

Course	Agricultural Science II
Unit	Plant Science
Lesson	Plant Growth Factors
Estimated Time	50 minutes

Student Outcome

The student will be able to describe factors that affect plant growth and development.

Learning Objectives

1. Identify the factors which affect plant growth.
2. Explain how light affects the processes of plant growth.
3. Identify the role water plays in plant growth.
4. Identify the elements which are necessary for plant growth.
5. Explain the methods which are used by plants to obtain nutrients.
6. Explain how plant growth is affected by temperature.

Grade Level Expectations

SC/ME/1/B/09-11/b

SC/LO/1/B/09-11/b

SC/LO/2/B/09-11/c

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. *Plant Science* (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1991.
2. *Plant Science Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- ☐ Two small flats
- ☐ Bean seeds

Supplemental Information

1. Internet Sites
 - ☐ Environmental Factors Affecting Growth: Light, Temperature, Water, Nutrition. Oregon State University Extension. Accessed January 22, 2008, from <http://extension.oregonstate.edu/mg/botany/heat.html>.
 - ☐ Photosynthesis. Estrella Mountain Community College, Arizona. Accessed January 22, 2008, from <http://www.emc.maricopa.edu/faculty/farabee/BIOBK/BioBookPS.html>.
 - ☐ Plant Growth and Development as the Basis of Forage Management. West Virginia University Extension Service. Accessed January 22, 2008, from <http://www.caf.wvu.edu/~forage/growth.htm>.
 - ☐ Temperature Effect on Plants. North Carolina Cooperative Extension. Accessed January 22, 2008, from <http://www.ces.ncsu.edu/depts/hort/consumer/weather/tempeffect-plants.html>.

2. Print

- ❑ Parker, Rick. *Introduction to Plant Science*, rev. ed. Clifton Park, NY: Delmar Learning, 2003.

Interest Approach

Using two small flats (horticultural container for planting seed), plant bean seeds to germinate. Water one flat and place it in a sunny spot for warmth. The other flat should not be watered and should be placed away from the sun in a cooler spot. Have students keep a record of the time it takes the seeds in each flat to germinate. Discuss possible problems and solutions to this demonstration, and relate the demonstration to the topic.

Communicate the Learning Objectives

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5. Explain the methods which are used by plants to obtain nutrients.
6. Explain how plant growth is affected by temperature.

Instructor Directions	Content Outline
Objective 1 <i>Plant growth is an irreversible process during a plant's life that increases plant volume or dry weight or both. The growth process of a plant is dependent on several factors.</i>	Identify the factors which affect plant growth. <ol style="list-style-type: none">1. Light2. Water3. Nutrients4. Temperature
Objective 2 <i>Of the factors that affect plant growth, light is one that controls other processes within the plant.</i>	Explain how light affects the processes of plant growth. <ol style="list-style-type: none">1. Photosynthesis: In the presence of light, plants manufacture food using water and carbon dioxide.2. Phototropism: Light stimulates the longitudinal growth in plant stems through this process.3. Photoperiodism: In some plants, light triggers the development of flowers.
Objective 3 <i>Plants require water. Some plants, namely desert-type plants, can survive with very little water.</i>	Identify the role water plays in plant growth. <ol style="list-style-type: none">1. Makes up a large percentage of the plant's fresh weight2. Transports nutrients throughout the plant3. Involved in many chemical reactions
Objective 4 <i>Humans need certain vitamins and minerals in their diets for proper growth and development of</i>	Identify the elements which are necessary for plant growth. <ol style="list-style-type: none">1. Elements from air<ol style="list-style-type: none">a. Carbonb. Hydrogen

Instructor Directions	Content Outline
<p><i>bones, muscles, and skin and also to heal the body after an injury. Plants also need nutrients for growth and development.</i></p>	<ul style="list-style-type: none"> c. Oxygen 2. Primary macronutrients <ul style="list-style-type: none"> a. Nitrogen b. Phosphorus c. Potassium 3. Secondary macronutrients <ul style="list-style-type: none"> a. Calcium b. Magnesium c. Sulfur 4. Micronutrients <ul style="list-style-type: none"> a. Iron b. Manganese c. Boron d. Copper e. Zinc f. Molybdenum g. Chlorine
<p>Objective 5</p> <p><i>Nutrients that aid in the proper growth and development of plants must be available to the plant.</i></p>	<p>Explain the methods which are used by plants to obtain nutrients.</p> <ul style="list-style-type: none"> 1. Absorption is the process through which plant roots absorb nutrients and water from the soil. 2. Translocation is the movement of nutrients and water throughout the plant.
<p>Objective 6</p> <p><i>Heat can influence plant growth both positively and negatively.</i></p>	<p>Explain how plant growth is affected by temperature.</p> <p>Temperatures above or below the optimum will reduce plant growth.</p> <ul style="list-style-type: none"> 1. Temperatures <u>below</u> optimum cause a decrease in gaseous exchanges; diffusion and osmosis slow down because the permeability of membranes is more difficult. 2. As the temperature rises <u>above</u> optimum, enzymes become less stable and break down causing plant inactivity.
<p>Application</p>	<p>Other activities</p> <ul style="list-style-type: none"> 1. Have students place a plant in the window and observe how the plant moves towards the light over the period of a few days. Discuss with students phototropism and its causes. 2. Obtain white carnations. Allow the carnations to sit without water for a few hours. Then, place them in

Instructor Directions	Content Outline
	water dyed with food coloring (red, blue). Discuss with students phloem and xylem tissues. Explain how water helps transport needed nutrients throughout the plant.
Closure/Summary	Understanding the factors involved in plant growth enables scientists, agronomists, and farmers to produce crops. Factors such as light, water, nutrients, and temperature all play a vital role in plant growth and development.
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. False 2. True 3. False 4. True 5. d 6. b 7. b 8. Nitrogen, Phosphorus, Potassium (can be in any order) 9. Calcium, Magnesium, Sulfur (can be in any order) 10. Boron, Manganese, Copper, Zinc, Iron, Chloride, Molybdenum (can be in any order)