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Impact of Layered Soil Structure on Integration and Revolution Processes

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Abstract: Soil depth profile structure has great impact. rainfall infiltration, erosion processes. A laboratoryExperiment. carried out. simulate infiltration, erosion Processes. different Layered soils,. explore. impact. layered structures. infiltration runoff, water erosion processes.: showed, runoff time decreased while runoff , intensity. soil erosion increased. increasing rainfall intensity. layered soils. top sand layer, bottom clay layer had higher stable infiltration rate under a given rainfall intensity, Soil erosion. reduced. layered soils. top clay layer, bottom sand layer yielded more sediments, Soil erosion. increased.. general soil. single layer had. highest yields. runoff, sediments followed. soils. two layers, three layers. this indicated, intensity. soil erosion may be decreased. thE increase. numbers. soil layer.:. this study would provide scientific basis. modeling. layered soil infiltration, erosion processes.

Keywords: Layered Soil Infiltration Runoff erosion

1. Materials and Methods

Disturbed soil sample for test, air-dried after soil sample is retrieved,Rolling,After smashing5mmSoil sieve, evenly mixed and back up.According to the original soil bulk density control, air-dried soil according to the volume of soil tank,Volumetric Water Content 2%And soil bulk density to calculate the soil quality required for each treatment.8 cm.Before loading the test soil, First fill in the bottom of the test slot6 cmThick fine sand, and then covered with fine gauze permeable to ensure that the experimental soil layer of water permeability and natural slope similar.Then fill in the test with soil, and fill the soil in the Soil Trough..Pay special attention to compaction in the wall of the soil slot, avoid water infiltration along the gap, resulting in unreasonable test results.The layered interface of soil with different texture can be used to level and repair the soil surface during landfill to produce a certain surface roughness, so that the two layers can be closely integrated..Test soil combination table2..Acquisition1.Secondary Runoff Sediment sample.After the rainfall, the runoff mud was measured by weighing method,and the runoff volume was recorded. The sediment was separated and measured by drying method..Penetration Rate Calculation Formula[17-20 ~ 21]:Type inI-Penetration rate (Cm min^{-1});R-Rainfall intensity (Mm min^{-1});T-Rainfall duration (Min);Theta-Soil trough slope ;F-Traffic in the time interval (G);S-Sediment Yield in the time interval (G);K-Conversion coefficient of the production flow into the volume of water (1g cm^{-3});A-Soil Trough cross-sectional area ($Cm^{2.}$).The layered soil in two of rainfall strength under don't runoff when the soil infiltration rate difference not and runoff after the layered soil of average infiltration rateThere is big difference.The same time single-layer soil (figure?2a) Average infiltration rate performance for: Sand>Loessial Soil>Lou soil (in rainfall time range sand no surface runoff drop how much rain just infiltration how much); two-layer soil combination (figure?2b) The average infiltration rate performance for: Sand-Lou Soil>Lou Soil-Sand; three-layer soil combination (figure2c) The average infiltration rate performanceFor: Sand-Lou Soil-Loessial Soil>Lou Soil-Sand-Loessial Soil.Above results show that different level soil infiltration strength with time of change by soil layered combination style decision.Different Level soil infiltration characteristics by each layer soil water potential and each layer soil water rate of common role.In nature in different location soil water can state of difference is water movement of driving force the two points between soil water potential energy of poor[27].For the same water content of clay and sand by soil texture decision of matric potential for soil water suction of negative soil water rate(Table1) Is Lou Soil<Loessial Soil<Sand; the soil water potential is Lou Soil<Loessial Soil<Sand.So single-layer,Layered Soil soil between pore difference big capillary role was cut off make water transport by the hinder permeability but reduce.From test results see same rainfall strength under sand cover viscosity of soil layered structure of infiltration ability higher than that viscosity cover sand of layered structure and rainfallAnd the runoff coefficient is lower, which may be related to the low rate of soil infiltration.

layered soil..

