



# SEASONAL ANALYSIS OF SOIL OF KALA TALAO, DURGADI (GANESH GHAT), GANDHARI LAKE, GAURIPADA TALAV & UMBERDAE TALAV FOR ASSESSMENT OF POLLUTION

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**Abstract :** Soil pollution assessment is a very crucial thing as mainly plants grow in the soil and if the soil is contaminated or polluted the plants will not have a health environment to grow which will indirectly affect us when we consume the fruits or the vegetables that grow in the same soil. Along with it, the heavy metal pollution in the soil is increasing day by day which may prove to be fatal for the growth of agricultural products. The presence of heavy metals leads to biological toxicity. Hence it is necessary to take proper preventive measure to avoid causing soil pollution and saving the environment.

**Index Terms –** Soil pollution, Environment, Biological toxicity, Agricultural products, Heavy metals

## I. INTRODUCTION

Soil pollution refers to the contamination of soil with anomalous concentrations of toxic substances. It is a serious environmental concern since it harbours many health hazards. For example, exposure to soil containing high concentrations of benzene increases the risk of contracting leukaemia. An image detailing the discolouration of soil due to soil pollution is provided below.

It is important to understand that all soils contain compounds that are harmful/toxic to human beings and other living organisms. However, the concentration of such substances in unpolluted soil is low enough that they do not pose any threat to the surrounding ecosystem. When the concentration of one or more such toxic substances is high enough to cause damage to living organisms, the soil is said to be contaminated.

Soil heavy metal pollution has become a worldwide environmental issue that has attracted considerable public attention, largely from the increasing concern for the security of agricultural products. Heavy metals refer to some metals and metalloids possessing biological toxicity, such as cadmium, mercury, arsenic, lead, and chromium. These elements enter the soil agro-ecosystem through natural processes derived from parent materials, and through anthropogenic activities. Heavy metal pollution poses a great threat to the health and well-being of organisms and human beings due to potential accumulation risk through the food chain. Remediation using chemical, physical, and biological methods has been adopted to solve the problem. Phytoremediation has proven to be a promising alternative to conventional approaches as it is cost effective, environmentally friendly, and aesthetically pleasing. To date, based on the natural ability of extraction, approximately 500 taxa have been identified as hyperaccumulators of one or more metals. In addition, further research integrating biotechnological approaches with comprehensive multidisciplinary research is needed to improve plant tolerance and reduce the accumulation of toxic metals in soils.

## ➤ KALA TALAO

Bhagva Lake is commonly known as Kala talao. It is one of the top tourist attractions in Kalyan city. It is situated at Swanand Nagar, Kalyan west; district Thane, Maharashtra, 421301 Kala talao was built by Adil Shah of Bijapur and located at a distance of a kilometre and half from Kalyan railway station. It covers around 24 acres area. Earlier known as Shenale lake, it is managed and maintained by Kalyan-Dombivli Municipal Corporation (KDMC).

It is Open for all for Morning Walk, boating is also done & Balasaheb Thakre Memorial Museum Built In respect.

The water of this talav is used mainly by the people residing in nearby areas. People mainly use the water for drinking and for all the other household chores.



## ➤ DURGADI [GANESH GHAT]:

Currently the most popular place in town, The Ganesh Ghat is a place to chill out with friends and family on weekends or holidays. It was created by the Corporation as a recreation spot. It is referred to as the Chowpatty for the Kalyan residents.

One can visit the Ghat during evenings to enjoy the bhel puri, pani puri and other numerous food stalls. One can enjoy the local snacks and refreshments. It is a good place for children to enjoy the portable merry go round.

Earlier activity such as boat ride was available during the day up to 9:00 p.m. in the evening.

The water from this place is mainly used by the people living in nearby places for day-to-day activities.





## **GANDHARI:**

Popular among bikers, Gandhari Nadi is perfect for an evening stroll too. Spanning the width of the river is a bridge that serves as a great hangout point if you want to catch the sunset or simply relax after a long day. After you are done with all your exploring stop by here to enjoy a few calming moments with the water. After all, all that hustle's got to end with a well-deserved reward.

