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Effect of integrated nutrient management (INM) on growth parameters of timely sown wheat (*Triticum aestivum* L.)

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Abstract
An experiment was conducted during *rabi* season of 2018-19 and 2019-20 at Agronomy Research Farm, ANDUA&T Kumarganj, Ayodhya (U.P.) India. The experiment consists of fourteen treatments were laid out in Randomized Block Design (RBD) with three replications. As per experiment the results revealed that the growth parameters were significantly influenced by different integrated nutrient management at successive growth stages of crop except 30 DAS. Crop growth rate increased progressively with increase in duration of wheat crop. Crop growth rate was maximum up to 90 DAS and thereafter, a slow increase in growth was obtained up to harvest. Among the integrated nutrient management, 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1} proved to found better as regarding of plant height (83.90, 95.90 cm), dry matter accumulation (1073.50, 1111.00 g m^{-2}) and number tillers per (334.66, 341.36 m^{-2}) at harvest stage in respective years. Whereas leaf area index was measured maximum at 60 DAS after than it declined. The minimum growth parameters were observed under control.

Keywords: Growth, wheat, plant height, dry matter, LAI and tillers

Introduction

Wheat (*Triticum aestivum* L.) being a major cereal crop cultivated in India and abroad. It belongs to Poaceae family. Wheat generally grown in *rabi* season and it can be successful grown in the tropical and sub-tropical climates and also in the temperate zone. Wheat can tolerate to severe cold and snow and resume growth with the setting in warm weather in spring. It can be cultivated from sea level to an altitude of 3300 meters. The most favorable climatic condition for wheat cultivation is cool and moist weather during the vegetative growth period followed by dry, warm weather for the grain to mature and ripening. The optimum temperature range for ideal germination of wheat seed is 20-25 ^{0}C. Warm and dry climatic conditions are not suited for wheat during the heading and flowering stage, excessively high or low temperatures and drought are harmful to wheat. Cloudy weather with high humidity and low temperatures is conducive for rust attack. It requires about 25-30^{0}C optimum average temperature at the time of ripening. The temperature at the time of grain filling and development are very crucial for yield. Temperatures above 25^{0}C tend to depress grain weight. Wheat contains more protein in the form of gluten than other cereals crop. Wheat occupied an acreages about 215.29 million ha with production of 730.84 million metric tonns with productivity of 3390 kg ha^{-1} (Anonymous, 2019) [2]. In India it is grown on 29.55 million ha^{-1} (13.43% global area) with the production of 101.20 million tonns (1.3% rises previous year) and productivity about 3424 kg ha^{-1} (Anonymous, 2019) [2]. In Uttar Pradesh wheat occupied about 9.78 million ha^{-1} achieved rank first in production (31.99 million tonns) with productivity (3269 kg ha^{-1}). But the productivity is comparatively lower than that the Punjab (5030 kg ha^{-1}) and Haryana (4410 kg ha^{-1}).

Present time adoption of intensive cropping system will meet the food as per the demands of increasing population, it requires high input energy, which are not only responsible for environment degradation but also increased the cost of cultivation. After the green revolution, production of crops has increased to a great extent due to the use of chemical fertilizers but their indiscriminate use has led to soil sickness, ecological hazards and depletion of other sources of energy. The recent energy crisis, high fertilizer cost and low purchasing power of the farming community have made it necessary to re-think alternatives.

Under these situations, INM is a good option in food grain security as well as to maintain soil health. Integrated nutrient management (INM) is the combined use of mineral fertilizers with organic resources such as cattle manures, crop residues, urban/rural wastes, composts, green manures etc. It contributes in attaining agronomical feasible, economically viable, environmentally sound and sustainable high crop yields in cropping systems by enhancing nutrient use efficiency and soil fertility, reducing nitrogen losses due to nitrate leaching and emission of greenhouse gases. Kaur *et al*. (2018) [5] reported that the plant height (cm), dry matter accumulation (g), leaf area index and number of tillers (m^{-2}) of wheat improved significantly by the application of FYM @10t ha^{-1} and phosphorus @ 80 kg P_2O_5 ha^{-1}.

