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# Study of Physiological Properties of Soil Order & in Bastar Zone Chhattisgarh State

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## ABSTRACT

Abstract: study of soil taxonomy there are at least 12 soil order classified in zonal, intra zonal and a zonal orders. Classification is the grouping of object in some orderly and logical manner it is based on the physiochemical properties of soils, basically soils are classified as sandy loamy or clay soil on the basis of their characteristics. The soil order mainly found in bastar zone that in intrazonal manner is alfisols, inseptisols and entisols. Chhattisgarh is predominantly rainfed although it receives high rainfall and has a good ground water resources, most of the farmers grow only one crop in rainy season and most areas use efficiently of applied water is very low. Soil of bastar plateu region belong to entisol, inceptisol and alfisol orders and dominating subgroups are lithic, ustorthent typic haplustept and typic haplustept. Application of organic matter like FXM or compost to all the subgroups and particularly lithic ustorthent will improve the water retention and storage capacity of soil. Physiochemical properties analysis of different subgroups collectively ranged.

**Keywords:** Soil order classified, FXM or compost, inseptisols and entisols.

## INTRODUCTION

Based on rainfall pattern, temperature, soil type and existing cropping pattern Chattisgarh state can be divided into three natural regions viz. north hill region, plain region,

and bastar plateu region of Chattishgarh. In Chattisgarh state major sources of irrigation are cannals, tubewells, tanks and wells. Soil as mediam of plant. Growth should also be physically fertile the soil which support plants is a variable mixture of solids, liquid and gases and is called three phase system. slit loam about 50%of the total volume, optimum moisture for plant growth 25% of the total volume is occupied by water and 25% by air the Inorganic solid phase is composed of minerals the quantitative interrelationship of the solid, liquid and air components of soil are defined interns of many useful physical pararmeters of soil these are partical density, specific volume, porosity, capillary and non-capillary gravimetric water content soil texture, particle size classification. In other words soils are the products of chemical ,biochemical and physical processes effect the earth material under various landform and also the climate and geographic history of the region in which they evolved. Under the control of these factors chemical compounds are trans located and deposited in deeper soil horizons by biocycling and sometimes they are removed from the soil by leaching. Nearly 90 percent of the mineral matter most of the soil consists of the combined oxides of the silicon, aluminium, and Iron and other oxide of calcium ,magnesium , sodium and potassium each makeup about 1-2% and the oxide of manganese phosphorus, and sulphur, constitute only a friction of a percent of the mineral soil components.

## MATERIAL AND METHODS

Profile soil samples were collected from few sites of Bastar division representing 9 dominant subgroups the sampling sites are selected each block and three soil profiles were dug for each site and samples were collected from 0-15,15-30,30-45,45-60 ,60-90 and 90-120 cm depth of each profile

### Soil order entisol samplelling

These soils are recently formed soils with little or no evidence of development of pedomic horizons. They have ochric pipedon and sometimes anthropic epipedon. These soils are formed on steep actively eroding slopes on flood plains receiving new deposits of alluvium. They are formed on variety of climatic conditions. The parent material is also variable which may be recent alluvium, sand dunes or even a variety of entisols in alluvial bottom lands are cultivated for a variety of grain and vegetables crops and used for pastures in bastar the dominating sub order in orthents dominating sub groups are typic ustorthent and lithic ustothent.

### Physiochemical and hydrological characteristics

Physiochemical and hydrological properties of entisols are sandy clay loam to clay in textube with clay content, data of electrical conductivity, salinity problem pH range, higher organic carbon content, fe, Mn, Zn and Cu in typic.

**Table 1**

| Soil depth(cm) | EC (dSm3) | pH2.5 | OC(%) | $CaCO_3$ | Texture class | Bulk density (Mgm-3) |
|---|---|---|---|---|---|---|
| 0-15 | 0.01 | 5.62 | 0.313 | 2.000 | SC | 1.52 |
| 15-30 | 0.01 | 5.56 | 0.402 | 0.667 | SC | 1.55 |
| 30-45 | 0.01 | 6.36 | 0.015 | 0.917 | SC | 1.57 |
| 45-60 | 0.01 | 6.65 | 0.104 | 0.458 | SC | 1.58 |
| 60-90 | 0.01 | 6.96 | 0.030 | 0.375 | SC | 1.59 |
| 90-120 | 0.01 | 6.83 | 0.060 | 0.500 | SC | 1.60 |

## Soil order inceptisols sampling

These soils represents the early stage of soil formation which is more advanced than that of entisol but still short of the degree of development found in alfisol the inceptisol are developed recently owing to the alternation of the parent material but without much leaching and accumulation of material is the sub soil profile development is too weak in these soil is normally the soil are formed in low rolling parts of the land scape in and around steep mountain fronts in sequence of alluvial traces of soil are formed of intermediate positons between entisols nearest the stream in bastar. The dominating subgroups under these order typic haplustept and vertic haplustept.

## Physio-chemical and hydrological characteristics

Physiochemical and hydrological characteristics of Inceptisols are vertic haplustept have clavey texture with clay content varying from 48 to 55 percent the remaining soil profile of 3,4,5 and 7 subgroup typic haplustept are sandy clay loam to clay with clay content ranging from 33.2 to 50.4% clay ontent in the soils. The soil. The soil particles of this sub group, organic carbon context was higher in surface layers than sub surfaces layers. all the were non-calcareas in narture and their CaCo3 context varied from 0417 to 1.916 percent on the soil had sufficient levels of available fe,Mn,Cu in 0-120 cm deep profiles. Data on soil water diffusity and hydraulic conductivity the soil as function of water content presented.