## ➤ GAURIPADA

Gauripada Talav is well famous place in area with nice complex and lot of crowded place. It is nearby Shahad station and Kalyan station. Birla college and school, hospital, parks are well situated in area. Well Connected with roads and Markets, railway, auto stand etc. During Ganpati this talav is mainly one of the areas where “Ganpati Visarjan” takes place. This talav has a temple nearby and mostly all the used materials from the pooja are thrown in the talav thus making it polluted



## ➤ UMBERDAE

Umberdae talab is mainly located near the Raunak city area of Kalyan west region. It is basically a small village in the midst of Kalyan. The people in the nearby are use this water for their daily household chores and also bring their cattle near the talab for giving them a bathe. The water of this talab is used on a daily basis and is the home to many fishes too.



## TESTING PARAMETERS

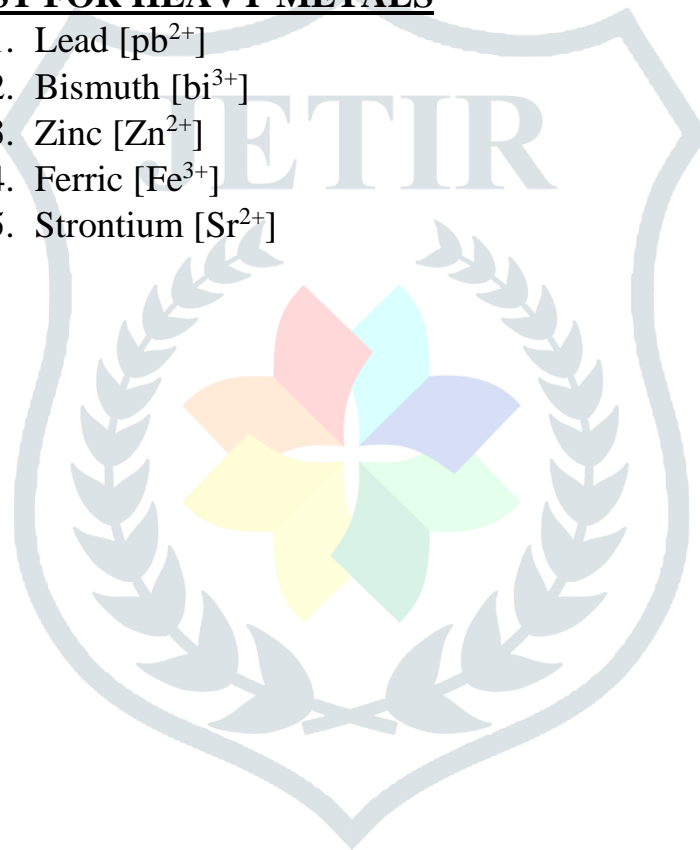
### ▲ SOIL ANALYSIS

- **CHEMICAL TEST**

1. pH of soil
2. Organic matter of soil
3. Calcium carbonate content in soil

- **TEST FOR HEAVY METALS**

1. Lead [ $Pb^{2+}$ ]
2. Bismuth [ $Bi^{3+}$ ]
3. Zinc [ $Zn^{2+}$ ]
4. Ferric [ $Fe^{3+}$ ]
5. Strontium [ $Sr^{2+}$ ]



## CHEMICAL TESTS

### DETERMINATION OF pH OF THE GIVEN SOIL SAMPLE .

#### FLOW CHART

Take 1 gm of air-dried soil sample. Add 10 ml of distilled water.

Put a pinch of  $\text{BaSO}_4$  . Mix well. Allow it to stand for 15 -20 min .

Transfer the supernatant in a test tube . To this add 0.2 ml of PH indicator.

Shake well and allow it to stand for 15 - 20 min.

Compare the color developed with those on the std. color chart on the universal indicator bottle.

