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Physical and chemicals characteristic of soil from different sites of Jilani Park Lahore (Race Course Park) and recommendation for improvement of soil fertility

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Abstract
The current study was carried out to determine the effects of plant covers on soil of Jilani Park Lahore. Ten random sites were selected: six sites from grass lawn, two from under tree plantation, and one from flower bed and one was selected from bare patch. Soil samples had dominant percentage of silt and the dark brown (10YR 4/3) to dark reddish brown (10YR 5/4) color was the dominant color observed in the soil of almost all the profile which indicated the soil uniformity. Lime nodules were mostly present in every profile. Soil pH of selected sites varied from 7.7 to 8.5 but under canopy and grass patches ranged from 9.8 to 10.3. Most of soil samples were non-saline but soil under plant cover was moderately saline. The analyses revealed that the soil contained increased proportion of accessible and low quantity of Nitrogen. Moreover, the Jilani's Park soil also contained a significant amount of organic matter. These properties indicate that the soil of Park is somewhat fertile and need some management. It is obligatory to conserve its beauty. The restoration and maintenance include scrapping of 5 ft dead surface of the lawns, removal of debris beneath the lawns, supply of silt, irrigation system and purchase of pesticides.

Keywords: Silt, nitrogen, grass lawn, irrigation system, Jilani's park

Introduction
Soil is the combination of organic and inorganic compounds. Living things are the major constituent of organic part while inorganic part consists of non-living things such as rocks and minerals [1]. Inorganic part of soil is made by the process of weathering of superficial layer of earth crust. Sometimes plants are also involved in soil formation process [2]. Soils have four main parts including water, air, minerals and organic matter. The soils which have consistent texture and completes the requirement of air and water for plant with pH ranging from 6.0-6.8 are referred as fertile soil [3]. Soil nutrient deficiency is one of the important factors that limit crop yield in soil of the dryland. Nitrogen is also important component for the crop production [4]. Fertile soils have sufficient amounts of nutrients like micro and macronutrients necessary for the rapid and proper growth of plants. By calculating fertility status, the nutrients available for plants can be governed [5]. The combine effects of chemical, physical as well as biological process soils are highly variable that operates with distinct intensities and distinct scales [6]. Site-specific management of nutrients, generally a variable rate fertilizers application acknowledges the solution. The soil organic matter (SOM) plays an important role in maintaining soil structure and productivity in agro ecosystem [8, 9, 10]. SOM has widely been used as a most effective indicator for the proper functional response of soils to land use intensification [9, 11, 12]. Soil fertility is the ability of soil to provide essential elements for proper growth of plants [13]. Soil fertility can be examine through chemical and physical parameters of soils and soil nutrient deficiency is one of the important factors that limit crop yield in soil of the dry land than biotic and abiotic factors effect on the soil property [14, 15, 5]. Urbanization causes the destruction of natural ecosystems followed by the conversion of land structure such as parks, garden and lawns [16]. Parks provides the space for growing the proper plants growth and has less effect from urbanization [17]. A park is planned space usually have outdoor, terraces, rose beds, cultivation and enjoyments of the plants and other forms of nature [18]. Urbanization is being accelerated at global scale, having potentially huge impacts on soils in surrounding areas and cities. This results in an incredible urban soils' heterogeneity [19].

The development of urban areas worldwide makes our considerate of the effect of urbanization on soils increasingly important [20]. Race course park (Jilani Park) is one such place which has a lot of people attention. Race course park is located at Southeast of Bagh-i-Jinnah. The cool and green Race Course Park is the place that has a polo game in polo ground. It is also good for jog or stroll. The objectives of the study to evaluate the physical and chemical properties of soil, level of fertility, check the soil characteristics at different sites and to suggest some management options for improvement of the park.

Materials and Method

Experimental site and Soil Sampling

This particular study was carried out in Racecourse Park, Lahore. The methodology to determine chemical parameters of soil and soil texture were taken from the Guidelines proposed by Ali and Rafique (1978) [21]. During their survey, ten sites were selected from different plots of Racecourse Park, Lahore for sampling. Six sites from grass lawn, two from under tree plantation, one from flower bed one was selected from bare patch. With the help of hand augur. Soil samples have been obtained from the sit that was selected. The diameter of augur was 7cm.The augur was marked with different points i.e. 6, 12, 24, 36, 48 and 60 inches.

