IMPACT OF WATER HYACINTH ON NITROGEN, PHOSPHORUS AND POTASSIUM

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Abstract - Recently, attention is being devoted to the utilization of water hyacinth since the efforts to control plant growth by chemical; biological and mechanical means have met with little success. The real challenge is not how to get rid of this weed but how to benefit from it and turn it into a crop. Thus, the issue of water hyacinth should be looked from a different view. During these experimentations it is necessary to control the growth of water lettuce and its spreading over the entire stretch of river. If not controlled, this may lead to over growth and spreading of water lettuce over the stretch of river and block the sunlight entering into the river water affecting the growth of aquatic flora and fauna. Hence phytoremediation using water lettuce for removal of contamination in river water can be a better option in future.

KEYWORDS - Water Hyacinth, Phytoremediation, Pistia, Water Lettuce, Nitrate, Phosphate, Potassium, Spectrophotometer, Flamephotometer.

1. INTRODUCTION

Water pollution is major environmental issue in India. The largest source of water pollution in India is untreated sewage. The other sources of pollution include agricultural runoff and unregulated small-scale industry. Most rivers, lakes and surface water in India are polluted.

Sewage discharged from cities, towns and some villages are the predominant cause of water pollution in India. Investment is needed to bridge the gap between sewage India generates and its treatment capacity of sewage per day. Major cities of India produce 38354 million litres per day (MLD) of sewage, but the urban sewage treatment capacity is only 11786 MLD. A large number of Indian rivers are severely polluted as a result of discharge of domestic sewage.A 2007 study found that discharge of untreated sewage is the single most important source of pollution of surface and ground water in India. There is a large gap between generation and treatment of domestic waste water in India. The problem is not only that India lacks sufficient treatment capacity but also that the sewage treatment plants that exist do not operate and are not maintained. The majority of the government owned sewage treatment plants remain closed most of the time due to improper design or poor maintenance or lack of reliable electricity supply to operate the plants, together with absentee employeesand poor management. The waste water generated in these areas normally percolates in to the soil or 1. The uncollected waste accumulates in the urban areas causing unhygienic conditions and releasing pollutants that reach into the surface of ground water.

There are different species of water hyacinth observed in rivers. For example, pistia, eichhorniacrassipes, etc. This

study is related with pistia which is also known as water lettuce. Water hyacinth is free floating plant with many spongy, dusty green simple leaves the leaves are covered in very fine hairs and arranged in a spiral pattern from the centre of the plant. The leaves are 1 to 6 inches wide and have large veins running their length. The flowers are seldom seen. Water hyacinth is a very aggressive invader and can from thick floating mats. If these mats cover the entire surface of the pond, they can cause oxygen depletions and fish kills. Water hyacinth should be controlled so they do not cover the entire pond. Submerged portions of all aquatic plants provide habitats for many for many micro and macro invertebrates. This invertebrates in turn are used as food by fish and other wild life species. (eg. Amphibians, reptiles, ducks, etc.) After aquatics plants die, their decomposition by bacteria and fungi provides food (called "detritus") for many aquatic invertebrates. Water hyacinth has no known direct food value to wild life and is considered a pest species. Pistia is a genus of aquatic plant in the arum family, Araceae. The single species it comprises, Pistia stratiotes, is often called **water cabbage, water hyacinth, nile cabbage or shell flower.** The genus name is derived from the greek word (pistos), meaning "water", and refers to the aquatic nature of plants. Pistia stratiotes has often been grown as an ornamental in lakes, ponds aquria and gardens. It is often used in tropical aquariums to provides cover for fry and small fish. It has medicinal properties and can be used as fodder for cattles and pigs. It can be beneficial in certain instances as it outcompetes algae for nutrients in water, thereby preventing massive algal blooms. However, these uses cannot compensate for these plants overall negative impacts.

2. Materials And Methods

PARAMETERS TO BE CHECKED-

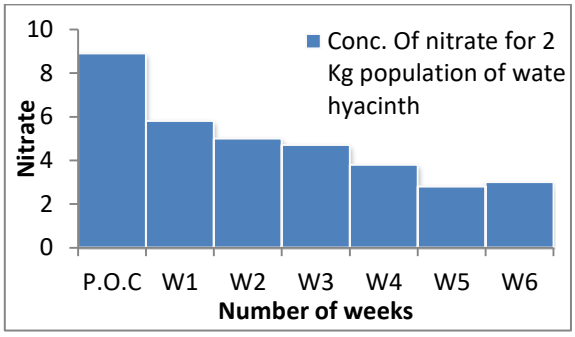
i. Nitrate by using spectrophotometer.
ii. Total phosphorous by using spectrophotometer.
iii. Potassium by using flame photometer.

