

## Lesson A4–2

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# Understanding Growing Media Components

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**Unit A.** Horticultural Science

**Problem Area 4.** Growing Media, Nutrients, and Fertilizers

**Lesson 2.** Understanding Growing Media Components

### **New Mexico Content Standard:**

**Pathway Strand:** Plant Systems

**Standard: I:** Apply principles of anatomy and physiology to produce and manage plants in both a domesticated and natural environment.

**Benchmark: I-B:** Test appropriate materials or examine data to evaluate and manage soil/media nutrients.

**Performance Standard:** 1. Collect and test soil/media and/or plant tissue. 2. Interpret tests of soil/media and/or plant tissue. 3. Identify soil slope, structure and type. 4. Evaluate soil/media permeability and water-holding capacity. 5. Determine the chemical properties of soil/media.

**Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

1. Describe the components of soil.
2. List the components of a soilless mix.
3. Compare and contrast the use of soil versus a soilless mix.

**List of Resources.** The following resources may be useful in teaching this lesson:

**Recommended Resources.** One of the following resources should be selected to accompany the lesson:

Schroeder, Charles B., et al. *Introduction to Horticulture*, Third Edition. Danville, Illinois: Interstate Publishers, Inc., 2000.

**Other Resources.** The following resources will be useful to students and teachers:

Reiley, H. Edward and Carroll L. Shry, Jr. *Introductory Horticulture*, Sixth Edition. Albany, New York: Delmar Publishers, 2002.

## List of Equipment, Tools, Supplies, and Facilities

Writing surface  
Overhead projector  
Transparencies from attached masters  
Copies of student lab sheets  
Samples of soil  
Samples of soilless mixes

**Terms.** The following terms are presented in this lesson (shown in bold italics):

Clay  
Inorganic  
Loam  
Mineral matter  
Organic matter  
Pasteurization  
Peat moss  
Perlite  
Sand  
Silt  
Soil  
Soil amendment  
Soilless mix  
Sterilization  
Vermiculite

**Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

*Have the students collect a sample of soil from their yards. Students should try to identify the components they find in the soil (bark, leaves, stones, insects, weed seeds). Next, lay out samples of a potting mix. Challenge the students to find similar components in the potting mix. Ask the students to then list the components of a growing medium. Then lead the students into a discussion on what actually makes a soil.*

## Summary of Content and Teaching Strategies

**Objective I:** Describe the components of soil.

**Anticipated Problem:** What are the components of soil?

- I. **Soil** is the outer portion of the Earth's crust that supports plant growth. Soil varies from one location to another based on the parent material that created the soil and the climate of that particular location. Soils are often characterized by the amount of mineral matter found in them.
  - A. **Mineral matter** is **inorganic** (non-living) substances that form soil. The three types of mineral matter found in soil are sand, silt, and clay. **Sand** is the largest soil particle. You can physically separate and see individual grains of sand. Sand is beneficial for soil drainage. However, if a soil is too sandy, it will not hold enough water for plant growth. **Silt** is a particle of soil that is produced by the action of water breaking down minerals. Silt is smaller than sand and is often found near rivers. **Clay** is the smallest particle of soil. Clay holds moisture very well but when it dries out, it often cracks and forms hard clumps. Sand, silt, and clay, the 3 minerals found in soil, make up about 45% of soil composition. When there are equal amounts of sand, silt, and clay present in soil, it is called a **loam**.
  - B. Soils are also composed of 5% organic matter. **Organic matter** is living or dead plants and animals. Organic matter is necessary for plant growth because of its high nutrient content.
  - C. The remaining 50% of soil is composed of 25% air and 25% water. Soil is actually tiny particles with pore spaces around them. The pore spaces fill with air and water, and aid in plant growth.

*One way to help students master this objective is to provide several samples of soil for the students to examine. Be sure to include sandy soils, soils with clay, and loam. Have the students examine the feel of the soil and notice the colors. Show TM: A4–2A as a review of the components of soil.*

## **Objective 2:** List the components of a soilless mix.

**Anticipated Problem:** What are the components of a soilless mix?

- II. Soil is not used very often in the production of floriculture crops. Soil is very heavy, not always readily available, and can be full of undesirable weed seeds and insects. As a replacement to soil, greenhouse growers are turning to soilless mixes. A **soilless mix** is a combination of organic and inorganic substances that will provide sufficient support for plant growth. A soilless mix does not contain topsoil. Common components in a soilless mix are:
- A. Peat moss—**Peat moss** is plant material that originates in bogs. Peat moss has great moisture and nutrient holding capacity. Peat moss is also lighter in weight compared to soil. It is important to remember that peat moss is acidic in nature and can affect the pH of the mix.
  - B. Perlite—**Perlite** is white in color and comes from heat-treated lava rock. Perlite is used in the soil mix to aerate the soil. It is also very lightweight.
  - C. Vermiculite—**Vermiculite** comes from the mineral mica and is shiny brown in color. It has high moisture holding capacity and is very lightweight. Vermiculite is often used as the media for germinating seeds.
  - D. The greenhouse grower can add other soil amendments to their mix like sand or bark. A **soil amendment** is an item added to a planting mix for the purpose of increasing the quality and growth of plants.

