



International Journal of Research in Agronomy

E-ISSN: 2618-0618

P-ISSN: 2618-060X

© Agronomy

www.agronomyjournals.com

2024; 7(6): 704-706

Received: 07-03-2024

Accepted: 12-04-2024

Yash Gupta

Department of Agriculture,
Maharishi Markandeshwar,
Deemed to be University, Mullana,
Ambala, Haryana, India

Ishwar Singh

Department of Agriculture,
Maharishi Markandeshwar,
Deemed to be University, Mullana,
Ambala, Haryana, India

RK Behl

Department of Agriculture,
Maharishi Markandeshwar,
Deemed to be University, Mullana,
Ambala, Haryana, India

Rakesh Kumar

Department of Agriculture,
Maharishi Markandeshwar,
Deemed to be University, Mullana,
Ambala, Haryana, India

Vishavjeet Singh

Department of Agriculture,
Maharishi Markandeshwar,
Deemed to be University, Mullana,
Ambala, Haryana, India

Corresponding Author:

Yash Gupta

Department of Agriculture,
Maharishi Markandeshwar,
Deemed to be University, Mullana,
Ambala, Haryana, India

Effect of macro and micro nutrients application on yield attributes and yield in wheat (*Triticum aestivum* L.) under late sown conditions

Yash Gupta, Ishwar Singh, RK Behl, Rakesh Kumar and Vishavjeet Singh

DOI: <https://doi.org/10.33545/2618060X.2024.v7.i6j.951>

Abstract

A field experiment was conducted during winter (*Rabi*) season of 2022-2033 to study “Effect of macro and micro nutrients application on yield attributes and yield in wheat (*Triticum aestivum* L.) under late sown conditions”. The experiment was laid out in Randomized Block Design (RBD), three replications of a single variety and ten nutrient treatments. The ten nutrient treatment were T₁: 50% RDF +20 kg/ha MgSO₄, T₂: 50% RDF +20 kg/ha FeSO₄, T₃: 50% RDF +20 kg/ha ZnSO₄, T₄: 75% RDF +15 kg/ha MgSO₄, T₅: 75% RDF +15 kg/ha FeSO₄, T₆: 75% RDF +15 kg/ha ZnSO₄, T₇: 100% RDF 150:60:60 kg/ha N:P₂O₅:K₂O, T₈: 100% RDF + 10 kg/ha MgSO₄, T₉: 100% RDF + 10 kg/ha FeSO₄, T₁₀: 100% RDF + 10 kg/ha ZnSO₄. The findings showed that the biological yield, grain yield, straw yield, (111.99, 49.48, and 62.51 q/ha) were reported highest in 100% recommended dose of fertilizers + 10 kg/ha ZnSO₄ respectively. The highest gross, net returns was obtained in T₁₀ followed by T₉, while minimum gross return and net return was obtained in T₁. Highest value of B: C ratio (1.46) was obtained in T₁₀.

Keywords: Wheat, grain yield, nutrients, zinc, nitrogen, iron

Introduction

One of the major food crops that farmed worldwide is wheat (*Triticum aestivum* L.). Wheat crop is cultivated over the world for its nutritious and valuable grain. It is the most significant crop in terms of agronomy and nutrition, necessary for increased livelihoods, food security, and the reduction of poverty. After rice, wheat is the second most produced cereal for human consumption. Wheat dominates agronomic crops in terms of production and acreage, and it plays a key role in agricultural policies and farming. The global acreage under wheat crop accounts for 220.60 million hectares, with production of 788.5 million metric tonnes (Anonymous, 2023). India is the second-largest wheat grower in the world, behind China. India leads the world in wheat acreage. In India, estimated area under wheat crop was 304.69 lakh hectares in 2021–2022, with an expected 106.84 million tonnes of wheat produced during that time (Anonymous, 2022-23). In Haryana, total production of wheat was reported at (10.45 million tonnes) in 2021-2022 (Anonymous, 2021-2022).

