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Sandeep Kumar Kharra
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

Tarun Kumar
Department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute (NAI),
Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj,
Uttar Pradesh, India

Corresponding Author
Sandeep Kumar Kharra
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 Sikar district of Rajasthan, India

Sandeep Kumar Kharra, Narendra Swaroop and Tarun Kumar

Abstract
Soil sample were collected from three blocks of the Sikar district from three depth *viz*. 0-15 cm, 15-30 cm and 30-45 cm for the "Assessment of Physical Properties of Soil from Different Blocks of Sikar District, Rajasthan" was carried out in 2019-21. Nine sampling points in different villages were selected for the analysis. The colour of soil changed between the three depths of 0-15 cm, 15-30 and 30-45cm at all the locations. There was also difference in colour of dry and wet soils was soil colour found in dry condition was, vary dark greyish brown and dark brown. The sand, silt and clay % varied from 75.15-79.40%, 12.20-13.60%, and 11.40-10.67% respectively. The texture classes identified were sandy clay loam and sandy clay. The bulk density ranges from 1.58-1.68 Mg m-3 the particle density ranges from 2.61-2.69 Mg m-3. The pore space (%) ranges from 43.02-42.16%.

Keywords: Soil texture, physical properties, Sikar district

Introduction
Soil is composed of particles of broken rock (parent materials) which have been altered by physical, chemical and biological processes that include weathering with associated erosion. Soil is created from the alteration of parent material by the interactions between the lithosphere, hydrosphere, atmosphere, and biosphere (Balaram Sahu and Jayati Mitra, 2016) [10].

Soil is the basic resource for agriculture and its proper management is essential to sustain agricultural production and soil productivity. Soil testing is one of the best available tools, to ascertain the physical characteristics & nutrient status of a field so as to assess the fertilizer requirement for a crop or a cropping system (Singh and Brar, 2005) [4].

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). The district Sikar is located in the east-central part of Rajasthan. Geographically, the district lies at 27.5767º N latitude and 75.0611º E longitude and 427 m altitude. Geographical Area of Sikar district is 7742 sq km^2. It is capital of Rajasthan. (District Fact Book, 2019) [2].

Materials and Methods
The district Sikar is located in the east-central part of Rajasthan. Geographically, the district lies at 27.5767º N latitude and 75.0611º E longitude and 427 m altitude. Geographical Area of Sikar district is 7742 sq km2. The three land use systems *viz*. Neemkathana, Khandla, Shrimadhopur, Barren\uncultivated land were selected in Sikar district. The soil samples were collected from each land use systems using GPS and replicate with three, from four soil depths (0-15, 15-30 and 30-45 cm). 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) [3]. 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), bulk density, partilce density and percent pore space was determined by 100 ml graduated measuring cylinder method (Muthuvel *et al.*, 1992) [6].

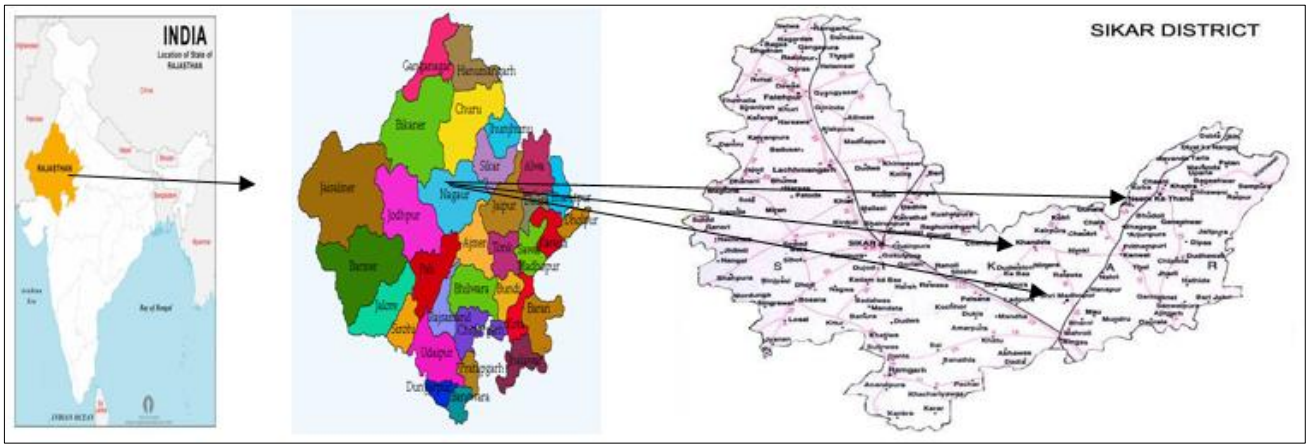

Fig 1: Locating sampling sites on map of Sikar district, Rajasthan

Results and Discussion

A. Physical properties

The results revealed that most of the soils of Sikar 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 loamy sandy (Table 2). The bulk density in soils from different villages varied from 1.46 to 1.68 Mg m^{-3}. The bulk density increases with the increase in soil depth (Table 2). The sand content increasing with increasing depth. The similar result trend found in Shrimadhopur and Khandala block. The similar results were also reported by Rasool *et al.* (2014) [7]. The particle density of soil varied from 2.56 to 2.70 Mg m^{-3}. The particle density increased due to increase in soil depth (Table 2). The similar result trend found in Shrimadhopur and Khandala block. Such type of results were also reported by Rathore (1993), Ram *et al.* (2010), Vedari and Naidu (2018) [9] and Laxman *et al.* (2019). Percent Pore Space of different soil depths varied from 40.99% to 36.98%. (Table 3) Soil containing high organic matter possesses high porosity. The percent pore space decreases with increase in depth of soil. The results were similar to that reported by Sharma and Kumar (2003) [8] and Laxman *et al.* (2019).