*One way to help students master this objective is to have them see the actual soil amendments. Have the students review in groups, the origin of the soilless mix components, and the purpose of using each component.*

## **Objective 3:** Compare and contrast the use of soil versus a soilless mix.

**Anticipated Problem:** Why should a greenhouse grower use a soilless mix over a soil mix in the production of floriculture crops?

- III. Greenhouse growers should compare the advantages and disadvantages of using a soilless mix versus a soil mix before deciding on the appropriate medium for their particular crop.
- A. The advantages of a soilless mix are:
    - 1. The mix is uniform. It does not vary in components, texture, or nutrients.
    - 2. The mix is sterile. **Sterilization** is a process that eliminates all disease organisms, insects, or weed seeds. Soil mixes often contain these items and a grower who chooses to use a soil mix must pasteurize his or her soil before using it. **Pasteurization** is the process of heating soil to 180°F for one-half hour to kill the harmful diseases, weed seeds, and insects.
    - 3. Soilless mixes can be manipulated to improve the drainage and moisture holding capacity of the mix.

4. A grower can personally mix the combination of components exactly to what he or she needs for their particular crop.
  5. Soilless mixes are easier to ship and move because they are lightweight.
- B. The disadvantages of a soilless mix are:
1. Fertilizers often need to be added more frequently to the mix because the mixes are lacking in minor plant food elements. Soil contains and holds many of these minor nutrients.
  2. When plants are grown outdoors, the wind can blow dry pots over because the mix is very light.
  3. It is sometimes difficult to transplant a plant from a soil mix to a soilless one. The roots often will not grow into the new media and the plant will die because it can not absorb any moisture.

*One way students can master this objective is to assign each student or group of students, a component of soilless mix or soil mix. Have the students research the uses of the components. Students should also search for advantages or disadvantages of using each component. Then divide the students into two teams and have them debate the use of soil versus a soilless mix.*

**Review/Summary.** Use the student learning objectives to summarize the lesson. Set up an identification quiz and have the students correctly identify the components of soil and soilless mixes. The debate at the end of Objective 3 could be used as a way to summarize all the objectives in the lesson.

**Application.** Application of this lesson can be achieved through the following ways:

Showing TM: A4–2A

Completing LS: A4–2A

Performing the classroom debate

Reading related sections of *Introduction to Horticulture*

**Evaluation.** The evaluation of the student achievement of the objectives for the lesson will be the successful performance of the experiment, the debate, and the written test. A sample written test is attached.

## **Answers to Sample Test:**

### **Part One: Matching**

1=f, 2=c, 3=b, 4=d, 5=a, 6=e

### **Part Two: Completion**

1. loam
2. perlite

3. vermiculite
4. peat moss

**Part Three: Short Answer**

1. advantages—lightweight, sterile, uniform  
disadvantages—lacks minor nutrients, hard to accept transplants, pots blow over

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# Test

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## Lesson A4–2: Understanding Growing Media Components

### Part One: Matching

*Instructions.* Match the term with the correct response. Write the letter of the term by the definition.

- |                   |                     |         |
|-------------------|---------------------|---------|
| a. sand           | b. silt             | c. clay |
| d. organic matter | e. inorganic matter | f. soil |

- \_\_\_\_\_ 1. The upper portion of the Earth's crust that supports plant growth.
- \_\_\_\_\_ 2. The smallest particle of soil.
- \_\_\_\_\_ 3. Found along rivers.
- \_\_\_\_\_ 4. Living or decaying plant and animal material.
- \_\_\_\_\_ 5. The largest particle of soil.
- \_\_\_\_\_ 6. Non-living material.

### Part Two: Completion

*Instructions.* Provide the word or words to complete the following statements.

