Int.J.Curr.Microbiol.App.Sci (2017) *6*(9): 4585-4590

International Journal of Current Microbiology and Applied Sciences
ISSN: 2319-7706 **Volume 6 Number 9 (2017) pp. 4585-4590**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2017.607.479

Studies on Secondary and Micro Nutrient Properties of Soil Profiles in Village Baragaon Nandur, Taluka Rahuri, Maharashtra, India

Vaddepally Pavan*, M. R. Chauhan and A. G. Durgude

Department of Soil Science and Agriculture Chemistry, Mahatma Phule KrishiVidyapeeth, Rahuri-413722, Maharashtra, India
**Corresponding author*

Keywords

Entisols, inceptisols, vertisols, Ca, Mg, Fe, Mn, Zn, Cu

Article Info

Accepted:
28 June 2017
Available Online:
10 July 2017

A B S T R A C T

Soil profile studies was conducted in Baragaon Nandur Village, four soil orders *viz* two entisols, one inceptisols, vertisols were analyzed for chemical properties which are derived from basalt, basaltic alluviam and slightly conditioned by topography. Calcium was ranged from 22.30, 19.70 to 23.78, 18.20 to 26.51, 17.5 to 25.5 cmole (p+) kg^{-1} in Entisols (A), Entisols (B,) Inceptisols, and Vertisols, soils respectively. In case of magnesium it wasranged from 14.75, 8.86 to 13.58, 8.75 to 16.47, and 9.23 to 13.33 cmole (p+) kg^{-1}. in Entisols (A), Entisols (B), Inceptisols, Vertisols, soil pedons respectively.Available sulphur in the soil was 10.75 mg kg^{-1}in Entisols (A), and it was ranged from 7.54 mg kg^{-1} to 15.75 mg kg^{-1} In Entisols (B). While in Inceptisols it was ranged from 10.37 to 14.12 mg kg^{-1} and inVertisols this range was 6.37 to 24.5 mg kg^{-1}.The value of DTPA extractable Fe ranged from 2.04 to 3.07 mg kg^{-1} in Entisols (B), 4.10 to 4.25 mg kg^{-1} in Inceptisols, 2.07 to 5.81 mg kg^{-1} in Vertisols and 4.33 mg kg^{-1} in Entisols (A). DTPA extractable Mn content of Entisols (A) was 4.42 mg kg^{-1}.Entisols (B) was ranged from 2.29 to 3.50 mg kg^{-1}. Manganese content in Inceptisols ranged from 3.19 to 4.98 mg kg^{-1}. in Vertisols it was ranged from 2.30 to 4.90 mg kg^{-1}.Zinc content was 0.49 mg kg^{-1} in Entisols (A) and it was ranged from 0.24 to 0.32 mg kg^{-1}, 0.28 to 0.53 mg kg^{-1}, and 0.38 to 0.45 mg kg^{-1}, in Entisols (B), Inceptisols and Vertisols respectively. Copper content in Entisols (A), Entisols (B), Inceptisols, and Vertisols, ranged from 1.18, 0.44 to 0.92 mg kg^{-1}, 1.73 to 2.46 mg kg^{-1}, and 1.56 to 2.07 mg kg^{-1}respectively.The present investigation was undertaken to generate comprehensive information about the characteristics of soil for evolving proper soil and water management strategies so as to maximize and sustain agriculture production.

Introduction

Soils are considered as the integral part of the landscape and their characteristics are largely governed by the landforms in which they are developed. Topographic maps, aerial photographs and remote sensing data provide useful tools for geomorphic analysis of the region and help in the soil survey and mapping (Pandey and Pofali, 1982). The life supporting systems of a country and socio-economic development of its people depends on the soils. More than ever before, a renewed attention is being given to soils due to rapidly declining land area for agriculture, declining in soil fertility and increasing soil

degradation, land use policies and irrational and imbalanced use of inputs (Kanwar, 2004). All the above factors call for a paradigm shift in research away from the maximum crop production to the sustainability of the crop production system without degradation of soil health and environmental quality.

Systematic study of morphology and taxonomy of soils provides information on nature and type of soil, their constraints, potential, capabilities and their suitability for various uses (Sehgal, 1996).