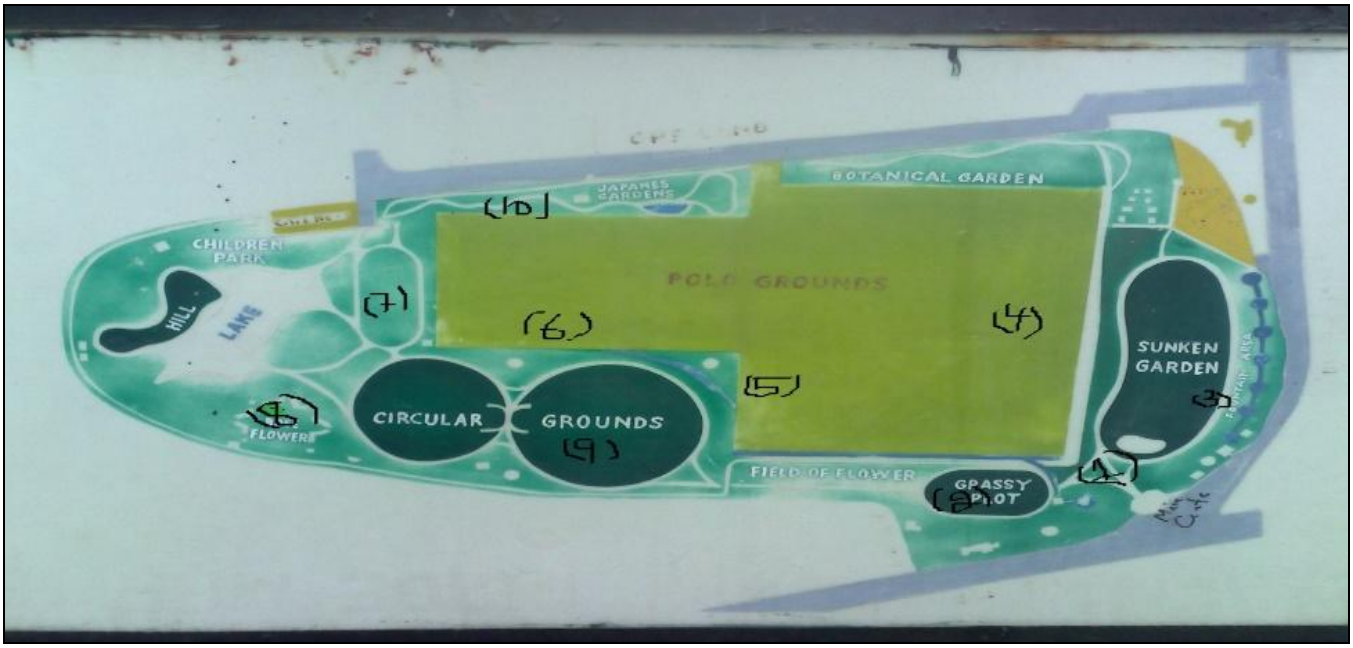


Fig 1: Map of Race Course Park showing location of sampling sites.

Morphological properties of soil samples

Morphological properties of each soil sample like soil texture, abundance, pH, color, and calcareousness, biological features, presence of artifacts, lime nodules and roots were observed at the spot. Color of soil samples were examined from Munsell chart, containing 196 soil color chips.

Preparation of soil samples for analysis

The soil samples were dried by spreading on metal tray. Soil samples were made free from leaves, roots, artifacts; any decomposed organic compounds and other biological features. Soil's clods were cracked into smaller ones via hand. Soil samples were then heated at 20 to 25ºc temperature and humidity ranging from 20 to 60% by placing them in oven to remove moisture content. During drying increased temperature should be kept off. The reason behind is that, reversible changes occur and influence on pH as well as concentration of phosphate. After oven drying the soil samples were grounded with the help of pestle and mortar. 2mm sieve was used to sieve the grounded soil samples. The aggregated soil samples left behind on the sieve were ground again and passed again all the way through strainer. Soil samples were shifted in broad mouth screw-topped plastic bottles after sieving.

Saturated soil sample paste preparation

The beaker was taken containing 150 grams of soil sample, declined and taped to make the soil surface sloping. After that, almost half of the slope of soil, the water was poured. Soil was stirred with the help of spatula. To obtain accurate paste stirring was continued. This include the analysis of pH, Electrical conductivity, Calcium plus Magnesium, Carbonates and Bicarbonates, Chloride, Sodium, Potassium, Phosphorous, Organic matter, Sulfates, Soil texture.

Calculations

Silt + Clay = (30second reading+1minute reading)-reading of blank

%Sand =100-(Silt + clay)

%Clay = (4:30hour reading+18hour reading)-reading of blank

%Silt + (Silt + clay) - %clay

Statistics analysis

Duncan's Multiple Range Test (DMRT) was used to evaluate the data obtained from different soil samples [22]. Software package Co-Stat, version 3.03 was used to analyze the significance of results at a certain probability level which is necessary to reach a definite conclusion.

