International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(1): 1218-1222

Received: 01-11-2017
Accepted: 02-12-2017

Sonendra Kumar
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidalaya Raipur (C.G), India

RS Khande
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidalaya Raipur (C.G), India

HL Sonboir
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidalaya Raipur (C.G), India

N Pandey
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidalaya Raipur (C.G), India

MC Bhambri
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidalaya Raipur (C.G), India

Correspondence
Sonendra Kumar
Department of Agronomy, College of Agriculture, Indira Gandhi Krishi Vishwavidalaya Raipur (C.G), India

Effect of sowing time, spacing and nipping on growth and yield of chickpea (*Cicer arietinum* L.) under irrigated condition

Sonendra Kumar, RS Khande, HL Sonboir, N Pandey and MC Bhambri

Abstract
The present investigation entitled was carried out on effect of sowing time, spacing and nipping on growth and yield of chickpea (*Cicer arietinum* L.) under irrigated condition during *rabi* season of 2016-17 at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The soil of the experiment field was clay (*Vertisols*) in texture with neutral soil reaction, low in available nitrogen, medium in phosphorus and high in potassium content. The experimental was laid out in split-split design with three replications. The treatments comprised of four sowing time *viz*., first week of November (D1), third week of November (D2), first week of December (D3) and third week of December (D4) in main plot and three spacing *viz*., 30 cm (S1), 40 cm (S2) and 50 cm (S3) in sub plot and three nipping *viz*., no nipping (N1), one at nipping 30 DAS (N2) and one nipping at 40 DAS (N3) in sub-sub plot. The test variety was JG-130. The results of the experiment indicated that the growth parameter *viz*., plant height, number of branches plant^{-1} (34.96), dry matter accumulation plant^{-1} (40.18 g), number of nodules plant^{-1} (45.93), dry weight of nodules plant^{-1} (0.72 g) and leaf area index (4.86) were maximum at 3rd week of November sowing time.

Keywords: Chickpea, Nipping, Sowing time, Spacing, and Yield attributes

Introduction

Chickpea (*Cicer arietinum* L.) is the second-most important pulse crop after pigeon pea in the World for human diet and other use. Chickpea is an important winter season pulse crop in India grown as a dry pulse crop or as a green vegetable with the former use being most common. It is cultivated in area of 13.54 million hectares with a total production of 13.10 million tonnes and average productivity of 967.6 kg ha^{-1} (Anonymous, 2013) [2]. It ranks first in area cultivated in India, grown over an area of 8.25 million hectares with production of 7.34 million tonnes with average productivity of 889 kg ha^{-1} (In during (Anonymous, 2016) [2]. Madhya Pradesh, Uttar Pradesh, Rajasthan, Maharashtra, Gujarat, Andhra Pradesh and Karnataka are the major chickpea producing states sharing over 95 per cent area.

Chhattisgarh state has good agro-ecological situation for chickpea production. It is grown over an area of 0.2 Million hectares with an annual production of 242.7 thousand tonnes and an average productivity of 1035 kg ha^{-1} during (Anonymous, 2016) [2]. Chickpea is a key source of protein and it plays an important role in human nutrition for large population in the developing world. It is valued for its nutritive seeds with an inexpensive and high quality source of protein (18-22%), carbohydrate (52-70%), fat (4-10%), crude fibers (1.37%), lysine (195-205 mg^{-1}), carotene (89-94 mg^{-1}), fiber (3%), minerals (calcium, magnesium, phosphorus, iron, zinc) and vitamins (Yadav *et al*., 2007) [20]. It is a versatile source of nutrients for man, animal and soil. It forms a balanced diet when supplemented with cereals (Abu Shakars and Tannous, 1981) [13]. Chickpea is the most important *rabi* season crop in Chhattisgarh, however, its area under cultivation is decre such as, wheat, vegetable and summer rice with increasing irrigation facilities. It leaves substantial amount of residual nitrogen for subsequent crops and adds plenty of organic matter to maintain and improve soil health and fertility. The climate is changing world wide which has affected the growth and development of the various crops. However, the ill effects of climate change can be minimized with some agronomic management. The most important factors affecting chickpea productivity are temperature and photoperiod. The length of winter season is decreasing day by day and chickpea crop is more exposed to higher temperature during flowering which is the most sensitive stage.

