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EFFECT OF DIFFERENT DOSES OF NITROGEN ON GROWTH AND YIELD OF CHICKPEA (*CICER ARIETINUM*)

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Abstract

A field experiment was conducted to study the effect of different level of nitrogenous doses (25%, 50%, 75% and 100% of RDF) on chickpea. The experiment was laid out in Randomized Block Design (RBD) with seven treatments and three replications during *Rabi* season of 2017-2018 at Lovely Professional University, Phagwara, Punjab. The aim of experiment was to focus on the different level of nitrogenous dose and their effect on the morphological characters like Plant height (PH), Stem girth (SG) and No. of branches per plant. The best treatment was T5: 100% of RDF in chickpea brought out fundamentally a proper growth, development and yield of the crop during this experiment.

***Key words*:** Crop, Inorganic fertilizer, Morphology, Rhizobium

Introduction

Legumes are main source of protein in human and other certain livestock. It plays an important role in crop rotation which can enhance soil fertility and reduce the number of weeds, diseases and insect pests. (Chemining wa, Vessey, 2006; Albayrak *et al*., 2006). Chickpea (*Cicer arietinum* L.) is the third most broadly use pulse crop after bean and soybean. The agronomical significance of chickpea depends on its high protein (19.3– 25.4%) for the human and animal food and its being utilized increasingly as a good source of protein (Add Ref.). It can be utilized as food and green manure (Ali *et al*., 2004; Togay *et al*., 2008; Erman *et al*., 2011; Namvar *et al.,* 2011). Chickpea have the capacity to fixed atmospheric nitrogen in relationship with rhizobium strains. Chickpea could be considered as a good crop for intercropping and crop rotation (Shurigin *et al*., 2015).

Nitrogen (N) deficiency is one of the most important factors for reducing the yield of crop (Salvagiotti *et al*., 2008; Namvar *et al*., 2011). Nitrogen is an essential element in the plant growth as it enhanced the vegetative growth of the plant and considered as a building block of the protein. Accordingly, the supply of nitrogen to the plant will increased the protein, amino acids, cellular material and chlorophyll content (Kibe *et al*., 2006; Walley *et al*., 2005; Alam, Haider, 2006; Caliskan *et al*., 2008; Salvagiotti *et al*., 2008). Alam and Haider (2006) reported that impacts of nitrogen fertilizer increased total dry matter (TDM), leaf area index (LAI), crop growth rate (CGR) and net assimilation rate (NAR). Nitrogen deficiency causes a decrease in development rate, chlorosis, growth stunted and decreases in crop yield (Caliskan *et al*., 2008; Erman *et al*., 2011).

Material and Methods

Location

A field experiment was conducted during *Rabi* 2017-2018 in the experimental field of Lovely Professional University. Phagwara, Punjab. The soil of experimental plot was sandy loam having pH 7.2 (Singh *et al.* 2018). The climate of the fields comes under Agro ecological sub region (northern plain, hot sub humid eco-region Punjab). Area comes under the semi arid zone with annual rainfall 527.1 mm.

Treatment Details

For the present investigation Chickpea variety PBG-5 was used with seven different treatments. The combinations of seven treatment were tried in three replications using Randomized Block Design (RBD). The treatments were T_0: Control, T_1: Seed inoculation by Rhizobium culture, T_2:25% N, T_3: 50% N, T_4: 75%N, T_5: 100% RDF and T_6: Rhizobium +100% of RDF. As per the treatment the seed was inoculated with Rhizobium about two hours before sowing for T_1 and T_6. For the all treatment the first irrigation was given at 15 Days After Sowing (DAS) and second at 60 Days After Sowing (DAS). The morphological observations were recorded on different growth stages like vegetative, flowering and pod formation while the yield attributes were recorded at maturity.

Results and Discussion

Yield component

Plant Height (cm)

Plant height is an important index of growth parameter during the growth period. It is a more of varietal characteristic but it may be modified by different agronomic practices. The data on periodic

plant height at vegetative, reproductive and at maturity stage are presented in Table 1.