Results

The morphological features of soil samples from different sites at different depths were noted during field analysis. The results of morphological properties of soils are illustrated in the following tables.

Morphological Features of Soil of Sites 01 to 10 at Depths (0-150cm)

	Morphological Features	0-15 cm	15-30 cm	30-60 cm	60-90 cm	90-120 cm	120-150 cm
Site 01	Color	10YR 3/2	10YR 4/3	10YR 4/3	10 YR 4/4	10YR 5/4	10YR 5/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Moderates	Moderates	Moderates	Moderates	Moderates	Moderates
	Artifacts	P&B-fF	B-Vf	Nil	Nil	Nil	Nil
	Lime Nodules	F-Vf	F-Vf	VF-Vf	VF-Vf	VF-vf & com.	VF-vf & com.
	Roots	VF-F&f	VF-f	F&m -Vf&f	F-Vf&f	VF-Vf	VF-Vf
Site 02	Color	10YR 4/2	10YR 4/3	10YR 4/4	10YR 4/4	10YR 4/4	10YR 4/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Slight	Slight	Slight	Slight	Slight	Slight
	Artifacts	F-Vf&B	VF-Vf,B&P	VF-Vf	Nil	Nil	Nil
	Lime Nodules	F-Vf	VF-Vf	Nil	VF-Vf	VF-Vf	VF-Vf
	Roots	F-f	F-f	F-Vf &f	VF-Vf &A	VF-Vf	VF-Vf
Site 03	Color	10YR 4/2	10YR 4/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Moderates	Moderates	Moderates	Moderates	Moderates	Moderates
	Artifacts	B&p-Ff	F-Vf	Nil	Nil	Nil	Nil
	Lime Nodules	F-f&C	F-f	F-f&m & S	F-Vf	F-Vf &Co&C	VF-Vf &C0&A
	Roots	F-Vf&m &C	F-Vf&f	VF-Vf	VF-Vf	VF-Vf	Nil
Site 04	Color	10YR 3/4	10YR 3/3	10YR 4/4& 10YR 4/3	10YR 4/4	10YR 4/4	10YR 4/4
	Texture	Loamy sand	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Slight	Moderates	Moderate b& slight R	Slight	Slight	Moderates
	Artifacts	P&B& S-f	F-f,m G&B	Nil	Nil	Nil	Nil
	Lime Nodules	Nil	Nil	f-m	Nil	Nil	Nil
	Roots	F-C, Vf-m&M	F&VF-C,f&m	F&Vf-f	F-Vf	VF-Vf	VF-Vf
Site 05	Color	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3	10YR 4/3
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Non-calcareous	Slight	Slight	Slight	Slight	Slight
	Artifacts	Nil	N&P, F-Vf	P&B-F,C-f	VF.VF& Co&S-f	VF &f	Nil
	Lime Nodules	Nil	Nil	F-f&M	Nil	Nil	Nil
	Roots	F-f&M	F& Vf-f	Vf-D&M	Nil	Nil	Nil
Site 06	Color	10YR 5/3	10YR 4/4	10YR 5/4	10YR 5/4	10YR 5/4	10YR 5/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Moderates	Strong	Strong	Strong	Strong	Strong
	Artifacts	Nil	Nil	Vf-B	Nil	Nil	Nil
	Lime Nodules	F-C&M, f-Co	F&Vf-A&C	F&Co-f&A&M	F-M& f-C	F&f-M, Co-m	f-M&s
	Roots	F&VF-M,Vf-f	F-Vf&M	VF-Vf	Nil	Nil	Nil
Site 07	Color	10YR 4/3	10YR 4/4	10YR 4/4	10YR 5/4	10YR 5/4	10YR 5/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Moderates	Strong	Moderates	Moderates	Moderates	Moderates
	Artifacts	Nil	f-s&B	Nil	Nil	Nil	Nil
	Lime Nodules	F-Vf	VF-Vf&M	Nil	Nil	Nil	Nil
	Roots	F&Vf-f&M	F&Vf-f	F-Vf	F-VF&Vf-f	Vf-VF	Nil
Site 08	Color	10YR 4/2	10YR 4/3&10YR 4/4	10YR 5/4	10YR 4/2&10YR 5/4	10YR 5/4	10YR 5/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Slight	Moderates	Moderates	Moderates	Moderates	Moderates
	Artifacts	Nil	Nil	Nil	Nil	Nil	Nil
	Lime Nodules	F-f	Nil	Nil	Nil	Nil	Nil

