

<http://www.pjbs.org>

PJBS

ISSN 1028-8880

**Pakistan
Journal of Biological Sciences**

ANSI*net*

Asian Network for Scientific Information
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan

Effects of NP Levels, Seed Rates and Row Spacing on Wheat

Khair Mohamamd Kakar, Muhammad Arif and ¹Shaukat Ali
Department of Agronomy, NWFP Agricultural University Peshawar, Pakistan
¹Department of Agriculture Extension Baluchistan, Peshawar, Pakistan

Abstract: NP levels of 120:60, 180:80 and 240:100 kg ha⁻¹, seed rates of 100, 125 and 150 kg ha⁻¹ and row spacing of 15, 30 and 45 cm were studied in the experiment. Tillers m⁻², plant height, thousand grain weight, grain yield and biological yield were significantly affected by NP levels while tillers m⁻² and plant height of wheat were significantly affected by seed rates and row spacing as well.

Key words: Wheat, NP levels, seed rates and row-spacing

Introduction

The prosperity of Pakistan depends directly and indirectly on proper wheat husbandry and therefore, any improvement in yield and production will improve the food situation of the country and well being of the farmers and all others. The future targets, to meet the food requirements of the growing populations, can be achieved either by increasing area under wheat or maximizing yield per unit area. Production can also be enhanced by adopting appropriate production technology with use of high yielding varieties, proper sowing time, optimum seed rate, adequate amount of fertilizer and proper planting geometry i.e. (line to line or row to row distance). Among the several factors responsible for low yield in Pakistan, late planting, use of unbalanced and low rate of fertilizers and improper seed rates are important and research on these limiting factors will certainly lead to high yields. Some investigators concluded that narrow rowed sowing was superior in yield and more economical than broader rows (Sumkova, 1956; Tetterfield, 1959 and Pereira *et al.*, 1988). Grain yield of wheat was significantly increased with increasing NP levels to a certain level (Paulsen *et al.*, 1984; Ali, 1990 and Sultan *et al.*, 1991). Ghaffar and Shahidullah (1987) obtained the highest grain yield at seed rate of 140 kg/ha and eminent biological yield at the rate of 180 kg/ha. Since not much work has been conducted on the combined effect of seed rate, planting geometry and fertilizer levels on wheat, hence a study was intended to find the combine effect of these factors on wheat.

Materials and Methods

To study the effect of NP levels, seed rates and row spacing on wheat, an experiment was conducted at Agricultural Research Farm of NWFP Agricultural University, Peshawar, during 1994-95. The experiment was laid out in RCB design with split plot arrangement and four replications. NP levels were allotted to the main plots while seed rates and row spacing to sub plots. The sub-plot size was 9 m². The following factors were studied in the experiment. NP levels (kg ha⁻¹) were 0:0, 120:60, 180:80 and 240:100 having row spacing, 15, 30 and 45 cm and seed rates of 100, 125 and 150 kg ha⁻¹. The number of tillers (m⁻²), plant height (cm), thousand grain weight (g), grain yield (kg ha⁻¹) and biological yield (kg ha⁻¹) were studied. The data were analyzed statistically using SAS (SAS institute, 1986) and LSD was used as a test of significance.

Results and Discussion

Tillers m⁻²: Data regarding number of tillers m⁻² are recorded in Table 1. Statistical analysis of the data indicated that row

spacing; fertilizer levels and interaction between seed rate and row spacing had significantly affected the tillers m⁻² of wheat. The highest number of tillers m⁻² (657) was recorded in 15 cm apart rows followed by 30 cm row spacing with 556 tillers m⁻². The possible argument might be that close rows increased the number of seedlings m⁻², which increased number of tillers while the other two spacings followed subsequently. Interaction of seed rates and fertilizer levels indicated the highest number of 724 tillers m⁻² was transcribed at seed rate of 150 kg ha⁻¹ and N:P level of 240:100 kg ha⁻¹. The possible logic to explain the phenomenon could be that initially more seed was placed in the rows and amply supplied with maximum N:P level which led to more tillers as compared to other two seed rates. This observation is in line with Singh *et al.* (1987), who revealed that seed rates and fertilizer combination significantly affected the tillers of wheat.

