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Waste Water Treatment Using Water Hyacinth

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Problem : Water pollution created by Industrial waste

Title of Research : Treatment of Water Pollution in the most Economical & Eco friendly way (Reducing the Water Pollution treatment costs by 98%) by a Female School Student.

Abstract:- The main goal of this study is to investigate the use of Water Hyacinth (WH) for the treatment and purification of dirty water, with a focus on industrial waste water. This product's primary and most important goal has been to address and conserve the environment in the most natural way possible. The item is widely available. Throughout its entire life cycle, the facility is economically feasible in terms of production and maintenance. It necessitates the least amount of human effort. It is a highly adaptable plant that can be easily grown and whose rate of development is in multiples with little care, and that too in a wide range of environmental circumstances. In the water hyacinth treatment plant, the experiment resulted in a reduction in pollutants/nutrients, odour, and colour. It is also cost effective when compared to the traditional approach of wastewater treatment in water treatment plants.

I. INTRODUCTION

As we all know, Water pollution is a very serious problem in India. As per the statistics around 70-80% of water in India is severely polluted. Every year 38 million People in India suffer from waterborne diseases like Typhoid, Cholera, Diarrhea and especially the Children. Worldwide water borne diseases cause more deaths than aids, tuberculosis, and measles under 5-year-old children. It not only damages the health of Children but also contributes to lowering India's GDP and economic problem. It is estimated that there is a loss of 80 billion $ to India annually. One of the biggest contributors to water pollution are the industries. The water that is discharged from the industries is full of metal ions, like $Mg^{2+,}$ Zn^{2+} Ni^{2+} Fe^{2+}, Co^{2+}, Pb, Hg, Sr^{2} etc. The research involves the growing of water hyacinth in a water treatment plant and along the riverbanks.

The Water Hyacinth (WH), is known as the world's most un-welcomed flora due to its invasive nature, can through its roots, as well as some organic compounds, which are carcinogenic and have concentrations of approximately 10,000 times compared to generically found water. The root structure of the water hyacinth provides a suitable environment for aerobic bacteria to remove various impurities present in water. The weed is well known for its reproduction potential, and it is supported by the fact that it can double its population twelve days. Further, it has the ability to grow in severe polluted waters.

Water Hyacinth (WH) can be cultivated for purification of industrial wastewater or sewer water, in addition to available techniques. Once established, they require no special care except occasional thinning to keep them from choking out everything else in the pond. They quickly take hold and begin to grow. They could be further pruned down when they cover more than 60 percent of the water surface.

The plant can also be used for different purposes like composting, substrate for mushroom farming, nutritious food for cattle, feed for biogas generation, protein synthesis, fiber for furniture, as lubricants to apply on the horse's body, for wastewater treatment and other application of water hyacinth into a co-compost material such as soil amendment to the sandy soil, can improve hydro-physical, chemical parameters of soil and will supply the growing crops with several

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nutrients. Water hyacinth has also drawn attention due to its bioremediation ability, capable of removing pollutants from domestic and industrial waste water effluents. Thus, the issue of water hyacinth should be evaluated from energy, engineering as well as environmental perspectives.

➢ *Hypothesis*

Coca-Cola has been ordered to stop drawing ground water for a bottling plant which supplies most of southern India after a court found that it was ruining the environment. In a ruling which threatens to close the 16-hectare (40-acre) Coca-Cola plant in Kerala, southern India, the state's high court has ordered the company to close its boreholes and stop drawing ground water in one month's time. A thousand local families have been protesting for 608 days, claiming the plant is drawing so much water it is turning their rice paddies into a desert and killing their coconut palms. They brought the action in defiance of the state government, which supported the company. The court said that if it was to continue work at the bottling plant, the company must find alternative sources of water, but this is a tall order in an area which has suffered two dry years and has gone months without rain.

Therefore, in such an area one may aim to grow water hyacinth in the rivers where this plant drains water into so that the water could first be treated and then it is further sent to water treatment plants where it is further purified and then it is drained back into the rivers. Therefore, preventing the water pollution and the loss faced by the farmers.

II. PROCESS

➢ *To test the presence of lead ion in the roots of water hyacinth:*

We first crushed the roots of water hyacinth which was dissolved in water containing lead. Then we added some sodium hydroxide and potassium chromate and we also added hydrochloric acid to this solution to make it clear. Thus, after this we stirred the solution and it turned yellow in color which depicted the presence of lead in the solution thus proving that just as the plant soaks lead similarly it has the capability of socking other metal ions as well.

