EFFECT OF THE SOIL PROPERTIES ON THE RATE ON THE RATE OF INFILTRATION

To Find Properties of soil.

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Abstract: ***The constant infiltration rate of different soils under different soil conditions were calculated at near uben river. Experimentation work was carried out on black cotton, clay and sandy soil. Soil particle size distribution (PSD) is used to estimate some soil process, soil moisture characteristics, and infiltration rate (IR). The object of this study was to determine more important primary article diameters that control IR. The experiments were conducted using double-ring method with constant head of 5cm in 15 different soil and three replications. We are take a different types of soil and in laboratory we find out density of soil, water content and particle size analysis to that soil. We take the soil sample to the site in core cutter equipment and we are find out classification or properties of soil.***

Index Terms - Infiltration, Infiltration rate, soil condition.

I. INTRODUCTION

Infiltration is the physical process of water entering the soil from its surface. The amount of water that infiltrates into the soil and its variation with time depend upon slope, soil structure, surface roughness, soil texture, surface cover, hydraulic development of plant irrigation, surface and subsurface water pollution and ground water recharge.Basically, the soil particle size, the soil particle size distribution, and the structure of the soil determines the moisture characteristics. Soil particles are basically composed of sands, silt, clays, and organic matter. Sands include particle sizes which range from 0.05mm to 2.0mm in size. This is a very large range of particle sizes. Silt particle range in size from 0.05mm to 0.002mm and clay particles are those particle less than 0.002mm in size. On the other hand, very fine particle (clay and silt) tend to drain poorly, but hold on to more water in the soil system. The distribution of soil particle (size and relative amounts) is used to determine the soil textural class. Infiltration is the process by which water on the ground surface enters the soil. Infiltration is the downward entry of water into the soil. The velocity at which water enters the soil is infiltration rate. Infiltration rate in soil science is a measure of the rate at which soil is able to absorb rainfall or irrigation. Infiltration is caused by two forces: gravity and capillary action. The water infiltrating into the soil moves downward through larger soil pores under the force of gravity. The smaller surface pores take in water by capillarity. When the capillary pores at the surface are filled and intake capacity reduced infiltration rate decrease. As a trend the rate of infiltration is high in the beginning. It decreases rapidly in the initial stages and then slowly till it approaches a nearly constant rate in about 30 to 90 minutes depending upon the type of soil.

II. TERMINOLOGIES

Soil structure: - The clumping of the soil textural components of sand, silt and clay forms aggregates and the further association of those aggregates into larger units forms soil structures called pads. The soil structure affects aeration, water movement, conduction of heat, plant root growth and resistance to erosion. Water has the strongest effect on soil structure due to its solution and precipitation of minerals and its effect on plant growth

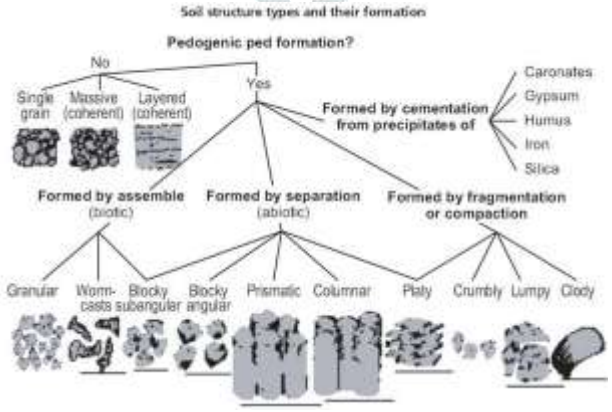


Figure: - Soil Structure

Soil Water characteristics: -The moisture stored in or flowing through the soil affects soil formation, structure, stability and erosion and is of primary concern with respect to plant growth.

Available soil water: -When a field is flooded, the air space is displaced by water. The field will drain under the force of gravity until it reaches what is called field capacity, at which point the smallest pores are filled with water and the largest with water and air. Field capacity corresponds with a suction equivalent of 1/3 bar. Plants that use the water must produce increasingly higher suction, finally up to 15 bar. At

15 bar suction, the soil water amount is called wilting point. The amount of water remaining in a soil drained to field capacity and the amount that is the available are functions of mainly soil texture. The available soil moisture can be determined in the laboratory.

