Revitalizing Soil by Managing Soil Microorganism Populations to Sustainably Increase Crop Production

Kratcha, Emma (School: Hankinson Public School)

In agriculture around the world, we are diminishing beneficial soil microorganism populations, causing higher crop susceptibility to plant-parasitic nematodes, increased fertilizer need, and overall lower crop production. The goal of my research was to determine if increased soil organic matter content, adjusted soil pH, or Iron supplementation could increase beneficial soil microorganism populations and manage parasitic nematode populations to effectively boost yields. To begin my research, I applied agricultural products to 100 feet^2 (each) of marked soybean field in three different locations. The applications were: Cow Manure, Chicken Manure, Worm Castings, Industrial Molasses, and Fish Byproduct (organic matter sources); Lime and Sulfur (pH adjustment); and agricultural Iron. I tested these applications because of their agricultural availability, and I always compared them to control groups. To evaluate how these applications affect plant growth and soil health, I tested for the following features in July, August, and at Harvest (per application per location): Plant Height, Shoot Mass, Root Mass, Root Length, Soil Bacteria and Fungal Colonies, Free-Living and Plant-Parasitic Nematode Populations, and Relative Soil Biological Decomposition Levels. I also completed yield testing. Throughout my testing, I found substantial and statistically significant correlations between soil microorganism populations, plant growth, and yields. I found that Cow Manure, Industrial Molasses, and Iron showed great increases in beneficial microorganism populations while also decreasing parasitic nematode populations and increasing yields. In summary, using new methods of soil management has proven potential for improving soil health, agricultural sustainability, and crop production.

Awards Won: