THE GROWTH AND YIELD OF A FEW SEMI-DWARF WHEAT VARIETIES AS AFFECTED BY SEED RATES

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An experiment was conducted at the Agronomy Field laboratory of the Bangladesh Agricultural University, Mymensingh, representing the non calcareous dark grey floodplain soils of Bangladesh in order to evaluate the effect of seed rate on the yield and yield contributing characters of various wheat varieties. The yield produced by Inia 66 and Sonalika differed significantly from Kalyansona. Inia 66 produced the highest grain yield (2.81 tons/ha) which was identical to that of Sonalika (2.68 tons/ha). Seed rates used in the study was 80, 100, 120, 140, 160 and 180 kg/ha. The medium seed rates of 120 to 140 kg/ha were found to perform better in the production of wheat grain.

INTRODUCTION

In Bangladesh, wheat occupies the second position as cereal crop next to rice. It covers an area of about 46,700 acres as stated by Brammer [3]. Reports show that the high yielding Mexican wheat varieties gave 3714 to 7900 kg grain yield per ha. and it could be more economical to grow wheat as compared to rice and other crops in the winter season [1].

The high yielding Mexican cultivars of wheat require proper management for optimum growth and production. For the successful production of crops various factors such as good varieties, cultural practices, proper seed rate and irrigation are considered to be the major factors. A good variety of wheat with optimum seed rate produces optimum number of plants per unit area [4].

An attempt has therefore, been made in this investigation to evaluate the effect of seed rates on the yield of grains and other yield contributing characters of some Mexican wheat varieties.

MATERIALS AND METHODS

The experiment was conducted at the Agronomy Field Laboratory of Bangladesh Agricultural University, Mymensingh during the period from November 1979 to April 1980 on a medium high land belonging to the non calcareous dark grey foodplain soils. The soil of the experimental field was silty loam having soil reaction nearly to neutral.

The three exotic varieties of wheat used in the trial were (i) Sonalika, (ii) Kalyansona and (iii) Inia 66. All these varieties were originated from Mexican wheat varieties.

The experiment was laid out in a split plot design. The number of treatments (3x6 = 18) used in this study were replicated 3 times giving altogether 18x3 = 54 unit plots. To each main plot one variety was assigned. The size of the each unit plot was 2.5x4.0m ($10m^2$), i.e. 1/1000th of ha. After full preparation of the land, it was uniformly fertilized with a basal dose of 110 kg N, 80 kg P_2O_5 and 60 kg K_2O per hectare from urea, triple superphosphate and muriate of potash, respectively. The entire quantity of triple super phosphate and muriate of potash and half of the total quantity of urea were applied during land preparation and the rest half of urea was applied as top dressing in two equal instalments, at 24 days and 42 days after sowing. The plots were then laid out.

The seed rates that were assigned in the sub-plot are given below:

1. 80 kg per hectare coded as S_1
2. 100 " " " " S_2
3. 120 " " " " S_3
4. 140 " " " " S_4
5. 160 " " " " S_5
6. 180 " " " " S_6

The seed was sown on November 25, 1979 and was harvested plotwise at maturity on March 21, 1980. The crop was sown in dibbling method with line to line distance

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of 25 cm. All cultural operations including weeding, thinning, spraying, irrigating etc. were performed as an when necessary. The number of plants kept for each treatment are given in Table 1. The yield contributing characters were studied in 10 randomly selected plants from each unit plot. Grain and straw yields recorded plot-wise were expressed in tons/ha.

Table 1. Number of plants for each treatment per meter of a row kept after full establishment

Variety	Seed rate (kg/ha)					
	80	100	120	140	160	180
Sonalika	50	62	74	86	98	110
Kalyansona	60	72	84	96	110	120
Inia 66	55	67	79	91	103	115

All data were statistically analysed and the mean difference were adjudged by Duncan's New Multiple Range Test according to steel and Torrie [8].

RESULTS AND DISCUSSION

The results on yield and different yield contributing characters studied have been presented in Table 2. The cultivar Sonalika showed highest plant height (89.92 cm). It differed significantly from Kalyansona and Inia 66. Kalyansona produced lowest plant height of 79.43 cm. Pendleton

and Dungan [5] observed that plant height was varied depending on cultivars used.

Seed rate of 80 kg per hectare produced maximum plant height which was significantly different from other seed rates used. The lowest plant height was observed for the highest seed rate (180 kg per ha) used. The present finding regarding this particular character is in agreement with that of Pendleton and Dungan [5] and Soroup and El-Sharkawy [7]. They suggested that the higher plant height with lower seed rates were due to minimum number of plants per unit area and subsequent vegetative growth. Lower seed rates provide lower number of population per unit area, facilitated more spacing, maximum light and nutrients for the plants, resulting in vigour growth.

The lowest seed rate (80 kg per hectare) produced the highest number of effective tillers per plant. The seed rates of 80 and 100 kg per hectare produced identical values. From this study it was noted that lowest the seed rate highest was the number of effective tillers. This might be due to wider space and consequently less competition which favoured tillering and resulted in the production of more effective tillers. The similar results on the number of effective tillers per plant were reported by pendleton and Dungan [5] and Soroup and El-Sharkawy [7].

The length of the spike was found to be the highest in cultivar Sonalika (Table 2) which was identical with Inia 66 but differed significantly from that of Kalyansona. Seed rates also exerted a great deal of variation in the length of

Table 2. Effect of cultivar and seed rate on different agronomic characters studied in wheat

Treatment	Plant height (cm)	No. of effective tillers/plant	Length of spike (cm)	No. of fertile grains/spike	Weight of 1000 grains (g)	Grain yield/ha (tons)	Straw yield (tons/ha)
a) Variety							
Sonalika	89.92a*	3.77a	8.04a	37.42c	42.19a	2.68a	3.85a
Kalyansona	79.43c	3.79a	7.43b	41.42a	32.43c	2.33b	3.57b
Inia 66	84.84b	3.82a	7.88a	39.01b	35.85b	2.81a	3.91a
b) Seed rate (kg/ha)							
80	87.52a	4.38a	8.22a	41.76a	38.16a	2.41bc	3.33e
100	85.93b	4.21ab	7.94b	40.70ab	37.36b	2.60b	3.73d
120	85.36b	4.05b	8.00b	39.61bc	37.46ab	2.97a	3.84c
140	84.36c	3.70c	7.75c	38.94cd	36.97b	2.92a	3.77d
160	82.94d	3.27d	7.46d	37.78de	35.79c	2.50bc	3.93b
180	82.26d	3.12d	7.34d	37.71e	35.18c	2.24c	4.07a

*Figures with letter in common do not differ significantly.

spike. The highest length of spike was produced by the lowest seed rate (80 kg per hectare). This was significantly different from the remaining seed rates. The shortest length of spike was produced by the seed rate of 180 kg per hectare. Maximum legnth of spike recorded due to the minimum seed rate might be the result of less competition of plants. The results obtained by Soroup and El-Sharkawy [7] were in the partial agreement with the present finding.

The interaction of the cultivars and seed rates significantly influenced the length of the spike. The seed rate of 80 and 180 kg per hectare when sown with cultivar Sonalika produced the longest and shortest length of spike. A similar trend was observed in the case of cultivars Kalyansona and Inia 66 with slight deviation. However, it can be stated that cultivars maintained a general trend of increasing the length of spike with decreasing seed rates. Sonalika possesses the maximum length of spike with the seed rate of 80 kg per hectare and the minimum length of spike was produced by Kalyansona with the seed rate of 180 kg per hectare.

Regarding the number of fertile grains per spike, the cultivar Kalyansona produced the highest number of fertile grains per spike which differed significantly from that of Inia 66 and Sonalika. Inia 66 produced the second highest number and the difference was significant. Singh *et al.* [6] observed a varietal differences in their experiment in respect of fertile grains per spike which was similar to the present study.

It has been found from the study that the lower the seed rates the higher is the fertility of grains per spike. The lowest seed rate (80 kg per hectare) produced the highest number of fertile grains per spike. This was identical with the seed rate of 100 kg per hectare, which was different from the rest of the seed rates used. Soroup and El-Sharkawy [7] also observed that the lower the seed rates the higher was number of the grains per spike. It can be postulated from the result that, due to lower rate the population per square meter was lower as a result of which plants obtained better environment for growth and development and ultimately produced a higher number of fertile grains per spike.

In respect of 1000 grains weight the cultivar Sonalika produced the highest seed weight which was significantly different from the other cultivars used. Kalyansona, the lowest producer of 1000 grain weight differend significantly with Inia 66. This result was in partial agreement to Singh *et al* [6].

The lowest seed rate (80 kg per ha.) produced highest 1000 grains weight which was identical with that of 120 kg per ha. There was, however, no significant difference ob-

served among the rates of seeds at 100, 120 and 140 kg per ha. and also between 160 and 180 kg per ha. The highest weight of 1000 grains weight might be the result of the thinner population and higher spike length which favoured the better formation of grains. The result obtained in this study was supported by Barthakur *et al.* [2]

The grain yield produced by Sonalika and Inia 66 were significantly higher than Kalyansona (2.33 tons per ha.) Inia 66 gave the highest grain yield (2.81 tons per ha.) The present findings are in agreement with those of Barthakur, *et al.* and Vaishya and Singh [9].

The highest grain yield of 2.97 tons per ha. was observed from the seed rate of 120 kg per ha. and this was identical with that of 140 kg per ha. (2.92 tons grains/ha). The seed rates 80, 100 and 160 kg per ha. statistically produced a similar grain yield. The lowest yield was obtained for 180 kg seed rate per ha. From this study it can be concluded that neither the lower seed rates nor the higher were better for obtaining higher grain yield. The medium seed rate of 120 or 140 kg per ha. was the best. Vaishya and Singh [9] found that the seed rate of 125 kg per ha. and above showed an appreciable increase of grain yield. El-Sharkawy *et al* [4]. found significantly lower grain yield in Mexican wheat for 80 kg of seed rate than 100 kg per ha.

The effect of cultivars and seed rates showed a significant variation on straw yield. The cultivar Inia 66 produced the highest straw yield of 3.91 tons per ha. and was identical with Sonalika (3.85 tons per ha). These two cultivars produced significantly higher straw yield than that of Kalya Kalyansona (3.57 tons per ha.).

Different investigators have reported different findings in this aspect. The finding of Pendleton and Dungan [5] and Vaishya and Singh [9] was that straw yield influenced mostly by the choice of the variety which supported the result of the present study.

Regarding seed rates, the highest seed rate (180 kg per ha.) produced the highest straw yield (4.07 tons per ha.). The lowest seed rate (80 kg per ha.) produced the lowest straw yield (3.33 tons per ha.). This indicated that higher the seed rates the higher was the straw yield brought about by the higher number of population per unit area.

The straw yield was increased with increased rate of seeds per ha. as reported by Vaishya and Singh [9].

From the study it can be concluded that the cultivar Inia 66 was the best performing cultivar considering all the agronomic characters studied. Following Inia 66, Sonalika was found to be the next superior cultivar. Considering the effect of seed rate it can be suggested that higher grain yield can be obtained from a medium seed rate of 120 to 140 kg per ha.

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