Original Research Article

ASSESSMENT OF PHYSICO-CHEMICAL PROPERTIES OF SOIL FROM DIFFERENT BLOCKS OF KOMARAM BHEEM, ASIFABAD DISTRICT, TELANGANA

Abstract

The objectives to determine the availability of macro nutrient in soil of these soil samples and provide the assessment of 12 sampling locations were selected. Soil samples were collected at the depth of 0-15 cm and 15-30 cm respectively. Soil textural classes were Sandy clay loam. The Water Holding Capacity varies from (38.24 to 45.84%), Bulk Density varies from (1.32 Mg m^{-3} to 1.48 Mg m^{-3}). Particle Densityvaries from (2.31 Mg m^{-3} to 2.45 Mg m^{-3}). % Pore Space (43.49% to 49.16 %) the physical condition of the soil was found good. The pH of soil is alkaline in nature (7.25 to 8.92) and the Electrical Conductivity (0.18 to 0.48 dSm^{1}) was suitable for all crops. Organic carbon was found low to medium (0.33 to 0.48%). These soils have low Nitrogen (200.00 kg ha^{-1} to 220.00 kg ha^{-1}) in all villages. Phosphorus (16.24 kg ha^{-1} to 26.58 kg ha^{1}) is found medium to high. Potassium (225.24 kg ha^{-1} to 277.51 kg ha^{-1}) is found medium in range. Calcium (4.02 to 5.45meq $100g^{-1}$)and Magnesium (1.92to 2.76meq $100g^{-1}$)are sufficient in this soil. There is an including awareness of the need to pay greater attention in the role of macronutrients enhancement in the soil for good soil health and proper nutrition of plant so as to attain optimum economic yield and soil is suitable for all major tropical and sub-tropical crops.

Key words: *KomaramBheemAsifabad district, Physico-chemical properties, Soil Health, Nutrient availability etc.*

INTRODUCTION

Soil is a precious and irreplaceable resource that could be described as the "soul of infinitelife".Itscropproducingcapacityistheessenceoflifeinthesoil,anditsproductivityisgreatlyinfluenced by soil fertility, management practices, and climate **(Lal, 2011).**The term "soil"representsoneofthemostdynamicandintricatenaturalsystemsonthesurfaceofthe earth.It is crucial for the survival of various life forms and serves as a medium for plant

growth,providingthemwith thenutrientstheyneed**(Tewari*etal.*, 2016)**. Thus, without prior knowledge on status of soil fertility might have been resulted adverse effects on soils as well as crops both in terms of nutrient deficiency and toxicity either by adequate or over usage of fertilizers **(Madhavi *et al*., 2018)**. Soil analysis is a process that involves testing soil samples to determine their physical,chemical, and biological properties. Theresultsof a soilanalysis canhelp farmers andgardenersmakeinformeddecisionsabouthowtomanagetheirsoilforoptimalcropyieldsandalso used to make recommendations for fertilization **(Smith and Mullins, 2015)**.Theknowledgeaboutthephysicaland chemicalpropertieshelpsin managing the resources while working with a particular soil. The aim is to setappropriateguidelinesforsustainableproductivityfor betterutilizationandmanagementofthesoilforparticularland use. (Pradhan *et al*.,2020)

Keeping in view of importance of soil's physical and chemical properties, the present study of Physico-chemical properties of soil collected from various locations of district of KomaramBheem, Asifabad, Telangana undertaken. The soil sample collection is from 3 blocks of KomaramBheemAsifabad District in the state of Telangana. Each selecting 4 villages. Samples will be collected randomly from a site of each village using soil auger, Khurpi Knife by composite sampling method at a depth of 0-15cm, 15-30cm.A comparison of the Physico-chemical Properties of some of the soils of different regions of the Telangana state has been undertaken by comparing the results of the present study with the studies done earlier in the other regions of the state. Hence, a detailed study for evaluation of soils is needed to realize the concept of Physico-chemical analysis successfully. With this following objective, a study has been undertaken in soil resources inventory for sustainable land use planning in KomaramBheem region of Telangana.

