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RESPONSE OF WHEAT (*TRITICUM AESTIVUM* L.) CROP TO FYM AND PHOSPHORUS FERTILIZATION UNDER SEMI-ARID CLIMATIC CONDITION

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ABSTRACT

A field experiment was conducted during rabi seasons of 2011-12 at the research farm of R.B.S college, Bichpuri, Agra (UP) to assess the response of wheat (*Triticum aestivum* L.) crop to FYM and Phosphorus Fertilization under semi-arid climatic condition. The experiment was layout in a randomized block design with four levels of FYM (0, 2.5, 5.0 and 10 t ha^{-1}) and four levels of phosphorus (0, 40, 80 and 120 kg ha^{-1}) with three replications. The results revealed that the increasing dose of FYM up to 10 t ha^{-1} significantly, increased the grain and straw yield of wheat crop over control. But the growth and yield attributes of wheat were maximum with the application of 10 t ha^{-1}. Increasing level of FYM increased the yield of wheat grain and straw over control. The maximum yield of grain (3.23 t ha^{-1}) and straw yield (4.30 t ha^{-1}) were recorded with 10 t FYM ha^{-1}. The increases of grain and straw yield with this treatment were 25.48 and 19.66 % over control, respectively. The increasing levels of Phosphorus fertilizers increased the growth and yield attributes up to 120 Kg P_2O_5 ha^{-1} over control. But grain and yield attributes of wheat were maximum with the application of 80 kg P_2O_5 ha^{-1}. Increasing levels of Phosphorus fertilizers increased the yield of wheat grain and yield over control. The maximum yield of grain (3.33 t ha^{-1}) and straw yield (4.47 t ha^{-1}) were recorded with P_{80}. The increases in grain and straw yield with this treatment were 28.08 and 26.63 % over control, respectively. The crop quality in respect of content and yield of wheat increased significantly with conjoint use of fertilizers and maximum values were recorded with 80 kg P_2O_5 ha^{-1} and 10 t FYM ha^{-1} treatment. Increasing levels of FYM and Phosphorus fertilizers up to 80 kg P_2O_5 ha^{-1} and 10 t FYM ha^{-1} also resulted in higher uptake of N, P, K and Zn by the crop and highest uptake of N, P, K and Zn by wheat crop was recorded with 80 kg P_2O_5 ha^{-1} and 10 t FYM ha^{-1} and the lowest in control. The soil organic carbon, available N, P, K and Zn content also improved with 80 kg P_2O_5 ha^{-1} and 10 t FYM ha^{-1} over control and lowest values of these parameters were recorded in control.

***Keywords*:** Phosphorus, Zinc, Farmyard manure nutrient uptake, yield, wheat.

Introduction

Wheat (*Triticum aestivum* L.) has been regarded as its Origen in antiquity its recognition as food grain dates back to early settlement and development of mankind. Wheat is grown from Arctic Circle to tropical plains of Northern India. It is adopted itself to high plateau of Bolivia, South Africa, Tibet and to the alkaline desert of Egypt and Turkistan. It is cultivated on a variety of geographical situations ranging from the equator to 70C North (Scandinavia), from humid region of Europe and Japan to Sahavon and Asiatic Ocean, below sea level in Palestein to high-up mountains in Himalayas, East Africa and South America. Wheat occupies fourth position in world acreage under cereals and hire in the total cereal production. India ranks seventh in the total area as well as in the production of wheat in the world, the area, production and productivity for the period of 1998-99 of the country were 7.60 million hectares, 14.35 million metrictons and 18.88 quintal/hectare respectively. The state of Uttar Pradesh Occupies an area of 4.3 percent (0.33 million hectare) and 4.9 percent production (0.70 million metrictons) of the Country in this cereal. Wheat has got special value keeping in view its industrial importance and its existence under problematic to grow successfully. In Uttar Pradesh wheat has its own significance in the total food grain production being second in importance as a winter cereal crop. It is used mainly as human food and animal feed. Only a small portion of the produce is utilized in the industry for malting, brewing and pearling and baby food. In nutritive value, wheat is superior because it possesses comparative higher protein and lysine and high digestibility in the in the

absence of gluten. The demand for good quality wheat for the malting and brewing is increasing fast.

