

Full Length Research Paper

An Investigation on Physico-chemical Characteristics of the Soils in Yadgir district, Hyderabad, Karnataka region, India.

Nanda B.N. and Puttaiah E.T.

Department of Post Graduate studies and Research in Environmental Science, Gulabarga University, "Jnana Ganga", Kalaburgi-585 106, Karnataka, India.

Journal No: 47359

Article history

Received: 12-10-2017

Revised: 15-10-2017

Accepted: 21-11-2017

Corresponding Author:

Nanda B.N

Gulabarga University,
"Jnana Ganga", Kalaburgi-
585 106, Karnataka, India.

Abstract

Soil is the most important component of the environment which enables to sustain the biological activity of plants. Various environmental edaphic factors appeared to have influenced diversity of the soil algae. Soil fertility is generally improved by the organic matter produced by these organisms (Mishra, 2004). Major goal of this investigation was to assess the biodiversity of algae in relation to certain physico-chemical characteristics of soils; the samples were collected from 100 different study sites of Yadgir district. In this communication the data generated with regard to pH, Soil colour, OC, Phosphate and so on during study period has been documented.

Key words: Parameters, Different landuses, Variations, Pedology, Metabolism.

Introduction

Top soils of agricultural land plays, a crucial role in productivity of the crops grown in the respective lands. It is very well known that the fertility of the soils depends on the physico-chemical characteristics of the soils. Therefore, before making any attempt to grow crops, it is very essential to know the soil chemistry. A critical review of the literature has revealed that there is no systematic investigation on the physico-chemical properties of the soils of Yadgir district. It is with this background, the present study has been carried out on the physico-chemical aspects of 100 soil samples collected from different land uses of Yadgir district, and the results obtained are discussed in this paper.

Materials and Methods*Description of the study area*

Yadgir district is situated in the northern part of Karnataka between 16.46⁰N & 77.8⁰E latitude and 16.77⁰N & 77.13⁰E longitudes with an area of 5.6 square kilometer. The average population of the area is 10, 50,000. The major soil types fall under the category of black cotton soils. Annual rainfall ranges between 630mm-806 mm. Major crops grown in this region includes cotton, turdal, jowar, bajra and groundnut.

Sample Collection methods

For the purpose of studying physico-chemical characters of the soils of the district, 100 locations have been identified based on different land uses. From these identified stations 500 grams of soil samples were collected as per the standard techniques, put in suitable capacity of polythene covers labeled and brought to the laboratory for further analytical work. Further, the soil samples were dried; the lumps were made into powder and stored in suitable capacity of polythene bags. In all 10 physico-chemical parameters such as pH, Electrical conductivity, Organic carbon, sulphur, phosphate, Potassium, Zinc, Manganese, Copper, Iron and Nitrogen have been studied and the following procedure has been adopted for the analysis of each parameter.

- pH-pH was determined with the help of standard pH meter. The soil samples were prepared as per the standard techniques for measurements.
- Electrical Conductivity- Determined using multigrade Conductivity Bridge (immersion type cell).
- Organic Carbon- Spectrophotometric method. (Results expressed in terms of percentage).
- Phosphate- Bray's method spectrophotometric method.(values expressed in terms of Kgs/hectare)
- Potassium-By Flame photometric method. (Expressed in terms ofKgs/hectare)
- Nitrogen - By kjeldal method
- Micro nutrients like copper, iron, manganese and zinc were analyzed using Atomic Absorption Spectrop Further. (All are expressed in terms of parts per million).

Results and Discussion

pH

Soil could be either acidic or alkaline. Sometime it could be neutral also. In the present investigation pH of the soil sample varied from a minimum of 7.07 which was recorded from the soil samples collected from Surpur (51) to a maximum of 8.71 from a soil samples collected at Krishnapur (78). The data recorded indicates that, out of 100 soil samples studied in almost 50% of the soil pH varied between 7&8 indicating that they are highly alkaline. H.S.Thind, D.L. Rowel (1999) is of the opinion that the algal photosynthetic activity probably is responsible for the decrease or increase of the pH values in the crop fields. In our studies some of the soil samples where pH less than 7 found to harbor relatively high population density of algae as compared to that of soils with alkaline conditions. Probably, the algal density lies significant role in the variations of the pH value.

