



## EFFECT OF LAND CONFIGURATIONS AND IRRIGATION SCHEDULING ON GROWTH AND YIELD OF CHICKPEA

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**Abstract:** Significantly higher grain yield of chickpea ( $19.38 \text{ q ha}^{-1}$ ) was recorded with irrigation at 60 mm CPE on ridges and furrows layout with total consumptive use of water (397.5 mm and WUE  $4.29 \text{ kg ha}^{-1} \text{ mm}$ ) over other treatments. Lower grain yield ( $17.05 \text{ q ha}^{-1}$ ) was recorded with irrigation at 40 mm CPE on flat bed. The irrigation at 70 mm CPE recorded maximum WUE ( $6.52 \text{ kg ha}^{-1} \text{ mm}^{-1}$ ) with consumptive water use (282.5 mm). Growing chickpea in sandy clay loam soil with surface irrigation at 60 mm CPE on ridges and furrow seems to be the best practice for higher productivity.

**Key words:** IW/CPE ratio, Irrigation Scheduling, regimes, land configuration.

### Introduction

In Maharashtra, chickpea is generally grown on flat beds, which results in low yield due to temporary water logged condition, coupled with compaction, especially in clay soils. When the crop is grown in ridges and furrows, its yield get enhanced, as compared to that in flat bed (More 1970, Shaikh and Mungse 1998). Irrigation scheduling in combination with land configuration, therefore forms an important aspect in managing the irrigation water. Hence, present investigation was undertaken to study the Effect of land configuration and different irrigation scheduling on growth and yield of Chickpea.

### Material and methods

The field experiment was conducted at Research-cum-Demonstration farm of Interfaculty Department of Irrigation Water Management, PGI, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (Maharashtra, India) during *rabi* season of 2009-10. The experiment was laid out infactorial randomized block design. The treatments were combinations of two planting layouts *viz.*, flat bed, ridges and furrows and four irrigation levels as 40, 50, 60 and 70 mm CPE.

The plots were 6.00 x 3.00 m in size, on which seeds were sown on flat bed and ridges and furrows. Therecommended fertilizer dose (25:50:30

kg N,  $\text{P}_2\text{O}_5$  and  $\text{K}_2\text{O ha}^{-1}$ ) was applied. as a basal dose at the time of dibbling. One common irrigation was given immediately after dibbling. Thereafter, irrigations were applied at 6 cm depth as per treatments.

The number of pods per plant, weight of pods per plant, weight of grains per plant, test weight, grain yield  $\text{q ha}^{-1}$ , straw yield  $\text{q ha}^{-1}$ , biological yield and harvest index were recorded at the harvest.

### Results and Discussion

The mean plant height, plant spread, number of branches per plant and dry matter per plant were significantly influenced by planting layouts. The plant height and spread of chickpea increased up to 60th day after sowing. Maximum plant height (47.50 cm) was recorded in ridges and furrows which was significantly more over flat bed treatment (45.12 cm). Significantly higher number of branches (10.03) were recorded due to the cultivation of chickpea in ridges and furrows, rather than flat bed (9.59). The maximum dry matter accumulation was recorded in ridges and furrows (30.57 g), which was at par with that of flat bed (29.72 g).

The number of pods per plant (41.67), weight of pods per plant (18.46 gm), weight of grains per plant (15.90 gm) and test weight (251.88 gm) were recorded in ridges and furrows, which were significantly superior over those obtained on flat bed

(37.9, 16.34gm, 14.01gm and 245.45 gm respectively). Similar results were reported by Ugale (2000) and Nimbalkar (2008)

The grain yield (18.91 q ha<sup>-1</sup>), straw yield (14.61 q ha<sup>-1</sup>) and the biological yield (33.50 q ha<sup>-1</sup>) recorded in ridges and furrows was significantly superior over flat bed treatment (17.38 q/ha, 13.30 q/ha<sup>-1</sup> and 30.68 q ha<sup>-1</sup> respectively). The beneficial effect of ridges and furrows on productivity of chickpea might be due to favorable environment for optimum soil, water, air equilibrium due to loose, friable seed beds created in the root zone of the crop throughout growth period. Similar results were reported by More (1979) and Shaikh and Mungse (1998). The harvest index (56.88) recorded in flat bed was significantly superior over ridges and furrows (55.50). The consumptive use of water was higher in ridges and furrows (362 mm). The water use efficiency was higher on ridges and furrow (5.53 kg ha<sup>-1</sup> mm<sup>-1</sup>) as compared to flat bed (5.33 kg ha<sup>-1</sup> mm<sup>-1</sup>).

The plant height, plant spread, number of branches per plant and dry matter per plant were significantly influenced by different irrigation scheduling and planting layouts. Maximum plant height (49.43cm) plant spread (45.40 cm) and number of branches (11.33) were recorded with irrigation at 60mm CPE, which was significantly superior over rest of the irrigation treatments.

Significantly maximum dry matter plant<sup>-1</sup>. (31.73 g) was recorded at 70 mm CPE. Significantly maximum number of pods per plant. (44.46), weight of pods per plant (20.32g), weight of grains per plant (17.62g) and thousand seed weight (272.16 gm) were recorded at 60 mm CPE irrigations, followed by irrigations at 70 mm CPE. Significantly maximum grain yield (19.38 qha<sup>-1</sup>), straw yield (15.80 q ha<sup>-1</sup>), and biological yield (35.18 q/ha<sup>-1</sup>) was recorded at 60 mm CPE irrigation while, the harvest index was maximum (60.15) at 40 mm CPE irrigation. Similar results have been reported by Sandhu and Prihar (1978) and Nimbalkar (2008).

