



Effect of Different Sowing Techniques and Varieties on yield of Wheat (*Triticum aestivum* L.)

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ABSTRACT

Wheat (*Triticum aestivum* L.) is one of the most widely grown cereal crop in the world and increasing the grain yield is an important national goal to face the continuous increasing food needs. Technique of sowing is one of the important factors affecting the yield of wheat. Number of sowing techniques is being used by farmers. Out of which four techniques namely sowing of seed using happy seeder, super seeder, zero till drill and rotavator/disc harrows were selected. In this regard, a survey was conducted in different villages of district Shaheed Bhagat Singh Nagar, Punjab by *Krishi Vigyan Kendra*, Langroya with an objective to determine the sowing techniques used by farmers, variety grown and its effect on the yield of wheat. The results showed that major area of the district was under variety HD 3086 and Unnat PBW 343. Most of the farmers got higher yields (21-23q/acre) using Happy seeder. The lowest yield was obtained from the use of rotavators/disc harrows (16-18q/acre). Super seeder being a new technology was used by very few farmers but it has also helped in getting yields higher than zero till drill and rotavators/disc harrows.

INTRODUCTION

Wheat (*Triticum aestivum* L.) is one of the most widely grown cereal crop in the world. The area under wheat is increasing every year being the most important food grain and staple food of Indians especially in northern parts of the country. The total area under the crop is about 29.8 million hectares in the country. India accounts for 8.7% of total world production of wheat. The production of wheat in the country has increased significantly from 75.81 million MT in 2006-07 to an all-time record high of 105 million MT in 2019-20. Major varieties of wheat grown in district SBS Nagar were Unnat PBW 343, HD 3086, HD 2967, PBW 677, WH 1105 and PBW 725. Technique of sowing is one of important factors which compensate the low tillering in wheat, to give the best plant distribution in the field and to save the labour in controlling weeds within ridges or rows (Kabesh *et al*, 2009). Increasing grain yield of wheat is an important national goal to face the continuous increasing food

needs. The objective of the present study was to investigate the effect of different sowing techniques on the yield of the wheat. Four major sowing techniques were identified namely:

Sowing using Happy seeder: Happy Seeder is one of the promising technologies which is used for sowing wheat without any burning of rice residue. This technology is eco-friendly and improves the soil health as well as saves water (Land force, 2018; Mooventhani *et al*, 2018). Happy seeder offers the means of drilling wheat into rice stubble without burning, eliminating air pollution and loss of nutrients and organic carbon due to burning, at the same time as maintaining or increasing yield (Sidhu *et al*, 2007)

Sowing using Super seeder: The main function of the Super Seeder machine is to plough standing paddy stubble in soil and sow wheat seed simultaneously in a single operation after the harvesting of the paddy with combine harvester having Super-SMS attachment.

Sowing using rotavator/disc harrows: Rotavator is used as both primary and secondary tillage operations. A good seedbed and pulverization of the soil is achieved in a single pass of the rotavator. It is used in both dry land and wet land conditions. It is also suitable for incorporating straw and manure in the field. The tractor mounted disc harrow consists of two gangs of discs mounted one behind the other. The disc on front gang throws soil outwards and the rear gang inward. Therefore, no soil remains uncut by the offset disc harrow. Disc harrow is secondary tillage implement. It is used after the primary tillage. It is used to break the clods developed during primary tillage operation.

Sowing using zero till drill: Seed drill consists of a wooden beam to which 3 to 6 tines fixed. These tines open the furrows into which the seeds are dropped. Holes are made into these tines and into these holes, the bottom ends of bamboo or metal seed tubes are fitted. These seed tubes are connected at the top to a wooden seed receptacle called hopper. The seeds are fed at a uniform rate 'into this hopper by skilled labour walking behind the seed drill.

