



P-ISSN: 2349-8528

E-ISSN: 2321-4902

www.chemijournal.com

IJCS 2020; 8(3): 2636-2643

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Received: 21-03-2020

Accepted: 25-04-2020

K Ramesh

Department of Soil Science and
Agricultural Chemistry,
Agricultural College, Bapatla,
ANGRAU, Guntur, Andhra
Pradesh, India

V Bhanu Prasad

Department of Soil Science and
Agricultural Chemistry,
Agricultural College, Bapatla,
ANGRAU, Guntur, Andhra
Pradesh, India

Corresponding Author:**K Ramesh**

Department of Soil Science and
Agricultural Chemistry,
Agricultural College, Bapatla,
ANGRAU, Guntur, Andhra
Pradesh, India

Description of macro morphological features of soil profiles of Singarayakonda Mandal, Prakasam district, A.P

K Ramesh and V Bhanu PrasadDOI: <https://doi.org/10.22271/chemi.2020.v8.i3al.9612>**Abstract**

Seven representative pedons from Singarayakonda, Pakala, Pataiahgaripalem, Kalikivaya, Binginepalle, Old Singarayakonda and Modaguntapadu of Singarayakonda mandal in Prakasam district of Andhra Pradesh were selected and studied. All the pedons were described for their morphological features. Horizon-wise soil samples were collected and analyzed for various physical, physico-chemical and electro-chemical properties. The results of physico-chemical properties revealed that slightly alkaline to moderately alkaline (black soils) and acidic to moderately acidic in soil reaction was observed in red soils. Calcium was the dominant cation on the exchange complex in both black, red and sandy soils followed by Mg^{+2} , Na^{+} and K^{+} . Soils were siliceous in nature but silica content decreased and with increase in depth. Alumina shared the major portion in sesquioxides content and showed increasing trend with increase in depth in black but it was reverse in red soils. The soils were low to medium in available nitrogen and phosphorus, deficient to sufficient in available sulphur and well supplied with potassium. The sandy soils had low to medium available nitrogen and phosphorus and low amounts of sulphur and potassium. The available zinc and iron were in deficient range whereas copper and manganese were in sufficient range (black soils). In red soils, iron was sufficient and zinc was deficient. Copper and manganese were sufficient. Sandy soil was deficient in zinc and iron while copper and manganese were in sufficient range.

Keywords: pedons, horizon, morphological features and electrochemical properties**Introduction**

Andhra Pradesh is one of the largest state in India with geo coordinates ranging between $12^{\circ} 37'$ to $19^{\circ} 54'$ north latitude and $76^{\circ} 46'$ to $84^{\circ} 46'$ east longitude. The most important soil groups in the state are red and laterite soils occupying sixty six per cent and black soils occupying twenty five per cent of the total geographical area. Black soils are grouped under Vertisols and Vertic sub groups of Inceptisols. These soils are formed from a variety of parent materials like granite, gneiss, schists, etc. They are known as "Nalla Reguda" meaning "the black earth". The principal soil forming process of haploidisation by pedoturbation is responsible for the development of black soils. These soils are fertile but low infiltration rate, poor drainage, salinity are some of the constraints for crop production.

Red soils occupy nearly one fifth of the total geographical area of the country. These soils are very often occur in association with laterite soils. They are well drained and are often found on higher elevations of toposequences. Red and laterite soils are highly variable in nature and are subjected to soil erosion, droughts, crust formation.

The systematic study of soil characteristics is the pre-requisite for complete exploitation of soil types by appropriate management practices. The clay mineralogical data is necessary for predicting physico chemical behaviour of soils and for the management of sustainable agriculture. Soil health is also very much dependent on the nature and quality of minerals present in clay fractions.

According to Buol *et al.* (1998) ^[1] understanding of soil genesis and classification is a pre-requisite for sound land use planning and land management. Systematic study of soils is important for better scientific utilization for agricultural production. There is however, a lot of scope left for conducting systematic studies in these soils. So the present study is on the soils of Singarayakonda mandal in Prakasam district of Andhra Pradesh which has both red and

black soils. The soils of the mandal has got agricultural importance as these soils are under food, vegetable and commercial crops cultivation.

Materials and Methods

A. Processing soil samples

Soil samples were air-dried under shade and pounded with wooden hammer. They were passed through 2 mm sieve.

B. Physical Properties

1. Particle size analysis

The particle size analysis was carried out by Bouyoucos Hydrometer method.

2. Soil density

Particle density was determined by specific gravity bottle method. Bulk density was determined by Clod method. For determining the density of sandy soils, Core sampler method was used (Jackson, 1973) [5].

