

# Taste and Teach

## February - Leafy Greens



### Five **Fun Facts** About Spinach & Lettuce!

- Americans consume an average of 30 pounds of lettuce per person each year.
- There are three types of spinach varieties: Smooth Leaf, Savoy and Red Veined.
- Lettuce was recently grown, harvested and eaten aboard the International Space Station.
- Spinach typically takes 21-50 days to grow. Lettuce can take from 65 to 130 days to grow, depending on what time of year it is planted.
- There are three types of lettuce varieties: head, leaf and romaine.

### Three **Fun Teaching Ideas!**

- Read the book, *Tops and Bottoms* by Janet Stevens, and use the ideas in the Ag-Bite activity to bring the book to life!
- Use the Fact and Activity Sheets and other research, to compare and contrast the nutritional value of lettuce and spinach.
- Have students create a salad recipe! Check out the word problems on the *Lettuce Introduce You* page from *What's Growin' On?*.

*Explore all the great spinach and lettuce resources in this section!*

# Lettuce

Information compiled by California Foundation for Agriculture in the Classroom

**How Produced** – Cool weather is important in lettuce production. Lettuce is a cool-season, annual crop. It grows best in moderate daytime temperatures (73° F) and cool nighttime temperatures (45° F). Lettuce grows well in loose, fertile, sandy-loam soils that are well-supplied with organic matter. Soil should be well-drained and moist, and have a slightly acidic pH of 6.0 to 6.5. Since lettuce seeds are so small, a well-tilled seedbed is essential - large clods will reduce germination. Lettuce is hand-harvested and takes place year-round, from April to October in the Salinas Valley, California and from November to March in Yuma, Arizona. Lettuce is one of the top three vegetables produced in the US, along with tomatoes and potatoes. Iceberg lettuce accounts for about 1/2 of the lettuce produced in the US, with the other 1/2 including romaine, butterhead and leaf lettuces. Growing, harvesting, and marketing of lettuce is mainly from large-scale growers with organic production gaining in popularity. World-wide, the US is the second largest lettuce producer (behind China), with most of the lettuce coming from California and Arizona.



**Commodity Value** – In 2014, lettuce was number six in California commodity values, generating sales of 2 billion dollars. Lettuce is in the top 20 of California exports, coming in at number 14 with \$337 million in sales. Canada takes in the highest amount of California grown lettuce exports at 88%. Imports of lettuce to California are limited to less than 5%, and come from Mexico and Canada.

**Top Producing Counties** – Monterey County is the top lettuce producing county, producing more than 70 percent of the crop and generating 1.48 billion dollars. The second highest producing county is Imperial at \$158 million, and third highest is Santa Barbara at \$107 million. Lettuce is easy to grow and yet sensitive to temperature – frost damages it, and heat causes the stem to grow quickly and

the plant to go to seed. Ideal conditions are mild weather, and moist, fertile soil explaining why the coastal counties do well in spring and summer months and Imperial County and Arizona do well in winter months.

**Nutritional Value** – Lettuce is low in calories, fat-free, cholesterol-free, and low in sodium. It has 11 calories per one cup. Lettuce contains dietary fiber along with omega fatty acids that promote good health. Lettuce also provides immune capability with the help of mineral contents like manganese, magnesium, potassium, iron, phosphorus, and calcium. Presence of these mineral compounds decreases harmful free radicals in the body and improves the body's immune system as well as protects from viral infections and related diseases. The iron content in lettuce contributes many beneficial properties for health. Iron is required for the formation of red blood cells and the transportation of oxygen to different parts of the body. These nutritional benefits of lettuce can help prevent anemia and aid in protecting the body from indigestive agents. Lettuce also breaks down heavy protein and carbohydrates helping the stomach function properly. Lettuce contains vitamin A (which helps protect the eye), vitamin C, thiamine and vitamin B6.

