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Using Different Filter Media for Purification of Village Pond Water

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Introduction

The earth is a hydrous planet and water is the most required resource for the well- being of human as well as other life forms. The plants and animals exist on the earth must have good quality water to survive. The water is most abundant commodities on the earthbut the share of good quality water is very less and available source of water is most misused. If there is no water then life would not be on the earth. The water covers almost 71% of the area of earth and it is very important for survival of the ecosystem. Only 3.1% of water on the surface is fresh; the remaining 96.5% resides in the ocean. Of freshwater, 68.7% resides in glaciers, 30.1% underground, and about 1.2% is located in lakes, rivers, and swamps which is used by man for industrial, domestic and agricultural purposes (Gleick 1993).

The village ponds in Punjab state had great importance and these were considered as the gift to the mankind. These ponds have been serving the community in more than one way. Water in ponds was the salvation of the people in Punjab. Nearly three decades ago, rain and runoff water were used for drinking and bathing animals by storing it in ponds. Presently, the state has approximately 12,500 villages and in these villages about 20,000 ponds are located (Anon 2018). In the last few decades, due to increase in built up area in the villages, the surface runoff generated got increased. Moreover, the increased household waste water discharge due to increase in water use, coupled with concrete channels and roads, left no space for natural recharge and hence inundated the village ponds. In villages, many households have installed family toilets with septic tanks and the discharge of these septic tanks also goes into the channels and ultimately in village ponds. Therefore, the pondskeep on receiving the waste water throughout year. Because of quality issue of village pond water, villagers have also stopped using this water for animal use as well as irrigation purpose. Moreover, the villagers bath their animals in the animal sheds, resulting in more discharge of waste water to the ponds.

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The greater household waste water discharge coupled with discharge of animal waste increases the contamination of the village ponds. Theinfiltration of water has decreased due to non-cleaning of silt from the pond beds. Due tolow infiltration rate from pond, the water is remained inundated in these ponds. This kind of waste water therefore having very bad smell, and the water source located near the village pond, water either hand pump or tube well may get contaminated which must be otherwise ecofriendly with environment and must be usable, otherwise it will lose its importance and become a source of difficulty.

Wherever possible, by periodical cleaning of these ponds so as to restore their basic character. Some studies recommend the use of this water as a source of irrigation or for growing timber-yielding plants. Unless strong evidence of toxicity through heavy metals is available, it may not be proper to prevent the use of this valuable source of water and nutrients. Proper planning for the use of village pond wastewater for irrigation will result in conserving good quality groundwater for irrigation and the additional water will be availablefor irrigation as well as other needs of the state. Its use will also helpful to clean the village ponds and reduce the problem of the unhygienic environment in the vicinity of the pond. Several conventional and innovatory technologies are available for treatment of village pondwater and its use for irrigation but the treatments are costly, it is therefore, desirable to develop a technology to reuse the village pond water and to make village pond water suitable for irrigation. Therefore, this study is planned to make village pond water suitable for irrigation by passing through filter media.

Determination of Water Quality Parameters

Electrical conductivity (EC) is a measure of the ability of an aqueous solution to carry an electric current. This ability depends on the presence of ions; on their total concentration, mobility, and valence; and on the temperature of measurement. The electrical conductivity of the village pond wastewater was determined using digital electrical conductivity meter dS/m. The instrument was calibrated each time before its use for maintaining accuracy.

Total dissolved solids (TDS) indicate the concentration of dissolved solids of a solution. The total dissolved solids were determined by digital total solid meter (mg/l).

Total solids (TS) were determined by oven dry method. in the beaker, 100 ml sample as taken and was oven dried at 105^0C.

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pH: is the term used universally to express the intensity of the acidity of a solution. The pH of sample was determined using electrode and pH meter. The instrument was calibrated withpH buffers each time before its use.

The efficiency of the filter media was determined using the concentration of particular water quality parameter before and after filtration. Based on the efficiency of each filter media, the combination of the filter media was decided.

$$\text{Media filtration efficiency} = 1 - \frac{C_{AF}}{C_{BF}} \times 100$$

Where,

C_{AF} = Concentration after filtration

C_{BF}= Concentration before filtration

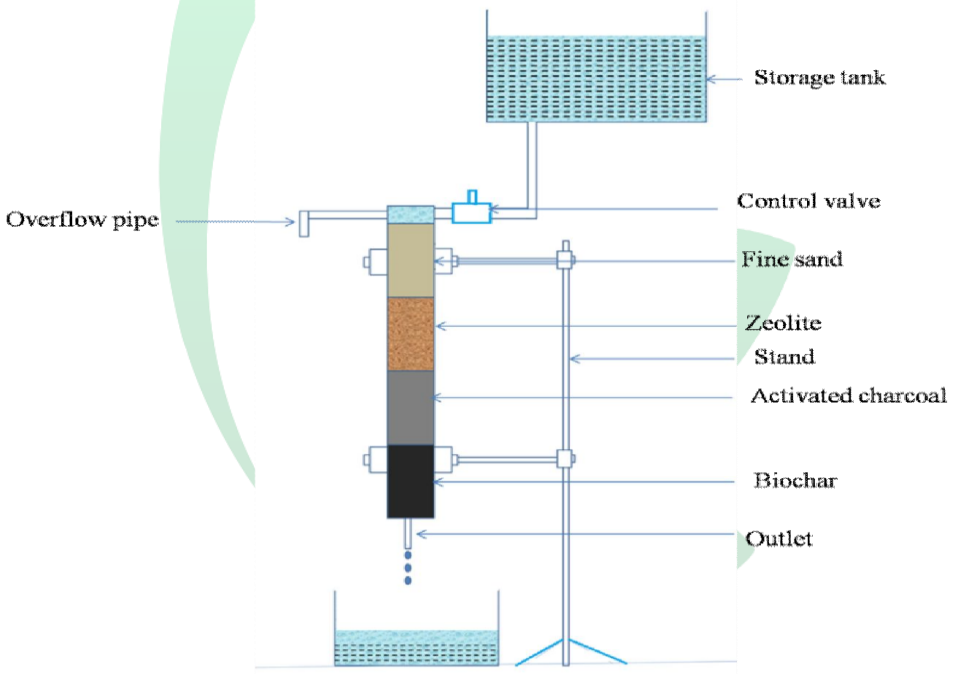

Fig. Line diagram showing arrangement of filter media in the column

Conclusion

Result concluded that the discharge rate of 5 l/h, materials depth 40 cm and water head 10cm decreases the values of BOD, COD, TSS and TDS values more efficiently than uncontrolled flow of water and discharge rate 8l/h. The 40cm depth of material was found more efficient than the 30cm depth of material whereas there was insignificant difference in

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the efficiency at 10, 20 and 30 cm head so 10 cm head along with 40cm material depth was selected. Efficient materials based on the removal efficiency was selected (zeolite, activated charcoal, biochar and fine sand) at depths 40 cm and head 10 cm. The four materials were arranged one over the other in the column. Two cycles of 24, 48, 96 and 168 h duration was performed and effluents were collected at the outlet and again parameters were determined. The collected effluents were tested for BOD, COD, TDS, TSS, TS, pH and EC and compared with the initial values.

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