3. Colour

Munsell's colour notation of hue, value and chroma were evaluated both for air dried and moist samples as per standard procedure.

4. Water holding capacity, pore space and volume expansion

These parameters were determined by following Keen Raczkwsk's method as described by standard procedure. Sticky point was determined by the method of Sowers as described by standard procedures.

5. Co-efficient of linear extensibility (COLE)

COLE is the ratio of the difference between the moist length and dry length of a clod to its dry length. It is $(L_m - L_d) / L_d$ where L_m is the length of moist clod and L_d is the length when dry (Keys to Soil Taxonomy, 1998) [18].

C. Chemical Properties

1. Soil reaction (pH)

pH of the soil samples was determined in 1:2 soil water suspension and 1:2 IN KCl by using pH meter (Jackson, 1973) [5].

2. Electrical conductivity (EC)

The electrical conductivity was determined in 1:2 soil water suspension by using conductivity bridge (Jackson, 1973) [5].

3. Organic carbon

Organic carbon content of the soil samples was estimated by wet digestion method of Walkley and Black is rapid titration method as described by Jackson, 1973 [5].

4. Free calcium carbonate

The free calcium carbonate content was determined by rapid

titration method as described by Piper (1966) [10].

5. Cation exchange capacity

Cation exchange capacity of the soils was estimated by saturating a known weight of the soil with IN sodium acetate solution (pH: 8.2). Excess sodium acetate was leached out by washing it with 95 per cent ethanol. The adsorbed sodium was displaced with IN neutral ammonium acetate (pH: 7.0) solution. The concentration of the sodium in the leachate was estimated by aspirating directly into the flame photometer the CEC was expressed as C mol (p+) kg⁻¹ (Jackson, 1973) [5].

6. Exchangeable cations

The exchangeable cations Ca²⁺, Mg²⁺, Na\ K⁺ were determined by extracting the soil with IN neutral ammonium acetate. Potassium and sodium were determined by aspirating the leachate directly into the flame photometer. The exchangeable calcium and magnesium were determined by Versenate method.

7. Available macro nutrients

Nitrogen was estimated by the alkaline permanganate method as described by Subbaiah and Asija (1956) [20]. Available phosphorus content in the soils was extracted by adding Olsen's reagent as described by Olsen *et al.* (1954) [9]. The phosphorus in the extract was determined by Murphy and Diley method (using ascorbic acid as reducing agent) as described by Watanabe and Olsen (1965) [9] using spectrophotometer with red filter at 660 nm wavelength. Potassium in the soils was extracted by using neutral normal ammonium acetate and estimated by aspirating the extract into the flame photometer (Jackson, 1973) [5]. Available sulphur in the soil sample was extracted with 0.15 per cent Calcium chloride solution as described by standard procedure. It was estimated by turbidimetric method.

8. Available micro nutrients

Twenty grams of soil was shaken with 40 ml of Diethylene triamine penta acidic acid (DTPA) extractant of pH 7.3 for 2 hours. The contents were filtered. In the available filtrate, zinc, copper, iron and manganese were determined in the titrate by using atomic absorption spectrophotometer. The results were expressed as parts per million (Lindsay and Norvell, 1978) [8].

Results and Discussion

Seven pedons were selected for the present study from Singarayakonda, Pakala, Pataiahgaripalem, Kalikavaya, Binginepalli, Old Singarayakonda and Modaguntapadu villages of Singarayakonda mandal in Prakasam district. All the pedons were opened upto beyond one metre depth and each pedon was differentiated into horizons. Horizon thickness and sequence are furnished in Table 1.

