

The Effect of Organic Decay on Algae

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Abstract

The water quality in the North Bosque River is a concern to the Waco Community. This experiment focuses on nitrate and phosphate release from different types of organic matter found in the North Bosque River and their effect on algae growth. It is hypothesized that manure will have the greatest positive effect on algae. To test this assumption, five mesocosms were set up. The Control container held water from the North Bosque River and the remaining four held manure, plant matter (leaves), animal matter (crayfish), and nitrates and phosphates. Each mesocosm was tested for chlorophyll amounts and nitrate/phosphate concentration. These results were then compared to the control to determine the effects of each substance. The data showed that the hypothesis was incorrect. The crayfish released the highest amounts of nutrients and had the most algae growth.

Introduction

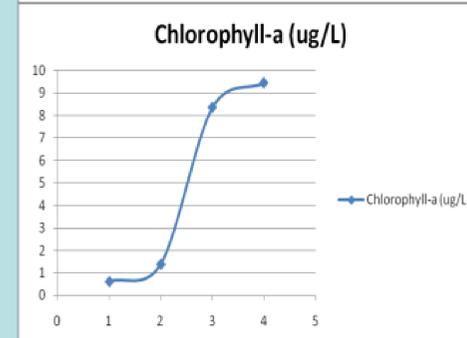
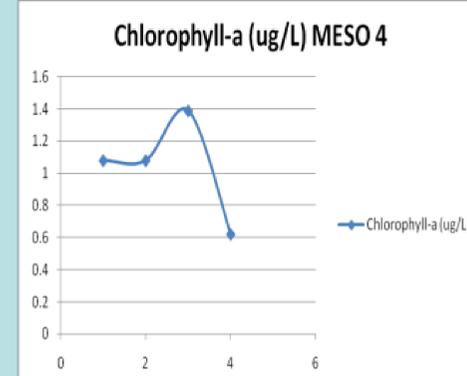
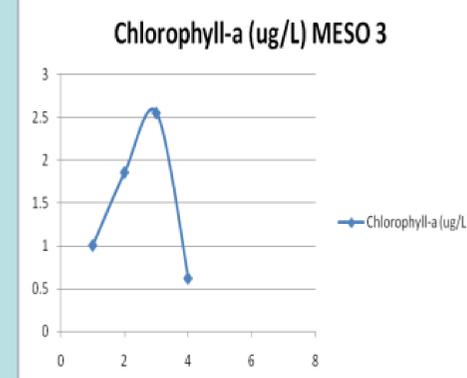
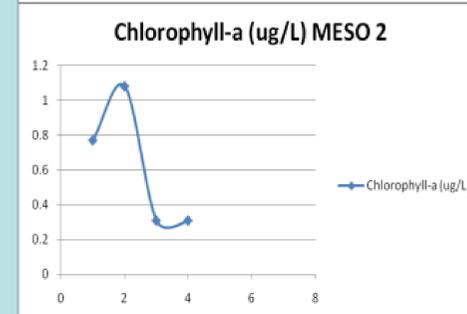
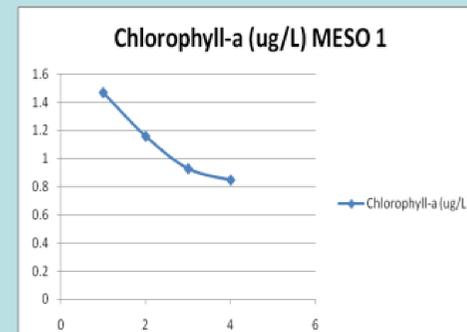
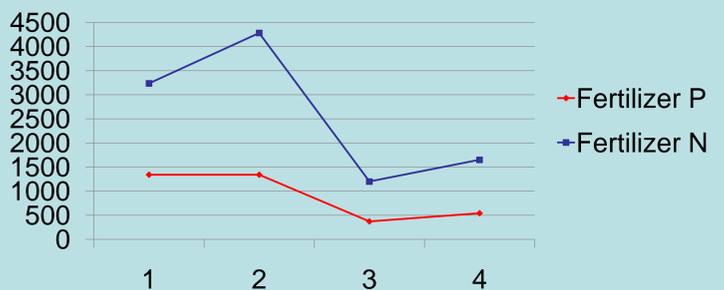
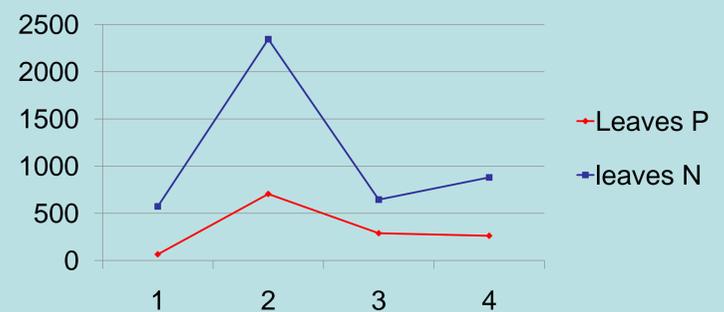
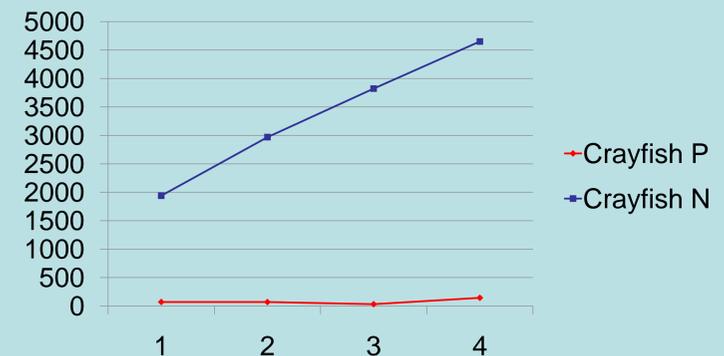
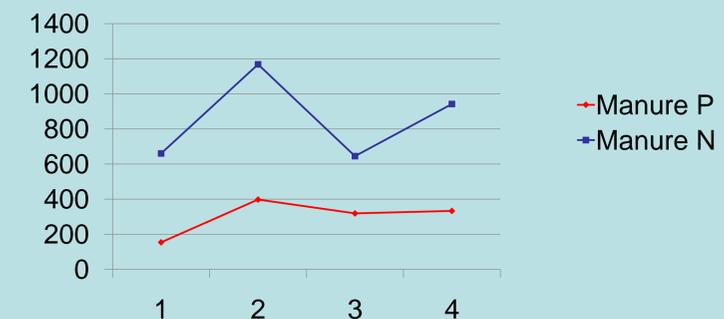
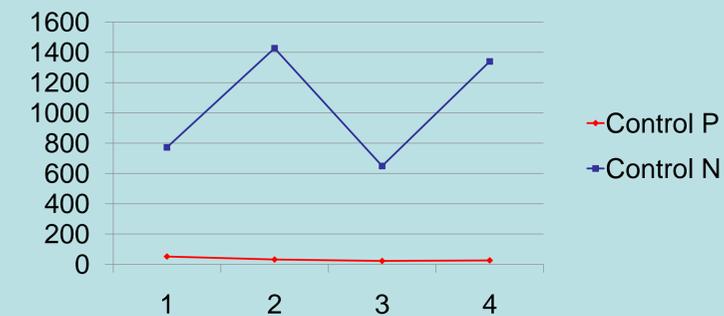
Nitrates and Phosphates are the key nutrients that cause algae growth. These inorganic substances are derived from decomposed organic materials (Gebremariam 2007). The release of nutrients occurs over time (White et al. 2005). This experiment focuses on the rate of nitrate and phosphate release from different types of organic matter found in the North Bosque River. Several different organic materials will be tested to determine which contributes the most to algae growth. The hypothesis for this experiment is manure will release the most nutrients and therefore, will produce more algae.

