International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2017; 5(5): 544-546

Received: 15-07-2017
Accepted: 16-08-2017

**D Swetha**
D. Swetha, Ph. D Scholar, Agronomy, College of Agriculture, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad, Telangana, India

**SA Hussain**
S. A. Hussain, Professor, Agronomy, College of Agriculture, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad, Telangana, India

**Correspondence**
**D Swetha**
D. Swetha, Ph. D Scholar, Agronomy, College of Agriculture, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad, Telangana, India

# Effect of moisture regime on yield attributes and yield of chickpea cultivars (*Cicer arietinium* L.)

**D Swetha and SA Hussain**

**Abstract**
The field experiment was conducted at College farm, Acharya N.G. Ranga Agricultural University, Hyderabad during 2013-14 to study the effect of moisture regimes on yield and yield attributes of chickpea cultivars. The experiment was laid out in a randomized block design (two factors) with one factor I: treatments of four moisture regimes viz., $I_1$ (Rainfed), $I_2$ (0.3 IW: CPE), $I_3$ (0.6 IW: CPE), $I_4$ (0.9 IW: CPE) and factor II : varieties JG-11 and Annegiri and replicated thrice. Among moisture regimes, Irrigation scheduled at 0.6 IW: CPE ($I_3$) produced significantly higher yield attributes and grain and haulm yields of chickpea but it was on par with 0.9 IW: CPE ($I_4$). The JG-11 variety has produced higher grain yield than Annegiri.

**Keywords:** Chickpea, yield and yield parameters, irrigation scheduling, IW/CPE ratio

## 1. Introduction
Chickpea (*Cicer arietinium* L.) is a *rabi* pulse crop and largest produced food legume in South Asia and the third largest produced food legume globally. It is predominantly grown on residual soil moisture as is evident from the fact that of the total area in the country, only 1.96 million ha (28.3%) is irrigated (FAI 2005) [6]. Experimental results of Bhaskara Reddy (1980) [1] revealed that keeping the total quantity of irrigation water constant, increasing the frequencyof irrigation would maximize the yields in several crops. Because of high productivity under assured irrigation, a climatological approach based on IW/CPE ratio in irrigation scheduling has been found most appropriate as it integrates most of the weather parameters which determine the water requirement of a crop and increase production by at least 15 to 20 per cent (Dastane, 1972) [4]. Keeping this in view, this study was undertaken to investigate the influence of moisture regimes on yield and yield attributes of chickpea cultivars.

## 2. Materials & methods
A field experiment was conducted to during *rabi*, 2013-2014. The research work was carried out at College Farm, College of Agriculture, Rajendranagar, Hyderabad. The soil of the experimental field was sandy loam in texture with pH of 7.8. The soil was low in available nitrogen (226 kg $ha^{-1}$), available phosphorus (18.5 kg $ha^{-1}$) and medium in available potassium (235 kg $ha^{-1}$) contents. The experiment was laid out in a randomized block design (two factors) with one factor I: treatments of four moisture regimes *viz.*, $I_1$ (Rainfed), $I_2$ (0.3 IW: CPE), $I_3$ (0.6 IW: CPE), $I_4$ (0.9 IW: CPE) and factor II : varieties JG-11 and Annegiri and replicated thrice. Chickpea was sown after treating the seed with Rhizobium and were hand dibbled @ 2 seeds $hill^{-1}$ at a depth of 6 cm and sowing was carried out in N-S direction leaving 10 cm space between two hills with a row to row gap of 30 cm. Immediately after sowing basal application of N-20, $P_2O_5$-50, $K_2O$-40 kg $ha^{-1}$ was applied. The mean daily maximum temperature during the crop period ranged from 27.4$^0$C to 32.8$^0$C with an average of 28.9$^0$C, while the daily mean minimum temperature ranged from 7.51$^0$C to 18.53$^0$C with an average of 13.9$^0$C. The mean pan evaporation (USWB- class A pan) recorded during the crop period ranged from 1.73 to 4.51 mm $day^{-1}$ with an average of 3.19 mm $day^{-1}$. In general, the weather was congenial for the cultivation of chickpea during *rabi*, 2013-2014. Yield attributes and yield were recorded at harvest. Statistical analysis was done to all the recorded data as per Panse and Sukhatme (1985).

