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Evaluation of soil physical properties of farmer's field of Jaipur District, Rajasthan, India

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and Sanwar Mal Yadav**

Abstract

A lab experiment was conducted for an evaluation of soil physical properties of farmer's field of Jaipur district of Rajasthan. A certain depth wise soil samples were collected from various depth viz. 0-15 cm, 15-30 cm and 30-45cm. The analysis of the soil samples manifested that the soil samples fall under loamy sand to sandy loam. The soil color varied from Dark brown (10 YR 3/3) to yellowish brown (10 YR 5/4). Soil having bulk density range from 1.40 to 1.52 Mg m⁻³ with the mean value of 1.46 Mg m⁻³ and particle density range from 2.44 to 2.57 Mg m⁻³ with the mean value of 2.50 Mg m⁻³. The pore space ranges from 39.08% to 43.53% with the mean value of 41.30%. The value of sand, silt and clay in the soils varied from 72.20% to 80.20%, 10.20% to 16.50% and 8.30% to 13.60%. The results obtained thus indicate that the study soils mainly fit for cultivation of pearl millet, ground nut, cowpea, wheat, barley, mustard, coriander and fenugreek. On the basis of analysis, it was found that using organics with in – organics to managed present and future deficiencies of nutrients in these soils and also improve soil health for future generation.

Keywords: Soil analysis, density, Jaipur *etc.*

Introduction

Soil is a natural medium for crop production. Plants derive their nutrients, water and support from the soil. The suitability of the soil as a medium for plant growth depends upon its ability to provide sufficient amount of water and nutrient in available form which in turn is controlled by its properties. The knowledge of soil properties helps in its management, improvement of problematic soil and implementation of efficient fertilizer techniques.

The district jaipur is located in the eastern border of Thar Desert, a semi-arid land of Rajasthan. Geographically, the district lies at 26°91'24'' N, latitude and 75°78'73'' E longitude and 431m altitude. Geographical Area of Jaipur district is 11,152 sq km. The climate of district is monsoon influenced hot semi-arid climate (koppen climate classification BSh) with long, extremely hot summers and short, mild to warm winters. The average annual temperature is 25.1 °C in Jaipur. In a year, the average rainfall is 601 mm. (District Factbook, jaipur, 2019)

Physical properties analysis generally includes simple, fast and low-cost methodologies. The physical properties of soil that were assessed were bulk density, particle density, porosity, and soil colour. The texture describes the proportion of three sizes of soil particles and the fineness or coarseness of a soil. Soil texture is an important factor affecting the balance between water and gases, but it is very stable along time, independently on the soil management. Therefore, bulk density and total porosity can better represent the effects of soil use and management on the water and air relationships (Beutler *et al.*, 2002) ^[1].

Methodology

The Jaipur district is located in the eastern border of Thar Desert, a semi-arid land of Rajasthan Geographically, the district lies at 26°91'24'' N, latitude and 75°78'73'' E, longitude and 431 m altitude. Geographical Area of Jaipur district is 11,152 sq km. The climate of district is monsoon influenced hot semi-arid climate (koppen climate classification) with long, extremely hot summers and short, mild to warm winters. The average annual temperature is 25.1°C in Jaipur. In a year, the average rainfall is 601 mm. Soil sampling was done from total nine villages of jaipur district. A total of 27soil samples were collected from different site using soil auger, screw auger and khurpi at the depth of 0-12cm, 15-30cm and 30-45cm. The collected soil samples were air dried in shade, clods were broken with wooden mallet and powered soil

is then sieved with 2mm sieve and analysed for physical parameters in laboratory. The physical parameters include soil texture, bulk density, partical density, and Soil Pore Space. Soil textural class was determined by using Bouyoucos

Hydrometer (Bouyoucos, 1927) [2]. Bulk density and Partical density was determined by using Graduated Cylinder method (Muthuval et al., 1992). Soil Colour was determined by using Munsell Colour Chart (Albert Henry Munsell, 1971) [5].