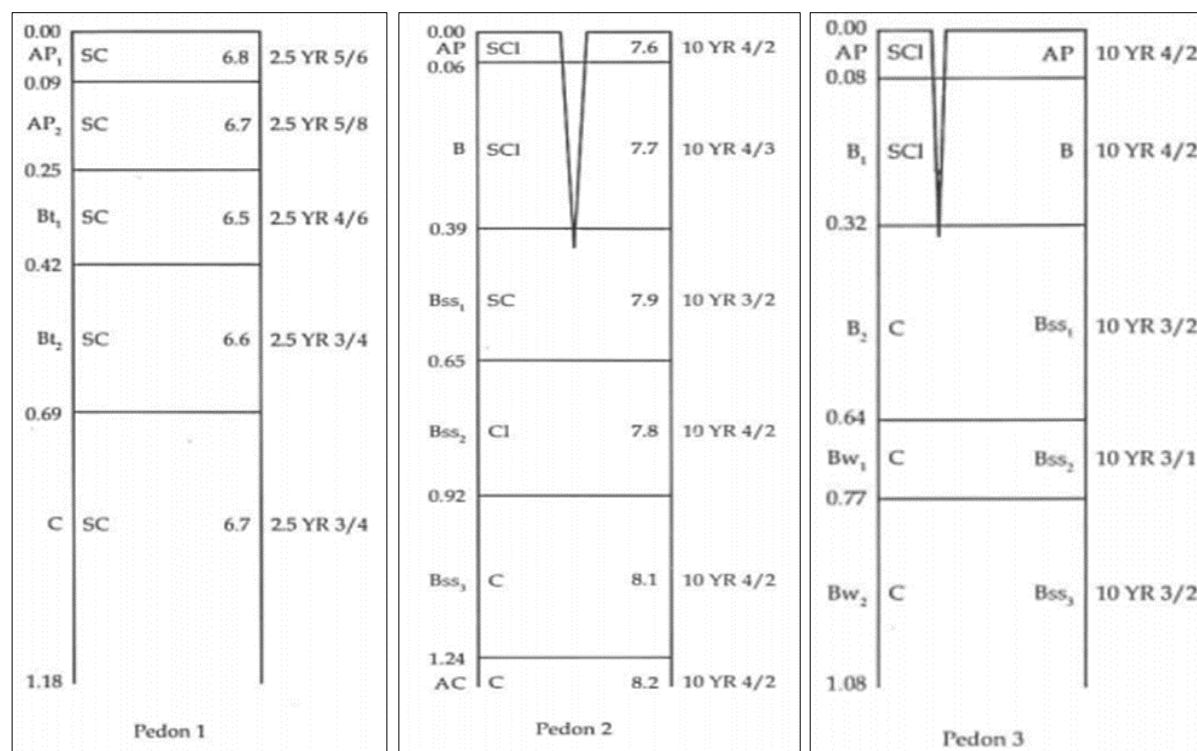
Table 1: Details of the pedons of soil profiles of Singarayakonda mandal

Pedon No	Location	Horizon	Horizon thickness
1	Singarayakonda	Ap	0.00 - 0.09
		Ap2	0.09 - 0.25
		Bt ₁	0.25 - 0.42
		Bt ₂	0.42 - 0.69
		C	0.69-1.18
2	Pakala	Ap	0.00 - 0.06
		B	0.06 - 0.39
		Bssi	0.39 - 0.65
		Bss ₂	0.65 - 0.92

		Bss₃	0.92-1.24
		AC	Below 1.24
3	Potaiahgaripalem	Ap	0.00 - 0.08
		B₁	0.08 - 0.32
		B₂	0.32 - 0.64
		Bwi	0.64 - 0.77
		Bw₂	0.77 - 1.08
		C	Below 1.08
4	Kalikivayi	Ap	0.00 - 0.11
		Bwi	0.11 - 0.24
		Bw₂	0.24 - 0.52
		Bss₁	0.52 - 0.87
		BSS₂	0.87-1.32
		AC	Below 1.32
5	Binganipalli	Ap	0.00 - 0.09
		AB	0.09 - 0.34
		c	0.34 - 0.69
		c₂	0.69 - 0.94
		c₃	0.94-1.36
		Ca	Below 1.36
6	Old Singarayakonda	Ap	0.00 - 0.16
		B	0.16 - 0.54
		Bt₁	0.54 - 0.78
		Bt₂	0.78 - 1.02
		Bt₃	1.02-1.27
		C	Below 1.27
7	Mulaguntapadu	AP	0.00 - 0.11
		Bwi	0.11 - 0.35
		BW₂	0.35 - 0.72
		Bt₁	0.72-1.12
		C	Below 1.12

A. Morphological features of different pedons

The summary of the morphological features were presented in figure 1 and the details are furnished here