Effect of sowing techniques and variety on wheat yield has been studied by many researchers. Manan and Sharma (2017) studied the effect of variety and method of sowing on the yield of wheat in district Kapurthala. The analysis revealed that farmers were preferring new technologies and new varieties. Zero tillage technique was considered economical and time saving technique by the farmers. The yield using rotavator and broadcasting was found to be higher as compared to row sowing. Before sowing of wheat managing of paddy straw is a major concern for farmers. Many in-situ crop residue management techniques are being promoted by Punjab Agricultural University and *Krishi Vigyan Kendra* Langroya. A survey was also conducted for rice residue management options preferred by farmers of district Shaheed Bhagat Singh Nagar (Jaidka *et al*, 2020). The study revealed that farmers prefer happy seeder technology for sowing of wheat. Use of Happy seeder helped in soil moisture

conservation, suppression of weeds, reduction in green house emission and improvement in soil quality (Singh *et al*, 2005, Bindu *et al*, 2018). Thus, keeping in view, the different techniques available for sowing of wheat, a study was conducted in order to determine the effect of sowing technique on the yield of wheat.

MATERIAL AND METHODS

The Shahid Bhagat Singh Nagar district is one of the smaller districts of Punjab having an area of 1267 Sq. Km's consisting of population of 612310 as per 2011 census. The land is fertile due to the presence of river Sutlej and is irrigated through tube wells and canals except some part of the Balachaur sub-division falling in Kandi Area. There are five blocks in district SBS Nagar namely: Aur, Balachaur, Banga, Nawanshahr and Saroya.

Table 1 . Profile of district SBS Nagar.

Total Geographical area	119
Cultivable area	91
Net sown area	95
Net irrigated area	86
Area under wheat	75

Area ('000 ha)

A survey was conducted to identify the types of sowing techniques used for sowing wheat by farmers and yield obtained from different techniques. A simple questionnaire was prepared. The data were collected from 100 randomly selected farmers from different villages of the district SBS Nagar. During survey the farmers were enquired about the technique of sowing, seed rate used, amount of fertilizer (Urea and DAP) used and final yield of the crop obtained. The collected data is presented in table 2. The cost of sowing included the cost of herbicides/ insecticides used. This data were collected for the year 2019-20.

Statistical Analysis

Statistical analysis of the recorded data in order to study the effect of different sowing techniques

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and wheat variety on the yield of wheat was done using SPSS Software. Univariate analysis was done. Technique of sowing and variety sown were taken as independent variable and wheat yield was taken as dependent variable. Pair wise comparisons of varieties and techniques were done. Evaluations were based on a $p \leq .05$ level of significance.

RESULTS AND DISCUSSION

Area under different varieties of wheat

The area under different varieties of wheat in district SBS nagar is presented in Table 1. It can be clearly seen that area under variety HD 3086 was the highest (49%) followed by Unnat PBW 343 (20%) and PBW 677 (13%).

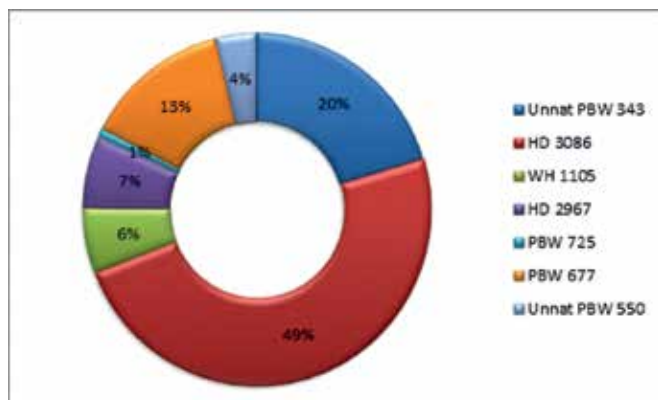


Fig 1. Percentage area under different varieties of wheat in district SBS Nagar

It can be seen that the area under the varieties recommended by Punjab Agricultural University, Ludhiana was highest in the district SBS Nagar. The area under HD 3086 was highest accounting for 46.21 per cent and Unnat PBW 343 was 20 per cent of total area of the district. The seeds of recommended varieties were available at the Krishi Vigyan Kendra (KVK), Langroya at subsidized rates in order to encourage farmers to use improved recommended varieties. The farmers find it easier to purchase seeds from KVKs due to easy availability and assurance of best quality which will eventually help them in getting higher yields. Along with the seeds, they also get knowledge from KVK about the seed rate to be used, recommended amount of

fertilizers and also about the insecticide/herbicide spray in case the wheat is infected with some disease.

Some of the other qualities of these varieties were: HD 3086 is resistant to yellow rust and brown rust and it has superior bread making qualities whereas PBW Unnat 343 is resistant to lodging and water lodging.

