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Assessment of soil health from different villages of Jhadol block, Udaipur, Rajasthan, India

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Abstract
The twenty-seven soil samples were collected from nine different villages in December 2022 from Jhadol block, Udaipur, Rajasthan. The collected soil samples were analyzed for their physico-chemical parameters and presence of heavy metals by using standard laboratory techniques. The result showed that the soil of Jhadol block is clay loam in soil texture, nearly neutral in soil reaction, very low to low in soil organic carbon content, low to medium in nitrogen content, low to high in phosphorus content, low to high in potassium content, high amount of Ca and Mg, and in heavy metals; Zn content are in deficient range, Mn is in sufficient range, whereas Fe and Cu are in high levels in maximum portion of study area. Soil contains higher amount of iron oxides due to iron mines which is dangerous for crop production and it can be mitigate by cropping tolerant varieties. The deficient nutrient can be replenished to avoid the crop suffering from the deficiency and optimum utilization of nutrients. Integrated nutrient management can be adopted for sustainable soil fertility management as well as to achieve higher crop production.

Keywords: Physico-chemical Parameters, heavy metals, Iron ore mines, Jhadol, Udaipur

Introduction
Soil is a vital resource, can be termed as “Soul of infinite life”. The essence of life in the soil is its crop producing capacity that is, the soil productivity largely depends on soil fertility, management practices and climate. The word soil represents one of the most active and complex natural systems on the earth’s surface. It is essential for the existence of many forms of life and provides medium for plant’s growth and also supplies the organisms with most of their nutritional requirements (Tewari *et al*., 2016) [8]. Optimal physical and chemical soil properties will lead to optimal soil biological properties and ideal soil health and productivity. Healthy soils constitute the foundation of thriving ecosystems and societies and are directly tied to food and nutritional security, water quality, human health, climate change mitigation and biodiversity (Manter *et al*., 2017) [10]. For the high crop yield the farmers used the pesticides and fertilizers in excess amount causes serious environmental problems and consider their possible impact on soil health. Hence, balanced fertilizer application is important for high crop yield. (John *et al*., 2010) [9].

Materials and Methods
Sampling site and collection
Udaipur is located at 24º31'30" N 73º40'37" E. The city covers an area of 64 km^2 and lies at an altitude of 598.00 m (1,962 ft) above sea level. It is located in the southern region of Rajasthan, near the Gujarat border. Udaipur with its lakes lies on the south slope of the Aravalli Range in Rajasthan.
Udaipur city has a hot semi-arid climate. The three main seasons, summer, monsoon and winter respectively, dominate the city of Udaipur. Being located in the desert lands of Rajasthan, the climate and weather of Udaipur is usually hot. The summer season runs from mid-March to June and touches temperature ranging from 23 °C (73 °F) to 44 °C (111 °F) in the months of March to June. Monsoons arrive in the month of July heralded by dust and thunderstorms. The winter season prevails from the month of October till the month of March. Humidity, which prevails during monsoons, diminishes at the arrival of winters.
Soil samples were collected from Jhadol block from nine different villages. Samples were collected randomly using soil auger by composite sampling method at depths of 0-15, 15-30 and 30-45 cm. All the samples were divided into four parts and then among them two samples were collected and only half kg sample is being taken for the soil analysis by the conning and quartering method.

Table 1: The methods of analysis for different soil parameters

S. No.	Particulars	Scientist Name	Methods	Unit
Physical Properties				
1.	Bulk density	Black (1965) [11]	Pycnometer	Mg m^{-3}
2.	Particle density	Black (1965) [11]	Pycnometer	Mg m^{-3}
3.	Textural class (Sand, Slit, Clay)	Bouyoucos (1927) [12]	Bouyoucos hydrometer	Percentage (%)
4.	Pore space	Black (1965) [11]	-	Percentage (%)
5.	Water Holding capacity	Muthuval *et al.* (1992) [13]	Graduated measuring cylinder	Percentage (%)
Chemical Properties				
1.	Soil pH (1:2.5)	Jackson (1958) [14]	Digital pH meter	
2.	Electrical conductivity (1:2.5)	Wilcox (1950) [15]	Digital conductivity meter	dS m^{-1}
3.	Organic carbon	Walkley and Black (1947) [16]	Wet oxidation method	Percentage (%)
4.	Available nitrogen	Subbiah and Asija (1956) [17]	Soil alkaline permanganate method	kg ha^{-1}
5.	Available phosphorus	Olsen *et al.* (1954) [18]	Photometric colorimeter method	kg ha^{-1}
6.	Available potassium	Schollenberger and Simon	Flame photometric method	kg ha^{-1}

Result and Discussion

Physical Properties

The textural classification of soil in different villages of Jhadol block. The texture classification of soil samples was shown clay loam in all villages.