MODEL STUDY RESULTS-

2.1. NITROGEN

Duration	Conc. of nitrate for 2 Kg population of water hyacinth
Point of collection (P.O.C)	8.9
Week 1 (W1)	5.8
Week 2 (W2)	5
Week 3 (W3)	4.7
Week 4 (W4)	3.8
Week 5 (W5)	2.8
Week 6 (W6)	3

Table No2.1 Reduction In Nitrate Concentration



Graph No. 2.1 Effect Of Water Hyacinth Treatment On Nitrate Removal

The concentration of nitrogen measured as nitrate in the treatment was observed to be 8.9 mg/l in the raw sewage water. From graph 2.1, it is observed that nitrogen content was observed to be decreasing throughout the treatment process due to the continuous consumption by water hyacinth showing that the more the density of water hyacinth in the water, the more the reduction in the concentration of Nitrate can be seen.

2.2 – POTASSIUM –

Duration	Conc. Of Potassium for 2 kg population of water hyacinth
Point of collection (P.O.C.)	2.0

Week 1(W1)	1.2
Week 2 (W2)	1.0
Week 3(W3)	0.85
Week 4(W4)	0.60
Week 5(W5)	0.49
Week 6(W6)	0.33

Table No. 2.2 Reduction In Potassium Concentration

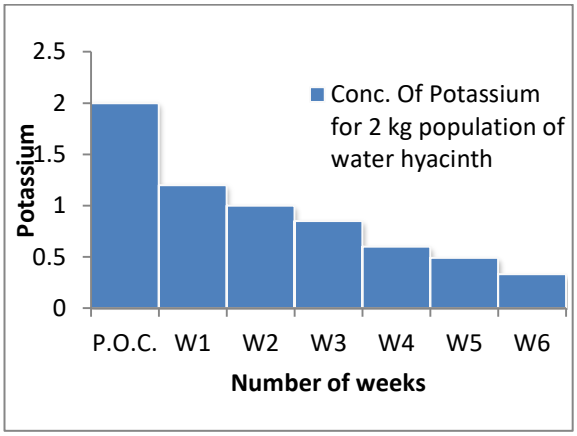


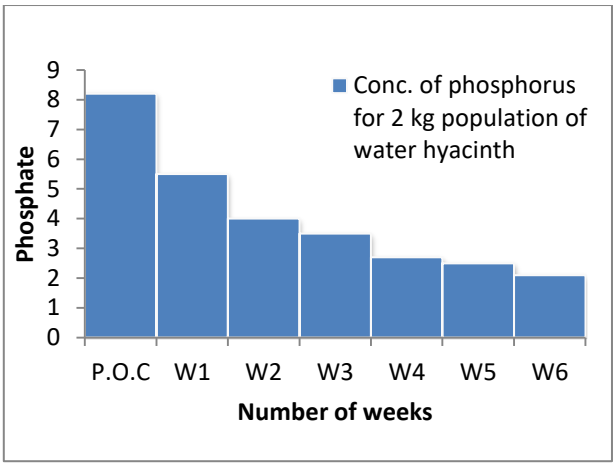
Table No. 2.2 Reduction In Potassium Concentration

The concentration of potassium was observed to be 2.0 mg/l in the raw sewage water. From graph 2.2, it is observed that the concentration of potassium was observed to be decreasing throughout the treatment process due to the continuous consumption by water hyacinth showing that the more the density of water hyacinth in the water, the more the reduction in the concentration of potassium can be seen.

2.3 –PHOSPHORUS–

Duration	Conc. of phosphorus for 2 kg population of water hyacinth
Point of collection(P.O.C)	8.2
Week 1(W1)	5.5
Week 2 (W2)	4.0
Week 3 (W3)	3.5
Week 4 (W4)	2.7
Week 5 (W5)	2.5
Week 6 (W6)	2.1

Table No. 2.3 Reduction In Concentration Of Phosphorus



Graph No. 2.3 Effect Of Water Hyacinth Treatment On Phosphate Removal

Phosphorus occurs in natural water in low quantity as many aquatic plants absorb and store phosphorus many times for their actual immediate needs. Low concentration of phosphorus affect the growth of aquatic flora as it is very essential plant nutrient. Phosphorus decreased significantly in the waste water solutions, as these elements are all nutrients for plants, hence they are most likely taken up by the lettuce.

