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Full Length Research Paper

Studies on the Physico-chemical Characteristics of the Soils of Kadur, Chikkamagalur District with Special Reference to pH, EC and OC-Part-I

Chudamani T., and Puttaiah E.T.
Department of Post Graduate Studies and Research in Environmental Science, Gulabarga University, "Jnana Ganga" Kalaburgi-585106, Karnataka, India

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Corresponding Author:
Chudamani T
Department of Post Graduate Studies and Research in Environmental Science, Gulabarga University, "Jnana Ganga" Kalaburgi-585106, Karnataka, India

Abstract
The understanding of soil characteristics is a prerequisite before it is used for any agricultural activities. Soil properties like organic carbon, Electrical conductivity and pH play a significant role in maintaining soil conditions suitable for plant growth. Many a times pH becomes very critical factor in supporting the growth of a particular group of higher plants depending on its either acidic or alkaline nature. Electrical conductivity also indicates the mineral salts condition in the soil which is inturn closely related to pH variations. Similarly, organic carbon plays a vital role in nutrient management and crop productivity of soils. In the present study pH, EC and Organic carbon in 100 soil samples of Kadur taluk has been discussed and documented. It is found that almost 89% of the soil samples were alkaline in nature ranging from 6.7 to 8.59 whereas, EC values fluctuated between 0.3mmoh's/cm to 1.8mmoh's/cm with 95% of soils showing its value below 1mmoh's/cm. However, the concentration of organic carbon varied from a minimum of 0.4% to a maximum of 1.84% with about 88% of soils recording its value below 1%. This is the first report on the physico-chemical parameters of the soils of Kadur and its surrounding areas.

Key words: *Soil Characteristics, pH, Electrical Conductivity and Organic Carbon.*

Introduction

The soil has been rightly described as the store house of minerals and a producer of vegetative crops. The soil provides ideal environmental conditions for living organisms and acts as a medium for detritus food chain. It is a complex of physico chemical system which provides water, mineral salts, nutrients and other factors required for the growth and sustenance of living organisms. Therefore, it is indeed a complex and dynamic system. Obviously it is of paramount importance to know the characteristics of the soils before attempting to grow any particular crop in that soil. Therefore, analysis of soil for various physico-chemical characteristics is a prerequisite. A critical perusal of the available literature has revealed that no systematic study has been so for made to understand the quality of soil in different landuse of Kadur and its surrounding areas. Therefore, systematic analyses of cultivated soils of Kadur taluk was undertaken and in this paper the variations in the concentration of only pH, EC and OC has been reported.

Materials and methods

Description of the study area

Kadur is located at 13°33 N and 76°01 E, 13°55 N and 76°01 E. It has an average elevation of 763msl. The larger portion of the Taluk consists of the Malnad or the hilly region, which contains some of the wildest mountain scenery known in the southern part of India. The major soil types found in this region include red loamy, red sandy, mixed red soil and black cotton soils. Annual rain fall of this area is around 620mm. Major crops of this area are jowar, ragi, sunflower, areca nut and coconut.

For the present study a total of 100 soil samples were collected from cultivated soils of Kadur and its surrounding areas during 2012. Thus collected soil samples were brought to the laboratory and later they were air dried, lumps were powdered, sieved through 0.2 mm mesh and stored in polythene cover for future analytical work. Thereafter, the samples were analyzed following the established techniques and the results were documented. In this communication three parameters viz., pH, EC and OC have been discussed. For the purpose of measurement of soil pH a standard pH meter was used and Electrical Conductivity was measured with the help of a Multigrade conductivity bridge expressed in mmoh's/cm (immersion type cell). The Organic Carbon was determined by Spectrophotometric method and the results were expressed in terms of percentage.

