Supplying Nutrients to Floriculture Crops

Unit A. Horticultural Science

Problem Area 4. Growing Media, Nutrients, and Fertilizers

Lesson 3. Supplying Nutrients to Floriculture Crops

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-A: Analyze and evaluate nutritional requirements and environmental conditions to develop and implement a fertilization plan.

Performance Standard: 1. Describe nutrient sources. 2. Determine plant nutrient requirements for optimum growth. 3. Identify function of plant nutrients in plants. 4. Determine the environmental factors that influence and optimize plant growth. 5. Apply nutrients to plants for economic growth. 6. Describe nutrient application methods and appropriate practices.

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

1. Name the nutrients needed for plant growth.
2. Describe pH and how it is modified.
3. Describe the components of a fertilizer.
4. Explain the methods of applying fertilizers to floriculture crops.
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:


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


List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Samples of fertilizers
pH meter
Various foliage, flowering, and vegetable plants
Soil test kit

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

Chlorosis
Complete fertilizer
Deficient
Fertilizer
Fertilizer analysis
Incomplete fertilizer
Limestone
Macronutrient
Micronutrient
Nitrogen (N)
Phosphorus (P)
Potassium (K)
Slow release fertilizer
Soil pH
Soil test
Sulfur
**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.

Lay out several examples of fertilizers. Pick a flowering plant and ask the students to find the correct fertilizer for that particular plant. Ask them why they chose that fertilizer. Repeat this activity with a houseplant and a vegetable plant. Then ask the students to describe how they would use the fertilizer (mix with water, apply to the soil, spray on the leaves). Finally, ask the students to describe what is in the fertilizer that helps plants grow.

**Summary of Content and Teaching Strategies**

**Objective 1:** Name the nutrients needed for plant growth.

**Anticipated Problem:** What are the nutrients needed for plant growth?

I. Plants need nutrients in order to grow properly. Plants receive most of the nutrients that they need from the growing media. In order to maintain healthy plants, a grower must provide the right type and amount of nutrients to the media so that the plants can absorb the nutrients and grow. Plant nutrients can be divided into two groups, macronutrients and micronutrients.

A. **Macronutrients** are those elements that are needed in the largest amount by the plant. The macronutrients are nitrogen (N), phosphorus (P), potassium (K), calcium (Ca), magnesium (Mg), and sulfur (S). **Nitrogen (N), phosphorus (P), and potassium (K)** are considered primary nutrients and their main purpose is to produce green leafy growth (nitrogen), increase flower and fruit production (phosphorus), and provide disease resistance (potassium).

B. Those nutrients that are needed in smaller amounts by the plants but are still essential to plant growth are called **micronutrients**. The micronutrients are boron (B), copper (Cu), chlorine (Cl), iron (Fe), manganese (Mn), molybdenum (Mo), and zinc (Zn).

C. A **soil test** can be performed on the soil to determine which nutrients are present or deficient (absent or lacking). When nutrients are deficient in the soil, the plant growth is adversely affected. Oftentimes, plants visibly show a nutrient deficiency by turning colors. When nitrogen is deficient in the soil, a plant’s older leaves will start to turn yellow (chlorosis) and eventually die. A plant will show purpling in the stem or leaf when phosphorus is deficient in the soil.

One way to help students master this objective is to have them perform a simple soil test on various soil samples. Many commercial kits are available to test soil. Students can work to find out what nutrients are available in their soil sample. Then students can divide the nutrients into macronutrients and micronutrients.
**Objective 2:** Describe pH and how it is modified.

**Anticipated Problem:** What is pH and how is it modified?

II. Many times, the nutrients that are needed for plant growth are present in the soil, but the plants do not have access to the nutrients. Nutrient availability is influenced by the pH of the soil. Soil pH measures the amount of acidity or alkalinity in the soil. It is based on the amount of hydrogen ions present in the soil.

A. Soil pH can range from 1 to 14. pH readings of 1 to 6 are acidic, while readings of 8 to 14 are alkaline or basic. A pH reading of 7 is neutral.

B. Plants have specific pH ranges that are ideal for maximum plant growth. Most plants prefer a pH of 5.6 to 7 with the exception of azaleas and blueberries which prefer a more acidic pH.

C. A soil test can be done to determine the pH of the soil and amendments can be added to modify the pH. In order to raise the pH, limestone can be added to the soil. Sulfur is added to the soil to lower the pH.

One way to help students master this objective is to have them use a soil test kit to test the pH of various soil samples. Students could then set up an experiment using soils with varying pH ratings and after the completion of the experiment, discuss the effects of pH on plant growth. Display TM: A4–3A to illustrate the pH scale.

