International Journal of Environmental Sciences
ISSN: 2229-7359
Vol. 11 No. 18s, 2025
https://theaspd.com/index.php

Effect Of Nitrogen Levels And Seed Rate On Growth And Yield Of Wheat (Triticum Aestivum L.)

Abhishek Kumar[1], Dr . Raghubir Singh Uppal[2], Dr.Baljinder Singh[3]
[1]Department of Agronomy Guru Kashi University, chaudharyak26@gmail.com
[2]Professor Department of Agronomy, dr.rsuppal@gmail.com
[3]Associate Professor, Department of Agronomy, Faculty of Agriculture, baljindersds@gmail.com

Abstract
The field experiment entitled "Effect of Nitrogen levels and seed rate on growth and yield of wheat (Triticum aestivum L.)" variety PBW826 was conducted at the experimental farm of the University College of Agriculture, Guru Kashi University Talwandi Sabo during Rabi season 2024-25 The experiment was conducted in Randomised complete block design with ten treatments and three replications. The results showed that application of Treatment (T9) as registered maximum growth parameters and yield attributes N_{125} @ 156.5kg ha^{-1} with seed rate @100 kg ha^{-1} gave higher plant height (102.5cm) Number of tillers m^{-1} row length(134), LAI (4.80), Test weight (48.4 g), Grain yield (49.9 q ha^{-1}) and Harvest index (43.7) observed and in Treatment (T4) N_{75} 93.5kg ha^{-1} with seed rate @110 kg ha^{-1} higher Straw yield (74.3q ha^{-1}) and Biological yield (120.3q ha^{-1}) observed than rest of the treatments.
Keywords: *Wheat, Nitrogen, seed rate, Economics, Harvest index.*

INTRODUCTION

The most widely grown food crop worldwide is wheat (Triticum aestivum L). It is the second most important staple meal in India, behind rice. The nutritional content of wheat is comparable to that of other important cereals. It has a higher protein content than other cereals, and in addition to their nutritional value, they are primarily focused on supplying the distinctive ingredient "gluten," which is crucial for dough punchers.
Punjab is ranked third in terms of both productivity and wheat production. Punjab contributes 31.00 percent, the highest per hectare production in India, with 14.81 percent of the nation's land planted to wheat. (Anonymous, 2023-24). Despite its low yield, wheat is exposed to a variety of biotic and abiotic stresses.
The cropping method, chemical fertilizers (NPK), overliming acid soils, and the growing demand for high-yielding varieties to feed the world's population are some of the factors that contribute to insufficiency issues (Fageria 2007). Ali et al. (2000) Although nitrogen is essential for rapid plant growth and high production per hectare, it is one of the main elements that lowers wheat yield if it is not supplied in the right amounts. All of the metabolic processes that plants go through depend on nitrogen. The primary element of plants, particularly in the creation of living tissues, is nitrogen.
Nitrogen is an essential nutrient for plants since it is the main building block of proteins and amino acids. Normal growth and productivity depend on a healthy supply of nitrogen. Brady and weil (2002).

MATERIALS AND METHODS

The field experiment was carried out during the rabi season of 2024 and 2025 at the students Research farm of the Department of Agronomy, Guru Kashi University, Bathinda, Punjab, India. The soil of the experimental field was sandy loam having ph 7.30 ,electrical conductivity 0.28 dS m^{-1}, Organic carbon 0.25% available N 120.2 kg ha^{-1}, available P_2O_5 29.3kg ha^{-1} k_2O 230.2 kg ha^{1} The experiment consists of ten treatments combinations and replicated three times was set out in Randomised complete plot design with different seed rate and different nitrogen fertility levels. Total number of plots was 30. Nitrogen fertilizer applied via urea was applied in 3 split doses. For the treatment requiring Nitrogen. Phosphorus and Potassium. The details of the treatments are presented in Table 1.