There are many factors responsible for the low yield of chickpea. The use of traditional or low yielding varieties and adoption of poor management practices are of great importance. Amongst the agronomic practices, sowing methods and proper spacing are of great importance (Reddy *et al.* 2003) [10]. Sowing time had a marked effect on growth and development of crop (Mittel and Srivastava, 1964) [6]. Optimum sowing time provides more time for growth and development of plant which is favorable for higher yield whereas both early and late sowing hinder the growth and development with lowering seed yield. (Gurung *et al.*1996) [5]. Chickpea is normally sown during second fortnight of October to first fortnight of November in Chhattisgarh. Studies have shown that early winter sowing (mid-October to mid-November) is the optimum period (Saxena, 1987) [12]. Late sowing, after November 18 reduced yield by 28 per cent for every 10 day interval delay sowing time.

Materials and Methods

The experiment was carried out during *rabi* season of 2016-17 at Instructional cum Research Farm, Indira Gandhi Krishi Vishwavidyalaya, Raipur, Chhattisgarh. The soil of the experiment field was clayey (*Vertisols*) in texture with neutral soil reaction, low in available nitrogen, medium in phosphorus and high in potassium content. The experimental was laid out in split-split design with three replications. The treatments comprised of four sowing time *viz*., first week of November (D1), third week of November (D2), first week of December (D3) and third week of December (D4) in main plot and three spacing *viz*., 30 cm (S1), 40 cm (S2) and 50 cm (S3) in sub plot and three nipping *viz*., no nipping (N1), one at nipping 30 DAS (N2) and one nipping at 40 DAS (N3) in sub-sub plot. The test variety was JG-130.

The results of the experiment indicated that the growth parameter *viz*., plant height, number of branches plant^{-1} (34.96), dry matter accumulation plant^{-1}, number of nodules plant^{-1}, dry weight of nodules plant^{-1} and leaf area index were maximum at 3rd week of November sowing time. Among different spacing, 50 cm spacing produced maximum growth parameters which was at par with 40 cm spacing. As regards to nipping, most of the growth parameter were higher with one nipping at 30 DAS and at par with nipping at 40 DAS.

The yield attributes *viz.*, number of pods plant^{-1}, number of seeds pods^{-1} 100-seed weight, seed yield, straw yield and harvest index were maximum at 3rd week of November sowing. Among spacing of chickpea, 50 cm recorteded maximum values of yield attributes and seed yield which was however at par with 40 cm spacing. Regarding effect of nipping, one nipping at 30 days exhibited higher value of yield attributes and seed yield.

Among all combination of the treatments, sowing of chickpea at 3rd week of November at 50 cm spacing with nipping at 30 or 40 DAS produced maximum seed yield, net return and B:C ratio. The uptake of nitrogen, phosphorus and potassium were also recorded higher in sowing time 3rd in week of November with 50 cm spacing and nipping at 30 DAS statistically at par with nipping at 40 DAS.

Result and Discussion

Number of pods Plant^{-1}

A significant reduction was recorded in number of effective pod plant^{-1} with successive delay in sowing time after 3rd week of November (Table 1-3 and Fig. 1 and 2). Among different sowing time, 3rd week of November sown crop exhibited significantly more number of pods plant^{-1} (83.48) with significant difference followed by 1st week of November (76.31) sowing. The lowest number of pods was recorded in 3rd week of December sown crop with significant difference to others. The reduction in number of pods plant^{-1} was 8.59, 31.7 and 46.68 % in 1st week of November, 1st week of December and 3rd week of December sowing respectively, over 3rd week of November sowing. Optimum weather condition favours growth and development of plants which leads in more number of pods plant compared to un favorable condition occurred under delayed sowing resulting in lesser growth and developmental period. The beneficial effect of early sowing on pods plant^{-1} was also reported by Sharma *et al*. (1988) [14], Dixit *et al.*, (1993a) [3] and Prasad *et al*. (2012) [8].

Regarding effect of spacing, closer spacing of chickpea exhibited lesser number of pods plant^{-1} as compared to wider row spacing of 50 cm. Significant maximum number of pods plant^{-1} was noted under 50 cm (74.21) with significant difference followed by 40 cm (65.14). The lowest number of pods plant^{-1} was recorded under 30 cm row spacing (56.65) with significant difference to other spacing. Increase in row spacing resulted in increasing number of pods plant^{-1} in general. Wider spacing had 14.99 and 31.0% higher number of pods plant^{-1} under 40 cm and 50 cm spacing, respectively, as compared to closer spacing of 30 cm. This is because of efficient utilization of nutrient, water and solar radiation at wider row spacing as compared to narrow row spacing. Increase in pods plant^{-1} with increase in row spacing had also been reported by Saini and Faroda (1997) [11], Thakur *et al.* (1998) [19], Mondal (2000) [7] and Sonboir *et al*. (2017) [17].

