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Effect of sulphur and FYM on yield content and uptake of nutrient by wheat

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Abstract

A field experiment was conducted at agricultural research farm of R.B.S. college, Bichpuri, Agra during the rabi season of 2018-2019 to study the response of wheat to sulphur and FYM. The plant height enhanced significantly with increasing doses of FYM and sulphur. The grain also increased by supplying higher doses of FYM and sulphur. The soil application of FYM and sulphur improved the contents and uptake values of nitrogen, phosphorus, potassium and sulphur by wheat crop. Better production of wheat crop could be achieved by adopting treatment combination as 40 kg S ha⁻¹ with FYM @ 10 t ha⁻¹.

Keywords: crop yield, nutrients uptake

Introduction

India is the third largest wheat (*Triticum aestivum* L.) growing country in the world. Wheat occupies commanding position in Indian agriculture. Wheat is an important winter season cereal occupying 52.8% of total rabi food grains. Wheat has got special value keeping in view its industrial importance and its existence under problematic soils and climatic conditions where other cereals of the same season fails to grow successfully. The application of FYM in soil helps in increasing the fertility of soils as well as physical condition including its water holding capacity. Organic manures, which were perhaps the major sources of plant nutrients in traditional agriculture, received less emphasis with the advent of high analysis chemical fertilizer. Without detracting from the fact that chemical fertilizer will continue to be main instrument for quickening the pace for agricultural production the recent researches indicate that a judicious combination of organic manures and fertilizers can better maintain the long-term soil fertility and sustain high levels of productivity. Therefore, use of both organic manure and chemical fertilizer in appropriate proportion assume special significance as complementary and supplementary to each other in crop production. Management of nutrients is an important aspects of these problem soils. Systemic nutrient management experiments are needed to find out ways and means to overcome such nutrient disorder and restore and sustainable crop production in semi-arid climatic condition of Agra region.

Material and Methods

A field experiment was laid out during rabi seasons of 2018-2019 at the research farm of R.B.S College, Bichpuri, Agra with wheat (*Triticum aestivum*) variety. The soil was sandy loam in texture having pH 8.8, organic carbon 0.43%, available nitrogen 201.3 kg ha⁻¹, available phosphorus 14.40 kg ha⁻¹, available potash 222.0 kg ha⁻¹, available sulphur 13.5 kg ha⁻¹. Total no. of plots 36 using randomized block design (R.B.D) with three replication. Levels of FYM 0, 5 and 10 t FYM ha⁻¹ and Sulphur 0, 20, 40 and 60 kg S ha⁻¹. Recommended dose of nitrogen and phosphorus was given through urea and single super phosphate to the wheat crop respectively. At harvest, the grain and straw yields were recorded. Plant analysis for N,P,K and S and their uptake at final harvest. Grain and straw samples were washed properly with distilled water followed by 0.1 N HCL and then in glass distilled water. Plants samples were first dried in sun and finally in oven at 70 C. Nitrogen in plants determined by Colorimetric methods. Phosphorus and sulphur content in acid extract were determined by ammonium molybdate vanadate, yellow colour method (Chapman and Pratt (1961) and turbidimetric method (Chesnin and Yen (1951) respectively. From the dilute extract, potassium was determined directly with the help of flam photometer.

