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Determination of pH and NPK of Soil in Majalgaon of Beed District

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ABSTRACT

Healthy soil produces healthy crops. Soil is the only source of nutrients for cultivating the crops. Health and fertility of any soil can be determined from the investigation its pH and the content of available NPK i.e., nitrogen (N), phosphorus (P) and potassium (K). Changes in pH of the soil changes the nutrient availability to large extent. Nitrogen is a macronutrient and it has major role in plant metabolism and growth. After nitrogen, phosphorus is the next required macronutrient for the plants and it makes greater than 1% of dry organic matter. It has remarkable effect on the growth of plants. It is available in plants in the soil in organic as well as inorganic form. Potassium is an important nutrient for plant growth. It is also needed in ample amount for plant growth. The role of potassium in plants is in opening and closing of their stomata. Lack of these elements has adverse effect on the plant growth and lowers the yield. For the systematic study soil samples from eleven villages were collected that are located in Majalgaon taluka of Beed district, Maharashtra, India. Results obtained by analysis suggests that pH is more than 7 which indicates that all the soil samples are slightly alkaline in nature, available nitrogen is in low to medium range, phosphorus is in low in range, potassium is in medium range. For the determination of pH and NPK, instruments used are pH meter, Micro-Kjeldahl digestion and distillation unit, UV-Visible spectrometer and Flame photometer, respectively. Study recommends the use of fertilizers to improve the fertility status of the selected locations.

Keywords: pH, NPK, soil, Majalgaon

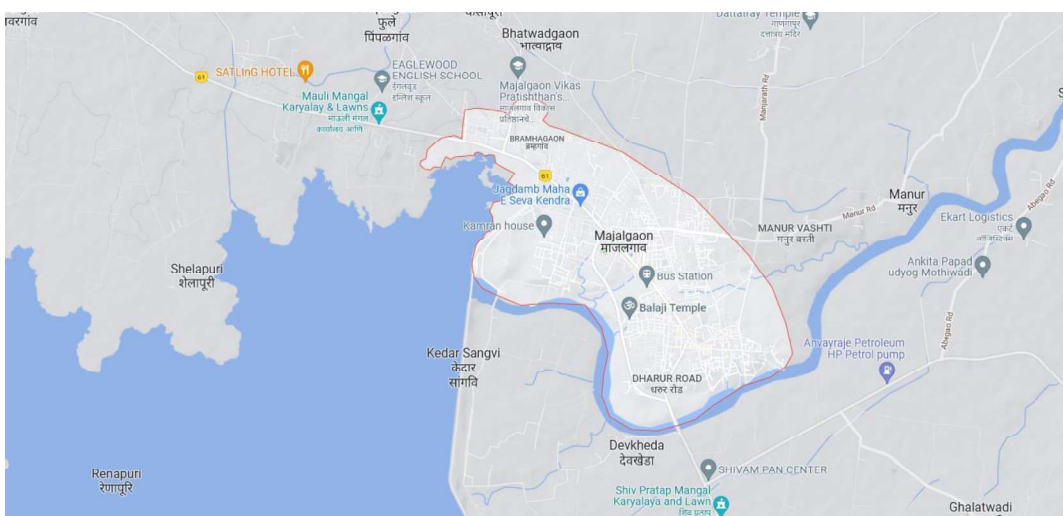
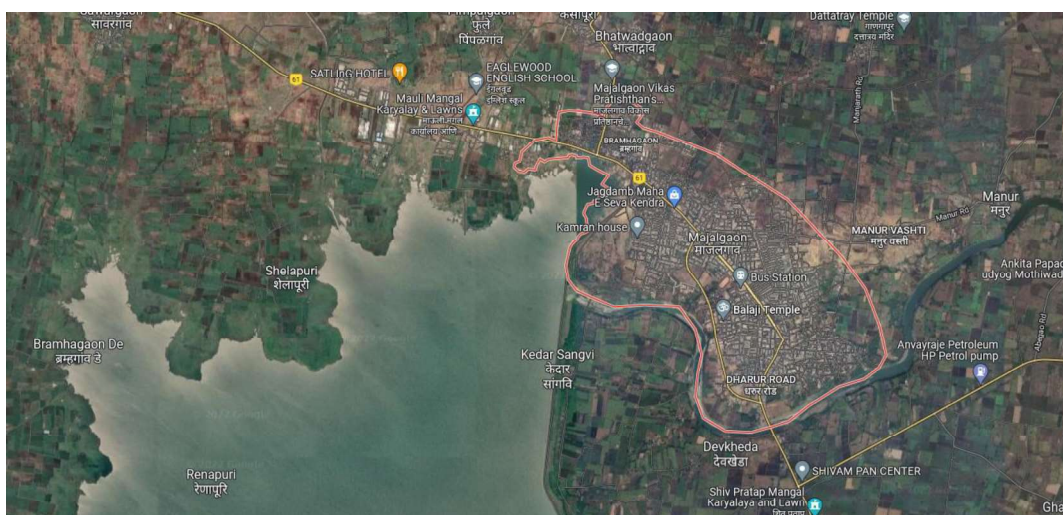
I. INTRODUCTION