As regards fertilizer levels, maximum number of tillers m⁻² (685) was recorded at N:P level of 240:100 kg ha⁻¹, followed by N:P level of 180:80 kg ha⁻¹ with 622 tillers m⁻². The plausible reason might be that N:P fertilizer was a basic requirement of wheat crop; N increased the vegetative growth and P enhanced the root growth, which helped in the development of tillers and therefore maximum number of tillers m⁻² were accounted for highest N:P level. This observation is confirmed by Rajput *et al.* (1989a), who stated that total number of tillers and productive tillers of wheat were significantly affected by various N:P applications.

Plant height (cm): Data relating plant height are shown in Table 2. Perusal of the data revealed that NP levels, seed rates and row spacing significantly affected plant height of wheat. Taller plants (104cm) were noted at N:P level of 240:100 kg ha⁻¹ followed by other treatments. Plants attained maximum height (102cm) in plots seeded at the rate of 150 kg ha⁻¹ followed by seed rate of 125 kg ha⁻¹ and 100 kg ha⁻¹. This might be due to the dense population and inter and intra plant competition for sunlight. Plants achieved maximum height at row spacing of 30 cm and 45 cm (101cm). Three way interactions of seed rate, row spacing and NP levels were also significant. Tallest plants of 107 cm were recorded at NP level of 180:80 kg ha⁻¹, seed rate of 150 kg ha⁻¹ and row spacing of 15 cm.

Thousand grain weight (g): Data referring thousand grain weight of wheat are reported in Table 3. Analysis of the data intimated that seed rates and row spacing did not significantly affect the thousand grain weight of wheat. The effect of N:P levels on thousand grain weight of wheat was significant. Highest thousand grain weight (30.80 g) was recorded at N:P

Kakar *et al.*: Effect of NP levels, seed rates and row-spacing on wheat

Table 1: Tillers m⁻² as affected by fertilizer levels, row spacing and seed rates in wheat.

Seed Rates (kg ha ⁻¹)	Row spacing (cm)	NP fertilizer levels (kg ha ⁻¹)				Mean
		(0:0)	(120:60)	(180:80)	(240:100)	
100	15	481.32	778.88	581.54	658.88	624.94a
	30	435.46	448.66	560.04	718.65	540.70bc
	45	382.88	510.96	385.24	613.21	473.07c
125	15	423.33	597.76	772.10	748.88	635.54a
	30	348.27	480.32	618.37	685.16	533.03bc
	45	406.69	496.48	495.93	574.16	493.31c
150	15	439.71	727.21	836.01	840.62	710.89a
	30	372.55	596.47	703.21	705.77	594.50b
	45	333.13	725.43	647.43	625.80	582.95bc
100		433.25 EFG	579.21 BCD	508.94 DEF	663.58 AB	546.24bc
125		392.76 FG	524.85 CDE	628.84 ABC	669.40 AB	553.96bc
150		381.80 G	683.13 AB	720.78 A	724.06 A	629.44a
	15	448.12	700.99	729.92	749.46	657.12 A
	30	385.43	508.48	627.21	703.16	556.08 B
	45	374.23	577.72	509.43	604.39	516.44 B
Mean		402.59 C	595.73 B	622.19 AB	685.68 A	

Means of the same category followed by different letters are significantly different at 0.05 level of probability, using LSD test.

Table 2: Plant height as affected by fertilizer levels, row spacing and seed rates in wheat.

Seed Rates (kg ha ⁻¹)	Row spacing (cm)	NP fertilizer levels (kg ha ⁻¹)				Mean
		(0:0)	(120:60)	(180:80)	(240:100)	
100	15	89 D	90 D	107 A	105 ABC	98c
	30	89 D	104 ABC	102 ABC	105 ABC	100b
	45	90 D	101 ABC	102 ABC	101 ABC	99bc
125	15	89 D	99 C	102 ABC	101 ABC	98c
	30	92 D	105 ABC	101 ABC	105 ABC	101ab
	45	91 D	103 ABC	106 AB	104 ABC	101ab
150	15	87 D	104 ABC	107 A	104 ABC	101ab
	30	100 BC	103 ABC	103 ABC	104 ABC	103a
	45	91 D	107 A	107 AB	107 A	103a
100		90	99	104	104	99 B
125		91	102	103	103	100 B
150		93	105	106	105	102 A
	15	89 D	98 B	105 A	103 A	99 B
	30	94 C	104 A	102 A	105 A	101 A
	45	91 CD	104 A	105 A	104 A	101 A
Mean		91 A	102 A	104 A	104 A	

Means of the same category followed by different letters are significantly different at 0.05 level of probability, using LSD test.

Table 3: Thousand grains weight (g) as affected by fertilizer levels, row spacing and seed rates in wheat.