3. CONCLUSION

Pollution of river water is an environmental concern today. Pawana river is an example of such river. It is highly polluted due industrial waste discharge either treated or untreated. Untreated wastewater discharge includes toxic heavy metals and surface runoff during rainy season leads to introduction of nutrients such as nitrogen, phosphorus, potassium and many others. Conventional techniques used for removal of these parameters are very costly.

From the above study it is observed that there was drastic reduction in the concentration of nitrate, potassium and phosphorus. So from the study conducted it can be concluded that phytoremediation by water lettuce can be used to extract these nutrients from sewage water. It is also observed that higher the density of water hyacinth on the water surface higher the absorption of the nutrients can be seen. Therefore phytoremediation technique using water lettuce can be effective and economical. From the above study we can observe that heavy metal and nutrient removal

by water lettuce is quiet efficient and effective.During these experimentations it is necessary to control the growth of water lettuce and its spreading over the entire stretch of river. If not controlled, this may lead to over growth and spreading of water lettuce over the stretch of river and block the sunlight entering into the river water affecting the growth of aquatic flora and fauna.

Hence phytoremediation using water lettuce for removal of contamination in river water can be a better option in future.

REFERENCES

1. **ShahabaldinRezania, MohanadossPonraj , AmirrezaTalaiekhozani , Shaza Eva Mohamad , Mohd Fadhil Md Din, Shazwin Mat Taib , Farzaneh Sabbagh , Fadzlin Md Sairan**"Perspectives Of Phytoremediation Using Water Hyacinth For Removal Of Heavy Metals, Organic And Inorganic Pollutants In Wastewater."14 Aug 2015.
2. **W.H.T. Ting, I.A.W. Tan, S.F. Salleh, N.A. Wahab.** "Applications Of Water Hyacinth (EichhorniaCrassipes) For Phytoremediation Of Ammoniacal Nitrogen." 9 Feb 2018.
3. **E. SanmugaPriya , P. Senthamil Selvan** "Water Hyacinth (EichhorniaCrassipes)-An Efficient And Economic Adsorbent For Textile Effluent Treatment." 1 March 2014.
4. **Hongjie Qin, Zhiyong Zhang, Minhui Liu, Haiqin Liu, Yan Wang, XuezhengWen,Yingying Zhang, Shaohua Yan** "Site Test Of Phytoremediation Of An Open Pond Contaminated With Domestic Sewage Using Water Hyacinth And Water Lettuce."23 July 2016.
5. **H.M. Saleh** "Water Hyacinth For Phytoremediation Of Radioactive Waste Simulate Contaminated With Cesium And Cobalt Radionuclides." 11 October 2011.
6. **MesaniaRizwana, Marjadi Darshan and Desai Nilesh** "Phytoremediation Of Textile Waste Water Usingpotential Wetland Plant: Eco Sustainable Approach." 2014.
7. **Jia-Chuan Zheng , Hou-Qi Liu , Hui-Min Feng , Wen-Wei Li, Michael Hon-Wah Lam , Paul Kwan-Sing Lam , Han-Qing Yu** "Competitive Sorption Of Heavy Metals By Water Hyacinth Roots."2 Aug 2016.
8. **JukkritMahujchariyawong ,Saburo Ikeda** "Modelling Of Environmental Phytoremediation In Eutrophic River — The Case Of Water Hyacinth Harvest In Tha-Chin River, Thailand." 19 December 2000.
9. **Aloyce W. Mayo, Emmanuel E. Hanai** "Modelling Phytoremediation Of Nitrogen-Polluted Water Using Water Hyacinth (*EichhorniaCrassipes*)" 28 October 2016.
10. **M. M. Mufarrege, H. R. Hadad, M. A. Maine** "Response Of*Pistia Stratiotes* To Heavy Metals (Cr, Ni, And Zn) And Phosphorous."09 Jun 2009.
11. **Fidelis O. Ajibade, Kamoru Adeniran**. "Phytoremediation Efficiencies of Water Hyacinth in Removing Heavy Metals in Domestic Sewage." (A Case Study of University of Ilorin, Nigeria).