Soil Bulk Density (Mg m^{-3})

The bulk density in a soil ranges from 1.32 -1.47 Mg m^{-3}. V_6 – Dewas was reported as highest bulk density *i.e*., 1.47 (Mg m-3) followed by V_9 - Khemli *i.e.* 1.47 (Mg m-3) while V_1 - Dongriyawas was reported as lowest bulk density *i.e.* 1.32 (Mg m-3). The higher bulk density may be due to intensive cultivation practiced in Dewas. Significant results were observed by (Ahad *et al*., 2015) [1].

Soil Particle Density (Mg m^{-3})

Soil particle density ranges from 2.36– 2.49 Mg m^{-3}. V_6 - Dewas was reported as highest particle density *i.e.* 2.49 (Mg m-3) followed by V_8 - Kolar *i.e.* 2.49 (Mg m-3), and lowest was found in V_4 - Salar *i.e.* 2.36 (Mg m-3). Higher particle density may be due to scare organic matter found in soil of Dewas village. Similar results were reported by (Chaudhari *et al*., 2013) [3].

Soil Porosity (%)

Soil porosity in a soil sample ranges from 42.89 – 49.25%. V_6 -Dewas reported as highest porosity of 49.25% followed by V_1 - Dongariyawas of 48.88%, while V_9 - Khemli reported as lowest porosity *i.e.* 42.89%. Lower porosity may be a result of higher bulk density in Khemli. Significant results were observed by (Ahad *et al*., 2015) [1].

Water Holding Capacity (%)

The values of water holding capacity of soil ranges from 38.68– 45.17%. Highest water holding capacity was observed in the V_8 - Kolar which was 45.17% followed by V_6 – Dewas *i.e.* 45.17% as there is high organic carbon content whereas the lowest water holding capacity was observed in V_9 - Khemli *i.e.* 38.68% which is due to low organic carbon content in the soil sample. Similar results were reported by (Das *et al*., 2018) [4].

Table 2: Results of physical properties of Jhadol block, Udaipur

S. No.	Soil bulk density			Soil particle density			Soil porosity			Soil water holding capacity		
	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm
V_1- Dongariyawas	1.32	1.34	1.38	2.38	2.4	2.44	48.88	46.78	44.32	44.26	42.48	40.18
V_2- Nandiya	1.34	1.36	1.4	2.37	2.42	2.45	47.73	45.82	43.25	42.34	41.57	39.19
V_3 - Deorawas	1.35	1.37	1.4	2.39	2.43	2.46	46.59	45.15	43.76	44.19	41.37	39.59
V_4 - Salar	1.36	1.38	1.41	2.36	2.39	2.44	47.56	46.17	43.96	42.48	41.96	39.72
V_5- Jharol	1.4	1.43	1.45	2.38	2.43	2.47	48.76	46.52	43.25	43.59	41.34	39.63
V_6- Dewas	1.42	1.45	1.47	2.4	2.44	2.49	49.26	47.36	44.75	45.17	43.58	40.26
V_7- Adwaniya	1.38	1.4	1.43	2.39	2.43	2.48	48.15	46.57	43.81	44.25	41.23	39.45
V_8- Kolar	1.41	1.43	1.46	2.42	2.46	2.49	49.09	47.61	44.62	45.17	43.38	39.23
V_9- Khemli	1.43	1.46	1.47	2.4	2.44	2.47	47.14	45.78	42.89	43.29	41.97	38.68
F- test	NS	NS	NS	NS	NS	NS	NS	NS	NS	S	S	S
S.Em. (±)	-	-	-	-	-	-	-	-	-	0.5	0.59	0.58
C. D. @ 5%	-	-	-	-	-	-	-	-	-	1.5	2.46	2.32

Soil Chemical Properties

Soil pH

pH of a soil samples ranges from 6.92 – 7.65 *i.e*., neutral in nature, thus the pH indicates the availability of all nutrients should be high in the soil. The highest pH value was observed in the V_4 - Salar *i.e.* 7.65 followed by V_9 - Khemli *i.e.* 7.62 and the lowest pH was found in V_2 – Nandiya *i.e.* 6.92. The results shown the pH in neutral range. The pH is significant and appropriate for the nutrient availability. Similar significant results were reported by (Basavaraja *et al*., 2017) [2].

