



# Depth wise (“0 to 15” and “15 to 30” cm) Distribution of Soil Physical Properties of Dausa Tehsil of Dausa District of Rajasthan, India

P. C. Bairwa <sup>a++,#\*</sup>, K. K. Sharma <sup>a‡</sup>, Shakuntala <sup>a#</sup>,  
R. L. Meena <sup>a†</sup>, R. Sammauria <sup>a^</sup>, R. S., Meena <sup>a##</sup>,  
K.C. Gupta <sup>a^</sup>, H. P., Parewa <sup>a#^</sup>, R. Verma <sup>a++</sup>, C. Kumawat <sup>a++</sup>,  
Rani Saxena <sup>a§</sup>, B. S. Dhakad <sup>a^^</sup> and Rajesh <sup>a§</sup>

<sup>a</sup> Sri Karan Narendra Agriculture, University, Jobner, District, Jaipur, India.

## Authors' contributions

This work was carried out in collaboration among all authors. Author PCB designed the study, performed the statistical analysis, wrote the protocol, and wrote the first draft of the manuscript. Author KKS and Author RS managed the analyses of the study. Author HPP managed the literature searches. All authors read and approved the final manuscript.

## Article Information

DOI: <https://doi.org/10.9734/ijpss/2025/v37i75544>

## Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here: <https://pr.sdiarticle5.com/review-history/126518>

**Original Research Article**

**Received: 06/09/2024**

**Accepted: 08/11/2024**

**Published: 24/06/2025**

<sup>++</sup> Assistant Professor Soil Science,

<sup>#</sup> Ph.D. Scholar;

<sup>†</sup> Assistant Professor P Pathology;

<sup>‡</sup> Professor Soil Science;

<sup>^</sup> Professor Agronomy;

<sup>##</sup> Professor Horticulture;

<sup>#^</sup> Associate Professor Soil Science;

<sup>§</sup> Assistant Professor Agronomy;

<sup>^^</sup> Assistant professor Ag. Microbiology;

\*Corresponding author: E-mail: [pcdfns@yahoo.com](mailto:pcdfns@yahoo.com), [pcbairawa.soils.rari@sknau.ac.in](mailto:pcbairawa.soils.rari@sknau.ac.in);

**Cite as:** Bairwa, P. C., K. K. Sharma, Shakuntala, R. L. Meena, R. Sammauria, R. S., Meena, K.C. Gupta, H. P., Parewa, R. Verma, C. Kumawat, Rani Saxena, B. S. Dhakad, and Rajesh. 2025. “Depth Wise (“0 to 15” and ‘15 to 30’ Cm) Distribution of Soil Physical Properties of Dausa Tehsil of Dausa District of Rajasthan, India”. *International Journal of Plant & Soil Science* 37 (7):13-23. <https://doi.org/10.9734/ijpss/2025/v37i75544>.

## ABSTRACT

An investigation on Depth wise ("0 to 15" and "15 to 30" cm) distribution of Soil physical properties of Dausa tehsil of Dausa district of Rajasthan was undertaken in the year 2021. 242 soil samples were collected at two depth ("0 to 15" and "15 to 30" cm) and analysed. Different results were recorded. The sand content varies from 73.00 to 82.80 and 71.30 to 81.30 per cent, silt content varies from 9.10 to 14.20 and 9.50 to 15.60 and clay content ranged from 7.90 to 12.80 and 8.60 to 13.30 per cent. The bulk density was ranged from 1.45 to 1.54 and 1.46 to 1.55 Mg m<sup>-3</sup>, while, particle density was ranged from 2.49 to 2.67 and 2.51 to 2.68 Mg m<sup>-3</sup>. The percent porosity was varying from 38.40 to 45.69 and 38.34 to 44.78%. under surface ("0 to 15" cm) and sub-surface ("15 to 30" cm) layers respectively. Based on sand, silt and clay contents, these soils classified into sandy loam and loamy sand textural classes. Out of 121 sub-surface soil samples 13 (10.74%) fell in loamy sand and 108 (89.26%) samples fell in sandy loam texture class. Therefore, the majority of soils were belonged to sandy loam category.

*Keywords: Physical properties; texture; bulk density; particle density; sand; silt; clay; soil analysis; Dausa tehsil.*

## 1. INTRODUCTION

Soil is the most vital and precious natural resource that sustains life on the earth. It takes almost 1000 years to produce an inch of topsoil (Chandra and Singh). The most important constituents in soil are organic matter, an appreciable amount of it in soil tremendously increases soil fertility. Decay of organic matter release nitrogen, phosphorus and mineral nutrients in forms available to plants. Soil is a component of the lithosphere and biosphere system. It is a vital natural resource that supports life system and socio-economic development. Soil productivity and sustainability depends on a dynamic equilibrium between its physical and chemical properties. The study of soil use in its spatial context is essential to understand the area of optimum soil use and degraded areas. The comprehensive study of soil use is of immense value to ensure better returns from the soil to meet future requirements for food and industrial raw materials and successful planning of agricultural growth. The natural resources like soil, water and vegetation form an integral part of tropical ecosystem warranting due attention to ensure ecological security and sustainable socio-economic development. Soil is an important component in human's total stock of natural resources which underpins food production (Buol et al. 2003). However, the characterization of soil physical, properties is lacking in the studied area. A systematic study of soils is necessary for better utilization of land and water resources to tackle soil and water problems. Understanding the physical properties of soil at various depths is essential for assessing soil health, fertility, and crop suitability and productivity. The findings

might be helped farmers and agricultural planners in making informed decisions about crop selection and soil management. It can provide insights into water retention, drainage, and nutrient availability are crucial for sustainable land use. Generally, the research contributes to understanding the effects of land use changes and environmental factors on soil quality, impacting agriculture and policy in the Dausa district and beyond for similar agro - ecological zone.

At this juncture, soil testing along with GPS reading and GIS based mapping would enable to assess the soil fertility status of the particular location. The GPS and GIS helps in collecting a systematic set of georeferenced samples and generating spatial data about the distribution of nutrients (Sharma 2004).

