International Journal of Plant & Soil Science

Volume 35, Issue 21, Page 439-444, 2023; Article no.IJPSS.107426
ISSN: 2320-7035

Response of Integrated Nutrient Management on Growth Parameters of Wheat (*Triticum aestivum* L.)

Aman Kol [a++*], Rohit Kumar Singh [a#], Vijay Bagare [a#], Rohit Kumar [a#] and Ratnesh Kumar [a#]

[a] Mangalayatan University, Jabalpur (M.P.), India.

Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/IJPSS/2023/v35i213994

Open Peer Review History:
This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: https://www.sdiarticle5.com/review-history/107426

Original Research Article

Received: 12/08/2023
Accepted: 15/10/2023
Published: 20/10/2023

ABSTRACT

A field study was carried out at Agronomy farm of faculty of the Agriculture, Mangalayatan University, Jabalpur (M.P.) during Rabi season 2022 to evaluate Response of Integrated Nutrient Management on Growth Parameters of Wheat (*Triticum aestivum* L.). The experiment was comprised of twelve treatments combination of T_1 (Control (100%)), T_2 (50% RDF), T_3 (Azotobacter +100% RDF), T_4 (FYM + 100% RDF), T_5 (PSB +100% RDF), T_6 (50% RDF + Azotobacter), T_7 (50% RDF + FYM), T_8 (50% RDF + PSB), T_9 (50% RDF + Azotobacter + FYM), T_{10} (50% RDF + Azotobacter + PSB), T_{11} (50% RDF + FYM) + PSB) and T_{12} (50% RDF + Azotobacter + FYM+ PSB) in RBD replicated thrice. The wheat variety LOK-1 was taken during investigation. On the basis of findings, it is concluded that treatment T_4 (Farm yard manure (FYM) + 100% RDF) proved to be most efficient in wheat crop production and produced better results in essence with growth parameters compared over other treatments.

[++] *M.Sc. (Agronomy);*
[#] *Assistant Professor;*
**Corresponding author: E-mail: amankol.robin@gmail.com;*

Keywords: Wheat; bacteria; FYM; azotobactor; treatment.

1. INTRODUCTION

Wheat (*Triticum aestivum* L.) is an important cereal crop grown in India and other countries, a member of the Poaceae family. Rabi season is when wheat is primarily grown. Crop is grown even 60^0C of north altitude, temperature of tropical and subtropical and trigid northern regions.Two billion people world's population depend primarily on it for sustenance. After rice, wheat is the food grain most frequently grown worldwide, and more than a billion people use it in various forms daily. Because they provide our population with food, wheat and rice are regarded as the foundation of the country's food security system [1-3].

The world produced 730.84 million tons of wheat with a productivity of (3390 kg ha^{-1}) on an area of 215.29 million ha (Anonymous, 2019). Wheat was grown on 29.55 million hectares (13.43% of the world's land area) in India, with a productivity of 3424 kg/ha-1 and a yield of 101.20 million tons (1.3% more than the previous year). With a productivity of 3500 kg/ha and an area of 330.2 lakh ha, India produces roughly 10.23 million tonnes of wheat. Madhya Pradesh surpassed Punjab to the top among wheat-producing states this year. With a production of 16 million tonnes and productivity of 3298 kg/ha, M.P. covers an area of 10.02 million hectares [4].

In the last few years, it has been produced exclusively utilizing high-analysis chemical fertilizers on the Indo-Gangetic plains, resulting widespread nutrient deficit. Farmyard manure (FYM) application to soil has been a long-standing practice [5-7]. According to Blair et al. [8] and Kundu et al. [9], FYM application has improved soil structure, while increasing crop yield, soil fertility, organic matter, and microbiological activity. Compared to using only organic or inorganic fertilizers, combining organic and inorganic fertilizers delayed days to 50% heading, plant height, leaf area index yield, and yield components of wheat [10].

Any farming system intended to increase and sustain productivity must include the practice of managing soil fertility [11,12]. Therefore, technology must be developed for the proper fertilizer dosage that can guarantee an economically optimal crop yield, maintain soil nutrient reserves, and not have a long-term negative impact on the environment. In today's intense and exploitative agriculture, which seeks to boost crop output, micronutrients have achieved significant significance. The rapid depletion of micronutrients in the soil has been accelerated in India by heavy cropping with nutrient-deficient high-yielding varieties combined with the application of high-analysis fertilizer [13].

2. MATERIALS AND METHODS

The study was conducted on the wheat during the Rabi season of 2022 at the Agronomy farm of Faculty of Agriculture, Mangalayatan University, Jabalpur situated at latitudes of 23^0 58' N and longitude of 80^0 81'E in mid northern part of Jabalpur division of Madhya Pradesh, India.

