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Ashok Choudhary
Research Scholar, Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Narendra Swaroop
Associate Professor, Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Corresponding Author
Ashok Choudhary
Research Scholar, Department of Soil Science and Agricultural Chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

Assessment of physical properties of soil from different blocks of Jaipur district, Rajasthan, India

Ashok Choudhary and Narendra Swaroop

Abstract
An experiment was conducted during the year 2020 and 2021 to assess the physical and chemical properties of soils in the Jaipur district of Rajasthan. The twenty-seven soil samples were collected from different blocks of Jaipur district from different depth (0-15 cm, 15-30 cm and 30-45 cm) at the farmer's fields. Longitude and latitude (26˚55′10″ N and 75˚47′16″ E) positions of experimental sites. After an analysis the physical properties of the soil samples the soil colour varied from (Light yellowish brown, brownish yellow and brownish yellow) in the dry condition and (yellowish brown, dark yellowish brown and dark yellowish brown) predominated in wet condition and. Mostly blocks having the sandy loam soil texture. The bulk density varied from 1.23 to 1.33, 1.27 to 1.35 and 1.30 to 1.38 Mg m^{-3}. Particle density ranged from 2.23 to 2.33, 2.25 to 2.35 and 2.29 to 2.37 Mg m^{-3}. The Water Holding Capacity was ranged from 44.53 to 60.12, 42.89 to 57.44, and 41.27 to 56.30% and Pore Space percentage was varied from 42.42 to 45.09, 41.92 to 43.56, and 41.77 to 43.67%.The Specific Gravity varied from 2.43 to 2.52, 2.44 to 2.56 and 2.46 to 2.59. The use of organic manure for promoting soil health and soil quality.

Keywords: Soil colour, physical properties, Jaipur etc.

Introduction
Soil is one of the most precious natural resources, which provides a medium for plant growth to meet our food and fiber needs (Naphade *et al.*, 2021) [8]. Land is a basic natural resource on which development of human with other living beings along with water and plants are going on from the beginning of the creation. Inadequate management of natural resource affected bio diversity, agriculture productivity and ecological balance. Soil word has been derived from Latin word *solum* which means earthly material in which all the living things survives on the inside and outside of the periphery. The Edaphology correlate to plants and human beings considered as a soil habitat. The minor difference between pedology and edaphology, Pedology means only study of the soils, its description and its classification. On the other hand, Edaphology means study of plants and humans habitants. Soil is the most vital natural resource, can be termed as 'Soul of infinite life' and it is the exclusive source of infinite living organisms which supports the life of crop plants by acting as a medium for growth along with providing nutrients, air, and water (Rajshri *et al.*, 2021) [11].
Rajasthan is a state in northern India. It is the largest Indian state by area and the seventh largest by population. The state covers an area of 3,42,239 square kilometers or 10.4 percent of the total geographical area of India. Geographically, Rajasthan is located between 27˚23′28″ North latitude and 73˚25′57″ East longitude. Rajasthan is located on the north-western side of India, where it comprises most of the wide and inhospitable Thar Desert (Ministry of Home Affairs, 2018). Jaipur is a district of Rajasthan. Jaipur is located between 26˚55′10″ N and 75˚47′16″ E. It has an average elevation of 431 meters (1414 feet) from sea level. The district has an area of 11,152 square kilometers. The climate of the Jaipur district is extremely hot in the summers and short, mild to warm in the winters. The average annual temperature is 25.1˚C in Jaipur. The average annual rainfall of the region is 650 mm. Pearl millet, groundnut, cluster bean, sorghum and green gram are the main kharif crops where, as wheat, mustard, barley, gram, pea, rapeseed and taramira are the major Rabi crops of the district. Therefore, the present investigation was undertaken to assess the physical properties of soils from different blocks of Jaipur district. (District Fact Book, 2019) [3].

Materials and Methods
Rajasthan is a state in northern India. The state covers an area of 3,42,239 square kilometers or 10.4 percent of the total geographical area of India. Geographically, Rajasthan is located between 27˚23′28″ North latitude and 73˚25′57″ East longitude.

Jaipur is a district of Rajasthan. Jaipur is located between 26˚55′10″ N and 75˚47′16″ E. The entire study area was divided into three different blocks from the district were taken under study, *viz.*, Phulera (Block I), Amber (Block II) and Chomu (Block III) with three different sites taken from each village (Fig. 1). Total twenty seven soil samples were collected at different depths of 0- 15 cm, 15-30 cm and 30-45 cm respectively at the site. The locations of the samples were recorded by using the handheld mobile app GIS system. The collected soil samples were processed and analysed for physical properties of soil by standard analytical methods.

The data was recorded during the course of investigation were subjected to statistical analysis by analysis of Completely Randomized Design (CRD) as per the method of "Analysis of Variance" (ANOVA) technique (Fischer, 1927) [4]. The type of ANOVA adopted for the experiment was two-way factor analysis without replication.

