

INFLUENCE OF INTEGRATED NUTRIENT MANAGEMENT ON YIELD, UPTAKE AND CROP QUALITY OF WHEAT

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Abstract— The field experiment on wheat was conducted at pot culture house of the Department of Soil Science and Agril. Chemistry, C.S. Azad University of Agriculture and Technology, Kanpur during rabi season 2012-13. The doses of experiment were T-1 (Control), T-2 120 kg N + 60 Kg P + 60 Kg Kha⁻¹, T-3 120 kg N + 60 Kg P + 60 Kg Kha⁻¹ + vermicompost, (5 q ha⁻¹), T-4 120 kg N + 60 Kg P + 60 Kg K ha⁻¹ Azotobacter, T-5 120 kg N + 60 Kg K ha⁻¹ + 60 K + 10 Kg Zn, T-6 120 kg N + 60 Kg P + 60 Kg K ha + vermicompost (5 q ha⁻¹) + Azotobacter and T-7 120 kg N + 60 Kg P + 60 Kg K + Vermicompost 5 q ha⁻¹ + Azotobacter + 10 kg Zn. The result showed that the grain yield of wheat varied from 30.00 to 53.00 q ha⁻¹ and straw yield of wheat from 40.00 to 67.00 q ha⁻¹. It was noted the N uptake varied from 70.80 to 145.64 kg ha⁻¹, P from 13.60 to 31.78 kg ha⁻¹, K from 74.20 to 148.59 kg ha⁻¹ and Zinc from 84.00 to 250.45 g ha⁻¹. The lysine content in wheat varied from 3.0 to 2.84 per cent and protein content in wheat varied from 11.25 to 12.75 per cent. The dose of N₁₂₀ + P₆₀ + K₆₀ + Vermicompost 5 q ha⁻¹ + Azotobacter + Zn₁₀ were found most suitable in respect of crop yield, uptake of nutrient and quality of wheat.

Keywords: experiment, wheat, chemistry.

I. INTRODUCTION

Wheat (*Triticum aestivum* L.) is most staple and second most important crop after rice in country, which contributed nearly one third of total production. Wheat production in 2013-14 was 87 million tones and area about 29.8 million hectare. India being the second largest in population, it is also the second largest in wheat consumption after China. The ideal ratio of NPK is 4:2:1 in cereal crops. The most significant result are obtained, when we use bio fertilizers in the combination of inorganic fertilizers and organic manures (Singh *et al.*, 2004). Nitrogen is major structural nutrient of the cell along with P and K. It helps in building up vegetative growth of plants. The deficiency of nitrogen badly affect the crop growth and causes shrivelling of grain and poor crop yield. Phosphorus is also important major plant nutrient for better crop production. It is necessary for photosynthesis. Potassium is the third major plant

nutrient and plays very important in photosynthesis and translocation of nutrients from leaves to the seed.

Vermicompost increases uptake of available nutrients in wheat. Azotobacter increases growth of grain and straw yield of wheat crop. Zinc is involved in protein and carbohydrate metabolism through several enzyme systems. Zinc increases the grain and straw yield of wheat with increasing levels of zinc application.

II. MATERIALS AND METHODS

The experiment was conducted in micro plots of "pot culture house" of the Department of Soil Science and Agricultural Chemistry, Chandra Shekhar Azad University of Agriculture & Technology, Kanpur during the rabi season 2012-13. The wheat variety Malviya 64 were taken for study with 7 treatments and 4 replications. The initial characteristics of soil were analyse to know the nutrient status of soil. The soil of experimental field is normal pH and EC, low in organic carbon, medium available nitrogen, available P and available K but low in case of available Zn. The pH, EC and organic carbon are analyse by the method described by Jackson (1967) available N was determine by alkaline per magnate method as described by Subbiah and Asija (1956) Available phosphorus was extracted with 0.5 NaHCO₃ Olsen *et al.* (1954). The P was estimated in extract by Vandomolybdate yellow. colour method (Jackson 1967). The available K was determined by flame photo meter. Available zinc was determined by atomic absorption spectro photometer. The plant samples were also analyse for NPK and Zn. Nitrogen was determined by Kjeldahl's method Jackson (1967). Phosphorus was estimated colorimetrically Chapman and Pratt (1961). Potassium was estimated by flame photometric method. Zinc was estimated by atomic absorption spectrophotometer as described by Lindsay and Norwell (1978) lysine was estimated by colorimetric method as described by Tsai *et al.* (1972) in wheat grain.

Table-1 : Effect of different treatments on grain and straw yield (q ha⁻¹) of wheat.