## 3. Results and Discussion

### 3.1 Yield attributes

A close observation of the data on yield attributes mentioned in table 1. clearly reveals the fact that increased moisture availability significantly influences the yield attributes like number of pod plant and test weight (g).

The maximum number of pods plant$^{-1}$ (74.27 and 65.30 for JG-11 and Annegiri, respectively) was recorded with $I_3$ (0.6 IW: CPE) treatment, where as the lowest number of pods plant$^{-1}$ (53.20 and 46.25 for JG-11 and Annegiri, respectively) was recorded under $I_1$ (control). A further increase in the moisture regime failed to influence the number of pods plant$^{-1}$ from 0.6-0.9 IW: CPE ratio as supported with results of Patel *et al*. (1988) [3, 13] and Mansur *et al*. (2010). This could be ascribed to the fact that moisture availability in the root zone increased the nutrient uptake which produces multiple physiological effects and to increase in net assimilation followed by source to sink of the photosynthates. Similar findings were reported by Singh and Dixit (1992) [16], Dixit *et al*. (1993) [5], Dabhi *et al.* (1998) [3], Reddy and Ahlawat (1998), Kaushik and Chaubey (1999) [7], Chandrasekhar and Saraf (2005) [2] and Mustafa *et al*. (2008) [8]. The varieties significantly influenced the number of pods plant$^{-1}$. All the treatments differed significantly among themselves. $I_3$ (74.27 pods plant$^{-1}$ of JG-11) recorded highest number of pods which is at par with $I_4$ treatment (70.17 pods plant$^{-1}$ of JG-11), while $I_1$ put forth the lowest number of pods (53.20 pods plant$^{-1}$ of JG-11). JG-11 recorded significantly higher pods (74.27 pods plant$^{-1}$) when compared with Annegiri (61.52 pods plant$^{-1}$). Similar findings were reported by Naik *et al*. (2012) [9] and Rao *et al*. (2012) [14].

No.of seed pod$^{-1}$ in chickpea showed that irrigation schedules, varieties and their interactions has no significant effect. These results are in conformity with those of Dixit *et al*. (1993) [5], Chaudhari *et al.* (1998), Reddy and Ahlawat (1998), Kaushik and Chaubey (1999) [7], Chandrasekhar and Saraf (2005) [2].

Irrigation treatment $I_3$ recorded significantly higher test weight (24 g and 20.83 g for JG-11 and Annegiri, respectively) as compared to the rest of the irrigation treatments and was followed, in decreasing order, by $I_4$ (23.84 g and 20.2 g for JG-11 and Annegiri, respectively), $I_2$ (21.42 g and 18.13 g for JG-11 and Annegiri, respectively) and $I_1$ (19.04 g and 17.23 g for JG-11 and Annegiri, respectively) treatments, respectively. The treatment $I_4$ and $I_3$ were on par with each other and were significantly superior to $I_1$ treatment which recorded the lowest test weight. The increase in test weight with the increase in irrigation frequency might be due to better growth of the crop, efficient dry matter partitioning and better translocation to the sink, leading to the formation of large sized seeds. In the case of highest irrigation level *i.e.* $I_4$ treatment, the decrease might be due to too frequent irrigation leading to poor grain filling when compared with $I_3$. These results were in conformation with those of Patel *et al*. (1988) [3, 13], Singh and Dixit (1992) [16], Chandrasekhar and Saraf (2005) [2]. The variety JG-11 has recorded highest test weight (24 g) when compared with Annegiri (20.83 g). Similar results were recorded by of Rao *et al*. (2012) [14]. But the interaction effect of varied moisture regime and varieties was non significant (Naik *et al*., 2012) [9].

