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RESIDUAL EFFECT OF PHOSPHORUS SOURCES ON THE AVAILABILITY OF P IN BLACKGRAM

P.SINGARAM and G.V. KOTHANDARAMAN*

ABSTRACT

A field experiment was conducted during 1985-86 at Tamil Nadu Agricultural University, Coimbatore with five phosphatic fertilizer sources and three levels to study the residual effect of fertilizers added to the preceeding crops of fingermillet and maize. A residual crop of blackgram was raised in a cropping sequence of fingermillet-maize-blackgram and the results indiciated that the availability of soil P increased significantly with all the five sources viz., single superphosphate, rock phosphate, rock phosphate + single superphosphate, rock phosphate + phosphobacterium and Diammonium phosphate. The higher level (90 kg P_2O_5/ha) resulted in enhanced availability of phosphorus in all the five sources.

Phosphorus is an essential nutrient element directly affecting crop yield. Application of P in the form of fertilizers has, therefore, become a necessity under most conditions for augmenting crop yield. However, fertilizer P is a costly input. This and its relatively poor utilization by individual crops and fixation - immobility phenomena in the soil, are some of the principal factors that warrant an efficient mangement of fertilizer P (Goswami and Mohinder singh. 1976). The quantity of P absorbed by a single crop from the fertilizers have residual effect on the succeeding crop which is often benefitted by the residual P (Talashilkar and Kadrekar, 1979). Keeping these in view, a study was undertaken to find out the residual effect of differenct P sources on blackgram in a cropping sequence of fingermillet, maize and blackgram at Tamil Nadu Agricultural University, Coimbatore.

MATERIALS AND METHODS

A field experiment was carried out during 1985-86 to evaluate different sources of P for a cereal based cropping sequence of fingermillet-maize-blackgram at Tamil Nadu Agricultural University farm, Coimbatore. The experiment was laid out in factorial randomised block design with three replication. The nutrient status of the clay loam soil (typic ustropept) was found to be

*Department of Soil Science and Agricultural Chemistry, Tamil Nadu Agricultural University, Coimbatore - 641 003

Table 1. Availabel P (ppm) in soil of blakgram

Treatment	Flowering stage				Harvest stage			
	E1	E2	E3	Pool	E1	E2	E3	Pool
Source								
SSP	9.5	14.9	15.5	13.3	7.4	11.1	11.9	10.1
RP	8.7	11.6	11.3	10.5	8.6	11.9	10.8	10.5
RP + SSP	8.3	12.5	12.2	11.2	8.3	11.7	11.5	10.5
RP + PB	8.0	11.4	12.5	10.6	7.3	10.9	11.4	9.9
DAP	8.5	13.4	14.1	12.1	7.4	9.4	9.9	8.9
Control	3.6	3.7	3.7	3.7	3.5	3.5	4.0	3.7
Level								
30 kg P2O5/ha	7.7	11.1	11.1	10.0	7.1	9.5	9.8	8.8
60 kg P2O5/ha	8.7	13.1	13.9	11.9	7.9	11.4	11.5	10.3
90 kg P2O5/ha	9.9	14.2	14.2	12.8	8.3	12.1	12.0	10.8
Source: SED	0.59	0.78	0.84	0.43	0.56	0.86	0.95	0.47
CD	NS	1.61	1.72	0.86	NS	NS	NS	0.93
Level : SED	0.46	0.61	0.65	0.33	0.43	0.66	0.74	0.36
CD	0.94	1.24	1.33	0.66	0.89	1.30	1.51	0.72

E1 Second residual effect; E2: First residual effect; E3: Cumulative residual effect;

SSP; Single superphosphate; RP: Rock phosphate adn PB: Phosphobacterium

low, low and high in respect of available N, P and K respectively with a pH of 8.02. There were 16 treatments consisting of five sources of P, viz., single superphosphate, rock phosphate, rock phosphate + single superphosphate, rock phosphate + phosphobacterium (**Bacillus megaterium**) and Diammonium phosphate and three levels of P, viz., 30, 60 and 90 kg P_2O_5/ha along with an absolute control. Phosphorus fertilizers were applied to fingermillet only, to study the second residual effect (E1 environment) to maize only to study the first residual effect (E2 environment) and to both fingermillet and maize to study the cumulative residual effect (E3 environment) on the third crop of blackgram. The residual crop of balckgram (Co.5) was raised in the same undisturbed plots without adding any fertilizers. Nitrogen was added in the form of urea uniformly to all the plots for fingermillet and maize crop and potassium was not added since the soil contained a high amount of available K.

RESULTS AND DISCUSSION

The data on the available P status of soil at flowering and harvest stages of the residual crop of blackgram are furnished in Table 1.

Flowering stage

The mean available P ranged from 3.6 to 15.5 ppm for the various environments. The different sources of P did not vary significantly at the second residual effect (E1 environment). However, significant differences were observed among the sources at the first residual effect (E2 environment), cumulative residual effect (E3 environment) and also in pooled analysis. Among the sources, single superphosphate and diammonium phosphate registered significantly higher available P, while rock phosphate and its combinations recorded only lower values. The higher level of 90 kg P_2O_5/ha was associated with an enhanced available P status of soil with all the sources and environments. Among the residual effects

studied, the available P was higher with the cumulative residual effect (E3 environment) where fertilizer P sources were added to both fingermillet and maize crops while it was lower with the second residual effect (E1 environment).

The plots which received phosphorus showed a three fold increase in the available P status of soil over control. The water soluble sources were proved superior to water insoluble sources (Prasad et al., 1985) and successive increasing levels of P caused a progressive increase in the available P status of soil at the flowering stage (Patel et al., 1985). Among the environments, incubation for a longer period of time was found to be lesss efficient. The P added to the preceeding crop helped in higher amounts of available P inspite of the very odd situations prevailing under the experimental conditions that favoured fixation. But such a phenomenon could not be observed because of the increased availability of P in the case of water soluble P sources, rock phosphate and its combinations. The increased availability of P on account of the residual effect was also observed by Rajendra Prasad et al. (1985)

Harvest stage

The mean available P ranged from 3.5 ot 12.1 ppm at harvest stage for all the environments studied. There was no significant difference in the availability of P among the sources of P and for all the environments studied. Here also the higher level (90 kg P_2O_5/ha) resulted in an increased available P. As observed in flowering stage, at harvest stage also, the available P was higher with the cumulative residual effect (E3 environment) where fertilizer P sources were added to both fingermillet and maize crops while it was lower with the second residual effect (E1 environment).

Application of rock phosphate and its combinations and also the water soluble source of P at all levels left behind a higher amount of residual available P. Higher dose of P application could also account for a higher level of residual phosphorus in the soil. The absence of significant difference among the sources for any of the environments can be taken to mean that even the water insoluble sources like rock phosphate applied alone or in combination with either single superphosphate or phosphobacterium proved as efficient as single superphosphate or diammonium phosphate in recording a higher available P status of soil. It is in accordance with the findings of Tandon (1986).

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