

FIXING DESIRED PLANT POPULATION FOR BETTER YIELD OF WHEAT AT GHIOR AND SATURIA UPAZILA OF MANIKGANJ DISTRICT

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ABSTRACT

The experiment was conducted at Ghior and Satoria upazilas under Manikganj district during December, 2018 to March, 2019 to fix-up the targeted plant population for confirmation of better yield of wheat. To full-fill the set objectives five seed rate such as 60kg^{ha}⁻¹, 80 kg^{ha}⁻¹, 100 kg^{ha}⁻¹, 120 kg^{ha}⁻¹ and 140 kg^{ha}⁻¹, respectively were considered as treatments. In both of the locations, due to differences of plant population the significant variations were observed in terms of plant height, number of total tiller hill⁻¹, number of effective tiller hill⁻¹, panicle length, number of grain panicle⁻¹, 1000-grain weight, grain yield and straw yield of wheat. Results revealed that 100 kg^{ha}⁻¹ seed rate produced the highest grain and straw yield (2.45 t^{ha}⁻¹, 2.48 t^{ha}⁻¹ and 4.37 t^{ha}⁻¹, 4.52 t^{ha}⁻¹) at Ghior and Satoria upazila, respectively. The lowest grain and straw yield (1.75 t^{ha}⁻¹, 1.78 t^{ha}⁻¹) were in 60 kg^{ha}⁻¹ seed rate at Ghior, whereas 3.15 t^{ha}⁻¹ in 60 kg^{ha}⁻¹ and 3.31 t^{ha}⁻¹ in 140 kg^{ha}⁻¹ seed rate at Satoria upazila respectively. The study finally concluded that excessive plant populations did not confirm the highest yield of wheat, rather the optimum/desired plant population ensured the targeted yield of wheat at Manikganj district of Bangladesh.

Key words: Wheat, seed rate, grain yield.

Introduction

Wheat (*Triticum aestivum* L.) is a crop of global significance. It is a staple food of millions of people. It supplies about 20 percent of the food calories for the world's growing population. Carbohydrate and protein are two main constituents of wheat. Wheat is considered as the king of cereal crop because its cultivation is easier, nutrient content is higher and ecologically suitable. In Bangladesh, it is the second staple food crop next to rice having an annual production of 9.58 lakh tonnes and total area of 4.39 lakh hectares (AIS, 2010). Though wheat is an important cereal crop in Bangladesh, its average yield is low compared to other wheat growing countries of the world. In Holand, UK, France and Norway, the average yield of wheat is 7.50, 6.20, 5.90 and 4.80 t/ha, respectively, whereas in Bangladesh it is only 2.10 t/ha (FAO, 1999). Wheat yield in farmers field is very low i.e. only 2 t/ha but in the research stations it is about 4 t/ha (BARI, 1990). This might be due to the use of improper production technology by the farmers. To get maximum yield it is necessary to use quality seed and improved agronomic techniques such as optimum seed rate, time of seeding, irrigation, fertilizer application, weeding, water management, time of harvest etc. There is a need to increase the yield of wheat per unit area in Bangladesh to provide the ever-increasing food requirement of the country, as the cultivable area is very limited and there is little scope to expand the area for production of wheat. Seed rate influences the yield and yield contributing characteristics of wheat (Singh and Singh, 1987). Higher amount of seed rate generally increases plant population resulting intra-crop competition thereby affecting the yield. On the other hand, lower seed rate may reduce the yield drastically as the grain yield is positively correlated with plant population (Vukadinovic *et al.*, 1986). With these end in view an attempt was undertaken to evaluate the effects of different seed rates on crop growth and yield of wheat for ensuring the food security in Bangladesh.

