

Unit E: Organic Matter

Lesson 2: Important Elements and Nutrients in Soil for Plants

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

1. Develop a list of essential elements for plant growth.
2. Determine importance of different nutrients based on need.
3. Explain use of nutrients by plants based on availability.

Recommended Teaching Time: 2 Hours

Recommended Resources: The following resources may be useful in teaching this lesson

- A PowerPoint has been provided

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides

Terms: The following terms are presented in this lesson (shown in italics and on PowerPoint Slide 2)

- Macronutrients
- Micronutrients
- Beneficial nutrients

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.

Ask students what are the requirements for plants to grow. After they say the normal soil, water, air, and sunlight, ask them what else they need. If they cannot develop a connection, ask them what kinds of things we need. Like what we breathe. Then after they begin naming different elements, ask them how much they need. Ask which ones are more important. At the end, make sure they understand that there are at least 20 different elements that are needed for plants to grow. Have them realize that different plants require different amounts of those 20 elements. From this discussion lead into the content of Objective #1.

Summary of Content and Teaching Strategies

Objective 1: Develop a list of essential elements for plant growth.

(PowerPoint Slide 3)

- I. There are 20 essential elements needed for proper plant growth.
 - A. Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorous, Potassium.
 - B. Calcium, Magnesium, Sulfur, Boron, Chlorine, Copper.
 - C. Iron, Manganese, Sodium, Zinc, Molybdenum, Nickel, Silicone, Cobalt.

Have students make 20 different flash cards with one of the essential elements on each. On one side of the card have the name of the element and on the other side of the card have the Periodic Symbol which can be found on PowerPoint Slide 8. The students should use these flash cards to help each other study the 20 different essential elements. Then as a group of 4 or 5, have each group of students develop a way that will help them remember these different elements. They could write a poem, a song or any other creative way for them to remember these elements. The teacher can determine based upon the work of the students how much time to allow for this activity.

Objective 2: Determine importance of different nutrients based on need.

(PowerPoint Slide 4)

- II. Nutrients are specific forms of elements that are used by plants. Nutrients are needed in different degrees of importance.
 - A. Carbon, Hydrogen, and Oxygen are supplied by the air and water.
 - B. A Specific form of one element that is in the usable form is P_2O_4 , which is phosphorous. K_2O is the usable nutrient form of the element potassium.
 - C. *Macronutrients* are nutrients needed in larger quantities.
 - 1. Nitrogen
 - 2. Phosphorous
 - 3. Potassium
 - 4. Calcium
 - 5. Magnesium
 - 6. Sulfur

(PowerPoint Slide 5)

- D. *Micronutrients* are needed in small quantity.
 - 1. Boron
 - 2. Chlorine
 - 3. Copper
 - 4. Iron
 - 5. Manganese
 - 6. Sodium
 - 7. Zinc
 - 8. Molybdenum
 - 9. Nickel

- E. *Beneficial Nutrients* are not required but help in growth.
 - 1. Silicone
 - 2. Cobalt

Have students take their flash cards and separate them into the different degrees of importance. Then they should develop a game that will help them remember their different degrees of importance.

Objective 3: Explain use of nutrients by plants based on availability.

(PowerPoint Slide 6)

III. Different things will make different nutrients available.

- A. pH of soil will help determine availability of nutrients.
- B. Organic matter will increase availability of different nutrients.
- C. Soil used often for plant production will often have depleted amounts of Nitrogen, Phosphorous, and Potassium, or N, P, and K. This should be added every year or every other year to depleted soils.

Use PowerPoint Slide 7 to show how different pH levels will determine availability of nutrients. Then, have students use the litmus paper that was made in a previous lesson and test some soil samples from around the school. After they get the soil sample pH, have them determine the availability of the different nutrients provided on PowerPoint Slide 7.

Review/Summary: Use the student learning objectives to summarize the lesson.

Questions on PowerPoint Slide 9 can be used to help the students review the material.

Application: Students should say their poem or saying in order to remember the important nutrients. Then they should use PowerPoint Slide 8 and find all 20 in the Periodic Table of Elements.

Evaluation: Evaluation should focus on student achievement of this lesson's objectives. A sample test has been provided.

Answers to Sample Test:

Part One: Matching

1=c, 2=a, 3=a, 4=b, 5=c, 6=b

Part Two: Completion

1. pH
2. Oxygen, Hydrogen, Carbon
3. Macronutrients
4. Micronutrients and Beneficial Nutrients

Sample Test

Name_____

Test

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Part One: Matching

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

a. Macronutrients

c. Beneficial Nutrients

b. Micronutrients

_____ 1. Silicone.

_____ 4. Nickel

_____ 2. Nitrogen.

_____ 5. Cobalt.

_____ 3. Magnesium

_____ 6. Manganese.

Part Two: Completion

Instructions. Complete the following statements.

1. Soil _____ will determine availability of nutrients for plants.

2. Soil provides _____, _____, and _____ in the air
and water in soil.

3. Soil will be depleted of _____ after continual use of plant and
crop growth.

4. Soil will keep most _____ and _____
because very little is needed by plants for growth.