Soils of Maharashtra State have been broadly classified as 1) The laterites and lateritic soils 2) The costal saline and costal alluvium soils 3) Shallow medium and deep black soil 4) Gray and red soils of mixed parent materials and 5) Saline, saline-alkaline and non-saline-alkaline soils (Raychaudhari and Chakravarty, 1943). Soil is a vital natural resource and should be used judiciously according to its potential to meet the increasing demands of ever growing population. To ensure optimum agricultural production, it is imperative to know best fact about our soils and their management to achieve sustainable production. The quality of soil needs to be looked into because presently the natural resources are being over exploited. Soils of Maharashtra State are categorized as poor in fertility and vary widely in genetic, morphological, physical, chemical and biological characteristics (Challa *et al.,* 1995).

The nutrient deficiencies started appearing in different areas due to introduction of intensive production systems after green revolution period. It is due to net removal rates of micronutrients by crops being higher under intensive productivity regimes (Kanwar, 2004). The nutrient deficiencies situation was further increased by the discontinuous and diversified use of organic manures and chemical fertilizers. A soil profile is a historic record of all the soil farming processes and farms the unit of study in pedagogical investigation. It also helps in soil classification and forms the basis for practical studies of soils. A study of soil profile is important from crop husbandry point of view, since it reveals the surface and subsurface characteristics and qualities, namely depth, texture, structure, drainage conditions and soil-moisture relationships, which directly affect plant growth. It helps to classify the soils and to understand soil-moisture-plant relationships.

Study Area

The Village Baragaon Nanduris boundary between region located in between 19° - 21'N latitude and 74°- 35' E longitude and covers total geographical area of 3845 ha. The elevation is 500m above mean sea level. The Village Baragaon Nandur, is situated about 38 km away from Ahmednagar city.Soils of Village Baragaon Nanduris derived from the igneous rocks *viz*. Basalt (Deccan trap) which is basic in nature containing mainly feldspars, augite and small amount of titaniferrous magnetite mineral. In the vesicular rocks the any of daloidal cavities are filled with mineral like zeolite and quartz. The soils of Village Baragaon Nandurare under the cultivation of Jowar, Bajara, Wheat, Gram, Pigeon Pea, Soybean, Black Gram, Safflower, Sugarcane and Cotton crops. The natural vegetation grown comprises of dry deciduous tree species and some grasses. The climate is usually hot and potential evapo-transpiration (PET) is far excess of the precipitation and is classified as semi-aired tropical. Village Baragaon Nandur, Taluka Rahuri, Dist-Ahmednagar experience a hot spell from the month of March and May, with rains from June to September. The mean annual maximum and minimum temperatures were ranged from 32.9^{0}C and 18.8^{0}C, respectively. The Village Baragaon Nandur has annual precipitation of 517.8 mm. The rainfall is torrential, erratic, scanty and ill distributed.

Materials and Methods

The survey and sampling was carried out in Village Baragaon Nandur, Taluka Rahuri, Dist- Ahmednagar. Four soil profile site were selected by using GPS (Global Position System) for study after travelling through the area where inceptisols, entisols, vertisols are present. Recorded of surveyed fields, latitude, longitude and altitude was maintained. Profile were dug at selected sites and detailed morphological examination was carried out as per procedure laid down in USDA soil survey manual. Soil sample were collected horizon wise. The soil samples from selected site were collected by using stainless steel auger to avoid iron contamination. Total 12 samples collected from the different horizons of two Entisols, one Inceptisol, and one Vertisol.

Soil samples were brought to the laboratory and air dried under shade avoiding contamination with foreign materials and then crushed with a wooden pestle. The sample is then screened through a 2mm sieve and the pebbles, stones and roots were rejected. About 0.5 to 1kg of air dried crushed soil sample was put in the plastic sample bottle, labeled and stacked on the open sample racks for analysis. Each soil sample was analysed for following physical, chemical properties of soil.

Results and Discussion

The soil profile study was conducted on four soil orders of Village Baragaon Nandur such as two Entisol, one Inceptisol, and one Vertisols. The result of the investigation is described under following heading.

Exchangeable cations (Calcium and Magnesium)

Among the Exchangeable cations calcium is dominant followed by magnesium in all the soil pedons indicating calcium bearing minerals in parent rock. Similar result was reported by Maji *et al.*, (2005).

Calcium was ranged from 22.30, 19.70 to 23.78, 18.20 to 26.51, 17.5 to 25.5 cmole (p+) kg^{-1} in Entisols (A), Entisols (B,) Inceptisols, and Vertisols, soils respectively. Vertisols having more exchangeable calcium followed by Inceptisols, Entisols.

