International Journal of Science and Research (IJSR)
ISSN (Online): 2319-7064
Index Copernicus Value (2015): 78.96 | Impact Factor (2015): 6.391

Physico Chemical Analysis of Soil Organic Carbon of Some Villages of Chuda Tehsil District: Surendranagar (Gujarat) India

Mahesh R. Solanki

Gujarat Arts and Science College, Chemistry department, Ahmedabad-380009, Gujarat, India

Abstract: ***In present scenario world population is growing rapidly. It is projected that food requirement will be doubled in next twenty years, Therefore agriculture farmland is under tremendous pressure to fulfill this huge production barrier. To accelerate food production, soil fertility is important parameter in agriculture business. .Soil fertility is determined by various parameters like electrical conductivity, alkalinity, acidity, nitrogen, phosphorous, organic carbon and available potassium, This soil analysis paper revealed proportion of organic carbon in soil Chuda taluka, Dist. Surendranagar. It shows villages of this taluka possess low, medium, high, proportion of organic carbon. This soil analysis results are useful to farmer to rectify the problem arised due to out range of organic carbon and helpful to decide how much quantity of compost fertilizer blend with soil for increasement of crop production. Soil organic carbon and productivity is depends on various parameter like morphology, physico- chemical parameters and biological constitute. . determination from Chuda taluka Sample were analysed for Soil organic carbon Dist.Surendranagar . The result revealed that available organic carbon ranged between 0.31 to 1.22 percentage .Main objective of this soil analysis is to estimate SOC as per Government of Gujarat Agriculture department lab manual under soil health card project.***

Keywords: Soil organic carbon, soil fertility , Soil analysis, Chuda

1. Introduction

Soil fertility determine by various parameter like Organic matter is the decomposed and partially decomposed remains of plants and animals in the soil. the agents of decay are the millions of bacteria and micro-organisms which are present in every gram of soil. soil without organic matter is nothing more than finely ground rock. Organic Matter is vital because it contains, and maintains, the vast population of microscopic organisms in the soil. these microbes are the key to fertility and have a beneficial effect both before and after death. When active they transform complex organic materials into forms which will later be available to plant roots. in the process they produce heat-hence the heat that is produced from a compost heap. When dead, plant nutrients are released as well as colloidal gums. it is these gums which cement the soil particles together producing a well aggregated, crumbly texture allowing good root penetration, improving water infiltration and reducing erosion. Under normal conditions there is a rough balance which naturally maintains organic matter levels in the soil. However, under cultivation conditions decomposition is increased and more organic matter is lost than is replaced by natural means. this can be reversed overtime by reducing tillage thus reducing decomposition and increasing external organic inputs such as farm yard manures and greenwaste composts

Soil organic carbon (SOC) is the carbon associated with soil organic matter. Soil organic matter is the organic fraction of the soil that is made up of decomposed plant and animal materials as well as microbial organisms, but does not include fresh and un-decomposed plant materials, such as straw and litter, lying on the soil surface. Soil carbon can also be present in inorganic forms, e.g. lime or carbonates in some soils in the drier areas.

Carbon cycle

SOC forms part of the natural carbon cycle Organic material is manufactured by plants through the process of photosynthesis, using atmospheric carbon dioxide and water as raw materials. The plants (and the animals as part of the food chain) eventually die and return to the soil where they are decomposed and recycled .Minerals are released into the soil and carbon dioxide back to the atmosphere.

There is a continuous turnover of organic carbon materials in soil, and SOC is not a uniform material but rather a complex mixture of organic compounds at different stages of decomposition.

Soil organic carbon is important for all three aspects of soil fertility, namely chemical, physical and biological fertility.

Nutrient availability. Decomposition of soil organic matter releases nitrogen, phosphorus and a range of other nutrients for plant growth. SOC is food for soil organisms, from bacteria to worms, which hold onto nutrients and release them in plant available forms.

Soil structure and soil physical properties. SOC promotes soil structure by holding the soil particles together as stable aggregates improves soil physical properties such as water holding capacity, water infiltration, gaseous exchange improve aggregation, prevent erosion, decrease evaporation, improve infiltration , root growth and ease of cultivation.

Biological soil health. As a food source for soil fauna and flora, soil organic matter plays an important role in the soil food web by controlling the number and types of soil inhabitants which serve important functions such as nutrient cycling and availability, assisting root growth and plant nutrient uptake, creating burrows and even suppressing crop diseases.

