Evaluation of physical properties of soil of Rashmi block, Chittorgarh, Rajasthan

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ABSTRACT

An evaluation of physical properties of soil of Rashmi block of Chittorgarh district, Rajasthan was carried out in 2016-17. Twelve sampling points in different villages were selected for the analysis. Soil samples were collected at depths of 0-15 and 15-30 cm. The colour of soil changed between the two depths of 0-15 and 15-30 cm at all the locations. There was also difference in colour of dry and wet soils. The study revealed that range of particle density was from 1.96 to 2.90 g/cm^3, of bulk density from 1.05-1.25 g/cm^3, of water retaining capacity from 55.88 to 68.75 per cent and of specific gravity from 1.31 to 2.41. The sand, silt and clay ranges were from 47.3 to 76.7, 5 to 34.5 and 18.2 to 36.5 per cent respectively. The results indicated that the soil of the surveyed area had good water holding capacity and physical condition. Thus it was suitable for almost all tropical and sub-tropical crops.

Keywords: Physical properties; soil; colour; particle density; bulk density; water retaining capacity; texture; specific gravity

INTRODUCTION

Soil sampling is the most vital step for any soil analysis. Soil is a dynamic natural body developed as a result of pedogenic processes through weathering of rocks, consisting of mineral and organic constituents, possessing definite chemical, physical, mineralogical and biological properties, having a variable depth over the surface of the earth and providing a medium for plant growth (Thakre et al 2012). Soil formation is a constructive as well as destructive process. Destructive process predominates the physical and chemical breaking down of materials, plants and animal structures which results in the partial loss of more soluble and volatile products. Constructive forces develop new chemical compounds both mineral and organic that provide new distribution or association characteristics, structural properties as well as chemical compositions. These factors influence the plant growth in the soil (Pujar et al 2012).

Since soils in general are degrading due to poor management and faulty land use at a rate faster than their natural degeneration it becomes imperative to protect them from further degradation as there is a concomitant decline in soil quality to produce healthy crops.

Hence a detailed study for characterization and evaluation of soils is needed to realize the concept of soil health and quality analysis successfully. With this objective a study was undertaken in soil resources inventory for sustainable land use planning in Chittorgarh region of Rajasthan.

METHODOLOGY

Study was undertaken during 2016 in Rashmi block of district Chittorgarh, Rajasthan. Chittorgarh district lies on southeastern part of Rajasthan. It is surrounded by Kota in east and Pratapgarh district in southwest, Udaipur in west and Bhilwara and Bundi in north. The total geographical area of the district is 750639 hectares which stands at 3.03 per cent of the total area of the state. Soil samples were collected at two different depths of 0-15 and15-30 cm in 12 villages

