Effects of Irrigation and Phosphorous Levels on Yield Attributes and Yield of Chickpea (Cicer Arietinum L.) in Eastern Uttar Pradesh.

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Abstract

A field experiment entitled “Effect of irrigation and phosphorous levels on yield attributes and yield of chickpea (*Cicer arietinum* L.)” was conducted at the Research Farm of M.L.K.(P.G.) College, Balrampur during two consecutive *rubi* seasons of 2006-07 and 2007-08.The results revealed that, the application of two irrigations, one each at branching and pod formation stage in conjunction with 60 Kg P_2O_5/ha provided highest yield and yield contributing characters of chickpea as compared to other treatments.

Keywords: Chickpea, Irrigation, Nutrient Management, Phosphorous.

Introduction

Chickpea (*Cicer arietinum* L.) is an important winter season food legume having extensive geographical distribution. The world cicer is derived form the Greek “Kiros” referring to well known Roma family Cicero. Arietinum is derived from the Latin word “aries” meaning ram which refers to ram’s head shape of the kabuli chickpea. Chickpea is known by different names in various countries such as gram, chana, bengalgram, pois, hoos, hommos, grao-de-beco and garbanzo. Chickpea mostly consumed in the form of processed whole seed or dal. It is used in preparing of variety of snacks, sweets and condiments. Fresh green seed are also consumed as green vegetables. In India, chickpea occupying 8.81 mha area with production of 6.68 mt accounts 65 and 68 percent of total global area and production, respectively (Ali *et al* 2003). Globally, chickpea is cultivated on about 10.4 million hectares area adding 8.57 million tons of grain to the global basket, with an average productivity 826 kg/ha (Ali & kumar, 2005. Major chickpea producing states Madhya Pradesh, Rajsthan, U.P., Maharastra, Karnataka and Gujarat which together, accounts for more than 85 percent of area and 96 percent of the production.

Approximately 60% of the total pulse is contributed by rabi pulse. Chickpea is predominantly grown under rainfed condition during winter season in country. Depending upon the location and availability of soil moisture, sowing time is extended from second fortnight of September to last week of October. The most important abiotic stress is soil moisture stress at various stages of crop growth and to a lesser extents, salinity. Occasionally, water logging and deficiency of mineral nutrient in soil can also cause stresses. Out of the major physiological constraints imposed by various abiotic stresses, drought and heat alone can cause more than 50% yield loss in chickpea. Among the primary factors of crop production that determine productivity, moisture availability is the most important. Soil moisture stress has a great impact on soil temperature, plant nutrient availability, activities as well as survivility of soil flora and fauna, root growth and activity. In case of severe stress there is disruption of normal cell metabolism which is accompanied by break down of proteins and carbohydrates causing an increase in the concentration of sugars, leaf phosphorous, and nitrogen migrate from older leaves to the stem. In addition to this, phosphate fertilization of chickpea promotes growth, nodulation, and enhances yield, grain quality, regulate the phosphate synthesis, govern physio-bio-chemical process and also help in root enlargement, nodule production and thereby increase nitrogen fixation (Siag *et al.*1990). Although phosphorus availability is governed by a number of factors, moisture regime and phosphorous status of the soil exerts over helping influence. Since information on water management in chickpea under varying levels

of phosphorous are very meagre and fragmented. The present experiment were planned to find out effect of irrigation and phosphorous on yield contributing characters and yield of chickpea.

Materials and Methods

The present experiment was conducted at M.L.K. (P.G.) College form at Balrampur, during two consecutive rabi season of 2006-07 and 2007-08. The experiment was laid out in split plot design having four irrigation levels viz. I_0- un-irrigated, I_1- irrigation at branching stage, I_2- irrigation at pod formation stage, I_3- irrigation at branching at pod formation stage, as main plot treatments, and four phosphorous levels viz. P_0- 0kg P_2O_5/ha, P_1-20 kg P_2O_5/ha, P_2-40 kg P_2O_5/ha, P_3-60 kg P_2O_5/ha, as sub plot treatments. Total 16 treatment combinations replicated four times. The soil of the experimental site was silty loam in texture with low organic carbon (0.38% and 0.38%) and nitrogen (179.8 and 188.6 kg/ha), medium in phosphorous (14.8 and 15.6 kg/ha), and potassium (264.6 and 255.4 kg/ha).

There was 42.26 and 6.8 mm rainfall during the respective seasons. The observations on plant height, number of branches per plant, number of nodules per plant, number of pods per plant, number of grains per pod and grain yield taken at the time of harvest. The data collected from the experiment were subjected to statistical analysis with the procedure of split plot design as suggested by Gomez and Gomez (1984).

Results and Discussion

The results obtain from the experiment presented in the Table-1. The plant height of chickpea increased significantly with various irrigation schedule given at different critical stages of growth over control. The tallest plant height (53.52 and 52.12 cm) was recorded in the treatment having irrigation at two stages i.e. one each at branching and pod formation stage (I_3), which significantly superior over the other treatments. Similar trend also observed in second year of experiment. The maximum plant was recorded with highest dose of phosphorous (60 kg P_2O_5/ha) as compared to rest of the treatments

Table1. Effect to Irrigation and Phosphorous Levels on Yield Attributes and Yield of Chickpea in the Course form.

