

Response of Some Wheat Varieties to Nitrogen Fertilizer Levels and Seeding Rate at Sharkia Governorate B- Yield and Its Components

Mona M. Esawy, Elsayed E. Hassan, Ali A. Hassan, Alsayed B. Gaballah

Plant Production Department, Faculty of Technology
and Development, Zagazig University

Corresponding author : alihassan@zu.edu.eg

ABSTRACT

The field experiments were conducted during 2022/2023 and 2023/2024 seasons to investigate the effect of two wheat cultivars (Giza 171 and Misr 3), three levels of nitrogen fertilization (60, 90 and 120 Kg N/fed) and three seeding rate (30, 60 and 90 Kg /fed) on some agronomic characteristics and grain yield/fed. Results indicated that Masr 3 wheat variety excelled Giza 171cultivar in an important traits such as number of spikes/m², number of grains/spike, 1000 – grains weight and grain yield/fed in both growing seasons and combined data.

Increasing of nitrogen level from 60 up to 120 Kg N/fed. had a significant effect on the traits of No. of spikes/m², No. of grains/spike, 1000-grain weight and grains yield/fed. in both seasons and its combined data

Grain yield as ton/fed. was affected by nitrogen fertilization, and gradually increased by increasing N level from 60 up to 120 Kg N/fed. in both seasons and its combined data.

In this investigation increasing Seeding rate from 30 to 90 Kg /fed. had a significant effect on all studied traits during studied seasons and combined data.

Seeding rate had a significant increase in grain yield/fed in both seasons and clearly evident that grain yield was increased by increasing the rate of seeds for growing wheat cultivars under this study.

In most cases, the interaction between studied factors i.e. wheat cultivars, nitrogen fertilization and Seeding rate not show any significant effect on the studied characteristics in both seasons and combined data.

Conclusively it can be recommended that by increasing the nitrogen fertilization level of 120 Kg N/fed. and using 90 kg seeds/fed. for increasing the wheat grain yield in the area of Sharkia Governorate under the two used wheat cultivars in this study Misr 3 and Giza 171, respectively.

Key words: Nitrogen fertilizer levels - seeding rate – cultivars – wheat.

INTROUDUCTION

Wheat (*Triticum aestivum*, L.) is one of the most important major cereal crop all over the world, as well as in Egypt. It is used as staple food for more than one third of the world population (**Abd Allah and El-Gammaal, 2009**). It is consumed in many forms, such as bread, cakes, biscuits, bakery products, and many confectionery products. Its straw is used for animal feed and also for manufacturing paper. In Egypt the quantity of wheat grain production must be increased to cover local consumption. The annual consumption of wheat in Egypt is about 16.9 million tons, while the annual local production is about 9 million tons. Efforts of scientists were done to minimize the gap between local production and consumption are directed towards two ways, i.e. expanding the

cultivated wheat area and increasing the wheat productivity from the land unit area by selecting the high yielding varieties and balanced fertilization.

Nitrogen plays a vital role in increasing yield of the wheat crop. Application of proper amount of nitrogen is considered key to obtain high yield of wheat (Chebrolu *et al.*, 2022).

Seeding rate is one of the important production factors. Higher wheat grain yield with better quality requires appropriate seeding rate for different cultivars. Increase in Seeding rate above optimum level may only enhance production cost without any increase in grain yield (Birhanu *et al.*, 2021).

The optimum seed rates for wheat alter with variety, location and method of planting. Wheat sowing at higher Seeding rate produced greater plant height” and also “higher yield attributes, such as grains/spike, grains weight/spike, 1,000 grains weight and number of effective tillers.

This study was done to determine the optimum seeding rate for two wheat cultivars viz. Giza 171 and Masr3 from three seeding rates (30, 60 and 90 kg /fed.) as well as nitrogen fertilization level 60.90 and 120 kg N. per feddan.

MATERIALS AND METHODS

Two field experiments were conducted during 2022/2023 and 2023/2024 growing seasons in an extension field at Abo-Sharabia Village, Sharkia Governorate, Egypt to investigate the effect of two wheat cultivars (Giza 171 and Misr 3), three levels of nitrogen fertilization (60, 90 and 120 Kg N/fed) and three seeding rate (30, 60 and 90 Kg /fed) on some agronomic characteristics and grain yield/fed.

