Effects of Heightened Nitrate Levels: Cattail v. Bulrush
Drew Papadelis, Dillon Gasper, Gilbert Ruiz. Baylor University Waco, TX 76798

Abstract

The Lake Waco Wetlands (LWW) are used to purify the water coming from the North Bosque River (Waco). Bulrushes and cattails are often used in constructed wetlands (Seyoum et al. 2008). To test which species of bulrush and cattail in nitrate heightened conditions, bulrushes (Scirpus sp.) and cattails (Typha sp.) were harvested from similar locations in the wetlands. The plants were cleaned, weighed, and labeled. With each species, one group served as the control and the remaining two groups contained added nitrate. The nitrate levels of each bin’s water were tested weekly. However, results from the nitrate testing was inconclusive. Despite this, under high nitrate conditions, the bulrushes grew 81% and the cattails grew 194%. These results suggest that cattails are better adapted to increased nitrate conditions when compared to bulrushes.

Methods

The experiment used 15 bulrush and 15 cattail plants from similar locations in the Lake Waco Wetlands. Each plant was cleaned, weighed, and labeled. Each species were sorted into three groups with similar average weights. Two experimental groups received 10 grams of fertilizer (26-0-0) and one group served as a control. All plants were replanted into 60 L mesocosm containers filled with 20 L of wetland water and 20 cm of soil. Water samples of 40 mL were taken weekly from each mesocosm and tested with a DR-890 colorimeter. After 3 weeks, the plants were removed, cleaned, and weighed for weight change.

Results

The graph above shows the nitrogen testing resulted in inconclusive data. The values were not consistent and a trend was unable to be deduced. However, the mass differences from the start to finish of the experiment showed clear advantages in the cattails. Cattail in control bins and spiked nitrate bins increased by 20% and 194%, respectively. In comparison, bulrush in control and spiked nitrate mesocosms grew by 33% and 82%. The cattails were clearly more robust and responded well to the nitrogen increase and their relocation to their mesocosms.

Discussion

The results from the nitrate tests were not accurate due to the lack of data points and the questionable accuracy of the machine used in testing. The time consuming testing process made it difficult to run multiple samples from the same week leaving the researchers with only one data point to rely on. The initial and final weights of the plants did show a correlation to the amount of nitrogen in the water and overall growth. This suggests that bulrush may be more effective at taking up nitrate under average nitrate levels, but cattail is far more effective under heightened nitrogen levels. Meaning that in a heavily polluted aquatic environment, cattail would be more effective for water purification purposes.

Conclusion

The rate at which the cattail grew was 3.8 times more than the bulrush growth rate. The data suggests that bulrush may be more effective at taking up nitrogen under lower nitrogen levels, but cattail is far more effective under heightened nitrogen levels. Meaning that in a heavily polluted aquatic environment, cattail would be more effective for water purification purposes. These results may assist wetland engineers to create better nitrogen-fixing wetlands.

Acknowledgments

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Literature Cited:


“Lake Waco Wetlands.” <www.lakewacowetlands.com>