Electrical Conductivity

The concentration of ions present in the soil is directly related to the strength of electric current flowing through it. Higher the salt content, lower is the resistance offer by the solution for flow of current and higher in Electrical conductivity. Therefore, Electrical conductivity serves as the index of the salt content. In the present study Electrical conductivity of the soils ranged from a minimum of 0.14 mili mohs at Burusunagi, soil sample no.46 to a maximum of 1.83 mili mohs at Krishnapur, soil sample no.72. In almost 50% of the soil samples, Electrical conductivity remained less 1 millimohs. So it is inferred that salt content of the soil regulates the Electrical conductivity.

Organic Carbon

Soil Organic Carbon serves as a reservoir of plant nutrient in promoting water storage and regulations of microbial activity. In the present investigation, Organic Carbon concentration varied from the minimum of 0.23mili mohs at Hallesagara in soil sample no.28. to a maximum of 4.22 mili mohs at Krishnapur in soil sample no.74. Generally sandy soil samples showed very low content of Organic Carbon as compared to black soils, where commonly cotton is grown. Nevertheless, the data recorded indicates that almost 57% of soil samples found to contain Organic Carbon less than 1% indicating that they are less fertile. Norbert Kamjunke (2010), has discussed the impact of temperature and the Organic Carbon content of the soil and pointed out that it has got an indirect effect and the variation of the Organic Carbon, but the microorganisms in the soil play a positive significant role in regulating the Organic Carbon content in the soil, the present investigation however, the partial agreement with that of above author.

Nitrogen

The importance of nitrogen in crop productivity is well understood. It plays a significant role in the soil fertility and also the crop yield. Naturally it is added to the soil through nitrogen fixation by microorganisms or it may be added into the soil as chemical fertilizer. Studies have also shown that the nitrogen fixing blue green algae also enriched the soil fertility. If the concentration of nitrogen in the soil samples is considered, it varied from a minimum of 224 Kg/hectare in the soil sample collected from Halesagar (Shahpur), in the soil samples number 29 and a maximum of 658 Kg/hectare in the soil sample collected from Burusunugi (Shahpur), in the soil sample number 50. However, in almost 65% of the soil samples it varied from 250 kg/hectare to 300 kg/hectare. Such a variation of nitrogen in soil samples has been studied by Bongaele and Bharathi (1975).

Phosphorous

Phosphorous is an essential nutrient and known to play a significant role in capturing and converting suns energy into useful plant compounds. It is one of 17 nutrients, essential for plant growth and plays a very significant role in protein synthesis. In the absence of phosphate, plants cannot complete their life cycle. The occurrence of phosphate in natural condition is generally very low. In the present study where phosphatic fertilizers are extensively used for better yield of crop found to contain little higher amounts of phosphates. However, it varied from a minimum of 18.8 Kg/hectare in the soil samples collected from Yadgir & Khanapur in soil samples number 40 & 53 and a maximum of 37.2 Kg/hectare is collected from Sagara (Surpur), in the soil sample number 92.

Potassium

Generally, potassium concentration in soils is found in a relatively lesser concentration. In the present study it ranged from a minimum of 125.0 Kg/hectare in the soil sample collected from Krishnapur (soil samples number 78 & 79) and to a maximum of 1458.6 Kg/hectare in the soil sample collected from Kadimgera (surpur), (soil sample number 67).

Micronutrients

Micro nutrients are as important as major and secondary nutrients although the plants require them in lesser quality. Nevertheless, lack of any one of the micronutrients in soil can limit the plant growth, even all other essential nutrients are presents in adequate quantity. In the present study, the following micronutrients are studied and their variations are documented.

Zinc: Zinc is an essential micro nutrient required in very low concentration for human and plant metabolism activity as it catalyses more than 100 enzymes. Zinc deficiency results in many human and plant diseases. In the present study Zinc concentration varied from a minimum of 0.22ppm in soil sample number 3 collected from Chigerehalli (Shahpur) to a maximum of 0.98ppm in soil sample number 77 from Bommanahalli (Surpur).

Copper Copper is another important essential nutrient for plant growth and is required in very low quantity. In most of the soils, it is present in adequate amount that facilitates in getting optimum crop yields, however, its deficiency in soils result in browning of leaf tip and chlorosis. In the present study the concentration of copper in soil samples studied in more or less similar to that of Zinc and varied from a minimum of 0.11ppm from soil samples collected from Halesagar (Shahpur), in the soil sample numbers 27 & 94 into a maximum of 0.89ppm in soil sample collected from Javargi (Shahpur), in soil sample number 6. About 75% of the soil samples found to contain copper less than 1ppm.