## 2. MATERIALS AND METHODS

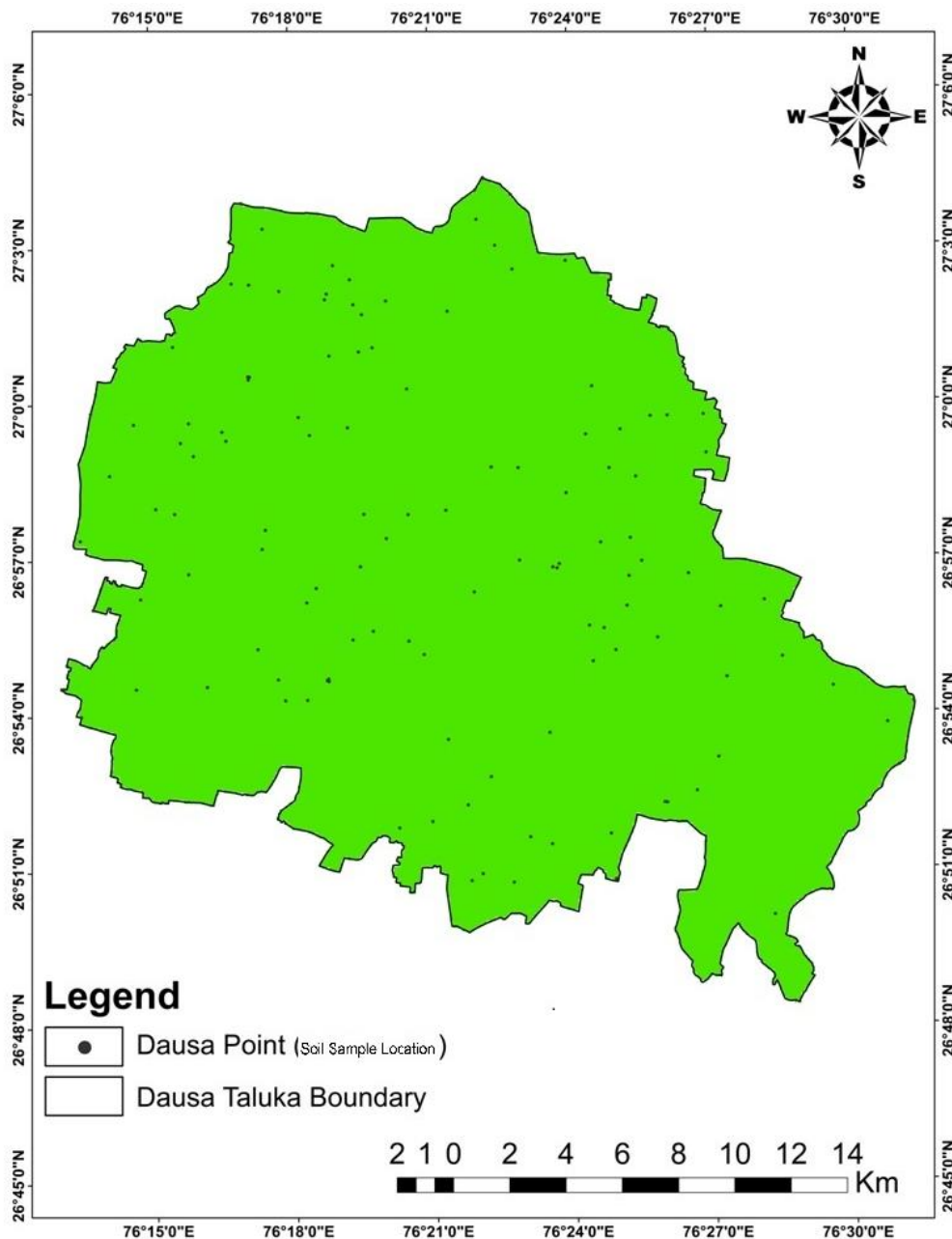
The soil samples were collected from all the villages at least apart from tehsil of Dausa district having variations in slope/topography, colour and cropping pattern and behaviour. Two depth-wise samples viz., "0 to 15" cm, "15 to 30" cm was collected and analyzed. Samples were collected only from the open places. The samples were analysed for physical properties. A sample collection sheet is prepared for proper tagging and packing of the samples on the site. Dausa district lying between latitude 26° 23' and 27° 15' and longitude 76° 0' and 77° 02'. The area studied lied in the agroclimatic zone IIIA (Semi-arid eastern Plains) of Rajasthan. Dausa tehsil is located between 76° 33,48" East Longitude (degrees) and 26° 89'44", North latitude (degree). The climate of the Dausa is semi-arid. In

summer, maximum temperature varies from 38 to 45°C, whereas, in winter generally minimum temperature lies between 5 and 18°C. The mean annual rainfall of the locality is 450 mm, most of this is received during monsoon season. Main source of irrigation is tube well. A maximum 52 to 58 °C soil temperature has been recorded at surface during summer months.

## 2.1 Collection of Soil Sample

Geo-referenced surface soil samples at the depth of “0 to15” and “15 to 30” cm were

collected from Dausa tehsils. The latitude and longitude of sampling sites were recorded with the help of different Global Positioning System. Selection of field in village in such a way that it should be representative of whole area of the village and sample was taken from progressive farmers. Approximately 242 surface and sub surface soil samples were collected from the entire selected villages at the depth of “0 to15” and “15 to 30” cm with the help of khurpi and hand- held global positioning system (GPS) over the entire area.



Map 1. Details of location of sampling sites of Dausa Tehsil of Dausa District

**Table 1. Methods used for soil analysis**

S. No	Test parameter	Methods	References
<b>A. Soil analysis</b>			
<b>(i) Mechanical Analysis</b>			
1.	Soil texture	International Pipette Method	Piper (1950)
<b>(ii) Physical Properties</b>			
1	Bulk Density	Method No. 38 of USDA Hand Book No. 60	Richards (1968)
2	Particle Density	Method No. 39 of USDA Hand Book No. 60	Richards (1968)
3	Porosity (percent)	Method No. 40 of USDA Hand Book No. 60	Richards (1968)

## 2.2 Process of Soil Sampling

After collecting the soil samples, they were brought to the laboratory. These samples were dried under shade. After that the processing was done as follows: After the air drying under the shade the unwanted materials like roots, stones, and others are should be discarded. The clods in the sample would be broken by using the wooden mallet. After that the samples should be sieved with 2 mm sieve. Sieved samples should be stored in polybags for further estimation of different physical parameters. All the precautions and standard procedures were used to estimate the physical properties of the soil and followed the procedure described by Jackson.

