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Influence of Row Spacing on the Grain Yield and the Yield Component of Wheat (*Triticum Aestivum* L.)

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ABSTRACT

An experiment was conducted to determine the influence of different row spacing on grain yield and yield components of wheat variety **PBW 373** at the agronomic research **Pilli Kothi Farm is situated in Jaunpur the eastern part of Uttar Pradesh**, Faculty of Agriculture, Tilak Dhari Post Graduate College Jaunpur U.P. The results revealed that different row spacing significantly affected plant population $^{m-1}$, 1000 grain weight, biological yield and grain yield. Number of grains Ear^{-1}, Ear length (cm) and harvest index remained non significant. Maximum tillers m^{-1} (165.0) were observed at row sowing techniques of spacing 22 cm. While maximum 1000 grain weight (48.60 g) were recorded at wider row spacing of 22 cm. Maximum biological yield (12 t ha^{-1}) and grain yield (5.25 t ha^{-1}) were also observed row sowing spacing of 22 cm).

KEYWORDS: *Row spacings, grain yield, yield components, wheat*

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INTRODUCTION

The grain yield is a function of interaction between genetic and environmental factors like soil type, sowing time and method, seed rate, fertilizers and time of irrigation. Among these factors row spacing plays a vital role in getting higher grain yield.

Wheat is generally planted by broadcast method by most of the farmers in the country and only progressive farmers and researchers use line sowing. Now-a-days due to infestation of weeds, it has become necessary to sow the crop in lines with a suitable row spacing, which may help in cultural operations, herbicides application, inter-cropping and increasing or decreasing seed rate without any adverse effect on the final grain yield. Proper row spacing is important for maximizing light interception, penetration, distribution in crop canopy and average light utilization efficiency of the leaves in the canopy, and thus affect yield of a crop. Wider spacing between rows or pairs of rows, not only allow more light to reach the lower leaves at the time of grain formation but also allows easy inter-culture for weed control and inter-cropping (Ayaz *et al.,* 1999). Similarly Nazir *et al.* (1987), Shafi *et al.* (1987) and Surendra *et al.* (1985) led to the conclusion that wheat grain yield was not reduced to a significant extent by increasing the row spacing and suggested that wider planting geometry technology can be adapted without any risk of reduction in yield, may facilitate inter-tillage devices for effective weed control and inter-cropping i n wheat.

Knowledge of yield components responses to manipulations of management inputs is basic for the establishment of consistent and profitable intensive management system for wheat. In northern USA, the commonly used row spacing is 17.8 cm, but based on studies in Pennsylvania,a row spacing of 12.7 cm should give consistent increase in yield. [Roth *et al.* (1984)] but Frederic and Marshall (1985) stated that decreasing the row spacing resulted in significant grain yield increases ranging from 6.0 to 13.2% with a mean of increase 8.2%.

Dhiman *et al.* (1984) reported that wheat varieties gave 13-18% higher grain yield when planted by disc drill in cross rows than in one direction only. Singh and Uttam (1993) in a field trial also found that grain yield was higher with bi-directional method of sowing. Arif et al. (199 7) also found that line or bi - directional sowing gave significantly higher grain yield than broadcasting.

The main objective of this experiment was to determine the influence of different row spacings the yield and yield components of wheat variety **PBW 373** during 2019.

Materials and Methods

The experiment was conducted at the Agronomic research field, Pilli Kothi Farm is situated in Jaunpur the eastern part of Uttar Pradesh, Faculty of Agriculture, Tilak Dhari Post Graduate College Jaunpur U.P. to study the influence of row spacing sowing technique on yield components and grain yield of wheat. The experiment was conduct out in Randomized Complete Block Design by using Gross plot size of 4.0 x 4.0 m and Wheat variety PBW 373 was sown at different row spacings as detailed below:

Row spacing (cm)	Symbols
14.0	T_1
15.0	T_2
16.0	T_3
17.0	T_4
18.0	T_5
19.0	T_6
20.0	T_7
21.0	T_8
22.0	T_9

Crop was sown at recommended seed rate of 125 Kg ha-1. Five irrigations were applied during the course of experiment. Nitrogen was applied @ 100 Kg ha-1 through Urea and phosphorus was applied @ 40 kg ha-1 as Single super phosphate and @ 40 kg ha-1 MOP. Half dose of nitrogen and full dose of phosphorus was applied at the time of sowing and was thoroughly mixed into soil by ploughing and planking. Rest of nitrogen was applied tow times with CRI and Peak tillering stage. All other cultural practices were applied to need.

The procedures used for data collection on the different parameters was as under:

Number of plants m^{-1}

An area of 1 m^{-1} was selected at random in each plot to count total number of plants.

Ear Length (cm) and Grains per ear

Five Ear were randomly selected from each plots. Each Ear was measured with rural from the base of the Ear to the apex to record the Ear length in cm. To record the grain per Ear, each Ear was threshed separately and grain of each Ear were counted and average.

1000-Grain Weight (g)

1000 grains were counted at random from each plot and their weights were taken by electric balance.

Biological Yield (t ha^{-1})

Crop of each plot was harvested manually and tied into bundles. The biological yield was recorded in kg by weighing the bundles of each plot with the help of spring balance and then subsequently converted into ha^{-1}.