Materials and Methods

An experiment was conducted on Effect of Integrated Nutrient Management (INM) on growth parameters of timely sown wheat (*Triticum aestivum* L.) during *rabi* season of 2018-19 and 2019-20 at the Agronomy Research Farm, ANDUA&T Kumarganj, Ayodhya (U.P.). The experiment consists of fourteen treatments *i.e.* T_1-100% RDN (Recommended Dose of Nitrogen), T_2. 75% RDN, T_3. 75% RDN + $ZnSO_4$ @ 25 kg ha^{-1}, T_4. 75% RDN + Sulphur @ 40 kg ha^{-1}, T_5. 75% RDN + $ZnSO_4$ @ 25 kg ha-1+ Sulphur @ 40 kg ha^{-1} T_6. 75% RDN+25% N through FYM, T_7. 75% RDN+25% N through FYM + $ZnSO_4$ @ 25 kg ha^{-1}, T_8. 75% RDN+25% N through FYM + Sulphur @ 40 kg ha^{-1}, T_9. 75% RDN+25% N through FYM + $ZnSO_4$ @ 25 kg + Sulphur @ 40 kg ha^{-1}, T_{10}. 75% RDN+25% N through (poultry manure), T_{11}. 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1}, T_{12}. 75% RDN+25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}, T_{13}. 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1} and Control (T_{14}) treatments were laid out in Randomized Block Design (RBD) with three replications. The experimental field was well drained and leveled in order to determine the fertility status and soil class, soil samples were collected randomly from different places of the experimental field with the help of soil auger at the depth of 0-15 cm for physico-chemical analysis before execution of the fertility treatments. The soil was silty loam with the pH of (8.20, 8.30) with EC (0.24, 0.25 dS/m). The organic carbon content of soil was (0.32, 0.33%) with available nitrogen (135.72, 137.60 kg ha^{-1}), available phosphorous (14.35, 15.40 kg ha^{-1}), available potassium (247.30, 248.33 kg ha^{-1}), available sulphur (7.15, 7.30 kg ha^{-1}) and available Zinc (0.56, 0.59 ppm ha^{-1}). The experimental site falls under the sub-tropical climate of Indo-Gangatic alluvial plains zone (IGP) having alluvial calcareous soil and located at 26º47' N latitude and 82º12’ E longitude with an altitude of 113 m above the mean sea level. Variety PBW 154 was shown proper moisture stage on 18 Nov., 2018-19 and 19 Nov., 2019-20. The seed was treated with thirum @ 2.5 g kg^{-1} seed to control the fungal diseases. The seeds were placed in manually opened furrows at the depth of 5 cm below with the row spacing of 22.5 cm apart. The seeds were applied informally in each and every plots @ 100 kg ha^{-1}. Nitrogen, phosphorus and potassium fertilizer were applied in the forms of Urea, DAP and Muriatic of potash @ 120, 60 and 40 kg ha^{-1}, respectively. Full dose of phosphorus, potassium and half dose of nitrogen were applied as basal dressing 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.

Leaf area index was calculated by the following relationship (Mckee 1964).

$$\text{Leaf area index} = \frac{\text{Total leaf area (cm}^2\text{)}}{\text{Total land area (cm}^2\text{)}}$$

Result and Discussion

Plant height increased progressively with increase in duration of wheat crop (table 1). Crop growth rate was maximum up to 90 DAS and thereafter, a slow increase in growth was obtained up to harvest. The plant height was significantly influenced by the various integrated nutrient management practices. The taller plants were recorded with the application of 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha-1 + Sulphur @ 40 kg ha^{-1} (T_{13}), which was statistically at par with T_9, $T_{11,}$ and T_{12} treatments, respectively at all the successive growth stages of crop. This might be due to increment of additional nutrient applied as the form of different component of INM. The increase components seems to have been broad about by increases in amount of growth substances and naturally occurring phytohormones with increase nitrogen supply. Probably the increase in auxin, cell division and cell enlargement by the supply of higher level of INM brought about increased in the plant height. Pandey *et al*. (2004) [7]. Whereas the minimum plant height was recorded in control at all the growth stages this might be due to lack of the nutrient available in soil. The similar finding given by Khattak *et al.* (2015) [6].

