Available online at www.ijpab.com

DOI: http://dx.doi.org/10.18782/2582-2845.8415

ISSN: 2582 – 2845

Ind. J. Pure App. Biosci. (2020) *8*(6), 425-430

Indian Journal of Pure & Applied Biosciences

Peer-Reviewed, Refereed, Open Access Journal

Research Article

Characterization of Soils of Shivamogga District for Primary and Micronutrients

Rekha, M. V.*, Hanumanthaswamy, B. C. Nagaraja, R. and Arun Kumar, P.

Krishi Vigyana Kendra, UAHS, Shivamogga

*Scientist (Soil Science & Agricultural Chemistry), KVK, UAHS, Shivamogga, Navule-577204

*Corresponding Author E-mail: rekhamv17@gmail.com

Received: 9.11.2020 | Revised: 14.12.2020 | Accepted: 18.12.2020

ABSTRACT

The study was conducted to know the fertility status of soils of Shivamogga district. The soil samples which were analyzed at Krishi vigyana Kendra, Shivamogga during 2018-19 and 2019-20 subjected for primary and micronutrient characterization. Soil characterization revealed that soil samples were slightly acidic to neutral in reaction with low soluble salts. The available nitrogen and potassium were low to medium in range. The available phosphorus was higher in nature. Among micro nutrients except Zinc other nutrients like Copper, Iron and Manganese were sufficient in nature.

Keywords: *Soil Fertility, Major nutrients, Micro-nutrients.*

INTRODUCTION

Nutrient availability plays an important role in crop production. Availability of nutrients depends on soil, climate, cropping system, management practices etc. (Raysschaert et al., 2004). Evaluation of soil fertility thus, serves as one of the most important tool to achieve higher crop yields. Soil tests provide information about nutrient availability upon which the fertilizer recommendations could be made for maximizing crop yields. Maintenance of optimum concentration of plant nutrient in soil has significant agronomic importance, as they are vital to maintain physiological plant functions. The availability of nutrients is very sensitive to changes in soil environment and they are largely influenced by soil reaction (Lindsay, 1972). These soil properties are directly influenced by native soil properties and crop management practices. The present study was conducted systematically for Shivamogga district to assess nutrients availability in soil.

Shivamogga is one of the districts lies in the malnad region, there are 7 taluks comes under this district. Among these Bhadravathi, Shikaripura and Shivamogga taluks comes under Southern transitional zone (zone-7) and some parts of the district namely, Soraba, Hosanagara, Sagara and Thirthahalli taluks belongs to hilly zone (zone-9).

Cite this article: Rekha, M.V., Hanumanthaswamy, B.C., Nagaraja, R., & Arun Kumar, P. (2020). Characterization of Soils of Shivamogga District for Primary and Micronutrients, *Ind. J. Pure App. Biosci. 8*(6), 425-430. doi: http://dx.doi.org/10.18782/2582-2845.8415

The Shivamogga district located 640m above sea level as the district lies in the tropical region, rainy season occurs from June to October. The annual rainfall of the district is 1813 mm and the average temperature is 25.8 °C. The sown area of the district is 264077 ha. The major soil forms found in Shivamogga district are red gravelly red clay soil; lateritic gravelly and lateritic clay soil; medium deep black soil and brown forest soil. The major crops grown in the district are paddy, maize, areca nut and ginger. Shivamogga district contributing 4% to GSDP of Karnataka from agriculture and other allied sector.

MATERIALS AND METHODS

The present study was conducted at Krishi Vigyana Kendra Shivamogga during 2018-19 and 2019-20. Soil samples were collected from the farmers before application of organic manure and fertilizers. Farmers collected the samples from the depth of 30-45cm depending upon the cropping system. Collected soil samples were air dried and sieved (2 mm). Processed soil samples were analysed for soil pH and EC (1:2.5 soil: water ratio) by pH meter (Model Systronics 361) and EC meter; Among major soil nutrients, alkaline potassium permanganate method for available-N (Subbiah & Asija, 1956); ammonium molybdate complex colorometric method for available - P_2O_5 (Jackson, 1973) and ammonium acetate extractant - flame photometric method for available K_2O (Jackson, 1973) were adopted. DTPA extractable micronutrients viz. Fe, Mn, Zn and Cu by Atomic Absorption Spectrophotometer (Lindsay & Norvell, 1978). Finally, these observations were subjected to suitable statistical tests for interpretations.

