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EFFECT OF CONDUCTIVITY AND pH ON THE SOIL IN DIFFERENT TRAFFIC AREAS OF HYDERABAD

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ABSTRACT

Urban soils act as a sink for heavy metals and other pollutants due to anthropogenic activities such as vehicular emissions, waste water sludges and industrial wastes. Anthropogenic activities like industrial and energy production, construction waste disposal, domestic heating systems contribute to increase levels of heavy metals in the soil. Heavy metal accumulation in the soils is of considerable important because they are persistent, non biodegradable and toxic to biota if they exceed threshold value. Urban soils vary spatially due to soil composition and they bring change in land use and land cover and play a key role in environmental change. Additional input of waste materials, land scaping and rapid change of land use also contributed unpredictable modifications of soil properties and poor soil structure increasing the concentration of heavy metals. Road side soil samples were collected from different places in the twin cities of Hyderabad representing activities taking place across the metropolitan city of Hyderabad. PH, conductivity, colour of the soil, crystalline amorphous nature of soils were determined. From the results of this study, the samples collected from different areas shows variation in their colour like dark brown, reddish brown, black, reddish and Black/Brown colour. From the brown colour of soil indicates the presence of iron component goethite $Fe(OH)_3$, hematite Fe_2O_3, black colour indicates MnO_2 and humus content. The electrical conductivity of soil samples was varied between 0.09 to 3.2. In all the samples Conductivity of with respect to levels from surface to 10 cms decreased variably. The PH of the road side soils is ranging from 7.5 to 8.3 which enhance the increased heavy metals.

KEYWORDS: Traffic areas, Soil, p H, Conductivity, Heavy Metals, Pollution.

INTRODUCTION

Urban soils[1] act as a sink for heavy metals and other pollutants due to anthropogenic activities such as vehicular emissions, waste water sludges and industrial wastes. Anthropogenic activities like industrial and energy production, construction waste disposal, domestic heating systems contribute to increase levels of heavy metals in the soil. [3]Heavy metal accumulation in the soils is of considerable important because they are persistent, nonbiodegradable and toxic to biota if they exceed threshold value.

[5]Urban soils vary spatially due to soil composition and they bring change in land use and land cover and play a key role in environmental change. [7]Additional input of waste materials, land scaping and rapid change of land use also contributed unpredictable modifications of soil properties and poor soil structure increasing the concentration of heavy metals.

Soil pH[2] is an indication of the acidity or alkalinity of the soil and it is measured in pH units. Soil PH is defined as the negative logarithm of the hydrogen ion concentration. The pH scale ranges from 0 to 14 with pH-7 as the neutral point. As the amount of hydrogen ions in the soil increases the pH decreases indicating the acidic nature and from pH 7 to 14 the soil increasingly more alkaline or basic.

The electrical conductivity is the property that has a material to transmit or conduct electrical current (1-12). The apparent soil conductivity is a measure of the bulk electrical conductivity and it is influenced by porosity, concentration of dissolved electrolyses texture, quantity and composition of colloids organic matter and water content in soil.[8]

Hyderabad is a common capital of Telangana and Andhra Pradesh. It has a population of 6,809,970. It is the fourth biggest city in India. It is the fourth biggest city in India. It is governed by Greater Hyderabad Municipal Corporation (GHMC). It has an area of 650 sq.kms. The topography of the city is sloping rocky terrain of grey and pink granites. It has a unique combination of wet and dry climate that borders hot-semi arid climate. The city lies at 17.366^{o}N and a attitude of 78.476 E^{o} longitude. Most of rain will be received by south-west summer monsoon and it falls between June and September. This city is polluted heavily by industrial, vehicular activities. Taking that factor into consideration, present study has been carried out to analyse the characteristics of soil samples.

Topography

The city lies in Deccan Plateau and rises above an average height of 536m. Rocky and hilly regions are under obliteration for urbanisation. Grey and Pink granites are among worlds oldest geographically it is located in the northern part of Deccan plateau, on banks of river musi. It is a slopy terrain. The city's soil is red sandy with areas of black cotton soil.

MATERIALS AND METHODS

Sample collection areas

[12]The selection of the sampling sites was mainly based on the approach that sampling must be carried out wherever possible near road-ascents, road descents, roadblocks, detours and at points of traffic jams that may assure high rates of polluted soils.

- **Banjara Hills**

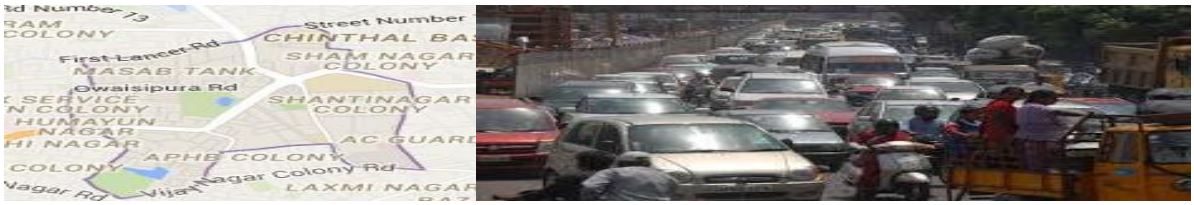
(Collections from google maps).

