

Analysis of Soil to Ensure NPK Proportion at Various Sites of Manikpunj Village, District Nashik (M.S.) India

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Abstract: Nitrogen (N), phosphorus (P) and potassium (K) are the vital macronutrients of the soil that potentially controls the growth and development of various crops. Adequate availability of NPK in the soil is important to accelerate crop growth and improve yield. It is time to investigate the NPK proportion of different soils before growing crops to minimise losses for farmers and crop choice. Soil samples from various sites of Manikpunj village have been collected by visiting the fifteen farmers, and analysis of NPK has been carried out using standard methods. The proportion of NPK in various soils is controlled by rocks, climate, geomorphology, biological activity, and time. In the present work, the authors gathered data regarding NPK proportion in soils collected from various sites of Manikpunj village in Nashik district. It was observed that different areas of soil had different physicochemical characteristics. Proper use of suitable inorganic fertilisers (N-P-K) would effectively sustainable the management and improve soil fertility status. Such types of monitoring of soil samples are beneficial to knowing the concentration of various parameters present in the soil. From the above study, it is observed that, in the soil of the Manikpunj village area, the potassium is present in samples F2, F3 at a higher concentration and moderate concentration of nitrogen in samples F1, F5, F6 and samples F6, F9, was observed with very less phosphorus content. As per our data, we recommended that Manikpunj village farmers preferably Cultivate leguminous crops once a year or use biofertilisers, Vermicompost fertilisers, and chemical fertilisers rich in nitrogen and phosphorus to cultivate various crops in their field.

Keywords: Soil, NPK, Crop, Manikpunj, Growth, Biofertilizers

I. INTRODUCTION

The soil may be defined as a thin layer of earth crust that serves as a natural medium for the growth of plants. It is the unconsolidated mineral matter that has been subjected to and influenced by environmental factors, parent materials, climate, organisms and topography, all acting over periods(1). Soil differs from its parent's material in the morphological, physical, chemical and biological properties. Also, different soils differ in some or all the properties, depending on the difference in the genetics and environmental factors. Some soils are red, some are black, some are deep, some are shallow, some are coarse-textured, and some are fine-textured. The use of organic manure, green manuring, green leaf manuring, and crops residue with inorganic fertilisers reduces the demand for inorganic fertilisers. It increases the efficiency of applied nutrients due to their favourable effect on soil's physical, chemical, and biological properties (2). Soils act as natural sinks and filters for various metals (Pendias and Pendias, 1984). Proper use of suitable inorganic fertilisers (N-P-K) would effectively sustainable the management and improve soil fertility status. Such types of monitoring of soil samples are beneficial to knowing the concentration of various parameters present in soil (3).

Soil serves to various degrees as a reservoir of nutrients and water for crops, providing mechanical anchorage to roots. The components of soils are minerals, organic matter, water and air, the proportions of which vary and which together form a system for plants growth. Physical characteristics of soil include depth of topsoil, porosity, water holding capacity, texture, crushing and aggregation. (4). To analyse soil quality, we should study the availability and amount of Nitrogen, Phosphorus and Potassium contents in the soil. The fifteen samples were collected from various sites in the Manikpunj village, and an analysis was performed to know its NPK proportion. Soil scientists of the present decade (5&6) analysed NPK contents of different Soils.

II. MATERIALS AND METHODS

2.1 Soil Sample Collection

In the present investigation, soil samples were collected from fifteen farmer's fields in February 2022. The soil was sampled from four corners and the farmer's land centre. It is noticed that the soil collected represents higher clay content. This soil analysis involves sample preparation, digestion or extraction and finally, determination of NPK concentration. Soil samples were hand crushed to the size of natural grain and sieved to obtain minus 80 ASTM mesh to obtain a good anomaly to the background contract as proposed by (7).

2.2 Sample Preparation and Analysis of Soil

The soil samples were subjected to sample preparation. This includes hand crushing, sieving, grinding, and lastly, dissolving in distilled water. This stage helps in obtaining a truly representative homogeneous sample. Care was taken to avoid contamination, and finally, using "Agrinex Soil Health Kit-40 capsules (NPK & pH). The various concentration of NPK was analysed.