Results

pH: The most outstanding character of the soil is its pH whether it is acidic, alkaline or neutral in nature. The living organisms especially higher plants respond so quickly to the soil pH variations because it tends to control so much of soil chemical environment and the associated crops grown in that particular soil. Long back, during 1945 Lund in his investigation on British soils noted a poor population of diatoms in soils which are acidic with a pH range between 3-4. On the other hand, he could record rich chlorophycean population in those soils indicating the fact that acidic soils support luxuriant population of Chlorococcalian algae. Similarly, Norton and Davis (1975), in their survey on soil algae of Alachua Country recorded maximum species diversity of Chlorophycean members in acidic soils with range of pH between 3 and 4. On the contrary, Milind J. Jadhav and Balasaheb S. Nimbhore (2015) while studying on diversity of algae in the methi field soils of Aurangabrad recorded moderately alkaline soils with a pH value between 8 and 9 supporting luxuriant growth of Chlorophycean algae which may be due to change in the climatic condition. Further, alkaline pH is known to damage agricultural fields as a consequence of accumulation of more salts which may range from 25 to 8,000mg/L as has been stated by H. Kaur (2005). In nutshell, it is the pH which determines the soil chemistry and plays a significant role in the decrease or increase of crop yield. Furthermore, acidic soils tend to have more of metal ions like Fe, Al and Mg in soluble form and pose deleterious a impact on plant and animal life that are present in such acidic soils. Leelavathi S. and Puttaiah E.T.(1992) while working on the distribution of soil algae in Mysore district recorded pH between 7 and 8 with a luxuriant growth of blue green algae and concluded that pH above 7 is favourable for blue green algae particularly for heterocytous population.

Electrical Conductivity: It is an established fact that the Electrical Conductivity of soils varies significantly at different soil types. Its variation also depends on soil temperature and dissolved mineral content of a particular soil medium in question. Electrical Conductivity is generally assessed in water medium to check its purity and in soils it is generally measured to understand the capacity to convey electrical current. In agricultural fields the Electrical Conductivity will be increased enormously due to release of calcium ions from organic material (Chaudhary et.al., 1981, Hifzur Rehman 1986, Ganapathi et.al., 2016). Further, increase in salt content of the soil due to application of chemical fertilizers along with farm yard manure also increases Electrical Conductivity of soils as has been reported by Parashuram Chandravamshi (1998) and Gajanana et.al., (2005). However, Jagadeesh (2000) is of the opinion that if only NPK is added to the soil without farm yard manure reduces the Electrical Conductivity.

Organic Matter: The importance of organic matter in soil very well known. It provides food for soil micro organisms and it takes part in chemical reactions such as ion exchange and increases the water holding capacity of the soil. Further, it is the major source of nutrients like NPK and energy for soil dwelling organisms. It improves aeration, contributes to the weathering of mineral matters and reduces soil erosion (H.Kaur, 2005). Therefore, soil organic matter is an index of soil fertility status and better crop growth (Ganapathi et.al., 2016). Sinha et.al., (1983); Patiram and Singh (1993); Jagadeesh, (2000) and Ganapathi et.al., (2010) are of the opinion that the organic carbon status would increase at a steady rate if organic manures are added to the soils continuously when ever required. Subramanian and Kumaraswamy have also observed an increase in the organic carbon status in the soil due to addition of farm yard manure. Babhulkar et.al., (2000) have also made a similar observation with regard to the increased status of organic carbon when farm yard manure was added.

Discussion and Conclusion

In the present investigation pH value was recorded to be a minimum of 6.7 in soil number 19 collected from Chikkangala area wherein at the time of soil collection paddy was harvested and the colour of soil was black clay. A maximum of 8.59 pH was recorded in soil number 89 collected from Kadur. At the time of soil sampling (soil no. 89) a standing crop of sorghum was noted and the colour was black clay. Further, out of 100 soil samples analyzed about 89% of soils showed slightly alkaline nature whereas, the remaining ones showed acidic pH. This observation is in conformity with the studies made by Bongale and Bharati (1980). On the contrary to this Ganapathi et.al. (2016), observed a pH value below 5 in the soil samples studied by them in a rainfed area of Western Ghat region. A similar observation was also made by Suresh Lal and Mathur (1988). The fore going reveals that the pH varies in its value depending on the type of soil and could be maintained at neutral level if suitable quantity of organic fertilizers is applied instead of inorganic fertilizers as has been pointed out by Kumara et.al. (2014). The present investigation reveals that the soils are alkaline in nature.

In the present study Electrical Conductivity values were found to vary from a minimum of 0.3 mmoh's/cm in soil number 28 collected from Tangali Tandya to a maximum of 1.8 mmoh's/cm in soil sample number 47 collected from Dombarahally area. In the former case at the time of sampling ragi crop harvest was over and the soil colour was brown and in the latter case arecanut and coconut plantation with black soil was noted respectively. It is very important to note that about 95% of the soil samples studied recorded Electrical Conductivity less than 1mmoh's/cm while, only in 5% of soil samples it was found to be above 1mmoh's. A similar observation has been made by Ganapathi et.al., (2016) and Jagadeesha (2000). Therefore, our observations are in partial agreement with that of above authors.