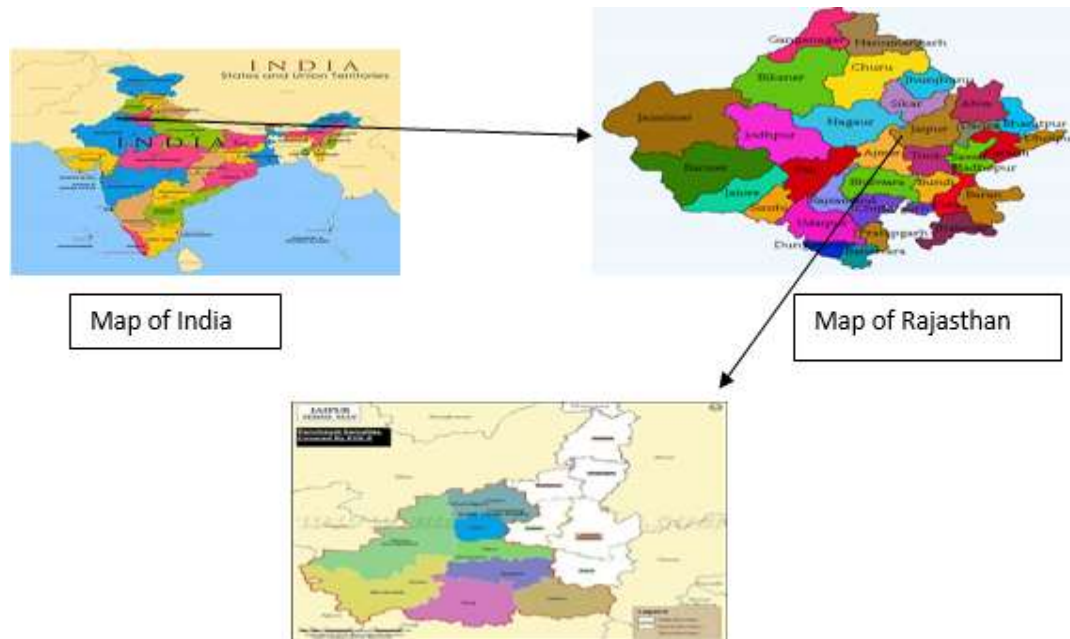


Fig 1: Shows map of India and map of Rajasthan

Results and Discussion

The results revealed that most of soil colour of Farmer’s field in dry condition of soil. The colour varies from 10 YR 3/3 (Dark brown) 10 YR 5/4 (yellowish brown) in soil profile. Soil texture of soil samples was fall under loamy sand and the sand content in the studied soils ranges from 71.00 to 80.20 %, silt from 10.20 to 16.50 % and clay from 8.30 to 13.60%. The bulk density of soils in ranged from 1.40 to 1.52 Mg m⁻³. The soils under study showed an increasing trend with the depth of soil profile. The higher value of Bulk density of soils was due to the coarse texture, presence of calcium carbonate and low organic carbon content. Similar results were obtained

by Laxaman *et al.*, (2019) [3]. The Particle density of soils in ranged from 2.44 to 2.57 Mg m⁻³. The soils under study showed an increasing trend with the depth of soil profile. In general higher value of particle density was observed in sub–surface horizon of the profiles which might be due to relatively higher amount of weather able minerals which is dominant in area, lower value of organic carbon content leading to increase in weight of soil solid. The value of pore space of soils in ranged from 39.08 to 43.63%. The soils under study showed a decreasing trend with the depth of soil profile. Similar results were obtained by Laxaman *et al.*, (2019) [3].