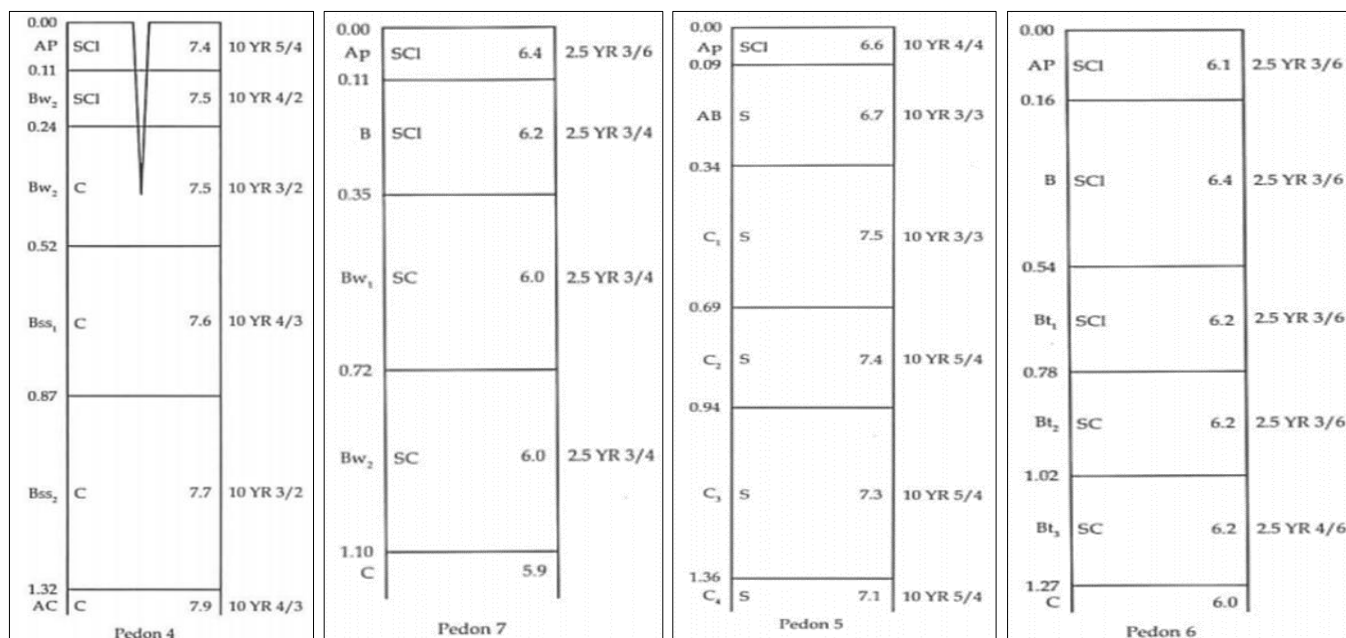


Fig 1: Morphological features of Pedons 1-7 of Singarayakonda mandal of prakasham district

Singarayakonda Pedon

This pedon was deep extending up to 1.18 m with five horizons. It was reddish brown to dark reddish brown in colour, sub-angular blocky in structure, sandy clay in texture, non-sticky to slightly sticky and non-plastic to slightly plastic in consistence, few to many pores and medium to common roots. Compact ferruginous concretionary layer mixed with gneisses was observed below 1.18 m depth.

Pakala Pedon

This pedon was deep. It extended beyond 1.24 m with six horizons. Soil colour varied from very dark greyish brown to dark greyish brown. Texture varied from sandy clay loam to clay. It also revealed sub-angular blocky and angular blocky structures in surface and sub-surface horizons. Sub-surface horizons were sticky and plastic, very sticky and very plastic under wet consistence at sub-surface horizons. Coarse fine to many few roots and medium fine to many few pores were also present. Cracks of 2 - 5 mm width deepening to about 30 - 40 cm and slickensides were also present in deeper layers.

Pataiahgaripalem Pedon

This pedon was extending beyond 1.01 m with five horizons. It was found to be dark greyish brown to very dark greyish brown in colour, sandy clay loam to clay in texture and sub-angular blocky to angular blocky in structure; consistence was sticky to very sticky and plastic to very plastic. Fine to many few roots and medium fine to many, few pores were present. Cracks which were narrow (1-2 cm) and shallow (30 - 5 cm) are also observed. Few indistinct slickensides were also noticed in deeper layers.

Kalikavayi Pedon

This pedon was deep extending beyond 1.32 m with six horizons. It was very dark greyish brown to dark greyish brown in colour, sandy clay loam to clay in texture granular/sub-angular blocky to angular blocky structure. It was slightly sticky to very sticky and slightly plastic to very plastic in consistence. Medium fine to many few roots and medium fine to common few pores were also present. Cracks of 2 to 6 mm width of about 30 - 50 cm depth were also identified; slickensides were present in deeper layers.

Bingenipalli Pedon

This pedon was deep extending beyond 1.36 m depth with six horizons. It was yellowish brown to dark yellowish brown in colour, sandy in texture. It was a single grain structure with medium fine to many, very few roots and medium coarse to many common pores. Water stagnation in lower layers was also observed for short period during the year.

