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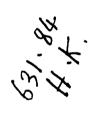
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INTRODUCTION

Ritrogen is composity the most important fertilizer element applied to sail, its offects being manifested quickle on plant growth and ultimately on crop yields. The marked increase in crop yields, in the world, recorded during the past 30 years could largely be linked with the steadily increasing rates of nitrogen application.

Phosphorus, potassium, as well as the other essential nutrients are in a sense less important, as they are needed in smaller amounts besides that agricultural soils are commonly able to provide a larger percentage of the crop requirements for these elements compared to nitrogen. Recently larger rates of application of nitrogen, especially to soils that are low in this element has been greatly increased.

From a scientific standpoint, there has been extensive studies lasted for many years to investigate the efficiency of nitrogen applied to soils, What is the fate of the nitrogen after it reaches the soil? How much of it is actually recovered in harvested crops and how much is lost, and through what channels, or by what mechanism?

All those queries as some disvers. The extension in the ulture area is sometimed out on the vestern coastal calcareous soils of U.A.R. Thus, it seems reasonable to study the N balance in these soils, in a trail aiming to clarify nitrogen losses and gains under our local conditions.

REVIEW OF LITERATURE

H. THE DE LICERATURE

During the past fifty years or more, many attempts have been made to draw up notrogen balance sheets for both cropped and unempped soils.

On the sade of income, accurate values for additions in forms of rainfall, irrigation water, seeds, fertilizers and manures are usually available. However, if legumes are grown, there are difficulties because the quantity of nitrogen supplied from the air by Rhizobia is not likely to be known accurately under field conditions.

On the expenditure side of the balance sheet, accurate values for the nitrogen removed in harvested crops are commonly available. As for wind and water erosion, there are usually of only minor importance in carefully planned field studies. Leaching, however, presents a major problem.

Nitrogen Gain

Maintenance of soil nitrogen depends mainly on symbiotic and non-symbiotic nitrogen fixing organisms. The nitrogen fixation is carried out by two types of biological systems:

a) the plant-bacteria symbiosis in which the nitrogen is fixed by close co-operation between higher plants and micro-organisms, particularly in root or leaf tissues.

1- Non-symbiotic mitrogen fixation :

nitrogen.

Fixation by higher plants themselves had never been proved unequivocally, although claims to have done so have been made periodically since the discovery of nitrogen fixation. As an example is the claim by Chakraborty and Gupta (1959) that rice plants grown in nutrient solution fix nitrogen. This was, however, refuted by Hart and Roberts (1961) who repeated these experiments under more carefully controlled conditions. Müller (1963) reported gains of nitrogen by pea and maize plants grown with their root system in sterile nitrogen-free nutrient solutions to which vitamin B₁₂ was added.

Russian workers claim to have extracted from higher plants, an enzyme which is capable of N-fixation. Such extracts from birch, tobacco and begonia leaves and from rye, wheat, oats and timothy showed enrichment of up to 2 atom percent excess $\rm N^{15}$ in the ammonia + amide fraction after 30 minutes exposure to labelled $\rm N_2$ (Turchin, Berseneva and Zhidkikh, 1963).

blue-green algae. This view has been confirmed by Singh (1961) in his monograph on the role of blue-green algae in the nitrogen economy of Indian agriculture. The inoculation experiments made by Bjalfve (1956, 1962) also indicated that algae may fix appreciable amounts of nitrogen in soil. Using flasks for his experiments, he found that algae fixed 350 lb/ac/an in light in contrast to 20 lb/ac/an for those kept in dark, using sandy soil supplemented with P, K, Ca and straw. Relwani (1963) inoculated a soil with a mixed culture of blue-green algae. His experiments were also repeated in pots and field. His results indicated that the algae provided an effective substitute for dressing of ammonium nitrogen.

Soils contain a number of free living nitrogenfixing organisms, and though most investigations had been focused on two groups of bacteria i.e. Azotobacter and clostridia; the demonstration in recent years shows that a wide
variety of micro-organisms posses nitrogen-fixing ability.

Many workers (Jensen, 1950 and Allison, 1955), at least
those outside of Russia and India, consider that the average quantity of nitrogen fixed in the soil by free-living
organisms is small; thus some believe that their effect
should be neglected in the balance.

Other reports, however, indicate that approciable amounts of mitrogen could be fixed in field plots, or lysimeters, usually estributed to non-symbiotic bacteria. Chapman, Liebig and Rayner (1949) reported gains up to 40 pounds of N per acre annually under mustard, and Gel'Tser (1961) reported from 45 to 66 kg/hectar/year under perennial grasses and iries. On studying changes occurring in the nitrogen fractions in sharaqi soils Abdel-Malek and Rizk (1966) found that the increase in nitrogen specially organic fraction is due to the increase in Azotobactor counts. Such is supported by the findings of Taha et al. (1967) who stated that the increase in the amount of nitrogen fixed could be attributed to the presence of high densities of Azotobacter and clostridia. The average amounts of nitrogen fixed per week were found to be 0.61, 0.49, 0.97, 1.22 and 2.60 g H/100 gof carbon oxidized in the O, N, NP, NPK and FYM treatments respectively.

Call for soil inoculation by the free living N-fixing has appeared recently from the belief that certain beneficial micro-organisms could be scanty in a particular soil. This had been practiced on a wide scale, usually with Azotobacter cultures, by the Russians. In contrast, other views find a little critical evidence concerning the increases in

The control of the co

on the action of mineral nitrogen of mineral M suppress evidenced that high concentrations of mineral M suppress nitrogen fixation (Jensen, 1950). Delwiche and Wijler (1956) found that 1.0 - 1.5 m.e. nitrate/g soil prevented nitrogen fixation by Azotobacter. Ebert (1959) showed that amide-, NH₄⁺-, and NO₃-N strongly depressed fixation due to preferential uptake of the applied nitrogen. Iswaran (1960) found that the added N innibited nitrogen fixation, ammoniacal nitrogen showed the smallest effect while NO₃-N exhibited the largest one. Greenland (1962) found that 200 p.p.m. NO₃-N was sufficient enough to prevent any increases in soil N during incubation, while in the absence of nitrate increases up to 10% of the initial total N were obtained.

Shawky (1970) on studying the availability of soil ammoniacal nitrogen to Azotobacter and its effect on mitrogen fixation found that the fixation took place in spite of the presence of relatively big amounts of