Herbivory Student Reading

Herbivory is the act of consuming plants (primary producers) by animals. There are many factors to take into consideration when studying herbivory and the effects of herbivory, such as the type of plant and the type of herbivore consuming the plant. Often, insect herbivory is overlooked, even though insects tend to be one of the biggest threats to many plant species.

**Plant Nutrients**

Below is a table of nutrient levels in common trees. Think about how nutrient levels will influence herbivory rates on different tree species.

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| --- | --- | --- | --- |
| Tree Species | Carbon % dry mass | Nitrogen % dry mass | Lignin % dry mass |
| Northern red oak | 50.6 | 2.2 | 25.9 |
| Red maple | 49.8 | 1.8 | 18.3 |
| Sugar maple | 48.9 | 2.1 | 19.3 |
| Eastern white pine | 51.8 | 1.3 | 26.3 |
| Northern white cedar | 53.0 | 1.3 | 26.2 |
| Eastern hemlock | 51.4 | 1.5 | 17.4 |

**Plant Defenses**

Luckily, plants are not helpless when it comes to protecting themselves. While they cannot get up and run, they have developed numerous ways to defend against being eaten, and to reduce the effects of herbivory.

**Physical Defenses:** plant hairs, prickles, spines, thorns discourage herbivory of insects and other grazers. Some plants have tissue that is thick, tough and unpalatable to discourage herbivory.

**Chemical Defenses**: One way that plants defend themselves is by producing tannins. Tannins are a diverse group of chemical compounds, and are produced by many plant species. Tannins bind and precipitate proteins and are responsible for the dry pucker feeling in your mouth after drinking cranberry juice or eating unripe bananas. Before chemicals were developed, tannins were used to “tan” animal hides into leather. Animal skins were soaked in tannin rich water for weeks to soften the leather, but the tannins also create a chemical complex that would prevent microbial decomposition of the animal skins.

Some plants have evolved to protect themselves using tannins. These chemicals can be found in the leaves, buds, seeds, roots, and stems of many plants. Due to the anti-microbial properties of tannins and their toxicity to some wood-rotting fungi, plants that have these defense mechanisms tend to suffer from less herbivory. Plants vary in the amounts of tannins in different parts of their structure. Hemlock bark is high in tannins but their needles remain relatively low in tannins. Oak trees have high amounts of tannins in their leaves, while willow and cottonwood trees have lower levels of tannins in their leaves. Some plants have seasonal changes of tannin levels as well.

Think about the defenses you saw when you were collecting herbivory leaves from your school woodland plot. Did you observe any of the above defenses?

Many herbivores have evolved adaptations that allow them to determine which plants contain fewer chemical defensive chemical compounds. Some insects have chemical sensors on their feet that allow them to taste the plant before they consume it. Many mammalian herbivores use their keen sense of smell to detect bitter tasting compounds. Younger leaves that tend to contain fewer chemicals are preferred by herbivores.