Old Singarayakonda pedon

This pedon was deep extending to a depth of 1.27 m with six horizons dark reddish brown to reddish brown in colour; sandy clay loam to sandy clay in texture. Granular structure in surface and sub-angular blocky structure in sub-surface horizons, medium fine to many few roots and also medium fine to few pores, patchy thick cutans were also present in sub-surface horizons. Parent material was weathered gneiss mixed with ferruginous concretions.

Moolaguntapadu pedon

This pedon was extending up to 1.10 m with five horizons. It was sandy clay loam to sandy clay in texture; granular structure in surface and sub-angular blocky structure in sub-surface horizons, fine to many fine roots and fine to many few pores. Patchy thick cutans were also observed in sub-surface horizon. Weathered gneiss mixed with ferruginous concretions parent material Pedons 2 and 4 were characterised by the presence of AC horizons whereas pedons 1, 3, 5, 6 and 7 were differentiated as A-B-C horizons. Haploidization, illuviation and *in situ* formation of clay were the main reasons responsible for the occurrence of differences between horizons. AC profiles in Vertisols of different districts of Andhra Pradesh were reported by Gurumurthy *et al.* (1996) [3]. Sidhu *et al.* (1998) [19] observed the B horizon development in Inceptisols of trans-Yamuna river transect. In sandy soils weak profile development was observed due to inert nature of parent material. Sehgal *et al.* (1993) [14] reported no profile development in sandy soils of different parts of India. Vadivelu and Bandhyopadhyay (1997) [22] noticed the horizon sequence of Ap, G, C₃ and C_i in sandy soils of Minicoy Island of Lakshadweep. Ramalakshmi *et al.* (1999) [11] observed the Ap, C_i, C₂, C₃ and C_i in sandy soils of Karlapalem mandal in Guntur district.

B. Different Physico - chemical properties of pedons

Particle size analysis results were discussed and different soil

physical properties are enlisted in the Table 2. For the particle size limiting diameters, USDA system was followed:

Table 2: Physical properties of the pedons of soil profiles of Singarayakonda mandal

Horizon	Depth (m)	Bulk density Mg m ⁻³	Particle density Mg m ⁻³	Water holding capacity %	Pore space %	Volume expansion %	Sticky point %
1 Ap	0.00 - 0.09	1.41	2.43	31.35	41.97	4.40	13.35
Ap ₂	0.09 - 0.25	1.43	2.45	32.40	41.63	4.60	14.40
Bti	0.25 - 0.42	1.46	2.46	33.80	40.65	5.00	15.25
Bt ₂	0.42 - 0.69	1.48	2.48	34.02	40.32	4.70	16.08
C	0.69 - 1.18	1.50	2.45	33.25	38.77	4.60	16.75
2 Ap	0.00 - 0.06	1.29	2.55	46.00	49.41	26.50	31.30
B	0.06 - 0.39	1.35	2.51	49.50	46.21	27.00	34.00
Bssi	0.39 - 0.65	1.36	2.56	52.60	46.87	27.82	34.51
Bss ₂	0.65 - 0.92	1.41	2.60	56.40	45.76	30.59	35.00
Bss ₃	0.92-1.24	1.48	2.52	57.65	41.26	31.00	38.45
AC	>1.24	1.54	2.58	60.75	40.31	32.43	39.00
3 Ap	0.00 - 0.08	1.32	2.60	50.00	49.23	25.60	32.40
Bi	0.08 - 0.32	1.34	2.54	49.55	47.24	28.40	33.60
Bj	0.32 - 0.64	1.41	2.60	52.66	45.76	29.30	36.56
Bw ₁	0.64 - 0.77	1.46	2.52	56.00	42.06	31.40	39.40
Bwj	0.77 - 1.08	1.52	2.58	58.00	41.08	33.50	41.00
4 Ap	0.00 - 0.11	1.31	2.58	47.50	49.22	27.50	34.50
Bwi	0.11 - 0.24	1.36	2.54	51.00	46.25	27.00	35.00
Bw ₂	0.24 - 0.52	1.40	2.41	52.50	41.90	29.50	37.50
Bssi	0.52 - 0.87	1.47	2.60	56.00	43.46	31.50	39.50
Bss ₂	0.87-1.32	1.48	2.52	58.90	41.26	32.85	41.85
AC	1.32 +	1.50	2.57	59.75	41.63	34.50	42.00
5 Ap	0.00 - 0.09	1.49	2.56	18.75	41.79	0.23	-
AB	0.09 - 0.34	1.52	2.49	18.15	38.95	0.20	-
Ci	0.34 - 0.69	1.54	2.62	17.25	41.22	0.18	-
c ₂	0.69 - 0.94	1.63	2.60	16.45	37.30	0.18	-
C ₃	0.94-1.36	1.60	2.59	15.25	38.22	0.16	-
q	1.36 +	1.61	2.57	14.75	37.35	0.17	-
6 Ap	0.00 - 0.16	1.42	2.44	30.13	41.80	5.65	13.56
B	0.16 - 0.54	1.44	2.49	31.05	42.16	5.80	14.25
Bti	0.54 - 0.78	1.47	2.50	32.90	41.20	6.01	15.08
Bt ₂	0.78-1.02	1.51	2.53	33.70	40.71	4.80	15.90
Bt ₃	1.02-1.27	1.49	2.50	33.95	40.40	4.75	16.72
C	1.27 +	1.47	2.48	32.70	40.72	4.66	17.01
7 Ap	0.00-0.11	1.37	2.52	30.75	45.63	4.25	15.41
Bvv ₁	0.11-0.35	1.43	2.50	31.62	42.80	4.56	15.91
Bwj	0.35 - 0.72	1.46	2.53	27.05	42.29	5.01	17.06
lit.	0.72-1.12	1.50	2.54	30.04	40.94	4.60	17.25
C	> 1.12	1.51	2.51	32.51	39.84	4.65	17.90

