Oklahoma Roots—and Leafy Greens

Objective

Students will learn about various edible roots and leafy greens that grow in Oklahoma. Students will engage in various scientific experiments, math activities, art activities, and mapping activities related to roots and leafy greens.

Background

Some of our most nutritious foods come from the roots and leafy tops of certain plants. Carrots are a rich source of betacarotene. Beet roots give us folic acid. Their leaves give us potassium and an important antioxidant. Spinach, along with greens like Swiss chard, mustard greens, kale and collard greens, provide Vitamins K, A, C and many other nutrients. Even the lowly dandelion, considered a weedy pest on Oklahoma lawns, is a valuable source of many nutrients.

The onion is considered a root vegetable, but is a bulb, not a root. Onions provide dietary fiber, Vitamin C, Vitamin B6, potassium, and other key nutrients.

Most root vegetables and leafy greens grow best as cool season crops in the spring and fall of Oklahoma's long growing season.

CARROTS

What vegetable has roots that are good for you and tops so pretty they have been used to decorate hats? The Elizabethans and early Stuarts in England used the flowers, fruit, and leaves of carrots as fashion accessories for hats and dresses. Carrot tops were highly prized as a substitute for feathers, especially in the fall, when their colors were more vibrant.

The carrot is a member of the parsley family and is related to parsnip, celery and fennel. It probably originated in Afghanistan. In the wild, carrots' original color was white. The carrots we eat are orange because the Dutch bred them to be that color in the 17th century. Before that, most cultivated carrots were purple. They were grown that way in the Middle East and India as far back as the tenth century.

Orange carrots are an excellent source of the deep yellow carotenoids that produce Vitamin A. They are also a good source of magnesium, potassium, Vitamins C and B complex, and a form of calcium that is easily absorbed by the body. Steaming makes the betacarotene more readily available to the body as heat breaks down the tough cellular walls that encase the nutrient.

Standard

GRADE 1
P.A.S.S.
Science Process—1.2; 2.1; 3.1,2; 4.3
Social Studies—1.1
Visual Arts—3.1,2
Music—3.3
COMMON CORE
Language Arts—1.RF.2; 1.L.2,5
Math Process—MP.1,2,3,4,5,6,8
Math Content—1.OA.1,2,4,6; 1.NBT.4,5,6; 1.G.3

GRADE 2
P.A.S.S.
Science Process—1.2; 3.1,2; 4.3
Life Science 2.1
Social Studies 2.3; 4.2
Visual Arts—3.1,2
Music—3.3
COMMON CORE
Language Arts—2.SL.6; 2.L.1,3
Math Process—MP.1,2,3,4,5,6,8
Math Content—2.OA.1,3,4; 2.G.3; 2.NBT.5

GRADE 3
P.A.S.S.
Science Process—1.2; 2.1; 3.1,2; 4.3
Life Science—2.1,2
Visual Arts—3.1,2
Music—3.3
COMMON CORE
Language Arts—3.RL.10; 3.W.1,2,3,4,10
Math Process—MP.1,2,3,4,5,6,8
Math Content—3.OA.1,2,3,4,6,7,8; 3.NBT.1,3

(Continued on next page.)

Standards (Cont.)

GRADE 4

P.A.S.S.
Science Process—4.1,2; 2.1; 3.1,3; 4.1
Life Science—3.1
Social Studies—2.2
Visual Arts—3.1,2
Music—3.3
COMMON CORE
Language Arts—4.RL.9; 4.W.1,2,3; 4.L.3
Math Process—MP.1,2,3,4,5,6,8
Math Content—4.NF.1,5; 4.NBT.4,5,6; 4.OA.1,2,3,4

GRADE 5

P.A.S.S.
Science Proces—1.2; 2.1; 3.1,3; 4.1
Life Science—2.1,2
Visual Arts—3.1,2
Music—3.3
COMMON CORE
Language Arts—5.RL.2,5,10; 5.RI.10; 5.W.1,3,7,8; 5.L.2
Math Process—MP.1,2,3,4,5,6,8
Math Content—5.NBT.5,7

Spinach Salad

Spinach is delicious as a salad vegetable. Many children prefer raw spinach to lettuce and usually prefer raw spinach to cooked spinach. Provide raw spinach and other salad ingredients and let students build their own salad. Spinach is an excellent source of both Vitamin A and folacin. It is also a source of fiber, potassium and Vitamin C.