**Table 2**

| Soil depth(cm) | EC (dSm3) | pH2.5 | OC(%) | $CaCO_3$ | Texture class | Bulk density (Mgm-3) |
|---|---|---|---|---|---|---|
| 0-15 | 0.10 | 5.18 | 0.596 | 0.500 | | 1.32 |
| 15-30 | 0.06 | 5.10 | 0.328 | 0.708 | | 1.39 |
| 30-45 | 0.03 | 5.30 | 0.253 | 0.628 | | 1.40 |
| 45-60 | 0.03 | 5.50 | 0.387 | 1.083 | | 0.42 |
| 60-90 | 0.02 | 5.80 | 0.267 | 1.208 | | 0.43 |
| 90-120 | 0.01 | 6.10 | 0.030 | 0.417 | | 1.45 |

**Water storage capacity of the inceptisols profiles**

**Table 3**

| Profile no | Name of the sub group | Profile water storage water Cmm-3 depth | Category for profile water capacity |
|---|---|---|---|
| 3 | Typic haplustept | 7.56 | Low |
| 4 | Typic haplustept | 23.96 | Very high |
| 5 | Typic haplustept | 17.31 | High |
| 6 | Vertic haplustept | 19.89 | High |
| 7 | Typic haplustept | 17.48 | High |
| 8 | Typic haplustept | 17.18 | High |
| 9 | Typic haplustept | 22.80 | Very high |
| 10 | Typic haplustept | 18.46 | High |

**Soil order:** alfisols are basic rich mineral soils characterized by a light coloured surface horizon over a clay enriched argillic sub surface horizon. These soils are rich in Fe, Al, oxides with case saturation of more than Inseptisols, but less so than the ultisols, thin to thick clay clay coating are observed on the bed faces in their horizons. These soils tend to develop under varied types of climate and vegetation removal of flocculating agents like ca-mg carbonates and under the influence of percolating water. In Chhattisgarh the dominating subgroups under alfisols are typic rhodulstalf and typic haplustalf.

**Physio-chemical and hydrological characteristics**

Physiochemical and hydrological characteristics of the alfisols profiles are texture of the soil ranged from sandy clay context varying from 24.0 to 57.5 percent bulk density also increased with increase in soil depth organic carbon content in the soil depth organic carbon content in the soil generally decrease with depth some groups were non calcereons in nature and their caco3 content varied from 0.208 to 2.63%. Data on DTPA extractable fe,Mn,Zn and Cu in the soil layers of alfisols profiles are presented data on soil as water content unsaturated hydraulic conductivity and soil water diffusivity decreased with decrease in water content varied with soil texture higher magnitude of change was observed in typic rhodustalf profile than in vertic hapstulf soil profiles.

## LITERATURE REVIEW

Soil Moisture regimes (SMR) – soil moisture regime refers to the presence or absence of water in a soil of different times of the year. Soil is considered moist when it is at moisture tension of less than 1500KPa(15 bar) and dry when the tension is 1500(KPa -15bar) or more with in the soil moisture control system (SMCS) are determined by the soil depth to which the soil at wilting point is moistured when 2.5cm and7.5cm of water are added at the in general conditions.

**Erosion Index**

Erosion index was computed from the following relationship described by sahietal Erosion Index = dispersion ration/(clay/0.5 water holding) Dispersion ratio was calculated from the following relationship described by author[u Dispersion Ratio=water dispersible (silt+clay)/total (silt+clay)x100

Water dispersible silt + clay was determined by dispersing Water dispersible silt + clay was determined by dispersing 25g soil in 1000ml distilled water without adding any dispersing agent shaking end-over-end for 20 times and pipetting out 20ml of soil suspension from 10cm depth.

**Water storage capacity of the soil**

Soil of Chattisgarh are developed by the action and nuteraction vaccines material and climate soils fall 5 orders and 9 sub groups entisols, Inceptisols,alfisols mollisols and vertisol, soil orders constitute 16.5,13.8 37.0 0.5 and 24.5 of the total cultivated area of the state accordingly reviewed in[1].

Soil of five sub groups authors in[2] reviewed the current research of sandy soil are slightly acidic to concentration slightly alkaline in reaction with no appreciable salt concentration in root zone.

Authors in[3] reviewed to high cation exchange capacity and high base saturation. Authors in[6] reviewed organic carbon content is relatively high some of the sub groups show poor to moderate permeability and moderate transient flow parameters author in[7] describe the alfisol under are sandy clay loam to clay in texture with almost uniform bulk density the profile soils are slight to moderately acidic in reaction author in[9] characterized by high base saturation and moderate cation exchange capacity.

These soils show good permeability and transmission characteristics with very high profile water storage capacity.

Authors on[4] reviewed erosion behaviour of soil content bulk density, organic carbon content and dispersion ratio.

Authors in[5] reviewed poor soil fertility severe soil erosion high un filtration poor irrigation facilities frequent drought occurrence and water in low lands are the main limiting factors responsible.

Author[8] reviewed simple correlation coefficient organic carbon, calcium carbonate and cation exchange capacity and water retained at field capacity.

Author[10] reviewed the physiological properties of soil subgroups and interrelationships of entisols, inceptisols and alfisol of specially of dividing the bastar zone to grown the productivity of varieties of crop.

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