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Effect of FYM with combination of inorganic sources of nitrogen on growth and development of wheat (*Triticum aestivum* L.)

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Abstract
The experiment conducted during Rabi season of 2017-18 at student instructional farm of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur to Effect of FYM with combination of inorganic sources of nitrogenon on growth and development of wheat (*Triticum aestivum* L.) Variety K-1006 (shekhar). The experiment consist 12 treatments in randomized block design*viz.*T_1 50% recommended dose of nitrogen (RDN) only, T_2 75% recommended dose of nitrogen (RDN), T_3 100% recommended dose of nitrogen (RDN), T_4 125% recommended dose of nitrogen (RDN) T_5 150% recommended dose of nitrogen(RDN), T_6 50% recommended dose of nitrogen (RDN)+5ton FYM/ha, $T_7$75% recommended dose of nitrogen (RDN)+5ton FYM/ha, T_8 recommended dose of nitrogen 100%(RDN) +5ton FYM/ha, $T_9$125% recommended dose of nitrogen (RDN)+5ton FYM/ha, T_{10} 150% recommended dose of nitrogen (RDN) +5ton FYM/ha, T_{11} 150% recommended dose of nitrogen (RDN)+Fe+5ton FYM/ha, T_{12} 150% recommended dose of nitrogen (RDN)+Zn+5ton FYM/ha .The application of 150% recommended dose of nitrogen (RDN)+Zn+5ton FYM/ha, found superior in terms of plant height, dry and fresh weight, leaf area index, relative growth rate of plant due to balance nutrition and check nutritional loses in this treatment.

Keywords: FYM, zinc, plant height, fresh and dry weight of plant leaf area index, relative growth rate

1. Introduction
Wheat (*Triticum aestivum* L.) represents about 30% of the bread wheat is the major staple food source for a large part of global population. The global significance of wheat could be simply realized in the way that more food is made with wheat than any other cereals. Indian soil are generally deficient in nutrients particularly nitrogen. It has been universally observed that nitrogen use efficiency which is low as about 30-37% is utilized while rest is lost through volatilization, denitrification and leaching. The phosphorus and potash use efficiency is 15-20% and 20-40% respectively while rest is fixed in the soil and not available to the plant easily. The relationship between fertilizer and food security is most clearly shown in the case of N, the dominant nutrient in terms of global use. The use of three major nutrients as chemical fertilizer is necessary to achieve production target of wheat. Micro nutrient are also necessary to achieve sustainability in production and to improve quality of wheat. During last one decade the practice of reducing inorganic fertilizer doses by 25-50% with complimentary doses of organic manures did not achieve sustainability in wheat production. The integration of supper imposed quantity of micronutrient, organic manures, microbial supplements along with 100% dose of inorganic fertilizers (NPK only) catching attention of scientific communities, now days. Organic and mineral fertilizers are complementary often the best yields are only achieved when inorganic and organic nutrients are applied together. The role of micronutrients along with major nutrients has their important role in improvement of plant height, fresh and dry weight of plant, LAI and RGR.

2. Material and Method
The experiment was conducted in field number 8 at student instructional farm [SIF] of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur (U.P.), India, during Rabi season 2017-18. The soil was silt loam in texture with 7.8 pH. The experiment was conducted in RBD design and experiment consisted of 12 treatments *viz.*

T_1 50% recommended dose of nitrogen (RDN) only, T_2 75% recommended dose of nitrogen (RDN), T_3 100% recommended dose of nitrogen (RDN), T_4 125% recommended dose of nitrogen (RDN) T_5 150% recommended dose of nitrogen(RDN), T_6 50% recommended dose of nitrogen (RDN)+5ton FYM/ha, $T_7$75% recommended dose of nitrogen (RDN)+5ton FYM/ha, T_8 recommended dose of nitrogen 100%(RDN) +5ton FYM/ha, $T_9$125% recommended dose of nitrogen (RDN)+5ton FYM/ha, T_{10} 150% recommended dose of nitrogen (RDN) +5ton FYM/ha, T_{11} 150% recommended dose of nitrogen (RDN)+Fe+5ton FYM/ha, T_{12} 150% recommended dose of nitrogen (RDN)+Zn+5ton FYM/ha. The recommended dose of nitrogen, phosphorus and potassium, 150 kg, 60 kg and 40 kg ha-1, respectively. Neem coated urea (46%), DAP (18% N, 46% P2O5), MOP (60% K2O), FYM (0.5% N, 0.25% P2O5, 0.5 K2O). The organic manures FYM and in combinations were applied uniformly as per treatment and incorporated into the soil before sowing.

