

Garden Mosaics

science

people

cultures

action



by **MARIANNE KRASNY**



Cornell University

PROGRAM MANUAL

ACTION PROJECTS

Action Projects allow you to make a difference in your community. You can design your own Action Project based on what you have learned from the gardeners and what interests you.

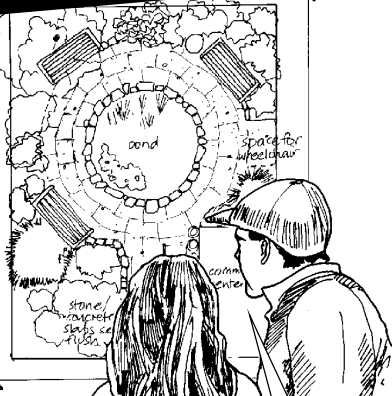
SOME IDEAS FOR ACTION PROJECTS

PRESENT!

We're going to tell you about our community garden and how it helps our neighborhood.

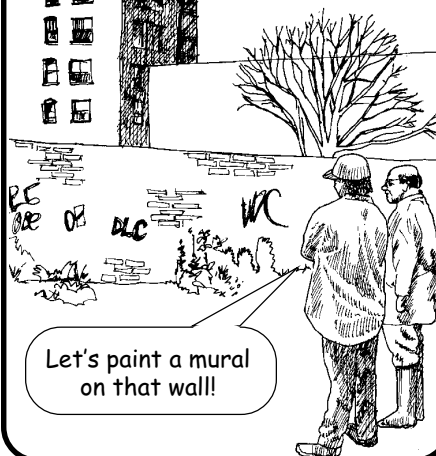


DESIGN!



We made this garden plan with people at the community center.

CREATE!



Let's paint a mural on that wall!

PUBLISH!

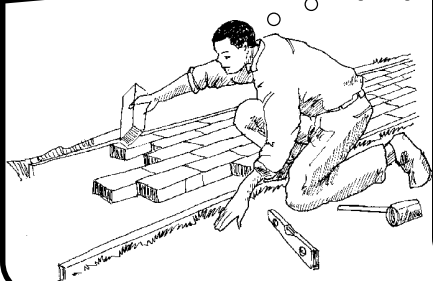
This recipe sounds healthy...

...and good to eat!



We put your favorite collards recipe in the book.

BUILD!



When this path is finished, people in wheelchairs will be able to reach their garden plots more easily.



EDUCATE!

Look at this sign!



It's one of many we made to help explain about the plants growing in the garden.

CELEBRATE!

We helped the gardeners grow and cook this food.



EXPERIMENT!

This experiment may help gardeners control garden weeds.

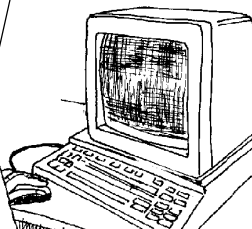


WHAT TO DO

1. Do Background Research

- ✓ Read some of the Action Project reports on the Garden Mosaics website.
- ✓ Discuss what you have learned about the gardeners and the neighborhood.

What Action Project will help the gardeners?



We need to make the most of our talents.

2. Decide what to do

- ✓ Discuss your ideas with the gardeners.
- ✓ Fill out the Action Project Planning Form.
- ✓ Discuss the steps you will take and who will be responsible for what.

Do you like our ideas?

Yes. Who is going to help?

What about fund-raising?

We need to work out what materials we need.

When should we start, and how long will the project take?



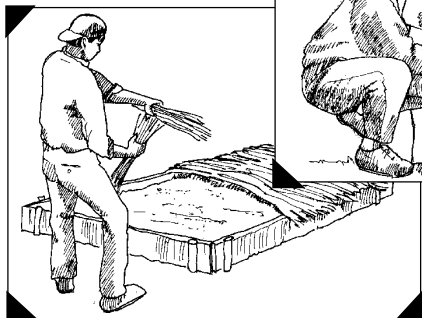
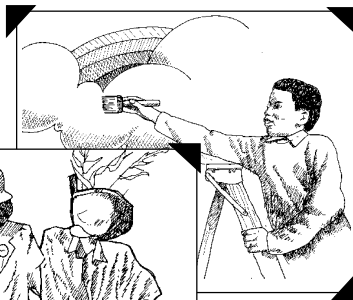
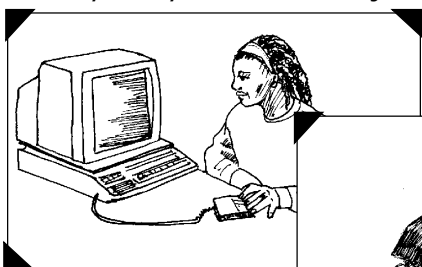
Do we need to get permission?

We should take photos of the project at different stages so we can show others how we did it.

Will the project need looking after when we have completed it?

3. Do it

- ✓ Carry out your Action Project.



4. Tell others about your Project

- ✓ Share the results with gardeners and other community members.
- ✓ Describe your Action Project using the Online Action Project Form and submit it to the Garden Mosaics website.



AERIAL PHOTOGRAPHS Science Page

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features, such as roads and buildings. You can see how land use and communities change over time by studying a series of airphotos taken of the same place at different times.

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4. Grassy areas have a smooth texture.
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Size

6. Highways are wider than streets.
7. Museums, factories, churches, schools, stores, and apartment buildings are larger than houses.