Table 1: Representing Soil Colour at different depth of Farmers field of Jaipur district, Rajasthan

Site	Farmer’s Field	0-15 cm	15-30 cm	30-45 cm
Amer	Khannipura	Dark yellowish brown	Dark yellowish brown	Dark yellowish brown
	Jal soo	Dark yellowish brown	Dark yellowish brown	Dark yellowish brown
	Anopura	Dark yellowish brown	Dark yellowish brown	Dark yellowish brown
Chomu	Jatpura	Dark yellowish brown	Dark yellowish brown	Dark yellowish brown
	Amerpura	Dark yellowish brown	Dark brown	Dark yellowish brown
	Anatpura	yellowish brown	Dark yellowish brown	Dark yellowish brown
Jhotwara	Machawa	Brown	Brown	Dark yellowish brown
	Hathoj	Brown	Brown	Dark yellowish brown
	Mundyaramser	Dark yellowish brown	Dark yellowish brown	Dark yellowish brown

Table 2: Representing Soil Pore Space at different depth of Farmers field of Jaipur district, Rajasthan.

Site	Farmer’s Field	0-15 cm	15-30 cm	30-45 cm
Amer	Khannipura	42.89	41.21	39.45
	Jal soo	42.55	42.05	41.50
	Anopura	40.85	40.40	39.76
Chomu	Jatpura	41.33	40.90	39.78
	Amerpura	41.15	40.25	39.08
	Anatpura	40.31	39.76	39.08
Jhotwara	Machawa	43.63	43.37	42.90
	Hathoj	41.13	40.78	39.93
	Mundyaramser	41.08	40.20	39.10

Table 3: Representing Soil Texture, Bulk density and Particle density of soil at different depth (cm) of Farmers Field of Jaipur district, Rajasthan

Site	Farmers Field	Soil Texture	Bulk Density (Mg m ⁻³)			Particle Density (Mg m ⁻³)		
			0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm
Amer	Khannipura	Loamy sand	1.46	1.49	1.52	2.51	2.52	2.52
	Jal soo	Loamy sand	1.43	1.45	1.45	2.49	2.51	2.51
	Anopura	Loamy sand	1.44	1.45	1.46	2.49	2.52	2.51
Chomu	Jatpura	Loamy sand	1.40	1.41	1.44	2.45	2.49	2.49
	Amerpura	Loamy sand	1.40	1.43	1.44	2.46	2.50	2.50
	Anatpura	Loamy sand	1.44	1.46	1.49	2.44	2.49	2.48
Jhotwara	Machawa	Loamy sand	1.43	1.45	1.46	2.47	2.54	2.50
	Hathoj	Loamy sand	1.45	1.45	1.47	2.49	2.56	2.53
	Mundyaramser	Loamy sand	1.44	1.45	1.47	2.48	2.57	2.52