Experiments were sown on November 7th and November 15th in first and second seasons, respectively. The soil of the experimentation sites was clay in texture with pH 8.38 and containing 556.7 ppm (means of the two seasons for the upper 30 cm of soil depth), Nitrogen fertilization (Urea 46%N) was applied as a treatment at rate of 60, 90 and 120 kg N/fed. in three equal portions, the first was applied at sowing, the second prior to the first irrigation (60 days) and the third one before the second irrigation at 30 days.

A split split plot design with three replications was used. Wheat cultivar occupied the main plots while nitrogen rates were arranged in the subplots, as well as, seeding rates arranged in the sub-sub-plot. Each sub-plot consisted of 15 rows 3.5 m long and 20 cm. in width (plot area = $3.5 \times 3 = 10.5 \text{ m}^2$). Wheat grains were drilled in rows. Surface irrigation and other agronomic practices were adopted as usually done by the local growers. At harvest time, ten fertile plants were randomly taken from the second inner row of each sub sub-plot to determine plant height (cm), spike length (cm), number of grains/spike and 1000-grain weight/(g). Also a fixed area of 2 m^2 was harvested from each sub-sub-plot to determine the number of spikes/ m^2 , and grain yield/fed.

Data were recorded on ten guarded plants from each entry as follows:

- 1- Number of spike/ m^2 : It was determined by counting number of fertile spike per plant.
- 2- Number of grains/spike: It was counted as an average number of grains collected per spike.
- 3- Weight of 1000-grain (g): It was recorded by the mean weight of random 1000kernel samples.
- 4- Grain yield per feddan, (ton): it was estimated by weighting the grains the of feddan.

Statistical analysis:

Data of both seasons were significantly analyzed according to Snedecor and Cochran (1980). For comparison between means, Duncan’s multiple range test was applied (Duncan, 1955). Means followed by the same alphabetical letter (s) are not significantly different at the 0.05 level of significant.

RESULTS AND DISCUSSION

1- Number of spikes/m²:

The statistical analysis of variance for data of this character indicated that all studied factors had a significant effects on this trait in the experiment with except that in combined data for seeding rate where did not had any significantly affected on this trait as showed in Table (1) and Fig (1).

Concerning the effect of wheat cultivars on number of spikes/m², the results showed significant differences between them and revealed that Misr 3 cultivar surpassed Giza 171 variety on produce high number of spikes/m² in the two growing seasons and their combined. These results are harmony with those of Hassan (2018).

Also, Table (1) indicated that N. level fertilization had a significant effect on number of spikes/m² in the two studied seasons and showed that the No. of spikes/m² increased by increasing N levels from 60 up to 120 kg N/fed. these results are agree with simeral results which obtained by Javaid Iqbal et al. (2012). They reported that number of spikes/m² were highest value at nitrogen of 120 kg/fed. and lowest value at zero level of nitrogen.

Similarly, the obtained results indicate significant effect for seeding rate on number of spikes/m² in both studied seasons and its combined which indicate that No. of spikes/m² increased by exceeding the rate of seeds/fed. from 30 to 90 kg/fed. and these results are in harmony with Soomro *et al.*(2009), Rafiqueet *et al.*(2010) and Kelemu *et al.* (2024).

In most cases the interactions between studied factors were not significant except in the second season, that results revealed significant effect between the studied factors.

Table (1): The effect of wheat cultivars, nitrogen fertilizer levels and seeding rate on number of spikes per m²

Treatments	Seasons		Combined data
	2022/2023	2023/2024	
<u>Cultivars:</u>			
Giza 171	219.9 b	224.8 b	222.35 b
Misr 3	226.4 a	228.4 a	227.4 a
F. test	*	*	*
<u>Nitrogen fertilizer levels: (kg/fed.)</u>			
60	218.16 c	222.3 c	220.23 c
90	223.5 b	226.9 b	225.2 b
120	227.0 a	230.6 a	228.8 a
F. test	*	*	*
<u>Seeding rate: (kg/fed.)</u>			
30	221.6 c	228.1 a	224.85
60	223.1 b	226.6 b	224.85
90	224.8 a	225.1 c	224.95
F. test	*	*	N. S
<u>Interaction:</u>			

