Effect of organic manure of nitrogen nutrients on economic benefits of wheat (Triticum aestivum)

ABSTRACT

A field experiment was conducted at crop research center of IFTM University Moradabad (U.P.) field experiment carried out during the Rabi season 2022–2023. The texture of the sandy loam soil in the experimental field was sandy loam. The randomized block design method was used for the statistical analysis, and the ten treatments included three replications of the application of biofertilizers and V.C. FYM. Treatments were T_1 (control), T_2 (Pressmud @ 10 t ha^{-1} + PSB + Azotobactor), T_3 (Pressmud @ 10 t ha^{-1} + PSB), T_4 (FYM @ 10 t ha^{-1} + PSB + Azotobactor), T_5 (FYM @ 10 t ha^{-1} + PSB), T_6 (VC @ 5 t ha^{-1} + PSB) T_7 (VC @ 5 t ha^{-1} +PSB+Azotobactor), T_8 (50%N Through FYM+50% Through NPK), T_9 (75%N Through FYM+25%Through NPK) T_{10} (100% NPK 120:60:40)wheat variety DBW90 was sown on during December 2022. The levels of NPK fertilizer were associated with a rise in the economic benefits. The outcome showed that, under the treatment 100% NPK of RDF T_{10}, the highest gross return of Rs. 111061 of ha^{-1}, the highest net return of Rs. 74821 of ha^{-1}, and the maximum benefit of cost ratio 2.06 were all recorded. When it came to economics, the treatment that used 100% NPK of RDF was found to be superior and statistically comparable to T_8. It is also possible to maintain soil fertility, which is crucial for sustainable crop production, by applying organic matter and fertilizers in conjunction with inorganic ones.

Keywords:*FYM, Pressmud, Biofertilizer, NPK*

Introduction

"According to the Food and Agriculture Organization of the United Nations (FAO), 761 million tons of wheat were produced worldwide in 2020, with Europe being the second largest producer area after Asia (representing a production share of 34 % and 46 %, respectively;)"(FAO, 2022). "Due to its several end-use products (e.g., pasta, bulgur, bread, couscous), this cash crop has considerable commercial importance. Only in Europe, wheat generated 45.1 billion euros of gross product value in 2020, which accounted for 9 % of the total gross production of the agricultural sector" (FAO, 2022). "In terms of varieties, wheat. ssp. durum) contains fewer but larger grains than bread wheat"(**Calderini***et al.,* 2006). "Although bread wheat is widely sown around the world, durum wheat (*Triticum aestivum* L. ssp. durum) can grow in more restricted agricultural areas like the Mediterranean region,

which accounts for more than 50 % of the world's cultivated area" (Marti and **Slafer**, 2014). "The Mediterranean region has water and high-temperature stresses occurring mainly at the end of the growing season" (**Acevedo***et al.,* 1999). "Consequently, durum wheat could be a crucial crop for global food security" (Erenstein*et al.,* 2022).

"Wheat (*Triticumaestivum* L.), one of the cereal crops grown worldwide, is a significant staple food for the roughly 2.6 billion people who live on the planet. This important staple crop provides almost half of the calories consumed in West and Central Asia, as well as North Africa. India has produced impressive amounts of wheat over the past 40 years, making it the second-largest producer in the world after China. Worldwide, the agricultural sector employs more people than all other occupations combined. The amount of wheat produced has increased dramatically since independence, rising from 6.60 million tonnes in 2020–21 to 109.52 million tonnes in 2020–21" (**Anonymous**, 2021)."Based on climate, crop duration, and soil type, India has been divided into five major wheat-growing zones, namely North Eastern Plains Zone, North Western Plains Zone, Peninsular zone Northern Hills zone, and Central Zone, thus accounting for 29.80 m ha area under wheat cultivation which contributes 19.73 % of net sown area of India. Integrated nutrient management are essential for proper plant growth. The total area, production and productivity of wheat in India were 31.45 million hectares (22.4% area of total cultivated area), 107.59 million tonnes and 3425 kg ha^{-1}, respectively during 2019-20. Haryana is one of the leading wheat producing states of India where 13.27 million tonnes of wheat was produced (10.77% of total wheat production) from an area of 2.52 million hectares (8.24% of the total area under wheat cultivation at the national level) with a productivity of 5265 kg ha^{-1} (2nd highest after Punjab in India) during 2019-201. In terms of total area, production, and productivity in India in 2019–20, wheat accounted for 31.45 million hectares (or 22.4% of the total cultivated area), 107.59 million tonnes, and 3425 kg ha-1. Growing demand in tandem with population growth is a major crop vulnerability and bottleneck in the context of climate change conditions" (**Kumawat*et al.*, 2022).**