Methodology

Sampling site and collection

Telangana is situated on the Deccan plateau in the central stretch of the eastern seaboard of the Indian Peninsula. It covers 112,077 square kilometres (43,273 sq. mi). The region is drained by two major rivers, with about 79% of the Godavari River catchment area and about 69% of the Krishna River catchment area, but most of the land is arid. Telangana is also drained by several minor rivers such as the Bhima, the Maner the Manjira the Musi, and the Tungabhadra. Soil samples were collected from 3 different Blocks of KomaramBheemAsifabaddistrict in

Telangana. Four different locations selected from each block. The samples are collected from all 4 directions from one village with 0-15cm and 15-30cm depth. Twenty-four Samples are collected with the help of GPS.

Methods

Analysisofthe soil sampleswere underthemethods,the physical parametersinclude SoilTexture, Bulk Density, Particle Density,Water Holding Capacity, whereaschemicalparametersinclude pH, Electrical Conductivity, Organic Carbon, Macro-Nutrients (N, P, K) Soil textural classwas determinedby usingBouyoucosHydrometer(Bouyoucos,1927).Bulk density, Particledensity,WaterholdingcapacitywasdeterminedbyusingGraduatedMeasuring Cylindermethod (Muthuaval et al., 1992). pH was estimated with the help of Digital pH meter after making1:2 soil water suspension (Jackson, 1958). Electrical Conductivity was estimated with the help ofDigitalConductivitymeter(Wilcox,1950).PercentOrganicCarbonwasestimatedbyWetOxidation method(WalkleyandBlack,1947). Available Nitrogen was estimated by AlkalinePotassium Permanganate method, using Kjeldahl apparatus (Subbiah and Asija, 1956), AvailablePhosphorus was estimated by Olsen's extraction followed by Spectrophotometric method (Olsen etal., 1954), available Potassium was estimated by Neutral normal Ammonium Acetate extractionfollowedby Flamephotometricmethod (Toth andPrince,1949).

RESULTS AND DUSCUSSION

Physico-chemicalCharacteristics

The Soil Textural classes identified as Sandy clayloam. The sand, silt and clay percentage varied from 46.56 to 60.56 sand, 12.36 to 16.36 silt and 25.08 to 37.72 clay. Bulk Density was varied from the 1.32 Mg m^{-3} to 1.48Mg m^{-3} and the highest Bulk Density was found in$ShivapurV_2$ (1.48 Mg m^{-3}) from Sirpur (t)Block. The Particle Density varied from 2.31 Mg m^{-3} to 2.45Mg m^{-3} and the highest Particle Density was found in$VempelliV_3$ (2.45 Mg m^{-3}) from the KaghaznagarBlock. The Pore Space (%) ranged from 43.22% to 49.16 %. The highest Pore Space % was found at $TonkiniV_3$ (49.16%) from the Sirpur (t) Block. The Water Holding Capacity (%) ranged from 38.24 to 45.84 % and the highest Water Holding Capacity was found at$TonkiniV_3$ from Sirpur (t)Block.The pH value ranged from 7.25 to 8.92 and the highest value was recorded at$Vempelli V_3$ (pH 8.92) from the Kaghaznagar Block. The Electrical Conductivity ranged from (0.18 to 0.48 dS m^{-1}) and the highest value was recorded at$Tonkini V_3$ (0.48 dS m^{-1}) from the Sirpur (t)Block and the soil was found to be normal. The value of total Organic Carbon (%) varied from

0.33 to 0.48% and the range of organic carbon content was found low to medium.The Available Nitrogen content of soil ranged from 200 to 220 kg ha^{-1} and Nitrogen content was low in all villages. The Available Phosphorus content of soil ranged from 16.24 to 26.58 kg ha^{-1}. The phosphoruscontent was found medium to high. Available Potassium content of soil ranged from 225.24 to 277.51 kg ha^{-1}. The potassium content was found Medium in range in all the villages.Exchangeable Calcium content of soil ranged from 4.02 to 5.45 [meq $100g^{-1}$] with the highest value recorded atTonkini V_3 (5.45) [meq $100g^{-1}$] from the Sirpur (t)Block. Exchangeable Magnesium content of soil ranged from 1.92 to 2.76 [meq $100g^{-1}$] with the highest value recorded atCharigaon V_4 (2.76) [meq $100g^{-1}$] from the Kaghaznagar Block. Calcium and Magnesium are very sufficient in this soil.

