



E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(4): 3047-3049
Received: 05-05-2019
Accepted: 07-06-2019

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Effect of pre-sowing seed treatment with micronutrients and growth regulators on yield and seed quality parameters of chickpea (*Cicer arietinum* L.)

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Abstract

The present study was carried out on effect of pre-sowing seed treatment with micronutrients and growth regulators on yield and seed quality parameters of Chickpea (*Cicer arietinum* L.). The experiment was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during Rabi-2018. The experiment was laid out in Randomised Blocked Design and comprised of 13 treatments and each replicated 3 time in (Field parameters) and Completely Randomised Design comprised of 13 treatments and each replicated 4 times (lab parameters). In plant growth, yield and quality parameters of chickpea var. 'Radhey' treatment T₈ (Gibberellic acid -0.5%) has shown maximum performance followed by T₂ (ZnSO₄ -0.5%) and the least performance was observed in T₀(control) when compared with other treatments.

Keywords: Micronutrients, growth regulators, chickpea crop, yield and seed quality parameters

Introduction

Chickpea (*Cicer arietinum* L.) is one of the oldest and most widely consumed legumes in the world, particularly in tropical and sub-tropical areas. It is one of the oldest pulse crops cultivated throughout India since ancient times. Chick pea is popularly known as "Bengal gram" (or) "Channa" (or) "Gram" in India. Chickpea belongs to "Fabaceae" family and its botanical name is "*Cicer arietinum* L". Chickpea is the third most important pulse crop in the world (Garg *et al.* 2011) after dry bean and peas, produced in the world (Anon., 2011). It accounts for 20% of the world pulse production. but it ranks first among pulses in India. Among the annual seed crops, it ranks 14th in terms of area and 16th in production (Knights *et al.*, 2007).

Chickpea is the third most important pulse crop in production, next to dry beans and field pea (FAO, 2011). Chickpea is a good source of carbohydrates and protein, together constituting about 80 per cent of the total dry seed mass (Chibbar *et al.*, 2010) [7] in comparison to other pulses.

Chickpea is the main source of dietary protein of the majority of Indians and is grown as grain legume. It is also very high in dietary fibre and thus is a healthy food source. Chickpeas are also a significant source of calcium, zinc, phosphorus, vitamin and iron. According to the International Crops Research Institute for the Semi-Arid Tropics, on an average, chickpea seed contains 23% protein, 64% total carbohydrates, 47% starch, 5% fat, 6% crude fibre, 6% soluble sugar and 3% ash. The growing leaves contain malic and oxalic acids which are used as medicine.

Materials and Methods

The Research study was conducted at experimental research field, Department of Genetics and Plant Breeding, Naini Agriculture Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj during rabi-2018. The experiment was carried out at Field Experimentation Centre of the Department of Genetics and Plant Breeding, Sam Higginbottom University of Agriculture, Technology & Sciences, Prayagraj (UP) during Rabi-2018. The source of seed material was obtained from local seed market and the experiment was conducted in Randomized block design (R.B.D) with three replications. The data was collected on five randomly selected plants from each plot and measurement of different observations was recorded. the experiment was conducted in Randomized block design (C.R..D) with three

replications. The data was collected on ten randomly selected seedlings from each treatment and measurement of different observations was recorded. The treatments were represented as T₀ (Control), T₁ (ZnSO₄ 0.1%), T₂ (ZnSO₄ 0.5%), T₃ (FeSO₄ 0.1%), T₄ (FeSO₄ 0.5%), T₅ (CuSO₄ 0.1%), T₆ (CuSO₄ 0.5%), T₇ (GA3 0.1%), T₈ (GA3 0.5%), T₉ (Auxin 0.1%), T₁₀ (Auxin 0.5%), T₁₁ (Cytokinin 0.1%), T₁₂ (Cytokinin 0.5%).

Results and discussion

In terms of growth and yield parameters like Field emergence, Number of primary branches per plant, Number of seeds per plant, Number of seeds per pod, Pod weight (g) and Seed yield per plant (g) the treatment T₈ (GA3 @0.5%) recorded as high among all the treatments followed by T₂ (ZnSO₄ -0.5%) and the least performance was observed in T₀ (control) while compared with other treatments.

In terms of days to 50% flowering and days to 50% maturity the early flowering and maturity was recorded in treatment T₈

(GA3 @0.5%) and the late and least performance was observed in T₀ (control).

In terms of quality parameters like Germination percentage, Root length (cm), Shoot length (cm), Seedling length (cm), Seedling fresh weight (g), Seedling dry weight (g), Vigour index I, Vigour index II the treatment T₈ (GA3 @0.5%) recorded as maximum followed by T₂ (ZnSO₄ -0.5%) and the least performance was observed in T₀ (control) while compared with other treatments

These parameters were significantly influenced by application of gibberellic acid -0.5% followed by ZnSO₄ -0.5%.

Acknowledgement

I gratefully record my indebtedness to Dr Bineeta M. Bara, Dr. Prashant Kumar Rai, Assistant Professor, Department of Genetics and plant breeding, SHUATS, my Advisor & Co-Advisor, for their constant encouragement and support. I express my gratitude to D. Sai Pavan for his valuable suggestions.