Its low productivity is primarily caused by inadequate crop establishment, mis-timed irrigation, and inadequate fertilizer supplies. In wheat, the technique of crop establishment and the availability of fertilizer have an impact on the yield, economics and efficiency of nutrient utilization. Micronutrients are needed for the growth and development of plants and have a significant position in crop yields due to their essentiality. In actuality, their significance is increased by their crucial role in improving soil production and providing nutrition for plants. Keeping these facts in views, the present investigation was designed to determine “Effect of macro and micro nutrients application on yield attributes and yield in wheat (*Triticum aestivum* L.) under late sown conditions”. This paper deals with the response of wheat variety PUSA Gautami (HD3086) to different macro and micro nutrients.

Materials and Methods

A field experiment was carried out to determine “Effect of macro and micro nutrients

application on yield attributes and yield in wheat (*Triticum aestivum* L.) under late sown conditions” in 2022-23 winter (Rabi season) at the research farm of the Department of Agriculture at Maharishi Markandeshwar (Deemed to be University), Mullana-Ambala, Haryana. In order to set up the experiment, randomised block design was used with ten nutrient treatments e.g. T₁: 50% RDF +20 kg/ha MgSO₄, T₂: 50% RDF +20 kg/ha FeSO₄, T₃: 50% RDF +20 kg/ha ZnSO₄, T₄: 75% RDF +15 kg/ha MgSO₄, T₅: 75% RDF +15 kg/ha FeSO₄, T₆: 75% RDF +15 kg/ha ZnSO₄, T₇: 100% RDF 150:60:60 kg/ha N:P₂O₅:K₂O, T₈: 100% RDF + 10 kg/ha MgSO₄, T₉: 100% RDF + 10 kg/ha FeSO₄, T₁₀: 100% RDF + 10 kg/ha ZnSO₄. In this research the variety of Wheat PUSA Gautami (HD 3086) was taken. The sowing was carried out using a tractor-drawn seed drill at a row-to-row spacing of 22.5 cm and plant to plant spacing 5 cm. The seeds were planted 4-5 cm deep. Observation were recorded on plant height at 30, 60, 90 DAS and at harvest,

yield and yield attributes, and economic studies. The data was analyzed using ANOVA (Analysis of Variance) table.

Results and Discussion

Growth Attributes

Plant height data (Table 1) showed that the treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) recorded the highest plant height at 30, 60, 90 DAS and at harvest stage (20.3, 53.6, 94, and 96.6 cm, respectively) which was statistically significant with T₉ (100% RDF+10 kg/ha FeSO₄) 19.9, 52.2 92.7 and 95.2 cm, respectively. The minimum plant height noted at 30, 60, and 90 DAS, as well as at harvest stage, were 17.7, 42.3, 81.1, and 83.4 cm, respectively, in treatment T₁ (50% RDF + 20 kg/ha MgSO₄). Similar results of plant height at 30, 60, 90 DAS and at harvest stage were recorded by Prajapati *et al.* (2022) [6] in his research work.

Table 1: Effect of macro and micro nutrients application on plant height (cm) at 30, 60, 90 DAS and at harvest stage in wheat under late sown conditions

Symbol	Treatments	Plant height (cm)			
		30 Days	60 Days	90 Days	At Harvest
T ₁	50% RDF +20 kg/ha MgSO ₄	17.7	42.3	81.1	83.4
T ₂	50% RDF +20 kg/ha FeSO ₄	17.7	43.2	82.6	84.6
T ₃	50% RDF +20 kg/ha ZnSO ₄	17.9	43.9	83.4	85.6
T ₄	75% RDF +15 kg/ha MgSO ₄	18.1	46.8	86.7	88.4
T ₅	75% RDF +15 kg/ha FeSO ₄	18.3	47.5	87.4	89.6
T ₆	75% RDF +15 kg/ha ZnSO ₄	18.8	48.6	88.9	91.3
T ₇	100% RDF 150:60:60 kg/ha N: P ₂ O ₅ :K ₂ O	19.1	50.0	90.4	92.4
T ₈	100% RDF + 10 kg/ha MgSO ₄	19.3	50.9	91.8	94.4
T ₉	100% RDF + 10 kg/ha FeSO ₄	19.9	52.2	92.7	95.2
T ₁₀	100% RDF + 10 kg/ha ZnSO ₄	20.3	53.6	94.0	96.6
Factors	CD (P=0.05)	0.3	0.6	0.8	0.6
	SE(m) ±	0.1	0.2	0.3	0.2

Yield and yield attributes

Among the various treatments, (Table 2) the treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) was recorded highest length of spike (9.30 cm) which was statistically significant with treatment T₈ (100% RDF+10 kg/ha MgSO₄) (9.00 cm). Data presented in Table 2 showed that the treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) recorded the highest number of grains per spike and number of effective spike per m² (47 and 266.34, respectively) which was statistically significant with T₉ (100% RDF+10 kg/ha FeSO₄) 46 and 260.34, respectively. The

minimum number of grains per spike and number of effective spike per m² 42.67 and 218.34 respectively, were recorded in treatment T₁ (50% RDF + 20 kg/ha MgSO₄).