Banjarahills, original habitants are Banjara tribes and they use to perform folk dances at family functions and wedding till about 12 years ago. It is named after Banjara Bhavan the residence of Mehdi Nawab Jung. This area is of rocky terrain. It has 14 roads it is one of 150 boroughs of Greater Hyderabad. The coordinates of Banjara Hills are 17.4167^{o}N and 78438247 E. It Tank bund road in the Hyderabad,

- **Tankbund**

Tankbund road runs between Hyderabad and Secunderabad and it connects the two cities. The tank bund dams Hussain sagar on the eastern side. It is located at 17.45^{o}N and 78.5^{o}E.

➢ **Somajiguda**



Somajiguda initially a peaceful residential locality and now it has turned into a modern business centre and it is close to city centres such as Begumpet, Punjagutta and Khairthabad. The cooridinates are 17^{o} 428911^{o} Nand 78.455343^{o}E.

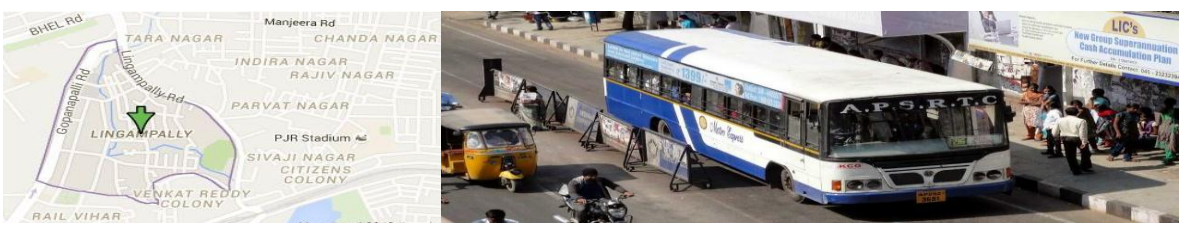
➢ **Khairthabad**

Khairthabad lies at the coordinates 17.436793^{o}N and 78. 443906^{o}E. Khairthabad is named after a khairunnisa bomb placed next khairthabad mosque. It is a major road junction of somajiguda, Ameerpet, Khairthabad circle, Anand nagar, and Lakdikapul.

➢ **Masabtank**

Masabtank is named after Maa-Sahaba tank. It is a major suburb of Hyderabad, India. The population of this area is 1, 50,000. The area lies at the junction Road1 Banjarahills, Humuyunnager and Lakdikapul.

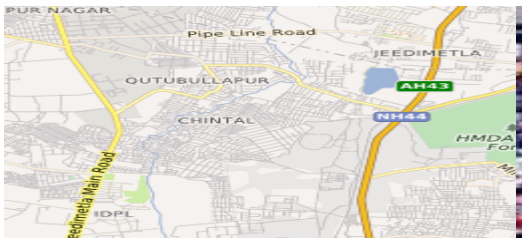
➢ **Lingampally**



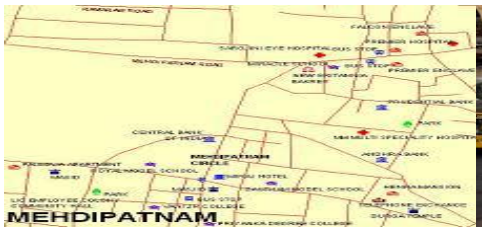
Lingampally is a suburb near Hyderabad (city). It is close to BHEL and is located on national high way of Mumbai. Many residential colonies lie around Lingampally. The coordinates of this area are 17.483473^{o}N and 78.311731^{o}E.

➢ **Lothukunta**

Lothkunta is a suburb in the cantonment on the northern border of Hyderabad city, Telangana, India. It is situated at a distance of around 7 km from Secunderabad and approximately 14 km from Hyderabad. It lies on the national highway. Lothkunta comes under mandal- Malkajgiri -Population - 193,863.Lothukunta is a suburb in the cantonment on the northern border of Hyderabad city in Telangana.

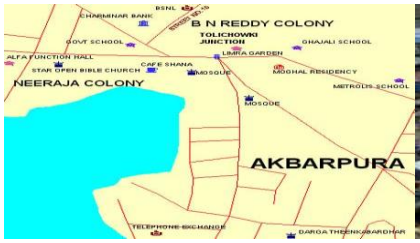


➢ **Medhipatnam**



Medhipatnam is the major suburb in Hyderabad India. It derives its name from Nawab Mehdi Nawaz Jung. It is located in 17.3959^{o}N and 78.4312^{o}E.

