

Unit F: Harvesting Fruits and Nuts

Lesson 1: Harvest Tree Fruits, Small Fruits, and Nuts

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

1. Explain when and how to harvest tree fruits.
2. Understand harvesting systems for small fruits.
3. Understand and describe nut harvesting.

Recommended Teaching Time: 3 hours

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

- A PowerPoint has been developed for use with this lesson plan

List of Equipment, Tools, Supplies, and Facilities

Writing surface
PowerPoint Projector
PowerPoint Slides

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

penetrometer
refractometer

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.

Place a variety of fruits and nuts in front of the class. Hold up one fruit or nut at a time and ask a few of the students how they think this fruit or nut was harvested.

Use this approach to move into Objective 1.

Summary of Content and Teaching Strategies

Objective 1: Explain when and how to harvest tree fruits.

(PowerPoint Slide #3)

- I. Tree fruits develop maximum flavor and quality when allowed to mature on the tree but will depend on the species, variety, growing season and climate.

(PowerPoint Slide #4)

A. Citrus fruits

1. There is no ripening process in citrus fruits and no such thing as "tree ripe" fruit.
 - a. Citrus fruits pass from immature to mature and finally to a overmature condition while remaining on the tree, but the changes are slow and spread over several months.
 - b. The only way to determine maturity is to taste the fruit.

(PowerPoint Slide #5)

- c. Fruit color is a poor indication of ripeness, because many fruits have fully colored rinds a long time before they can be eaten.
- d. Don't expect citrus fruits to increase in sweetness or ripen more fully once you've picked them, as do peaches and some other fruits.
- e. When picked at any stage of maturity, the citrus fruit does not change after picking, except that it may decay or slowly dry out.

(PowerPoint Slide #6)

2. Unless damaged by frost, citrus fruit keeps longer on the tree than if picked and stored.
 - a. Once you begin to harvest, pick fruit from the lower branches first, leaving the high fruit until later in the season.
 - b. There are two reasons for this; one is that frost is often more severe near the ground, so low hanging fruit is more likely to be damaged when the weather is cold; secondly, a fruit-rotting fungus disease called brown rot may splash from the soil, where it lives, onto fruit hanging low on the tree.

(PowerPoint Slide #7)

- c. Brown rot can penetrate unblemished citrus fruit rind, unlike other decay organisms which require a break in the rind to cause injury.

(PowerPoint Slide #8)

3. When you're picking citrus fruit that you plan to store for a while, be careful not to bruise or break the skin.
 - a. Fruits that are cut or scratched during harvesting will rot fairly quickly in storage.
 - b. Citrus fruits with perfectly sound skin are fairly decay proof, and will last in cool, moist storage for several weeks (3° to 8 °C, 85 to 95 percent relative humidity).
 - c. Under dry conditions at room temperature, fruits develop off flavors and shrivel within a week to 10 days.

(PowerPoint Slide #9)

B. Apples

1. Apples are one of the more difficult fruits to determine ripeness.
2. A tool called a **penetrometer** is used in commercial operations to determine how much pressure it takes to break the skin of the apple.
 - a. Depending upon the tool and the apple variety, the pressure will vary.

(PowerPoint Slide #10) This slide shows a picture of a penetrometer. The end at the bottom is pushed into the apple just until it punctures the skin. At that point the needle on the gauge will stop and show how much pressure was required to break the skin. Each penetrometer will have different measurements for each apple so refer to the manufacturer's guidelines.

(PowerPoint Slide #11)

3. Another indicator of apple maturity is falling fruit and ease of removal from the tree.
 - a. Grab a fruit and gently twist while lifting up.
 - b. If the fruit easily separates from the tree it is likely ready for harvest.
 - c. If the fruit does not separate and stays attached to the tree it will need more time to mature.

(PowerPoint Slide #12)

4. Color is not generally a reliable indicator of apple maturity as each variety varies in color and the growing season can affect color.
5. Care should also be taken when harvesting apples as the size of trees vary greatly.

(PowerPoint Slide #13)

- C. Pears
 1. Pears develop maximum flavor and quality when ripened off the tree.
 - a. When a few pears on a tree start to mature, harvest all of the fruits and place them in a cool, dark place.

(PowerPoint Slide #14)

- D. Pomegranates
 1. Pomegranates are ripe when they have developed a distinctive color and make a metallic sound when tapped.
 - a. The fruits must be picked before over maturity when they tend to crack open, particularly when rained on.

