



ASSESSMENT OF THE SOIL FERTILITY STATUS IN THE SEMI ARID REGION, CHITTOOR DISTRICT OF ANDHRA PRADESH, INDIA

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ABSTRACT

The soil fertility data with specific reference to micronutrients was carried out by analyzing 1000 soil samples from 6 mandals of Chittoor district of Andhra Pradesh. The average percentage deficiency of the nutrients for 6 mandals (Tirupati(R)&(U), Chandragiri, Renigunta, Pakala and Pulicherla) was found to be SULPHUR- 9.76%, ZINC- 19.63%, IRON- 25.96%, MANGANESE- 8.62%, COPPER- 0% and BORON- 8.14%. The maximum Sulphur and Manganese deficiency were found in Tirupati(U) of about 16.33 & 12.24%. The maximum Zinc and Boron of about 23.45 & 14.53% were found in Chandragiri, whereas the maximum deficiency of Iron was found to be 41.30% in Tirupati(R). The Copper content in 6 different mandals of Andhra Pradesh was found to be 0%.

Key words: physicochemical parameters of the soils

1. **INTRODUCTION**

Soil plays a major role in determining the sustainable productivity of an Agro ecosystem. The sustainable productivity of a soil mainly depends upon its ability to supply essential nutrients to the crop. The deficiency of micronutrients has become a major constraint in optimizing crop productivity and soil sustainability (Bingham, 1982; Chesnin and Yien, 1950). The availability of micronutrients in soil is dependent on the parent material, pedogenic process and soil management which may promote, in some cases a reduction of cationic micronutrients content. Reduction in native levels of micronutrients in soils due to continuous shipping away of micronutrients without replenishment has been a cause of concern for all the stakeholders. It is well known that optimum plant growth and crop yields depend upon plant available micronutrients to the crop not on their total concentration. Therefore, viable approach is to concurrently carryout the soil fertility mapping on rotation basis in terms of space and time by encompassing all holdings and farming community.

2. **Methodology Soil sampling analysis:**

The soil samples were air dried, ground (< 2 mm) and analyzed for physico-chemical and fertility parameters. The pH (1:2.5) and electrical conductivity (EC) (1:2.5) of soils were measured using standard procedures as described by Jackson (1973). Organic carbon (OC) was determined using the Walkley-Black method (Nelson and Sommers 1996). Available nitrogen (N) was estimated by alkaline permanganate method (Subbiah and Asija 1956). Available phosphorus (Olsen P) was measured using sodium bicarbonate (NaHCO₃) as an extractant (Olsen and Sommers 1982). Available potassium (K) was determined using the

ammonium acetate method (Jackson, 1973). Available sulphur (S) was measured using 0.15 percent calcium chloride ($\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$) as an extractant (Williams and Steinbergs, 1959). Micronutrients (Fe, Zn, Cu and Mn) were extracted by DTPA using the procedure outlined by Lindsay and Norvell (1978). Variability of data was assessed using mean standard deviation and coefficient of variation for each set of data. Availability of N, P and K in soils are interpreted as low, medium and high and that of available sulphur (S), zinc (Zn), iron (Fe), copper (Cu) and manganese (Mn) interpreted as deficient and sufficient by following the criteria given in table 1.ct.

Result and discussion:

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC
1.	Tirupati(R)	Panakam	23	13.04	26.09	30.43	0	13.04	8.70
		Vemuru	20	10	30	10	0	0	15
		Thanapalli	10	10	10	10	0	10	50
		Nallamanikalva	12	0	58.33	0	0	16.67	33.3
		Kupuchandra peta	3	0	33.33	0	0	33.33	66.6
		Bramhanapattu	14	14.29	64.29	0	0	0	21.4
		Kuntrapakam	10	0	60	0	0	0	0
		Kotturu	10	0	60	0	0	10	50
		Mundlapudi	14	14.29	57.14	0	0	7.14	28.5
		Chiguruwada	20	15	70	0	0	10	45.0
		Ramanujapalli	5	0	40	0	0	0	0
		Kalluru	5	0	40	0	0	20	40
		C. Mallavaram	5	0	80	0	0	0	0
		Gollapalli	10	0	50	0	0	0	40
Peruru	10	10	20	10	0	20	40		

Table .1.0 Physico-chemical properties and available major nutrients status in tirupati area

