

Original Research Article

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

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 T₁ (Control (100%)), T₂ (50% RDF), T₃ (Azotobacter +100% RDF), T₄ (FYM + 100% RDF), T₅(PSB +100% RDF), T₆ (50% RDF + Azotobacter), T₇ (50% RDF + FYM), T₈ (50% RDF + PSB), T₉ (50% RDF + Azotobacter + FYM), T₁₀ (50% RDF + Azotobacter + PSB), T₁₁ (50% RDF + FYM) + PSB) and T₁₂ (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 T₄ (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.

Keywords: Wheat, bacteria, FYM, Azotobacter and treatment

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 60⁰C of north altitude, temperature of tropical and subtropical and trigrid northern regions. Two billion people world's **population depends** 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.

The world produced 730.84 million tons of wheat with a productivity of (3390 **kg ha**) on an area of 215.29 million ha (Anonymous, 2019). Wheat was grown on 29.55 million

Comment [A1]: Kg/ha

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 (Anonymous, 2019).

Comment [A2]: Kg/ha

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. According to Blair et al. (2006) and Kundu et al. (2007), 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 (Manna et al., 2005).

Any farming system intended to increase and sustain productivity must include the practice of managing soil fertility. 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 (Singh, 2009).

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° 58' N and longitude of 80° 81' E in mid northern part of Jabalpur division of Madhya Pradesh, India.

Growth parameters:

Number of plants/m² at 10 DAS

Number of plants/m² from five random places in the plot was counted at 10 DAS and the average was expressed as number of plants per m².

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 up to the tip of panicle after heading, then averaged and expressed in cm.

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 leaf area index plant⁻¹.

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.

Results & Discussions

Observations taken for various growth parameters are given below.

Number of plants/m² (10 DAS):

Number of plants/m² (10 DAS) varied from range 80.15 to 70.45. Treatment T4 (FYM + 100% RDF) showed maximum number of plants/m² (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).

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).

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)

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 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).

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 T5 (25.69), T3 (25.33), T7 (25.14), T8 (24.56), T6 (24.12), 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 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 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 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).

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 m² at 10 DAS (80.15), however treatment T1 (Control) showed the minimum number of plants per m² 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 60DAS (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).

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