Treatments	Plant height (cm)		Number of branches perplant		Number of nodules perplants		Nomber of pod per plant		Number of grains per pod		Grain yield (q/ha)	
	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08	2006-07	2007-08
Irrigation level												
I_0	46.01	44.35	13.32	12.94	8.90	8.47	30.26	29.07	1.50	1.49	16.86	16.73
I_1	49.01	47.10	15.00	14.78	10.23	10.15	35.06	33.56	1.65	1.71	19.80	18.22
I_2	48.01	46.23	14.11	13.63	9.79	9.13	32.12	31.17	1.59	1.62	18.73	18.23
I_3	53.52	52.12	17.72	17.30	11.46	10.30	38.55	37.05	1.75	1.74	21.94	20.08
SEm±	1.37	1.33	0.41	0.40	0.27	0.27	1.10	1.07	0.05	0.05	0.43	045
CD(at 5%)	4.41	4.25	1.32	1.30	0.88	0.87	3.53	3.44	0.16	0.16	1.40	1.48
Phosphorous Level												
P_0	45.67	43.70	13.06	12.96	8.92	8.51	25.00	23.64	1.45	1.55	14.70	13.88
P_1	48.55	46.75	14.70	14.33	10.05	9.75	31.60	31.05	1.61	1.60	18.98	16.67
P_2	50.40	48.67	15.74	15.23	10.39	9.87	37.06	35.61	1.67	1.65	21.01	19.75
P_3	51.92	50.68	16.65	16.13	10.04	10.92	41.51	40.01	1.77	1.78	22.64	21.75
SEm±	1.21	1.17	0.36	0.35	0.24	0.23	1.07	1.05	0.05	0.05	0.34	0.23
CD (at 5%)	3.49	3.37	1.04	1.02	0.70	0.68	3.10	3.02	0.14	0.14	1.08	1.23

during both the year of experiment. The branches per plant recorded significantly higher under two irrigations (I_2) over the rest of the treatment. Same trend also observed in the next year of studies. The maximum number of branches per plant was recorded with the application of 60 kg P_2O_5/ha (P3) which was at par with P_2 and observed significantly superior over rest of the treatment during 2006-07 and 2007-08. The maximum numbers of nodules per plant was recorded with the application of two irrigations (I_3), which was significantly superior over rest of the irrigation treatments during both the years. Phosphorous at the rate of 60 kg/ka P_2O_5 recorded significantly highest number of nodules per plant during both the years as compared to other treatments. The maximum number of pods per plants increased with increasing levels of irrigations. The maximum number of pods per plant was recorded with the application of two irrigations which was significantly superior over all the irrigation treatment during both the years. Significantly maximum number of pods per plant was associated with the application of 60 kg P_2O_5/ha during both the years. Similar trend was also observed in the case of number of grains per pod. The examination of data indicates that irrigation schedule at various critical stages of the growth had significant impact on grain yield of chickpea. The highest grain yield was obtained with two irrigations one each at branching and pod formation stage (I_3) which was significantly superior over rest of the treatments during both the years. The application of two irrigation (I3) enhanced the crop yield by 30.13 and 32.73% over I_0, 17.13 and 21.18% over I_1, and 10.80 and 14.59% over 1_2, during 2006-07 and 2007-08 respectively. Phosphorous application also significantly influenced the grain yield of chickpea. The maximum grain yield (22.64 and 21.75q/ha) was found with application of 60 kg P_2O_5/ha (P_3) which was significantly superior over rest of the treatment during both the year. The results obtained are in the agreement with **Sheldarke and Saxena (1979),** Singh & Singh(1989), Joseph & Verma (1994) and Meena et.al. (2006).

Conclusion

The results summarized that, the application of two irrigations, one each at branching and pod formation stage along with 60 kg P_2O_5/ha to be found best as compared to the rest of the treatment. Hence may be recommended for chickpea crop grown by the farmers of eastern Uttar Pradesh.

Reference

1. Ali, M and Kumar, S. 2005. Chickpea (Cicer arietinum L.) research in India, accomplishment and future strategies. Indian J. Agric. Sci. 75(3):125-133.
2. Ali, M: Kumar, S. And Singh N.B. 2003. Chickpea research of India. Indian Institute of Pulse Research: 99-118.
3. Gomez. K.A. and Gomez. A.A. 1984. Statistical procedure for agricultural research. 2nd John Willey and Sons. New Yark: 660.
4. Joseph. B. And Verma. S.C. 1994. Response of rainfed chickpea (Cicer arietinum L.) to Jalshakti incorporation, phosphorous and sulphur fertilization. Indian J. Agron. 39(2): 312-314.
5. Meena. L.R.: Singh. R.K. and Gautam, R.C. 2006. Effect of moisture conservation practices, phosphorous levels and bacterial inoculation on growth, yield and economics of chickpea (Cicer arietinum L.). Legume Research.29(1): 68-72.
6. Sheldrake, A.R. and Saxena, N.P. 1979. Growth and development of chickpea under progressive moisture stress. Page 465-483 in stress Physiology in crop plants (Mussell. It and steples R.Ceds) Newyark. USA John wiley.
7. Siag. R.K. Verma. B.L. and Sidhu B.S. 1990. Effect of irrigation regimes and Phosphorous level on yield and water use effieciency of chickpea. Indian J. of Pulse Res. 3(1): 31-35.
8. Singh. D.P. & Singh. T.P. 1989. Response of gram to row spacing and phosphorous fertilization. Indian J.Agron.33(1):107-109.