Sieved soil samples were determined for physical properties of soil like its soil textural class by Bouyoucos hydrometer method (Bouyoucos, 1927) [1], soil colour by using Munsell soil colour chart (Munsell, 1954) [6], bulk density, partilce density, percent pore space and water holding capacity was determined by 100 ml graduated measuring cylinder method (Muthuvel *et al.*, 1992) [7].

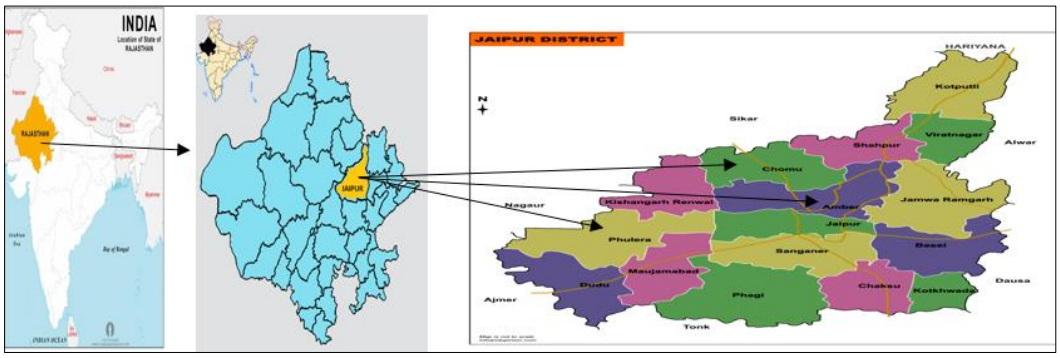

Fig 1: Locating sampling sites on map of Jaipur district, Rajasthan

Results and Discussion

A. Physical properties

The results revealed that most of the soils of Jaipur district in dry condition, reflected light yellowish brown (10YR 6/4) to brownish yellow (10YR 6/8) colour and in wet condition, reflected yellowish brown (10YR 5/8) to dark yellowish brown (10YR 4/6) colour mentioned in Table 1. Soil texture of soil samples was fall under sandy loam (Table 2). The bulk density in soils from different villages varied from 1.23 to 1.38 Mg m^{-3}. The bulk density increases with the increase in soil depth (Table 2).

The bulk density decreased due to high organic matter content or vice versa. A similar result has also been identified by Urmila *et al.*, (2018) [12]. The particle density of soil varied from 2.23 to 2.37 Mg m^{-3}. The particle density increased due to increase in soil depth (Table 2). The increased in the particle density is due to soil depth, water quality and their interaction. Same analysis has been done by Meena *et al.*, (2017) [5]. The water holding capacity (%) of soil varied from 41.27% to 60.12% (Table 3). These variations were due to clay, silt and organic carbon content and low WHC in sandy soils due to high sand and less clay content. The WHC increased with an increase in the clay content at the sites. The Irregular trend of this WHC with depth was also due to the illuviation and eluviation of finer fractions in different horizons. Same analysis results have been reported by Pusty & Panda (2019) [10]. Percent Pore Space of different soil depths varied from 42.35% to 45.09%. (Table 3) Soil containing high organic matter possesses high porosity. The percent pore space decreases with increase in depth of soil. Same analysis result has been reported by Choudhary *et al.*, (2020) [2].

Table 1: Soil Colour of different villages in dry and wet condition of soil in Jaipur at 0-15 cm, 15-30 cm and 30-45 cm depths

Blocks	Villages	Soil Colour					
		Dry condition			Wet condition		
		0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm
Phulera	Dhera	Light yellowish brown	Brownish yellow	Brownish yellow	Brown	Dark yellowish brown	Dark yellowish brown
	Hingoniya	Yellow	Yellow	Brownish yellow	Yellowish brown	Yellowish brown	Yellowish brown
	Bobas	Light yellowish brown	Brownish yellow	Brownish yellow	Yellowish brown	Dark yellowish brown	Dark yellowish brown
Amber	Daulatpura	Light yellowish brown	Light yellowish brown	Brownish yellow	Dark greyish brown	Dark yellowish brown	Dark yellowish brown
	Sirsali	Brownish yellow	Brownish yellow	Brownish yellow	Brown	Dark yellowish brown	Dark yellowish brown
	Khannipura	Brownish yellow	Brownish yellow	Yellowish brown	Yellowish brown	Brown	Dark yellowish brown
Chomu	Kaladera	Light yellowish brown	Brownish yellow	Brownish yellow	Yellowish brown	Yellowish brown	Yellowish brown
	Malikpur	Brownish yellow	Yellowish brown	Yellowish brown	Yellowish brown	Dark yellowish brown	Dark yellowish brown
	Samod	Brownish yellow	Brownish yellow	Brownish yellow	Brown	Dark yellowish brown	Dark yellowish brown

