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Effect of various row spacing on Wheat (*Triticum aestivum* L.) varieties in black cotton soil in south east Rajasthan

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Abstract

A field experiment was conducted at Instructional Farm, School of Agricultural Sciences, Kota during *rabi* 2016-17. The experiment consisted of 12 treatment combinations comprising of four spacing (15.5, 17.5, 19.5, 21.5 cm) and three varieties (Raj 1482, Raj 3077, Raj 4037.) The experiment was conducted in factorial randomized block design and it was replicated four times.

Result of field experiment revealed that among three wheat varieties grown, variety Raj 3077 gave highest plant height. Maximum grain yield (5.70 t ha^{-1}), straw yield (7.90 t ha^{-1}) was recorded in variety Raj 3077. Variety Raj 3077 recorded significantly higher net returns (Rs.61630.00 ha^{-1}) and B C ratio (2.0). Amongst row spacing, growing of wheat variety Raj 3077 at 19.5 cm row spacing recorded highest dry matter at 90 DAS over other row spacing. Row spacing 19.5 cm gave significantly higher grain yield (5.10 t ha^{-1}) and straw yield (7.85 t ha^{-1}). Sowing of wheat at 19.5 cm row spacing recorded significantly higher net return and B C ratio (Rs.68800.00 ha^{-1} and 2.40).

Key words: *Row Spacing, Plant height, Grain yield, highest dry matter, straw yield, net return,Wheat (Triticum aestivum L.).*

1. Introduction

Common wheat (*Triticum aestivum* L.), also known as bread wheat, is a cultivated wheat species. Wheat is grown on more land area than any other food crop (222.42 million hectares, 2016-17) in the world. World trade in wheat is greater than for all other crops combined.(Source: Directorate of economics & statistic 2015-2016). In 2016, world production of wheat was 739.53 million metric tons making it the second most-produced cereal after maize. Since 1960, world production of wheat and other grain crops has tripled and is expected to grow further through the middle of the 21st century.

Among various agronomic factors, the row spacing of wheat is very important for proper distribution of plants over cultivated area, thereby better utilization of available soil and atmospheric resources. Wheat is generally sown in straight unidirectional rows at 22.5 cm apart. Apart 22.5 cm spacing the space between the rows of plants is so much that the plants are not able to fully utilize the available solar radiation and nutrients from the soil, due to which plants could not make sufficient use of available resources for photosynthesis (Reddy and Reddi, 2002). However, some researches carried out on the wheat spacing have indicated that reduction of spacing of wheat from normal 22.5 cm has given higher yield and better use of available resources for photosynthesis.

The narrow row spacing of 18.0 cm consistently produce the higher wheat yield as compared to wider row spacing of 24.0 cm and 36.cm (Mohammad and Wal , 2003). The development and recommendation of high yielding adaptable varieties is considered to be the first step to generate maximum production. In recent past, a number of wheat varieties were developed by plant breeders which have high yield potential but all the varieties do not perform well in the same plant spacing. Several wheat varieties have been developed according to adaptability of different agro climate zone of India. Selection of appropriate varieties is most important for increasing the yield and productivity of wheat. Hence , in present investigation an efforts was made for assessing the performance of varieties under existing agro climate conditions at varying row spacing.

2. Materials and Methods

A field experiment was conducted at the during *rabi*, 2016-17. At Research Farm, School of Agricultural Sciences, CPU, Kota. The experiment was laid out in factorial randomized block design with 12 treatments, comprising four row spacing (15.5 cm, 17.5 cm, 19.5 cm and 21.5 cm) and three varieties (Raj 1482, Raj 3077 and Raj 4037)The annual rainfall of the region is 650 – 1000 mm, most of which is contributed by south west

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monsoon from July to September. The experimental soil was black cotton clay in texture, organic carbon (0.35%), low in available nitrogen (260kg^{-1}), available phosphorus (25kg^{-1}) and available potassium (390kg^{-1}) with slightly alkaline pH (8.5)., replicated four times and The sowing of crop was done on 20.11.2017 the seed rate taken was 100 kg/ha. The crop was sown with recommended fertilizer dose (120: 60:40 kg N:P:K ha^{-1}) through urea (46%) One third of Nitrogen, Full dose of phosphorus, potassium were applied a basal dose. Remaining N were applied through urea and DAP. Plant protection measures and irrigations were provided as and when required. The data pertaining to growth parameters on wheat recorded at 90 days after sowing were plant height (cm), dry matter accumulation (g), plant population at 15 DAS, grain yield (t/ha) and straw yield (t/ha).

3. Results and discussion

Effect of treatments on plant height

Data presented in table 1 show that plant height was found to be significantly influenced due to various treatments on different varieties of wheat. Plant height of Raj 3077 at 90 DAS and at harvest stage was 103.58 cm and 105.32 cm, respectively, which was followed by Raj 4037 at 90 DAS and at harvest stage (94.1 cm, 96.13 cm), respectively.

