

Effect of Seed Rate and Nitrogen Application in Dwarf Wheat

By

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ABSTRACT

An experiment was conducted to study the effect of the seed rate and nitrogen levels on semi-dwarf wheat 'Lerma Rojo'. Seed rate did not affect any ancillary plant character, grain and straw yields, except ear length whereas nitrogen resulted in significant increase in height, ear length, grain and straw yield. 120 kg nitrogen per ha gave the highest grain yield followed by 80 kg and 160 kg nitrogen per ha. An optimum dose of 121 kg nitrogen and 91 kg seed rate per ha was calculated.

INTRODUCTION

Mexican semi dwarf and dwarf varieties of wheat were released for general cultivation to farmers in 1965-66. The optimum agronomic practices recommended for the indigenous tall wheat varieties were found not applicable as such to the semi dwarf and dwarf varieties (Anon. 1965). Therefore, agronomic research work on semi dwarf and dwarf wheat varieties was initiated with the view to find out the optimum seed rate and nitrogen requirement of semi dwarf variety 'Lerma Rojo'.

MATERIALS AND METHODS

The studies were conducted at the Research farm of J. V. College Baraut (Meerut) during the *rabi* season of 1966-67. The soil of experimental plot was loam of average fertility have good moisture retaining capacity

with 7.8 pH. The experiment was laid out in split plot design with four replications keeping seed rates (50, 75, 100 and 125 kg per ha) in main plots and nitrogen levels (0, 40, 80, 120 and 160 kg per ha) in sub plots. The net plot size was 1/286 ha. The dimensions of the plot were 5.0 × 3.5 m. The seeds were sown on 5th November, 1966. A basal dose of 60 kg, P₂O₅ + 30 kg K₂O per ha were given at the time of sowing. Half of the dose of nitrogen was applied at sowing and rest at the time of first irrigation through ammonium sulphate. The crop was irrigated as and when required. The data on height, tiller per plant, number of fertile spikelets, ear length, number of grains per ear, grain and straw yield were recorded and subjected to the statistical scrutiny. The relationships of grain or straw yield with nitrogen and seed rate separately were studied by quadratic equation of the form $Y = a + b x - c x^2$ as descri-

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TABLE 1. Effect of different treatments on plant characters and yield

Treatment	Tillers/plant	Height (cm)	Spikelet/ear	Ear length (cm)	Grains/ear	Grain yield (kg/ha)	Straw yield (kg/ha)
Seed rate (kg/ha)							
50 (S ₁)	5.36	98.30	19.50	11.17	32.23	4604	9948
75 (S ₂)	5.24	103.40	19.05	10.80	33.67	4733	11306
100 (S ₃)	5.19	103.82	17.85	10.68	34.15	5214	12084
125 (S ₄)	4.33	104.65	17.80	10.47	32.65	4821	10608
C. D. 5%	NS	NS	NS	0.327	NS	NS	NS
Nitrogen level							
0 (N ₀)	4.54	96.7 ^c	18.12	10.46	32.39	4054	7772
40 (N ₁)	4.95	100.18	18.42	10.50	31.41	4.95	9637
80 (N ₂)	4.97	103.63	18.62	10.65	33.90	5230	11262
120 (N ₃)	5.04	104.35	19.12	11.28	34.88	5568	14467
160 (N ₄)	5.91	107.46	18.43	10.76	33.42	5225	11801
C. D. 5%	NS	2.768	NS	0.518	NS	486	882

bed by Steel and Torrie (1960). The optimum levels of nitrogen and seed rate were obtained from the first derivative of above equation.

RESULTS AND DISCUSSION

Effect of seed rate : The plants raised with seed rate of 50 kg/ha were significantly more in earhead length

than those raised with higher seed rates (S₂, S₃ and S₄). However, the ear length variation between S₂ and S₃, S₃ and S₄ were not significant. Treatment S₄ resulted in the lower ear length (10.4) as compared to other seed rates. The seed rate failed to affect the tiller per plant, length, number of spikelets per ear and grains per ear (Table 1).

TABLE 2. Yield and net returns at maximum and optimum levels of nitrogen application on wheat

Nitrogen level	Nitrogen (kg/ha)	Yield (kg/ha)	Response due to fertilizer	Income from response/ha	Cost of treatment	Nitrogen from treatment application
Maximum	149.83	5409.10	1544.71	1158.53	337.12	821.41
Optimum	127.90	5361.19	1503.99	1127.99	287.77	840.22

TABLE 3. Yield and net return at maximum and optimum levels of seed rate application on wheat

Seed rate	Levels (kg/ha)	Yield (kg/ha)	Value of yield (kg/ha)	Cost of seed rate [Rs/ha]	Total return [Rs/ha]
Maximum	92.71	5556.43	4167.32	92.71	4074.71
Optimum	91.14	5555.38	4166.54	91.14	4075.50

The seed rate did not affect the grain and straw yield significantly though increased seed rate, increased the grain and straw yield upto 100 kg (S_3) per ha in both the cases. A seed rate of 125 kg (S_4) per ha tended to decrease grain and straw yield. The findings are in conformity with those of Anant Rao (1960) and Anonymous (1965), Tomer and Mathur (1966), Sharma (1968) and Singh and Randhawa (1970).