As concerned to effect of nipping on number of pods, nipping of chickpea exhibited more number of pods plant^{-1} compared to no nipping. Significantly maximum number of pods plant^{-1} was recorded under one nipping at 40 DAS (66.78) which was at par with one nipping at 30 DAS (66.70). The lowest number of pods plant^{-1} was recorded under no nipping (62.51) with significant difference. The average increase in number of pods plant^{-1} was 6.77 % due to nipping over no nipping. Nipping at 40 DAS and 30 DAS recorded 6.83 and 6.70 % higher number of pods plant^{-1} as compared to no nipping. The nipping is known to accumulate more photosynthates which are utilized for development of higher number of pod (Singh and Singh, 1992, Singh and Devi, 2006) [16, 15]. One nipping at 30 to 45 DAS recorded higher number of pods plant^{-1} compared to no nipping (Sonboir *et al.*, 2017 and Sujatha *et al.* 2016) [17, 18].

The interaction effect of sowing time and spacing exhibited that 50 cm spacing recorded higher number of pods plant^{-1} at all sowing time with significant difference to other spacing, however it was at par with 40 cm spacing in 1st week of December and 3rd week December sown crop. Among all the combination, 3rd week of November with 50 cm spacing recorded highest number of pods with significant difference to other. Similarly lowest number of pods was recorded in 3rd week of December with 30 cm spacing which was at par with 3rd week of December 40 cm spacing.

The interaction effect of sowing time and nipping showed that one nipping at 40 DAS recorded maximum number of pods plant^{-1} in 1st and 3rd week of November sowing which was however at par with nipping at 30 DAS. Moreover in 1st and 3rd week of December sowing, maximum number of pods was noted in no nipping with significant difference. The nipping in December sown crop exhibited reduction in number of pods plant^{-1}. Among all combinations, the higher number of pods was recorded in 3rd week of November sowing with nipping at

40 DAS which was however, at par with nipping at 30 DAS on same date of sowing. The least number of pods was noted in 3rd week of December sown and nipping at 40 DAS, which was at par with nipping at 30 DAS on the same time of sowing only. Development of pods in chickpea depends on vegetative growth and number of branches favoured by sowing time, spacing and nipping. Due to this lesser number of pods in December sown may have been observed.

Table 1: Effect of sowing time, spacing and nipping on yield attributes of chickpea

Treatment	Number of pods plant^{-1}	Number of seeds pod^{-1}	100 Seed weight (g)
Sowing time			
1st week of November	76.31	1.73	22.35
3rd week of November	83.48	1.75	24.01
1st week of December	57.02	1.62	20.25
3rd week of December	44.51	1.48	18.47
SEm±	0.70	0.01	0.18
CD (P=0.05)	2.43	0.04	0.63
Spacing			
30 cm	56.65	1.62	20.96
40 cm	65.14	1.65	21.40
50 cm	74.21	1.66	21.45
SEm±	0.68	0.01	0.11
CD (P=0.05)	2.03	NS	0.32
Nipping			
No nipping	62.51	1.62	20.98
One nipping at 30 DAS	66.70	1.64	21.32
One nipping at 40 DAS	66.78	1.67	21.50
SEm±	0.55	0.01	0.10
CD (P=0.05)	1.58	0.04	0.30

Table 2: Interaction effect of sowing time and spacing on number of pods plant^{-1} of chickpea

Sowing time	Spacing			
	30 cm	40 cm	50 cm	Mean
1st week of November	64.00	74.01	90.93	76.31
3rd week of November	68.22	83.56	98.65	83.48
1st week of December	52.68	57.96	60.43	57.02
3rd week of December	41.71	45.01	46.82	44.51
Mean	56.65	65.14	74.21	

SEm±	CD (P=0.05)	
S at same D	1.35	4.06
D at same or different S	1.31	4.10

Table 3: Interaction effect of sowing time and nipping on number of pods plant^{-1} of chickpea

Nipping	Sowing time				
	D_1*	D_2*	D_3*	D_4*	Mean
No Nipping	68.65	73.49	60.49	47.41	62.51
One nipping at 30 DAS	79.46	87.84	56.09	43.41	66.70
One nipping at 40 DAS	80.83	89.09	54.49	42.71	66.78
Mean	76.31	83.48	57.02	44.51	

