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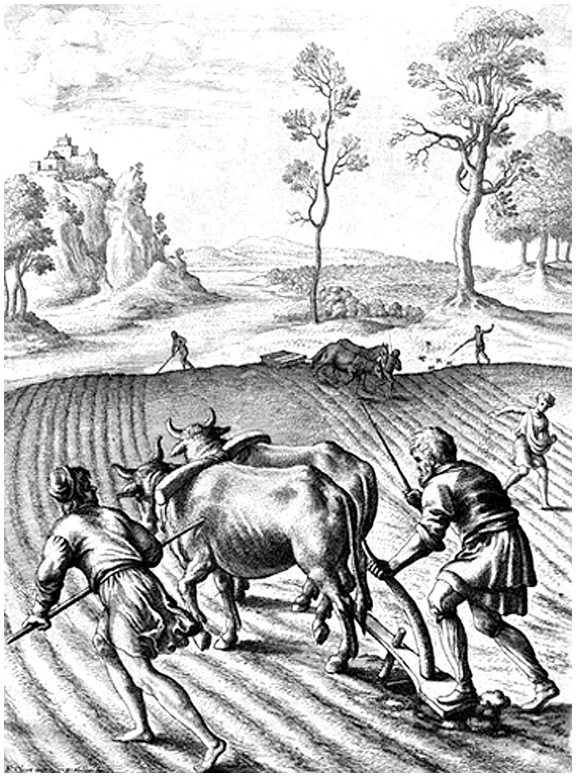

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Effect of Seed Rate and NPK Fertilizer on Growth and Yield of Wheat Variety Punjnad-1

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Abstract: The study was conducted for two consecutive crop seasons at Agronomic Research Station, Bahawalpur during Rabi 2000-2001 to 2001-2002 to evaluate maximum yield potential of wheat variety punjnad-1 as affected by various seeding rates 75, 100, 125 and 150 kg ha^{-1} and NPK levels 0-0-0, 100-50-0, 150-100-50 and 200-100-50 kg ha^{-1}. Maximum wheat grain yield of 4293 kg ha^{-1} was recorded with fertilizer, level of 150-100-50 NPK kg ha^{-1} with seeding rate of 125 kg ha^{-1}. It was closely followed by same fertilizer level with seeding rate of 100 kg ha^{-1} by giving 4287 kg grain yield ha^{-1} which showed that equally good results were obtained with fertilizer dose of 150-100-50 kg ha^{-1}. It showed that higher dose of NPK fertilizer induce more tillering and grain weight in wheat plants under low seed rate which compansate reduction in grin yield. In both seasons increasing fertilizer levels NPK upto 150-100-50 kg ha^{-1} with seeding rate of 75, 100 and 125 kg ha^{-1} significantly and linearly enhance wheat grain yield while reduction in yield was obtained beyond this fertilizer dose and seeding rate.

Key words: *Triticum aestivum* L., seed rate, NPK fertilizer levels, yield components, Pakistan

Introduction

Wheat (***Triticum aestivum*** L.) is the main food crop of Pakistan which is grown on an area of 8.0463 million hectares with an annual production of 21.078 million tonnes of grain, giving an average yield of 2.491 tonnes per ha during the year 1999-2000 (Anonymous, 2002). This yield level of wheat is far below than the potential yield, despite all out efforts made in this direction, yield of wheat is a result of many contributing factors, among these seeding rate and NPK fertilizer are also important and can only contribute by using appropriate seed rate and dose of NPK fertilizers.

Ahmad ***et al.*** (1995) conducted experiment using seed rates of 40 , 60, 80, 100 and 120 kg ha^{-1}. Kafil (1996) concluded that higher grain yield of whet was obtained when the crop was grown at the seeding rate of 100 kg ha^{-1}. This increased grain yield was due to increased fertile tillers per unit area. Khan (1996) concluded that higher grain yield of wheat was recorded when the crop was grown at the seeding rate of 125 kg ha^{-1}. This increased grain yield was due to increased fertile tillers per unit area.

Upadhyay and Tiwari (1996) concluded that wheat cv. Sonalika and Lok 1 were sown at rates of 90, 120 or 150 kg ha^{-1} and mulched with 10 t. rice straw, 5 t. sawdust or soil mulches. Lok 1

gave significantly higher grain yield than Sonalika, grain yield increased up to 120 kg N which was higher with a sowing rate of 150 than 100 kg ha^{-1} and mulching with rice straw produced the highest grain yield. Arif ***et al.*** (1997) reported that grain yield was affected significantly by seed rates. Seed rate of 100 kg ha^{-1} proved to be highly economical as compared to 125 and 150 kg ha^{-1}. Rafique ***et al.*** (1997) reported that after planting wheat using four seeding densities, 40, 80, 120 and 160 kg ha^{-1} that the highest grain yield of 28.80 q. ha^{-1} was obtained with seed rate of 120 kg ha^{-1}. Naresh ***et al.*** (1999) reported that wheat cv. S 308 was given 40 , 80 or 120 kg N ha^{-1} and was not mulched. Growth and yield were generally better with 80 or 120 kg N than 40 kg and with mulching than without.

Auti ***et al.*** (1999) reported that wheat cv. HD 2189 was given 30-15-15, 60-30-30, 90-15-45 or 120-60-60 kg NPK ha^{-1}, using 5 different sources. Grain and straw yield, grain protein content and N and K uptake increased with increasing fertilizer rate. There ware no significant differences between the sources. Maqsood ***et al.*** (1999) determine the response of two wheat genotypes, LU-26 and Pak-81 to NPK application at 0- 0 - 0, 100-50-0, 100-75-0 and 100-100-50 kg ha^{-1} under late sown conditions were carried out following rice on a sandy clay loam soil at Faisalabad. LU-26 showed a greater response to fertilizer application than Pak-81. Application of K did not significantly increase wheat yield over NP.

Nazir ***et al.*** (2000) performed experiment using seed rates of 100 and 150 kg ha^{-1}. Seed rate of 150 kg+ ha^{-1} gave significantly higher grain yield (3101 Kg ha^{-1}) than 100 Kg ha^{-1}. The present study was conducted to find out the appropriate seed rate and NPK fertilizer dose for newly evolved wheat variety Punjnad-1 under irrigated conditions of Bahawalpur.

Materials and Methods

The study was carried out at Agronomic Research Station, Bahawalpur during Rabi 2000-2001 to 2001-2002 to find out the appropriate seed rate in exploring the mamximum yield potential of wheat variety Punjnad-1. The trial was laid out in Split Plot design with three replications and a pot size of 4.5 X 6 m^{-2} having fertilizer in main plots and seed rate in sub plots. The experiment involved the following levels of two factors:

Fertilizer Kg ha^{-1}

	N	P_2O_5	K_20
F_1	0	0	0
F_2	100	50	0
F_3	150	100	50
F_4	200	100	50

Seed rate Kg ha^{-1}

S_1	75
S_2	100
S_3	125
S_4	150

The data on yield and yield components were recorded. The data recorded were statistically analysed using least significant difference test at 5% level of probability (Steel and Torrie, 1980).

Results and Discussion

The analysis of variance showed significant differences among different levels of NPK fertilizer for all the characteristics at different seeding rates. A thorough scrutiny of the data revealed superiority of seed rate of 125 kg ha^{-1} over others and among fertilizer 150-100-50 NPK kg ha^{-1} was the best for all growth parameters and consequently the grain yield. The data given in Table 1 depicts a detailed scenario of yield performance of different NPK levels at different seeding rates. The highest mean grain yield of 3458 kg ha^{-1} was obtained when seed rate was

Table 1: Wheat grain yield kg h^{-1} as affected by different seed rates (S) and fertilizer levels (F) during Rabi year 2000-2001 to 2001-2002