CONCLUSION

The results of experiment are concluded as soil colour, soil texture, bulk density, percent pore space, water holding capacity and specific gravity of soil of KomaramBheemAsifabad Block was found significantly good for plant growth. The soils of KomaramBheemAsifabad District were found alkaline in nature which is suitable for crop growth. The percent Organic Carbon, N, P, K, content of the soil significantly varied from Low to Medium. Calcium and Magnesium are sufficient in the soil.

REFERENCE

Anonymous (1971). Munsell colour chart. Munsell colour company inc. 2241 N. calveri street, Baltimore, Marytanel 21212, USA.

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) Thehydrometerasanewmethodforthemechanicalanalysisofsoils. *SoilScience,* **23**(5):343-357.

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

Jackson,M.L.(1958) SoilChemicalAnalysis:AdvancedCourse.*Madison,WI:Universityof WisconsinPress.*

Jackson, M.L.(1985) Soil ChemicalAnalysis - AdvancedCourse(2nded.).*Madison,WI:Universityof Wisconsin Press.*

Lal,R.(2011) Soildegradationasareasonforinadequatehumannutrition.*FoodSecurity*,**3**(2):137-147.

Meena,H.M.,Swapnil,R.andMeena,M.(2018) Soiltesting:Atoolforquickcharacterization of soil fertility status. *International Journal of Current Microbiology andAppliedSciences*, **7**(10):784-792.

Munsell, A. H. (1971) Munsell's description of his colour system, from a lecture to theAmericanPsychologicalAssociation. *AmericanJournalofPsychology***23**(2):236-244

Muthuvel, S., Subramanian, S.K. and Govindasamy, R. (1992) Water holding capacity,bulk density and particle density of soils of the Western Ghats of Tamil Nadu. *Journal of theIndianSocietyof Soil Science*, **40**(1): 122-124.

Olsen. S.R., Cole. C.V., Watanabe. F.S. and Dean. L.A. (1954) Estimation of AvailablePhosphorusinSoilsbyExtractionwithSodiumBicarbonate.*U.S.DepartmentofAgriculture*,CircularNo.**939**: 1-19.

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.

Smith,M.A.andMullins,G.L.(2015) Soiltestingandplantanalysisfornutrientavailability:Arevie w. *Journal ofPlant Nutrition*, **38**(9:1270-1285.

Subbiah. B. V. and Asija. G. L. (1956) A rapid procedure for the determination of availablenitrogen in soils. *Current Science*, **25**: 259-260.

Tewari, R. K., Shukla, A. K., Singh, S. K.,andSingh,A.K.(2016) Soilorganicmatteranditsroleincropproduction:areview.*JournalofApplied andNatural Science*, **8**(4): 2424-2434.

Tewari,R.,Dahiya,I.

andSingh,S.(2016) Soilandlandusemappingusingremotesensing andGISforsustainablelandman agementinHaryana.*JournaloftheIndianSocietyofRemote Sensing*,**44**(1):129-140.

Toth, S.J. and Prince A.L. (1949) Estimation of cation exchange capacity and exchangeableCa,Kand Nacontent of soil byflame photometer technique.*SoilScience*,**67**:439-445.

Walkley, A. (1947) Critical examination of rapid method for determining organic carbon insoils,effectofvariationindigestionconditionsandofinorganicsoilconstituents,*SoilScience*,**632**: 251.

Wilcox,L.V.(1950) Electricalconductivity,*AmericanWaterWorksAssociationJournal*,**42**:775-776.