## 2.3 Statistical Analysis

The data obtained for different parameters of soil analysis were statistically analysed for correlation using the procedure given by Snedecor and Cochran (1967).

## 2.4 Methods used for soil analysis Methods of Analysis

The soil samples were analyzed as per methods given in Table 1.

## 3. RESULTS AND DISCUSSION

### 3.1 Physical Properties

#### 3.1.1 Particle size distribution

It was found that most of the soils of villages of Dausa and Sikrai tehsils having lot of variability in the relative percentage of sand, silt and clay. The data presented in Table 2 revealed that sand content in 242 surface ("0 to 15" cm) and sub-surface ("15 to 30" cm) soil samples of Dausa tehsil ranged from 73.00 to 82.80 and 71.30 to 81.30 per cent, with a mean value of 78.57 and 77.18 having, standard deviation 2.14 and 2.18

percent with coefficient of variation 2.73 and 2.82 per cent. Maximum sand percentage (82.80 and 81.30%) were recorded in Kalakho (D-51) village while, minimum (73.00 and 71.30%) was recorded in Nangal Chapa (D-110) village in both the layers respectively. The silt content ranged from 9.10 to 14.20 and 9.50 to 15.60 per cent, maximum silt percentage (14.20 and 15.60) were recorded in Nangal Chapa (D-110) in both the layer, minimum (9.10 and 9.50%) was found in Kalakho (D-51) in both the layers with a mean value of 11.52 and 12.21 having, standard deviation 1.25 and 1.28 percent with 10.88 and 10.48 per cent coefficient of variation. As the clay percentage is concerned, the clay content ranged from 7.90 to 12.80 and 8.60 to 13.30 per cent, maximum clay percentage (12.80 and 13.30) were recorded in Nangal chapa (D-110) village however, minimum (7.90 and 8.60%) was found in Rohda (D-116) and Lohasari (D-1) with a mean value of 9.91 and 10.61 having, standard deviation 1.10 and 1.09 percent with 11.08 and 10.28 per cent coefficient of variation. Recorded observations revealed that out of 121 surface soil samples of Dausa tehsil 48 (39.67%) were loamy sand and 73 (60.33%) were sandy loam in textural class. Based on sand, silt and clay contents, these soils classified into sandy loam and loamy sand textural classes. Out of 121 sub-surface soil samples 13 (10.74%) fell in loamy sand and 108 (89.26%) samples fell in sandy loam texture class. Therefore, the majority of soils were belonged to sandy loam category.

The per cent sand content in soils of Dausa tehsils decreased with increased in the depth of soil while, per cent of silt and clay content increased with increased the depth of soil and its vice versa. The clay content was higher in the sub-surface as compared to the surface due to clay illuviation (Chandrakala et al. 2018).

Increase in clay content with depth which might be due to downward translocation of finer particles from the surface layers (Murthy, 1988). Gradual increased in clay content with increasing

**Table 2. Physical properties of soils of Dausa tehsil of Dausa District**

S. No.	Sample code No	Sand (%)		Silt (%)		Clay (%)		B D (Mg m <sup>-3</sup> )		P D (Mg m <sup>-3</sup> )		Porosity (%)		Textural Class	
		0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	D <sub>1</sub>	80.50	79.30	11.20	12.10	8.30	8.60	1.46	1.48	2.62	2.63	44.27	43.73	Loamy sand	Loamy sand
2	D <sub>2</sub>	78.00	76.30	12.30	13.50	9.70	10.20	1.47	1.49	2.63	2.64	44.11	43.56	Sandy loam	Sandy loam
3	D <sub>3</sub>	80.00	78.50	10.10	11.10	9.90	10.40	1.48	1.50	2.63	2.64	43.73	43.18	Loamy sand	Sandy loam
4	D <sub>4</sub>	74.80	72.50	13.20	14.40	12.00	13.10	1.45	1.46	2.64	2.65	45.08	44.91	Sandy loam	Sandy loam
5	D <sub>5</sub>	77.90	77.00	11.20	12.10	10.90	10.90	1.46	1.47	2.59	2.60	43.63	43.46	Sandy loam	Sandy loam
6	D <sub>6</sub>	76.30	74.80	14.10	14.50	9.60	10.70	1.45	1.46	2.52	2.53	42.46	42.29	Sandy loam	Sandy loam
7	D <sub>7</sub>	80.10	78.10	10.40	11.50	9.50	10.40	1.49	1.50	2.64	2.65	43.56	43.40	Loamy sand	Sandy loam
8	D <sub>8</sub>	80.40	79.00	10.50	10.90	9.10	10.10	1.52	1.52	2.59	2.60	41.31	41.54	Loamy sand	Sandy loam
9	D <sub>9</sub>	79.30	78.60	11.30	11.80	9.40	9.60	1.51	1.52	2.62	2.61	42.37	41.76	Sandy loam	Sandy loam
10	D <sub>10</sub>	80.10	78.80	10.20	11.10	9.70	10.10	1.53	1.54	2.57	2.59	40.47	40.54	Loamy sand	Sandy loam
11	D <sub>11</sub>	76.70	75.60	12.10	12.60	11.20	11.80	1.46	1.47	2.58	2.60	43.41	43.46	Sandy loam	Sandy loam
12	D <sub>12</sub>	79.30	77.90	11.20	11.60	9.50	10.50	1.50	1.51	2.60	2.61	42.31	42.15	Sandy loam	Sandy loam
13	D <sub>13</sub>	77.20	75.70	11.90	12.30	10.90	12.00	1.46	1.47	2.67	2.68	45.32	45.15	Sandy loam	Sandy loam
14	D <sub>14</sub>	75.50	73.90	13.50	14.20	11.00	11.90	1.45	1.46	2.52	2.53	42.46	42.29	Sandy loam	Sandy loam
15	D <sub>15</sub>	76.40	75.10	12.50	13.60	11.10	11.30	1.46	1.46	2.59	2.61	43.63	44.06	Sandy loam	Sandy loam
16	D <sub>16</sub>	80.10	79.30	10.40	10.60	9.50	10.10	1.50	1.51	2.58	2.60	41.86	41.92	Loamy sand	Sandy loam
17	D <sub>17</sub>	80.60	78.50	10.20	12.00	9.20	9.50	1.50	1.51	2.64	2.65	43.18	43.02	Loamy sand	Sandy loam
18	D <sub>18</sub>	82.10	80.50	9.60	10.30	8.30	9.20	1.54	1.55	2.57	2.59	40.08	40.15	Loamy sand	Loamy Sand
19	D <sub>19</sub>	77.80	76.90	12.20	12.60	10.00	10.50	1.46	1.46	2.67	2.68	45.32	45.52	Sandy loam	Sandy loam
20	D <sub>20</sub>	76.00	75.50	12.90	13.10	11.10	11.40	1.45	1.47	2.62	2.63	44.66	44.11	Sandy loam	Sandy loam
21	D <sub>21</sub>	76.50	75.30	13.20	13.60	10.30	11.10	1.45	1.46	2.67	2.68	45.69	45.52	Sandy loam	Sandy loam
22	D <sub>22</sub>	79.30	78.80	10.50	10.80	10.20	10.40	1.46	1.48	2.67	2.68	45.32	44.78	Sandy loam	Sandy loam
23	D <sub>23</sub>	78.40	77.10	11.60	12.10	10.00	10.80	1.47	1.47	2.54	2.56	42.13	42.58	Sandy loam	Sandy loam
24	D <sub>24</sub>	80.70	79.50	9.70	10.30	9.60	10.20	1.53	1.54	2.54	2.56	39.76	39.84	Loamy sand	Sandy loam
25	D <sub>25</sub>	82.10	80.80	9.70	10.10	8.20	9.10	1.53	1.53	2.62	2.63	41.60	41.83	Loamy sand	Loamy Sand
26	D <sub>26</sub>	78.30	78.00	11.80	11.80	9.90	10.20	1.46	1.47	2.61	2.63	44.06	44.11	Sandy loam	Sandy Loam
27	D <sub>27</sub>	79.00	78.30	10.90	11.20	10.10	10.50	1.50	1.51	2.58	2.60	41.86	41.92	Sandy loam	Sandy Loam
28	D <sub>28</sub>	78.10	76.90	12.10	12.30	9.80	10.80	1.46	1.48	2.54	2.56	42.52	42.19	Sandy loam	Sandy Loam
29	D <sub>29</sub>	79.20	78.30	10.90	11.40	9.90	10.30	1.53	1.54	2.61	2.63	41.38	41.44	Sandy loam	Sandy Loam
30	D <sub>30</sub>	79.60	78.40	11.30	11.70	9.10	9.90	1.48	1.50	2.64	2.64	43.94	43.18	Sandy loam	Sandy Loam
31	D <sub>31</sub>	79.30	78.00	11.80	12.30	8.90	9.70	1.50	1.50	2.65	2.65	43.40	43.40	Sandy loam	Sandy Loam
32	D <sub>32</sub>	79.40	77.60	10.80	12.10	9.80	10.30	1.48	1.49	2.62	2.63	43.51	43.35	Sandy loam	Sandy Loam