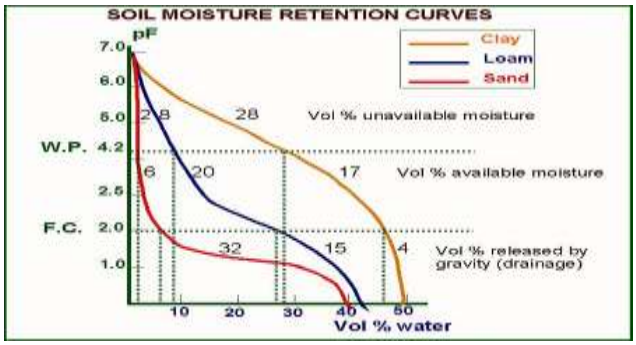


Figure: - Availability of water

Soil Texture: - The mineral component of soil, sand, silt, clay, determine a soil's texture. Soil texture affects soil behaviour, in particular its retention capacity for nutrients and water. Soil components larger than 2 mm are considered as rock and gravel and can be included in texture class. For example, a sandy loam soil with 20% gravel would be called a gravelly sandy loam. When the organic component of a soil is substantial, the soil is called organic soil rather than mineral soil.

Figure: - Soil Texture

Color: - Soil colour is determined by organic matter content, drainage condition, and the degree of oxidation. Soil colour, while easily discerned, has little use in predicting soil characteristics it is of use in distinguishing boundaries within a soil profile, determine the organic of a soil's parent material, as an indication of wetness and waterlogged conditions, and as a qualitative means of measuring organic, salt and carbonate contents of soil.

Consistency: - Consistency is the ability of soil to stick together and resist fragmentation. It is of use in pre directing cultivation problem and the engineering of foundation. Consistency is measured at three moisture condition: air-dry, moist and wet. More precise measure of soil strength is required prior to construction.

Porosity: - Pore space is that part of the bulk volume that is not occupied by their mineral or organic matter but is open space occupied by either air or water. ideally, the total pore space should be 50% of the soil volume. The air space is needed to supply oxygen to organisms decomposing organic matter, humus, and plant roots. pore space also allows the movement and storage of water and dissolved nutrients.

Density: - Density is the weight per unit volume of an object. Particle density is the density of the mineral particle that make up a soil; i.e. It excludes pore space and organic material. particle density averages approx. 2.65g/cc.e. A high bulk density indicates either compaction of the soil or high sand content. A lower bulk density by itself does not necessarily indicate higher suitability for plant growth.

Water flows: -Water moves through soil due to the force of gravity, osmosis and capillarity. At zero to 1/3 bar suction, water moves through soil due to gravity this called Saturated flow. At higher suction, water movement is called unsaturated flow. Water flows can be measured in the field.

III. METHODOLOGY

In this project we are find to properties of soil. After the rate of infiltration, we are find out, Density of soil, Watercontent, Particle size analysis. We are going to the different places and take a number of different sample. That all sample to find density of soil, water content and particle size analysis. On the site we will take a sample used to core cutter method.

Select a location: - (1) Makhiyala, (2) Majevadi, (3) Toraniya, (4) Bhesan.

