

Research Paper :

Dynamics of phosphorus fractions in a calcareous Vertic Haplustepts under AICRP-LTFE soils

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ABSTRACT

Available status of P in LTFE soils was decreased after long run, but that was also increased in treatments where FYM application was there *i. e.* T_8 and T_9 . There was overall increase in inorganic-P and total-P status, but status of available-P decreased due to calcareous soil, but due to chelating effect of organic material in treatments T_8 and T_9 there was increase in the availability of phosphorus after long run in the LTFE soils. Available-P status of LTFE soil at initial stage was low in category ($< 28 \text{ Kg P}_2\text{O}_5 \text{ ha}^{-1}$) in most of the treatments, after long run (8th year) it was more decreased except in treatments which were received FYM (T_8 and T_9). Due to application of FYM available status of P_2O_5 in LTFE soil increased up to high category ($> 56 \text{ Kg P}_2\text{O}_5 \text{ ha}^{-1}$) from low category. After a span of 8 years most of the fractions of phosphorus depleted negatively *i.e.* increased in status, but there was also found positive depletion in case of Al-P, Fe-P, Ca-P and available-P, it might be attributed to transformation of phosphorus and plant uptake as an available-P. Application of FYM also prevents depletion in available-P status of soil.

Key words : AICRP-LTFE soils, Total phosphorus, Total inorganic phosphorus, Organic phosphorus, fractions of the inorganic-P, Saloid bound-P, Al-P, Fe-P, Reductant soluble-P, Occluded-P and Calcium-P

Phosphorus is essential nutrient for the plant growth. The importance of phosphorus in maintenance of soil fertility and improving crop productivity is well recognized in Indian soils, most of which are either deficient or marginal in P status. Soils are also known to vary widely in their capacity to supply phosphorus to plants. Only a small fraction of total P in soil is found in plant available form. The crop response to P has been a controversial issue especially for cotton (Oosterhuis, 2001) and groundnut in the soils of Gujarat (Golakiya, 1998). The mania of organic farming has made this issue a moot point. To clarify this aspect, the study of the changes in the fractions of P at regional level and in a site specific LTFE will provide a sound base. The ultimate answer to anti-fertilizer arguments is to be sought from the dynamics of the forms of P on large scale over a period of time. Hence, there is a need for depth study of dynamics of different fractions of Phosphorus under long term cultivation, present investigation was carried out.

MATERIALS AND METHODS

Surface soil samples (0-15 cm) were collected from the AICRP-LTFE soils conducted on groundnut-wheat sequence in RBD at Instructional Farm Junagadh Agricultural University, Junagadh during the year 1999 (Initial), 2002-03 (4th year, after wheat) and 2006-07 (8th year, after wheat). The treatments were T_1 - 50 % NPK of recommended doses in G'nut-Wheat sequence, T_2 -

100 % N P K of recommended doses in G'nut -wheat sequence, T_3 -150 % N P K of recommended doses in G'nut -wheat sequence, T_4 - 100 % N P K of recommended doses in G'nut -wheat sequence + ZnSO_4 @ 50 kg ha^{-1} once in three year to G'nut only (*i.e.* '99, 02, 05 etc), T_5 - N P K as per soil test, T_6 - 100 % N P of recommended doses in G'nut -wheat sequence, T_7 - 100 % N of recommended doses in G'nut -wheat sequence, T_8 - 50 % N P K of recommended doses + FYM @ 10 t ha^{-1} to G'nut and 100 % N P K to wheat, T_9 - Only FYM @ 25 t ha^{-1} to G'nut only, T_{10} - 50 % N P K of recommended doses + *Rhizobium* + PSM to G'nut and 100 % N P K to wheat, T_{11} - 100 % N P K of recommended doses in G'nut -wheat sequence (P as SSP) and T_{12} - Control. These soil samples were analyzed to determine the different forms of phosphorus on the basis of method mentioned below.

Total Phosphorus:

The total-P was determined by digesting 1.0 g, of 0.15 mm sieved, oven dried soil with HNO_3 and HClO_4 acids and then followed vanadomolybdate method (Hesse, 1971).

Total inorganic phosphorus:

The inorganic-P was extracted with Conc. HCl (Hesse, 1971) and the P in solution was determined with chlorotannous reduced molybdophosphoric blue colour