Study Of Different Parameters For Polluted Water And Their Effect On Biotic Component (Epipremnum Aureum)

Deepika and *Praveen Kumar Sharma

Department of Chemistry, School of Chemical Engineering and Physical Sciences, Lovely Professional University, Phagwara, Punjab, India-144411
Email:- pk_pandit1982@yahoo.com

Abstract: Humans are in the process of development, due to various anthropogenic activities, water quality regularly degraded. Percentage of pollutants in water increases day by day and disturbed natural environment. Present work is carried out in Lovely Professional University, India, and based on water analysis with different parameters such as water hardness, pH, alkalinity, TDS, COD and conductance etc. In addition to this, the effect of polluted water on the growth of biotic component (epipremnum aureum) were also studied.
Keywords: Chemical oxygen demand, Pollution, TDS, Alkalinity, Biotic Component.

INTRODUCTION

Major part of earth is covered by water (around 2/3 of earth). Also our body consisting of 75% of water. According to WHO, "access to safe drinking water is essential to human health, human right as well as major part of policy for health protection." Groundwater is the main source of drinking water because of its purity. [1]

As humans are in the process of development; due to various anthropogenic activities the water quality is regularly degraded. Major pollutants of water are inorganic chemicals (sulfates, nitrates, carbonates etc) organic (insecticides, detergents, food processing waste etc.) and microorganism. Agriculture is also responsible for the degradation of water quality. Fertilizers used in agriculture fields (rich in nitrogen, potassium, phosphorous), manures (contain nitrogen, ammonia and other dangerous pathogens), improper way of irrigation are the main source of pollutants in the water [2]. Human activities such as industrialization, Mining, Construction of Dams, Roads, Tunnels different customs, traditions are mainly responsible for the water pollution. Now a day's non serious way of disposing the industrial waste, domestic waste, agriculture effluents as well as acidic rain are main cause of water contamination. These reasons making the water saline and polluted [3]. Pollutants present in water may be not toxic but they can produce bad odour, colour and taste problems.[4]

Due to the use of polluted water health issues regularly increased. Polluted water may cause outbreak of serious water born diseases such as typhoid, cholera, bacterial diarrhea, etc. This type of water may causes the death of a human. Polluted water is not only the problem of human beings but it affecting the other components of environment. The excess concentration of toxic chemicals in water creating a problem of algal blooms , loss of oxygen, lack of fishes, loss of aquatic plants and loss of biodiversity. The degradation of water quality affecting the aquatic life very badly especially plants. [5-8] Extreme rise in nutrients such as N, P in water cause the algae bloom. Water quality is reflected by the number of algae present in the water. The amount of biomass population is change by the large number of

algae reproduction. The algae are synthesized by photosynthesis using the inorganic component and sunlight. Main important component of algae cells is chlorophyll-a. pH value of water is affected by the amount of CO_2. Due to the process of photosynthesis algae present in water absorb carbon dioxide and release oxygen and this affect the pH of water [9].

Water pollutants creating a major problem for the plants and their growth. Heavy metals such as cadmium, copper, lead, chromium and mercury present in water are major environment pollutants. However few metals like copper, manganese, cobalt, zinc and chromium are essentials to plant metabolism in trace amounts. But at excessive levels, they have potential to become toxic for plants. These metals are activators of enzyme reactions. Cadmium, mercury and arsenic are poisonous to metal-sensitive enzymes resulting in growth inhibition. [10].

Review of literature

A brief literature survey is carried out for finding a research problem based on current environmental issue. A literature survey is based on previous researches. People generally carry out a literature review for design/finding a research problem. It is a collected body of scholarly works related to a topic. It gives a hypothetical as well as experimental analysis of the given task. [11] Literature search gives all the information available on a topic which results in a list of references. Its main benefit is that we will be able to find the gaps and weakness in the exciting research and then come up with useful and meaningful research questions.[12]

Water is the major source of life; without water life cannot exit on this planet. Earlier all the water bodies are having the ability to oxidize organic materials present in the water. But due to increased anthropogenic activities such as industrialization, mining, farming etc. natural purification phenomenon is not enough to oxidize such materials.

In the present time various process are available to treat the waste water i.e. biological, advanced oxidation, electrochemical process, electro-coagulation process etc.

Methodology and Procedure:

Effects of polluted water on plant (Epipremnum aureum) were carried out in following manners.

Water Quality: - Quality of water was tested on following parameters [11-16].

- pH,
- Total dissolved solid (TDS)
- Chemical oxygen demand (COD)
- Hardness,
- Conductance
- Alkalinity

Preparation of samples: Two water samples were prepared.