**For additional information:**

California Leafy Green Products  
(916) 441-1240  
Website: [www.safeleafygreens.org](http://www.safeleafygreens.org)  
YouTube: [youtube.com/user/CALeafyGreens](https://www.youtube.com/user/CALeafyGreens)

Leafy Greens Council  
(716) 517-0248  
Website: [www.leafy-greens.org](http://www.leafy-greens.org)



# Lettuce Activity Sheet

## ANCIENT EGYPT



- Tomb paintings depict lettuce
- Stems used instead of leaves
- Grown for seed and oil

2500 B.C.

## CHINA



- Consumed as a cooked vegetable
- Lettuce traveled to Persia, Greece, Rome
- Stem lettuce variety native to the area

5<sup>TH</sup> CENTURY

## WESTERN EUROPE



- Shorter-stemmed varieties developed
- Christopher Columbus brought lettuce to the New World

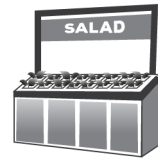
15<sup>TH</sup> CENTURY

## AMERICA Modern Varieties Developed



EARLY 1900s

## WORLD



- Salad bar popularity
- Plant breeding for disease-resistance and more varieties

1970s

## CALIFORNIA

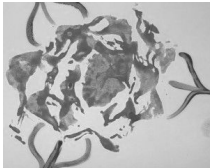


- 1/3 of California-grown lettuce is sold in ready-to-eat packaging
- Contributes 70% of total lettuce exports

TODAY

### Lesson Ideas

- Research Ready-to-Eat bagged lettuce. Include when it started and its success. Compare its popularity to head lettuce.
- Make an artistic salad using leafy greens and other vegetables.
- Identify and illustrate different lettuce varieties.
- Research Lettuce Mosaic Virus and/or the Soil-Dwelling Springtail.
- Create a green smoothie recipe.
- Using the art principle of perspective, research and draw a lettuce or other agricultural field.
- Create artwork using lettuce head stamping (art, see below).



### Fantastic Facts

1. Lettuce is a member of the sunflower family.
2. Over 90% of lettuce sold in the US is grown in California and Arizona.
3. California is the "salad bowl" of America, producing a year-round supply of lettuce, celery, broccoli, and cauliflower.
4. Americans consume 30 pounds of lettuce per person each year.
5. The first modern iceberg variety was created by TW Whitaker of the USDA and was named Great Lakes, although it was developed in California.
6. *Lactuca sativa* is the botanical name for common garden lettuce.
7. Drawings of lettuce are found on ancient Egyptian tombs.
8. Lettuce was recently grown, harvested, and eaten on board the International Space Station.

### Lesson Plan: Growing Lettuce From a Stem

**Introduction:** Lettuce and other leafy greens can be grown from a cutting. Have your students design a science experiment to observe the phenomenon. Research and find out why it works.

**Objective:** Students will investigate what plants need to grow.

**California Standards:** CC ELA: SL.3-12.4, WHST.6-12.7  
NGSS:4-LS1-1, 5-LS1-1, MS-LS1, HS-LS1

**Materials:** Stems or cuttings from heads of lettuce, bowls, water, observation tools – notebook, pencil, thermometer, ruler.

#### Procedure:

1. Brainstorm what plants need to grow. Ask what would happen if we cut the stem of the lettuce off and put it in water? Have students make predictions. Students will work in groups of 3-4.
2. Bring in heads of lettuce for each group. Cut the stem off about 1 inch from the bottom. Save for the experiment. Use the lettuce for a class salad.

3. Place the cut stem in a bowl of water. Add about ½ to 1 inch of water.
4. Place the bowl in the window or under lights.
5. Draw a picture and record other measurements such as date, time, temp, size, lettuce type, etc.
6. Change the water in the bowl every other day and observe the cutting every day. Watch for new leaves and roots. Make observation notes.
7. After two weeks, you may plant your lettuce in a pot or outside. Continue to make observations.
8. Research why the plants were able to grow after being cut and only with sun and water. Consider other experiments you can conduct to improve lettuce growth.
9. Have groups present their results using evidence, data, and a model to support their findings.



## Commodity Fact Sheet

# Spinach

Information compiled by Fresh Express

**How Produced** – Before planting, the farmer will till and prepare the soil. Spinach can be grown on a variety of soil types but the best crops come from sandy loam soil, which is usually found along rivers. The sandy ground makes harvesting easier after rainfall because of good drainage. Drainage quality also affects the irrigation cycle. Since spinach is not a deep-rooted crop, it relies on frequent irrigations to maintain the proper soil moisture levels for ideal growth.