(PowerPoint Slide #15)

2. The pomegranate is equal to the apple in having a long storage life.
 - a. It is best maintained at a temperature of 0° to 5°C and can be kept for a period of 7 months within this temperature range and at 80 to 85% relative humidity without shrinking or spoiling.
 - b. The fruits improve in storage, becoming juicier and more flavorful.

(PowerPoint Slide #16)

- E. Figs
 1. Figs must be allowed to ripen fully on the tree before they are picked.
 - a. They will not ripen if picked when immature.
 2. A ripe fruit will be slightly soft and starting to bend at the neck.
 3. Harvest the fruit gently to avoid bruising.

(PowerPoint Slide #17)

4. Fresh figs do not keep well and can be stored in the refrigerator for only 2 – 3 days.
5. Some fig varieties are delicious when dried.
 - a. They take 4 – 5 days to dry in the sun and 10 -12 hours in a dehydrator.
 - b. Dried figs can be stored for six to eight months.

(PowerPoint Slide #18)

F. Mulberries

1. White and red mulberry fruits (and hybrid fruits) are ready for harvest in late spring.
 - a. The fruits of white mulberries are often harvested by spreading a sheet on the ground and shaking the limbs.
2. The fruit of black mulberries ripen in summer to late summer.
 - a. Black mulberry fruits are more difficult to pick.
 - b. As the berries are squeezed to pull them loose, they tend to collapse, staining the hands (and clothing) with blood red juice.

(PowerPoint Slide #19)

3. Unwashed the berries will keep several days in a refrigerator in a covered container.
4. The ripe fruits of the black mulberry contain about 9% sugar with malic and citric acid.
 - a. The berries can be eaten out of hand or used in any way that other berries are used, such as in pies, tarts, puddings or sweetened and pureed as a sauce.
 - b. Slightly unripe fruits are best for making pies and tarts.
 - c. Mulberries blend well with other fruits, especially pears and apples.
 - d. They can also be made into wine and make an excellent dried fruit, especially the black varieties.

Ask students how we can know when fruit is ready to harvest. Discuss color and firmness. Explain what should be done to maximize the storage time and keep the freshness of the fruit. Obtain fruit that is immature, ripe, and overripe. Compare their characteristics. Stress that the best quality fruits are tree ripened (except for pears and citrus). Stress the point that most fruit purchased in the market or a grocery store is not tree ripened. A reason for growing your own fruit is the potential for superior quality and freshness over what can be purchased.

Objective 2: Understand harvesting systems for small fruits.

(PowerPoint Slide #20)

II. Most small fruits are harvested by hand.

- A. Raspberries and blackberries are perishable products so harvest time, handling, and storing are key to quality.
 1. Color change is a good indication of ripeness.
 2. Flavor is the best indication of harvest ripeness.
 3. Berries picked too early will continue to ripen but sweetness, quality and size will be sacrificed.
 4. Overripe berries will be soft, poor quality, and rapidly deteriorate.

(PowerPoint Slide #21)

- B. With grapes, color, sugar content, taste, aroma, and ease of berry separation from the stem are indications of ripeness.
 1. For wine grapes, extensive testing is done to determine harvest readiness.
 2. The **refractometer** is a hand-held instrument used in the field to estimate the sugars present in grapes or other fruits.
 3. Laboratory tests are made to determine the acid level of the grapes.
 4. It is important to note that grape clusters do not continue to ripen after being cut from the vine, so they should not be harvested before they are fully ripe.

(PowerPoint Slide #22) This slide shows a refractometer. Place a bit of the fruit juice on the blue lens at the end of the tube. Place the flap down over it and point it towards a light source. The bottom right picture shows what you will see in the refractometer. The middle scale is the sugar content while the scale on the right is percent water. This tool can be used for most any fruit but is generally used for grapes and apples.

(PowerPoint Slide #23)

- C. Maturity and harvest time will depend upon the variety, weather and other growth factors, so knowing when to harvest the fruit will greatly improve the quality.

Compare the keeping ability of the various small fruits and discuss the implications that this characteristic has on harvesting. Depending on the time of year you may be able to harvest berries, and use the owner of the patch or vineyard as a guest speaker with the class.

Objective 3: Understand and describe nut harvesting.

(PowerPoint Slide #24)

III. Harvest all types of nuts as soon as they are ready since late harvesting reduces crop volume, lowers nut quality, and shortens storage life.

