International Journal of Chemical Studies

P-ISSN: 2349–8528
E-ISSN: 2321–4902
IJCS 2018; 6(5): 1781-1784

Received: 05-07-2018
Accepted: 10-08-2018

Leema Mathew
Research Scholar, Department of Agronomy, Tamil Nadu Agricultural University, Tamil Nadu, India

S Sanbagavalli
Associaate Professor, Department of Agronomy, Tamil Nadu Agricultural University, Tamil Nadu, India

Dr. C Chinnisamy
Professor, Department of Agronomy, Tamil Nadu Agricultural University, Tamil Nadu, India

Correspondence
Leema Mathew
Research Scholar, Department of Agronomy, Tamil Nadu Agricultural University, Tamil Nadu, India

Yield and economics of rainfed chickpea as influenced by sowing time and sowing methods

Leema Mathew, S Sanbagavalli and Dr. C Chinnisamy

Abstract
A field experiment was conducted during *Rabi* 2017-18 at Tamil Nadu Agricultural University, Coimbatore to study the influence of sowing time and methods on the productivity and economics of rainfed chickpea. The field experiment was laid out in Strip plot design with four time of sowing comprised of October last week, November first week, November second week and November third week and four methods of sowing viz., broadcast, line, seed drill and country plough sowing. The sixteen treatment combinations were replicated thrice. Chickpea variety JG 11 was used. November first week with country plough sowing resulted in higher grain yield (967 kg ha^{-1}), gross return (Rs. 44,458 ha^{-1}), net return (Rs. 19,819 ha^{-1}) and B:C ratio (1.80) Followed by line sowing during November third week.

Keywords: chickpea, sowing time, sowing methods, yield, economics

Introduction
Chickpea is an important pulse crop which is cultivated under rainfed condition in India. In India chickpea is cultivated in an area of 8.32 million ha with a production of 12.1 million tonnes. India ranks first in area and production of chickpea by contributing about 66 per cent and 64 per cent of area and production, respectively. The productivity of chickpea in India is very low compared to other developed countries. However the average productivity of Tamil Nadu is 652 kg ha^{-1} which is less than the country average (931 kg ha^{-1}). Different agronomic practices affect the yield of chickpea. The country would require 39 million tonnes of total pulses by 2050, which will require pulses production to grow at an annual rate of 2.2 per cent (Singh *et al.,* 2017) [7]. To meet this increasing demand, it becomes essential to identify and bridge the production constraints to augment the yield of pulses.

Frost, disease incidence, moisture stress and poor adoption of technology are the major problems in the cultivation of winter pulses in India. Numerous environmental and genetic variables interact during the growing period of chickpea in determining its productivity. Selection of suitable time and method of sowing plays an important role in improving the productivity of chickpea.

Time of sowing is an important management factor that affects the productivity of most of crops since it decides the environmental conditions to which phenological stages of crop are exposed. Growth and development of a crop is influenced by the modified environment resulting from different time of sowing. Usually chickpea sowing is taken between mid-October to mid-November. However, delay in sowing is often when it is grown in sequence with *Kharif* crops. Drastic reduction in yield may occur due to this delayed sowing. (Mansur *et al.*, 2010) [3]. so proper time of sowing is an important non- monetary input that helps in improving the productivity of chickpea.

Sowing method is of considerable importance because it ensures optimum plant population and enables plant to utilize land and other resources more efficiently for better growth and development (Ahmed *et al.,* 2011) [1]. Farmers usually follow broadcast method of sowing which is cheap method but has a lot of disadvantages as in some areas of the field there is a dense population in which there is a lot of competition between plants for nutrients, moisture and space. This competition may results in yield reduction. Seed rate requirement under broadcast sowing is also high. So selection of suitable sowing method also plays an important role in determining the yield of chickpea under rainfed condition.