Table 1: Soil Colour of different villages in dry and wet condition of soil in Sikar 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
Shrimadhopur (B_1)	Jaswantpura(V_1)	Light yellowish brown	Brownish yellow	Brownish yellow	Brown	Dark yellowish brown	Dark yellowish brown
	Kanchanpura(V_2)	Yellow	Yellow	Brownish yellow	Yellowish brown	Yellowish brown	Yellowish brown
	Kalyanpura(V_3)	Light yellowish brown	Brownish yellow	Brownish yellow	Yellowish brown	Dark yellowish brown	Dark yellowish brown
Khandla(B_2)	Jairampura(V_4)	Light yellowish brown	Light yellowish brown	Brownish yellow	Dark greyish brown	Dark yellowish brown	Dark yellowish brown
	Dulhepura (V_5)	Brownish yellow	Brownish yellow	Brownish yellow	Brown	Dark yellowish brown	Dark yellowish brown
	Kanwat(V_6)	Brownish yellow	Brownish yellow	Yellowish brown	Yellowish brown	Brown	Dark yellowish brown
Neemkathana(B_3)	Chala(V_7)	Light yellowish brown	Brownish yellow	Brownish yellow	Yellowish brown	Yellowish brown	Yellowish brown
	Godawas(V_8)	Brownish yellow	Yellowish brown	Yellowish brown	Yellowish brown	Dark yellowish brown	Dark yellowish brown
	Jeelo(V_9)	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 Sikar 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
Shrimadhopur (B_1)	Jaswantpura(V_1)	Loamy sand	1.46	1.50	1.54	2.58	2.60	2.64
	Kanchanpura(V_2)	Loamy sand	1.48	1.50	1.56	2.57	2.63	2.70
	Kalyanpura(V_3)	Loamy sand	1.49	1.51	1.55	2.56	2.62	2.67
Khandla(B_2)	Jairampura(V_4)	Loamy sand	1.50	1.53	1.57	2.57	2.59	2.65
	Dulhepura (V_5)	Loamy sand	1.49	1.54	1.59	2.59	2.60	2.65
	Kanwat(V_6)	Loamy sand	1.48	1.50	1.58	2.58	2.62	2.68
Neemkathana(B_3)	Chala(V_7)	Loamy sand	1.58	1.62	1.68	2.60	2.62	2.68
	Godawas(V_8)	Loamy sand	1.54	1.59	1.66	2.61	2.64	2.69
	Jeelo(V_9)	Loamy sand	1.52	1.56	1.67	2.57	2.62	2.65

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

Blocks	Villages	Pore Space (%)		
		0-15 cm	15-30 cm	30-45 cm
Shrimadhopur (B_1)	Jaswantpura(V_1)	43.41	42.30	41.66
	Kanchanpura(V_2)	42.41	42.96	42.22
	Kalyanpura(V_3)	41.79	42.14	41.94
Khandla(B_2)	Jairampura(V_4)	42.41	41.31	40.15
	Dulhepura (V_5)	42.47	41.92	41.13
	Kanwat(V_6)	43.02	42.74	42.16
Neemkathana(B_3)	Chala(V_7)	39.23	38.23	37.31
	Godawas(V_8)	40.99	39.77	37.40
	Jeelo(V_9)	41.31	40.22	36.98

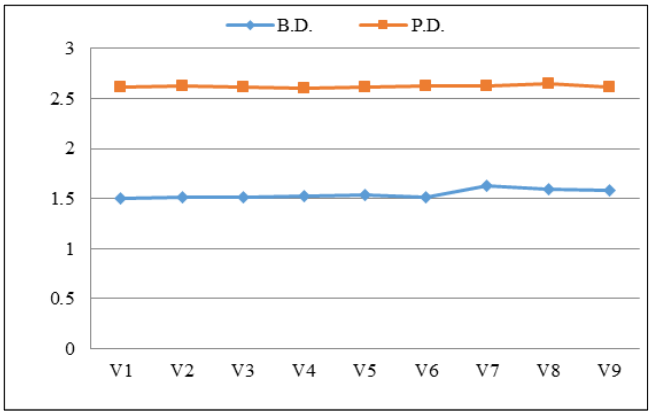

Fig 2: Pore Space (%) of soil in different villages of Sikar at 0-15 cm, 15-30 cm and 30-45 cm depths

Conclusion

It is concluded that soil parameters were studied during the course of investigation responded good physical properties. By analysing the taken soil sample 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 Sandeep Kumar Kharra, confirm that none of others have any conflicts of interest associated with this publication.

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