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Assessment of Soil Physical Parameters from Shahabad Block in Kurukshetra District, Haryana, India

Sonu*, Ram Bharose, Tarence Thomas and Iska Srinath Reddy

Department of Soil Science and Agricultural Chemistry, Naini Agricultural Institute, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj 211 007 U.P., India

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ABSTRACT

The purpose of this study was to observe physical parameters of soil from Shahabad block located in Kurukshetra district within Haryana state during 2022-23 and the analysis conducted on the soil parameters indicated that this particular soil type has sandy loam texture. In terms of colour variation during different moisture levels – In a dry state varies between light-reddish-brown to dark-gray-brown whereas in a wet state there's variation seen from reddish-brown to grey. The soil samples showed variation in their bulk densities within the range of approximately 1.18-1.39 Mg m^{-3}, while their particle densities fell within the range of about 2.31-2.51 Mg m^{-3}, with percent pore spaces spanning around 44.2-49.78%. Additionally, their corresponding values for water retention capacities were found about 39.25-43.93%. Observations indicate that regular soil testing is helping farmers follow better management practices leading to appropriate nutrient application and consequently enhancing physical parameters of soils.

Key words: *Shahabad block, Soil testing, Physical parameters, Texture, etc.*

Introduction

Described as the soul of infinite life -soil is both precious and irreplaceable. Its productivity is largely influenced by factors such as soil fertility management practices and climate which significantly affect its crop producing capacity that form an integral part of life in soil (Lal, 2011). Soil represents a highly dynamic and intricate natural system that exists on Earth's surface, and its importance lies in being a critical source of plant nourishment while simultaneously functioning as a vital medium for different lifeforms to survive (Tewari *et al.*, 2016). During a process known as soil analysis testing takes place to identity physical, chemical and biological characteristics, which is an essential step in helping farmers and gardeners make informed decisions about how best to manage their land in order to yield an optimal harvest. Soil analysis results can also help determine fertilizer recommendations Smith and Mullins, 2015. Soil testing involves qualitative analysis of soils to establish their inherent fertility status and it has been widely accepted as a scientific method (Meena *et al.*, 2018). The majority of soil formation in Haryana is attributed to alluvial deposits, covering alluvial in the southwestern region are piles of wind-blown sand that have taken the form of sand dunes. In regards to alluvial types across this area, it's important to note that aside from flood plains near Yamuna and Gagger rivers, the rest of it con-

sists mainly of a type known as banger. However, Yamuna and Ghaggar flood plains are referred to as khadar due to accumulation of recent alluvial. All these types of soil fall into classification such as Entisols or Inceptisols or Alfisols according to soil taxonomy Tewari *et al.,* 2016.

Methodology

Kurukshetra is located at Latitude 29°-522 to 30°-122 & Longitude 76°-262 to 77°-042 in the North Eastern part of Haryana State. The district covers 3.46% area of the State. The district is bordered by districts of Haryana State namely Karnal district in the south and south eastern, Kaithal district in the south western and Ambala district in the north. The district is also bordered by Patiala district of Punjab State in the north-west. Soil samples were collected from the ten different villages from Shahabad block viz., Dau-majra (V_1), Mohri (V_2), Landhi (V_3), Kalyana (V_4), Ram Nagar (V_5), Rawa (V_6), Chhapra (V_7), Kalsana (V_8), Shahabad (V_9), and Yara (V_{10}). The samples are collected from all 4 directions from one village with 0-15 and 15-30 cm depth. Analysis of the soil samples were under the physical parameters, Soil texture refers to proportion of sand, silt and clay particles which was determined by using Hydrometer (Bouyoucos, 1927) and soil colour was determined by Munsell Colour Chart (Munsell, 1971). Bulk density, Particle density, Water retaining capacity was determined by using Graduated Measuring Cylinder method (Muthuvel *et al.,* 1992).

Results

The color of the soil sample in a dry condition varies from light reddish brown to dark grayish brown and in wet condition, it also varies from reddish brown to gray. The same finding was seen by Sharma and Choudhary (2016). According to Sharma and Choudhary, soil color is primarily influenced by the organic matter content, mineral composition, and soil moisture. For instance, soils with a high organic matter content tend to have a darker color because of the presence of humus, which is a dark-colored, organic material. Similarly, soils that are rich in iron oxides tend to have a reddish-brown color, while soils that are high in calcium carbonate may have a white or gray color.

The Soil Texture of experimental sites was identified as Sandy Clay Loam. The sand, silt and clay percentage varied from 66.43 to 68.89 sand, 14.94 to 20.90 silt and 11.55 to 17.80 clay in Sandy Loam. Sandy loam soils have a high proportion of sand particles, which are typically larger in size and provide good drainage and aeration to the soil. Similarly According to Narwal *et al.,* 2006, the same results were reported.