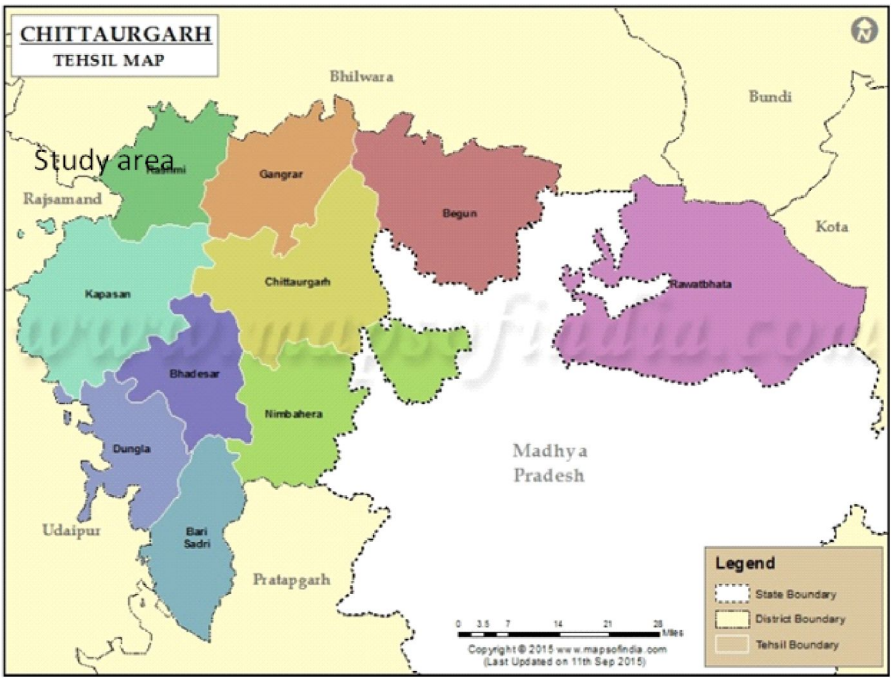
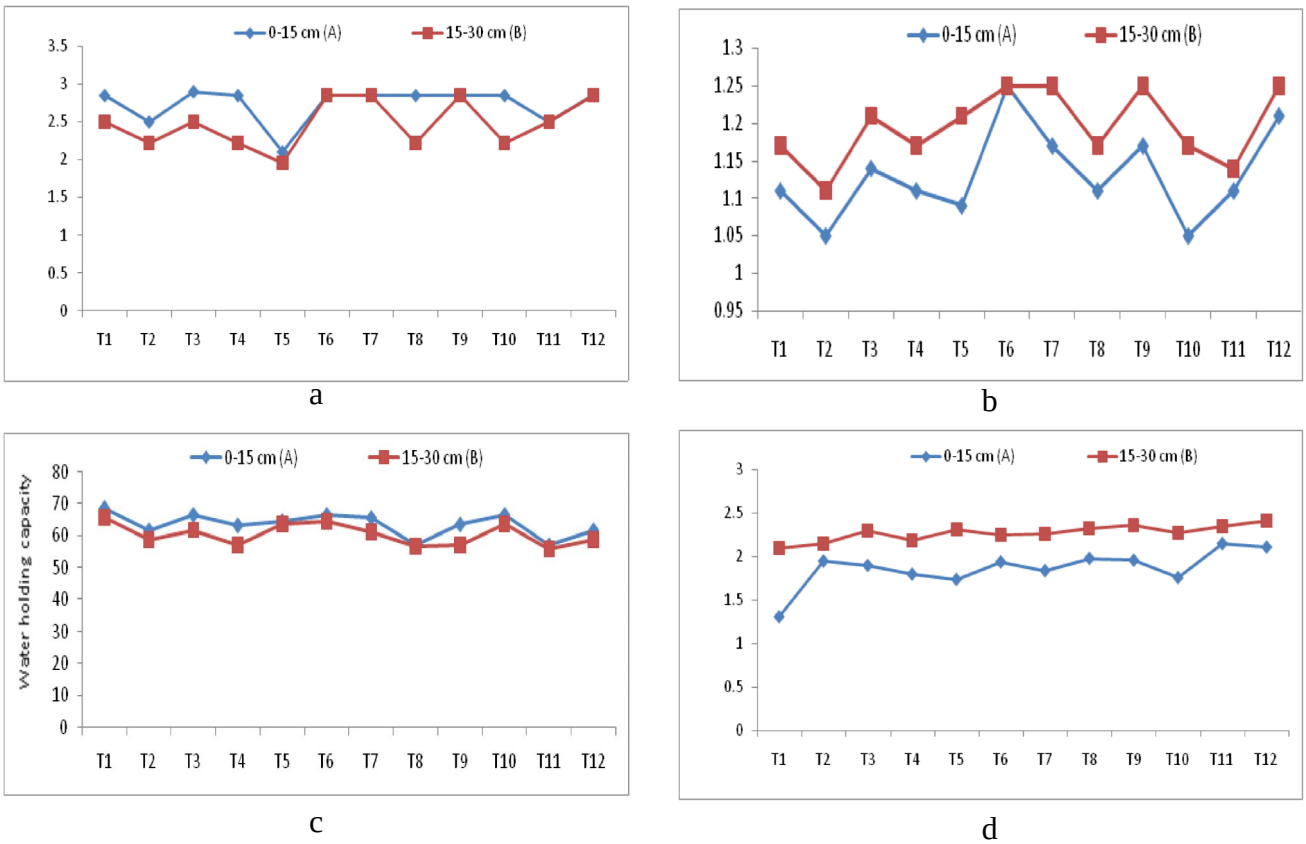


Fig 1. Map showing the study area



Rampuriya (T1), Bhimgarh (T2), Pawli (T3), Narayanpura (T4), Rood (T5), Jagpura (T6), Lasadiya (T7), Muroli (T8), Jadana (T9), Adana (T10), Dindoli (T11), Bhopla (T12)

Fig 2. Particle density (a), bulk density (b), water retaining capacity (c) and specific gravity (d) of soils of Rashmi block

of Rashmi block of the district (Fig 1) namely Rampuriya (T_1), Bhimgarh (T_2), Pawli (T_3), Narayanpura (T_4), Rood (T_5), Jagpura (T_6), Lasadiya (T_7), Muroli (T_8), Jadana (T_9), Adana (T_{10}), Dindoli (T_{11}), Bhopla (T_{12}). Totally twenty four samples were collected from the selected villages. The colour of the soil was determined as per Anon (1971). The soil texture was measured as per the method given by Bouyoucos (1927), bulk density, particle density and water retaining capacity by Black (1965) and specific gravity by Prakash et al (2012).

