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# Analysis of Soil Sample from Phar Ti Ma Chike' Village Tract Loikaw Township

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## ABSTRACT

In this research work, the soil samples were collected from Phar Ti Ma Chike' Village Tract Loikaw Township. Soil samples were collected from the upper position near to the surface about 0-10 cm. Physicochemical properties of the soil samples were determined. In physical properties, the moisture and texture of the soil samples were measured by oven drying method and pipette method and then pH value was also measured by pH meter. Furthermore, the major components such as nitrogen, phosphorus, potassium and organic matters of the soil samples were determined for chemical properties. The contents of exchangeable cations such as $Ca^{2+}$ and $Mg^{2+}$ were analysed.

***KEYWORDS:*** *soil, moisture, texture, nitrogen, phosphorus, potassium*

## 1. INTRODUCTION

Soil is a mixture of minerals, organic matter; gases, liquids, and countless organisms that together support life on Earth. Soil is the material found on the surface of the earth that is composed of organic and inorganic material. The chemistry of a soil determines its ability to supply available plant nutrients and affects its physical properties and the health of its living population. In addition, a soil's chemistry also determines its corrosivity, stability, and ability to absorb pollutants and to filter water. It is the surface chemistry of mineral and organic colloids that determines soil's chemical properties [9].

The soil texture is determined by the relative proportions of the individual particles of sand, silt, and clay that make up the soil.

The interaction of the individual mineral particles with organic matter, water, gases via biotic and abiotic processes causes those particles to flocculate (stick together) to form aggregates or peds. Where these aggregates can be identified, a soil can be said to be developed, and can be described further in terms of color, porosity, consistency, reaction (acidity), etc. Soil reactivity is expressed in terms of pH and is a measure of the acidity or alkalinity of the soil. More precisely, it is a measure of hydrogen ion concentration in an aqueous solution and ranges in values from 0 to 14 (acidic to basic) but practically speaking for soils, pH ranges from 3.5 to 9.5, as pH values beyond those extremes are toxic to life forms [1] [7].

Soil temperature depends on the ratio of the energy absorbed to that lost. Soil has a temperature range between -20 to 60 °C, with a mean annual temperature from -10 to 26 °C according to biomes. Soil temperature regulates seed germination, breaking of seed dormancy, plant and root growth and the availability of nutrients. Soil temperature has important seasonal, monthly and daily variations, fluctuations in soil temperature being much lower with increasing soil depth [8].

Soil color is primarily influenced by soil mineralogy. Many soil colours are due to various iron minerals. The development and distribution of colour in a soil profile result from chemical and biological weathering, especially redox reactions. As the primary minerals in soil parent material weather, the elements combine into new and colourful compounds. Iron forms secondary minerals of a yellow or red colour, organic matter decomposes into black and brown humic compounds, and manganese and sulfur can form black mineral deposits. These pigments can produce various colour patterns within a soil [3].

Seventeen elements or nutrients are essential for plant growth and reproduction. They are carbon C, hydrogen H, oxygen O, nitrogen N, phosphorus P, potassium K, sulfur S, calcium Ca, magnesium Mg, iron Fe, boron B, manganese Mn, copper Cu, zinc Zn, molybdenum Mo, nickel Ni and chlorine Cl. Nutrients required for plants to complete their life cycle are considered essential nutrients. Nutrients that enhance the growth of plants but are not necessary to complete the plant's life cycle are considered non-essential. With the exception of carbon, hydrogen and oxygen, which are supplied by carbon dioxide and water, and nitrogen, provided through nitrogen fixation, the nutrients derive originally from the mineral component of the soil [2].

Soil is used in agriculture, where it serves as the anchor and primary nutrient base for plants. The types of soil and available moisture determine the species of plants that can be cultivated. However, as demonstrated by aeroponics, soil material is not an absolute essential for agriculture. Soil material is also a critical component in the mining, construction and landscape development industries. Soil serves as a foundation for most construction projects. The movement of massive volumes of soil can be involved in surface mining, road building and dam construction. Earth sheltering is the architectural practice of using soil for external thermal mass against building walls. Many building materials are soil based [4].

The main object of this research is to evaluate the fertility status of the soil samples from Phar Ti Ma Chike' Village Tract Loikaw Township. It provides a basis for the recommendation of fertilizer and soil amendments. The laboratory test provides chemical information which is then used together with an evaluation of specific crop requirements and physical characteristics of the soil to determine the amounts of different nutrients and soil amendments required.

## 2. Materials and Methods Sample Collection

The soil samples were collected from Phar Ti Ma Chike' Village Tract Loikaw Township. In this research work, soil from the upper position near to the surface about 0-10 cm, which contains the greaest amount of organic matter and strongly influenced by biological processes were investigated.

