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RESIDUAL EFFECT OF PRIMED ROCKPHOSPHATE ON SUCCEEDING PULSE CROP*

It is now well recognised that the portion of fertilizer phosphorus taken up by the plant is often lower and that all phosphatic fertilizers would leave residual phosphorus which succeeding crop could use. Motsara and Data (1971) odserved that rockphosphate was significantly superior to superphosphate in its residual effect. It is evident from the literature that many workers have tested the efficiency of rockphosphate as a source of phosphorus for rice and leguminous crop.

A pot culture experiment was conducted in some of the major rice soils of Kerala such as karappadom and kayal soils of Kuttanad. laterite soil of Kottayam, coastal sandy soil of Kayamkulam and kole soil of Trichur district. The experiment was to study the efficiency of primed rockphosphate in moist aerobic soil before puddling, for different duration and phosphorus rates for increasing grain yield of rice, during the year 1979-80. The treatments of the experiments are listed below:

1 Control (No phosphorus)

2 Superphosphate at flooding. 45 kg P_2O_5/ha

3 Rockphosphate at flooding, ,,

4 Rockphosphate one week before flooding in moist aerobic soil, 45 kg P_2O_5/ha

5 Rockphosphate two weeks flooding in moist aerobic soil, 45 kg P_2O_5/ha

6 Rockphosphate at flooding, 67.5 kg P_2O_5/ha

7 Rockphosphate one week before flooding in moist aerobic soil, 67.5 kg PA

8 Rockphosphate two weeks before flooding in moist aerobic soil, 67.5 kg P_2O_5

9 67.5 kg P_2O_5/ha half applied as superphosphate and the other half as rockphosphate at flooding.

The fertilizers used were ammonium sulphate (20%N), superphosphate (17.5kg P_2O_5), Mussorie rockphosphate (20% P_2O_5) and muriate of potash (60%K_2O). In treatments 4, 5, 7 and 8 rockphosphate was primed in moist aerobic soil. Water was added to the air dried soil to maintain 70 to 80 per cent of field moisture capacity and the moisture status was maintained throughout the priming period. At the end of the period, the pots were flooded and basal dose of fertilizers were incorporated. A crop of rice was raised. Grain yield was recorded at harvest. Grain and straw samples were analysed for phosphorus and phosphorus uptake computed from the dry weight of grain and straw.

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After the rice crop the soil in the pots were partially dried under shade, mixed thoroughly and the soil was filled in the respective pots. Cowpea seeds of the variety New Era were sown at the rate of two seeds per pot. The pots were irrigated whenever necessary. Nitrogen and potassium were applied at the rate of 20 kg N and 10 kg K_2O per hectare respectively as basal dressing. The crop was harvested 45 days after planting. The plant material was dried at 80°C in an air oven and dry weight recorded. The samples were powdered and analysed for P content. Phosphorus uptake was computed from content and dry weight of plant material.

Grain yield and P uptake by rice crop (Table 1 and Table 2) indicated that at the rate of 45 kg P_2O_5 per hectare application of rockphosphate in moist aerobic

Table 1

Grain yield of rice (g/pot)

Treatments	Soil				
	S_1	S_2	S_3	S_4	S_5
T_1	7,02	1.60	5.90	4.50	9.80
T_2	4.49	13.00	10.10	4.70	15.50
T_3	8.33	17.10	14.10	1.40	18.20
T_4	8.81	19.64	10.30	3.40	16.60
T_5	9.60	22.41	11.20	5,40	18.40
T_6	16.25	17.65	8.00	6.80	14,50
T_7	16.59	15.60	13.70	6.10	16.70
T_8	10.96	13.10	15.80	5.00	13.60
T_9	19.12	20,40	23.10	4.40	17,60
C. D. for comparison (5% level)	7.84	6.03	1.57	1.36	4.24
Mean of treatments T4 and T5	9.21	21.00	10.80	4.40	17.50
CD forcomparison with T1 and T2 (5% level)	6.79	5.22	1.32	1.18	3.68

S_1 : Karappadom soil
S_3 : Laterite soil
S_5 : Kayal soil
S_4 : Coastal sandy soil
S_2 : Kole soil

Table 2

Phosphorus uptake of rice (g/pot)

Treatments	Soil				
	S_1	S_2	S_3	S_4	S_5
T_1	0.027	0.016	0.032	0.012	0.022
T_2	0.035	0.041	0.056	0.019	0.030
T_3	0.056	0,066	0.067	0.011	0.051
T_4	0.035	0.055	0.050	0.013	0.045
T_5	0.040	0.060	0.048	0.012	0.046
T_6	0.062	0.076	0.034	0.027	0.053
T_7	0.053	0.069	0.053	0.030	0.058
T_8	0.043	0.044	0.051	0.021	0.044
T_9	0.080	0.079	0.075	0.036	0.052
C. D for comparison (5% level)	0.015	0.019	0.017	—	0.017
Mean of treatments T_4 and T_5	0.037	0.062	0,049	—	0.046
C. D for comparison with T_1 and T_2 (5 % level)	0.013	0.017	0.015	—	0,015

soil resulted in efficient utilisation of P by the rice plant for grain production. The bulk of the requirement of phosphorus for grain production was absorbed by rice plant during the active tillering stage (Patnaik and Gaikwad, 1969). When rock-phosphate was applied in moist aerobic soil, most of the phosphorus was converted to iron phosphate, which on subsequent flooding becomes available for the rice crop. The fact was also evident in fractionation studies of inorganic phosphate where Fe–P fraction was dominant when compared to other forms in treatments with soils having primed rockphosphate. Uptake of phosphorus was higher from rockphosphate applied at flooding in all soils.