### 3.2 Grain Yield

The highest grain yield was obtained when irrigation was scheduled at an IW:CPE ratio of 0.6 ($I_3$) (1882 kg ha$^{-1}$ and 1655 kg ha$^{-1}$ for JG-11 and Annegiri, repectively), but it was on par with $I_4$ (IW:CPE-0.9 ) (1722 kg ha$^{-1}$ and 1542 kg ha$^{-1}$ for JG-11 and Annegiri, repectively) treatment and $I_4$ is onpar with $I_2$ (1567 kg ha$^{-1}$ and 1322 kg ha$^{-1}$ for JG-11 and Annegiri, repectively). The higher grain yield with more frequent irrigation might be accounted for their favorable influence on the growth characters (plant height and number of branches respectively) and yield attributing characters (no. of pods plant$^{-1}$ and test weight, respectively). In case of $I_4$ treatment which provide maximum frequency of irrigation (four irrigations), the decrease in grain yield as compared to $I_3$ treatment might be due to frequent irrigations leading to relatively lesser seed filling as it was evident from the data on test weight. Similar findings were reported by Yusuf *et al.* (1980), Palled *et al.* (1985) [10], Chandrasekhar and Saraf (2005) [2]. With an increment in the no. of pods plant$^{-1}$ and test weight, the grain yield was significantly increased. The JG-11 variety recorded significantly higher grain yield (1882 kg ha$^{-1}$ at 0.6 IW: CPE ratio) as compared to Annegiri (1655 kg ha$^{-1}$ at 0.6 IW:CPE ratio). These results were in conformity with Naik *et al*. (2012) [9], Rao *et al*. (2012) [14].

Interaction effect between irrigation levels and varieties was non significant with regard to the grain yield.

### 3.3 Haulm yield

Irrigation level $I_3$ recorded the maximum haulm yield (893 kg ha$^{-1}$ and 794 kg ha$^{-1}$ for JG-11 and Annegiri, repectively), but was on par with $I_4$ treatment (822 kg ha$^{-1}$ and 657 kg ha$^{-1}$ for JG-11 and Annegiri, repectively). The increase in haulm yield with increased in irrigation frequency of irrigation might be accounted for high vegetative growth and dry matter production. Similar findings were reported by Dabhi *et al.* (1998) [3] and Singh *et al*. (2005) [15]. The varieties significantly differ among themselves higher haulm yield was obtained with JG-11 variety (893 kg ha$^{-1}$) when compared with Annegiri (794 kg ha$^{-1}$). Similar findings were reported by Rao *et al*. (2012) [14]. Interaction effect of irrigation schedules and varieties has shown inconsistence which resulted in non significant.

Form for going discussion, it can be concluded that, Irrigation scheduled at 0.6 IW:CPE ($I_3$) produced significantly higher yield attributes and grain and haulm yields of chickpea but it was on par with 0.9 IW:CPE ($I_4$). The JG-11 variety has produced higher grain yield than Annegiri.

**Table 1:** Yield attributes of chickpea varieties influenced by varied moisture regime

| Treatments | No. Of pods plant$^{-1}$ | | | No. Of seeds pod $^{-1}$ | | | Test weight (g) | | |
|---|---|---|---|---|---|---|---|---|---|
| | V1 | V2 | Mean | V1 | V2 | Mean | V1 | V2 | Mean |
| T1-control | 53.20 | 46.25 | 49.73 | 1.00 | 1.07 | 1.03 | 19.04 | 17.23 | 18.14 |
| T2-0.3iw:cpe | 62.07 | 54.13 | 58.10 | 1.00 | 1.00 | 1.00 | 21.42 | 18.13 | 19.78 |
| T3-0.6 iw:cpe | 74.27 | 65.30 | 69.78 | 1.00 | 1.07 | 1.03 | 24.00 | 20.83 | 22.42 |
| T4-0.9 iw:cpe | 70.17 | 61.52 | 65.85 | 1.13 | 1.00 | 1.07 | 23.84 | 20.2 | 22.02 |
| Mean | 63.18 | 55.23 | 59.20 | 1.03 | 1.03 | 1.03 | 22.08 | 19.10 | 20.59 |
| | Se(m) | Cd | | Se(m) | Cd | | Se(m) | Cd | |
| Factor a | 1.64 | 4.97 | | 0.02 | Ns | | 0.55 | 1.68 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Factor b | 2.32 | 7.03 | | 0.03 | Ns | | 0.78 | 2.37 | |
| Factor ( a x b) | 3.28 | Ns | | 0.04 | Ns | | 1.11 | Ns | |

IW: CPE- Irrigation Water: Cumulative Pan Evaporation
V1- JG-11, V2-Annegiri, Factor A-Varieties, Factor B- Irrigation levels

