

Research Paper :

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

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ABSTRACT

The application of FYM also maintained or increased potassium status of LTFE soils. In treatments of FYM (T_8 and T_9), the status of potassium fractions increased. There was overall decrease in available- K_2O status of LTFE soils after 8 year, except in treatments which received FYM (T_8 and T_9), where K_2O status of soil increased as compared to initial status. Water soluble-K also decreased in LTFE soil after a span of 8 years, except in treatments which received FYM (T_8 and T_9). Same results were also recorded in case of exchangeable-K, HNO_3 soluble-K, reserve-K and total-K, here also approved that for maintaining K fertility of soil at long run, it is essential to add organic fertilizer with inorganic ones for maintaining available potassium level in soil, application of organic manure is essential. In fact, all fractions of potassium decreased after a long run in intensive cropping of LTFE soils without addition of FYM. So it is alarming us to use organic fertilizer with inorganic one for maintaining K fertility status of soil in long run. At initial stage of experiment (1st year) available- K_2O status of LTFE soils showed high category ($> 280 \text{ Kg } K_2O \text{ ha}^{-1}$), but after long run (8th year) it decreased to medium category ($140\text{-}280 \text{ Kg } K_2O \text{ ha}^{-1}$), except in treatment of FYM application (T_8 and T_9), where increment in K_2O level was found rather than its depletion. Further it was established that, FYM is essential for maintaining soil fertility at long run. Similar results were also recorded in case of all other fractions of potassium.

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Potassium (K) is absorbed by plants in larger amounts than any other nutrient except N. Although total soil content exceeds crop uptake during a growing season, in most cases only a small fraction of it available to plants. Total soil K content ranges between 0.5 to 2.5% and it is lower in coarse-textured soils formed from sandstone or quartzite and higher in fine textured soils formed from rocks high in K-bearing minerals. The potassium is mobile in plant, unlike other major elements, it's not the integral part of the plant component but, it acts as a catalyst for carbohydrate and nitrogen metabolism, protein synthesis as well as formation, break down and translocation of starch. It also regulates the activity of other essential elements in plant. It neutralizes physiologically important organic acid and activates various enzymes promoting the growth of meristematic tissues. It also plays an important role in monitoring the water balance in plants. After introduction of high yielding varieties and intensive and multiple cropping system along with use of high analysis nitrogenous and phosphatic fertilizers on long run resulting now the soils are started depleting in potassium from high to medium and up to low levels as evidenced by soil testing and crop response (Prasad, 1992). In such conditions crop may respond to potassium application.

Therefore, there is a need to study the dynamics of different forms of potassium in intensive agriculture on long run basis, 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