SEm±	CD (P=0.05)	
N At same D	1.11	3.15
D At same or different N	1.15	3.52

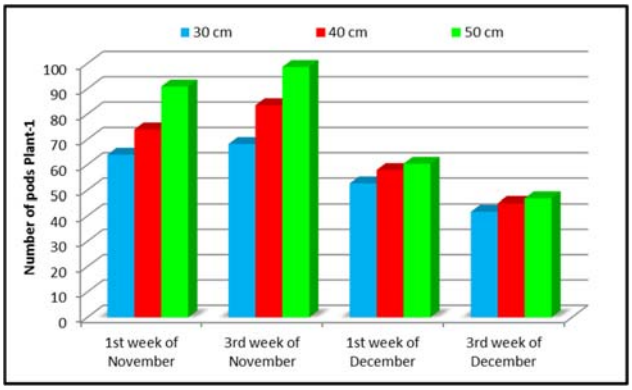

Fig 1: Interaction effect of sowing time and spacing on number of pods plant^{-1} of chickpea

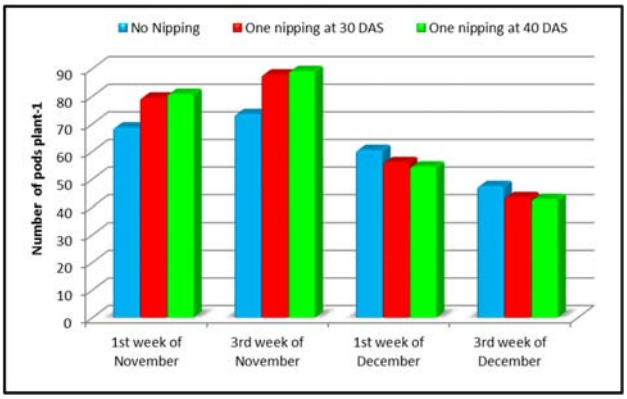

Fig 2: Interaction effect of sowing time and nipping on number of pods plant^{-1} of chickpea

Number of seed pods^{-1}

Maximum number of seed pod^{-1} was recorded in 3rd week of November (1.75) sowing which was however at par with 1st week of November sowing (Table 1). The lowest number of seed pods^{-1} was observed under 3rd week of December sowing with significant difference to other sowing time. The seed pod^{-1} was favorably influenced due to sowing time. Delayed sowing of chickpea in December resulted in lesser seed pod^{-1}. This may be due to increased temperature in delayed sowing at flowering and maturity. This is in agreement with the findings of Rajput *et al*. (1986) [9] who observed higher values of pods plant^{-1} with the 15th November sowing. The beneficial effect of early sowing time on seed pods^{-1} was also reported by Sharma *et al*. (1988) [14].

Nipping of chickpea exhibited higher number of seed pods^{-1} as compared to no nipping. Significantly maximum number of seed pods^{-1} was recorded under one nipping at 40 DAS (1.67) which was at par with one nipping 30 DAS (1.64). The lowest number of seed pods^{-1} was recorded under no nipping (1.62) which was at par with one nipping at 30 DAS.

100-seed weight (g)

Among different sowing time, it is clear from the data (Table 1) that 100 seed weight was recorded higher in 3rd week of November (24.01) sowing with significant difference followed by 1st week of November (22.35). Minimum 100 seed weight was observed in 3rd week of December sowing with significant difference to other sowing time. The yield parameter of chickpea *i.e.* 100-seed weight was favorably influenced due to sowing time.

Timely sowing provides favorable weather condition for growth and development of seeds leading to more bolder seeds. Delayed sowing coincides with higher temperature at grain development stage which leads to more small sized grain. This is in agreement with the findings of Rajput *et al.* (1986) [9] who observed higher values of 100-seed weight with the 15th November sowing. The beneficial effect of early sowing time on 100-grain weight was also reported by Sharma *et al*. (1988) [14].

The 100 seed weight was noted higher in wider spacing and it decreased with lower in spacing. Maximum 100 seed weight (21.45) was recorded under spacing of 50 cm which was at par with 40 cm spacing (21.40). Minimum 100 seed weights were observed under 30 cm spacing (20.96) with significant difference. Increase in row spacing resulted in increasing 100-seed weight in general. This is because of efficient utilization of nutrient, water and solar radiation at wider row spacing as compared to narrow row spacing. Increase in yield attributing characters with increase in row spacing has also been reported by Saini and Faroda (1997) [11], Thakur *et al.* (1998) [19] and Mondal (2000) [7].

