Bulletin of Environment, Pharmacology and Life Sciences
Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [3] 2017: 01-04
©2017 Academy for Environment and Life Sciences, India
Online ISSN 2277-1808
Journal's URL:http://www.bepls.com
CODEN: BEPLAD
Global Impact Factor 0.533
Universal Impact Factor 0.9804
NAAS Rating 4.95

FULL LENGTH ARTICLE **OPEN ACCESS**

Fertility status of salt affected soils in Srikalahasthi division of Chittoor district of Andhra pradesh

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ABSTRACT
A reconnaissance survey was conducted to study the macronutrient status of some salt affected soils collected form Srikalahasthi division of Chittoor districtof Andhra pradesh. The soil samples were collected from representative areas in the mandals and analyzed for organic carbon, available nitrogen, phosphorous, potassium and sulphur and these were categorized and classified accordingly. All most all the salt affected soils showed low in organic carbon and available nitrogen content. Majority of soils showed medium in phosphorous. Potassium content of soils varied from low to high. Sulphur content was sufficient in majority of soils. Significant positive correlations were found to exist between organic carbon and available nitrogen, phosphorous and potassium status of the soil under study.
Keywords: *macronutrients, organic carbon, nitrogen, phosphorous, potassium and Sulphur.*

Received 23.06.2017 Revised 10.07.2017 Accepted 22.08. 2017

INTRODUCTION

Soil testing is necessary for making fertilizer recommendations to increase crop production. Indiscriminate use of fertilizers, however may add to salinity besides extra expenditure to the farmers. Salinity patches were noticed in Srikalahasthi division of Chittoor district of Andhra pradesh which restricting the agricultural production. The saline and alkali soils are usually low in nitrogen, medium to high in phosphorous and potassium. However, precise information on the fertility status of the salt affected soils of Srikalahasthi division of Chittoor district is lacking and hence the present investigation was undertaken.

MATERIALS AND METHODS

The study area covers salt affected patches of Srikalahasthi divisionin Chittoor district, Andhra pradesh which includes major cropping areas with different soils types. 152 soil samples were collected from Srikalahasthi division comprising of five mandals viz., Srikalahasthi, Yerpedu, B.N.Kandriga, Thotembedu and K.V.B.Purammandals were selected for the study. All the soil samples collected were air dried and ground to pass through 2 mm sieve. Collected samples were analyzed for organic carbon, available nitrogen, phosphorous, potassium, sulphur and classified accordingly (Table 1). Organic carbon by rapid titration method (Walkley and Black 1934). Available nitrogen (N) was estimated by alkaline permanganate method of subbiah and Asija (1956). Available Phosphorous (P) was extracted with 0.5 M $NaHCO_3$solution buffered at pH8.5 (Olsen *et al*. 1954). Phosphorous in the extract was determined by developing blue color using Ascorbic acid method (Watanabe and Olsen 1956). Available potassium (K) was extracted by shaking the requisite amount of soil sample with 1 N NH_4OAc (pH 7.0) solution (1:5 soil: solution ratio) for 5 minutes. The filtrate was used for determining available K with the help of flame photometer (Jackson, 1973). Available sulphur (S) in the soil was extracted with 0.15% $CaCl_2$ and sulphur in the extract was determined turbidimetrically using $BaCl_2$ crystals (Hesse, 1971). Simple correlation studies between organic carbon and macronutrients were carried out as per the procedure described by Gomez and Gomez (1984).

RESULTS AND DISCUSSION

Organic carbon :

Organic carbon in these soils ranged between 0.03 to 1.07 per cent with an average value of 0.33. The study pertaining to organic carbon status of these soils revealed that out of 152 soil samples, 119, 24 and 9 soil samples were low, medium, and high in organic carbon status of soils, respectively.As per the rating chart for organic carbon proposed by Ramamoorthy and Bajaj (1969). Majority of soils of all mandals studied had shown very low organic carbon content. Similar results were reported by Rama Krishna Prasad *et al*. (1998) in black and alluvial soils of Andhra Pradesh. The low organic carbon of soils could be ascribed to rapid decomposition of organic matter in semi-arid climatic conditions existing in the study area. Another reason for registering low organic carbon status in the study area was possibly because of lesser application of organic manures *viz.,* FYM by the farmers, high temperatures and good aeration in the soil which increases the rate of oxidation of organic matter.