RESULT AND DISCUSSION

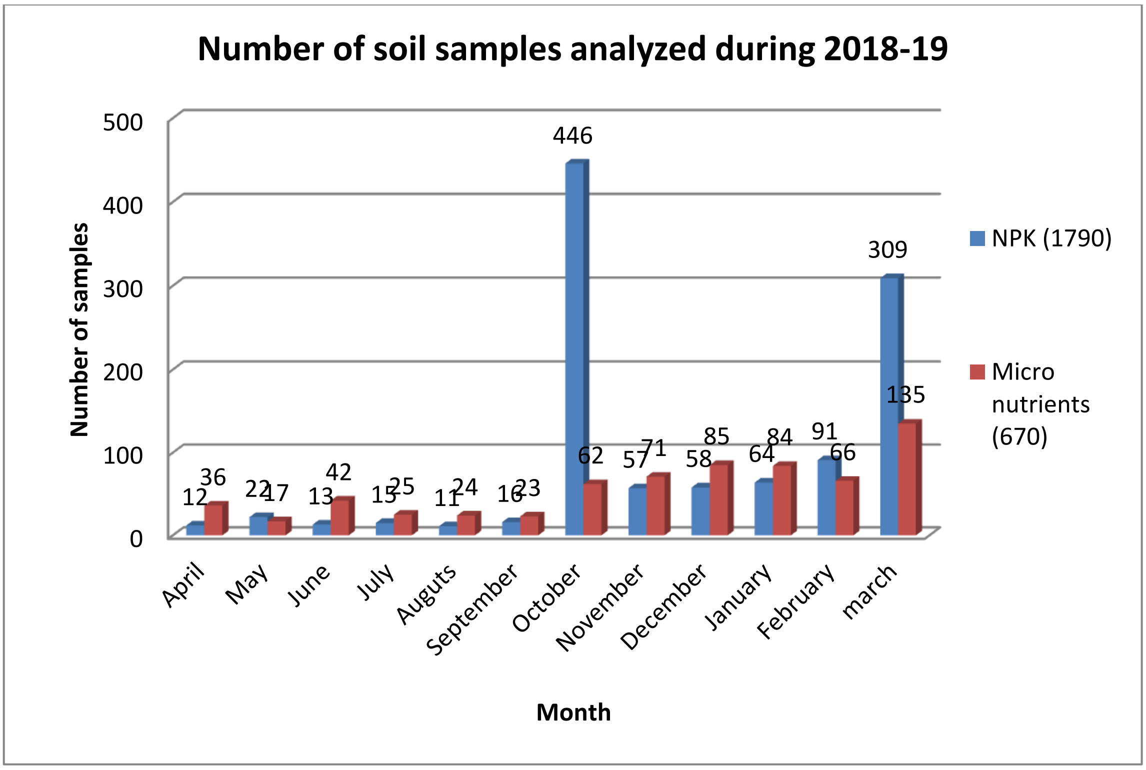
Totaly 1790 samples in 2018-19 and 1702 soil samples in 2019-20 were analyzed at KVK, Shivamogga. The more number of soil samples were analyzed during the month of October and November followed by May and March month (Graph-1). These are the best months for fertilizer application in arecanut, ginger and paddy crops. During these months the farmers must collected soil samples from their gardens for testing the soil samples and apply the fertilizers based on soil test result.