Shape

8. The circle at the end of the park is a traffic circle.

Location

9. The white circles in grassy areas are ball fields. Circles at the end of a road are traffic circles.

SCALE

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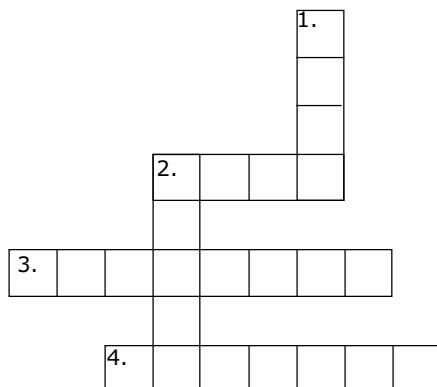
CROSSWORD PUZZLE

Across

- How you can tell a factory from a house.
- What clue helps you to tell the difference between a circle in a park from a circle along a road?
- How coarse or smooth an object appears.

Down

- Blackness or whiteness of an object.
- How you can tell a football field from a baseball diamond.



TRY THIS

INTERPRETING AN AIRPHOTO

Here are some questions about the small scale airphoto of Prospect Park. Use clues such as tone, texture, size, shape, and location to answer as many questions as you can. Write your answers on a separate sheet of paper.

- Near what number on the airphoto does the park have dense woods? What clues did you use to figure this out?
- What are the white, winding lines in the park? What clues did you use to guess?
- How many blocks is it from the large traffic circle at the top end of the park to the small traffic circle on the left side of the park (near number 8)?
- Are there any buildings in the park? How can you tell?
- The area near number 2 is a residential neighborhood. What do you think some of the larger buildings could be?
- Measure the length of the park on the airphoto in centimeters. Then multiply this length by 240 to get the actual length of the park in meters.



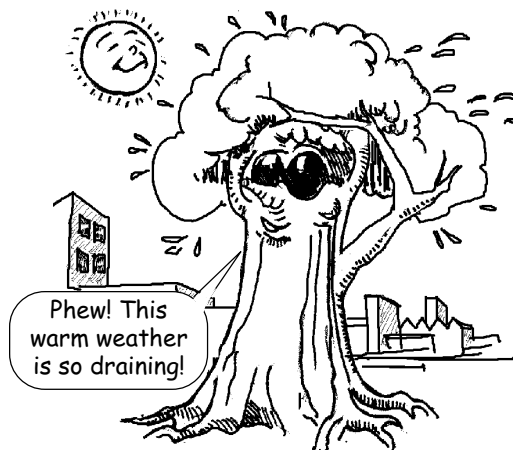
SPOTLIGHT ON RESEARCH

Satellite images show that vegetation can cool cities

Satellite images are similar to airphotos in that they are taken looking down on Earth from above. Scientists can use satellite images to help understand our environment. For example, scientists wondering about the effect of plants and pavement on air temperatures examined two different kinds of images of Rochester, NY. One was a thermal image, which showed warmer areas in lighter tones and cooler areas in darker tones. The other was a color composite image, which showed different kinds of surfaces in different colors. For example, vegetation appeared green, bare soil was pink, and pavement and rooftops were blue.

When the scientists compared the two images, they discovered that the cooler areas in the city were over vegetation. They hypothesized that areas over vegetation were cooler because of water moving out of plants into the air, or "transpiration." Through transpiration, plants give off lots of water. As the water moves from plants to air, heat is taken from the air. The more plants there are, the more water they give off and the cooler the air.

Source: Lougeay, R. (1996). Land use, land cover, and local climate. *Applications in Remote Sensing*. Vol. 4. Remote Sensing Core Curriculum Project, Department of Geography at the State University of New York at Geneseo. <<http://www.research.umbc.edu/~tbenja1/lougeay1/>>



RIDDLE

Why are airphotos like fish?

Answer: They both have scales.

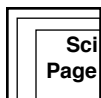
AERIAL PHOTOGRAPHS Teaching Tips



LEARNING OBJECTIVES

Youth will be able to

- * Observe visual clues on an airphoto, and use them to identify different features.
- * Use scale to measure distances on an airphoto.
- * Explain how airphotos are used as tools for studying an area.



HOW TO USE THE AERIAL PHOTOGRAPHS SCIENCE PAGE

It is important for youth to have clear copies of the airphotos in order to identify features. Use as high a quality printer as possible, and try to print out enough copies directly from the printer for each group of youth. If you cannot print out enough copies from the printer for each group of youth, use a laser color copier to make copies. It should be possible for 2-3 youth to work together on one copy of the Science Page.

Explain to youth that the first time they look at an airphoto, familiar objects, like trees, buildings, and streets may appear unfamiliar because they are being viewed from overhead, as if from an airplane. But as they become familiar with clues, such as tone, texture, shape, and location, they will be able to extract more and more information from an airphoto. Give them time to observe and discuss all the features listed under "How to 'Read' Airphotos."

Ask: How do you think airphotos could be put to practical use? (Answer: Airphotos are used in studies of community land use and history, archaeology, forestry, soil mapping, and military intelligence, among others.)

Make sure youth understand how to use the scale of an

airphoto. Ask: If an airphoto has a scale of 1:24,000, then how far on the ground is one centimeter on the map? (Answer: 24,000 cm, or 240 m) What do 2 inches on the map represent? (Answer: 48,000 inches, or 4,000 feet). Explain that many airphotos have a scale of 1:24,000 because people measure distance on the airphoto in inches rather than centimeters. (24,000 can be evenly divided by 12 inches to find a distance in feet.) Please note: when you print the Science Page, the scale of the maps may be altered slightly.