Approximately 90 percent of U.S. spinach is grown in California and Arizona. Spinach grows best during cool periods of the year. Almost 50 percent of spinach produced in California is grown in the Salinas Valley in Monterey County, where spinach is produced from February through November. Spinach is a quick-growing, cool-season vegetable that grows best at temperatures from 45°F to 75°F. The foggy and cool summers of the California central coast and the clear and cool winters of the Arizona desert provide ideal growing conditions for spinach.

Spinach is planted relatively shallow at about ½ to ¾ inch depth and at high seed densities of 21 to 48 seed lines per 80-inch beds. These high seed densities result in about 3.5 million plants per acre. Spinach can be harvested in the Salinas Valley 21 to 50 days after planting. Spinach is grown for fresh market (bunched or packaged) and for the processing (frozen) industry. Most of the spinach is mechanically harvested using a machine with a front cutter bar. After harvesting, spinach is typically cooled to 34°F at centralized cooling facilities before being transported to the processing plant. Spinach has a very high respiration rate and is therefore quite perishable. If kept at low temperatures, spinach can be stored for 14 to 18 days.

**History** – Spinach has been consumed for thousands of years. It is believed that spinach made its way into Indian and Asian cooking through Arab traders who carried it to Asia from the Middle East. In the 11th and 12th centuries, spinach became a popular vegetable in Spain, and from there it diffused to Germany, Italy, England, and France. It has been used in salads, soups, in baked dishes with cheese, yogurt, and in tortellini. In the early 19th century, American colonists introduced spinach to North America. At least three varieties were grown by 1806. With the development of canning and freezing, the popularity of spinach increased world-wide. The increase in spinach consumption in the U.S. has been due to the sale of freshly packaged teen and baby spinach.

**Varieties** – Types of spinach are classified as smooth leaf, savoy, and red veined. California grows all three. Smooth leaf varieties have a mature leaf length of about six inches. Savoy spinach is very crinkly and has the same sized leaf as the smooth leaf variety. Red veined spinach has a smaller leaf, similar to the all-green baby leaf types, but adding attractive color and nutrients associated with the red color in the leaf veins. There are many varieties in each type of spinach. Popular varieties in California include Avenger, Bolero, Bossanova, Dolphin, Emilia, Falcon, Lazio, Palco, Unipak, and Whale. Varieties are constantly being developed and may replace these currently popular ones.



**Commodity Value** – The acreage of fresh market spinach in California has continuously increased by 30 percent over the last decade from 15,000 acres in 2001

to 19,600 acres in 2011, while the acreage of processing spinach remained constant at 7,300 acres. In 2011, the total crop volume for spinach (fresh market and processed) was 606 million pounds, showing an increase of 59 percent from 2001. California accounts for 58 percent of the nation's total spinach production. Spinach ranks number 41 among all commodities grown in California.

**Top Producing Counties** – The top counties for spinach production in California are Monterey (66 percent), San Benito (9 percent), Imperial (8 percent), Ventura (6 percent), and Santa Barbara (4 percent).

**Nutritional Value** – Fresh spinach is a good source of antioxidant vitamins like A and C and phenolic antioxidants like lutein, zeaxanthin, and beta-carotene. These compounds are scavengers against free radicals and play a healing role in aging and different diseases, including cancer, and promote normal eye-sight. Spinach is an excellent source of vitamin K, which is important for strengthening the bone mass. It also contains vitamin B6 and folates.

### For additional information:

Chiquita Brands/Fresh Express  
(831) 772-6057

Website: [www.freshexpress.com](http://www.freshexpress.com)



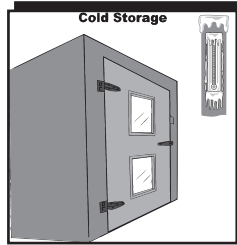


# Spinach Activity Sheet



◀ #1

Food safety specialists carefully examine field conditions, monitoring crop quality and food safety compliance prior to planting, and during production and harvest.



◀ #2

Cold temperatures are critical to freshness. Growers cool down spinach within hours of harvesting and keep it chilled from the field to the store.

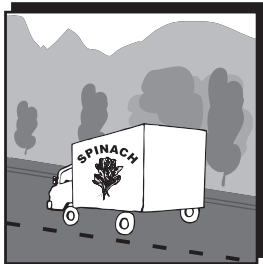


◀ #3

From the field, spinach is transported to packaging facilities where it is thoroughly washed, rinsed, and gently dried. Often spinach is packaged in a breathable bag for long-lasting freshness.