➢ *To test the presence of cadmium ion in the roots of water hyacinth:*

We first crushed the roots of water hyacinth which were dissolved in water containing cadmium. Then we passed h_2s gas for 5 minutes then we saw that the solution turned yellow in color. We then boiled this yellow ppt with 4-5cm^3 of ammonium sulphide. Then filter this solution and wash the ppt with water. Now dissolve HCL acid and potassium ferrocyanide to this solution, we see that the solution turns bluish white in color thus this confirms the presence of Cd^{2+}.To the second test tube we added sodium hydroxide solution thus forming white ppt. Hence, we prove the presence of cadmium in the roots of water hyacinth.

Fig 1:- MODEL PHOTOGRAPH

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Fig 2:- MODEL PHOTOGRAPH

III. IMPLEMENTATION

- Water Hyacinth (WH) plant will be grown in the initial phase of the water treatment process.
- The plant, Water Hyacinth (WH) with its suction capability will suck all these metal ions.
- The water would then be further treated at a water treatment plant.
- The treated water would be drained into the water table or into the rivers and other water bodies.
- Growing along the banks of nullah, ponds, lakes and rivers could also be an effective way of keeping a check on water pollution.

Fig 3:- MODEL PHOTOGRAPH

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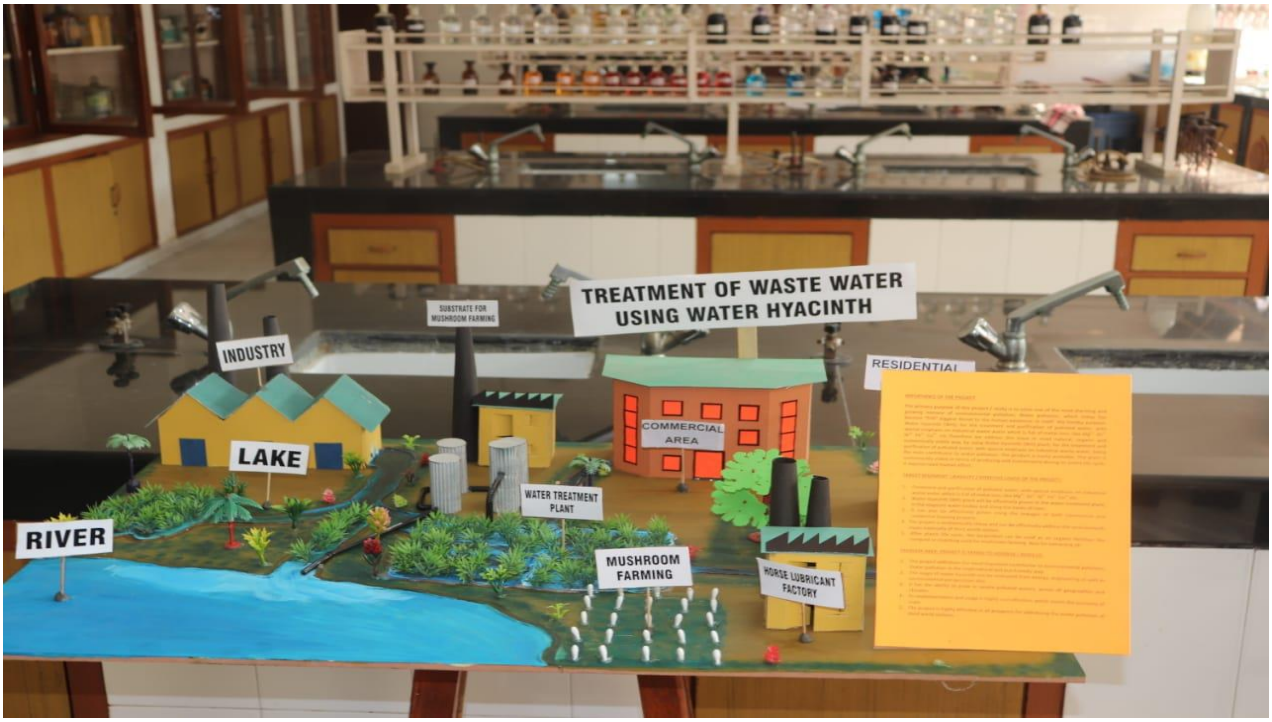

Fig 4:- MODEL PHOTOGRAPH

IV. COMMON QUESTIONS REGARDING MY RESEARCH

Q1. What is your innovative product/service?