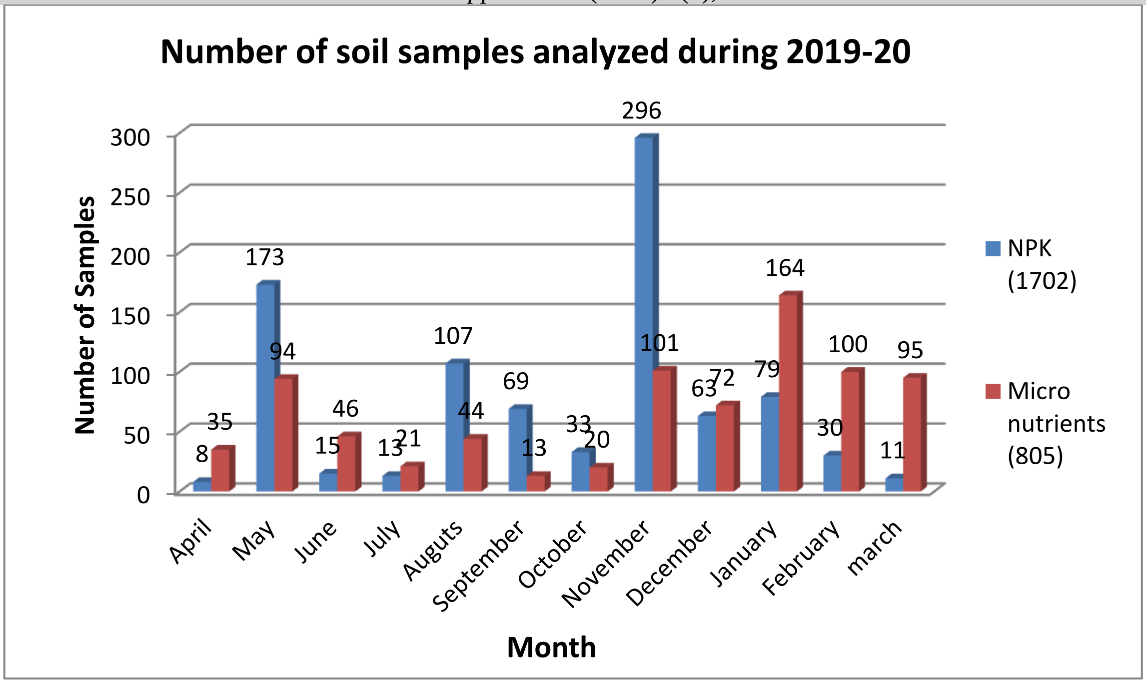
The status of pH and EC, among soil samples are given in Table 1 and 2. During 2018-19, 1790 samples and 2019-20, 1702 soil samples were analyzed. Nearly 70 per cent of soil samples (n = 1189) exhibited a pH range of 6.5-7.5 (Neutral). While, 307 samples (17.20 %) and 352 samples (20.68%) were acidic in nature (< 6.5) remaining 9 per cent of the samples were alkaline in nature (>7.5), 4.50 and 4.48 is the lowest pH and 8.78 and 8.68 is the highest pH recorded among the samples in 2018-19 and 2019-20, respectively. The acidic nature of the soil is due to their parent materials were acid and initially low in the basic cations or because these elements have been removed from the soil profile by normal rainfall leaching or the harvesting of crops (Ananth Narayana & Ravi, 1997). The electrical conductivity of the soil is < 0.8 dS/m in 69.40% and 95.30 per cent of the samples. Only 45 samples in 2018-19 % 7 samples in 2019-20 were found > 2.5 dS/m. The low EC indicated that the soluble salts were leached out of soil under high rainfall area; consequently there was no salt accumulation in these soils (Rao, 1992).

The data on available major nutrient status is presented in Table 1. The extent of available nitrogen content varied from 77.40 to 825.60 kg ha^{-1} in 2018-19 and 51.60 (low) to 903 kg ha^{-1} (high) in 2019-20. Most of the samples were found low to medium in nature. Among these 61.50 per cent samples (n=1101) and 57 per cent (n=976) of the samples were in the medium range of 280-560 N kg/ha in 2018-19 and 2019-20, respectively. The medium nitrogen attributed to recycling of biomass (leaf-litter and residue and addition of manures). Variation in available-N in soil may be attributed by different cropping systems and decomposition of SOM. Continuous application of organic matter is known to enhance available N content of soil (Korikanthimath et al., 2002 & Stangel et al., 1994). The longer the dry spell, the higher is the formation of mineral and nitrate N (Stewar, 1988).

The available phosphorus content varied from 11.32 (low) to 848.73 kg/ha (high). More than half of the samples were found high in nature (> 59.10% and 62.10%). Among 1702 samples only 5.58 per cent (n=95) of the samples were in the low range of < 22.9 kg P_2O_5/ha. Nearly 32.31 per cent samples were medium in available phosphorus content (< 22.9-56.3 kg/ha). Excessive phosphorus in soil may caused by repeated use of manures or non-organic fertilizers. Unlike other plant nutrients, phosphorus does not leach in the soil; too much phosphorus in the soil may build up over the course of several growing seasons (Anand swarup & Chillar, 1986).