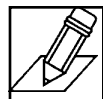
Students like to identify their home, school, local stores, and other familiar features on airphotos. It is possible to view airphotos on the Internet through the website of the United States Geological Survey (USGS): <http://mapping.usgs.gov>
A more direct link is:

<http://terraserver.microsoft.com>

If you need further assistance, phone 1 (888) ASK-USGS.

You can purchase airphotos from USDA's Aerial Photography Field Office (APFO). Go to this web site for ordering information <http://www.apfo.usda.gov/orderingimagery>

You may wish to order a manual entitled Explorations from an Aerial Perspective, by Eugenia Barnaba et al., which includes many more activities for youth to learn about using airphotos to study their community. The manual is available from Cornell Media Services at <http://www.cce.cornell.edu>
You can order on-line or by phone: (607) 255-2080.



CROSSWORD

Answers

Down: 1. tone; 2. shape;
Across: 2. size; 3. location;
4. texture.



TRY THIS

Once youth have observed the 9 features listed on the front of the Science Page, challenge them to be an airphoto detective, and see how many of the activity questions they can answer correctly.

Answers

1. 5. The coarse texture indicates it is a forested area.
2. Roads; shape, size and location are clues that indicate they are roads.
3. 19 blocks.
4. Regular-shaped white spots at number 7 are buildings.
5. Large buildings in a residential neighborhood could be churches or schools.
6. about 10.5 cm x 240 = 2,520 m



SPOTLIGHT ON RESEARCH

The source of this information is Lougeay, R. 1996. "Land Use, Land Cover, and Local Climate." Vol.4 Applications in Remote Sensing. Remote Sensing Core Curriculum Project, Department of Geography at the State University of New York at Geneseo. <http://www.research.umbc.edu/~tbenja1/lougeay1/>

To help youth understand how transpiration helps cool an area, have them wet a hand and blow on it. The hand will feel cooler because the water takes heat energy from the hand as it evaporates. In the same way, as the water transpired from trees evaporates, it takes heat energy from the trees, so the local air temperature decreases.

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ALACHE Science Page

DID YOU KNOW?

Alache is a multi-purpose plant. People use it as a vegetable, an herb, and as medicine. When the plant gets big, farmers cut it to feed their animals.

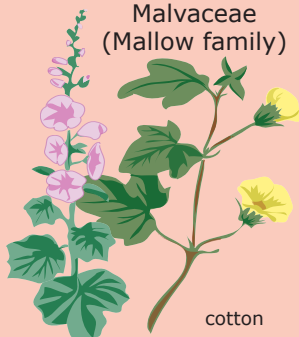


I hope this tea made from alache leaves gets rid of my cough.

CLASSIFYING ALACHE

Alache belongs to the Malvaceae, or Mallow, family. About 1,000 species are in this family, including cotton, hollyhock, and okra.

FAMILY
Malvaceae
(Mallow family)



hollyhock

Flowers of plants in this family are large and showy, with five petals.

GENUS

Anoda

In Latin, this means "without nodes."

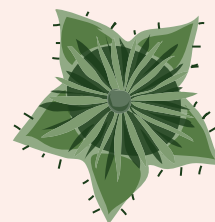


Nodes are places along a stem where leaves are attached. The flower stem of alache has no nodes or leaves attached.

SPECIES

cristada

means "crest" or "ridge."



The seed pod of alache has ridges radiating out from its center.

ORIGINS

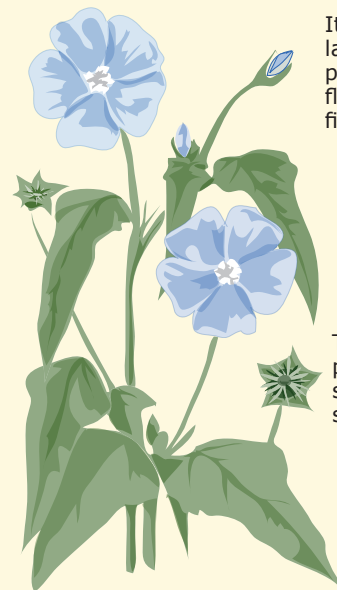
Alache is native to tropical America, north to Arizona and Texas.



For centuries, farmers in Central America have allowed alache to grow freely in their cornfields. Seeds from plants in one growing season sprout and grow in the next rainy season. Farmers gather the plants as needed.

THE ALACHE PLANT

Alache is a soft-stemmed plant, with pointed leaves.



It has white, lavender, or purple-blue flowers with five petals.

The seed pods are shaped like stars.

GROWING AND HARVESTING ALACHE

In most parts of the U.S. you can grow alache as an annual. This means it lasts for only one growing season.

Will alache grow here? I know alache likes sunny and sheltered places like this, but the soil is poor.



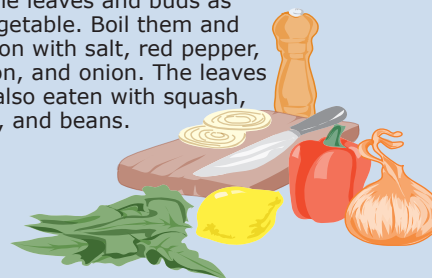
That's true, but it's well-drained. These alache plants will grow to about 1.5 meters.