Materials and Methods

The experiment was conducted at Ghior and Satoria upazila under Manikganj district during *rabi* season of December, 2018 to March, 2019. Generally, the fertility status of two fields was moderate, having low status of organic matter. The above two experimental fields were also a piece of well drained high land

with moderately even topography. A variety of wheat-Shatabdi was used for conducting this study. The crop was sown on 10 December, 2018 and harvested on 15 March, 2019. There were five different seed rate such as $S_1=60 \text{ kg ha}^{-1}$, $S_2= 80 \text{ kg ha}^{-1}$, $S_3= 100 \text{ kg ha}^{-1}$, $S_4= 120 \text{ kg ha}^{-1}$ and $S_5= 140 \text{ kg ha}^{-1}$ considered as treatments. The RCBD design was practiced with 3 replications. Crop was fertilized according to variety recommendation. Intercultural operations were done as and when necessary. The crop was harvested at proper maturity. Before harvesting, 10 plants were randomly selected from each plot for collecting data on yield attributes. Data were collected on plant height, no. of total tiller per hill, no. of effective tiller, panicle length, number of grain per panicle, 1000-grain weight, grain yield and straw yield. The collected data were analyzed using computer package MSTAT-C and mean differences were adjudged by using Duncan's Multiple Range Test (Gomez and Gomez, 1984).

Results and Discussion

The effect of different seed rates significantly affected plant height, number of total tiller per hill, number of effective tiller per hill, panicle length, number of grain per panicle, 1000-grain weight, grain yield and straw yield which are presented in Tables 1-2.

Plant height: The variations in plant height linked to the seed rates are depicted in Table 1. The highest plant height was recorded as 82.11 cm which was statistically identical with S_2 and S_4 treatment and the lowest was recorded as 75.94 cm which was statistically identical with S_5 treatment at Ghior upazila. On the other hand the highest plant height (82.25 cm) was recorded in S_3 treatment which was statistically identical with S_2 and S_4 treatments and the lowest was recorded as 77.58 cm in S_5 treatment which was identical with S_1 treatment at Satura upazila (Table 1).

Table 1. Effect of seed rate on plant height, total tiller hill⁻¹, effective tiller hill⁻¹, panicle length and number of grain per panicle of wheat var. Shatabdi

Seed rate	Plant height (cm)		Total tiller hill ⁻¹		Effective tiller hill ⁻¹		Panicle length (cm)		No. of grain panicle ⁻¹	
	Ghior	Satura	Ghior	Satura	Ghior	Satura	Ghior	Satura	Ghior	Satura
S_1	75.94b	78.08b	5.43b	5.48b	3.61c	3.63c	8.30b	8.36b	29.44b	29.56b
S_2	79.87a	80.06a	5.54a	5.63a	3.84ab	3.72bc	8.81a	8.79a	32.44a	33.06a
S_3	82.11a	82.25a	5.45ab	5.59a	3.92a	3.99a	8.76a	8.89a	32.95a	32.65a
S_4	78.93ab	81.45a	5.30c	5.35c	3.73bc	3.75bc	8.60a	8.41ab	29.62b	31.55ab
S_5	77.45b	77.58b	4.91d	4.93d	3.63d	3.60d	8.26b	8.29b	27.57c	27.62c
CV	3.39	3.65	1.81	2.15	3.60	4.21	3.44	4.02	5.24	5.14
L. of sig.	**	*	**	**	*	**	**	**	**	**

Table 2. Effect of seed rate on 1000-grain weight, grain yield and straw yield of wheat var. Shatabdi

Seed rate	1000-grain weight (g)		Grain yield (tha ⁻¹)		Straw yield (tha ⁻¹)	
	Ghior	Satura	Ghior	Satura	Ghior	Satura
S_1	44.46a	43.49ab	1.75d	1.78d	3.15d	3.58cd
S_2	44.27a	44.29a	2.03b	2.06b	3.92c	3.95c
S_3	44.62a	44.68a	2.45a	2.48a	4.37a	4.52a
S_4	44.26a	44.28a	2.12b	2.29ab	4.11b	4.18b
S_5	42.92b	41.86b	1.78c	1.82c	3.27d	3.31d
CV	3.22	5.15	5.45	7.05	3.41	4.31
L. of sig.	*	*	**	*	**	**

Number of total tiller per hill: The variations in number of total tiller per hill in response to the seed rates are depicted in Table 1. Number of tiller per hill is an important yield contributing character. The highest

number of total tiller per hill was recorded as 5.54 in S_2 treatment which was statistically identical with S_3 treatment and the lowest was recorded in S_5 treatment in Ghior upazila. On the other hand the highest number of tiller per hill 5.63 was recorded as S_2 treatment which was statistically identical with S_3 and the lowest was recorded in 4.93 in S_5 treatment and S_1 , S_4 treatments remain in the middle position at Saturia upazila (Table 1).

Number of effective tiller per hill: Number of effective tiller is also an important yield contributing character. It was observed that the highest number of effective tiller was recorded as 3.92 in S_3 treatment and the lowest was recorded as 3.63 in S_5 treatment at Ghior upazila. On the other hand the highest number of effective tiller per hill as 3.99 was recorded in S_3 treatment and the lowest was recorded as 3.60 in S_5 treatment and S_1 , S_2 , S_4 treatments remain in the middle position at Saturia upazila (Table 1).

Panicle length: The highest panicle length was found 8.81cm in S_2 treatment which was statistically identical with S_3 and S_4 and the lowest was found 8.26 cm in S_5 treatment which was statistically identical with S_1 treatment. The highest panicle length 8.89 cm was recorded in S_3 treatment which was statistically identical with S_2 and S_4 treatments and the lowest was recorded as 8.29 cm in S_5 treatment which was identical with S_1 treatment at Saturia upazila (Table 1).

Number of grain per panicle: Number of grain per panicle is also an important yield contributing character. The highest number of grain per panicle was recorded as 32.95 in S_3 treatment which was statistically identical with S_2 treatment and the lowest was recorded as 27.57 in S_5 treatment and S_1 and S_4 treatments were remain in middle position at Ghior upazila. The highest grain per panicle 33.06 was recorded in S_2 treatment which was statistically identical with S_3 and S_4 and the lowest was recorded as 27.62 cm in S_5 treatment and S_1 treatment was remain in the middle position at Saturia upazila (Table 1).

1000-grain weight: Thousand grain weights varied significantly with different treatments. The highest thousand grain weight was recorded as 44.62g in S_3 treatment which was statistically identical with S_1 , S_2 , and S_4 treatments and the lowest was recorded as 42.92g in S_5 treatment at Ghior upazila. On the other hand, the highest thousand grain weight was recorded as 44.68g in S_3 treatment which was statistically identical with S_1 , S_2 and S_4 treatments and the lowest as 41.86g was recorded as S_5 treatment (Table 2).

Grain yield: Grain yield is the ultimate goal of the experiment. Grain yield varied significantly with different treatments. The highest grain yield was recorded as 2.45 t ha^{-1} in S_3 treatment and the lowest grain yield was recorded as 1.75 t ha^{-1} in S_1 treatment and S_2 , S_4 , S_5 remain in the middle position at Ghior upazila. The highest grain yield 2.48 t ha^{-1} was recorded in S_3 treatment and the lowest was 1.78 t ha^{-1} was recorded in S_1 treatment and S_2 , S_4 , S_5 remain in the middle position at Saturia upazila (Table 2).

Straw yield: Straw yield is also important yield contributing character of wheat. Straw yield varied significantly with different treatments. The highest straw yield was recorded as 4.37 t ha^{-1} in S_3 treatment and the lowest was recorded as 3.15 t ha^{-1} in S_1 treatment. The S_2 , S_4 , S_5 treatments remain in the middle position at Ghior upazila. The highest straw yield 4.52 t ha^{-1} was recorded in S_3 treatment and the lowest (3.31 t ha^{-1}) was recorded in S_5 treatment. Here the S_1 , S_2 , S_4 remain in the middle position at Saturia upazila (Table 2).

Result revealed that, plant height, number of effective tiller, number of grain per panicle, 1000-grain weight, grain yield and straw yield was found highest both in Ghior and Saturia upazila (Table 1, 2). In most growth and yield parameters it was found the highest yield in 100 Kg ha^{-1} seed rate. Comparatively lower and higher seed rate i. e., 60 and 140 Kg ha^{-1} produced lower grain yield, straw yield and other yield attributes. It might be due to low population or excess population. In case of 60 Kg ha^{-1} seed rate, it produced minimum number of plant population, on the other hand 140 Kg ha^{-1} seed rate produced excess number of plant population, which are faces in malnutrition. Ultimately all yield attributes become hampered. These results are in agreement with the findings of Kabir *et al.*, 2009 and Soomro *et al.*, 2009.

Conclusion

It can be concluded that among five seed rates 100 Kg ha⁻¹ is suitable for getting higher yield. Between two locations higher grain yield and other yield attributes were found in Satoria upazila. It may be due to meteorological effect. Further experimentation is needed for more confirmation.

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