International Journal of Soil and Crop Sciences, Vol. 1(1) pp 1-4, October 2013
www.springjournals.net/ijscs

Length Research Paper

Effect of Phosphorus fertilizer on yield and yield components of chickpea/*cicer arietinum*) at Kelemeda, South Wollo, Ethiopia

[*1]Seid Hussen,[2]Fikrte Yirga, [2]Fetelwork Tibebu

[*1] Wollo University,Department of plant Sciences,Dessie,P. O.Box 1145, Ethiopia
[2]Graduate Students from Wollo University,Department of plant Sciences,Dessie,P.O.Box 1145, Ethiopia

Accepted 4th October, 2013

A filed experiment was carried out to study the effect of varying levels of phosphorus ($T_{1=}$ 0kg/ha, $T_{2=}$ 30kg/ha, $T_{3=}$ 60kg /ha, T_4=90kg/ha and $T_{5=}$120kg/ha) on growth performance and yield of chickpea (Cicer –arietinum) variety Aratiy at the experimental field of Wollo university, Kelem meda, during winter season in 2013. The results revealed that phosphorus levels significantly affected plant height, number of branches per plant and number of pods per plant. The maximum plant height (39.25cm) was recorded from plots received 60kg P_2O_5 ha^{-1}, while the minimum plant height (32.5cm) was recorded from the control. Similarly higher number of branches per plant was recorded from the same treatment. The maximum number of pods per plant (49) was observed from the application of 60kg P_2O_5 ha^{-1}. Generally the results revealed that the application of 60kg P_2O_5 ha^{-1} better performance in all of the parameters studied. However this research was conducted using irrigation, in one location and season. Thus, it should be replicated in multi location and season so as to assure the results of the experiment.

Keywords: experiment, chickpea, phosphorus, pods per plant

INTRODUCTION

Chickpea (*cicer arietinum*) also known as Bengalgram and simply gram in English is popularly called as china in India because of cultivated area, it is the nineteenth most important crop grown in the world. About 70% of world production of chickpea comes from Asia. It is predominantly grown in cool, dry periods on receding soil moisture. Chickpea is known to have originated in western Asia (probably eastern Turkey). The cultivated chickpea is not found in the wild and *c. reticulatum* is its progenitor, white *c.exhinospernum* is a close relative. From west Asia, it spread to Europe and in more recent times, it was introduced in tropical Africa, central and southern America and Australia. Introduction of chickpea in India is from atransikhera in utter Pradesh and this dates backs to 2000BC (Chaludhury, 1970). It is introduction to peninsular India appears to be between 500 and 300 BC (Wishnu, 1974).

The yield potential of the crop varies according to the management practices given to it. Among these practices fertilization especially that of Phosphorus has a key role on yield of chickpea .Phosphorus can be replaced rapidly enough for optimum crop production .In the case of nutrient, fertilizer addition are normally necessary for high yields to be attained. Phosphorus, in particular is an essential input and soil nitrogen levels need to be augmented in many case. There needs to be sufficient fertilizer input to allow the retaliation of high yield but their utilization depends on the removal of other impediments to yield such as disease on weed. in adequate 'p' nutrition affects various metabolic processes, plant are retarded in growth ,poor root system ,small thin erect darkish green color appear on old leaves ,reddish color stems ,leaves fall prematurely ,impaired fruit setting

Phosphorus is essential for the general health and vigorous all in plant some specific factor that have been associated to phosphorus are root development increasing stack and more stem strength ,improve flower formation and seed production more uniform and earlier crop maturity increase nitrogen fixing capacity of legumes ,improve in crop quality and resistant to plant disease.