RESULTS and DISCUSSION

Data on soil colour are given in Table 1, soil texture in Table 2 and the particle density, specific

Table 1. Soil colour in dry and wet conditions of the soil

Village	Soil colour at two depths (cm) of soil	
	0-15	15-30
Dry condition		
Rampuriya	10 YR, 3/3 Dark brown	10 YR, 3/2 Very dark grayish brown
Bhimgarh	7.5 YR, 3/2 Dark brown	7.5 YR, 4/4 Brown
Pawli	10 YR, 5/6 Yellowish brown	10 YR, 6/6 Brownish yellow
Narayanpura	10 YR, 4/3 Dark brown	10 YR, 5/2 Grayish brown
Rood	10 YR, 3/3 Dark brown	10 YR, 3/3 Dark brown
Jagpura	10 YR, 4/2 Dark grayish brown	10 YR, 4/2 Dark grayish brown
Lasadiya	7.5 YR, 5/4 Brown	7.5 YR, 4/4 Dark brown
Muroli	10 YR, 5/6 Yellowish brown	10 YR, 5/4 Yellowish brown
Jadana	10 YR, 3/2 Very dark grayish brown	10 YR, 4/4 Dark yellowish brown
Adana	7.5 YR, 3/2 Dark brown	7.5 YR, 4/4 Dark brown
Dindoli	10 YR, 6/4 Light grayish brown	10 YR, 6/3 Pale brown
Bhopla	10 YR, 6/6 Brownish yellow	10 YR, 6/8 Brownish yellow
Wet condition		
Rampuriya	10 YR, 3/2 Very dark grayish brown	10 YR, 3/2 Very dark grayish brown
Bhimgarh	7.5 YR, 5/4 Brown	7.5 YR, 4/2 Dark brown
Pawli	10 YR, 5/4 Yellowish brown	10 YR, 6/6 Brownish yellow
Narayanpura	10 YR, 3/3 Dark brown	10 YR, 4/2 Dark grayish brown
Rood	10 YR, 3/3 Dark brown	10 YR, 3/3 Dark brown
Jagpura	10 YR, 4/2 Dark grayish brown	10 YR, 4/2 Dark grayish brown
Lasadiya	7.5 YR, 4/4 Dark brown	7.5 YR, 4/4 Dark brown
Muroli	10 YR, 4/4 Dark yellowish brown	10 YR, 4/4 Dark yellowish brown
Jadana	10 YR, 4/2 Dark grayish brown	10 YR, 4/3 Dark brown
Adana	7.5 YR, 4/4 Dark brown	7.5 YR, 4/4 Dark brown
Dindoli	10 YR, 3/2 Very dark brown	10 YR, 6/3 Pale brown
Bhopla	10 YR, 4/2 Dark grayish brown	10 YR, 3/2 Very dark grayish brown

Table 2. Mechanical analysis of soil texture of different villages

Village	Sand (%)	Silt (%)	Clay (%)	Textural class
Rampuriya	57.4	19.3	23.3	Sandy clay loam
Bhimgarh	59	23	19	Sandy loam
Pawli	62.5	13.5	24	Sandy clay loam
Narayanpura	72.7	5.6	21.7	Sandy clay loam
Rood	47.3	34.5	18.2	Loam
Jagpura	45.5	32	22.5	Clay loam
Lasadiya	70	12.1	17.9	Sandy loam
Muroli	63	12.5	24.5	Sandy clay loam
Jadana	57.5	16.5	26	Sandy clay loam
Adana	65.5	22.1	12.4	Sandy loam
Dindoli	59	15	26	Sandy clay loam
Bhopla	76.7	5	18.3	Sandy loam

gravity, bulk density and water retaining capacity of the soil of 12 sites in Fig 2.

The colour of soil changed between the two depths of 0-15 and 15-30 cm at all the locations. There was also difference in colour between dry and wet soils (Table 1).

Under soil texture the sand content ranged from 45.5 (Jagpura) to 76.7 per cent (Bhopla), silt from 5 (Bhopla) to 34.5 (Rood) and clay from 12.4 (Adana) to 26.0 per cent (Jadana and Dindoli). Texture of the soil was loam, clay loam, sandy loam and sandy clay loam in the study area (Table 2).

The highest particle density (2.90 g/cm^3) was found at Pawli village at depth of 0-15 cm and lowest (1.96 g/cm^3) at depth of 15-30 cm at Rood village. Bulk density was highest (1.30 g/cm^3) at Jagpura at depth of 15-30 cm and lowest (1.05 g/cm^3) at depth of 0-15 cm of Bhimgarh village. Similar results were reported by Chaudhari et al (2013) (Fig 2). The maximum water retaining capacity was recorded at Rampuriya village (68.75%) at depth of 0-15 cm and lowest at Narayanpura village (57.14%) at depth of 15-30 cm. The maximum specific gravity (2.41g/cm^3) was found at Bhoplia at the depth 15-30 cm and lowest (1.31 g/cm^3) at Rampuriya at the depth 0-15 cm.

The study showed that there were differences in the physical characteristics of the soils within the Rashmi block. However the soils were in good condition and fit for cultivation of different tropical and subtropical crops.

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