Five **Fun Facts** About Berries!

- Blueberry is America’s favorite flavor of muffin!
- The average strawberry has 200 seeds.
- Unripe blackberries are actually red!
- The strawberry belongs to the genus *Fragaria*, which makes it a close relative to the rose.
- Blueberries grow on shrubs that live all year long.

Four **Fun Teaching Ideas**!

- Watch this video on berries from California Bountiful: https://www.youtube.com/watch?v=Qd8BaYN2vkg
- Match the berries! Students will learn how different types of berries grow and what they look like in *What’s Growin’ On?*
- Brainstorm! Think of all the ways berries can be eaten throughout the day (breakfast, lunch, dinner, snacks and dessert). Work in teams and then compare to see which team comes up with the most unique ways to eat berries.
- Design a colorful plate of food! Use paper plates and clippings from grocery store ads to create a balanced and healthful meal. See the *Colorful Fruits and Veggies* page from *What’s Growin’ On?*

*Explore all the great berry resources in this section!*
How Produced — Blueberries are part of the Ericaceae plant family, which includes the flowering azalea and heather plants. They grow best in acidic soil with plenty of water and good drainage. Highbush blueberries—the ones you find in grocery stores—grow on bushes planted in long rows. The bushes can grow up to 12 feet tall, but most peak at about 6 feet. In the spring, clusters of white blossoms pop up all over the bushes and are pollinated by bees. Each blossom eventually becomes a berry—first hard and green, then reddish purple, and finally blue.

California blueberries are harvested from May through July. For the fresh market, blueberries are mainly picked by hand. For other markets, blueberries are gathered with large machines that gently shake each bush so ripe berries fall into a catching frame.

Berries are gathered in large bins and transported by truck or tractor from the field to a packing plant, where they are sorted, cleaned, and packaged in clear clamshell containers. These containers are stored in large refrigerated rooms until they’re taken to market.

History — When Europeans arrived on the continent, Native Americans were already using wild blueberries year-round. They dried blueberries in the sun and added them whole to soups, stews and meat, or crushed them into a powder which was rubbed into meat as a preservative. The Native Americans also used blueberries for medicinal purposes. They called blueberries “star berries” because the blossom end of each berry, the calyx, forms a perfect five-pointed star.

Native Americans developed one of the first blueberry baked goods, a simple pudding made with blueberries, cracked corn, and water. Many historians believe it was part of the first Thanksgiving feast.

During the 20th century, people didn’t think wild blueberries could be domesticated. In 1908, Frederick Coville, a USDA botanist, began breeding wild blueberry plants with superior genetic traits. In 1912, with the help of Elizabeth White, the daughter of a New Jersey farmer, Coville successfully harvested a crop of plump and flavorful berries like those we enjoy today. The team sold the first commercial crop of blueberries in 1916.

Today, blueberries are found in nearly 4,000 products including pet food and cosmetics.

Varieties — With California’s numerous micro-climates, many different blueberry varieties can thrive in the state. There are hundreds of varieties, but only about a dozen are sold commercially. Farmers usually grow several varieties at a time. When blueberries are harvested, the varieties are combined which gives a batch of blueberries its varied colors, textures, and levels of sweetness. Each variety is unique in its size, shape, color, and taste.

Commodity Value — Over the past five years, blueberry production and consumption has almost tripled. California is one of the top six blueberry producing states in North America. In 2018-2019, blueberry growers received an average of $4.05/pound. California moved 71 million pounds of blueberries into domestic and export markets. Most of the state’s crop stays in California, with some transported to other states. About 12 to 15% is exported, with Canada, Japan, and Southeast Asia being the top international markets.

Top Producing Counties — With 80 individual producers, blueberries are grown throughout California. In the most recent season, California farmers produced blueberries in 28 counties on nearly 9,000 acres. The greatest blueberry acreage can be found in Tulare County, where blueberries are grown on roughly 2,400 acres. San Joaquin, Kern, and Fresno counties follow Tulare County in total acreage for blueberry production.