Table 1: List of Treatments

T_1: N_o with seed rate @100 kg ha^{-1}

T_2:N_{75} @93.5kg ha¹ with seed rate @ 90 kg ha^{-1}
T_3:N_{75} @93.5kg ha¹ with seed rate @ 100 kg ha^{-1}
T_4:N_{75} @93.5kg ha¹ with seed rate @ 110kg ha^{-1}
T_5 :N_{100} @125kg ha¹ with seed rate @ 90kg ha^{-1}
T_6: N_{100} @125kg ha¹ with seed rate @ 100kg ha^{-1}
T_7: N_{100} @125kg ha¹ with seed rate @ 110kg ha^{-1}
T_8 : N_{125} @156.5kg ha¹ with seed rate @ 90kg ha^{-1}
T_9: N_{125} @156.5kg ha¹ with seed rate @ 100 kg ha^{-1}
T_{10}: N_{125} @156.5kg ha¹ with seed rate @ 110kg ha^{-1}

Statistical Analysis

The significance of the difference of treatments were tested using OPSTAT software (Sheoran et al.1998) at 5 percent level of significance.

RESULTS AND DISCUSSION

1. Plant height (cm)

The data related to plant height Were recorded at 30, 60 and 90 DAS and at harvest and have been presented in Table 2. Treatment (T10):N_{125} @156.5kg ha^{-1} with seed rate @ 110kg ha^{-1} (18.2cm), (37.5cm),(67.8cm) and (102.5cm) at 30,60,90 DAS and at harvest recorded the Maximum plant height of wheat which was statistically at par with the treatment 156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} (17.9cm), (36.8cm), (66.2cm), (100.8cm) at 30,60,90 DAS and at harvest. But it was significantly higher than other Treatments of seed rate and nitrogen.level.

2. Number of tillers m^{-1} row length

The data regarding the number of tillers m^{-1} row length recorded at 30, 60, 90 and 120 DAS and have been presented in Table 2.Treatment (T9):N_{125} @ 156.5kg with seed rate @ 100kg ha^{-1} recorded the maximum number of $tillers^{-1}$m row Length (134) of wheat which was statistically at par with treatment(T8):N_{125} @ 156.5kg ha^{-1} with seed rate @ 90kg ha^{-1} (131) and it was significantly higher than other treatments of seed rate and Nitrogen levels. This variation of number of tillers m^{-1} row Length can be attributed to using different seed rates. Higher N levels resulted in more cell division elongation and adequate supply of nitrogen resulted in increase.

These. Results are also in line with the observations recorded By Khan et al (2000).

3. Leaf Area Index

Results pertaining to mean separation values showed that in response to different level of Applied seed rates and nitrogen levels, treatment (T9) :N_{125} @156.5kg ha^{-1} with seed rate @ 100 kg per ha recorded the maximum leaf area index values of (2.54),(5.69),(4.80) at 60,90,120 DAS wheat which was statistically at par with (T8) N_{125} 156.5kg ha^{-1} with seed rate @ 90kg ha^{-1} (2.45),(5.60),(4.74) Leaf Area index at 60, 90, 120 DAS but it was Significantly higher than other treatments of seed rate and nitrogen levels at 60, 90 And 120 DAS.Increased on leaf area index with higher doses of nitrogen were probably due to stimulatory effect of nitrogen on leaf area through cytokines, synthesis resulting more leaf area index Khanpara et al.(2003).

4. Test weight (g)

Test weight is a reliable index of seed development and plumpness and consequently the grain quality and yield of wheat. The data in the Table showed that there is significant effect of seed rate on test weight of wheat. Treatment (T9):N_{125} @156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} recorded the highest test weight of wheat (48.4g) which was statistically at par with treatment(T8):N_{125} 156.5kg ha^{-1} with seed rate @ 90kg ha^{-1}

(47.8g) however, it was significantly higher than other treatments of seed rate and nitrogen levels. Control with seed rate @ 100 kg ha^{1} observed the lowest values of test weight of wheat (42.2g).

5. Grain yield (q ha^{-1})

Perusal of the data revealed that grain yield of wheat varied significantly due to different seed rate and nitrogen levels. Treatment (T9): N_{125} @156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} recorded the highest grain yield of wheat (49.9q ha^{-1}) which was statistically at par with treatment (T6): N_{100} @125kg ha^{-1} with seed rate @ 100kg ha^{-1} but it was significantly higher than other treatments of seed rate and nitrogen levels. Control with seed rate @ 100 kg ha^{-1} (48.8q ha^{-1}) observed the lowest values of grain yield of wheat (34.8q ha^{-1}). The result suggests that moderate seed rate produced maximum grain yield. Treatment(T9): N_{125} @ 156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1}, (T6): N_{125} @125kg ha^{-1} with seed rate @ 100kg ha^{-1} recorded 43.4 and 40.3%, respectively over control with seed rate @100 kg ha^{-1} (T1). Hussain et al .(2002) observed significant increase in grain, Stover and dry matter yield with increasing N doses up to 50 kg N ha^{-1}.