- A. Nuts are easily harvested by gently knocking the branches and nuts with a long plastic, wood or fiberglass pole.

(PowerPoint Slide #25)

B. Almonds

1. Harvest should begin when about 95 percent of the nuts have hulls that have split open to expose the in-shell almond inside.
 - a. Hull split begins in the top of the tree and progresses downward.
 - b. To prevent birds from stealing your crop and insects from infesting the nuts, harvest as soon as most (75 percent or more) of the hulls have split open.
 - c. It is also important to keep your tree well watered up to the time of harvest, since the hulls will not split well if the tree is water stressed.

(PowerPoint Slide #26)

2. The best way to knock almonds from trees is to strike the small branches with a pole or to strike the major branches with a rubber mallet made for that purpose.
 - a. It is a good idea to spread a tarp beneath the tree to help catch the falling nuts.
 - b. Pick nuts up promptly to prevent ants from invading and damaging kernels.

(PowerPoint Slide #27)

3. After harvest, remove hulls promptly from the nuts; in the home orchard, hull removal is best done by hand.
 - a. Almonds harvested at the proper time usually require additional drying to prevent mold growth in storage.
 - b. To dry the nuts, spread them in a thin layer on a tray or screen to allow good air circulation and stir often.

(PowerPoint Slide #28)

- c. Birds commonly steal almonds while they are drying; you may need to cover the drying nuts with screen or plastic netting to prevent loss.
- d. If rain threatens, cover the nuts or move them to a covered patio.
 - i. Check the nuts often for dryness.
 - ii. Remove shells from several nuts and break the kernels.
 - iii. Rubbery kernels indicate that additional drying is necessary.
- e. Almonds are ready for storage when their kernels are crisp to brittle when broken.

(PowerPoint Slide #29)

C. Walnuts

- 1. Walnuts are considered mature when the membrane between the kernel halves turns completely brown.
 - a. At this point, kernels are at their lightest color and highest quality.
 - b. Usually, harvest must wait until the hull begins to split from the nut.
 - c. As fall approaches, crack open a few nuts, especially from the upper part of the tree.

(PowerPoint Slide #30)

- d. Browning of the packing tissue and loosening of the hull are good signs of the approaching harvest.
- e. Hulls loosen last in the tree top, so it is important to sample nuts there to determine when to harvest.
- f. It is also important to keep the tree well watered through harvest time to promote hull split; hulls will not separate readily from nuts if the tree is water stressed.

(PowerPoint Slide #31)

- 2. For best kernel quality, harvest as soon as you can separate the hulls from the in-shell nuts.
 - a. Serious problems may result if you delay harvest past the optimum time, including darkened kernels, insect infestation of both the hull (walnut husk fly) and the kernel (navel orangeworm), and losses to birds.
 - b. Begin harvesting when most (85 percent or more) of the nuts can easily be removed from the tree, and when the hulls can readily be removed from all or nearly all (95 percent or more) of the harvested nuts.

(PowerPoint Slide #32)

D. Pistachios

- 1. The first sign that pistachio kernels are mature and nearing harvest is when the hulls covering the nuts change from green to a reddish color.
 - a. You can remove the red hull from a nut easily by squeezing the hull between finger and thumb.
 - b. The hulls that remain green after most have turned red will not separate easily from the nut shells, and indicate blanks.

(PowerPoint Slide #33)

- 2. Harvest pistachios as early as possible in order to avoid insect infestations and losses in kernel quality.

- a. You can begin to harvest when you can easily dislodge the nuts from the cluster, usually within one to three weeks after hulls turn red.
- b. Periodically tap a few fruiting branches in the tree to see how many nuts fall free and so determine when the tree is ready for harvest.
- c. It is best to wait until most of the crop is mature and then to harvest the whole tree at once.

(PowerPoint Slide #34)

- d. Harvest pistachios by using a stout pole to knock the nuts from the branches onto a tarp spread beneath the tree.
- e. Because the nuts have split shells and hulls at harvest, they are very susceptible to contamination.
- f. Do not allow the nuts to come into direct contact with the ground.

(PowerPoint Slide #35)

- 3. Remove the hulls right after harvest.
 - a. If you allow the hulls to remain on the nuts for an extended period after harvest you will encourage shell and kernel staining and possibly mold growth.
 - b. To remove the hulls easily, spread the nuts out on a table with a screen top and gently rub the nuts over the screen.
 - c. Hardware cloth works well as a hulling screen: it is rigid, and the 1.2 cm mesh allows hulls, but not nuts, to fall through.
 - i. You can make a smaller huller by placing the screen over the top of a bucket.