Nutritional Value — Blueberries are low in fat, a good source of fiber, and an excellent source of manganese. A one-cup serving of blueberries contains 80 calories and virtually no fat. One serving helps satisfy recommended daily fiber intake. Dietary fiber is important in maintaining digestive health and reducing the risk of heart disease. A single serving of blueberries delivers almost 25% of one’s requirement of vitamin C, which helps the body maintain a healthy immune system. Blueberries are high in manganese. Manganese plays an important role in bone development and converting proteins, carbohydrates, and fats into energy.

For additional information:
California Blueberry Commission
(559) 221-1800
Website: www.calblueberry.org

U.S. Highbush Blueberry Council
www.blueberry.org
Blueberry Activity Sheet

Where are California’s top 5 blueberry destinations?

1. Canada
2. Japan
3. Hong Kong
4. Taiwan
5. United Kingdom

Lesson Ideas

• Make a family tree showing several subfamilies, genera, and species related to the Ericaceae plant family.
• Write an expository paragraph highlighting different ways Native Americans used blueberries for medicinal purposes.
• Investigate the history of fruit crate labels. Create a vintage-looking fruit crate label for California grown blueberries.
• Visit www.calblueberry.org and rewrite one of the recipes to serve your entire class.
• Create a bar graph comparing the vitamin C content of a variety of fruits and vegetables, including blueberries.
• Early American colonists made blue paint by boiling blueberries in milk. Experiment with making different shades of blue before painting a masterpiece.
• Compare the cost per pound of fresh, frozen, and canned blueberries. Make a bar graph highlighting your findings. Track the cost over time and create a line graph.

Fantastic Facts

1. Blueberry bushes can grow up to 12 feet tall.
2. Blueberries are stored in large refrigerated rooms until they’re taken to market.
3. The first commercial crop of blueberries was harvested in 1916.
4. Canada imports more California blueberries than any other country.
5. Tulare County has the greatest blueberry acreage.
6. One serving of blueberries provides the recommended amount of daily fiber.
7. Native Americans used wild blueberries for food and medicinal purposes.
9. Fresh market blueberries are harvested by hand, while other markets (frozen, dried, canned) use machines.

Lesson Plan: Testing Soil pH

Introduction: Blueberries require acidic soils. UC Cooperative Extension recommends a soil pH between 4.8 and 5.5. If you plant blueberries in neutral or alkaline soils (soil pH 7 or higher) the plants will yellow and grow poorly, if at all.

Objective: Students will test soil pH and determine if it is adequate for growing blueberries. Students may amend the soil to attain the proper pH requirements.

California Standards: ELA CC: RST.6-10.3, 7; NGSS: MS-LS1-5

Materials: pH test strips (available at most garden centers), hand trowel, distilled water

1. Brainstorm with the class what plants need to grow. Record ideas. Be sure to include space, water, air, soil, light, and nutrients. Explain that when we talk about soil, there are minimum requirements the soil must meet. One of these requirements is the pH, or acidity, of the soil.
2. Collect a soil sample from a potential planting site. The soil should be collected from approximately 5-10 centimeters below the soil’s surface.

3. Place the soil in a bowl. Pour distilled water into the bowl until the soil has the consistency of a milkshake. Stir the mixture to ensure the water is fully incorporated.
4. Hold a pH test strip at the non-reading end and dip the strip into the dirt mixture for 20-30 seconds. Lift the pH strip from the water and dip it briefly in distilled water to clean off the dirt.
5. Use the color-coded key included in your pH test kit to read the pH of your soil.
6. Test the soil pH of several different sites around your home or school. Plot your data on a map. Provide a site recommendation based on evidence for planting blueberry bushes.
7. If your sites tested above pH 7, add acidifying material such as sulfur and ammonium-based fertilizers. Retest the soil. Add additional acidifying material, testing as necessary, until you reach the desired level. Continue to add material periodically to maintain a low pH.
How Produced – Strawberries thrive along California’s coast because western ocean exposure and Pacific winds insulate the fields from extreme temperatures and weather, providing the ideal conditions for growing strawberries almost year-round. Strawberry plants are grown in stock nurseries and then transplanted into fields where they grow for another three months before they begin producing fruit. Strawberries are grown all year long in California, with the peak strawberry season occurring in April, May, and June when volume rises from about a million trays per week to eight million trays. That is about 72 million pounds per week.