6. Straw yield (q ha^{-1})

The data on straw yield of wheat as affected by seed rate and nitrogen levels. Have been presented in Table 3. Data clearly indicated that on straw yield increased with increase in seed rate.

Treatment (T4): N_{75} @ 93.5kg ha^{-1} with seed rate @ 110kg ha^{-1} recorded the highest straw yield (74.3q ha^{-1}) which was statistically at par with (T7): N100 125kg ha^{-1} with seed rate @ 110kg ha^{1} (71.8q ha^{-1}) , (T10): N_{125} @156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} (71.4q ha^{-1}) and it was significantly higher than other treatments of seed rate and nitrogen levels. Control with seed rate @ 100 kg ha^{-1} observed the lowest straw yield of wheat (60.2q ha^{-1}) .

7. Biological yield (ha^{-1})

The data on biological yield of wheat as affected by seed rate and nitrogen levels have been presented in Table 3. Data clearly indicated that on biological yield increased with increase in seed rate. Treatment (T9): N_{125} @ 156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} recorded the highest biological yield (120.2q ha^{-1}) which was statistically at par with (T10):N_{125} @ 156.5kg ha^{-1} with seed rate @ 110kg ha^{-1} (120.2q ha^{-1}), (T7): N_{100} @ 125kg ha^{-1} with seed rate @ 110kg ha^{-1} (119.1q ha^{-1}) and (T4):N_{75} @93.5kg ha^{-1} with seed rate @ 110kg ha^{-1} (118.0q ha^{-1}) but it was significantly higher than other treatments of seed rate and nitrogen levels. Control with seed rate @100 kg ha^{-1} observed the lowest biological yield of Wheat.(95.0q ha^{-1}).

8. Harvest Index (%)

The data Indicated that application of seed rates and nitrogen levels had significant effect on harvest index of wheat. Treatment (T9): N_{125} @156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} (43.7) recorded the highest harvest index values which was statistically at par with treatment (T6): N_{100} @125kg ha^{-1} with seed rate @ 100kg ha^{-1} (42.8) and (T3) :N_{75} 93.5kg ha^{-1} with Seed rate @ 100 kg ha^{-1} (41.9) But it was significantly higher than other treatments of seed rate and nitrogen levels.

Control with seed rate @ 100 kg ha^{-1} (36.6) observed the lowest values of harvest index of wheat.

Table 2 Effect of Nitrogen levels and seed rate on growth parameters of wheat.

Treatment	Plant height (cm)	No of tillers m^{-1} row length	Leaf area index	Test weight (g)
T1:No with seed rate @100 kg ha^{-1}	86.8	83	3.60	42.2
T2:N_{75} @93.5kg ha^{-1} with seed rate @ 90 kg ha^{-1}	95.2	116	4.40	44.5
T3:N75 @93.5kg ha^{-1} with seed rate @ 100 kg ha^{-1}	97.1	115	4.38	44.2
T4:N75 @93.5kg ha^{-1} with seed rate @ 110kg ha^{-1}	98.1	112	4.26	43.1
T5: N100 @125kg ha^{-1} with seed rate @ 90kg ha^{-1}	97.1	120	4.60	47.3
T6: N100 @125kg ha^{-1} with seed rate @ 100kg ha^{-1}	99.2	127	4.42	42.4

T7: N100 @125kg ha-1 with seed rate @ 110kg ha^{-1}	99.7	118	4.39	44.0
T8: N125 @156.5kg ha^{-1} with seed rate @ 90kg ha^{-1}	98.5	131	4.74	47.8
T9: N125 @156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1}	100.8	134	4.80	48.4
T10:N125 @156.5kg ha^{-1} with seedrate @ 110kg ha^{-1}	102.5	122	4.69	45.2
CD(P = 0.05)	2.4	10.0	0.12	0.8
SE(m) ±	0.8	3	0.04	0.2
CV (%)	10.3	12.1	6.3	5.5

Table 3 Effect of Nitrogen levels and seed rate on yield attributes of wheat .