Soil is one of the greatest natural resources of the nation in India nearly 8.4 million hectares land pose a serious threat to our increase food production to meet the expending needs of its teeming population. The population of our Country escalating at an alarming rate of 2.2% per annum is expected to stabilize at 1.40 million in the year 2040 AD. The land for the agriculture is shrinking and expect for salt affected soils these appear little scope constitute 182.2 million hectares about 75% to meet this pressing demand, there are to sources open to us, one to increase the area under the plough and the other to increase the production per unit by using adequate amount of plant nutrients. So far as the extension of area is concerned, there as marginal scope for increasing the area under cultivation, yet in many cases it can be done only at greater cost and many even be uneconomical. Therefore, a greater attention will have to be paid for increasing the production per unit area unit time for which there is considerable scope in our Country.

The application of FYM in the soil helps in increasing the fertility of soil as physical condition including its water holding capacity. Organic manures, which were perhaps the major sources of plant nutrients in tradition agriculture, receive less emphasis with the advent of high analysis chemical fertilizers. Without detracting from the fact 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 fertilizer better maintain the long-term soil fertility and sustain high levels of productivity. Therefore, use of both organic manure and chemical fertilizers in appropriate proportion assume special significance as complementary and supplementary to each other in crop production.

Phosphorus is essential element required for plant growth and root development. It is found in every living cell of the plant and animals. It is known to be associated with several vital functions in the plant body such as utilization of sugar and starch, photosynthesis, nucleus formation, cell division, fat and albumin formation, cell organization and transfer of the heredity. The availability of phosphorus from soil to plants depends upon the equilibrium adjustment around the root zone. The equilibrium is influenced mainly by slat concentration, pH, calcium carbonate, nature of exchangeable complex and organic matter. Conducted that in highly saline sodic media about 10-15% more needed. Since the role of phosphorus in symbiotic nitrogen fixation is well established, it is worth while to investigate its effect under sodic environment.

Materials and Methods

The field Experiments ware conducted at the research farm of R. B. S. College, Bichpuri, Agra during rabi of 2011 – 12. The Agra district is located South – East of Delhi in the semi – arid or gray steppe soil region of south – Western Uttar Pradesh. The interest of 27.2^0 N attitude and 77.9^0 E Longitude is about 21 km South of Agra City. The experimental site is characterized by semi-arid climate and average annual Rainfall of Agra district is about 675 mm; 90% rain is received during august and September through south monsoon rains, which start by the end of June and continue up to September. However, a few showers common occur during winter months also and sometime fog frosts are experimented. The average temperature in summer remains well above 40^0C.

Characteristics of Experimental soil:

The composite soil Sample was taken from the experimental site before (0 - 30 cm) before sowing and subjected to the analysis for some important physio-chemical characteristics.

Table 1: Characteristics of the experimental soil

S.N.	Soil characteristics	Method of Determination	Value
1.	Mechanical analysis (A) Sand (B) Silt (C) clay	International pipette method piper, 1950	 63.70 18.10 18.20
2.	Texture classes	International pipette method piper, 1950	Sandy loam
3.	pH (1:2.5 soil water suspension)	Method No. 21 (B), USDA hand book No. 60, (Richards, 1954)	8.0
4.	**EC** (dSm^{-1} at 25^0 C)	Method No. 4 (B), USDA hand book No. 60, (Richards, 1954	1.4
5.	Organic Carbon %	Jackson (1973)	0.44
6.	Available Nitrogen (kg ha^{-1})	Subbiah and Asija (1956)	170.50
7.	Available Phosphorus (kg ha^{-1})	Olsen et al. (1954)	10.0
8.	Available Potassium (kg ha^{-1})	By flame photometer	190.50
9.	Available Zn (ppm)	By Atomic Absorption spectrometer	0.50