Table 1: Bulk density and Particle density of Soils of KomaramBheemAsifabadDistrict

Blocks	**Villages**	**Bulk Density (Mg m^{-3})**		**Particle Density (Mg m^{-3})**	
		0-15cm	**15-30cm**	**0-15cm**	**15-30cm**
Kaghaznagar**(B1)**	Kosini (V_1)	1.35	1.38	2.31	2.42
	Regulaguda (V_2)	1.43	1.45	2.35	2.41
	Vempelli (V_3)	1.35	1.40	2.38	2.45
	Charigaon(V_4)	1.32	1.38	2.32	2.40
Sirpur (t)**(B2)**	Rudraram(V_1)	1.36	1.38	2.35	2.41
	Shivapur (V_2)	1.45	1.48	2.37	2.43
	Tonkini (V_3)	1.42	1.44	2.34	2.42
	Parigaon (V_4)	1.34	1.38	2.38	2.44
Kouthala**(B3)**	Talodi (V_1)	1.38	1.42	2.35	2.41

	Kanki (V_2)	1.33	1.37	2.37	2.43
	Chandaram (V_3)	1.43	1.45	2.33	2.42
	Muthampet (V_4)	1.36	1.40	2.34	2.40
	F-Test	S	S	NS	NS
	S. Em. ±	0.021338	0.021338	0.034396	0.034396
	C.D @5%	0.06228	0.06228	-	-

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187 **Table 2:** PercentPore Space (%) and Water Holding Capacity of Soils of KomaramBheem
188 AsifabadDistrict

Blocks	**Villages**	**Pore Space (%)**		**Water Holding Capacity (%)**	
		0-15cm	**15-30cm**	**0-15cm**	**15-30cm**
Kaghaznagar**(B1)**	Kosini (V_1)	45.75	43.58	40.21	38.59
	Regulaguda (V_2)	47.73	45.67	42.25	40.41
	Vempelli (V_3)	46.55	44.57	40.64	38.24
	Charigaon(V_4)	47.15	45.35	43.42	40.48
Sirpur (t)**(B2)**	Rudraram(V_1)	48.45	46.65	43.08	40.81
	Shivapur (V_2)	46.95	43.49	42.25	40.13
	Tonkini (V_3)	49.16	46.94	45.84	43.25
	Parigaon (V_4)	48.25	45.46	44.32	41.89
Kouthala**(B3)**	Talodi (V_1)	47.28	45.33	43.52	40.49
	Kanki (V_2)	47.66	45.60	43.21	40.66
	Chandaram (V_3)	45.92	43.22	40.92	38.65
	Muthampet (V_4)	48.86	46.84	42.25	40.25
	F-Test	S	S	S	S
	S. Em. ±	0.576390	0.576390	0.692018	0.692018

C.D @5%	1.68236	1.68236	2.019858	2.019858

Table 3: Soil pH, EC (dS m^{-1}) and Percent Organic Carbon (%) of soils of KomaramBheem, Asifabad District

Blocks	**Villages**	**pH**		**EC (dS m^{-1})**		**OC (%)**	
		0-15cm	**15-30cm**	**0-15cm**	**15-30cm**	**0-15cm**	**15-30cm**
Kaghaznagar**(B1)**	Kosini (V_1)	8.18	8.25	0.32	0.36	0.48	0.45
	Regulaguda (V_2)	7.45	7.50	0.31	0.35	0.46	0.40
	Vempelli (V_3)	8.85	8.92	0.28	0.33	0.47	0.41
	Charigaon(V_4)	7.34	7.61	0.38	0.41	0.48	0.46
Sirpur (t)**(B2)**	Rudraram(V_1)	8.24	8.42	0.18	0.23	0.41	0.35
	Shivapur (V_2)	7.25	7.65	0.38	0.42	0.37	0.33
	Tonkini (V_3)	8.33	8.41	0.43	0.48	0.46	0.43
	Parigaon (V_4)	7.45	7.54	0.42	0.45	0.35	0.34
Kouthala**(B3)**	Talodi (V_1)	8.25	8.51	0.35	0.42	0.47	0.43
	Kanki (V_2)	7.63	7.86	0.31	0.37	0.46	0.42
	Chandaram (V_3)	8.25	8.89	0.33	0.37	0.42	0.40
	Muthampet (V_4)	7.81	7.98	0.35	0.41	0.44	0.41
	F-Test	S	S	S	S	S	S
	S. Em. ±	0.136	0.136	0.005	0.005	0.006	0.006
	C.D @5%	0.395	0.395	0.015	0.015	0.0196	0.0196