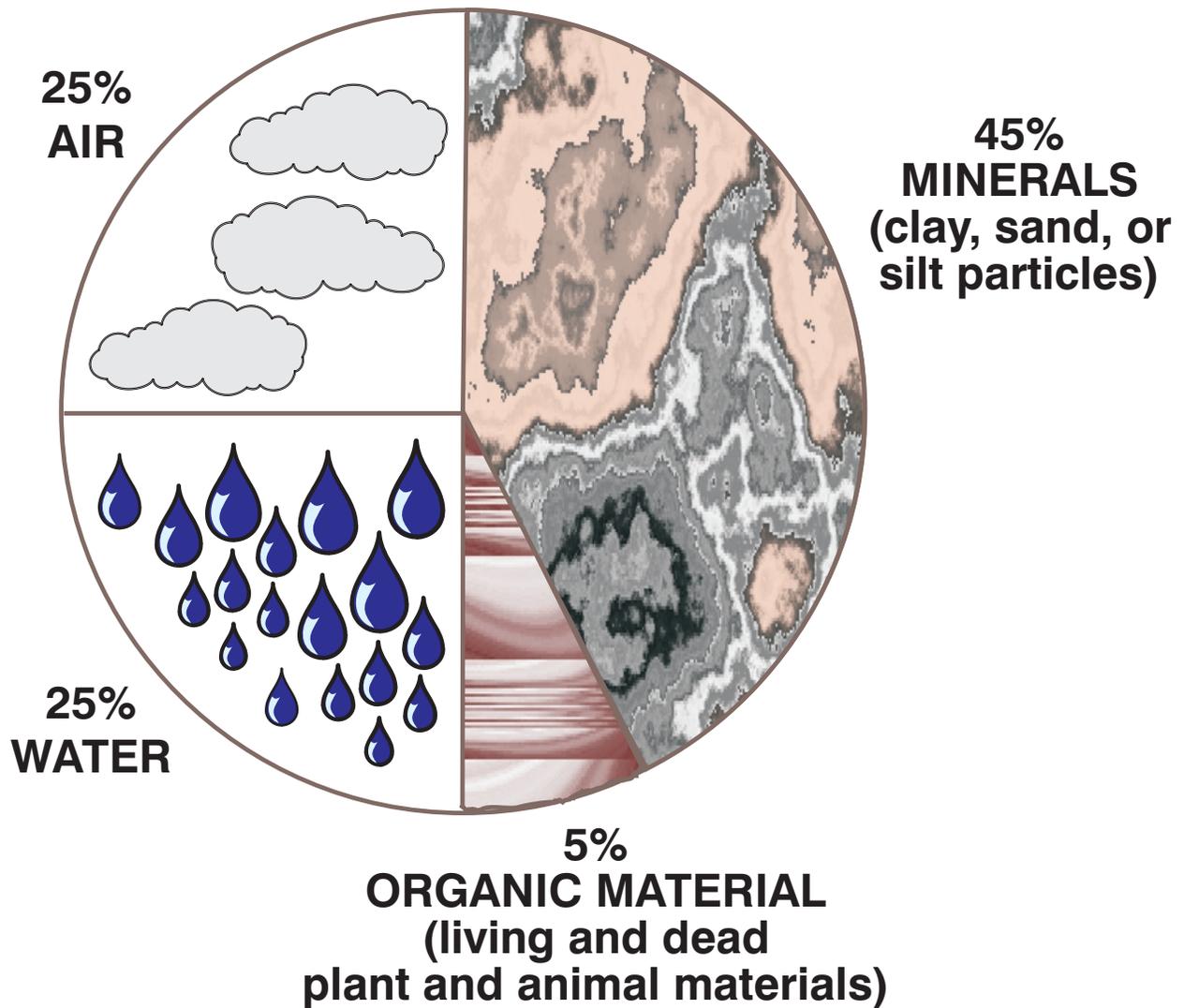
1. A soil that contains equal amounts of sand, silt, and clay is called a \_\_\_\_\_.
2. \_\_\_\_\_ is white in color and aids in soil drainage.
3. \_\_\_\_\_ is from the mineral mica and is good for seed germination.
4. \_\_\_\_\_ is plant material that originates from bogs.

### Part Three: Short Answer

*Instructions.* Provide information to answer the following questions.

1. What is an advantage of using a soilless mix? What is a disadvantage?

# SOIL COMPOSITION



*(Courtesy, Interstate Publishers, Inc.)*

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# Lab Sheet

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**Purpose:**

Students should design an experiment to test the success of various soil and soilless mixes on the growth of plants.

**Materials:**

Soil  
sand  
perlite  
vermiculite  
peat moss  
germinating flats  
seeds (marigolds work well)  
water  
labels

**Procedure:**

1. Place the students in groups of 2 or 3.
2. Lay out all the materials that could be used in the lab.
3. Challenge the students to write an experiment that tests the success of the various mixes on the growth of plants. Students should follow the scientific method (Purpose, Hypothesis, Material, Procedure, Results, and Conclusion).
4. Have the students set up their experiment and record results.
5. After two to three weeks, students should write a conclusion for their experiment.