The major problems of developing countries in the area of crop production are low productivity which was

Table 1. effect of different p_20_5 levels on the plant height

Treatment	Plant height
T_1	32.5[a]
T_2	34.25[a]
T_3	39.25[b]
T_4	39[b]
T_5	38[b]

Table 2. ANOVA table for plant high of chickpea

Source of variation	Df	Ss	Ms	Fcal	Ftab	
					0.05	0.01
Replication	3	40.55	13.5	3.47[ns]	3.49	5.95
Treatment	4	153.3	38.32	9.85*	3.26	5.41
Error	12	46.1	3.89			
Total	19	240.55	12.66			

attributed because of so many reasons. The productivity of a crop could be improved by using appropriate technologies such as recommended fertilizer rate. However the recommended rate of fertilizer might vary according to crop type, location, soil type etc. So far a number of researches have been done on chick pea but impact of Phosphorus fertilizer, especially on localities like Kelem Meda is scanty. Thus this research was initiated to identify the optimal level of Phosphorus fertilizer for localities which have similar agro ecology with that of Kelem Meda.

RESEARCH METHODOLOGY

Description of the Experimental site

The experiment was conducted in south Wollo Zone, Dessie town Wollo university at Kelem meda which has an altitude of 2600 m.a.s.l, annual rain fall ranging from 900 – 1000 mm and temperature ranging from 12°c–26°c. The soil type of the experimental site is heavy clay soil and the weather condition of the area is under "Dega".

Experimental design

The experiment was conducted in randomized complete block design (RCBD) with four replication and five treatments. The total experimental area would be4m x 5m =20m^2 and the experimental area has total of 20plots and each plot has an area of 1m x 1.2m^2 =1.2m^2 the distance between plots and block are 0.5m and 1m respectively. The treatments are designated as T_1, T2, T3, T4 and T_5.

Data collected

Data were collected from randomly selected and tagged plants from the central row excluding, the border rows. The parameters that were considered during data collection are: plant height, number of branches and number of pods per plant.

RESULT AND DISCUSSION

Effect of different phosphorus levels on the plant height of chickpea

Plant height (cm), as affected by various levels $p_2{}^0{}_5$ is shown in (table 1). Tactical analysis revealed that $p_2{}^0{}_5$ application significantly ($p<0.05$) affected plant height. Maximum plant height (39.25cm) was recorded from those plots that had received 60kg $p_2{}^0{}_5$ ha^{-1} while minimum plant height (32.5) was observed in control plots. Previous analysis of the soil showed that "p" content was slightly deficient, thus chickpea showed a positive response to its addition. These results are in conformity with those of (Dahiya etal., 1993) who reported that 46, 57 and 69kg $p_2{}^0{}_5$ ha^{-1} respectively increased plant height and number of branches. (table 1

Table 3. Effect of different DAP levels on the number of branches plant

Treatment	Number of branches
T_1	6.75^b
T_2	7.75^a
T_3	9.37^b
T_4	7.75^a
T_5	8.75^b

Table 4. ANOVA table for number of branches plant $^{-1}$

Source of variation	Df	Ss	Ms	Fcal	Ftab	
					0.05	0.01
Replication	3	3.85	1.28	18.28^*	3.49	5.95
Treatment	4	16.46	4.1	58.57^*	3.26	5.41
Error	12	0.84	0.07			
Total	19	21.15	1.11			

Table 5. Effect of different DAP levels on number of pods plant^{-1}

Treatment	Pod number
T_1	30.75^a
T_2	33.5^b
T_3	49^b
T_4	33.75^b
T_5	30.75^a

above).

From table 2 above there is significant increase in plant height with $p_2^0{}_5$ application which can be attributed to the fact that p_20_5 enhances plant vigor and strength of the stalk (Bahadur et al., 2002). During this study we examined that these results also resemble the findings of (Jain and Trivedi, 2005) who reported an increase in plant height with $p_2^0{}_5$ application. (table 2)

Effects of different phosphorus levels on number of branches per plant

The number of branches per plant was significantly affected by various phosphorus levels (table 3 and table 4 above). The application of p_20_5 at 60kgha^{-1} produced significantly higher number of branches per plant (9.37) than the control . All other fertilizer levels varied significantly among themselves for number of branches per plant. The minimum number of branch per plant (6.75) was recorded in control plots.