It was evident (table 2) that average seed rate independent of technique of sowing varied from 100-112kg/ha. Although, recommended seed rates were 100kg/ha but some of the farmers have also used 125kg/ha. Higher seed rate leads to more dense crop hence affecting the productivity negatively. The effect of seed rate on the yield of the crop irrespective of the variety used is shown in Fig 2. It was clear that use of higher seed rate has not led to any substantial increase in the yield of the crop.

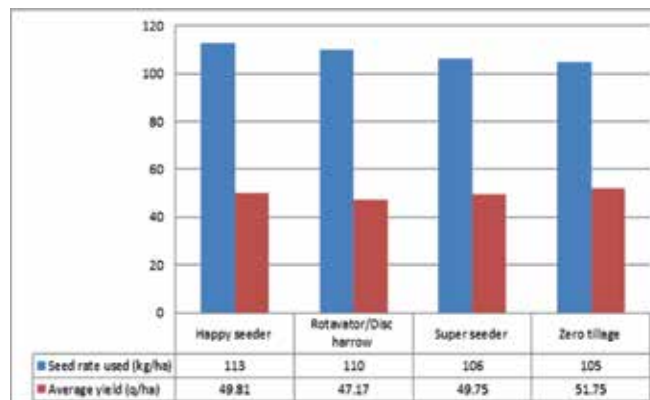


Fig 2. Effect of seed rate on the yield of wheat sown using different techniques

As it was evident that most of the farmers have used 250kg/ha of urea whereas amount of DAP used was 125 kg/ha. Some of the farmers have used only urea. The organic carbon content of most Indian soils was very low and nitrogen deficiency is universal. Most of the soils are low to medium in phosphorus and potassium, and sulphur deficiencies have developed over time. Soil fertility depletion and the increasing deficiencies of certain micronutrients are causes of concern. Use of fertilizers is therefore essential in order to maintain the productivity of soil.

Table 2. Techniques used for sowing of wheat with some critical inputs

Sr. No.	Variety	Sowing method used	Seed rate used (kg/ha)	Urea (kg/ha)	DAP (kg/ha)
1.	Unnat PBW 343	Happy seeder	112.5±4.47	239.5±9.22	118.7±2.5
		Rotavator/Disc harrow	115.0±3.9	267.7±8.06	125.0±2.8
		Super seeder	113.7±5.77	253.7±9.7	125.0±2.5
		Zero drill	106±2.9	241.0±5.5	135.7±4.1
2.	PBW 725	Happy seeder	110.5±2.6	270.75±6.6	108.2±3.5
		Rotavator/Disc harrow	115±3.7	270.0±2.5	125.0±2.5
		Zero drill	104.25±3.5	229.25±4.5	83.2±1.5
3.	HD 2967	Happy seeder	105.7±1.5	250.0±2.5	156.7±4.9
		Rotavator/Disc harrow	112.5±2.7	250.0±4.3	125.0 ±2.5
		Super seeder	108.25±3.6	250.0±2.0	125.0±2.5
		Zero drill	105.0±3.5	375.0±2.5	375.0±10.5
4.	HD 3086	Happy seeder	112.5±3.1	250.0±2.1	125.0±2.5
		Rotavator/Disc harrow	112±2.5	300.0±2.6	125.0±3.5
		Super seeder	100±4.5	250.0±2.1	125.0±2.5
		Zero drill	104.2±2.2	291.7±3.5	93.7±3.5
5.	Unnat PBW 550	Happy seeder	120.75±2.8	292.8±2.5	137.5±5.5
		Rotavator/Disc harrow	100.0±2.5	250.0±5.7	125.0±2.5
		Zero drill	125.0±3.1	250.0±7.5	200.0±3.5
6.	PBW 677	Happy seeder	112.5±2.0	250.0±5.1	125.0±1.5
		Rotavator/disc harrow	105.0±2.2	250.0±4.9	125.0±2.6
		Super seeder	112.5±1.6	250.0±4.1	125.0±3.2
		Zero tillage	105.0±2.1	375.0±4.5	250.0±5.9