	Fertilizer levels				
Seed rates	F_1	F_2	F_3	F_4	Mean
S_1	1392k	3559h	4129e	4174de	3313c
S_2	1456ij	3702g	4287a	4224bc	3417b
S_3	1500i	3740f	4293a	4231b	3458a
S_4	1515i	3798f	4190cd	4160de	3416b
Mean	1466C	3700B	4225A	4197A	
Cd_1 for fertilizer	46 kg ha^{-1},	Cd_1 for seed rates	33 kg ha^{-1},	Cd_1 for fertilizer X seed rates	46 kg ha^{-1}

Table 2: Number of fertile tillers (m^{-2}) of different seed rates (S) at different fertilizer levels (F) of year 2000-2001 to 2001-2002

	Fertilizer levels				
Seed rates	F_1	F_2	F_3	F_4	Mean
S_1	249j	340h	372f	392bcd	338.0C
S_2	251j	258g	382e	395abc	346.2B
S_3	254j	362g	384de	400ab	350.1B
S_4	266l	372f	389cde	402a	357.3A
Mean	254.9D	357.8C	381.5B	397.3A	
Cd_1 for fertilizer	5.929 kg ha^{-1},	Cd_1 for seed rates	6.229 kg ha^{-1},	Cd_1 for fertilizer X seed rates	8.855kgha^{-1}

Table 3: 1000-grain weight (g) of different seed rates (S) at different fertilizer levels (F) of Year 2000-2001 to 2001-2002

	Fertilizer levels				
Seed rates	F_1	F_2	F_3	F_4	Mean
S_1	20f	39bc	40ab	38.67cd	34.42A
S_2	19.33fg	39bc	40.33a	38.33cd	34.25AB
S_3	18.67gh	37.67de	39.33abc	38.33cd	33.50BC
S_4	17.67h	37e	38.67cd	37.67de	32.75C
Mean	18.92C	38.17 B	39.58A	38.25B	
Cd_1 for fertilizer	1.267 kg ha^{-1},	Cd_1 for seed rates	6.229 kg ha^{-1},	Cd_1 for fertilizer X seed rates	8.855kgha^{-1}

125 kg ha^{-1}. Seed rate more or less than this rate resulted in significantly lowered values for all the treatments. Therefore, seed rate of 125 kg ha^{-1} may be considered as optimum for maximum wheat grain yield. As far as fertilizer levels were concerned a fertilizer dose of 150-100-50 NPK kg ha^{-1} was optimum for maximum wheat grain yield of 4225 kg ha^{-1} followed non significantly by 4197 kg ha^{-1} where NPK fertilizer was given @ 200-100-50 ha^{-1}. A significantly lowered values were recorded when fertilizer was given @ 100-50-0 NPK kg ha^{-1} while very poor results were obtained by control plots. Similar findings were reported by Ahmed ***et al.*** (1995) Khan (1996), Upadhyay and Tiwari (1996) Raifq ***et al.*** (1997) and Auti ***et al.*** (1999) However, some contradictory findings were reported by Kafil (1996), Arif ***et al.*** (1997) Maqsood ***et al.*** (1999) and Nazir ***et al.*** (2000). The interaction between fertilizer levels and seed rate was also significant reflecting optimum seed rate for different NPK levels.

Fertile tillers (m^{-2})

A glance at the Table 2 revealed that highly significant values for fertile tillers were recorded when seed rate was 150 kg ha^{-1} followed significantly by 125 and 100 kg ha^{-1} seed rate respectively While lowest values were recorded where seed rate was 75 kg ha^{-1} for this yield component . As far as fertilizer levels were concerned fertile tillers were maximum when fertilizer was given @ 200-100-50 NPK kg ha^{-1} while significantly lowest values were recorded by all the other fertilizer levels. The interaction between fertilizer levels and seed rate was also significant. Similar findings were reported by Kafil (1996) and Khan (1996).

1000 Grain weight (g)

It is clear from Table 3 that maximum 1000 grain weight was obtained when seed rate was the minimum while lowest values for this yield component were recorded by increasing seed rate to the maximum level. As far as fertilizer levels were concerned 1000-grain weight was maximum when fertilizer was given @ 150-100-50 NPK kg ha^{-1} . Fertilizer more or less than this level this yield component decreased significantly. The interaction between fertilizer levels and seed rates was also significant.

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