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC	
2.		Pudipatla	5	0	20	0	0	0	0	
		Cherlopali	4	25	50	0	0	0	0	
		Paidipalli	31	6.45	29.03	3.23	0	6.45	45.16	
		Durgasamudram	19	5.26	21.05	0	0	0	26.32	
	TOTAL NO OF SAMPLES 230									
	Tirupati(U)	Akkarampalli	6	16.6	0	0	0	0	0	0
		Timminaidupalem	7	14.3	42.8	14.2	0	0	0	0
		Mangalam	7	14.3	42.8	0	0	0	0	14.2
		Settipalli	9	33.3	22.2	22.2	0	0	0	44.4
		Chennaiahgunta	20	10	30	15	0	10	10	10
	TOTAL NO SAMPLES 49									
	3.		Ramireddypalli	38	28.9	31.5	0	0	0	44.7
Kotala	22		13.6	40.9	9.0	0	9	13.6		
Thondawada	39		10.2	30.7	0	0	17.9	7.6		
Sanambatla	38		15.7	36.8	18.4	0	13.1	7.8		

Table .2.0 Physico-chemical properties and available major nutrients status in tirupati area

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC
	Chandragiri	Nagapatla	18	16.6	50	22.2	0	27.7	22.2
		Chinthalagunta	9	44.4	44.4	33.3	0	55.5	22.2
		A.Rangampeta	34	20.5	32.3	2.9	0	11.7	26.4
		Narsingapuram	19	0	31.5	5.2	0	52.6	68.4
		Chandragiri	69	18.8	36.2	0	0	5.8	17.3
		Agarala	12	16.6	50	16.6	0	16.6	33.3
		Mamanduru	15	13.3	53.3	33.3	0	40	13.3
		Panapakam	22	18.1	22.7	22.7	0	13.6	36.3
		M.Kothapalli	31	16.1	32.2	3.2	0	6.4	3.2
		Kalroadpalli	31	19.3	41.9	6.4	0	12.9	6.4
		Reddivaripalli	15	6.6	26.6	6.6	0	33.3	53.3
		Bheemavaram	13	0	15.3	15.3	0	0	15.3
		Sheshapuram	32	9.3	6.2	6.2	0	0	6.2
		Chinaramapuram	30	6.6	53.3	6.6	0	0	43.3
	Pullaigaripalli	11	0	9.0	18.1	0	72.7	45.4	

Table .3.0 Physico-chemical properties and available major nutrients status in chandragiri area

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC	
4.	Renigunta	Kondareddikandriga	18	27.7	16.6	11.1	0	16.6	44.4	
		c								
		Kotramangalm	18	11.1	33.3	0	0	0	33.3	
		Thandlam	18	0	30	20	0	10	30	
		Molagamudi	18	10	40	10	0	10	40	
		Athuru	18	50	20	10	0	20	0	
		Yellamanadyam	18	0	10	10	0	0	40	
		Nallapalyam	18	11.1	44.4	33.3	0	11.1	33.3	
		Thookivakam	18	33.3	33.3	16.6	0	0	33.3	
		Thathayakalava	18	0	30	20	0	10	30	
		Surapakasam	18	5	30	15	0	10	25	
		Jeepalem	18	0	37.5	12.5	0	0	0	
		Amavaripatada	18	9	9	0	9.0	0	18.1	
		Gajulamandyam	18	7.6	7.6	0	0	7.6	30.7	
Karkambadi	18	0	6.5	4.3	0	8.7	6.5			

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC
	Renigunta	R.Agraharam	10	0	10	0	0	10	10
		Annasamipalli	15	0	26.6	6.6	0	0	13.3
		Anagunta	5	0	0	0	0	20	0
		DP Kandriga	10	20	30	20	0	20	10
		Krishnapuram	29	6.9	6.9	10.3	0	6.9	24.1
		Mamandur	13	0	7.6	7.6	0	15.3	15.3
		S.V Purram	7	0	42.8	28.5	0	0	42.8
		Yedhalacheruvu	10	20	20	20	0	20	20
		R.Malavaram	30	6.6	16.6	10	0	3.3	13.3
		Sanjevaihpateda	6	33.3	16.6	16.6	0	33.3	66.6
		Venkatapuram	10	40	30	10	0	20	20
		Balupali	10	0	30	10	0	10	10
		Xerragunta	6	0	33.3	33.3	0	0	50
		Vepamanupateda	11	0	18.1	0	0	9.0	27.2
		Adhusupalem	5	0	20	0	0	20	0

Table .4.0 Physico-chemical properties and available major nutrients status in Renigunta area

