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Research Paper

Effect of Integrated Nutrient Management in Wheat (Triticumaestivum L.) Crop in Alluvial Soils of Agra.

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Abstract: *A field experiment Effect of integrated nutrient mangement in wheat (TriticumaestiviumL.) crop in alluvial soils of Agra was conducted during the winter (Rabi) season of 2021-2022 at Agricultural Research Farm,of R.B.S. College, Bichpuri, Agra (U.P.) The treatment weare tasted in randomized block design with four replication.The integration of inorganic and organic sources of nutrients are To(Control) ,T_1 (Vermicompost 2.5 t/ha), T_2(Vermicompost5 t/ha), T_3(N_{60}, P_{30}, K_{20}kg/ha), T_4 (N_{120}, P_{60}, K_{40} kg/ha)and T_5(N_{60}, P_{30}, K_{20}kg/ha+Vermicompost 2.5t/ha). The result indicated that the integration of nutrients both of both sources treatmentsT_5 proved significant better results in terms of growth, yield attributes, yield, protein content in grain, nutrient NPK content and uptake both grain and straw in comparison to control. The performance of treatment may be arranged in descending order $T_5>T_4>T_3>T_2>T_1>T_0$.*

Keywords*: Continuous, Integrated Nutrient Management, Vermicompost, Wheat etc.*

I. Introduction

Wheat is the second most important food crop next to be rice and it contributes nearly35% to the national food basket. Among winter crops, it contributes about 49% of the food grains. India rank 1 st in the total area, production and productivity for the period of 2020-2021 of the country were 34.50 million hectares, 109.52 million tones and 35.00 quintal/ha, respectively. The state of Uttar Pradesh occupies an area of 3-4 percent and 4.9 percent production (35.77 million tones) particularlyin some states like south- west U.P., Rajasthan, Haryana and Gujarat, covering million-hectare land. In view of the spread and contribution of food pool of the nation, as a coarse cereal-wheat system, there appeared a need to sustain the decline crop yields and depleting soil fertility due to continuous cropping, over mining of soil nutrients, imbalance and inadequate fertilizer use, also decreasing crop response to nutrients. In fact, integrated nutrients management system is the combined use of fertilizers with organic resources such as organic manures (FYM, compost, crop residues, green manuring and bio fertilizers (Antil et al.,2011) Its basic concept is sustaining soil and crop productivity through optimization of all possible sources of plant nutrients in an integrated manner. In this system all mineral and organic nutrient sources are integrated into the crop production system and are utilized in an efficient and judicious manner for it contributes in attaining sustainablecrop production and sound environmentally viable, economically feasible, agronomically sustainable high crop yields by enhancing nutrient use efficiency and soil fertility. Increasing carbon sequestration, reducing nitrogen losses due to nitrate leaching. Therefore, the nutrient needs of crop production systems can best be achieved through integrated nutrient management (Sharma et al., 2015). Moreover, for higher fertilizer use efficiency and sustainability of cropping system, there is need to recommend and develop site specific nutrient management strategies**.**

II. Materials and Methods:

The field experiment was carried out during rabi season of 2021-2022onwheatcropat R.B.S. College, Research Farm Bichpuri, Agra (U.P.).The soil was sandy loam in texture, with pH 8.4,organic carbon 0.40%, available N 145.5 kg/ha, available P 17 kg/ha, and available potash 185.50 kg/ha. Experiment was laid out in Randomized Block Design having 6 treatments and 4 replications in wheat crop. The nutrient was applied through Urea 46% N, DAP (18% N & 46% P2O5) and muraite of potash (60%K2O), respectively, as per treatment, were applied in furrows 3-4 cm below the seed at sowing time. Remaining half quantity of nitrogen as per treatment was top dressed at the crop stage of 30 days after sowing. The amount of various organic manures vermicompost was applied. The wheat variety Lok-1 was sown on 13 November, 2021and harvesting at maturity on 16 Apri, 2022. The details of treatment given in table (1).