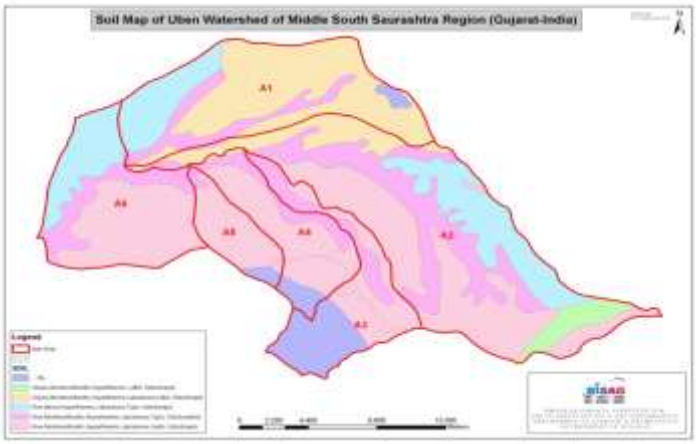


Figure: - Soil map of uben watershed

IV. RESULT AND DISCUSSION

BHESAN: -

WATER CONTENT%	
weight of (container +soil) w1kg=	0.112
weight of(container)w2 kg=	0.042
weight of soil(w1-w2) w3kg=	0.07
weight of own dried (soil container) w4=	0.109
weight own dried soil (w4-w2) w5kg=	0.067
water content%	4.29%

Table 1: - Water content of soil

CALCULATION OF DENSITY OF SOIL BY CORE CUTTER METHOD	
weight of mould+soil(w1 kg)=	2.644
weight of mould(w2 kg)=	0.974
weight of soil (w1-w2)w3kg=	1.67
caculation of density kg/m^3(weight/volume of mould)=	1636.452719

Table 2: - Calculation of density of soil

SEIVE ANALYSIS						
weight of dry soil sample+pan(gm) =		1368				
weight of pan(gm)=		0				
weight of dry soil sample(gm) =		1368				
seive size (mm)	**Mass of each (sieve + retained soil)in gm**	**weight of each sieve in gm**	**weight of soil Retained in gm**	**% weight retained**	**cumulative % retained**	**cumulative % passing**
4.75	383	0	383	23.04%	23.04%	76.96%
2.36	210	0	210	12.64%	35.68%	64.32%
1.18	243	0	243	14.62%	50.30%	49.70%
0.6	169	0	169	10.17%	60.47%	39.53%
0.425	143	0	143	8.60%	69.07%	30.93%
0.3	55	0	55	3.31%	72.38%	27.62%
0.15	86	0	86	5.17%	77.56%	22.44%
0.075	57	0	57	3.43%	80.99%	19.01%
pan	22	0	22	1.32%	82.31%	17.69%

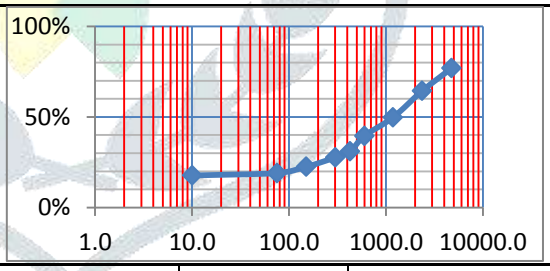
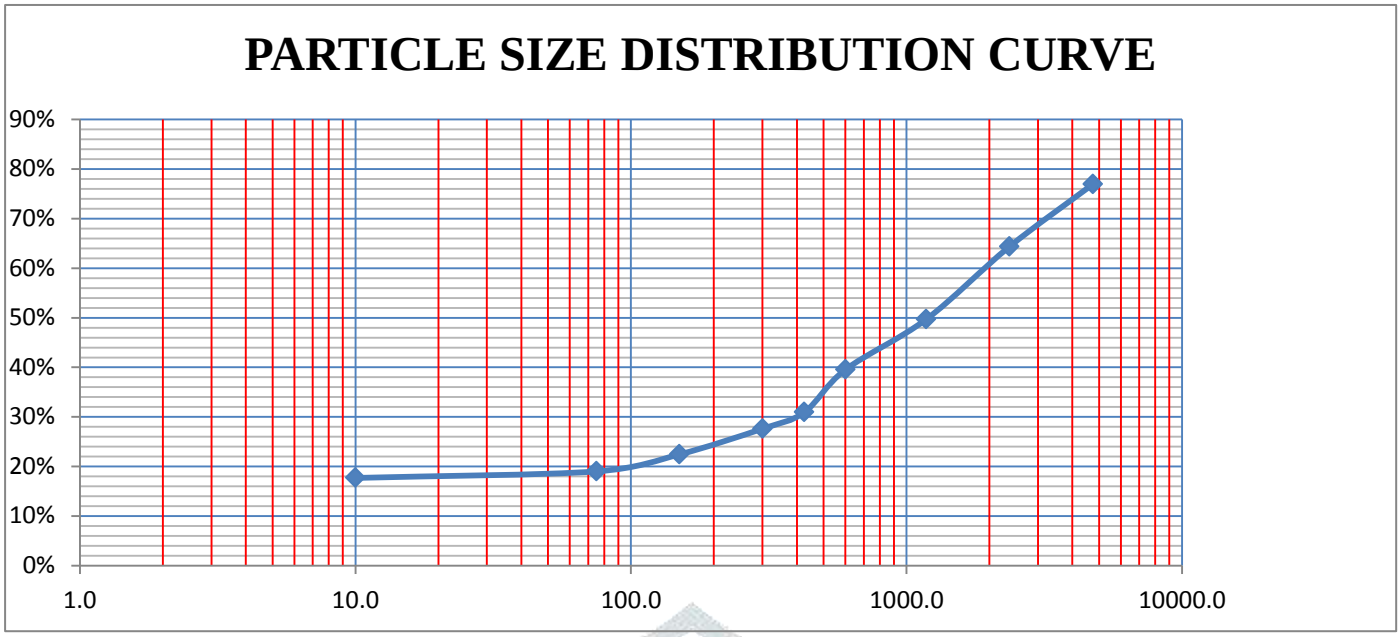


