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Physicochemical Properties and its Relationship with Water Holding Capacity of Soil in Deulgaon Raja region Maharashtra

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ABSTRACT

The aim of this paper is to study the physicochemical properties of soil and find out its relationship with water holding capacity .A study was carried out to assess the physical and chemical properties of soils and its relationship with water holding capacity (WHC) from various villages near by Deulgaon Raja District Buldana. About 60 soil samples were collected from different villages near by the Deulgaon Raja. Physicochemical properties of soil samples were studied and water holding capacity of soil was checked It was concluded that soil texture mainly clay fraction and total organic matter content had influenced on WHC. It was suggested that the high content of clay fraction and organic matter on soil should be incorporated to the soils with improving WHC.

Keywords: pH, Electrical Conductivity, Total Organic Matter Content, Water Holding Capacity.

I. INTRODUCTION

Deulgaon raja is located in Vidharba region of Maharashtra state, farmers from this region are suffering from infertility of soil and low crop yield. Vidharba region is also known in India for large number of farmer's suicide. So by checking the physicochemical properties of soil samples and their relation with water holding capacity we can take necessary action to increase the soil fertility and it also helps to select the crops suitable for that soil. Soil is the natural body of animal, mineral, and organic constituents differentiated into horizons of variable depth, which differ from the material below in morphology, physical makeup, chemical properties and composition, and biological characteristics . Soil possesses physical, chemical, and biological properties. Physical properties such as available water holding capacity (WHC) is controlled by texture of the soil, amount of organic matter content, and structure of the soil. Soil has complex function which is beneficial to human and other living organism. It acts as a filter, buffer storage, transformation system, and thus protects the global ecosystem against the adverse effects of environmental pollutants . Soil is the supporting structure of plant life and water is essential to sustain plant life. Some of water is retained in the soil and some moves through the soil. It moves readily downward after an irrigation or rain and eventually reaches the ground water. Textural and structural, and organic matter characteristics determine how water is held in soil. The productivity of crops depends on the availability of soil moistures as well as nutrients status of soils. The availability of residual moisture to crops during winter season depends on the WHC of soil. The soil with small WHC will require more frequent irrigation than those with large WHC. This is controlled primarily by soil texture and organic matter and other soil properties. The physical properties of a soil play an important role in determining its suitability for crop production. Therefore, the present study was carried out to assess the status of physical and chemical properties and its relationship with WHC of soil from various villages near Deulgaon Raja District Buldan.

II. METHODS AND MATERIAL

The study area was villages near by the Dulgaon Raja Taluka Buldana District, Maharashtra. 60 soil samples were collected from the different villages near by Deulgaon Raja.Soil samples were collected according to standard

procedure. Composite soil samples were taken and prepared for necessary analysis in the laboratory. The collected samples were analyzed for different physicochemical properties. The texture in the present experiment was determined by the hydrometer method. Organic matter was determined by the standard procedure. The pH, electrical conductivity (EC), and WHC were determined by using the procedures.

III. RESULTS AND DISCUSSION

Soil Texture

It was observed that the soil samples basically clay loamy type. The texture of soil samples is given in Table 1. The results show that slit is more than clay and sand, and the values could be arranged in the ranges of sand: 15-30, silt 28-50 and clay: 25-40. Usually, clay loam soil is considered as more preferable for agricultural crops , but it seems that good crop production can be taken in loamy soil. Soil texture is considered as important parameters of crop cultivated soil because it influences the WHC of soil that control the flow dynamics of water, nutrients, and salts in soil. Soil texture varies from different area some sample has high amount of slit and some sample with high amount of clay.

Soil pH and EC

The soil pH and EC test are best source available to known the nature of soil and soluble salts status**.** The pH values of soil samples ranged from 5.20 to 6.8 (Table 2). It was found that some of the soil samples were acidic in nature and some were in normal range which is good for all types of crop. The EC of soil samples ranged from 0.30 to 0.46 dSm−1.All samples have lower Electrical Conductivity.

