Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 13 [1] December 2023 : 82-87

Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
ORIGINAL ARTICLE **OPEN ACCESS**

Effects of organic manure of nitrogen nutrients on the yield attribute and yield of wheat (*Triticum aestivum* L.)

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ABSTRACT
A field experiment was conducted during Rabi season 2022 to study the "Effects of organic manure of nitrogen nutrients on the yield attribute and yield of wheat (Triticum aestivum L.)" on crop research Centre of IFTM University Moradabad (U.P.). The soil of the experimental field was loam in texture. The design applied for statistically analysis was carried out with randomized block design with 10 treatments consist application of V.C. FYM and biofertilizers in three replications. 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 result revealed that plant height, number of tillers m^{-2}, number of grains spike^{-1}, 1000 grain's weight (g) were affected significantly by different NPK levels and FYM, Vermicompost and biofertilizers application. The growth and yield attributes showed an increase with increase in the NPK fertilizer levels. 100% RDF recorded significantly highest grain yield (47.26 q ha^{-1}) and straw yield (54.75 q ha^{-1}). Among the various treatments where 100% NPK was applied proved to be superior and it statistically at par with T_8 and T_9 in terms of growth, yield attributes and yield. By comparing the yield obtained in the different treatments, it was found that 40% NPK can be saved with the application of FYM and vermicompost @ 10 and 5 tons ha^{-1}. Moreover the application of organic in integration with inorganic fertilizers could also maintain the soil fertility which is much important for sustainable crop production.
Keywords: *FYM, Vermicompost, PSB, Azotobacter and Pressmud.*

Received 05.10.2023 Revised 12.10.2023 Accepted 07.12.2023

INTRODUCTION

Wheat (*Triticum aestivum* 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 [1]. 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 2019-20. 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 [1].

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 [2]. The beneficial effect of FYM on yield was also reported by [3]. 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 [2] 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 [3]. 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 [5]. Intensive cropping systems are typically used to grow wheat and NPK fertilizers are used extensively. According to a 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.

MATERIAL AND METHODS

The experimental site IFTM, University is at Lodhipur Rajput, Delhi Road NH-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. The field was fair situated levelled and had good drainage having assured irrigation facility.

Sources used

A brief account of the sources used in experiment and its salient features have been discussed as under. Urea: It contains 46% Nitrogen DAP: It contains 46% P_2O_5 & 18% Nitrogen FYM: It contains 0.5% nitrogen. Phosphorous 0.2% end potassium 0.5% is a best source of organic matter for plant waste 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 plant nutrition, increasing and improving crop yield's: Phosphate solubilizing bacteria. Azotobactor: It is crucial to remember that azotobactor biofertilizers uses have shown that they are of tremendous help in ensuring plant health. The azotobactor is widely used in agriculture to increase soil fertility and stimulate plant growth. The presence of azotobactor 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 azotobactor is critical to the food industry as well.

RESULTS AND DISCUSSION

Plant height

Data on plant height taken at various stages as influenced by different treatment are presented in Table-1 and Figure-1. Plant height increase rapidly with the advancement in crop age and reached maximum at harvest stage. The improvement in fertility status resulted a significant increase in plant height over control at all the stages. The increase in plant height from 30, 60, 90 DAS and at harvest was found maximum under all fertilizer levels. At 30 days stage, maximum plant height (20.10 cm) recorded under T_{10} treatment was found statistically similar to the plant height recorded in T_7, T_8 and T_9 significantly taller than rest of the treatment in T_1 was significantly lower. Plant height recorded at 60 DAS was significantly affected by different treatments. The maximum plant height (61.36 cm) recorded under T_{10} was found statistically at par to T_8 and T_9 plant height recorded in T_1 was significantly lower. At 90 days stage, maximum plant height (85.40 cm) recorded under T_{10} was found statistically at par to T_8 and T_9 significantly taller than the rest of the treatments with exception of T_1 and T_9 plant height recorded under rest of the treatments. The Difference in the plant height between T_8 was statistically similar. Plant height recorded in T_1 was significantly lower. At harvest maximum plant height (85.60 cm) recorded under T_{10} was significantly higher than T_8 and T_9 while rest of the treatments was found statistically at par. Plant height recorded in T_1 was significantly lower. 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 [6, 7].