The primary purpose of this product is to solve one of the most alarming and growing menace of Environmental pollution; Water pollution, which today has become "THE" biggest threat to human existence; in itself. Therefore, we have proposed to address this issue in the most natural, organic and economically viable way, by using Water Hyacinth (WH) plant; for the treatment and purification of polluted water, with special emphasis on Industrial waste water; being the main contributor to water pollution.

Q2. What challenge(s) is your product/service designed to solve?

My product is basically designed to solve the problem of growing menace of water pollution, which in today's time has become one of the biggest threats to the environment. As we all are well aware the biggest contributor to water pollution is the industrial waste, followed by Commercial and residential discharge. The waste water discharge consists of highly poisonous and toxic materials, especially the industrial discharge contains metal ions like magnesium, zinc, nickel, iron, cobalt, lead, mercury, cadmium and strontium-90, etc. The plan involves treating this waste water in more natural and safe way by growing water hyacinth in water treatment plants, along the discharge drain and on the river banks, thus ensuring the water flowing down or immersed in the ground table is free of poisonous pollutants and in turn discouraging use of chemicals used for treating this water. In addition, growing this plant around water bodies where water is stagnant or which come up due to floods in that region.

Q3. What are the key features of your product/service that make it special?

- The primary and the critical aim of this product has been to address and conserve the environment in the most natural way.
- The product is easily available. The plant is economically viable in terms of producing and maintenance during its entire life cycle. It requires least human effort.
- It is a highly adaptable plant which can be easily grown, and its pace of growth is in multiples with least care, that too in most of the climatic conditions spreading across the geographies.
- It absorbs most of the metal water pollutants especially some of the most poisonous ones, like Arsenic, Copper, cadmium, Mercury, and Lead, which are the main constituents of Industrial discharge
- Water Hyacinth can be easily grown along the sewages of both Commercial and Residential set up and can absorb minerals and inorganic substances from the polluted water.
- After the plant's life cycle, the by-product can be used as an organic fertilizer like compost or mulching. This compost is highly organic, it helps in improving the soil structure, it ventilates the soil and makes it easy for water percolating through soil.
- This process is economically cheap and can effectively address the environmental issues especially of India and third world nations.

Q4. How is your product/service innovative and different from other products/services intended to solve the same challenges?

- My project addresses the most important contributor to environmental pollution, Water pollution in the most natural and eco-friendly way.
- The usage of water hyacinth can be evaluated from energy, engineering as well as environmental perspectives also.
- The root structure of the water hyacinth provides a suitable environment for aerobic bacteria to remove various impurities present in water.
- The weed is well known for its reproduction potential, and it is supported by the fact that it doubles its population within the span of twelve days.
- It has the ability to grow in severe polluted waters, across all geographies and climates.
- Branch roots in Water Hyacinth can absorb plant nutrients and keep them into its trunks and leaves.
- Its implementation and usage are highly cost effective, which meets the economy of scale.
- The project is highly effective in all prospects for addressing the water pollution of third world nations.

V. ECONOMIC IMPACT VIA EXPERIMENTAL DATA

COST COMPARATIVE SHEET						
HEAD	**WATER HYACINTH**			**WATER TREATMENT PLANT**		
PARTICULARS	PRICE PER UNIT/PER PERSON	QUANTITY PER 100 Sqm	PRICE	PRICE PER UNIT/PER PERSON	QUANTITY PER 100 Sqm	PRICE
PRODUCT COST	100	47	4700	2,50,000	1	2,50,000
MAINTENANCE						
LABOUR / OPERATIONS	100	10	1000	100	100	10,000
TRANSPORTATION	150	2	300	150	20	3000
ELECTRICITY	0	0	0	10	5000	50,000
INSTALLATION CHARGES	20	47	940	20000	1	20000
RESULTS	**TOTAL COST**		6940	**TOTAL COST**		3,33,000

VI. OUTSTANDING HUGE BENEFITS

With the help of the above table, we observe a massive difference between the cost of the present system and my research benefits. There is a 98 % cut in the costs when water hyacinth is used instead of the machinery in the water treatment plant.

VII. CONCLUSION

The experiment clearly results in the reduction of pollutants/nutrients, odor, and color in the water hyacinth treatment plant. Apart from this, it is also economical as compared to the usual method of treatment of wastewater in water treatment plants.

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