The dry matter accumulation increased with increasing the rate of photosynthesis (Table 2). The highest dry matter accumulation was recorded under 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha-1 + Sulphur @ 40 kg ha^{-1} (T_{13}) treatments, which was statistically at par with T_1, T_7, T_9 and T_{11} treatments, respectively. While it was significantly superior over rest of treatments at all successive growth stages of plant. The significant improvement dry matter accumulation was observed when increased the different component of nutrients sources. This was not only provides nutrients but also improved physical condition of soil in respect of granulation, friability and porosity they also increased cation exchange capacity and phosphate and sulphate availability of soil, low nitrogen loses due to slow release of nutrient from different components of integration. The biological role of the nitrogen as an essential constituent of chlorophyll in harvesting of solar energy and the regulation of cellular metabolisms of protein, structural units and biological catalyst etc. Thus these mechanism improved the plant height, number of leaves, leaf area index and number of tillers which have ultimately enhanced the dry matter accumulation (Jain, 2012) [4].

Integrated nutrient management practices significantly influenced on leaf area index at 30, 60 and 90 DAS in both the years experimentation (table 3). Among the integrated nutrient management, 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1} was received maximum leaf area index, which was statistically at par with each and every treatment except control at 30 DAS. The leaf area index progressively increased upto 60 DAS after that it decreased. The maximum value of leaf area index (5.25, 5.40) and 90 DAS leaf area index (4.46, 4.59) were noted also in aforesaid treatment, It was found statistically at par T_1, T_7, T_9, and T_{11} treatments and significantly superior over rest of the treatments. This might be due to maximum availability of nutrient in soil cause more nutrient uptake by in plant, which increased although growth parameters *i.e.* plant height, number of leaf plant^{-1}, number of tillers m^{-2} which has ultimately enhanced the leaf area index. Bachhao *et al.* (2018) [3].

Obvious from the data have been summarized in table 4 result revealed that the number of tillers significantly increased with the increasing of different components of plant nutrients. The number of tillers were increased progressively up to 90 DAS and thereafter decreased. As par described data, the maximum number of tillers (m^{-2}) were observed with the application of 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}, which was significantly higher over control. However, it was at par with all the integrated nutrient management sources. This might be due to increase the application of different components of INM in soil results enhanced the nutrient status of the soil as well as increased the microbial activity of soil, which might be due to plant get favorable condition for growth and development as well as chlorophyll content by canopy of plants caused more photosynthesis which was ultimately increased number of tillers m^{-2}. These similar finding given by Akhtar *et al.* (2018) [1].

Summary and Concussion

The different component of integrated nutrient management were increased with increase the growth parameters as par duration of the crop. Among the integrated nutrient management, application of 75% RDN+25% N through (poultry manure) + $ZnSO_4$ @ 25 kg ha^{-1} + Sulphur 40 kg ha^{-1} recoded maximum growth parameters in respect of plant height, dry matter accumulation plant^{-1}, leaf area index and number of tillers at different growth stages of crop. However, the minimum value of growth parameters was received under control during both the years of experimentation.

Table 1: Plant height (cm) at subsequent growth stages of wheat as influenced by various integrated nutrient management (INM)

Treatments	30 DAS		60DAS		90 DAS		At harvest	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	25.10	25.30	68.90	70.30	86.60	87.40	87.00	87.80
T_2: 75% RDN	24.30	24.50	64.70	66.00	80.90	82.50	81.30	82.90
T_3: 75% RDN + ZnSO4 @ 25 kg ha^{-1}	24.80	25.00	67.00	68.30	83.50	85.40	83.90	85.40
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	24.60	24.80	65.10	66.40	81.40	83.00	81.80	83.40
T_5: 75% RDN + ZnSO4 @ 25 kg ha^{-1}+ Sulphur @ 40 kg ha^{-1}	25.00	25.30	70.00	71.40	86.10	89.30	86.50	89.80
T_6: 75% RDN+25% N through FYM	24.80	25.00	67.90	69.30	83.80	86.60	84.20	87.00
T_7: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg ha^{-1}	25.30	25.50	71.00	72.40	87.90	90.50	88.40	90.90
T_8: 75% RDN+25% N through FYM + Sulphur @ 40 kg ha^{-1}	25.10	25.30	70.30	71.70	87.50	89.60	87.90	90.00
T_9: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg + Sulphur @ 40 kg ha^{-1}	25.40	25.70	73.30	74.80	91.60	93.50	91.50	94.00
T_{10}: 75% RDN+25% N through (poultry manure)	24.90	25.10	68.50	69.90	84.90	87.90	85.30	88.40
T_{11}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1}	25.50	25.80	72.80	74.30	91.00	92.90	91.50	93.40
T_{12}: 75% RDN+25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	25.20	25.40	71.80	73.20	88.80	92.30	89.20	92.82
T_{13}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	25.60	25.80	74.80	76.30	91.60	95.40	92.10	95.90
T_{14}: Control	23.40	23.60	56.00	57.00	68.00	69.20	68.30	69.50
S.Em±	0.86	0.81	2.38	2.54	3.68	3.14	3.21	3.10
CD at 5%	2.15	2.10	6.91	7.36	10.71	9.13	9.31	9.02

Table 2: Dry matter accumulation (g m^{-2}) at successive growth stages of wheat crop as influenced by various integrated nutrient management (INM).

