International Journal of Botany Studies
www.botanyjournals.com
ISSN: 2455-541X
Received: 07-09-2021, Accepted: 24-09-2021, Published: 08-10-2021
Volume 6, Issue 5, 2021, Page No. 1083-1085

Effect of different planting methods on yield and economics of wheat in Punjab

Amit Kumar[1], Meenakshi Seth[2]
[1] Master of Science in Agronomy, University Institute of Agricultural Sciences, Chandigarh University, Punjab, India
[2]Assistant Professor, University Institute of Agricultural Sciences, Chandigarh University, Punjab, India

Abstract
The experiment was carried out at Crop Research Centre of University Institute of Agricultural Sciences, Chandigarh University, Gharuan (Mohali) during *Rabi* season, 2020-21 to study the effect of different planting methods on yield and economics of wheat in Punjab. The experiment was laid out in a randomized block design with seven treatments *i.e.* mould board plough, zero tillage, dibbler, happy seeder, rotavator, seed drill and control. Results revealed that yield attributes, grain and straw yield of wheat were increased with the use of mould board plough. The yield attributes and yield of the crop were highest with the use of mould board plough. Mould board plough significantly increased the grain yield of wheat over control by 67.5 per cent. Mould board plough had maximum net returns per rupee invested (1.37) over control (0.43).

Keywords: dibbler, economics, mould board plough, planting methods, seed drill

Introduction

Triticum aestivum L. or common wheat is one of the most widely grown crop for its seed. It is one of the food eaten worldwide and is considered as a staple food. Rice-wheat is a major cropping system. These crops are harvested in sequence a year where rice during the wet monsoon season and wheat generally dry and cool winter season. Due to the introduction of high-yielding varieties of rice and wheat, double cropping of these two crops becomes feasible. Productivity and area under these two crops are being increased day by day (Hobbs and Morris 1996) [1]. In irrigated areas rice is transplanted after puddling the fields. This practice destroys the soil's physical properties that have the implications of wheat crop (Hobbs *et al*, 2000) [9]. In addition, under the changing of socio-economic environment of our country, laborers are not accessible to doing agricultural related operations. These circumstances likewise produce work deficiencies and further raising work costs. Alternative techniques for establishing crops, particularly this cropping sequence, requiring less work, water, fertilizer and so on without forfeiting profitability are required. Wheat is planted with different sowing methods depending upon the available soil water, time of planting, amount of residue in the field and availability of planting machine. Proper methods of planting enhance resource availability, such as sunlight capture, moisture and nutrient availability leading to the proper root system development from the early stage of crop growth (Harishankar *et al*, 2017) [8]. Crop growth and productivity might differ beneath different sowing strategies and planting densities (Ehsanullah *et al*, 2017) [4]. Different planting methods have their own benefits. In India, wheat is planted through broadcasting not only requires higher seed rate but also result in lower plant population, drill sowing is recommended methods because of its uniform seed distribution at desired depth, which usually results in higher germination and uniform stand. Mould board plough is a primary tillage implement which is used for primary tillage operations. It cuts trash and buries it completely. Zero tillage reduces tillage to only one pass. It allows a hole in the ground to plant seed or seedling. The Happy Seeder is a tractor-mounted machine that cuts and lifts rice straw, sows wheat into the soil, and deposits the straw over the sown area as mulch. Rotavator is a tractor-drawn implement which is mainly used for seed bed preparation within one or two passes and is suitable in removing & mixing residual of maize, wheat, sugarcane etc., thereby, helps to improve soil health and save fuel, cost, time & energy as well. Similarly, seed drill is a device that sows the seeds for crops by metering out individual seeds, positioning them in the soil, and covering them to a certain average depth. It sows the seeds at equal distances and proper depth, ensuring they get covered with soil and are saved from being eaten by birds. Dibbling is a method of cultivation that uses a tool called a dibber to help plant a seed. A dibber is, in effect, a simple pointed stick that allows you to create Sowing methods guarantee proper crop establishment and optimum plant population in the field, as well as facilitating plants to utilize the land and other resources more efficiently and purposefully toward growth and development (Gul *et al*, 2015) [7]. Planting methods plays a vital role in the growth and development of crop which can directly leads to the good soil health and economic condition of the farmer. Therefore, an experiment was conducted during *Rabi* 2020-21 to study the effect of different planting methods on yield and economics of wheat in Punjab.

Material and Methods

The experiment was conducted at Experimental farm of University Institute of Agricultural Sciences, Chandigarh University, Gharuan (Mohali) during *Rabi* season of 2020-21 to examine the effect of different planting methods on yield and economics of wheat at an altitude of 309 meters above sea level in the semi-arid, sub-tropical latitude 30º7' N and 76º5' E longitude. The soil of the experimental site was clay loam in texture and nearly neutral in reaction. The soil was low in organic carbon and available nitrogen, medium in available phosphorus and available potassium.

