

Effect of differential water soluble phosphorus in fertilizers with and without FYM and biofertilizers on soil fertility and uptake by wheat

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ABSTRACT

Field experiment was conducted to study the effect of different sources with varying solubility of phosphorus with and without FYM and biofertilizers on soil fertility and nutrient uptake by wheat. The highest uptake of N, P and K was observed with the treatment of SSP (0:16:0) having 100 per cent water soluble phosphorus with and without FYM and biofertilizers, pH and EC of soil after harvest of wheat was non significant however there was slight increase in EC with FYM and biofertilizers application. Highest available N (240.42 kg ha⁻¹) was observed with 30 per cent WSP source while highest available P (18.91 kg ha⁻¹) was observed with 100 per cent WSP source of phosphorus with FYM and biofertilisers.

Key words : Differential water soluble phosphorus, Soil fertility, Uptake and wheat.

INTRODUCTION

Wheat is one of the major cereal crops in Maharashtra grown over an area of 6.65 lakh ha. With production of 7.78 lakh tones. To meet out demands of over increasing population of our country, it is necessary to improve the production of food crops. For sustainable production of wheat, it is also important to improve and maintain soil facility and nutrient availability. Phosphorus availability is considered as a major constraint for crop production in calcareous black soil due to high precipitation and low availability. The availability of phosphorus is influenced by its solubility in water, soil properties, organic manures and biofertilizers. Therefore, it is required to compare different sources having differential water soluble phosphorus with and without FYM and biofertilizers. Present experiment was conducted to study the effect of sources of P with and without FYM and biofertilizers on nutrient uptake by wheat and soil fertility.

MATERIALS AND METHODS

The field experiment was conducted at Post Graduate Institution Farm, Mahatma Phule Krishi Vidyapeeth, Rahuri. The soil belonged to sawargaon soil series under inceptisol and was classified as clay having 55.09 per cent clay content, pH 8.15, CaCO₃ 8.7 per cent, organic carbon 0.58 per cent, available nitrogen, phosphorus and potassium 234, 7.9 and 380 kg ha⁻¹, respectively and phosphorus fixing capacity is 17 mg kg⁻¹. The experiment was designed as Randomized Block Design (RBD) with nine treatments. The experimental details were: T₁= control, T₂= (15:15:15)nitrophosphate – 30 per cent water soluble phosphorous, T₃= (15:15:15)

nitrophosphate – 50 per cent WSP, T₄= (20:20:20) nitrophosphate – 60 per cent WSP, T₅=SSP (0:16:0)-100 per cent WSP, T₆= (15:15:15) nitrophosphate -30 per cent WSP+FYM+ biofertilizers, T₇= (15:15:15)-50 per cent WSP+FYM+ biofertilizers, T₈= (20:20:20)-60 per cent WSP+FYM+ biofertilizers, and T₉= SSP (0:16:0) -100 per cent WSP+ FYM+biofertilizers. The fertilizers were applied as per RDF (120:60:40) through different sources of P, urea and muriate of potash. The FYM was applied at 10tha⁻¹ and biofertilizers like Azotobactor Azospirillum and PSB at 25 g kg⁻¹ each for seed treatment were used. The nutrient uptake and soil properities were determined by standard methods.

RESULTS AND DISCUSSION

Fertility status of soil:

The pH and EC of soil after harvest of wheat were found to be non significant among all the treatments, However, EC was slightly increased with suphala (20:20:20) 60 per cent WSP and SSP – 100 per cent WSP with and without FYM and biofertilizers (Table 1).

Among the different sources nitrophosphate having 30 per cent WSP was found better for available nitrogen content of soil and the availability was 240.42 and 246.74 kg ha⁻¹ without and with FYM and biofertilizers, respectively.

Available phosphorus in soil ranged form 6.66 to 18.91 kg ha⁻¹. Maximum available P content was observed due to application of SSP-100 per cent WSP without FYM and biofertilizer (14.40 kg ha⁻¹) and with FYM and biofertilizers 18.91 kg ha⁻¹. Available P content by 60 per cent WSP source with and without FYM and biofertilizers T₅ and T₈ were at par with each other (Table 1).Increase

