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Effect of Sowing Methods and Seed Rates on Grain Yield and Yield Components of Wheat Variety Pak-81

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Abstract: The results revealed that sowing method greatly affected the number of fertile tillers, biological yield, grain yield and harvest index value whereas grain spike^{-1} and 1000-grain weight were non significant. Among the method pore method supersede broadcast method. Similarly seed rates also highly significantly affected the grain yield and yield components except 1000-grain weight. Seed rate of 175 kg ha^{-1} produced grain yield of 5325. 13 kg ha^{-1} and proved to be the most economical seed rate. Though the interaction of methods and seed rates on number of fertile tillers and biological yield were highly significant, all other parameters were non significantly affected.

Key words: Sowing methods seed rate, grain yield

Introduction

Wheat (*Trfticum aestivum* L.) belongs to the family poaceae tribe hordeae. It is the most important winter cereal and food grain crop in the world. Wheat is primarily used as a staple food which provides more protein than any other cereal crop. It is consumed in many forms like bread, cakes, biscuits, bakery products and many other confectionery products. More over its straw is used as animal feed and also in the manufacturing of papers. Wheat has a wide range of adaptability to various climatic and soil conditions. The chief leading wheat producing districts in Pakistan are Jhang, Gujranwala, Vehari, Sahiwal and Okara in Punjab. Nawabshah, Therparkar, Haiderabad, Khairpur and Sakhar in Sindh. Swat, Bannu and Dora Ismail Khan in N.W.F.P. while Jafer Abed and Tamboo in Baluchistan (Shah, 1994). Amongst many factors of crop production the pattern of planting is of great significance, as it not only determined the proper crop stand establishment but also the production of individual plant through balancing the plant to plant competition and facilitating the conversion of light energy to harvest yield of crop. There is no uniform recommendation by the agronomists regarding the seed rate for unit area, for example Ciha (1983) reported that higher yield can be obtained by sowing of 75 kg ha^{-1}. On other hand Salazar *et al*. (1996), reported that wheat seeded at a rate as low as 5 kg seed ha^{-1} can yield as much grains yield as conventional seeding rate, while Khan (1993) and Shah (1994) recommended 100 kg seed rate ha^{-1} for obtaining higher grain yield.

Materials and Methods

The effect of sowing methods and rates on wheat variety Pak-81 were studied at the agronomic research area, Faculty of Agriculture, Goma] University, D.I. Khan, during the winter 1993-94.

Two seeding methods i.e., M_1 Mechanical row seeding method (pore method) and M_2 broadcast seeding method and seven seeding rates i.e., 100, 125, 150, 175, 200, 225 and 250 kg ha^{-1} were evaluated for their effects on yield components.

The experiment was laid out in split-plot design with four replications with a plot size of 3x5 m^2. Methods of sowing were allotted to main plots and seeding rates to sub-plots. All other agronomic practices were kept constant except treatments.

The data collected was subjected to the analysis of variance techniques (Steel and Torrie, 1984) and duncan's multiple range test at 1% level of probability used for comparing the treatment means.

Results and Discussion

Number of fertile tillers (m^{-2}): Table 1 indicated that sowing method, seed rates and their interaction had highly significant effect on fertile tiller. Pore method of sowing gave more fertile tillers m^{-2} as compared to that of broadcast method. A seed rate of 175 kg ha^{-1}and pore method (S_1 M_1) produced maximum average number of fertile m^{-2} followed by S_5 M_2, S_6 M_2 produced minimum average number of tillers m^{-2}. The interaction between methods and seed rates were also found to be highly significant.

Increased number of fertile tillers in pore method could be ascribed to proportionate distribution of seed and better start as compared to the broadcast method. A seed rate of 175 kg ha^{-1} gave maximum number of fertile tillers as compared to both (S_5 M_2 and S_2 M_2) lower and higher seed rates. Similar finding were reported by Barriga and Pihan (1980), Markovic (1983), Hazar and Ceylon (1985) and Sadiq and Lalah (1986). They noted that by increasing sowing rate increased the number of fertile tillers.

Number of grains spike^{-1}: The potential of grains spike^{-1} is measured in term of its number of grains which is an important yield component. The data presented in Table 2 indicates that number of grains spike^{-1}by sowing methods and their interaction with seed rates was significantly affected by seed rates. Pore method of sowing showed slightly more number of grains spike^{-1} as compared to broadcast method. Table 2 showed that the grains of 58.13 spike^{-1} is in S4 whereas minimum number (43.95 grain spike^{-1} was computed in S1. The decreased in number of grains spike^{-1} by increasing sowing rates may be due to excessive densities, such findings have also been reported by Hazar and Ceylon (1985), Abd-El-Gawad *at al*. (1980) and Anderson (1987).

Table 1: Number of fertile tillers (m^{-2}) of wheat variety Pak-81 as affected by sowing methods and seed rates

	Seed rates (kg ha^{-1})							
Methods	100	125	150	175	200	225	250	Mean
Pore	374.50	327.25	401.00	445.25	326.75	375.75	278.50	361.28 A
Broadcast	288.50	370.25	344.75	378.00	229.75	230.75	324.25	309.39 B
Mean	331.5D	384.80	372.913	411.6A	278.0F	303.4 E	301.4 E	

Means not sharing a letter in common differ significantly at 1% level of probability

Table 2: Number of grains $spike^{-1}$ of wheat variety Pak-81 as affected by sowing methods and seed rates