Number of tillers m^{-1} row length

The data regarding No. of tillers m^{-1} row length of wheat was recorded at different crop growth stages and analyzed statistically and present in Table-1 and Figure-2. The mean data on number of tillers m^{-1} row length at 30, 60, 90 DAS and at harvest. It is clear from the table that the number of tillers were affected significantly due to application of different treatments at all the stages. At 30 DAS observation, the maximum numbers of tillers (61.80) recorded in the T_{10} were statistically similar to T_8 and T_9 while significantly superior to rest of the treatments with exception of T_6 and T_7, rest of the treatments of integration were found statistically at par. Significantly lowest numbers of tillers were recorded in control. At 60 DAS observation, the maximum numbers of tillers (82.66) recorded in the T_{10} were statistically similar to T_8 and T_9 while significantly superior to rest of the treatments with exception of T_6 and T_7, rest of the treatments of integration were found statistically at par. Significantly lowest numbers of tillers were recorded in control plot. At 90 DAS observation, the maximum numbers of tillers (76.50) recorded in the T_{10} were statistically similar to T_7, T_8 and T_9 while significantly superior to rest of the treatments with exception of T_6 and T_5, rest of the treatments of integration were found statistically at par significantly lowest numbers of tillers were recorded in control. At harvesting, the maximum number of tillers (75.63) recorded in T_{10} were found significantly higher than T_7, T_8 and T_9 statistically at par. Significantly lowest numbers of tillers were found in T_1. The effect of different treatments on numbers of tillers measured at various intervals indicates that T_{10} and T_8 were superior to rest of the treatments. Similar results of greater number of tiller with exception of control number of tiller at harvest under different treatments were more or less similar with the application of recommended dose in combination with organic fertilizers [8].

Spike length (cm)

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-3. A considerable fluctuation in the average spike length (cm) can be attributed to the application of NPK biofertilizers, FYM and vermicompost. Spike length (cm) recorded a minimum of (4.60 cm) in T_1 and a maximum of (11.66 cm) in T_{10}. Spike length (cm) recorded in T_8 and T_9 was significantly higher than the Spike length (cm) recorded in the remaining treatments, with a statistically significant number of these differences. Lowest numbers of spike length (cm) were recorded in control (T_1). Similar results of greater Spike length (cm) 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 [9, 10].

Number of grains spike^{-1}

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-3. The application of NPK biofertilizers, FYM and vermicompost has significant effects on the mean data on grains per spike. Grain spikes^{-1} recorded a minimum of (30.26) in T_1, a maximum of (48.56) in T_{10}. The number of grain spikes^{-1} in T_8 and T_9 was significantly higher than the number of grains in the other treatments, with a statistically significant difference. The control arranges (T_1) had the fewest recorded grains spikes^{-1}.

Test weight

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-3. According to data, the weight of 1000 grains increased with each subsequent increase in fertility. The T_{10} treatment produced the largest weight of 1000 grains, while the T_1 "control" produced the lowest. The 1000 grain weight recorded under the other treatments did not increase significantly, with the exception of T_8 and T_9 (Table-1). Few records of the minimum and noticeably lower 1000 grain weight than the other treatments were found in T_1.

Grain yield (q ha^{-1})

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-4. Various treatments had a significant impact on the grain yield of wheat, which varied from (21.30 to 47.26 q ha^{-1}). 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 control treatment yielded the lowest amount of wheat (21.30 q ha^{-1}).

Straw yield (t ha^{-1})

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-4. Different treatments had a significant impact on wheat straw yield, which increased between (39.06 and 54.75 q ha^{-1}). The variations in straw yield brought about by fertilizer treatment turned out to be substantial. The total recorded treatment yielded a significantly higher amount of straw (54.75 q ha^{-1}) than the control treatment (T_1).

Table-1: Plant height (cm) and numbers of tillers at 30, 60, 90 DAS and at harvesting stage as influence by Effect of organic manure and nitrogen nutrient

Treatment	Plant height (cm)				Numbers of tillers			
	30 DAS	60 DAS	90 DAS	Harvesting stage	30 DAS	60 DAS	90 DAS	Harvesting stage
T_1: WITHOUT NPK)	10.83	40.93	58.36	59.96	38.10	54.00	55.10	53.73
T_2: Pressmud @ 10 t ha^{-1} + PSB + Azotobactor	18.66	47.16	70.56	71.33	49.06	64.93	62.43	60.60
T_3: Pressmud @ 10 t ha^{-1} + PSB	15.70	42.06	66.76	69.86	43.66	60.13	59.23	56.73
T_4: FYM @ 10 t ha^{-1} + PSB + Azotobactor	18.80	49.03	72.03	73.06	52.167	67.66	65.03	63.23
T_5: FYM @ 10 t ha^{-1} + PSB	15.96	46.03	68.56	70.43	46.73	62.46	62.06	59.26
T_6: VC @ 5 t ha^{-1} + PSB	18.70	51.26	74.73	75.73	54.96	70.96	67.00	65.93
T_7:VC @ 5 t ha^{-1} +PSB+Azotobactor	19.20	54.03	76.40	79.10	57.00	73.93	70.80	67.16
T_8: 50%N Through FYM+50% Through NPK	19.90	60.83	82.76	83.76	60.00	79.73	73.96	72.90
T_9: 75%N Through FYM+25%Through NPK	19.56	57.83	80.93	81.70	58.86	76.30	70.30	68.63
T_{10}: 100% NPK 120:60:40	20.10	61.36	85.40	85.60	61.8	82.66	76.50	75.63
SE (m)	0.2	1.1	2.1	1.7	1.04	2.5	1.9	2.8
C.D.	0.8	3.4	6.5	5.3	3.12	7.6	5.9	8.5