The experiment was carried out using Randomized Block Design with three replications and four treatment each Level. The details of the treatments level of FYM were: Four [Control (F_0), 2.5 (F_1), 5.0 (F_2) and 10.0 (F_3) t ha^{-1}]. The detail of the treatments level of Phosphorus ware: Four [Control (P_0), 40 (P_1), 80 (P_2) and 120 (P_3) Kg P_2O_5 ha^{-1}]. Treatment combination – F_0P_0-(1), F_0P_1-(2), F_0P_2-(3), F_0P_3-(4), F_1P_0-(5), F_1P_1-(6), F_1P_2-(7), F_1P_3-(8), F_2P_9-(9), F_2P_1-(10), F_2P_2-(11), F_2P_3-(12), F_3P_0-(13), F_3P_1-(14), F_3P_2-(15), F_3P_3-(16).

Seedbed preparation and sowing: The field was prepared by one dep ploughing using tractor drawn soil turning plough followed by two cross harrowing and leveling. In order to ensure ideal conditions for germination, pre-sowing irrigation was given about 6 days before sowing. For sowing, about 5 cm deep furrows were opened at a spacing of 21 cm and each furrow was sown uniformly with reweighed seed @ 100 kg ha^{-1} and covered by soil immediately.

Fertilizer application: Recommended dose of nitrogen (1/2 dose of the n was applied basal dressing and remaining half nitrogen dose was top dressed at first node, which comes about 30-35 days after sowing) and potash was applied to every plot through urea and muriate of potash, respectively. Whereas, the phosphorus was supplied to plots as needed through single super phosphate. Full dose of phosphorus (P_2O_5) as specified treatment and potassium (K_2O) were mixed together and placed about 4 cm below the seed in the furrow at the sowing time.

Irrigation: The first irrigation was given as per sowing irrigation was given as per physiological growth stages taking rainfall into consideration.

Weeding: Weeds were removed manually with the help of khurpi at 40 days after sowing.

Harvesting and Threshing: The crop was harvested at proper stage of maturity as determined by visual observation. The border rows harvested first and removed from experimental field. Then net plots were harvested. The produce was tied into the bundles labeled and allowed to dry in the sun for adequate number of days. The bundles were weighed after drying and taken to threshing floor. Then threshing of the produce of individual net plot was done manually.

Results and Discussion

To study the effect of FYM and Phosphorus application on wheat crop.

Data pertaining to the growth yield, nutrient composition and uptake values by wheat crop have been statistically analyzed and same have been presented and discussed below:

Grain yield: Grain yield of wheat increased significantly with increasing levels of FYM. It is quite clear that maximum grain yield of wheat was recorded under highest level of FYM (10.0 t ha^{-1}). The increase in grain yield of wheat with F_1 (2.5 t ha^{-1}), F_2(5.0 t ha^{-1}) and F_3 (10.0 t ha^{-1}) were 14.06, 19.77 and 25.48 percent over control, respectively. From these results it may be inferred that the beneficial effect of FYM is due to its contribution in supplying additional plant nutrients, improvement of soil physical conditions and biological 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 Kumar *et al*. (2010) and Chauhan *et al*. (2010).

It is evident from Table 1 that grain yield of wheat significantly affected by phosphorus levels. It is also noted thatP_2level of phosphorus (80 Kg ha^{-1}) proved better over control in case of enhancement in grain yield of wheat. The increase in grain yield of wheat with P_1 (40 Kg ha^{-1}), P_2 (80 Kg ha^{-1}) and P_3 (120 Kg ha^{-1}) were 15.38, 28.08 and 23.08 percent over control, respectively. These results are in favors of Kumawat and Kumawat (2009), Singh *et al*., (2010) and Dixit *et al*. (2011).