Available Nitrogen:

The available nitrogen content of salt affected soils was ranged from 18.9 to 554.40 kg N ha^{-1} with a mean value of 139.03 kg N ha^{-1}. Among 152 soil samples studied for available nitrogen, 133 soil samples (87.5 per cent) and 19 samples (12.5 per cent) were found to be low and medium in available nutrient status of the soils, respectively. It is well known fact that efficiency of applied nitrogen was very low in salt affected soils in which the alkaline conditions would exists. These alkaline conditions were responsible for loss of nitrogen through mechanism like ammonia volatilization. De Datta and Buresh (1989) also reported that efficiency of supplied nitrogen was very low due to fact that nitrogen is lost through various mechanisms like ammonia volatilization, nitrification succeeding denitrification, chemical and microbial fixation, leaching and run off which resulted in low amount of nitrogen in cultivated soils. The low available nitrogen status of the soils could also be attributed to the low amount of organic matter recorded in the study area. This was confirmed by obtaining the significant and positive correlation between organic carbon and available nitrogen (r = 0.699**).

Available Phosphorous:

The available phosphorous content of soil samples ranged from 0.87 to 111.00 kg ha^{-1} with a mean value of 26.96 kg ha^{-1}. The wide range of available phosphorous was also observed in different mandals of Srikalahasthi division.Out of 152 soil samples studied for available phosphorous, 36 (23.68per cent), 54 (35.52per cent) and 62 (40.78per cent) soil samples were low, medium and high in available soil phosphorous, respectively as per the rating chart given by Muhr*et al.* (1965). Adequate amount of available phosphorous in majority of soils (76.3 per cent) might be attributed to continuous application of phosphate fertilizers to crops which resulted in build up of phosphorous as efficiency of applied phosphorous was low and it comes in available form very slowly. Similar results were also reported by Sharma *et al.* (2008). Plants take up only 10-40 per cent of applied phosphorous during crop growing season and the rest resides in soils as soluble products (Aulakh and Pasricha, 1999). Presence of considerable amount of available phosphorous in the salt affected soils was also reported by Ravikumar*et al.* (2007), Polara *et al.* (2006) and Anitha*et al.* (2001).

Available potassium

The available potassium content of soils of study area ranged from 33.94 to 506.65 kg ha^{-1} with a mean value of 194.69 kg ha^{-1}. The study reveals that out of 152 soil samples studied for available potassium, 18 (11.84 per cent), 81 (53.28 per cent) and 53 soil samples (34.86 per cent) were said to be high, medium and low, respectively as per the rating chart for available potassium established by Muhr*et al.* (1965). It was more explicit that nearly 65.12 per cent of soil samples contains adequate amount of available potassium. It might be attributed to the prevalence of potassium rich minerals like illite and feldspar. These results were in confirmity with findings of Bhangu and Sindhu (1991) and Ravikumar*et al*. (2007).

Available sulphur

The available sulphur content of soils of study area ranged from 4.05 to 135.01 mg kg^{-1} with a mean value of 40.29 mg kg^{-1}. The lowest value of 4.05 mg kg^{-1} was seen Yerpedu mandal and the highest value of 135.01 mg kg^{-1} was observed in B.N.Kandriga mandal. Wide variation in sulphur content was observed in almost all the mandals of Srikalahasthi division.Out of 152 soil samples collected from different mandals of Srikalahasthi division, 77.63 per cent of soil samples showed sufficient in available sulphur content while only 22.37 percent of soil samples showed deficient in available sulphur content. High concentration of available sulphur might be due to continuous application of sulphur fertilizer *viz.,* super phosphate, ammonium sulphate, gypsum etc. to satisfy the needs of growing plants. Similar results were given by Sharma *et al*. (2008) in Amritsar district in Punjab and also by Nega*et al.* (2001).Presenceof appreciable amount of sulphur in irrigation water might also be the reason for sufficient amount of accumulating available sulphur in soils (Pasricha*et al*., 2001).