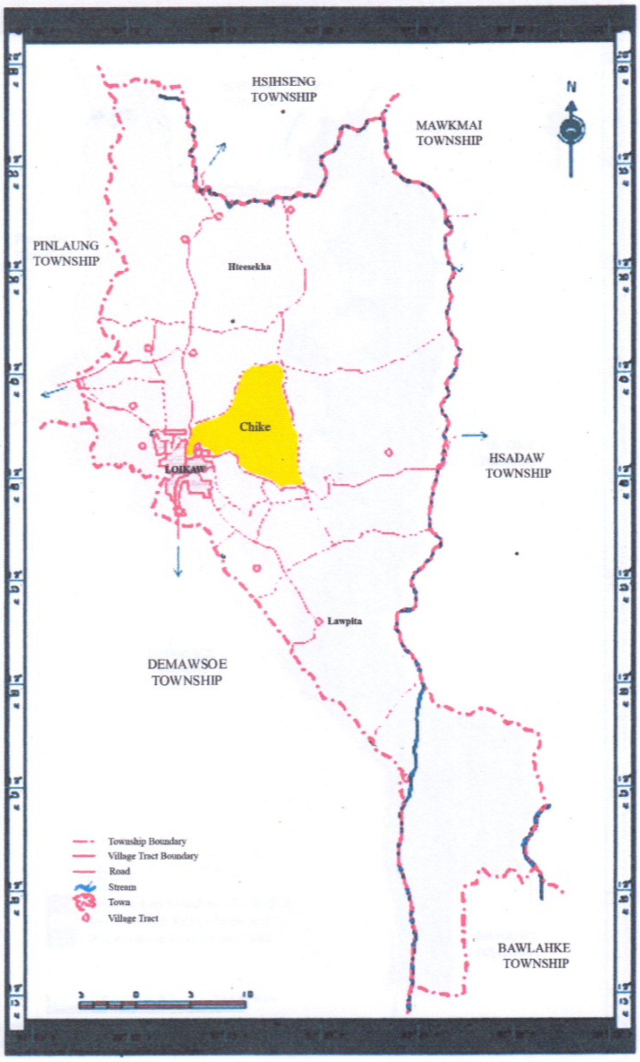


**Figure1. Location Map of Soil Sample Collected Area**

### Preparation of Soil Samples

The samples should be broken up into small lumps and spread them out on stout sheets of brown paper, for air-drying. After two weeks, the soil has dried, the sample was ground and sifted, gravel roots were discarded and the remaining part was taken for testing.

### Determination of Moisture

Constant weight of porcelain basin was first determined. Then about 5 g of sample was placed in basin and weighed accurately. It was allowed to dry in electric oven at 105°C. Then it was cooled in desiccator. It was done to constant weight. From the loss in weight the percentage of moisture of the sample under analysis was calculated [6].

### Determination of Texture by Pipette Method

About 10 g of air-dry soil was weighed accurately and placed in a 500 $cm^3$ conical flask and some amount of distilled water was added. The flask was heated till boiling. 10 $cm^3$ of 10% sodium pyrophosphate solution was added to disperse the soil colloids and heating was continued for about fifteen minutes after which it was cooled. After cooling, the contents were transferred to a 100 $cm^3$graduated cylinder and the solution was made up to the mark with distilled water and then kept overnight to allow the soil colloids to settle.

The next day, the contents were stirred for about four minutes, the solution from 9 cm depth was pipetted with 25 $cm^3$ pipette and then it was transferred to a porcelain basin and evaporated on a water bath. From the weighed amount of residue the percentage of clay and silt were calculated.

After four hours of the stirring, the solution was pipetted with 25 $cm^3$ pipette from 4 cm depth and evaporated to dryness. From this residue, the percentage of clay was calculated. Then, the percentage of silt was obtained by difference. To determine the amount of sand the remaining solution was poured into 53 µm sieve and the clay and silt were washed with water. The percentage of sand was calculated [6].

### Determination of pH

About 20 g of sample was weighed accurately and placed into a conical flask. Then 50 $cm^3$ of distilled water was added (the ratio of sample to water was 1:2.5) and shaken for half an hour. The pH was measured by pH meter using glass electrode. The pH meter was calibrated with pH 4.0 buffer solution before use [5].

### Determination of Organic Matter

About 0.4 g of fine soil sample was weighed accurately and put in a clean dry conical flask. 10 $cm^3$ of 0.4 M chromic acid solution was poured and stirred carefully. Then a small funnel was inserted in the flask and heated on a hot plate to boil faintly. After boiling, the funnel and the neck of the flask was washed with distilled water. 5 drops of 0.2 % phenylanthranilic acid solution was added and the titration was done with 0.4 N Mohr's solution till the content attained green colour [6].

### Determination of Available Nitrogen

About 20 g of soil sample was weighed accurately and transferred into 500 $cm^3$ distillation flask and 20 $cm^3$ of distilled water was added, followed by 100 $cm^3$ of 0.32% $KMnO_4$ and 100 $cm^3$ of 2.5% NaOH solution. Both reagents were freshly prepared. The contents were distilled into a known amount (10 $cm^3$) of 0.01 M $H_2SO_4$ until 30 $cm^3$ distillate was collected. Then the excess of acid was titrated against 0.02M NaOH solution by using methyl red as an indicator. A blank determination was carried out with the same fashion [6].