Note down the value of the pH obtained for each sample.  
Determine whether the given sample is acidic, basic, or neutral



## **DETERMINATION OF ORGANIC MATTER CONTENT IN THE GIVEN SOIL SAMPLES**

### **METHOD: WALKLEY AND BLACK METHOD**

#### **FLOW CHART**

Take dried soil and pass through the sieve

Weigh accurately 1 gm of soil sample and transfer it to dry 250 ml conical flask

Add 10 ml of 1N  $K_2Cr_2O_7$  solution and shake the mixture to mix the contents. Then add 10 ml of conc.  $H_2SO_4$  slowly and mix it gently by swirling. Do this carefully in order to avoid throwing soil up from the sides of the flask. (When conc.  $H_2SO_4$  is added lot of heat is produced because dilution of concentrated  $H_2SO_4$  is an exothermic reaction.

Cover the flask and keep at room temperature for 30 minutes

After the reaction is over dilute the contents with 100 ml distilled water and add 5 ml of  $H_3PO_4$  or 1 gm NAF and shake vigorously to mix

Now add 0.5-1 ml of DPA indicator solution. It will give violet or bluish-purple color to the suspension

Titrate the contents with 0.5N FAS till the color changes from violet to bright green. Note the volume of FAS solution required

At the same time run a blank under identical conditions with the same quantity of reagents but without the soil sample. Titrate the contents with 0.5N FAS . This is blank reading

## **DETERMINATION OF $\text{CaCO}_3$ CONTENT IN THE GIVEN SOIL SAMPLES**

### **FLOW CHART**

Take 1 gm of dried soil without gravels in 250 ml conical flask

Add exactly 100 ml of 1N HCL. Cover with a watch glass and allow it to stand for 1 hour with vigorous shaking intermittently

Let the soil settle down

Take 10 ml of supernatant in a conical flask

Add 0.5 ml of BTB indicator

Titrate the contents against 1N NaOH till the color changes from colorless to blue at the end point

Repeat the titration for blank by using 10 ml of 1N HCL

## TEST FOR HEAVY METALS

### DETERMINATION OF HEAVY METALS PRESENT IN THE GIVEN SOIL SAMPLES

- ❖ For analysis of heavy metals , the process of acid digestion of soil sample is required

#### ACID DIGESTION OF SOIL

Keep the soil in oven for about 12-24 hours at about 100<sup>0</sup>c. Grind in mortar and pestle to make it fine and sieve it

Take 1 gm of the sieved soil in a conical flask. Add 10 ml of conc. HNO<sub>3</sub> and heat it. After it gets heated turn off the flame and cool the mixture for about 10 minutes

After cooling again add 5 ml of conc. HNO<sub>3</sub> and continue to heat for about 30 minutes. If brown gas is observed again add 5 ml of conc. HNO<sub>3</sub> until the reaction is complete. Then allow it to cool

Now add 2 ml of distilled water + 3 ml of H<sub>2</sub>O<sub>2</sub> (hydrogen peroxide) and heat until it starts boiling. Again add 1 ml of H<sub>2</sub>O<sub>2</sub> until change is observed (yellowish)

Heat the mixture continuously till the final volume is reduced to about 5 ml. Now let the mixture cool and then add 10 ml of HCL. Now again heat the mixture for about 15 minutes

Cool the mixture. After the mixture has been cooled filter through Whatman filter paper with the help of funnel in the conical flask

After the mixture has been filtered transfer the final filtrate in 100 ml volumetric flask and fill with distilled water until the mark

Mix the content thoroughly. Now the solution is ready for analysis of heavy metals



## TEST FOR HEAVY METALS

### ❖ LEAD (Pb<sup>2+</sup>):

2 drops of sample + 4-5 drops of 4NH<sub>2</sub>SO<sub>4</sub> (Sulfuric acid ) → white ppt

### ❖ BISMUTH ( Bi<sup>3+</sup> ) :

2 drops of sample + 4NHNO<sub>3</sub> till acidic + 2 drops of 10% Thiourea solution  
Shake well → Yellow ppt