Treatments	30 DAS		60DAS		90 DAS		At harvest stage	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	83.75	82.92	527.09	545.41	878.49	909.02	1021.5	1057.0
T_2: 75% RDN	81.67	81.25	443.91	459.76	739.86	766.26	860.3	891.0
T_3: 75% RDN + ZnSO4 @ 25 kg ha^{-1}	83.33	83.75	470.49	487.10	784.15	811.84	911.8	944.0
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	82.92	82.50	458.21	473.95	763.68	789.91	888.0	918.5
T_5: 75% RDN + ZnSO4 @ 25 kg ha^{-1}+ Sulphur @ 40 kg ha^{-1}	84.17	85.00	505.42	522.81	842.75	871.35	979.5	1013.2
T_6: 75% RDN+25% N through FYM	82.50	82.92	489.58	505.99	815.97	843.32	948.8	980.6
T_7: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg ha^{-1}	84.17	85.00	512.39	529.42	853.98	882.36	993.0	1026.0
T_8: 75% RDN+25% N through FYM + Sulphur @ 40 kg ha^{-1}	83.37	84.17	502.07	519.61	836.78	866.02	973.0	1007.0
T_9: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg + Sulphur @ 40 kg ha^{-1}	85.00	85.42	547.99	567.34	913.32	945.57	1062.0	1099.5
T_{10}: 75% RDN+25% N through (poultry manure)	82.92	83.33	489.68	507.23	816.14	845.38	949.0	983.0
T_{11}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1}	85.00	85.83	516.52	535.61	860.86	892.68	1001.0	1038.0
T_{12}: 75% RDN+25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	84.17	85.00	501.55	519.10	835.92	865.16	972.0	1006.0
T_{13}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	85.42	86.25	553.93	573.28	923.21	955.46	1073.5	1111.0
T_{14}: Control	78.33	79.58	340.82	352.69	568.03	587.81	660.5	683.5
S.Em±	2.35	2.78	21.81	16.79	27.68	29.60	42.66	43.44
CD at 5%	7.05	8.34	63.39	48.80	80.46	86.05	124.02	126.27

Table 3: Leaf area index at successive growth stages of wheat crop as influenced by various integrated nutrient management (INM).

Treatments	30 DAS		60DAS		90 DAS	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	1.39	1.40	5.00	5.12	4.25	4.35
T_2: 75% RDN	1.27	1.29	4.21	4.32	3.56	3.67
T_3: 75% RDN + ZnSO4 @ 25 kg ha^{-1}	1.29	1.30	4.46	4.58	3.79	3.90
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	1.27	1.29	4.34	4.46	3.70	3.80
T_5: 75% RDN + ZnSO4 @ 25 kg ha^{-1}+ Sulphur @ 40 kg ha^{-1}	1.36	1.37	4.79	4.92	4.07	4.18
T_6: 75% RDN+25% N through FYM	1.30	1.21	4.63	4.77	3.95	4.05
T_7: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg ha^{-1}	1.38	1.39	4.85	4.99	4.12	4.25
T_8: 75% RDN+25% N through FYM + Sulphur @ 40 kg ha^{-1}	1.35	1.36	4.75	4.90	4.05	4.16
T_9: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg + Sulphur @ 40 kg ha^{-1}	1.40	1.41	5.20	5.33	4.42	4.53
T_{10}: 75% RDN+25% N through (poultry manure)	1.32	1.33	4.64	4.77	3.94	4.05
T_{11}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1}	1.39	1.40	4.90	5.03	4.16	4.27
T_{12}: 75% RDN+25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	1.37	1.38	4.75	4.88	4.05	4.15
T_{13}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	1.41	1.42	5.25	5.40	4.46	4.59
T_{14}: Control	1.25	1.26	3.23	3.32	2.75	2.82
S.Em±	0.05	0.06	0.21	0.17	0.13	0.13
CD at 5%	0.15	0.18	0.60	0.48	0.37	0.39

