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Research Paper

Traditional home made water-filter technique in Chhattisgarh

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Abstract: The water coverage area of Chhattisgarh according to Government survey is about 95%. But due to raising problem of pollution and lack of care, the quality of water is getting down and has become difficult to access pure water which is drinkable as well as cost effective. Traditional Matka (Clay Pot) filter is many times used in Chhattisgarh to solve this problem. Matka filter has been programmed successively in Bihar, India. For generations, earthen pots or Matka have been used to store water and keep it Cool. Water stored in Matka is cooled at about 10^0C and 14^0C and is said to have a refreshing flavour, makes it ideal for drinking. A different layer of physical particles as media (coal, sand, pebble, lime) in definite thickness of layer is considered in this study. Matka is a pot made by mixture of clay and sand. We considered water from different sources for comparison before and after filtration in terms of quality. It is possible to substitute the electronic purifier with Matka filter because of cost effective, easy to maintenance (does not require skilled person) in rural as well as urban area which is affected by ground water contamination. This convenient and handy filter successfully filter water from all the sources i.e., bore, tap and pond water. Now we are looking at improved service and improved quality of water. There has been a huge improvement from the last three decades, when the government started giving priority to drinking water and sanitation.
Keywords: Matka (Clay Pot), Filter; Pebble, Purifier; Contamination.

INTRODUCTION

It is absolutely true that no life without water means that mans, plant, animal as well as microorganisms depends on water for survival. Rama Sharma and Shivesh Pratap Singh (2014) Worldwide, many problems associated with the lack of clean, fresh water are well known. Nearly 1.2 billion people lack access to safe drinking water, 2.6 billion have little or no sanitation, and millions of people die annually - 3,900 children a day from diseases transmitted through unsafe water or human excreta. We see enormous hope in so much innovation happening in this water sector. India is going through a very dynamic phase. We find that people are approaching these issues from so many different perspectives. There are lots of

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groups of people who are fighting very vocally and who are pushing for reviving traditional systems. Though the technique was helping the villagers to drink iron free water, but the design of the local filters exposed the beneficiaries to secondary sources of contamination. This traditional home made filter technique is useful in villages to overcome the problem of excessive iron in drinking water.

A modified 'Matka' filter was the outcome of this study which had the advantage of following a local technique along with providing iron free water Megh Pyne Abhiyan (2011). This will help to remove water contamination also. This specially designed mud water filter is made out of locally available clay, sand, charcoal and brick. The demand for Matka filters has provided the local potters with an opportunity to strengthen their traditional livelihood practice.

MATERIAL AND METHODS

Materials Required - Clay, fine sand, and hay or saw dust. Required proportions- 1:1:5 (1 part saw dust/hay, 1 part fine sand, 5 parts clay).

Process - Take the above materials in the 1:1:5 ratio and mix well using water. During this the mixture should be carefully searched for hard particles like Small stones etc. A fine mixture is prepared so that earthen vessels can be moulded out of it. After preparing the mixture, three pots (Matka) shaped like a hollow spindle are moulded (with tapping arrangement at the bottom) of similar dimension- diameter 10 inches, height 1 foot and wall thickness 0.59 inch.

Construction of Matka Filter

This is completed in two stages-

The artisan shapes the filter manually and this done in the following

Stage 1: Construction of Kiln and Baking Process:

Materials required- Dried cow dung cakes (for fuel), paddy straw and clay.

Baking method - The moulded pots are set in a kiln and covered with a paste of clay and paddy straw so that the heat from the fire spreads uniformly over the pots. The pots are fired in the kiln for two days and then removed. The lowest pot with a hole on the side wall is then fitted with a tap using cement. With this the outer body of the Matka filter is ready.

Stage 2: Construction of filter:

WHO (2003) had elaborated simple filtration method by using fabric mesh of stainless steel or polyester (aperture 50-45 um), which was sufficient for removing algae cells and large protozoa. Chlorine is commonly used as a disinfectant. Probably these two measures would be easily adopted by villagers. K. P. Skandhan et al (2011). The filtration component is constituted of four layers (as shown in Fig. 1), each separated by a fabric mesh. A nylon mesh is placed inside the pot and 2.5 inch thick layer of pebbles are spread on it. Then a thickness of 1.5 inch fine sand tied in cloth is spread using nylon mesh separation. The sand before being placed on the mesh is washed to remove dirt and clay present on it. This is followed with a new fabric mesh and now a 2 inch thick layer of wood/bamboo charcoal (coal) is spread on top and a similar approach is adopted with the mesh. At last, another fabric mesh with 2 inch layer of sand and a brick bat is placed over it and the mesh is tied. The filtration medium is finally covered with a fabric mesh. This completes the filtration section of the Matka filter. The design developed has pots with a 10 inch diameter and wall thickness of 0.59 inch. The filter is 1 foot high and has a capacity of 15.69 litres.