Slope runoff was calculated by water balance method, that is, runoff equals rainfall minus infiltration. Therefore, slope runoff is closely related to soil infiltration rate..In layered soil, the thicker the upper soil particles, the longer the runoff generation time, and the lower the runoff coefficient..For example, sand-Kōtu-In the yellow soil60mm h^{-1}And90mm h^{-1}Runoff time under rainfall intensity was37 minAnd35 min, And the earth-Sand-Loessial Soil combination in two of rainfall intensity under runoff time only19 minAnd12 min.This is because Lou Soil in lower in water unsaturated Loessial Soil and Lou soil water suction greater than sand upper sand of Water Potential greater than Loessial soil flow will down into; and for Lou Soil-Loessial Soil-Sand of soil structure Lou Soil of infiltration rate slow soil water saturated than slow produce runoff faster.So Upper for texture coarse of layered soil runoff time long runoff coefficient low soil erosion strength is weak.

2.3 Different layered structure soil Runoff Sediment Yield of change

Two of rainfall strength under layered soil of Runoff Sediment Yield as shown in Figure3Shown in.Can see rainfall erosion process middle quicksand of with rainfall strength of increase were was increase trend.In total rainfall certain of situation under runoff and infiltration of was negative correlation soil of infiltration ability with infiltration process of the and gradually reduce infiltration rate also gradually reduce SO infiltration of

Time Extension and gradually reduce the and runoff with time extension was increase trend.The soil level combination type in production flow the smallest is sand-Lou Soil-Loessial Soil combination main because upper sand particles coarse water permeability strong slow down the rain the erosion degree of the Lou Soil and Loessial Soil Water unsaturated water suction big[28]Increase the soil of Penetration ability and then reduce the soil erosion process in the production flow.For two-layer or three-layer soil combination upper soil is sand its erosion runoff were lower than the upper soil is Lou Soil of Combination.

Single-layer soil erosion sediment yield for Lou Soil>Loessial Soil Two Soil Erosion Sediment Yield for Lou Soil-Sand>Sand-Lou Soil three-layer soil sediment yield for Lou Soil-Sand-Loessial Soil>Sand-Lou Soil-Loessial Soil (don't sediment yield).Above results (on viscosity sand layered structure soil of erosion High Strength in Sand under layered structure Soil.Because Lou soil clay content is high soil pore tight soil infiltration ability low combined with lower is sand its water absorption ability is weak (total soil water potential low) to cause Lou Soil-Sand of erosion runoff and sediment yield maximum.In addition overall three-layer soil layered structure anti-erosion of ability greater than two and single-layer soil structure and soil structure upper for the sand or permeability is high soil when, soil Resistance Rainfall Erosion of ability is strong.Raindrop role under soil particles dispersion soil surface easy to Formation Physical seal small of particles of occurring shift he yue shift this is by rain of energy and soil characteristics decision[29].Karasawa army of study results shows that soil clay content high its

Mechanism closed role the strong[30]So in the industry in aspects of double-layer soil or three-layer soil surface clay content high soil infiltration ability weakened runoff increase.Soil of Erosion Sediment Yield The in upper soil particles of size and its infiltration rate of Level.Different Combination level soil of cumulative production Abortion

Sediment performance for: three-layer soil<Two-layer soil<Single-layer soil (layered combination level the more soil anti-erosion ability may be the greater the surface soil permeability increase the water rate increase soil by degree of erosion of the will reduce.

3. Conclusion

(1) With the rainfall strength increase homogeneous soil and layered soil of runoff time were shorter and runoff coefficient were increase; surface soil texture loose runoff time delay runoff coefficient low; homogeneous Lou Soil of runoff when

<Two-layer soil Configuration<Three-layer soil configuration; runoff coefficient is homogeneous

Lou Soil>Two-layer soil Configuration>Three-layer soil Configuration.

(2) Lou Soil,Loessial Soil and sand particles between pores exist difference the greater the Will the to water blocking of Role.So water content in homogeneous soil layer and layered soil configuration in the change is different of main depends on Layer

-Soil configuration soil water potential and Water Rate.

(3) Soil Infiltration Rate of size by Layered Soil the flow of water and decided

Of.Three-layer soil combination of Infiltration Rate size for the sand-Loessial Soil-Lou Soil>Sand-Lou Soil-Loessial Soil>Lou Soil-Sand-Loessial Soil>Lou Soil-Loessial Soil-Sand.Soil water of infiltration is have soil water potential play a leading role.So in Rainfall Erosion Process in non-Saturated Soil Water Movement pore is and big gas connected soil of total water potential is head pressure.Layered Soil of head pressure decided to Soil Infiltration Rate.

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