S. No.	Sample code No	Sand (%)		Silt (%)		Clay (%)		B D (Mg m <sup>-3</sup> )		P D (Mg m <sup>-3</sup> )		Porosity (%)		Textural Class	
		0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
33	D <sub>33</sub>	78.50	77.30	11.40	11.90	10.10	10.80	1.47	1.48	2.59	2.61	43.24	43.30	Sandy loam	Sandy Loam
34	D <sub>34</sub>	79.60	78.50	11.20	11.70	9.20	9.80	1.52	1.52	2.52	2.53	39.68	39.92	Loamy sand	Sandy Loam
35	D <sub>35</sub>	80.40	79.20	10.80	11.10	8.80	9.70	1.53	1.54	2.56	2.57	40.23	40.08	Lomay sand	Sandy Loam
36	D <sub>36</sub>	82.00	80.10	9.10	10.10	8.90	9.80	1.53	1.53	2.52	2.54	39.29	39.76	Loamy sand	Loamy sand
37	D <sub>37</sub>	81.00	80.30	9.80	10.10	9.20	9.60	1.52	1.52	2.61	2.63	41.76	42.21	Loamy sand	Loamy sand
38	D <sub>38</sub>	81.70	80.50	9.30	9.90	9.00	9.60	1.53	1.53	2.57	2.59	40.47	40.93	Loamy sand	Loamy sand
39	D <sub>39</sub>	78.30	77.00	12.30	12.90	9.40	10.10	1.47	1.48	2.53	2.56	41.90	42.19	Sandy loam	Sandy Loam
40	D <sub>40</sub>	79.60	79.00	10.30	10.60	10.10	10.40	1.50	1.51	2.67	2.68	43.82	43.66	Sandy loam	Sandy Loam
41	D <sub>41</sub>	80.70	79.60	10.20	10.80	9.10	9.60	1.52	1.52	2.62	2.63	41.98	42.21	Loamy sand	Sandy Loam
42	D <sub>42</sub>	79.80	78.00	11.20	11.80	9.00	10.20	1.53	1.53	2.61	2.63	41.38	41.83	Loamy sand	Sandy Loam
43	D <sub>43</sub>	80.00	78.70	10.70	11.20	9.30	10.10	1.51	1.52	2.64	2.65	42.80	42.64	Loamy sand	Sandy Loam
44	D <sub>44</sub>	78.70	77.30	11.20	11.50	10.10	11.20	1.47	1.49	2.60	2.61	43.46	42.91	Sandy loam	Sandy Loam
45	D <sub>45</sub>	79.90	78.60	11.80	12.30	8.30	9.10	1.50	1.50	2.63	2.64	42.97	43.18	Loamy sand	Sandy Loam
46	D <sub>46</sub>	80.60	79.20	11.40	11.70	8.00	9.10	1.52	1.52	2.63	2.65	42.21	42.64	Loamy sand	Loamy sand
47	D <sub>47</sub>	80.40	78.60	10.30	11.10	9.30	10.30	1.50	1.50	2.54	2.55	40.94	41.18	Loamy sand	Sandy loam
48	D <sub>48</sub>	80.70	79.70	10.10	10.30	9.20	10.00	1.51	1.51	2.52	2.53	40.08	40.32	Loamy sand	Sandy loam
49	D <sub>49</sub>	81.00	80.00	9.90	10.20	9.10	9.80	1.52	1.52	2.62	2.63	41.98	42.21	Loamy sand	Loamy Sand
50	D <sub>50</sub>	80.30	78.60	10.30	11.30	9.40	10.10	1.51	1.52	2.57	2.59	41.25	41.31	Loamy sand	Sandy Loam
51	D <sub>51</sub>	82.80	81.30	9.10	9.50	8.10	9.20	1.54	1.54	2.50	2.51	38.40	38.65	Loamy sand	Loamy Sand
52	D <sub>52</sub>	82.20	80.20	9.40	10.30	8.40	9.50	1.51	1.51	2.65	2.66	43.02	43.23	Loamy sand	Sandy Loam
53	D <sub>53</sub>	80.20	78.70	10.70	11.40	9.10	9.90	1.50	1.51	2.67	2.68	43.82	43.66	Loamy sand	Sandy Loam
54	D <sub>54</sub>	80.30	79.00	11.60	12.10	8.10	8.90	1.52	1.52	2.64	2.65	42.42	42.64	Loamy sand	Sandy Loam
55	D <sub>55</sub>	79.90	78.10	10.50	11.40	9.60	10.50	1.48	1.49	2.55	2.56	41.96	41.80	Loamy sand	Sandy Loam
56	D <sub>56</sub>	80.00	78.20	10.10	11.40	9.90	10.40	1.48	1.51	2.50	2.52	40.80	40.08	Loamy sand	Sandy Loam
57	D <sub>57</sub>	80.30	79.40	10.40	10.80	9.30	9.80	1.52	1.52	2.63	2.64	42.21	42.42	Loamy sand	Sandy Loam
58	D <sub>58</sub>	79.80	77.70	10.30	11.50	9.90	10.80	1.50	1.52	2.59	2.61	42.08	41.76	Sandy Loam	Sandy Loam
59	D <sub>59</sub>	80.20	79.10	10.60	10.80	9.20	10.10	1.51	1.53	2.59	2.60	41.70	41.15	Loamy Sand	Sandy Loam
60	D <sub>60</sub>	79.80	78.70	11.10	12.10	9.10	9.20	1.54	1.55	2.65	2.66	41.89	41.73	Loamy Sand	Sandy Loam
61	D <sub>61</sub>	76.10	75.00	12.80	13.70	11.10	11.30	1.49	1.51	2.60	2.61	42.69	42.15	Sandy Loam	Sandy Loam
62	D <sub>62</sub>	78.60	76.60	10.90	12.80	10.50	10.60	1.53	1.54	2.57	2.59	40.47	40.54	Sandy loam	Sandy Loam
63	D <sub>63</sub>	80.40	78.70	10.10	11.20	9.50	10.10	1.53	1.55	2.65	2.65	42.26	41.51	Loamy sand	Sandy Loam
64	D <sub>64</sub>	77.20	76.20	12.60	13.60	10.20	10.20	1.54	1.55	2.65	2.66	41.89	41.73	Sandy loam	Sandy Loam
65	D <sub>65</sub>	79.70	78.50	10.70	11.10	9.60	10.40	1.53	1.54	2.65	2.66	42.26	42.11	Loamy sand	Sandy Loam
66	D <sub>66</sub>	77.70	75.60	12.50	13.70	9.80	10.70	1.50	1.52	2.51	2.52	40.24	39.68	Sandy loam	Sandy Loam