**Objective 3:** Describe the components of a fertilizer.

**Anticipated Problem:** What are the components of a fertilizer?

III. A fertilizer is any material that is provided to plants to supply the nutrients needed for plant growth. Fertilizers vary in the components they contain, the way they are applied, and the function they serve.

A. When choosing a fertilizer to use, one should always look for the fertilizer analysis on the bag or box. The fertilizer analysis states the percentage of primary nutrients (nitrogen, phosphate, and potash) present in the fertilizer. The analysis is written as 3 numbers, for example, (15-10-26). The numbers, always in this order, represent the percent of nitrogen, phosphorus, and potash, present in the fertilizer. So the example above has 15% nitrogen, 10% phosphate, and 6% potash.

B. If a fertilizer contains all three primary nutrients, it is called a complete fertilizer. If a fertilizer is lacking any of the three primary nutrients, it is an incomplete fertilizer.

C. Fertilizer analysis do not equal 100%. The rest of the fertilizer composition would be some micronutrients and other filler materials that are necessary for the fertilizer to be applied and decompose.

One way to help students master this objective is to have the students study various fertilizer bags. Then have the students determine if the fertilizer is complete or incomplete, and the percentage of nitrogen, phos-
phate, and potash present in the fertilizer. Use TM: A4–3B to summarize the concept of fertilizer composition.

**Objective 4:** Explain the methods of applying fertilizers to floriculture crops.

**Anticipated Problem:** How are fertilizers applied to floriculture crops?

IV. When growing floriculture crops, it is important to use the right type of fertilizer for the end result. A fertilizer high in nitrogen should be used for houseplants, and a fertilizer high in phosphorus should be used for flowering plants. It is equally important to time the fertilizer in a way that is most beneficial to the plants. The grower should also consider the application method that eliminates the most waste, making the fertilizer most cost effective.

A. Fertilizers can be applied in a liquid form, which would then be sprayed directly onto the foliage.

B. Fertilizers can be granular in nature. These fertilizers are usually not water soluble and are a slow release fertilizer. A slow release fertilizer slowly dissolves over a period of time, releasing the nutrients into the soil. Plant food stakes are an example of a slow release fertilizer.

C. Most often, plants are fertilized as they are watered. The fertilizer comes in a powered form. It mixes with water, turning into a liquid, and as the plants are watered, they are also fed.

One way to help students master this objective is to once again have the students study various fertilizers. Have the students hypothesize on how the fertilizer is applied and then lead the students into a discussion on the best ways to fertilize plants.

**Review/Summary.** Use the student learning objectives to summarize the lesson. Have the students evaluate several plants and discuss the health of each plant. Students could also practice reading fertilizer bags. Ask the students what each fertilizer will do for the plants. The student responses can then determine which objectives need clarification.

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

Reading related sections of *Introduction to Horticulture*

**Evaluation.** The evaluation of the student achievement of the objectives for the lesson will be the successful completion of the lab and written test. A sample written test is attached.

**Answers to Sample Test:**

**Part One: Matching**

1 = c, 2 = f, 3 = a, 4 = d, 5 = e, 6 = b
**Part Two: Completion**
1. limestone
2. chlorosis
3. boron, copper, chlorine, iron, manganese, molybdenum, and zinc

**Part Three: Short Answer**
1. liquid, granular
Lesson A4–3: Supplying Nutrients to Floriculture Crops

Part One: Matching
Instructions. Match the term with the correct response. Write the letter of the term by the definition.

a. nitrogen  
b. phosphorus  
c. macronutrient  
d. potassium  
e. micronutrient  
f. pH

1. Plants need these in large amounts. _____
2. Measures the acidity/alkalinity in the soil. _____
3. Gives the plants their green leafy growth. _____
4. Is symbolized by the letter K. _____
5. Plants need these in lesser amounts. _____
6. Helps plants flower. _____

Part Two: Completion
Instructions. Provide the word or words to complete the following statements.

1. _____________would be added to the soil to raise the pH.

2. A plant that has older yellowing leaves, could have ________________.

3. _________________ is an example of a micronutrient.

Part Three: Short Answer
Instructions. Provide information to answer the following question.

1. What are two ways to apply a fertilizer?
pH Scale

Degree of Acidity or Alkalinity

- Strong
- Moderate
- Mild
- Neutral
- Slight
- Medium
- Strong
- Very Strong
- Extreme

pH Values

- 8
- 7
- 6
- 5
- 4

(Courtesy, Interstate Publishers, Inc.)
FERTILIZER COMPOSITION

16% nitrogen (N)—If it is a 100 pound bag, it contains 16 pounds of nitrogen.

4% phosphoric acid (as $P_2O_5$)—If it is a 100 pound bag, it contains 4 pounds of phosphoric acid.

8% potash (as $K_2O$)—If it is a 100 pound bag, it contains 8 pounds of potash.

(Courtesy, Interstate Publishers, Inc.)