SPINACH

Spinach originally came from Persia (now Iran) where it was known as "aspanakh." By the 1300s, it had spread to Europe and Britain where it was popular in religious communities, particularly during Lent. It was being cultivated in North America by the early part of the 19th century.

Students may or may not be familiar with the cartoon character Popeye, whose superhuman strength was said to have come from eating spinach. In the 1930s, Popeye was so popular that the spinach industry credited Popeye with increasing spinach consumption by 33 percent. If possible, acquire some old Popeye cartoons to show, and discuss the likelihood that spinach or any other food would have the immediate results that spinach had for Popeye. Students should understand that the benefits of good nutrition come over time with consistent good habits.

BEETS

Beets are natives of Europe and North Africa, and were originally found near the sea in southern Europe and around the coasts of the Mediterranean.

Beets are doubly valuable because we eat both the roots and the leafy green tops. The roots are an excellent source of fiber and phosphorous and are high in folic acid (iron). The leafy greens contain potassium, calcium and betacyanin (an antioxidant).

Beets have such stiff cell walls that it is hard for the human digestive system to extract the nutrients inside. Cooking will not soften the cellulose in the cell walls of the beet, but it will dissolve enough of the hemicellulose so that digestive juices are able to penetrate. Cooking also activates flavour molecules in beets, making them taste better.

SWISS CHARD

Swiss chard is a tall leafy green vegetable with a thick, crunchy stalk that comes in white, red or yellow with wide, fan-like green leaves. Many Oklahoma gardeners grow chard in their flower beds, just for its beautiful leaves. Chard is delicious when chopped and added to scrambled eggs, soups or stir fry. Unlike spinach and other greens, it can stand up to the heat of Oklahoma's long summers.

Chard belongs to the same family as beets and spinach and has a similar flavor. It has the bitterness of beet greens and the slightly salty flavor of spinach leaves. Both the leaves and stalks of chard are edible.

The homeland of chard is not in Switzerland but the Mediterranean. It was named for the Swiss botanist who determined its scientific name. The Greek philosopher, Aristotle, wrote about chard in the fourth century B.C. The ancient Greeks and

Romans honored chard for its medicinal properties.

Swiss chard gets excellent marks for its concentrations of Vitamin K, Vitamin A, Vitamin C, magnesium, manganese, potassium, iron, Vitamin E, and dietary fiber. Swiss chard is also a source of copper, calcium, Vitamin B2, Vitamin B6, protein, phosphorous, Vitamin B1, zinc, folate, biotin, niacin and pantothenic acid.

MUSTARD, TURNIPS AND RUTABAGAS

Turnips and rutabagas are members of the mustard family. As with beets, we eat both the roots and the leafy parts. The leaves of the mustard plant, called mustard greens are also a valuable leafy green.

Turnips can vary in size and shape tremendously with some reaching fifty pounds. Some, have reddish rings around the crown of the vegetable root. Others are purple. Turnips were the original jack-o-lanterns. The Irish brought the tradition to the US but found that pumpkins were easier to carve and more plentiful.

Experts believe rutabagas may be the offspring of the wild cabbage and the turnip. They have a firm, yellow-orange flesh similar to that found in yellow-flesh potatoes. They are also more dense and sweeter than turnips, and contain less moisture. To add to their shelf life most rutabagas are waxed. This wax must be peeled or removed prior to cooking. Rutabagas, known also as “swedes,” can be purple, white or yellow in colour with white or yellow flesh.

Turnips and rutabagas are considered winter vegetables because they are available all through the winter. They are mashed or used to thicken stews and casseroles. Turnips are also great eaten raw, when peeled and sliced as chips or sticks; or shredded into a green salad or coleslaw.

KALE AND COLLARD GREENS

Kale and collard greens are ancient, "headless" members of the cabbage family. Kale is loaded with calcium, potassium, indoles (cancer-fighting substances), beta-carotenes, and other antioxidants. Collards have the same nutrients, but in lesser concentration. One cup of kale provides more than the daily requirement of vitamins A and C. It is also a good source of calcium and fiber.

Kale is a very bitter green, and is most palatable when combined with other, sweeter ingredients, like potatoes or onions. Collard greens have a much softer, sweeter taste than kale. When you combine the two greens in the same dish, the mild collard flavor mitigates the sharpness of the kale.