Soil EC (dS m^{-1})

EC in a soil samples ranged from 0.06-0.24 dS m^{-1}. Highest EC content was reported in V_8 - Kolar *i.e.* 0.24 dS m^{-1} followed by V_8 – Kolar *i.e.* 0.18 dS m^{-1} whereas the lowest EC content was observed in V_5 – Jharol *i.e.* 0.06 dS m^{-1}. Hence, all the soil under the study area is safe for all types of crop production with respect to the soluble salt content. The results were found to be significant. Similar results were reported by (Basavaraja *et al*., 2017) [2].

Soil Organic Carbon (%)

Organic carbon soil samples value ranges from 0.09 – 0.38%. The results were found to be significant. Highest organic carbon reported in V_7 - Adwaniya *i.e*., 0.38% followed by V_4 - Salar *i.e.* 0.33% whereas the lowest organic carbon was observed in V_5 – Jharol *i.e.* 0.09%. Soil organic carbon status was found to be very low to low which enables the soil for medium crop production. Similar results were reported by (Deshmukh *et al*., 2012) [5].

Table 3: Results of chemical properties of Jhadol block, Udaipur

S. No.	Soil pH			Soil EC (dS m^{-1})			Soil organic Carbon (%)		
	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm
V_1-Dongariyawas	7.27	7.38	7.41	0.09	0.1	0.1	0.3	0.25	0.24
V_2- Nandiya	7.02	6.92	6.94	0.09	0.07	0.16	0.32	0.25	0.22
V_3 - Deorawas	7.34	7.45	7.4	0.1	0.17	0.11	0.31	0.26	0.24
V_4 - Salar	7.59	7.65	7.65	0.09	0.15	0.13	0.33	0.29	0.23
V_5- Jharol	7.09	6.94	6.67	0.07	0.06	0.1	0.24	0.21	0.09
V_6- Dewas	7.1	7.02	7.17	0.11	0.11	0.14	0.18	0.15	0.09
V_7- Adwaniya	7.25	7.24	7.32	0.1	0.08	0.08	0.38	0.27	0.24
V_8- Kolar	7.22	7.25	7.31	0.23	0.18	0.24	0.17	0.15	0.12
V_9- Khemli	7.54	7.5	7.62	0.16	0.08	0.11	0.18	0.15	0.09
F- test	S	S	S	S	S	S	S	S	S
S.Em. (±)	0.13	0.09	0.12	0.005	0.005	0.003	0.003	0.003	0.002
C. D. @ 5%	0.39	0.28	0.37	0.001	0.001	0.001	0.01	0.01	0.006

Soil Nitrogen (kg ha^{-1})

Nitrogen content in soil sample ranges from 162 – 310 kg ha^{-1}. The results were found to be significant. Highest nitrogen content in soil was observed in V_7 - Adwaniya *i.e*., 310 kg ha^{-1} followed by V_2 - Nandiya *i.e*., 295 kg ha^{-1} and the lowest nitrogen content was reported in V_8 - Kolar *i.e*., 162 kg ha^{-1}. The soil samples of the villages were found to be low to medium in nitrogen content. The reason may be attributed to the fact that nitrogen content is positively correlated with organic matter content which decreases with depth. Similar results were observed with (Sheeba *et al*., 2019) [7].

Soil Phosphorus (kg ha^{-1})

Phosphorus in soil samples ranged from 16 – 30 kg ha^{-1}. The results were found to be significant. Highest phosphorus was reported in V_7 – Adwaniya *i.e.* 30 kg ha^{-1} followed by V_5 - Jharol *i.e.* 29 kg ha^{-1} whereas the lowest phosphorus content was observed in V_8 - Kolar *i.e.* 16 kg ha^{-1}. Available phosphorus status was found to be low to high which enables the soil for higher crop production. Significant results were observed (Das *et al*., 2018) [4].

Soil Potassium (kg ha^{-1})

Potassium content in the soil samples ranges from 77 – 289 kg ha^{-1} The results were found to be significant. Highest potassium content was reported in V_7 - Adwaniya *i.e.* 289 kg ha^{-1} followed by V_4 - Salar *i.e.* 286 kg ha^{-1} whereas the lowest potassium content was observed in V_9 – Khemli *i.e.* 77 kg ha^{-1}. The status of potassium was found moderate in the whole region due to alluvial soil which is moderate to high in available potassium. Similar results were observed with (Sharma *et al*., 2014) [6].

