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IMPACT OF DIFFERENT WHEAT VARIETY AND SOWING METHODS ON GRAIN YIELD OF WHEAT (TRITICUM AESTIVUML.) CROP IN SHIKOHABAD, U.P.

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ABSTRACT
A field experiment was conducted at J. S. University shikohabad U.P. agriculture farm house during the winter seasons of 2019-2020 and 2020-2021 to study the Different Wheat Variety and Sowing Methods on Grain Yield of Wheat crop. Variety comprises of PBW-343 and PBW-502 were allocated in main plot whereas three sowing methods System of wheat intensification (SWI) at 22 cm × 22 cm, Line sowing at 26 cm × continuous and broadcasting were allocated in sub-plot under split plot design with four replications. PBW502 variety gave higher grain yield as compared to PBW-343 variety. SWI at 22 cm × 22 cm recorded significantly higher tillers (269 and 256 m-2) as compared to line sowing at 26 cm and broadcasting during both the years. SWI at 22 cm × 22 cm spacing recorded significantly higher grain yield (3820 and 3915 kg/ha) during 2019-2020 and 2020-2021, respectively. But it was found at par with line sowing at 25 cm x continuous method. Economic analysis of different sowing methods showed that both line sowing and SWI were found superior over broadcasting method. Highest Net returns of NPR 73,185 and 63,545 was obtained from line sowing and SWI methods respectively.
KEYWORDS: Broadcasting, line sowing, SWI, variety and yield

Introduction
Wheat (Triticum aestivumL.) is a member of the poaceae family, is one of the second main grain crop in the world. It is the important staple food of the world which meets most of the protein requirement of the people. Wheat is a nutritious food value containing 12 percent protein, 1.72 percent fats, and 69.60 percent carbohydrate used for manufacturing of bread, cakes, bakeries, alcohol etc and in India. According to project director report, DWR, 2016-17, Cultivating land of wheat occupies in area of 30.72 million hectares with a production of 98.51millions tonnes with a national productivity of 30.93 quantal/hectare in India (Ritesh et al 2020).
Weather (low and high temperature stress, high RH and drought), lack of suitable high yielding genotypes for specific production domain; poor performance of existing cropping system and technologies of production being followed. Number of genetic and external factors controls the ultimate yield of wheat crop. An optimum level of single factor will not cause any appreciable increase in the yield itself, but a combination of factors contributes to the ultimate yield of wheat. It is well recognized that by keeping proper row spacing and input like seed treatment, fertilizer and seed rate etc. have an effective role in increasing the yield of crops. Wheat is generally planted by broadcast method by most of the farmers in U.P, only progressive farmers and research scientists use line sowing. Now a day due to infestation of weeds, labor scarcity and partial mechanization in U.P. line sowing is being practiced with proper row spacing, which besides facilitating inter-culture and

convenient herbicide application for effective and effective weed control; help in intercropping and reducing the seed rate per hector without any adverse effect on the final grainyield.

Material and Methods:

An experiment was conducted during winter seasons of 2019-2020 and 2020-2021 at agriculture farm house of PBW-343U.P. The climate of experimental site was semi-arid region with elevation of 106masl, where maximum temperature goes up to 43.5OC. The experiment was laid out in split plot design including variety viz; PBW-343 and PBW-502 as main plot and different sowing methods viz; broadcasting, line sowing (26 cm × continuous line sowing) and system of wheat intensification (SWI) at 22 cm × 22 cm as sub plot factor with four replications. Under SWI, two seeds were sown at 22 cm × 22 cm spacing while in broadcasting at 148 kg/ha (farmers practice) and line sowing at 125 kg/ha seed rate was applied. Fertilizer was applied at 120:80:60 N2:P2O5:K2O for line sowing and 105: 26: 22 N2:P2O5:K2O kg/ha for broadcasting. Other intercultural operations were done as per recommended practices. Under SWI, 500 ml cow urine, 250 g vermicompost and 120 g of jaggery were added per liter of water and thoroughly mixed with seed containing water. The mixture was left for 5-7 hours and then filtered. The filtered seeds were treated with Bavistin 2.5 g kg–1 seed and kept in wet jute bag for 9-11 hours. The seeds were dried in shade for half an hour just before sowing to facilitate easy sowing of seeds [4].

