A Low-Cost Technique to Combat Eutrophication and Soil Contamination in Organic Agricultural Communities

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In organic agricultural communities, the soil is contaminated with chemical runoff from Nitrogen, Phosphorus, and Potassium (NPK) fertilizer ions that diffuse from neighboring farms. These ions can enter water sources, causing eutrophication (when water has plant nutrients), thus generating an algae bloom. The purpose of this project was to use materials available in an agricultural setting to create a low-cost barrier for the prevention of soil contamination from NPK fertilizer ions. The materials tested were: activated carbon, sugarcane bagasse, hay, waste tea, rice hulls,and various combinations of the materials. In 16 “fields” (trays represented fields) 45 grams of soil was placed on both sides of the field (the soils were separated to represent two fields) , and 5 grams of fertilizer was added to one side. An infuser with the various combinations was placed between the soils, and 10 'Vigna radiata' seeds were planted 2 centimeters apart. Data about exact nitrate and estimated chlorine content (ppm) as well as soil moisture, pH levels, and plant height (cm) was collected from the unfertilized section. A program was written in R to conduct three statistical analysis tests on the data, and sugarcane bagasse with rice hulls showed to be the most efficient combination (contained 2.4505 ppm of nitrate). Thus, a novel polymer blend was created using the cellulose in bagasse and starch from rice hulls to act as the barrier. It can be concluded that this low-cost technique is effective at preventing fertilizer ions from leaching into fields and water sources.

Awards Won:

Third Award of $1,000

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