Relationship between organic carbon and macro nutrients

A positive and significant correlation was observed between organic carbon and available nitrogen, phosphorous and potassium (Table 3).Similar results were also proposed by Vijaya Kumar (2009) in soils of Ongole division of Prakasam district in Andhra Pradesh.

Table 1. Criteria for assessment of organic carbon and macro nutrients in soils

S.No	Nutrient	Low	Medium	High	Proposed by
1.	Organic carbon (per cent)	< 0.5	0.5-0.75	> 0.75	Ramamoorthy and Bajaj, 1969
2.	Available N (Kg ha^{-1})	< 280	280-560	> 560	
3.	Available P(Kg ha^{-1})	< 10	10-24.6	> 24.6	Muhr*et al*.,1965
4.	Available K (Kg ha^{-1})	< 108	108-280	> 280	
5	Available sulphur (mg kg^{-1})	Sufficient	> 10 mg kg^{-1}		
		Deficient	< 10 mg kg^{-1}		

Table 2. organic carbon and macro nutrient status of salt affected soils of Srikalahasthi division of Chittoor district of Andhra pradesh

Soil nutrient	Minimum	Maximum	Mean
Organic carbon (per cent)	0.03	1.07	0.33
Available Nitrogen (Kg ha^{-1})	18.90	554.40	139.03
Available Phosphorous (Kg ha^{-1})	0.87	111.00	26.96
Available Potassium (Kg ha^{-1})	33.94	506.65	194.69
Available Sulphur (mg kg^{-1})	4.05	135.01	40.29

Table 3. Correlation between organic carbon and macro nutrients

	OC	N	P	K
OC	1	0.699	0.387	0.382
N		1	0.425	0.311
P			1	0.160
K				1

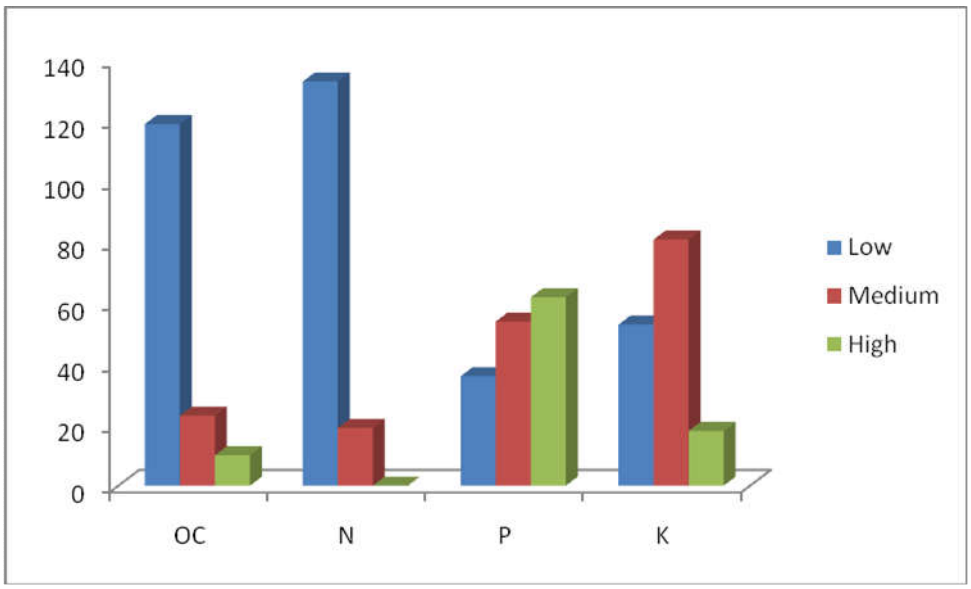

Fig: Proportion soil samples showing status of OC, N, P, K

CONCLUSION

Salt affected soils of Srikalahasthi division of Chittoor district of Andhra pradesh showed poor in organic carbon and nitrogen content due to the high temperatures and loss of nitrogen in different forms. Phosphorous had shown wide variation in all the mandals of Srikalahasthi division. Adequate amount of Potassium and Sulphur was observed in all the mandals of Srikalahasthi division.