As a buffer against toxic and harmful substances. Soil organic matter can lessen the effect of harmful substances e.g. toxins, and heavy metals, by acting as buffers, e.g. sorption of toxins and heavy metals, and increasing degradation of harmful pesticides. Organic matter is a useful aid in limiting pH fluctuation Soil carbon plays a vital role in regulating climate, water supplies and biodiversity, and therefore in providing the ecosystem services that are essential to human well-being .A number of factors influence the rate of decline of soil organic matter levels including soil type and physical properties, climate, topography, vegetation and land management practice. Soils with organic matter levels above 3.4% are not considered to be vulnerable. This equates to a soil organic carbon content of 2%. The conversion factor from soil organic carbon to soil organic matter is approximately 1.72 (i.e., SoilOrganic Matter (SOM) = 1.72 multiplied by Soil Organic Carbon (SOC)).]. SOM is in equilibrium with climate, soil mineralogy, and environment, providing limited capacity to accumulate organic matter.

2. The Study Area

Surenranagar district has a geographical area of about 10,489 sq. km and falls in the survey of Degree sheets 41N and 41M, between North latitudes 22degree, 8 radial and 23 degree 3 radial and East longitude 70 degree 58 radial and 72 degree 12 radial .The district has 651 villages and 10 taluka. Surendranagar district is the average hilly areas, piedmont slopes and alluvial plains(main land) largest dry district as near to Kutchh small desert in Gujarat in India. It covers 531 sq. m. forest area and 7624 cultivable area which have major three types of soil 1.Medium black 2.Red sady soils and 3. Salty soil among them Chuda taluka lies between latitudes 22 degree 19 radial N and longitude 71 degree 35 radial E with an altitude of 63m above the sea level. Chuda is one of the important tehsil of Surenranagar distric..It consist of 38 villages..In this study, 12-village soil samples are taken randomly for SOC analysis. This analysis perfomed at STL under the soil health card program by Government of Gujarat, India

3. Soil Sampling and Analysis

Soil samples were sampled by a systematic sampling strategy at 0 to 20 cm depth below the surface. The samples were dried and passed through a 2 mm sieve to prepare them for testing. All the samples were tested using standard method by following the "Methods Manual-Soil Testing in India". Organic Carbon was determined by using Walkley-Black method . The samples were analysed by equiptronics Digital colorimeter.

4. Tools and Techniques

We have derived and analysed the all above mentioned samples data according to Government of Gujarat, Agriculture Department Soil Testing Laboratory Manual. .

Table 1: Soil organic carbon of selected samples from the sample sites

Sample Site	L.S. No	Organic carbon percentage	Sample site.	L.S. No.	Organic carbon Percentage
Kanthariya	526	1.016	Vaniyavadar	20	0.78
Kanthariya	529/1	1.12	Vaniyavadar	73/1	0.86
Kanthariya	557/2	1.14	Vaniyavadar	92/1	0.9
Kanthariya	562	1.17	Vaniyavadar	111/1	1.01
Kanthariya	571/2	1.11	Vaniyavadar	113	1.22
Kanthariya	587/2	1.21	Vaniyavadar	92/1	0.9
Chachana	358	0.5	Chhaliyala	2-Jun	0.89
Chachana	363	0.54	Chhaliyala	22	0.84
Chachana	374	0.64	Chhaliyala	39	0.81
Chachana	377	0.49	Chhaliyala	50	0.73
Chachana	383/1	0.31	Chhaliyala	55	0.71
Chachana	122/2	0.36	Chhaliyala	56	0.69
Vanala	91/1	0.63	Velavadar	44/2/4	0.41
Vanala	96	0.65	Velavadar	49/2/1	0.42
Vanala	112	0.72	Velavadar	52/2	0.63
Vanala	114/1	0.4	Velavadar	50/1/2	0.46
Vanala	122/1	0.49	Velavadar	52/2	0.42

Vanala	144	0.63	Velavadar	58/1	0.63
Mojidad	156	1.12	Ramdevgahdh	2-Feb	0.33
Mojidad	251	1.16	Ramdevgahdh	1-Aug	0.61
Mojidad	271	1.18	Ramdevgahdh	23	0.55
Mojidad	289/4	1.17	Ramdevgahdh	10	0.59
Mojidad	342/1	1.16	Ramdevgahdh	64	0.57
Mojidad	348/10	1.21	Ramdevgahdh	61/2	0.6
Sonatha	356/1/1	1.15	Nagnesh	19/2	0.78
Sonatha	355	1.16	Nagnesh	31/2	0.58
Sonatha	662/6	1.21	Nagnesh	40/1	0.76
Sonatha	100	1.16	Nagnesh	44	0.51
Sonatha	209/1	1.12	Nagnesh	45	0.58
Sonatha	209/2	1.18	Nagnesh	62/1	0.73
Khadiya	21/2	0.68	Chhalala	2-Sep	0.86
Khadiya	21/4	0.7	Chhalala	10	0.59
Khadiya	24/2	0.59	Chhalala	17	0.54
Khadiya	27	0.64	Chhalala	18/1	0.58
Khadiya	29/2	0.6	Chhalala	19/2/	0.68
Khadiya	34	0.68	Chhalala	32	0.88

