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Research Paper

Studies of Nutrient Management for Improving Growth Parameter and Yield of Chickpea (*Cicer arietinum*) Crop through the Use of Farm Yard Manure and Rhizobium

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A B S T R A C T

A field experiment was conducted during *Rabi* Season at KarguvaJi Agriculture Research Farm, Department of Agronomy Institute of Agriculture Science at Bundelkhand University Jhansi UP India, during 2015-16 with the objective the studies effect of FYM and Rhizobium on growth plant height, no. of pods/plant, no. of branches per plant. The results of the study could be concluded that all the growth Physiological characters of chick pea germination 69.74% to 51.00%, Plant height 58.00 cm to 31.00 cm, number of branches per plant 40 to 21.00, number of pods per plant highest 106 and lowest 56.00, test weight of 1000 seeds 194.33gm to 141.00gm and yield 990.00gm 502.67gm, yield as compared to control due to balance use of Rhizobium15 gm/kg seed and FYM (T_6 450< $T_5$400<$T_4$350<T_3 300<T_2 250<T_1 200gm T_0 no use) @ per ha. Further it was suggested that the INM is best option to improve the seed yield of chick pea.

***Key words*:** *Cicer arietinum*, Growth parameters, Nutrient management, Yield, Rhizobium

Chickpea (*Cicer arietinum* Linneaus) is the third most important food legume grown in Indian. Chickpea a member of family Fabaceae and self-pollinated crops, chickpea is an important food legume with wide geographical distribution India is the largest production of chickpea, according for 64% global chickpea production [1] pulses are important sources of protein for India large and growing population, India it is also known as king of pulses. Pulses are endowed with unique property of maintaining and restoring soil fertility through biological nitrogen fixation. Pulses are also known to respond well to phosphatic fertilizer as phosphors play in important role in root growth nodulation and nitrogen fixation in plant. Indian distribution of chickpea is throughout country but six state MP UP Rajasthan Maharashtra Andhra Pradesh and Karnataka together contribute 93% of production from 92% area [2]. Chickpea or Bengal gram (*C. arietinum* L.) is the most important pulse crop of India. Itis grown in over 45 countries in all Countries of the world and area under this crop is about 11 million hectares with 9millian tones production [3]. Low soil fertility is a major problem facing chickpea production in India, use of farm yard manure as fertilizer is a cheaper source of nutrients compared to the inorganic fertilizer and its use also leads to improved soil nutrient status and improved chickpea yield. Chickpea occupies important position in human diet due to a major source of dietary protein for population of the country due to the presence of nitrogen fixing bacteria in its root which improves the soil fertility by way of fixing atmospheric nitrogen [4]. These are also used as high protein fodder mixed with Cereal leaves. Chickpea contents 21.1% protein, 61.5% carbohydrate, and 4.5% fat. It is also rich in calcium, iron and niacin [5]. It is grown usually rainfed cool weather crop or dry climate crop in semi-arid reasons, with relative humidity of 21-41% as optimum for seeds setting. It fixes nitrogen with rhizobium bacteria on root and although as a long day plant, flowers in every photo period [6].

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MATERIALS AND METHODS

A field experiment was conducted during *Rabi* Season at KarguvaJi Agriculture Research farm, Department of Agronomy Institute of Agriculture Science at Bundelkhand University Jhansi UP India, during 2015-16. The soil is the experimental were sandy and clay (Red soil) in texture with saline alkalinity (7.3 pH) in reaction. The available nitrogen, phosphors, potash, zinc, sulphur and organic carbon were 124.32, 18.3, 256, 0.42, 12.7 and organic 0.37% respectively. The experiment was laid out in a randomized block design with seven treatments and three replications. The treatments were T_1- 200gm FYM/ microplot + rhizobium 15 gm/Kg/seeds, T_2 - 250gm FYM / microplot + rhizobium 15gm/Kg/seeds, T_3- 300gm FYM / microplot + rhizobium 15 gm/Kg/seeds, T_4- 350gm FYM/ microplot + rhizobium 15 gm/Kg/s, T_5- 400gm FYM / microplot + rhizobium 15 gm/Kg/seeds, T_6- 450gm FYM / microplot + rhizobium 15 gm/Kg/seeds, T_0- 000gm FYM / microplot + rhizobium 00 gm/Kg/seeds (Control). The chickpea variety (Radheycv) was 25 × 30cm spacing farm yard manure was given at the time of ploughing before of seed 15dey at deferent doses at recommendation of each experiment plot and seed in

inoculation was done with Rhizobium. The observation on number of plants, number of branches per plant, number of plant height in cm, number of pods/ plants, germination% and test weight of 1000 seeds in gm.

RESULTS AND DISCUSSION

The effect of different nutrient management practices was assessed for improving growth parameter and their effects on the yield and yield attributing characters of experimental crop chickpea in the present investigation conducted at Karguwaji Agriculture farm of Bundelkhand University, Jhansi, in *Rabi* season 2015-2016.

Germination

The perusal of the data presentation in (Table 1) revealed that highest germination percentage was counted in soil treated with 450g farm yard manure (FYM) in integration with rhizobium treated seeds in T_6 (69.74%) followed by T_5 (64.73%), T_4 (54.77%), T_3 (55.34%), T_2 (53.52%), and T_1 (52.34%) as compared to the adequately control T_0 (51.35%). Maximum germination percentage was recorded in treatment given with 450g farm yard manure (FYM) on soil in integration with rhizobium treated seeds sown in same plot, it may be due to cumulative and synergistic effect of farm yard manure and rhizobium [7]. In one hand, farm yard manure. In favour of present findings, [8] conducted a field experiment to assess the response of rhizobia inoculation, farm yard manure and inorganic fertilizer nitrogen on four selected legume crops viz. common bean, lime bean, green gram and lablab in split plot design.