Soil is essential for proper growth of plants. It should have all the required nutrients in ample quantity for proper growth and functioning in biological systems. If the soil is not healthy, plants grown on it will also lack those nutrients. If the soil has all the required nutrients then the crops grown are rich with nutrients. Thus, soil plays a crucial role in producing healthy crops and results in successful agriculture [1]. It is to be noted that production of crops also increases with soil rich in nutrients. To check health of soil it is important to check different constituents of soil by its analysis. What kind of fertilizer is to be used for a particular soil depends on the lack of nutrients in it. Different types of soil require different kind of fertilizers and in different amount.

Thus, type and amount of fertilizer to be used for a soil depends on the health of soil. Thus, by proper soil analysis one gets the idea about the nutrients present in soil. From this data, one can decide the type and amount of fertilizer to be used for the enrichment of soil. For different type of crops of soil different types of soil is needed. Thus, enrichment of soil with a particular nutrient relies on the type of crop to be produced in that soil [2]. This can be known from the analysis of soil.

This research is limited to the analysis of soil for pH, nitrogen, phosphorus and potassium. The fertility status of soil majorly depends on the pH and the said elements present in soil [1]. For this, eleven different village in Majalgaon taluka were selected. Therefore, analysis of soil in these regions is considered as the starting point for the determination of type and amount of fertilizer needed for the soil in these regions. Soil analysis provides the information about the type of soil and with this knowledge one can improve the fertility of soil by adding the fertilizers to yield the desire crops production. Determination of physico-chemical properties and available nutrient status of the soil of an area is vital for improving production of crops [3].

II. STUDY AREAS



The study area is eleven nearby villages of Majalgaon in Beed district. Beed district is under Maharashtra state in India. The eleven villages considered for soil analysis are Devkheda, Nagzari, Chinchagavan, Bramhgaon, Renapuri, Shelapuri, Punandgaon, Sawargaon, Mangrool, Laul and Limgaon. The selection of villages for soil analysis was determined from the amount of land used for crop productivity.

III. MATERIALS AND METHODS

Soil sampling

From each village three samples were collected from random areas. All together 33 samples were collected. After collection, soil samples were air dried and soil was made clean by removing roots, stones, pebbles etc. Soil samples were sieved and were collected in cloth bags with a tag of date and location from where the soil was collected. Total 4 parameters with respective methods as shown in table I were used to assess the physico-chemical properties of soil.

Table I: Showing the various parameters of soil sample analysis and methods. S. No	Parameter	Method
1	pH	pH metry
2	Available N	Micro-kjeldahl distillation unit
3	Available P	Spectrophotometry
4	Available K	Flame photometry

IV. RESULTS AND DISCUSSION

Soil pH: pH of soil strongly affect the nutrient availability and it is defined as the negative logarithm of hydrogen ion concentration (H^+). It is an notable property of soil as it greatly affects the microbial activity in the soil, physical properties of soil, and availability of nutrients to crops. pH affects all physical, chemical and biological properties of soil. Availability of N, P and K in general is low below 5 and above 7. pH values of different soil samples are shown in Table- II. It was found that the soil samples of all villages are slightly alkaline because their pH ranges between 6.9-8.5. Low alkaline characters may be due to less rain fall. Slightly alkaline pH of these soil samples may be due to the large quantity of calcium carbonate content in soil. The soil in these regions is basaltic organic which makes the soil rich in basic cations [4]. All these villages have a suitable pH for growing crops. There is no much pH difference between these eleven villages. The pH of the different sites is as shown in table II:

