

Unit E: Fruit and Nut Production

Lesson 7: Mulberry Production

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

1. Describe the history and species of *Morus*.
2. Discuss mulberry physiology.
3. Discuss the growth of mulberry trees.
4. Harvest mulberry.

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
- <http://www.crfq.org/pubs/ff/mulberry.html>

List of Equipment, Tools, Supplies, and Facilities

Writing surface
PowerPoint Projector
PowerPoint Slides
Samples of mulberries
Mulberry trees for propagating or grafting
Fruit tree and seed catalogs and/or internet access

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

dioecious
monoecious
catkins

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.

Hold up mulberry fruit and/or leaves and ask the students to identify what it is. Discuss mulberry production in Afghanistan. Ask the students, “Are mulberries a popular fruit in Afghanistan? Why or why not?” Once they have discussed this, ask them to list some varieties of mulberries, and list them on the chalkboard or use the computer and PowerPoint projector.

Use this approach to move into Objective 1.

Summary of Content and Teaching Strategies

Objective 1: Describe the history and species of *Morus*.

(PowerPoint Slide #3)

I. There are 10 to 16 different species of the *Morus* genus.

(PowerPoint Slide #4)

- A. Black mulberries (*Morus nigra*) originated in Southwest Asia.
 - 1. It is a small deciduous tree growing to 10–13 meters tall.
 - 2. The edible fruit is dark purple, almost black, when ripe, 2–3 centimeters long.

(PowerPoint Slide #5)

- B. White mulberry (*Morus alba*) originated in East Asia.
 - 1. It can grow 10-20 meters tall and bear fruit that is about 1 to 2.5 centimeters long.
 - 2. This species is very important in China for the production of silk.

(PowerPoint Slide #6) This slide shows a picture of silk worms. In the bottom left is a picture of a silkworm larva and a cocoon. The white cocoon is where the silk comes from. In the top right picture there are a group of silkworm larvae feeding on mulberry leaves.

(PowerPoint Slide #7)

- C. Red mulberry (*Morus rubra*) originated in eastern North America.
 - 1. This tree can grow 10 to 15 meters tall bearing fruit 2-3 centimeters long with a resemblance to blackberries.

(PowerPoint Slide #8)

- D. Russian Mulberry (*Morus alba* var. *tatarica*) is a variation of white mulberry.
 - 1. These trees grow 9 to 15 meters tall.
 - 2. The fruit can range in color from red to white.

(PowerPoint Slide #9)

- E. 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.
 - 1. Slightly unripe fruits are best for making pies and tarts.

2. Mulberries blend well with other fruits, especially pears and apples.
3. They can also be made into wine and make an excellent dried fruit, especially the black varieties.

(PowerPoint Slide #10)

- F. Mulberries are not commonly grown for commercial production in Afghanistan.
 1. The majority of mulberries are planted for dry and fresh use.
 2. The trees are mostly planted around the edges of fields as a border.

(PowerPoint Slide #11) This slide shows a picture of dried white mulberries harvested in Afghanistan.

Discuss with students the uses for mulberries. Tell the students “Raise your hand if you have ever had mulberries before.” Allow the students to determine if there are any other common varieties of mulberry grown in Afghanistan.

Objective 2: Discuss mulberry physiology.

(PowerPoint Slide #12)

- II. Mulberries are very easy to grow and in most cases require very little care.
 - A. All three mulberry species are deciduous trees of varying sizes.
 1. White mulberries can grow to 24 meters and are the most variable in form, including drooping and pyramidal shapes.
 2. The red mulberry can reach 21 meters. in height.
 3. The black mulberry is the smallest of the three, sometimes growing to 9 meters in height, but it tends to be a bush if not trained when it is young.

(PowerPoint Slide #13)

- B. The species vary greatly in longevity.
 1. Red mulberry trees rarely live more than 75 years, while black mulberries have been known to bear fruit for hundreds of years.
 2. The mulberry makes an attractive tree which will bear fruit while still small and young.