Yield of different varieties of wheat using different sowing techniques

The yield of different varieties of wheat namely: Unnat PBW 343, PBW 725, HD 2967, HD 3086, PBW 677 and Unnat PBW 550 as affected by different sowing techniques is shown in fig 3. For variety Unnat PBW 343 highest yield was obtained using super seeder (51.7 q/ha) whereas lowest was obtained using happy seeder (46.7 q/ha). For variety PBW 725 highest yield was obtained

using Happy seeder (51.5 q/ha) whereas lowest was obtained using rotavator/disc harrow (46.5 q/ha). Wheat variety HD 2967 sown using zero till drill gave the maximum yield of 55q/ha followed by happy seeder which helped in getting yield of 52.5q/ha. The lowest yield was obtained in case of use of rotavator/disc harrow was 37.5 q/ha. Mean values of yields along with the standard deviations under different varieties and technique of sowing is given in table 3.

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The data (Table 4) showed the effect of different independent parameters i.e variety sown and technique of sowing was significant. The combined effect of variety sown and technique of sowing was also found to be significant ($p \leq .05$). Happy seeder machine helps in sowing of wheat into paddy stubbles while retaining the crop residue as surface mulch. It has many benefits such as 60-70 per cent less weed growth, water saving (particularly pre-sowing irrigation), improved soil health (through improvements in nutrient supply capacity and soil structure) and environment quality improvement. This in turn leads to the increase in yield of the crop. Most of the farmers have experienced increased yield through the use of Happy seeder. It is important to get the training to use this machine as its use in wrong way or with higher seed rate can lead to more fuel usage and lesser yield as is the case with some of the farmers who have not got the desired yield by using happy seeder. The super seeder plough the standing paddy residue and sow seeds for the next wheat crop, in a single operation. This technology is superior to Happy seeder and also more expensive. It requires a tractor of 65 hp to run the machine.

Table3: Descriptive Statistics Average yield as affected by different wheat variety sown and technique of sowing used.

Dependent Variable: Average yield (q/ha)			
Wheat variety	Technique of sowing	Mean	Std. Deviation
V1	T1	45.83	.47376
	T2	47.71	.12021
	T3	50.84	.47376
	T4	47.95	.25456
	Total	48.08	.81233
V2	T1	50.72	.41012
	T2	45.84	.47376
	T3	49.37	.35355
	T4	47.91	.23335
	Total	48.46	.82621

V3	T1	51.87	.35355
	T2	38.25	.42426
	T3	50.21	.12021
	T4	53.75	.70711
	Total	48.52	2.61431
V4	T1	53.12	.35355
	T2	46.50	.14142
	T3	48.00	.28284
	T4	50.62	.35355
	Total	49.56	1.10551
V5	T1	51.87	.35355
	T2	45.62	.35355
	T3	46.87	.35355
	T4	48.12	.35355
	Total	48.12	1.03510
V6	T1	50.62	.35355
	T2	48.12	.35355
	T3	48.00	.28284
	T4	53.75	.70711
	Total	50.12	1.05830
Total	T1	50.68	1.01018
	T2	45.34	1.40109
	T3	48.88	.62549
	T4	50.35	1.13300
	Total	48.81	1.34961

For varieties HD 3086 and PBW 677 maximum yield was obtained by the use of Happy seeder (52.5q/ha) whereas use of rotavator/disc harrows gave minimum yield. Whereas for variety Unnat PBW 550 maximum yield was obtained using zero till drill (55q/ha) and minimum was obtained using rotavator/disc harrows (47.5q/ha). Most of the farmers used Happy seeder and got higher yield followed by zero till drill and lowest yield in most of the cases was obtained in use of rotavator/disc harrows. Pairwise comparison of different techniques of sowing is presented in table 5. It was clear from the table that the mean difference between different techniques of sowing was significant at 5% level of significance.

Table 4. Tests of Between-Subjects Effects

Dependent Variable: Average yield (q/ha)					
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	82.009 ^a	23	3.566	23.773	.000
Intercept	18299.611	1	18299.611	122007.574	.000
Wheat variety	4.474	5	.895	5.965	.001
Technique of sowing	34.365	3	11.455	76.374	.000
Wheat variety * Technique of sowing	43.170	15	2.878	19.188	.000
Error	3.600	24	.150		
Total	18385.219	48			
Corrected Total	85.608	47			

a. R Squared = .958 (Adjusted R Squared = .918)

Table 5. Pairwise comparison for technique of sowing.