In case of magnesium it wasranged from 14.75, 8.86 to 13.58, 8.75 to 16.47, and 9.23 to 13.33 cmole (p+) kg^{-1}. in Entisols (A), Entisols (B), Inceptisols, Vertisols, soil pedons respectively.

Exchangeable calcium decreased with depth and magnesium in most of horizon increased with depth which might be due higher solubility of magnesium salts in their leaching down the profile. (Krishanamoorthy and Govindarajan, 1977).

Available Sulphur

Availability and distribution of sulphur are controlled by amount and type of clay, organic matter content and management practices.

Available sulphur in the soil was 10.75 mg kg^{-1}in Entisols (A), and it was ranged from 7.54 mg kg^{-1} to 15.75 mg kg^{-1} In Entisols (B). While in Inceptisols it was ranged from 10.37 to 14.12 mg kg^{-1} and inVertisols this range was to 6.37 24.5 mg kg^{-1}. Most of all the soils of Village Baragaon Nandur were sufficient in sulphur as per the critical limit 10 mg kg^{-1} except Entisols (A).

Available sulphur showed significant correlation with organic carbon, considering critical limit. (Bandopadhyay and Chattopadhyay, 2001, Shrinivasarao *et al.*, 2005).

Table.1 Standard analytical methods used for chemical analysis of soil samples

Sr. No.	Parameters	Method used	Reference
Soil analysis			
1.	Available (Fe,Mn,Zn and Cu)	Atomic Absorption Spectrophotometer	Lindsay and Norvell (1978)
2.	Exchangeable Ca^{2+}, Mg^{2+}	Versenate titration	Page (1982)
3.	Available S	0.15% $CaCl_2$ extractable	Williams and Steinbergs(1969)

Table.2 Chemical properties of Representative Pedons of Village Baragaon Nandur

Pedonno.	Exchangeable (cmol (P^+) Kg^{-1})		Available nutrients (mg Kg^{-1})				
	Ca	Mg	S	Fe	Mn	Zn	Cu
Pedon 1 Entisols(A)							
P_1-0-22	22.30	14.75	10.75	4.33	4.42	0.49	1.18
Pedon 2 Inceptisols							
P_2-0-26	26.51	16.47	14.12	4.25	4.98	0.53	2.46
26-58	19.74	8.75	12.25	4.21	3.42	0.25	1.58
58-75	18.20	11.35	10.37	4.10	3.19	0.28	1.73
Pedon 3 Vertisols							
P_3-0-28	25.50	11.02	24.5	5.81	4.90	0.45	2.07
28-66	20.80	9.23	15.37	4.05	2.78	0.39	2.03
66-90	17.50	12.18	10.87	3.83	2.43	0.39	1.80
90-120	20.7	13.33	6.37	2.07	2.30	0.38	1.56
Pedon 4 Entisols (B)							
P_4- 0-30	23.78	12.79	15.75	3.07	3.50	0.32	0.92
30-68	21.92	8.86	11.62	2.22	2.68	0.29	0.68
68-100	22.21	10.43	9.25	2.93	2.29	0.24	0.56
100-150	19.70	13.58	7.54	2.04	2.38	0.29	0.44

Available micronutrients (Fe, Mn, Zn and Cu)

Every micro-nutrient element plays an important role in plant processes. Their significance in physiological processes and plant metabolism is equally important.

The data on available micro-nutrient given in table 2. The value of DTPA extractable Fe ranged from 2.04 to 3.07 mg kg^{-1} in Entisols (B), 4.10 to 4.25 mg kg^{-1} in Inceptisols, 2.07 to 5.81 mg kg^{-1} in Vertisols and 4.33 mg kg^{-1} in Entisols (A). All the soil pedons are deficient in Fe content except the surface horizon of the Veritisols. Surface layer of Vertisols had sufficient in Fe content and it decreases with depth. (Pharande *et al.*, 1996)

DTPA extractable Mn content of Entisols (A) was 4.42 mg kg^{-1}.Entisols (B) was ranged from 2.29 to 3.50 mg kg^{-1}. Entisols are sufficient in Mn content. Manganese content in Inceptisols ranged from 3.19 to 4.98 mg kg^{-1}. Status of Mn is good in Vertisols it ranged from 2.30 to 4.90 mg kg^{-1}. All the soils

contain Higher Mn might be due to parent material i.e. ferromagnesium minerals.