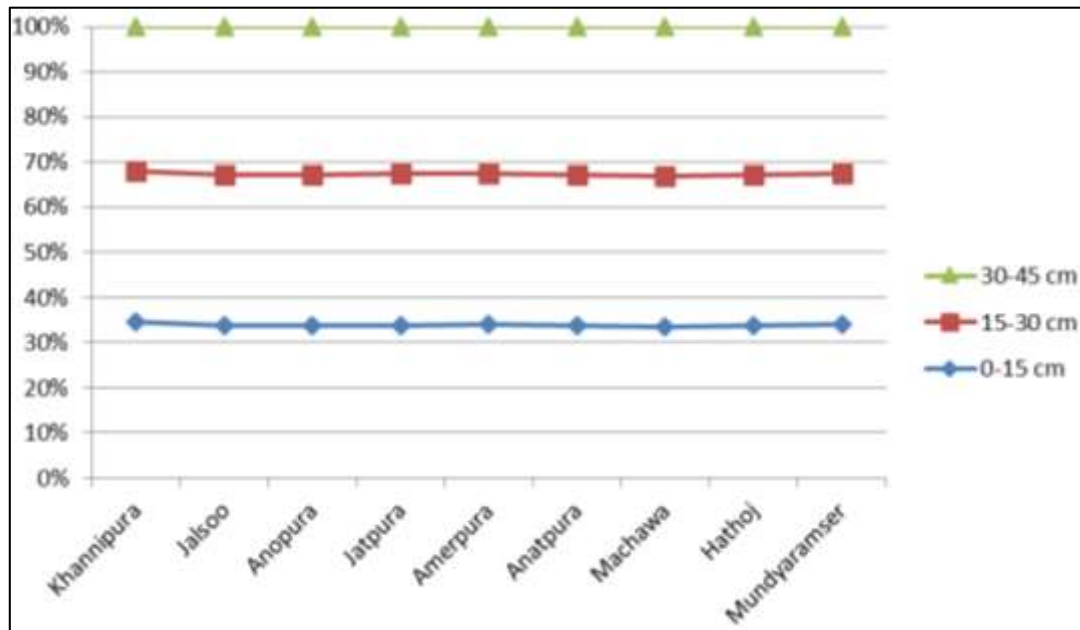


Fig 2: Representing Soil Pore Space at different depth of Farmers field of Jaipur district, Rajasthan.

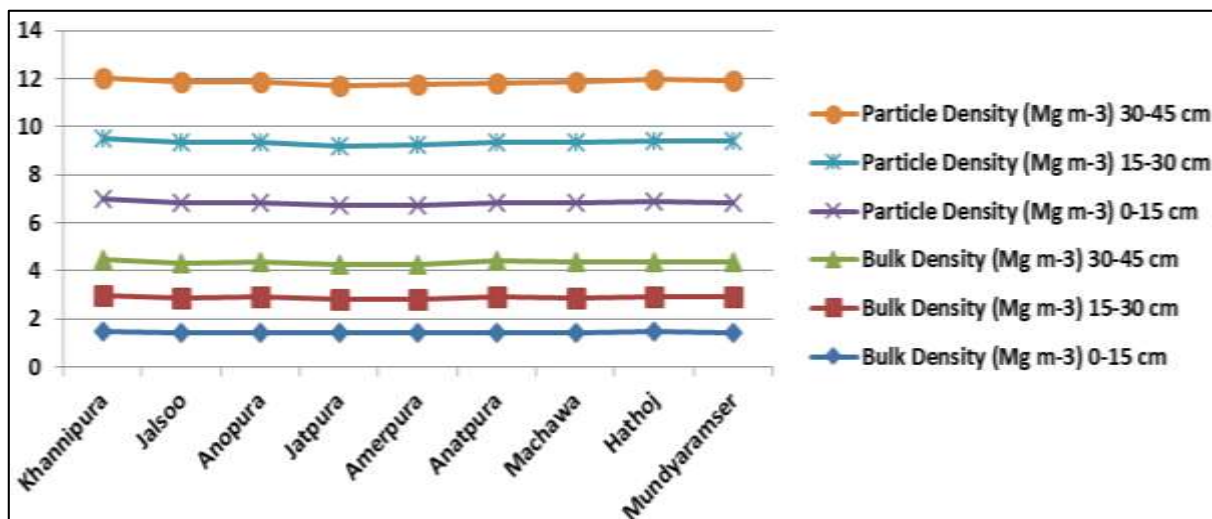


Fig 3: Representing Soil Texture, Bulk density and Particle density of soil at different depth (cm) of Farmers Field of Jaipur district, Rajasthan

Conclusion

The majority of soils of study area were loamy to sandy loam in soil texture and colour from dark yellowish brown to yellowish brown. There for using organics in combination with in-organics to managed present and future deficiencies of nutrients in these soils and also improve soil health for future generation. The main aim of this investigation was to determine the physical properties of soil due to paucity in

information in the selected study areas. Not only would this benefit the farming to make practical decisions in adopting farming techniques and incorporate fertilizer based on soils test thereby improving productivity and yield but also add to the database on soils in these areas for reference for further scientific research. The results of the investigation have been summarized below. Range has been included considering both the profile depths.

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