III. RESULTS AND DISCUSSION

3.1 Nitrogen Contents in the Soil

Nitrogen (N) is an important nutrient that promotes rapid plant growth and improves grain yield and quality. Nitrogen is generally the most limiting nutrient as it is needed in large amounts and is readily lost as a gas (volatilised) and by leaching (washing out of the root zone) (8). The results of a study presented in the table indicated that in all the soil samples of the Manikpunj village area, the available N was found to be low to medium (10 to 30 kg acre⁻¹). It may be due to the differences in organic matter content of soil (9) and low rainfall in this area.

The Nitrogen concentration range in soils was between 10- and 30 kg acre⁻¹. The average N concentration in the studied soil samples was 24.33 kg acre⁻¹. Table 1 shows the detailed data on nitrogen composition in different soil samples. It is clear from the data that concentration contours noticed from samples F1, F4, F7, F8, F9, F10, F12, F14 and F15 showed higher nitrogen concentration and the samples F1, F5, and F6 showed lower concentration contours. This difference in nitrogen concentration is due to fewer humus contents and little soil quality, and this will provide an idea about the selection of crop plants to be cultivated.

3.2 Phosphorus Contents in the Soil

Phosphorus (P) is an essential plant nutrient for root development, tillering, early flowering, and ripening. It is especially deficient in sandy soils with low organic matter contents; it varies in acid and alkaline soils (10). Table 1 shows the phosphorus composition in the soil samples from the study area. The soil's minimum and maximum phosphorus values were 10 kg acre⁻¹ and 25 kg acre⁻¹, respectively.

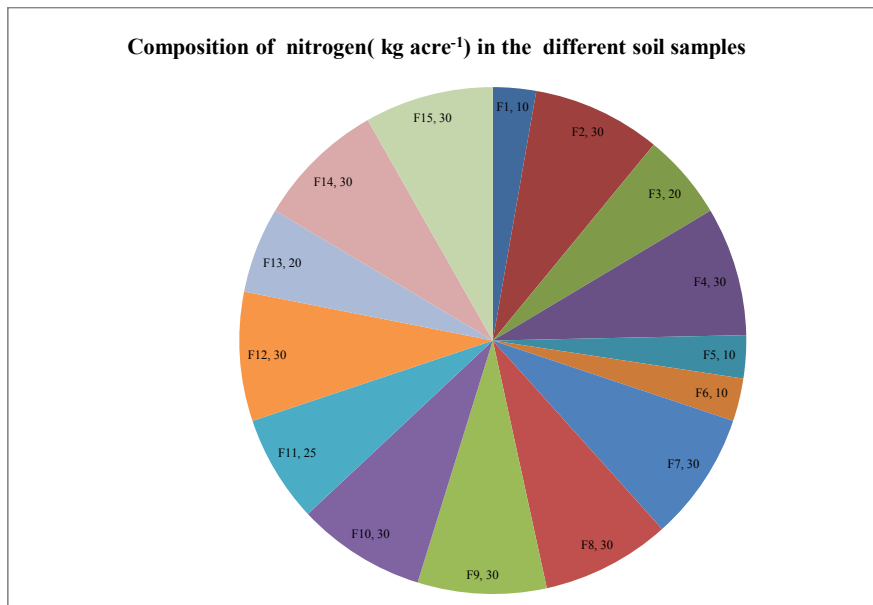
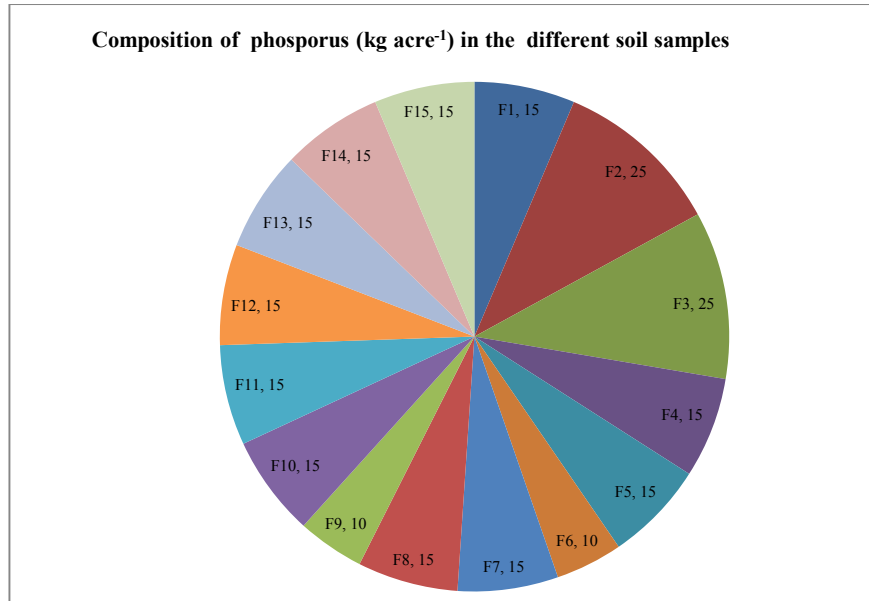
It is clear from the data that concentration contours noticed from samples F2 and F3 showed higher Phosphorus concentration, and the samples F6 and F9 showed lower concentration contours. The variation in phosphorus availability might be due to the CaCO₃ content in the soil (11). Low rainfall in this area differed soil properties and agronomic practices.

