

# **Unit A: Introduction to Fruit and Nut Production**

## **Lesson 3: Future Developments of Fruit and Nut Techniques**

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

1. Discuss the role of biotechnology in fruit and nut crop production.
2. Explain the uses of tissue culture in fruit and nut crops.
3. Describe how mechanization has made fruit and nut production more efficient.
4. Explain the effects space research has had on the production of fruit and nut crops.

**Recommended Teaching Time:** 2 hours

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

- A PowerPoint has also been developed with use of this lesson plan

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

Writing surface

PowerPoint Projector

PowerPoint slides

Genetically improved or modified fruits

Materials used for micro propagation (optional)

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

Genetic engineering

Mechanization

Biotechnology

Micro propagation

Tissue culture

**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.

Display examples of high quality and low quality fruits and vegetables. Discuss the differences in desirability and which the consumer would want to purchase.

**\*\* Use this activity to lead into the lesson content.**

# Summary of Content and Teaching Strategies

## Objective 1: Discuss the role of biotechnology in fruit and nut crop production.

### (PowerPoint Slide #3)

- I. The characteristics of the fruit or nut tree being grown have important implications on the success of the farm and the quality of the fruit.
  - A. Growers need varieties that are hardy and tolerant of soil and climatic conditions.

### (PowerPoint Slide #4)

- B. Varieties that are pest resistant and have high yields are important to producers.
- C. Research to develop new varieties involves biotechnology, tissue culture, mechanization, and the space program.

### (PowerPoint Slide #5)

- II. One of the newest and most important techniques in fruit and nut production is genetic engineering.
  - A. **Genetic engineering** is a biotechnology technique that manipulates the genes in plant cells.
  - B. Genetic engineering allows scientist to transfer desirable genes to the chromosomes of other organisms.
  - C. Genetic engineering creates “designer” crops that can withstand sub-optimal soil and climatic conditions.

### (PowerPoint Slide #6)

- D. New varieties are developed that are resistant to insects, diseases, and herbicides.
- E. Plant structures and shapes are improved to improve harvesting and maturing processes.
- F. Gene modification can improve yields, flavor, and nutrition of crops.

Try to obtain some fruit and nut varieties which have been improved or modified by genetic engineering and modification. If live examples cannot be obtained two examples are provided on PowerPoint slides #7 and #8.

## Objective 2: Explain the uses of tissue culture in fruit and nut crops.

### (PowerPoint Slide #9)

- III. When a new type of fruit or nut tree is produced producers want as many of these new trees as possible. This can be achieved through **tissue culture**.
  - A. Tissue culture is an asexual **micro propagation** technique that involves taking a small piece of plant tissue and growing it in a sterile culture.
  - B. Many plants can be produced in a small area.
  - C. Specialized laboratory facilities are necessary to provide a sterile environment.

**(PowerPoint Slide #10) Shows pictures of tissue culture and micro propagation.**

**Picture 1 shows a growth chamber full of plants propagated using micro propagation methods. The new plants require specific growing conditions that a growth chamber can provide.**

**Picture 2 shows plants growing in media ready for transplant to pots.**

**Picture 3 shows a cactus grown using micro propagation**

**Picture 4 shows the various stages of a plant grown using micro propagation.**

**If resources are available, show the students the materials needed to conduct micro propagation.**

**Objective 3:** Describe how mechanization has made fruit and nut production more efficient.

**(PowerPoint Slide #11)**

- IV. Using machines to do the labor in fruit and nut production greatly increases the quality and quantity of fruit produced.
  - A. **Mechanization** increases the level of production.
  - B. It is involved in the growing, harvesting, processing, and storage of crops.
  - C. Mechanization increases yields and profits.

**(PowerPoint Slide #12) Shows a picture of mechanical harvesting of grapes. If possible show pictures of the local machinery used, if any, to harvest fruit and nuts.**

**Objective 4:** Explain the effects space research has had on the production of fruit and nut crops.

**(PowerPoint Slide #13)**

- V. One way to produce more food and to expand our exploration of space is to produce the food in space.
  - A. Scientists are developing technology to produce food crops in space.

**(PowerPoint Slide #14)**

- B. The challenges of crop production in space include environmental conditions, crop selection, and waste recycling.
  - 1. Environmental conditions must provide adequate light, moisture, plant nutrition, and temperature.
  - 2. Crop selection involves nutrition, taste, and space requirements.
  - 3. Crops must grow faster and produce more.
  - 4. Inedible plant parts, water, and human waste must be recycled through plant production.

**The main purpose of this objective is for the students to understand that food can be grown in outer space. As an activity have the students form small groups of 3-4 and determine what they would need to grow food in space. They should consider: will soil be used? How will the plants receive water? What type of light will be needed? They can design their system and present it to the class.**

**Review/Summary:** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions on PowerPoint Slide # 15 can also be used as review.

**Application:** Students will be able to discuss the impacts that current and future technology will have on the fruit industry in Afghanistan.

**Evaluation:** Evaluation should focus on student achievement of this lesson's objectives. A sample written test is attached.

### **Answers to Sample Test:**

1. A
2. E
3. D
4. C
5. B
6. F
7. True
8. False
9. True
10. True

## Sample Test

Name \_\_\_\_\_

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## Test

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### Unit A Lesson 3: Future Developments of Fruit and Nut Techniques

#### **Part I: Matching**

Match the following vocabulary words with the correct definition.

- A. Genetic engineering
- B. Biotechnology
- C. Tissue culture
- D. Mechanization
- E. Micro propagation

1. \_\_\_\_\_ A biotechnology technique that manipulates the genes in plant cells.
2. \_\_\_\_\_ A technique that involves taking a small piece of plant tissue and growing it in a sterile culture.
3. \_\_\_\_\_ This method increases the level of production with the use of machines
4. \_\_\_\_\_ A method to produce large quantities of plants from a single plant.
5. \_\_\_\_\_ The science to change organisms or their environment or to get products from organisms

#### **Part II: True or False**

If the statement is true write T on the line. If it is false write F.

6. \_\_\_\_\_ Fruit and nut growers can grow any plant without regard to soil, climate or hardiness.
7. \_\_\_\_\_ New varieties of fruit and nut plants have been developed that are resistant to herbicides, diseases and insects.
8. \_\_\_\_\_ Micro propagation can be done in any environment and doesn't necessarily need to be sterile.
9. \_\_\_\_\_ Mechanization increases yields and profits.
10. \_\_\_\_\_ Plants can be grown in space so long as the environmental conditions provide adequate light, moisture, plant nutrition, and temperature.