From the above comparison of significance treatment two and four are non significance but there is significance difference between treatment one, three and five. Treatment three has higher number of branches per plant. Application of phosphorus increased the availability of nitrogen and potassium (Saeed et al., 2004) which resulted in better plant growth and more number of branches per plant. (Jain and Singh, 2003) have also reported that number of branches per plant in pea increased with phosphorus application

Effect of different phosphorus level on the number of pods per plant

Number of pods per plant is an important yield determinant in pulse crops. Data regarding number of pods per plant are presented in table 5 above and table 6 below.The analysis of variance showed that the difference among the means of treatments were significant. The maximum number of pod per plant (49)

Table 6. ANOVA table for number of pods plant^{-1}

Source of variation	Df	Ss	Ms	Fcal	Ftab	
					0.05	0.01
Replication	3	224.6	74.86	166.3*	3.49	5.95
Treatment	4	99.8	24.95	55.44*	3.26	5.41
Error	12	5.4	0.45			
Total	19	329.8	17.3			

were recorded in fertilizer at optimum application (60kg $p_2{}^{o}{}_5$ ha^{1}) and minimum number of per plant (30.75) were recorded in control treatment .This increase in the number of pod plant $^{-1}$ with the application $p_2{}^{0}{}_5$ might have resulted from more pronounced growth of the plant which in turn had increased number of pods per plant. Similar results were reported by (Siag, 1995). However, maximum (49) number of pods plant^{-1} was record from those plots that were fertilized with 60kg $p_2{}^{o}{}_5$ ha1 while minimum 30.75 number of pods plant ^{1} was produced by plots where no $p_2{}^{o}{}_5$ was applied .

The minimum number of pods in control might have been due to less availability of N and P and stunted growth .The results were same as reported by (ref 9???) who noticed that addition of p_2o_5 at 60 kg ha^{-1} doubled the number of pods per plant. The application of p might have enhanced the photosynthetic activity which resulted in more number of seed per plant. Similar results have been reported by (ref 9???) who examined significantly higher number of seeds per pod with the application of p as compared to control.

CONCLUSION AND RECOMMENDATION

The application of phosphorus fertilizer had significantly affected all of the parameters; plant height, number of branches per plant and number of pods per plant.

The application of 60kg P_2O_5 had result better performance in all of the parameters studied. However this research was conducted in short period of time and did not include most important parameter (yield), thus it should be done in multi locations and seasons so as to assure the results of the present experiment and to include yield components .

ACKNOWLEDGEMENT

Above all we would like to prostrate for God, who gave patient and made our work successful. Our great appreciation is also to Wollo University, Department of plant sciences, who materialized us all inputs necessary for the research.

REFERENCES

Chaludhury KA (1970). saraswatks Hason sn and csourrj 400 – 3500 years old barley, rye and pulses from atranjikhera scicu 37, 531 – 533

Wishnu M (1974). the beginning of agriculture ppole botanical evidence in india. IHU thionled, evolutionary studies in world crops diversity and changes in india sub continent combridge.

Dahiya S, Mehar S, Singh M (1993). Relative growth performances of chickpea genotypes to irrigation and fertilizers application. Haryana J. Agron. 9(2): 172-175.

Bahadur MM, Ashrafuzzaman M,Chowdhury MF, Mazumder DN (2002). Response of chickpea (Cicer arietinum) varieties to different levels of phosphorus. Crop Research Hisar. 23(2):293-299

Jain PC, Trivedi SK (2005). Response of chickpea to phosphorus and bio-fertilizers, Legume Res. 28(1):30-33.

Saeed M, Akram HM, Iqbal MS, Yar A, Ali A (2004). Impact of fertilizer on the seed yield of chickpea. Int. J. Agric. and Biol. 6(1):108-109 [Field Crops Absts. 57 (9):2005].

Jain LK, Singh P (2003). Growth and nutrient uptake of chickpea as influenced by phosphorus and nitrogen. Crop Res. 25(3):401-413 [Field Crops Absts. 23(2):2004].

Siag RK (1995). Response of Kabuli chickpea to genotypes phosphorus. Indian J. Agron. 40(3): 4