Clay Fraction

The results of the particle size analysis revealed that the clay content increased with depth in all the pedons that were studied. Pedon 2, 3 and 4 (black soils) had relatively higher clay content ranging from 27.96 to 55.75 per cent while in pedons 1, 6 and 7 (red soils) the clay content ranged from 28.10 to 42.64 per cent. In pedon 5 (sandy soil) the clay content was relatively less than in red soils and ranged from 8.76 to 9.76 per cent. Lowest clay content was recorded in Cj horizon of pedon 5 with the highest clay content of 9.76 per cent in Ap horizon in pedon 5.

Silt Fraction

Silt content ranged from 2.09 to 28.02 per cent. High silt content of 28.02 per cent was observed in B horizon of pedon 2 (black soil) while the lowest silt content was recorded in Ap horizon of pedon 5 (sandy soil). More or less increasing trend with depth was observed in pedon 7 (red soils) while the trend was not much variation in pedons 2, 3 and 4 (black soils). No particular trend was observed in pedon 5 (sandy soil).

Fine Sand Fraction

The fine sand fraction content varied from 22.70 to 78.70 per cent. Higher fine sand content of 78.70 per cent was observed in Ap horizon of pedon 5 (sandy soil) while the lowest fine sand content was noticed in Bw₂ horizon of pedon 3 (black soil). All the pedons did not show any trend with depth.

Coarse Sand Fraction

Coarse sand content varied from 3.00 to 29.35 per cent. Higher coarse sand content of 29.35 per cent was observed in C horizon of pedon 6 while the lowest coarse sand content was recorded in deeper horizons of pedons 2 and 3.

The black soil pedons studied were slightly to moderately alkaline in reaction. All black soils pedons exhibited increasing trend with depth due to accumulation of exchangeable bases. Lower pH values of red soils than black soils were observed. Chand and Mandal (2000) [2] also observed similar results in Alfisols of West Bengal. The pH of sandy soils ranged from 6.6 to 7.5. Similar type of soil reaction (neutral) was reported by Jassal *et al.* (2000) [7].

Black and red soils (pedons 1, 2, 3, 4, 6 and 7) showed EC ranging in between 0.09 and 2.28 dSm⁻¹ and the soils were non-saline. The organic carbon content of all the pedons varied from 0.12 to 0.69 per cent. Higher values were recorded in surface horizons due to accumulation of organic matter. Singh *et al.* (1995) [16] reported higher organic carbon content in granite-gneiss derived soils than that derived from Mahananda alluvium. All the pedons showed decrease in organic carbon with increase in depth. This was due to organic residues deposition on the surface horizons. Similar results were made by Ray *et al.* (2000) [12].

C. Details regarding Available nutrient status:

The details regarding available macronutrient status are enlisted in table 3 and micronutrient status is enlisted in table. 4. The available nitrogen content varied from 36 to 156 mg kg⁻¹ in all the soils. This content had shown a decreasing trend with depth. This might be due to decreasing trend of organic carbon with depth, as evident from positive correlation ($r = +0.84$) with organic carbon. Similar type of results was also observed by Sahoo *et al.* (1998) [13] in black soils of Rajasthan.

