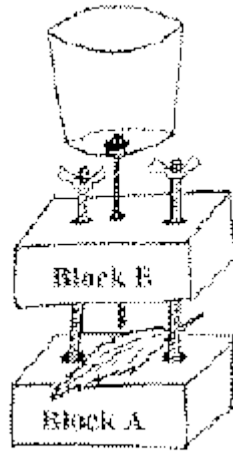


Leaf Me Alone--I'm Tough

Note: The following research idea has not been fully developed into an activity but has been tried in some workshops and classrooms. If you try it, let us know how it went by sending a note to [epp@mhub.facstack.wisc.edu](mailto:epp@mhub.facstaff.wisc.edu).



How tough are the leaves of prairie plants? Does leaf toughness vary in: sun-grown and shade-grown leaves? young and old leaves? leaves of different species? the tip and the base of a leaf? environment in which the plant is grown? prairie versus woodland plants? Make a simple Leaf Toughness Meter and begin to find out.

Introduction

The physical toughness of leaves is an ecological characteristic that varies greatly by species of plant and by habitat. The toughness and thickness of leaves is thought to be an adaptation to light and temperature conditions. Plants growing in shady spots tend to have large, thin leaves that are efficient in capturing the available light. Plants growing in full sun tend to have thicker leaves which may help to reduce water loss through transpiration. It is also possible that "tough" leaves may be more resistant to insect attack than are thin, delicate leaves.

In order to easily measure leaf toughness in the classroom, we have developed a Leaf Toughness Meter (LTM). The LTM is simple and inexpensive to make and hopefully can lead students to pose a large range of questions and devise simple, yet significant, questions.

Materials

To make a Leaf Toughness Meter (LTM), you will need the following materials:

- Two 7-inch lengths of a 2 x 4 piece of lumber
- Two 4-5 inch bolts (1/4" diameter)
- Two washers (to fit the 1/4" bolts)
- Two wing nuts (to fit the 1/4" bolts)
- One 4" bolt (1/8" diameter)
- Two washers (to fit the 1/8" bolt snugly)
- One plastic food container (at least 2-cup volume)
- 1/2 lb. beebees
- Two film cans
- Drill with 1/8" and 1/4" and 5/16" bits

Using Your Leaf Toughness Meter

To use the Leaf Toughness Meter (LTM), first remove the cup and attached bolt. Place a leaf on top of Block A (shown above). Slide the two bolts through Block B, leaving the leaf sandwiched between the two blocks. Tighten the wingnuts so that the leaf is held snugly between the two blocks. Pick up the cup and attached bolt and gently lower the bolt through the hole in the center of Block B until the bolt rests on top of the leaf. Drop the beebees into the plastic cup until the weight of beebees in the cup is sufficient to puncture the leaf. Measure the volume of beebees needed to puncture the leaf and record.

Hints: 1. Film cans hold 40 cc's and can be marked ahead of time in 10cc increments and provide an easy way to measure beebee volume. (Clear film cans work best.)

2. Make certain that your leaf will not be punctured on a leaf vein--unless that is what you are testing!

Constructing Your Leaf Toughness Meter

1. Cut two 7-inch lengths of a 2 x 4 piece of lumber.