Nipping of chickpea exhibited more 100 seed weight as compared to no nipping. Significantly maximum 100 seed weight was recorded under one nipping at 40 DAS (21.50) which was at par with one nipping 30 DAS (21.32). The lowest 100 seed weight was recorded under no nipping (20.98) with significant difference. The higher seed quality parameters noticed with nipping at 40 DAS may be due to increase in photosynthetic area leading to higher photosynthetic rate, better assimilation and accumulation of more photosynthates resulting into better seed development as evident with higher 100-test weight observed by Gnyandev (2009) [4] in chickpea. Sujatha *et al.* (2016) [18] also reported that the nipping at 45 DAS recorded higher 100-seed weight.

References

1. Anonymus. FAOSTAT. data 2013.
2. Anonymous. Krishi Darshika, I.G.K.V., Raipur (C.G.). 2016, 5.
3. Dixit JP, Dubey OP, Soni NP. Effect of sowing date and irrigation on yield and nutrient uptake by chickpea (*Cicer arietinum* L.) cultivars under Tawa command area. Haryana Journal Agronomy. 1993a; 38(2):227-231.
4. Gnyandev B. Effect of pinching, plant nutrition and growth retardant sprays on seed yield, quality and storage studies in china aster [*callistephus chinensis* (l.) *nees*]. *M. Sc. (Agri.) Thesis,* University Agricutral Science, Dharwad, Karnataka, India, 2009.
5. Gurung GB, Rijal DK, Gurung BD. Effect of sowing time on grain yield of chickpea under rainfed condition at Pakhribas, PAC Technical Paper Pakhribas Agril. Centre. 1996; 172:222.
6. Mittel SP, Srivastava G. Seed yield in relation to bulb size and seed stalks in onion. Indian Jornal Horticultral. 1964; 21:264-269.
7. MondaI S. Response of chickpea (*Cicer arietinum* L.) varieties to dates of sowing and row spacing under late sown condition. *M.Sc. (Agronomy) Thesis*, G.B. Pant University of Agriculture and Technology, Pantnagar, 2000.
8. Prasad D, Bhan C, Sharma V, Prasad H. Effect of various plant geometry on Chickpea (*Cicer arietinum* L.) under different dates of sowing: A Review. Journal of Progressive Agriculturally. 2012; 3(2).
9. Rajput RL, Shrivastava UK, Yadav RP. Response of chickpea to sowing dates. Indian Journal Agronomy. 1986; 31(1):95-96.
10. Reddy BVS, Reddy PS, Bidinger F, Blummel M. Crop management factors influencing yield and quality of crop residues. Field Crops Research. 2003; 84:57-77.
11. Saini SS, Faroda AS. Effect of sowing time, its pattern and seed rate of growth and yield of 'H86-143' chickpea (*Cicer arietinum* L.*).* Indian Journal of Agronomy. 1997; 42(4):645-649.
12. Saxena ME. Agronomy of chickpea. In the Chickpea (Ed. M.C. Saxena and K.B. Singh), Wallingford: CAB International. 1987, 207-232.
13. Shakara AS, Tannous RI. Nutritional value and quality of chickpea. In: chickpea, Edition: C. Wabb and G. C. Haetin, CAB. Farnhan Royal, England. 1981, 192-202.
14. Sharma ML, Chauhan YS, Bhardwaj GS, Sharma RK. Relative performance of chickpea varieties to sowing dates. Indian Journal Agronomy. 1988; 33(4):452-454.
15. Singh MS, Devi S. Profitability of nipping in cultivation of pea (*Pisum sativum*). An indigenous agro-technique in Manipur. Indian Journal of Agronomy. 2006; 51(3):206-208.
16. Singh VK, Dixit RS. Effect of moisture regime and sowing date on chickpea (*Cicer arietinum* L). Indian Journal Agronomy. 1992; 37(4):739-743.
17. Sonboir HL, Sahu BK, Tripathi VK. Evaluation of row spacing and nipping on productivity and profitability of chickpea under irrigated condition. *Green Farming*. 2017; 8(2):422-425.
18. Sujatha M, Uppar DS, Deahpande VK, Nawalagatti. Seed hardening, nipping and foliar spray of cycocel on growth, yield quality of chickpea (*Cicer arietinum* L.) *Environment & ecology*. 2016; 35(2):703-707.
19. Thakur HS, Sinha NK, Raghuwanshi RKS, Sharma RS. Response of gram (*Cicer arietinum* L.) varieties to plant

population and date of sowing, Indian Journal Agronomy. 1998; 43(2):315-317.

20. Yadav SS, Longnecker N, Dusunceli F, Bejiga G, Yadav M, Rizvi AH *et al*. Uses, consumption and utilization. In: Chickpea Breeding and Management (Yadav, S.S., Redden, R., Chen, W. and Sharma, B.,Eds). CAB, Wallingford, UK. 2007, 71-100.