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Preliminary Chemical Assessment of Soils in Some Rural Areas of Konaseema region, East Godavari District, AP

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Abstract
Soil is an important part of our agriculture. It supports the components of atmosphere. The chemical condition of any soil is essential for proper implementation of other management practices. Therefore the Physicochemical study of soil is very important because both physical and chemical properties can affect the soil productivity. Keeping in view of agricultural activities and anthropogenic activities there is a need of analyzing the soils for physicochemical parameters in Konaseema region, East Godavari District. The preliminary physicochemical analysis (pH, EC,TDS, TH, TA, Cl^-) is carried out for soil samples collected in rural areas. The results revealed that some soils are basic in nature and containing some dissolved salts of calcium and magnesium.

Keywords: Soil, Physicochemical study, Agriculture, Anthropogenic activity

1. Introduction

Soil is one of the important natural resource for plants and crops. Top layer of the soil is considered as fertile layer and formation of top layer requires several years [1]. All living things depend on plants and plants grow in soil for day to day need. Soils are medium in which crop grows to food and cloth. Soil is not only important for agriculture but also have more useful for living organisms. In the terrestrial ecosystem the soil fulfills many functions including those that are essential for sustaining plant growth [2]. The rapidly increasing human populations and their needs/uses of the land for various agricultural activities have brought about extensive land use changes and soil management practices throughout the world [3]. The ability of a soil to generate some products or perform some functions may decline with certain land uses. These manifests as changes in soil properties such as nutrient content (nitrogen, phosphorus, potassium, calcium, magnesium, sodium), pH, organic matter, cation exchange capacity, structure etc [4,5]. It has been observed that as the fertility of soil declines, soil structure weakens and the soil becomes susceptible to erosion [6]. Soil has complex function which is beneficial to human and other living organism. It acts as a filter, buffer storage, transformation system and thus protects the global ecosystem against the adverse effects of environmental pollutants [7]. The relative importance of anthropogenic or management factors compared to non-anthropogenic physical, chemical, or biological factors will generally be determined by the function or application for which a soil quality assessment is made. The crop management practices change the soil structural characteristics which relatively affect the hydrologic properties of soil and influence the plant growth. Keeping in view the present agricultural and anthropogenic activities in konaseema region, it is proposed to carry out the preliminary chemical analysis of soils for assessing its quality for useful applications.

2. Experimental

The samples were collected near agricultural activity areas of Mummidivaram, Allavaram, Gangalakurru areas of Konaseema region, East Godavari district. The samples were collected in polythene covers and prepared extract as per the standard procedures. The soil samples were characterized for some preliminary Physicochemical parameters pH, EC, Total Hardness(TH), Total Alkalinity (TA), Chloride(Cl^-). pH is determined by pH meter (Analab Scientific) and Conductivity is measured by Conductivity Meter (Analab Scientific). Total Hardness, Total Alkalinity and Chloride are estimated by titrimetry. The irrigation parameters Magnesium Hazard (MH) and Residual Sodium Carbonate (RSC) are determined by the following relation.

Residual Sodium Carbonate (RSC) = $(CO_3^{2-} + HCO_3^-) - (Ca^{2+} + Mg^{2+})$ meq/L

Magnesium hazard(MH) = (Mg^{2+}/(Ca^{2+}+ Mg^{2+})) *100 meq/L

3.Results & Discussion:

Table 1:Physico-chemical analysis of Soil samples (**pH, EC, TDS, TH, Cl^-, Ca^{2+}, Mg^{2+}**)

Sno	sample code	pH	EC(µmhos/cm)	TDS (mg/L)	TH (mg/L)	Ca^H (mg/L)	Mg^H (mg/L)	Cl^- (mg/L)	Ca^{2+} (mg/L)	Mg^{2+} (mg/L)
1	S1	8.3	613	392	300	100	200	56.7	40	48.8
2	S2	8.9	519	332	220	100	120	49.7	40	29.3
3	S3	8.1	268	171	140	120	20	28.4	48	4.88
4	S4	7.8	268	171	200	140	60	28.4	56	14.6
5	S5	7.5	684	438	80	20	60	92.2	8	14.6
6	S6	8.3	354	226	40	20	20	28.4	8	4.88
7	S7	8.2	351	225	100	20	80	35.5	8	19.5
8	S8	7.6	262	167	60	40	20	21.3	16	4.88
9	S9	7.6	442	283	60	20	40	21.3	8	9.76
10	S10	7.5	262	167	180	160	20	28.4	64	4.88
11	S11	7.9	542	347	160	100	60	28.4	40	14.6
12	S12	7.9	327	209	140	60	80	28.4	24	19.5
13	S13	8.2	401	257	100	60	40	21.3	24	9.76
14	S14	8.1	374	240	120	80	40	21.3	32	9.76
15	S15	7.9	345	221	140	100	40	28.4	40	9.76
16	S16	7.8	268	171	220	140	80	28.4	56	19.5
17	S17	7.8	362	232	140	40	100	28.4	16	24.4
18	S18	7.8	241	155	220	120	100	42.5	48	24.4
19	S19	7.8	943	603	580	280	300	220	112	73.2
20	S20	8.1	304	195	160	140	20	35.5	56	4.88