Table-2: Effects of organic manure of nitrogen nutrients on the yield attributes and yield of wheat (*Triticum aestivum* L.)

Treatment	Spike length (cm)	Number of grains $spike^{-1}$	1000 grains weight (g)	Grains yield (q ha^{-1})	Straw yield (q ha^{-1})	Biological yield (q ha^{-1})	Harvest index (%)
T_1: Control	4.60	30.26	31.16	21.30	46.29	63.33	32.95
T_2: Pressmud @ 10 t ha^{-1} + PSB + Azotobactor	6.03	37.63	37.00	35.93	46.76	84.36	38.46
T_3: Pressmud @ 10 t ha^{-1} + PSB	5.00	33.50	33.90	32.30	49.95	81.86	34.23
T_4: FYM @ 10 t ha^{-1} + PSB + Azotobactor	7.00	38.10	39.70	37.36	50.93	85.96	39.16
T_5: FYM @ 10 t ha^{-1} + PSB	5.66	35.40	35.36	33.60	48.40	83.33	36.66
T_6: VC @ 5 t ha^{-1} + PSB	7.73	40.30	41.16	39.95	50.76	88.33	40.73
T_7:VC @ 5 t ha^{-1} +PSB+Azotobactor	8.36	42.16	43.66	42.56	51.60	93.03	42.76
T_8: 50%N Through FYM+50% Through NPK	10.6	47.40	48.86	44.66	54.47	97.59	45.71
T_9: 75%N Through FYM+25%Through NPK	9.73	45.00	45.43	43.00	55.20	95.12	43.66
T_{10}: 100% NPK 120:60:40	11.6	48.56	51.43	47.26	57.80	100.76	46.36
SE (m)	0.57	1.02	2.01	2.12	0.7	2.5	2.4
C.D.	1.7	3.07	6.02	6.3	2.2	7.5	7.4

Biological yield (q ha^{-1})

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-4. With the exception of treatments T_7, T_8 and T_9, treatment T_{10} (100.76 q ha^{-1}) was found to be significantly superior and produced the highest biological yield. The variations in straw yield brought about by fertilizer treatment turned out to be substantial. With each increase in fertilizer supply, the biological yield rose noticeably. The three treatmentsT_7, T_8 and T_9 were noticeably better than the others.

Harvest Index

Data on plant height taken at various stages as influenced by different treatment are presented in Table-2 and Figure-4. Regarding the impact of fertilizer on the harvest index, no discernible trend was found. On the other hand, T_6, T_7 produced the highest harvest index, followed by T_8, T_9 and T_{10} (100%) NPK produced the lowest.

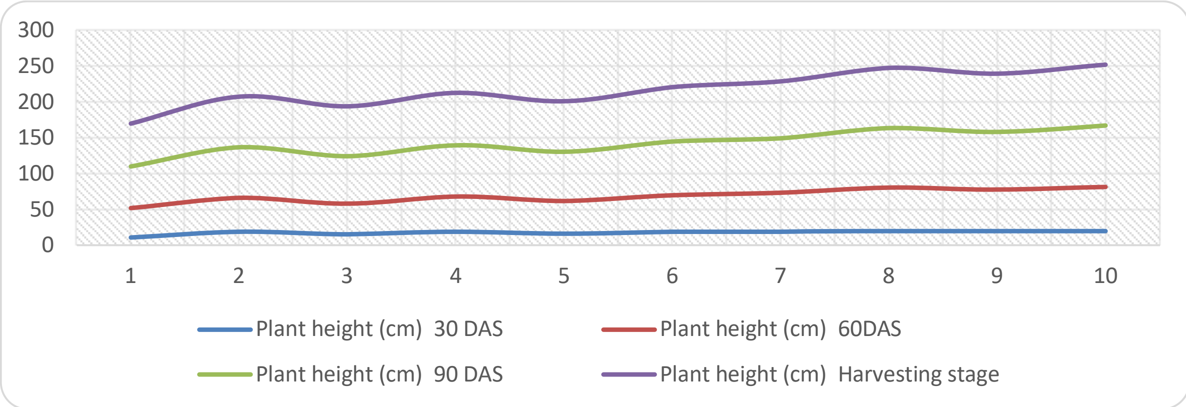

Figure-1: Plant height (cm) and numbers of tillers at 30, 60, 90 DAS and at harvesting stage as influence by Effect of organic manure and nitrogen nutrient