"Plant and animal wastes that are utilized as sources of nutrients for plants and released once they break down are known as organic nutrient sources. By matching soil nutrient availability with crop demand, the idea of applying both organic and biological nutrient sources simultaneously is being promoted more and more to increase nutrient use efficiency. It has been demonstrated to boost crop yields by controlling the nutrient supply and minimizing nutrient losses to the environment. This leads to high resource utilization efficiency, lower costs, and better nutrient availability. The soil microbiome and soil

enzymes are also influenced by crop residue quantity, quality, FYM, and biofertilizers (Azotobacter). The beneficial effect of FYM on yield was also reported" by (Singh *et al.* 2019). The significant interaction effect between N and FYM revealed that the application of FYM increased the grain and straw yield of wheat at all the levels of nitrogen. The focus has shifted to inexpensive nutrient sources like organic and biological sources to supplement chemical fertilizers in recent years due to the decline in soil health brought on by the global energy crisis and the rise in the price of chemical fertilizers **(Kumar *et.al* ,2022**) application of 50% RDF+ FYM @ 5.0 t/ha found to be best in the terms of growth attributes such as plant height, dry weight, grain yield (28.70 and 29.52 q ha^{-1}), straw yield (41.88 and 42.13 q ha^{-1}) and biological yield (70.68 and 71.75 q ha^{-1}) during 2021-22, respectively, compared to each other treatment combination ."Application organic manures increased the wheat yield relative to the control. The wheat plant height, number of tillers, spike length, straw yield, grain yield and 1000- grain weight all were statistically different from that of control. The findings of the trial suggested that crop productivity may be improved significantly by the application of various organic manures for longer time". (Ibrahim *et al* 2008).Intensive cropping systems are typically used to grow wheat, and NPK fertilizers are used extensively, maintaining sustainable yields, increasing fertilizer nutrient use efficiency, and conserving fertilizer resources all depend on optimal fertilizer management. One of the main nutrients that plants lack is nitrogen, especially in the sandy loam soil of the semiarid western region of Uttar Pradesh. Optimal nitrogen availability is necessary for robust vegetative growth. Therefore the present study entitled "Effect of organic manure of nitrogen nutrients and yield of wheat (Triticum aestivum L.)"Was carried out with the followingObjective:

1. To study the effect of various nutrients on growth, yield and yield attributing characters of wheat.

2. To work out the economic feasibility of different nutrient management options.

MATERIALS AND METHODS

The experimental site IFTM, University is at Lodhipur Rajput, Delhi Road N H- 24, Moradabad, (U. P.) at the backs of Ram-Ganga River. The district Moradabad lies between 28°21' to 28° 16' North latitude and 78°4 'to 79 East longitude above mean sea level of (193.23) meters. The experimental plots have uniform topography with homogenous fertility and soil characteristics typical to suit wheat crops cultivations. The field was fair situated levelled and had good drainage having assured irrigation facility.Ten treatments

were tested on Rabi wheat in RBD with three replications.Recommended doses of NPK (120:60:40) for wheat are applied, half dose (50%) of Nitrogen, full doses of phosphorus and potassium were applied as basal doses, 25 percent dose of nitrogen was applied at the time of first irrigation and remaining 25 per cent at panicle initiation stage according stage according to the treatment.A brief account of the sources used in experiment and its salient features have been discussed as under. Urea: It contains 46% NitrogenDAP: It contains 46% P2O5& 18% Nitrogen FYM: It contains 0.5% nitrogen. Phosphorous 0.2% end potassium 0.5% is a best source of organic matter for plant west materials decomposed, dry matter, plant growth and development Vermicompost: It contains Nitrogen 2-3% and phosphorus l.55-2.25% is an excellent source of potassium 1.85-2.25% for plat nutrition, increasing and improving crop yield's: Phosphate solubilizing bacteria. Azotobactor: It is crucial to remember that Azotobacter Biofertilizer uses have shown that they are of tremendous help in ensuring plant health. The Azotobacter is widely used in agriculture to increase soil fertility and stimulate plant growth. The presence of Azotobacter is prominent in biofertilizers. They are also crucial in the manufacture of alginic acid that is renowned in medicine as an antacid. It is also essential to highlight that Azotobacter is critical to the food industry as well.