All strawberries are picked, sorted, and packed in the field by hand. Trays of strawberries are then rushed to shipping facilities where they are cooled to 32°F. Within 24 hours of harvest, fresh market strawberries are loaded on refrigerated trucks for delivery across the country. This unique and sophisticated distribution system ensures this highly perishable fruit reaches consumers in fresh-from-the-field condition.

History – This luscious fruit can be traced back as far as the Romans, and perhaps even the Greeks. Medieval stonemasons carved strawberry designs on alters and around the tops of pillars in churches and cathedrals, symbolizing perfection and righteousness. During the same time period, strawberries were served at important state occasions and festivals to ensure peace and prosperity.

The most common explanation for how the strawberry got its name is that children in the nineteenth century threaded the berries onto straw and offered them for sale. Fresh strawberries began to flourish in California in the 1950s due to improved cultural technologies.

California strawberry growers are leading research in ways to conserve water, protect the soil, and reduce fertilizer and pesticide use. One of the first agricultural groups to adopt drip irrigation technology to conserve water, they continue to invest millions of dollars in non-chemical farming methods. Progressive and sustainable farming practices include innovative integrated pest management (IPM) strategies that work with nature to control pests, advanced irrigation management practices, and new strawberry varieties that resist pests and diseases.

Varieties – Different varieties are suited to particular climates and growing regions. Southern California varieties are adapted for warmer temperatures and shorter daylight hours for early fruit production. Northern varieties have been selected for a longer production cycle, which extends through the fall. For more than 65 years, commercial varieties have been developed by pomologists at the University of California. Successes include the development of new commercial strawberry varieties now grown throughout the world and precedent-setting solutions to disease and pest control.

Commodity Value – Strawberries are among the top five most frequently consumed fruits, and consumption is steadily increasing. One in five families reported eating more strawberries in the past year than previous years. In 2015, strawberries produced in California accounted for 88 percent of the U.S. strawberry production. Nearly 32,000 acres are devoted to strawberry production in California. Canada, Mexico, and Japan are primary export markets for fresh and frozen California strawberries. Today, strawberries represent a $2.3 billion industry in California.

Top Producing Counties – California harvests more than two billion pounds of fruit annually. The leading counties in strawberry production include Santa Barbara, Orange, Ventura, San Diego, Monterey, Santa Cruz, and San Luis Obispo.

Nutritional Value – California strawberries are an excellent source of vitamin C, providing more than 100 percent of the recommended daily value, and are a source of potassium, folate, and fiber. Naturally low in sugar, a one cup serving of strawberries has only 45 calories. Research shows eating eight strawberries a day may improve memory, and reduce the risk of heart disease and some cancers.

For additional information:
California Strawberry Commission
(831) 724-1301
Website: www.californiastrawberries.com
Strawberry Activity Sheet

Plant Parts

Lesson Ideas

• Create a map of California highlighting the major counties where strawberries are grown.
• Estimate the number of seeds on a strawberry and devise a simple method for determining the number of seeds.
• Calculate the surface area and volume of a strawberry.
• Discuss different pests that affect strawberry production and methods for controlling these pests.
• Devise a method of estimating the quantity of strawberries produced on an acre of land.
• Write a paper entitled, "California—The Strawberry Capitol of the United States." Use www.calstrawberry.com for your research.
• Discuss the advantages and disadvantages of hand and machine harvesting. Invent a machine to harvest strawberries.
• Analyze the economic impact export markets have on the California strawberry industry.

Fantastic Facts

1. The average strawberry has 200 seeds.
2. Strawberries are harvested by hand.
3. Strawberries are typically propagated using vegetative reproduction.
4. One serving of strawberries contains more than 100 percent of the recommended daily value for vitamin C.
5. Strawberries do not continue to ripen after harvesting.
6. During California’s peak production, 72 million pounds of strawberries can be picked in one week.
7. An average acre of California farmland can produce 21 to 27 tons of strawberries.
8. Strawberries are perennial plants, but are often planted annually.
9. California grown strawberries account for 88 percent of the nation’s production.

Lesson Plan: Make Your Own Strawberry Leather

Introduction: Strawberries can be used to make several tasty and nutritious snack foods.

Objective: Students will demonstrate measuring, food processing, and food safety skills as they make a strawberry treat.