A x b	N. S	*	N. S
A x C	*	*	N. S
B x C	N. S	*	N. S
A x B x C	N. S	*	N. S

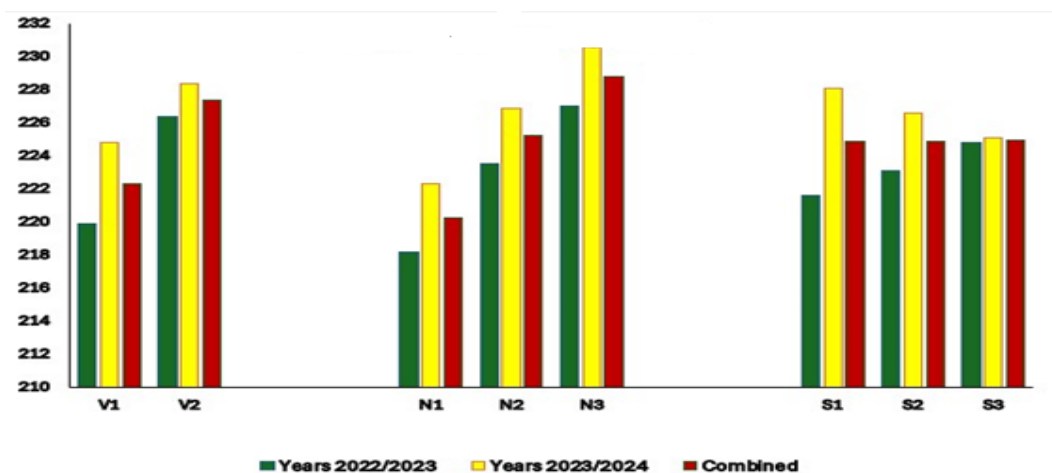


Fig (1): Number of sipkes/m2

2- Number of grains/spike:

The statistical analysis of variance of data for number of grains/spike indicated that it was significantly affected by all studied factors, i.e. wheat cultivars, nitrogen fertilization levels and seeding rate, in both seasons and their combined data as showed in Table (2) and Fig (2).

Data pertaining the effect of wheat cultivars on number of grains/spike are given in Table (2) and showed significant effect on this trait and revealed that Misr 3 variety was surpassed Giza 171 variety in number of grains/spike. These results are in harmony with Javid Iqbal *et al.* (2012) and Omnya *et al.* (2022).

Also, seeding rate treatments had favorable and significant effect on number of grains/spike in both seasons and its combined data which indicated that number of grains/spike increased by increasing the rate of seeds, these results are harmony with Javaid Iqbal *et al.* (2012), Omnya *et al.* (2022) and Kelemu *et al.* (2024).

Nitrogen fertilization has effected significantly on this trait and showed clearly that the number of grains/spike increased by increasing the dose of nitrogen from 60 up to 120 kg/fed. This result are true in both seasons and its combined data.

Table (2): The effect of wheat cultivars, seeding rate and nitrogen fertilizer levels on number of grains/spike

Treatments	Season		Combined data
	2022/2023	2023/2024	
<u>Cultivars:</u>			
Giza 171	50.4 b	52.18 b	51.29 b
Misr 3	58.7 a	56.40 a	57.55 a
F. test	*	*	*

Nitrogen fertilizer levels: (kg/fed.)			
60	51.3 c	50.16 c	50.73 c
90	54.6 b	55.16 b	54.88 b
120	57.6 a	57.55 a	57.57 a
F. test	*	*	*
Seeding rate: (kg/fed.)			
30	53.3 c	52.6 c	52.95 c
60	54.5 b	54.2 b	54.35 b
90	55.8 a	55.9 a	55.85 a
F. test	*	*	*
Interaction:			
A x b	*	*	N. S
A x C	*	N. S	N. S
B x C	*	N. S	N. S
A x B x C	*	*	N. S