Result and Discussion

Yield Studies

The results indicate that the grain yield of wheat crop increased significantly with increasing levels of FYM as compared to control. The maximum grain yield was obtained with highest doses F2 (10 t ha⁻¹) of FYM application during rabi season of 2018-19 (Table-1). The FYM levels F1 (5t ha⁻¹) and F2 (10t ha⁻¹) resulted 31.53 and 55.75 percent grain yield over control, respectively. The FYM levels F1 and F2 resulted 35.97 and 50.34 percent enhancement in straw yield over control, respectively. Beneficial effect of FYM is due to its contribution in supplying additional plant nutrients, improvement of soil physical conditions and ecological process in soil. Metabolites root activities increased resulting absorption of moisture and other nutrient enhanced resulting in to higher production. Similar results were observed by Lal *et al.* (2016) [4] Pathan (2010) [8] and Kumawat *et al.* (2011) [2]. Table-2 reflects that the grain yield of wheat crop enhanced significantly with increasing levels of sulphur as compared to control. It is clear that there was no significant difference found between the levels S2 (40 kg ha⁻¹) and S3 (60 kg ha⁻¹) with respect to grain yield of wheat crop. The sulphur levels S1 (20 kg ha⁻¹), S2 (40 kg ha⁻¹) and S3(60 kg ha⁻¹) 22.45, 46.23 and 54.34 percent enhancement in grain yield of wheat crop over control, respectively. The increase in grain yield on addition of sulphur might be due to their deficiency in experimental soils, these results are in favour of Nagar *et al.* (2020) [7]. Straw yield followed the similar trend. The maximum straw yield was recorded under highest level F2 (10 t ha⁻¹) of FYM. The FYM levels F1 and F2 resulted 35.97 and 50.34 percent enhancement in straw yield over control, respectively. Similar results were also reported by Pathan (2010) [8] and Kumawat *et al.* (2011) [2]. The straw yields increased significantly with rising the sulphur levels over control. The S1, S2, and S3 levels resulted 21.27, 40.70 and 46.27 percent increase in straw yield over control, respectively. Similar results were reported by Lal *et al.* (2019) [5] and Lal *et al.* (2012) [3].

Table 1: Effect of FYM and Sulphur application on grain and straw yield wheat crop.

Treatment	Grain Yield (q ha ⁻¹)	Straw Yield q ha ⁻¹)
FYM Levels		
F0	10.40	26.38
F1	13.68	35.87
F2	16.18	39.66
S.Em+-	0.50	0.54
C.D at 5%	1.44	1.55
Sulphur Levels		
S0	10.60	26.80
S1	12.98	32.50
S2	15.50	37.71
S3	16.36	39.20
S.Em+-	0.39	0.59
C.D at 5 %	1.12	1.70

Nitrogen Uptake

The nitrogen utilization by grain and straw increases significantly with increasing levels of FYM as compare to control. The minimum nitrogen uptake by grain and straw was recorded under highest level of FYM. The enhance nitrogen

content, grain and straw yield due to the use of FYM may be possible reason for increasing nitrogen uptake by wheat crop. Similar results were observed by Lal *et al.* (2012) [3] Kumar *et al.* (2010) [1] and Singh *et al.* (2011). Nitrogen uptake by grain and straw of wheat enhance significantly with increasing levels of sulphur. The minimum nitrogen uptake by grain and straw was found with S3(60 kg ha⁻¹) level of sulphur. However, the difference between S2 and S3 levels was not ground significant in case of nitrogen utilization by grain and straw of wheat crop. The enhance nitrogen content & straw/grain yield due to the use of sulphur may be the possible reason for improving nitrogen uptake by wheat crop similar to these findings Singh *et al.* (2005) [12].

Phosphorus Uptake

The data on phosphorus uptake (Table-2) revealed that significant increase in phosphorus uptake by grain and straw of wheat was observed with each higher level of FYM as compared to control. Similar results were observed by Lal *et al.* (2016) [4] Ravankar *et al.* (2005) [10], Kumar *et al.* (2010) [1] and Singh *et al.* (2011) [11]. Evolution of data present in Table-2, shows that the P uptake by grain and straw of wheat enhance significantly with rising the levels of sulphur. The maximum phosphorus uptake by grain and straw was found with S3 (60 kg ha⁻¹) level of sulphur. However the difference between S2 and S3 levels was not found significant in case of phosphorus utilization by grain and straw of wheat crop. Similar to these findings, Singh *et al.* (2005) [12].

