FLOC AND FLOW: Using Electrocoagulation and Granular Media Filtration to Improve Water Quality

Trees, Matthew (School: Trees Family Home School)
Guerrero, Garrett (School: Guerrero Home School)

“Clean, accessible water for all” is one of the United Nations’ sustainable development goals. Electrocoagulation(EC), a form of decontamination using electricity, can help meet this goal for everyone. This study investigated the effects of 60 minutes of EC on Concho River water, as well as the effects of granular media filtration following EC. An EC system was designed and constructed using a polypropylene chamber, aluminum heatsinks and Arduino processing technology. The system ran for 60 minutes, followed by filtration through units composed of charred banana peels, biochar, corncobs, and pecan shells. These filters were used to construct an “experimental” tower, which was then compared to an “industry standard” tower composed of zeolite, anthracite and sand. The dependent variables were Coliform bacteria, E. coli, Total Dissolved Solids (TDS), ammonia, iron, nitrate, phosphate, pH, conductivity, and temperature. Analysis of means supported all four hypotheses ($p<.05$): EC raised temperature and reduced coliform, E. coli, iron. All filters reduced pH; banana, pecan reduced iron; banana, pecan, biochar reduced TDS; banana, biochar reduced conductivity. Industrial tower reduced E. coli, ammonia, and raised temperature. Experimental and Industrial towers reduced TDS, conductivity. This study concluded that electrocoagulation for 60 minutes effectively reduced pH, temperature, and iron, while granular media filtration and tower filtration improved the effects of EC on coliform, E. coli, ammonia, pH, TDS, conductivity, temperature, and iron. Expanding EC and granular research into recyclable media could provide sustainable solutions for improving water quality.

Awards Won: