

Unit D: Production of Field Crops

Lesson 6: Growing Oil Crops

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

1. Describe cotton and discuss its value
2. Describe sunflowers and discuss its value
3. Describe flax and discuss its value
4. Describe soybeans and discuss its value

Recommended Teaching Time: 2 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.hort.purdue.edu/newcrop/afcm/flax.html>
- <http://www.hort.purdue.edu/newcrop/afcm/sunflower.html>
- <http://en.wikipedia.org/wiki/Cotton>

List of Equipment, Tools, Supplies, and Facilities:

Writing surface
PowerPoint Projector
PowerPoint Slides
Cotton plant
Cotton balls
Sunflower plant
Sunflower seed
Flax plant
Products made from flax

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

- Legume
- Oil crops
- Linters
- Boll
- Cotton picker
- Retting

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.

Show students samples of the seeds covered in this lesson. Have students compare the seeds to each other and to others covered in previous lessons. Ask students to explain how the seeds are alike and different. Ask students to think of products made from these crops. Continue with the lesson.

Summary of Content and Teaching Strategies

Objective 1: Describe cotton and discuss its value.

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I. Cotton

- A. Cotton is a soft, staple fiber that grows around the seeds of the cotton plant, a shrub native to tropical and subtropical regions around the world, including the Americas, India and Africa.

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The fiber most often is spun into yarn or thread and used to make a soft, breathable textile, which is the most widely, used natural-fiber cloth in clothing today. Both the fiber and seeds from cotton are used to produce many products.

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- B. Cotton is started from seed and the cotton growing season is 150 to 180 days.
- C. To plant by hand, drag a garden hoe in a straight line the length of the garden to create a row for planting. If making more than one row, make them about 37 centimeters apart from each other. Then pre-moisten the soil with a good deep watering.

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- D. Successful cultivation of cotton requires a long frost-free period, plenty of sunshine, and a moderate rainfall, usually from 600 to 1200mm. Soils usually need to be fairly heavy, although the level of nutrients does not need to be exceptional. Large proportion of the cotton grown today is cultivated in areas with less rainfall that obtain the water from irrigation.

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- E. Cotton fibers grow inside a ***boll***, the pod or capsule of the cotton plant.
- F. Each cotton boll contains approximately 28 to 35 cotton seeds.

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- G. Cotton continues to be picked by hand in many countries.

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However, in some parts of the world, cotton is harvested mechanically, either by a ***cotton picker***, a machine that removes the cotton from the boll without damaging the cotton plant, or by a cotton stripper, which strips the entire boll off the plant. Cotton strippers are used in regions where it is too windy to grow picker varieties of cotton.

(PowerPoint Slide 10 shows examples of a cotton picker and a cotton stripper)

(PowerPoint Slide 11)

Harvesting is done after the bolls break open

(PowerPoint Slide 12)

- H. Cotton is a perennial crop in the tropics and without defoliation or freezing, the plant will continue to grow.
- I. After harvest, cotton is stored in modules and then transported to the gin where it is sucked into the building through pipes.
- J. The seed and lint (cotton fibers) are separated and the lint is pressed into bales and taken to the textile mill.

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- K. At the mill, the lint is cleaned and mixed and goes to a carding machine to be cleaned further.
- L. After carding, the combing machine finishes cleaning and straightening the fiber and twists it into a rope called a sliver.
- M. The sliver goes through a drawing frame and a slubber to pull the soft rope and begin twisting it.

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- N. The spinning frame winds cotton yarn onto bobbins.
- O. The cotton yarn is turned into fabric on looms.
- P. After it is woven, the fabric is sent to a finishing plant to be bleached, pre-shrunk, dyed, and printed before being turned into clothing or other products.

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- Q. A bale of cotton weighs approximately 218 kilograms
- R. For every 45 kilograms of cotton, there is 75 kilograms of cotton seed.
- S. **Linters**, the short fuzz on the cotton seed, are used for plastics, explosives, paper products, padding for furniture, mattresses, and car cushions.