Materials and Methods

The experiment was carried out during *Rabi* season of 2017-18 at Tamil Nadu Agricultural University, Coimbatore. The soil of the experimental field was sandy loam in texture with low in available nitrogen, high in available phosphorus and potassium. The experiment was laid out under strip plot design with three replications. Sowing time and methods were taken as horizontal and vertical factors, respectively. Sowing time comprised of October last week (D_1) November first week (D_2), November second week (D_3) and November third week (D_4). Sowing methods included broadcast (S_1), line (S_2), seed drill (S_3) and country plough (S_4) sowing. The variety used was JG 11.

Grain yield from net plot area was weighed and expressed in kg ha^{-1}. The cost of cultivation was calculated by considering prevailing market prices of inputs, wages and actual cost involved on various aspects from sowing up to harvest including the field preparation was worked out and expressed in Rs. ha^{-1}. Gross return was calculated using grain yield and market price and expressed in Rs. ha^{-1}. Net return was calculated by deducting the cost of cultivation from gross return and indicated in Rs. ha^{-1}. Benefit cost ratio (BCR) is the gross return per rupee invested was calculated as follows.

$$BCR = \frac{\text{Gross return (Rs. ha}^{-1})}{\text{Total cost of cultivation (Rs. ha}^{-1})}$$

Results and Discussion

Grain yield

The interaction between sowing time and methods significantly influenced the grain yield of chickpea and the data is presented in Table 1. Sowing on November first week with country plough resulted in higher grain yield (967 kg ha^{-1}) followed by line sowing during November third week with grain yield of 923 kg ha^{-1}. Broadcast sowing on October last week resulted in lesser grain yield in chickpea (508 kg ha^{-1}) which was 47 % less than sowing on November first week using country plough. This might be due to the beneficial effects of favourable weather condition during November first week sowing and also good aeration under country plough sowing might have resulted in higher plant height, leaf area and number of branches plant^{-1} and which in turn resulted in the production of more photosynthates that favouring to the sink. Similar result was reported by Soomro *et al.*(2009) [8].

Table 1: Interaction effect of sowing time and methods on grain yield (kg ha^{-1}) of chickpea

Treatments	D_1	D_2	D_3	D_4	Mean
S_1	508	678	617	608	603
S_2	607	923	810	710	763
S_3	520	865	693	683	690
S_4	781	967	745	740	808
Mean	604	861	713	685	716
	D	S	D at S	S at D	
SE.d	27.3	30.9	49.0	51.1	
CD (p=0.05)	86.7	98.4	156	163	

Sowing time (D)
D_1 - October last week
D_2 - November first week
D_3 - November second week
D_4 - November third week

Sowing methods (S)
S_1 - Broadcast sowing
S_2 - Line sowing
S_3 - Seed drill sowing
S_4 - Country plough sowing

Economics

Data pertaining to economics due to different treatments and treatment combinations are presented in Table 2 and 3.

Higher crop yield with lesser cost of cultivation could result in improved economic parameters like gross return, net return and B: C ratio. The data clearly indicate that cost of cultivation was the same (Rs. 24,282 ha^{-1}) for different sowing times except October last week sowing (Rs. 24,967 ha^{-1}). Additional charge for fungicide was incurred under October last week sowing. The result is in conformity with the findings Chaitanya and chandrika (2006) [2] and Prasad *et al.* (2012) [6]. However, among sowing methods, line sowing (Rs. 25,895 ha^{-1}) incurred higher cost followed by sowing behind the country plough (Rs. 24,995 ha^{-1}). Sowing using seed drill resulted in lower cost of cultivation (Rs. 21,645 ha^{-1}). This might be due to the reduced seed rate and less labour and time requirement for sowing under seed drill. Pal *et al.* (2015) [5] also reported the similar results in chickpea.

Chickpea sown during first week of November recorded higher gross return (Rs. 39,603 ha^{-1}) followed by November second week sowing (Rs. 32,811 ha^{-1}). October last week sown chickpea incurred lower gross return (Rs. 27,803 ha^{-1}). Sowing during October last week produced 29.8 per cent lesser gross return than November first week. Among sowing methods, higher gross return (Rs. 37,176 ha^{-1}) was resulted due to country plough sowing followed by line sowing with return Rs. 35,069 ha^{-1}. Sowing through broadcasting reported lower gross return (Rs. 27,779 ha^{-1}). This might be due to higher grain yield. Country plough sowing resulted in 25.3 per cent increased gross return than broadcast sowing.