Effect of nitrogen: The height of the plant and ear length were affected significantly with the nitrogen

application (Table—1). The application of nitrogen failed to increase the number of tillers per plant, number of fertile spikelets per ear and number of grains per ear. Nitrogen application to 'Lerma Rojo' gave significant effect on grain and straw yield. A linear increase in grain and straw yield was recorded upto 120 kg nitrogen per ha, with 160 kg nitrogen per ha, yield decreased considerably and showed quadratic trend. Treatment N_3 , gave significantly more grain and straw yield over N_1 and N_0 . Straw yield followed the trend of

grain yield and treatment N_3 gave the maximum yield.

The increase in the grain and straw yield may be attributed to the ancillary plant characters like tillers per plant, length, number of grain per ear and fertile spikelets which seems to have jointly caused significant effect on grain and straw yield. Treatment N_4 (160 kg N/ha) resulted in decreased yield due to the vigorous plant growth which lodged ultimately. Thus it may be inferred that 'Lerma Rojo' could not respond beyond 120 kg nitrogen per ha. These results are in conformity with Mann (1965), Sharma (1968), Randhawa *et al.*, (1969).

Quadratic production functions: Quadratic production function for nitrogen and seed rate were calculated and given below for grain and straw yield :

Nitrogen: Grain $Y = 3857.20 + 20.51 N - 0.06842 N^2$; $R^2 = 0.08775$
 Straw $Y = 8767.54 + 40.57 N - 0.118392 N^2$; $R^2 = .8906$

Seed rate: Grain $Y = 1911.5 + 78.62S - 0.424S^2$; $R^2 = 0.7583$
 Straw $Y = 9933.69 + 261.28S - 27.176 S^2$; $R^2 = 0.7603$

The high value coefficient of determination (R^2) given as above, shows that the quadratic equation worked out holds good. Grain and straw yield were estimated with these equations.

Maximum level: Maximum nitrogen level was worked out to be 149.83 per ha which gave Rs.827.41 as

net returns due to incidence of nitrogen application. The maximum seed rate was 92.71 kg per ha of 'Lerma Rojo' which gave total income of Rs. 4047.71 per ha (Table-2 and 3).

Optimum nitrogen and seed rate: When the price 'Lerma Rojo' grain was Rs. 0.75 per kg and the price of nitrogen at Rs. 2.25 per kg the optimum level of nitrogen application was 127.9 kg per ha. resulting in Rs. 840-22 net return due to nitrogen application. The optimum seed rate when seed for sowing valued at Rs. 1.00 per kg and the produce at the rate of Rs. 0.75 kg the optimum seed rate worked out to 91.14 kg per ha. Thus it may be concluded that the seed rate of 91.14 kg per ha and nitrogen level 127.90 kg per ha are more safer for fetching the optimum grain yield under the irrigated conditions of Yamuna zone.

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REFERENCES

- ANONYMOUS, 1965. Results of Agronomic Experiments on dwarf wheat, Proc. All India Wheat research workshop.
- ANANT RAO, N. K. and M. L. GUPTA, 1960. Response of wheat varieties to different sowing dates and seed rates. *Indian J. Agron.* 26 : 351.

- MANN, H. S. 1965. Response of paddy, wheat potato, groundnut, cotton to fertilizers and other agronomic practices on alluvial black red and laterite soils of India, *Indian J. Agron.* **10** : 1-9.
- RANDHAWA, A. S. and B. P. SINGH. Response to N, P, K. fertilizer under irrigation conditions of Punjab, *J. Research* (in press).
- RANDHAWA, A. S., S. C. ANAND and B. P. SINGH. 1969. Effect of N, P, K, on wheat under irrigated condition of Punjab *J. Research* **6** : 14.
- SHARMA, K. C. 1968. Planting dates and seedling rates and rates of nitrogen experiments on dwarf wheats Proc. 7th All India Agronomy sub committee wheat Res., workshop 44.
- SINGH, B. P. and A. S. RANDHAWA. 1970. Influence of sowing date and seed rate on wheat yield. *The Allahabad Farmer* **44** : 83.
- STEEL, R. G. D. and J. H. TORRIE. 1960. Principles and procedures of statistics (Chapter 16).
- TOMER, P. S., and O. P. MATHUR. 1966. Effect of time of sowing and seed rate on yield of wheat under channel irrigated area in Rajasthan, *Indian J. Agron.* **11**: 66.