#4 ▶

After packaging, spinach is transported swiftly and safely to retail locations across the country. Maintaining consistent cold temperatures is important so every refrigerated truck is monitored throughout its journey to ensure spinach stays cool, fresh, and delicious.



#5 ▶

Consumers enjoy eating spinach. Everyone knows that fresh spinach makes a delicious side dish, but it also makes a nutritious meal on its own.



## Lesson Ideas

- Traceability systems inform consumers about where their food comes from and plays a significant role in minimizing food safety risks. Visit [www.freshexpress.com/yoursaladstory](http://www.freshexpress.com/yoursaladstory) to track the origins of fresh, packaged spinach.
- Locate on a Western U.S. map where spinach is predominantly grown. What are the climatic differences or similarities?
- Based on the total pounds of spinach produced in California in 2011, how many pounds would have been grown in Monterey County? How many tons is this?
- Illustrate the process of photosynthesis and explain the role chlorophyll plays in spinach growth.
- Compare and contrast the nutritional value of spinach to other leafy greens such as mizuna, iceberg lettuce, and arugula.
- Create a delicious recipe using spinach and provide a cooking demonstration for the class. Explain safe food preparation and give everyone in the audience a sample.

## Fantastic Facts

- The three main spinach varieties are Smooth Leaf, Savoy, and Red Veined.
- It takes 21 to 50 days for a spinach plant to mature.
- After harvest, spinach is cooled to a temperature of 34 degrees F.
- Spinach is a significant source of vitamin A, vitamin C, vitamin B6, vitamin K, folate, beta-carotene, lutein, and zeaxanthin.
- The best spinach crops come from sandy loam soil, which has good drainage and makes harvesting easier.
- The Salinas Valley produces the most spinach in California.
- California grows 58 percent of the nation's total spinach.
- Spinach originated as a food crop in the Middle East.

## Lesson Plan: Steamed or Raw?

**Introduction:** Spinach is packed with nutrients, easy to prepare and tasty too! In fact, spinach can be prepared many different ways. This activity will encourage students to add spinach to their diets.

**Objective:** Students will compare the visual appearance, taste, texture, and smell of fresh and steamed spinach.

**California Standards:** CC ELA: W.3-12.7; WHST.6-12.2, 7  
NGSS: 5-PS1-2; MS-PS1-2

**Materials:** Raw and steamed spinach (prepared before or during class), paper plates, forks, napkins, observation journals, pencils.

### Procedures:

- After students wash their hands, instruct them to use all their senses to observe the raw spinach. Keep in mind color, texture, smell, sound, and taste. Students may record observations in their journals.

- Repeat the observation activity above with steamed spinach.
- Research and compare the nutritional value of raw and steamed spinach. Discuss why the nutritional values differ and investigate the chemical processes involved in cooking spinach.
- Determine the differences in serving size for raw and steamed spinach.  
one cup raw = \_\_ cup steamed
- Ask students to explain which type of spinach they liked best and why. Discuss the balance between choosing the most nutritious product and personal taste preference.
- Optional: Give students the opportunity to compare the qualities and nutritional value of canned and frozen spinach too.



# 'Lettuce' Introduce You...

Lettuce, a leafy vegetable we use for salad, in sandwiches, and other dishes, is known to scientists by its scientific name of *Lactuca sativa*.

Lettuce has a long history in California. Lettuce began to be **cultivated** commercially in California in the 1930s. Today, lettuce is in California's Top-Ten most valuable agricultural commodities. California is the leading producer of lettuce in the United States, producing more than 73% of all lettuce grown in the United States. It grows year round in California. Monterey and Imperial counties are the top producers of lettuce.

There are three main kinds of lettuce: head, leaf, and romaine. Head lettuce is round and tight and shaped like a cabbage. Iceberg lettuce is a type of head lettuce. Leaf type is loose and leafy. Butter, Red and Green Leaf are types of leaf lettuce. Romaine is tall with slender leaves.

## Activity

Identify each kind of lettuce; write your answer under each one.



