

New tool for cleaning up soils and waterways: Prickly pear

January 19 2012, By Dennis O'Brien



Some prickly pear cactus varieties can be grown as a gentle bioremediation tool for high levels of salinity and selenium in arid soils. Credit: Gary Bañuelos

A U.S. Department of Agriculture (USDA) scientist has discovered what may be an effective tool for cleaning up soils and waterways in parts of California's San Joaquin Valley: a drought-tolerant cactus.

Ancient seas once covered the west side of the valley, and those seas left behind [marine sediments](#), shale formations and deposits of selenium and other minerals in the [soil](#). Crops grown there need to be irrigated, but the resulting [runoff](#), when it contains high levels of selenium, can be toxic to fish, [migratory birds](#), and other wildlife that drink from [waterways](#) and drainage ditches. Selenium runoff is subject to monitoring by regional water quality officials.

Soil scientist Gary Bañuelos with USDA's Agricultural Research Service (ARS) thinks he has found a promising way to rid the soil of selenium: planting prickly pear cactus (*Opuntia ficus-indica*). The plant takes up selenium from the soil and volatilizes it, reducing deposits that would otherwise enter drainage ditches and waterways.

ARS is USDA's principal intramural scientific research agency, and this research supports the USDA commitment to agricultural sustainability.

Bañuelos, who works at the [San Joaquin Valley](#) Agricultural Sciences Center in Parlier, Calif., initially conducted greenhouse studies to evaluate the ability of different varieties of *O. ficus-indica* to tolerate poor quality soils. Based on those observations, he then spent three years evaluating five prickly pear varieties from Mexico, Brazil, and Chile for salt and boron tolerance in selenium-laden soils by collecting soils and sediments from the area and growing the varieties in field test plots. He followed normal agronomic practices and used a drip irrigation system that produced very little run off.

Prickly pear was thought to be sensitive to high salinity, and many of the plants grown in test plots were smaller and produced less fruit than those in control soil plots. But the results, published in *Soil Use and Management*, showed that prickly pear grew reasonably well in the poor quality soils with very little water.

The studies also showed that the plants took up selenium, volatilizing some of it and keeping some in their fruit and leaf-like stems (cladodes), and that tolerance to salinity and boron depends on the genotype. The cactus variety from Chile showed the highest tolerance, as well as being the best at producing fruit and accumulating and volatilizing selenium. The work is continuing with a focus on selecting specific varieties that can be used as bioremediation tools.

[Read more](#) about this research in the January 2012 issue of *Agricultural Research* magazine.

Provided by USDA Agricultural Research Service

Citation: New tool for cleaning up soils and waterways: Prickly pear (2012, January 19) retrieved 21 June 2024 from <https://phys.org/news/2012-01-tool-soils-waterways-prickly-pear.html>

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