Wastewater Treatment: The Use of Mealworm Gut Bacteria (Tenebrio molitor) To Isolate and Identify Bacteria That Can Biodegrade Polystyrene

Rock, Rowan (School: Cloquet Senior High School)

This study was done to determine if mealworm gut bacteria could again be quantified, isolated using differential media, identified, and then further used to biodegrade polystyrene (PS). The microbes from the gut bacteria fed PS and oatmeal were inoculated onto twelve nutrient agar media plates. Four colonies were isolated, DNA was extracted, and a Polymerized Chain Reaction (PCR) was run in order to amplify the 16s rRNA gene. The sequences were Standard Blasted for identification and placement on their phylogenetic tree. This year the identified cultured gut bacteria and polystyrene were incubated singly to determine which bacteria were/was best at metabolizing the polystyrene. The original hypothesis was if mealworm gut bacteria was isolated, then at least one or more of the bacteria can be identified and all of them would be able to degrade PS equally. This hypothesis was partially supported. Three strains of gut bacteria were identified. Enterobacter cancerogenus strain MiY-F and Enterobacter sp. CTSP4 had significantly higher optical density levels than Bacillus licheniformis. There was no significant difference in the mass of polystyrene ingested by the bacterial strains. Possibly, indicating that the two Enterbacter species were able to break down the PS more efficiently, getting more energy for growth. All three species were isolated from diverse environments, appear to be incredibly durable, and able to survive in the presence of Polystyrene in ways other microorganisms can not. Finding ways to degrade these plastics in wastewater treatment facilities is important, possibly all three strains could be used.

Awards Won: