

DOESN'T PLAY WELL WITH OTHERS

GRADES 9-12

OBJECTIVE

Help students better understand and apply the principles of plant competition.

MATERIALS

Potting mix
Terrariums
Cereal rye seed
Kale or spinach seed
Scissors
Electronic scale (sensitive to tenths of grams)

BACKGROUND

Cover crops provide multiple services that help enhance soil and environmental health. In addition to preventing soil erosion and improving soil organic matter, cover crops can also reduce weed growth. In the broad sense, weeds are defined as any unwanted plants. Weeds can have a significant effect on cash crop yields by competing with crops for water, nutrients, and sunlight.

Farmers often use herbicides to reduce weed populations; however many of these chemicals can be harmful to people and wildlife. Cover crops are gaining popularity as tools to reduce weed growth by out-competing weeds for resources. For example, a stand of rye can block most of the sunlight from reaching the soil surface and can prevent weed germination, or starve weed seedlings. In addition to direct competition for resources, some cover crops such as rye and oats contain allelopathic chemicals that inhibit the growth and development of nearby plants.

Plant competition can be multi-faceted. Understanding how plant competition works may provide more tools for reducing the negative impacts associated with weeds and excessive herbicide use.

DEFINITIONS

Allelopathy- Process by which a plant releases chemicals (allelochemicals) into the soil that inhibit the growth or development of neighboring plants

Cash Crop- A crop that is grown for the purpose of being harvested and sold, also known as a main crop

Competition- The process by which individuals are trying to obtain the same limited resource

Cover Crop- A crop seeded with the purpose of protecting or improving soil health; cover crops are grown outside of the regular cash crop growing season

Germination- When a plant emerges from seed, also known as sprouting

Herbicide- A chemical that kills plants

Weed- An undesired plant

TEACHER PREPARATION

Prior to the onset of this exercise, a basic review of photosynthesis and resource competition would help students gain maximum benefit from this activity. The living cover treatment should be seeded 3 weeks prior to the onset of the experiment to ensure that the living cover has adequate growth.

INSTRUCTIONS

1. Two terrariums of roughly the same size will be partially filled with equal amounts of potting mix. One of the terrariums will be seeded with rye 3 weeks prior to the onset of the experiment. The goal is to ensure a healthy stand of rye growth.
2. At the onset of the experiment, both terrarium treatments will be sprinkled with 20 grams of kale/spinach seed. Every care should be taken to ensure even distribution of the seed.
3. Three weeks after the onset of the experiment, all above-surface “weed” (kale/spinach) plant material from each terrarium will be collected by cutting with scissors as close as possible to the soil surface. Afterwards this plant material will be weighed to determine how much kale/spinach growth occurred in each terrarium. Care should be taken to ensure that the “weed” growth from each terrarium is kept separate, weighed and recorded separately and clearly marked so as not to confuse interpretation of this experiment.

DISCUSSION QUESTIONS

Prompt students to answer the following questions after the experiment data have been recorded:

- Which terrarium had the most weed (kale/spinach) growth?
- Which factors may have contributed to the observed differences in weed growth?
- Based on the results of this experiment, is rye effective at reducing weed growth?
- Based on data from this experiment, if every one gram of weed growth reduced a farmer’s profit by 1 cent per square foot, how much money would a farmer save per acre by having a cover crop? (For simplicity we will assume that each terrarium is exactly one square foot. There are 43,560 square feet per acre.)

CHALLENGE QUESTION

Many farmers terminate their cover crops with herbicide prior to planting their cash crop. Based on what you know about the uses of cover crops, is having a cover crop better for the environment than not having a cover crop? Why or why not?

ADDITIONAL RESOURCES

For Teachers:

<http://www.ipm.iastate.edu/ipm/icm/2000/5-8-2000/earlyweed.html> (Early-season weed competition)

<http://www2.hawaii.edu/~leary/files/whm16-38.pdf> (Weed Competition- Book Chapter)

http://www.extension.iastate.edu/ilf/sites/www.extension.iastate.edu/files/ilf/Cover_crops_glossary_sheet.pdf
(Cover Crop Glossary produced by Iowa Learning Farms)

<http://www.extension.iastate.edu/ilf/page/webinars> (Weed Management and Cover Crops - Archived webinar by Iowa Learning Farms)

http://www.epa.gov/caddis/ssr_herb_int.html (EPA-Herbicides Introduction)

For Students:

<http://www.youtube.com/watch?v=H9MV5CgPgIQ> (Jungle plants competing for sunlight)

<http://extension.psu.edu/pests/ipm/schools/educators/curriculum/weeds/introweeds> (What are weeds and why do we care?)

http://www.extension.iastate.edu/ilf/sites/www.extension.iastate.edu/files/ilf/Cover_crops_glossary_sheet.pdf
(Cover Crop Glossary produced by Iowa Learning Farms)