Available Nitrogen (N)

Nitrogen is a macronutrient and it is required in large quantity for plant metabolism and growth. Plant takes nitrogen in the form of NO_3^- ion, in an aerobic condition whereas in the form of NH_4^+ ion in anaerobic condition [5]. A Kjeldahl method was used for the determination of nitrogen content in the soil samples. The values of available Nitrogen of different soil samples are shown in table II. Nitrogen gives dark green colour to plants. Generally, nitrogen deficiency occurs in early growth and it results in delay in maturity in plants. It was observed that the soil sample of Shelapuri village has the highest nitrogen content with 485.40 kg/ha in the soil.

The lowest nitrogen content was found in Limgaon village with 210.65 kg/ha. It was found that the nitrogen content was low in some place and medium in some place. The nitrogen content in the soil low to medium as shown in table II.

Table II: Showing the value of pH and NPK content in soil samples

Sr. No.	Samples	pH	Nitrogen (kg/ha)	Remarks	Phosphorus kg/ha	Remarks	Potassium kg/ha	Remarks
1.	Devkheda	7.1	402.80	Medium	6.51	Low	217.322	Medium
2.	Nagzari	7.4	290.60	Medium	8.21	Low	275.421	High
3.	Chinchagavan	7.3	404.20	Medium	8.35	Low	268.641	High
4.	Bramhgaon	6.9	270.80	Low	7.23	Low	218.109	Medium
5.	Renapuri	8.4	365.50	Medium	7.41	Low	269.521	High
6.	Shelapuri	7.5	485.40	Medium	8.51	Low	250.468	High
7.	Punandgaon	8.2	365.21	Medium	10.29	Low	257.832	High
8.	Sawargaon	7.1	474.71	Medium	9.41	Low	252.322	High
9.	Mangrool	8.1	452.71	Medium	7.35	Low	274.324	High
10.	Laul	7.9	230.82	Low	8.41	Low	271.352	High
11.	Limgaon	7.7	210.65	Low	10.47	Low	220.720	Medium

Available Phosphorus (P)

Phosphorus is the next most essential macronutrient present in the biological systems, which makes more than 1% of dry organic matter [6]. It is also a major factor that affects plant growth. It is present in the soil in both organic and inorganic form. The values of available Phosphorus of different soil samples are shown in table-II. The primary role of phosphorus in a plant is to store and transfer the energy produced from the photosynthesis for growth and reproductive processes. Ample amount of phosphorus helps in root growth. Deficiency of P reduces the yield by delaying maturity, prevents growth, and restricts the use of energy by the plant. Phosphorus is a limiting nutrient for crops and forage for production. Soil samples of all villages selected shows that they are low in phosphorus content. The phosphorus content in the soils are found in the range of 6.51 kg/ha – 10.47 kg/ha which is quite low. Deficiency of P reduces the yield by delaying maturity, prevents growth, and restricts the use of energy by the plant. The details of phosphorus content in different soil samples is shown in table II

Available potassium (K)

Potassium is an essential nutrient for plant growth. It is a macronutrient since it is needed by plant in a major quantity [7]. Potassium helps the plant in opening and closing of their stomata. Lack of potassium reduces the plant growth and lowers the yield. The values of available potassium of different soil samples are shown in table- II. It was observed that soils of the villages have medium to high potassium content. It ranges from 217.322 kg/ha - 275.421 kg/ha.

V. CONCLUSION

Physico-chemical properties determination is needed to know the fertility status of soi. Form this data one can know the amount and type of fertilizer to be used to enhance the crop productivity. Soil fertility can be known

from this data. Thus, it can be concluded that pH of soil is good for the type of crops taken in these regions. Low content of nitrogen and phosphorus suggests to use fertilizers rich in these nutrients. As the amount of NPK is different in these regions different amount of fertilizer is to be used. Fertility status can be improved by addition of inorganic fertilizers and organic manures. Results obtained by analysis suggests that pH is more than 7 which indicates that all the soil samples are slightly alkaline in nature, available nitrogen is in low to medium range, phosphorus is in low in range, potassium is in medium range. Present study will help the farmers to know the NPK content of the soil and use of different types of fertilizers to get the better quality of produce and conservation of soil and water.

VI. ACKNOWLEDGMENTS

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