Table 2: Interpretation of soil organic carbon properties

LOW	MEDIUM	HIGH
<0.5	0.5-0.75	>0.75

5. Results and Discussion

The organic carbon value of soil samples are varied from 0.31 to 1.22 percentage so in SOC contex result shows samples possess lower to higher range.A number of factors influence the rate of decline of soil organic matter levelsFine textured, clay soils hold much more than sandy soils for two reasons. Firstly clay particles form bonds that hold organic compounds. secondly, decomposition occurs more quickly in well aerated sandy soils. a sandy loam will rarely hold more than 2% organic matter. . HigherLevels of soil organic matter are generally in the cooler and humid regions of the world versus the warm

Soils with organic matter levels above 3.4% are not consideredto be vulnerable. This equates to a soil organic including soil type and physical properties, climate, topography, vegetation and land carbon content of 2%. The conversionfactor from soil organic carbon to soil organic matter is approximately 1.72 (i.e., Soi Organic Matter (SOM) = 1.72 multiplied by Soil Organic Carbon (SOC)).Lower level of SOC may be increased by organic fertilizer, covering of crops, rotation of crops.

6. Conclusion

Following conclusions from this study can be made for the Chuda taluka Dist.Surendranagar in Gujarat state.Analysis shows organic carbon of samples between 0.31 to 1.22 percentage in study Chuda tehsil. . The SOC of soil should be consider important parameter in agriculture crop productivity Generally SOC range between 0.50 to 0.75 percentage suggested soil health is good . Highest EC recorded is 1.22 percentage at L.S.No 113 at Vaniyavadar viilage site. In Summary ,With careful management the preservation and accumulation of soil organic matter can help to improve soil productivity resulting in greaterfarm profitability.

7. Acknowledgement

We are highly thank full to Principal and Head of chemistry department of Gujarat Arts and Science college,Ahmedabad for encouragement during this soil analysis work. We are also thankful to the Secretary of Soil Project Gujarat Government. All the Teaching and non-teaching staff of Gujarat Arts and Science college,Ahmedabad for helping us for this entire soil analysis work.

References

[1] J L Lemunyon and R.G. Gilber, *Journal of Production Agriculture*, **1993**, 6[4]:483-486.
[2] G Stefanic, *Romanian Agricultural Research* **1994**, 2, 107-116.
[3] 91.http://en.wikipedia.org/wiki/Chuda
[4] Soils of Gujarat - http://goo.gl/CF9Rb
[5] P K Gupta, Methods in Environmental analysis, 2nd Edition Agrobios, Kota, India **2000**, 101
[6] R Rawds,Earth is first Organics, Chemical Engineering News, Compendium on Soil health Report American Chemical Society, **1997**, 20-22
[7] Mayur Shah, Prateek Shilpkar, Ajay Shah, Amit Isadara and Anilsinh Vaghela, *J Adv, Res*. **2011**,2(1), 50-53.
[8] R W Miller and R.L. Donahue, Soils in our Environment 7th edition Prentice Hall Ine, New Jersey-07362,**1995**, 67-68.
[9] Mali VS, Zende NA, Verma UK. Correlation between soil physic-chemical properties and available micronutrients in salt effected soils, 17th WCSS 2002; Thailand
[10] "Methods Manual-Soil Testing in India", Department of Agriculture & Cooperation Ministry of Agriculture Government of India 2011.
[11] Singh RP, Mishra SK. Availablemacronutrients(N,P,K and S) in the soils of chiraigaon block of district Varansi(U.P.) in relation to soil Characteristics. Indian J Sci Res 2012;3(1):97-100
[12] Patel Prakash L.,Patel Nirmal P., Patel Prakash H. and Gharekhan Anita.
[13] yaraTechnical bulletin No.5 soil organic matter. ypl.laboratory@yara.com www.yara.com/analysis
[14] **Dr Yin Chan** Principal Research Scientist (Soils), Richmond NSW Department of Primary Industries