International Journal of Chemical Studies

**P-ISSN: 2349–8528**
**E-ISSN: 2321–4902**
IJCS 2018; 6(6): 1378-1380

Received: 11-09-2018
Accepted: 14-10-2018

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# Influence of time of sowing, spacing and cultivars on yield traits of chickpea (*Cicer arietinum* L.)

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**Abstract**
A field experiment was conducted during *Rabi season* in 2011-12 at C.S.A. U A& T, Kanpur on sandy loam soil to study the effect of different sowing times (3rd November and 18 November 2012), spacing (30, 40 and 50 cm) and varieties (KGD-1168, KWR-108, Uday and Avarodhi) on yield and yield attributes of chickpea (*Cicerarietinum* L). The experiment was laid out in a split-split plot design with three replication. The study found that there were significant differences in yield and yield attributes which was substantially higher in 3rd November date of sowing, yield attributes recorded higher when crop was sown 50 cm apart but grain yield (2241.7 kg/ha) was significantly higher with 40cm row spacing and variety KWR-108 recorded higher yield and yield attributing character. The objective of this study was to determine the effects of different sowing dates, spacing and appropriate variety.

**Keywords:** sowing, spacing, cultivars, chickpea

## Introduction
Chickpea is one of the important pulse crops rich in protein and very important for human nutrition. NFSM (National food security mission) increases the demand of pulses. Cicer is suitable for region with warm weather and semi-dry conditions, which are planted in spring in warm region. Cicer is resistant to dry conditions; its base temperature is 5 and can be alive before minus nine temperatures. Plant density and plant arrangement affect the absorption of light and nutrients. Optimum density is one of the factors that have effect on yield (Li *et al.*, 2008) [6]. Chickpea is an annual grain legume traditionally grown in the tropics and the Mediterranean regions of the world. The use of high plant density usually increases seed yield of chickpea in areas with a short growing season (Gan *et al.*, 2003) [3], but the magnitude of the yield increase depends on environmental conditions. Optimum density is one of the factors that have effect on yield, but there are some studies have shown that density does not have a significant effect on yield of cicer (Valimohammadi *et al.*, 2007, Valimohammadi *et al.*, 2009) [1, 2] and some studies have shown that density have a significant effect on yield of chickpea (Gana *et al.*, 2007, Gholipoor 2009) [12, 4]. Two major constraints to chickpea production in the northern cropping region are disease and frost damage (Whish *et al*, 2007) [11]. In both cases, sowing date can be used as a strategy to influence yield through avoidance of cold temperatures during flowering, and to reduce the effect of disease. Selecting an optimum sowing time can also be a compromise between maximising yield potential and minimising disease levels. Earlier sowing can expose the crop to more rain events which increases crop biomass but also increases the risk of Ascochyta blight, Gray mold, and soil moisture deficit during grain filling. Later sowing results shorter plants (harvesting difficulties) and increased heliothis pressure, but may reduce vegetative water use and reduce the exposure to Ascochyta and Phytophthora infection events and minimise the risk of Gray mold (Matthews and Mc Caffery, 2011) [5]. Selection of suitable varieties as per agro-climatic/sowing conditions could play an important role in increasing the productivity level of the crop. The potential productivity of different varieties varies according to agro-climatic conditions.

## Material and Methods
The investigation was carried out at Students Instructional Farm, C.S.A. University of Agriculture and Technology, Kanpur during *rabi* 2011-2012. Geographically, Kanpur is situated in the subtropical alluvial tract of central plains on the bank of holy river Ganga at $26^0$ 21.6' North Latitude and $80^0$ 24' east longitude at an elevation of 129.5m above the sea level. The mean annual rainfall is about 800mm in this area.

The soil of experimental field was alluvial in origin. The experiment was laid out in split-split plot design with 24 treatment combinations comprised of two dates of sowing (November 3rd and November) three row spacing (30, 40 and 50 cm) and four varieties (KGD-1168, KWR-108, Avarodhi and Uday). These parameters were used in field as main plot, sub plot and sub-sub plot sequently and replicated at 3 times. N, P was applied at the rate of 15kg $ha^{-1}$and 40 kg $ha^{-1}$. All plots were harvested and threshed manually. Data of seed yield, straw yield and biological yield were recorded from individual plot and converted on hectare basis. Harvest index was calculated by grain yield divided by biological yield.

**Result and Discussion**

It was observed that the pods per plant, test weight, straw and grain yield were significantly higher in 3rd November sown crop as compared to 18th November sown crop (table 1). Date of sowing could not exhibit significant effect on production of grain per pod. Date of sowing only could affect the grain weight per plant significantly. Crop sown on 3rd November had maximum seed weight per plant (14.98g) compared to 18th November sown crop (13.89g).

The yield attributing characters recorded substantially higher in early sowing than latter sowing mainly due to the fact that the vegetative growth of the chickpea in early sown crop was better than latter sown crop that gave positive impact on yield attributing characters. Singh *et al.* (2003) [7], Kumar *et al.* (2003) [3] were also of the similar opinion.

Yield attributing characters *viz.*, number of pods/plant, number of grain/pod, grain weight/plant and test weight were recorded at maturity (table 1). These yield attributing characters were increased with the increase in the row spacing. Number of pods/plant was recorded significantly higher in 50cm (59.22) row spacing over 30 cm (55.61) and 40 cm (57.79) row spacing by a margin of 6.11% and 2.41% respectively. The significantly highest number of pods/plant recorded in 50cm row spacing as compared to 30 and 40 cm row spacing which was positively associated with branch bearing capacity of the plant, which was observed significantly highest in 50cm row spacing. Number of grains/pod was also superior in 50cm row spacing over 30 and 40cm row spacing because the competition for roots and shoots space, water, sunlight etc. was less in 50cm row spacing than 30 and 40cm spacing. Such lower competition for above factors provided better condition for seed formation. The grain weight/plant, the most important yield attributing character was recorded numerically higher in 50cm row spacing as compared to 30 and 40cm row spacings due to the fact that number of pods/plant and test weight were also the highest in 50cm row spaced crop as compared to 30 and 40cm row spacing Venkatachalapathi *et al*. (2004) [10] were also of the similar opinion. The significantly higher yield recorded in 40 cm row spaced crop seemed to be associated with the combined effect of plant stand and yield attributing characters because 30 cm (187659.2) row spacing recorded highest plant stand followed by 40 cm (179383.3) and 50 cm (170190.6) row spacing but yield attributing characters observed in 30cm row spacing were inferior over 40 and 50cm row spacing.

Number of branches/plant observed at maturity was found non-significant due to different varieties (table 1) because all the varieties were grown in the similar input operation along with climate. Singh *et al.* (2012) [8] also could not observed significant differences in the total number of branches/plant among the varieties. Grain weight per plant was recorded all most similar in all the varieties but chickpea variety KWR-108(14.81g) recorded the highest grain weight per plant because this variety produced significantly highest test weight (17.50g), number of grains/pod (2.02) and number of pods/plant (58.77). The significantly higher number of pods/plant recorded in KWR-108 was attributed to the fact that this variety recorded numerically higher number of total branches at maturity. Thus number of pods/plant seemed to be positively associated with total number of branches/plant at maturity. These associations are obvious because increase in total number of branches/plant is supposed to have comparable increase number of pods/plant. Singh *et al.* (1994) also observed positive correlation between total number of branches and number of pods/plant. Chickpea variety KWR-108 out yielded significantly than KGD-1168, Avarodhi and Uday by margin of 5.43%, 6 % and 5.14% respectively. The highest biological yield (5200.0kg/ha) recorded with KWR-108 was attributed due to the fact that growth and yield attributing characters of this variety was superior to others. A positive correlation between seed yield/unit area biological yield and harvest index were also recorded by Singh *et al.* (2012) [8].

**Table 1:** Influence of Treatments on Yield and Yield attributes characterof Chickpea

| Treatments | No. of pod per plant | No. of grain per pod | Test weight (g) | Grain weight per plant (g) | Straw yield (kg/ha) | Economic yield (kg/ha) |
|---|---|---|---|---|---|---|
| **Date of sowing/ sowing temperature** | | | | | | |
| Nov. 3/22.9ºC | 60.05 | 2.01 | 17.24 | 14.98 | 3091.4 | 2268.3 |
| Nov.18/21.3ºC | 55.02 | 1.91 | 16.86 | 13.90 | 2824.4 | 1966.4 |
| SE(M)± | 0.07 | 0.02 | 0.06 | 0.07 | 24.5 | 14.3 |
| CD at 5% | 0.41 | NS | 0.38 | 0.44 | 150.9 | 88.1 |
| **Spacing** | | | | | | |
| 30cm | 55.61 | 1.85 | 16.67 | 13.98 | 3250.0 | 2062.5 |
| 40cm | 57.79 | 1.96 | 16.98 | 14.37 | 2963.3 | 2241.7 |
| 50cm | 59.22 | 2.06 | 17.50 | 14.98 | 2660.4 | 2047.9 |
| SE(M)± | 0.38 | 0.01 | 0.16 | 0.24 | 23.5 | 14.5 |
| CD at 5% | 1.25 | 0.05 | 0.52 | NS | 76.5 | 47.1 |
| **Varieties** | | | | | | |
| KGD-1168 | 57.18 | 1.90 | 16.81 | 14.20 | 2967.8 | 2088.9 |
| KWR-108 | 58.77 | 2.02 | 17.50 | 14.81 | 2991.1 | 2208.9 |
| Avarodhi | 56.87 | 1.91 | 16.89 | 14.26 | 2931.9 | 2076.4 |
| Uday | 57.33 | 2.0 | 17.00 | 14.52 | 2940.8 | 2095.3 |
| SE(M)± | 0.40 | 0.02 | 0.18 | 0.19 | 35.2 | 34.5 |
| CD at 5% | 1.15 | 0.07 | 0.52 | NS | NS | 99.0 |

## Conclusion

Chickpea variety KWR-108 in early sowing (3rd November) and Uday in late sowing (18th November) were observed suitable varieties. A row distance of 40cm was observed appropriate to both the condition. It could be advantageous to grow chickpea 'KWR-108' during 1st week of November and 'Uday' in delayed sowing 3rd week of November at row distance of 40cm for highest yield and more economic return / unit area.

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