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Influence of Different Priming Methods on Growth, Nodulation and Yield of Kabuli Chickpea (*Cicer arietinum* L.) var. Dollar

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ABSTRACT: Rabi, on the occasion of 2019-20 investigated a set of thirteen priming treatments in Kabuli chick pea in randomized block design with three replicants. The seeds of Kabuli chickpea were treated with GA_3 @100, 200ppm, IAA @100, 200ppm, SA @100, 200ppm, moringa leaf extract @3,5%, neem leaf extract @3,5%, *Rhizobium japonicum*@200gm/kg and 300gm/kg of seed. The analysis of the difference revealed that the significance due to the seed priming treatments is the amount of squares. Different seed priming treatments have a significant effect on plant height 30 and 60DAS (cm), number of pods / number of plants, number of nodules / plant at crop, pod weight / plant (g), seed yield / plant (gm), Biological yield. (gm / plot) and seed yield (g / plot). The treatments for these characters are significantly different. Field emergence and the number of primary and secondary branches per plant were not affected. T1 (gibberellic acid (GA3) @ 100 ppm) significantly affected plant height at 30 DAS (cm), plant height at 60 DAS (cm) and pod / plant number. Bio-priming with *Rhizobium japonicum* 200 g / kg seed significantly affected the number of nodules / plants harvested, and *Rhizobium japonicum* @ 300 g / kg seed significantly pod weight / plant (gm), seed yield / plant (gm), and seed yield (g) / Plot). Present study was conducted to find out best plant growth regulator on growth and yield of chickpea .Therefore present study reveals that for plant growth GA_3 @ 100 ppm, *Rhizobium japonicum* @ 200 gm / kg seed is useful for higher nodules and *Rhizobium japonicum* @ 300 gm / kg seed is used for getting higher yield in Kabuli chickpea.

Keywords: Chickpea, GA_3 and IAA, *Rhizobium japonicum*

INTRODUCTION

Chickpea is one of the important pulse crops grown in India and is an important source of protein in the vegetarian diet. Chickpea is a self-pollinating crop that belongs to the family Leguminosae with chromosome number (2n = 16). It is the third most important pulse crop in the world in terms of pulse production, India contributes 25% of the total world production (Poonia *et.al.* 2015). The major producing states are Madhya Pradesh, Rajasthan, Maharashtra, Andhra Pradesh and Uttar Pradesh. India produces 25% of the world's GDP (13.50 million tonnes).

Chickpeas are high in protein, dietary fiber, carbohydrates (total carbohydrates) and minerals such as calcium, magnesium, potassium, phosphorus, iron, zinc and manganese and are considered a nutraceutical plant. Due to the high concentration of protein and carbohydrates, chickpeas play an important role in human nutrition and play a particularly important role in solving malnutrition problems in developing countries. Chickpeas are preferred for food legumes (Siddique *et. al.,* 2000). Due to its multiple uses in some areas. Chickpea is considered unique due to its high protein content which accounts for about 40% of its weight. Chickpea legume crop has health benefits which can reduce the risk of cardiovascular, diabetic and cancer.

Chickpea contain significant amounts of all amino acids except sulfur, which can be supplemented with whole grains in the daily diet. Carbohydrates are an important storage carbohydrate, followed by dietary fiber, oligosaccharides and simple sugars such as glucose and sucrose.Chickpeas are a great source of important vitamins such as riboflavin, niacin, thiamine, folate and vitamin A precursor β-carotene. Like other legumes, chickpea seeds also contain anti-nutrients that can be reduced or eliminated by different cooking methods (Jukanti *et.al.* 2012).

The main advantage of present study is seed priming with *Rhizobium japonicum* has increased more number of nodules and yield of Kabuli chickpea.

MATERIALS AND METHODS

The details of the materials used and the methods adopted in the investigation which was carried out at CRF SHUATS, Naini (Prayagraj) India, during Rabi season 2019.

