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Review Article

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Nutrient analysis of soil samples from various places

Sonikajha and Suneetha V.

School of Biosciences and Technology, Vellore Institute of Technology, Vellore, Tamilnadu

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ABSTRACT

The analysis of nutrient is done in order to measure the nutrient that is present in the soil and it provides all the necessary information that is required in order to set the target of nutrient application. It also allows the detection and monitoring of the changes in the parameters of soil. The result depends on quality of soil samples. In this review paper, the soil samples collected from horticulture spot, lakeside, agriculture area and mountain are studied. For the estimation of total Nitogen, available Phosphorus, available potassium and exchangeable Calcium and Magnesium the methods used are Kjeldahl method, Bray's or Olsen's method, Flame photometric method and EDTA titration method respectively.

Keywords: kjeldahl method, topsoil, fertilizer, flame photometric method, Bray's method, EDTA, soil sampling, extractant

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INTRODUCTION

Nitrogen (N) , potassium(K) and Phosphorus (P) are very essential for plant growth and also for the strengthening of reproductive parts , activation of enzymes and carbohydrate metabolism[1]. Nitrogen and Phosphorous are not available to the plants directly. They are incorporated in the organic material. Potassium (K) is present in elemental form, exchangeable form or as a part of mineral lattices. Calcium(Ca) and Magnesium(Mg) interfere in soil activity as well as activate a number of plant enzyme systems. The deficiency of any of these elements has retarding effect on the growth of plant[1,2].

1.1 Nitrogen

Nitrogen occurs in several forms: Nitrate(NO_3^-) and nitrite(NO_2^-) anions, ammonium(NH_4^+) and organic compounds. For high production, the application of N fertilizers can be done. This can be determined after the estimation of soil Nitrogen content. If the soil Nitrogen content is low, the application of N fertilizers becomes indispensible[1,4]. Adequate supply of this element is associated with the plant growth and the deep green plant color. The excess of this element can delay the crop maturity and prolong the growth period[5]. The soil which is deficient in Nitrogen has stunted plant growth and they show signs of *chlorosis* too[3,11]. There should be a proper quantity and proportion of soluble N which can be absorbed by the crop. This quantity is influenced by some local site factors like rooting habits of crop, removal of nitrate by leaching, the status of moisture in that part of root zone where the Nitrogen resides and presence or absence of the residues of crop[11].

1.2 Phosphorus

Phosphorus occurs in soil in both organic and inorganic form[6]. The inorganic form is more important for the crop nutrition[5,7]. Most of the P is absorbed by the plants as HPO_4^- and $H_2PO_4^-$ ions or soluble organic phosphates[11]. The

availability of Phosphorus in soil is very variable because it depends on the mineral soil composition, organic materials and its rate of decomposition, local climatic conditions and the morphological properties of soil. The supply of P at the early vegetative growth phase strengthens its reproductive parts and formation of seeds. It can also hasten the maturity of plant and it is said to improve the resistance of certain fruits, vegetables and forages from disease. Its deficiency will lead to discoloration of older leaves and leaf edges[8,9].

1.3 Calcium

It is present in the soil either as soluble Ca_2^+ on the base complex or as free Calcium carbonate ($CaCO_3$). In temperate soil it is present in abundance but it is absent in highly weathered tropical soils. It has a double role in the fertility of soil. It acts as plant nutrient at the same level as N, P and Mg as well as a pH regulator[10].

1.4 Magnesium

It is the constituent of chlorophyll molecule, related to the metabolism of Phosphorus. It also activates number of plant enzymes. It is absorbed by the plant roots as Mg^{++} ion[14,15]. If the soil has deficiency of Mg then the plant grown in such soil will become pale yellow and then turns brown and necrotic[14].

1.5 Potassium

It is present in the soil in different forms. K in the soil solution which is in equilibrium with exchangeable K^+ is difficult to distinguish from it, the exchangeable K^+ that is affected by the content of clay, mineral decomposition intensity and the fertilizer's quantity[13,15]is also a form of Potassium in soil.

The requirement of plant for K is high relatively because plants absorb it in higher amount than other nutrient. The deficiency of K leads to *Chlorosis* or *necrosis*.

EXPERIMENTAL SECTION

1.6 Sites used for soil sample collection: all the soil samples were collected from different sites located in Vellore. Four types of soil samples were collected. A.) soil sample from horticulture spot. B.) soil sample from lake side. C.) soil sample from Mountain. D.) soil sample from agricultural area.

1.7 Soil sampling: The topsoil samples were taken from 0-10 cm of depth at four equidistant positions in each plot. When the sampling was done, the surface of soil in all plots was dry.

1.8 Estimation of soil nutrient:

A. Total nitrogen is estimated by kjeldahl method[2]

B. Available Phosphorus is estimated by two methods: Bray's method which is the best method for acidic soils and olsen's method which is best for neutral and alkaline soils[2].

C. Available Potassium is estimated by Flame photometric method[2]

D. Exchangeable Calcium and Magnesium is usually determined in the neutral ammonium acetate extract of soil. The extraction is carried out by shaking the soil and the extractant of mixture is followed by either filtration or centrifugation. Then the determination of Ca and Mg is done either by EDTA titration method or by the atomic absorption spectrophotometer after removal of organic matter and ammonium acetate[2]

CONCLUSION

Nutrient analysis is the measurement of nutrients present in the soil which is removed from the soil using an extracting solution. The nutrient analysis of soil will provide the necessary information to set the target of nutrient application. It is then used to set up the target of nutrient application which is then used to calculate the rate of manure and fertilizer application. The results of tests from regular field sampling will allow the detection and monitoring of the changes in soil parameters (pH, nutrients, salinity) with the time[1].

It is must for the soil analysis results to be interpreted within the context of the expected yield response for the crop which is to be grown under the specific management and environmental conditions. The results depend on the quality of soil samples collected and also the strategy of sampling that is used[5]. If the samples are poor it will lead to inaccurate nutrient recommendations.

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