California Standards: CC ELA: RL.3-5.3, 4; RST.6-12.3, 4  
CC Math: 3-4.MD.2, 5.MD.3

Materials: Strawberries (1½ cups per group of 4 students), light corn syrup, lemon juice, jelly roll pan, blender or food, masking tape, processor, plastic wrap.

Procedure:
1. Place 1½ cups of clean strawberries in a blender or food processor and process until smooth.
2. Stir in ½ teaspoon lemon juice and 1½ teaspoons light corn syrup.
3. Line a jelly roll pan with heavy-duty plastic wrap, taping the plastic wrap to the corners of the pan with masking tape.
4. Pour the strawberry mixture into the pan, spreading evenly. Leave at least a one-inch margin on each side.
5. Dry in an oven at 150°F for seven to eight hours or until the surface is dry and no longer sticky.
6. Remove the leather and plastic wrap from the pan while still warm (hands must be clean and dry) and roll up in a jelly roll fashion. Cut into logs and store in plastic wrap for a maximum of five days. Have the students take their strawberry leather home or enjoy it as a class snack.
7. Math extension: Write the cooking measurements in standard units, such as milliliters, liters, or cubic units.

Growing Season and Peak Production
Mixed berries are popular super foods. What makes them so super? They are packed with vital nutrients, such as antioxidants, that are important for good health. Examples of berries include blueberries, blackberries, raspberries, and strawberries.

Blueberries are perennial, deciduous shrubs. They are commonly grown as free standing shrubs. When the berry is a deep blue color they are carefully hand-picked and rushed to nearby packing houses and then delivered fresh to the grocery store.

Blackberry and raspberry plants start flowering in the spring and berries ripen in the summer. Some varieties are vine-like and are grown on trellises. When ready for harvest the blackberry will have a solid center while the raspberry is hollow.

Commercially, strawberries grow on plastic covered beds, close to the ground. On average, it takes 30 days for the fruit to ripen before being picked. When the strawberries are ready to be harvested they are hand-picked, placed in clamshells or other packaging, transported to a cooler, and delivered to stores or restaurants.

Blueberries are an excellent source of antioxidants!

Standards:
- ELA- Grade 3: Reading 2.1, 2.3, 2.6
- Grade 4: Reading 2.2
- Grade 5: Reading 2.1
- Grade 6: Reading 2.1

You and your family visit a local U-pick farm to pick fresh berries. They have three varieties in season: raspberries, blueberries, and strawberries. The raspberries and blueberries are $3.25 per pound and strawberries are $2.99 per pound. Calculate the cost of purchasing ½ a pound of raspberries, ¼ pound of blueberries, and 1¾ pounds of strawberries. Round to the nearest cent.

Standards:
- Mathematics - Grade 3: Number Sense (NS) 3.3, 3.4, Algebra and Functions (AF) 3.1, Mathematical Reasoning (MR) 1.0, Grade 4: NS 1.3, 1.5, MR 1.2, Grade 5: NS 2.4, 2.5, MR 1.2, Grade 6: NS 2.3, 2.4, MR 1.0, Grade 7: NS 1.2, MR 1.0

Sources: Highbush Berry Council www.blueberry.org, California Strawberry Commission www.calstrawberry.org, Network for a Healthy California Harvest of the Month www.harvestofthemonth.com
Strawberries Strategies

Californians love their berries. Strawberries grow especially well in our state because of the temperate climate from the coast. Here is a story of the many strategies people use to take extra care to grow scrumptious strawberries.

Breeding
Growing strawberries starts even before they are planted. Scientists look for ways to make healthy strawberry plants by making them more resistant to pests and diseases.

Planting
 Virtually all strawberry plants in California start as runners trimmed from mother plants, grown at high-elevation nurseries in Northern California. Once strong and healthy, they are shipped to farms across the state, where they are planted by hand.

Harvesting
All strawberries are picked by hand. Strawberry harvesting teams work hard to pick each berry and pack it inside a clamshell container. The containers are placed inside trays that are quickly transported to shipping facilities where they are cooled.

Selling and Shipping
Within 24 hours of being picked, the berries are loaded into refrigerated trucks and transported across the country and the world. 88% of the berries grown in the United States come from California. Berries are sold as fresh or frozen, or they are used as ingredients in other products.

