JOURNAL OF ENVIRONMENTAL QUALITY

Removal of a Common Antibiotic from Water by Clay-Coated Diatoms

Much of the antibiotics used during animal production end up in wastewater and are eventually applied to croplands as irrigation. Repeated application of wastewater-containing antibiotics to cropland may lead to increased antibiotic resistance in the environment. This increased resistance will reduce antibiotic effectiveness, which may impact human health.

In an article recently published in the *Journal of Environmental Quality*, researchers report the binding efficiency of three commercially available diatomaceous earth sources for removing a common antibiotic from wastewater. It was shown that the "raw" diatomaceous earth—bentonite clay and organic matter—was the most efficient binding agent of the three tested. Further processing of raw diatomaceous earth to remove the interference of the organic matter film improved the binding efficiency by 1.8 times. In addition, the removal of the organic matter improved separation properties of the material, resulting in a binding agent that could be incorporated into an efficient wastewater treatment process.

This research demonstrated that raw diatomaceous earth could be used as a binding agent for the removal of antibiotics from wastewater. These results are an important step towards the development of a robust and affordable method for removing antibiotics from agricultural wastewaters.

Backdrop: Example of beef feedlot runoff containing manure solids. Systems are designed to remove most of these solids prior to application to cropland. Inset: Example of feedlot pen surface with excreted manure solids containing unmetabolized and metabolized antibiotics. Precipitation carries these solids to holding ponds for partial treatment before being applied to cropland. Photos by Dr. Bryan Woodbury.

Adapted from Stromer, B.S., Woodbury, B., and Williams, C.F. (2019). The efficacy of three diatomaceous earth sources for removing tylosin from aqueous systems. *Journal of Environmental Quality, 48*, 1863–1871. https://doi.org/10.2134/jeq2018.11.0409

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CROP SCIENCE

USDA Core Collection of Common Bean Needs to Be Updated

Gene banks like the one the USDA operates for the USA maintain collections of crop genetic diversity. These collections are crucial to assure the resilience of our crops when faced with changing conditions like global warming, the introduction of new pests, and new consumer preferences.

Some of these collections—like the common bean collection—are quite large, which makes a comprehensive initial evaluation more difficult. One solution for this conundrum is a Core Collection, which would represent 5–10% of the entire collection. The common bean core collection of the USDA was one of the first to be established in the early 1990s.

In a recent article published in *Crop Science*, the content of this core collection was evaluated using our current knowledge of common bean crop diversity. Analyses of DNA diversity data, seed type information, and phaseolin seed protein data showed that several gene pools of common bean were either underrepresented or absent in the core collection.

The researchers recommended, based on these results, the development of a separate core collection for wild common bean and specific additions to the core collection of domesticated types. Specialized core collections can be developed that address specific constraints like disease or drought stress, cooking time, and human nutrition traits.

Two undergraduate students work in the Gepts Laboratory at the University of California–Davis. Photo courtesy of Paul Gepts.

Adapted from Kuzay, S., Hamilton-Conaty, P., Palkovic, A., and Gepts, P. (2020). Is the USDA core collection of common bean representative of genetic diversity of the species, as assessed by SNP diversity? *Crop Science, 60*. https://doi.org/10.1002/csc2.20032

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