REFERENCES

1. Anitha, G., Prasad, B.R and Ratnam, M. 2001. Fertility status and physicochemical properties of soils at Konanki ORP site, Marturumandal, Prakasham district of Andhra Pradesh. *The Andhra Agricultural Journal*. 48(1&2):48-55.
2. Aulakh, M.S. and Pasricha, N.S. 1999. Effects of rate and frequency of applied P on crop yield, P uptake, and fertilizer P use efficiency and its recovery in groundnut- mustard cropping system. *Journal of Agricultural Sciences, Cambridge.* 132: 181-188.
3. Bhangu, S.S and Sindhu, P.S. 1991. Potassium mineralogy of five benchmark soils of Central Punjab. *Journal of Potassium Research*. 18: 243-245.
4. De Datta, S.K and Buresh, R.J. 1989. Integrated N management in irrigated rice. *Advances in Agronomy.* 10: 143-169.
5. Gomez, K.A and Gomez, A.A. 1984. *Statistical procedures for Agricultural Research*. Second edition, Wiley - Inter Science Publications, New York.
6. Hesse, P.R. 1971. *A text book of soil chemical analysis*. John Murray publication Ltd., London.
7. Jackson, M.L. 1973. *Soil Chemical Analysis*. Oxford IBH Publishing House, Bombay. 38.
8. Muhr, G. R., Datta, N. P., Sankarasubramoney, H., Leley, V. K and Dunabha, R. L. 1965. *Soil testing in India*. Second edition, USAID Mission to India, New Delhi.
9. Nega, Y., Srikanth, K., Sudhir, K and Sharanappa. 2001. Sulphur status of an Alfisol under continuous cropping and fertilization schedule. *Indian Journal of Agricultural Sciences*.71 (5):334-336.
10. 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.*United States, Department of Agriculture Circular No*. 939.
11. Pasricha, N.S., Sharma, B.D., Arnon, C.L and Sindhu, P.S. 2001.Potassium distribution in soils and ground waters of Punjab. *Journal of Potassium Research*. 17: 1-13.
12. Polara, K.B., Polara, J.V and Patel, M.S. 2006. Fertility status of salt affected soils of NorthWest Agro climatic zones of Gujarat. *Journal of the Indian Society of Coastal Agricultural Research.* 24(1): 48-49
13. Rama Krishna Prasad, P., Subbaiah, G.V., Satyanarayana, V and Srinivasa Rao, Ch.1998. Water retention characteristics of predominant soil types in command areas of Krishna, Godavari and Sarada river of Andhra Pradesh. *Journal of the Indian Society of Soil Science.* 46:171-176.
14. Ramamoorthy, B and Bajaj, J.C. 1969. Available N, P and K status of Indian Soils. *Fertilizer News.*14 (8):25-37
15. Ravikumar, M.A., Patil, P.L and Dasog, G.S. 2007. Mapping of Nutrients status under 48A distributary in Malaprabha right bank command of Karnataka by geographic information system technique-I: Major-nutrients. *Karnataka Journal of Agricultural Sciences*. 20 (4):735-737.
16. Sharma, P.K., Anil Sood, Setia, R.K., Tur, N.S., Deepak Mehra and Singh, H. 2008a. Mapping of macronutrients in soils of Amritsar district (Punjab)-A GIS approach. *Journal of the Indian Society of Soil Science*. 56 (1):34-41.
17. Subbaiah, B.V and Asija, C.L. 1956. A rapid procedure for the estimation of available nitrogen in soils. *Current Science*. 25: 259-260
18. Vijaya Kumar, M. 2009. Survey of salt affected soils of Ongole division, Prakasam district, Andhra Pradesh. *M.Sc (Ag.) thesis*, submitted to Acharya N.G. Ranga Agricultural University, Hyderabad.
19. Walkley, A and Black, C. A. 1934. Estimation of soil organic carbon by the chromic acid titration method. Soil Science. 37: 29-38.
20. Watanable, F.S and Olsen, S.R, 1965. Test of Ascorbic acid method for determining phosphorus in water and sodium bicarbonate extracts of soil. *Soil Science Society of America Journal*. 29: 677-678.

CITATION OF THIS ARTICLE

M.Manimalika, A.Prasanthi and N. Sunitha. Fertility status of salt affected soils in Srikalahasthi division of Chittoor district of Andhra pradesh. Bull. Env. Pharmacol. Life Sci., Vol 6 Special issue [3] 2017: 01-04