S. No.	Sample code No	Sand (%)		Silt (%)		Clay (%)		B D (Mg m <sup>-3</sup> )		P D (Mg m <sup>-3</sup> )		Porosity (%)		Textural Class	
		0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
67	D <sub>67</sub>	74.70	73.10	13.20	14.30	12.10	12.60	1.54	1.54	2.64	2.65	41.67	41.89	Sandy loam	Sandy Loam
68	D <sub>68</sub>	78.00	76.60	12.30	13.20	9.70	10.20	1.54	1.55	2.64	2.65	41.67	41.51	Sandy loam	Sandy Loam
69	D <sub>69</sub>	80.20	78.40	11.00	11.70	8.80	9.90	1.47	1.49	2.51	2.53	41.43	41.11	Loamy sand	Sandy Loam
70	D <sub>70</sub>	76.70	75.00	13.20	13.90	10.10	11.10	1.46	1.48	2.58	2.60	43.41	43.08	Sandy loam	Sandy Loam
71	D <sub>71</sub>	73.70	72.60	13.80	14.10	12.50	13.30	1.48	1.50	2.65	2.66	44.15	43.61	Sandy loam	Sandy Loam
72	D <sub>72</sub>	75.30	73.30	12.60	13.90	12.10	12.80	1.52	1.54	2.57	2.58	40.86	40.31	Sandy loam	Sandy Loam
73	D <sub>73</sub>	77.50	75.90	13.10	14.10	9.40	10.00	1.50	1.52	2.59	2.61	42.08	41.76	Sandy Loam	Sandy Loam
74	D <sub>74</sub>	78.00	76.20	11.60	12.50	10.40	11.30	1.54	1.54	2.61	2.62	41.00	41.22	Sandy Loam	Sandy Loam
75	D <sub>75</sub>	81.10	79.00	10.10	11.10	8.80	9.90	1.52	1.53	2.52	2.54	39.68	39.76	Loamy sand	Sandy Loam
76	D <sub>76</sub>	76.60	75.70	13.30	13.80	10.10	10.50	1.54	1.54	2.60	2.62	40.77	41.22	Sandy Loam	Sandy Loam
77	D <sub>77</sub>	78.10	76.70	12.70	13.10	9.20	10.20	1.49	1.51	2.61	2.62	42.91	42.37	Sandy Loam	Sandy Loam
78	D <sub>78</sub>	77.90	76.50	12.80	13.10	9.30	10.40	1.48	1.50	2.55	2.57	41.96	41.63	Sandy Loam	Sandy Loam
79	D <sub>79</sub>	79.10	77.60	11.10	11.80	9.80	10.60	1.52	1.52	2.61	2.62	41.76	41.98	Sandy Loam	Sandy Loam
80	D <sub>80</sub>	77.10	75.60	11.90	12.60	11.00	11.80	1.50	1.51	2.51	2.53	40.24	40.32	Sandy Loam	Sandy Loam
81	D <sub>81</sub>	76.10	74.70	12.80	13.10	11.10	12.20	1.46	1.48	2.61	2.62	44.06	43.51	Sandy Loam	Sandy Loam
82	D <sub>82</sub>	77.00	75.40	12.30	12.80	10.70	11.80	1.54	1.54	2.64	2.65	41.67	41.89	Sandy Loam	Sandy Loam
83	D <sub>83</sub>	78.00	77.10	12.80	13.20	9.20	9.70	1.54	1.55	2.59	2.61	40.54	40.61	Sandy Loam	Sandy Loam
84	D <sub>84</sub>	75.50	74.40	12.90	13.30	11.60	12.30	1.49	1.51	2.63	2.64	43.35	42.80	Sandy Loam	Sandy Loam
85	D <sub>85</sub>	76.20	75.30	13.60	13.80	10.20	10.90	1.54	1.55	2.64	2.65	41.67	41.51	Sandy Loam	Sandy Loam
86	D <sub>86</sub>	77.10	75.10	11.80	13.10	11.10	11.80	1.47	1.49	2.51	2.53	41.43	41.11	Sandy Loam	Sandy Loam
87	D <sub>87</sub>	74.30	72.80	13.50	14.10	12.20	13.10	1.52	1.53	2.62	2.63	41.98	41.83	Sandy Loam	Sandy Loam
88	D <sub>88</sub>	79.00	77.40	10.80	11.40	10.20	11.20	1.53	1.53	2.50	2.52	38.80	39.29	Sandy Loam	Sandy Loam
89	D <sub>89</sub>	75.00	73.90	12.90	13.20	12.10	12.90	1.54	1.54	2.61	2.62	41.00	41.22	Sandy Loam	Sandy Loam
90	D <sub>90</sub>	80.00	78.50	11.50	11.80	8.50	9.70	1.50	1.52	2.58	2.60	41.86	41.54	Loamy sand	Sandy Loam
91	D <sub>91</sub>	75.40	74.10	12.90	13.10	11.70	12.80	1.49	1.51	2.61	2.63	42.91	42.59	Sandy Loam	Sandy Loam
92	D <sub>92</sub>	76.00	74.50	13.10	14.10	10.90	11.40	1.53	1.54	2.53	2.55	39.53	39.61	Sandy Loam	Sandy Loam
93	D <sub>93</sub>	75.60	74.30	12.50	13.40	11.90	12.30	1.51	1.52	2.60	2.61	41.92	41.76	Sandy Loam	Sandy Loam
94	D <sub>94</sub>	77.20	75.70	12.40	13.50	10.40	10.80	1.48	1.50	2.62	2.63	43.51	42.97	Sandy Loam	Sandy Loam
95	D <sub>95</sub>	81.50	80.00	10.20	10.60	8.30	9.40	1.49	1.51	2.64	2.65	43.56	43.02	Loamy sand	Loamy Sand
96	D <sub>96</sub>	73.50	72.20	14.10	14.50	12.40	13.30	1.49	1.50	2.57	2.58	42.02	41.86	Sandy Loam	Sandy Loam
97	D <sub>97</sub>	79.70	78.10	10.50	11.80	9.80	10.10	1.54	1.55	2.63	2.64	41.44	41.29	Sandy Loam	Sandy Loam
98	D <sub>98</sub>	75.70	73.90	12.50	13.80	11.80	12.30	1.53	1.53	2.64	2.65	42.05	42.26	Sandy Loam	Sandy Loam
99	D <sub>99</sub>	76.00	73.90	12.80	13.70	11.20	12.40	1.47	1.49	2.57	2.58	42.80	42.25	Sandy Loam	Sandy Loam
100	D <sub>100</sub>	78.70	77.40	11.20	12.10	10.10	10.50	1.50	1.52	2.57	2.59	41.63	41.31	Sandy Loam	Sandy Loam