## Lettuce: How do you grow?

The lettuce you purchased at your local market is very fresh. There is a lot of planning and preparation before a lettuce crop is planted. First, the farmer prepares the field by using a laser to level the field, then **beds** are prepared to plant seeds. Sprinklers or drip irrigation are used to water the emerging plants and throughout their growing season. It is important to fertilize plants so that plants are healthy. **Integrated Pest Management (IPM)** is used to control pests and diseases that could harm plants. Lettuce is harvested carefully and quickly when it is ready to eat. Harvested lettuce is cooled and stored just above freezing to keep it fresh. Lettuce is then transported in a refrigerated truck to market.

## Activity

### 'Lettuce' Keep you Healthy!

Lettuce may help maintain

- Vision
- Healthy immune system
- Cell growth

95% of lettuce is water!

Lettuce is high in Vitamin A

**CA Standards** ELA CCSS: RI.3-4.1, 7, WA.3-5.2, 7, SL.3-5.2, RI.6-8.1, W.6-8.2, 7, SL.6-7.2, RST.6-8.1, 7, WHST.6-8.7; Math CCSS: 3-4.MD.2, 5.MD.1, 6.NS.1, 7.NS.2; NGSS: 3-LS.1-1, 4-LS.1.A, 5-LS.1-1, LS.1.C, MS-LS.1-1

**Source:** <http://learnaboutag.org/caspecialtycrops/legibles.pdf>, <http://anrcatalog.ucdavis.edu>, [www.cdffa.ca.gov](http://www.cdffa.ca.gov)

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Today there are many options in purchasing lettuce. Lettuce can be purchased unwrapped or wrapped in cellophane, in bulk, or even in a bag as a prepared salad mix.

## Activity

Create a salad recipe for two using California Lettuce. Use other "Top-Ten" California commodities as ingredients (walnuts, almonds, strawberries, tomatoes, grapes). Create and write your recipe. Be sure to record ingredients, measurements (in standard form like cups, teaspoons, etc) and instructions. Then, figure out the recipe for the entire class!

### Salad for Two

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### Salad for the Class

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## Career Spotlight

**What jobs are involved in producing lettuce?** Choose a job related to lettuce production using evidence from the text or doing additional research. On a separate sheet of paper, draw a picture of yourself in a lettuce career spotlight, and write a paragraph about what you do.

## STEM: How long do you grow?

Using a calendar, compute the answer:

**When is Harvest?** When lettuce is planted in the summer, it takes 65 to 80 days to grow. If it was planted on June 5, what would be the earliest day it could be harvested?

**When to Plant?** If lettuce is planted in late fall, it could take as long as 130 days to grow. If you want to harvest on January 12, when should you plant?



# Tops or Bottoms

Encourage students to eat more fruits and vegetables by familiarizing them with the plant parts we eat.

## Activity

1. Read the book "Tops and Bottoms" by Janet Stevens.
2. Have all of the fruits and vegetables from the book in a basket. Discuss the fruits and the vegetables with the students.
3. As you pull random fruits and vegetables from the basket or grocery bag have students make the following gestures based on how the fruit or vegetable grows:
  - grows underground (touch their toes)
  - grows in the middle (crouch)
  - grow on top of the soil (stand tall with hands to the sky)

## Materials

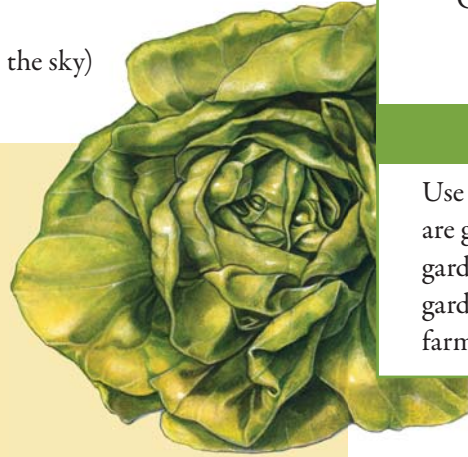
- Tops and Bottoms by Janet Stevens
- Grocery bag or basket
- Assortment of fruits and vegetables
- Photos of fruits and vegetables: Fresh Fruit and Vegetable Photo Cards, CDE.ca.gov (optional)

## Tip

Use fruits and vegetables that are growing in the school garden, from students' home gardens, or from a local farmers market.

