# *Original Research Article*

**Assessment of Physico Properties in soils from different blocks of Jaipur district, Rajasthan**


## Abstract

The year 2021-2022, An analysis experiment was done For identification physico properties of soils from the Rajasthan state at the Jaipur district area. For further study, Twenty-seven soil samples were taken from farmer's fields in different three blocks of Jaipur district at depths 0-15 cm, 15-30 cm and 30-45 cm. The soil texture in the examined region was sandy loam. The difference of soil colour also noticed in both the Air-dry condition and Moist condition and the colour was light yellowish brown (10YR6/4) to brownish yellow (10YR5/8) and bulk density was from 1.24-1.34 Mg $m^{-3}$, The range of particle density was from 2.27-2.34 Mg $m^{-3}$ and the pore space 37.77 to 43.65 %. The water retaining capacity (WRC) of soil ranged between 43.56 to 57.28 %. The specific gravity of soil ranged between 2.33 to 2.46. The manure and organic fertilizers is sutaible for good soil health and maximum crop production at the farmers field.



Keywords: Physico Properties, Texture, Soil colour, B,D., W.R.C., Jaipur, etc


## Introduction

Soil is a dynamic natural body formed as a result of pedogenic processes by changing rock climates, including minerals and organic elements, with chemical, physical, mineralogical and biological properties, with varying depth of surface, and providing medium to plant growth. (Thakre *et al.*,2012). Soil is a finite and non-renewable resource that decides whether agricultural development programmes can be implemented in each country on the planet. Because of urbanisation, infrastructural expansion, industrial growth, and land degradation losses due to rapid erosion and secondary salinization, the arable land area has been shrinking (Lal, 2013).

Generally, the soil types of Rajasthan are sandy, saline, alkaline, and calcareous soils and were commonly called clay, loamy, and black lava soils. Groundwater level is very low because the annual rainfall is approximately 360 mm and the ground water level is very deep. Water is available at depths of 100 to 61 meters. India Rajasthan is divided into three agro-climate zones: Zone VI, Trans-Gangetic Plains region, Zone VIII, Central Plateau and Hills region, and Zone XIV, region of Western Dry. The soil of the Rajasthan region is classified as Aridisols, Alfisols, Entisol, Inceptisols, and Vertisol according to the USDA Land Division program (Chiroma *et al.*, 2014). The capital of Rajasthan is the state of Jaipur and Jaipur is located between 26˚55′10″ N and 75˚47′16″ E. Jaipur has an average height of 1414 feet from sea level and Jaipur 11,152 $km^2$. The weather in Jaipur is desert. The average annual temperature is 25.2°C. The average rainfall in the Jaipur region is estimated at 650 mm. This type of climate and climate are applicable to kharif plants for example pearl millet, groundnut, cluster bean, sorghum, green gram and rabies plants wheat, mustard, barley, gram, pea, rapeseed, and taramira. As a result, current research was conducted to examine the visible soil structures from different blocks in the Jaipur region (2019 District Fact Book).

## Materials and Methods

State Rajasthan is situated at north side in India . The Rajasthan state 3,42,239 $km^2$ geographical area and it this is 10.4% of India's total geographical area. The Rajasthan state 27°23′28″ North latitude and 73º25′57″ East longitude on the map. It is a largest state of India.

Rajasthan's district of Jaipur 26º55′10″ N latitude and 75º47′16″ E longitude is present on the Map. The all study area was marked and divided in 3 blocks and in each block where selected 3 villages from the Jaipur district, they are Keshav Nagar ($V_1$), Morija ($V_2$), Nindola ($V_3$) in Chomu block ($B_1$), Goner ($V_4$), Shrikishanpura ($V_5$) and Durgapura ($V_6$), block in Sanganer ($B_2$), and Shivpuri ($V_7$), Manoharpur ($V_8$), Nwalpura ($V_9$), block in Shahpura ($B_3$). At collection of soil sampling site , twenty-seven soil samples were collected at different depths of 0-15 cm, 15-30 cm, and 30-45 cm. The site of the samples were recorded by hand held mobile app GIS system. The physical properties of soil, soil texture and soil colour were determined method using the Bouyoucos hydrometer **(Bouyoucos, 1927)** and the Munsell soil colour chart **(Munsell, 1971).** bulk density, particle density, % pore space, and water holding capacity **(Muthuvel *et al.*, 1992).** Specific gravity analysis using R.D Bottle method **(Black.1965).** All data recorded and statistical data alalysis using Completely Randomized Design (CRD), or the method using "Analysis of Variance" (ANOVA) **(Fischer,1927).**

