Comparative Microbe Inhibition by *Peltandra virginica*, *Scirpus tabernaemontani*, and *Typha domingensis* in the Lake Waco Wetlands.

Abstract:
The objective of comparative microbe inhibition was to observe the interaction of plant species' microbial community in cells two and four of the Lake Waco Wetlands. Determining which plants act as better inhibitors for potentially harmful microbes would present possibilities for improvements of artificial wetlands. If the plant roots in the wetlands play a major part in filtering then, due to the previous filtration by other plant roots, the plants from cell two will be more effective in killing microbes than those from cell four. To illustrate the gradual decrease in resistance, it was necessary to obtain the exudates by crushing dried plant roots and applying them to filter paper discs. Microbes were cultured on TSA plates, agar plates used for growing microbes, from water samples to create a lawn of growth. Discs were then placed on the plates and allowed to sit in the incubator for 24 hours, at this time they were checked for zones of inhibition. The results were inconclusive, no zones of inhibition were observed. The conclusion was the number of microbes in the water were too great for the amount of root chemical to effectively inhibit.

Introduction:
Wetlands are a cheaper and more natural way for trapping sediments, capturing nutrients and cleaning polluted waters travelling to and from estuaries, rivers and lakes. Healthy wetland plants help maintain drinkable water and their roots pull in nutrients from the water and build up rich soils which create a filtering effect (Schmidt 1979). Harmful microbes that enter the Waco Wetlands can be filtered out before reaching Lake Waco by root exudates, or chemicals released by roots. Exudates initiate and inhibit certain microbes from soil to roots of certain plant species (Schmidt 1979). Root exudates prevent the uptake of detrimental microbes that could ruin the filtering process (Schmidt 1979). The goal of this project was to pin point certain plant species combinations that are the most effective at filtering out microbes which will then provide the cleanest water for the community and improve artificial wetlands.

Materials:
-4 TSA Plates
-Shovel
-2 Buckets
-4 Sterilized Water Collection Bottles
-Scissors
-Mortar and Pestle
-Forceps
-Labeled Ziplock bags
-UV light
-Bunsen Burner
-Sterilized Swabs
-Sodium Hypochlorite
-Distilled Water
-Incubator
-Filter Paper Discs
-Marker

Figure 5: *Scirpus bernaemontani* (Soft-Stem Bulrush)

Figure 6: *Peltandra virginica* (Green Arrow Arum)

Figure 7: *Typha domingensis* (Southern attail)

Procedure:
1.Identify three species present in both cell two and cell four. Refer to figures 5-7.
2.Using a shovel and buckets collect 3-4 individual plants (with roots intact) of each species depending on root size from both cells.
3.Collect water samples from each cell using the sterilized water collection bottles.
4.Use scissors to remove the roots from each plant and rinse with water.
5.Use UV light to kill any microbes present on the roots. (Step added after first trial)
6.Using a mortar and pestle crush the roots until enough liquid is collected to saturate a filter paper disc. (Rinse mortar and pestle with sodium hypochlorite and distilled water and repeat after each plant is crushed).
7.Using a sterilized swab, coat a TSA plate with water from each individual cell. Divide the plate into three sections using a marker. (Use a plate for each cell).
8.Use forceps to place a chemical soaked filter disc from each plant into a different section on the plate (be sure to flame the forceps in between each).
9.Place the plates in an incubator for 24 hours and check for zones of inhibition.
10.Place all plates and samples in a biohazard container.

Figure 1: Microbial Growth Plate from Trial One Cell Four.

Figure 2: Microbial Growth Plate from Trial Two Cell Two

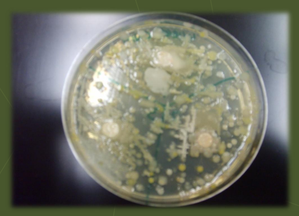

Figure 3: Microbial Growth Plate from Trial Two Cell Four.

Figure 4: Microbial Growth Plate from Trial One Cell Two.

Results:
The results of the experiment were inconclusive. Upon viewing the plates shown in figures 1-4, after allowing them to incubate we observed no zones of inhibition, or ring shaped areas without microbial growth. The microbial growth on both plates and in both tests appeared to be similar indicating that there was no difference between the cells or any effects from the use of UV lights. Although microbial growth wasn't inhibited we feel that the exudates still have to ability to kill microbes, but only certain ones, as well as the prevention of growth of other plants in the surrounding areas. (Rovira 1969)

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Conclusion:
The hypothesis was rejected as indicated by the inconclusive data. It may be attributed to the vast number of microbes present in the water sample for the exudates to inhibit; zones of inhibition cannot be observed if the microbial community if too large. No other sources of error were encountered during this experiment, however , the amount of root chemical necessary to illustrate zones of inhibition might vary. Additionally, the effects of UV lights and decreased resistance to microbes from cell 2 to cell 4 remains unknown. Despite the results from this particular experiment, the intrinsic connection between root exudates and the interplay among microbes is still apparent (Schmidt, 1979). Likewise, they have still been proven to have great implications in the growth levels and nutrients in microbial communities.

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