	Seed rates (kg ha^{-1})							
Methods	100	125	150	175	200	225	250	Mean
Pore	52.70	48.97	51.90	56.12	54.37	48.37	42.95	50.77
Broadcast	49.86	50.22	50.77	53.02	49.62	4-4.00	44.40	48.84
Mean	51.28 AB	49.60 AC	51.34 AB	54.58 A	52.00 AB	46.19 CD	43.670	

Means not sharing a letter in common differ significantly at 1% level of probability

Table 3: 1000 grain weight (g) of wheat variety Pak-81 as affected by sowing methods and seed rates

	Seed rites (kg ha^{-1})							
Methods	100	125	150	175	200	225	250	Mean
Pore	38.50	36.48	37.25	39.68	37.55	38.05	38.95	38.00
Broadcast	38.88	38.70	37.83	409.5	38.35	35.83	37.18	37.96
Mean	37.46	37.59	37.54	40.31	37.95	36.94	38.06	

Table 4: Biological yield (kg ha^{-1}) of wheat variety Pak-81 as affected by sowing methods and seed rates

	Seed rates (kg ha^{-1})							
Methods	100	125	150	176	200	225	250	Mean
Pore	10960.3	10836.8	13292.8	14000.3	13474.0	15084.0	14145.3	13084.8 A
Broadcast	7729.3	9285.8	9431.5	11253.5	11253.8	12950.3	13373.8	10793.5 El
Mean	9345 0	995113	11380 C	12780 8	1236013	14020 A	13760 A	

Means not sharing a letter in common differ significantly at 1% level of probability

Table 5: Harvest index value (%) of wheat variety Pak-81 as affected by sowing methods and seed rates

	Seed rates (kg ha^{-1})							
Methods	100	125	150	175	200	225	250	Mean
Pore	41.20	48.80	40.41	39.87	36.85	29.54	28.19	37.8613
Broadcast	40.92	49.25	51.04	430.96	45.78	27.90	29.24	41.16 A
Mean	41.19 B	49.03 A	45.72 AS	41.91 8	41.318	28.72 C	28.72 C	

Means not sharing a letter in common differ significantly at 1% level of probability

Table 6: Grain yield (kg ha^{-1}) of wheat variety Pak-81 as affected by sowing methods and seed rates

	Seed rates (kg ha^{-1})							
Methods	100	125	150	175	200	225	250	Mean
Pore	4462.5	5306.5	5318.0	5580.8	4973.3	4452.5	3900.3	4854.8 A
Broadcast	3170.0	4556.5	4785.3	5069.5	5122.8	3602.8	3918.3	43176.9 B
Mean	3811.3 B	3931.5 B	5051.3 A	5325.3 A	5048.0 A	4027.6 B	3909.3 B	

Means not sharing a letter in common differ significantly at 1% level of probability

1000-Grain weight: This is a very important character of wheat as yield component. The averages of 1000-grain weight of wheat variety Pak-81 given in Table 3, would reveals that methods of sowing, seed rates and their Interaction had non significant effect on 1000-grain weight. As regard that methods of sowing the maximum mean weight of 38.00 g was recorded in pore method and minimum weight of 37.96 g was recorded in broadcast method. It is indicated In the Table 3 that the highest 40.95 g of 1000-grain weight was in S4.

Kandera (1988) reported that grain weight is controlled by environment, genetic make-up, soil fertility specially soil nitrogen and phosphorus.

Biological yield: The data regarding biological yield ha^{-1} given in Table 4 show that the biological yield of wheat ha^{-1} is highly significantly affected by methods of sowing and seed rates but significantly affected by their interaction. Pore method of sowing as shown in Table 4 indicated that biological yield ha^{-1} was more as compared to that of broadcast method of sowing, The highest mean biological yield 13084.75 kg ha^{-1} was noted in pore method, Whereas the least biological yield 10793.5 kg ha^{-1} was recorded in broadcast method. It is evident from table that the highest biological yield that were obtained from S_6 M_2 and the lowest biological yield was found in S_1 M_2. Higher biological yield ha^{-1} found in pore method as compared to broadcast method. This may be due to more plant per unit area. Liu *et al*. (1981) reported that climatic factors on agronomic characters varied among cultivars

and sowing methods.

Harvest Index: The relationship between total biological yield of crop was expressed in term of harvest index which ultimately determines the ability of converting the dry matter into economic yield. The analysis of variance pertaining to harvest index for the different sowing methods and seed rates are given in Table 5 which indicate that though there was visible differences among all the treatments but these differences were statistically non significant. On average the harvest indices of methods ranged between 37.85 to 41.18% and harvest index ices of seed rates ranged between 41.0 and 28.72%. It was evident from the Table 5 harvest indices of S_6 and S_1 were less than the other treatments. This was clearly indicated that even the physiological ability of wheat plant to utilize dry matter towards economic yield was not affected to a significant extent by associated cultivars.

Grain yield (kg ha^{-1}): The grain yield ha^{-1} is a function of the integrated effect of the yield components which were influenced differently by growing conditions. The data presented in Table 6 showed that sowing methods and seed rates had highly significant effects whereas their interactions showed non significant effects. The highest mean grains yield of 4856.62 kg ha^{-1} was noted in pora method and the least grain yield of 4317.86 kg ha^{-1} was found in broadcast method of sowing. There were little differences in grain yield as affected by pora and broadcast methods of sowing. It is evident from the table that the highest grain yield was in S_4 M_1 and the lowest grain yield was in S_1 M_1 decreased grain yield ha^{-1} with an increase in seed rates may be attributed to lodging of crop and shriveled grains, such findings have also been reported by Ciha (1983) that increase rate about 200 kg ha^{-1} had not significantly affected the grain yield.

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