The data on available potassium in soils of Shimogga district are presented in Table 1. The available potassium was found to be in the range of 17.47 to 846.00 K_2O kg/ha in 2018-19 and 54.38 to 1205.00 K_2O kg/ha in 2019-20. More than 50 per cent of the soils exhibited medium potassium levels (144-336 kg K_2O kg/ha) and 1/3rd of the samples had low range of available potassium and few soil samples were found in higher range of available potassium (>336 kg K_2O kg/ha). The variation in the availability of potassium may be attributed to intensive agricultural practices in irrigated areas leading to the removal of soil potassium (Balangoudar, 1989).





Graph 1: Number of soil samples analyzed at KVK, Shivamogga during 2018-19 and 2019-20

Table 1: Status of pH, EC and Major Nutrients in soils of Shivamogga district during 2018-19 and 2019-20

Chemical characteristics of soils	**No. of samples (n)**			**Lowest**	**Highest**
pH	**< 6.5 (Acidic)**	**6.5-7.5 (Neutral)**	**>7.5 (Alkaline)**		
2018-19	307	1327	156	4.50	8.78
	17.20%	74.10%	8.70%		
2019-20	352	1189	161	4.48	8.68
	20.68 %	69.86 %	9.45 %		
EC (dS/m)	**<0.8 (Low)**	**0.8-2.5 (Medium)**	**>2.5 (High)**		
2018-19	1242	503	45	0.015	2.60
	69.40%	28.10%	2.50%		
2019-20	1622	73	7	0.012	3.69
	95.30 %	4.29 %	0.41 %		
Extent of Primary nutrients in soil	**No. of samples (n)**			**Lowest**	**Highest**
Available Nitrogen (kg N ha^{-1})	**Low (< 280)**	**Medium (280 – 560)**	**High (> 560)**		
2018-19	584	1101	105	77.40	825.60
	32.60%	61.50%	5.90%		
2019-20	710	976	16	51.60	903.00
	41.72 %	57.34 %	0.94 %		
Available Phosphorus (kg P_2O_5 ha^{-1})	**Low (< 22.9)**	**Medium (22.9 - 56.3)**	**High (> 56.3)**		
2018-19	159	573	1058	11.32	848.73
	8.90%	32.00%	59.10%		
2019-20	95	550	1057	12.21	493.20
	5.58 %	32.31 %	62.10 %		
Available Potassium (kg K_2O ha^{-1})	**Low (< 144)**	**Medium (144 - 336)**	**High (> 336)**		
2018-19	525	1091	174	17.47	846.00
	29.30%	60.90%	9.70%		
2019-20	412	920	370	54.38	1205.00
	24.21 %	54.05 %	21.74 %		

Table 2: Status of micro nutrients in soils of Shivamogga district during 2018-19 and 2019-20

Extent of Number of Micro nutrients in soil	No. of samples (n)		Lowest	Highest
DTPA-extractable Copper (Cu in ppm)	**Deficient (< 0.2 ppm)**	**Sufficient (> 0.2 ppm)**		
2018-19	34	636	0.11	28.74
	5.07%	94.93%		
2019-20	50	755	0.08	39.22
	6.21 %	93.79 %		
DTPA-extractable Zinc (Zn in ppm)	**Deficient (< 0.6 ppm)**	**Sufficient (> 0.6 ppm)**		
2018-19	334	336	0.06	4.42
	49.85%	50.15%		
2019-20	367	438	0.14	14.40
	45.59 %	54.41 %		
DTPA-extractable Iron (Fe in ppm)	**Deficient (< 4.5 ppm)**	**Sufficient (> 4.5 ppm)**		
2018-19	41	629	1.18	43.16
	6.12%	93.88%		
2019-20	59	746	2.42	57.20
	7.33 %	92.67 %		
DTPA-extractable Manganese (Mn in ppm)	**Deficient (< 2.5 ppm)**	**Sufficient (> 2.5 ppm)**		
2018-19	38	632	0.14	30.50
	5.67%	94.33%		
2019-20	73	732	0.32	66.08
	9.07 %	90.93 %		

The data on DTPA extractable micronutrients in 670 samples during 2018-19 and 805 samples during 2019-20 were analyzed and presented in Table 2. The amount of DTPA-Cu, DTPA-Fe and DTPA-Mn were sufficient in 90 per cent of the samples. Only 34 and 50 samples in DTPA-Cu, 41 and 59 samples in DTPA-Fe, 38 and 73 samples in DTPA-Mn were deficient in 2018-190 and 2019-20, respectively. DTPA-Cu in soils ranged from 0.08 to 39.22 ppm, DTPA-Fe in soils ranged from 1.18 to 57.20 ppm and DTPA-Mn in soils ranged from 0.14 to 66.08 ppm. The soil pH has a major influence on solubility of iron containing minerals and hence its availability in soil is good (Lindsay, 1972 & Obreza et al., 1993). The solubility of Fe and Mn increases as the soil environment changes from aerobic to anaerobic due to reduction of Fe^{+3} to Fe^{+2} (Arora & Shekon, 1981 & Lamture & Patil, 2015). Frequent irrigation practices in irrigated areas and Heavy rainfall in hilly regions might have enhanced iron availability.

