# Soil Analysis for Optimal Growth, Development, and Production, for Bajara in Bangarwadi, Satara

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**Abstract**

Soil analysis helps determine the levels of essential nutrients available to plants, including macronutrients (N, P, K, C, pH, EC). It ensures that plants receive the right amount of each nutrient for optimal growth and development, preventing deficiencies or excesses that can hinder yields. Soil analysis helps in making informed fertilizer recommendations, avoiding over- or under-fertilization, which can be costly and environmentally damaging. By understanding soil fertility, farmers can implement sustainable farming practices that maintain soil health and productivity for the long term. Soil analysis is a key tool for maximizing crop yields by ensuring that plants have access to the nutrients they need to thrive. Bajara, like other crops, requires adequate levels of nitrogen (N), phosphorus (P), and potassium (K), carbon (C), pH, EC for healthy growth and development. Representative soil samples are collected from the field to be analysed. The samples were analysed, where the levels of various nutrients are determined.

**Keywords:** pH, EC, Carbon, Nitrogen Phosphorus

## I. Introduction:

Soils under permanent pasture, especially peat ones, are usually characterized by acidic pH, shortage of available forms of phosphorus and potassium [1, 2]. For optimal (Pearl Millet) growth, development, and production, soil analysis is crucial to ensure plants receive all the necessary nutrients in balance, helping farmers make informed decisions about fertilizer applications and soil management practices. Soil analysis helps determine the availability of essential nutrients like nitrogen (N), phosphorus (P), and potassium (K), which are vital for Bajara growth [3]. By understanding the soil's nutrient status, farmers can apply fertilizers more efficiently, avoiding over-application and reducing environmental impact. Soil analysis can identify specific nutrient deficiencies in different crops, allowing for targeted fertilizer applications to correct these imbalances [4]. Regular soil testing helps monitor soil health and identify potential problems, such as soil acidity or salinity, which can negatively impact Bajara growth. By optimizing nutrient availability and soil conditions, farmers can achieve higher yields and improve their overall crop productivity [5]. Efficient fertilizer management, informed by soil analysis, helps protect the environment from nutrient runoff and water pollution. Soil analysis can help farmers make cost-effective fertilizer decisions, leading to better resource utilization and increased profitability [6-7]. Soil analysis goes beyond just nutrient levels, it also helps determine soil pH, organic matter content, and other physical and chemical properties that affect plant growth[8- 10]. The aim of the study is to evaluating the content of pH, EC, carbon, nitrogen, potassium and phosphorus in soil against the changes in pH caused by fertilization and liming. Therefore, it is necessary to find out the most beneficial source and level of pH, EC, carbon, nitrogen, potassium and phosphorus from the point of view of yield, nutrient uptake and quality of Bajara crops.

## II. Material and methods:

**Determination of pH from Soil**

Take 10gm soil sample in 50 ml glass beaker add 25ml distilled water & shake well keep 10min as it is. After 10 min deep PH electrode & record Ph of the soil.

**Determination of Electrical conductivity from Soil**

Take 10gm soil sample in 50 ml glass beaker add 25ml distilled water & shake well keep 10min as it is. After 10 min deep conductivity cell into it & record EC of the soil.

**Determination of available Organic Carbon from Soil**

Take 1 gm soil sample in 500 ml conical flask add 10 ml 1N $K_2Cr_2O_7$ with pipette shake well slowly. Add Conc.$H_2SO_4$ slowly cool and keep to 30 min. after 30 min add distilled water. Add 3-4 of ferroin indicator &titrate it with 0.5N $FeSO_4$ solution. End point orange to brown the green blue and finally red.

**Determination of available Nitrogen from Soil**

Take 5 gram in a long testing tube & 25 ml 0.33% $KMnO_4$ in it& put it in to kjeldals equipment. Take 25 ml of 2% boric acid in 250ml conical flask & add 3-4 drops of mixed indicator in it. Add 25 ml of 2.5% NaOH through reagent which placed outside of machine & directly connected to test tube in the equipment. The conical flask containing boric acid and mixed indicator which kept inside the machine where gas passed by pipe &still remove when color change against 0.1N HCl solution.

**Determination of available Phosphorus from Soil**

Take 2gm sample in 250ml conical flask. Add 15ml 0.5M $NaHCO_3$ into it & shake well & shake well. Filter it through ordinary filter paper. Take 5ml filtrate into a 50 ml volumetric flask. Add 4-5drpos of P-nitrophenol into it then yellow color obtained. Add 2.5 M $H_2SO_4$ that time $Co_3$ evolved. Till the solution become colorless. Add 10ml Ammonium molybidate into it. Add freshly prepared 1ml Stannous Chloride ($SnCl_2$).After the complete addition measure the absorbance at 660nm at double beam spectrophotometer.