(PowerPoint Slide #14)

- C. Mulberry trees are either **dioecious**, meaning male and female flowers are on separate trees, or **monoecious**, meaning male and female flowers are on the same tree, and sometimes will change from one sex to another.
 1. The flowers are held on slim cylindrical, flower clusters called **catkins** that appear in the axils of the current season's growth and on spurs on older wood.
 2. Mulberries are wind pollinated and some cultivars will set fruit without any pollination.
 3. Cross-pollination is not necessary.

(PowerPoint Slide #15) This slide shows a picture of a catkin on mulberry. The white spots are the flowers. Mulberries release pollen by quickly releasing it. The pollen can be released in less than 25 microseconds and cause the petals to reflex at half the speed of sound.

(PowerPoint Slide #16)

- D. Botanically the fruit is not a berry but a collective fruit, which looks like a blackberry.
 - 1. When the flowers are pollinated, they and their fleshy bases begin to swell.
 - 2. Ultimately they become completely altered in texture and color, becoming succulent, fat and full of juice.
 - 3. In appearance, each tiny swollen flower roughly resembles the individual drupe of a blackberry.

(PowerPoint Slide #17)

- 4. The color of the fruit does not identify the mulberry species.
 - a. White mulberries, for example, can produce white, lavender or black fruit.
 - b. White mulberry fruits are generally very sweet but often lacking in needed tartness.
 - c. Red mulberry fruits are usually deep red, almost black, and in the best clones have a flavor that almost equals that of the black mulberry.

(PowerPoint Slide #18)

- d. Black mulberry fruits are large and juicy with a good balance of sweetness and tartness that makes them the best flavored species of mulberry.
- e. The refreshing tart taste is in some ways reminiscent of grapefruit.
- f. Mulberries ripen over an extended period of time unlike many other fruits which seem to come all at once.

Have the students observe a mulberry tree. If no mulberry tree is available try to provide detailed pictures of the leaves, stems, trunk and fruit. Have students observe these various structures and write down their descriptions. Provide some mulberries for the students to dissect, observe, and taste.

Objective 3: Discuss the growth of mulberry trees.

(PowerPoint Slide #19)

- III. Mulberries need full sun and also adequate space.
 - A. The distance between trees should be at least 4.5 meters.
 - 1. The trees are quite wind-resistant with some cultivars used as windbreaks.
 - B. Mulberries like a warm, well-drained soil, preferably a deep loam.
 - 1. Shallow soils such as those frequently found on gravel are not recommended.

(PowerPoint Slide #20)

- C. Although somewhat drought-resistant, mulberries need to be watered in dry seasons.
 - 1. If the roots become too dry during drought, the fruit is likely to drop before it has fully ripened.
- D. Mulberries generally thrive with minimal fertilization.
 - 1. An annual application of a balanced fertilizer such as 10:10:10 NPK will maintain satisfactory growth.

(PowerPoint Slide #21)

- E. No special pruning techniques are needed after the branches have been trained to a sturdy framework, except to remove dead or overcrowded wood.

1. A mulberry tree can be kept to a tidy form by developing a set of main branches, and then pruning laterals to 6 leaves in July in order to develop spurs near the main branches.
2. It is not advisable to prune the trees heavily since the plant is inclined to bleed at the cuts.
3. Cuts of more than one centimeter in diameter generally do not heal and should be avoided at all cost.
4. The bleeding will be less severe if the tree is pruned while it is dormant.

(PowerPoint Slide #22)

- F. Mulberries can be grown from seed, although the plants can take 10 years or more to bear.
1. Seed should be sown as soon as extracted from the fruit, although white mulberry seeds germinate better after stratifying one to three months before planting.
 2. Sprig budding is the most common method for grafting mulberries.
 - a. A T-cut is made in the rootstock and a smooth, sloping cut is made on the lower end of the scion.
 - b. The scion is then inserted into the T and wrapped and sealed.