Table 1 : Effect of variable WSP fertilizers on chemical properties of soil

Treatments	pH	EC (dSm ⁻¹)	Available N (kg ha ⁻¹)	Available P (kg ha ⁻¹)	Available K (kg ha ⁻¹)
T ₁ - Control	8.15	0.37	205.48	6.66	353.59
T ₂ - 30% WSP nitrophosphate (15:15:15)	8.15	0.37	240.42	9.04	380.56
T ₃ - 50% WSP nitrophosphate (15:15:15)	8.15	0.37	237.30	9.91	381.66
T ₄ - 60% WSP nitrophosphate (20:20:20)	8.15	0.38	235.25	13.03	382.62
T ₅ - 100% WSP nitrophosphate (0:16:0)	8.15	0.39	234.77	14.40	384.73
T ₆ - 30% WSP Suphala (15:15:15)+FYM+ biofertilizers	8.10	0.37	246.74	11.32	381.37
T ₇ - 50% WSP Suphala (15:15:15)+FYM+ biofertilizers	8.15	0.37	244.74	13.70	384.33
T ₈ - 60% WSP Suphala (15:15:15)+FYM+ biofertilizers	8.15	0.38	241.46	17.19	386.14
T ₉ - 100% WSP SSP(0:16:0)	8.15	0.39	236.10	18.91	387.75
S.E.±	0.42	0.51	1.65	0.72	1.23
C.D. (P=0.05)	N.S	N.S	4.96	2.17	3.69

NS-Non significant

Table 2 : Effect of variable WSP fertilizers on nutrient uptake by wheat

Treatments	Nutrient uptake (kg ha ⁻¹)		
	N	P	K
T ₁ - Control	57.24	12.01	58.71
T ₂ - 30% WSP nitrophosphate (15:15:15)	82.38	16.27	82.54
T ₃ - 50% WSP nitrophosphate (15:15:15)	99.79	20.56	109.25
T ₄ - 60% WSP nitrophosphate (20:20:20)	110.99	22.53	119.73
T ₅ - 100% WSP nitrophosphate (0:16:0)	114.43	25.26	134.57
T ₆ - 30% WSP nitrophosphate (15:15:15)+FYM+ biofertilizers	93.24	18.73	93.95
T ₇ - 50% WSP nitrophosphate (15:15:15)+FYM+ biofertilizers	114.36	24.36	120.87
T ₈ - 60% WSP nitrophosphate (15:15:15)+FYM+ biofertilizers	132.81	29.00	142.27
T ₉ - 100% WSP SSP(0:16:0)	136.15	29.67	152.90
S.E.±	2.40	0.86	3.81
C.D. (P=0.05)	7.20	2.57	11.47

in available P content was due to organic source, biofertilizer and their complementary effect with fertilizer by preventing fixation and precipitation. Similar results were also reported by Mishra and Singh (1989). Available potassium showed non significant results but there was slight increase in available potassium with application of FYM and biofertilizers.

Uptake of nutrients:

The highest uptake of N, P and K 114.43, 25.26 and 134.57 kg ha⁻¹, respectively was found with application of SSP (0:16:0) – 100 per cent WSP among different sources followed by T₄ (20:20:20- nitrophosphate)- 60 per cent WSP. Nitrogen and Phosphorus uptake at T₅ and T₄ was at par with each other. Dixit *et al.* (1984) also reported significant increase in N uptake by application of SSP All the treatments with FYM and biofertilizers showed significant increase in nitrogen 93.24 to 136.15 kg ha⁻¹, Phosphorous 18.73 to 29.67 ka ha⁻¹ and potassium 93.95 to 152.90 kg ha⁻¹. Application of

SSP -100 per cent WSP with FYM and biofertilizers showed significantly superior N, P and K uptake over all treatments except T₈ (Nitrophosphate-60% WSP + FYM + biofertilizers)(Table 2). Aziz Quereshi (1996) observed the same trend of nutrient uptake with and without biofertilizers. Ashwath and Dravid (2002) also observed increased P uptake as a effect of fertilizers, organic manures and biofertilizers in wheat crop.

The results of present study indicated that solubility of phosphorous in fertilizer sources, FYM and biofertilizers affects the nutrient uptake by wheat. Among the different sources of phosphorous SSP-100 per cent WSP with FYM and biofertilizers is significant for nutrient uptake and soil fertility.

REFERENCES

Ashwath, O.P. and Dravid, M.S. (2002). Performance of pigeon pea with residual fertility in wheat-pigeon pea cropping sequence under integrated nutrient management. *Annals Agri. Res., ICAR*, **23** (4) : 611-617.

Aziz Quereshi, A. (1996). Interactive effect of phosphate Solubilizing micro organisms and phosphatic fertilizers in the P nutrition of soybean, mustard and wheat. Ph.D. Thesis, IARI, New Delhi.

Dixit, M.L., Verma, K.S. and Chandnary, M.L. (1984). Response of wheat to different levels of fertilizer application based on soil test recommendations. *Haryana Agric. Univ. Res.*, **14**(1) : 39-44.

Mishra, S.N. and Singh, A.P. (1989). Studies on phosphorus availability and uptake by groundnut. *J. Legume Res.*, **12**(4): 160-164.

Sapatnagar, H.G., Rasal, P.H. and Patil, P.L. (2001). Effect of super phosphate, FYM and phosphate solubilizers on yield of green gram. *J. Maharashtra Agric. Univ.*, **26**(1) : 120-121.

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