Data collected on phosphorus uptake and grain yield of rice indicated that application of rockphosphate at flooding for the rice crop though resulted in higher total uptake of phosphorus, more grain yield was obtained for treatments which received primed rockphosphate. Thus increased phosphorus uptake by the rice crop might have exhausted soils receiving rockphosphate at flooding. Availability of phosphorus for cowpea might have decreased in those treatments resulting in low phosphorus uptake and dry matter production. On the other hand priming of rockphospate in moist aerobic soil left more residue and hence higher uptake of the element by the succeeding pulse crop.

Table 3

Dry matter yield and phosphorus uptake of cowpea

Treatments (applied for rice crop)	Dry matter yield g/pot					Mean	P uptake, mg/pot					Mean
	S_1	S_2	S_3	S_4	S_5		S_1	S_2	S_3	S_4	S_5	
T_1	1,84	4.50	6.47	4,50	3.28	4.12	2.44	2.83	2.85	2.82	2.70	2.73
T_2	5.03	6.62	9.36	7.86	6.66	7.11	3.89	4.04	3.53	3.55	3.32	3.67
T_3	6.16	7.76	10.47	8.68	10.41	8.70	4.06	5.76	4.19	4.20	5.45	4,53
T_4	6.53	8.43	11.19	11.17	12.57	9.98	4.44	5.68	5.50	4.26	5.93	5.24
T_5	7.30	9.17	10.67	11.39	13.00	10.33	4.60	5.72	6.54	4.58	5.93	5.47
T_6	6.18	9.55	13.72	6.00	12.45	9.58	4.24	7.34	6.77	4.28	4.36	5.40
T_7	7.09	9.48	11.73	11,89	11.88	8.40	4.80	9.10	8.60	4.30	5.32	6.42
T_8	7.11	8.44	9.69	11.33	11.05	9.50	3.88	7.18	4.82	4.18	4.00	4.80
T_9	7,46	10.86	24.55	27.00	20.50	19,50	51.00	9,65	9.70	5.10	6,86	7.30
Mean	6.08	8.31	11.99	11.11	12.09	9.92	4.16	6.25	5.88	4.14	4.87	5.06

c. o (0.05) for comparison between treatments = 0.16
for comparison between soils = 0.21
for comparison of combinations = 4.47

for comparison between treatments = 0.012
for comparison between soils = 0.064
for comparison of combinations = 0.14

Data on dry matteryield and phosphorus uptake of cowpea are presented in Table 3. Significant differences were noted between treatments in total dry matter production of cowpea. Superphosphate–rockphosphate mixture at the rate of 67.5 kg P_2O_5/ha applied to the previous rice crop at planting produced the highest dry matter yield in all the soils and was significantly superior to other treatments. The lowest dry matter yield was recorded in the control treatment followed by superphosphate treatment. At 45 kg P_2O_5/ha priming rockphosphate for two weeks in moist aerobic soil before planting of the previous rice crop resulted in highest dry matter yield and phosphorus uptake. Phosphorus uptake followed the same pattern on dry matter yield with respect to various treatments applied to the preceeding crop of rice.

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സംഗ്രഹം

നീർവാർച്ചയുള്ള മണ്ണിൽ ഏകദേശം രണ്ടാഴ്ചക്ക് മുമ്പായി റോക്ക്ഫോസ്ഫേറ് ഉഴുതുചേർക്കുന്നതായാൽ നെല്ലിന് സൂപ്പർ ഫോസ്ഫേറിനോളം തന്നെ ഗുണകരമാണെന്ന് വെള്ളായണി കാർഷിക കോളേജിൽ നടത്തിയ പരീക്ഷണത്തിൽ നിന്നും തെളിഞ്ഞിരിക്കുന്നു. റോക്ക് ഫോസ്ഫേറ് നടീൽ സമയത്ത് വെള്ളം കെട്ടിനിർത്തിയ ശേഷം നൽകിയാൽ ദോഹലഭേത കൂടുമെങ്കിലും നെല്ലിന്റെ വളർച്ചയുടെ പ്രാരംഭഘട്ടത്തിൽ ലഭ്യമാകാത്തതിനാൽ വിളവ് കൂട്ടാൻ സഹായിക്കുന്നില്ല. എന്നാൽ ആദ്യം പറഞ്ഞപ്രകാരം നീർവാർച്ചയുള്ള മണ്ണിൽ ഉഴുതുചേർക്കുന്നതായാൽ നെല്ലിന് മാത്രമല്ല നെല്ലിന് ശേഷം ഇടുന്ന പയറിനും ഗുണകരമായി കണ്ടിരിക്കുന്നു.

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References

Motsara, M. R. and Datta, N. P. 1971 Rockphosphate as fertilizer for direct application in acid soils. *J. Indian Soc. Soil Sci.* 19: 107-114

Patnaik, S. and Gaikwad, S. T. 1969 Efficiency of phosphorus and potassium absorbed during various growth stages of IR 8 forgrain production. *Indian J. agric. Sci* **39**: 117–121