Effect of treatments on dry matter accumulation

Data presented in table 1 show that effect of different varieties on dry matter accumulation in 0. 5 m row length by various treatments was found non significant at 90 DAS and at harvest, respectively. Among various row spacings, effect of various treatments was found significant at 90 DAS and at harvest stage of crop. Maximum dry matter accumulation was recorded at 19.5 cm spacing at 90 DAS and at harvest stage which was *at par* with 21.5 cm row spacing at both the growth stages. Nanda and Patro (1996) conducted field experiment during *rabi* season at Bhubaneswar (Orissa) to find out narrower row spacing at 15.0 cm had the highest dry matter at harvest over 20.0 cm row spacing. At Udaipur (Rajasthan), cross sowing at 22.5 cm spacing recorded significantly higher crop dry matter at all the growth stages as compared to line sowing (Suthar, 2006).

Table 1. Effect of row spacing and varieties on Dry matter accumulation, Plant Population m^{-1} row length, Plant height (cm) and Yield (t ha^{-1}) on wheat

Treatment	Dry matter accumulation (g) 0. 5 m row length		Plant height (cm)		Yield (t ha-1)	
Varieties	90 DAS	At harvest	90 DAS	At harvest	**Grain**	**Straw**
Varieties						
Raj1482	109.96	169.62	93.2	95.49	5.2	7.2
Raj3077	116.73	175.23	103.58	105.32	5.7	7.9
Raj4037	114.26	173.6	94.1	96.13	5.5	7.5
SEm ±	3.49	3.32	0.91	0.83	0.1	0.11
CD (P = 0.05)	NS	NS	2.63	2.39	0.29	0.33
Row spacing (m)						
15.5	91.25	152.1	96.91	96.4	4.4	7.1
17.5	116.65	175.02	95.96	98.03	4.5	7.35
19.5	125.1	184.1	95.85	98.89	5.1	7.85
21.5	123.02	181.4	94.96	96.58	4.8	7.5
SEm ±	4.03	3.83	1.05	0.96	0.11	0.13
CD (P = 0.05)	11.59	11.02	NS	NS	0.33	0.38

Effect of treatments on yield

Data presented in table 1 show that grain and straw yield significantly influenced various treatments by different varieties and row spacing. It was found that highest grain and straw yield was 5.7 t/ha and 7.9 t/ha of Raj 3077 variety. Grain yield was found *at par* with Raj 4037 variety (5.5 t/ha). Among various row spacing, highest grain and straw yield was recorded at 19.5 cm spacing which was *at par* with 21.5 cm row spacing. An experiment conducted at Gibson and Salmon Gums (Western Australia) during 2000 showed that narrow row spacing of 18.0 cm consistently produced higher wheat yield as compared to wider row spacing of 24.0 cm and 36.0 cm on both experimental sites Sand plain and Mallee soils (Mohammad and Wal, 2003).

4. Conclusion

Row spacing 19.5 cm registered maximum dry matter accumulation at 90 DAS and at harvest followed by 21.5 cm and 17.5 cm, all three these spacing was at par one together and found statistically superior over 15.5 cm row spacing. Row spacing 19.5 cm registered maximum grain yield (5.10 t ha^{-1}) followed by Raj 4037 (4.80 t ha^{-1}). Row spacing *i.e.* 17.5, 19.5 and 21.5 cm were statistically at to each other, but 19.5 and 21.5 cm row spacing was statistically superior over 15.5 cm. Variety Raj 3077 registered significantly higher plant height 90 DAS and harvest over varieties Raj 1482 and Raj 4037. Maximum grain yield was obtained under variety Raj 3077 (5.70 t ha^{-1}) followed by Raj 4037 (5.50 t ha^{-1}), both these varieties were statistically at par one another but significantly superior to Raj 1482.

References

[1] Anderson R, Assenheimer C, Eshpeter N, Griffiths E, Metzger B, Papworth, Lowvene, Ragan G and Vance J, Investigation into row spacing with direct seeded barley, canola and wheat. Government of Alberta, *Project report* 1-13, (2010).

[2] Bhullar MS and Wali VS, Effect of seed rate and row spacing on efficiency of clodinofop for combating Isoproturon resistant *Phalaris minor* in wheat. *Plant protection* 19:143-146, (2010).

[3] Borger CPD, Hashem A, and Pathan S, Manipulating crop row orientation to suppress weeds and increase crop yield. *Weed Science* 58(2), pp. 174–178, (2010).

[4] Choudhary S and Sharma RK, Comparative evaluation of Indian and European wheat cultivar. *Annals of Agricultural Research* 21: 454-455, (2000).

[5] Hussain M, Mehmood Z, Khan MB, Farooq S, Lee DJ, and Farooq M, Narrow row spacing ensures higher productivity of low tillering wheat cultivars. *International Journal of Agriculture and Biology* 14(3), pp. 413–418, (2012).

[6] Jat RS, Nepalia V and Jat RL, Effect of weed control and sowing on production potential of wheat. (*Triticum aestivum* L.). *Indian Journal of Agronomy* 48: 192-195, (2003).

[7] Mali H and Chaudhary J, Performance of bread wheat (*Triticum aestivum* L.) varieties under different row spacing. *Indian Journal of Agronomy* 4(2):55-57, (2011).

[8] Pandey BP, Basnet KB, Bhatta MR, Sah SK, Thapa RB and Kandel TP, Effect of row spacing and direction of sowing on yield and yield attributing characters of wheat cultivated in Western Chitwan, Nepal. *Agricultural Sciences* 4(7), pp 309–316, (2013).

[9] Porter PM and Khalilian A, Wheat response to row spacing in relay intercropping systems. *Agronomy Journal*, 87(5), pp 999–1003, (1995).