

Research Paper :

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

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ABSTRACT

With respect to forms of nitrogen it can be deduced that there was a declined in soil nitrogen levels. Ammonical-N and Nitrate -N status of LTFE soils in general decreased after long run, but it increased in the treatment T₁₀ due to fixation of atmospheric nitrogen by *Rhizobium* bacteria. Whereas available-N status in treatments which received FYM (T₈ and T₉), marginally increased. At initial stage of experiment (1st year) available nitrogen status of LTFE soils falls under medium range (250-500 kg N ha⁻¹), but after 4th year it decreased to lower range (<250 Kg N ha⁻¹) in most of the treatments and then after 8th year all treatments exhibited low range of available nitrogen status in soil, except treatments which received FYM (T₈ and T₉) which showed medium range in available-N status of LTFE soils. It was established here that for maintaining N fertility of soil at long run, addition of FYM is essential with inorganic fertilizers. In LTFE soils the per cent depletion of different forms of nitrogen was interesting under all treatments. The total-N and O. C. showed negative depletion after a span of 8 year and available-N exhibited positive depletion in all treatments.

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Nitrogen is an important element for plant life. In the importance it comes only next to carbon, hydrogen and oxygen as it figures in the composition of proteins, nucleic acid, growth hormones, vitamins etc. It is also one of the main structural components of a living organism. Only a small proportion of total N is present in the available forms (NH₄⁺ and NO₃⁻) in the soil. Nitrate is first reduced to ammonium level in a series of steps in order to be absorbed by the plants. The average Indian soil contains about 0.05 per cent nitrogen. Nitrogen occurs in soil as inorganic and organic compounds. Nitrates and nitrites of calcium, potassium etc. are the main inorganic forms of nitrogen while organic form chiefly the proteins. The mineral N of the soil exists as NH₄⁺, NO₃⁻ and sometimes NO₂⁻ either in soil solution, on exchange sites of soil particles or as NH₄⁺ held by clay minerals. Some gaseous nitrogen may also be found in the soils atmosphere and dissolved in soil solution. In most of the soils, the bulk of nitrogen is as an organic form and usually near the surface. The inorganic forms of nitrogen include nitrite which is usually a transitional stage between nitrate and ammonium, and is easily removed. Nitrogen also occurs as exchangeable ions, fixed forms and traces of gaseous forms such as dinitrogen and nitrogen monoxide and elemental nitrogen. Considering this fact, there is a urgent need to study the dynamics of different fractions of nitrogen under intensive cropping system and hence, the present investigation was planned.

MATERIALS AND METHODS

Surface soil samples (0-15 cm) were collected from the AICRP-LTFE soils conducted on groundnut-wheat sequence in Randomized Block Design replicated four times 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 T₁- 50 % NPK of recommended doses in G'nut-wheat sequence, T₂- 100 % N P K of recommended doses in G'nut -wheat sequence, T₃-150 % N P K of recommended doses in G'nut -wheat sequence, T₄ - 100 % N P K of recommended doses in G'nut -wheat sequence + ZnSO₄ @ 50 kg ha⁻¹ once in three year to G'nut only (*i.e.* '99, 02, 05 etc), T₅ - N P K as per soil test, T₆ - 100 % N P of recommended doses in G'nut -wheat sequence, T₇- 100 % N of recommended doses in G'nut -wheat sequence, T₈ - 50 % N P K of recommended doses + FYM @ 10 t ha⁻¹ to G'nut and 100 % N P K to wheat, T₉ - Only FYM @ 25 t ha⁻¹ to G'nut only, T₁₀ - 50 % N P K of recommended doses + *Rhizobium* + PSM to G'nut and 100 % N P K to wheat, T₁₁ - 100 % N P K of recommended doses in G'nut -wheat sequence (P as SSP) and T₁₂ - Control. These soil samples were analyzed to determine the different forms of nitrogen on the basis of method mentioned below.

Total nitrogen:

Total nitrogen was determined by the modified