**Determination of available Potassium from Soil**

Take 5 g soil sample in a 100 ml conical flask. Add 25 ml of 1 N ammonium acetate to it. Shake this solution on a shaker at 180 rpm for 1 hour. Then filter this solution using Whatman No. 42. Use this filtrate to determine K (potassium) using a flame photometer.

| Sr. No. | PH | EC | OC | N | P | K |
|---|---|---|---|---|---|---|
| 1 | 8.2 | 0.23 | 0.825 | 225.79 | 7.10 | 66.08 |
| 2 | 8.2 | 0.23 | 1.065 | 250.88 | 9.07 | 59.36 |
| 3 | 8.6 | 0.23 | 0.810 | 213.25 | 22.08 | 64.96 |
| 4 | 8.6 | 0.95 | 0.870 | 225.79 | 11.43 | 228.48 |
| 5 | 8.4 | 0.23 | 0.795 | 250.88 | 0.39 | 316.96 |
| 6 | 6.3 | 0.24 | 0.330 | 238.34 | 5.52 | 440.16 |
| 7 | 8.1 | 0.22 | 0.855 | 213.25 | 3.15 | 364.00 |
| 8 | 8.2 | 0.22 | 0.795 | 225.79 | 17.74 | 114.24 |
| 9 | 8.2 | 0.23 | 0.810 | 213.25 | 10.25 | 61.60 |
| 10 | 8.1 | 0.22 | 0.090 | 238.34 | 9.86 | 54.88 |

**Table No. 1: Macro nutrient analysis of soil samples**

## III. Results and Discussion:

For optimal Bajara growth, soil analysis is crucial to determine nutrient levels and pH, allowing for balanced fertilization and maximizing yields. The obtained results were reported in the **Table No.1** for per hector. This ensures plants receive the necessary nutrients, including macronutrients (PH, EC, N, P, K, OC,) and micronutrients, in the right proportions. Soil analysis reveals the levels of essential plant nutrients (like PH, EC, nitrogen, phosphorus, potassium, and Organic Carbon) and their availability to the plants. Soil pH significantly impacts nutrient availability. Bajara thrives in a pH range of 6.0 to 7.5, so testing helps determine if the soil is too acidic or alkaline and if amendments are needed. Soil analysis helps determine the type and amount of fertilizer needed to correct nutrient deficiencies and prevent over-fertilization, which can be costly and harmful to the environment. Beyond nutrients, soil analysis can assess soil texture, organic matter content, and other physical and chemical properties that influence water-holding capacity, aeration, and overall soil health. By addressing nutrient imbalances and optimizing soil conditions, soil analysis contributes to healthy plant growth, development, and ultimately, higher Bajara yields. Essential for leaf and stem growth, and overall plant vigour. Proper proportion of PH, EC, N, P, K, OC, help for root development, growing, flowering, and seed formation and resistance for disease, water uptake, and overall plant health. These are required in small amounts but are vital for various metabolic processes. These play important roles in plant structure and enzyme activity.

## IV. Conclusion:

For optimal Bajara growth, development, and production, soil analysis is crucial to ensure plants receive a balanced supply of all necessary nutrients, which can be determined through testing and then used to inform fertilizer and soil management practices. Here's a more detailed explanation ,Soil analysis helps determine which nutrients are present in the soil and at what levels, allowing farmers to identify potential deficiencies or imbalances. By understanding the soil's nutrient status, farmers can apply fertilizers more effectively, avoiding over- or under-fertilization, which can lead to reduced yields or environmental issues. Soil analysis can also reveal information about soil pH, organic matter content, and other factors that affect plant growth and nutrient availability, allowing for better soil management practices. By using soil analysis to guide fertilizer application, farmers can reduce their reliance on synthetic fertilizers, promoting more sustainable agricultural practices. Bajara, like other crops, requires macronutrients like nitrogen (N), phosphorus (P), and potassium (K) in adequate amounts for healthy growth. Soil pH plays a crucial role in nutrient availability. Most crops, including Bajara, thrive in a slightly acidic to neutral pH range (around 6.0 to 7.0). Soil pH can affect the availability of certain nutrients, so understanding the pH of the soil is important for effective nutrient management. Soil test reports typically provide information on the levels of various nutrients, including N, P, K, like macronutrients. Based on the soil test results, agronomists or extension services can provide recommendations for fertilizer types and application rates to address any identified nutrient deficiencies. By ensuring that plants have access to the necessary nutrients, farmers can expect higher yields and better quality crops. Balanced nutrition contributes to stronger, healthier plants that are more resistant to diseases and pests. Efficient fertilizer use reduces the risk of nutrient runoff and pollution of water bodies.

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