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Yield and water use of chickpea (*Cicer arietinum* L.) as influenced by irrigation and land configuration

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ABSTRACT

Field experiment was conducted in *rabi* season on clay soil of College Farm, Gujarat Agricultural University, Navsari to find out the effect of irrigation and land configuration on yield and water use of chickpea. The results revealed that irrigation applied at 0.8 IW/CPE ratio resulted in significantly higher seed and haulm yield of chickpea over other ratios of irrigation but it remained at par with frequent irrigation at 1.0 IW/CPE ratio. Also there was the drastic reduction in water use efficiency with the increase in frequency of irrigation. While in method of sowing, ridges and furrow method of sowing produced significantly higher seed and haulm yield of chickpea with maximum water use efficiency.

Key words : Chickpea, Irrigation, Land configuration, Yield

INTRODUCTION

Chickpea (*Cicer arietinum* L.) is the most important winter grain legume cultivated in India. About 90 per cent of chickpea cultivation is followed under rainfed condition. Hence, its production is largely depends on the availability of residual soil moisture during the post-monsoon period. Supply of timely and adequate irrigation is a key factor for high and economic yields. Land configuration also plays a vital role in increasing the crop production. Area of South Gujarat falls under heavy rainfall area and due to clayey nature of soil there is possibility of water logging and poor aeration. Chickpea is very sensitive to water logging condition hence, results in heavy plant mortality. Sowing the crops on ridges under such situations is found advantageous as compared to normal sowing on flat seed beds. Since very little work has been done on the effect of irrigation and land configuration on the performance of chickpea therefore, the present investigation was undertaken to study the effects of irrigation and land configuration on chickpea.

MATERIALS AND METHODS

The experiment was conducted during the winter season at the College Farm, N. M. college of Agriculture, Navsari Agricultural University, Navsari. The experiment was laid out in a split plot design with four replications. The treatment combinations consisting of four levels of irrigation ($I_{1:}$ 0.4, $I_{2:}$ 0.6, $I_{3:}$ 0.8, $I_{4:}$ 1.0 IW/CPE ratio) and three land configuration methods (C_1: Flat bed, C_2: Board bed and furrow, C_3: Ridge and furrow). The clay soil having pH of 7.3 with 0.49% organic carbon, 0.048% total N, 32.43 kg.ha^{-1} available P and 350.0 kg.ha^{-1}available K. The field capacity, permanent wilting point and bulk density of 0-90 cm soil layer were 31.96%, 18.2% and 1.45 g/cc, respectively. A recommended dose of chemical fertilizer 25-50-0 kg NPK per hectare was applied uniformly. Entire quantities of N and P were applied as basal dose through urea and SSP, respectively. Sowing of seed was done at 30 cm row distance. One common irrigation was given uniformly to all the treatments for proper germination. The irrigation depth was maintained 60 mm in each irrigation. The total numbers of applied irrigations were 4, 5, 6 and 7 under 0.4, 0.6, 0.8 and 1.0 IW/CPE ratio, respectively.

RESULTS AND DISCUSSION

Effect of irrigation:

Irrigation scheduling at 0.8 IW/CPE ratio produced significantly higher seed yield than 0.4, 0.6 and 1.0 IW/CPE ratio (Table 1). While straw yield was significantly higher with irrigation ratio of 1.0 IW/CPE over 0.4 IW/CPE ratio but it was at par with 0.6 and 0.8 IW/CPE ratio. Sandhu *et al*. (1978) also reported that excessive vegetative growth due to frequent irrigation reduced the yield potential and suggested that the optimum grain requires continuous translocation of nutrients to the developing seeds.

Effect of land configuration:

The land configuration markedly influenced the yield of chickpea (Table 1). The ridge and furrow method of sowing was significantly increased the seed and straw yield than flat bed sowing method. The beneficial effect of ridge and furrow on productivity of chickpea might be due to loose and friable seed bed provided to the root

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Table 1: Yield and Water use efficiency of chickpea as influenced by irrigation and land configuration

Treatments	Grain yield (kg/ha)	Straw yield (kg/ha)	Total quantity of water applied (mm)	Consumptive use of water (mm)	Water use efficiency (kg/ha-mm)
Irrigation IW/CPE ratio (I)					
I_1 :0.4	950	1322	240	214.33	4.43
I_2 : 0.6	1011	1395	300	265.67	3.81
I_3 : 0.8	1156	1429	360	321.33	3.60
I_4 : 1.0	1022	1498	420	381	2.68
S.E. $\pm$	41.2	32.9			
C.D. (P=0.05)	131.8	105.4			
Land configuration (C)					
C_1	963	1347	300	300	3.21
C_2	1025	1415	295.75	295.75	3.49
C_3	1116	1472	291	291	3.81
S.E. $\pm$	34.62	27.03			
C.D. (P=0.05)	101.04	78.90			
Interaction					
I x C	NS	NS	NS	NS	NS

NS-Non significant

zone of the crop throughout the growth period. Thereby the favourable micro environment *i.e.* soil water-air equilibrium might have created better crop growth and yield. More (1979) reported that ridge and furrows method of sowing was found to be better for increasing the yield of chickpea.

Water use efficiency:

Water use was computed as the sum of irrigation water, effective rainfall and profile water depletion. The water use was affected by differential post-sowing irrigation under different IW/CPE ratios. The highest water use efficiency (4.43 kg/ha-mm) was obtained under 0.4 IW/CPE ratio. The total water use was not appreciably influenced by different land configuration method. The higher value of CU (consumptive use) of water and WUE were recorded under flat bed and ridge and furrow method of irrigation, respectively.

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