Table 1: Effects of FYM and Phosphorus on grain and straw yield (t ha^{-1}) of wheat crop

Treatments	**Yield (t ha^{-1})**	
FYM Levels	**Grain Yield**	**Straw Yield**
F_0	2.63	3.56
F_1	3.00	4.07
F_2	3.1i5	4.25
F_3	3.23	4.30
SEM ±	0.020	0.40
C.D at 5%	0.056	1.13
Phosphorus Levels		
P_0	2.60	3.53
P_1	3.00	4.04
P_2	3.33	4.47
P_3	3.20	4.33
SEM ±	0.020	0.40
C.D at 5%	0.056	1.13

Straw yield: Straw yield of wheat increased significantly with increasing level of FYM (Table 1) it is quite clear that maximum straw yield of wheat was recorded under highest level of FYM (10 t ha^{-1}) the increase in straw yield of wheat with F_1 (2.5 t ha^{-1}), F_2 (5.0 t ha^{-1}) and F_3 (10.0 t ha^{-1}) 14.33, 19.38, 19.66 percent over control, respectively. It may be due to the gradual release and steady supply of nutrients from

humus organics throughout the growth and development of wheat crop. Similar observations were also reported by Jat *et al*. (2008) and Sisodia *et al*. (2010).

It is evident from table 1 that straw yield of wheat significantly affected by phosphorus levels. It is also noted that P_2 level of phosphorus (80 Kg ha^{-1}) proved better over control in case of straw yield of wheat. Time increases in straw yield with P_1 (40 Kg ha^{-1}), P_2(80 Kg ha^{-1}) and P_3 (120 Kg ha^{-1}) were 14.45, 26.63 and 22.66 over controls, respectively, similar results were observed by Kumawat and Kumawat (2009) and Singh *et al*. (2010).

Nitrogen content: It could be inferred from table 2 that nitrogen content in grain and straw of wheat significantly affected by the dose of FYM. The F_3 level of FYM proved better in case of nitrogen contain of wheat. It is also clear that nitrogen content of wheat increased with increasing dose of FYM. It might be due greater availability of nutrients under adequate supply of available nutrient by FYM application. The beneficial influence of applied FYM has reported by Sisodia *et al*. (2010) and Singh *et al*. (2011).

Table 2 : Effect of FYM and Phosphorus on nitrogen content (%) of wheat crop

Treatments	Nitrogen Content (%)	
FYM Levels	**Grain**	**Straw**
F_0	2.38	0.401
F_1	2.54	0.431
F_2	2.67	0.457
F_3	2.84	0.468
SEM ±	0.044	0.0023
C.D at 5%	0.124	0.007
Phosphorus Levels		
P_0	2.37	0.401
P_1	2.52	0.430
P_2	2.83	0.463
P_3	2.66	0.456
SEM ±	0.044	0.0023
C.D at 5%	0.124	0.007

A critical observation of data given in table 2 indicated that the Phosphorus levels significantly affect the nitrogen content of in grain and straw of wheat. However, the nitrogen content of wheat increased with increasing levels of phosphorus as compared to each preceding lower level of phosphorus. The maximum nitrogen content of wheat was noted with highest level of phosphorus (80 Kg ha^{-1}). Similar results were reported by Singh *et al*. (2005) and Tripathi *et al*. (2006).

Phosphorus content: It is apparent from table 3 that phosphorus potassium content in grain and straw of wheat increased significantly with application of FYM over control, similar to these findings Sisodia *et al*. (2010) and Singh *et al*. (2011).

A perusal of data given in table 3 indicated that the phosphorus content of wheat increased significantly with increasing levels of phosphorus in comparison to control. The highest significantly phosphorus content was observed at P_2 level of phosphorus (80 Kg ha^{-1}) over control. Similar results were reported by majority of worker such as Arya and Kalra (1988) and Singh *et al*. (2005).