### ❖ ZINC (Zn<sup>2+</sup>):

2 drops of sample + 4NH<sub>2</sub>SO<sub>4</sub> till acidic + 4-5 drops of 5% K<sub>4</sub>Fe(CN)<sub>6</sub> → White ppt

### ❖ FERRIC (Fe<sup>3+</sup>):

2 drops of sample + 2-3 drops 5% K<sub>4</sub>Fe (CN)<sub>6</sub> → Blue colour or ppt

### ❖ STRONTIUM (Sr<sup>2+</sup> ):

2 drops of Sample + 5 drops of K<sub>2</sub>CrO<sub>4</sub>+ 4N NH<sub>4</sub>OH till alkaline → yellow coloured ppt

## OBSERVATIONS

### CHEMICAL TESTS

#### + pH OF SOIL SAMPLE

It is a measure of hydrogen ion activity in soil solution. Measured in the field or in the laboratory using an electrode or some form of indicator solution or test strip, soil pH is broadly linked to the pH of the parent material, but is often affected by pedological processes such as the leaching of solutes.

**OBSERVATION TABLE NO 1:**

SAMPLES	MONSOON SEASON	
	pH VALUE	NATURE
Umberdae	8.5	ALKALINE
Gandhari	8.0	ALKALINE
Durgadi	6.5	ACIDIC
Gauripada	7.5	ALKALINE
Kala Talav	8.5	ALKALINE

**OBSERVATION TABLE NO 2:**

SAMPLES	WINTER SEASON	
	pH VALUE	NATURE
Umberdae	7.0	NEUTRAL
Gandhari	9.0	ALKALINE
Durgadi	8.5	ALKALINE
Gauripada	7.5	ALKALINE
Kala Talav	7.0	NEUTRAL

**OBSERVATION TABLE NO 3:**

SAMPLES	SUMMER SEASON	
	pH VALUE	NATURE
Umberdae	8.5	ALKALINE
Gandhari	7.0	NEUTRAL
Durgadi	7.5	ALKALINE
Gauripada	5.5	ACIDIC
Kala Talav	8.5	ALKALINE

