# Soil Erosion Studies Using Simulated Rainfall

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**Abstract**: A study was conducted in vertisol to determine variation in runoff, soil loss and particle size distribution with different Antecedent Moisture Condition (AMC). The runoff and soil loss increased as AMC increased. However the particle size distribution in the sediment is not affected by either antecedent moisture condition or by total runoff. But the amount of each particle size varied with increasing AMC.
**Keywords**: vertisol, AMC, runoff, soil loss and particle size distribution

## 1 Introduction

Land is one of the most precious natural resources. It is degraded by many ways. Among these, soil erosion particularly by water is the most serious problem (45.3%) in the Indian sub continent (Sehgal, 1996). Due to this erosion, 5,334mt of top soil (16.4 t/(ha • yr)) are being eroded every year (Dhruvanarayana and Rambabu, 1983).

The particle size distribution of eroded sediment is a major component in erosion/sedimentation (Knisel, 1980) because sediment size is a primary factor determining displacement of sediment particles detached from soil surfaces by rainfall. The amount of primary particles and clay present in sediment is influenced by physical and chemical properties of the soil. Thus the size of eroded soil particle is highly related with productivity.

The particle size distribution in sediment eroded from a given soil is usually determined by applying simulated rainfall on field plots and collecting the runoff (Mayer *et al*., 1986). Although field experiments by natural rainfall provide valuable information, they are both time consuming and expensive. Rainfall simulator provides an option of creating rainstorms at any time and place (rapid), efficient and also better control.

This experiment was conducted in vertisol of Bellary district, Karnataka by using rainfall simulator to study runoff, soil loss and the particle size distribution of erosive sediment with different antecedent moisture condition (AMC).

## 2 Materials and methods

Black soils were collected and filled in the tray size of 1.5 m x 1.0 m x 0.23 m having 1 % slope. The initial characteristics of the soil such as bulk density, particle density, and pore space percentage were determined by using Keen-Raczkowski method (Keen and Raczkowski, 1921) and the particle size distribution was determined by international pipette method (Piper,1966). Simulated rainfall intensity of 93—95 mm/hr was allowed over the soil tray over a time period of 20 min for continuous 5 days. During that period observation were recorded after initial calibration of the rainfall simulator.

## 3 Results and discussion

The initial characteristics of the soil determined were Bulk density 1.33 g $cc^{-1}$; particle density 2.04 g $cc^{-1}$; pore space 34%; hydraulic conductivity 0.8mm $h^{-1}$; clay 51.45%; sand 21.2% and silt 18.05%.

During the 5 days observation period, the moisture percentage varied from 2.5 to 31.29. The runoff and soil loss increased as antecedent moisture condition increased. The increase was highly significant for first 4 days and there was no significant difference between 4th and 5th day (Table 1). It might be due to the saturation of the soil.

The particle size distribution in the sediment was not affected by either AMC or by total runoff. But the amount (%) of each particle size varied with increasing AMC (Fig. 1).

**Table 1 Effect of Antecedent Moisture Condition on runoff and soil loss**

| AMC (mm) | Moisture | | Runoff (mm) | Soil loss ($t \cdot ha^{-1}$) |
|---|---|---|---|---|
| | (%) | Depth (mm) | | |
| 0.00 | 2.5 | 0.33 | 3.3 | 0.20 |
| 31.60 | 11.8 | 1.57 | 7.4 | 0.37 |
| 62.92 | 28.15 | 3.74 | 10.11 | 0.41 |
| 94.72 | 28.43 | 3.78 | 18.12 | 0.95 |
| 126.32 | 31.29 | 4.16 | 18.18 | 0.97 |

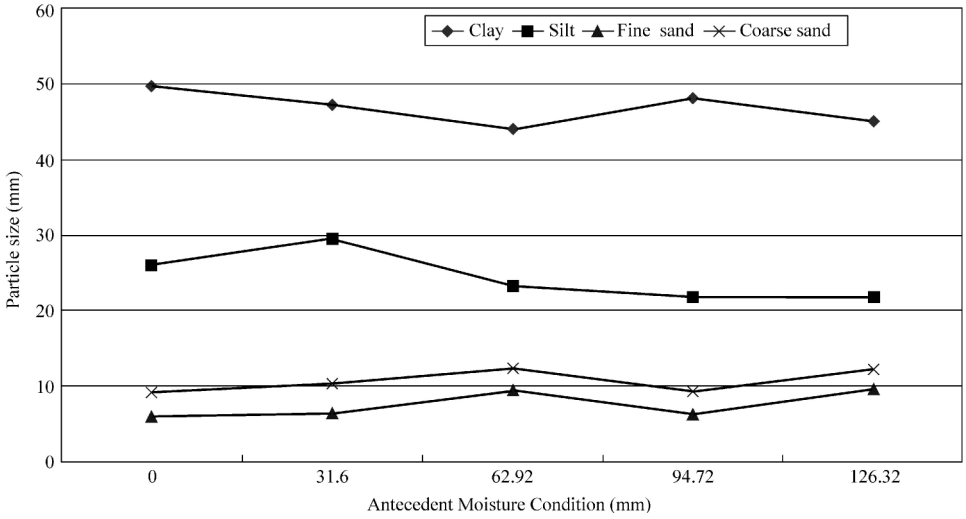


**Fig.1** Particle size distribution of eroded sediment under different AMC

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