Table 4: Results of macro nutrients of Jhadol block, Udaipur

S. No.	Soil Nitrogen (kg ha^{-1})			Soil Phosphorus (kg ha^{-1})			Soil Potassium (kg ha^{-1})		
	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm	0-15 cm	15-30 cm	15-45 cm
V_1-Dongariyawas	266	221	196	26	22	18	272	222	178
V_2- Nandiya	295	251	218	28	24	20	285	250	210
V_3 - Deorawas	270	223	206	26	22	19	269	224	184
V_4 - Salar	276	240	212	27	25	22	286	236	190
V_5- Jharol	254	205	186	29	26	20	112	92	80
V_6- Dewas	248	198	179	28	25	21	107	96	87
V_7- Adwaniya	310	242	221	30	28	24	289	232	208
V_8- Kolar	232	186	162	23	20	16	257	220	198
V_9- Khemli	260	213	177	24	20	18	105	95	77
F- test	S	S	S	S	S	S	S	S	S
S.Em. (±)	4.08	2.98	2.69	0.29	0.32	0.24	4.05	3.17	2.64

Conclusion

It can be concluded that the soils of Jhadol block of Udaipur, Rajasthan are in good physical condition which favors the cultivation of most of the crops, especially maize and wheat. Soil texture showed high clay percentage, neutral in pH, very low to low organic carbon content, low to medium in NPK. The deficiency of nutrients can be mitigated by the use of some inorganic fertilizers or organic fertilizers. Tolerant

varieties can be used and Integrated Nutrient Management can be adopted.

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References

1. Ahad T, Kanth TA, Nabi S. Soil Bulk Density as Related to Texture, Organic Matter Content and Porosity in Kandi Soils of District Kupwara (Kashmir Valley), India. International Journal of Scientific Research. 2015;4(1):198-200.
2. Basavaraja PK, Dey P, Mohamed Saqeebulla H, Yogendra ND. Geo reference-based soil fertility status in Hassan district of Karnataka, India for development of nutrient plan. Indian Journal of Soil Conservation. 2017;45(2):141-147.
3. Chaudhary DR, Ghosh A, Sharma MK, Chikara J. Characterization of some salt-affected soils of Amethi, Uttar Pradesh. Agropedology. 2013;16(2):126-129.
4. Das A, David AA, Swaroop N, Thomas T, Rao S, Hasan A. Assessment of Physico-chemical properties of river bank soil of Yamuna in Allahabad city, Uttar Pradesh. International Journal of chemical studies. 2018;6(3):2412-2417.
5. Deshmukh MS, Kachave TR, Kanase PM. Evaluation of macro and micronutrient status of pomegranate orchards from Maharashtra region by soil and leaf analysis, Journal of Pharmacognosy and Phytochemistry. 2020;9(1):1378- 1382.
6. Sharma R, Madhuri S, Rishi LR, Herojeet R. Evaluation of Surface Water Quality for irrigation purposes in Limestone Mining areas of District Solan, Himachal Pradesh, India. International Journal of Innovative Science, Engineering & Technology. 2014;1(8):369-375.
7. Sheeba SS, Pillai S, Mini V. Assessment and rating of available nutrient status of rice soil in the southern laterites of Kerala. Journal of Pharmacognosy and Phytochemistry; c2019. p. 269-272.
8. Tewari G, Khati D, Rana L, Yadav P, Pande C, Bhatt S, *et al*. Assessment of Physicochemical Properties of Soils from Different Land Use Systems in Uttarakhand, India. Journal of Chemical Engineering and Chemistry Research. 2016;3(11):1114-1118.
9. John MS, Mohammad Y, Ullahshah H, Bat J. Soil health. 2010;42(3):1909-1922.
10. Manter DK, Delgado JA, Blackburn HD, Harmel D, de León AAP, Honeycutt CW. Opinion: Why we need a national living soil repository. National Academy of Sciences of the USA; c2017, 114.
11. Black JW, Duncan WA, Shanks RG. Comparison of some properties of pronethalol and propranolol. British Journal of Pharmacology and Chemotherapy. 1965 Dec;25(3):577.
12. Bouyoucos GJ. The hydrometer as a new method for the mechanical analysis of soils. Soil science. 1927 May 1;23(5):343-54.
13. Muthuval P, Udayasoorian C, Nateson R, Ramaswami PP. The Laboratory manual on soil analysis for Physical and chemical characteristic of soil, introduction to soil analysis. Laser typeseeting and off-set printing by scroll EDP; c1992, 68.
14. Chang SC, Jackson ML. Soil Phosphorus Fractions in some representative soils 1. Journal of Soil Science. 1958 Mar;9(1):109-19.
15. Hatcher JT, Wilcox LV. Colorimetric determination of boron using carmine. Analytical chemistry. 1950 Apr 1;22(4):567-9.
16. Walkley A, Black IA. Determination of organic matter in the soil by chromic acid digestion. Soil Sci. 1947;63:251-64.
17. Subbiah BV. A rapid procedure for the determination of available nitrogen in soils. Curr Sci. 1956;25:259-60.
18. Olsen SR. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. US Department of Agriculture; c1954.