➢ **Tolichowki**

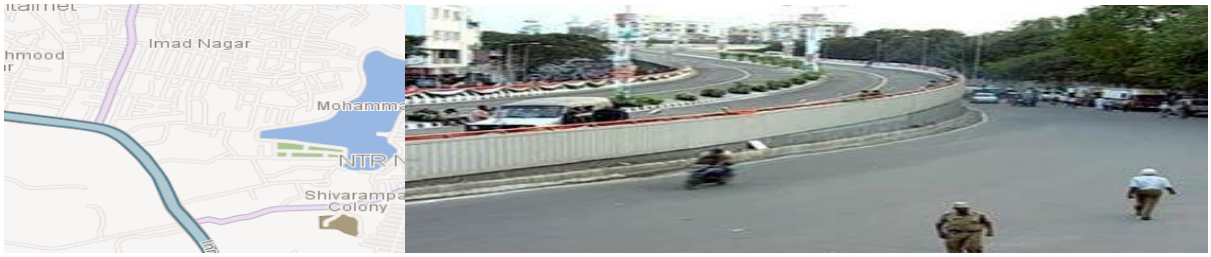


Tolichowki is a major suburb in Hyderabad, India. The name Tolichowki comes from the Urdu word 'Toli', meaning 'troupe', and 'Chowki', meaning 'post'. It is located in 17° 22′ 28″ N, 78° 26′ 30″ E.

➢ **Secunderabad**

Secunderabad also spelled sometimes as Sikandar-a-bad), popularly known as the twin city of Hyderabad is located in the Indian state of Telangana. Geographically divided from Hyderabad by the Hussain Sagar lake, Secunderabad is no longer a separate municipal unit and has become part of Hyderabad's GHMC municipality. It is located in 17.45, 78.5.

➢ **Aaramghar**

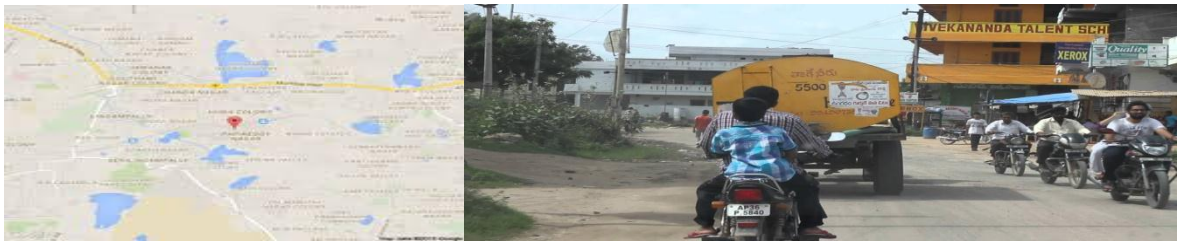


Aramghar is near to shivarampally in outskrit of Hyderabad.It is located in 17°19'12"N 78°25'53"E.

➢ **Secretariat**

It is placed in center of the hyderbad city near to tankbund and surrounded by many tourism places, Because of it heavy present in this area.it is located 17° 27′ 0″ N, 78° 30′ 0″ E.

➢ **Bheeramguda**



Beeramguda is the place where to Famous Temple of Lord Shiva is located. It is located on the Hyderabad-Bombay NH-9 Hwy, near to Patancheru in the Ramachandrapuram Area.Nearby cities: Sangareddy, Tandur, Armoor,Coordinates: 17°31'10"N 78°18'3"E.

Sample Collection: From the mentioned area, samples were collected by using spiral auger of 2-5 cm diameter and all the road side samples were placed in clean plastic bags for further analysis.

Experimental Methods: The conductivity, PH, colour intensity of the soil samples were determined by using digital conduct meter, PH meter and colorimeter.

RESULTS AND DISCUSSIONS

Table -1.

Traffic areas soil conductivity and pH					
Khairatabad					
	colour	**conductivity**	**pH7**	**pH4**	**pH9**
Surface	Dark brown	0.09	8.36	7.57	8.55
5cm	Dark brown	0.4	8.37	7.43	8.44
10cm	Dark brown	0.8	8.34	7.43	8.42
Masab tank					
Surface	Dark brown	0.42	7.72	7.32	8.1
5cm	Dark brown	2.1	7.62	7.33	7.98
10cm	Dark brown	1.4	7.63	7.32	7.81
Banjarahills					
Surface	Black	0.3	7.92	7.68	8.08
5cm	Black	0.3	7.82	7.64	8.01
10cm	Black	0.1	7.72	7.65	8.07
Tolichoki					
Surface	Black	3	7.8	7.63	8.02
5cm	Black	1.4	7.72	7.52	8.09
10cm	Black	1.2	7.64	7.53	8.02
Mehidipatnam					
Surface	Reddish brown	1.5	7.79	7.32	8.33
5cm	Reddish brown	0.6	7.77	7.34	8.29
10cm	Reddish brown	1	7.89	7.29	8.29
Secunderabad					
Surface	Reddish brown	0.7	7.56	7.12	8.09
5cm	Reddish brown	2.3	7.39	6.94	7.85
10cm	Reddish brown	2.7	7.4	6.91	7.83
Somajiguda					
Surface	Dark brown	1.4	7.2	6.7	7.54
5cm	Dark brown	1.6	7.12	6.76	7.61
10cm	Dark brown	1.8	7.05	6.8	7.64
Lothkunta					