Among the various treatments, (Table 2) the treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) was recorded highest test weight (39.63 g) which was statistically significant with treatment T₈ (100% RDF+10 kg/ha MgSO₄) (39.17 g). Similar results of yield attributes were recorded by Arshad *et al.* (2016) [4] during his research work.

Table 2: Effect of macro and micro nutrients application on yield attributes in wheat under late sown conditions

Symbol	Treatments	Length Of Spike(cm)	No. of grains/spike	No. of Effective Spike/m ²	Test Weight (g)
T ₁	50% RDF +20 kg/ha MgSO ₄	8.30	42.67	218.34	36.96
T ₂	50% RDF +20 kg/ha FeSO ₄	8.40	43.00	223.00	37.28
T ₃	50% RDF +20 kg/ha ZnSO ₄	8.40	43.34	227.34	37.62
T ₄	75% RDF +15 kg/ha MgSO ₄	8.60	45.00	232.00	38.14
T ₅	75% RDF +15 kg/ha FeSO ₄	8.60	45.00	237.34	38.45
T ₆	75% RDF +15 kg/ha ZnSO ₄	8.70	45.67	242.67	38.78
T ₇	100% RDF 150:60:60 kg/ha N: P ₂ O ₅ :K ₂ O	8.90	46.00	248.34	38.98
T ₈	100% RDF + 10 kg/ha MgSO ₄	9.00	46.67	253.34	39.17
T ₉	100% RDF + 10 kg/ha FeSO ₄	9.20	46.00	260.34	39.49
T ₁₀	100% RDF + 10 kg/ha ZnSO ₄	9.30	47.00	266.34	39.63
Factors	C.D. 5%	0.30	0.87	4.85	0.28
	SE(m) ±	0.10	0.29	1.62	0.09

Among the various treatments (Table 3) the data presented in treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) registered highest grain and biological yield (49.48 and 111.99 q/ha, respectively)

which were statically significantly with T₉ (100% RDF+10 kg/ha FeSO₄) 47.92 and 109.06 q/ha, respectively. The lowest grain and biological yield were registered with T₁ (50% RDF+

20 kg/ha MgSO₄) 34.37 and 82.04 q/ha, respectively.

As per data presented in Table 3, treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) registered highest straw yield (62.51 q/ha) which was statistically significant with treatment T₈ (100% RDF+10 kg/ha MgSO₄) (59.57 q/ha). The lowest straw yield was recorded with treatment T₁ 50% RDF +20 kg/ha MgSO₄ (47.67 q/ha).

Data presented in Table 3 showed that, the treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) registered highest harvest index (44.18%) which was statistically significant with treatment T₅ (75% RDF+15 kg/ha FeSO₄) (43.14%). Similar results of straw yield, harvest index, grain yield and 1000-grain weight were recorded by Prajapati *et al.* (2022) ^[6] in his research work.

Table 3: Effect of macro and micro nutrients application on yield in wheat under late sown conditions

