



Macronutrient Status of Tobacco Growing Soils of Prakasam district, Andhra Pradesh

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ABSTRACT

The present study was carried out by collecting 100 representative soil samples from tobacco growing soils of Prakasam district. The soils were found to be neutral to moderately alkaline in reaction. All the soil samples were non-saline. The soils of the region were low to medium in organic carbon. The available nitrogen, phosphorus and potassium low to medium, low to high and medium to high, respectively. The available nitrogen, phosphorus were significantly and positively correlated with organic carbon.

Key words: *Tobacco growing soils, N, P, K, Nutrient index, Nutrient status.*

Tobacco, a quality conscious commercial crop is grown on the soils of Prakasam district. The tobacco growing area in Prakasam district was 71,593 ha. The wide variation in the physico-chemical and nutrient status of the soil. These properties influence the type, grade and quality of tobacco produced. Evaluation of fertility status of the soil before tobacco planting is a pre-requisite for optimum NPK fertilizer recommendation to get quality leaf. Among several other factors influencing tobacco productivity, soil fertility and fertilizer use contribute nearly 50 percent of yield and quality improvement (Krishnamurthy and Deosingh, 2002).

In order to sustain productivity of these soils and increases the yield, there is a need to characterize, which helps in identifying the existing problems and suggesting suitable reclamation measures. Keeping this in view the present study was carried out to characterize the soils in terms of physico-chemical properties and nutrient status of the soil.

MATERIAL AND METHODS

One hundred representative soil samples up to 15 cm depth were collected during the month of June 2014. Soil reaction was determined in 1:2.5 soil water suspension using glass electrode pH meter and the conductivity was estimated using Wheatstone conductivity bridge (Jackson, 1973).

Organic carbon content of the soils was determined by wet digestion method of Walkley

and Black as described by Jackson (1973). The nitrogen was analysed by alkaline potassium permanganate method (Subbiah and Asija, 1956). The phosphorus was analysed by Olsen's method (Watanabe and Olsen, 1965). Potassium in soil was estimated by neutral normal ammonium acetate (Muhr *et al.*, 1965). Nutrient index limits as adopted by Ramamoorthy and Bajaj (1969).

RESULTS AND DISCUSSION

Physico-chemical Properties

The data pertaining to soil reaction of tobacco growing soils of Prakasam district in terms of pH values are presented in table 1. Soils were neutral to moderately alkaline in reaction with values ranging from 7.2 to 8.4 with a mean value of 7.7. Critical observation of data revealed that 4 per cent soil samples were under neutral (6.6-7.3), 70 per cent samples were mildly alkaline (7.4-7.8) and remaining 26 per cent were under moderately alkaline (7.9-8.4) in reaction. Similar pH values were earlier reported by Ram *et al.* (2014a) in soils of Markapur mandal, Prakasam district. Those soils which were neutral to moderately alkaline in reaction which could be attributed to accumulation of clay, bases and lime.

The electrical conductivity of soils samples varied from 0.10 to 0.80 with a mean value of 0.27 dS m⁻¹ (Table 1). The soils were non-saline ranged from 0.10 to 0.80 with a mean value of 0.27 dS m⁻¹. All soils were non-saline due to continuous preparatory cultivations and agricultural practices

Table 1. Physico-chemical properties of tobacco growing soils of Prakasam district.

S.No	Name of the mandal	pH		EC (dS m ⁻¹)		OC (%)	
		Range	Mean	Range	Mean	Range	Mean
1	Naguluppalapadu	7.4-8.2	7.7	0.14-0.34	0.20	0.16-0.48	0.31
2	Ongole	7.4-8.4	7.9	0.12-0.71	0.31	0.01-0.71	0.23
3	Santhanuthalapadu	7.6-8.2	7.9	0.20-0.31	0.27	0.20-0.35	0.24
4	Tanguturu	7.2-8.0	7.5	0.19-0.55	0.35	0.19-0.55	0.35
5	Kandukuru	7.4-8.0	7.7	0.15-0.78	0.28	0.15-0.45	0.31
6	Jarugumalli	7.4-7.9	7.7	0.11-0.80	0.39	0.23-0.64	0.36
7	Maddipadu	7.4-8.0	7.6	0.10-0.30	0.20	0.01-0.67	0.32
8	Korisapadu	7.3-8.0	7.6	0.12-0.27	0.17	0.15-0.87	0.37
	Overall	7.2-8.4	7.7	0.10-0.80	0.27	0.01-0.87	0.31

Table 2. Nutrient status of tobacco growing soils of Prakasam district.