Harvest the alache leaves and stems when they are young and tender. Cut the stems near the bottom. The plants resprout easily after cutting. Once alache forms seeds, the leaves become too old and tough to eat.

USES IN COOKING

In Latin America, alache is used as a vegetable and cooking herb.

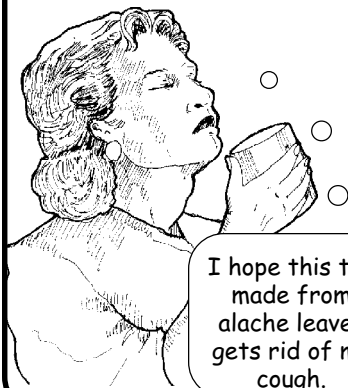
You can prepare young alache leaves and buds as a vegetable. Boil them and season with salt, red pepper, lemon, and onion. The leaves are also eaten with squash, corn, and beans.



ALACHE Science Page

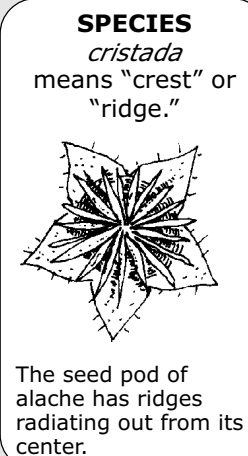
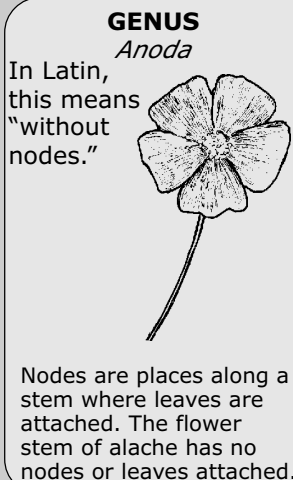
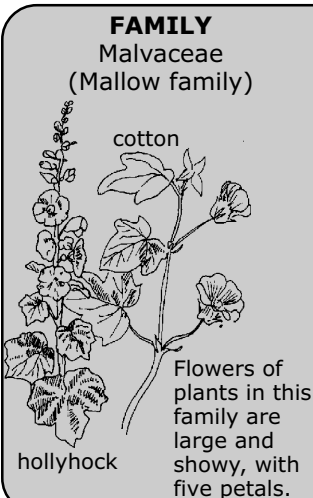
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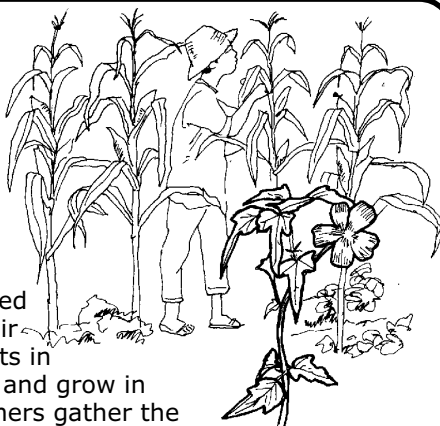
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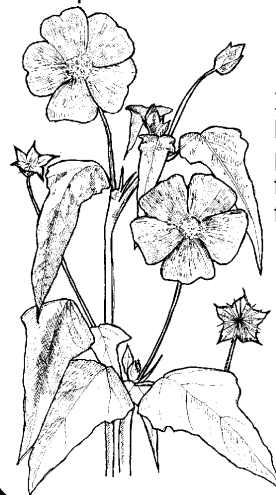
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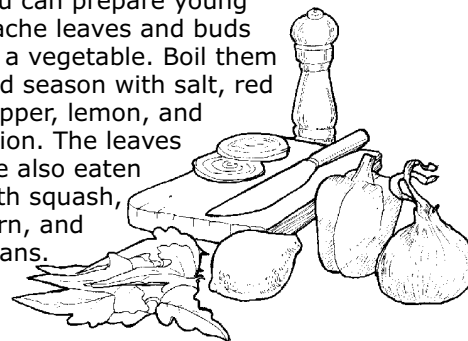
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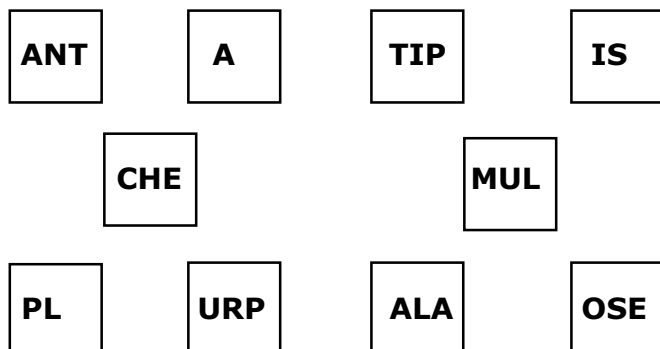
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ALACHE LETTER TILES

Unscramble the tiles below to reveal a message.



TRY THIS

DISCOVER ALACHE RECIPES

Alache is traditionally prepared in several different ways. In this activity, you will collect information and write a traditional recipe for alache.