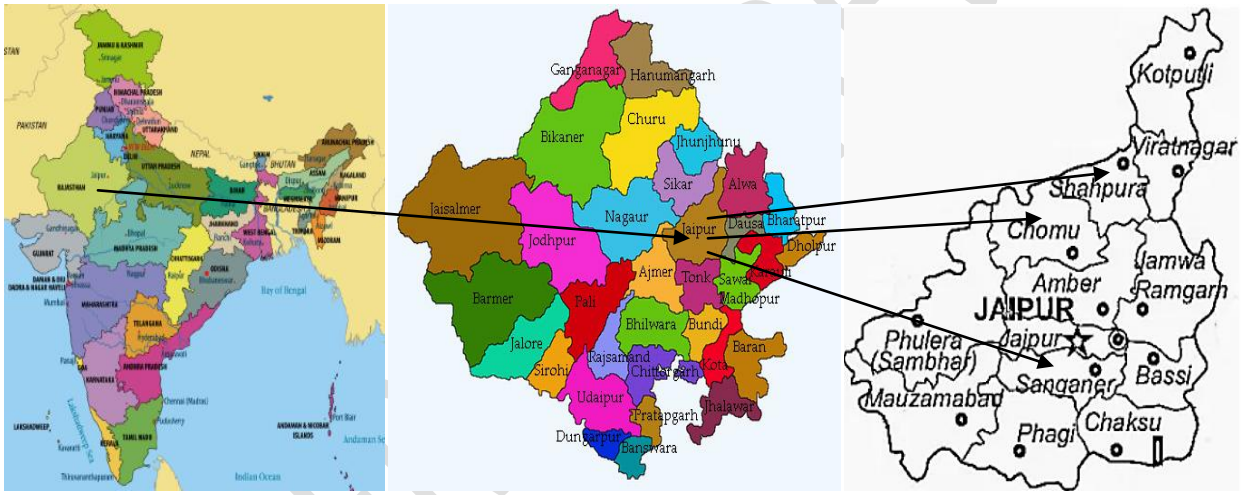


Fig 1: Soil Sampling sites under map

## Results and Discussion

### Physical properties

The results showed in soils from different villages of most of Jaipur district soils, Sandy Loam Texture was discovered at three depths (0-15 cm, 15-30 cm, and 30-45 cm) (Table-1, Fig-2). The percentages of sand, silt, and clay ranged from 60.11 to 72.60 percent, 13.35 to 24.59 percent, and 12.35 to 15.62 percent, respectively (Table-1, Fig-2). Same type result finding by **Mehta *et al.*, 2012, Meena *et al.*, 2017, and Choudhary *et al.*, 2021.** The soil colour of soil also noticed in both the Air- dry condition and wet condition. The Soil colour was Light Yellowish-Brown (10YR6/4) colour to brownish yellow (10YR5/8) (Table-2). Similar results were reported by **Mehta *et al.*, 2012 and Choudhary *et al.*, 2021.** The results showed in soils from different

villages The maximum bulk density was 1.35 Mg $m^{-3}$ at 30-45 cm in village Morija ($V_2$), and the lowest bulk density was 1.22 Mg $m^{-3}$ at 0-15 cm in village Nwalpura ($V_9$). with increasing soil depths, the bulk density increases (Table-1, Fig-2). **Meena *et al.*, 2017, Urmila *et al.*, 2018, and Choudhary *et al.*, 2021** all reported similar findings. At depth 30-45 cm in village Morija ($V_2$), the maximum particle density was 2.37 Mg $m^{-3}$, while at 0-15 cm in village Shivpuri, the minimum particle density was 2.24 Mg $m^{-3}$ ($V_7$). Bulk density is lower than particle density (Table-1, Fig-2). **Meena *et al.*, 2017, Urmila *et al.*, 2018, and Choudhary *et al.*, 2021** all reported similar findings.