A variation was observed in net return (Fig. 1) due to sowing time and methods. November first week sowing of chickpea resulted in higher net return with return of Rs. 15,321 ha^{-1} followed by November second week sowing (Rs. 8,529 ha^{-1}). Sowing of chickpea during last week of October incurred lower net return (Rs. 2,836 ha^{-1}). With respect to sowing methods, country plough sowing produced higher net return (Rs. 12,181 ha^{-1}) followed by seed drill sowing (Rs. 10,110 ha^{-1}). Broadcast sowing of chickpea incurred lower net return of Rs. 3,184 ha^{-1}. Among treatment combinations, sowing on first week of November using country plough resulted in higher gross return of Rs. 44,458 ha^{-1} followed by November first week sowing using seed drill (Rs. 39,810 ha^{-1}). Broadcast sowing during October last week recorded lower gross return of Rs. 23,419 ha^{-1}. Sowing of chickpea on first week of November using country plough was the best treatment combination with a net return of Rs. 19,819 ha^{-1}. Broadcast sowing during October last week found to uneconomical with negative net return of Rs. 1362 ha^{-1}.

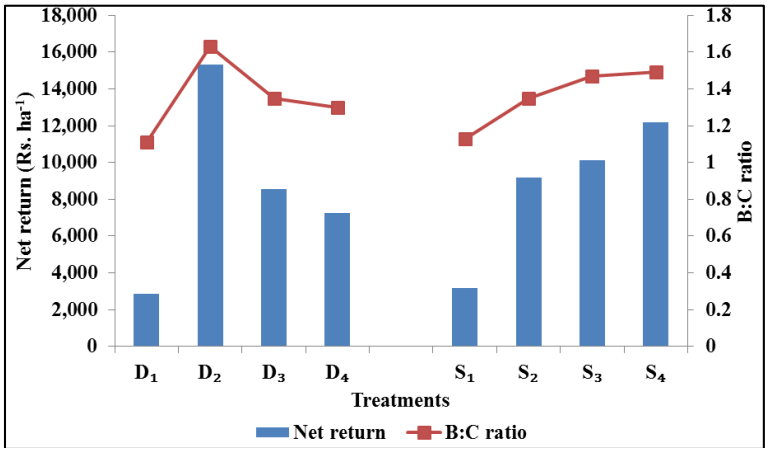

Fig 1: Effect of sowing time and methods on net return and B: C ratio of chickpea

Higher B: C ratio of 1.63 (Fig. 1) was reported in the first week of November sowing followed by November second week sowing (1.35). Sowing on October last week resulted in lower B: C ratio (1.11). Among sowing methods, country plough sowing recorded higher B: C ratio (1.49) followed by seed drill sowing (1.47). Sowing by the broadcast method reported lower B: C ratio (1.13). Treatment combination of sowing on first week of November using country plough resulted in higher B: C ratio of 1.80 followed by November first week sowing using seed drill (1.73). Broadcast sowing during October last week found to uneconomical with B: C ratio of 0.95. Higher grain yield combined with comparatively less cost of cultivation might have increased the benefit cost ratio. Nagarajaiah *et al.* (2010) [4] also reported the similar results in Urdbean.

Table 2: Cost of cultivation and economic returns of chickpea for different treatment combinations

Treatment	Grain yield (kgha^{-1})	Total cost of cultivation (Rs.ha^{-1})	Gross return (Rs.ha^{-1})	Net return (Rs. ha^{-1})	B.C ratio
D_1S_1	508	24,781	23,419	-1,362	0.95
D_1S_2	607	25,431	27,931	2,500	1.10
D_1S_3	520	23,306	23,875	569	1.02
D_1S_4	781	24,981	35,941	11,500	1.43
D_2S_1	678	24,439	31,212	6,773	1.28
D_2S_2	923	25,089	42,438	17,349	1.69
D_2S_3	865	22,964	39,810	17,386	1.73
D_2S_4	967	24,639	44,458	19,819	1.80
D_3S_1	617	24,282	28,423	4,141	1.17
D_3S_2	810	24,282	37,251	12,969	1.53
D_3S_3	693	24,282	31,900	7,618	1.31
D_3S_3	745	24,282	34,255	9,433	1.41
D_4S_1	608	24,439	28,033	3,594	1.15
D_4S_2	710	25,089	32,653	7,564	1.30
D_4S_3	683	22,964	31,434	8,470	1.37
D_4S_4	740	24,639	34,035	9,396	1.38

