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DYNAMICS OF PHOSPHORUS IN SOIL UNDER THE INFLUENCE OF INORGANIC PHOSPHORUS SUPPLY

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ABSTRACT

A field experiment was conducted in June 2006 in order to evaluate the adsorption and desorption behaviour of phosphorus in neutral normal soil. The experimental plot was located at Madurai District, Tamilnadu, India. The experimental soil has the pH of 7.2, EC 4 dSm^{-1} and the available phosphorus content is 8 kg ha^{-1}. The experiment was conducted with different levels of P *viz.*, 0 (T_1), 75(T_2), 100(T_3), 125(T_4), 150(T_5), 175(T_6) and 200 (T_7) per cent recommended dose of phosphorus (RDP). The recommended dose of phosphorus is 62.5 kg/ha.The treatments were laid out in plots of size 5 x 4 m in Randomised Block Design with three replications. The test crop as maize was grown upto 105 days. During the crop growth, the soil samples were analyzed for the different fractions of phosphorus viz., Ca–P, Fe-P, Al-P, Saloid bound P, reductant soluble P and organic P at an interval of 15 days. Asper the analytical report, increasing levels of phosphorus increased the concentration of Ca-P and Fe-P, Al-P, Saloid bound P, reductant soluble P and organic P upto 200% RDP. Over a period of time, the concentration of Ca-P, Fe-P and organic P increased at all levels of P added from 15 to 105 days. The highest value was observed with the application of 200% RDP in all cases. But a decreasing trend was observed in the concentration of Al-P and saloid bound P with progress of time. The maximum release was observed with the application of 200% (T_7) RDP. There was no definite pattern of change in the concentration of reductant soluble P with time at all the levels.

INTRODUCTION

Among the major nutrients, phosphorus ranks next to nitrogen in importance on account of its vital role in major life processes. Its availability to the growing crop at required level is of prime importance in soil fertility. Selection of suitable P fertilizer based on soil type is very important. The importance of phosphorus in the maintenance of soil fertility and improving productivity is recognized now, as two-thirds of Indian soils are known to give universal response to P application. It is the most critical element in highly weathered tropical and subtropical soils and per cent utilization of applied P by the crops is very low. Recovery rate rarely exceeds 20 per cent and rest is rendered unavailable due to chemical adsorption in the soil. Phosphorus is one of the limiting nutrients in soils because of its high adsorption and very low recovery of the applied phosphorus caused by the conversion into Ca-P, Na-P and further change of unextractable form. Keeping these points in mind, the present investigation was takenup.

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MATERIALS AND METHODS

A field experiment was conducted in June 2006 in order to evaluate the adsorption and desorption behaviour of phosphorus in neutral normal soil. The experimental plot was located at Madurai District, Tamilnadu, India. The experimental soil has the pH of 7.2, EC 4 dSm^{-1} and the available phosphorus content is 8 kg ha^{-1}. The experiment was conducted with different levels of P *viz.*, 0 (T_1), 75(T_2), 100(T_3), 125(T_4), 150(T_5), 175(T_6) and 200 (T_7) per cent recommended dose of phosphorus (RDP). During the crop growth, the soil samples were analyzed for the different fractions of phosphorus viz., Ca–P, Fe-P, Al-P, Saloid bound P, reductant soluble P and organic P at an interval of 15 days. The P fractionation procedure was done by using the method established by Peterson and (1966).

RESULTS

As per the analytical report, increasing levels of phosphorus increased the concentration of Ca-P and Fe-P, Al-P, Saloid bound P, reductant soluble P and organic P upto 200% RDP.

Over a period of time, the concentration of Ca-P (215.62 to 218.92 kg ha^{-1}), Fe-P (241.75 to 244.68 kg ha^{-1}) and organic P (1204.06 to 1209 .15 kg ha^{-1}) increased at all levels of P added from 15 to 105 days. The highest value was observed with the application of 200% RDP in all cases. But a decreasing trend was observed in the concentration of Al-P (217.50 to 208.50 kg ha^{-1}) and saloid bound P (171.54 to 169.26 kg ha^{-1}) with progress of time. The maximum release was observed with the application of 200% (T_7) RDP. There was no definite pattern of change in the concentration of reductant soluble P with time at all the levels.

Conclusion

The graded levels of P application gradually increased the concentration of different fractions of P viz., Ca-P, Fe-P, saloid bound P, Al-P, reductant soluble P and organic P in soils. This might be due to the reason that the P fixing capacity of the soils exhibited a rise with increase in the levels of P applied. These results are in accordance with the findings of Mallikarjuna *et al*. (2003). Over a period of time, the concentration of Ca-P and Fe-P increased at all levels of P added in soil. The increase in Ca-P and Fe-P is might be due to a larger proportion of applied P was transformed in to Ca-P form and that with time there was a further shift of Fe-P. The concentration of saloid bound P, Al-P and reductant soluble P decreased with increasing intervals of time at all levels of P added in all soils. The decrease in the aforesaid fractions might be due to the reason that the shift in the adsorption, desorption and dissolution-precipitation equilibria involved in the dynamics of soil P. This finding corroborates with the reports of Bhattacharya *et al.* (2003).

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