1. Try to find alache growing in a community garden. You will most likely find it growing in a Latino garden.
2. If possible, interview gardeners who grow alache. Find out what country the gardeners originally come from. Ask them to describe when and how alache is grown and harvested. Record this information.
3. Ask the gardeners to describe different ways it is used. For example do they use it as a medicine or as a food?
4. If it is used as a medicine, what ailments is it used to treat, and how is it prepared and administered?
5. If it is used as a food, ask them to describe exactly how it is prepared. Write down the directions, and then use your notes to develop a recipe. The recipe should include a list of ingredients, the number of servings, and step-by-step directions.
6. If possible, try out your recipe. You may wish to invite people who cultivate and use alache to help you prepare your dish.
7. Send in your recipes to Garden Mosaics, Department of Natural Resources, 16 Fernow Hall, Ithaca, NY 14853, or as an attached file to gardenmosaics@cornell.edu. We will share them with other Garden Mosaics participants.



SPOTLIGHT ON RESEARCH

Alache in fields grows taller than alache in forests

In central Mexico, alache grows wild in forests and along pathways. It also grows in farmers' fields and orchards. Scientists wanted to find out how the size and other traits of the plant vary from one place to another. They also wanted to find out how people in this area use alache.

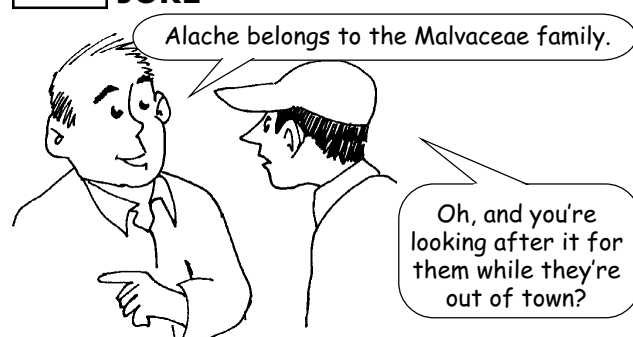
They randomly selected 134 plants from forests, fields, and orchards, and measured the height, number of branches, and number of seed pods for each plant. They found that alache growing in fields and orchards is taller and has more branches and seed pods than wild alache. The scientists proposed an explanation for this difference: Plants in fields and orchards are growing in richer soil and do not have to compete with weeds. How might the scientists design a study to see if their proposed explanation, or hypothesis, was correct?

The scientists also interviewed 34 farmers who grow, use, and sell alache. They discovered that most use alache as a vegetable. It is an important part of the diet during the rainy season. Farmers boil the fresh leaves and buds until they are soft and the water becomes slimy. Next they mix the leaves and buds with mushrooms, squash, beans, or meat. The scientists tested the nutrient content of alache, and discovered that it is high in protein and starch. Some people also use alache as a medicine, mostly as a tea for coughs. Many people harvest and sell alache at the local market.

Source: Rendon, B., Bye, R., and Nunez-Farfan, J. (2001). Ethnobotany of *Anoda cristata* (L.) S chl. (Malvaceae) in Central Mexico: uses, management and population differentiation in the community of Santiago, Mamalhuazuca, Ozumba, State of Mexico. *Economic Botany*. Vol. 55 (4), 545-554.



JOKE



CAUTION

Please get advice from a doctor before using alache for medicinal purposes.

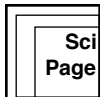
ALACHE Teaching Tips



LEARNING OBJECTIVES

Youth will be able to:

- * Identify alache.
- * Explain how to grow and harvest alache.
- * Describe how alache is traditionally grown and used.
- * Research alache recipes.



HOW TO USE THE ALACHE SCIENCE PAGE

Alache grows in the wild throughout the warmer parts of the Americas. It is found in a few scattered sites in Arizona and Texas. Although still used as edible greens, especially in Mexico and Central America, it is becoming less popular. You can sometimes find it being cultivated by Latinos in community gardens as far north as New York City.

Point out alache growing in the garden or show some alache that has been harvested. Ask youth if they know what it is. Youth from Latin American countries may be familiar with alache, but they may know it by a different common name. The name alache or alanche is what it is called in the Puebla region of Mexico. Other common names include anoda (Puerto Rico), aguatosa (Oaxaca), violeta (Huastec), limete ts'ohool (Huastec for "bottle plant"), pax'tamac, tasa wich (Huastec for "glass flower"), and tsayaltsay (Maya). Among some other common names used by native people in Mexico and Central America are: altea, amapola morada, amapolita, amapolita del campo, bioleta, camanilla morada, estrella, malva cienegera, and malva de castilla. Point out to youth that no matter where they are in the world, alache has the same scientific name, *Anoda cristada*. Ask: Why do you think it is useful to give scientific names to plants and other living things? (Answer: This prevents a lot of confusion. When botanists or

gardeners use the scientific name for alache, they understand exactly what plant it is, no matter where they come from or what language they speak.)

In the southern and midwestern United States, alache is a weed in soybean and corn fields. Farmers in those areas know it by the common name spurred anoda. Ask: How can alache be a multi-purpose plant in Mexico and a weed in the United States? (Answer: A "weed" is just a plant that is growing where it is not wanted. Any plant can be considered a weed if it is growing where it is not wanted. It grows in corn fields in Mexico, but farmers there use it for many purposes.)