Like other greens, kale descends from wild cabbage that originated in Asia Minor though it is known for it’s popularity in Scandinavia, Germany, Holland and Scotland. Kale was brought to the United States in the 17th century by English settlers. It is now a favorite in the southern United States where, like many cooking greens, it has

Vocabulary

antioxidant—a substance that opposes oxidation or prevents or makes difficult reactions made easier by oxygen. Research suggests that antioxidant-rich foods may slow down, prevent, or even reverse certain diseases that result from cellular damage.

bulb—an underground vertical shoot that has modified leaves (or thickened leaf bases) that are used as food storage organs by a dormant plant. A bulb's leaf bases generally do not support leaves, but contain food reserves to enable the plant to survive adverse conditions. The leaf bases may overlap and surround the center of the bulb as with lilies, or may completely surround the inner regions of the bulb, as with the onion. A modified stem forms the base of the bulb, and plant growth occurs from this basal plate. Roots emerge from the underside of the base, and new stems and leaves from the upper side.

cultivate—to raise or assist the growth of by tilling or by labor and care; to improve or develop by careful attention

illuminated manuscript—a manuscript in which the text is supplemented by the addition of decoration or illustration, such as decorated initials, borders and miniatures.

nutrient—a substance that furnishes nourishment.

root—the leafless usually underground part of a plant that absorbs water and minerals, stores food, and holds the plant in place

wild—growing or produced without human aid and careServes 4 as a side dish

Why did the Queen of Hearts wants to behead the Seven-of-Spades in *Alice's Adventures in Wonderland* by Lewis Carroll?

He brought the cook tulip roots instead of onions.

Wild Onions

The appearance of wild onions in the early spring signals a time of celebration for the Cherokees and other tribes in eastern Oklahoma. In the early spring, many Indian churches, stompgrounds, clubs and other groups hold wild onion dinners. Families and friends also often make an outing of gathering wild onions and/or eating them together. The wild onions are cleaned and added to scrambled eggs and are usually served with other Indian dishes such as fry bread and grape dumplings. Wild onions grow in a variety of conditions but are best gathered where a loose moist soil promotes thick growth and easy digging.

been considered a poor man's food.

Like most cooking greens, kale can grow in colder temperatures and withstand frost — which actually helps produce even sweeter leaves. Kale can also grow well in the hot weather in the southern United States and in poor soil.

ONIONS

Onions originated in the Fertile Crescent and have been cultivated for at least 7,000 years. They are part of the lily family. The name onion stems from the Latin word *unus* meaning oneness or unity.

The Egyptians believed onions had strength-producing powers and fed them to the laborers who built the pyramids. The Romans ate onions for strength and courage, and Alexander the Great ordered his troops to eat onions to improve their vitality.

The ancients weren't wrong about onions. They have many health benefits. Quercetin, an antioxidant compound in onions, helps fight cancer and prevent heart attacks. Onions also have anti bacterial properties. Onions are a good source of Vitamin C, potassium, dietary fiber, Vitamin B6, and folic acid. They also contain calcium, iron, have a high protein quality, are low in sodium, and contain no fat.

The first Pilgrims brought onions with them on the Mayflower. However, they found that strains of wild onions already grew throughout North America. Indians used wild onions in a variety of ways, eating them raw or cooked, as a seasoning or as a vegetable. Such onions were also used in syrups, as poultices, as an ingredient in dyes and even as toys. According to diaries of colonists, bulb onions were planted as soon as the Pilgrim fathers could clear the land in 1648.

DANDELIONS AND OTHER WILD GREENS IN SPRING

The name dandelion comes from an Old French phrase, dent-de-lion, which means "lion's tooth." Dandelions got their name from this phrase because of their sharply-lobed leaves, which make them look like teeth.

Dandelions first came to the Midwestern US from Europe to provide food for honeybees, also imported from Europe.

While the dandelion is considered a weed by many gardeners, the plant has several culinary and medicinal uses. Dandelions are actually grown commercially on a small scale as a leaf vegetable. The plant can be eaten cooked or raw in soup or salad. The young leaves and unopened buds can be eaten raw in salads. Older leaves have a slightly bitter taste and are usually cooked. Dandelion salad is often accompanied with hard boiled eggs. CAUTION: NEVER EAT DANDELIONS OR OTHER PLANTS FROM AREAS THAT HAVE BEEN TREATED WITH PESTICIDES.