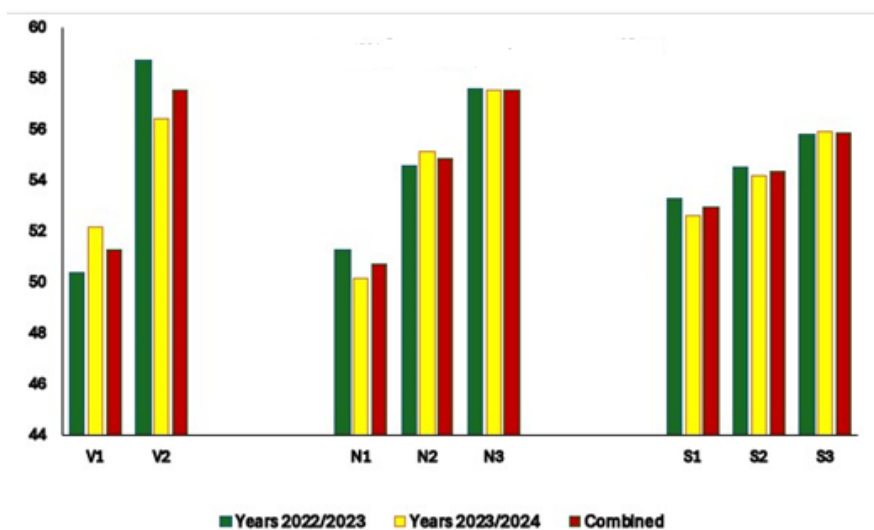


Fig (2): Number of grains/spike

3- 1000 grains weight:

The statistical analysis of variance indicated that 1000 grains weight found to be significantly affected by wheat cultivars, nitrogen fertilization levels and seeding rate in both seasons and its combined analysis of data during the two studied seasons as showed in Table (3) Fig (3). All possible interactions among the main factors of this study did not reveal the level trait significant excepting that wheat cultivars X nitrogen fertilization in the second season only.

The averages of 1000- grains weight in both seasons and its combined data as affected significantly by wheat cultivars and Masr 3 variety gave heavy grains of wheat than Giza 171 wheat variety.

Table (3): The effect of wheat cultivars, nitrogen fertilizer levels and Seeding rate on 1000 grains /weight.

Treatments	Season		Combined data
	2022/2023	2023/2024	
<u>Cultivars:</u>			
Giza 171	50.03 b	56.44 b	53.23 b
Misir 3	52.48 a	57.96 a	55.22 a
F. test	*	*	*
<u>Nitrogen fertilizer levels : (kg/fed.)</u>			
60	49.05 c	56.6 b	53.05 c
90	50.9 b	57.2 ab	54.05 b
120	53.27 a	57.7 a	55.48 a
F. test	*	*	*
<u>Seeding rate: (kg/fed.)</u>			
30	49.6 c	55.7 c	52.65 c
60	51.2 b	57.2 b	54.2 b
90	52.8 a	58.5 a	55.65 a
F. test	*	*	*
<u>Interaction:</u>			
A x b	N. S	*	N. S
A x C	N. S	N. S	N. S
B x C	N. S	N. S	N. S
A x B x C	N. S	N. S	N. S

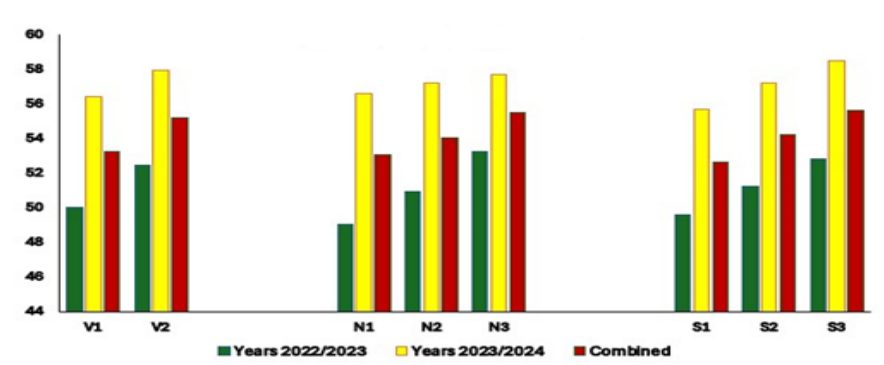


Fig (3): 1000-grains weight

The obtained results in this table also clearly evident that N. level treatment had a significant affect on this trait, whereas the 1000-grains weight increased by exceeding the applied of N. level from 60 up to 120 kg N/fed., this true in both seasons and its combined data. These results are in general similar according seeding rate which significantly affected the 1000-grains weight in both studied seasons. In this respect, these results are harmony of Chebrolu *et al.* (2022), Omnya *et al.* (2022) and Kelemu *et al.*(2024).