**Determination of Available Phosphorus**

About 2 g of sample was weighed accurately and placed into shaking bottle. 400 $cm^3$ of ammonium sulphate and sulphuric acid buffer solution (pH = 3) was added and the bottle was taken for half an hour. After that, it was filtered. 50 $cm^3$ of filtrate was pipetted into 100 $cm^3$ volumetric flask. Then 4 $cm^3$ of 2.5 % ammonium molybdate solution was added. This was followed by the addition of 6 drops of freshly prepared chlorostannous acid and made up to the mark with distilled water. Within 15 minutes after adding the chlorostannous acid to the filtrate, the intensity of colour was measured at wavelength 660 nm by using spectrophotoeter [6].

**Determination of Available Potassium**

About 5 g of sample was weighed accurately and placed in a 100 $cm^3$ shaking bottle containing 50 $cm^3$ of 1 N ammonium acetate solution. The bottle was taken for one hour and the solution was filtered. The amounts of potassium was measured unity the flame photometer [6].

**Determination of Exchangeable Calcium and Magnesium**

About 2.5 g of sample was weighed accurately and placed in a 500 $cm^3$ shaking bottle containing 250 $cm^3$ of 1 N sodium chloride solution. The bottle was shaken for three minutes and kept overnight and then filtered.

25 $cm^3$ of filtrate was pipette into conical flask and then 5 $cm^3$ of ammonium buffer solution (pH = 10) was added. It was titrated with 0.02 N EDTA solution until the color changed from red to blue.

To determine calcium: 25 $cm^3$ of the same soil solution was pipetted into a conical flask. 2 $cm^3$ of 10 % NaOH and about 0.1 g of murexide indicator powder were added and titrated against 0.02 N EDTA solution until the colour changes from red to violet [5].

## 3. Results and Discussion

The experimental work in this paper is the chemical analysis of soil samples from Phar Ti Ma Chike' Village Tract Loikaw Township. This paper is paid to the interest of determination of chemical constituents of soil quantitatively. Characteristics studies are moisture content, texture, pH and organic matter. Moreover available nitrogen, phosphorous, potassium, and exchangeable cations such as calcium and magnesium are determined.

**Physicochemical Analysis of Soil Sample**

The results are shown in Table.

**Table (1) Physicochemical Analysis of Soil Sample**

| Sample | pH | Moisture content % | Organic matter% |
|---|---|---|---|
| 1 | 5.74 (morderately acid) | 3 | 1.04 (Low) |

The pH value of soil sample was to be 5.74 (modrately acid). Most garden plants perform well in a soil with pH 6.0 - 7.0. So, pH of all soil samples need to adjust neural with suitable method. The moisture percent of the soil was found to be 3%. The organic matter was found to be 1.04. To increase organic carbon present, organic fertilizer such as green manure, live stoke manure, crop residues and household waste should be added.

### 3.2. The Content of Texture Present of Soil Sample

**Table (2) Texture Analysis of Soil Sample**

| Sample | composition | | | |
|---|---|---|---|---|
| | Sand % | Silt % | Clay % | Texture class |
| 1 | 0.97 | 40.85 | 58.18 | Silty Clay |

According to textural analysis, the type of soil sample is silty clay.

### 3.3. Available Nitrogen, Phosphorous and Potassium Contents of Soil Sample

**Table (3) Available NPK Contents of Soil Sample**

| Sample | N (ppm) | P (ppm) | K (ppm) |
|---|---|---|---|
| 1 | 62 (medium) | 10 (medium) | 52 (Low) |

### 3.4. Exchangeable Cations Analysis of Soil Sample

**Table (4) Exchangeable Cations Analysis of Soil Sample**

| Sample | mg/100g of soil | |
|---|---|---|
| | $Ca^{++}$ | $Mg^{++}$ |
| 1 | 1.78 (Low) | 1.07 (Low) |

## 4. Conclusion

In this paper, soil samples were collected from Phar Ti Ma Chike' Village Tract Loikaw Township for chemical and physical analysis. The pH value of soil sample was to be 5.74 (modrately acid). The pH of all soil needs to adjust neutral with suitable method. The moisture percent of the soil was found to be 3% and textural analysis of soil sample is silty clay. The content of organic matter was found to be 1.04 % (low level). To increase organic carbon present, organic fertilizer such as green manure, live stoke manure, crop residues and household waste should be added. The content of available nitrogen in soil sample was found to be 62 ppm (medium level). The content of available phosphorus was found to be 10 ppm (medium level) and available potassium was found to be 54 ppm (low level). Therefore the trace amount of N, P, and K fertilizer may be supplied to the soils. Moreover, the content of exchangeable calcium and magnesium in soil sample were found to be 1.78 and 1.07. Thus, it is deduced that the soil samples can be applied for the cultivation of crops but the chemical (or) natural fertilizer should be added to the soil for various kinds of cultivations.

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