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Solubilization of rock phosphate by spent wash and its effect on nitrogen, phosphorus and potassium uptake by wheat (*Triticum aestivum* L.) in an inceptisol

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Abstract
Application of 100% N&K + 75% P through SSP recorded significantly highest N, P, K and S uptake by crop found significantly superior to their lower levels. Results further indicate that solubilization of rock phosphate remained at par with RP:SW@1:80 but recorded significantly N,P,K, and S uptake by grain and straw as compared to remaining levels of rock phosphate and control. The application of RP:SW@1:40 significantly increased the N, P, K and S uptake by grain and straw and total uptake. These improvement manifested in highest values of crop productivity in terms of uptake by grain, straw under this treatment. The RP:SW@1:40 recorded the highest N, P, K and S uptake by wheat crop.

Keywords: nitrogen, phosphorus, potassium, sulphur, uptake, rock phosphorus, spent wash

Introduction
In India, Total resources of rock phosphate and apatite as per UNFC system as on 1.4.2010 are placed at 296.3 and 24.23 million tonnes receptively and The consumption of apatite and rock phosphate in 2011-12 was about 3.96 million tonnes.

Effect of spent wash on crop ecology, it is necessary to understand its exact chemical composition. It has been revealed that factors such as pH, electrical conductivity (EC), BOD, COD and the organic C, N, P and K contents of spent wash may affect plant growth (Mahimairaja and Bolan, 2004). The main aimed at achieve an eco-friendly utilizing abundant resources of low grade rock phosphate which is unacceptable to the P fertilizer industry and the spent wash-a foul smelling, waste water from the distilleries, which create the problem of environmental pollution.

Phosphorus is one of the critical nutrient elements which plays important role in increasing crop growth and crop yield. When Phosphate fertilizers is applied in soil, than 80% of the P gets rapidly fixed into insoluble compounds as Ca-P in alkaline, and as Fe-P and Al-P in acid soils and only very low (15-20%) recovery by crops in a growing season. In soil, soluble P average concentration from 0.05 to 10 ppm, out of which only a small amount of P is available to plant (Bhattacharyya and Jain, 2000). In soil P moves mainly by diffusion and the rate of diffusion is very slow (10-12 to 10-15 m^2 sec^{-1}). Since the P uptake rate by crops is quite high, it creates a zone around the roots that is depleted of P. So phosphatic fertilizers becomes necessary to maintain optimum P concentration in the root zone. N, P and K is also required in large amounts by crops, so the large amount of phosphatic fertilizers is required for enhance the crop production for growing population of the country.

Material and Methods
Low grade Udaipur Rock Phosphate (URP) called as 'Rajphos' procured from Rajasthan State Mines and Minerals Ltd., Udaipur, Rajasthan was used. Some of the selected characteristics/constituents of URP are presented in Table 1. The spent wash (SW) was collected from the K.M. Sugar Mill Faizabad, Utter Pradesh. All the physico- chemical analysis was conducted in laboratory of the Department of Soil Science & Agricultural Chemistry, Institute of Agricultural Sciences, BHU, Varanasi and some of the selected characteristics/constituents of SW are presented in Table 1. The extent of P-solubilization from lowgrade Udaipur rock phosphate (RP) by spent wash (SW) was studied by mixing RP and SP in different ratios. The RP:SW ratios were1:1, 1:2, 1:5, 1:10, 1:20, 1:40, 1:60, 1:80 and 1:100. To obtain these ratios 100, 50, 20, 10, 5, 2.5, 1.7, 1.25, 1.0 g of RP was mixed in 100 ml of SW in plastic bottles in triplicates. These bottles were agitated on a mechanical shaker for one hour and then the suspension obtained was filtered through Whatman No. 40 filter paper.

The filtrate thus obtained was analyzed for pH (Systronics Digital pH meter), electric conductivity (Elico Conductivity Bridge), and soluble P, fluorine. In the filtrate was determined of total P by digesting the filtrate as per procedure used in place of Soluble P because the colour of the filtrate was actually the colour of the spent wash there was a problem in getting the colourless filtrate. The amount of P was spent wash extractable P of the rock phosphate obtained was designated as a soluble P.

Table 1: Effect of levels of Phosphorus and Rock Phosphate solubilizing by Spent Wash on N, P, K and S uptake by seed and straw of wheat (Pooled mean)

Treatments	N uptake (kg/ha)		P uptake (kg/ha)		K uptake (kg/ha)		S uptake (kg/ha)	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
Main plot								
Control (Absolute)	58.17	20.24	7.47	4.58	16.03	75.19	21.85	32.78
100% RD of N & K +50% P through SSP	74.60	29.47	9.68	5.80	22.73	93.93	29.93	44.15
100% RD of N & K +75% P through SSP	89.47	36.64	11.45	7.27	27.20	115.30	35.70	54.24
100% RD of N & K +75% P through RP	86.68	34.86	10.97	6.78	25.91	109.03	34.09	50.83
100% RD of N & K +100% P through RP	88.88	35.74	11.36	7.03	26.59	112.27	35.10	52.28
SEm±	1.56	0.54	0.17	0.12	0.51	1.91	0.61	0.79
CD (p=0.05)	4.61	1.60	0.50	0.35	1.50	5.62	1.81	2.32
CV (%)	9.63	8.48	8.13	9.29	10.53	9.23	9.57	8.21
Sub plot								
No SW	64.13	27.53	8.28	4.51	18.59	86.92	23.62	40.52
RP:SW @ 1:10	81.68	31.47	10.38	6.37	24.18	102.46	32.60	47.20
RP:SW @ 1:40	87.44	33.69	11.20	7.25	26.28	109.05	34.98	50.44
RP:SW@ 1:80	84.99	32.87	10.88	7.04	25.71	106.15	34.13	49.26
SEm±	1.27	0.45	0.15	0.09	0.45	1.62	0.49	0.64
CD (p=0.05)	3.55	1.25	0.42	0.26	1.27	4.53	1.37	1.80
CV (%)	9.56	8.53	8.90	8.93	11.47	9.60	9.38	8.21