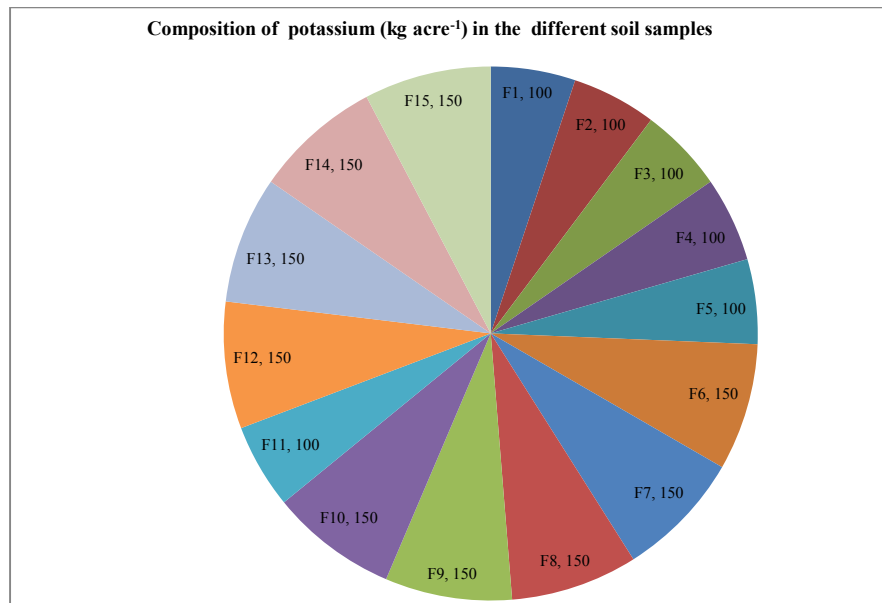
3.3 Potassium Contents in the Soil

Potassium is one of the important parameters for the development of the plant. It is involved in many plants' metabolic reactions, including the regulation of photosynthesis and the production of sugars used for various plants' metabolic



processes (12). Table1 shows the composition of potassium in the soils from the study area. Its minimum value was 100 kg acre⁻¹ and its maximum value was 150 kg acre⁻¹. It is clear from the data that concentration contours noticed from samples F6, F7,F8,F9,F10,F12,F13,F14 and F14 showed higher phosphorus concentration and the samples F1,F2,F3,F4,F5, and F11 showed lower concentration contours. Applying synthetic fertilizers to cultivate crops may have resulted in persistently high potassium values in the study area.



**Table 1:** NPK composition observed in studied soil samples

Sr. No	Location	N	P	K
F1	Manikpunj Village	10 kg acre ⁻¹	15 kg acre ⁻¹	100kg acre ⁻¹
F2	Manikpunj Village	30 kg acre ⁻¹	25 kg acre ⁻¹	100 kg acre ⁻¹
F3	Manikpunj Village	20 kg acre ⁻¹	25 kg acre ⁻¹	100 kg acre ⁻¹
F4	Manikpunj Village	30 kg acre ⁻¹	15 kg acre ⁻¹	100 kg acre ⁻¹
F5	Manikpunj Village	10 kg acre ⁻¹	15 kg acre ⁻¹	100 kg acre ⁻¹
F6	Manikpunj Village	10 kg acre ⁻¹	10 kg acre ⁻¹	150 kg acre ⁻¹
F7	Manikpunj Village	30 kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹
F8	Manikpunj Village	30 kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹
F9	Manikpunj Village	30 kg acre ⁻¹	10 kg acre ⁻¹	150 kg acre ⁻¹
F10	Manikpunj Village	30 kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹
F11	Manikpunj Village	25 kg acre ⁻¹	15 kg acre ⁻¹	100 kg acre ⁻¹
F12	Manikpunj Village	30 kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹
F13	Manikpunj Village	20 kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹
F14	Manikpunj Village	30 kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹
F15	Manikpunj Village	30kg acre ⁻¹	15 kg acre ⁻¹	150 kg acre ⁻¹