3. Result and Discussion

The data regarding plant population /m^2 recorded at initial stage(15 DAS) were summarized in table 1. The result shows that initial plant stand of wheat was found statistically non - significant. The data related to plant height (cm) was recorded at 30, 60, 90 DAS and at maturity stage were summarized in table 1. The plant height at 60, 90, DAS and at maturity stage was influenced significantly by various treatment. The treatment comprising recommended dose of nitrogen (150 kg/ ha)+ Zn(25kg/ha) + 5 ton of FYM /ha recorded maximum plant height(12.60, 83.60, 89.87, 95.31 cm) at 30, 60, 90 DAS and at maturity stage, respectively which was at par to the recommended dose of nitrogen (150 kg/ha) + Fe (25kg/ha) + 5 ton of FYM /ha, and 150% recommended dose of nitrogen along with 5 ton of FYM/ ha, 125% recommended dose of nitrogen along with FYM 5 ton/ ha, and 100% recommended dose of nitrogen along with 5 ton of FYM/ha and the lowest plant height was recorded with 50% RDN. Similar result reported by Khalh *et al*. (1994) [5] and Menka Mehra*et al.* (2007) [6]. The data related to fresh weight of plant (g) recorded at 30, 60, 90 DAS and at harvesting stage were summarized in table 1. The data revealed that at 30,60, 90 DAS and at maturity stage fresh weight of plant with recommended dose of nitrogen(150kg/ha) +Zinc(25kg/ha) +5 ton FYM/ha was significantly higher (19.26, 138.76, 55.24,27.80 g respectively at 30, 60, 90 DAS and at maturity stage of the crop) than rest of the treatments. The treatment recorded maximum fresh weight of plant which was at par with recommended dose of nitrogen (150 kg/ha) +Fe(25kg/ha) + 5 ton FYM/ha. The lowest fresh weight of plant were recorded with 50% recommended dose of nitrogen at different growth stages. Similar result reported by Sharma *et al.* (2007) [8] and Singh *et al.* (2007) [9]. The dry weight of plant increased progressively with age of crop.The data presented in table No 1 revealed that at any particular growth stage (30,60,90 DAS and at maturity) the maximum dry weight of plant (2.14,14.61,18.08,22.15 respectively) was recorded in the treatment comprising recommended dose of nitrogen(150kg/ha) +Zn +5 ton FYM/ha followed by recommended dose of nitrogen(150 kg/ha) +Fe(25 kg/ha)+5 ton FYM/ha. The lowest dry weight of plant was recorded with 50% recommended dose of nitrogen at different growth stages. Similar findings reported by Bhagwati *et al.* (1992) [2]. Leaf area index worked out at 30,60,90 DAS and at maturity stage of the crop presented in table 2. The data revealed that LAI increased with the advancement of crop growth up to 60 DAS and decreased thereafter. At 30, 60,90 DAS and maturity stage, application of recommended dose of nitrogen(150kg/ha)+Zn(25kg/ha) + 5 ton FYM/ha resulted in highest (1.43, 5.92, 4.38, 2.73 respectively) leaf area index and significantly higher than rest of the treatments but which was at par with recommended dose of nitrogen(150 kg/ha)+ Fe(25kg/ha + 5 ton FYM/ha at all the growth stages of crop and minimum leaf area index was recorded with 50% recommended dose of nitrogen. Similar findings reported by Ranwa (1997) [7], Sardana *et al*. (2002) [8] and Sharma and Acharya (1997) [9]. The data related to relative growth rate (RGR) of plant recorded at 30, 60, 90 DAS and at harvesting stage were summarized in table 2. The RGR increased with faster rate of crop age up to 30-60 DAS and decreased thereafter 60-90 DAS, 90DAS to maturity stage. the application of recommended dose of nitrogen(150kg/ha) + Zn(25kg/ha) + 5 ton FYM/ha resulted in maximum relative growth rate during 30-60, 60-90, and 90 – maturity stage of the crop and were significantly superior to rest of the treatments. The lowest relative growth rate (0.256, 0.077, 0.090 at 30-60 DAS, 60-90 DAS, and 90DAS – maturity stage, respectively) was observed with 50% recommended dose of nitrogen at all the intervals. Similar findings reported by Ranwa (1997) [7] and Sharma and Acharya (1997) [9].

Table 1: Effect of treatment on plant initial population, plant height, fresh and dry weight of plant at different intervals.

