Asian Jr. of Microbiol. Biotech. Env. Sc. Vol. 24, No. (3) : 2022 : 552-555
© Global Science Publications
ISSN-0972-3005
DOI No.: http://doi.org/10.53550/AJMBES.2022.v24i03.0020

FERTILITY STATUS OF SOIL FROM DIFFERENT BLOCKS OF KOMARAM BHEEM ASIFABAD DISTRICT, TELANGANA

A. PRAGNA[1], AMREEN HASAN[2*], TARENCE THOMAS[3], ARUN ALFRED DAVID[4] AND AKSHITA BARTHWAL[1]

([1]Research scholar, [2*]assistant professor, [3]professor, [4]associate prof.)
Department of Soil science and Agricultural chemistry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh, India

(Received 27 March, 2022; Accepted 29 May, 2022)

Key words: Physico-chemical, Soil, Depths, Nutrient availability etc.

Abstract– The purpose of this study was to evaluate the physico-chemical characteristics and nutrient availability of soil at various depths, *i.e.*, 0-15cm, 15-30cm, and 30-45cm, from different blocks in the Komaram Bheem Asifabad district of Telangana. Results revealed that soil is moderately alkaline and slightly saline electrical conductivity. Low to medium organic carbon content and macronutrients *viz.* nitrogen and phosphorus are low to medium and medium to high potassium. Secondary nutrients *i.e.*, calcium and magnesium are quite adequate. Micronutrients such as zinc, copper and Iron are found in permissible amount.

INTRODUCTION

Soil is one of the most important resources of the nature. All living things depends on plants, and plants grow in soil for day-to-day need. Soils are medium in which crop grow to food and cloth. Soil is not only important for agriculture but also have more useful for living organisms. Soil as a component of the terrestrial ecosystem fulfills many functions including those that are essential for sustaining plant growth. The importance of soil as a reservoir of nutrients and moisture for the production of forage and plant species has been recognized since the beginning of the forest management as a science. Any parts of earth surface that support vegetation also bears a covering of soil. Vegetation distribution and development largely depends on the soil condition (Tale and Ingole, 2015). The deficiency of nutrients has become major constraint to productivity and sustainability of soils. For the better growth of plants, amongst many other factors, thirteen essential elements are required to be present in soil in proper proportion and available form. Soil fertility is the status or the inherent capacity of the soil to supply nutrients to plants in adequate amounts and in suitable proportions. Soil productivity is the capacity of the soil to produce crops with specific system of management and is expressed in terms of yields. Soil fertility and productivity are the key pillars for food production and soil quality is of equal significance in the background of soil degradation caused by many factors. Crop growth is influenced by aerial and soil environment. Suitable environment is necessary for better germination, growth and yield of crops. The higher nutrient availability is favourable when soil has higher water holding capacity, proper aeration and less soil strength or mechanical resistance. All productive soils may be fertile but all fertile soils need not be productive which may be due to problems like water logging, saline or alkaline conditions, adverse climate etc (IOSR-JAC, 2014). The concept of soil fertility includes not only the quantity of nutrients a soil contains but how well nutrients are protected from leaching, how available the nutrients are and how easily plant roots can function. Depending upon the cropping pattern, leaching, erosion, etc soil loses a considerable amount of nutrients every year. Soil testing provides information regarding nutrient availability in soils which forms the basis for the fertilizer recommendations for maximum crop yield. It also helps in reducing excess and indiscriminate use of fertilizers, pesticides, fungicides etc which eventually cause pollution since farmers and planners are lack of knowledge regarding the quantity of these to be applied (Shivanna and Nagendrappa, 2014).

The main aim of this investigation was to determine the physico-chemical properties and nutrient distribution in the soil. This would enable farmers in making effective decisions about farming techniques and fertilizers incorporation based on soil tests, so increasing productivity and yield, as well as adding to the database on soils in these areas for future scientific research.

MATERIALS AND METHODS

Sampling Procedure

In the district 3 villages was selected randomly for sampling. Three different sites were taken in each farmer's field represented three profile depths *viz*., 0-15 cm, 15-30 cm and 30-45 cm, totally 27 samples were collected with 9 samples representing one farmer'sfield. At sampling site, soil samples were collected separately by a random selection from field with help of khurpi, spade, digging bar and meter scale. Samples were collected from Centre of the fields in order to avoid the edge effect.