## PHOTOGRAPH



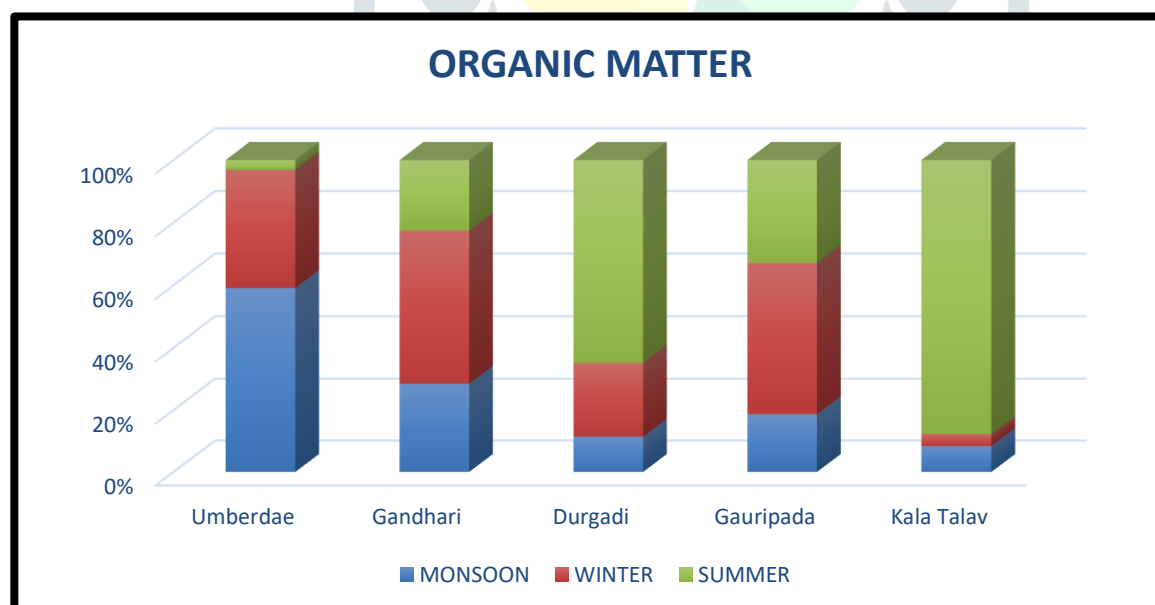


## ORGANIC MATTER OF SOIL SAMPLE

Organic matter comes from living materials that fix and store carbon and deliver it as a source of energy to the soil. More specifically, organic matter is divided into three types, depending on the time it takes for the organic matter to fully decompose

### OBSERVATION TABLE NO 4:

SAMPLES	SEASONAL VARIATION ( In %)		
	MONSOON	WINTER	SUMMER
Umberdae	0.94	0.60	0.05
Gandhari	0.67	1.15	0.53
Durgadi	0.32	0.67	1.82
Gauripada	1.15	2.98	2.03
Kala Talav	0.39	0.18	4.08



# PHOTOGRAPH

**INITIAL:**



**FINAL:**

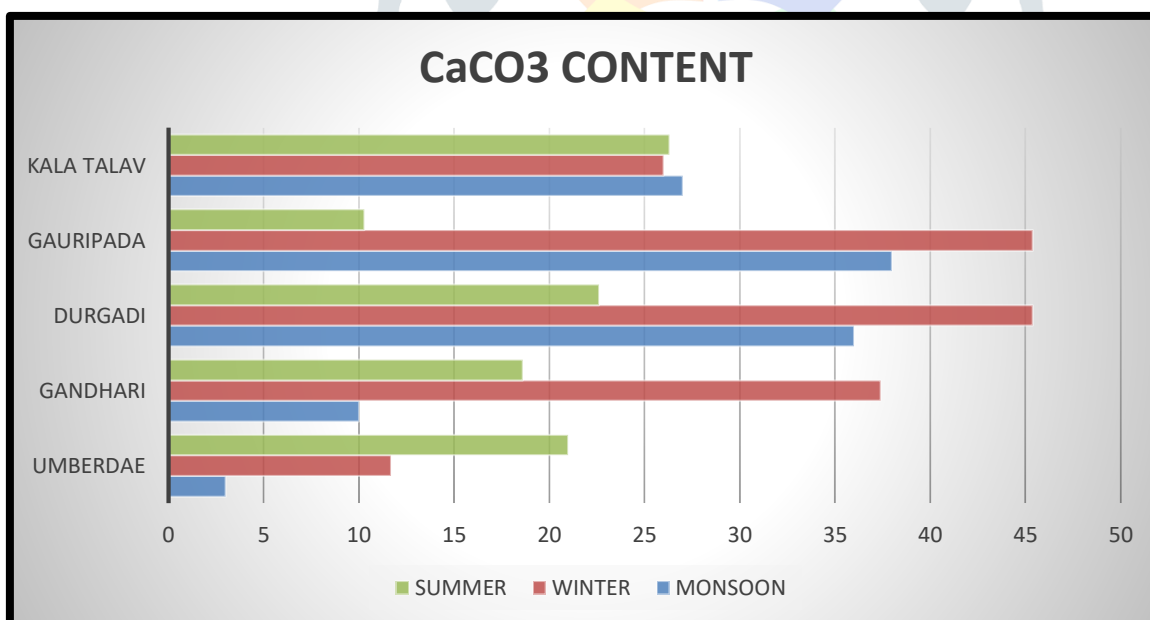


## CaCO<sub>3</sub> CONTENT OF SOIL SAMPLE

CaCO<sub>3</sub> enters the soil through limestone, marble leaching into the soil. Also, the decomposition and deposition of bones of animals into the soil increases the amount of CaCO<sub>3</sub> in the soil. Excess of CaCO<sub>3</sub> in the soil makes it alkaline, thus affecting plant growth of soil flora & fauna.