Table1:Treatment details

Treatment	Combination
T_0	Control
T_1	Vermicompost 2.5t/ha
T_2	Vermicompost 5t/ha
T_3	N_{60},P_{30}, K_{20} Kg/ha
T_4	N_{120}, P_{60}, K_{40} Kg/ha
T_5	N_{60}, P_{30}, K_{20}/ha +Vermicompost 2.5t/ha

Table 2: Growth parameters and yield attributes:

Treatment	Plant height (cm)	No. of tillers/plant	Spike length (cm)	No. of grain/spike	100, grain weight (g)
T_0	76.5	4.5	8.22	56.25	34.75
T_1	80.0	5.3	8.72	60.00	37.00
T_2	83.75	6.25	9.05	63.25	38.50
T_3	86.75	7.0	9.35	66.75	39.50
T_4	89.5	7.75	9.73	69.00	40.50
T_5	92.75	8.62	10.12	71.00	42.00
SEm ±	**0.67**	**0.41**	**0.13**	**0.719**	**0.502**
CD at 5%	**2.72**	**1.65**	**0.54**	**2.899**	**2.025**

III. Results and Discussion:

1.Growt hand yield attributes:

Data pertaining to different growth, parameter table no (2&3) plant height (cm), No. of tillers/plant, Spike length (cm), No. of grain/spike and **100,** grain weight (g). all above finding it may be narrated that T_5,(N_{60}, P_{30}, K_{20}/ha +Vermicom post 2.5t/ha) proved most suitable organic with inorganic fertilizer treatment combination for increasing the plant height of wheat. Similar result was also reported by **Singh and Pathak (2003), Das and Ram (2005), Ravankar et. al(2006) and Yadav et. al (2007).** Tiller per plant of wheat crop. The result indicated that the application INM treatment significantly increased no. of tillers per plant as comparison to control. arranged as T_5>T_4>T_3>T_2>T_1>T_0. Similar result was reported by **Kumawat et. al (2006)**. The tallest spike was obtained under T_5(10.12cm),treatment followed byT_4(9.73 cm), T_3(9.35 cm), T_2(9.05 cm),T_1(8.72 cm) and lowest under T_0(8.22cm) treatment similar result was observed by **Yadav el. al (2007),**The number of grain per spike and 1000 grain weight of wheat crop increased significantly with increased due to application value was recorded under T_5,(N_{60}, P_{30}, K_{20}/ha +Vermicom post 2.5t/ha) followed by T_4>T_3>T_2>T_1>T_0 (lowest under control) both no of grain per spike and 1000 grain weight in (g) . Similar result was observed by **Singh and Pathak (2003), and Ravankaret.al(2005**).

Grain and straw yield q/ha and protein content (%) in grain:

Table no: 3 Effect of different treatment on grain, straw q/ha and protein % in grain.

Treatment	Grain (q/ha)	Straw (q/ha)	Protein (%) in grain
T_0	44.0	91.0	11.73
T_1	47.8	95.7	11.88
T_2	50.7	99.7	12.07
T_3	53.0	104	12.24
T_4	55.7	107	12.38
T_5	57.6	109	12.78
SEm ±	**0.68**	**0.81**	**0.219**
CD at 5%	**2.77**	**3.26**	**0.884**

Data pertaining to different yield, parameter tables no 3. The increase in grain yield of wheat due to application of INM treatment over control. Overall, the treatmentT_5gave better performance in enhancing the grain yield in comparing to rest of the treatments during the investigation. The superiority of the various treatment may be arranged T_5,(N_{60}, P_{30}, K_{20}/ha +Vermicom post 2.5t/ha) followed by T_4 >T_3>T_2>T_1 >T_0. The INM treatment significantly increased the straw yield of wheat crop as compare to control. The treatment T_5andT_4 resulted 109 and 107 kg/ha enhancement in straw yield of wheat crop over control 91.0 kg/ha. Similar, findings were also reported by **Gauri Shankar et. al (2002), Singh and Pathak(2003), Ravankar et. al (2005) and Yadav et. al (2007).** The finding of protein content in grain of wheat are summarized, it is seem that

application of INM treatment enhanced the protein content in grain in comparison to control. The maximum protein content observed under $T_{5,}$and lowest in control. Our findings are in accordance with those of **Chauhan et. al (2005) and Mishra et. al(2007).**