Plant height ranged from 12.83 (T1) to 13.67 (T3) at vegetative stage, 47.97 (T1) to 53.07 (T3) at reproductive stage and 48.70 (T4) to 51.87 (T2) at maturity. Plant height was found to be maximum in T3 (vegetative stage), T2 (Reproductive stage) and T4 (Maturity) due to high percentage of nitrogen and nitrogen easily provide to plants which helps in good vegetative growth.

Table1: Effect of different doses of nitrogen on plant height (cm)

Treatment	Vegetative stage	Reproductive stage	Maturity
T_0	13.13±0.42	48.27±0.24	50.70±0.67
T_1	12.83 ±0.67	47.97±0.85	50.97±0.60
T_2	13.50±0.53	53.07±0.66	51.87±0.53
T_3	13.67±0.42	50.97±0.75	52.57±0.51
T_4	13.33±0.36	51.70±0.59	48.70±0.55
T_5	13.53±0.67	51.73±0.54	51.07±0.69
T_6	13.60±0.60	48.97±0.48	49.90±0.50

Number of Branches Plants per Plant

Number of branches per plant is essential parameters of plant biometry and plays an important role to achieve higher grain yield. The data regarding number of primary and secondary branches was recorded periodically at vegetative, reproductive and at maturity which are presented in Table 2.

Number of branches per plant ranged from 3.4 (T6) to 4.3 (T2) at vegetative stage, 4.4 (T3) to 5.2 (T1) at reproductive stage and 4.7 (T2) to 5.7 (T1) at maturity. In vegetative stage, highest value of branches $plnat^{-1}$ showed in T_2 (25% N), in reproductive stage T_1 (Rhizobium treatment) and in maturity stage T_1 (Rhizobium treatment).

Table 2: Effect of different doses of nitrogen on number of branches plant per plant

Treatment	Vegetative stage	Reproductive stage	Maturity
T_0	3.7±0.04	4.5±0.0.03	5.0±0.03
T_1	4.2±0.08	5.2±0.04	5.7±0.05
T_2	4.3±0.18	4.6±0.04	4.7±0.03
T_3	3.8±0.05	4.4±0.05	5.0±0.04
T_4	3.8±0.04	5.1±0.03	5.2±0.03
T_5	3.5±0.01	4.6±0.03	5.3±0.04
T_6	3.4±0.04	5.0±0.04	5.2±0.03

Stem Girth (mm)

The data presented in Table 3 showed the effect of nitrogen application on the stem girth of chickpea. Stem girth differed significantly (p = 0.05) amongst the treatments. In vegetative stage, the highest value of stem girth is showed in T_3 (50% N), in reproductive stage T_1 (Rhizobium treatment) and in maturity stage T_1 (Rhizobium treatment) and T_6 (Rhizobium + RDF).

Table 3: Effect of different doses of nitrogen on Stem girth

Treatment	Vegetative stage	Reproductive stage	Maturity
T_0	3.8±0.04	9.0±0.05	8.8±0.04
T_1	3.6±0.05	9.2±0.04	9.0±0.02
T_2	3.8±0.02	9.0±0.04	8.8±0.04
T_3	4.1±0.04	8.8±0.02	8.4±0.03
T_4	4.0±0.03	9.0±0.03	8.6±0.03
T_5	3.7±0.05	9.0±0.04	8.8±0.03
T_6	3.8±0.03	9.1±0.05	9.0±0.04

Grain Weight (kg)

The data presented in Table 4 showed that both of the studied experimental factors (N application and Rhizobium inoculation) had significant effects on grain yield of chickpea. The highest rate of N fertilizer (100% of RDF) showed the greatest grain yield. Application of 100% of RDF increased grain yield 84.68% compared to the least application of N fertilizer (control). Furthermore, T_6 (Rhizobium + RDF) plant indicated more grain yield than the T_1 (Rhizobium) plants. T_6 (Rhizobium + RDF) plants increased grain yield about 98.81% compared to T_1 (Rhizobium) plants.

Table 4: Effect of different doses of Nitrogen on grain weight of chickpea

Treatment	Grain Weight (Kg)
T_0	3.87±0.09
T_1	3.33±0.10
T_2	4.10±0.04
T_3	4.20±0.06
T_4	4.20±0.07
T_5	4.57±0.08
T_6	3.37±0.04

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