

LANDSCAPE AND TURF MANAGEMENT

Lesson 14: FERTILIZERS

I. LESSON DESCRIPTION

Students read a guide on fertilizer types, formulations, and application, then answer a brief verbal quiz. *Estimated time requirement for this lesson is 28 minutes.*

Curriculum Standards: National Agriculture, Food and Natural Resources (AFNR) Career Cluster Content Standards, National Council for Agricultural Education, 2009:

- AFNR LifeKnowledge® and Cluster Skills Standards (CS):
 - CS.01.01.01.a. Work productively with a group or independently.
- Plant Systems (PS):
 - PS.02.03.01.a. Identify the essential nutrients for plant growth and development and their major functions.
 - PS.02.03.01.b. Describe nutrient deficiency symptoms and recognize environmental causes of nutrient deficiencies.
 - PS.02.03.02.a. Discuss the influence of pH and cation exchange capacity on the availability of nutrients.

PS.02.03.04.a. Identify fertilizer sources of essential plant nutrients, explain fertilizer formulations and describe different methods of fertilizer application.

Fertilizer practices constitute an important part of the practice of horticulture.

Student Learning Objectives: After completing this lesson, students will be able to recognize several types of fertilizers and to interpret the N-P-K analysis of a fertilizer product.

Instructional Methods: Reading Assignment, Verbal Quiz, Lab

II. LESSON PLAN

Legend:

Text in normal face - Represents teacher's words.

Text in italic face - Represents suggestions for the teacher.

Interest Approach:

- QUESTION: Consider once again the various needs of a plant: carbon dioxide, water, light. Think about the growing medium – can we grow a plant without soil?
- ANTICIPATED RESPONSES: *(Students provide opinions; hopefully the topic of hydroponics should arise.)*
- QUESTION: Think about some of the vegetables you may have seen in the supermarket, vegetables grown hydroponically. Yes, we can grow a plant without soil, but we have to provide some means of support such as a tomato stake. But what else do we need to provide? If there is no soil, there are no soil nutrients. Where will plants find the elements it needs to manufacture food?
- ANTICIPATED RESPONSES: *(Students provide opinions; hopefully the topic of liquid fertilizers should arise.)*
- ANSWER: While hydroponically grown plants can grow without soil, they cannot grow without nutrients. Liquid fertilizers are included in their water supply.
- Remember, most plants use light energy to convert carbon dioxide from the air, and water from the soil, into organic compounds for the plants' source of energy; plants can synthesize all of their required amino acids and vitamins. Remember also the 17 essential elements that are critical for a plant to thrive.

Relevancy:

- The essential elements required for plant growth are again the topic today, as we learn to monitor nutrient levels and apply fertilizers accordingly.

Learning Objectives:

- After completing this lesson, you will be able to recognize several types of fertilizers and to interpret the N-P-K analysis of a fertilizer product.
- Now let's move into a study session on fertilizers.

Instructional Methods

Reading Assignment: 10 minutes estimated

- Distribute the reading assignment if it has not been done already, 14_Fertilizer_Reading.pdf.*
- Please take 10 minutes to study this reading assignment.

Verbal quiz: 15 minutes estimated

- The students may refer to their handouts, then they respond verbally to each question.*
- True or False: A yellow leaf always signifies a nutrient deficiency. *(Answer: False, a yellow leaf can also indicate poor soil drainage, over-watering, root nematodes, or root injury.)*
- True or False: Agricultural limestone has a low pH. *(Answer: False, limestone has a high pH since it is alkaline, so you apply it to soil that is too acid.)*
- If we need to boost phosphorus levels, should we use ammonium sulfate (21-0-0), or bone meal? *(Answer: Use bone meal; ammonium sulfate has no phosphorus.)*
- You need to apply ammonium sulfate (21-0-0) to a lawn measuring 5000 square feet. The recommended rate is one pound of nitrogen per 1000 square feet. How many pounds of fertilizer will you need to buy? *(Answer: You'll need five pounds of nitrogen since 5000 is five times as large as 1000. To calculate fertilizer needed, you need to multiply that five pounds by 5, since 21-0-0 contains only one-fifth of its weight as nitrogen, so you'll need 25 pounds of 21-0-0 fertilizer.)*
- You arrive at the store with the calculations above, but they're out of ammonium sulfate. However they do have some bags of 10-0-0 fertilizer. How many pounds will you need? *(Answer: 50 pounds – you just double the result of the prior question since 10-0-0 contains about half the nitrogen of 21-0-0.)*
- On June 20, your neighbor asks you whether she should apply a liquid fertilizer solution or a pelletized slow-release fertilizer to her lilacs and viburnums. How will you respond? *(Answer: She should apply the liquid fertilizer solution, since the slow-release fertilizer will continue providing nutrients to these shrubs after the July 1 deadline. Remember, you don't want to encourage woody plants to produce late season growth that may not harden off completely, and fall victim to winter damage.)*

Conclusion

- By monitoring plant health and testing soil conditions, you can employ a fertilizer program that helps your plants thrive.
- If you observe deficiency symptoms in your plants at home, consider whether they are telling you they need certain nutrients. Or better yet, take a soil test and determine an appropriate fertilizer program so that no deficiency symptoms appear.
- We've completed a short study of an important horticultural practice, fertilization; another practice will be the next topic as we highlight the key principles of pruning.

OPTIONAL ACTIVITIES

- Consider doing a soil test. The Soil Testing Laboratory at the University of Minnesota offers soil testing. As a group, follow the instructions on the website to collect samples of soil, mail them in, then evaluate the results as a group when you receive the report. You can use the exercise just to experience the process of a test, or you can add interest by testing the soil in an area where vegetation is particularly luxuriant or problematic. For more information, visit their website at <http://soiltest.cfans.umn.edu/index.htm>.
- Assign students a research project to explore benefits of the organic approach to gardening. Students could search for current studies that answer specific questions such as, "What is the environmental impact of organic fertilizers, as compared to that of synthetic fertilizers?" "Is it true that chemical fertilizers destroy beneficial soil life such as earthworms?" "Does the organic approach to fertilizing make certain crops more immune to diseases?"

RESOURCES

Books:

- Timber Press has a wide array of quality books for horticulture. Located in Portland, Oregon, they publish books about gardening, horticulture, botany, natural history, and the Pacific Northwest. <http://www.timberpress.com/>

Websites:

- <http://www.newfarm.org/> - *New Farm* magazine from Rodale Institute. Look for the Search feature on the home page and enter a key word to research, such as "fertilizers".