4- Grain yield (Ton/fed):

Table (4) include the averages of grain yield (Ton/fed) as affected by the two studied cultivars, the three nitrogen levels and the three seeding rate and their interaction in both seasons and its combined data.

It is quite likely to note that Masr 3 wheat variety gave 3.03 Ton/fed while Giza 171 gave 2.53 Ton/fed as average of two studied seasons. In this respect, it showed that the Gemmeiza 9 wheat cultivars surpassed markedly Gemmeiza 5 cultivars in each of number of spikes/m² and grain yield/fed.

Also, the obtained data in this table showed that increasing the applied nitrogen rate from 60, to 120 kg N/fed., in both seasons and its combined data gave significantly increased in grain yield as Ton/fed.

Contradictory findings were reported in this respect, Seidy et al (2017), Javaid Iqbal et al. (2012), and Omnya et al. (2022).

Concerning the effect of seeding rate on the trait of grain yield per feddan, the results showed a significant positive effect and the yield increased by increasing the Seeding rate from 30 to 90 kg/fed.

There results are harmony with similar data obtained by Birhquu *et al.* (2021), Arian *et at.* (2022), and Omnya *et al.* (2022).

Moreover, many infestigator found that Seeding rate had significant effect on wheat grain yield. The obtained results are in agree with those of El-Seidy *et al.* (2017), Naman Gurjar *et al.* (2024) and Kelemu *et al.* (2024) showed.

Table (4): The effect of wheat cultivars, nitrogen fertilizer levels and seeding rate on grain yield (Ton/fed.)

	Years		Combined data
	2022/2023 season	2023/2024 season	
<u>Cultivars:</u>			
Giza 171	2.33 b	2.79 b	2.56 b
Misr 3	2.929 a	3.12 a	3.03 a
F. test	**	*	*
<u>Nitrogen fertilizer levels (kg/fed.)</u>			
60	2.40 c	2.66 c	2.53 c
90	2.53 b	2.98 b	2.75 b
120	2.96 a	3.22 a	3.09 a
F. test	*	*	*
<u>Seeding rate: (kg/fed.)</u>			
30	2.49 c	2.78 c	2.63 c

60	2.60 b	2.98 b	2.79 b
90	2.81 a	3.10 a	2.95 a
F. test	*	*	*
<u>Interaction:</u>			
A x b	*	*	N. S
A x C	N. S	N. S	N. S
B x C	N. S	N. S	N. S
A x B x C	*	*	N. S

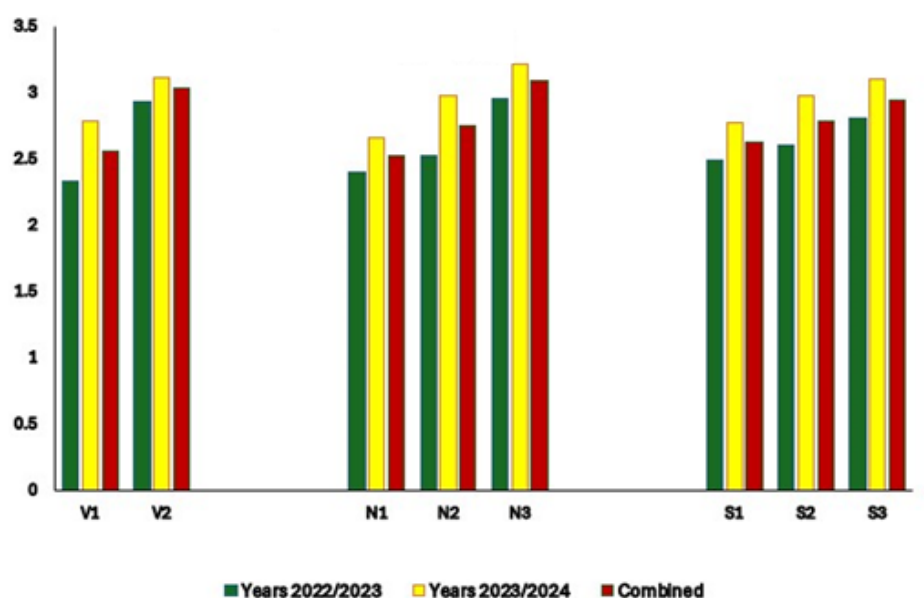


Fig (4) : Grain yield/fed.