Results and discussion

Spike length (cm)

The mean data is presented in Table.1 Fig.1 spike length (cm) show a significant variation due to effect of vermicompost, FYM, biofertilizers application with NPK. Minimum, Spike length (cm) 4.60 was recorded in T_1 while maximum 11.66 in T_{10} significantly similar number of Spike length (cm) recorded in T_8 and T_9 were significantly higher than the Spike length (cm) recorded in rest of the treatments. Lowest numbers of Spike length (cm) were recorded in control (T_1). Similar results of greater plant height with exception of control plant height at harvest under different treatments were more or less similar with the application of recommended dose in combination with organic fertilizers. Were also represented by **Kumar *et al*. (2022)**

Number of grains spike^{-1}

Mean number of grains spike^{-1} as affected by different treatment is presented in Table.1Fig.1.The mean data on grains per spike show a significant variation due to effect of vermicompost, FYM, biofertilizers application with NPK. Minimum, grains spikes-^{1} 30.26 was recorded in T_1 while maximum 48.56 in $T_{10.}$ Significantly similar number of grain

spikes^{-1} recorded in T_8 and T_9 were significantly higher than the grains recorded in rest of the treatments. Lowest numbers of grains spikes^{-1} were recorded in control (T_1). Similar results of greater plant height with exception of control plant height at harvest under different treatments were more or less similar with the application of recommended dose in combination with organic fertilizers. Were also represented by **Kurchania*et.al.* (2023**), **Patra *et.al.* (2019),**

Test weight

The mean of 1000 grains weight as influenced by different treatment are presented in Table.1Fig.1.Data revealed that every successive increase in fertility level increased 1000 grains weight. The highest 1000 grain's weight was recorded with T_{10} treatment and lowest under T_1 'control. With exception of T_8 and T_9 the 1000 gram weight recorded under rest of the treatments did not raised significantly. Minimum and significantly lowest 1000 grain weight than the rest of the treatments was few recorded in T_1.

Grain yield (q ha^{-1})

Data pertaining to grain yield as influenced by different treatments are presented in Table.1Fig.1.The grain yield of wheat which ranged from 21.30 to 47.26 q ha^{-1} respectively was influenced significantly .The maximum grain yield 47.26 q ha^{-1} respectively recorded with the application was 100% NPK was found statistically at par with treatment T_7, T_8 and T_9. The minimum yield of wheat 21.30 q ha^{-1} was recorded from the treatment under control. The effect of FYM, vermicompost and presumed application with 50%N through FYM+50% Through NPK was not similar and the grain yield in 75%N through FYM+25%Through NPK was significantly higher than. Grain yield was statistically similar in the treatments receiving 100% NPK and 75%N through FYM+25%Through NPK. The effect of biofertilizers inclusion with FYM @ 10 t ha^{-1} + PSB + Azotobactor was not appreciable but when biofertilizers were applied with vermicompost it yielded statistically at par to T_9.

The yield of a crop species depend on the source-sink relationship and is the cumulative function of various growth parameters and yield attributing characters of wheat i.e. effective tillers, number of grains per spike, and 1000- grain weight. Statistical analysis of data revealed that 100% NPK produced significantly higher yield attributes like, number of grain per spike and test weight, which was statistically followed by $T_8$50%N through FYM+50% through NPK ha^{-1} More yield attributes were found in the treatment where FYM, VC,Biofertilizers and 50 % NPK were applied this may be due to combined effects

of organic and inorganic sources on the adequate nutrients supply for longer period, which will affects crop growth and photosynthetic activity

Gross return (Rs./ha)

The data presented in Table.2and fig.2 shows that the highest gross return Rs.111061 of ha^{-1} under the treatment 100 % NPK of RDF T_{10} closely followed by Rs.104240 with the treatment T_8 50%N Through FYM+50% through NPK. The lowest return Rs.50055 was observed with control treatment where no fertilizer applied among the treatment .

Net returns (Rs./ha)

Table.2 and fig.2 indicate that the highest net return Rs. 74821 of ha^{-1} was recorded under the treatment 100 % NPK of RDF T_{10} just followed by Rs. 69015 with the treatment $T_8$50%N Through FYM+50% Through NPK. The minimum net return Rs.25585 of one hectare was recorded with control treatment where no fertilizer application.

Benefit: cost ratio (Rs./ha)

Table.2 and fig.2 revealed that the maximum benefit: cost ratio 2.06 was calculated under the treatment T_{10}-100% NPK Followed by 1.83 with the treatment $T_8$50%N through FYM+50% Through NPK. However, minimum benefit: cost ratio 1.04 was calculated under T_1. Based on one year study it is revealed that the highest gross return of Rs. 111061 ha^{-1} was obtained from the treatment 100% NPK followed by the application of $T_8$50%N through FYM+50% through NPK ha^{-1}. The maximum net profit of Rs.74821 ha^{-1} was recorded under the treatment 100% NPK closely followed by T_{10}-100% NPK ha^{-1}. "The maximum net profits under the recommended dose of fertilizers were also reported Cost recovery is an important reform strategy in agricultural advisory services. A number of different countries have contracted out advisory services to private providers or have diversified the funding of this activity" (Ali *et al.,* 2008).