The crop was sown on November 18, 2019 and November 18, 2020 with a plot size of 3.5 m x 5 m. Full dose of phosphorus, Muriate of potash and half dose of Nitrogen were applied to wheat as basal dose at the time of sowing. The remaining dose of N was top dressed at 25 Days after sowing. To work out the economics of different sowing method treatments information on the existing market price of seed, fertilizer and herbicides were used. Cost of labor was calculated by taking into account the prevailing labor wages at the time of investigation. Gross returns, net returns and benefit cost ratio were worked out by using the following formula, Gross return= Grain yield x market rate of grain Net returns= Gross returns- total cost of cultivation

$$\text{Benefit Cost ratio} = \frac{\text{Gross returns}}{\text{Total cost of cultivation}}$$

Result and Discussion:

Effect of varieties

There was significant effect of variety on number of tillers per square meter but nonsignificant effect was observed in plant height, panicle length, thousand grain weight and grain yield in both years (Table 1). Significantly highest numbers of tillers per square meter was recorded by PBW-502 variety. However higher grain yield was recordedbyPBW-502incomparisontoyieldofPBW-343.Highestgrainyieldof PBW-502 might be due to higher number of tillers per square meter, panicle length and thousand grain weights. Combined analysis of both years' data also revealed the same results (Table 2). So, both tested improved wheat varieties; PBW-343 and PBW-502 can be grown successfully under different sowing methods.

Effect of sowing methods

Plant height, number of tillers per square meter, thousand grain weight and grain yield were

significantly different among different sowing methods while panicle length was not found significantly different (Table 1). SWI wheat sown at 22 cm × 22 cm spacing recorded significant higher tillers (269 and 256 m-2) during both years but it was at par with line sowing (Table 1).

Table 1 Plant growth, yield and yield attributes of wheat as influenced by variety and sowing methods during 2019/20 and 2020/21

Treatment	Plant height (cm.)		Panicle length(cm.)		No. of Tillers, m^2		1000 grain weight(gram)		Grain yield	
	2019-20	2020-21	2019-20	2020-21	2019-20	2020-21	2019-20	2019-20	2019-20	2019-20
Variety										
PBW-343	82	81	12	13	198	224	52.6	41.9	3440	3165
PBW-502	81	82	13	14	290	227	51.4	43.8	3850	3180
F-test	ns	ns	ns	ns	*	ns	ns	ns	ns	ns
LSD(0.05)					63					
Swing methods:										
Broadcasting	76	77	12	12	215	176	51.5	41.2	3540	2310
Line Sowing 26cm. Continuous	77	78	12	11	236	246	50.7	42.3	3682	3420
SWI (22X22cm)	92	91	11	11	268	252	52.4	42.4	3745	3850
F-test	**	**	ns	ns	*	**	ns	*	ns	**
LSD(0.05)	5.7	5.7			39	45.32		1.7		507.9
F-test	ns	ns	ns	ns	ns	ns	ns	ns	ns	
Grand Mean	83	83	12	13	245	230	52.7	42.3	3655	3185
CV(Percent)	5.7	5.7	8.4	8.3	13	16.3	7.8	3.7	12.2	13

**** and *denotes significant at 1percent and 5 percent ns denotes non-significant**

Higher number of tillers m-2, panicle m-2 and tillers hill-1 obtained in rice planted under SRI method as compared to farmers practices [5]. Significantly higher thousand grain weight was recorded in SWI methods irrespective of spacing as compared to line sowing and broadcasting (Table 1). This may be due to the wider spacing and proper aeration under SWI method. The results revealed that there was significant difference in grain yield during 2020-2021 and combined analysis of both year data also reflected the same results. SWI method of wheat sowing at 22 cm × 22 cm spacing recorded significantly higher grain yield (3850 kg/ha and 3745 kg/ha) during 2020-2021 and combined analysis of 2019-2020 and 2020-2021 over other treatments (Table 1 and 2) but it was at par with

line sowing. Similar results
has also been reported by [6], from his experiment at farmers' fields at J.S. University Shikohabad, U.P. where wheat variety 'Lok-1' has yielded 3.6, 2.3 and 2.5 kg/plot of 3.5 m2 size i.e.,5.5, 5.0 and 5.85 t/ha in SWI, line sowing and broadcasting methodsrespectively.

