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Assessment of soil nutrient status in Kandukuru village of SPSR, Nellore District

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ABSTRACT

The present study was carried out to assess the nutrient status of kandukuru village in SPSR Nellore district of Andhra Pradesh. Two hundred surface soil samples (0-20 cm) from kandukuru village were collected and analyzed for their soil physico- chemical properties like pH, EC, OC and available macronutrients N, P, K. Analytical data was interepted and statistical parameters like range, mean, standard deviation were calculated. Soils were slightly acidic to alkaline (6.28-8.50) in reaction, non-saline (0.07-0.99) and low in organic carbon (0.04-0.93). The soils were in available available Nitrogen (85.0-257 Kg ha^{-1}), low to medium in available Phosphorus (5.20-50.6 Kg ha^{-1}) and medium to high in available Potassium (220-740 Kg ha^{-1}). The present study reveals that the study area has low OC, available N, P.

Key words: *Kandukuru Village, Nutrient status and Soil*

Soil, the most precious natural resource, contains all the necessary nutrients needed for agricultural growth. Soils are naturally heterogeneous. They varies from place to place and many of its properties vary in time too (Heuvelink and Webster, 2001). The causes of this heterogeneity within and between agricultural fields are due to soil forming processes and geology of the parent material with some influence coming from management practices.

Soil nutrients are essential elements and compounds present in the soil that are crucial for growth and development of plants. These nutrients are vital for various metabolic processes in plants influencing their overall health, productivity and quality. Under the changing climatic scenarios, sustaining agricultural production and enhancing input use efficiency is highly crucial to ensure food security in future. Crop productivity is considerably affected by soil characteristics such as soil organic carbon, nutrient availability, salinity, pH, and soil moisture**.** In this connection a study was conducted to assess the soil nutrient status in Kandukuru village with an objective to categorize the nutrient availability in various soils of Kandukuru village.

MATERIAL AND METHODS

The Kandukuru village geographically is blend of black and mixed type of black and red soils. A total of 200 surface (0-20 cm) composite soil samples were collected. The soil samples were air-dried, ground (< 2 mm) and analyzed for physicochemical 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 (1967). Organic carbon (OC) was determined using the Walkley and Black's wet oxidation method as outlined by Jackson (1973). Available nitrogen (N) was estimated by alkaline permanganate method (Subbiah and Asija 1956). Available phosphorus was measured using Olsen's extractant as described by Olsen *et al.* (1954) phosphorus in the extract was determined by Murphy and Riley method (using ascorbic acid as a reducing agent) as described by Watanabe and Olsen (1965). Available potassium (K) was determined using the ammonium acetate method (Jackson 1973).

The ratings for Organic carbon, available available nitrogen, P_2O_5, K_2O given by Tandon (2005) represented in Table 1.

Nutrient Index (NI)

Nutrient index (N.I) value is a measure of nutrient supplying capacity of soil to plants (Singh *et al.,* 2016). The nutrient index approach introduced by Parker *et al.* (1951), this index is used to evaluate the fertility status of soils based on the samples in each of the three classes, *i.e.,* low, medium and high. Nutrient index was calculated for the soil samples analyzed using the following formula:

Table 1 Soil test ratings of Organic carbon and available N, P_2O_5 and K_2O

Nutrient	units	Soil test rating		
		Low	Medium	High
Organic carbon	Percent	<0.5	0.5-0.75	>0.75
Available Nitrogen	Kg ha^{-1}	<280	280-560	>560
Available P_2O_5		<22.9	22.9-56.3	>56.3
Available K_2O		<129.6	129.6-336	>336

(N.I.) = [(NL × 1 + NM × 2 + NH × 3) / NT]

Where,

NT = total number of samples analyzed for a nutrient in given area

NL = number of samples falling in the low category of nutrient status

NM = number of samples falling in the medium category of nutrient status

NH = number of samples falling in high category of nutrient status

The index values are rated into various fertility categories viz., low (<1.67), medium (1.67-2.33) and high (>2.33) for available N, P and K.