The largest percent pore space was reported at 0-15 cm in village Keshav Nagar ($V_1$), while the smallest percent pore space was measured at 30-45 cm in village Shivpuri ($V_7$). The % pore space decreases sharply as depth increases (Table-1, Fig-2). Similar findings were reported **by Meena *et al.*, 2017, Urmila *et al.*, 2018, and Choudhary *et al.*, 2021.** The maximum water holding capacity was found 60.12 % at 0-15cm in village Nwalpura ($V_9$) and minimum water holding capacity was found 41.27 % at 30-45 cm invillage Morija ($V_2$) (Table-1, Fig-2). These variations were due to clay, silt and organic carbon content and low Water holding capacity in sandy soils due to high sand and less clay content. Similar results were reported by **Urmila *et al.*, 2018, Pusty & Panda, 2019, and Choudhary *et al.*, 2021.** However in Village Shivpuri ($V_7$) had the highest specific gravity of 2.56 at 30-45 cm, while village Morija had the lowest specific gravity of 2.33 at 0-15 cm ($V_2$) (Table-1, Fig-2). Clay, silt, and organic carbon concentration all played a role, as did low Water holding capacity in sandy soils due to high sand and low clay content. **Sahu and David, 2014, and Choudhary *et al.*, 2021**

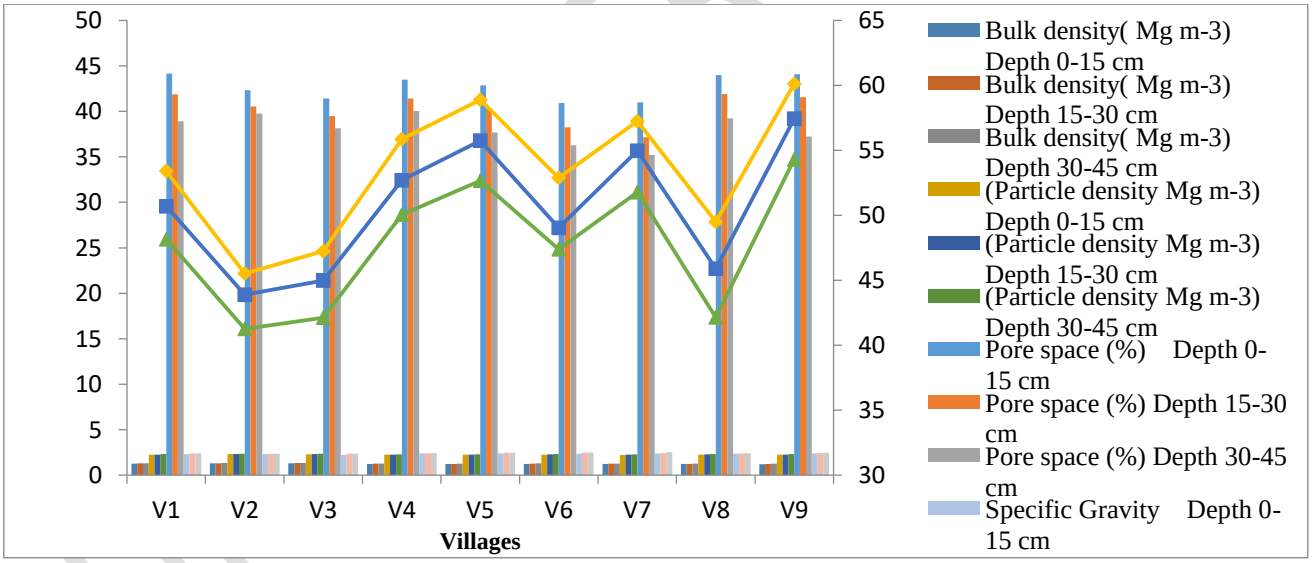


**Fig 2:** Status of Physico soil properties of different blocks (villages) of Jaipur, Rajasthan

**Table 1:** Bulk density (Mg $m^{-3}$), Particle density (Mg $m^{-3}$) and % Pore space, Water holding capacity, Specific Gravity and Soil Texture of soil in different villages of Jaipur at 0-15 cm, 15-30 cm and 30-45 cm depths.

| Blocks | Villages | Depth (cm) | BD (Mg $m^{-3}$) | PD (Mg $m^{-3}$) | Pore Space ( %) | W.H.C. | Specific Gravity | Soil Texture |
|---|---|---|---|---|---|---|---|---|
| $B_1$ | $V_1$ | 0-15 | 1.29 | 2.26 | 44.17 | 53.41 | 2.35 | Sandy Loam |