Table 2: Physicochemical analysis of Soil samples (TA, CO_3^{2-}, OH^- & HCO_3^-) and Irrigation parameters of RSC and MH

SNo	sample code	TA (mg/L)	CO_3^{2-} (mg/L)	OH^- (mg/L)	HCO_3^- (mg/L)	Irrigation parameters	
						RSC(meq/L)	MH(meq/L)
1	S1	240	BDL	BDL	292.8	BDL	66.12
2	S2	140	BDL	BDL	170.8	BDL	53.96
3	S3	80	BDL	BDL	97.6	BDL	13.99
4	S4	60	BDL	BDL	73.2	BDL	29.44
5	S5	80	BDL	BDL	97.6	BDL	74.49
6	S6	60	BDL	BDL	73.2	1.61	49.39
7	S7	120	BDL	BDL	146.4	BDL	79.59
8	S8	60	BDL	BDL	73.2	1.21	32.80
9	S9	120	BDL	BDL	146.4	BDL	66.12
10	S10	80	BDL	BDL	97.6	BDL	10.87
11	S11	140	BDL	BDL	170.8	BDL	36.87
12	S12	120	BDL	BDL	146.4	BDL	56.52
13	S13	80	BDL	BDL	97.6	BDL	39.42
14	S14	80	BDL	BDL	97.6	BDL	32.80
15	S15	60	BDL	BDL	73.2	BDL	28.08
16	S16	60	BDL	BDL	73.2	BDL	35.78
17	S17	80	BDL	BDL	97.6	BDL	70.93
18	S18	100	BDL	BDL	122	0.848	44.85
19	S19	260	BDL	BDL	317.2	BDL	51.12
20	S20	80	BDL	BDL	97.6	BDL	12.24

Table 3 : Correlation between pH, EC, TH, TA, Cl^-, Ca^{2+} and Mg^{2+}

	pH	EC	TDS	TH	TA	Cl^-	Ca^{2+}	Mg^{2+}
pH	1							
EC	0.059	1						
TDS	0.059	1	1					
TH	0.052	0.613	0.613	1				
TA	0.222	0.783	0.783	0.758	1			
Cl^-	-0.110	0.841	0.841	0.815	0.548	1		
Ca^{2+}	-0.060	0.306	0.306	0.869	0.434	0.882	1	
Mg^{2+}	0.142	0.755	0.755	0.889	0.609	0.817	0.7	1

S: Sample BDL: Below Detectable Limit

4. Discussion:

pH of soils in rural areas ranges from 7.46 to 8.86 with a mean of 7.945. In some samples S1, S2, S6, S7, S13 it crossed permissible limit indicating the basic nature of soils.EC of soils ranges from 241.41µs/cm to 942.6 µs/cm with a mean of 406.472 µs/cm. All the samples of EC are in permissible limits.The low values of EC indicating the absence of salinity.
Total dissolved salts of soils range from 154.50 mg/L to 603.26 mg/L with a mean of 260.26 mg/L .These values show that the samples contain lack of dissolved salts. TA of soils range from 60 mg/L to 260 mg/L with a mean value of 105 mg/L . In some samples S1, S20 crossed the permissible limits which indicates the soils are slightly alkaline nature. TH values of soils ranges from 40mg/L to 580 mg/L with a mean value of 168 mg/L. In sample S19 crossed the permissible limit indicating the presence of ca^{2+} and mg^{2+} ions in the soil.Chloride ion concentration of soils ranges from 21.27 mg/L to 219.79 mg/L with a mean value of 43.60 mg/L. In all samples chloride ions are within the permissible limits. Calcium ion concentration of soils ranges from 8 mg/L to 112 mg/L with a mean value of 37.2 mg/L. In sample S19 it exceeded the permissible limit. Magnesium concentrations of soils range from 4.88 mg/L to 73.2 mg/L with a mean value of 18.3 mg/L. In samples S1, S19 it exceeded the permissible limit indicates the discharge of agricultural wastes in soil samples. Bicarbonate concentrations in soil samples varies from 73.2 mg/L to 317.2 mg/L.The Carbonate concentration in samples were below detectable limit. The Hydroxide ion concentration in samples were below the detectable limit. Residual Sodium Carbonate is used to assess the water quality for irrigation purpose. It was observed that in most of the samples RSC is in below detectable limit and the values varies from 0.848 meq/L to 1.61 meq/L. More magnesium present in soils, attack the soil quality and decreases the crop yield. The values of MH varies from 10.87meq/L to 79.59 meq/L. In some samples S2,S5,S7,S9,S12,S17 and S19 high values of MH are noted. To find out the relationship among the parameters, correlation analysis is performed. It was observed that EC is strongly correlated with TDS and Cl^- . TH is strongly correlated with Ca^{2+} and Mg^{2+}.

5. Conclusion:

pH of soils indicated slightly alkaline nature. Lower EC values of soils indicating that the soils are non saline in nature. The lower values of TDS indicated that lack of dissolved salts. Higher TA of soils near agricultural areas indicated the alkaline nature. Chloride concentrations in soils indicated that the absence of corrosive nature. The irrigation parameters of RSC and MH showed that soil quality is damaging due to higher values of magnesium hazard. Higher TH is indicated by its correlation with Ca^{2+} and Mg^{2+}.

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