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Studies on quality seeds with row-spacing at different levels of seed rate of wheat

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Abstract
The treatments were evaluated in split plot design. Quality seeds, spacing and Seed rates significantly affected all the plant traits during experiment. In respect of growth parameters like initial plant population and plant height, yield attributes like length of ear and number of grains/ear and yield were recorded higher with breeder seed along with 22.5 cm row-spacing at 120 kg/ha levels of seed rate as compare to other treatments.

Keywords: quality, seed, plant growth and yield

Introduction
Wheat is an annual plant belonging to the family Poaceae having about six hundred genera and ten thousand species of grasses. *Triticum aestivum* L. (common wheat), *Triticum durum* (Durum Wheat) and *Triticum compactum* are the three important species of wheat and are mainly consumed to make bread, pasta and softer cakes, cookies, and pastries. Wheat also provides other valuable benefits to human beings as well. Wheat is also cultivated as fodder crop for livestock on a small scale. Wheat straw is also being used not only to feed animals but also as construction material for roofing thatch (Denyer *et al*., 1995) [3]. Biofuel, beer and vodka are the other wheat products produced after fermentation. Wheat is also being used as a major ingredient in making pizza, macaroni, spaghetti, noodles and puddings. Amongst the industrial uses of wheat, the production of starch for paper industry is important. Wheat starch is used for laundering, paper laminating and corrugating adhesives, textiles, wall paper, billboard paste and paper "additives" (DHAKA, 2007) [4].

Method and Materials
The field experiment was conducted at SIF, C. S. A. University of Agriculture and Technology, Kanpur during two rabi season 2016-17 and 2017-18 which is situated in the alluvial tract of Indo - Gangatic plain in central part of Uttar Pradesh between 250 26' to 260 58' North latitude, 790 31' to 310 34' East longitude and altitude of 125.9 meters. The irrigation facilities are adequately available on this farm. Geographically, the region falls under sub-tropical zone of indo-Gangetic alluvial of eastern Uttar Pradesh in India. The annual rainfall of this region is about 890 mm. Most of the rains are received from mid-June to the end of the September. Out of the total annual rainfall, about 85-90 per cent of rainfall received during South-westrnaly monsoon (June to September). The experiment was laid out in split plot design (SPD) with 3 replications. In which quality seeds (Breeder, Foundation and certified seed) in main plot, row-spacing (15 cm , 22.5 cm and broadcast) in sub plots and seed rate (80 and 120 kg/ha) were allocated in sub-sub plots. The observations were recorded on growth attributes, yield attributes and yields of crop. The crop was harvested at field maturity. The analysis of variance was carried out using the split plot design.

Results and Discussion
Soil Quality
Soil of the experimental field was sandy loam category with moderate fertility status having sand (%)-55.30, Silt (%)22.60, Clay (%)-18.65, pH 7.40., EC (dSm-1 at 25^0C)-0.30, Organic Carbon 0.42 %, Available Nitrogen 260.0 kg ha^{-1}, Available Phosphorus 12.30 kg ha^{-1}, Available Potassium 193.50 kg ha^{-1},

Growth Attributes
Effect of quality seeds
It is clear from the data presented in table showed that initial plant population/m^2 did not influence significantly due to different quality of seed as breeder, foundation and certified seed during both the years of experiment.

The data on plant height showed that the higher plant height was significantly recorded under breeder seed over foundation and certified seed at all growth stages of crop during 2016-17 and 2017-18. However, maximum plant height 106.69 cm and 112.05 cm was found under breeder seed and minimum plant height 95.89 cm and 100.66 cm, respectively, was observed under certified seed.

Effect of row-spacing

The data given in Table-1 resealed that the initial plant population/m^2 was recorded significantly higher in 22.5 cm row-spacing in both years of experiment and minimum number of initial plant population/m^2 was recorded in 15 cm row-spacing and broadcast during two years.

An examination of data indicates that plant height was significantly increased at 22.5 cm row-spacing over 15 cm and broadcast in both the years of experiment. However, highest plant height 105.13 and 110.39 cm was recorded under 22.5 cm spacing and lowest plant height 98.11 and 103.01 cm was obtained with broadcast during 2016-17 and 2017-18.

Effect of seed rate

The seed rate also significantly influenced the initial plant population/m^2 during both the years of investigation. However, 120 kg/ha seed rate produced higher plant population and than 80 kg/ha seed rate.

The application of different level of seed rate produced marked significant variation on plant height when it increased up to 120 kg level at all the growth stages during both the years of investigation. However, maximum plant height 103.74 and 108.95 cm was observed with 120 kg/ha seed rate. While, minimum plant height 100.76 and 105.79 cm were obtained under 80 kg/ha seed rate level.

Yield Attributes

Effect of quality seeds

It is clear from the table- 2 the length of ear head was significantly influenced by different quality of seeds. The highest length of ear (10.58 and 11.11 cm) was found under breeder seed fallowed by foundation seed (10.33 and 10.84 cm), while minimum length of ear (9.50 and 9.98 cm) was recorded with certified seed during first and second year, respectively. The data revealed that quality seeds caused marked significant variation in the two years of study. The highest weight of grains/ear (2.48 and 2.60 g) was found with breeder seed fallowed by foundation seed during 2016-17 and 2017-18. While, the lowest weight of grains/ear (2.22 and 2.34 g) was recorded with certified seed during 2016-17 and 2017-18.