RESULTS AND DISCUSSION

Soil physico-chemical properties

Soils of the Kandukuru village were neutral to alkaline (6.28 to 8.50) in reaction with a mean pH of 7.44, (Table 4). soils of the study area have five reaction classes *viz.,* slightly acidic (1%), neutral (32%), mildly alkaline (58.5%), moderately alkaline (8%) and strongly alkaline (0.5%) (Table 2). The variation in soil pH was related to parent material, rainfall and topography. Similar results were reported by Subbaiah *et al.* (2022) in soils of Kadapa district. All the soils in this region are non-saline (Table 3). The electrical conductivity of the study region ranges from 0.07 to 0.99 dS $m^{-1}$with a mean value of 0.24 dSm^{-1} (Table 4), due to excessive salt leaching and good drainage conditions that encouraged the removal of released bases by percolating and drainage water, Soil EC is within the normal range making the soils ideal for crop growth. Similar results were obtained by Jyothi *et al*. (2017). The organic carbon content in the study area was low to high and ranged from 0.04 to 0.93 per cent with a mean value of 0.33 per cent and standard deviation of 0.15(Table 4). Nearly 87 per cent of total samples has low, 11 per cent of samples has medium and 2 per cent of samples has high organic carbon content (Table 5). The low OC content in the soil samples may be due to quicker pace of organic matter breakdown, little to no input of organic manures, and sparse vegetation on the fields reduce the possibility of OC buildup in the soils Similar results were obtained by Vedadri and Naidu (2018).

Soil available macronutrients

The available nitrogen in the study region is low (Table 5). The available N content varied from 85.0 to 257 Kg ha^{-1} with a mean of 168 Kg ha^{-1}, standard deviation of 41.4 and NI value of 1.00. (Table 6). The low available N could be attributed to soil management, varied application of FYM and fertilizers to previous crops. Another probable factor could be the low organic matter content in these places due to semiarid climatic conditions, which enable rapid decomposition and removal of organic matter, resulting in N deficiency. (Subbaiah, 2020).

The available phosphorus in the study region is low to medium. Nearly 53.5 per cent of total samples has low and 46.5 percent has medium in phosphorus content (Table 5). It is ranged from 5.20 to 50.6 Kg ha^{-1} with a mean value of 24.0 Kg ha^{-1}, standard deviation of 12.3 and NI value of 1.47. (Table 6). Phosphorus is present in soil as solid phase with varying degree of solubility. When water soluble P is added to the soil, it is converted very quickly to insoluble solid phase by reacting with soil constituents. These reactions affect the availability of P and as a result of these reactions, a very small amount of total P is present in soil solution at any time reflected by

Table 2. Distribution of Soil reaction (pH) in the soils of Kandukuru village

Category	No. of Samples	% Samples
Slightly acidic (6.1-6.5)	2	1
Neutral (6.6-7.3)	64	32
Mildly alkaline (7.4-7.8)	117	58.5
Moderately alkaline (7.9-8.4)	16	8
Strongly alkaline (8.5 -9.0)	1	0.5

Table 3. Distribution of EC (dS m^{-1}) in the soils of Kandukuru village

Category	No. of Samples	% Samples
Non- Saline (0-2	200	100

Table 4 Soil Physico-chemical properties

Statistic	pH	EC dS m^{-1}	OC %
Range	6.28-8.50	0.07-0.99	0.04-0.93
Mean	7.44	0.24	0.33
SD	0.34	0.12	0.15

Table 5 Distribution of available nitrogen, P_2O_5, K_2O

Nutrient	Low		Medium		High	
	No. of samples	% samples	No. of samples	% samples	No. of samples	% samples
Organic carbon	174	87	22	11	4	2
Nitrogen	200	100	-	-	-	-
P_2O_5	107	53.5	93	46.5	-	-
K_2O	-	-	34	17	166	83

Table 6 Available macronutrients

Statistic	Available macronutrients (kg ha^{-1})		
	N	P_2O_5	K_2O
Range	85.0-257	5.20-50.6	220-740
Mean	168	24	456
SD	41.1	12.3	124
Nutrient Index (NI)	1.00	1.47	2.83

soil testing. High and continuous application of phosphatic fertilizers might have resulted in occurrence of medium phosphorus in soils (Siva Prasad *et al.*, 2023)

The available potassium in the study region was medium to high. The available potassium is varied from 220 to 740 Kg ha^{-1} with a mean value of 456 Kg ha^{-1}, standard deviation of 124 and NI value of 2.83. (Table 6). Nearly 17 per cent of total samples are under medium and 83 per cent of total samples has high in potassium content (Table 5). The greater potassium could be attributed to more intensive weathering, release of labile K from organic residues, use of K fertilizers, and upward translocation of potassium from deeper depths, together with capillary rise of ground water due to semiarid climatic conditions (Subbaiah *et al.*, 2023).