2.1 Growth Parameters

2.1.1 Number of plants/m^2 at 10 DAS

Number of plants/m^2 from five random places in the plot was counted at 10 DAS and the average was expressed as number of plants per m^2.

2.1.2 Plant height (cm)

The heights of ten randomly tagged plants were measured at different successive stages of crop growth starting from 30, 60, 90 DAS and at harvest. Plant height of the wheat was recorded with the help of meter scale from base of plant to the tip of upper most leaf of the plant before panicle emergence and upto the tip of panicle after heading, then averaged and expressed in cm.

2.1.3 Leaf area index

The number of average green leaves per plant was recorded randomly from five places in each plot at 30, 60, 90 DAS. Average value was expressed in terms of lead area index $plant^{-1}$.

2.1.4 Number of tillers

Number of tillers were recorded by counting tillers number per 1.0 m row length at five rows in each plot at 30, 60, 90 DAS and at harvest stage, then averaged and expressed in terms of number of tillers m^{-1} row length.

3. RESULTS & DISCUSSIONS

3.1 Observations Taken for Various Growth Parameters are Given Below

3.1.1 Number of plants/m^2 (10 DAS):

Number of plants/m^2 (10 DAS) varied from range 80.15 to 70.45. Treatment T4 (FYM + 100% RDF) showed maximum number of plants/m^2 (80.15) followed by T5 (79.69), T3 (79.25), T7 (78.59), T8 (78.17), T6 (77.87), T9 (77.65), T10 (76.15), T12 (75.85), T11 (75.65). Treatment T1 (control) showed minimum plant height (70.45) followed by T2 (71.85).

3.1.2 Leaf area index (60 DAS)

Leaf area index at 60 DAS varied between 4.20 to 3.21. Treatment T4 (FYM + 100% RDF) showed maximum leaf area index (4.20) followed by T5 (4.11), T3 (3.97), T7 (3.92), T8 (3.83), T6 (3.74), T9 (3.65), T10 (3.57), T12 (3.49) and T11 (3.44). However, T1 (control) showed minimum plant height (3.21) followed by T2 (3.32).

3.1.3 Plant height

Plant height was measured at different days interval i.e. 30, 60, 90 DAS and at harvest. Plant height at 30 DAS and 30 DAS varied from 11.41 cm to 18.23 cm. Treatment T4 (FYM + 100% RDF) showed maximum plant height (18.23cm) followed by T5 (17.85cm), T3 (16.56cm), T7 (16.03cm), T8 (15.78cm), T6 (15.12cm), T9 (14.29cm), T10 (14.13cm), T12 (13.68cm) and T11 (13.43cm). Treatment T1 (control) showed minimum plant height (11.41cm) followed by T2 (13.26cm).

Plant height (60 DAS) varied from 36.15 cm to 47.56cm. Treatment T4 (FYM + 100% RDF) showed maximum plant height (47.56 cm) followed by T5 (46.11cm), T3 (45.54cm), T7 (43.86cm), T8 (43.26cm), T6 (43.16cm), T9 (42.89cm), T10 (42.26cm), T12 (41.6cm), T11 (41.45cm). Treatment T1 (control) showed minimum plant height (36.15cm) followed by T2 (41.56cm).

Plant height (90 DAS) varied from 68.12 cm to 81.63cm. Treatment T4 (FYM + 100% RDF) showed maximum plant height (81.63 cm) followed by T5 (80.15cm), T3 (79.81cm), T7 (79.26cm), T8 (78.69cm), T6 (78.15cm), T9 (77.15cm), T10 (76.96cm), T12 (76.84cm), T11 (75.86cm). Treatment T1 (control) showed minimum plant height (68.12cm) followed by T2 (73.45cm).

Plant height at harvest varied from 70.13 cm to 83.66cm. Treatment T4 (FYM + 100% RDF) showed maximum plant height (83.66cm) followed by by T5 (82.18cm), T3 (81.83cm), T7 (81.29cm), T8 (80.71cm), T6 (80.16cm), T9 (79.17cm), T10 (78.98cm), T12 (78.86cm) and T11 (77.87cm). Treatment T1 (control) showed minimum plant height (70.13cm) followed by T2 (75.49cm).

3.1.4 Number of tillers/m

Number of tillers/m was measured at different days interval i.e. 30, 60, 90 DAS and at harvest. Number of tillers/m (30 DAS) varied from 20.22 cm to 26.42 cm. Treatment T4 (FYM + 100% RDF) showed maximum number of tillers/m (26.42) followed by by T5 (25.69), T3 (25.33), T7 (25.14), T8 (24.56), T6 (42.12), T9 (23.86), T10 (23.22), T12 (23.06), T11 (22.76). Treatment T1 (control) showed minimum number of tillers/m (20.22) followed by T2 (22.45).

