Original Research Article

Impact of Nitrogen and Iron on growth and yield attributes of chickpea (*Cicer arietinum* L.).

ABSTRACT

A field experiment was conducted during *Rabi* season 2021 at the experimental field of the Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India which is located at 25^0 30' 42''N latitude, 81^0 60' 56" E longitude, and a height of 98 meters above sea level. The soil of the experimental field in Sandy loam in texture, nearly neutral in soil reaction (PH 7.1), low in organic carbon (0.36%) available N (171.48 kg/ha), available P (27.0 kg/ha) and K (291.2 kg/ha). The Experiment was laid out in Randomized block design with 9 treatments replicated thrice based on one year of experimentation. The treatments consisted of three levels of Nitrogen – 15, 20 and 25 kg/ha and three levels of Iron – 2.5,5 and 7.5 kg/ha. The treatment combinations were T_1: 15kg/ha Nitrogen +2.5kg/ha Iron, T_2: 15kg/ha Nitrogen + 5kg/ha Iron, T_3: 15kg/ha Nitrogen +7.5kg/ha Iron, T_4: 20kg/ha Nitrogen +2.5kg /ha Iron, T_5: 20kg/ha Nitrogen + 5kg /ha Iron, T_6: 20kg/ha Nitrogen + 7.5kg /ha Iron, T_7: 25kg/ha Nitrogen +2.5kg /ha Iron, T_8: 25kg/ha Nitrogen + 5kg /ha Iron and T_9: 25kg/ha Nitrogen +7.5kg /ha Iron. The results revealed that treatment with application of Nitrogen at 25 kg/ha + Iron at 7.5 kg/ha recorded significantly highest plant height (48.8 cm), No. of Nodules (23.0), dry weight (55.7 g/plant), number of pods per plant (61.2), seeds per pod (3.5), seed index (26.00 g), seed yield (1919.1 kg/ha) and Haulm yield (3186.6 kg/ha).

Keywords: Chickpea, Nitrogen, Iron, Growth and Yield**.**

INTRODUCTION

. Chickpea plays an important role in sustaining soil productivity by improving its physical, chemical and biological properties and trapping atmospheric nitrogen in their root nodules **(Ali and Kumar, 2005) [1].** India ranks first in area and production of chickpea followed by Australia, Pakistan and Turkey. This crop is tolerant to drought, can be grown successfully on well drained loamy to sandy loam soils under residual moisture (**Yadav *et al.*, 2019) [2].**

Nitrogen is required for both vegetative and reproductive growth of a crop. It is primarily applied to agricultural crops through the soil. Foliar nitrogen administration, on the other hand, effectively boosts both vegetative and reproductive growth. Photosynthates are used for root nodule formation and function during early development of grain legumes, but as flowering begins, the developing seeds require higher nitrogen levels.

Iron (Fe) plays an important role in chlorophyll synthesis and act as structural component of hemes, hematin and leghaemoglobin involved in the nitrogen fixation in pulses catalysed by an enzyme called "nitrogenase" **(Larson *et al.*, 2018) [3]**. Moreover, iron is the most essential micronutrient for plant growth especially for chickpea grown on saline and alkaline soils (**Larson *et al.*, 2015) [4].**