The average of grain yield/fed. was not affected significantly by the interactions between studied factors except the interaction between wheat cultivars and nitrogen levels in the second season only.

Conclusively it can be recommended that by increasing the nitrogen fertilization level of 120 Kg N/fed. ,and using 90 kg seeds/fed. for increasing the wheat grain yield in the area of Sharkia Governorate under the two used wheat cultivars in this study Misr 3 and Giza 171, respectively.

REFERENCES

1. **Abd Allah-Soheir M. H. and A.A. El-Gammaal (2009).** Estimate of heterosis and cmbining ability in diallel bread wheat crosses (*Triticum aestivum* L.). Alex. Sci. Exch. J., 30(1): 76-85.
2. **Arian MA, MA Sial and MA Javed (2002).** Influence of different seeding rates and row spacings on yield contributing traits in wheat. Pakistan Journal of Seed Technology.1(1):1-6.
3. **Birhanu G. Abubaker H., Mohamed A. and Bahri Univ. (2021).** Response of bread wheat (*Triticum aestivum* L.) to seeding rate and fertilizer types on yield and yield components. Journal of Agronomy Research. Article DOI: 10.

4. **Chebrolu S., Rajesh S. and Pratyasha T. (2022).** Effect of levels of nitrogen and Seeding rate on growth and yield of wheat (*Triticum aestivum* L.). International Journal of Environment and Climate Change. Article no. IJECC. 12(10): 997-1004.
5. **Duncan, D.B. (1955).** Multiple Range and Multiple F-Test Biometrics. 11:1-42.
6. **El-Seidy E.H., Morad A. A. and El-Refaey R.A. (2017).** Effect of nitrogen fertilizer levels on some wheat varieties belonging two species. Menoufia J. Plant Prod., Vol. 2 June, P207 – 217.
7. **Javaid I., Khizer H., Safdar H., and Anser A. (2012).** Effect of seeding rates and nitrogen levels on yield and yield components of wheat (*Triticum aestivum* L.), Pakistan J. of Nutrition, 11 (7): 629-634.
8. **Kelemu N., Fenta A. and Habtamu Y. (2024).** The effect of seed and nitrogen-phosphorous fertilizer rates on growth and yield components of bread wheat (*Triticum aestivum* L.) in Burie District, Northwestern Ethiopia: Dataset article. journal homepage: www.elsevier.com/locate/dib, Data in Brief 54.
9. **Naman G., Jaidev S., Aakash M., Pradeep K., and Pradeep R. (2024).** Effect of different nitrogen levels on growth and yield of wheat (*Triticum aestivum* L.). International Journal of Research in Agronomy SP-7(9): 413-415.
10. **Omnya M.A. Elmoselhy, M. Mohiy and A.M. Mostafa (2022).** Effects of seeding rates and nitrogen fertilizer levels on the productivity of some bread wheat genotypes in new lands under Sinai and upper Egypt conditions. SVU-International Journal of Agricultural Sciences, 4 (1): P 111-123
11. **Rafique SM, Rashid M, Akram MM. (2010).** Optimum Seeding rate of wheat in available soil moisture under rainfed conditions. Journal of Agricultural Research.;47(2).
12. **Soomro UA, Ur Rahman M, Odhano EA, Gul S, Tareen A. (2009).** Effect of sowing methods and Seeding rate on growth and yield of wheat (*Triticum aestivum*). World Journal of Agricultural Sciences. 5(2):159-162.
13. **Snedecor, Q. W. and W. G. Cochran (1980).** Statistical methods 7th ed. Ioa Univ. Press. Ames. I, A, U. S. A.