It was observed that different areas of soil had different physicochemical characteristics. Proper use of suitable inorganic fertilisers (N-P-K) would effectively sustain the management and improve soil fertility status. Such types of monitoring of soil samples are beneficial to knowing the concentration of various parameters present in the soil. From the above study, it is observed that, in the soil of the Manikpunj village area, the potassium is present in samples F2, F3 at a higher concentration and moderate concentration of nitrogen in samples F1, F5, F6 and samples F6, F9, was observed with very less phosphorus content. As per our data, we recommended that Manikpunj village farmers preferably cultivate leguminous crops once a year or use biofertilisers, Vermicompost fertilisers, and chemical fertilisers rich in nitrogen and phosphorus to cultivate various crops in their field.

REFERENCES

- [1]. Mujawar. K, Dongare Y., Merge. N, Chaudhari. H, Kharat. G, Patil. A Kamm. R, Gaikwad. A. and Shaikh. I, 2019 "Analysis of Soil to Suggest Proper Crop Pattern from Pokhara Kapur Area, Taluka Mohol, District Solapur, Maharashtra. *J. of Infor. And Comput. Sci*, 9 (12).
- [2]. Meshram. M. K, B. S. Dwivedi, K. R. Naik, R. Thakur and K.S. Keram, 2017 "Impact of organic and inorganic sources of nutrients on yield, nutrient uptake, soil fertility and economic performance of rice in a to pichaplustert" *J. Soils and Crops*, 28(1): 31-36.
- [3]. Share. D.K, 2018, Geographical Analysis of Soil Fertility in Nashik District (Maharashtra), *Aayushi International Interdisciplinary Research Journal* 5(2).
- [4]. Yadav. R.K and N. Verma, 2019. Studies of some soil health parameters of districts Bareilly, U.P (India), *J. Soils and Crops*, 29(1): 68-73.
- [5]. Thornton. C.M and K. Shrestha, 2021. The Brigalow Catchment Study: Clearing and burning brig low (*Acacia harpophylla*) in Queensland, Australia, temporarily increases surface soil fertility before nutrient decline under cropping or grazing. *Soil Research*, 59: 146-169.
- [6]. Kaplan. R.D and H. S. Patode, 2004. Groundwater pollution due to industrial effluent at Tuppa, New Nanded, Maharashtra, India. *Environmental Geology* 46(6): 871-882.
- [7]. Fletcher. W.K, 1981. The analytical method in geochemical prospecting, In G.J.S, Govett (Editor); *Handbook of exploration geochemistry*, vol.1, Elsevier, Amsterdam, pp.255.
- [8]. Waikar. S.L, V. D. Patil and A. L. Dhamak, 2014. Status of macronutrients in some soils of Central Farm of MKV, Parbhani (Maharashtra). *J. of Agric. and Veteran. Sci.* 7(12): pp.54-5.
- [9]. Malewar. G. U, A. L. Dhamak and I. Syed, 1998. Inter-relationship forms of Fe with properties of soils of the semi-arid area of Northern Marathwada. *J. Maharashtra Agric Univ.*, 23 (2): 199-201.
- [10]. Syers. J. K, A. E. Johnston, D. Curtin, 2008. The efficiency of soil and fertiliser use Reconciling changing concepts of soil phosphorus behaviour with agronomic information, Food and Agriculture Organization of the United Nations, Rome. 18: pp.1-123.
- [11]. Bharambe, P. R. Kadam, S. G. Shinde, S.D. and Shelke, D.K (1999). Characterisation of soils Majalgaon canal command area (Jayakwadi project stage II) *J. Indian Soc. Soil Sci.* 47 (4): 749-754
- [12]. Hasanuzzaman. M, M. H. M. Borhannuddin Bhuyan, K. Nahar, Md. S Hossain, J. A. Mahmud, Md. S. Hossein, A. A. Chowdhury Masud, Moumita and M. Fujita, 2018. Review Potassium: A Vital Regulator of Plant Responses and Tolerance to Abiotic Stresses. *MDPI, Agronomy*, 8(31).