

Original Research Article

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Effect of Integrated Nutrient Management on Soil Properties, Yield Attributes and Yield of Wheat (*Triticum aestivum* L.)

Abhimanyu Yadav¹, Adesh Kumar^{1*}, Ved Prakash¹, Neeraj Kumar¹,
Ashutosh Tiwari² and R.K. Yadav³

¹Department of Soil Science and Agricultural Chemistry, ²Department of Plant Biotechnology, ³Department of Crop Physiology, N.D. University of Agriculture and Technology, Narendra Nagar (Kumarganj) Faizabad -224 229 (U.P.), India

*Corresponding author

ABSTRACT

Keywords

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A field experiment was conducted during winter season of 2014-15 on wheat at Instructional Farm of Narendra Deva University of Agriculture and Technology, Kumarganj, Faizabad (UP). The soil of the experimental field was silt loam having pH 8.25, EC 0.35 dSm⁻¹, organic carbon 4.4 g Kg⁻¹ available nitrogen 195 Kg ha⁻¹, available P 12 Kg ha⁻¹ and available K 240 Kg⁻¹ the experiment was consisted of 8 treatments viz. T₁ (control), T₂ (100 % RDF), T₃ (75 % RDF), T₄ (75 % RDF + 25 % N-FYM), T₅ (75% RDF + *Azotobacter*), T₆ (50 % RDF + 50 % N-FYM) T₇ (50 % RDF + 50 %N-FYM + PSB) and T₈ (50 % RDF + *Azotobacter* + PSB) were laid in the randomized block design with three replication. The highest values of yield and yield attributes were recorded with treatment T₇ (50% RDF + 50% N- FYM + PSB) which was significantly superior over control as well as T₃ (75% RDF), T₅ (75% RDF + *Azotobacter*) and T₈ (50% RDF + *Azotobacter* + PSB) and statistically at par with rest of the treatments.

Introduction

Wheat (*Triticum aestivum* L.) is one of the most important cereal crops of the world. Among the world's most important food grains, it ranks next to rice. It is eaten in various forms by more than one billion in the world. Millions of farmer in developing countries need adequate resource for augmenting crop productivity and sustainability of soil. Therefore to maintain fertility and productivity of soil at sustainable level for long duration, there is need to adopt the concept of integrated nutrient management. Organic manure such as farm

yard manure, vermin-compost, crop residues, biofertilizer, green manure and chemical fertilizer are considered to be an integral component of integrated nutrient management and may help to recover soil health in cropping system. As they improve soil fertility and physical properties such as soil structure, aeration, porosity, infiltration rate and water holding capacity and decrease soil crusting, organic matter in soil improve physical condition of the soil for better performance of micro-organism and physical status of soil. Organic matter affects crop

growth and yields either directly supplying nutrients or indirectly by modifying soil physical properties such as stability of aggregates, porosity and available water capacity that can improve the root environment and stimulate plant growth. Organic matter not only increases the water holding capacity of the soil but also proportion of water available for plant growth and improves physical properties of soil (Sial *et al.*, 2007).

Materials and Methods

A field experiment was conducted during winter season of 2014-15 in silt loam soil at instructional farm of Narendra Deva University of Agriculture and technology Kumarganj, Faizabad (26.47°N and 82.12°E). Initial soil characteristics (0-15cm) of the experimental soil were pH 8.25 (1:2.5 soil and water suspension), electrical conductivity 0.35 dSm⁻¹ organic carbon 4.40 gm kg⁻¹, available N kg ha⁻¹, available P 12 kg ha⁻¹, available K 240 kg ha⁻¹. The treatment consisted of T₁ control, T₂ 100% RDF (120:60:40 kg ha⁻¹N: P₂O₅: k₂O); T₃, 75% RDF, T₄ 75 % RDF + 25 % N-FYM, T₅, 75% RDF+ Bio-fertilizer (*Azotobacter*); T₆ 50% RDF + 50 % N-FYM, T₇ (50 % RDF + 50 %N-FYM + PSB) and T₈ 50 % RDF + *Azotobacter* + PSB. The experiment was laid out in a randomized block design with 3 replications. FYM was applied as per treatment one week prior to pre-sowing irrigation. Wheat crop (CV NW 2036) was sown at proper moisture on first Dec. 2014 at a row spacing of 20cm. Half of N and full doses of P and K were added at the time of sowing as per treatments. The remaining dose of N was top dressed in two equal splits after 1st and 2nd irrigation. The sources of N, PO₅ and K₂O were urea, single super phosphate and mutate of potash respectively. Plant height was recorded at 30, 60, and 90 DAS. Yield and yield attributes were recorded at

harvest. Soil samples collected before sowing and after harvest of wheat were analyzed for pH and EC in 1:2.5 soil water suspension; organic carbon, available N, available P and available K (Jackson, 1973).

Results and Discussion

Various levels of nutrients applied through fertilizers alone and their combination with FYM and bio-fertilizers influenced the plant height significantly. It is further evident from the perusal of data that the highest plant height (93.2 cm) was recorded under the treatment T₇ (50 % RDF + 50 % N-FYM + PSB) and minimum (60.4 cm) in T₁ (control) at harvest stage.

The increase in plant height under various inorganic fertilizer levels alone and in combination with organic sources might be due to increasing availability of nutrients to the plants. The results are in harmony with findings of Khan *et al.*, (2007) as well as Soleimanzadeh and Gooshchi (2013)

The data presented in table 1 revealed that maximum number of effective tillers (92.6), grains ear⁻¹(61.6) and test weight (36.6) were recorded under treatment T₇ (50 % RDF + 50 % N-FYM + PSB) which was statistically at par with T₂ (100 % RDF), T₄ (75 % RDF + 25 % N-FYM and T₆ (50 % RDF + 50 % N-FYM) while least in T₁ (control). The test weight was non-significant and not affected by various treatments. Similar results have been reported by Devi *et al.*, (2011). Maximum grain and straw yields were recorded under treatment T₇-50 % RDF + 50 % N-FYM + PSB which was statistically at par with T₂ (100% RDF) T₆ (50 % RDF + 50 % N-FYM) and T₄ (75 % RDF + 25 % N-FYM) and significantly superior over rest of the treatments. The results corroborated with observations taken by Devi *et al.*, (2011).

Table.1 Effect of treatments on growth, yield attributes and yields of wheat

Treatments	Plant height(cm)	Effective tillers(m-1)	Grains ear-1	Test weight	Yield qha-1	
					Grain	Straw
T1	60.4	80.0	34.0	35.8	17.9	26.5
T2	93.0	90.5	60.5	36.6	41.6	60.3
T3	82.5	84.4	52.2	36.4	32.8	49.1
T4	91.6	88.0	59.0	36.6	39.6	57.0
T5	84.1	86.6	55.4	36.5	35.6	53.0
T6	92.1	89.8	59.7	36.6	39.9	57.2
T7	93.2	92.6	61.6	36.6	41.9	60.7
T8	81.1	86.0	55.0	36.3	34.8	51.8
SEm	3.02	1.30	1.99	0.18	1.11	2.42
CD(p=0.05)	9.11	3.80	6.05	0.51	3.35	7.36

Table.2 Effect of INM treatments on pH, EC, organic carbon and available nutrients in Post-harvest soil

Treatments	pH	EC (dSm-1)	OC (gKg-1)	Available nutrients (kg ha ⁻¹)		
				N	P	K
T1	8.30	0.29	3.1	180.2	11.0	200.0
T2	8.26	0.29	3.3	194.2	12.2	213.6
T3	8.28	0.29	3.2	185.6	12.1	210.1
T4	8.24	0.27	3.5	192.7	12.4	213.6
T5	8.29	0.30	3.3	189.9	12.4	210.7
T6	8.20	0.25	3.8	195.2	12.3	215.5
T7	8.20	0.25	3.8	195.2	12.4	215.5
T8	8.28	0.30	3.3	187.8	12.2	208.9
SEm	0.11	0.01	0.1	2.3	0.12	2.58
CD(p=0.05)	NS	NS	0.3	7.2	0.35	7.83

It is due to more supply of P₂O₅, helps in maintaining better source-sink inter relationship by increasing sink capacity by its role in energy transformation. Various INM treatments could not decrease the pH and EC of post-harvest soil significantly.

The higher buildup of organic carbon (3.8 gm kg⁻¹) was noted in T-7 (50% RDF + 50% N-FYM + PSB) as well as in T-6 (50% RDF + 50% N- FYM) which was statistically at par with T-4 (75% RDF +25% N-FYM) and significantly superior over rest of the treatment. The buildup of organic carbon must be due to addition of FYM. Similar result was

also reported by Mohemmed *et al.*, (2014) and Eldardiry *et al.*, (2013).

Maximum available N (195.2 kg ha⁻¹) was recorded in the treatment T-7 (50% RDF + 50% N- FYM + PSB) as well as in T-6 (50% RDF + 50% N- FYM) which was significantly superior over T₃ (70% RDF) as well as control and statistically at par with rest of the treatments. Maximum available P (12.45 kg ha⁻¹) was recorded on the treatment T-7 (50% RDF +50% N- FYM + PSB) which was significantly superior over control and statistically at par with rest of the treatments. Similar trend in available potash was also

noted as in table 2. The result exhibited that the INM through organic and inorganic fertilizer used in suitable combination improved the soil fertility. The present findings are in conformity with findings of Kumar (2014), Davari *et al.*, (2012) and Essan and Lattief (2014).

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