S. No	Treatment	Grain yield (q ha ⁻¹)	Percent increase over control	Straw yield (q ha ⁻¹)	Percent increase over control
1.	T ₁	30.00	-	40.00	-
2.	T ₂	46.50	55.00	56.50	41.25
3.	T ₃	47.50	58.33	58.40	46.00
4.	T ₄	48.50	62.00	59.20	48.00
5.	T ₅	48.00	60.00	62.00	55.00
6.	T ₆	50.50	68.33	63.50	58.75
7.	T ₇	53.00	76.67	67.00	67.50
	SE ±	0.199		0.505	
	CD (at 5%)	1.116		1.062	

Table-2 : Effect of different treatments on total uptake on NPK and Zn

	Treatment	N (kg ha ⁻¹)	P (kg ha ⁻¹)	K (kg ha ⁻¹)	Zn (g ha ⁻¹)
1.	T ₁	70.80	13.60	74.20	84.00
2.	T ₂	116.03	21.56	115.52	179.57
3.	T ₃	122.41	23.63	120.93	192.10
4.	T ₄	126.33	25.64	124.33	200.88
5.	T ₅	127.56	26.92	132.08	218.20
6.	T ₆	135.92	28.44	137.85	220.92
7.	T ₇	145.64	31.78	148.59	250.45
	SE ±	2.552	1.204	2.271	2.268
	CD (at 5%)	5.362	2.531	4.772	6.014

Table-3 : Effect of different treatments on protein and lysine content in wheat grain.

Sl. No.	Treatments	Protein (%)	Lysine (%)
1.	T ₁	11.25	3.00
2.	T ₂	11.87	2.82
3.	T ₃	12.19	2.80
4.	T ₄	13.31	2.81
5.	T ₅	12.25	2.76
6.	T ₆	12.50	2.78
7.	T ₇	12.75	2.84
	SE ±	0.323	0.055
	CD (at 5%)	0.679	0.110

III. RESULT AND DISCUSSION

Integrated nutrient management system involved efficient and judicious supply of nutrient through chemical fertilizers, organic manures and biofertilizers. The integrated supply and use of plant nutrients from chemical fertilizers and organic manures has been shown to produce higher crop yield than when applied alone. The increases productivity results from their combined effect and the synergistic effect that help to improved physical, chemical and biological properties of soil and consequently the soil organic matter and nutrient status in balanced manner. Indigenously available organic source of nutrient have been recorded to enhances the efficiency and reduce the requirement of chemical fertilizers and cost of cultivation.

The grain and straw yield of wheat are presented in table No. 1.

Grain yield :-

The grain yield varied from 30.00 to 53.00 q ha⁻¹. The N₁₂₀ kg + P₆₀ kg + K₆₀ kg ha⁻¹ + Vermicompost (5 q ha⁻¹) + Abotobacter + Zn₁₀ dose gave the highest grain yield. About 76.67 percent yield increases with the addition of NPK, vermicompost, Azotobacter and Zinc in comparison to control. Several other workers reported the results in conformity with the results of present study. Alam *et al.* (2008), Khan *et al.* (2011) and Tyagi and Mahapatra (2012).

Straw yield :-

The straw yield of wheat varied from 40.00 to 67.00 q ha⁻¹. The dose of N₁₂₀ kg + P₆₀ kg + K₆₀ kg ha⁻¹ + Vermicompost (5 q ha⁻¹) + Azotobacter + Zn₁₀ gave the maximum straw yield. The results are statistically significant and all the treatment gave superior than control. Increased straw yield due to addition of N,P,K, Vermicompost, Azotobacter and Zn have been reported by many scientists. Kumar *et al.* (2007) Rahim and Waraich (2010) and Sunar *et al.* (2012).

The data related to the uptake values are presented in table No. 2.

Uptake :-

The uptake values of nutrients in grain and straw increased with increasing levels of nutrients and biological yield of crop. It was recorded that N uptake varied from 70.80 to 145.64 kg ha⁻¹, P from 13.60 to 31.78 kg ha⁻¹, K from 74.20 to 148.59 kg ha⁻¹ and Zn from 84.00 to 250.45 g ha⁻¹. The uptake values indicate the appropriate quantity of nutrients required for optimum yield in present investigation. Similar kind of results has been reported by Majumdar *et al.* (2012) and Sunar *et al.* (2012).

The data of crop quality are given by Table No. 3.

Crop quality :-

The maximum protein content in wheat grain was observed in T₇ (N₁₂₀ kg + P₆₀ kg + K₆₀ kg ha⁻¹ + Vermicompost (5 q ha⁻¹) + Azotobacter + Zn₁₀ treatment and lowest in control. In case lysine content the highest value was recorded in control and lowest in T₇ treatment. Thus there is a negative relationship appeared in between protein and lysine content. The increase in protein content at the cost of lysine also reported by Lerner *et al.* (2006) and Madan *et al.* (2009).

Conclusion :-

The dose of N₁₂₀ kg + P₆₀ kg + K₆₀ kg ha⁻¹ + Vermicompost (5 q ha⁻¹) + Azotobacter + Zn₁₀ gave the best results in terms of grain and straw yield, uptake values and protein content. So it is concluded that application of vermicompost, azotobacter and zinc along with the combination of NPK gave best results to the farmers.

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