| | | 15-30 | 1.30 | 2.28 | 41.86 | 50.70 | 2.39 | |
| | | 30-45 | 1.33 | 2.32 | 38.92 | 48.16 | 2.40 | |
| | $V_2$ | 0-15 | 1.31 | 2.32 | 42.35 | 45.53 | 2.33 | Sandy Loam |
| | | 15-30 | 1.33 | 2.35 | 40.55 | 43.89 | 2.34 | |
| | | 30-45 | 1.35 | 2.37 | 39.77 | 41.27 | 2.36 | |
| | $V_3$ | 0-15 | 1.32 | 2.31 | 41.42 | 47.24 | 2.24 | Sandy Loam |
| | | 15-30 | 1.34 | 2.33 | 39.49 | 44.99 | 2.37 | |
| | | 30-45 | 1.36 | 2.36 | 38.13 | 42.13 | 2.38 | |
| $B_2$ | $V_4$ | 0-15 | 1.25 | 2.26 | 43.49 | 55.86 | 2.39 | Sandy Loam |
| | | 15-30 | 1.27 | 2.28 | 41.42 | 52.70 | 2.41 | |
| | | 30-45 | 1.29 | 2.30 | 40.04 | 50.05 | 2.44 | |
| | $V_5$ | 0-15 | 1.24 | 2.25 | 42.84 | 58.89 | 2.42 | Sandy Loam |
| | | 15-30 | 1.26 | 2.27 | 40.36 | 55.75 | 2.46 | |
| | | 30-45 | 1.28 | 2.31 | 37.36 | 52.66 | 2.48 | |
| | $V_6$ | 0-15 | 1.25 | 2.27 | 40.92 | 52.89 | 2.38 | Sandy Loam |
| | | 15-30 | 1.28 | 2.29 | 38.23 | 49.04 | 2.49 | |
| | | 30-45 | 1.31 | 2.32 | 36.29 | 47.39 | 2.52 | |
| $B_3$ | $V_7$ | 0-15 | 1.24 | 2.24 | 41.00 | 57.24 | 2.41 | Sandy Loam |
| | | 15-30 | 1.27 | 2.27 | 37.17 | 54.97 | 2.43 | |
| | | 30-45 | 1.29 | 2.30 | 35.23 | 51.78 | 2.56 | |
| | $V_8$ | 0-15 | 1.23 | 2.27 | 43.98 | 49.50 | 2.38 | Sandy Loam |
| | | 15-30 | 1.26 | 2.30 | 41.92 | 45.90 | 2.40 | |
| | | 30-45 | 1.28 | 2.33 | 39.24 | 42.15 | 2.44 | |
| | $V_9$ | 0-15 | 1.22 | 2.25 | 44.09 | 60.12 | 2.42 | Sandy Loam |
| | | 15-30 | 1.25 | 2.28 | 41.56 | 57.44 | 2.44 | |
| | | 30-45 | 1.27 | 2.34 | 37.23 | 54.30 | 2.49 | |
| F-test | Due to depths | | S | S | S | S | S | |
| | Due to site | | | | | | | |
| S.Ed.(±) | Due to depths | | 0.02 | 0.02 | 0.45 | 1.77 | 1.75 | |
| | Due to site | | 0.03 | 0.03 | 0.62 | 5.45 | 5.42 | |
| C.D.at 5% | Duetodepths | | 0.004 | 0.006 | 0.092 | 0.005 | 0.007 | |
| | Due to site | | 0.010 | 0.001 | 0.53 | 0.002 | 0.004 | |