	Roots	F-f,VfC&T	F-f&T	Nil	Nil	Nil	Nil
Site 09	Color	10YR 4/3	10YR 4/3	10YR 4/4	10YR 4/4& 10YR 5/4RM	10YR 4/4& 10YR 5/4RM	10YR 4/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Non-calcareous	Non-calcareous	Non-calcareous	Moderates	Slight	Slight
	Artifacts	F&f-B	F&Vf-f,B&c	Nil	Nil	Nil	Nil
	Lime Nodules	Nil	Nil	Nil	Nil	Nil	Nil
	Roots	F-VF&C	F-f	F-f	F-f	F-f	F-VF&f
Site 10	Color	10YR 4/3& 10YR 4/4	10YR 4/4	10YR 4/4	10YR 5/4	10YR 5/4	10YR 5/4
	Texture	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam	Silt loam
	Calcareousness	Moderate	Strong	Strong	Strong	Strong	Strong
	Artifacts	Nil	Nil	Nil	Nil	Nil	Nil
	Lime Nodules	F-f& M	Nil	F-VF &f-C	F-f &M	F-VF &C	F-C &M
	Roots	F-f&M	F-f, M&Co	F-f &Co	Nil	Nil	Vf-Co

Abbreviations: B=Brick Pieces P=Pottery pieces D=Decayed Co=Coarse Com= Common F=Fine M=Medium f=Few V=very m=Many Y=Yellow R=Red

Soil samples had dominant percentage of silt and it was noted that the dominant soil color in almost all the profile was dark brown (10YR 4/3) to dark reddish brown (10YR 5/4) which indicated the uniformity of soil. Lime nodules were mostly present in all the profile. Soil pH of selected sites varied from 7.7 to 8.5 but under canopy and grass patches ranged from 9.8 to 10.3.Most of soil samples were non saline but soil under plant cover was moderately saline.

Particle Size Distribution

At different depth of different sites, particle size distribution such as %sand, %silt and % clay were analyzed and data is presented in following graphs.

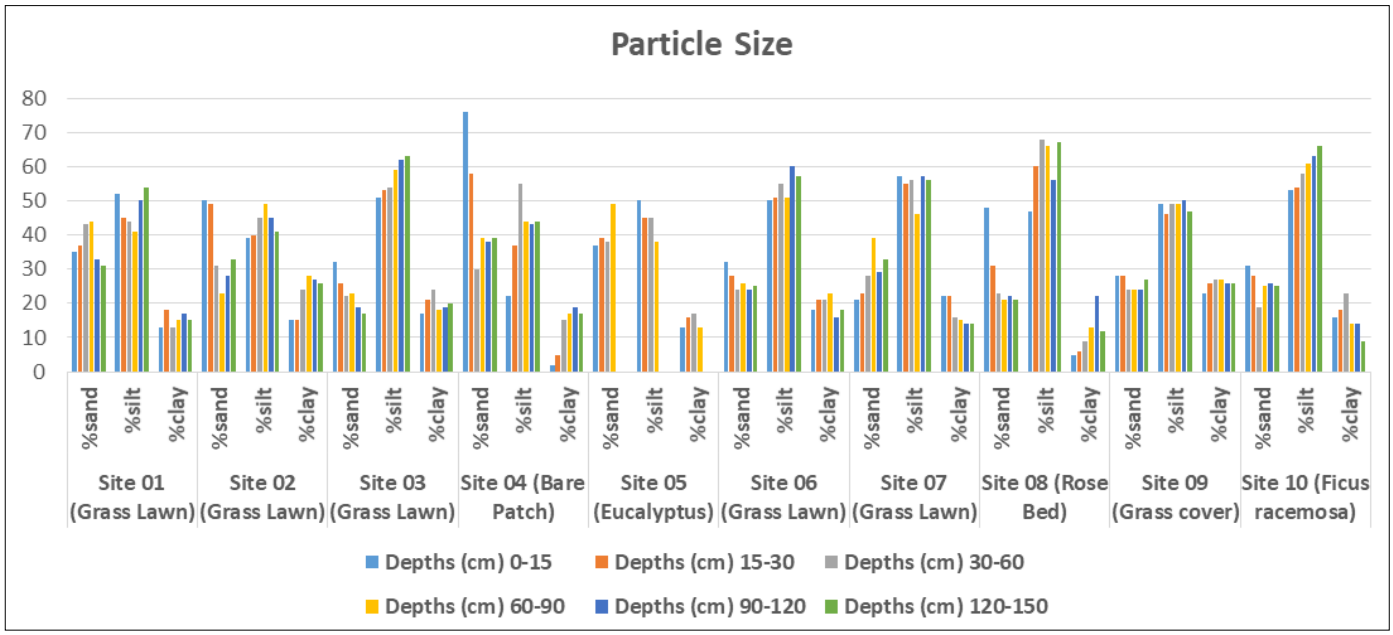
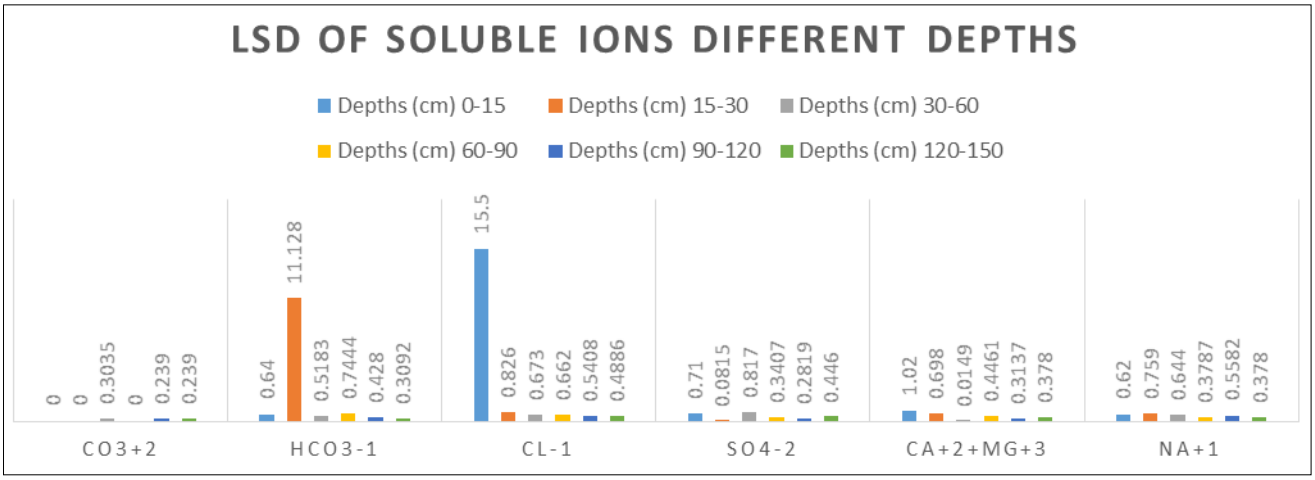