How to use: Contaminated water in poured in the top most pot which gets filtered through the filtration medium placed in the pot.

Contamination free water gets collected in the lowest pot and is poured using the tap.

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Precaution:

1. Lid must be placed back in its position after filling the pot.
2. Water should be removed from the lowest pot using the tap only.
3. Filter should be placed at a higher position (as shown in Fig. 2) so that it is easy to remove water using the tap at the bottom.
4. Materials used in the filter (sand, wood charcoal and chipped Bricks) must be checked and cleaned to maintain the quality of water.

Advantages of Matka filter:

1. It is made from locally available materials.
2. It is inexpensive.
3. Production and use of this filter also provides employment to potters.
4. Due to the transpiration from the earthen material of the filters, the water stored in it remains cool.
5. This filter is an indigenous solution to obtain iron free drinking water.

RESULT:

In present study, Fig. 1 show different layers of filter media used are coal/charcoal, fine sand, pebbles/grit and limestone in depth of 5cm, 15.25cm, 6.35cm and 0cm respectively for the filter volume of 15 litres.

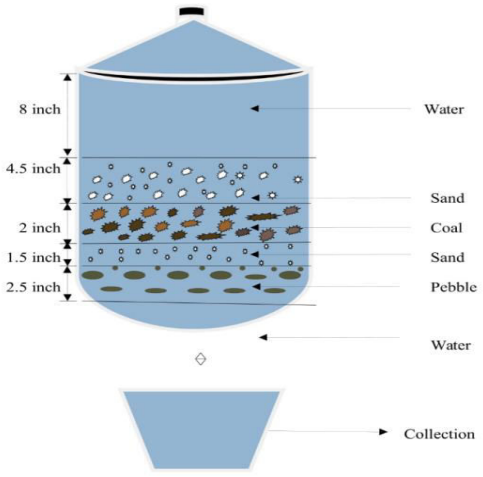

Fig.1 Matka filter different layer phase diagram

Fig. 2 is the final product and the total expenditure of 1unit Matka filter is shown in Table 1. The smell and colour of the water got successfully removed from all the sources of water.

Fig.2 Matka filter with stand

Table 1: Total expenditure of 1unit Matka filter

Cost Component	Expenditure for Production Of 1 Unit (in Rs.)
2 Unit Matka	140
Raw Material	10
Stand	30
Total cost	180

Chlorine is added at last as it is commonly used as a disinfectant. These will kill the remaining bacteria and other infectants. The conditioned water sample filters were weighed before and after sampling with an electronic balance. Water samples were placed in polyethylene bottles Dhananjay et al (2011). According to WHO standards, EC quality of drinking water is 1400µS/cm. Priyanka Tiwari (2017) Table. 2 show the EC values of water.

Table 2: Electrical conductivity of water sample

Sample	Electrical Conductivity
After Filter Bore Water (AFB)	1577 µS/cm
Before Filter Bore Water (BFB)	1245 µS/cm

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After Filter Tap Water (AFT)	965 µS/cm
Before Filter Tap Water (BFT)	519 µS/cm
After Filter Pond Water (AFP)	508 µS/cm
Before Filter Pond Water (BFP)	248.7 µS/cm

EC values of product water were increased after filtration for all the sources indicating successful filtration. Water samples from all the sources were examined in terms of absorbance for its quality before and after filtration at 254 nm, 280nm and 400 nm for assessment of presence of organic compounds (as shown in Table 3).

Table 3: Absorbance value of water sample

Sample	254nm	280nm	400nm
After Filter Bore Water (AFB)	1.485	2.681	0.094
Before Filter Bore Water (BFB)	1.493	2.697	0.114
After Filter Tap Water (AFT)	1.235	2.678	0.083
Before Filter Tap Water (BFT)	1.458	2.670	0.077
After Filter Pond Water (AFP)	1.136	2.624	0.090
Before Filter Pond Water (BFP)	1.457	2.674	0.088

It was observed that absorbance value of water was comparatively low for the samples after filtration for all the sources indicating successful filtration. Absorbance test is done using UV-Visible spectra Kalanithi *et al* (2015) at NIT Lab, Raipur.

DISCUSSION

It is our responsibilities that we secure and utilize our traditional technique that is beneficial for human as well as environment. Matka filter can be use in rural area in place of electronic water filter in large scale to improve quality of drinking water. In Chhattisgarh 17 out of 27 districts affected by water contaminants so this method is good to overcome the drinking water purification problem in less cost.

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