S. No.	Sample code No	Sand (%)		Silt (%)		Clay (%)		B D (Mg m <sup>-3</sup> )		P D (Mg m <sup>-3</sup> )		Porosity (%)		Textural Class	
		0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm	0-15 cm	15-30 cm
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
101	D <sub>101</sub>	81.20	80.20	10.30	10.90	8.50	8.90	1.46	1.48	2.58	2.60	43.41	43.08	Loamy sand	Loamy Sand
102	D <sub>102</sub>	75.00	74.10	12.80	13.10	12.20	12.80	1.54	1.55	2.59	2.60	40.54	40.38	Sandy Loam	Sandy Loam
103	D <sub>103</sub>	78.00	76.20	11.90	12.50	10.10	11.30	1.45	1.47	2.55	2.57	43.14	42.80	Sandy Loam	Sandy Loam
104	D <sub>104</sub>	80.10	79.20	11.40	11.60	8.50	9.20	1.52	1.53	2.59	2.61	41.31	41.38	Loamy sand	Sandy Loam
105	D <sub>105</sub>	80.10	78.60	10.50	11.60	9.40	9.80	1.54	1.55	2.51	2.53	38.65	38.74	Loamy sand	Sandy Loam
106	D <sub>106</sub>	80.20	78.80	10.50	11.60	9.30	9.60	1.48	1.50	2.62	2.63	43.51	42.97	Loamy sand	Sandy Loam
107	D <sub>107</sub>	78.10	76.20	11.60	12.40	10.30	11.40	1.50	1.52	2.61	2.62	42.53	41.98	Sandy loam	Sandy Loam
108	D <sub>108</sub>	77.80	76.40	12.40	13.30	9.80	10.30	1.51	1.53	2.51	2.53	39.84	39.53	Sandy loam	Sandy Loam
109	D <sub>109</sub>	80.00	78.50	10.10	11.10	9.90	10.40	1.54	1.55	2.61	2.62	41.00	40.84	Loamy sand	Sandy Loam
110	D <sub>110</sub>	73.00	71.30	14.20	15.60	12.80	13.10	1.50	1.52	2.61	2.63	42.53	42.21	Sandy loam	Sandy Loam
111	D <sub>111</sub>	78.00	76.50	11.20	12.60	10.80	10.90	1.49	1.51	2.59	2.61	42.47	42.15	Sandy loam	Sandy Loam
112	D <sub>112</sub>	76.40	74.60	13.50	14.60	10.10	10.80	1.53	1.54	2.63	2.64	41.83	41.67	Sandy loam	Sandy Loam
113	D <sub>113</sub>	80.10	78.50	10.40	11.10	9.50	10.40	1.50	1.51	2.52	2.54	40.48	40.55	Loamy sand	Sandy Loam
114	D <sub>114</sub>	80.40	78.90	10.50	11.50	9.10	9.60	1.50	1.52	2.60	2.61	42.31	41.76	Loamy sand	Sandy Loam
115	D <sub>115</sub>	80.80	79.00	10.30	11.10	8.90	9.90	1.50	1.51	2.51	2.53	40.24	40.32	Loamy sand	Sandy Loam
116	D <sub>116</sub>	81.90	80.70	10.20	10.50	7.90	8.80	1.49	1.52	2.65	2.65	43.77	42.64	Loamy sand	Loamy Sand
117	D <sub>117</sub>	78.30	76.60	11.30	12.30	10.40	11.10	1.46	1.48	2.62	2.63	44.27	43.73	Sandy loam	Sandy Loam
118	D <sub>118</sub>	80.30	79.00	11.20	11.60	8.50	9.40	1.47	1.49	2.64	2.65	44.32	43.77	Loamy sand	Sandy Loam
119	D <sub>119</sub>	77.20	75.60	11.90	13.10	10.90	11.30	1.51	1.53	2.49	2.51	39.36	39.04	Sandy loam	Sandy Loam
120	D <sub>120</sub>	75.00	73.70	13.90	14.10	11.10	12.20	1.47	1.49	2.58	2.60	43.02	42.69	Sandy loam	Sandy loam
121	D <sub>121</sub>	76.30	75.20	13.50	13.70	10.20	11.10	1.48	1.50	2.64	2.65	43.94	43.40	Sandy loam	Sandy loam
<b>Range</b>	<b>Maximum</b>	82.80	81.30	14.20	15.60	12.80	13.30	1.54	1.55	2.67	2.68	45.69	44.78	-	-
	<b>Minimum</b>	73.00	71.30	9.10	9.50	7.90	8.60	1.45	1.46	2.49	2.51	38.40	38.34	-	-
	<b>Mean</b>	78.57	77.18	11.52	12.21	9.91	10.61	1.50	1.51	2.59	2.61	42.16	41.74	-	-
	<b>SD</b>	2.14	2.18	1.25	1.28	1.10	1.09	0.03	0.03	0.05	0.04	1.53	1.42	-	-
	<b>CV</b>	2.73	2.82	10.88	10.48	11.08	10.28	1.87	1.67	1.83	1.70	3.62	3.39	-	-