Fig 2: Soil composition of Different Sites at the Depth of 0-150

Figure (2) shows that maximum values of sand were found in the site 4 and 8. Percentage of silt is almost same in all sites except site 4 that show minimum value of silt. Maximum values of clay are found in site 7 and 9. All these figure show that the % age of sand, silt and clay have slight variation, so the texture of soil is mostly uniform.

Soluble Ions

For determination of the and salinity of soil samples, soluble ions were studied from the soil sampling site of various depths. These soluble ions are carbonates, bicarbonates, chlorides, sulphates, calcium plus magnesium and sodium.



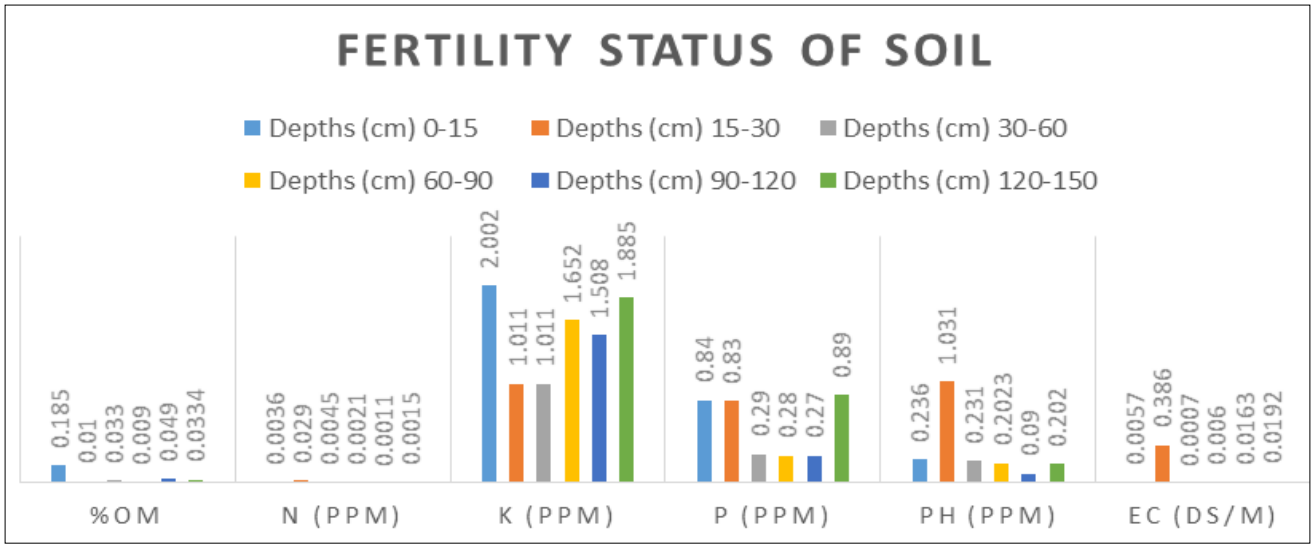
The mean followed by different letters in the same column are much different at P<0.05 according to Duncan's test; ±: Standard deviation; LSD: Least Significant Difference.