CAREER: Plant Pathologist

Cecilia Wilson, Plant Pathologist, Bayer CropScience, West Sacramento, CA

What do you do in your job? I run tests on plants to see how I can help them fight against pests and disease.

What training did you need for your job? I needed a bachelor’s degree and lab experience. Much of my training was on the job.

What is an interesting thing that you’ve learned in your job? I’ve learned that plants can be plagued by multiple diseases at the same time.

Anything else you’d like to add? Everything looks so different at the microscopic level! I love that being a scientist can help farmers grow food to feed the world!

Activity

True/False
1. Strawberries have lots of Vitamin C. T/F
2. Strawberries each have about 50 seeds. T/F
3. California produces about 88% of our country’s strawberries. T/F
4. Strawberries grow on trees. T/F
5. The country of Belgium has a strawberry museum. T/F

Class Connection
Go to a grocery store produce section. Check strawberry labels or ask where the strawberries were grown. Mark the location on a map. Compare locations with other students’ findings.

STEM Activity: Strawberry DNA
Using common household items, you can separate and observe strawberry DNA. This experiment can be done in class, for a science fair, or even just for fun! Go to the website: www.genome.gov/Pages/Education/Modules/StrawberryExtractionInstructions.pdf
Or visit LearnAboutAg.org for another version in Extra! Extra!

Classroom Extensions.
Colorful Fruits and Veggies

Many red fruits and vegetables contain important nutrients and phytonutrients that help to keep your heart healthy. Examples of red fruits and vegetables with high contents of vitamin C and/or fiber are listed.

Red bell peppers, guavas, radishes, papayas, raspberries, pomegranates, and tomatoes.

Many blue and purple fruits and vegetables contain phytonutrients that protect against cancer. These fruits and vegetables can improve memory and keep your heart healthy. These fruits and vegetables are a good source for vitamin C.

Blackberries, plums, purple asparagus, purple onions, and blueberries.

Several green vegetables and fruits can be a good source of potassium, fiber, and/or calcium. Potassium helps your heart beat correctly and assists your muscles in contracting. Fiber helps with digestion and calcium helps build strong bones.

Broccoli, kale, artichokes, collard greens, spinach, pears, and kiwifruit.

Our bodies benefit from eating colorful fruits and vegetables! Use the information located in the colorful stars and the body at right to illustrate each of these benefits. For example, if you were to eat carrots, color the eyes orange because carrots contain vitamin A which supports healthy eyes and vision. Research other fruits and vegetables to find out what nutrients they contain – notice there are a variety of colors that can also be a good source of vitamin A.

### Activity

Survey your class to determine food preferences. First, select one of the five food groups: fruits, vegetables, protein, dairy, grains. The food group you select will determine the theme for your survey. Next, think of at least five different foods that are in your selected food group. For example, if you chose fruits you might list peach, cherry, mango, grapes, and kiwifruit. Survey your classmates, asking which of these five foods they prefer. Create a bar graph in the space provided to illustrate your results.

(Write in the food group you selected.)

<table>
<thead>
<tr>
<th>Food Group</th>
<th>Preferences</th>
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<tbody>
<tr>
<td>Fruits</td>
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<td>Vegetables</td>
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<td>Protein</td>
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<td>Dairy</td>
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<td>Grains</td>
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</tbody>
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### Materials:
- Newspaper ads
- Paper plate
- Magazine
- Scissors
- Glue

### Design Your Meal

The MyPlate food icon shows us how to create a healthy meal, including specific proportions of the five food groups: fruits, vegetables, protein, grain, and dairy. Fill half your plate with a colorful rainbow of fruits and vegetables. Using a grocery store ad, cut out healthy foods you like from each of the food groups. Glue the food onto the plate in the appropriate place to create YourPlate!

### Dig Deeper:
Calculate the total cost of your meal using the advertised price. Visit www.foodapedia.gov to calculate the nutritional value of the meal.

### Standards:
- Health Education - Grade 4: 3.1a, 3.2a
- Health Education - Grade 5: 3.1a, 3.2a
- Health Education - Grade 7 and 8: 3.1a


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