*Data not statistically analysed
Chickpea grain price: Rs.45 kg^{-1}; haulm price: 50 paisa kg^{-1}

Sowing time (D)	**Sowing methods (S)**
D_1 - October last week	S_1 - Broadcast sowing
D_2 - November first week	S_2 - Line sowing
D_3 - November second week	S_3 - Seed drill sowing
D_4 - November third week	S_4 - Country plough sowing

Table 3: Effect of sowing time and methods on economics of chickpea

Treatment	Grain yield (kg ha^{-1})	Total cost of cultivation (Rs. ha^{-1})	Gross return (Rs. ha^{-1})	Net return (Rs. ha^{-1})	B:C ratio
Sowing time (D)					
D_1 - October last week	603	24,967	27,803	2,836	1.11
D_2 - November first week	861	24,282	39,603	15,321	1.63
D_3 - November second week	713	24,282	32,811	8,529	1.35
D_4 - November third week	685	24,282	31,528	7,246	1.30
Sowing methods (S)					
S_1 - Broadcast sowing	603	24,595	27,779	3,184	1.13
S_2 - Line sowing	762	25,895	35,069	9,174	1.35
S_3 - Seed drill sowing	690	21,645	31,755	10,110	1.47
S_4 - Country plough sowing	808	24,995	37,176	12,181	1.49

*Data not statistically analysed
Chickpea grain price: Rs.45kg^{-1}; haulm price: 50 paisa kg^{-1}

Conclusion

From the present study it could be concluded that sowing of chickpea during first week November using country plough is the best option to obtain maximum grain yield and economic returns under rainfed condition of Western zone of Tamil Nadu.

References

1. Ahmed A, Munsif F, Arif M, Nuaman M. Yield and yield components of maize as affected by sowing dates and sowing methods. FUUAST J Biol. 2011; 1(1):75-80.
2. Chaitanya S, Chandrika V. Performance of Chickpea varieties under varied dates of sowing in Chittoor district of Andhra Pradesh. Leg. Res. 2006; 29(2):137-139.
3. Mansur C, Palled Y, Halikatti S, Chetti M, Salimath P. Effect of dates of sowing and irrigation levels on growth, yield parameters, yield and economics of kabuli chickpea. Karnataka J Agril. Sci. 2010; 23(3):461-463.
4. Nagarajaiah K, Palled Y, Patil B, Khot A. Responce of Chickpea Varieties to Seed Rate and Time of Sowing Under Late Sown Conditions in Malaprabha Command Area. Karnataka J Agril. Sci. 2010; 18(3):609-612.
5. Pal D, Dwivedi A, Singh R, Kumar K, Singh A, Tomar S. Integrated Effect of Land Configurations and Weed Management Regimes on Weed Dynamics and Performance of Urdbean (*Vigna mungo* L. Hepper) in an Alluvial Soil. Indian J Sci. Technol. 2015; 8(11):1- 6.
6. Prasad D, Bangarwa A, Kumar S, Ram A. Effect of sowing dates and plant population on chickpea (*Cicer arietinum*) genotypes. Indian J Agron. 2012; 57(2):206.
7. Singh P, Shahi B, Singh K. Trends of Pulses Production: A Study on Current Scenario and Strategies in India with Special Reference to Bihar. Economic Affairs, 2017; 62(3):389-398.
8. Soomro UA, Rahman MU, Odhano EA, Gul S, Tareen, AQ. Effects of sowing method and seed rate on growth and yield of wheat (*Triticum aestivum*). World J Agric. Sci. 2009; 5(2):159-162.