Potassium Uptake

Potassium utilization by grain and straw increase significantly with increasing levels of FYM as compared to control and preceding lower level of FYM (Table-3). The maximum potassium uptake by grain and straw was recorded under highest level of FYM. Similar results were observed by Kumar *et al.* (2010) [1] and Singh *et al.* (2011) [11], potassium uptake by grain and straw of wheat enhanced significantly with rising levels of sulphur. The maximum potassium uptake by grain and straw was found with S3(60 kg ha⁻¹) level of sulphur Nagar *et al.*(2020) [7].

Sulphur Uptake

The maximum sulphur uptake by grain and straw was recorded under highest level of FYM. The enhanced sulphur content straw/grain yield due to the use of FYM may be the possible reason for rising sulphur uptake by wheat crop. Similar results were observed by Ravankar *et al.* (2005) [10], Kumar *et al.* (2010) [1], and Singh *et al.* (2011) [11]. The maximum sulphur uptake by grain and straw was found with S3 (60 kg ha⁻¹) level of sulphur. The interaction between FYM and sulphur application was noted significant with regards to sulphur uptake by wheat crop (Table 3-b). The minimum sulphur uptake was recorded with FoSo (control) treatment. The F2S2 (10 t FYM ha⁻¹ and 40 kg S ha⁻¹) treatment combination proved Significantly better over other treatment combinations.

It can be concluded that there was a significant increase in yield of wheat due to application of both FYM and S. The uptake of nutrients by the crop was also influenced by their application.

Table 2: Effect of FYM and sulphur application on Nitrogen and Phosphorus uptake by wheat crop.

Treatment	N- uptake (kg ha ⁻¹)			P-Uptake (kg ha ⁻¹)		
	Grain	Straw	Total Uptake	Grain	Straw	Total Uptake
FYM Levels						
F0	18.10	8.19	26.27	10.50	8.70	19.02
F1	23.94	12.91	36.85	14.36	12.91	27.27
F2	29.28	15.86	45.14	17.63	15.07	32.70
S.Em+-	0.82	0.87		0.58	0.61	
C.D. at 5%	2.35	2.50		1.66	1.77	
Sulphur Levels						
S0	18.02	8.04	26.06	10.60	8.57	19.17
S1	22.58	11.37	33.95	13.49	11.37	24.86
S2	27.59	14.70	42.29	16.44	14.32	31.06
S3	29.44	15.68	42.12	18.00	15.28	33.28
S.Em+-	0.69	0.43		0.83	0.37	
C.D. at 5%	1.98	1.22		2.40	1.05	

Table 3a: Effect of FYM and sulphur application on Potassium and Sulphur uptake by wheat crop.

Treatment	K- uptake (kg ha ⁻¹)			S-Uptake (kg ha ⁻¹)		
	Grain	Straw	Total Uptake	Grain	Straw	Total Uptake
FYM Levels						
F0	2.49	5.27	7.76	2.60	2.14	4.74
F1	3.83	8.25	12.08	3.96	3.94	7.90
F2	5.33	10.31	15.64	5.33	5.54	10.87
S.Em+-	0.36	0.42		0.28	0.31	
C.D. at 5%	1.02	1.20		0.80	0.90	
Sulphur Levels						
S0	2.33	4.28	6.61	2.75	2.14	4.89
S1	3.24	6.17	9.41	3.89	3.90	7.79
S2	4.50	8.29	12.79	5.27	5.60	10.87
S3	5.07	10.58	15.65	5.88	6.66	12.54
S.Em+-	0.30	0.35		0.20	0.36	
C.D. at 5%	0.85	1.00		0.55	1.02	

Table 3b: Interaction effect of FYM X Sulphur (F X S) on sulphur uptake (kg ha⁻¹) by wheat crop.

Treatment	Sulphur levels			
	S0	S1	S2	S3
FYM levels	345.0	581.0	887.0	898.0
F0	667.0	786.0	1046.0	1058.0
F1	761.0	940.0	1104.0	1114.0
F2				
S.Em+-				
C.D at 5%				

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