Table 4: Number of tillers per m^{-2} of wheat as influence by various integrated nutrient management (INM)

Treatments	30 DAS		60DAS		90 DAS		At harvest stage	
	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20	2018-19	2019-20
T_1: 100% RDN (Recommended Dose of Nitrogen)	199.0	201.0	306.74	312.88	325.91	332.43	319.52	325.91
T_2: 75% RDN	195.0	196.0	289.65	295.44	307.75	313.91	301.72	307.75
T_3: 75% RDN + ZnSO4 @ 25 kg ha^{-1}	200.0	201.0	301.33	307.35	320.16	326.56	313.88	320.16
T_4: 75% RDN + Sulphur @ 40 kg ha^{-1}	198.0	199.0	293.23	299.10	311.56	317.79	305.45	311.56
T_5: 75% RDN + ZnSO4 @ 25 kg ha^{-1}+ Sulphur @ 40 kg ha^{-1}	202.0	204.0	320.79	327.21	340.84	347.66	334.16	340.84
T_6: 75% RDN+25% N through FYM	198.0	199.0	313.35	319.62	332.94	339.60	326.41	332.94
T_7: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg ha^{-1}	202.0	204.0	316.03	322.36	335.79	342.50	329.20	335.79
T_8: 75% RDN+25% N through FYM + Sulphur @ 40 kg ha^{-1}	200.0	202.0	313.71	319.98	333.32	339.98	326.78	333.32
T_9: 75% RDN+25% N through FYM + ZnSO4 @ 25 kg + Sulphur @ 40 kg ha^{-1}	204.0	205.0	319.48	325.87	339.45	346.24	332.79	339.45
T_{10}: 75% RDN+25% N through (poultry manure)	199.0	200.0	310.47	316.68	329.88	336.47	323.41	329.88
T_{11}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1}	204.0	206.0	308.63	314.80	327.92	334.48	321.49	327.92
T_{12}: 75% RDN+25% N through (poultry manure) + Sulphur @ 40 kg ha^{-1}	202.0	204.0	311.08	317.30	330.52	337.13	324.04	330.52
T_{13}: 75% RDN+25% N through (poultry manure) + ZnSO4 @ 25 kg ha^{-1} + Sulphur @ 40 kg ha^{-1}	205.0	207.0	321.28	327.70	341.36	348.18	334.66	341.36
T_{14}: Control	188.0	196.0	233.47	238.14	248.06	253.02	243.19	248.06
S.Em±	7.03	7.80	10.36	14.16	14.08	13.79	8.96	11.57
CD at 5%	NS	NS	30.13	41.16	40.92	39.80	26.06	34.31

Reference

1. Akhtar N, Ramani VB, Yunus M, Femi V. Effect of Different Nutrient Management Treatments on Growth, Yield Attributes, Yield and Quality of Wheat (*Triticum aestivum* L.) International. Journal of Current Microbiology and Applied Science 2018;**7**:3473-3479.
2. Anonymous. Foreign Agriculture Service/USDA office of global analysis 2019.
3. Bachhao KS, Kolekar PT, Nawale SS, Kadlag AD. Response of different wheat varieties to different sowing dates. Journal of Pharmacognosy and Phytochemistry 2018;**7**(1):2178-2180.
4. Jain P. Effect of sowing methods, input and varieties levels on growth, yield components, yield and nutrient uptake of durum wheat (*Triticum durum* desf.). Trends in Biosciences 2012;5:22-24.
5. Kaur R, Kumar S, Kaur R, Kaur J. Effect of Integrated nutrient management on yield of wheat (*Triticum aestivum* L.) under irrigated conditions 2018;6(4):1800-1803.
6. Khattak SG, Peter JD, Wiqar A. Effect of Zn as soil addition and foliar application on yield and protein content of wheat in alkaline soil. J Natn. Sci. Foundation Sri Lanka 2015;43(4):303-312.
7. Pandey IB, Bharti V, Bharti RC, Mishra SS. Effect of fertilizer level and seed rates on growth and yield of surface seeded wheat (*Triticum aestivum* L.) under low land rice ecosystem of North Bihar. Indian Journal of Agronomy 2004;49(1):43-45**.**
8. Mckee GW. A coefficient for computing leaf area in hybrid corn. Agron. J 1964;56(2):240-241.