Influence of Wetland Interactions in Leaf Decay

Joshua Joseph, Phuong Ngo, & Clarry Elizondo
Biology Department, Baylor University, Waco, Texas 76798

Abstract

The purpose of this experiment was to identify the decay rates of two different types of leaves in the Waco Wetlands. The leaves being tested were the Texas live oak (*Quercus fusiformis*), which is terrestrial, and duck potato (*Sagittaria latifolia*), which grows under water. We prepared mesh litter bags, inserted an equal amount of each sample of leaves into the bags, and placed them into the Wetlands to start the process of decay. Duck potato leaves will have slower rate decay than live oak due to the leaf structure and chemical composition. The fact that Duck potato leaves weigh less individually as a plant and that the leaves contain less lignin and nitrogen makes the rate slow down. Also, microbial organisms prefer to feed on duck potatoes since the leaves are more thin and easier for them to consume, whereas, the live oak leaves are thicker. The hypothesis is that duck potato leaves will decay faster than live oak leaves because water-based plants are more in likely of decaying under water. Plants such as duck potatoes with weaker structures and fewer toxins present in the leaves are more probable to steadily disassociate in the water in terms of chemical nutrition in the wetlands. Each week for four weeks, we pulled out a sample of each leaf, dried them in the desiccator, and weighed them in an analytical balance. Each week, the duck potato leaves' weight changed drastically, while the live oak leaves remained about the same.

Introduction

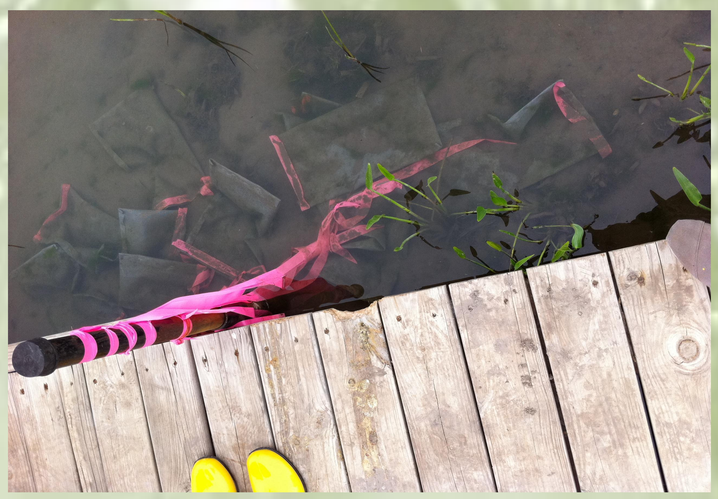
Leaf decomposition is essential to the environment as the mineral nutrients are released into the soil, absorbed by plants, and become nutrients for living plants. These nutrients can be consumed by plants in the soil and are used to help make new leaves, roots, flowers or seeds. The environment plays a vital role in the decomposition rates of leaves. If leaves are rich in nitrogen, the leaves will decompose much faster because the nitrogen enrichment speeds up microbial processes. Since duck potato is an aquatic plant, the leaves will have slower rate decay than opposed to live oak leaves, which is found in forest areas. Ratios of elements and chemical compounds found in certain species show a good indication of a leaf decay over a shorter amount of time. In particular Lignin: N will be used in the scope of this experiment.

Materials and Methods

Four samples of each of the following were gathered: Texas live oak (*Quercus fusiformis*) and Duck potato (*Sagittaria latifolia*). The leaves were gathered in groups that weighed 10.4 and 4.1 grams respectively. Samples were dried in a drying oven before experiment for 168 hours. Ten 12 x 6 inches of mesh litter bags and staple three sides were constructed with .853 mm openings and the groups were placed. Each of the two species were labeled a week to be drawn out and every week a bag was pulled out, dried for 168 hours and weighed. The bags were pinned to the surface of the wetlands roughly one foot shallow. Several washes were necessary at times.

Discussion and Conclusion

The data proved the hypothesis to be right. Water-based plants were more likely to decay under water than terrestrial plants in similar conditions. Reasons being can be because of the compounds, microbial and algae present in the water. It can be drawn that the species found in water are more readily disposable in the water with less toxins found in terrestrial plants. The algae present was spirogyra and the microbial found in the bags belong to phlyum Nematoda and Antropoda. Decay rates basically come down to the structure of the leaf and the chemicals that make up it. The greater number of nematodes in the separated species bag may have reduced fungal densities, affected microbial activity, which overall can alter the dynamics of the chemical composition and the physical structure. (Beare, Blair, and Parmelee) Because of a broken leaf structure, decay can break down quickly leaving the waters with an abundance of chemicals derived from the leaf.



Results

The data shows definite change in mass levels in the water over the span of 4 weeks. The decay of *Sagittaria latifolia* was shown to be 30.46 times more effective to decay than *Quercus fusiformis* was. By the end of the fourth week, *Quercus fusiformis had lost 25.97% of its mass whereas Sagittaria latifolia* lost 97.57% of its original mass. The data also shows a correlation between the lignin and nitrogen present in the two species. *Quercus fusiformis* contains 6.38% of lignin with 15.45% of nitrogen (as protein) present.(SPECIES:Quercus turbinella)Whereas *Sagittaria latifolia* contained 5.33% of nitrogen and 3.45% of lignin available. (The Titi Tuderancea Bulletin). The smaller the ratio the more likely to decay over a shorter amount of time.

Acknowledgements

Marty L. Harvill, Ph.D.; Baylor University Biology Department; Ms. Nora Schell; Lake Waco Wetlands; Baylor University Dean of Arts and Science.

Literature Cited

"Arrowhead, raw." *The Titi Tudorancea Bulletin*. Titi Tudorancea , 22 Jun 2008. Web. 3 May 2011. < http://www.tititudorancea.com/z/nutrition_facts_sagittaria_latifolia_arrowhead_raw.htm >.

Blair, John M., Robert W. Parmelee, and Michael H. Beare. "Decay Rates, Nitrogen Fluxes, and Decomposer Communiies of Single- and Mixed-Species Foliar Litter." *JSTOR*. Ecological Society of America, 05 Oct 1990. Web. 3 May 2011. <http://www.jstor.org/stable/1937606?seq=8>.

Tirmenstein, D. 1999. Quercus turbinella. In: Fire Effects Information System, [Online]. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station, Fire Sciences Laboratory (Producer). Available: http://www.fs.fed.us/database/feis/ 2011, May 4.