Zinc content was 0.49 mg kg^{-1} in Entisols (A) and it was ranged from 0.24 to 0.32 mg kg^{-1}, 0.28 to 0.53 mg kg^{-1}, and 0.38 to 0.45 mg kg^{-1}, inEntisols (B), Inceptisols and Vertisols respectively. All the soil pedons are deficient in Zn conternt as considering critical limit for zinc is 0.6.Similar results reported by (Sharma *et al.,* 1996). Depth wise decrease in zinc with depth was noticed because of low organic matter and variable clay content.

Copper content in Entisols (A), Entisols (B), Inceptisols, and Vertisols, ranged from 1.18, 0.44 to 0.92 mg kg^{-1}, 1.73 to 2.46 mg kg^{-1}, and 1.56 to 2.07 mg kg^{-1}respectively. Depthwise decrease in copper content in Vertisols and Entisols was noticed. (Pharande *et al.,* 1996).

References

Bandyopadhyay, P.K., and Chattopadhyay, G.N. 2001. Differentforms of Sulphur in relation to soil properties in some at Alfisols and Inceptisols of Birbhum district of West Bengal. *Agropedology*12, 82-85.

Challa, O., 1995. Gilgai micro relief in swell shrink soils. A case study from Solapur District, *Journal of the Indian Society of Soil Science*43, 649-652.

Kanwar, J.S., 2004. Address by the guest of honour, 69th annual convention of the Indian Society of Soil Science held at the Acharya N.G. Ranga Agricultural University (ANGRAU). *HydrabadJournal of the Indian Society of Soil Science* 52, 295-296.

Krishanamurti, P., and Govindrajan, S.V. 1977. Genesis and classification of associated red and black soils under Rajollbanda Diversion Irrigatton Scheme, (Andra Pradesh). *Journal of the Indian Society of Soil Science* 25, 239-246.

Lindsay, W.L., and Norvell, W.A. 1978. Development of DTPA soil test of Fe, Mn, Zn and Cu. *Soil Science Society of America Journal* 42, 421-428.

Maji, A.K., reddy, G.P Thayalan, S. and Walke, N.J. 2005. Characterization and classification of Landforms and soils over Basaltic Terrain in sub-humid tropic of Central India.*Journal of the Indian Society of Soil Science*53, 154-162.

Page, A.L., (Ed) 1982. Methods of Soil Analysis.Agronomy, Monograph No-9. Part-2.*American Society of Agronomy.Inc.Soil Science Society of America.Inc.*Publ. Madison, Wisconsin, USA.

Pandey, S., and Pofali, R.M. 1982. Soil-physiography relationship. Review of soil research in India. Part II. XII International Congress of Soil Science, New Delhi, India, 8-16 February, 1982, pp.572-584.

Pharande, A.L., Rasker, B.N and Nipunage, M.U 1996. Micronutrient status of important Vertisols and Alfisols soil series of Western Maharashtra. *Journal of Maharashtra AgriculturalUniversity 21***,** 182-185.

Raychoudhari, S.P., and Chakravarty, 1943. Studies on Indian red soils. *Journal of Indian Agricultural Sciences.* 13, 252-254.

Sehgal, J., 1996. *Pedology,* Concept and applications, Kalyani Publisher, New Delhi. pp, 123-125.

Sharma, B.L., Bhadoria, A.K.S Rathore, G.S. and Bapat, P.N. 1996. Evaluation of extractant for available Zinc and its form in Verttsols of Madyapradesh.*Journal of the Indian Society of Soil Science*44, 701-704.

Shrinivasrao Ch. Ganeshmurthy, A.N. Singh, R.N. and Masood Ali 2005. Status and

distribution of Sulphur vis-a-vis Taxanomic class wise distribution of sulphur in selected soil series of Inceptisol in West Bengal.*Journal of the Indian Society of Soil Science54,* 368-371.

Williams, C.H., and Steinberg, A. 1969. Soil sulphur fraction as chemical indices of available sulphur in some Australian soil *Australian Journal of Agricultural. Resources 10*, 340-352.

How to cite this article:

Vaddepally Pavan, M. R. Chauhan and Durgude A. G. 2017. Studies on Secondary and Micro Nutrient Properties of Soil Profiles in Village Baragaon Nandur, Taluka Rahuri, Maharashtra, India. *Int.J.Curr.Microbiol.App.Sci.* 6(9): 4585-4590.
doi: https://doi.org/10.20546/ijcmas.2017.607.479