Maximum total consumptive use of water (397.5 mm) was higher at 40 mm CPE and lowest at 70 mm CPE (282.5 mm). The seasonal water requirement was higher in 40mm CPE (480 mm) and lowest in 70 mm CPE (300 mm) irrigations. The highest water use efficiency was observed at 70 mm CPE (6.52kg ha<sup>-1</sup> mm<sup>-1</sup>) and lowest at 40mm CPE (4.29 kg ha<sup>-1</sup> mm<sup>-1</sup>) irrigations.

### Conclusion

From above results it is concluded that for getting higher grain yield of chickpea (19.38 q ha<sup>-1</sup>) it is recommended to sow chickpea with irrigation at 60 mm CPE on ridges and furrows layout with total consumptive use of water (397.5 mm and WUE 4.29 kg ha<sup>-1</sup> mm).

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**Table 1: Effect of land configuration and different irrigation regimes on growth and yield characters of Chickpea at harvest**

Treatments	Pant height	Plant spread (cm)	No. of Branches plant <sup>-1</sup>	Dry matter accumulation (g) plant ha <sup>-1</sup>	Biological yield qha <sup>-1</sup>
<b>A) Land configuration</b>					
L <sub>1</sub> . Flat bed	45.12	41.25	9.59	29.72	30.68
L <sub>2</sub> .Ridges and furrow	47.50	41.95	10.03	30.57	33.50
F test	Sig	N.S	Sig	Sig	Sig
S.Em+ <sub>-</sub>	0.32	0.10	0.10	0.24	0.69
C D at 5 %	0.97	0.31	0.30	1.13	2.11
<b>B)Irrigation regimes</b>					
1. I <sub>1</sub> : 40 mm CPE	43.53	38.7	7.95	28.64	28.39
2. I <sub>2</sub> : 50 mm CPE	44.73	39.50	9.33	29.80	31.57
3. I <sub>3</sub> : 60 mm CPE	49.43	45.40	11.33	30.66	35.18
4. I <sub>4</sub> : 70 mm CPE	47.53	43.43	10.63	31.73	33.24
F test	Sig	Sig	Sig	Sig	Sig
S.Em+ <sub>-</sub>	0.45	0.14	0.14	0.38	0.98
C D at 5 %	1.38	0.44	0.43	1.13	2.98
<b>C) Interaction</b>					
F test	N S	Sig	Sig	Sig	Sig
S.Em+ <sub>-</sub>	0.64	0.20	0.20	0.54	1.38
C D at 5 %	NS	0.62	NS	NS	NS
<b>General Mean</b>	46.31	41.60	9.81	30.14	32.09

**Table 2: Yield and yield contributing characters of Chickpea at harvest as influenced by different treatments**

Treatments	Number of pods plants <sup>-1</sup>	Weright of pods plant <sup>-1</sup> (gm)	Weight of grain plant <sup>-1</sup> (gm)	Test weight (gm)	Grain yield (qha <sup>-1</sup> )	Straw yield (qha <sup>-1</sup> )	Harvest index
<b>A) Land configuration</b>							
L <sub>1</sub> . Flat bed	37.91	16.34	14.01	245.45	17.38	13.30	56.88
L <sub>2</sub> .Ridges and furrow	41.67	18.46	15.90	251.88	18.91	14.61	56.50
F test	Sig	Sig	Sig	Sig	Sig	Sig	Sig
S.Em+ <sub>-</sub>	0.74	0.29	0.26	1.10	0.44	0.31	0.43
C D at 5 %	2.26	0.88	0.80	3.36	1.33	0.95	1.31
<b>B)Irrigation regimes</b>							
1. I <sub>1</sub> : 40 mm CPE	34.11	14.55	12.05	223.55	17.05	11.33	60.15
2. I <sub>2</sub> : 50 mm CPE	38.31	16.41	13.99	238.42	17.74	13.83	56.22
3. I <sub>3</sub> : 60 mm CPE	44.46	20.32	17.62	272.16	19.38	15.80	55.06
4. I <sub>4</sub> : 70 mm CPE	42.27	18.33	16.18	260.53	18.42	14.86	53.38
F test	Sig	Sig	Sig	Sig	Sig	Sig	Sig
S.Em+ <sub>-</sub>	1.05	0.41	0.37	1.56	0.21	0.44	0.62
C D at 5 %	3.20	1.25	1.14	4.75	0.65	1.34	1.89
<b>C) Interaction</b>							
F test	NS	NS	NS	NS	NS	NS	Sig
S.Em+ <sub>-</sub>	1.49	0.58	0.53	2.21	0.88	0.62	0.87
C D at 5 %	N.S	N.S	N.S	N.S	N.S	N.S	2.67
<b>General Mean</b>	39.79	17.40	14.96	248.67	18.15	13.95	56.69

Table 3: Yield and water applied to Chickpea as influenced by different layouts and irrigation regimes

Treatments	Irrigation Water applied (mm)	Effective rainfall	Consumptive use of water (mm)	Seasonal water requirement (mm)	Grain yield (kg $ha^{-1}$ )	Water use efficiency (kg $ha^{-1}$ mm)
<b>A) Land configuration</b>						
L <sub>1</sub> . Flat bed	390	---	326.1	390	1738	5.33
L <sub>2</sub> . Ridges and furrow	390	---	362.0	390	1891	5.53
<b>B) Irrigation regimes</b>						
1. I <sub>1</sub> : 40 mm CPE	480	---	397.5	480	1705	4.29
2. I <sub>2</sub> : 50 mm CPE	420	---	373.4	420	1774	4.75
3. I <sub>3</sub> : 60 mm CPE	360	---	322.8	360	1938	6.00
4. I <sub>4</sub> : 70 mm CPE	300	---	282.5	300	1842	6.52
<b>C) Mean</b>	390	---	344.05	390	1815	5.28