Standard methodologies were adopted for various physical and chemical analysis. Soil textural analysis of particles less than 2 mm was performed by the hydrometer method (Bouyoucos, 1927). The samples were matched against standard munsell soil colour chart (Munsell, 1971) to obtain hue, value and chroma combinations for soil colour. The bulk density (Mg m^{-3}), particle density (Mg m^{-3}), pore space (%) and water holding capacity (%) was determined by graduated 100 ml measuring cylinder method (Muthuvel *et al.*, 1992). Specific gravity of soil was determined by the relative density bottle or pycnometer method as laid out by Black (1965). Determination of soil pH was done from 1:2 soil-water suspension using digital pH meter (Jackson, 1958). Electrical conductivity (dS m^{-1}) was also determined from 1:2 soil-water suspension using digital EC meter (Wilcox, 1950). Organic carbon (%) was estimated by the wet oxidation method of Walkley and Black (1947). Available nitrogen (kg ha^{-1}) was determined using alkaline potassium permanganate method as given by Subbiah and Asija (1956), available phosphorous (kg ha^{-1}) by colorimetric method (Olsen *et al.*, 1954), available potassium (kg ha^{-1}) by flame photometer method as laid out by Toth and Prince (1949) after extraction with neutral ammonium acetate. Exchangeable calcium and magnesium [cmol (p^+) kg^{-1}] was determined by neutral ammonium acetate extraction method or EDTA (ethylene diamine tetracetic acid) method as laid out by Cheng and Bray (1951) and micronutrients *i.e.,* Zinc, Copper and Iron by extracting soil samples with diethylenetriamine penta acetic acid (DTPA) extractant as described by Lindsay and Norvell (1978).

RESULTS AND DISCUSSION

Physico-chemical Characteristics

The soil colour in dry condition varies from dark brown to very dark greyish brown and the colour in wet condition varies from dark greyish brown to very dark greyish brown. The soil texture was dominantly sandy clay loam in almost every site. The bulk density ranged from 1.11 to 1.33 (Mg m^{-3}). The particle density ranged from 2.26 Mg m^{-3} to 2.69 Mg m^{-3}. The pore space (%) ranged from 66.66 to 44.44 (%). The water holding capacity ranged from 50 to 65.71%. The specific gravity ranged from 2.16 to 3.12. as shown in table 1.

The soil pH ranged from 7.87 to 8.34 thereby indicating the soils are moderately alkaline. pH value increases with the increasing depth because the upper horizons receive maximum leaching by rainfall and by dissolved carbonic acids and presence of high amount of exchangeable sodium ions (Kumari *et al.*, 2017). The electrical conductivity ranged from 0.18 to 0.65(dS m^{-1}) indicating that, these soils were non-saline to slightly saline in nature (Sathyanarayana *et al.,* 2021). The soil organic carbon (%) ranged from 0.21 to 0.61%. The organic carbon decreases with increasing depth due to the fact that surface soil contains undecomposed and partial decomposed organic matter while subsoil contains decomposed organic matter which has undergone chemical and biological changes (Singh *et al.,* 2014).

Availabe Nutrients

The available nitrogen (kg ha^{-1}) ranged from 120.33 to 327.21 (kg ha^{-1}). The available nitrogen decreases with the increasing depth due to the fact it is positively correlated with organic matter content which decreases with depth and might be due to higher pH to the depth (Rajamani *et al.,* 2020). The

Table 1. Physico-chemical properties of soil at various depths i.e., 0-15, 15-30 and 30-45cm from Bheem Asifabad district