Table 3 : Effect on FYM and Phosphorus on Phosphorus content (%) of wheat crop

Treatments	Phosphorus Content (%)	
FYM Levels	**Grain**	**Straw**
F_0	0.56	0.041
F_1	0.58	0.046
F_2	0.61	0.052
F_3	0.65	0.055
SEM ±	0.004	0.001
C.D at 5%	0.113	0.003
Phosphorus Levels		
P_0	0.55	0.042
P_1	0.57	0.043
P_2	0.64	0.054
P_3	0.62	0.050
SEM ±	0.004	0.001
C.D at 5%	0.113	0.003

Potassium content: It is evident from the data given table 4 that F_3 level of significantly better response over F_0 (Control) with respect to potassium content in grain and straw of wheat. Further, the table 4 shows that the potassium content of wheat increased significantly with increasing levels of FYM tried in the present investigation. The similar results also noted by Sisodia *et al*. (2010) and Singh *et al*. (2011).

Table 4: Effect of FYM and Phosphorus on Potassium content (%) of wheat crop

Treatments	Potassium Content (%)	
FYM Levels	**Grain**	**Straw**
F_0	0.43	1.55
F_1	0.47	1.88
F_2	0.51	2.15
F_3	0.58	2.44
SEM ±	0.01	0.055
C.D at 5%	0.003	0.155
Phosphorus Levels		
P_0	0.42	1.53
P_1	0.49	1.88
P_2	0.57	2.50
P_3	0.55	2.17
SEM ±	0.01	0.055
C.D at 5%	0.003	0.155

In general, the data given in table 4 indicated that each higher level of phosphorus significantly resulted higher potassium content of wheat in comparison to preceding lower levels of phosphorus. The maximum potassium content was noted at P_2 level of phosphorus (80 Kg ha^{-1}). Our findings are in accordance with those of Patel *et al*. (2005) and Kumawat and Kumawat (2009).

Zinc content: An evaluation of data given in table 5 that the highest level of FYM (F_3) proved more significantly beneficial over F_0 (Control) in case of zinc content of in grain and straw wheat during throughout the experimentation.

It is further from table 5 that the zinc composition of wheat significantly enhanced with increasing levels of phosphorus as compare to control. it is also evidence that each higher level of phosphorus resulted significantly higher zinc content in grain and straw of wheat in comparison to preceding lower levels of phosphorus. The maximum enhancement in manganese content was at P_2 (80 Kg ha^{-1}) Similar findings were also reported by Gupta *et al*. (1981) and Islam *et al*. (2005).

Table 5: Effect of FYM and Phosphorus on Zinc content (ppm) of wheat crop

Treatments	**Zinc Content (ppm)**	
FYM Levels	**Grain**	**Straw**
F_0	12.4	10.8
F_1	14.2	12.4
F_2	16.7	13.8
F_3	19.9	16.3
SEM ±	0.65	0.44
C.D at 5%	1.84	1.24
Phosphorus Levels		
P_0	12.7	11.0
P_1	15.0	12.3
P_2	19.7	15.4
P_3	19.3	14.6
SEM ±	0.65	0.44
C.D at 5%	1.84	1.24

Effect on nutrient uptake:

Nitrogen uptake: It is apparent table 6 that the uptake of nitrogen by wheat crop increased significantly with increasing levels of FYM in comparison to control. the FYM level F_3@ 10 t ha^{-1}significantly increased the nitrogen utilization by wheat crop over control and F_1@ 2.5 t ha^{-1} level of FYM. The maximum significantly enhancement in nitrogen uptake by wheat crop was recorded at highest levels of FYM F_3@ 10 t ha^{-1}as compared to control. the enhanced nitrogen content and straw yield due to the use of FYM may be the possible season for increasing nitrogen uptake by wheat crop. Similar results were observed by Das and Ram (2005), Kumar *et al*. (2010) and Singh *et al*. (2011).

