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Replenishment of Olsen's Phosphorus (plant available phosphorus) in Soil by the Application of Chemical Phosphatic Fertilizer under Maize Cropping System

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Abstract: To evaluate the effect of inorganic phosphorus (P) sources on dynamics of Olsen's P which is the available form of P to crop plants, a field experiment was conducted in a neutral normal soil during June 2006 under maize cropping system. The experimental plot was located at Madurai District, Tamil Nadu, 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) by using Single Super Phosphate. The recommended dose of phosphorus for maize crop 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 results of the experiment revealed that the Olsen's P was increased with increasing levels of P from 75 to 200 % RDP at different stages of crop growth. With progress of time, a definite pattern of decrease in the concentration of Olsen's P was observed. The maximum reduction in the concentration of Olsen's P was recorded with the application of 200% RDP (T_7) from 15 to 105 days with the mean values ranged from 24.29 to 11.35 kg ha^{-1}. The treatment T_7 was followed by T_6, T_5, T_4, T_3, T_2, and T_1.

Keywords: *Olsen's P, Single super phosphate, Mobility, Phosphorus*

1. INTRODUCTION

Phosphorus (P) is an essential element classified as a macronutrient because of the relatively large amounts of P required by plants. Phosphorus is one of the three nutrients generally added to soils in fertilizers. One of the main roles of P in living organisms is in the transfer of energy. Organic compounds that contain P are used to transfer energy from one reaction to drive another reaction within plant cells. Adequate P availability for plants stimulates early plant growth and hastens maturity. Although phosphorus is essential for plant growth, its availability in Indian soil is very much low. Hardly, 20 % of P can be utilized and 80% can't be used by the plants due to fixation and precipitation of metallic and non metallic ions in the soil respectively. Among different fractions of P in soil, there exists a dynamic equilibrium between them but that could not replenish the available P pool. Due to aforesaid consequences, our Indian soils are universally deficient in P. Keeping the above points in mind, the present investigation was taken up.

2. MATERIALS AND METHODS

The experimental plot was located at Madurai District, Tamil Nadu, 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) by using Single Super Phosphate. The recommended dose of phosphorus for maize crop is 62.5 Kg/ha. The treatments were laid out in plots of size 5 x 4 m in Randomized Block Design (RBD) with three replications. The maize crop was grown up to maturity and harvested. Up to the maize crop cycle the different fractions of phosphorus of the soil are monitored by

analyzing the soil once in 10 days by using the method prescribed by Watanabe and Olsen (1965).

3. RESULTS AND DISCUSSION

The results of the experiment revealed that the Olsen's P was increased with increasing levels of P from 75 to 200 % RDP at different stages of crop growth (Table 1). With progress of time, a definite pattern of decrease in the concentration of Olsen's P was observed. The maximum reduction in the concentration of Olsen's P was recorded with the application of 200% RDP (T_7) from 15 to 105 days with the mean values ranged from 24.29 to 11.35 kg ha^{-1}. The treatment T_7 was followed by T_6, T_5, T_4, T_3, T_2, and T_1. This might be due to the close relation exist between the amount of organic matter and inorganic forms of soil P. This finding coincides with the reports of Mandal (1979). With advancement in crop growth, the Olsen's P concentration decreased at all levels of P added in normal, saline and sodic soils. Similar trend was also reported by Sihag *et al* (2005) and Mina and Singh (2005). This decrease in the concentration might be due to the removal of P by the crop from the soil solution.

4. CONCLUSION

It is concluded that the application of inorganic phosphorus either as Single super phosphate (SSP) or Diammonium phosphate (DAP) increased the concentration of plant available phosphorus in soil with the passage of time. But at the same time, the concentration may be decreased with the development of crops. This might be due to the reason of crop uptake or fixation or precipitation of phosphorus in soil.

Table 1. Effect of levels of phosphorus on Organic P (Kg ha^{-1}) concentration at different stages of crop growth in normal soil

Treatments	Days interval						
	15	30	45	60	75	90	105
T_1 - Control	9.15	7.64	6.02	5.83	5.81	5.75	5.71
T_2- 75% RDP	16.80	13.41	11.32	10.40	9.00	9.14	9.21
T_3- 100 % RDP	18.64	15.64	12.21	11.94	11.65	11.36	11.03
T_4- 125 % RDP	21.22	18.54	15.56	13.60	12.19	11.55	11.08
T_5- 150 % RDP	22.19	20.04	16.29	14.46	12.42	11.81	11.15
T_6 – 175 % RDP	23.56	21.59	18.71	14.94	12.82	11.85	11.24
T_7 – 200 % RDP	24.29	22.24	19.52	15.81	13.45	12.05	11.35

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