According to the U.S. Department of Agriculture, a serving (one cup) of uncooked dandelion leaves contains 280 percent of an adult's daily requirement of beta carotene as well as more than half the requirement of Vitamin C. Dandelions are also rich in Vitamin A.

Math

1. Wash a few carrots and cut them into 1/4-inch round slices.
   —Use the disks for counting practice, to create addition and subtraction facts, to demonstrate multiplication and division or to demonstrate percentages before making the necklaces.
2. "Rutabaga"—Counting by Fives
   —Bring a rutabaga and other tough-skinned vegetables to class.
   — Students will sit in a circle and pass the rutabaga around as they count from left to right, starting with the number one.
   —When the number five or any multiple of five comes up, the word "Rutabaga" is called out instead.
   —Match the other vegetables to different numbers, and play the game with different multiples.
   —Variation: Play the game with sevens. Whenever "Rutabaga" (or whatever) is called, the direction of the number-calling is reversed. If the game progresses into the 70s, the counting changes to "Rutabaga 1, Rutabaga 2," etc. Whenever a player makes a mistake, he or she gets one penalty point and starts the game from the beginning.

Visual Art

1. Make Carrot Necklaces.
   —After using carrots slices for the math activities above, thread a heavy duty needle with dental floss, and slip the slices onto the floss by pushing the needle through the core.
   —Once you've strung enough carrot disks, tie the ends together to form a necklace.
   —Lay it on paper in a dark, well-ventilated place, making sure the slices don't touch each other.
   As they dry, they turn into wrinkled beads. Drying takes a couple of weeks. Have students write or draw a comparison of the necklaces before and after drying.
2. Carrot Hats.
   —Provide carrots with tops still intact.
   —Students will use the tops to decorate hats, as described in the background.
   —Have a Carrot Top Parade.
   —Cut up the bottoms to eat.
3. Spinach ink—Spinach was used by medieval artists to produce a green pigment for illuminated manuscripts. It is one of the few non toxic natural green pigments, and is still used today as body paint.
   —Students will research and discuss illuminated manuscripts. —Run drained, canned or frozen (whichever is cheapest) spinach through a blender to produce pigment for students to use for producing their own illuminated manuscripts, using their best handwriting.
   —Cut holes in the sides of trash bags and split them up the middle on one side to make artist's smocks to protect students' clothing. Notify parents that students will be painting.

10-Minute Root Vegetables

2 medium carrots cut into 1/2-inch by-2-inch sticks (about 2 cups)
1 tablespoon unsalted butter
1 teaspoon sugar
1/2 teaspoon table salt
2 small parsnips cut into 1/2-by-1/2-by-2-inch sticks (about 1 cup)
1 small turnip cut into 1/2-by-1/2-by-2-inch sticks (about 1 cup)

Freshly ground black pepper

Bring the carrots, butter, sugar, salt, and 1/2 cup water to a boil over high heat in a large skillet and cook for 2 minutes. Add the parsnips and cook an additional 2 minutes. Add the turnips and continue cooking, stirring about every minute, until all of the liquid is evaporated and the vegetables are tender, browned, and shiny, about 6 minutes longer. Adjust the seasoning with salt and pepper to taste and serve immediately.

Write the names of all the vegetables used in the recipe above on slips of paper. Cut out pictures of the vegetables from magazines or grocery ads. Students will match the words with the pictures. Use the words and pictures to make a "Roots and Leafy Greens" bulletin board.

Baked Kale Chips

1 bunch kale
1 T olive oil
1 t seasoned salt

1. Preheat oven to 350 degrees F.
2. Line a non-insulated cookie sheet with parchment paper.
3. With a knife or kitchen shears, carefully remove the leaves from the thick kale stems and tear into bit size pieces.
4. Wash and thoroughly dry kale with a salad spinner.
5. Drizzle kale with olive oil and sprinkle with seasoned salt.
6. Bake until the edges are brown but not burnt, 10-15 minutes.

4. Beet dye—Cook beets, and use the water as a dye for eggs or for squares of unbleached muslin. Add vinegar or lemon juice for a more intense red.