Villages	Sites	Depth	Soil Texture	BD (Mg m^{-3})	PD (Mg m^{-3})	Porosity(%)	WHC (%)	pH	EC (dS m^{-1})	OC (%)	N (kg ha^{-1})	P (kg ha^{-1})	K (kg ha^{-1})	Ca(cmol(p$^+$)kg^{-1})	Mg (cmol(p$^+$)kg^{-1})	Zn (ppm)	Cu (ppm)	Fe (ppm)
Godelli	B_1V_1	0-15	Sandy clay loam	1.11	2.66	58.82	62.5	7.92	0.32	0.56	245.2	18.82	243.45	7.12	3.13	0.86	2.63	8.94
		15-30	Sandy clay loam	1.15	2.66	58.82	62.5	8.21	0.37	0.5	234.3	15.75	222.15	6.81	2.32	0.73	2.32	7.05
		30-45	Sandy clay loam	1.17	2.69	56.25	60.6	8.32	0.39	0.49	216.3	13.94	240.17	2.91	1.41	0.54	1.89	4.82
Marikguda	B_1V_2	0-15	Sandy clay loam	1.12	2.52	61.11	52.94	8.22	0.59	0.48	308	25.55	195.75	10.2	5.02	0.54	1.95	5.53
		15-30	Sandy clay loam	1.17	2.53	50	50	7.98	0.62	0.42	286.07	20.28	175.24	8.12	2.09	0.43	1.82	4.87
		30-45	Sandy clay loam	1.25	2.55	55.55	50	8.24	0.65	0.39	282.92	18.49	154.63	5.02	1.24	0.37	0.68	3.28
Ippalnavegaon	B_1V_3	0-15	Sandy clay loam	1.11	2.5	57.89	65.71	7.87	0.28	0.49	327.21	20.06	282.1	9.81	3.05	0.45	1.06	10.26
		15-30	Sandy clay loam	1.11	2.56	57.89	58.33	8.31	0.33	0.43	316.93	17.82	270.14	5.82	2.12	0.35	1.02	9.24
		30-45	Sandy clay loam	1.25	2.56	44.44	58.33	8.35	0.39	0.41	286.24	13.13	250.2	3.11	1.04	0.27	1.04	8.56
Goyagaon	B_2V_1	0-15	Sandy clay loam	1.17	2.35	58.82	60	7.99	0.58	0.53	172.97	36.41	199.76	18.32	2.18	3.14	1.22	10.57
		15-30	Sandy clay loam	1.25	2.35	50	56.25	8.12	0.58	0.51	141.4	31.84	175.23	17.34	2.11	2.6	1.04	9.65
		30-45	Sandy clay loam	1.33	2.36	50	50	8.25	0.61	0.49	120.33	29.35	165.45	15.31	1.16	1.98	1	8.88
Pipri	B_2V_2	0-15	Sandy clay loam	1.11	2.45	55	61.76	7.88	0.18	0.29	257.77	52.61	265.01	13.22	3.29	0.62	2.81	7.67
		15-30	Sandy clay loam	1.17	2.46	55	58.33	8.19	0.22	0.24	204.83	46.07	248.19	12.15	3.18	0.46	1.62	6.55
		30-45	Sandy clay loam	1.33	2.47	47.05	58.82	8.29	0.24	0.21	175.45	38.53	230.12	7.89	3.16	0.44	1.4	6.43
Dhanora	B_2V_3	0-15	Sandy clay loam	1.11	2.55	55	65.71	8.12	0.38	0.39	289.21	19.37	225.98	20.81	8.15	3.87	3.29	14.68
		15-30	Sandy clay loam	1.25	2.56	55	65.71	7.99	0.41	0.35	232.67	14.49	201.12	20.19	7.59	2.58	2.32	11.87
		30-45	Sandy clay loam	1.25	2.57	51.23	62.16	8.24	0.44	0.31	178.45	10.43	198.37	19.55	7.41	2.14	1.96	11.55
Goleti	B_3V_1	0-15	Sandy clay loam	1.11	2.65	57.18	56.25	7.98	0.43	0.61	245.2	35.53	308.15	26.2	7.09	1.66	2.21	9.38
		15-30	Sandy clay loam	1.25	2.65	52.24	56.25	8.25	0.48	0.58	200.01	29.18	278.32	19.72	6.08	1.49	1.5	7.89
		30-45	Sandy clay loam	1.33	2.66	50.25	55.88	8.25	0.51	0.53	185.44	23.68	242.16	20.72	5.74	1.11	0.81	7.2
Pulikurta	B_3V_2	0-15	Sandy clay loam	1.11	2.5	61.11	57.14	8.31	0.49	0.43	196.19	54.14	215.24	26.1	9.19	0.91	1.46	10.38
		15-30	Sandy clay loam	1.17	2.51	58.82	51.42	7.98	0.51	0.4	167.13	50.67	201.15	25.45	6.76	0.67	1.37	8.67
		30-45	Sandy clay loam	1.33	2.52	55.55	50	8.34	0.54	0.38	154.03	48.33	197.78	20.21	9.1	0.54	1.22	8.24
Gangapur	B_3V_3	0-15	Sandy clay loam	1.17	2.26	66.66	56.25	7.99	0.19	0.59	269.19	31.35	290.65	17.38	8.01	1.36	1.05	10.2
		15-30	Sandy clay loam	1.17	2.27	61.11	56.25	8.22	0.25	0.54	243.81	27.18	255.97	19.24	6.28	0.69	1.02	8.1
		30-45	Sandy clay loam	1.25	2.28	58.82	51.51	8.25	0.31	0.51	228.9	25.36	228.54	15.69	5.81	0.49	0.96	5.2
	Due to depth/site	F- test	-	NS/S	NS/S	S/S	S/S	NS/S	S/S	S/S	S/S	S/S	S/S	S/S	S/S	S/S	S/S	S/S
		S.Ed(+)	-	- / 0.033	- / 0.134	3.470/3.335	2.282/4.501	- / 0.059	0.035/1.470	0.036/0.103	26.975/52.254	4.042/12.969	17.882/37.498	2.177/7.063	0.769/2.641	0.309/0.938	0.373/0.552	1.309/2.267
		C. D @5%	-	- / 0.095	- / 2.663	0.0134/0.013	2.771/2.771	- / 0.892	0.142/1.629	3.983/5.514	2.954/4.511	5.233/1.759	0.000012/7.985	0.00005/6.347	0.002/7.295	0.001/1.852	0.001/0.0002	2.649/2.095