After youth have read the Science Page, ask: Why is alache called a multi-purpose plant? What are some ways it is used? (Answer: as a green vegetable, an herb, a medicine, and animal food). If some of the youth are familiar with alache, ask them to discuss what they know about it—how it is used in cooking, and how else they might have seen it used. Explain that it has a variety of uses in different parts of Latin America. In some parts of Mexico, it is mainly used in soups and stews. In other areas of Mexico, it is used to flavor tamales and mole sauce. It also has a variety of medicinal uses, including for coughs, hair loss, stomach inflammation, poor appetite, fever, measles, and deafness. Point out that the effectiveness of alache as a medicine has not been researched by scientists. A word of caution: *Tell youth that plants should not be used for medicinal purposes without the recommendation of a doctor.*

Explain that in Central America alache used to be considered famine food. If corn crops failed, then farmers could rely on alache and other edible greens for food. The consumption of alache and other edible greens has decreased in recent years because European

vegetables are considered more prestigious.



ALACHE LETTER TILES

When the tiles are unscrambled, the message is "Alache is a multi-purpose plant."



SPOTLIGHT ON RESEARCH

The source for this information is: Rendon, B. et al. (see reference section below).

Explain that ethnobotany is an exciting career that combines ethnology (the study of different cultures) and botany (the study of plants). Ethnobotanists learn a lot about plants from native people. They also learn about people from studying the plants they grow.



REFERENCES

Here are some useful references on alache:

Griffiths, M. 1992. The New Royal Horticultural Society Dictionary of Gardening. MacMillan Press. Vol. I:185.

Huxley, A., Kiple, K.F., and Ornelas, K.C. 2000. The Cambridge World History of Food. Cambridge U. Press. London, UK.

Martinez, M. 1944. Las Plantas Medicinales de Mexico. Ediciones Botas. Mexico.

Rendon, B., Bye, R., and Nunez-Farfan, J. 2001. Ethnobotany of *Anoda cristata* (L.) S chl. (Malvaceae) in Central Mexico: Uses, Management and Population Differentiation in the Community of Santiago, Mamalhuazuca, Ozumba, State of Mexico. Economic Botany: 55 (4): 545-554.

Turrill, W.B. 1956. Curtis's Botanical Magazine. Volume CLXXI. Tab. 288. The Royal Horticultural Society, London, UK.

ALFALFA Science Page

DID YOU KNOW?



Alfalfa has deep roots. Believe it or not, miners in Nevada once found alfalfa roots 40 meters (129 ft) down into the soil!

ORIGINS

Alfalfa is native to Asia, Europe, and North Africa. The Medians, who lived in what is today Iraq and Iran, grew alfalfa 3,300 years ago.



Alfalfa is sometimes called "Queen of Forages" because it is the oldest known plant used to feed animals.

THE ALFALFA PLANT

Alfalfa grows to about 1 meter (about 3 ft) high.



The purple flowers are grouped at the ends of stems.

Leaves have three leaflets.

Pods are curled.



Alfalfa has one long taproot with many side branches.

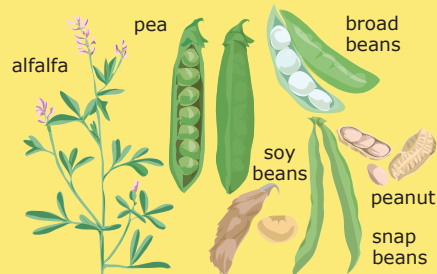
CLASSIFYING ALFALFA

Alfalfa belongs to the legume family.

All legumes have their seeds in pods. Many legumes have root nodules where special bacteria, called Rhizobia, live. These bacteria can take nitrogen from the air and change it into a form that plants can use.



FAMILY Fabaceae (Legume Family)

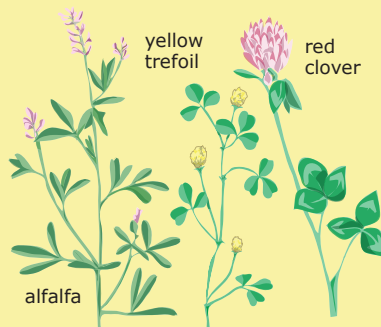


There are about 18,000 species in the legume family, which includes peas, beans, clover, and peanuts.

GENUS

Medicago

In Latin, "medica" means native of Media. Alfalfa was first grown by the Medians.



SPECIES *sativa*



In Latin, "sativa" means that which is sown.

GROWING ALFALFA

If you are not using a section of your garden, you can plant alfalfa to protect and improve your soil.

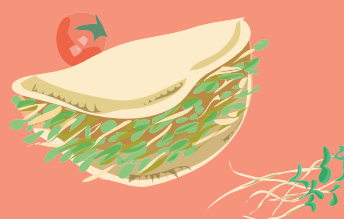
Sow in spring or summer. Sprinkle 2-3 grams of seeds per square meter (about 1 oz. per 12 sq. yards). Do not allow the alfalfa to grow for more than a year or it will be difficult to dig up. Turn it under and allow it to decay for six weeks before planting crops.

When I turn this alfalfa under, it will add lots of organic matter and nitrogen to my soil.



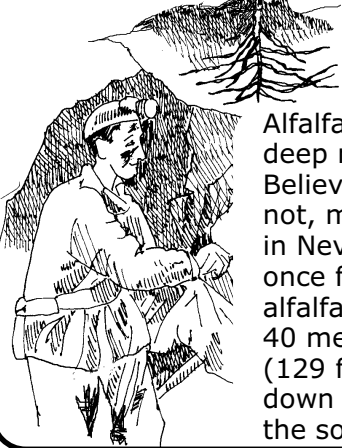
USES

Alfalfa is not only grown for animal food. Many people eat alfalfa sprouts in salads. Some people even eat the leaves, either cooked or raw.