Grain Yield (t ha^{-1})

Wheat bundles of each plot were sun dried and then threshed separately. The grain weight of each plot was recorded in kg and then subsequently converted into ha^{-1}.

Harvest Index (%)

Harvest index of each plot was calculated by using the following formula:

$$\text{Harvest index }(\%) = \frac{\text{Seed yield }\left(\text{kg}\cdot\text{ha}^{-1}\right)}{\text{Biological yield }\left(\text{kg}\cdot\text{ha}^{-1}\right)} \times 100$$

Results and Discussion

Plant population m^{-1}

Table indicated that all the treatment means had a significant difference among themselves. The row spacing (21 cm) gave higher plant population count (56.67) over other treatments. While narrow row spacing (14 cm) followed the row sowing technique. The lowest count (48.33) were produced by 14 cm apart rows (usual row to row distance) wheat spacing which was statistically at par with wider row spacing of 22 cm. The reduced plant population in increased row spacing might be due to more interplant competition within the row.

These results agree with those of Shafi *et al.* (1987), Rajput and Alam (1990) and Ahmad et al. (1999) reported that narrow row spacing produced significantly more tiller m-1. Holliday (1963) reported 2 to 10% increase in grain yield by increasing tiller count from using a narrow row spacing.

Ear length (cm)

Ear length is associated with number of grains and longer Ear produced maximum number of grains. The data in the table showed all the treatments were statistically at par with each other. However, maximum (9.5 cm) Ear length was recorded in wider row spacing of 22 cm. Minimum Ear length (7.33 cm) were observed in 15 cm apart rows. It might be due to more space, light and nutrients available to the plants in wider row spacing. Although all treatments are statistically at par. So, it can be concluded from these results that Ear length is genetic character of a variety, which is less influenced by agronomic practices. Khan *et al.* (2001) reported that varieties have different genetic potential regarding the Ear length.

Grains per Ear

Grains per Ear (Table 1) had a non-significant statistically difference among the treatments. Sowing of wheat in row spacing 22 cm sowing produced maximum grains (49.0). The greater number of grains Ear^{-1} of wheat in row sowing might be due to more space and nutrients utilization by the plants. Hence efficient utilization of space and nutrients by plants resulted in greater number of grains Ear^{-1}.

1000-Grain weight (g)

1000-grain weight is an important yield determining component of wheat. The table witnessed that 1000-grain weight was non-significant. The maximum 1000-grain weight (48.60) was observed in 22 cm apart row of wheat which differed significantly from all treatments row sowing of wheat. The minimum 1000-grain weight of (42.67) was recorded by 8 cm apart rows of wheat. It is concluded from these results that grain weight increased with increase in row spacing. Similar results were obtained by Sheikh et al. (1995) and Ayaz et al. (1999) who reported that row spacing had significant effects on 1000-grain weight.

Table 1: Influence of row spacing on the grain yield and the yield component of wheat (*Triticum aestivum* L.)

Treatment	Row spacing (cm)	Tillers m-1	Ear length (cm)	Grains per Ear	1000 grain weight (g)	Biological yield (t ha-1)	Grain yield (t ha-1)	Harvest index (%)
T1	14	153.67	7.63	42.67	44.97	11.25	4.44	39.47
T2	15	156.33	7.33	43,67	45.67	10.75	4.79	44.56
T3	16	163.33	8.10	45.33	46.73	11.42	4.71	41.28
T4	17	158.00	7.63	45.33	47.10	10.94	4.88	44.70
T5	18	154.67	8.27	47.33	45.77	11.02	4.88	44.37
T6	19	161.00	7.93	46.33	47.47	11.50	4.89	42.55
T7	20	163.33	8.70	47.33	48.17	11.79	4.81	40.85
T8	21	162.00	8.93	48.00	48.47	11.14	5.13	46.17
T9	22	165.00	9.50	49.00	48.60	12.00	5.25	44.91

Biological yield (t ha^{-1})

The data presented in table revealed that biological yield (ha^{-1}) of experimental treatments. Significant difference were found among different treatments. The average biological yield varied from 10.75 to 12.0 ha^{-1}. The effect of row spacing showed that the highest biological yield of 12.0 ha^{-1} was obtained from row sowing of 22 cm apart while lowest 10.75 ha^{-1} was obtained from 15 cm apart rows. The results obtained agree with Nazir *et al.*(1987) who reported that cross sowing increased biological yield.

Grain yield (t ha^{-1})

The grain yield is attributed to the cumulative effect of various yield components.

The data of grain yield (Table 1) evidenced that row spacing had significant effects on the grain yield. The maximum grain yield (5.25 ha^{-1}) was shown by row sowing method. The lowest grain yield of wheat was produced by 14 cm apart rows. It can be concluded from these results that 22 cm row sowing in depicted significantly higher yield over all other treatments. It might be due to uniform distribution of seed, utilization of environmental resources and less lodging with more wind resistance.

Harvest index (%)

The ability of a variety to convert the total dry matter into economic yield is indicated by its harvest index value. The data in Table 1 revealed that harvest index was statistically at par among various treatments. 21 cm apart rows of wheat recorded maximum harvest value (46.17%) while minimum harvest index recorded by 39.47 cm apart rows. Harvest index was related to grain weight but not to number of grains Ear^{-1}. However these results suggested that positive yield number of Ear unit^{-1} land area relationships are determined predominated by increase in dry matter production and not by increasing harvest index.

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