Table 4: Available Nitrogen, Phosphorous and Available Potassium (Kg ha^{-1}) of soils of KomaramBheemAsifabad District

Blocks	**Villages**	**Nitrogen (Kg ha^{-1})**		**Phosphorous (Kg ha^{-1})**		**Potassium (Kg ha^{-1})**	
		0-15cm	**15-30cm**	**0-15cm**	**15-30cm**	**0-15cm**	**15-30cm**
Kaghaznagar**(B1)**	Kosini (V_1)	215.00	210.00	21.55	18.65	246.54	225.24
	Regulaguda (V_2)	217.00	212.00	26.58	22.12	256.45	241.18
	Vempelli (V_3)	220.00	214.00	22.19	16.38	235.50	227.32
	Charigaon(V_4)	218.00	215.00	24.58	21.21	266.01	249.91
Sirpur (t)**(B2)**	Rudraram(V_1)	215.00	208.00	25.32	23.64	268.1	251.19
	Shivapur (V_2)	217.00	212.00	20.57	16.24	244.75	232.51
	Tonkini (V_3)	214.00	206.00	24.68	21.12	263.11	251.42
	Parigaon (V_4)	212.00	205.00	25.12	22.67	271.56	266.78
Kouthala**(B3)**	Talodi (V_1)	215.00	211.00	23.35	20.17	235.75	227.32
	Kanki (V_2)	216.00	208.00	25.14	22.64	254.36	236.59
	Chandaram (V_3)	206.00	200.00	22.33	19.26	265.41	257.51
	Muthampet (V_4)	210.00	205.00	21.84	18.45	277.51	269.23
	F-Test	S	S	S	S	S	S
	S. Em. ±	3.897	3.897	0.364	0.364	4.07	4.07
	C.D @5%	11.8	11.8	1.06	1.06	11.890	11.890

Table 5: Exchangeable Calcium and Magnesium [meq $100g^{-1}$]of soils of KomaramBheem, Asifabad District

Blocks	**Villages**	**Exchangeable calcium [meq $100g^{-1}$]**		**Exchangeable Magnesium [meq $100g^{-1}$]**	
		0-15cm	**15-30cm**	**0-15cm**	**15-30cm**
Kaghaznagar**(B1)**	Kosini (V_1)	4.82	4.63	2.68	2.42
	Regulaguda (V_2)	4.25	4.03	2.73	2.55
	Vempelli (V_3)	4.15	4.02	2.64	2.45
	Charigaon(V_4)	4.67	4.38	2.76	2.54
Sirpur (t)**(B2)**	Rudraram(V_1)	5.38	5.14	2.68	2.47
	Shivapur (V_2)	4.46	4.39	2.37	2.18
	Tonkini (V_3)	5.45	5.13	2.25	2.15
	Parigaon (V_4)	5.19	4.94	2.28	2.19
Kouthala**(B3)**	Talodi (V_1)	5.04	4.85	2.15	2.06
	Kanki (V_2)	4.85	4.74	2.03	1.92
	Chandaram (V_3)	4.66	4.37	2.10	1.98
	Muthampet (V_4)	4.95	4.84	2.14	2.05
	F-Test	S	S	S	S
	S. Em. ±	0.0677	0.0677	0.0373	0.0373
	C.D @5%	0.1976	0.1976	0.1089	0.1089