Fig 3: Concentration of Soluble Ions of Different Sites at Depth 0-150 cm

Figure (3) showed that the highest LSD value of Carbonates was 0.035 at 30-60 cm and slight variation was observed at different depths. The highest LSD value of Bicarbonates was 11.128 at 15-30 cm depth. The LSD value of Chloride was 15.5 at 0-15 cm depth. The LSD value of Sulfates was 0.817 which was highest at 30-60 cm depth. The highest LSD value of Ca^{+} Mg was 1.02 at 0-15 cm depth. The highest LSD value of Sodium was 0.759 at 15-30 cm depth.

Soil Fertility

The following parameters are potassium, phosphate, pH, organic matter and electrical conductivity, most important for the fertility point of view. According to Agricultural Department of Punjab, their evolution is necessary to determine the fertility of upper layer of soil.



The mean followed by different letters in the same column are much different at P<0.05 according to Duncan's test; ±: Standard deviation; LSD:

Fig 4: Fertility status of soil of Different Sites at Depth 0-150 cm

Figure (4) showed that the highest LSD value of Organic matters was 0.185% at 0-15 cm and slight variation was observed at different depths. The highest LSD value of Nitrogen was 0.029 ppm at 15-30 cm depth. The LSD value of Potassium was 2.002 ppm at 0-15 cm depth. The LSD value of Phosphorous was 0.89 ppm which was highest at 120-150 cm depth. The highest LSD value of pH was 1.031 ppm at 15-30 cm depth. The highest LSD value of Electrical Conductivity (EC) was 0.386 at 15-30 cm depth.

Discussion

Soil fertility is very essential for the survival of all life. Plants use their roots system and leaves to absorb essential elements in many forms. Nutrients availability to plants is dependent on various factors such as the physical and chemical properties of the element, the pH of the soil and its interactions with soil colloids, microbial activity as well as the physical properties of soil like temperature, moisture, compaction and aeration. It is essential that we should increase the understanding of physical, chemical as well as biological properties and relationship in the continuum of soil plant-atmosphere which took place in nutrients supply [23]. The result showed that all the sample of soil under study contains said having range between 17.58%. Silt percentage was greater than 40% in almost all the sample under study except some samples having a range of between 21-49% while 2-28% clay found in the soil samples. These percentages of silt, clay and sand indicates that the soil texture of the area under study is silt loam and loam. As silt is the dominant part of the soil samples of area under study, that's why uniformity in the soil material