Water sample 1(tap water), appearance – colorless and clear

Water sample 2(drain water), appearance-turbid

Both the samples were tested by the following methods-

Hardness of water sample:

Hardness of water is finding out by the use of EDTA method.

Procedure:

The total hardness of water was determined by the following procedure-

10ml of water sample1 was titrated against EDTA solution with Eriochrome Black- T (EBT) indicator. End colour point identifies as change in colour red wine to blue and burette readings were noted. Same procedure repeated with the water sample-2. Results are given in table no 2

Expression of the above reaction by the following reaction-

Ca^{2+} or Mg^{2+} + EBT → Ca-EBT or Mg-EBT (wine red complex)

EDTA forms a colorless complex with metal ions.

Ca-EBT or Mg-EBT + EDTA → Ca-EDTA or Mg-EDTA   + EBT

(Wine red complex)   (colourless stable complex)   (blue)

Alkalinity: Alkalinity of water was determined by an acid-base titration.

Procedure: Alkalinity of (10ml) water sample was titrated against the sulfuric acid with indicators phenolphthalein and methyl orange respectively. Same procedure was repeated with sample2. Results are given in table-2.

pH, Conductance and Total dissolved solid (TDS):- pH, conductance and TDS of water samples were observed by using pH meter(HANNA HI 8424), conductivity meter(HANNA HI 8733)and TDS meter respectively.

Chemical oxygen demand (COD):- COD value was determined by Iodometric titration.

Procedure: The following method was carried out to find the COD value of water sample- 10ml of water samples were taken in the conical flasks. After the addition of 5ml potassium dichromate flasks were kept in water bath at 100^0C for 1 hour. Afterwards the cooling of samples 5ml potassium iodide, 10 ml sulfuric acid were added. Then the starch indicator was added and titrated against sodium thiosulfate to colorless end point. Then the burette readings were noted.

Table no 1: Result of standard water with required parameters

Sr. No.	Month	Types of sample water	Hardness (ppm)	pH	Conductivity (ms)	Alkalinity (mg/l)
1.	February	Treated water	225	6.83	09.2	625
2.	April	Treated water	200	6.75	10.1	632

Table no 2: Result of required parameters of stage 1

Sr. No.	Sample water	No of leaves of money plant	Weight (g)	pH	TDS (ppm)	Hardness (ppm)	Alkalinity (mg/l)	Conductivity (mS)
1.	Tap water	7	16.27	7.39	313	160	375	5.0
2.	Drain water	9	20.26	7.45	848	370	756	132

Table 3: **Result of required parameters of stage 2**

S.No.	Types of water	No of leaves	Weight(g)	% decrease in weight	COD (mg/l)	pH	Alkalinity (mg/l)	Conductivity (mS)
1.	Tap water	8	15.50	4.7%	512	8.5	395	04.6
2.	Treated water	6	12.93	36%	440	9.03	788	11.4

Result and Discussion:

In present work comprehensive study of water pollutant effect in relation with different parameters such as water hardness, pH, alkalinity, TDS, COD and conductance etc. was carried out, on biotic component *Epipremnum aureum*(money plant) a plant species. It was done by comparing the plants growth in two different water samples, drain water(polluted)

and tap water (non-polluted).Water quality of both samples with above mentioned parameters also compared with standard treated water(Treated water of Lovely Professional University treatment plant and suitable of vegetation of examined plants). Present work were divided in two stages (February and April) as:-

Stage 1(February) - Initially both the plants (sample 1 and 2) are similar in color with different weight and number of leaves as well as same environmental conditions). Effects of pollutants were observed at the end of stage 2. Water quality incorporated with different parameter also examined in this stage (Result given in Table 2).

Stage 2 (April) –Growth of plant were examined with the polluted water as similar environmental conditions of stage-1. Water quality incorporated with different parameter also examined in this stage (Result given in Table 3).

After analysis of results in relation with different parameters such pH, alkalinity, Hardness, COD, TDS, Conductance as of both stages. It has been observed that water sample-2 have higher values of each above mentioned parameters and compared with water smple-1 and treated water (Standard).Thus on the basis of results it is easy to understand that the presence of pollutant (biotic and abiotic) in water sample-2 is responsible for higher value of each parameter which directly in relation with the growth the examined plants. Water pollutant effects were identified with change in colour, weight and number of leaves (Results given in Table-2 and 3).

Figure 1: Shows stage 1 plant condition in water sample 1

Figure 2: shows stage 1 plant condition in water sample 2

Figure 3: Shows stage 2 plant conditions in water sample1

Figure 4: Shows stage 2 plant conditions in water sample 2

Conclusion:

On the basis of literature survey and project work results, It has been observed that presence of pollutant directly affect the growth of plant reduce aesthetic value as well as decrease the usability of water.

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