**Table 2:** shows the colour of soil in different villages under dry and wet conditions in Jaipur at depths of 0-15 cm, 15-30 cm, and 30-45 cm.

| Blocks | Village | Dry condition | | | Wet condition | | |
|---|---|---|---|---|---|---|---|
| | | **0-15 cm** | **15-30 cm** | **30-45 cm** | **0-15 cm** | **15-30 cm** | **30-45 cm** |
| **$B_1$** | **$V_1$** | 10YR6/4 Light Yellowish Brown | 10YR6/6 Brownish yellow | 10YR6/8 Brownish yellow | 10YR4/3 Brown | 10YR4/4 Dark yellowish brown | 10YR4/4 Dark yellowish brown |
| | **$V_2$** | 10YR7/6 Yellow | 10YR7/6 Yellow | 10YR6/8 Brownis yellow | 10YR5/6 Yellowish brown | 10YR5/6 Yellowish brown | 10YR5/8 Yellowish Brown |
| | **$V_3$** | 10YR6/4 LightYellowish Brown | 10YR6/6 Brownish yellow | 10YR6/6 Brownisyellow | 10YR,5/8 YellowishBrown | 10YR4/6 Dark yellowish brown | 10YR4/6 Dark yellowish brown |
| **$B_2$** | **$V_4$** | 10YR6/4 Light Yellowish Brown | 10YR6/4 Light Yellowish Brown | 10YR6/6 Brownis yellow | 10YR4/4 Dark yellowish brown | 10YR4/4 Dark yellowish brown | 10YR4/6 Dark yellowish brown |
| | **$V_5$** | 10YR6/6 Brownish yellow | 10YR6/8 Brownish yellow | 10YR6/8 Brownish yellow | 10YR4/3 Brown | 10YR4/4 Dark yellowish brown | 10YR4/6 Dark yellowish brown |
| | **$V_6$** | 10YR6/6 Brownish yellow | 10YR6/8 Brownish yellow | 10YR5/6 Yellowish Brown | 10YR5/8 Yellowish Brown | 10YR4/3 Brown | 10YR4/4 Dark yellowish brown |
| **$B_3$** | **$V_7$** | 10YR6/4 Light Yellowish Brown | 10YR6/6 Brownish yellow | 10YR6/8 Brownish yellow | 10YR5/4 Yellowish Brown | 10YR5/6 Yellowish Brown | 10YR5/8 Yellowish Brown |
| | **$V_8$** | 10YR6/6 Brownish yellow | 10YR5/6 Yellowish Brown | 10YR5/8 Yellowish brown | 10YR5/6 Yellowish Brown | 10YR4/4 Dark yellowish brown | 10Y4/6 Dark yellowish brown |
| | **$V_9$** | 10YR6/6 Brownish yellow | 10YR6/8 Brownish yellow | 10YR5/8 Yellowish brown | 10YR4/3 Brown | 10YR4/4 Dark Yellowish brown | 10YR3/4 Dark yellowish brown |

**Conclusion:** The soil of investigated area was sandy loam textured soil. The soil colour was light Yellowish-Brown to brownish yellow which signifies a good organic matter. improve of soil health by using organic manure and bio fertilizers and improve soil physical condition at study area, depth from upper to lower soil layers pore space % decrease because soil compacted, that is not suitable for good soil aeration.

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