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Electrical conductivity study of soil samples of Chuda taluka area, Surendranagar district, Gujarat

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ABSTRACT

In the present studies on electrical conductivity of soils and their relationship with their physical properties like texture, bulk density and porosity were analyzed. We have taken 72 soil samples from different villages of chuda taluka in Surendranagar district of Gujarat. Soil samples were studied for electrical conductivity may find importance in better understanding of soil physics and also for agricultural applications.

Electrical conductivity of the soil profile can be used as an indirect indicator of a number of soils. Electrical conductivity of soil is recorded is 0.28 to 5.02 dS/m with the mean value of 0.95 dS/m. Most samples have found in good range and some of have found in high salinity conditions.

KEYWORDS : Electrical conductivity, soil, agriculture application, Chuda area

1.0 Introduction:

Today agriculture is challenged to produce food sufficiently and keep the quality of essential soil, water, and air resources. The utility of soil electrical conductivity is an indicator the condition of farmlands.

Electrical conductivity of soil is a criterion that correlates with soil properties and it affects crop productivity, including soil texture, salinity and cation exchange capacity, level of organic matter, drainage conditions and subsoil characteristic. The electrical conductivity of soil is different depending on moisture amount which held by soil particles. In a soil, clays have a high conductivity, silts have a medium conductivity and sands have a low conductivity. There is some soil properties that affect crop yield such as soil depth, pH, salt concentrations and available water gripping capacity also related with soil electrical conductivity. There are many chemicals, physical and biological activities are going on.

Soil texture is a soil characteristic used to describe the relative proportion of different sizes of grains and mineral particles in a soil. However particles are grouped according to their size and are typically named clay, silt, and sand. This classification of Soil texture is based on the fractions of soil.

The soil has different physical properties likes colour, texture, grain size, bulk density while, electrical properties include electrical conductivity, dielectric constant and permeability. There are some components which are governed the quality of soil they are physical, chemical and biological components. The amount of nutrients absorbing by crops through soil water is measured by electrical conductivity.

Analysis of EC to a number of different soil properties has related either within individual fields or across closely related soil landscapes. Examples include clay content, soil moisture, and cation exchange capacity and exchangeable Ca^{2+} and Mg^{2+}. Most of the variation in EC can be defined with salt concentration for saline soils. In fewer saline soils, conductivity variations are primarily a function of moisture content, soil texture and cation exchange capacity.

The present study is aim to know the variation of soil EC in Chuda surrounding area of Surendranagar district, Gujarat.

2.0 Study Area:

In Surendranagar district, Chuda is a one of the taluka out of 10 located in between North latitudes 22° 8′ and 23° 3′ and East longitudes 70° 58′ and 72° 12′. Surendranagar district covers 10489 sq. km area geographically. There are 11 towns and 651 villages in this district.

3.0 Materials and Methods:

3.1 Sample and Sampling:

The aims of this study was to measure electrical conductivity of soil samples from chuda taluka soil samples were collected from 72 different locations at the depth of 15cm, before sampling 15 mm topsoil should be removed across the required areas. These all samples had stored in polythene bags and taken to the laboratory and dried in an oven at a temperature of 105^0 C. The dried soil samples were comminuted with pestle and mortar and sieved with sieve of 2mm.

The study pertains to the quality of Chuda surrounding areas in Surendranagar district Gujarat 72 soil samples are selected.

3.2 Laboratory Procedures

Analysis of electrical conductivity is determined on a saturation extract of soil liquid of 1:2 soil, water suspension. Electrical conductivity is measured through digital conductivity meter. The conductivity meter must be calibrated and cell constant be obtained by using standard solution of 0.7445 gm of dry potassium chloride made in 1 liter of distilled water at 25°C. A 20gm of soil sample is constantly shaken for one hour with 40ml of distilled water in a conical flask. The physico-chemical parameter electrical conductivity was analyzed using the procedure as per Government soil laboratory standard method.