Manganese It is an important micronutrient, as it is very much necessary for the photosynthesis and Nitrogen metabolism in plants. If it is not supply in required quantity inter venal chlorosis occurs in the plant leaves. The other symptoms of Manganese deficiency in plants include formation of brown necrotic spots on leaves, premature leaf drop and delayed maturity in certain plant species. Normally organic soils, sandy soils in low organic matter and over limed soils contain very low quantity of manganese. In the present study, Manganese found to occur in the range of minimum 1.48ppm collected from Chigerehalli (Shahpur) in soil sample number 3 and maximum 5.58ppm in soil collected from Kadimgera (surpur), in soil sample number 66. About 50% of soil samples contain manganese in the range of above 5ppm.

Iron It is a very important micro nutrient that involves in the production of chlorophyll and its deficiency results in chlorosis. It is also a component of many enzymes related with energy transfer Nitrogen reduction and fixation. Iron deficiency results in the formation of yellow leaves and in severe cases leaves becomes white and brown, and fall off immediately. The content of iron in the present study is varied from a minimum of 2.77ppm in soil sample number 69 collected from Bommanahalli (Surpur) to a maximum of 7.86ppm in soil sample number 3 collected from Chigerehalli (Shahpur). It exhibited a wide range of variation for instance four samples have found to contain iron above 30ppm while in seven samples it varied to 20ppm to 30ppm and 9 samples showed that in between 10ppm to 20ppm and the remaining soil samples, it was found to be less than 10ppm. The details of variations of physico-chemical parameters studied are represented in the following graph.

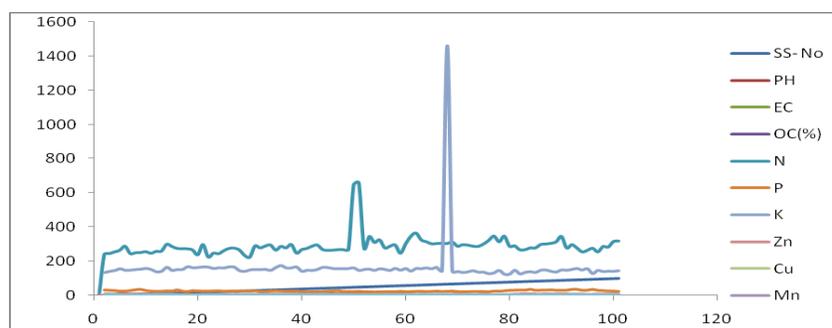


Fig 1. The details of variations of physico-chemical parameters studied are represented in the following graph.

Summary & Conclusion

Before any crop is grown in a particular land, a knowledge of physico-chemical property of the soil and the associated microflora especially the algal forms is very important. A critical perusal of the available literature, has revealed that no scientific investigation on the physico-chemical properties of the soils of Yadgir district is done. With this background, 100 soil samples have been collected from different identified sites and analyzed for certain physico-chemical parameters such as Nitrogen, Phosphorous, Potassium, Zinc, Copper, Manganese and Iron adopting established techniques. It is found that Nitrogen varied from a minimum of 224 Kg/h to a maximum of 658 Kg/h. While Phosphorous ranged between a minimum of 125 Kg/h to a maximum of 1458.6 Kg/h which is rather a very high as for as the Potassium concentration is considered in the natural soils and that may be due to addition of Potash waste fertilizer in excess. Zinc varied between a minimum of 0.22 ppm to a maximum of 0.98 ppm and similar to that Copper also varied for a minimum of 11 ppm to a maximum of 89 ppm. However, Manganese varied from a minimum of 1.48 ppm to a maximum of 5.8 ppm while Iron ranged from a minimum of 2.77 ppm to a maximum of 7.86 ppm. This observation is in conformity with those of Bongale and Bharathi (1975).

References

- Balachandar, D., P. Nagarajan and S. Gunasekaran. 2003. Effect of micronutrients on nodulation and yield of blackgram in acid soil conditions. *Legume Research*, 26(2): 153-134.
- D.R.Cullimore,(1968) Department of Biological Sciences University of Surrek UK. Source: *Plant and Soil*, vol.28 No.3; 460-462.
- Jackson, M.L.1973, *Soil chemical analysis*, prentis al, New Delhi. 1-538.
- Nagarajah, S., B.M. Nizar, M.M. Jauffer and M. Desilva. 1983. Zinc as eliminating nutrient for rice growth in midcountry wet zone of Srilanka. *Tropical Agri.*. 139: 67-74.
- Norbert Kamjunke(2010), "Temperature Affects the Response of Heterotrophic Bacteria and Mixotrophic Algae to Enhanced Concentration of Soil Extract"
- Soil Survey Staff, (1999). *Keys to soil taxonomy*, NRCS, ESDA, Blacksburg, USA.