In general, the nitrogen uptake increased significantly with increasing level of phosphorus. The P_2 (80 Kg ha^{-1}) level of phosphorus gave better performance regarding nitrogen uptake by wheat crop. The difference between P_2 and P_3 was not fount significant in case of nitrogen utilization by wheat crop. Similar to these findings Kumar *et al*. (2009), Kumawat and Kumawat (2009), Pathan *et al*. (2010) and Singh *et al*. (2010).

Table 6: Effect of FYM and Phosphorus on nitrogen and Phosphorus uptake (Kg ha^{-1}) by wheat crop

Treatments	**Nutrient uptake (Kgha^{-1})**					
	Nitrogen			**Phosphorus**		
	Grain	**Straw**	**Total**	**Grain**	**Straw**	**Total**
FYM Levels						
F_0	62.59	14.28	76.87	14.73	01.46	16.19
F1	76.20	14.54	93.74	17.40	01.87	19.27
F_2	84.11	19.42	103.53	19.22	02.21	21.43
F_3	91.73	20.12	111.83	20.99	02.36	23.35
SEM ±	1.88	0.51	2.42	0.47	0.118	0.60
C.D. at 5%	5.31	1.44	6.84	1.33	0.508	1.69
Phosphorus Levels						
P_0	61.62	14.16	75.78	14.30	01.48	15.78
P_1	75.60	17.37	92.97	17.10	01.74	18.84
P_2	94.24	20.70	114.94	21.31	02.41	23.72
P_3	85.12	19.74	104.86	19.84	02.16	22.00
SEM ±	1.88	0.51	2.42	0.47	0.118	0.60
C.D. at 5%	5.31	1.44	6.84	1.33	0.508	1.69

Phosphorus uptake: The FYM levels significantly increased the phosphorus uptake by wheat crop. The highest level of F_3(10 t ha^{-1}) proved better in case of phosphorus uptake by wheat as compared to control. The utilization of phosphorus enhanced significantly by the increasing level of FYM over control and preceding lower level of FYM. The enhanced phosphorus content and straw yield by using FYM may be the possible or increasing phosphorus uptake by wheat crop. Similar to the finding Sisodia *et al*. (2010), Kumar *et al*. (2011) and Singh *et al*. (2011). The maximum utilizationof phosphorus by wheat crop was recorded at P_2 (80 Kg ha^{-1}) level of phosphorus. Similar observations were also recorded by Kumar *et al*. (2009), Pathan *et al*. (2010) and Singh *et al*. (2010).

Potassium and Zinc uptake: A further study of table 7 reveals that the potassium uptake by wheat crop increased significantly with increasing levels of potassium as compared to control. Comparatively, more significant potassium uptake was found with highest level F3 (10 t ha^{-1}) of FYM. Similar to these finding Das and Ram (2005), Kumar *et al*. (2009) and Pathan *et al*. (2010).

Each higher level of phosphorus resulted more significant utilization of potassium in comparison to control Kumar *et al*. (2010) and Pathan *et al*. (2010). Similarly, significantly maximum enhancement in zinc uptake was recorded with highest level of FYM (10 t ha^{-1}). Whereas, the phosphorus level P_2 (80 Kg ha^{-1}) gave better performance in enhancing the utilization of zinc by wheat crop. Due to phosphorus application greater zinc content and enhanced straw yield of wheat caused the greater uptake of zinc by wheat crop. These results are in favor of Kumawat and Kumawat (2009) and Pathan *et al*. (2010).