ALFALFA Science Page

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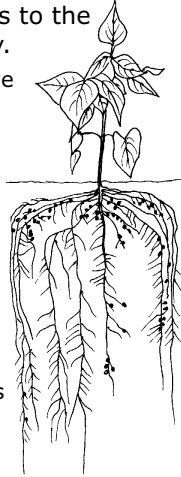


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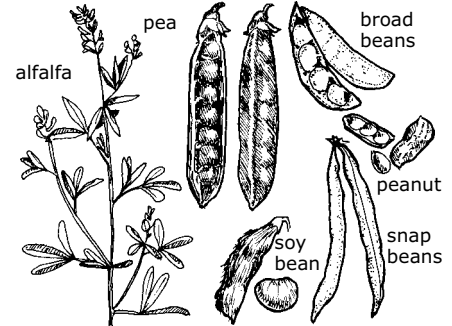
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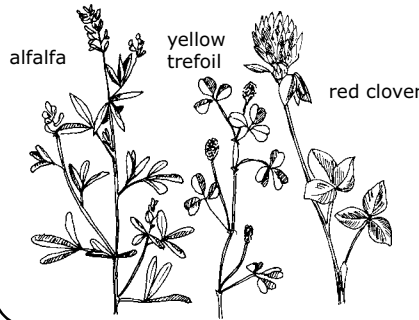


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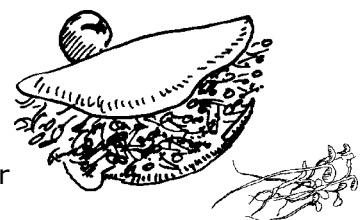
When I turn this alfalfa under, it will add lots of organic matter and nitrogen to my soil.



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USES

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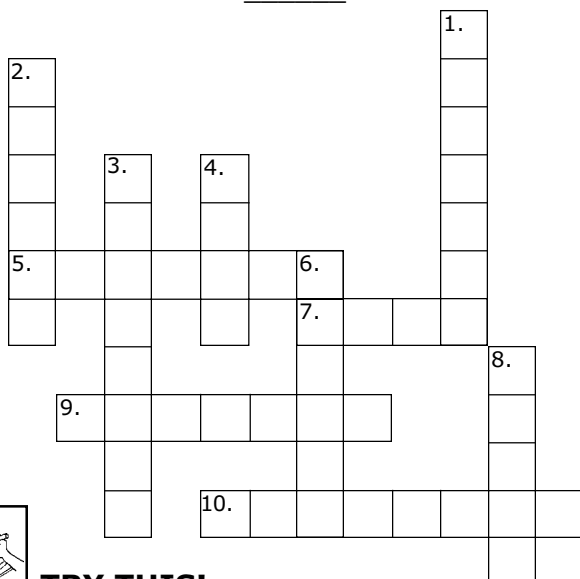
CROSSWORD PUZZLE

Across

5. Alfalfa was first grown by the _____.
7. All legumes have their seeds in _____.
9. Alfalfa has one very long _____.
10. Planting legumes can add _____ to the soil.

Down

1. Alfalfa is the oldest known plant used to feed _____.
2. Alfalfa belongs to the _____ family.
3. The scientific name for alfalfa is _____ *sativa*.
4. To improve your soil, you can grow alfalfa for not more than one _____, and then turn it under.
6. People eat alfalfa _____ in salads.
8. Alfalfa leaves have _____ leaflets.



TRY THIS!

GROWING ALFALFA SPROUTS

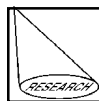
What You Need

- * alfalfa seeds for sprouting
- * glass, clear quart jar
- * piece of clean panty hose or cheesecloth
- * tablespoon
- * scissors
- * rubber band
- * water and sink

What You Do

1. Cut a piece of panty hose or cheesecloth that you can put on the top of your jar.
2. Measure and put a tablespoon of alfalfa seeds into your quart jar.
3. Put some water in the jar so that the seeds are completely covered up.
4. Put the cheesecloth or piece of panty hose on the top of the jar. Keep it in place by stretching a rubber band around the outer edge of the jar.
5. Let the seeds soak overnight.

6. The next day, drain out the water. Rinse the seeds with cool water. Place the jar on its side out of direct sunlight. The seeds need to be damp but not totally wet.
7. Every day, three times a day, rinse the alfalfa seeds with cool water. Each time be sure to drain the rinse water and place the jar back on its side.
8. In 3 or 4 days, the sprouts will be ready to eat! Make a garden or tossed salad and put your sprouts on top. Or, make a sandwich and add some sprouts!



SPOTLIGHT ON RESEARCH

Alfalfa: a Legume with Many New Uses

For thousands of years, alfalfa has been used to feed horses, cows, and other livestock. It has also been used to improve soils. Because it is a legume, it can grow on poor soils and add nitrogen to the soil. But now scientists in Minnesota are developing new varieties of alfalfa with important new uses. In this changing world, gasoline and plastics may become too expensive to make from oil. In place of oil, new varieties of alfalfa may be able to supply the raw materials to make fuel and plastics. For example, some varieties are being developed that have a lot of sugar in the stems, which can be used to produce fuel. Scientists also are developing alfalfa varieties that make beads of plastic in their leaves. They are still trying to figure out how to extract the plastic.