Table 2 Plant growth, yield and yield attributes of wheat as influenced by variety and sowing methods (Combined analysis of 2019-2020 and 2020-2021)

Treatments	Plant Height (cm)	Panicle Length (cm)	Number of tillers/m^2	1000 grain weight (gm)	Grain yield (kg/ha)
Variety					
PBW-343	**82**	**12**	**209**	**45.7**	**3245**
PBW-502	**81**	**13**	**282**	**48.1**	**3613**
F-test	**ns**	**ns**	*	**ns**	**ns**
LSD (0.05)			**32**		
Sowing Methods					
Broadcasting	**76**	**12**	**195**	**45.9**	**2913**
Line sowing (26 cm × continuous)	**77**	**12**	**241**	**46.8**	**3544**
SWI (22 cm × 22 cm)	**92**	**11**	**259**	**48.0**	**3789**
F-test	**	**ns**	**	**ns**	**
LSD (0.05)	**5.2**	**0.6**	**36.18**		**312.6**
Interaction					
F-test	**ns**	**ns**	**ns**	**ns**	**ns**
Grand Mean	**83**	**12**	**242**	**45.9**	**3326**
CV %	**4.9**	**7.2**	**9.8**	**6.8**	**6.7**

** and *denotes significant at 1 % and 5% ns denotes non-significant

Grain yield of wheat to the tune of 4.5, 3.7 and 2.0 t/ha with SWI at 22 cm × 22 cm plant spacing, line sowing at 26 cm and wheat sown under broadcast method respectively[7].TheAgaKhanRuralSupportProgram,workinginfarmers'fieldsat
Rajasthan has reported grain yield of wheat to the tune of 3.58 t/ha in SWI as compare to usual practice (3.53 t/ha) [2]. Perusal of results of present research in light of reports available from various agencies it may be inferred that the SWI methods are slightly superior than conventional line sowing and broadcasting methods of wheat with improved recommended practices and far superior to usual farmer's practice.

Economics analysis

Combined analysis showed that line sowing of wheat at 26 cm was found to be more economical than SWI and broadcasting methods. Line sowing at 22 cm fetched net returns of NPR. 75,556 with a net benefit cost ratio of 1.85 (Table 3). It may be due to the fact that requirement of manual labor

for sowing of wheat under SWI is much higher and labor shortage at the time of sowing is becoming a major constraint. Sowing of wheat by SWI method emerges to produce more grain yield but considering the cost and benefit of production it is not economical than line sowing until mechanization is done in SWI to replace required manual power.

Table: 3 Economic returns and cost of cultivation of different Sowing methods of wheat cultivation (Combined analysis of 2019-2020 and 2020-2021)

Sowing Methods	Total Cost (NPR/ha)	Gross Returns (NPR/h)	Net Returns (NPR/ha)	B:C Ratio
Broadcasting	**43,580**	**86,390**	**45,715**	**1.06**
Line sowing (26 cm × continuous)	**42,375**	**1,07,320**	**75,556**	**1.85**
SWI (22 cm × 22 cm)	**43,580**	**1,12,680**	**63,685**	**1.45**

Conclusion:

The conclusion drawn from the study shows that wheat sown under system of wheat intensification (SWI) at 22 cm × 22 cm spacing is better than line sowing at 26 cm and broadcasting methods in terms of grain yield. However, it is not economical than line sowing due to higher cost incurred in labor. Therefore, mechanization in SWI should be developed in order to replace required manual power and get higher profit.

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