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Response of integrated nutrient management practices on growth and yield of late sown wheat

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Abstract
The field experiment "response of integrated nutrient management practices on growth and yield of late sown wheat.' was conducted during winter season of 2015-16 The experiment consisting of treatment *viz*, T_1 (Control), T_2 (Inorganic source of nitrogen (120N: 60P : 40K), T_3 (100% RDF + 25% N through FYM), T_4 (100% RDF + 25% N through Vermicompost), T_7 (75% RDF through inorganic sources (90N: 45P : 30K), T_8 (75% RDF through inorganic sources +25% N through FYM), T_9 (75% RDF through inorganic sources + 25%N through Vermicompost), T_{10} (75% RDF through inorganic sources + 25% N through FYM + Azotobactor) and T_{11} (75% RDF through inorganic sources 25% N through Vermicompost + Azotobactor) were laid out in Randomized Block Design with three replications. Growth parameters such as plant height, number of shoots m^{-2}, total dry matter accumulation m^{-2} were significantly higher in 100% recommended dose of fertilizers and 25% N through Vermicompost + Azotobactor over other treatments. Yield attributes *viz*., spike length and number of grains spike $^{-1}$ were increased significantly with 100% recommended dose of fertilizers through inorganic source and 25% N through Vermicompost + Azotobactor which was at par with all treatments excepted T_1, T_7,T_8. Grain and straw yields and nutrient (NPK) uptake were maximum with 100% recommended dose of fertilizers and 25% N through Vermicompost + Azotobactor. Application of 100% of recommended dose of nitrogen through inorganic source + 25 % N Vermicompost + Azotobactor - improved available N P and K content in soil as compared to other treatments. Protein content was maximum with T_6 (100% recommended dose of fertilizers and 25% N through Vermicompost + Azotobactor). Highest gross returns were obtained with 100% recommended dose of fertilizers + 25% N through Vermicompost followed by T_5.The highest B:C ratio (1.78) were calculated with T_6 followed by T_5 (1.73) and lowest T_1 (1.10).

Keywords: FYM, integrated nutrient management vermicompost, azotobactor, RDF100% NPK

Introduction
Wheat (*Triticum aestivum* L.) belongs to the family Graminaeae (Poaceae), is a staple food of the world. The important and economic consideration for increasing wheat productivity is the effective use of nitrogen fertilization. In this endeavor proper blend of organic and inorganic fertilizer is important not only for increasing yield but also for sustaining soil health. The vermi composting is bio oxidation and stabilization of organic material involving joint action of earth worm and micro organisms. Although, microbes are responsible for the biological degradation of the organic matter, earthworms are the important drivers of the process, conditioning the substrate and altering biological activity. Farm yard manure by adding organic matter improves the physical condition of soil by increasing water holding capacity for maximum utilization of water. It also improve the chemical and biological condition of soil by increasing action exchange capacity and providing various organic acid and hormone which are important for soil aggregation and for beneficial micro organism which are important for soil aggregation and for beneficial micro organism which are involved in various biochemical process and release of nutrient. Application of FYM and inorganic N in integration improved the productivity and monetary returns of wheat and also maintained soil fertility. Application of farmyard manure (FYM) to soil have been practiced for many centuries and its application to soil have increased crop yield, improved soil fertility, increased soil organic matter, increased microbiological activities and improved soil structure for sustainable agriculture. Combination of both organic and inorganic fertilizers delayed days to 50% heading, plant height, yield and yield components and leaf area index of wheat compared with sole organic or inorganic fertilizer.

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Modification of nutrient uptake and ultimately boosting biological nitrogen fixation. Although increased level of production can be achieved by increased use of fertilizers, but continuous use of chemical fertilizers alone may lead to some detrimental effect on physico-chemical properties of soil and may not be so remunerative unless the fertility of soil is maintained at sustainable level by application of organic manure. Therefore, to maintain fertility and productivity of soil at sustainable level for long duration, use of organic manure is quite essential. Organic matters in soil improve physical condition of the soil for better performance of micro-organisms and physical status of soil.

Materials and Methods

The experiment was conducted during two consecutive Rabi season of 2015-16 at Agronomy Research Farm of Narendra Deva University of Agriculture and Technology, Narendra Nagar (Kumarganj), Faizabad (U.P.). The experimental site was situated about 42 kms away from Faizabad city on Faizabad - Raibareilly road at 26^0.47N latitude, 82^0.12 E longitudes and an altitude of 113 meters above mean sea level. The experiment consisted four varieties NDW-1014) and Treatments eleven with three replications. The experiment was laid out in randomized block design. T1 (Control), T2(100 % RDF (120N: 60P : 40K), T3(100% RDF + 25% N through FYM), T4(100% RDF + 25% N through Vermicompost), T5(100% RDF + 25% N through FYM + Azotobactor), T6(100% RDF + 25% N through Vermicompost + Azotobactor), T7(75% RDF (120N: 60P : 40K), T8(75% RDF +25% N through FYM), T9(75% RDF + 25%N through Vermicompost), T10(75% RDF + 25% N through FYM + Azotobactor) and T11(75% RDF + 25% N through Vermicompost + Azotobactor).The soil of experimental field was sandy loam in texture having low in organic carbon (0.35), available nitrogen (181.90kg/ha^{-1}), available P_2O5 14.60 kg/ha^{-1}) and available K_2O (243.12kg/ha^{-1}), Electrical conductivity (033 dSm^{-1}) with pH of soil is 8.13. Recommended doses of Fertilizer nitrogen, phosphorus and potassium were applied in the forms of Urea, SSP and Muriate of potash @ 120, 60 and 40 kg ha^{-1}, respectively. Full dose of phosphorus, potassium and half dose of nitrogen were applied at the time of sowing and rest half dose of nitrogen was applied as two split doses at the time of first irrigation and second irrigation. The seeds were sown at proper moisture on 24th December 2015 of variety NDW1014. Sowing was done in rows 20 cm. apart and 4-5 cm deep in seed drill. A certified seed was used @ 120 kg ha^{-1} in all the plots.