Science

1. Beets, spinach, Swiss chard, sugar beets, wild lambs quarter and the South American grain quinoa are all members of the Goosefoot family (*Chenopodium*). The leaves of plants in this family resemble the foot of a goose.
   —Show students the leaves of several different plants (spinach, Swiss chard, lettuce, mustard or collard greens, kale, etc.)
   —Students will identify leaves of the plants in the Goosefoot family by their similarity to the foot of a goose.
2. Beets require thinning after germination because more than one plant comes up from each seed.
   —Students will plant beet seeds and place in a sunny location outdoors or in a sunny window.
   —Students will record the number of seeds planted, estimate how many plants they think will germinate and compare their estimates with the number that does germinate.
   —Beets are ready to harvest 60-70 days after planting from seed. They are cool season plants and can be planted in a fall garden through August 15 or in February or March for harvest before school is out in the spring.
   —Students will project when beets should be ready for harvest, based on the date planted.
3. Fresh greens contain a large concentration of water, and students will be amazed at how much volume is lost when they are cooked.
   —Bring a handful of Swiss chard or other fresh greens to class.
   —Students will measure them before cooking.
   —Students will estimate the volume after cooking.
   —Students will measure again after cooking and graph results.
   —Serve with sliced, boiled eggs, and season with a splash of vinegar.
4. Students will make lists of vegetables and identify them as roots, leaves or other.
   —Students will design charts to show how vegetables would be classified.
5. The sulfuric compounds in onions are what make you cry when you cutting them up. One way to chop, cut or slice an onion without crying, place onion in freezer for a few minutes before cutting or cut them under water.
   —Students will develop their own methods for cutting onions without tears.
6. Cut onions into quarters.
   —Provides students with onion quarters and protective gloves to keep the smell off their hands.
   —Students will count the layers in the onion quarters.
   —Students will predict whether or not all the onions will have the same

number of layers. (Students may use gloves to keep the smell off their hands.)

7. Onions are a power house of nutritional benefits, but many children really dislike them. Try having a taste test with onions prepared in various ways—cooked, raw, chopped very fine, sliced, mixed with eggs or other foods, etc.
   —Students will develop a chart to record what they like and dislike about the variations (flavor—sweet, bitter, etc.; texture—slimy, crunchy, etc.). Also try different varieties of onions—red, white, green, wild, etc.
8. Grow green onions from the ends you cut off and throw away. Place the ends (with roots) in a cup of water and place them in a sunny window.
   —Students will observe and record observations.

Language Arts

1. Students will determine which of the following words rhyme with the word "beet:" sleep, meet, neat, speak, wheat, beak, sweet
   —Students will write a sentence using at least three of these words.
2. Students will brainstorm words that rhyme with kale and make up poems using as many of the words as possible.
3. Why do onions make you cry? The sulfuric compounds in onions are what make you cry. To chop, cut or slice an onion without crying, place onion in freezer for a few minutes before cutting or cut them under water. Have students develop their own methods for cutting onions without tears.
4. Students will make up fables with the title "Why the Onions Makes Us Cry?"
5. How are tulip roots (bulbs) different from onions? How are they the same? Provide samples of each for students to examine.
   —Students will write paragraphs comparing and contrasting them.
6. Students will discuss the meaning of this old English rhyme:
   Onion skins very thin, Mild winter coming in.
   Onion skins very tough, Coming winter very rough.
7. Gather wild onions in spring (from an area that has not been treated with pesticides or herbicides.)
   —Students will clean the onions for eating to demonstrate how much work went into the preparation of foods gathered from the wild for the relatively small yield.
   —Students write essays in which they discuss the difference in wild and cultivated foods.
8. Gather dandelions in spring.
   —Students will examine the leaves to see if they look like lion's teeth and notice the long roots which make them hard to eliminate from lawns. Find dandelions that have gone to seed and ask how their structure would help them spread quickly.
   —Students will write detailed descriptions of dandelions.
9. The beet got its name from the shape of its seed pods. When they swell they look lke the Greek letter beta.
   —Acquire beet seeds and show them to students. Soak them overnight.
   —Students will draw pictures of the seeds. Do they look like the letter "B?"

Extra Reading

Blackaby, Susan, and Charlene Delage, *Plant Plumbing: A Book About Roots and Stems*, Picture Window, 2005.