Seed Rates (kg ha ⁻¹)	Row spacing (cm)	NP fertilizer levels (kg ha ⁻¹)				Mean
		(0:0)	(120:60)	(180:80)	(240:100)	
100	15	26.27	28.98	31.37	30.19	29.20NS
	30	26.23	30.83	29.90	31.20	29.54 NS
	45	26.77	29.84	30.96	30.43	29.50 NS
125	15	28.79	29.92	29.85	30.68	29.81 NS
	30	27.17	28.75	31.04	30.29	29.31 NS
	45	29.57	31.30	31.01	30.91	30.70 NS
150	15	28.07	30.390	29.47	30.60	29.36 NS
	30	28.27	30.82	29.44	31.03	29.89 NS
	45	27.95	29.87	31.02	31.91	30.18 NS
100		26.42	29.89	30.74	30.61	29.41 NS
125		28.51	29.99	30.63	30.62	29.94 NS
150		27.76	30.33	29.98	31.18	29.81 NS
	15	27.37	29.73	30.23	30.49	29.46 NS
	30	27.22	30.13	30.13	30.84	29.58 NS
	45	28.10	30.34	30.99	31.08	30.13 NS
Mean		27.56 B	30.07 A	30.45 A	30.80 A	

Means of the same category followed by different letters are significantly different at 0.05 level of probability, using LSD test.

NS = Non significant.

Kakar *et al.*: Effect of NP levels, seed rates and row-spacing on wheat

Table 4: Yield (kg ha⁻¹) as affected by fertilizer levels, row spacing and seed rates in wheat.

Seed Rates (kg ha ⁻¹)	Row spacing (cm)	NP fertilizer levels (kg ha ⁻¹)				Mean
		(0:0)	(120:60)	(180:80)	(240:100)	
100	15	4721	4846	5444	6304	5329 NS
	30	4666	5943	5221	6554	5596 NS
	45	4861	4999	5166	6277	5326 NS
125	15	4916	5138	5999	6193	5561 NS
	30	4777	5277	5471	6332	5464 NS
	45	4944	5166	5249	6582	5485 NS
150	15	4860	4694	5194	6304	5263 NS
	30	4972	4777	5582	5888	5305 NS
	45	4305	4832	6528	6388	5513 NS
100		4749	5263	5277	6378	5417 NS
125		4879	5194	5573	6369	5504 NS
150		4721	4768	5768	6193	5360 NS
	15	4832	4893	5545	6267	5384 NS
	30	4805	5332	5425	6258	5455 NS
	45	4703	4999	5647	6416	5441 NS
Mean		4780 C	5075 C	5539 B	6314 A	

Mean of the same category followed by different letters are significantly different at 0.05 level of probability, using LSD test.
NS = Non significant.

Table 5: Biological yield (kg ha⁻¹) as affected by fertilizer levels, row spacing and seed rates in wheat.

Seed Rates (kg ha ⁻¹)	Row spacing (cm)	NP fertilizer levels (kg ha ⁻¹)				Mean
		(0:0)	(120:60)	(180:80)	(240:100)	
100	15	6806	12806	11278	12864	10938 NS
	30	8284	11421	11891	14259	11464 NS
	45	4694	12472	11695	12194	10264 NS
125	15	7250	13528	12714	14249	11935 NS
	30	8114	10609	12822	11556	10775 NS
	45	7076	10861	12467	16104	11627 NS
150	15	8614	9750	13414	13976	11438 NS
	30	10042	11078	13390	13377	11972 NS
	45	6330	12436	14401	14383	11887 NS
100		6595	12233	11621	13106	10889 NS
125		7480	11666	12667	13970	11446 NS
150		8328	11088	13735	13912	11766 NS
	15	7556 EF	12028 CD	12468 BCD	13696 AB	11437 NS
	30	8813 E	11036 D	12701 ABC	13064 ABC	11403 NS
	45	6033 F	11923 CD	12854 ABC	14227 A	11259 NS
Mean		7468 D	11662 C	12675 B	13662 A	

Mean of the same category followed by different letters are significantly different at 0.05 level of probability, using LSD test.
NS = Non-significant.

level of 240:100 kg ha⁻¹. Heavy grains might be attributed to availability of sufficient quantity of nutrient for translocation to sink (grain). The result is in conformity with Sultan *et al.* (1991), who concluded that all the fertilizer treatments increased the grain yield significantly.