Bulk Density was varied from 1.18 Mg m^3 to 1.39 Mg m^{-3} and the highest Bulk Density was found in Rawa V_6 (1.39 Mg m^{-3}). The bulk density of the soil increases with increase in soil depth. Generally, decreases in bulk density is due to high organic matter or vice-versa. Low bulk density in soil is often an indicator of healthy soil with good structure and pore space because of high organic matter, Singh *et al.* (2016) have also reported identical results.

The Particle Density varied from 2.31 Mg m^{-3} to 2.51 Mg m^{-3} and the highest Particle Density was found in Rawa V_6 (2.51 Mg m^{-3}). Particle density increase with depth same as bulk density. The particle density decreases is due to high organic matter or vice-versa. Similarly results were reported by Singh *et al.,* (2017).

Table 1. Soil texture and soil colour of Shahabad block

Village	Soil colour	Soil texture	
		Dry condition	Wet condition
Dau-majra (V_1)	Light reddish brown	Reddish Brown	Sandy loam
Mohri (V_2)	Light gray	Reddish Brown	Sandy loam
Landhi (V_{-3})	Light reddish brown	Reddish Brown	Sandyloam
Kalyana (V_4)	Light reddish brown	Reddish Brown	Sandyloam
Ram Nagar (V_5)	Light reddish brown	Reddish Brown	Sandyloam
Rawa (V_6)	Light gray	Very dark grayish brown	Sandy loam
Chhapra (V_7)	Light brownish gray	Very dark grayish brown	Sandyloam
Kalsana (V_8)	Light brownish gray	Very dark grayish brown	Sandyloam
Shahabad (V_9)	Light reddish brown	Reddish Brown	Sandyloam
Yara(V_{10})	Light brownish gray	Very dark gray	Sandy loam

Table 2. Estimation of Bulk density (Mgm^{-3}), Particle density (Mgm^{-3}), Water Holding Capacity (%) and Pore Space (%)

Village	Bulk density (Mgm-3)		Particle density (Mgm-3)		Pore space (%)		WHC (%)	
	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
Dau-majra (V_1)	1.21	1.22	2.34	2.34	48.29	47.86	44.19	42.21
Mohri (V_2)	1.24	1.25	2.37	2.37	47.67	47.25	43.53	42.14
Landhi (V_3)	1.33	1.35	2.42	2.42	45.26	44.21	43.42	41.56
Kalyana (V_4)	1.28	1.31	2.33	2.34	45.06	44.01	41.52	40.22
Ram Nagar (V_5)	1.32	1.34	2.44	2.45	45.90	45.30	42.88	41.97
Rawa (V_6)	1.37	1.39	2.51	2.51	45.41	44.62	42.37	40.85
Chhapra (V_7)	1.25	1.28	2.41	2.42	48.13	47.11	43.45	41.88
Kalsana (V_8)	1.28	1.29	2.31	2.32	44.59	44.29	40.59	39.25
Shahabad (V_9)	1.18	1.20	2.35	2.35	49.78	48.28	45.11	43.93
Yara(V_{10})	1.26	1.27	2.44	2.45	48.36	48.16	44.93	42.54

The Pore Space (%) ranged from 44.20% to 49.78 %. The highest Pore Space % was found at the site Shahabad V_9 (49.78%). Pore space decreases down the depth due to the compaction and consolidation of the soil at greater depths. Soil containing high organic matter possesses high porosity, Singh *et al.*, (2014) also reported similar outcomes.

The Water Retaining Capacity (%) ranged from 39.25 to 43.93 % and Shahabad V_9 hold the water best at 43.93%. Water retaining capacity of soil can decrease with increasing depth due to increase in soil density with depth. As the weight of the soil above increases, the pressure on the underlying soil particles increases, causing them to become more tightly packed. This results in a decrease in the size and number of pore spaces between soil particles, which in turn reduces the soil's ability to retain water. As a result, the water retaining capacity of soil tends to decrease with increasing depth, Sharma *et al.* (2016) also documented the same outcomes.

Conclusion

In conclusion, improved physical condition soil parameters which has shown texture of soil is sandy loam and soil colour was light reddish brown to dark greyish brown in dry condition and reddish brown to grey in wet condition. The results are significant due the integration use of management practices which enhance soil aggregation, improving soil structure, porosity and moisture holding capacity, it also promotes the activity of beneficial soil organisms, fostering a healthy and resilient soil ecosystem.

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