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC	
5.	Pakala	Kurakalava	22	0	13.6	4.5	0	9	4.5	
		TOTAL NO OF SAMPLES 371								
		Gorpadu	20	5	30	15	0	10	15	
		K. Vadepali	32	6.2	12.5	9.3	0	6.2	15.6	
		Gadanki	25	4	16	8	0	8	12	
		Dhamalacheruvu	49	2	20.4	8.1	0	6.1	10.2	
		Ganugapenta	35	5.7	11.4	5.7	0	11.4	14.2	
		Maddinayanipalli	43	9.3	20.9	13.9	0	9.3	18.6	
		Mogarala	31	6.4	19.3	9.6	0	12.9	9.6	
		Valivedu	13	3.3	13.3	3.3	0	6.6	10	
		Pakala	71	16.9	15.4	1.4	0	12.6	19.7	
		Achamaagraharam	10	0	10	0	0	0	30	
		Pedharamapuram	31	6.4	19.3	16.1	0	6.4	9.6	
		Pdhipatabilu	17	11.7	29.4	11.7	0	11.7	11.7	
TOTAL NO OF SAMPLES 394										

Table .5.0 Physico-chemical properties and available major nutrients status in pakala area

S.NO	NAME OF THE MANDAL	NAME OF THE VILLAGE	NO. SAMPLES	SULPHUR	IRON	MANGANESE	COPPER	BORON	ZINC
6.	Pulicherla	Kaveteigaripalli	24	8.3	12.5	12.5	0	4.1	16.6
		Rayavaripalli	21	0	14.2	9.5	0	4.7	14.2
		Yelankivaripalli	17	0	17.6	0	0	11.7	23.5
		Valavetivaripalli	12	0	8.3	16.6	0	8.3	8.3
		Ayavanlapalli	27	0	7.4	3.7	0	3.7	18.5
		Devalampeta	12	0	0	0	0	0	8.3
		Kalluru	32	0	21.8	6.2	0	3.1	15.6
		Bandharuvaripalli	20	0	20	5	0	5	20
		Mangalampeta	19	5.2	21.0	10.5	0	10.5	21
		Gadamvaripalli	16	0	12.5	12.5	0	6.2	12.5
		106.Ramreddypalli	22	18.1	18.1	9.0	0	0	18.1
		Reddyvaripalli	10	0	10	10	0	0	20
		Bodireddypalli	29	6.9	24.1	6.9	0	6.9	17.2
		Venkatadhasaripalli	25	8	12	8	0	8	24
TOTAL NO OF SAMPLES 286									

Table .5.0 Physico-chemical properties and available major nutrients status in pulicherla area

CONCLUSION:

Soil fertility refers to the inherent capacity of the soil to supply nutrients in adequate amounts and in suitable proportions for crop growth and crop yield. The trend in increasing the yield by adopting high yielding varieties has resulted in deficiency of

nutrients in soils and has reflected as deficiency symptoms in plants. Hence, it is required to know the fertility status of the soils of the state for applying the required dosage of fertilisers and planning the regional distribution of fertilisers. For this purpose, the soil samples collected from areas of about 1846 samples were collected from 6 Mandal's and were analysed for organic carbon, Nitrogen, P, K, Sulphur etc. To conclude, many things in ecology influence a soil's fertility and it is hard to talk about one factor without mentioning another, since they are interrelated. The acidity or PH scale is one of the main factors in determining soil fertility, but this is inevitably linked to water without which no life could exist. The higher the water content, lower the PH and higher the progressive replacement by hydrogen cations. This means that there will be less nutrients available for plant use. Most of the Macro Nutrients such as Nitrogen, Calcium, Magnesium, and potassium become more readily available as PH increase until PH reaches about nine. But nutrient Micro elements such as Iron, Manganese, and Aluminum become more available as PH decreases, generally the more basic a soil is more fertile it is to bacteria, earthworms and deciduous trees. Soils on the acidic side can be tolerated by a higher biomass of fungi, anthropoid animals and coniferous trees. Water availability is poor in sandy soils because of the great porosity that will drain water away. Clay type soils have much small spaces between the pores that is difficult for water nutrients to be sucked up. So a medium of these extremes which is a silt or sandy loam would be of least effort for a plant to obtain water. Soil with about 50% pore space is excellent to keep the soil fertile, by making sure that it is filled with oxygen and this in turn diminishes excess CO₂ and thereby avoiding a toxic build up. The types of organic matter namely mor and mull humus are the byproducts of factors like high drainage and poor nutrients cause mor and rich nutrient parent material with soil particles that are fairly coarse cause mull humus. These types are related to acidity of soil which in turn have different effects or fertility factors on different specie

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