Table 7: Effect of FYM and Phosphorus on potassium (Kg ha^{-1}) Zinc (g ha^{-1}) uptake by wheat crop

Treatments	Nutrient uptake (Kgha^{-1})					
	Potassium (Kg ha^{-1})			Zinc (g ha^{-1})		
	Grain	Straw	Total	Grain	Straw	Total
FYM Levels						
F_0	11.31	55.18	66.49	32.61	38.45	71.06
F1	14.10	76.52	90.62	42.60	50.46	93.06
F_2	16.06	91.30	107.36	52.60	58.65	111.25
F_3	18.73	104.92	123.65	64.28	70.09	134.37
SEM ±	0.35	4.22	2.62	0.018	3.79	3.80
C.D. at 5%	0.99	11.92	7.39	0.051	10.70	10.73
Phosphorus Levels						
P_0	10.92	54.01	64.91	33.02	38.83	71.85
P_1	14.70	75.95	90.65	45.00	49.69	94.69
P_2	18.98	111.75	130.75	65.60	68.84	134.44
P_3	17.60	93.96	111.56	61.76	63.22	124.98
SEM ±	0.35	4.22	2.62	0.018	3.79	3.80
C.D. at 5%	0.99	11.92	7.39	0.051	10.70	10.73

Summary and Conclusions

Yield Studies: The higher dose of FYM application significantly increased the grain and straw yield of wheat crop over control. The maximum grain and straw yield of wheat was recorded under FYM dose @ 10 t ha^{-1}, Phosphorus application @ 80 Kg ha^{-1}, caused the highest grain and straw production of wheat.

Chemical Composition: Higher dose of FYM @ 10 t ha^{-1}significantly increased the nitrogen content of wheat as compared to control. Similar results were also obtained with 80 Kg ha^{-1}phosphorus application. Each higher level of FYM significantly increased the phosphorus content as compared to control. Similar at P_2 level of phosphorus @ 80 Kg ha^{-1}over control. Application of FYM at higher level enhanced the potassium content in grain and straw of wheat crop. The phosphorus level P_2@ 80 Kg ha^{-1}enhanced the potassium content of wheat crop. Highest levels of FYM @ 10 t ha^{-1}have a significant favorable effect on zinc content of wheat crop. The P_2@ 80 Kg ha^{-1}level of phosphorus resulted significantly higher zinc content of wheat.

Uptake studies: FYM application up to 10 t ha^{-1} significantly enhanced the nitrogen uptake by wheat crop. The maximum significant enhancement in nitrogen uptake by wheat crop was recorded at P_2 level (80 Kg ha^{-1}) of phosphorus. The level of FYM had a beneficial effect on the utilization of phosphorus by wheat crop. The maximum value of phosphorus uptake was recorded with highest level @ 10 t ha^{-1}FYM. Similarly, highest level of manganese gave better

response in case of phosphorus utilization by wheat crop.

In general, the potassium uptake by wheat crop significantly increased with increasing doses of potassium as compared to control. Comparatively more significant potassium utilization was recorded with highest level of FYM @ 10 t ha^{-1}. The phosphorus @ 80 Kg ha^{-1}proved better with respect to potassium utilization by wheat crop. The zinc uptake by wheat crop tended to increase progressively with increasing levels of FYM. The maximum value of zinc uptake by wheat crop was noted with highest level of FYM. The greater uptake of zinc was recorded at 80 Kg ha^{-1} application dose of phosphorus.

Conclusions

The following conclusions are draw from the above stated summary:

1. The soil application of FYM @ 10 t $ha^{-1}$and @ 80 Kg ha^{-1} phosphorus as is recommended to the farmers for getting better production of wheat crop.
2. Application of FYM improved the content and uptake of nitrogen, phosphorus, potassium and zinc by wheat crop. Similarly, the content and uptake of these nutrients increased with higher level of phosphorus application.

References

Arya, M.P.S. and Kalra, G.S. (1988). Effect of phosphorus doses on the Growth yield and quality of summer moong (*Vigna radiata* L. wi lezek) and soil nitrogen. *Indian Journal of Agriculture Research*. **22** (1), 22-30.