The experimental material for the current research includes thirteen priming treatments, including control over chickpea seed. The experiment was performed in a randomized block (RBD) with three replicas under field

conditions. Chickpea seeds var. dollar is subject to growth regulators, GA_3, (Bora *et al.*, 2006) IAA, (Muhammad *et al.*, 2009) and salicylic acid @ 100 ppm and 200ppm (Marina Elangbam *et al.*, 2017). Leaf extract of neem and moringa 3 and 5% were used (Afzal *et al.*, 2012). (Biswas *et al.*, 2009) *Rhizobium* sp. @ 200gm / kg and 300gm / kg seed (Singh and Prasad 2014) were applied. Chickpea seeds were treated with the above primer for 12 hours. The average data of each character is reflected three times, statistically generated by the Analysis of Variations (Fisher 1936) method using RBD (Randomized Block Design by Panse and Sukhatme, (1961).

RESULTS AND DISCUSSION

In the current experiments, for letters, field emergence (%), plant height 30 DAS (cm), plant height 60 DAS (cm), number of primary branches / plants, number of secondary branches / plant, number of pods / plants, root Nodules / plant number at, pod weight / plant (gm), seed yield / plant (gm), biological yield (kg), and seed yield (g / plot). **Current work results are given below**

The average performance of the field emergence % ranged from 81.1 to 91.1, with an average performance of 88.00. Maximum seed germination was recorded at% T9 (Neem leaf extract @ 3%) (91.1) and minimum T12 (*Rhizobium japonicum* 300 g / kg seed) (81.1).

Plant height: The average performance of plant height at 30 DAS (cm) ranged from 17.76 to 29.54, with an average of 17.76. Maximum plant height at 30 DAS (cm) was recorded at T1 (gibberellic acid (GA_3) @ 100 ppm) (29.54) and minimum at T0 (control) (17.76).

The average performance of plant height at 60 DAS (cm) ranged from 28.59 to 39.81, with an average height of 36.07 cm. Maximum plant height at 60 DAS (cm) was recorded at T1 (gibberellic acid (GA_3) @ 100 ppm) (39.81) and minimum at T0 (control) (28.59).

The average number of primary branches / plants ranged from 3.47 to 4.13, with a maximum of 3.87 primary branches / plants recorded at T1 (gibberellic acid (GA_3) @ 100 ppm) (4.13) and a minimum of T12 (*Rhizobium japonicum* 300 g / kg seed) (3.47).

The average performance of the number of secondary branches / plants ranged from 12.4 to 13.87 with an average of 12.93. The maximum number of secondary branches / plants was recorded at T1 (gibberellic acid (GA_3) 100 ppm) (13.87) and the minimum at T3 (indole-3-acetic acid (IAA) @ 100 ppm) (12.4).

Number of nodules /plant: The mean performance of Number of nodules/plant at harvest ranged from 22.67 to 35.4with a grand mean of 31.3.

All the treatments were significantly higher for No. of nodules/plant at harvest in comparison to control. Among the significant treatments, T11 (*Rhizobium japonicum* 200gm/kg of seed) (35.4) was significantly higher in comparison to control and other treatments.

The average performance of pods / plant numbers ranged from 37.27 to 50.73 with 43.15 grand fish. The maximum number of pods / plants recorded was T1 (gibberellic acid (GA_3) @ 100ppm) (50.73), and the minimum was T0 (control) (37.27). The mean performance of No.of nodules/plant at harvest ranged from 22.67 to 35.4 with a grand mean of 31.3. maximum number of Nodules / plant at harvest were recorded at T11 (*Rhizobium japonicum* 200 g / kg seed) (35.4) and at least T0-controlled (unprimed) (22.67).

The average performance of pod weight / plant (gm) ranged from 21.89 to 24.19, with an average of 22.66. Maximum pod weight / plant (gm) was recorded at T11 (*Rhizobium japonicum* 200 g / kg seed) (24.19) and minimum at T9 (neem leaf extract @ 3%) (21.89).

The average performance of seed yield / plant (gm) ranged from 18.77 to 21.35, with an average of 19.79. Maximum seed yield / plant (gm) was recorded at T12 (*Rhizobium japonicum* 300 g / kg seed) (21.35) and minimum T0 (control) (18.77).

Plate1.

The average performance of biological yield (kg) ranged from 139 to 168.2, with an average of 149.45. Maximum biological yield (g / plot) was recorded at T12 (*Rhizobium japonicum* 300 g / kg seed) (168.2) and minimum T0-controlled (unprimed) (139).