Surface	Reddish	3.2	7.3	6.9	7.77
5cm	Reddish	1	7.64	7.26	8.15
10cm	Reddish	1.2	7.49	7.12	8.07

Table-2.

Pavement soil of different areas			
Area	**Colour**	**Conductivity**	**pH9**
Khairatabad	Dark brown	2.5	8.95
Tank bund	Black	3.2	7.69
Somajiguda	Brownish black	1	8.06
Banjara hills	Black	1.6	8.21
Masab tank	Dark brown	2.6	8.6
Tolickoki	Black	3	8.02
Aaramgud	Black	1.6	8.41
Secratariat	Dark brown	0.5	7.84
Lingampally	Black	2.1	8.3
Bheeramguda	Black	2.3	8.4

Soil electrical conductivity and pH of Soil Samples

[4]Road surfaces receive varying amount of heavy metals by the process of atmospheric deposition, sedimentation, impaction and interception.[14] Land use has generally been considered a local environmental issue, but it is becoming a force of global importance[15] The pH and EC are usually considered as indicators or measurement of the chemical nature of road dusts.

In Masab tank, the conductivity of soil is varying from 0.42 dS/m to 2.1 dS/m. At surface the conductivity is low at 5 cm it is high and again at 10 cm it is decreased. The texture of soil slit lome and non saline in nature.

In Mehdipatnam, the conductivity is from 1 dS/m to 1.5 dS/m. At surface it is high and decreased at 5 cm and increased at 10 cm indicating the slit loam and non saline in nature. In Secunderabad soil conductivity is 0.7 dS/m at surface as depth is increasing conductivity is increased to 2.7 dS/m variation is about 2.0 dS/m. The soil was saline in nature, as the salinity increase growth of the plants decreases In Banjara hills Lothkunta, Tolichowki, Somajiguda it is almost constant. The pavement soil samples conductivity was ranging from 0.5 to 3.2 dS/m. pH is one of the factors which influence the bioavailability and the transport of heavy metal [6]in the soil and according to [10]heavy metal mobility decreases with increasing soil pH (8 and above) due to precipitation of hydroxides, carbonates or formation of insoluble organic complexes.[11]

Colour of the soil in the different areas of Hyderabad

[8]Soil colour exhibits wide range of colours such as grey, black, white, red, brown, yellow and indicates the composition of soils. Colour of soil and distribution of colour is due to the chemical and biological weathering due to redox reactions taking place in the soil. From table, it can be indicated that most of the soils Khairthabad, Masab tank samjiguda are dark brown in colour and Medhipatnam, Secunderabad, Lothukunta soils are reddish brown in colour. Banjara hills, Tolichowki are black in colour. Lothukunta soil samples are reddish in colour. Black/Brown colour soil samples content. [5]The brown colour soil consists of iron component goethite FeOH, hemalite Fe_2O_3 black colour indicates MnO_2 and humas content (14 Conductivity of the soil samples with respect to levels from surface to 10 cms.

CONCLUSIONS

The soil electrical conductivity (EC) also differed significantly among sampling points (< 0.5 dS/m). By comparison, [9]classified EC of soils as: non saline < 2; moderately saline 2 - 8; very saline 8 - 16; extremely saline > 16. From the result of the study, the EC is classified as extremely saline. In secunderabad, Tolichoki, Lothkunta conductivity of soils were moderately saline in nature. Due to saline nature of soil plants can't grow normally in traffic areas.[12] The relatively higher EC values compared to the control site could be due to the presence of high levels of ionisable materials in the sampling sites, including metal cations as well as anions.

[13]pH values distribution is related to geology. Most of soil samples showed neutral and alkaline nature and there is no much variation with depth up to 10cm.The pH values obtained at all sampling sites were within the alkaline range that is in between 7.29 to 8.46 pH except Secunderabad, Lothkunta and Somajiguda which are slightly acidic in nature. The effect of pH on heavy metal availability to plants has been reported by many researchers and it is accepted that as pH decreases, the solubility of cationic forms of metals in the soil solution increases and, therefore, they become more available to plants.[16]

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