CONCLUSION

The study indicated that the Soils are slightly acidic to alkaline in reaction, non-saline and low in organic carbon. The soils were low in available Nitrogen with nutrient index value 1.0, low to medium in available P_2O_5 with nutrient index value of 1.47 and medium to high in available K_2O with nutrient index value of 2.83.

LITERATURE CITED

Heuvelink GBM, Webster R, 2001. Modelling soil variation: past, present, and future. *Geoderma*.100 (3-4): 269 – 301.

Jackson M L 1967. *Soil Chemical Analysis*, Prentice Hall India Pvt. Ltd.., New Delhi.

Jackson ML 1973. *Soil Chemical Analysis*. Oxford IBH Publishing House, Bombay. 38.

Jyothi V, PrasunaRani P, Ramana KV, Prasad P R K and Sreerekha M 2017. Physicochemical properties and soil fertility status of maize growing areas of Krishna delta, Andhra Pradesh. *The Andhra Agricultural Journal*. 64(4): 793-800.

Olsen S R, Cole C V, Watanabe F S and Dean L A 1954. Estimation of available phosphorus in soils by extraction with sodium bicarbonate. Circular from USDA. 921-939.

Parhad S L, Kondvilkar N B, Khupse S M, Reshma B, Sale R B and Patil T D 2018. Management of soil quality through assessment of macro and secondary nutrient status of Sindkheda tehsil of Dhule district (M.S.). *International Journal of Chemical Studies*. 6(3): 3098-3103.

Parker F W, Nelson W L, Winters E and Miles I E (1951). The broad interpretation and application of soil test information. Agronomy Journal, 43(3), 105-112.

Ramesh G and Hari Prasada Rao K 2005. Nutrient status of groundnut growing soils under rainfed conditions. *Indian Journal of Dryland Agricultural Research and Development*. 20(1): 35-40.

Singh G, Sharma M, Manan J and Singh G 2016 Assessment of soil fertility status under different cropping sequences in District Kapurthala. J Krishi vigyan, 5(1), 1-9.

Sivaprasad P N, Subbaiah P V, Rajasekhar N, Venkata Reddy I and Rajanarasimha M 2023. Assessment of Available Major and Micronutrient Status of Soils under Varied Cropping Systems of N.T.R district, Andhra Pradesh. *Indian Journal of Ecology*, 50(2): 345-350

Subbaiah B V and Asija C L 1956. A rapid procedure for the estimation of available nitrogen in soils. *Current Science*.25: 32.

Subbaiah P V 2020. Soil Fertility Assessment in Groundnut, Redgram, Blackgram, Sesamum Growing Areas of Krishna District in Andhra Pradesh. *The Andhra Agricultural Journal*, 67 (1): 47-55.

Subbaiah P V, Radhakrishna Y and Kaledhonkar M J 2022. Soil properties, land use and livelihood options in salt-affected areas of YSR Kadapa district, Andhra Pradesh, India. *Current Science*, 123(9):1136-1141.

Subbaiah P V, Radhakrishna Y and Kaledhonkar M J 2023. Soil Properties, Groundwater Quality And Land Use In Coastal Sand Ecosystem Of Andhra Pradesh. *International Journal of Agriculture Statistical Sciences*, 19(1): 365-371.

Tandon. Methods of analysis of soils, plants, waters, fertilizers & organic manures. Fertilizer Development and Consultation Organization. New Delhi, 2005.

Vedadri U and Naidu M V S 2018. Characterization, classification and evaluation of soils in semi-arid ecosystem of Chillakur mandal in SPSR Nellore district of Andhra Pradesh. *Journal of the Indian Society of Soil Science*. 66 (1): 9-19.

Watanabe F S and Olsen S R 1965. Test of ascorbic acid method for determining phosphorous in water and sodium bicarbonate extracts of soils. *Proceedings of Soil Science Society of America*. 29: 677-678.

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