### OBSERVATION TABLE NO 5{

SAMPLES	SEASONAL VARIATION ( In %)		
	MONSOON	WINTER	SUMMER
Umberdae	3	11.7	21
Gandhari	10	37.4	18.6
Durgadi	36	45.4	22.6
Gauripada	38	45.4	10.3
Kala Talav	27	26	26.3



## HEAVY METALS OF SOIL SAMPLE

These are generally defined as metals with relatively high densities , atomic weights, or atomic numbers. All heavy metals are not toxic , some of them are toxic.

### OBSERVATION NO 6:

#### FOR MONSOON SEASON

SAMPLE	METALS				
	LEAD (pb <sup>2+</sup> )	BISMUTH (Bi <sup>2+</sup> )	ZINC (Zn <sup>2+</sup> )	FERRIC (Fe <sup>2+</sup> )	STRONTIUM (Sr <sup>2+</sup> )
Umberdae	-	-	-	-	+
Gandhari	-	-	-	-	+
Durgadi	+	-	-	+	+
Gauripada	-	-	-	-	+
Kala Talav	-	-	-	-	+

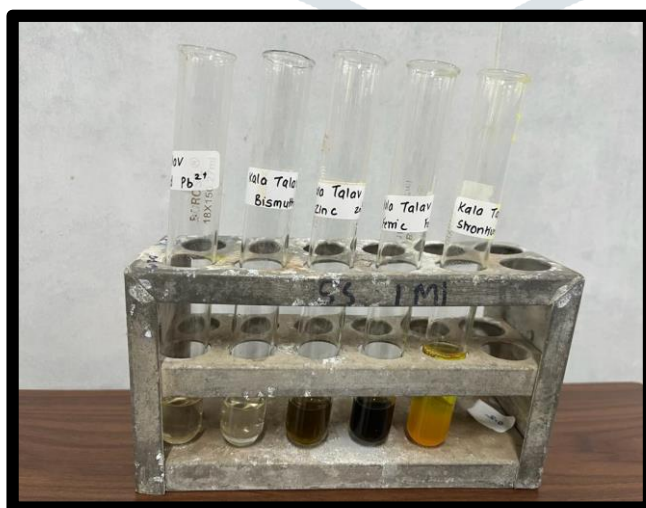
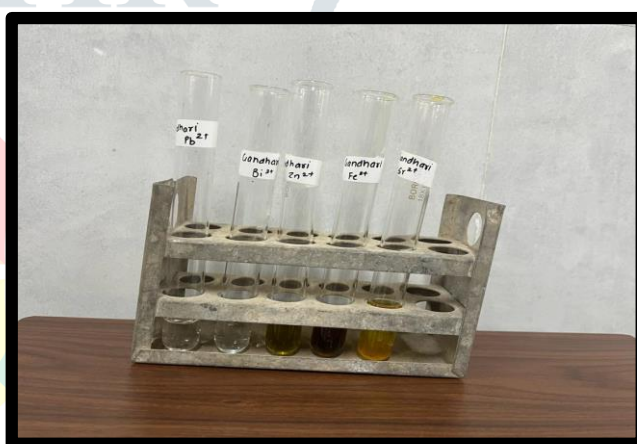
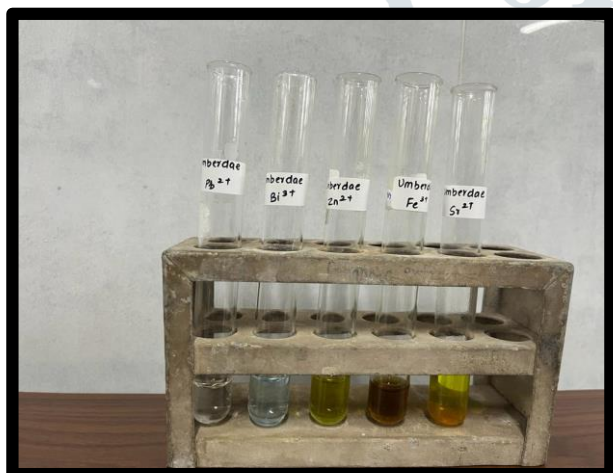
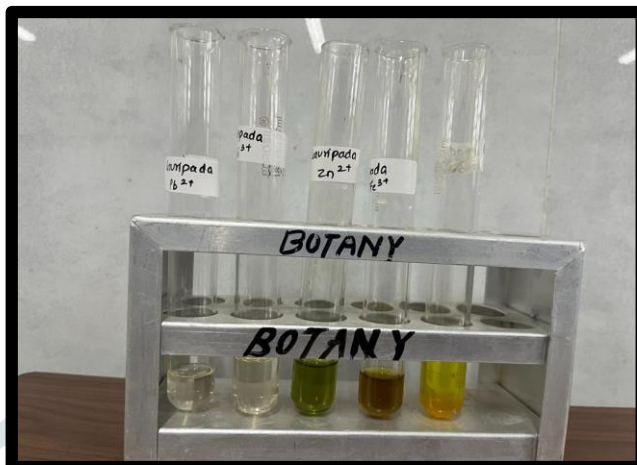
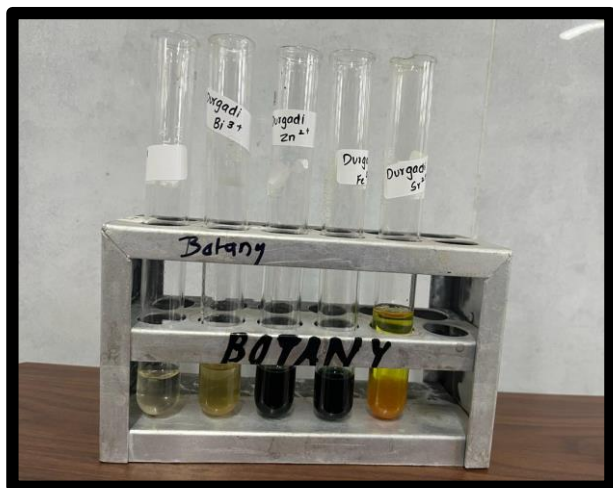
**OBSERVATION NO 7:****FOR WINTER SEASON**