(PowerPoint Slide #36)

- 4. Blank nuts are common wherever pistachios are grown.
 - a. The number of blank nuts you harvest each year depends upon the pistachio variety, the climate, the rootstock, and your cultural practices.
 - b. After removing the hulls, float the nuts in water to separate blank nuts (which float) from filled nuts (which sink).

(PowerPoint Slide #37)

- 5. You can dry pistachios in the sun on a plastic tarp somewhere with good air circulation.
 - a. Spread the nuts in a shallow layer no more than two nuts deep.
 - b. Under normal fall temperatures, sun-drying pistachios to the proper moisture content will take 3 to 4 days.
 - c. Pistachios are properly dried when the kernels are crisp but not brittle.

(PowerPoint Slide #38)

E. Pine nuts

- 1. Pine nuts are ready to be harvested as soon as the pine cones are mature and open.
 - a. Pick a pine cone from the tree and shake it.
 - i. If the nuts fall out freely the nuts are ready to harvest.
 - ii. Sometimes the cones will not fully open and will need to be opened to harvest the nuts.

(PowerPoint Slide #39)

- b. Harvest both the closed and open cones and place them in burlap or fine mesh bags.

- c. Place the harvested cones in the sun for 3 or 4 days to allow the cones to fully open.
 - i. Check the cones every few days to monitor the cones.
- d. Once the cones are dry and open, shake the bags to dislodge the nuts.
- e. The nuts will be at the bottom of the bag and can be sorted and dried.

(PowerPoint Slide #40)

- F. In large nut orchards, machines grab the trunks of the tree and vibrate it to remove all of the nuts on the tree within a few seconds.

Discuss the various methods of nut harvesting. Have the students discuss which methods work best for the different types of nuts. Ask a nut grower to come to the class and discuss how they grow and harvest nuts.

Review/Summary: Use the student learning objectives to summarize the lesson. Have the students explain the response to the anticipated problem of each objective. Student responses can be used to determine which objectives need to be reviewed. Questions on **PowerPoint Slide #41** can be used as review.

Application: Find a fruit or nut orchard to practice harvesting nuts. If this isn't possible have a variety of growers come to the class and discuss their operations for harvesting.

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

Answers to Sample Test:

Short Answer

1. What is a refractometer and a penetrometer and what are they used for?

A refractometer is a hand-held instrument used in the field to estimate the sugars present in grapes or other fruits. A penetrometer is used in commercial operations to determine how much pressure it takes to break the skin of the apple.

2. Which of the following fruit(s) decrease in quality if left to ripen on the tree? (circle the correct answer)

Citrus fruits, Apples, **Pears**, Pomegranates, Figs, Mulberries

3. What are the two main indicators of ripeness in blackberries and raspberries?

Flavor and color change.

4. What is the best way to harvest nuts in the home orchard?

Nuts are easily harvested by gently knocking the branches and nuts with a long plastic, wood or fiberglass pole.

5. Why should fruits and nuts be harvested as soon as possible?

Harvesting fruits and nuts as soon as they are mature will reduce insect infestations, bird scavenging and other natural damages.

6. Why is additional drying required for almonds?

They will mold when put in storage.

7. How can blank pistachio nuts be separated?

After hulling, place them in a bucket of water. The blank nuts will float while the full nuts will sink.

8. What indicates almonds are ready to harvest?

About 95% of the hulls have split on the tree.

Sample Test

Name_____

Test

Unit F Lesson 1: Harvest Tree Fruits, Small Fruits and Nuts

Part One: Short Answer

Instructions. Provide information to answer the following questions.

1. What is a refractometer and a penetrometer and what are they used for?

2. Which of the following fruit(s) decrease in quality if left to ripen on the tree? (circle the correct answer)
Citrus fruits, Apples, Pears, Pomegranates, Figs, Mulberries

3. What are the two main indicators of ripeness in blackberries and raspberries?

4. What is the best way to harvest nuts in the home orchard?

5. Why should fruits and nuts be harvested as soon as possible?

6. Why is additional drying required for almonds?

7. How can blank pistachio nuts be separated?

8. What indicates almonds are ready to harvest?