Stastical Analysis - The allocation of treatment in the plots was done randomly. The data recorded on different characters during the course of investigation were subjected to statistical analysis by using the analysis of variance Technique for randomized block design

Results and Discussion

Table 1: Effect of different treatments on growth characters of wheat.

Symbol	Treatments	Plant height (cm)	Number of shoots m^{-2}	Leaf area index	Dry matter accumulation (g m^{-2})
T_1	Control	51.35	250.04	2.20	406.00
T_2	100% RDF (120N:60P:40K)	73.70	431.46	3.40	755.00
T_3	100% RDF + 25% N through FYM	74.45	439.92	3.70	797.00
T_4	100% RDF + 25% N through Vermicompost	76.90	448.38	3.75	810.00
T_5	100% RDF + 25% N through FYM + Azotobactor	77.80	456.84	3.95	845.00
T_6	100% RDF + 25% N through Vermicompost + Azotobactor	80.65	461.07	4.00	873.00
T_7	75% RDF (120N: 60P:40K)	70.75	401.85	3.25	664.00
T_8	75% RDF + 25% N through FYM	71.30	414.54	3.32	695.00
T_9	75% RDF + 25% N through Vermicompost	72.50	423.00	3.57	731.00
T_{10}	75% RDF + 25% N through FYM + Azotobactor	74.20	435.69	3.50	778.00
T_{11}	75% RDF + 25% N through Vermicompost + Azotobactor	74.95	439.92	3.53	791.00
SEm±		3.21	17.63	0.14	27.58
CD at 5%		9.47	52.02	0.42	81.36

Table no 1 Shows that Crop growth is the result of modification in various morphological parameters like plant height, number of shoots m2, leaf area and dry matter accumulation. Any treatment affecting this parameter will ultimately affect the overall growth of the crop. The result of this study revealed that all the growth parameters were increased at a faster rate upto 90 DAS which could be said to be the peak growing point of the crop. Plant height and dry matter accumulation increased at a faster rate from 30-60 DAS and then increased steadily between 60-90 DAS and rate declined thereafter. Plant height, number of shoots meter-2, leaf area index, dry matter accumulation, were significantly affected by various fe treatment.

Table 2: Effect of different treatments on yield of wheat.

Symbol	Treatments	Grain yield (q ha^{-1})	Straw yield (q ha^{-1})	Harvest index (%)
T_1	Control	19.50	37.07	36.84
T_2	100% RDF (120N:60P:40K)	32.96	54.98	38.19
T_3	100% RDF + 25% N through FYM	34.49	56.18	38.82
T_4	100% RDF + 25% N through Vermicompost	34.72	56.83	39.07
T_5	100% RDF + 25% N through FYM + Azotobactor	37.47	59.19	39.24
T_6	100% RDF + 25% N through Vermicompost + Azotobactor	38.79	60.32	39.53
T_7	75% RDF (120N: 60P:40K)	28.01	50.07	37.08
T_8	75% RDF + 25% N through FYM	29.66	51.34	37.58
T_9	75% RDF + 25% N through Vermicompost	31.75	53.63	38.00
T_{10}	75% RDF + 25% N through FYM + Azotobactor	33.95	56.22	38.30
T_{11}	75% RDF + 25% N through Vermicompost + Azotobactor	34.50	57.27	38.20
SEm±		1.55	2.20	1.78
CD at 5%		4.57	6.50	1.95

Table no 2 Shows that significantly effect of integrated nutrient management on yield attributed parameter like as No. of spike m-2, spike length (cm), No. of grains spike-1 and 1000 grain weight (g) was not significantly effect. Organic source plant were able to absorb larger amount of nitrogen, phosphorus and potassium through their well developed root system. Secondly, the chemical fertilizer not only increase the production of photosynthesis but also the translocation on source to sink which resulted in increase number of spike m-2 spike length and number of grain spike-1 which have positive relationship with grain and straw yield. Harvest index also affected by various treatment. Treatment number T6, T5, T4, and T3 was statically at par each other and significantly superior over rest of treatment. It may be to less availability of nutrient to the plants. The increase in growth characters *viz.* plant height, leaf area index, dry matter accumulation resulted in increase straw yield dye to higher sodicity in the beginning nutrients might be released with much slower rate from organic source while the inorganic source are immediate nutrient release.

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