Conclusion

The integrated use of organic manure and chemical fertilizer (NPK, urea) significantly increased the yield of wheat and was more effective than the separate use of organic manure and chemical fertilizer.The highest net return Rs. 74821 of ha^{-1} was recorded under the treatment 100 % NPK of RDF T_{10} just followed by Rs. 69015 with the treatment T_8 50%N Through FYM+50% Through NPK. The minimum net return Rs.25585 of one hectare was recorded with control treatment where no fertilizer application. The size

of sink affects the production and movement of photosynthesis in the plants, for providing the necessary facilities for conducting Master research.

References

Acevedo E.H. , Silva P.C. , Silva H.R. , Solar B.R. (1999) Wheat production in Mediterranean environments

Ali ,Khan , Ashraf , Rehman, Abdullah , Akram and Farooq (2020) Influence of Different Organic Manures and Their Combinations on Productivity and Quality of Bread Wheat Journal of soil Science and plant Nutrition *Soil Sci Plant Nutr* **20**, 1949–1960.

Ali, A., A. Morteza, S.F. Hossain and A. Amir (2008). An assessment of farmers willingness to pay for wheat consultant engineers project: In Iran. Am. J. Agric. Biol. Sci., 3: 706-711. DOI: 10.3844/ajabssp.2008.706.711

Anonymous *et al.* (2021). First Advance Estimates of Production of Food grains for 2021-22 as of 21.09.2021, Directorate of Economics and Statistics, Government of India.

Calderini D.F. , Reynolds M.P. , Slafer G.A. (2006) Source - sink effects on grain weight of bread wheat, durum wheat, and triticale at different locations

Doll, J.P., and F. Orazem (1992). Production Economics: Theory with Applications. 2nd Edn., Krieger Publishing Company, ISBN-10: 0894647695, pp: 470.

Erenstein, M. Jaleta, K.A. Mottaleb, K. Sonder, J. Donovan, H.-J. BraunFAO STAT (2022) statistical database https://www.fao.org/faostat/es/#data

Kumar R. and B.L Pareek (2022) Effect of organic manure, fertilizer on growth and yield of wheat (*Triticum aestivum L*.) *The Pharma Innovation Journal 2022; 11(2): 2179*-2183.

Kumar Maurya, Singh B N. B, Kumar K., Kanaujia P. , Yadav R. (2022) Influence of organic farming packages on growth, yield attributes and yield of wheat (Triticum aestivum L) *The Pharma Innovation Journal 11(2): 1155-115.*

Kurchania B. N, B D.V . A., Gupta R. K, M.K and Kumar Munesh (2023) Impact of irrigation level and nutrient management on growth attributes and yield of wheat .*The Pharma Innovation Journal ; 12(3): 3565-356.*

Luthria D.L. , Y. Lu, K.M.M. John (2015) Bioactive phytochemicals in wheat: extraction, analysis, processing, and functional propertiesAO, 2022

Mahajan, A., Chaudhary, A. K., Jaggi, R. C. and Dogra, R. K. (2003). Importance of bio-fertilizers *in sustainable agriculture. Farm Forum, 3: 17-20.*

Mahajan, A., Chaudhary, A. K., Jaggi, R. C. and Dogra, R. K. (2003). Importance of bio-fertilizers *in sustainable agriculture. Farm Forum, 3: 17-20.*

Marti J. and Slafer G.A.,(2014) Bread and durum wheat yields under a wide range of environmental conditions

Monneveux P., Jing R., Misra S.C. (2012) Phenotyping for drought adaptation in wheat using physiological traits

Patra B., Singh J., Hooda and Kapoor A. (2019) Effect of seed priming, bio fertilizer inoculations and nitrogen levels on yield attributes, yield and economic returns of late sown wheat *International Journal of Chemical Studies , 7(3): 95-99.*

Kumawat L., Katiyar D. , Dotaniya M. L. , Yadav S. L and Sharma C(2022). Effect of Farmyard Manure, Azotobacter and Cow Urine on Plant Nitrogen, Phosphorus &Pottassium Uptake at Tillering, Jointing and Harvest Stage of Wheat Cropping System Biological Forum – An International Journal 14(1): 543-548

Table1. Effect of organic manure of nitrogen nutrients on economic benefits of wheat (*Triticum aestivum* L.)