Plant height

In general, plant height increased with age of plant, thus maximized at last stage of 60 DAS irrespective of treatments. Different treatments affect plant height significantly at any of the observational stages over the adequate control. Among all the treatments given in soil and on seed priming for improving plant health, T_6 (58.0cm) was enabled to obtain maximum length of chickpea due the synergistic effect of farm yard manure applied in soil and rhizobium given as seed treatment followed by T_5 (56.0cm), T_4 (51.67cm), T_3 (46.33cm), T_2 (41.33cm) and T_1 (34.33cm) as compared to the adequate control in T_0 (31.0cm). Farm yard manure is ideal source of bunch of nutrients which are readily available to the roots in soil. Similar kind of observation was also contributed by [9] in which the application of bio-organics (FYM + castor cake (B4) and FYM + *Rhizobium* + *Azotobacter* + PSB) were found significantly superior in improving the growth parameters particularly plant height.

Table 1 Effect of farm yard manure in integration with rhizobium on growth parameter and yield of chickpea (*Cicer arietinum* L.) under microplot trials

Treatments	Doses (g)	Germination (%)	Plant height (cm)	Number of pods plant^{-1}	Number of branches plant^{-1}	Test weight of 1000 seeds	Yield (g)
T_1	T_{200}	(52.34)	34.33	62.00	24.00	144.33	812.00
T_2	T_{250}	(53.52)	41.33	66.67	27.67	149.67	856.00
T_3	T_{300}	(55.34)	46.33	80.00	31.33	152.33	889.00
T_4	T_{350}	(54.77)	51.67	87.67	36.00	164.33	910.33
T_5	T_{400}	(64.73)	56.00	95.00	38.00	183.33	968.33
T_6	T_{450}	(69.74)	58.00	106.00	40.00	194.33	990.00
T_0	T_0	(51.35)	31.00	56.00	21.00	141.00	802.67
C.D.@ 5%		(03.28)	02.26	04.14	1.68	02.96	08.06

Number of pods per plant

On the light of observation, results presented in the form of (Table 1) demonstrated that out of seven treatments, 450g farm yard manure treated microplot in integration with rhizobium treated seed of T_6 was enabled to fetch highest number of pods (106.0) on chickpea, followed by T_5 (95.0), T_4 (87.67), T_3 (80.0), T_2 (66.67) and T_1 (62.0), as compared to the least one in adequate control T_0 (56.0). It may be due to the cumulative and synergistic effect of farm yard manure and rhizobium on health of chickpea plant and finally it gains the advantage for producing maximum number of pods [10]. A healthy soil may contribute to architect most potent and healthy plant which would be enabled to produce highest quality and productivity. To endorsing the present results, [11] also demonstrated through field experiment for evaluating the combined effect of farm yard manure and rhizobium on increasing the number of pods of chickpea, in which maximum number of pods on chickpea was recorded in the same treatment as compared to the individual one over the control.

Number of branches / plants

As results presented in (Table 3) showed maximum number of branches were found on chickpea plants of microplots of treatment in T_6 (40.0), followed by T_5 (38.0), T_4 (36.0), T_3 (31.33), T_2 (27.67) and T_1 (24.0) with minimum number of branches/plant in adequate control of T_0 (21.0).

Thousand seed weight

In accordance to the increasing number of pods per plant, seed size and shape also greatly influenced by increasing the dose of farm yard manure in integration with rhizobium in similar fashion. Among all the treatments, height data on 1000-seeds weight was observed in T_6 (194.33) followed by T_5 (183.33), T_4 (164.33), T_3 (152.33), T_2 (149.67) and T_1 (144.33) as compared to the control T_7 (141.0) as provided in (Table 1) their mean sum of squares have been included.

It is evident from the results given in (Table 1) revealed that 1000-seed weight of chickpea was influenced significantly by any of the treatment factors or their interaction over the adequate control. It may be due to the right shape and size of seeds by supplying of farm yard manure and rhizobium from soil. In the same line of action,

[12] also revealed that higher 1000-seed weight of chickpea seed in phosphorus treated microplots as compared to the control one.

Seed yield of chickpea

Seed yield of chickpea was influenced significantly by increasing the doses of farm yard manure in integration of rhizobium in T_1, T_2, T_3, T_4, T_5, and T_6 respectively.

Among all farm yard manure and rhizobium treatments, T_6 (990.0g), was able to produced significantly higher seed yield followed by T_5 (968.33g), T_4 (910.33g), T_3 (889.0g), T_2 (856.0g), and T_1 (812.0g), as compared to the adequate control in T_0 (802.67g) in which there was no farm yard manure and rhizobium application was done. Like above results obtained over the yield parameters, present results also endorsing, the maximum amount of quantity of farm yard manure and rhizobium would gain maximum yield due to the sufficient supply of nutrients to the individual plants in each treated replications of their respective treatments. In accordance with the present observations and results, [13] conducted a field experiment for evaluating the combined effect of farm yard manure and rhizobium on yield of chickpea in which maximum yield of chickpea was recorded in the same treatment as compared to the individual one over the control. Similarly, [14] also conducted an experiment for determining the effect of rhizobium in integration FYM, Azotobacter and PSB in improving yield of the chickpea in which combined effect of all the above components showed highest yield as compared to the individual one [15].

CONCLUSION

On the basis of present finding, the concept of eco-friendly integrated nutrient management is sincerely endorsed particularly in organic cultivation of chickpea because grower would like to eat/use toxin free and healthy agricultural produce. It is, therefore, the safe and minimal residue containing seeds would be very safe and noteworthy for consumer also for growers to get high remuneration.

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