Grain yield (kg ha⁻¹): Data relating grain yield of wheat are shown in Table 4. Perusal of the data dictated that seed rates, row spacing and their interactions did not significantly affect the grain yield of wheat while the effect of N:P levels on grain yield was significant. Grain yield was highest (6314 kg ha⁻¹) at N:P level of 240:100 kg ha⁻¹. The highest grain yield of wheat with maximum levels of N:P could be attributed to more number of tillers and heavier grains at the same level of NP. These results are confirmed by Yoon *et al.* (1991), who stated that various N:P fertilizer levels significantly increased the grain yield of wheat.

Biological yield (kg ha⁻¹): Data concerning biological yield are presented in Table 5, which reveal that biological yield of wheat was not significantly affected by row spacing and seed rates. The effect of N:P levels and interaction between row

spacing and N:P levels on biological yield of wheat was significant. Maximum biological yield (13662 kg ha⁻¹) was noted at fertilizer level of 240:100 N:P kg ha⁻¹. The reason could be that wheat crop effectively utilize the available and applied nutrients for the vegetative growth of crop i.e. more tillers, taller plants and healthy crop, which finally led to greater biological yield.

In interaction between row spacing and N:P levels, the highest biological yield (14227 kg ha⁻¹) was recorded at 45 cm apart rows and N:P level of 240:100 kg ha⁻¹. The possible reasons could be that the wheat crop sown in wider rows and supplied with balanced fertilizer, fully availed soil moisture, space and solar radiation for the production of more tillers, taller and healthy plants.

It can be concluded that row spacing of 30 cm, seed rate of 125 kg ha⁻¹ and NP level of 240:100 kg ha⁻¹ produced maximum grain yield and hence was recommended for commercial production of wheat.

References

Farnworth and Said, 1983. Effect of fertilizer (N:P) on winter wheat. *Field Crop Res.*, 37: 115-119.

Kakar et al.: Effect of NP levels, seed rates and row-spacing on wheat

- Ghaffar and Shahidullah, 1987. Effect of seed rate on wheat. Pak. J. Agric. Res., 12: 19-21.
- Khan, M.S. and M.I. Makhdum, 1988. Maximizing wheat grain yield by adopting optimum seed rate in the Southern Punjab. Pak. J. Agric. Res., 9: 16-18.
- Pereira, L.R., A.C. Bainer, J.A.R. Vellase and H.P. Santos, 1988. Row spacing and seed rate in two wheat cultivars. Pesquisa Agropecuaria Brasileria, 23: 1143-1149.
- Paulsen, D.F., Macold and C. Jones, 1984. Effect of Nitrogen and Phosphorus on winter wheat cultivars. Amer. J. Agric., 51: 69-72.
- Rajput, F.K.M., A.S. Arian, M.J. Rajput, S.M. Alam and A.W. Baloch, 1989a. The growth and yield of wheat as affected by different seed rates and row spacing. Sarhad J. Agric., 5: 479-482.
- Rajput, T.K., S.M. Alam and A.W. Baloch, 1989b. Effect of different NP combination on the growth and yield of wheat. Sarhad J. Agric., 5: 347-349.
- Sarandon, S.J. and M.C. Gianibelli, 1990. Effect of foliar urea and nitrogen application at sowing on wheat (*Triticum aestivum*). Fac. Agron. Univ. National Planta, Argentina., 9: 183-189.
- Singh, H., S. Rajendra and R. Singh, 1984. Effect of nitrogen and seed rate on wheat. Ind. J. Agron., 29: 129-135.
- Sultan, M. and G.F. Khan, 1991. Effects of nitrogen, phosphorus levels on the yield of wheat. Sarhad J. Agric., 10: 115-118.
- Sumkova, M., 1956. Narrow rowed sowing of wheat as a mean of increasing the crop yield. Russian J. Agric. Sci. USSR. 4: 125-157.
- Tatterfield, J.R., 1959. "Wheat". A comprehensive report on Field Crop Experiment of Gwebi, 56:17-21.
- Tian, J. and Z. Wang, 1986. Effect of Fertilizer and Row spacing on wheat. Chinese Agric. J., 34: 409-413.
- Yoon, E.B., Y.H. Yoon, Y.U. Kwon and M.G. Shin, 1991. Studies on fertilizer level, row spacing and sowing rate of winter wheat. Res. Report of the Rural Development Administration, Upland and Indus Crop, 33: 65-71.
- Sumkova, M., 1956. Narrow-rowed sowing of wheat as a means of increasing the crop yields. Russian Journal of Agric. Sci. USSR. 4: 125-157.