S.No	Name of the mandal	N (kg ha ⁻¹)		P ₂ O ₅ (kg ha ⁻¹)		K ₂ O (kg ha ⁻¹)	
		Range	Mean	Range	Mean	Range	Mean
1	Naguluppalapadu	135-235	175.70	9.80-61.60	29.45	605-990	838.50
2	Ongole	100-226	152.20	9.20-66.70	26.46	309-992	830.30
3	Santhanuthalapadu	141-185	156.26	5.60-28.70	16.54	470-875	800.45
4	Tanguturu	110-251	188.40	5.60-78.25	36.25	605-1003	889.66
5	Kandukuru	122-232	176.80	15.90-77.00	35.50	605-990	851.40
6	Jarugumalli	147-232	188.60	14.90-66.70	34.41	739-990	866.27
7	Maddipadu	82-251	188.33	14.90-98.00	39.04	457-1003	867.30
8	Korisapadu	110-210	170.40	5.60-51.30	26.80	403-979	827.00
	Overall	82-251	173.69	5.60-98.00	30.64	309-1003	845.40

Table 3. Nutrient index and fertility status of organic carbon, available nitrogen, phosphorus and potassium of tobacco growing soils of Prakasam district.

S.No	Name of the mandal	Nutrient index				Fertility status			
		Organic carbon	N	P	K	Organic carbon	N	P	K
1	Naguluppalapadu	1.00	1.00	1.50	3.00	L	L	L	H
2	Ongole	1.14	1.00	1.50	2.93	L	L	L	H
3	Santhanuthalapadu	1.00	1.00	1.50	3.00	L	L	L	H
4	Tanguturu	1.10	1.10	1.70	3.00	L	L	M	H
5	Kandukuru	1.00	1.00	1.92	3.00	L	L	M	H
6	Jarugumali	1.08	1.00	1.92	3.00	L	L	M	H
7	Maddipadu	1.07	1.00	1.79	3.00	L	L	M	H
8	Korisapadu	1.00	1.00	1.67	3.00	L	L	M	H
	Overall	1.05	1.01	1.69	2.99	L	L	M	H

L-Low, M-Medium, H-High

in tobacco growing areas. Similar results were reported by Krishnamurthy *et al.* (2007) in soils of Khammam district

The organic carbon content varied from 0.01 to 0.87 with a mean value of 0.31 per cent. (Table 1). As per the ratings given by Ramamurthy and Bajaj, (1969) 95 samples were low in organic carbon content (<0.5 %) while, the remaining 5 samples were medium (0.5-0.75 %). These results were similar with the findings of Ratnam *et al.* (2001) in soils of Ulavapadu mandal of Prakasam district. Low organic carbon content in these soils might be due to rapid oxidation of organic matter in semi-arid climatic conditions and less application of organic manures like FYM, compost (Krishnamurthy *et al.* 1981).

Nutrient status

The soil available nitrogen content of different mandals of Prakasam district ranged from 82 to 251 with a mean value of 173.69 kg ha⁻¹ (Table 2). Out of 100 soil samples 99 per cent soil samples were found to be low, whereas one per cent soil samples were medium in available nitrogen content as followed the ratings of Ramamoorthy and Bajaj (1969). The average nutrient index of the survey area as a whole with respect to available nitrogen was 1.01 (Table 3) which indicated that soils are low in nitrogen status. The low available nitrogen status of the soil might be attributed to low organic matter content, which may be evidenced by significant positive correlation ($r=0.430^{**}$) with organic carbon.