MATERIALS AND METHODS

The experiment carried out during *rabi* season of 2021 at Crop Research Farm, Department of Agronomy, Naini Agricultural Institute, SHUATS, Prayagraj (U.P.). which is located at 25^0 30' 42''N latitude, 81^0 60' 56" E longitude, and a height of 98 metres above sea level. The soil texture in the experimental plot was sandy loam, with a practically neutral soil reaction (PH 7.1), low organic carbon (0.44 percent), available N (171.48 kg/ha), available P (27.0 kg/ha), and available K (291.2 kg/ha) (**Jackson, M.L. 1973**) **[5].** The crop was sown on 28 November 2021 using variety RVG -202. The experiment was set up in a Randomized Block Design with three replications and nine treatments in total *Viz.*, T_1: 15kg/ha Nitrogen +2.5kg/ha Iron, T_2: 15kg/ha Nitrogen + 5kg/ha Iron, T_3: 15kg/ha Nitrogen +7.5kg/ha Iron, T_4: 20kg/ha Nitrogen +2.5kg /ha Iron, T_5:20kg/ha Nitrogen + 5kg /ha Iron, T_6: 20kg/ha Nitrogen + 7.5kg /ha Iron, T_7: 25kg/ha Nitrogen +2.5kg /ha Iron, T_8: 25kg/ha Nitrogen + 5kg /ha Iron and T_9: 25kg/ha Nitrogen +7.5kg /ha Iron. Recommended dose of fertilizers (P: K) will be supplied in the form of single super phosphate (SSP), and muriate of potash (MOP) as a basal dose in all plots, and the treatments (Nitrogen and Iron) were applied in the form of Urea and Ferrous sulphate according to the treatment levels in as basal doses. The growth Parameters were measured at 20, 40, 60,80 days intervals, as well as at harvest stage, from randomly selected plants in each treatment. The yield attributes were recorded at harvest form randomly selected plants in each plot. A statistical analysis was performed, and the mean was compared at a 5% probability level of significance (**Fisher, R.A. and Yates, F. 1963**) **[6].**

RESULTS AND DISSCUSSION

EFFECT OF NITROGEN AND IRON ON GROWTH ATTRIBUTES OF CHICKPEA.

1. Plant height (cm)

At 80 DAS, treatment with application 25 kg/ha Nitrogen +7.5kg /ha Iron was recorded maximum plant height (48.8 cm) which was significantly higher over rest of the treatments. However, the treatments with application of 25 kg/ha Nitrogen + 5kg /ha Iron (48.5 cm) and 20 kg/ha Nitrogen +7.5kg /ha Iron (47.9 cm) were found to be statistically at par with 25 kg/ha Nitrogen +7.5kg /ha Iron. Higher doses of nitrogen and iron reduced the nutrient deficiencies faced by the crop at advanced growth stages and led to the increased cell

division, cell elongation, chlorophyll production, photosynthetic rate was helpful for increased plant height. The findings obtained from the current study were in agreement with those of **Dhakad *et al.* (2005) [7] and Khan *et al.* (2014) [8]**

2. Number of nodules/plant

Maximum number of nodules per plant (23.0) was recorded with 25 kg/ha Nitrogen +7.5kg /ha Iron which was significantly superior over all other treatments and treatment with application of 25 kg/ha Nitrogen +5kg /ha Iron recorded (21.7) was found to be statistically at par with treatment application of 25 kg/ha Nitrogen +7.5kg /ha Iron. Maximum nodulation was observed due to the translocation of enzymes, metabolites, higher nutrient uptake efficiency influenced by the soil application of nitrogen at 25 kg/ha and Iron at 7.5 kg/ha. Similar results were obtained by **Pingoliya *et al.* (2014) [9], Neeraj *et al.* (2008) [10] and Meena *et al.* (2013) [11].**

3. Plant dry weight (g/plant)

Maximum plant dry weight (55.7 g/plant) was recorded with application of 25 kg/ha Nitrogen + 7.5 kg/ha Iron which was significantly superior over all other treatments and treatments with application of 25 kg/ha Nitrogen + 5 kg/ha Iron (55.4 g/plant) and 20 kg/ha Nitrogen + 7.5 kg/ha Iron (54.1 g/plant) were statistically at par with treatment application of 25 kg/ha Nitrogen + 7.5 kg/ha Iron. Higher dry matter accumulation is due to higher photosynthetic rate, translocation of nutrients, formation of regulating enzymes and better availability of nutrients, to crop from early growth stages to advanced reproductive stage. Results were similar to **Dhakad *et al.* (2005) [7], Khan *et al.* (2014)[8], Pingoliya *et al.* (2014) [9], Neeraj *et al.* (2008) [10] and Meena *et al.* (2013) [11].**

EFFECT OF NITROGEN AND IRON ON YIELD ATTRIBUTES OF CHICKPEA.