Table: EC data of different villages of Chuda taluka, district Surendranagar

Sample No.	Land Survey No.	Village	EC	Sample No.	Land Survey No.	Village	EC
1	155/1	Acharda	0.75	37	141/1	Mojidad	0.33
2	170/1	Acharda	1.96	38	141/2	Mojidad	0.90
3	237	Acharda	0.50	39	141/3	Mojidad	0.59
4	105/2	Acharda	2.00	40	143	Mojidad	1.13
5	186	Acharda	5.20	41	144	Mojidad	0.62
6	107	Acharda	0.60	42	145	Mojidad	0.75
7	10	Khadiya	1.82	43	57/3/20	Rangpur	0.75
8	203	Khadiya	0.83	44	59/1/1	Rangpur	2.20
9	13	Khadiya	3.2	45	59/1/2	Rangpur	0.28
10	14	Khadiya	2.8	46	59/2	Rangpur	0.95
11	16	Khadiya	0.99	47	60/1/1	Rangpur	1.13
12	43/1/1	Khadiya	1.44	48	60/1/2	Rangpur	1.02
13	358	Chachana	0.35	49	113/4	Vanara	1.04
14	362	Chachana	0.42	50	114	Vanara	0.34
15	363	Chachana	0.40	51	114/1	Vanara	0.39
16	365/1	Chachana	0.32	52	115	Vanara	0.44
17	368	Chachana	0.29	53	117	Vanara	1.69
18	368/1	Chachana	0.47	54	118	Vanara	3.0
19	6/2	Chhatriyara	0.53	55	14/1/1	Vaniyavadar	0.49
20	21	Chhatriyara	0.63	56	16/1/1	Vaniyavadar	0.56
21	43/p2	Chhatriyara	0.63	57	17/1/4	Vaniyavadar	0.70
22	44/p2	Chhatriyara	0.39	58	19/1	Vaniyavadar	0.69
23	50	Chhatriyara	0.60	59	20	Vaniyavadar	0.78
24	51/p3	Chhatriyara	0.73	60	42/1/1	Vaniyavadar	0.88
25	17/1	Chhalara	0.45	61	43/3/1	Veravadar	0.74
26	18/1	Chhalara	0.76	62	43/3/3	Veravadar	0.96
27	19/1	Chhalara	1.03	63	43/3/2	Veravadar	1.15
28	25	Chhalara	1.20	64	44/2/2	Veravadar	0.55
29	29/2	Chhalara	0.39	65	43/3/4	Veravadar	1.9
30	30/1	Chhalara	0.42	66	44/2/3/1	Veravadar	0.49
31	17/1	Nagnesh	1.03	67	163	Sejakpur	0.54
32	19/2	Nagnesh	4.2	68	161/02	Sejakpur	0.90
33	21/2	Nagnesh	1.02	69	161/01	Sejakpur	0.62
34	22/1	Nagnesh	3.2	70	161	Sejakpur	0.61
35	26/1	Nagnesh	0.79	71	160	Sejakpur	0.59
36	27/1	Nagnesh	0.60	72	159/02	Sejakpur	0.74

3.3 Result and Discussion:

For managing agricultural systems soil electrical conductivity is a useful indicator. In actuality, the interpretation of soil electrical conductivity must be taking into account the growth of plant(s). The soil electrical conductivity has little direct harmless effect on sandy mineral soils. However, soil electrical conductivity directly affects plants growing in the soil and water management too. The data of electrical conductivity of soils differs depending on the amount of moisture held by soil particles. Clays have a high conductivity, silts have a medium conductivity and sands have a low conductivity. The electrolytic electrical conductivity process is takes place through water-filled pores. Some cations Na^+, K^+, Ca^{2+}, Mg^{2+} and anions Cl^-, NO_3^-, $(SO_4)^{2-}$, HCO_3^- from salts dissolved in soil water carry electrical charges. Consequently, the EC of soils determines by the concentration of ions. The range of 0–1 dS/m EC indicates good health of soil. EC values above 1–2 dS/m result in diminished the growth of salt-sensitive plants and discontinuance of the microbial mediated processes of nitrification and denitrification. It varies from about 0.28 to 5.02 dS/m (Table) with the mean value of 0.41 dS/m in the study area and values of some samples lies in greater than 2 dS/m are recorded.

4.0 Conclusion:

Electrical conductivity of soil in Chuda taluka villages, Surendranagar district, Gujarat shows that most of soil samples are in the range of 0–1dS/m indicates soil health in good condition, 15 samples are in 1-2 dS/m have medium high salinity and rest are out of range have high salinity and high mineral percentage in ground water samples.

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