Available phosphorus content varied from 2.9 to 22.0 mg kg⁻¹ with decreasing trend with increase depth. Similar trend was observed by Gurumurthy *et al.* (1996) [3] in some soils of Andhra Pradesh. This showed the significant positive correlation ($r = +0.82$) with organic carbon and phosphorus ($r = +0.59$).

Medium to high status of available potassium was observed in black and red soils which showed decreasing trend with depth. Similar trend was reported by Jagannadham *et al.* (1995) [6]. High potassium content in the surface layers was

observed by Singh and Agarwal (1995) [16]. Potassium values were not much decreased in lower layers due to its origin from mineral source. Potassium showed significant positive correlation with organic carbon content ($r = +0.67$). Singh *et al.* (1998) [17] also observed similar type of positive correlation. Sandy soils were low in available potassium status.

Available sulphur content showed decreasing trend with variations 21 to 24.5 mg kg⁻¹ which were in accordance with the findings of Giridhar (1995) [4]. Available sulphur had shown a positive correlation ($r = +0.67$) with organic carbon. Black soils showed higher sulphur content than red soils. Higher sulphur values in Vertisols than Alfisols was reported by Trivedi *et al.* (1998) [21] in northern Madhya Pradesh.

Available zinc varied from 0.29 to 1.66 ppm in all the pedons. The highest value 1.66 ppm was observed in Bss2 horizon of pedon 2 (black soil) whereas the lowest value of 0.29 ppm was observed in Cj horizon of pedon 5 (sandy soil). The irregular trends of available zinc were observed in all the pedons except pedon 7 in which decreasing trend regarding depth was noticed.

Available copper content varied from 1.04 to 3.94 ppm. The highest value 3.94 ppm was observed in Ap horizon of pedon 2 (black soil) while the lowest value of 1.04 ppm was recorded in C4 horizon of pedon 5 (sandy soil). All the pedons did not follow any trend with depth except in which decreasing trend with depth was observed.

The available iron content in different horizons of the pedons varied from 2.00 ppm to 21.00 ppm. The highest value of 21.00 ppm was observed in Ap horizons of pedon 1 and 6, while the lowest value of 2.00 ppm was observed in sub-surface layers of pedon 5. The available iron content of all the pedons decreased from surface downwards.

Table 3: Macronutrients of the pedons of soil profiles of Singarayakonda mandal (mg kg⁻¹)

Horizon	Depth (m)	N	P	K	S
1 Ap	0.00 - 0.09	129	14.2	225	17.6
Ap ₂	0.09 - 0.25	110	12.4	210	15.0
Bt ₁	0.25 - 0.42	89	11.0	175	12.8
Bt ₂	0.42 - 0.69	81	8.9	160	11.4
C	0.69-1.18	67	6.0	150	10.6
2 Ap	0.00 - 0.06	145	20.5	291	24.5
B	0.06 - 0.39	131	20.0	287	20.0
Bssi	0.39 - 0.65	110	14.4	285	17.5
Bss ₂	0.65 - 0.92	96	10.6	223	12.6
Bss ₃	0.92-1.24	79	8.3	201	15.6
AC	>1.24	70	5.9	196	11.9
3 Ap	0.00 - 0.08	151	22.0	301	23.5
B ₁	0.08 - 0.32	136	12.5	284	19.4
B ₂	0.32 - 0.64	112	15.6	240	16.8
Bwi	0.64 - 0.77	86	12.1	192	11.9
BW ₂	0.77-1.08	64	7.9	186	10.8
4 Ap	0.00-0.11	156	19.5	289	20.5
Bwi	0.11-0.24	139	17.1	251	21.0
Bw ₂	0.24 - 0.52	120	16.0	232	16.5
Bssi	0.52 - 0.87	76	15.4	186	12.1
Bss ₂	0.87-1.32	70	11.0	171	10.2
AC	1.32 +	64	6.5	140	9.6
5 Ap	0.00 - 0.09	101	5.7	171	6.4
AB	0.09 - 0.34	92	5.1	132	5.1
C ₁	0.34 - 0.69	67	4.2	119	4.2
C ₂	0.69 - 0.94	51	4.6	112	3.1
C ₃	0.94-1.36	40	3.1	99	2.8
C ₄	1.36 +	36	2.9	89	2.1
6 Ap	0.00 - 0.16	121	15.0	240	18.0
B	0.16 - 0.54	103	13.4	225	14.0
Bt ₁	0.54 - 0.78	72	12.0	182	15.0
Bt ₂	0.78 -1.02	65	10.6	171	11.6

