

IIT Hyderabad uses activated jamun to remove fluoride from water

The activated jamun powder can be reused up to five times by heating it to 50 degree C

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Now, while removing excess fluoride from drinking water, the usual problems such as high operational costs and getting rid of toxic sludge will be a thing of the past. Researchers at the Indian Institute of Technology (IIT) Hyderabad have used activated jamun seed powder to bring the fluoride content in drinking water to less than the WHO limit of 1.5 mg per litre. The results were published in the *Journal of Environmental Chemical Engineering*.

The team led by Dr. Chandra S. Sharma from the Department of Chemical Engineering at IIT Hyderabad mixed the jamun seed powder thoroughly with potassium hydroxide and heated it to 900 degree C for an hour to produce activated jamun powder. The activation increases the pore volume several times and the surface area by more than 50 times. As a result, the fluoride adsorption efficiency increased several times compared to samples that were not treated with KOH but heated to 900 degree C.

The fluoride ion removal increases with a decrease in pH, with maximum adsorption found at pH 3. The activated jamun seed acquires a positive charge at low pH and the

positive charge attracts the fluoride ions while the negative charge in an alkaline medium repulses the fluoride ions.

With fluoride adsorption capacity of 3.65 milligram per gram, activated jamun seed was close to tea ash (3.75 milligram per gram) but much higher than other substances such as banana peel, coffee husk, and coconut shell.

"Besides testing the activated jamun seed powder in the lab we also tested it using groundwater taken from Nalgonda village, which is one of the worst fluoride-affected villages in India. After two hours of contact time, we were able to reduce the fluoride content from 3.2 milligram per litre to less than 1.5 milligram per litre, which is the WHO limit," says Dr. Sharma.

On heating the activated jamun powder to 50 degree C, the fluoride gets desorbed and the jamun powder can be reused up to five times. "About 96% of the fluoride can be desorbed. So there is a loss of only 4% efficiency after each desorption," he says.

Disposal of sludge

Disposal of the fluoride sludge is another area that the team is working on. "The fluoride ions desorbed



In business: Activated jamun powder was able to reduce the fluoride content of Nalgonda groundwater from 3.2 ml per litre to 1.5 ml per litre. ■ K. ANANTHAN

from the activated carbon will be present in very small quantity of water. We can add sodium hydroxide to this water to produce sodium fluoride," he says. The major objective of the current study was to evaluate the fluoride removal efficiency using a novel, low-cost activated carbon.

"We will next be testing the efficiency of the activated jamun powder in water containing multiple ions such as fluoride, arsenic and

heavy metals," says Ramya Araga the Department of Chemical Engineering at IIT Hyderabad and the first author of the paper.

"We have so far carried out all tests in batches. We need to now undertake column studies," says Araga. The continuous flow parameters have to be optimised to achieve best results; during the batch studies, two hours of contact time was needed for the fluoride to be removed.

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