Treatment	Spike length (cm)	Number of grains spike^{-1}	1000 grains weight (g)	Grains yield (q ha^{-1})
T_1: Control	4.60	30.26	31.16	21.30
T_2: Pressmud @ 10 t ha^{-1} + PSB + Azotobactor	6.03	37.63	37.00	35.93
T_3: Pressmud @ 10 t ha^{-1} + PSB	5.00	33.50	33.90	32.30
T_4: FYM @ 10 t ha^{-1} + PSB + Azotobactor	7.00	38.10	39.70	37.36
T_5: FYM @ 10 t ha^{-1} + PSB	5.66	35.40	35.36	33.60
T_6: VC @ 5 t ha^{-1} + PSB	7.73	40.30	41.16	39.95
T_7:VC @ 5 t ha^{-1} +PSB+Azotobactor	8.36	42.16	43.66	42.56
T_8: 50%N Through FYM+50% Through NPK	10.6	47.40	48.86	44.66
T_9: 75%N Through FYM+25%Through NPK	9.73	45.00	45.43	43.00
T_{10}: 100%NPK 120:60:40	11.6	48.56	51.43	47.26
SE (m)	0.57	1.02	2.01	2.12
C.D.	1.7	3.07	6.02	6.3

Table2. Effect of organic manure of nitrogen nutrients on economic benefits of wheat (*Triticum aestivum* L.)

Treatment	Cost of cultivation (Rs/ha)	Gross income (Rs/ha)	Net income (Rs/ha)	B: C Ratio
T_1	24470	50055	25585	1.04
T_2	29697	84435	54738	1.84
T_3	27260	75905	48645	1.78
T_4	30105	87796	57691	1.91
T_5	32890	78960	46070	1.4
T_6	30890	93882	62992	2.03
T_7	33124	100016	66892	2.01
T_8	35225	104240	69015	1.83
T_9	37230	101050	63820	1.71
T_{10}	36240	111061	74821	2.06

Figure.1Present effect of organic manure of nitrogen nutrients on economic benefits of wheat (*Triticum aestivum* L.)

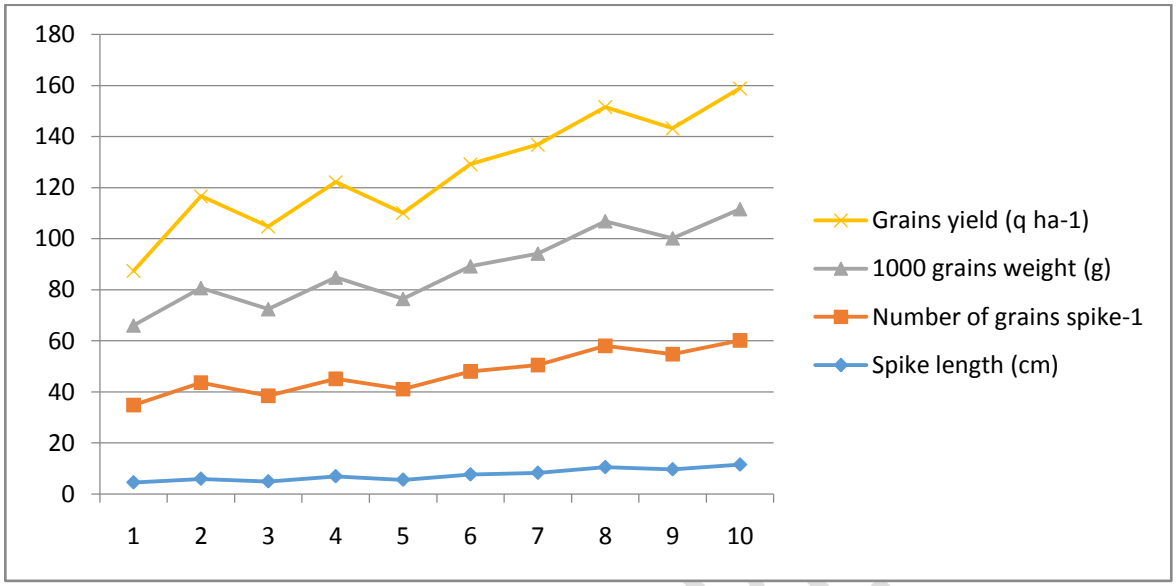

Figure.2 Present effect of organic manure of nitrogen nutrients on economic benefits of wheat (*Triticum aestivum* L.)