(PowerPoint Slide #23)

3. Other types of grafts are also usually successful, although there may be incompatibility between white and black mulberries.
 - a. Hardwood, softwood and root cuttings also are suitable methods for propagating mulberries.
 - b. Softwood cuttings of white mulberries root easily when taken in midsummer and treated with rooting hormone.
 - c. Red mulberries are less easily rooted.
 - d. Black mulberries are also somewhat difficult to propagate since they tend to bleed a lot.

(PowerPoint Slide #24)

- G. Mulberries are generally free of pests and diseases, although cankers and dieback can occur.
1. In some areas "popcorn disease" is an occasional problem, in which fruits swell to resemble popped corn.
 2. *M. alba* and *M. rubra* hybrids are particularly prone to this condition.
 3. The disease carries on from one season to the next, so collecting and burning infected fruits help control it.
 4. The ripe fruit is very attractive to birds, but there is usually enough fruit left over for harvesting.

Provide the students with mulberries to collect seeds. Plant the seeds and see how many germinate. Along with this, or instead of the previous activity, provide the students with materials to propagate trees via cuttings and grafting.

Objective 4: Harvest mulberry.

(PowerPoint Slide #25)

- IV. White and red mulberry fruits (and hybrid fruits) are ready for harvest in late spring.
 - A. The fruit of black mulberries ripen in summer to late summer.
 - B. The fruits of white mulberries are often harvested by spreading a sheet on the ground and shaking the limbs.
 - C. A surprising quantity can be gathered from a comparatively small and young tree.

(PowerPoint Slide #26)

- 1. Black mulberry fruits are more difficult to pick.
 - a. As the berries are squeezed to pull them loose, they tend to collapse, staining the hands (and clothing) with blood red juice.
- 2. Unwashed the berries will keep several days in a refrigerator in a covered container.

Discuss methods of harvesting mulberries with the students. Ask if any of them have ever harvested mulberries before. Discuss where they can purchase mulberries and how they are commonly sold in Afghanistan.

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

Student responses to the questions on **PowerPoint Slide #27** can be used to determine which objectives need to be reviewed.

Application: Provide the students with fruit seed and tree catalogs as well as internet access. Split the class into groups and have them research the common varieties of mulberry in Afghanistan and create an informational pamphlet about each variety. Alternately, have the students plant some mulberry trees that they grew or propagated.

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. Where did the genus *Morus* originate?
In various parts of Asia
2. What does dioecious and monoecious mean?
Dioecious means the male and female flowers are on separate plants and monoecious means the male and female flowers are on the same plant.
3. What type of soil do mulberries prefer?
Mulberries prefer a warm, well-drained soil, preferably a deep loam.
4. When do mulberries generally ripen?
White and red are ready in late spring. Black are ready in summer to late summer.
5. Discuss pruning methods for mulberry.
No special pruning techniques are needed after the branches have been trained to a sturdy framework, except to remove dead or overcrowded wood.

Part Two: Matching

1. C
2. D
3. A
4. B

Sample Test

Name_____

Test

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Part One: Short Answer

Instructions. Provide information to answer the following questions.

1. Where did the genus *Morus* originate?

2. What does dioecious and monoecious mean?

3. What type of soil do mulberries prefer?

4. When do mulberries generally ripen?

5. Discuss pruning methods for mulberry.

Part Two: Matching

Instructions: Match the common name in the left column to the Latin name in the right column.

- | | |
|--|-----------------------------------|
| <input type="checkbox"/> 1. White mulberry | A. <i>Morus nigra</i> |
| <input type="checkbox"/> 2. Red mulberry | B. <i>Morus alba var tatarica</i> |
| <input type="checkbox"/> 3. Black mulberry | C. <i>Morus alba</i> |
| <input type="checkbox"/> 4. Russian mulberry | D. <i>Morus rubra</i> |