BD - Bulk density	PD - Particle density	WHC - Water holding capacity	EC - Electrical conductivity	OC - Organic carbon
N - Nitrogen	P - Phosphorus	K - Potassium	Ca - Calcium	Mg - Magnesium
Zn - Zinc	Cu - Copper	Fe - Iron		

available phosphorous (kg ha^{-1}) ranged from 10.43 to 54.14 (kg ha^{-1}). The available phosphorous decreases with the increasing depth. Higher level of available phosphorous in surface soil could be attribute of favourable soil pH and organic matter content (Wani *et al.*, 2017). The available potassium (kg ha^{-1}) ranged from 154.63 to 308.15 (kg ha^{-1}). The exchangeable calcium (cmol (p^+) kg^{-1}) ranged from 2.91 to 26.20 (cmol (p^+) kg^{-1}). The exchangeable calcium decreases with the increasing depth due to the attribute of high Ph towards the depth (Malavath *et al.*, 2018). The exchangeable magnesium (cmol (p^+) kg^{-1}) ranged from 1.04 to 9.19 (cmol (p^+) kg^{-1}). The available zinc ranged from 0.37 to 3.87 (ppm). The available copper ranged from 0.96 to 3.29 (ppm). The available iron ranged from 3.28 to 14.68 (ppm). As shown in Table 1.

REFERENCES

Black, C.A. 1965. *Methods of Soil Analysis* Part – II. Chemical and microbiological properties. Agronomy Momograph No. 9*. American Society of Agronomy*, Inc. Madsion, Wisconsin, USA, 18-25.

Bouyoucos, G.J. 1927. The hydrometer as a new method for the mechanical analysis of soils. *Soil Science.* 23: 343-353

Cheng, K.L. and Bray, R.H. 1951. Determination of Calcium and Magnesium in soil and plant material. *Soil Sci.* 72: 449-458.

Fisher, R. A. 1960. Statistical methods and scientific induction. *Journal of the Royal Statistical Society Series.* 17: 69-78.