Effect of row-spacing

Significant improvement in length of ear was observed under different row-spacing. The row-spacing of 22.5 cm gave maximum length of ear (10.42 and 10.94 cm) as compare to 15 cm spacing (10.10.26 and 10.78 cm), while minimum length of ear (9.72 and 10.21 cm) was recorded under broadcast during 2016-17 and 2017-18. The different row spacing significantly not affected spike length. The result was confirmed by Iqbal, *et al.* (2012) [9]. It is clear from the data the row-spacing of 22.5 cm produced significantly highest weight of grains/ear (2.44 and 2.56 g) and minimum weight of grains/ear (2.28 and 2.38 g) was recorded with broadcast during both the years of experiment**.** results indicated that some of the yield parameters showed significant difference due to row spacing. A 30 cm row spacing showed greater impact on grains/spike. It was also reported by Ali *et al.*, (2007) [1].

Effect of seed rate

Under different levels of seed rate 120 kg/ha recorded significantly maximum length of ear (10.28 and 10.80 cm, respectively) while 80 kg/ha. Yield components such as spike length 2 (cm) was maximum at seeding rate of 150 kg/ha and minimum at seeding rate of 125kg/ha. The similar findings also find by Iqbal *et al.* (2012) [9]. The application of 120 kg/ha seed rate exhibit significantly maximum weight of grains/ear (2.41 and 2.52) fallowed by 80 kg/ha seed rate (2.34 and 2.45 g) during 2016-17 and 2017-18.

Economic yield

Effect of quality seeds

Among quality seeds significantly highest grain yield (50.91 and 53.02 q/ha) was obtained under breeder seed which was recorded higher over Foundation seed and lowest grain yield was obtained in certified seed (45.45 and 47.18 q/ha) during both the years of experiment.

Effect of row-spacing

The result showed that grain yield was significantly increased (50.12 and 51.85 q/ha) at 22.5 cm row-spacing and more than (46.56 and 48.45 q/ha) broadcast during two years of investigation. in the optimization of grain yield of wheat, plant distribution is a key factor. In contrast to high yield levels, at moderate levels, widening the row space did not decrease grain yield. Highest grain yield obtained with changing in row spacing's. The grain yield was not decreased by the wider row spacing, the similar findings given by Jürg Hiltbrunner *et al.* (2005).

Effect of seed rate

During both the years of investigation the 120 kg/ha seed rate gave significantly higher grain yield (49.42 and 51.59 q/ha) than 80 kg/ha seed rate (47.91 and 49.41 q/ha). Higher grain yield requires the use of appropriate seeding rates. Significant differences among seeding rates were identified. Lower seeding rates decreased grain yield (by 0.8 Mg ha^{-1}) results provide evidence that agronomic performances are influenced less by seeding rates. Seeding rate affected grain yield therefore, seeding rate should be considered as a factor in obtaining higher grain yields. It is reported by Valério *et al.* (2013) [17].

Table 1: Effect of different treatments on initial plant population and plant height (cm)

Treatments	Initial plant population		Plant height (cm)	
	2016-17	2017-18	2016-17	2017-18
Quality seeds				
Breeder	123.34	124.73	106.69	112.05
Foundation	122.27	123.55	104.18	109.40
Certified	122.40	123.90	95.89	100.66
SE(d) ±	0.56	0.68	1.22	1.35
CD at 5%	NS	NS	3.40	3.75
Spacing				
15.0	121.35	122.80	103.52	108.71
22.50	124.96	126.38	105.13	110.39
Broadcast	121.71	123.00	98.11	103.01
SE(d) ±	0.58	0.67	0.95	1.03
CD at 5 %	1.28	1.46	2.07	2.25
Seed rate				
80	120.25	121.63	100.76	105.79
120	125.10	126.49	103.74	108.95
SE(d) ±	0.80	0.75	1.26	1.35
CD at 5 %	1.69	1.59	2.66	2.84

Table 2: Effect of different treatments on length of ear head (cm), grain weight/ear (g) and economic yield (q/ha)

Treatments	length of ear head (cm)		grain weight/ear (gm)		Grain yield (q/ha)	
	2016-17	2017-18	2016-17	2017-18	2016-17	2017-18
Quality seeds						
Breeder	10.58	11.11	2.48	2.60	50.91	53.02
Foundation	10.33	10.84	2.42	2.53	49.64	51.30
Certified	9.50	9.98	2.22	2.34	45.45	47.18
SE(d) ±	0.07	0.10	0.02	0.03	1.04	1.06
CD at 5%	0.20	0.28	0.06	0.08	2.90	2.99
Spacing						
15.0	10.26	10.78	2.40	2.52	49.31	51.20
22.50	10.42	10.94	2.44	2.56	50.12	51.85
Broadcast	9.72	10.21	2.28	2.38	46.56	48.45
SE(d) ±	0.05	0.09	0.02	0.02	0.69	0.73
CD at 5 %	0.11	0.19	0.05	0.05	1.51	1.60
Seed rate						
80	9.99	10.49	2.34	2.45	47.91	49.41
120	10.28	10.80	2.41	2.52	49.42	51.59
SE(d) ±	0.06	0.11	0.02	0.03	0.54	0.58
CD at 5 %	0.14	0.24	0.05	0.06	1.13	1.22

Conclusion

Wheat sown with breeder seed at 22.5 cm row-spacing along with optimum seed rate of 120 kg ha-1 had better growth, yield attributes, and economic yield as compared to foundation seed and 15 cm row-spacing at 80 kg/ha seed rate. The interaction effect of Q1S2R2 (Breeder seed + 22.5 cm spacing + 120 kg/ha) was found superior for achieving higher grain yield.

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