Treatment	Initial plant population/m^2 at 15 DAS	Plant height (cm)				Fresh wt. (g)/plant				Dry wt (g)/plant			
		at 30 DAS	at 60 DAS	at 90 DAS	at maturity	at 30 DAS	at 60 DAS	at 90 DAS	at maturity	at 30 DAS	at 60 DAS	at 90 DAS	at maturity
50% RDN	123.33	11.65	55.21	59.35	64.23	17.85	91.67	36.45	18.30	1.98	9.65	11.95	14.64
75%RDN	121.66	11.76	61.56	66.17	70.52	17.97	102.19	40.66	20.50	2.00	10.76	13.32	16.32
100%RDN	124.00	11.95	66.77	71.78	76.13	18.27	110.89	44.13	22.24	2.03	11.67	14.45	17.70
125%RDN	122.90	11.98	69.38	74.59	78.77	18.33	114.96	45.85	23.13	2.04	12.12	15.01	18.39
150%RDN	123.66	12.07	72.98	78.45	83.21	18.45	121.15	48.22	24.29	2.05	12.75	15.79	19.34
50%RDN+5 ton FYM/ha	124.33	11.78	63.04	67.76	71.87	18.00	104.66	41.67	21.00	2.00	11.02	13.64	16.71
75% RDN+5 ton FYM/ha	125.11	11.81	66.54	71.53	75.86	18.06	110.48	43.98	22.17	2.01	11.63	14.40	17.63
100% RDN+5 ton FYM/ha	124.66	12.06	72.84	78.30	83.04	18.42	120.90	48.14	24.19	2.05	12.73	15.76	19.31
125% RDN+5 ton FYM/ha	121.90	12.25	76.01	81.71	86.66	18.72	126.19	50.22	25.33	2.08	13.28	16.65	20.15
150% RDN+5 ton FYM/ha	122.33	12.42	78.48	84.36	89.47	18.96	130.31	51.84	26.12	2.11	13.72	16.98	20.80
RDN+ Fe + ton	123.60	12.50	81.23	87.32	92.61	19.05	134.87	53.68	27.05	2.12	14.20	17.58	21.53

FYM/ha													
RDN+Zn+5 ton FYM/ha	122.70	12.60	83.60	89.87	95.31	19.26	138.76	55.24	27.80	2.14	14.61	18.08	22.15
SE(d) ±	4.33	0.72	2.44	3.03	3.23	1.11	4.97	2.75	1.05	0.25	0.68	0.80	0.98
CD at 5%	NS	NS	5.07	6.29	6.71	0.79	10.32	5.71	2.19	NS	1.42	1.66	2.03

Table 2: Effect of treatment on leaf area index and relative growth rate of wheat at different intervals

Treatment	Leaf area index				Relative growth rate		
	at 30 DAS	at 60 DAS	at 90 DAS	at maturity	30 DAS to 60 DAS	60 DAS to 90 DAS	90 DAS to maturity
50% RDN	1.31	3.91	2.89	1.80	0.256	0.077	0.090
75%RDN	1.32	4.36	3.22	2.01	0.292	0.088	0.100
100%RDN	1.34	4.73	3.50	2.17	0.321	0.096	0.108
125%RDN	1.35	4.91	3.63	2.26	0.336	0.101	0.113
150%RDN	1.36	5.18	3.83	2.38	0.357	0.107	0.118
50%RDN+5 ton FYM/ha	1.32	4.46	3.56	2.09	0.301	0.091	0.106
75% RDN+5 ton FYM/ha	1.33	4.71	3.48	2.17	0.321	0.096	0.108
100% RDN+5 ton FYM/ha	1.36	5.16	3.81	2.37	0.356	0.107	0.118
125% RDN+5 ton FYM/ha	1.38	5.38	3.98	2.48	0.373	0.112	0.117
150% RDN+5 ton FYM/ha	1.40	5.56	4.11	2.56	0.387	0.116	0.127
RDN+Fe+5 ton FYM/ha	1.41	5.75	4.25	2.65	0.403	0.121	0.132
RDN+ Zn+ 5 ton FYM/ha	1.43	5.92	4.38	2.73	0.416	0.122	0.136
SE(d) ±	0.02	0.15	0.14	0.08	0.03	0.005	0.006
CD at 5%	0.05	0.31	0.30	0.18	0.07	0.011	0.013

4. Conclusion

Based on the basis of results it may be concluded that the super imposed doses of 150% recommended dose of nitrogen (RDN)+Zn+5ton FYM/ha. under treatment 12, recorded better growth in term of plant height, dry and fresh weight of plant, leaf area index and relative growth rate due to balance nutrition and check nutritional loses in this treatment.

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