Chauhan, S.S., Kumar, V., Bhdaura, U.P.S. and Dwivedi, A.K. (2011). Effect of conjoint use of organic and inorganic fertilizer on soil fertility and productivity of soybean wheat crop sequence. *Annals of plant and Soil Research*., **13** (1), 47-50.

Das, D.K. and Ram, A.N. (2005). Effect of long-term fertilization and manuring on wheat productivity and soil fertility in a rice wheat cowpea cropping system. *Annals of Plant and soil Research*., **7**(1), 17-23.

Dixit, A., Dawson, J., Verma, R. and Diwan, P. and Kishore, P. (2011). Effect of integrated used of chemical on organic sources of nitrogen on growth and yield of barley. *Annals of Plant and soil Research*., **13**(1), 67-68.

Gupta, V. K. and Gupta S.P. (1981). Effect of zinc sources on growth and zinc nutrition of soybean (*Glycine max*. L.) in the presence of chloride and sulphate salinity. *Plant and Soil*, **81**, 299-304.

Jat, G., Sharma, K.K., Kumawat, B.L. and Bairwa, F.C. (2008). Effect of FYM and mineral nutrients on yield attributes, yield and net return of mustard. *Annals of plant and Soil Research*, **10**(1), 92-95.

Kumar, S., Singh, V. and Solanki, V.P.S. (2009). Effect of phosphorus on yield, quality and uptake of nutrients by sorghum. *Annals of plant and Soil Research*, **11**(2), 96-97.

Kumar, P., Singh, A. and Singh, A.K. (2010). Effect of bio-fertilizers, farmyard manure and nitrogen levels on growth yield and uptake of nutrients in wheat. *Annals of plant and Soil Research*, **12**(2), 92-94,

Kumawat, B.L. and Kumawat, A. (2009). Effect of phosphorus and Bio-fertilizers on mungbean in a typicustipsament. *Annals of plant and Soil Research*., **11**(2), 128-132.

Patel, A.; Namedo, K.N. and Saraiya, A.B. (2005). Effect of phosphorus and growth regulators on growth, yield and nutrient uptake of Black gram. *Annals of Plant and Soil Research*, **7**(1), 41-43.

Pathan, A.R.K.; Nag, A.K. and Singh, V. and Singh, C. (2010). Response of fenugreek to FYM, phosphorus and saline water irrigation. *Annals of Plant and Soil Research*., **12**(1), 27-29.

Singh, H; Singh, G. and Kumar, A. (2005). Effect of phosphorus and sulphur on yield and quality of Black gram. *Annals of Plant and Soil Research*, **7**(1), 99-100.

Singh, M.V.; Kumar, N.; Singh, R.K. and Mishra, B.N. (2010). Effect of phosphorus, sulphur and zine on growth, yield and uptake of nutrients in late sown wheat in Eastern Uttar Pradesh. *Annals of Plant and Soil Research*, **12**(2), 119-121.

Singh, R.N., Singh, S., Prasad, S.S., Singh, V.K. and Kumar, P. (2011). Effect of integrated nutrient management on soil fertility nutrient uptake and yield of rice-pea cropping system an upland acid soil of Jharkhand. *Journal of Indian Society of soil science*, **59**(2), 158-163.

Sisodia, R.S., Pandey, M. and Pal, A. (2010). Response of oat to FYM under sodic water irrigation. *Annals of Plant and Soil Research*, **12**(2), 86-88.

Selui, D., Senthy, P. and Dhakshinamoorthy, M. (2005). Effect of inorganic alone and in combination with farmyard manure on physical properties and productivity of vertic haplustepts under long term fertilization. *Journal of Indian Society of Soil Science*, **53**(3), 302-307.

Tripathi, S, Singh, T.and Tripathi, P.N. (2006). Effect of nitrogen, phosphorus and rhizobium on yield and quality of Cowpea. *Annals of Plant and soil Research*, **8**(1), 14-17.