Soil Total Organic Matter

The data showed that a large amount of organic matter was found in the soil samples (Table 2). If the organic carbon content is <0.50%, the soil is considered as low in carbon and if the same is >0.75%, the soil is considered very rich in carbon. In the present study, the values of organic matter are ranges of 2.15 -3.66. All the soil samples in the region contains sufficient amount of organic carbon. It was observed that some of samples have low organic matter.

Soil WHC

The results of soil WHC (Table 2) were found to be 72.4 -75.7 % in the soil samples collected from different villages. It is found that the soil texture has some effect on the WHC of soil. As the percentage of clay fraction increases in the soil, the WHC increases because clay can bind the water molecules more effectively. Thus, soils possessing high amount of clay will have enhanced WHC. Soils with little WHC is gradually dried out and retard the plant growth. It was also observed that as the organic matter increases the WHC of soil also increases. This clearly indicated that soil organic matter content influences the ability of soils to retain moisture. Similar result was suggested that addition of soil organic matter increases the soil WHC.

Relationship between Soil Texture and WHC of Soil Samples

WHC of soil samples are manly depends on soil texture (Table 1). As the percentage of clay in the soil sample increases, the WHC increases and as the percentage of sand in soil sample increases the WHC decreases. It was observed positive correlation between clay content and WHC. Similar relationship was also reported by the following researchers. And negative correlation was found between sand content and WHC. Thus soil with high clay percentage (Clay Loam) has high WHC capacity.

Relationship between Soil pH and EC with WHC of Soil Samples

It was found that there is a positive correlation between soil pH and WHC (r=0.705) and also a positive correlation between EC and WHC (r=0.722).

Relationship between Soil Organic Matter and WHC of Soil Samples

It was found that there is positive correlation between total organic matter content and WHC of the soil samples (r=0.804). Thus it indicates that soil samples with high organic matter increases the WHC of soil increases.

Table 1: Texture of soil samples

Sr. No.	Village Name	Number of samples	Sand (%)	Silt (%)	Clay (%)	Textural class
1	Pimpalgaon Chilamkha	10	22-28	35-45	25-32	Clay loam
2	Singaon	10	20-25	30-38	32-40	Clay loam
3	Mehunaraja	10	16-21	42-50	25-34	Clay loam
4	Bhivgaon	10	24-30	28-38	26-35	Clay loam
5	Kumbhari	10	21-25	33-40	28-38	Clay loam
6	Umberkhed	10	15- 22	38-45	28-35	Clay loam

Table 2: Physicochemical properties of soil samples

Sr. No.	Village Name	Number of samples	pH	EC (dSm-1)	TOC %	WHC %
1	Pimpalgaon Chilamkha	10	5.35-6.20	0.26-0.40	2.46-3.66	71.25-82.40
2	Singaon	10	5.60-6.60	0.30-0.44	2.24-3.50	72.30-81.35
3	Mehunaraja	10	5.80- 6.80	0.35-0.42	2.36-3.33	68.85-77.55
4	Bhivgaon	10	5.55-6.35	0.28-0.38	2.15-3.40	70.50-78.60
5	Kumbhari	10	6.00-6.50	0.33-0.46	2.30-3.10	67.25-75.35
6	Umberkhed	10	5.80-6.70	0.30-0.43	2.33-2.95	67.50-75.25

EC- Electrical conductivity, **TOC**- Total Organic Matter **WHC**- Water Holding Capacity

IV. CONCLUSION

The WHC of soil is a one of the important parameter of soil which determines the moisture contents required for growth of crops. It was observed that there is a strong relationship exists between soil texture, soil organic matter, and soil WHC. It was concluded that the increase in the soil organic matter could increase soil WHC. In addition, increase of soil clay fraction could increase soil WHC. Therefore, physicochemical properties of soil are the key components that control the soil WHC.

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