SAMPLE	METALS				
	LEAD (pb <sup>2+</sup> )	BISMUTH (Bi <sup>2+</sup> )	ZINC (Zn <sup>2+</sup> )	FERRIC (Fe <sup>2+</sup> )	STRONTIUM (Sr <sup>2+</sup> )
Umberdae	-	-	-	+	+
Gandhari	-	-	-	+	+
Durgadi	-	-	-	+	+
Gauripada	-	-	-	-	+
Kala Talav	-	-	-	+	+

**OBSERVATION NO 8:****FOR SUMMER SEASON**

SAMPLE	METALS				
	LEAD (pb <sup>2+</sup> )	BISMUTH (Bi <sup>2+</sup> )	ZINC (Zn <sup>2+</sup> )	FERRIC (Fe <sup>2+</sup> )	STRONTIUM (Sr <sup>2+</sup> )
Umberdae	-	-	-	+	+
Gandhari	+	-	-	-	+
Durgadi	+	-	-	+	+
Gauripada	-	-	-	-	+
Kala Talav	-	-	-	+	+

# PHOTOGRAPH



## **CONCLUSION:**

From the above observations it is evident that the sample of soil may have some pollutants as well as some amount of organic matter in it. Mostly the nature of the soil is alkaline . It is important to take proper measures to prevent soil from getting polluted so that the growth of plants is not altered.

## **ACKNOWLEDGEMENT:**

We wish to thank the Department of Botany for their constant help and support during the completion of the project

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