Number of tillers/m (60 DAS) varied from 39.25 cm to 59.56. Treatment T4 (FYM + 100% RDF) showed maximum number of tillers/m (59.56) followed by by T5 (57.16), T3 (54.12), T7 (50.15), T8 (48.55), T6 (47.12), T9 (46.58), T10 (45.48), T12 (44.74), T11 (42.12). Treatment T1 (control) showed minimum number of tillers/m (39.25) followed by T2 (39.43).

Number of tillers/m (90 DAS) varied from 59.45 cm to 75.69. Treatment T4 (FYM + 100% RDF) showed maximum number of tillers/m (75.69) followed by by T5 (73.15), T3 (72.11), T7 (70.26), T8 (69.86), T6 (69.14), T9 (68.45), T10 (67.85), T12 (66.69), T11 (64.85). Treatment T1 (control) showed minimum number of tillers/m (59.45) followed by T2 (61.08).

Number of tillers/m (at harvest) varied from 61.48 cm to 81.45. Treatment T4 (FYM + 100% RDF) showed maximum number of tillers/m (81.45) followed by by T5 (78.56), T3 (76.45), T7 (74.96), T8 (73.46), T6 (72.85), T9 (70.48), T10 (69.74), T12 (69.47), T11 (68.47). Treatment T1 (control) showed minimum number of tillers/m (61.48) followed by T2 (63.25).

Table 1. Effects of integrated nutrient management (INM) on growth parameters of wheat

Treatment	Number of plants per m-2 at 10 days after sowing	Leaf area index (LAI) at 60 days after sowing	Plant height (cm)				Number of tillers meter^{-1}			
			30 DAS	60 DAS	90 DAS	At harvest	30 DAS	60 DAS	90 DAS	At harvest
T1	70.45	3.21	11.41	36.15	68.12	70.13	20.22	39.25	59.45	61.48
T2	71.85	3.32	13.26	41.56	73.45	75.49	22.45	39.43	61.08	63.25
T3	79.25	3.97	16.56	45.54	79.81	81.83	25.33	54.12	72.11	76.45
T4	80.15	4.2	18.23	47.56	81.63	83.66	26.42	59.56	75.69	81.45
T5	79.69	4.11	17.85	46.11	80.15	82.18	25.69	57.16	73.15	78.56
T6	77.87	3.74	15.12	43.16	78.15	80.16	24.12	47.12	69.14	72.85
T7	78.59	3.92	16.03	43.86	79.26	81.29	25.14	50.15	70.26	74.96
T8	78.17	3.83	15.78	43.26	78.69	80.71	24.56	48.55	69.86	73.46
T9	77.65	3.65	14.29	42.89	77.15	79.17	23.86	46.58	68.45	70.48
T10	76.15	3.57	14.13	42.26	76.96	78.98	23.23	45.48	67.85	69.74
T11	75.65	3.44	13.43	41.45	75.86	77.87	22.76	42.12	64.85	68.47
T12	75.85	3.49	13.68	41.86	76.84	78.86	23.06	44.74	66.69	69.47
Sem (±)	1.41	0.17	0.67	1	1.5	1.16	0.83	2.46	2.23	2.47
SED	1.99	0.24	0.94	1.41	2.13	1.64	1.17	3.53	2.99	3.49
CD (5%) =	4.14	0.5	1.96	2.93	4.39	3.42	2.44	1.33	5.87	7.29

T1 - Control (100%): T2 - 50% RDF; T3 - Azotobacter (Azt.) +100% RDF; T4 - Farm yard manure (FYM) + 100% RDF; T5 - Phosphate solubilizing bacteria (PSB) +100% RDF; T6 - 50% RDF + Azotobacter (Azt.); T7 - 50% RDF + Farm yard manure (FYM); T8 - 50% RDF + Phosphate solubilizing bacteria (PSB); T9 - 50% RDF + Azotobacter (Azt.)+ Farm yard manure (FYM); T10 - 50% RDF + Azotobacter (Azt.)+ Phosphate solubilizing bacteria (PSB); T11 - 50% RDF + Farm yard manure (FYM) + Phosphate solubilizing bacteria (PSB); T12 - 50% RDF + Azotobacter (Azt.)+ Farm yard manure (FYM)+ Phosphate solubilizing bacteria (PSB)

