Use of plants in purification of drinking water

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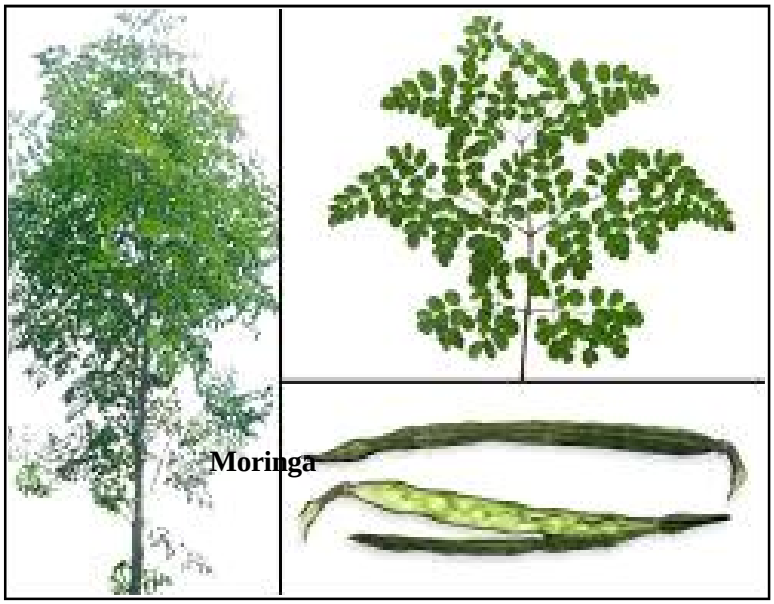
The availability of palatable and clean drinking water is becoming scarce in the present day-to-day life all over the world. Many rural and underdeveloped countries have no access to the conventional water purification devices due to which people dwelling there are forced to drink contaminated water. Water table is also decreasing day by day and the river water, even after treatment on a community basis, contains many biotic and abiotic contaminants. The levels of many metallic and poisonous pollutants like selenium, chromium, cadmium and arsenic have increased in water to dangerous levels. The consumption of these pollutants may damage kidneys, liver, heart and the nervous system. These also could lead to deadly diseases like cancer. The pathogenic bacteria which can cause serious health problems like cholera, dysenteries, tuberculosis, amoebiosis etc. are also present in the contaminated drinking water.


Prickly pear cactus


Moringa

Water purification and treatment systems are relevant for fresh drinking water, water that is made suitable for drinking, wastewater treatment and other uses. The variety of methods that exist to treat water and improve its quality are used globally today in a very widespread manner, including large scale municipal water treatment plants but also in private domestic use with small designated systems. Today we have different kinds of water purifiers available in the market which are available at a very broad price range. These purifiers are associated with their own disadvantages, like, some of them consume electric energy, some are made up of non- biodegradable and poisonous materials, some are very costly etc.

Use of living organisms : The implementing of purification using living organisms is known and works in practice for many years now, the principals of the method are natural and occur in nature all the time regardless of human intervention. But the use of this type of biological water treatment method is becoming more known and also more common due to the overall understanding that mankind needs to find more sustainable and ecological ways to live, treat our waste and co-exist with other systems on the planet.

Water purification using plants is a great natural method to treat mainly used water. Some plants have been proved to be excellent for water purification. Plants like the Prickly pear cactus (*Opuntia ficus-indica*), Moringa (*Moringa oleifera*), Nirmali (*Strychnos potatorum*), Tulasi (*Ocimum sanctum*) etc. have the capacity to purify water. The *Opuntia ficus-indica* was used for water purification by Mexican communities long back during the 18th and 19th century. Several plants have been still in use to treat contaminated water by the tribal communities in India. A group of scientists from the University of South Florida in Tampa rediscovered the natural method of water purification using *Opuntia ficus-indica* in 2010.


Nirmali

Mucilage from the desert plants is glue like gummy substance which acts as a flocculant in water (e.g. *Opuntia ficus-indica*). It can

precipitate substances into flakes and hence can remove substances like heavy metals (selenium, chromium, cadmium, arsenic etc.) and even bacteria from water. This thick gum is used by the plant to store water. When this gummy mucilage is added to water, it sticks to the particles and bacteria, which later sediments down to the bottom of the water. As per the new reports 98% of added bacteria were removed from the water sample. However, experiments are yet to be carried out in natural water.

Moringa Oleifera is a drought resistant tree which can grow on any types of soils including barren land. The seeds of this tree have coagulant properties and can purify turbid contaminated water. The seeds have to be crushed and the paste has to be mixed with water. The water has to be left undisturbed for an hour. The paste coagulates suspended impurities like bacteria, dirt, soil particles, organic substances, etc. and makes water ready for domestic consumption. Dust and bacterial sediments which can be later are separated from pure water lying on the top. The protein component of these seeds acts as polyelectrolyte which can cross-link with charged particles.


Tulsi

Ocimum sanctum is a famous medicinal plant and finds a widespread application in India. The seeds of this plant are also known for their water purification properties. However these seeds can purify water up to a certain extent (seed size is too small) and make it palatable for domestic purposes. *Strychnos potatorum* plant seeds are also commonly used to clean water in some states of India.

Aquatic plants contribute to purification of water by absorbing toxins into their root systems as nutrients and releasing important oxygen to further purification and for the bacterial colonies. Plants purify water by consuming excess nutrients and by de-acidifying it by removing CO_2. The important water purifying aquatic plants in natural conditions are *Nymphea alba, Phragmites australis, Sparganium erectum, Iris pseudacorus, Schoenoplectus lacustris, Carex acutiformis* etc.

Cactus and other plant products can be grown at many places at a lower cost. These plants can serve as a natural and renewable material for water filtration and at the same time save the lives of many people. It is a cost-effective alternative and also saves a lot of energy.

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