Treatment	**Grain yield (q ha^{-1})**	**Straw yield (q ha^{-1})**	**Biological yield (q ha^{-1})**	**Harvest index (%)**
T1:N_o with seed rate @100kg ha^{-1}	34.8	60.2	95.0	36.6
T2:N_{75} @93.5kg ha^{-1} with seed rate @ 90kg ha^{-1}	43.4	70.1	113.5	38.2
T3:N_{75} @93.5kg ha^{-1} with seed rate @ 100kg ha^{-1}	46.6	64.7	111.3	41.9
T4:N_{75} @93.5kg ha^{-1} with seed rate @ 110kg ha^{-1}	46.0	74.3	118.0	38.2
T5: N_{100} @125kg ha^{-1} with seed rate @ 90kg ha^{-1}	44.4	66.5	110.9	40.0
T6: N_{100} @125kg ha^{-1} with seed rate @ 100kg ha^{-1}	48.8	65.3	114.1	42.8
T7: N_{100} @125kg ha^{-1} with seed rate @ 110kg ha^{-1}	44.2	71.8	119.1	39.2
T8: N_{125} @156.5kg ha^{-1} with seed rate @ 90kg ha^{-1}	46.5	67.0	113.5	41.0
T9: N_{125} @156.5kg ha^{-1} with seed rate @ 100kg ha^{-1}	49.9	70.3	120.3	43.7
T10:N_{125} @156.5kg ha^{-1} with seedrate @ 110kg ha^{-1}	47.7	71.4	120.2	40.1
CD(P = 0.05)	2.1	3.8	4.8	2.2
SE(m) ±	0.7	1.6	1.6	0.7
CV(%)	12.5	9.2	13.4	6.8

CONCLUSION

Crop sown with seed rate @ 100 kg ha^{-1} gave higher growth parameters viz., plant height (100.8cm), number of tillers (134) Test weight and grain yield 100 kg ha^{-1}. Seed rate treatments produced statistically similar grain yield. Seed rate @100 kg ha^{-1} recorded higher grain yield than 90kg ha^{-1} and 110kg ha^{-1} a respectively. Application of nitrogen significantly enhanced the growth, yield attributes and grain yield in wheat. Application of 156.5 kg ha^{-1} RDN (49.9 ha-1) and 93.5kg ha^{-1} RDN (46q ha^{-1}) Nitrogen 156.5kg ha^{-1} with seed rate @ 100 kg ha^{-1} recorded the highest harvest index (43.7) ,Nitrogen 93.5kg ha^{-1} with seed rate @ 110kg ha^{-1} recorded the highest straw yield. (74.3q ha^{-1}) Gross return (1, 31,553) and Net return (289, 353) and B:C ratio (3.12) which was significantly higher than other treatments.

REFERENCES

1.Ali M A, Choudhry M A, Malik R, Ahmad (2000) Effect of various doses of nitrogen on the growth and yield of two wheat cultivar, Pak J of Biol Sci, **3** (2000)1004-1005.
2.Anonymous (2024) Information Service, Department of Agriculture, Punjab
3.Brady, N C and Weil R R, 2002. Phosphorus and potassium. The nature and properties of soils. Prentice-Hall of India, Delhi, 352.
4.Fageria N K 2007. Soil fertility and plant nutrition research under field Conditions: Basic principles and methodology. J Plant Nutri, 30 **(2)**, . 203-223.
5.Hussain M, Shah S H Hussain S and Iqbal K (2002) Growth, yield and quality response of three wheat (Triticum aestivum L.) varieties to different levels of N. P and K. Int J Agric Biol **4:** 189-98.
6.M Ayoub, S Guertin S Lussier , D L Smith, Timing and Level of Nitrogen Fertility Effects on Spring Wheat Yield in Eastem Canada, Crop Sci, 34 (1994) 748-on Growth, Yield and Productivity of Wheat (Triticum aestivum L.)-750.
7.Singh I D and Stoskoof Y C (1971). Harvest Index in cereals. Agron J. **63**: 224-226.
8.Khan R U, Rashid A, Khan A and Khan S G (2000). Wheat production as influenced by seed rate under rainfed condition of Dera Ismail Khan. Sarhad J of Agric, **13**:551-555
9.Khanpara V D, Porwal B L, Sahu M P and Patel J C (2003) Effect of sulphur and nitrogen on yield attributes and seed yield of wheat on vertisol. Indian J of Agron 38**(4)**:588-592.