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EFFECTS OF 2,4 D AND ATRAZINE ON MICROBIAL POPULATION OF DIFFERENT SOILS FROM A SUGARCANE PLANTATION AREA

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Soil degradation and contamination by chemical residues of agricultural origin, particularly nitrates, metals, and pesticides, as well the presence of agrochemicals and their degradation products on surface and groundwater, jeopardizing the environment and human health, have been documented in numerous scientific papers.

Brazil the 5th highest consumer of pesticides, (mainly herbicides used in sugarcane, and rice production) has a diverse variety of ecological systems. So, it is valuable to study the impact of intensive agriculture on these systems. Studies have identified an area of high risk of groundwater contamination by agrochemicals, since geological formation of the region exposes a natural vulnerability of an aquifer just below (100m), associated to the intense use of agrochemicals highly susceptible to infiltration. This area is located in the region of Ribeirão Preto, State of São Paulo, covered by the aquifer "Botucatu", main reserve of State's water supply, and these conditions are very susceptible to groundwater contamination. The "clean up" of sites already contaminated can be achieved by remediation and restoration techniques. Biological treatment systems can reduce or destroy residues and are seen as an option for clean-up strategy. Bioremediation was devised to exploit the genetic diversity and metabolic versatility of microorganisms in transforming contaminants into less harmful products that can be integrated into natural biogeochemical cycles.

In order to study the incorporation of selected soil microorganisms in delivery systems as a model system for bioremediation processes, we have been studying the interaction of herbicides with the microbial population by a characterization of this population, specially those can affect the degradation of herbicides.

Soils with diverse characteristics were sampled monthly from the area described above (09 points at 0-20 and 80-90 cm depth), covered with sugarcane. Those fresh samples were weighed (5g) and suspended in 50ml of sterilized water and incubated with agitation (150 rpm) at room temperature for 3h, for the initial determination of the viable microbial population in YP Glucose plates. Then, each 10 ml of every soil suspension was incubated for 28 days with yeast nitrogen base medium (YNB) containing atrazine (1 mg/ml) or 2,4-D (0,5mg/ml). Every week, the viable microbial population from control, atrazine and 2,4-D treated suspension was determined by plate counting and documented by photography. Meantime, pH, organic matter and humidity of the soil samples have been determined.

The results have shown both herbicides affected the microbial population present in the soils. The behavior of the microbial population has changed from May to June and July, when it was observed a significant fall in the pH, (>0.5) and a raise in organic matter (>1.0) in every sample. Those variations in pH and organic matter are probably due to soil manipulation, affecting also the microorganisms present, revealed by atrazine and 2,4-D treatment.

The analysis of the herbicides treatment has shown a 2,4-D growth inhibition of every 0-20 cm depth sample from February to May, June (0-20cm) and most of June, July and August (80-90 cm) samples were inhibited by atrazine, while September samples were drastically inhibited by 2,4-D. Atrazine and 2,4-D, most of the time, act antagonically, (one inhibits the other stimulates growth and vice-versa). During herbicides treatment a selection is observed restricting the microorganisms to one or few more species. Those representing every month profile were isolated for further studies.