The experiment was laid out in Randomized Block design with three replications having seven treatments of different combinations of sowing methods and crop residue management *viz*. mould board plough, zero tillage, dibbler, happy seeder, rotavator, seed drill and control. The layout of experiment was carried out manually and plots were prepared and then levelled. Wheat variety "Unnat PBW-343" was sown using seed rate of 100 kg ha^{-1} in first week on well prepared seed bed in December, 2020. The recommended dose of NPK in wheat crop used was 120 kg N, 60 kg P_2O_5 and 40 kg K_2O ha^{-1} in irrigated condition, respectively. Half dose of nitrogen and whole P_2O_5 and K_2O were incorporated in soil, as per the treatments, as basal dose and remaining half dose of nitrogen was top dressed at tillering stage of the wheat crop interculture, weeding and other palnt protection measures are done according to the need. To obtain the true treatment effects, four outer rows (two on each side) and 0.25 m on either side of each row were removed and then net plot of 6.0 m x 2.5 m was harvested with the help of combine.

Result and Discussion

Yield attributes of wheat

The perusal of data presented in Table 1 revealed that the maximum number of effective tillers were found in mould board plough (261.89) followed by dibbler (257.33). The lowest number of effective tillers m^{-2} (229.04) was found in control. The highest length of spike was found in mould board plough (11.56) which was statistically at par with dibbler (11.24) and seed drill (10.79). The smallest spike length among all treatments was found in control (8.92) where sowing was done through broadcasting method. Maximum number of grains $spike^{-1}$ was found in mould board plough (55.27) followed by dibbler (52.90). The lowest number of grains was found in control (42.22). These results are in accordance with Anand *et al* (2020) [2] who reported that mould board ploughing will increase the yield attributes of wheat like number of grains $spike^{-1}$. Different treatments on planting methods had no significant effect on 1000 grain weight of wheat crop. However, mould board plough (44.94 g) had maximum weight of 1000 seeds. Fischer *et al* (2002) [5] also found that 1000 grain weight was not affected by different planting methods.

Yield of wheat crop

Grain yield, straw yield, biological yield and harvest index of crop was evaluated and presented in Table 2. Results revealed that mould board plough produced significantly higher grain yield of wheat over control where sowing was done through broadcasting method. The grain yield in mould board plough was 5.7 percent more than dibbler. Seed drill also showed 52.9 per cent increase in grain yield than control. Strudley *et al* (2008) [11] reported that mould board plough increases the grain yield by increasing the soil properties. Gautam *et al* (2020) [6] also reported that highest grain yield was found in mould board plough compared to other traditional methods.

The data on straw yield presented in Table 2 revealed that mould board plough significantly increased the straw yield by 30.4 per cent over control. However, it was also statistically at par with dibbler and seed drill. The lowest straw yield among all the treatments was found in control (5019 kg ha^{-1}). This might be due to the fact that the loosen soil through mould board plough results in highest straw yield. Similar findings were also reported by Chen *et al* (2014) [3]. biological yield was significantly affected by different planting methods. Mould board plough significantly increased the biological yield of wheat than control by 42.6 per cent. Ahmad *et al* (2018) [1] also found that the biological yield of the wheat crop was significantly affected by mould board ploughing at the time of sowing. Harvest index did not vary significantly by the effect of planting methods. However, numerically the highest harvest index was found in mould board plough. Similar findings were also reported by Sadeghi and Bahrani (2009) [10].

Economics

Data presented in Table 3 revealed that maximum cost of cultivation was incurred under seed drill (Rs 56844 ha^{-1}) as compared to the lowest cost of cultivation incurred under mould board plough (Rs 49344 ha^{-1}). The cost of cultivation while using mould board plough was less compared to other best treatments such as dibbler (Rs 56244 ha^{-1}) and seed drill (Rs 56844 ha^{-1}). Mould board plough gave significantly higher gross returns (Rs116845 ha^{-1}) as compared to control (Rs 75867 ha^{-1}). Dibbler also had best gross returns comparatively (Rs 111786 ha^{-1}). Mould board plough recorded significantly higher net returns (Rs 67501 ha^{-1}) as compared to control (Rs 22723 ha^{-1}). Dibbler also had best net returns comparatively (Rs 55542 ha^{-1}). Mould board plough recorded maximum net returns per rupee invested (1.37) over control (0.43). Among other treatments, happy seeder and rotavator also had better net returns per rupee invested (1.10 and 1.08).

Conclusion

The yield attributes and yield of the crop was highest in mould board plough method of planting.. Mould board plough had maximum net returns per rupee invested over control. Among other treatments, happy seeder + crop residue and rotavator + crop residue also had better net returns per rupee invested.

Table 1: Effect of treatments on yield contributing characters of wheat

Treatments	No. of effective tillers m^{-2}	Spike length (cm)	No. of grains $spike^{-1}$	1000 grain weight (g)
Mould board plough	261.89	11.56	55.27	44.94
Zero tillage	236.67	9.10	44.83	39.67
Dibbler	257.33	11.24	52.90	44.51
Happy seeder	246.41	10.04	48.17	42.44
Rotavator	240.56	9.51	47.35	41.36
Seed drill	254.89	10.79	51.63	43.18
Control	229.04	8.92	42.22	38.34
SEm (±)	1.24	0.41	0.62	1.44
CD (P=0.05)	3.81	1.27	1.91	NS

Table 2: Effect of treatments on yield of wheat

Treatments	Grain yield (kg ha^{-1})	Straw yield (kg ha^{-1})	Biological yield (kg ha^{-1})	Harvest index
Mould board plough	4093	6547	10640	0.41
Zero tillage	3506	6114	9620	0.36
Dibbler	3872	6421	10293	0.40
Happy seeder	3670	6240	9909	0.37
Rotavator	3591	6183	9774	0.37
Seed drill	3738	6329	10066	0.37
Control	2444	5019	7463	0.33
SEm (±)	66	83	87	0.01
CD (P=0.05)	204	257	269	NS

Table 3: Effect of treatments on economics of wheat

Treatments	Cost of Cultivation (Rs ha^{-1})	Gross returns (Rs ha^{-1})	Net returns (Rs ha^{-1})	Net returns per rupee invested
Mould board plough	49344	116845	67501	1.37
Zero tillage	50344	102877	52533	1.04
Dibbler	56244	111786	55542	0.99
Happy seeder	50944	106794	55850	1.10
Rotavator	50344	104929	54585	1.08
Seed drill	56844	108627	51783	0.91
Control	53144	75867	22723	0.43
SEm (±)		1231	1231	0.02
CD (P=0.05)		3792	3792	0.07

References

1. Ahmad S, Shafi M, Ullah I, Rehman HU, Khan Z, Khan MA and Zada l. Yield and yield components of wheat as influenced by various tillage operations and seed rates. International Journal of Agricultural and Environmental Research,2018:4(1):54-60.
2. Anand G, Vicky S and Aulakh GS. Effect of various sowing technologies of wheat cultivation under rice-wheat cropping system in the western plain zone of Punjab. Multilogic in Science,2020:9(32):459-461.
3. Chen B, Liu E, Tian Q, Yan C and Zhang Y. Soil nitrogen dynamics and crop residues. A review. Agronomy for Sustainable Development,2014:34(2):429-442.
4. Ehsanullah, Shahzad Muhammad A, Anjum SA, Zohaib A, Ishfaq M and Warraich EA. Effect of different sowing methods and planting densities on growth, yield, fiber quality and economic efficacy of cotton. Pakistan Journal of Agriculture Research,2017:30(1):67-74.
5. Fischer RA, Santiveri F and Vidal IR. Crop rotation, tillage and crop residue management for wheat and maize in the sub-humid tropical highlands: I. Wheat and legume performance. Field Crops Research,2002:79(2-3):107-122.
6. Gautam A, Singh V and Aulakh GS. Effect of various sowing technologies of wheat cultivation under rice-wheat cropping system in the western plain zone of Punjab. Multilogic in Science,2020:9(32): 459-461.
7. Gul S, Khan MH, Khanday BA and Nabi S. Effect of sowing methods and NPK levels on growth and yield of rainfed maize (*Zea mays* L.). Scientifica, 2015, 1-6.
8. Harishankar, Pali GP and Tomar GS. Growth and yield of wheat (*Triticum aestivum* L.) as influenced by methods of sowing and seed rates. Progressive Research – An International Journal,2017:12:340-342.
9. Hobbs J, Cooney A and Fulton M. *Value Chains in the* Agri-Food Sector: What are they? How do they work? Are They for Me? Department of Agricultural Economics, University of Saskatchewan, Saskatoon, 2000.
10. Sadeghi H, Bahrani JM. Effects of crop residue and nitrogen rates on yield and yield components of two dryland wheat (*Triticum aestivum* L.*)* cultivars. Plant Production Science,2009:12(4):497-502.
11. Strudley MW, Green TR, Ascough IIJC. Tillage effects on soil hydraulic properties in space and time: State of the science. Soil and Tillage Research,2008:99(1):4-48.