DESIGNING OF SUSTAINABLE WATER PURIFIER USING ROOTS OF *Chrysopogon zizanioides*

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Introduction:

Vetiver grows to 150 centimetres (5 ft) high and forms clumps as wide. Under favourable conditions, the erect culms can reach three metres in height. The stems are tall and the leaves are long, thin, and rather rigid. The flowers are brownish-purple. Unlike most grasses, which form horizontally spreading, mat-like root systems, vetiver's roots grow downward, two to four metres (7–13 ft) in depth. The vetiver bunch grass has a gregarious habit and grows in tufts. Shoots growing from the underground crown make the plant frost and wildfire resistant, and allow it to survive heavy grazing pressure. The leaves can become up to 300 centimetres (10 ft) long and 8 mm (3⁄8 in) wide. The panicles are 15–30 cm (6–12 in) long and have whorled, 25–50 mm (1–2 in) long branches. The spikelets are in pairs, and there are three stamens. Activated carbons are made from a variety of carbonaceous source materials - including coconut shells, peat, hard and soft wood, lignite coal and olive pit to name but just a few. However, any organic material with a high carbon content can effectively be used to create activated carbons through physical modification and thermal decomposition. The most prevalent uses of activated carbon in today's world revolve around the treatment of process water, industrial and commercial wastewater and air/odour abatement issues. When converted to activated carbons, carbonaceous source materials possess the ability to effectively purify and remove a vast array of contaminants from water and wastewater streams.

Objectives:

1. To determine the Heavy metals, present in waste water.
2. To design water filter model using vetiver for the treatment of the waste water.
3. To evaluate the quality of Treated water.

Methodology:

Step 1: We have collected the bore well water from our campus i.e., GMIT at Davangere between 10AM -11AM on 27th Feb 2023 and also collected the required raw materials for the preparation of filter i.e., Vetiver roots, activated charcoal, gravels, water can and PVC pipes.

Step 2: The collected water then was taken to laboratory to determine the physical and chemical parameters i.e., presence of heavy metals it was done at BIET college at Davanagere.

Step 3: Then the water was passed through the designed filter.

1. We have taken the PVC pipes of 2,4 and 6 inch and 1feet long, end caps to each of the pipes and a water can.
2. For 2 and 4-inch PVC pipes hole size of 2 mm was made using the radial drilling machine.
3. Then we have arranged the pipes in the concentric manner by supporting them with the foaming sheet between not to coincide each other.
4. For the end cap of 2-inch pipe a hole was made and was connected with ½ inch PVC pipe for the inlet of water for the filter and the 6-inch pipe was connected to the water can and where the water can is fitted with the outlet/tap.
5. Here the 2-inch pipe was filled with activated charcoal.
6. And 4-inch pipe was filled with activated pebbles.
7. Then the roots of vetiver were compressed by a machine in the Mechanical laboratory at GMIT in Davangere and the compressed roots of vetiver which is the main raw material for our portable water filter was then filled into the water can.
8. After compression of the vetiver roots it was then loaded into the water can.
9. Then the PVC pipes which was filled with pebbles and activated charcoal was connected with the water can.

Step 4: After designing of the filter the collected and tested water was then passed through the designed portable water.

Step 5: After 24hr the treated water from the designed filter was collected.

Step 6: The collected filtered water was then sent to the laboratory for the physical and chemical testes in BIET at Davangere.

Step 7: The compression of the results with the standard values was made between the untreated water and treated water which was filtered through the designed portable water filter.

Result:

SL. NO	**TEST CONDUCTED**	**STANDARED VALUES**	**BEFORE TREATED**	**AFTER TREATED**
1	Colour	Colourless	Colourless	Colourless
2	Taste	Agreeable		
3	Odour	Agreeable	Odourless	Odourless
4	Temperature	Room Temperature	27°C	27°C
5	Turbidity	Below 1 NTU	0	0
6	P^H value	6.5 to 8.5	7.81	6.93
7	TSS	3 mg/lit	0.0336 mg/lit	0.094 mg/lit
8	TDS	500 mg/lit	417 mg/lit	373 mg/lit

9	Electrical conductivity	2500 µs/cm	625 µs/cm	552 µs/cm
10	Water hardness	200 mg/lit	260 mg/lit	200 mg/lit

SL. NO	TEST CONDUCTED	STANDARED VALUES	BEFORE TREATED	AFTER TREATED
1	Nitrate	45 mg/lit	2.48 mg/lit	1.84 mg/lit
2	Sulphate	200 mg/lit	6.21 mg/lit	1.24 mg/lit
3	Fluoride	0.6-1.2 mg/lit	0.21 mg/lit	0.42 mg/lit
4	Copper	1.3 mg/lit	0.01 mg/lit	Nil
5	Cadmium	0.003 mg/lit	Nil	Nil
6	Chromium	0.005 mg/lit	0.02 mg/lit	Nil
7	Iron	0.3 mg/lit	0.00 mg/lit	0.62 mg/lit
8	Zinc	5 mg/lit	0.01 mg/lit	0.08 mg/lit

Conclusions:

In conclusion, the project focused on the design sustainable water purifier utilizing the roots of the vetiver plant. The goal was to create an efficient and eco-friendly solution for water purification while harnessing the natural properties of the vetiver plant. Through the research and experimentation, it was determined that the vetiver plant's root system possesses excellent water purification capabilities. The roots have the ability to absorb contaminants, such as heavy metals and organic pollutants, while also reducing the growth of harmful bacteria and pathogens. The design of the sustainable water purifier incorporated a filtration system that utilized vetiver roots as the primary filtering agent. The roots were placed within a specially designed container, allowing water to pass through while capturing and removing impurities. The filtered water was then collected in a separate container, ready for consumption or further treatment if necessary.

Scope for future study:

Furthermore, the project highlighted the environmental benefits of using vetiver roots for water purification. The plant's natural filtration properties reduced the need for synthetic materials or additives, minimizing waste and potential harm to the environment. Additionally, the purification process itself was chemical-free and required minimal maintenance, making it a low-impact solution.