was noticed in all depths. Dark brown (10YR 4/3) to dark reddish brown (10YR 5/4) was the dominant soil color observed in almost every profile indicating the uniformity of the soil. Nitrogen is critically essential to plants because it is a fundamental part of the chlorophyll molecule and is essential in the formation of amino acids and proteins scattered materials. Lime nodules are mostly present in all the profile. The amount of nitrogen is mostly less than 1 ppm so according to Pakistan standard the soil of study area is satisfactory good. While in some sites the amount of nitrogen is zero. Soil organic matter effects of the soil directly as well as indirectly. Organic matter effects on many physical, chemical, and biological characteristics of fertile soil [24]. When organic matter exceeds 2%, it becomes a source of sulphur and phosphorous. The organic matter percentage present on the upper surface of the soil of the study area is mostly more than 1% so according to Pakistan standards the soil of study area is satisfactory to good. The accumulation of organic matter on the upper layer, the soil of study area has maximum amount of organic matter under grass vegetation as well as in one site under tree canopy comparing than the other vegetation. Over the time more organic matter accumulate under grasses. High organic matter was determined by Zia *et al.,* (1994) [25] in soil of northern areas of Pakistan. Under the canopy of tree higher proportion of organic matter may be due to effect of accumulation of large amount of litter.in the surface soils under study available phosphorus varies between 4.47 to 15.7 ppm except in one (site 5), where (20.2ppm) higher value of phosphorus was observed which is the range fall in the range of moderately fertile to fertile soil according to Pakistan standard. Official adjustment is required for the surface layer of some sampling site 1, 2, 8, and 9 because of poor condition. the value is more than 14ppm due to hoarding of organic matter in the soil. In the soil of Arecanut garden the amount of phosphorus was observed low to medium by Shetty *et al.,* (2008) [26]. While In the study area phosphorus was found in high amount was determind by Sharma *et al.,* (2008) [27]. According to standard of Pakistan in the surface area of all the sites the available amount of potassium fall in very poor soil condition ranged between 5.5 to 38 ppm except one site that is moderately fertile with 48 ppm value is the site under the canopy of tree. Similarly in the soil of Amritsar maximum amount of potassium observed by Sharma *et al.,* (2008) [27]. In Lebanese soil Zubaidi *et al.,* (2008) [28] observed that potassium accessibility differs widely. In the soil potassium contents controlled by mineral weathering and parent material according to Havlin *et al.,* (2003) [23]. Soil pH varies from 7.7 to 8.5 which indicates that this soil is slightly to moderately alkaline except some sites like site 3, and 6 under grass vegetation and site 5 under the canopy of tree where pH varies from 9.8 to 10.3 which look to be strange. In a study by Sharma *et al.,* (2008) [27] neutral to alkaline soil was observed which is similar to results in this study. According to standard of Pakistan soil under study is in the range of non-saline and electrical conductivity of soil under study varies between 0.074 to 0.99 dS/m. Although some sites are slightly strongly saline with electrical conductivity ranged between 1.13 to 8.32 dS/m. With reference to fertility surface soil in grass land area is considered very good with less than 1 electrical conductivity value, thus it is non saline. Although electrical conductivity value is more than 4.1of surface soil under tree vegetation that falls in the range of moderately saline. Also similar results shown by Sharma *et al.,* (2008) [27]. The ampleness of manganese and aluminum is harmful to plant in highly acidic soil. There is poor availability of magnesium, phosphorus and calcium in a soil with low pH. Favorable pH for microbial activity is 6.6 to 7.3. due to absorption of calcium carbonates on surface the solubility of phosphorus compound and calcium decreases in calcareous soil. According to [29] nutrient availability is influenced by pH. Except site 5 the electrical conductivity values are mostly 4 dS/m, and pH values are mostly less than 8.5 of soil under study, so soil of study area is considered as non-sodic and non-saline, so calculation of soluble ions for this soil is not necessary. For soil fertility the content of organic matter is one of the important factors in the soil. the chief percentage of silt is more than 50 percent and he texture regarding to fertility silt loam texture is treated as very good texture in the soil of Jilani park. In sampling site amount of phosphorus value is not good and the value of available potassium is very low. In the soil of study area organic matter are almost good. These aspects prove that some management is require for the moderately fertile to fertile soil of Racecourse.

Recommendations and Management Options

There should be proper disposal of waste like rappers, bottles, and leaves and removed from lake on daily basis to avoid from deposition of waste in the water and causes the sludge production on water. For the clarity and purity of water chlorine can be added. Presence of mud and dust at the base of lake is the cause of turbidity. High amount of carbonates and dissolve solids are present in this water and death may occur due to consumption of this water. Turbidity can be removed by the appropriate lining of lake. In sampling site due to insufficiency of iron molting is observed and by the drainage process it can be removed. By the reason of dry environment and less NPK pH is almost 9.2 in some sites, and addition of biofertilizer can make it normal. In such conditions to improve the garden bed establishment surface soils can be replaced by soils blended with composted soil condition or organic soil. Health of garden and soil fertility can be improved by altering the existing soil with compost product.

Conclusion

In Jilani park soil dominant percentage of silt is greater than 50% and the texture with reference to fertility silt loam texture is considered as very good texture. The amount of available potassium is dominantly low in sampling sites whereas the value of phosphorous is not good. Organic matter in this soil of study area is almost good. These attributes indicates that the soil of Racecourse is moderately fertile to fertile soil and it needs some managements.

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References

1. Kim C, Terry LS, Martin FJ. Canopy cover effects on soil nitrogen mineralization in north red oak (*Quercus rubra*) strands in northern Lower Michigan. Forest Ecol. Management. 1995; 76(1-3):21-28.
2. McDougall WB. Plant Ecology. 3rd Ed. Landon Henry Kimpton, WC, 1941.
3. Hall AD. The Soil.5th Ed. W. Albenarle Street, Landon. 1956; 1-6:211-215.