Results and Discussion

Uptake by grain and straw

The data in Table 1 revealed that N uptake by grain and straw tended to increase significantly with application of phosphorus (A_3) during both the years and in pooled analysis. While, the application of A_4 and A_5 found at par with A_3 during both the years and in pooled analysis. Significantly higher N, P, K and S uptake by grain, straw was recorded with A_3 over A_1 and A_2, in pooled basis and it was recorded by 53.81 and 19.93 per cent and 81.03 and 24.33 per cent higher in N uptake by grain and straw, 53.28 and 18.29 per cent and 58.73 and 25.33 per cent higher in P uptake by grain and straw, 69.68 and 19.67 53.34 and 22.75 per cent higher in K uptake by grain and straw and 63.39 and 19.28 65.47 and 22.85 per cent over A_1 and A_2, respectively in pooled analysis. In combination, addition of PROM in soil improved the nutritional status, soil physico-chemical properties and soil microbial population which resulted in increased availability of these elements and SSP provided the phosphorus with Ca and sulphur, resulted into there higher uptake by the crop. Uptake of N, P, K and S is a function of the content of these elements in seed and straw and their respective yields. Thus increase in content of these elements in seeds and straw and significant increase in yields have been resulted due to increased uptake of N, P, K and S by the crop. Basak and Subodh (2002) [2], Hemalatha *et al*. (2002) [3] and Kumar *et al*. (2002) [4] also reposted that P has improved the soil physical conditions and increased content turn improved the nutrient uptake.

Data on the N, P, K and S uptake by grain, straw of wheat presented in Table 4.1. The response of phosphorus with respect to N, P, K and S uptake by grain, straw was significant over control and B_2 (RP:SW@1:10) in pooled basis. The N, P, K and S uptake in grain recorded under B_3 (RP:SW@1:40) was 36.35 and 7.05, 35.27 and 7.90, 41.37 and 8.68 and 16.58 and 2.07 per cent and in straw 22.38 and 7.05, 60.75 and 13.81, 25.46 and 6.43 and 7.76 and 2.51 per cent higher in comparison to B_1 and B_2 level. But it was remained at par with B_4. The results of the present investigation are in line with those of EL-Desoky *et al.* (1993) who have reported that application of 90 kg K per feddan was increased the uptake of N, P and K in lentil crop, while Detroja *et al.* (1995) [5] reported that fenugreek crop fertilized with 30 kg K_2O ha^{-1} removed significantly higher N, P and K from soil. Similarly higher uptake of N, P and K in wheat (Singh and Singh, 2002) [6] due to application of varying levels of P have also been reported.

Conclusions

Based on the results of present study, it may be concluded that phosphorus level i.e. 100% N&K + 75% P through SSP and application of rock phosphate @ RP:SW@1:40 proved to be the most economic proportion for realising higher productivity as compared to other factors tried. The results emanated from present investigation have clearly established potential role of phosphorus and solubilization of rock phosphate in improving productivity of wheat. In long term the effect of solubilization rock phosphate may be visualized and doses of fertilizer (N&P) may be reduced to mitigate the ill effect of chemical fertilizers on soil health. Thus farmers of the zone may be encouraged to use rock phosphate in conjugation with fertilizers (N & P) to sustain the productivity of wheat crop.

References

1. Mahimairaja S, Bolan NS. Problems and prospects of agricultural use of distillery spent wash in India. In: Super Soil. Proceedings of the 3rd Australian New Zealand Soils Conf., University of Sydney Australia, 2004. (www.regional.org.au/au/assoi/supersoil 2004)
2. Basak RK, Sobodh K. Efficiency of mixture of rock phosphate and super phosphate in green fodder maize pea crop sequence in alluvial soil. Environment and Ecology. 2002; 20:894-896.
3. Hemalatha SV, Shankaralingappa BC, Sudhir K, Srikanth K, Siddaramappa R. Integrated phosphorus management

for pigeon pea in an Alfisol. Current Res. 2002; 31:55-58.
4. Kumar RM, Subbaiah SV, Surekha K. Evaluation of murrorie rock phosphate as source of phosphorus in rice-black gram system. Journal of Research ANGRAU. 2002; 30:1-7.
5. Detroja HJ, Sukhadia, Malavia DD. Yield and nutrient uptake by fenugreek (*Trigonella foenum-graecum* L.) as influenced by nitrogen, phosphorus and potash. Indian Journal of Agronomy. 1995; 40:160-161.
6. Singh V, Singh B. Effect of sulphur and potassium nutrition on yield and quality of maize. Annals of Plant and Soil Research. 2002; 4:235-237.