

Original Research Article

<https://doi.org/10.20546/ijcmas.2017.610.085>

Evaluation of Different Methods of Sowing of Sunflower at Farmers' Field in Central Plain Zone of Punjab, India

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ABSTRACT

Keywords

Cost of production,
Gross profit,
Methods of sowing,
Sunflower.

Article Info

Accepted:
07 September 2017
Available Online:
10 October 2017

This study was undertaken to evaluate the performance of sunflower sown by different methods in comparison to the manual sowing. The yield obtained in manual sown crop with the help of marker was found to be higher as compared to mechanical planter. Maximum gross profit was obtained under mechanical planting with thinning followed by manual sown with marker, which was more suitable than mechanical planting with thinning due to requirement of labour at the sowing time only. Hence, the farmers were advised to go for manual planting with marker and mechanical planting only if labour was available for the thinning.

Introduction

Sunflower oil is considered as premium when compared to other vegetable oils and is the largest selling oil in the branded oil segment. The crop requires a cool climate during germination and seedling growth. It requires warm weather from the seedling to flowering stage and sunny days during flowering to maturity. Sunflower can be grown on a wide range of soils and tolerates a moderate pH range and some salinity. It thrives best on deep loam soils with good drainage and irrigation facilities. Plant spacing is a major production factor that is often manipulated in order to ensure adequate plant population and to reduce yield losses due to overcrowding in arable crops. The choice of appropriate plant population also depends on the cost of planting methods, especially for hybrid seeds,

because high quality seeds constitute a major prerequisite for successful production of oilseed crops.

In the central zone of Punjab, sunflower is grown in different crop rotations like, Paddy-potato-sunflower, Paddy-peas-sunflower, Maize-potato-sunflower, Maize-toria-sunflower etc. A number of farmers also grow the crop as flora for their bee keeping units. Sunflower requires a well pulverized and weed free land with adequate moisture supply. The land is prepared by doing two to three ploughing followed by planking. For sowing of seed a number of practices are followed by farmers; manual (dibbling), semi-manual (use of marker followed by manual sowing) and mechanical (with locally

manufactured planter). Due to short window period available between the harvest of potato crop and sowing of sunflower crop, many farmers prefer to sow the crop with available crop planter. According to farmers' point of view, sowing of sunflower seed with multiple crop planter helps in:

Ease in intercultural operations and timely operation

Cost and energy saving

Less labour requirement

Reduced drudgery

Efficient water use

Business opportunity as service provider through custom hiring

Improved productivity and profitability

This study was undertaken with the objective to evaluate the performance of sunflower sown by different methods in comparison to the manual sowing through systematic laboratory and field tests. The evaluation also focussed on yield attributing factors i.e. plant population, plant spacing, seed yield and economics of various sowing methods followed at the farmers' field.

Materials and Methods

The study was carried out at farmers' field at three locations with GPS coordinates of 075°17.134'E & 31°06.413'N; 075°18.024'E & 31°07.142'N and 075°13.248'E & 31°12.848'N in Kapurthala and Jandhar districts in central zone of Punjab.

Sunflower seed was sown in the first week of February with 5 kg seed/ha after seed treatment with thiram @ 2g/kg seed.

Sowing of Pioneer's sunflower hybrid 64A57 was done by four methods i.e. Manually by dibbling method at 60 x 30 cm apart (T₁), with the use of tractor operated marker to make a hole for seed placement and manual pouring of seed at 60x30 cm (T₂), sowing with planter at 60x 20 cm apart (T₃) without thinning and (T₄) sowing with planter at 60x 20 cm apart followed by thinning manually after 20-25 DAS in order to maintain one plant per hill.

A complete package of practices recommended by the Punjab Agricultural University, Ludhiana was followed to raise a healthy crop. Various yield attributing factors namely plant population density, plant height and stem girth were determined at farmers' field as per recommended procedures.

Different parameters of flower i.e. head diameter, number of grains per head, 100 grains weight and grain weight per head were calculated to compare the performance of different methods. For this purpose, 50 plants were selected randomly for each parameter and the values were averaged. Cost of each and every operation was calculated for comparative study of different sowing methods. The cost of cultivation included cost of all the operations starting from land preparation till the harvest of crop. It includes cost of land preparation, seed cost, fertilizers, sowing cost, weeding, thinning, pesticides, harvesting and threshing of crop. The data thus obtained were statistically analysed using OPSTAT (Sheoran *et al.*, 1998).

Results and Discussion

Effect of method of sowing on plant population

The data regarding plant population density/m² of crop sown with planter (T₃) recorded significantly higher values (10.67)

than those sown with manual (T_1 , 7.33) and semi manual methods (T_2 , 8.67). The difference was found to be non-significant between T_1 and T_4 because manual thinning was performed in order to maintain a proper plant spacing, however, significantly higher number of plants/m² were observed in treatment T_2 than T_1 and T_3 (Table 1).

Effect of method of sowing on plant height and stem girth

It was observed that method of sowing did not affect plant height and stem girth significantly (Table 1) but a large variation in plant height was observed under treatment T_3 (crop sown with planter without thinning). The values

regarding stem girth showed that there was no particular trend associated either with plant height or methods of sowing.

Effect on flower parameters and seed yield

The flower is the basic yield attributing component in sunflower crop because on one plant only one flower is produced and that's why optimum plant population is very much essential for harvesting a good yield. Head diameter, head weight, average grain weight/head, 100 grain weight and average number of grains per flower were calculated for randomly selected flowers from each plot to determine the significance of planting methods on these factors.