Table 1: Mean Performance of Chickpea var. 'Radhey' for 10 Field Parameters

Treatments	Treatment	Field emergence	Number of Primary branches	Days to 50% flowering	Days to 50% maturity	Number of pods/plant	Pod weight (g)	Number of seeds/pod	Number of seeds/plant	Test weight (g)	Seed yield /plant (g)
Control	T ₀	77.78	2.27	81.33	109.33	15.80	6.99	14.20	1.20	90.17	5.41
ZnSO ₄ 0.1%	T ₁	85.19	2.87	78.00	106.00	19.87	7.99	22.93	1.40	101.53	5.25
ZnSO ₄ 0.5%	T ₂	91.36	3.00	79.33	107.33	21.33	8.67	26.13	1.53	102.97	7.23
FeSO ₄ 0.1%	T ₃	81.48	2.60	78.67	106.67	20.00	6.67	25.27	1.40	98.47	5.52
FeSO ₄ 0.5%	T ₄	82.72	2.67	77.67	105.67	20.20	7.81	30.40	1.60	101.77	6.03
CuSO ₄ 0.1%	T ₅	79.01	2.80	77.67	105.67	18.87	7.17	19.27	1.47	84.43	5.77
CuSO ₄ 0.5%	T ₆	80.25	3.07	75.33	103.33	18.47	7.12	24.20	1.47	97.07	6.29
GA3 0.1%	T ₇	93.83	2.80	77.33	105.33	24.80	7.98	26.93	1.53	105.67	7.32
GA3 0.5%	T ₈	96.30	3.33	75.00	103.00	27.53	8.50	28.33	1.80	106.57	7.90
Auxin 0.1%	T ₉	88.89	2.67	78.33	106.33	24.00	7.09	23.00	1.59	104.43	6.94
Auxin 0.5%	T ₁₀	90.12	2.93	76.33	104.33	24.73	7.44	27.27	1.61	103.93	7.24
Cytokinin 0.1%	T ₁₁	86.42	2.60	78.67	106.67	22.20	7.27	26.87	1.53	103.40	6.79
Cytokinin 0.5%	T ₁₂	93.83	2.87	76.33	104.33	23.73	8.03	28.13	1.47	104.33	7.57
	MEAN	86.70	2.81	77.69	105.69	21.66	7.60	24.84	1.51	100.36	6.56
	SE. D	5.68	0.27	1.43	1.43	2.18	0.55	3.69	0.12	0.87	0.51
	CV	8.02	11.91	2.25	1.65	12.37	9.01	18.40	10.13	1.49	9.85
	CD	11.72	0.56	2.95	2.95	4.51	1.15	7.63	0.25	2.54	1.08

Table 2: Mean Performance of Chickpea var. 'Radhey' For 8 the Lab Parameters

Treatments	Treatment	Germination %	Root length (cm)	Shoot length (cm)	Seedling length (cm)	Seedling fresh weight (g)	Seedling dry weight (g)	Vigour Index I	Vigour Index II
Control	T ₀	82.75	12.42	8.24	20.56	6.55	0.80	1700.58	66.23
ZnSO ₄ 0.1%	T ₁	85.25	16.80	10.38	27.14	7.03	0.95	2313.61	81.23
ZnSO ₄ 0.5%	T ₂	89.25	17.31	12.44	29.71	8.25	1.45	2653.09	129.43
FeSO ₄ 0.1%	T ₃	84.75	14.83	10.65	25.50	7.18	0.85	2162.48	72.05
FeSO ₄ 0.5%	T ₄	86.25	15.47	12.09	27.76	8.13	1.18	2394.04	101.63
CuSO ₄ 0.1%	T ₅	84.25	15.72	10.18	26.04	7.43	0.80	2193.93	67.71
CuSO ₄ 0.5%	T ₆	86.25	17.70	11.26	28.95	6.93	1.28	2496.98	109.73
GA3 0.1%	T ₇	89.75	20.45	12.87	33.29	8.58	1.23	2987.30	111.08
GA3 0.5%	T ₈	92.50	20.74	13.48	34.04	8.88	1.48	3135.32	136.00
Auxin 0.1%	T ₉	88.75	19.59	13.33	32.97	7.93	1.30	2925.98	115.43
Auxin 0.5%	T ₁₀	91.00	20.23	13.35	33.59	8.78	1.40	3056.94	127.35
Cytokinin 0.1%	T ₁₁	89.25	20.56	13.32	33.75	8.10	0.93	3011.50	82.70
Cytokinin 0.5%	T ₁₂	90.75	20.71	13.46	34.14	8.23	1.00	3102.71	90.50
	MEAN	87.75	17.89	11.93	29.80	7.84	1.13	2625.73	99.31
	SE. D	1.66	0.25	0.20	0.35	0.72	0.23	62.25	20.88
	CD	3.36	0.51	0.40	0.71	1.45	0.47	125.91	42.24
	CV	2.68	1.99	2.35	1.65	12.97	29.12	3.35	29.74

Conclusion

Based on the present investigation it is concluded that the treatment combination T₈ (Gibberellic Acid @ 0.5 %) was found best in terms of Growth, Seed yield and quality of

Chickpea, followed by treatment T₂ (ZnSO₄ @ 0.5 %) in all the parameters as compared to the treatment T₀ (Control)

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