4. Lal R, Stewart BA. Need for land restoration. Adv. Soil Sci. 1992, 17:1-11.
5. Maingi JM, Gitonga NM, Shisanya CA, Hornetz B, Muluvi GM. Population levels of indigenous *Bradyrhizobia* nodulating promiscuous soybean in two soils of the semi-arid and semi-humid agro ecological zones. J Agric. Rural Dev. Trop. 2006; 107(2):149-159.
6. Marschner P, Crowely D, Rengel Z. Soil Biology and biochemistry. 2011; 43(5):883-894.
7. Goovaerts P. Geostatistical tools for characterizing the spatial variability of microbiological and physico-chemical soil properties. Biol. Fert. Soils. 1998; 27:315-334.
8. Dalal RC, Dalal WM, Strong EJ, Weston, Gaffney J. Sustaining multiple production systems. 2. Soil fertility decline and restoration of cropping lands in subtropical Queensland Trop. Grassl. 1991; 25:173-180.
9. Carter MR. Analysis of soil organic matter storage in agro ecosystems M.R. Carter, B.A. Stewart (Eds.), Structure and Organic Matter Storage in Agricultural Soils, CRC Press, Boca Raton, all, New jerky, USA. 1996, 3-11.
10. Karlen DL, Mausbach MJ, Doran JW, Kline RG, Harris RF, Schuman GE. Soil quality: a concept, definition, and framework for evaluation. Soil Sci. Soc. Am. J. 1997; 61:4-10.
11. Whitbread AM, Whitbread GJ, Blair RDB, Lefroy. Managing legume leys, residues and fertilizers to enhance the sustainability of wheat cropping systems in Australia. Soil physical fertility and carbon Soil Tillage Res. 1998; 54:77-89.
12. Dalal RC, Dalal R, Eberhard T, Grantham DG, Mayer. Application of sustainability indicators, soil organic matter and electrical conductivity, to resource management in the northern grains region Aust. J Exp. Agric. 2003; 43:253-259.
13. Brady NC, Weil RR. The nature and properties of soil (13 Ed.). Macmillan Publishing Co. New York, 2005.
14. Prado Wilder L, de-Veiga M, Erosio'n y Pe'rdida de Fertilidad del Suelo. In: FAO (Ed.). Conferencia in Santiago, Chile, 27 de Julio al 18 de Agosto de, 1992. Proyecto GCP/RLA/ 107/JPN. Apoyo para una Agriculture Sostenible Mediante Conservacio'n y Rehabilitacio 'n de Tierras en Ame'rica Latina, 1993.
15. Peverill KI, Sparrow LA, Reuter DJ. Soil Analysis: An interpretation Manual, CSIRO, Collingwood, Australia, 1999, 170-174.
16. Honu YAK, Chandy S, Gibson DJ. Occurance of non-native species deep in natural areas of the Shawnee natural forest. Southern illions, USA. Natural Areas Journal. 2009; 29(2):117-187.
17. Jim CY, Chen WY. Pattern and divergence of tree communities in Taipesis main urban green spaces. Landscape. Urb. Plan. 2008; 84:312-323.
18. Turner T. Garden history: philosophy and design. New York. Spon press, 2005.
19. Schleus U, Wu Q, Blume HP. Variability of soils in urban and periurban areas in Northern Germany. Catena. 1998; 33:255-270.
20. Gregg JW, Jones CG, Dawson TE. Urbanization effects on tree growth in the vicinity of New York City. Nature. 2003; 424:183-187.
21. Ali Q, Rafiq M. Guidelines for soil texture determination, Pakistan Soils Bulletin. 1978; 11:14-30.
22. Steel RGD, Torrie JH. Principles and Procedures of Statistics. A biometrical approach. 2nd edition. McGraw-Hill, New York, USA, 1980, 20-90.
23. Havlin JL, Beaton JD, Tisdale SL, Nelson WL. Soil fertility and fertilizers, an introduction to nutrient management. 6th Ed. Person Education, Delhi, Indica, 2003, 443-445.
24. Stevenson FJ. Humus Chemistry: Genesis, Composition, Reactions. John Wiley & Sons, New York, 1982.
25. Zia MS, Baig MB, Tahir MB. Soil environment issues and their impact on agriculture productivity of high areas of Pakistan. Science Vision. 1994; 4(2):56-61.
26. Shetty YV, Nagamma MS, Kumar MD, Jayaprakash SM. Fertility status in arecaunt garden soils of Karnataka. Karnataka J Agri Sci. 2008; 21(4):503-506.
27. Sharma PK, Sood A, Setis RK, Tur NS, Mehra D, Singh H. Mapping of macronutrients in soils of Amristar District (Punjab). A GIS approach. J of the Indian Society of Soil Science. 2008; 56(1):34-41.
28. Zubaidi AA, Yanni S. Potassium status in some Lebanese soil. Lebanese J Sci, 2008, 9(1).
29. Foth HD, Ellis BG. Soil Fertility. 2nd Ed. Lewis Publishers. Landon, 1997.