As for as the concentration of organic carbon in the soils of the present study is considered, it is observed to be ranged from a minimum of 0.4% to a maximum of 1.84%. Tangali Tandya (soil number 27) found to contain 0.4% of organic carbon and a standing crop of ragi was found to be grown in that soil. Thuruvanahallly (soil number 92) found to register 1.84% of organic carbon where at the time of soil collection a fodder grass was grown. It is noteworthy to point out that almost 88% of the soil samples found to contain organic carbon below 1%. This observation is in accordance with that of earlier researchers (Ganapathi et.al., 2016, Sinha et.al., 1983;

Patiram and Singh 1993; Jagadeesh, 2000 and Ganapathi et.al., 2010) who have recorded soil organic carbon between 0.5% and 0.75%. The foregoing reveals that the soils under study are moderately rich in organic carbon and hence quite suitable for crop cultivation with farm yard manure application.

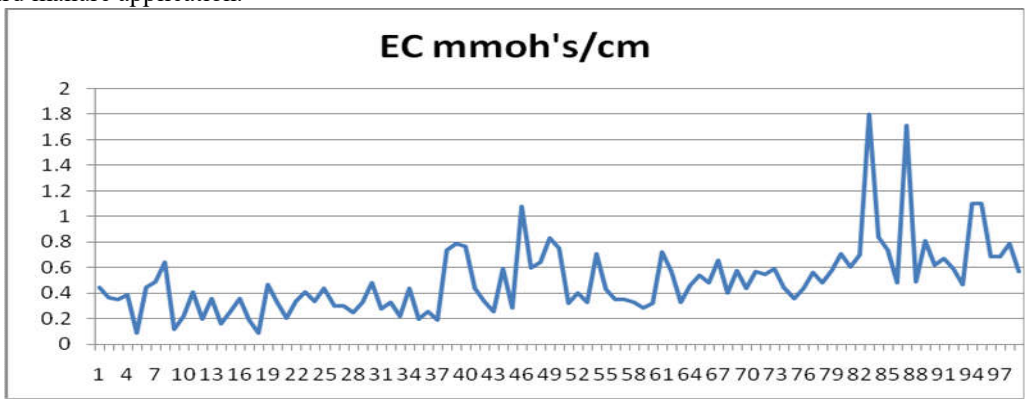

Fig: 1. Variations in EC values as observed in soil samples of Kadur and its surrounding areas (2012)

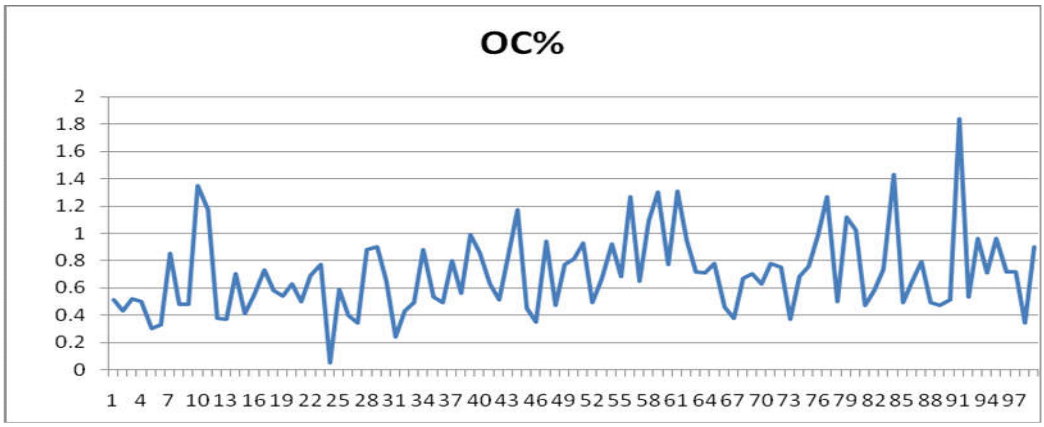

Fig: 2 Organic carbon (%) variations as observed in soils of Kadur and surrounding areas (2012).

Ethics: The authors read and approved the manuscript and no ethical issues involved.

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