Bt3	1.02-1.27	60	8.2	162	8.9
c:	1.27 +	56	7.1	149	7.2
7 Ap	0.00 - 0.11	130	14.7	247	17.9
Bwi	0.11 - 0.35	119	13.0	210	15.2
Bw2	0.35 - 0.72	102	12.6	192	13.1
Bt ₁	0.72-1.12	86	10.5	171	10.5
C	> 1.12	61	8.6	154	8.2

Table 4: Micronutrient status of the pedons of soil profiles of Singarayakonda mandal

Horizon		Depth (m)	Zn (ppm)	Cu (ppm)	Fe (ppm)	Mn (ppm)
1	Ap	0.00 - 0.09	0.52	1.86	21.00	27.60
	Ap ₂	0.09 - 0.25	0.48	1.84	19.00	27.60
	Bt ₁	0.25 - 0.42	0.32	1.82	18.50	26.00
	Bt ₂	0.42 - 0.69	0.56	1.71	15.60	24.50
	C	0.69-1.18	0.51	1.62	14.00	20.00
2	Ap	0.00 - 0.06	0.92	3.94	9.50	20.60
	B	0.06 - 0.39	0.98	2.20	8.00	20.20
	Bss ₁	0.39 - 0.65	1.60	3.92	7.50	21.60
	Bss ₂	0.65 - 0.92	1.66	2.16	6.70	20.00
	Bss ₃	0.92-1.24	0.94	2.40	6.60	20.00
	AC	>1.24	0.91	2.06	5.90	20.80
	Ap	0.00 - 0.08	0.88	2.32	18.00	23.20
3	Bi	0.08 - 0.32	0.80	2.31	16.60	25.20
	B	0.32-0.64	0.74	2.38	16.50	21.20
	Bwi	0.64 - 0.77	0.61	2.36	14.00	19.10
	Bw ₂	0.77-1.08	0.62	2.38	14.80	20.80
	Ap	0.00 - 0.11	0.96	2.00	11.50	23.60
4	Bw ₁	0.11-0.24	1.08	2.38	10.10	21.00
	Bw ₂	0.24 - 0.52	0.94	2.38	9.75	23.00
	Bssi	0.52 - 0.87	0.91	2.26	8.50	18.80
	Bss ₂	0.87-1.32	0.87	2.12	8.00	21.20
	AC	> 1.32	0.88	2.17	7.60	21.00
5	Ap	0.00 - 0.09	0.54	1.41	2.76	17.40
	AB	0.09-0.34	0.56	1.28	2.34	17.60
	C ₁	0.34 - 0.69	0.36	1.70	2.30	15.60
	C ₂	0.69 - 0.94	0.34	1.62	2.15	16.25
	c ₃	0.94 -1.36	0.29	1.31	2.00	15.80
	Ci	> 1.36	0.38	1.04	2.00	14.00
	Ap	0.00 - 0.16	0.56	2.68	21.00	22.60
6	D	0.16 - 0.54	0.58	2.06	20.00	22.20
	Bt ₁	0.54 - 0.78	0.56	1.74	19.50	21.80
	Bt ₂	0.78 -1.02	0.49	1.62	17.50	22.40
	Bt ₃	1.02-1.27	0.41	1.74	13.00	20.20
	c	> 1.27	0.38	1.61	11.50	20.00
	Ap	0.00 - 0.11	0.47	1.10	19.00	20.20
	Bw ₁	0.11 - 0.35	0.44	1.28	16.50	17.20
7	Bw ₂	0.35 - 0.72	0.42	1.54	14.00	16.40
	Bt ₁	0.72-1.12	0.41	1.80	13.00	19.80
	c	>1.12	0.39	1.71	11.00	17.20

Conclusion

All the pedons were deep to very deep. ABC profile development was observed in black soil pedons of 2, 3 and 4 AC horizons were identified in black soil pedons (2 and 4) and sandy soil (pedon 5). Diagnostic (Bt) argillic horizon was identified in pedons 1, 6 and 7 and Bw horizon in pedons 3 and 7. Transitional horizon 'AB' was also identified in pedon 5. The nutrient status of the soils showed low to medium nitrogen and phosphorus, deficient to sufficient in available sulphur and were well supplied with potassium. Regarding micronutrients in black soils, zinc and iron were deficient in range, whereas copper and manganese were in sufficient range. In red soils, iron was sufficient, and zinc was deficient and copper and manganese were sufficient. In sandy soil, deficiency in zinc and iron was observed while copper and manganese were sufficient in range.

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