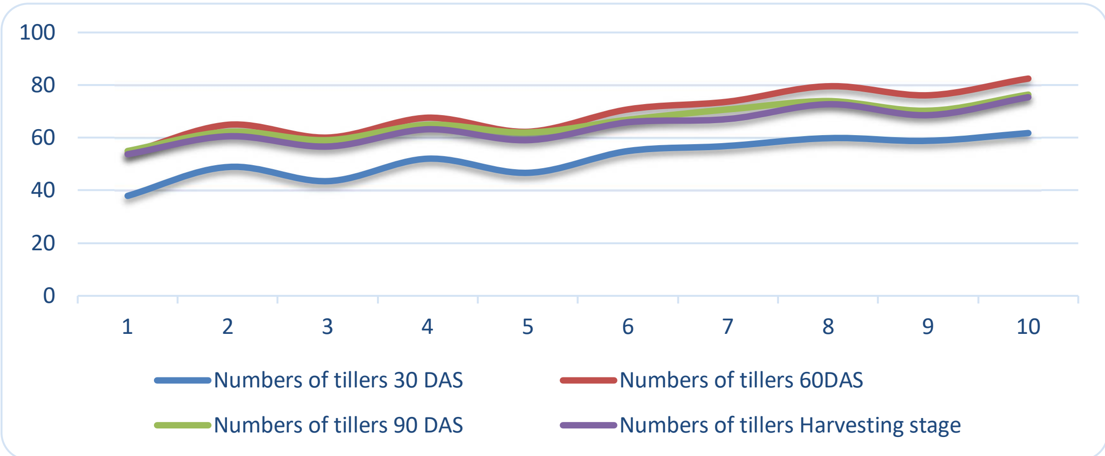

Figure-2: Plant height (cm) and numbers of tillers at 30, 60, 90 DAS and at harvesting stage as influence by Effect of organic manure and nitrogen nutrient

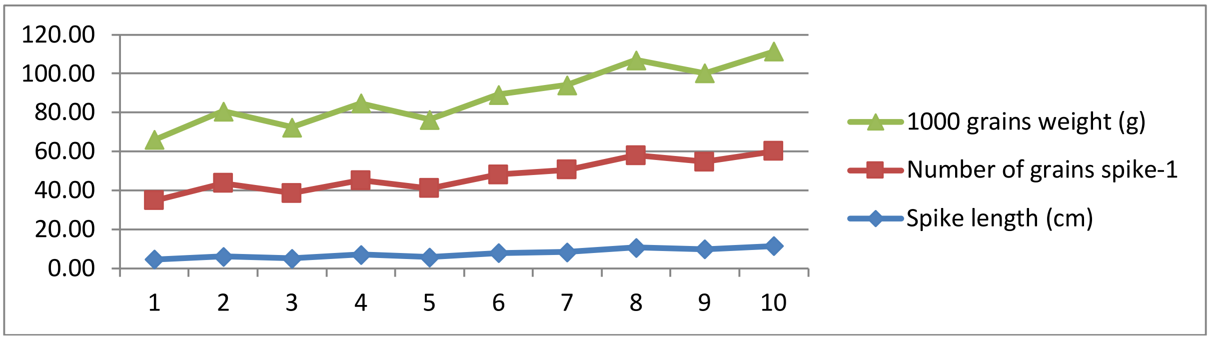

Figure-3: Present the effect of organic manure of nitrogen nutrients on the yield attributes and yields of wheat (*Triticum aestivum)* of biological yield, straw yield and grains yield

CONCLUSION

Significant improvement in growth parameters *viz*. plant height (cm), Number of grains spike^{-1}), Grain yield (q ha^{-1}), yield attributes and numbers of tiller were also recorded under T_{10} Treatment. Whereas lower recorded in control (no use of organic manure and fertilizers). The present study thus indicates that a combination of 100% RDF of nitrogen through NPK (T_{10}) is better use for the cultivation of wheat.

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CITATION OF THIS ARTICLE

Rohit K, Kamlesh K Y, Malay M S, Ashwani K, Samikhya B and Thupten T. Effects of organic manure of nitrogen nutrients on the yield attribute and yield of wheat (*Triticum aestivum* L.). Bull. Env. Pharmacol. Life Sci., Vol 13 [1] December 2023: 82-87