Seed yield: Average performance of seed yield (g / plot): 103.3 to 121.23 with an average of 114.55. Maximum seed yield (g / plot) was recorded at T12 (*Rhizobium japonicum* 300 g / kg seed) (121.23) and minimum at T0 (control) (103.3).

Table 1: Mean performance of 11 characters of Kabuli chickpea (Dollar).

S. No.	Treatments	Field Emergence %	Plant height at 30 DAS (cm)	Plant height at 60 DAS (cm)	No. of primary branches /plant	No. of secondary branches /plant	No. of pods/ plant	No. of nodules/plant at harvest	Pod weight/ plant (gm)	Seed yield/ plant (gm)	Biological yield (kg)	Seed yield (g/plot)
1.	Control	87.80	17.76	28.59	4.13	12.80	37.27	22.67	22.24	18.77	139.00	103.30
2.	Gibberellic Acid (GA_3) 100ppm	90.00	29.54	39.81	4.13	13.87	50.73	32.73	22.32	19.65	154.40	112.14
3.	Gibberellic Acid (GA_3) 200ppm	90.00	24.23	37.23	3.53	13.07	44.53	31.60	22.23	19.39	151.07	109.20
4.	Indole-3-Acetic Acid (IAA) 10ppm	90.00	25.45	39.48	3.80	12.40	43.20	33.53	22.71	19.39	145.27	114.08
5.	Indole-3-Acetic Acid (IAA) 200ppm	84.40	25.87	37.51	3.87	12.73	45.60	33.07	22.71	19.66	143.47	117.35
6.	Salicylic acid 100ppm	87.80	25.46	38.47	3.93	12.47	43.67	32.60	22.52	19.73	145.87	119.66
7.	Salicylic acid 200ppm	88.90	25.06	37.30	4.07	13.07	42.13	33.00	22.51	19.71	146.47	114.11
8.	Moringa leaf extract 3%	90.00	23.53	34.09	3.80	13.07	42.73	31.80	22.75	19.66	143.80	112.32
9.	Moringa leaf extract 5%	86.70	20.65	34.66	3.53	12.47	41.33	29.60	22.30	20.80	143.87	117.42
10.	Neem leaf Extract 3%	91.10	20.69	35.77	3.87	13.33	41.73	29.47	21.89	19.17	147.93	111.53
11.	Neem leaf Extract 5%	87.80	22.11	36.51	4.07	12.73	44.00	29.60	22.15	19.09	145.80	116.53
12.	*Rhizobium japonicum* 200gm/kg	88.90	21.47	34.86	4.07	12.93	41.33	35.40	24.19	20.91	167.67	120.23
13.	*Rhizobium japonicum* 300gm	81.10	21.61	34.69	3.47	13.20	42.67	31.87	24.04	21.35	168.20	121.23
Mean		88.00	17.76	36.07	3.87	12.93	43.15	31.3	22.66	19.79	149.45	114.55
Maximum		91.10	24.23	39.81	4.13	13.87	50.73	35.40	24.19	21.35	168.2	121.23
SEd		3.40	25.45	0.69	0.25	0.56	1.10	0.79	0.53	0.67	5.27	4.68
CD (p = 0.05)		9.90	25.87	2.00	0.72	1.63	3.21	2.30	1.11	1.40	10.89	9.66
CV		6.71	25.46	3.3	11.02	7.46	4.42	4.35	2.91	4.14	4.32	5.01

It is concluded from the present investigation of seed treatments with different kind of priming exhibited significant effect on seed yield and its contributing characters. Hormonal priming with GA_3 @100 ppm significantly affected plant height at 30 DAS and 60DAS as well No. of pods/plant. While bio-priming with *Rhizobium japonicum* @200gm/kg of seed was found useful for increasing No. of nodules/plant at harvest, and *Rhizobium japonicum* @300gm/kg of seed was found useful for increasing Pod weight/plant (gm), Seed yield/plant (gm), and seed yield (g/plot). Thus, application of GA_3 @100 ppm useful for plant growth and *Rhizobium japonicum* @200gm/kg of seed has increased number of nodules/plant at harvest and *Rhizobium japonicum* @300gm/ kg of seed is useful for increasing pod weight, seed yield of Kabuli chickpea (Table 1).

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