Table 2: Soil Texture, Bulk Density and Particle Density in different villages of Jaipur at 0-15 cm, 15-30 cm and 30-45 cm depths

Blocks	Villages	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
Phulera	Dhera	Sandy loam	1.29	1.32	1.33	2.27	2.31	2.33
	Hingoniya	Loamy sand	1.32	1.35	1.38	2.33	2.35	2.37
	Bobas	Loamy sand	1.33	1.34	1.36	2.31	2.33	2.35
Amber	Daulatpura	Sandy loam	1.26	1.29	1.31	2.27	2.28	2.3
	Sirsali	Sandy loam	1.23	1.28	1.29	2.23	2.26	2.29
	Khannipura	Sandy loam	1.29	1.30	1.31	2.26	2.29	2.31
Chomu	Kaladera	Sandy loam	1.26	1.29	1.30	2.25	2.27	2.29
	Malikpur	Sandy loam	1.30	1.33	1.34	2.28	2.29	2.32
	Samod	Sandy loam	1.23	1.27	1.30	2.24	2.25	2.29

Table 3: Water Holding Capacity (%) and Pore Space (%) of soil in different villages of Jaipur at 0-15 cm, 15-30 cm and 30-45 cm depths

Blocks	Villages	Water Holding Capacity (%)			Pore Space (%)		
		0-15 cm	15-30 cm	30-45 cm	0-15 cm	15-30 cm	30-45 cm
Phulera	Dhera	52.41	50.7	49.16	43.17	42.86	42.92
	Hingoniya	44.53	42.89	41.27	43.35	42.55	41.77
	Bobas	46.24	44.99	43.13	42.42	42.49	42.13
Amber	Daulatpura	55.86	53.7	53.05	44.49	43.42	43.04
	Sirsali	58.89	56.75	54.66	44.84	43.36	43.67
	Khannipura	51.89	49.04	47.39	42.92	43.23	43.29
Chomu	Kaladera	57.24	55.97	53.78	44.00	43.17	43.23
	Malikpur	48.5	46.9	45.15	42.98	41.92	42.24
	Samod	60.12	57.44	56.3	45.09	43.56	43.23

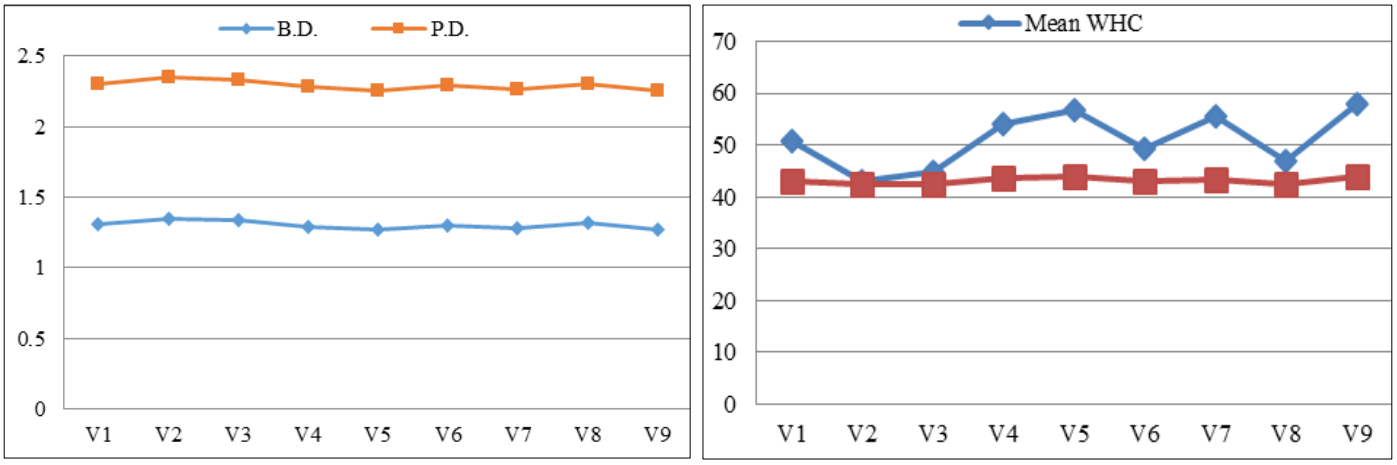

Fig 2: Show mean of WHC

Conclusion

It is concluded that soil parameters were studied during the course of investigation responded good physical properties. By analysing the taken soil sample, Sandy Loam and Lomy Sand Soil it has mixture of sand, silt and clay. The use of organic manure for promoting soil health and soil quality. It is concluded that there is a need of proper management approaches for attain optimum economic yield and maintain soil fertility.

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Conflict of Interest

As a corresponding Author, I Ashok Choudhary, confirm that none of others have any conflicts of interest associated with this publication.

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