In terms of distribution of DTPA-Zn, nearly half of the samples were found in sufficient range (> 0.6 ppm) while, other half of the samples recorded deficient in DTPA-Zn (< 0.6 ppm). DTPA-Zn in soils ranged from 0.06 to 4.42 in 2018-19 and 0.14 to 14.40 ppm in 2019-20. These variations among different irrigation system were may be attributed to different environmental factors like pH and SOM. Application of $ZnSO_4$ for maize is being practiced by many of the farmers which might have resulted in observing higher amount of DTPA-Zn in those soils (Vijayshekar et al., 2000).

In conclusion analyzed soil samples were slightly acidic to neutral in reaction with low soluble salts. The available nitrogen and potassium were low to medium in range. The available Phosphorus was high in nature. Among different micro nutrients except Zinc, the other nutrients like Copper, Iron and Manganese were sufficient in nature.

REFERENCES

Swarup, A., & Chillar, R. K. (1986). Build up and depletion of soil phosphorus and potassium and their uptake by rice and wheat in a long-term field experiment. *Plant and Soil*, *91*, 161-170.

Ananthanarayanaya, R., & Ravi, M. V. (1997). Nature of soil acidity of coffee growing soils of Karnataka. *J. Indian Soc. Soil Sci., 45*(2), 384-385.

Arora, C. L., & Sekhon, G. S. (1981). Influence of soil characters on DTPA extractable micronutrients cations in some soil series of Punjab. *J. Indian Soc. Soil Sci., 29,* 453-462.

Balanagoudar, A. B. (1989). Investigation on status and forms of sulphur in soils of North Karnataka. *M. Sc. (Agri.) Thesis, Univ. Agric. Sci*., Dharwad (India).

Jackson, M. L. (1973). *Soil Chemical Analysis*. Prentice Hall of India Pvt. Ltd., New Delhi.

Korikanthimath, V. S., Gaddi, A. V., Anke Gowda, S. J., & Rao, G. (2002). Soil fertility evaluation in plantation belt of Kodagu district, *Karnataka J. of Medicinal and Aromatic Plant Sci*., *24*, 401-409.

Lamture, S. V., & Patil, S. S. (2015). Micronutrients status in soil under command area of upper Kundalika project Beed district, Maharashtra. *Env. Sci., 4*(2), 2277–8179.

Lindsay, W. L. (1972). Inorganic Phase equilibria of micronutrients in soils. In: Mortvedt, J. J., (ed.) micronutrients in Agriculture. *Soil Sci. Soc. Am., Inc., Madison, WI*. 41-57.

Lindsay, W. L., & Norvell, W. A. (1978). Development of a DTPA soil test for Zn, Fe, Mn and Cu. *Soil Sci. Soc. Amer. J.*, *42*, 421-428.

Obreza, T. A., Alva, A. K., & Calvert, D. V. (1993). Citrus fertilizer management on calcareous soils. Circular 1127, soil and water science department, Florida cooperative extension service. *Inst. of Food Agric. Sci.,* University of Florida.

Rao, K. V. (1992). Dynamics of aluminium in base unsaturated soils of Karnataka. *Ph. D. Thesis, Univ. Agric. Sci.,* Bangalore (India).

Stangel, P., Pieri, C., & Mokwuyne, U. (1994). Maintaining nutrient status of soils: Macronutrients. In Greenland, D. J., and Szabolcs, I., (eds) soil resilience and sustainable land use. CAB international, Oxon, U.K., pp. 171-198.

Subbiah, B. V., & Asija, G. L. (1956). A rapid procedure for the estimation of available nitrogen in soil. *Curr. Sci.*, *25*, 259-260.

Vijaya Sekhar, R., Vittal Kuligod, B., Basavaraj, P. K., Dasog, G. S., & Salimath, S. B. (2000). Studies on micronutrient status in important black soil series of UKP command, Karnataka. *Andhra Agril. J., 47*, 141-143.