IOSR *Journal of Applied Chemistry* (IOSR-JAC) e-ISSN: 2278-5736. Volume 7, Issue 11 Ver. I. (Nov. 2014), PP 01-05

Jackson, M. L. 1973. *Soil Chemical Analysis.* Prentice Hall of India Pvt. Ltd., New Delhi.

Kumari, A.K., Rao, P.C., Padmaja, G. and Madhavi, M. 2017. Effect of Physico-Chemical Properties on Soil Enzyme Acid Phosphatase Activity of Some Soils in Vegetable Growing research station, Warangal, Telangana*. Journal of Pharmacognosy and Phytochemistry*. 7(6): 1852-1856.

Lindsay. W. L. and Norvell, W. A. 1978. Development of a DPTA soil test for heavy metals. *Soil Science Society of America Journal.* 42: 402-403.

Malavath, R., Mahesh, C., Balaguruvaiah, D. and Vidyasagar, G.E.C.H. 2018. Land use options and site suitability for sugarcane growing red soils, red laterite soils and black soils of Medak district of Telangana. *Journal of Pharmacognosy and Phytochemistry*. 7(2): 409-416.

Munsell, A.H. 1954. *Munsell Soil Color Charts.* Munsell Color Company Inc., Baltimore.

Muthuvel, P., Udayasoorian, C., Natesan, R. and Ramaswami, P.R. 1992. Introduction to Soil Analysis. Tamil Nadu Agricultural University, Coimbatore.

Olsen, S. R., Cole, C. V., Watnahe, F. S. and Dean, L. A. 1954. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. *U.S. Deptt. Agr. Circ.* 939.

Rajamani, K., Hari, N. and Rajashekar, M. 2020. Soil Fertility Evaluation and GPS-GIS Based Soil Nutrient Mapping of Krishi Vigyan Kendra, Palem, Telangana, *International Research Journal of Pure & Applied Chemistry.* 21(23): 139-145, ISSN: 2231-3443.

Sathyanarayana, E., Padmaja, G., Saranya, S., Bharghavi, J., Santhosh Kumar, M., Rajashekhar, M., Veeranna, J. and Kumari Sunita, 2021. Soil fertility status of soybean growing soils of Adilabad district, Telangana. *The Pharma Innovation Journal*. SP-10(10): 1112-1120.

Shivanna, A.M. and Nagendrappa, G. 2014. Chemical Analysis of Soil Samples to Evaluate the Soil Fertility Status of Selected Command Areas of Three Tanks in Tiptur Taluk of Karnataka, India, *IOSR Journal of Applied Chemistry* e-ISSN: 2278-5736. Volume **7**, Issue 11 Ver. I. PP 01-05.

Singh, Y.P., Raghubanshi, B.P.S., Tiwari, R.J. and Motsara, S. 2014. Distribution of Available Macro and Micronutrients in Soils of Morena District of Madhya Pradesh, *A Journal of Multidisciplinary Advance Research* Vol. 3, 01-08.

Subbiah, B. V. and Asija, C. L. 1956. A rapid procedure for the estimation of available nitrogen in soils. *Current Sci.* 25: 259-260.

Tale, K. S. and Ingole, S. 2015. A Review on Role of Physico-Chemical Properties in Soil Quality. *Chem Sci Rev Lett*. 4(13): 57–66.

Toth, S. J. and Prince, A. L. 1949. Estimation of cation exchange capacity and exchangeable Ca, K and Na content of soil by flame photometer technique. *Soil Sci.* 67: 439-445.

Walkley, A. 1947. Critical examination of rapid method for determining organic carbon in soils, effect of variation in digestion conditions and of inorganic soil constituents. *Soil Sci.* 632: 251.

Wani, S. A., Najar, G. R., Padder, B. A., Akhter, F. and Chand, S. 2017. Altitudinal and depth-wise variation of soil physico-chemical properties and available nutrients of pear orchards in Jammu & Kashmir, India. *Chem. Sci. Rev. Lett.* 6(23): 1638-1645.

Wilcox, L. V. 1950. Electrical conductivity. *Amer. Water Works Assoc. J.* 42: 775-776.