Dependent Variable: Average yield (q/ha)						
(I) Technique of sowing	(J) Technique of sowing	Mean Difference (I-J)	Std. Error	Sig. ^b	95% Confidence Interval for Difference ^b	
					Lower Bound	Upper Bound
T1	T2	2.134*	.158	.000	1.808	2.460
	T3	.717*	.158	.000	.391	1.044
	T4	.130	.158	.419	-.196	.456
T2	T1	-2.134*	.158	.000	-2.460	-1.808
	T3	-1.417*	.158	.000	-1.743	-1.090
	T4	-2.004*	.158	.000	-2.330	-1.678
T3	T1	-.717*	.158	.000	-1.044	-.391
	T2	1.417*	.158	.000	1.090	1.743
	T4	-.588*	.158	.001	-.914	-.261
T4	T1	-.130	.158	.419	-.456	.196
	T2	2.004*	.158	.000	1.678	2.330
	T3	.588*	.158	.001	.261	.914

Based on estimated marginal means

*. The mean difference is significant at the .05 level.

b. Adjustment for multiple comparisons: Least Significant Difference (equivalent to no adjustments).

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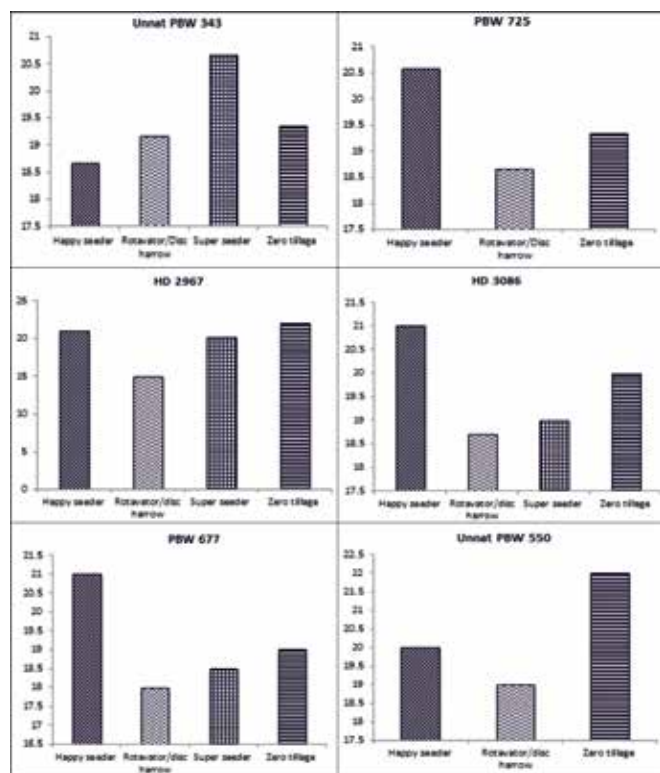
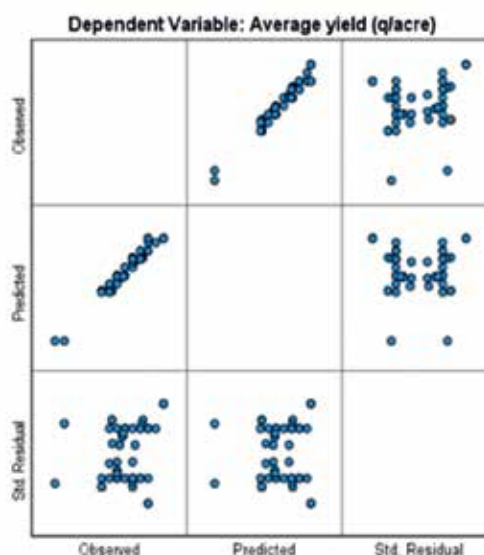


Fig 3. Effect of technique of sowing on yield of different varieties of wheat

CONCLUSION

Yield of wheat sown using the Happy seeder was comparable with or higher than yield using other methods of sowing. Use of the machines as per recommendation by the scientists, along with the use of optimum seed rate and fertilizers the yield of the wheat can be increased along with savings in number of irrigations applied. The lowest yield was obtained using conventional techniques of sowing such as rotavators and disc harrows. The use of zero tillage has also helped farmers in getting better yield.



Model: Intercept + Wheatvariety + Techniqueofsowing + Wheatvariety * Techniqueofsowing

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