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- T. Cotton is considered an oil crop. **Oil crops** are plants grown to produce vegetable oil from their seed or fruit. Cotton seed oil is used for shortening, cooking oil, and salad dressing.
- U. Cotton seed meal and hulls are used for fertilizer as well as feed for livestock, poultry, and fish.

**** Bring in a cotton plant to show the students. You may want to have the students hand-gin cotton bolls and practice twisting cotton fibers into yarn. If cotton bolls aren't available, students may use cotton balls to twist fibers. Ask if anyone grows cotton; have them explain their operation.**

Objective 2: Describe sunflowers and discuss its value.

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II. Sunflowers

- A. Evidence suggests that sunflowers were cultivated by Native Americans in present day Arizona and New Mexico about 3000 B.C.

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- B. Sunflowers may grow up to 3.7 meters tall with roots 2.7 meters deep.
- C. They usually have one stem with a large single flower or several smaller flowers.

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- D. As the name implies, sunflowers like the sun and do best when in a sunny location. A general guideline is to pick a spot that receives at least 6 hours of sunlight daily. If planted in a shady area, sunflowers may stretch to reach sun and thus will require additional staking support as they will if planted in a windy area. Tall varieties are often planted on a fence line to help with support.

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- E. Sunflowers are usually planted between April and June, and most sunflower varieties have a maturity between 75 and 110 days. The nice thing is that you can grow them from the last freeze until winter sets in again. Stop planting 75-100 days before the first winter freeze is expected in your location.

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- F. A planting depth of 2.5 to 8.9 centimeters. allows sunflower seeds to reach available moisture and gives satisfactory stands. Deeper plantings have resulted in reduced stands and yields. If crusting or packing of the soil is expected, with silt loam or clay soils, a shallower planting depth is recommended. Row spacing of 76 centimeters is most common.

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- G. To get oil after the sunflower seeds are harvested. Harvest when seeds in the center of each head are mature. The back of the head will turn greenish-yellow to yellow, and the bracts will turn brown. Cut with about a foot of stalk attached and hang the head in a warm, dry place.

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Cheesecloth or other netting tied around the head will prevent seeds from falling to the floor. If picked before completely dry, hang the head by the stalk in an airy, dry place, such as a well-ventilated attic. When thoroughly dry, gently rub the seeds from the head and store them in airtight containers, such as jars or well-tied bags.

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- H. There are both oil and non-oil types of sunflowers.
- I. Sunflowers have many uses.
 1. Edible uses for sunflowers include snack food and cooking oil.
 2. Non-edible uses for sunflowers include soap, candles, birdseed, and ornamental plants.

**** Bring in a sunflower plant to show the students. Ask if anyone grows sunflowers; have them explain their operation. You can also bring in sunflower seeds for students to sample.**

Objective 3: Describe flax and discuss its value.

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III. Flax

- A. Common flax (*Linum usitatissimum* L.) was one of the first crops domesticated by man. Flax is thought to have originated in the Mediterranean region of Europe. Production of flax was utilized for the fiber as well as the seed.

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- B. Flax is still produced for its oil rich seed, called linseed oil.
1. In parts of the world, linseed oil has been used as a drying agent for paints, varnishes, lacquer, and printing ink. Occasionally the straw is harvested and used to produce some paper products.
 2. Linseed oil meal is an excellent protein source for livestock containing about 35% crude protein. Flax straw on the other hand, makes a very poor quality forage because of its high cellulose and lignin content.

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- C. Flax is started from seed and grows to maturity in 90 to 180 days. Seed flax is an annual plant that grows to a height of 30 to 91 centimeters. It has a distinct main stem with numerous branches at the top which produce flowers. Branches from the base of the plant may also occur depending on variety, stand, and environment. The plant has a branched taproot system which may extend to a depth of .9 to 1.2 meters in coarse textured soil.

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- D. Flax is best adapted to fertile, fine textured, clay soils. It should not be grown on very coarse textured, sandy soils. Flax on peat or muck soils will be disappointing unless problems related to drainage, fertility, and weed control are solved.