## Classroom Activities

- Divide a piece of paper into TOP, MIDDLE, and BOTTOM. Brainstorm fruits and vegetables for each category.
- Define these plant parts: stem, roots, fruits, flowers.
- Use California Department of Education's Fresh Fruit and Vegetable Photo Cards to enhance the activity:
  - ▷ Distribute one card per student and instruct them to sort themselves based on plant part we eat, color, calories (highest to lowest), major producing states, or alphabetically.
  - ▷ Introduce students to some of the less well-known fruits and vegetables.
  - ▷ Educate students about which part of the plant is commonly eaten.
    - ▷ Show students some of the ethnic fruits and vegetables found in California markets.
    - ▷ Learn where many of the fruits and vegetables are grown in the United States.
    - ▷ Learn the scientific name (family, genus, species) of the produce they are eating.
    - ▷ Determine the nutrient analysis of specific fruits and vegetables.
    - ▷ Teach students the Spanish names of fruits and vegetables.



## California Standards

### Kindergarten

ELA CC: SL.K.1, 2; RI.K.1, 4, 10  
Physical Education Content: 1.1, 1.4, 1.8, 3.1 5.2, 5.4

### Grade 1

ELA CC: RI.1.1, 4, 10; SL.1.1, 2  
Physical Education Content: 2.2, 3.1, 5.1, 5.2, 5.6

### Grade 2

ELA CC: RI.2.1, 4, 10; SL.2.1, 2  
Physical Education Content: 1.2, 5.1, 5.2

### Grade 3

ELA CC: RI.3.1, 4, 10; SL.3.1, 2







## TASTING AND TESTING THE HARVEST

### Frozen, Canned or Fresh?

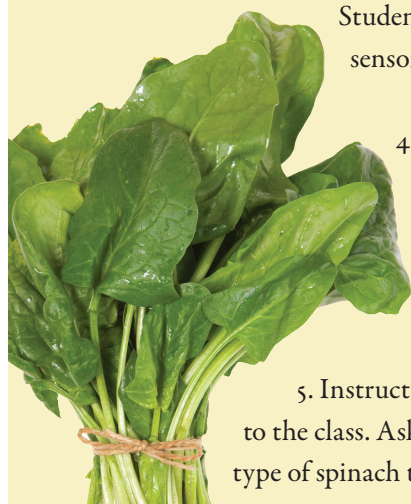
Cook three different kinds of spinach. The fresh spinach should be well washed, drained and cooked. Give each student group an equal share of frozen, canned and fresh spinach.

1. Show students a package of frozen spinach, a can of spinach and a bunch of fresh spinach. Discuss the nutritional value of spinach. Explain that each group will design an experiment that will examine the visual appearance, taste, texture and smell of all three types of spinach.

2. Brainstorm with the class possible methods of observing and recording the different features of the spinach. Set clear objectives for the experiments, such as experimental design, time restraints and data organization. Allow students time to develop their plan.

3. Have students present their plan to you (and/or the class) for approval. Provide feedback for each group and allow students to revise their plan.

Students shall wash their hands, conduct their sensory experiments and record observations.



4. Ask students what conclusions they can make based on the information they gathered. Discuss with the class different ways to present the information. Students create graphs and charts to represent their findings.

5. Instruct groups to present their findings to the class. Ask students to explain which type of spinach they liked best and why.

#### Objective:

Students will design an experiment to compare the flavors and textures of spinach, interpreting their findings with charts and graphs.

#### California Standards

**Grade 4:** ELA CC: SL.4.4, 5  
Math CC: 4.MD.4

**Grade 6:** ELA: SL.6.4,5  
NGSS: MS-PS1-4

**Grade 5:** ELA CC: SL.5.4, 5  
Math CC: 5.MD.2  
NGSS: 5-PS1-2, 3, 4

#### Materials:

- 3 frozen packages of spinach
- 3 cans of spinach
- 3 bunches fresh spinach
- 3 medium-sized pots
- Hot plate
- Water
- Forks
- Plates
- Napkins

#### Vocabulary:

Encourage students to use these words when making observations.

**Aftertaste:** the persistence of a sensation of flavors when food is no longer present.

**Mouthfeel:** food's physical and chemical interaction in the mouth, used often in the testing and evaluating of foodstuffs.

**Pungent:** having a strong odor that stings the nose, especially in acidic or spicy substances.

**Vibrant:** of bright color.

This lesson has been adapted from California Department of Education curriculum by California Foundation for Agriculture in the Classroom.