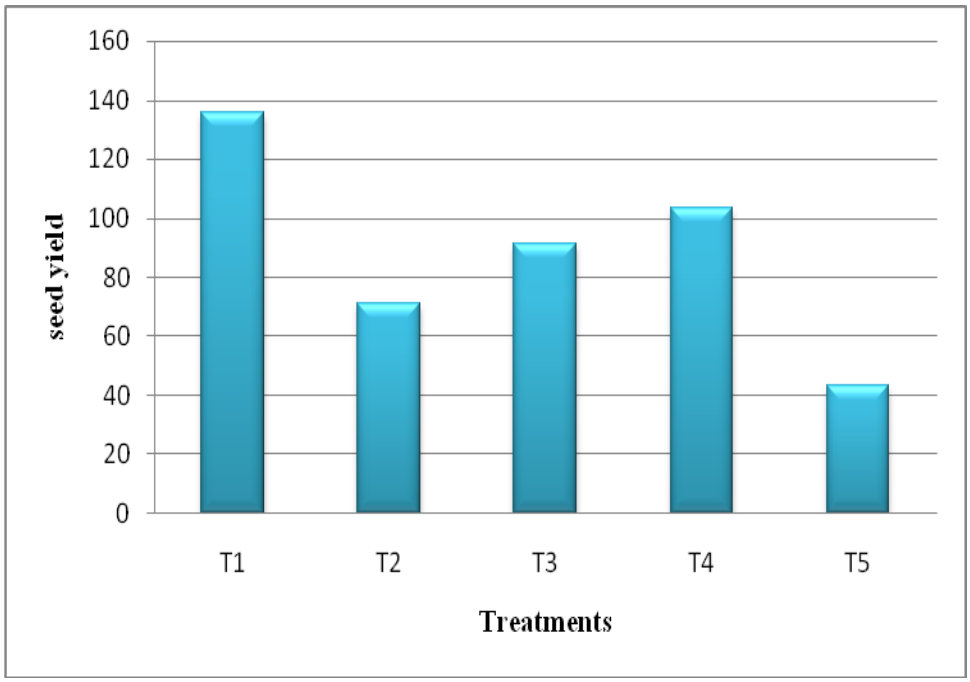


Fig.8 Histogram depicting mean performance for Seed yield/plot



T0=control, T1=*Trichoderma harzianum*@ 0.6%, T2= *Pseudomonas fluorescens*@ 0.6%, T3= Carbendazim 25% WS @ 0.2% + Mancozeb 50%, T4= Carbendazim @0.2%.

Seed quantitative parameters

Field emergence

The field emergence was resulted with maximum field emergence was depicted by *Trichoderma harzianum* 85.83 followed by Carbendazim 80, whereas minimum field emergence was depicted by control 60.

Number of plants per plot

The number of plants per plot was resulted with maximum number of plants per plot was depicted by *Trichoderma harzianum*24.50 followed by Carbendazim 22.25, whereas minimum number of plants per plot was depicted by control 11.75.

Plant height (cm)

The plant height was resulted with maximum plant height was depicted by *Trichoderma harzianum* 77.80 followed by Carbendazim 75.80, whereas minimum plant height was depicted by control 40.60.

Days to 50% flowering

The days to 50% flowering wasresulted with maximum days to 50% flowering was depicted by control 101.25 followed by *Pseudomonas fluorescens* 100.75, whereas minimum Days to 50% flowering was depicted by *Trichoderma harzianum* 90.75.

Number of primary branches

The number of primary branches wasresulted with maximum number of primary branches was depicted by *Trichoderma harzianum*3.25followed by Carbendazim 3, whereas minimum number of primary branches was depicted by control 1.75.

Number of pods per plant

The number of pods per plant was resulted with maximum number of pods per plant was depicted by *Trichoderma harzianum* 45 followed by Carbendazim 38.25, whereas minimum number of pods per plant was depicted by control 21.5.

Seed weight per plant

The seed weight per plant was resulted with maximum seed weight per plant was depicted by *Trichoderma harzianum* 17.61 followed by Carbendazim13.97, whereas minimum seed weight per plant was depicted by control 6.79.

Seed yield/plot

The seed yield per plot was resulted with maximum seed yield per plot was depicted by *Trichoderma harzianum* 135.89followed by Carbendazim 103.67, whereas minimum seed yield per plot was depicted by control 43.23.

It is concluded from the results of the experiment that among all the treatments, *Trichoderma harzianum* showed significant performance for field emergence, plant height, number of plants per plot, number of primary branches, number of pods per plant, seed weight per plant and seed yield per plot in organic priming followed by carbendazim in inorganic priming. Therefore, use of *Trichoderma harzianum* @ 0.6% and carbendazim @ 0.2% are recommended for treating chickpea for better quality, and quantity parameters.

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