Table 3: - Sieve analysis of soil

Fig: -



Particle size distribution graph

Density Kg/m3	Water Content %	Total Infiltration cm
1902.99	5.56	9.3

Table: - Bhesan soil data

	Cu (Uniformity Coefficient)	Cc (Coefficient of curvature)
D10	90	90
D30		
D60		

Table: - Bhesan Cu and Cc Value

MAJEVADI: -

Density Kg/m3	Water Content %	Total Infiltration cm
1636.45	6.35	11

Table: - Majevadi soil data

	Cu (Uniformity Coefficient)	Cc (Coefficient of curvature)
D10	120	30
D30		
D60		

Table: - Majevadi Cu and Cc Value

TORANIYA: -

Density Kg/m3	Water Content %	Total Infiltration cm
1675.64	9.09	11

Table: - Toraniya soil data

	Cu (Uniformity Coefficient)	Cc (Coefficient of curvature)
D10	130	49.23
D30		
D60		

Table: - Toraniya Cu and Cc Value

BHESAN: -

Density Kg/m3	Water Content %	Total Infiltration cm
1636.45	4.29	11

Table: - Bhesan soil data

	Cu (Uniformity Coefficient)	Cc (Coefficient of curvature)
D10	11	4.45
D30		
D60		

Table: - Bhesan Cu and Cc Value

V. ACKNOWLEDGMENT

My heart pulsates with the thrill for tendering gratitude to those persons who helped mein completion of the research paper.I extend my deep sense of gratitude and indebtedness to my guide Prof. Parag Savsani and Prof. Nevil Trambaliya,Department of Civil Engineering, Dr. Subhash Technical Campus for their kind attitude,invaluable guidance, keen interest, immense help, inspiration and encouragement whichhelped me carrying out my present work.

REFERENCES

[1] Brady, Niles, and Ray R. Weil. 2008. The Nature and Properties of Soil, 14th edition. Upper Saddle River, NJ: Prentice Hall. Comprehensive (965 pages) textbook on soils— great for those who want to "go deeper" into the origins, classifications, and workings of soil. Used as a college text.

[2] Dixon, J. B., and S. B. Weed, eds. 1989. Minerals in Soil Environments, 2nd Edition. Madison, WI: Soil Science Society of America. Very technical reference on soil minerals. Only the most hardy go here.
[3] Gershuny, Grace. 1993. Start with the Soil. Emmaus, PA: Rodale Press. A general book on soils and soil management geared toward organic gardeners. Easy to read and understand.
[4] Stell, Elizabeth P., 1998. Secrets to Great Soil. Pownal, VT: Storey Communications, Inc. An easy-to-read primer on soils, composting and basic gardening techniques. Includes numerous diagrams.