depth was observed from surface to sub-surface depth ("15 to 30" cm). Thus, increase in clay percentage with depth might be due to attributed to vertical migration or translocation of clay (Mustafa et al., 2011). Silt content in general also exhibited a regular trend with increasing depth which might be due to variation in parent material, topography or in-situ weathering and translocation of clay (Satish Kumar and Naidu, 2012). On the basis of textural analysis, it is found that most of soils of Dausa and Sikrai tehsil of Dausa district are sandy loam in texture having lot of variability in relation to proportion of sand, silt and clay. Similar results were observed by Vyas et al. (1974) in soils of Jaipur district, Gupta (2003) in soils of Nagaur tehsil of Rajasthan and Mathur et al. (2006) in soils of North-west plain of Rajasthan. The variation in relative percentage of sand, silt and clay was mainly because of deposition of finer fraction.

### 3.1.2 Bulk density

The data shown in Table 2 indicated that bulk density of surface and sub-surface soils of Dausa tehsil ranged between 1.45 to 1.54 and 1.46 to 1.55 Mg m<sup>-3</sup>. The maximum value was 1.54 Mg m<sup>-3</sup> and 1.55 Mg m<sup>-3</sup> and minimum value 1.45 Mg m<sup>-3</sup> and 1.46 Mg m<sup>-3</sup> was recorded in both the layers respectively. The corresponding mean value of BD were 1.50 and 1.51 Mg m<sup>-3</sup>, standard deviation 0.03 and 0.03 and coefficient of variation 1.87 and 1.67 per cent in surface ("0 to 15" cm) and sub-surface ("15 to 30" cm) soil samples respectively. The bulk density increased with depth which might be due to more compaction, low organic matter, less aggregation and secondary orientation or accumulation of clay in pre-space increased the bulk density or apparent density of sub surface soil. Similar results also reported by Kameriya (1995) in soils Agro-climatic zone – IIA of Rajasthan. These findings are in conformity with the work of Kar et al. (1986), Brar (1991), Mathan and Mahendra (1994), Agrawal et al. (2002) and Singh and Agrawal (2005).

### 3.1.3 Particle density

The data shown in Table 2 indicated that particle density of surface and sub-surface soils of Dausa tahsil ranged between 2.49 to 2.67 and 2.51 to 2.68 Mg m<sup>-3</sup>. The maximum value of particle density was 2.67 and 2.68 Mg m<sup>-3</sup> and minimum value of particle density were recorded 2.49 and 2.51 Mg m<sup>-3</sup> under surface ("0 to 15" cm) and sub- surface ("15 to 30" cm) layers. The

corresponding mean value of particle density were 2.59 and 2.61 Mg m<sup>-3</sup>, standard deviation 0.05 and 0.04 and coefficient of variation 1.83 and 1.70 per cent in surface and sub-surface soil samples respectively. The increase in particle density with depth could be due to a decrease in organic carbon. Minor variation in particle density might be due to changes in mineralogical composition of soil. Similar observation was also made by Kameriya (1995), Vyas et al. (1974), Naga (1984) and Yadav (1985).

### 3.1.4 Porosity

The data shown in Table 2 indicated that per cent porosity of surface ("0 to 15" cm) and sub-surface ("15 to 30" cm) soils of Dausa tehsil ranged between 38.40 to 45.69 and 38.34 to 44.78%. The maximum (45.69 and 44.78%) in Baadh Chhangla (D-21) village in both layers and minimum (38.40 and 38.34%) in Kalakho (D-51) and Barkheda (D-105) Villages were recorded. The corresponding mean value of percent porosity were 42.16 and 41.74%, standard deviation 1.53 and 1.42 and coefficient of variation 3.62 and 3.39 per cent in surface and sub-surface soil samples respectively. The pore space (%) decrease abruptly with increase in depth. Lower porosity under sub-surface ("15 to 30" cm) layer as compare to surface layer ("0 to 15 cm) might be due to compaction and low organic carbon in lower layer and variation in silt and sand fractions and their arrangement. Similar results were reported by Meena et al., (2017) and Urmila et al., (2018).