Symbol	Treatments	Yield (q/ha)			Harvest Index (%)
		Grain Yield	Straw Yield	Biological Yield	
T ₁	50% RDF +20 kg/ha MgSO ₄	34.37	47.67	82.04	41.89
T ₂	50% RDF +20 kg/ha FeSO ₄	36.24	49.41	85.65	42.31
T ₃	50% RDF +20 kg/ha ZnSO ₄	37.63	50.64	88.27	42.63
T ₄	75% RDF +15 kg/ha MgSO ₄	40.24	53.79	94.03	42.8
T ₅	75% RDF +15 kg/ha FeSO ₄	41.87	55.18	97.05	43.14
T ₆	75% RDF +15 kg/ha ZnSO ₄	43.29	56.69	99.98	43.31
T ₇	100% RDF 150:60:60 kg/ha N: P ₂ O ₅ :K ₂ O	44.92	58.02	102.94	43.64
T ₈	100% RDF + 10 kg/ha MgSO ₄	46.45	59.57	106.02	43.81
T ₉	100% RDF + 10 kg/ha FeSO ₄	47.92	61.14	109.06	43.95
T ₁₀	100% RDF + 10 kg/ha ZnSO ₄	49.48	62.51	111.99	44.18
Factors	C.D. 5%	1.38	2.03	2.86	0.9
	SE(m) ±	0.46	0.67	0.95	0.3

Economics

Data referring (Table 4) to economics was affected by various dose of fertilizers. The maximum cost of cultivation was recorded in the treatment T₈ (100% RDF+10 kg/ha MgSO₄) (60583 Rs./ha) and the least cost of cultivation was recorded in T₇ (100% RDF 150:60:60 kg/ha N:P₂O₅:K₂O) (57215 Rs./ha). The highest gross, net returns and B:C were observed in the

treatment T₁₀ (100% RDF+10 kg/ha ZnSO₄) (148902, 45842 Rs./ha and 1.46, respectively) and minimum gross, net returns and B:C were recorded in treatment T₁ (50% RDF+ 20 kg/ha MgSO₄) (106405 Rs./ha) 106405, 45842 Rs./ha and 0.76, respectively. Present findings related to economics were in conformity with Mishra *et al.* (2017) ^[5].

Table 4: Effect of macro and micro nutrients application on economics in wheat under late sown conditions

Symbols	Treatments	Economics			
		Cost of Cultivation (Rs./ha)	Gross Returns (Rs./ha)	Net Returns (Rs./ha)	B:C
T ₁	50% RDF +20 kg/ha MgSO ₄	60563	106405	45842	0.76
T ₂	50% RDF +20 kg/ha FeSO ₄	59617	111597	51980	0.87
T ₃	50% RDF +20 kg/ha ZnSO ₄	60493	115411	54918	0.91
T ₄	75% RDF +15 kg/ha MgSO ₄	60573	123163	62590	1.03
T ₅	75% RDF +15 kg/ha FeSO ₄	59862	127599	67737	1.13
T ₆	75% RDF +15 kg/ha ZnSO ₄	60521	131674	71153	1.18
T ₇	100% RDF 150:60:60 kg/ha N: P ₂ O ₅ :K ₂ O	57215	136069	78854	1.38
T ₈	100% RDF + 10 kg/ha MgSO ₄	60583	140105	79522	1.31
T ₉	100% RDF + 10 kg/ha FeSO ₄	60110	144628	84518	1.41
T ₁₀	100% RDF + 10 kg/ha ZnSO ₄	60549	148902	88353	1.46

Conclusion

From the research it was found that, application of combine dose of fertilizers e.g. 100% RDF+ 10 kg/ha ZnSO₄ was the most suitable dose of fertilizer to be adopted because, it gave highest performance in terms of growth parameters, yield and yield attributes and economic returns.

References

1. Anonymous. Government of India (GoI). Annual Report 2022-23 Department of Agriculture and Farmers Welfare, Ministry of Agriculture and Farmers Welfare; 2022-23.
2. Anonymous. USDA Circular on World Agricultural Production. Foreign Agricultural Service Circular Series WAP 6-23 June 2023; c2023
3. Anonymous. Agriculture statistics at a glance; c2021-22.
4. Arshad M, Adnan M, Ahmed S, Khan AK, Ali I, Ali M, Khan MA. Integrated effect of phosphorus and zinc on wheat crop. Am Eurasian J Agric Environ Sci. 2016;16(3):455-459.

5. Mishra S, Ali A, Singh AK, Singh G, Singh RR. Response of late sown Wheat to phosphorus and zinc nutrition in eastern Uttar Pradesh. Ann Plant Soil Res. 2017;19(1):23-28.
6. Prajapati A, Patel K, Chauhan Z, Patel C, Chaudhari P. Effect of Zinc Fertilization on growth, yield and quality of wheat (*Triticum aestivum* L.). Pharma Innov J. 2022;11(4):1399-1402.