Table.1 Effect of sowing methods on growth, yield parameters and yield of sunflower

Treatment	No. of plants/sq m	Plant height (cm)	Stem girth (cm)	Head Diameter (cm)	Head wt.(g)	Average grain wt/head (g)	100 grain wt (g)	No. of grains/head	Yield (q/ha)
T ₁	7.33	164.33	5.63	14.43	168.31	87.84	2.09	1567.67	18.93
T ₂	8.67	163.33	5.93	16.17	173.16	91.89	2.57	1627.33	20.13
T ₃	10.67	156.67	5.43	13.43	125.44	85.34	1.98	1508.33	17.70
T ₄	7.33	163.33	5.73	15.30	170.30	90.09	2.17	1598.67	19.60
CD (P=0.05)	1.22	N/A	N/A	0.63	3.19	1.08	N/A	30.53	0.46

Table.2 Cost of cultivation under different methods of sowing

Sr. No.	Field operation	Cost of cultivation (Rs/ha)			
		T ₁	T ₂	T ₃	T ₄
1	Land preparation	3000	3000	3000	3000
2	Cost of seed	1500	1500	1500	1500
3	Fertilizers	940	940	940	940
4	Sowing cost				
	I)Labour Charges	3500	4200	-	-
	II)Machine rent	-	750	1000	1000
	III)Fuel consumption	-	750	750	750
5	Weeding and earthing up	2500	2500	2500	2500
6	Thinning	2000	-	0	2000
7	Labour for irrigation	2000	2000	2000	2000
8	Pesticides	2500	2500	2500	2500
9	Harvesting+ Threshing	7000	7000	7000	7000
	Total	24940	25140	21190	23190

Table.3 Profitability of sunflower crop under different treatments

Treatment	Yield (q/ha)	Selling rate (Rs./q)	Gross income (Rs./ha)	Gross cost (Rs./ha)	Gross profit (Rs./ha)
T ₁	18.93	2800	53013	24940	28073
T ₂	20.13	2800	56373	25140	31233
T ₃	17.70	2800	49560	21190	28370
T ₄	19.60	2800	54880	23190	31690
C.D.	0.46	-	1300	-	1300

It was observed that method of sowing has a significant effect on these parameters. The flowers under treatment T₂ (marker+ manual sown crop) recorded significantly higher values for various parameters compared to other methods of sowing. The flower diameter and weight were highest for these flowers and therefore, all other corresponding yield contributing factors like average grain weight/head, 100 grain weight and average number of grains per flower were found to be highest (Table 1). Further, the seed yield obtained in treatments T₁, T₂, T₃ and T₄ was found to be 18.93, 20.13, 17.70 and 19.60 q/ha, respectively and significantly highest yield was obtained in treatment T₂ in which seeds were sown with the help of marker and dibbling method. It was noticed that

significantly lowest seed yield (17.70q/ha) was under treatment T₃ in which the plant population was significantly higher compared to all other three treatments. This might be due to the fact that plants grown at lower population reduce the overall competition between flower plants and thus, afforded them more efficient utilization of available resources to grow well and to increase yield attributes of sunflower plants (Radwan *et al.*, 1996). The results obtained were in agreement with Olowe (2005) and Suzer (2010).

Mc Master *et al.*, (2012) stated that final yield for sunflower crop is the sum result of individual plant emerging, developing, growing and ultimately producing a head. However, yield increases with increase plant

density up to a level which defines the optimum plant population but further increasing of plant density can lead to a constant and even decreased yield (Viorel *et al.*, 2015).

Comparative cost of production under different methods of sowing

The results revealed that minimum cost was involved in the machine sowing with planter whereas, maximum cost was involved in manual sowing (either with or without marker), in treatment T₄, additional cost was involved in thinning operation carried out after 20-25 DAS as compared to T₃ (Table 2). Except difference in the labour charges incurred in different treatments, all other costs remained same. These results were observed in agreement to El-Awad (2003), while evaluating the mechanical sowing of various field crops of cotton, sorghum and sunflower in comparison with manual sowing.

It was observed that maximum gross profit was obtained under treatment T₄, in which crop was sown with planter and thinning was done manually after 20-25 DAS, however, timely availability of labour is must for carrying out thinning operation (Table 3). On the other hand, treatment T₂, where seed was sown with the help of marker, incurred marginally less gross profit than T₄, which was more suitable than T₄ due to requirement of labour at the sowing time itself. In treatment T₃, where crop was sown with the help of planter and no thinning was performed, minimum yield was obtained and thus minimum gross profit. Hence, farmers were advised to go for sunflower sowing manually with the help of marker in order to increase the margin of profit from sunflower crop.

Sunflower crop was grown mainly after potato harvesting in comparison to spring

maize/summermoong/muskmelon/water melon. To boost up the economics of above given crop sequence, sunflower productivity needs to be increased by maintaining proper plant population. There is a recommendation of sowing of sunflower seed at 60X30 cm but availability of labour is becoming a major constraint in central plain zone of Punjab. Therefore, the farmers in the area tried different methods of sowing at their own level including seed planter and seed marker. Krishi Vigyan Kendra, Kapurthala evaluated different methods of sowing at the farmer's field and concluded that it was economical to sow the crop manually with the help of marker fixed in the tractor, whereas, the crop sown with planter without thinning operation yielded significantly less as compared to other methods of sowing.

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How to cite this article:

Bindu, Manoj Sharma, Jatinder Manan and Gurmeet Singh. 2017. Evaluation of Different Methods of Sowing of Sunflower at Farmers' Field in Central Plain Zone of Punjab, India. *Int.J.Curr.Microbiol.App.Sci*. 6(10): 691-697. doi: <https://doi.org/10.20546/ijcmas.2017.610.085>