

# Desert cactus purifies contaminated water for aquaculture, drinking and more

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Farm-grown fish are an important source of food with significant and worldwide societal and economic benefits, but the fish that come from these recirculating systems can have unpleasant tastes and odors. To clean contaminated water for farmed fish, drinking and other uses, scientists are now turning to an unlikely source—the mucilage or inner "guts" of cacti.

The researchers present their work today at the 251st National Meeting & Exposition of the American Chemical Society (ACS).

"We found there is an attraction between the mucilage of cactus and arsenic," says Norma Alcantar, Ph.D. "The mucilage also attracts sediments, bacteria and other contaminants. It captures these substances and forms a large mass or 'floc' that sort of looks like cotton candy. For sediments, the flocs are large and heavy, which precipitate rapidly after the interaction with mucilage."

The technology grew from century-old knowledge that mucilage from some common cacti can clean drinking water. Alcantar was first introduced to this process by her Mexican grandmother who described using boiled prickly pear cactus to capture particles in sediment-laced dirty water. The sediments sank, and the water at the top of the bucket became clear and drinkable.

In 2006, Alcantar, who is at the University of South Florida (USF), began experimenting with the cleansing properties of cactus. She and her team tried the approach to clean contaminated drinking water following the Haiti earthquake and found it worked well. Common worldwide, cacti are a sustainable product and are not only nontoxic, but are edible and considered a delicacy.

Following the 2010 Deepwater Horizon oil rig disaster, she and her USF team began to explore the ability of cacti to clean up oil contaminated seawater. While the research program never moved beyond bench scale, she says, cactus mucilage was found to be an effective oil dispersant.

More recently, Alcantar and Tunan Peng, a graduate research assistant in her lab, were approached by representatives from the Mote Marine Laboratory in Sarasota, Florida, who asked them to investigate whether cactus extract could clean recirculating aquarium water, as well as water

in aquaculture tanks and ponds.

Such tanks, Alcantar and Peng say, create conditions that encourage bacterial growth that in turn develops unpleasant smelly compounds, such as 2-methylisoborneol (known as MIB) and geosmin. These compounds result in the musty, earthy flavor that is sometimes in the water and the fish that live in it. At harvest, the current practice is to purge the fish and tanks with fresh water, which takes months, uses large amounts of [water](#) and stresses the fish, Alcantar says.

In a search for alternatives, Peng and Alcantar turned to cactus mucilage. Now, she adds, they are seeking to determine the mechanism that allows mucilage to be such an effective purifier.

Also, the researchers are currently studying the chemical composition of the mucilage, which is made up of carbohydrates and some 60 sugars, with the goal of synthesizing it in a lab. In addition, they are developing a prototype of a recirculating aquaculture system that uses [cactus](#) extract as a cleansing agent, and they will conduct a life cycle analysis of the system.

**More information:** Degradation of Taste and Odor Compounds with Cactus Mucilage Extraction: Applications for Recirculating Aquaculture Systems, the 251st National Meeting & Exposition of the American Chemical Society (ACS), 2016.

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