**Table 2:** Yield of chickpea varieties influenced by varied moisture regime

| Treatments | Grain Yield (Kg Ha$^{-1}$) | | | Haulm Yield (Kg Ha$^{-1}$) | | | Harvest Index (%) | | |
|---|---|---|---|---|---|---|---|---|---|
| | V1 | V2 | Mean | V1 | V2 | Mean | V1 | V2 | Mean |
| T1-Control | 1245 | 1008 | 1127 | 618 | 451 | 535 | 65.02 | 68.62 | 66.82 |
| T2-0.3iw:Cpe | 1567 | 1323 | 1445 | 750 | 583 | 667 | 64.33 | 70.73 | 67.53 |
| T3-0.6 Iw: Cpe | 1882 | 1655 | 1769 | 893 | 794 | 844 | 65.93 | 65.97 | 65.95 |
| T4-0.9 Iw: Cpe | 1722 | 1542 | 1632 | 822 | 657 | 740 | 65.77 | 67.09 | 66.43 |
| Mean | 1604 | 1382 | 1493 | 771 | 621 | 696 | 65.26 | 68.10 | 66.68 |
| | Se(M) | Cd | | Se(M) | Cd | | Se(M) | Cd | |
| Factor A | 72.05 | 218.55 | | 29.93 | 90.81 | | 1.51 | Ns | |
| Factor B | 101.90 | 309.07 | | 42.33 | 128.42 | | 2.13 | Ns | |
| Factor ( A X B) | 144.10 | Ns | | 59.87 | Ns | | 3.01 | Ns | |

IW:CPE- Irrigation Water: Cumulative Pan Evaporation+
V1- JG-11, V2-Annegiri, Factor A-Varieties, Factor B- Irrigation levels

## 4. References


1. Bhaskara Reddy G, Rami Reddy S, Sankara ReddiGH. Frequency and depth of irrigation for groundnut. Agriculture Water Management. 1980; 3:45-51.
2. Chandrasekhar K, Saraf CS. Influence of irrigation and fertility levels on growth and yield of late sown chickpea Cicer arietinium L. The Andhra Agricultural Journal. 2005; 52(3&4):322-325.
3. Dabhi BM, Patel JC, Solanki RM. Response of summer greengram to irrigation methods and varying moisture regimes. *Legume Research*. 1998; 21(2):96-100.
4. Dastane NG. A practical manual for water use research. Navbharat Publications, Pune, India. 1972, 12-15.
5. Dixit JP, Dubey OP, Soni NP. Effect of sowing date and irrigation on yield and nutrient uptake by chickpea cultivars under Tawa Command Area. Indian Journal of Agronomy. 1993; 38(1):227-231.
6. FAI. Fertiliser Statistics, The Fertilize Association of India. 2004–2005; 2(28).
7. Kaushik MK, Chaubey AK. Studies on irrigation requirement of chickpea Cicer arietinium L. Indian Journal of Agronomy. 1999; 44(2):367-369.
8. Mustafa MN, Karuna Sagar G, Chandrika V, Reddy PM. Growth and yield of chickpea as influenced by irrigation and nutrient management. *Legume Research.* 2008; 31(3):221-223.
9. Naik V, Pujari BT, Halepyati AS, Koppalkar BG. Growth and yield of late sown chickpea as influenced by irrigation methods, genotypes and planting densities. Karnataka Journal of Agricultural Science. 2012; 25(2):267-269.
10. Palled YB, Chandrashekharaiah AM, Radder GD. Response of bengalgram to moisture stress. Indian Journal of Agronomy. 1985; 30(1):104-106.
11. Panse VG, Sukhatme PV. *Statistical Methods for Agricultural Workers*. 3rd edn, ICAR, New Delhi, 1978, 347.
12. Parihar SS, Sandhu BS. Irrigation of field crops principles of practices. Published by Indian Council of Agricultural Research, Krishi Anusandhan Bhavan, Pusa, New Delhi. 1987.
13. Patel HR, Patel RG, Raman S. Response of summer greengram to moisture regimes and nitrogen fertilization. Indian Journal of Agronomy. 1988; 33(1):102-103.
14. Rao SR, Pratap Kumar Reddy A, Sailaja V. Yield, yield attributes and economics of chickpea as influenced by varieties and phosphorus levels. The Andhra Agricultural Journal. 2012; 59(4): 527-528.
15. Singh S, Malik RK, Punia SS. Performance of late sown chickpea *Cicer arietinium* L. and its economic feasibility as affected by irrigation, sulfur and seed inoculation. Haryana Agriculture University Journal Research. 2005; 35:131-134.
16. Singh VK, Dixit DS. Effect of moisture regimes and sowing date on chickpea Cicer arietinium L. Indian Journal of Agronomy. 1992; 37(4):739-743.