Treatment with 25 kg/ha Nitrogen +7.5kg /ha was recorded number of pods per plant (61.2), number of seeds per pod (3.5), seed index (26.0), Seed yield (1919.1 kg/ha) and Haulm Yield (3186.6 kg/ha) which were significantly highest than other treatments and the treatment with application of 25 kg/ha Nitrogen + 5kg /ha recorded number of pods per plant (60.6), seeds per pod (2.9), seed index (25.6 g), seed yield (1869.0 kg/ha) and haulm yield (3148.7kg/ha) which were statistically at par with treatment 25 kg/ha Nitrogen +7.5 kg/ha.

Interaction between the Nitrogen and Iron enhanced the better growth and development, higher rate of photosynthesis, better translocation of enzymes, metabolites and photosynthates in a good source-sink association, better association of yield attributes *viz.* number of pods per plant, number of seeds per pod and 100-seed weight due to differentiation led to the increased yield in chickpea. The findings were similar to those of **Dhakad *et al.* (2005) [7], Khan *et al.* (2014) [8], Pingoliya *et al.* (2014) [9], Neeraj *et al.* (2008) [10] and Meena *et al.* (2013) [11].**

CONCLUSION

Based on the research done in one season, it is concluded that for obtaining higher yield in chickpea, application of 25 kg/ha Nitrogen and 7.5kg /ha Iron along with

recommended dose of phosphorous and potassium as basal dose is advised as it is recorded higher plant height, dry weight, nodules per plant, number of pods per plant, number of seeds per pod, seed yield and Haulm yield.

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Table 1. Effect of Nitrogen and Iron on growth of Chickpea.

S. No.	Treatments	Plant Height (cm)	Number of Nodules per plant	Plant Dry weight (g/plant)
1	15kg/ha Nitrogen +2.5kg/ha Iron	43.0	13.8	48.7
2	15kg/ha Nitrogen +5kg/ha Iron	46.2	17.4	51.2
3	15kg/ha Nitrogen +7.5kg/ha Iron	46.0	17.9	52.9
4	20kg/ha Nitrogen +2.5kg /ha Iron	44.2	15.3	49.3
5	20kg/ha Nitrogen +5kg /ha Iron	47.2	18.6	53.7
6	20kg/ha Nitrogen +7.5kg /ha Iron	47.9	19.7	54.1
7	25 kg/ha Nitrogen +2.5kg /ha Iron	45.1	16.4	50.4
8	25 kg/ha Nitrogen +5kg /ha Iron	48.5	21.7	55.4
9	25 kg/ha Nitrogen +7.5kg /ha Iron	48.8	23.0	55.7
	F test	S	S	S
	SEm (±)	0.41	0.34	0.51
	CD (P=0.05)	1.23	1.03	1.51

Table 2. Effect of Nitrogen and Iron on yield attributes of chickpea.

S. No.	Treatments	No. of Pods/plant	No. of Seeds/pod	Seed Index (g)	Seed yield (kg/ha)	Haulm yield (kg/ha)	Harvest index (%)
1	15kg/ha Nitrogen +2.5kg/ha Iron	54.8	2.9	24.2	1312.3	2617.9	33.4
2	15kg/ha Nitrogen +5kg/ha Iron	56.4	3.1	25.0	1465.0	2836.1	34.1
3	15kg/ha Nitrogen +7.5kg/ha Iron	56.7	3.1	25.1	1474.1	2903.2	33.7
4	20kg/ha Nitrogen +2.5kg /ha Iron	55.5	2.9	24.7	1382.9	2684.3	34.0
5	20kg/ha Nitrogen +5kg /ha Iron	57.9	3.2	25.2	1573.7	3022.1	34.2
6	20kg/ha Nitrogen +7.5kg /ha Iron	59.0	3.4	25.4	1815.3	3070.4	37.2
7	25 kg/ha Nitrogen +2.5kg /ha Iron	55.7	3.0	24.8	1402.0	2755.7	33.7
8	25 kg/ha Nitrogen +5kg /ha Iron	60.6	3.4	25.6	1869.0	3148.7	37.2
9	25 kg/ha Nitrogen +7.5kg /ha Iron	61.2	3.5	26.0	1919.1	3186.6	37.6
	F test	S	S	S	S	S	S
	SEm (±)	0.40	0.06	0.20	17.52	34.69	0.33
	CD (P=0.05)	1.20	0.19	0.61	52.52	103.29	1.00