Methods and Materials

Five mesocosms were constructed measuring 28.5cm x 28.5cm x 91.4cm. Each mesocosm was then filled with 50 liters of wetland water from cell two. The first mesocosm was the control containing wetland water. Ten grams of dry weight horse manure, crayfish, and leaves were added to mesocosms two, three, and four respectively. Three grams of commercial liquid fertilizer 7-7-7 was added to mesocosms five (Starr and Taggart 1989). Weekly samples were collected for chlorophyll and nitrate/phosphate concentrations for four weeks. The nitrate/phosphate samples were sent to the Center for Reservoir and Aquatic Systems Research for testing. The chlorophyll samples were then analyzed using the Chlorophyll-a Test. The algae was filtered, soaked in an acetone bath, and then separated in a centrifuge. Lastly, a spectrometer was used to determine the chlorophyll concentrations.



Results



Results

In mesocosm one, the algae slowly died off. In the second mesocosm, the algae spiked on the second week, then abruptly decreased. The algae spiked on the third week in the crayfish mesocosm before dying. In the fourth container, the algae sharply increased on the third week, then died off. In the mesocosm containing fertilizer, the algae grew exponentially then started to level off on week four. Note that the graphs are not on the same scale.

Discussion

The hypothesis that manure will release more nitrates and phosphates and have the greatest positive effect on algae turned out to be incorrect. The data shows the third mesocosm containing crayfish produced the highest amount of algae. The crayfish contained higher amounts of useable nitrates than the other organic materials and decomposed at a linear rate. This led to the highest concentrations of algae. Comparing the organic mesocosms with the control and the fertilizer shows the different rates of decomposition and contributing factors towards algae growth. The sharp release of nutrients by the organic matter causes an increase in algae. As these nutrients are used, the alga depletes its food supply and dies. Once the alga dies it is expected that some of the nutrients will recycle allowing further algae growth. This experiment was not conducted long enough to see this effect. Overall, the data tends to show that the nitrates were the limiting factor in algae growth. Further studies will need to be conducted to see the implication of these findings on eutrophication in the North Bosque River.

Acknowledgements

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