Table 4 Nitrogen, Phosphorus and Potassium content (%)

Treatment	Nitrogen content (%)		Phosphorus content (%)		Potassium content(%)	
	grain	straw	grain	straw	grain	Straw
T_0	1.87	0.51	0.21	0.477	0.46	1.59
T_1	1.90	0.53	0.23	0.115	0.48	1.61
T_2	1.93	0.54	0.24	0.125	0.49	1.63
T_3	1.96	0.55	0.25	0.135	0.51	1.65
T_4	1.98	0.56	0.26	0.145	0.53	1.66
T_5	2.04	0.57	0.27	0.155	0.54	1.68
SEm ±	**0.35**	**0.003**	**0.003**	**0.168**	**0.005**	**0.003**
CD at 5%	**0.14**	**0.012**	**0.015**	**0.678**	**0.021**	**0.013**

Nitrogen, Phosphorus and Potassium content :

The data pertaining to different parameter table no(4) nitrogen, phosphorus and potassium content (%) it is quite clear that the nitrogen phosphorus and potassium content in grain and straw of wheat increased significantly with integrated use of inorganic fertilizer and organic sources over control. The treatment T_5, T_4 and T_3, better performance over rest of the treatment. However the integrated nutrient management do not differ from each other in case of nitrogen content in grain of wheat crop. The gradual release and steady supply of nutrient from humus throught out the growth and development of wheat crop in semi-arid conditions. Similar observations were also reported by **Singh and Pathak (2003), Das and Ram (2005), Chauhan et. al (2005), Mishra et. al (2007**). In the case of various treatment may be arranged as $T_{5,}$(N_{60}, P_{30}, K_{20}/ha +Vermicompost 2.5t/ha) followed by $T_4 > T_3 > T_2 > T_1 > T_0$. The phosphorus content in grain and straw enhanced by the applying of organic with inorganic fertilizers combination. It may be ascertain by the beneficial effect of vermicompost is due to its contribution in improving additional plant nutrients improvement of soil physical condition and biological processes in soil. Confirming the finding with those of **Das and Ram (2005), Chauhan et. al (2005)and Mishra et. al (2007).** Over all, the treatment T_5resulted in better over rest of the treatments in case of potassium content in grain and Straw of wheat crop. Similar to these finding **Jat et. al (2003).**

Table 5 Effect of different treatments on nitrogen & phosphorus uptake (kg/ha) by wheat crop.

Treatment	N-uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw
T_0	82.6	48.86	9.45	8.64	20.95	145.14
T_1	90.8	51.22	10.97	11.05	22.91	154.63
T_2	98.09	54.36	12.17	12.46	25.11	162.84
T_3	103.8	57.98	13.23	14.05	27.50	170.20
T_4	110.5	60.45	14.49	15.50	29.76	177.89
T_5	117.7	63.10	15.51	17.01	31.32	184.92
SEm ±	**2.61**	**0.556**	**0.24**	**0.547**	**0.46**	**1.835**
CD at 5%	**6.52**	**2.243**	**0.98**	**2.205**	**1.87**	**7.401**

Nitrogen, Phosphorus and Potassium uptake:

A perusal of the data on nitrogen phosphorus and potassium uptake by wheat crop was given table no (5). Wheat crop was significantly affected by different integrated nutrient management treatments. In general all the INM treatment increased N,P,K uptake in comparison to control. The treatment $T_{5,}$(N_{60}, P_{30}, K_{20}/ha +Vermicompost 2.5t/ha) followed by $T_4 > T_3 > T_2 > T_1 > T_0$ (control). Maintained their superiority over rest of the treatment in case of different nutrient utilized by wheat crop.

It is quite clear that with the application of integrated nutrient management treatment were richer in nutrient uptake. Similar, findings were drawn by **Sigh and Pathak (2003).** Clearly shown that greater phosphorus utilization is due to addition of nitrogen, protein synthesis in plant body improves there by needing other essential nutrient also proportionately.

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