## 4. CONCLUSION

Physical properties of soil are to be affected by the management practices adopted by the farmers and the degree of manure and fertilizer usage over a period of time. The almost soils of Dausa tehsils were found to be dominant as sandy loam in texture.

## DISCLAIMER (ARTIFICIAL INTELLIGENCE)

Author(s) hereby declares that NO generative AI technologies such as Large Language Models (ChatGPT, COPILOT, etc.) and text-to-image generators have been used during writing or editing of this manuscript.

## ACKNOWLEDGEMENTS

I highly grateful to Director Rajasthan Agricultural Research Institute, Durgapura, Jaipur, for their financial support to carried out the present work.

I also thankful to the Head, Division of Soil Science and Agricultural Chemistry, and Director RARI, Durgapura for providing necessary laboratory facilities and their technical cooperation and support.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

## REFERENCES

- Agarwal, P.B., Sinha, A.K. and Yadav, B.R. 2002. Influence of saline water irrigation and varying soil moisture regimes on soil properties, crop water use and yield of wheat inter crop. *Journal of the Indian Society of Soil Science*, 50: 287- 293.
- Brar, S. D. S. 1991. Bulk density as an index of soil texture. *Journal of the Indian Society of Soil Science*, 39: 557-559.
- Buol, S.W., Southard, R.J., Graham, R.C., McDaniel, P.A. 2003. *Soil Genesis and Classification*. 5th edition. Iowa State Press. A Blackwell Publishing Company.
- Chandra, R. and Singh, S.K. Study of macro nutrient and physical status of soil in a part of Varuna River in Varanasi, India 2009. *International Journal of Environmental Sciences*. 4 (4):468-471.
- Chandrakala, M., M. Ramesh, K. Sujatha, R. Hegde, and S. K. Singh. 2018. Soil fertility evaluation under different land use system in tropical humid region of Kerala, India. *International Journal of Plant & Soil Science* 24 (4):1–13.
- Gupta, K. 2003. Available micronutrient status and their effect on soil properties of Nagaur tehsil (Rajasthan). *M.Sc. (Ag.) Thesis*, Rajasthan Agricultural University, Bikaner.
- Kameriya, P.R. 1995. Characterization of soils of Agro-climatic zone of transitional plain of inland drainage (Zone IIa) of Rajasthan. *Ph.D. Thesis*, Rajasthan Agricultural University, Bikaner.
- Kar, S., Samus, R.P., Prasad, J., Gupta, C. P. and Subramangam, T. K. 1986. Compaction and tillage depth combinations for water management and rice production in low relative permeable soils. *Soil Tillage Research*, 6: 211-222.
- Kumar Y.S. Satish, Naidu M. V. S. 2012. Characteristics and Classification of Soils Representing Major Land forms in Vadamalalpeta Mandal of Chittoor District, Andhra Pradesh. *Journal of the Indian Society of Soil Science*. 60 (1) 63-67.
- Mathan, K.K. and Mahendra, P.P. 1994. Infiltration characteristics of soils as related to soil physical properties. *Journal of the Indian Society of Soil Science*, 42: 441-444.
- Mathur, G.M., Ramdev and Yadav, B.S. 2006. Status of zinc in irrigated North-West plain soils of Rajasthan. *Journal of the Indian Society of Soil Science*, 54: 359- 361.
- Meena, G.L., Singh, R.S., Singh, R.K., Meena, H.R., Meena, Suman, and Mina, B.L. 2017. Assessment of productivity potential of some soils of Aravali Hills based on parametric approach. *Indian Journal of Soil Conservation*, 28-39.
- Murthy, A.S.P. 1988. Distribution, Properties, and Management of Vertisols of India. In: Stewart, B.A. (eds) *Advances in Soil Science*. vol 8. Springer, New York, NY. <https://doi.org/10.1007/978-1-4613-8771-8-4>.
- Mustafa, A.A., Singh M., Ahmed N., Sahoo R. N., Khanna M., Sarangi A. and Mishra A. K. 2011. Characterization and classification of soils of Kheragarh, Agra and their productivity potential. *Journal of Water Management*, 19 (1) pp. 1-19.
- Naga, S.R. 1984. Physico-chemical properties and fertility status of soils of Sambher Panchayat Samiti, Jaipur district (Rajasthan) irrigated with saline ground water. *M.sc. (Ag.) Thesis*, Sukhadia University, Udiapur.
- Richards, L.A. 1954. Diagnosis and improvement of saline and alkaline Soils. *USDA Hand Book No. 60*. Oxford and IBH Pub. Co., New Delhi.
- Sharma, B. D., Arora, H., Kumar, R. and Nayyar, V. K. 2004. Relationships between soil characteristics and total and DTPA-extractable micronutrients in inceptisols of Punjab. *Communications in Soil Science and Plant Analysis*, 35, 799–818.
- Singh, I.S. and Agrawal, H.P. 2005. Characterization, genesis and classification of rice soils of eastern region of Varanasi, Uttar Pradesh. *Agropedology* 15, 29-38.
- Snedecor G.W. and Cochran W.G. 1967. *Statistical methods applied to experiments in agriculture and biology*. 5th ed. Ames, Iowa State University Press, 1956.
- Urmila Purohit HS, Singh D, Meena SC, Jain HK, Kumar Amit, Verma SN. 2018. Effect of

- tillage on physico-chemical indices of soil in maize based cropping sequence of southern Rajasthan. *International Journal of Chemical Studies* 6(4):2490-2493.
- Vyas, K.S., Marwaha, P.S. and Didal, M.L. 1974. Studies on the saline alkali soils of Jaipur district (Rajasthan) IV. Total exchange capacity and exchangeable cations. *Agriculture Agronomy Industries Journal*, 7: 3-4.
- Yadav, R. 1985. A study of physico-chemical properties and fertility status of irrigated soils of Amber tehsil, Jaipur. *M.Sc. (Ag.) Thesis*, Sukhadia University, Udiapur.

**Disclaimer/Publisher's Note:** The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of the publisher and/or the editor(s). This publisher and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.

© Copyright (2025): Author(s). The licensee is the journal publisher. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited.

*Peer-review history:*

*The peer review history for this paper can be accessed here:*

<https://pr.sdiarticle5.com/review-history/126518>