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- E. The best seedbed for flax is similar to the ideal seedbed for small seeded grasses and legumes. It should be well worked. The soil should be firm to avoid large air pockets. Fall plowing is preferred if erosion is not serious. The seedbed may be worked fairly shallowly, except where deeper plowing is required when flax follows maize. Cultivation following early fall plowing will aid in weed control.

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- F. A seeding rate of 19–23 kilograms of good seed per .4 hectare is recommended. Lower seeding rates often result in more severe weed problems. A 1.75 to 2.5 centimeters planting depth is suggested in clay soils. Flax seed is comparatively small and may fail to emerge from greater depths, especially if crusting occurs. Inexperienced growers often plant too deep, especially if the soil is loose.

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- G. Flax is usually ripe when the stems turn yellow, the bolls turn brown, and the seed can be easily threshed.

H. To harvest flax, the plants are either pulled up by the roots or cut with a drum mower. In either case, the flax is laid out to dry. After it is dry, the flax is deseeded and then soaked, or retted, to release individual fibers. After **retting** (soaking), the flax is cut in a mechanical turbine to extract fibers.

(PowerPoint Slide 32 shows a picture of drum mowers. PowerPoint 33 shows a picture of flax, after retting, being set up in the fields to dry)

**** Bring in a flax plant to show the students. Ask if anyone grows flax; have them explain their operation. If you have items that are made of flax, bring them in and show the class.**

Objective 4: Describe soybeans and discuss its value.

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IV. Soybeans

A. In some parts of the world, soybeans are grown. Soybeans can be considered a major world crop.

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Soybeans are considered an oil crop. Soybeans or *Glycine max*, is an annual legume. A **legume** is a plant that can fix nitrogen from the air in the soil. Soybeans have many industrial, human, and agricultural uses.

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B. Soybeans, or some part of the soybean, are used in a number of industrial products. Personal products such as soap, lotion, and creams made from soybeans are increasing in popularity. Household items such as linoleum, candles, plastics, paints, and adhesives may also include soybeans. Soybeans can also be used to produce insecticides, printing ink, and lubricants.

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C. In human foods soybeans are used in a variety of forms. Soy products are becoming popular with health conscious people because soybean meal contains twice the protein of beef and fish. Soybean products that can be found on many grocery store shelves include: soy milk, soy yogurt, soy hot dogs, and soy cheese. Soybean by-products are also used in salad dressings, margarine, cocoa, chocolate, candies, and flour.

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D. Animals also benefit from soybeans and soybean by-products. Soybean oil meal, soybean oil cake, and soybean meal can be used as sources of protein in animal feeds.

Review/Summary: Summarize the lesson by asking students to explain the content of each objective. Reinforce the key terms and concepts.

Application: Students can apply the information learned in this lesson by growing oil crops.

Evaluation: Student comprehension of these objectives can be measured with the attached test.

Answers to Sample Test:

Part One: Matching

1=b; 2=a; 3=d; 4=c

Part Two: Completion

1. fiber, seed
2. soy, soybean
3. sunflowers

Part Three: Short Answer

1. Use Objective 2 to grade
2. Use Objective 3 to grade
3. Use Objective 1 to grade

Test

Unit D Lesson 6: Oil Crops

Part One: Matching

Instructions Match the word with the correct definition.

- a. linters b. retting c. boll d. legume e. cotton picker

- _____ 1. Soaking fiber crops like flax to separate fibers.
_____ 2. Short fuzz on cotton seed.
_____ 3. A machine that removes the cotton from the boll without damaging the cotton plant
_____ 4. A plant that can fix nitrogen from the air in the soil.
_____ 5. The part of the cotton plant that contains the cotton fiber and seeds.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. Both _____ and _____ from the flax plant are processed into products.
2. _____ products are becoming popular with health conscious people because _____ meal contains twice the protein of beef and fish.
3. _____ need to be planted where they will receive at least 6 hours of sunlight daily.

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

1. Name two non-edible uses for sunflowers.
2. Name two flax products.
3. Name two cotton products.