The data pertaining to phosphorus (Table 2) revealed that the available phosphorus content of tobacco growing soil samples of Prakasam district ranged from 5.60 to 98.00 kg ha⁻¹ with a mean of 30.64 kg ha⁻¹. These findings were in accordance with the previous findings of Krishnamurthy *et al.* (2007). As per the rating given by Muhr *et al.* (1965), 38 samples under low phosphorus content, 54 samples under medium phosphorus content and remaining 8 per cent soil samples were high in phosphorus content. Average nutrient index of the survey area as a whole with respect to available phosphorus was 1.69 (Table 3) which indicated that soils were medium in fertility status. Significant positive correlation ($r=0.318^{**}$) was found between

available phosphorus and organic carbon might be due to presence of about 50% of total phosphorus in organic form. Available phosphorus was significantly and negatively correlated with pH ($r=-0.457$).

The data regarding potassium of the soil samples presented in table 2 ranged from 309 to 1003 with a mean of 845.44 kg ha⁻¹. The results were in tune with the previous findings of Krishnamurthy *et al.* (1983 b). About 99 per cent soil samples were high in available potassium status and the remaining 1 per cent were medium in their status according to Muhr *et al.* (1965). The nutrient index value of 2.99 (Table 3) indicated that the soils under investigation were high in available potassium content. The high potassium status might be due to continuous release of potassium from reserve sources into the soil solution, high buffering capacity, continuous application of fertilizers (Krishnamurthy *et al.*, 1983a).

LITERATURE CITED

- Jackson M L 1973** *Soil chemical analysis*, Prentice Hall India Private Limited, New Delhi: 41.
- Krishnamurthy V and Deosingh K 2002** Flue-cured tobacco soils of India: their fertility and management. *Central Tobacco Research Institute*, Rajahmundry, pp. 31-33.
- Krishnamurthy V, Ramakrishnayya BV and Gopalachari N C 1981** Fertility status of soils growing FCV tobacco in Guntur district, Andhra Pradesh. *Technical Bulletin*. No. 04: 1-49, *Central Tobacco Research Institute*.
- Krishnamurthy V, Ramakrishnayya B V and Gopalachari N C 1983a** Fertility status of soils growing FCV tobacco in East Godavari district, Andhra Pradesh. *Technical Bulletin*. No. 06: 1-49, *Central Tobacco Research Institute*.
- Krishnamurthy V, Ramakrishnayya BV and Gopalachari N C 1983b** Fertility status of soils growing FCV tobacco in Krishna district, Andhra Pradesh. *Technical Bulletin*. No. 05: 1-53, *Central Tobacco Research Institute*.

- Krishnamurthy V, Mahadevaswamy M, Rao C C and Reddy P R S 2007** Effect of continuous cultivation of FCV tobacco on fertility status of soils of Periyapatna in Mysore district of Karnataka. *Tobacco Research*, 33 (1&2): 63-66.
- Muhr G R, Datta N P, Sankarasubramoney H, Leley V K and Dunabha R L 1965** *Soil testing in India*. 2nd ed, USAID - Mission to India, New Delhi.
- Ram R L, Sharma P K and Ahmed N 2014** Characterization and fertility assessment of soils of Markapur mandal, Prakasam district, Andhra Pradesh for sustainable land use planning. *Indian Journal of Agricultural Research*, 48 (2): 127-133.
- Ramamurthy B and Bajaj J C 1969** Available N, P and K status of Indian Soils. *Fertilizer News*, 14(8): 25-37.
- Ratnam U V, Seshaiiah B V, Veeraiah K and Naidu MV S 2001** Nutrient status of sapota (*Achras sapota*) growing soils of Ulavapadu mandal of Prakasam district, Andhra Pradesh. *The Andhra Agricultural Journal*, 48 (1&2): 42-47.
- Subbiah B V and Asija C L 1956** A rapid procedure for the estimation of available nitrogen in soils. *Current Science*, 25: 259-260.
- Watanabe F S and Olsen S R 1965** Test for ascorbic acid method for determining phosphorus in water and sodium bicarbonate extracts of soil. *Soil Science Society of American Journal*, 29: 677-678.

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