Cherry, Lynne, *How Groundhog's Garden Grew*, Blue Sky, 2003.

Lin, Grace, *The Ugly Vegetables,* Charlesbridge, 2009.

Moser, Lisa, and Ben Mantle, *Perfect Soup*, Random House, 2010.

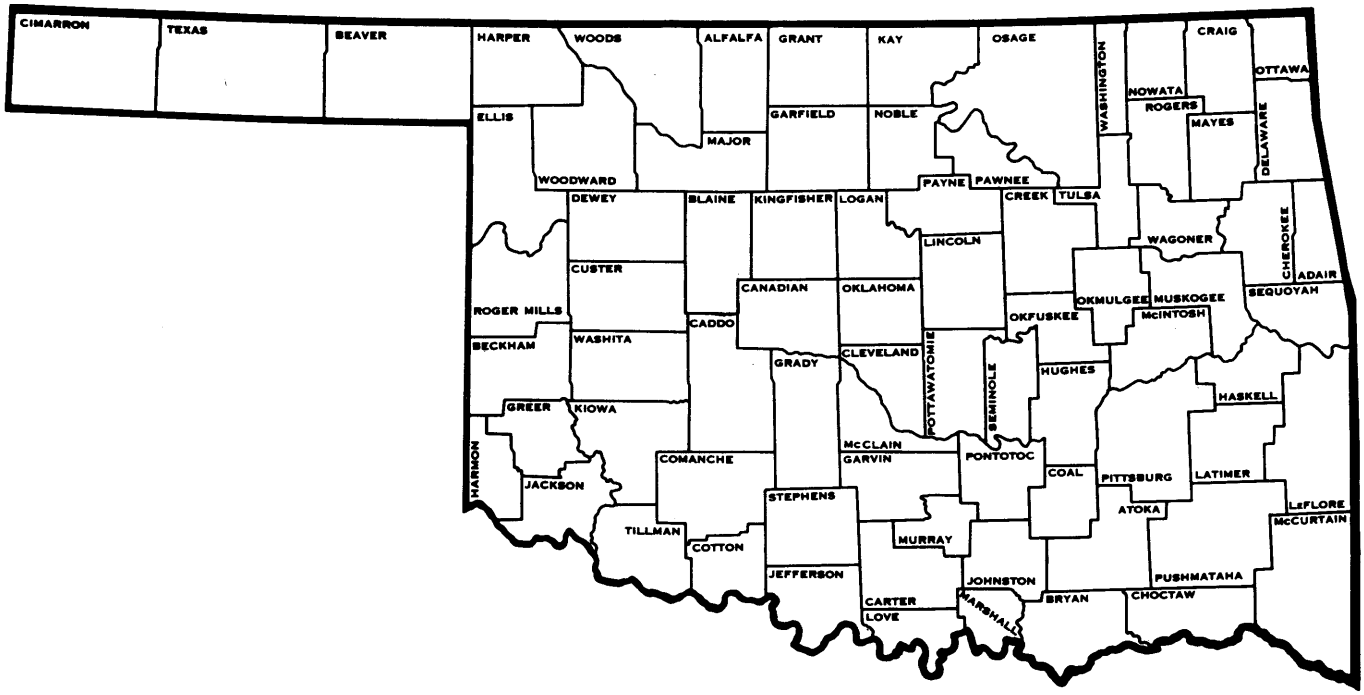
Salas, Laura Purdie, *Lettuce Introduce You: Poems About Food*, Capstone, 2008.

Stevens, Janet, *Tops & Bottoms*, Harcourt Brace, 1995.

Tagliaferro, Linda, *The Life Cycle of a Carrot*, Capstone, 2007.

Name _____

Where Do They Grow?



Color in the counties having the most acreage of these crops:

Beets—Payne, McCurtain
Carrrots—Kingfisher, McCurtain, Payne
Collards—Cleveland, Payne
Mustard Greens—Cleveland, LeFlore, Tulsa
Onions—Tulsa, Grady, Payne, Pottawatamie
Spinach—LeFlore, Cleveland
Turnips—Major, McCurtain, Payne

*Based on most recent US Census

Oklahoma Ag in the Classroom is a program of the Oklahoma Cooperative Extension Service, the Oklahoma Department of Agriculture, Food and Forestry and the Oklahoma State Department of Education.