4. CONCLUSION

The current study showed significance response of integrated nutrient management on wheat crop with the following conclusion. Treatment T4 (FYM + 100% RDF) showed the maximum number of plants per m^2 at 10 DAS (80.15), however treatment T1 (Control) showed the minimum number of plants per m^2 at 10 DAS (70.45). Treatment T4 (FYM + 100% RDF) showed the LAI at 60 DAS (4.20), however treatment T1 (Control) showed the minimum LAI at 60 DAS (3.21). Treatment T4 (FYM + 100% RDF) showed the maximum plant height at 30, 60, 90 DAS and at harvest (18.23, 47.56, 81.63 and 83.66 cm), however treatment T1 (Control) showed the minimum plant height at 30, 60, 90 DAS and at harvest (11.41, 36.15, 68.12 and 70.13 cm)**.** Treatment T4 (FYM + 100% RDF) showed the maximum number of tillers $meter^{-1}$ at 30, 60, 90 DAS and harvest (26.42, 59.56, 75.69 and 81.45), however treatment T1 (Control) showed the minimum number of tillers $meter^{-1}$ at 30, 60, 90 DAS and harvest (20.22, 39.25, 59.45 and 61.48).

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Singh P, Agrawal VK, Singh YV. Effect of potassium and FYM on growth parameters, yield and mineral composition of wheat (*Triticum aestivum* L.) in alluvial soil. Journal of Pharmacognosy and Phytochemistry. 2019;8(3):24-27.
2. Tiwari Himanshu, Naresh RK, Singh PK, Kumar Yogesh, Purushottam and Vivek. Effect of Integrated Nutrient Management on Growth and Productivity of Wheat (*Triticum aestivum* L.) in Typic Ustochrepts Soils of Western UP, India. International Journal of Plant & Soil Science.; Article no. IJPSS. 99677 ISSN: 2320-7035. 2023;35(11):129-142.
3. Tripathi Ashutosh, Rajnish, Niwas Ram and Yadav AS 2022. Response of integrated nutrient management on growth and productivity of wheat (*Triticum aestivum* L.) The Pharma Innovation Journal. 2022;11(7): 991-994.
4. Anonymous. Foreign Agriculture Service/USDA office of global analysis; 2019.
5. Ahmed Maqbool, Hyder Syed Ishtiaq, Ullah Atiq, Khan Raza Ullah, ahmad Muhammad Adeel, Hayat Asim, Arshad Nadeem. Response of Integrated Nutrient Management (INM) on Growth, Yield, and Nutrient use Efficiency of Wheat under Irrigated Conditions. Journal of applied research in plant science. J. Appl. Res Plant Sci. 2023;4(1):363-369, 2023.
6. Borse DK, VP Usadadia, Thorave DS. Nutrient Management in Wheat (*Triticum aestivum* L.) under Partially Reclaimed Coastal Salt Affected Soil of South Gujarat. Int. J. Curr. Microbiol. App. Sci. 2019;8(05):1590-1599.
7. Ramanandan, L. G., Narendra Swaroop, Arun Alferd David and Tarence Thomas. Influence of Integrated Nutrients on Growth and Yield Attributes of Wheat (*Triticum aestivum* L.) Crop [Cv.PBW-343] in Inseptisol. Int. J. Curr. Microbiol. App. Sci*.* 2020;9(06):2781-2794.
8. Blair NR, Faulkner D. Till AR, Poult PR. Longterm management impacts on soil C. N. and physical fertility. Soil and Tillage Research. 2006;91:30-38.
9. Kundu SR, Bhattacharyya V, Parkash BN, Ghosh, Gupta HS. Carbon sequestration and relationship between carbon addition and storage under rainfed soybean-wheat rotation in a sandy loam soil of the India Himalayas. Soil and Tillage Research. 2007; 92:8795.
10. Manna MC, Swarup A, Wanjari RH, Ravankar HN, Mishra B, Saha MN, Singh YV, Sahi DK, Sarap PA. Long-term effect of fertilizer and manure application on soil organic carbon storage, soil quality and yield sustainability under sub- humid and semi-arid tropical India. Field Crops Research. 2005;93:264-280.
11. Sheikh Muzafer Ahmad and Dwivedi Pinky. Response of Wheat (*Triticum aestivum* L.) to Organic manure and Chemical fertilizer. International Journal of Advanced Research In Sciences and Engineering. special. ISSN 23188354. 2018: 7(4)
12. Verma Himani, Pathak R. K., Kumar Anil, Sachan Ravindra, Pandey Hanuman Prasad, Tiwari Abhishek and Yadav Abhishek Singh. Effect of Integrated

Nutrient Management on Growth Parameters, Yield Components and Yield of Wheat (*Triticum aestivum* L.) under Central Plain Zone of Uttar Pradesh. International Journal of Plant & Soil Science.; Article no. IJPSS. 93209 ISSN: 2320-7035. 2022;34(23): 1050-1057.

13. Singh MV. Effect of trace element deficiencies in soil on human and animal health. Bulletin of the Indian Society of Soil Science. 2009;27:75-101.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/107426