And these are not the only possible new uses for alfalfa! Some scientists are developing ways to use alfalfa for cleaning up soil and water pollution. Alfalfa is very good at taking up excess nitrates in soil. If soil has excess nitrates, rain may carry these nitrates into ground water or into lakes and rivers. When people drink water with excess nitrates, they can get health problems. But if the water high in nitrates runs through a field of alfalfa, the roots take up the nitrates and clean the water. Other new varieties of alfalfa can take up other pollutants, such as atrazine, a longlasting chemical used to kill weeds.

Source: Comis, D. (2002). The Alfalfa factory: a remarkable perennial legume find many uses. <http://articles.findarticles.com/p/articles/mi_m3741/is_7_50/ai_90117980>



JOKE

Knock, knock. Who's there?
Al. Al who?
Al-fall-fa you because I think you're so cute!

6. sprout; 8. three.
Down: 1. animals; 2. legumes; 3. *Medicago*; 4. year;
Across: 5. Medians; 7. pods; 9. taproot; 10. nitrogen.

Crossword puzzle answers

CHINESE CABBAGE AND BOK CHOY Science Page

DID YOU KNOW?

Turnips, Chinese cabbage, and bok choy are all the same plant species.

Around the Mediterranean, ancient farmers saved seeds from the plants with the largest roots. They wanted plants with large roots that could be stored for winter. In ancient China, farmers saved seeds from the plants with the fleshiest stems and leaves. After hundreds of years of selecting seeds, the species evolved into the turnip in the Mediterranean and Chinese cabbage and bok choy in China.



THE CHINESE CABBAGE AND BOK CHOY PLANTS

Chinese cabbage leaves are in a "head" and bok choy leaves are loosely joined together.



The heads of Chinese cabbage can have different shapes.

Chinese cabbage leaves are crinkly, and have thick, white veins. The outside leaves are green. The inside leaves are green or yellow.



Chinese cabbage



bok choy

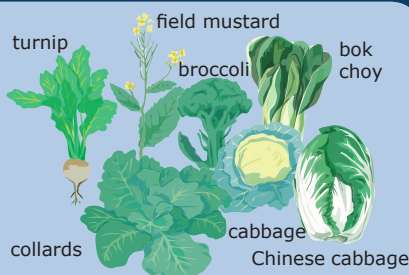
Bok choy has smooth, glossy green leaves and white stalks.

CLASSIFYING CHINESE CABBAGE AND BOK CHOY

FAMILY

Cruciferae or Brassicaceae (mustard family)

There are about 3,000 species of herbs, shrubs, and trees in this family.



GENUS

Brassica

In Latin, this means "like cabbage."



SPECIES

rapa

There are many varieties of this species, including:



turnip
B. rapa
variety rapa



bok choy
B. rapa
variety chinensis



Chinese cabbage
B. rapa
variety pekinensis

GROWING AND HARVESTING CHINESE CABBAGE AND BOK CHOY

These plants do best when the weather is cool and the days are short. If days are long or temperatures too hot or too cold, then flowers form instead of leaves. In areas with cold winters and hot summers, plant in the late summer and fall. In areas with cool or warm winters, plant in winter.

It's fall, so I can finally plant my bok choy. I'm going to grow some from seeds and some from transplants.



These plants like a rich, moist, loamy soil.

Harvest before seed stalks form. Cut close to the ground.

USES

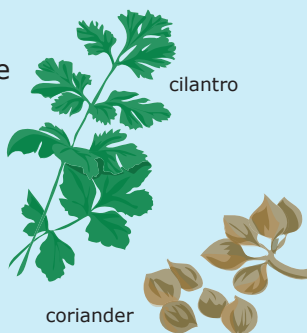
The leaves of bok choy and Chinese cabbage are crisp and have a mild flavor. They can be used in salads, stir-fries, and soups.



CILANTRO AND CORIANDER Science Page

DID YOU KNOW?

The herb cilantro and the spice coriander come from the same plant. Cilantro is the name used for the plant's leaves. Coriander is a spice made from the seeds. The seeds and leaves taste completely different.



ORIGINS

Coriander is native to southern Europe and the Mediterranean. It is one of the oldest spices in recorded history, and was used as long as 7,000 years ago.



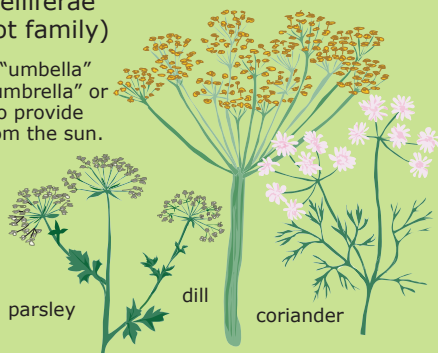
Coriander has been found in ancient Egyptian tombs.

CLASSIFYING CILANTRO

FAMILY

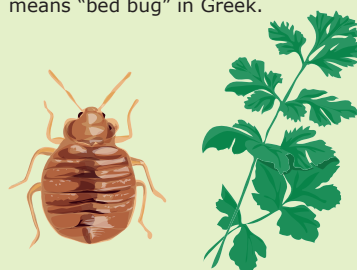
Umbelliferae
(Carrot family)

In Latin, "umbrella" means "umbrella" or parasol to provide shade from the sun.



GENUS

Coriandrum
means "bed bug" in Greek.



Some say the fresh leaves smell like bed bugs.

SPECIES

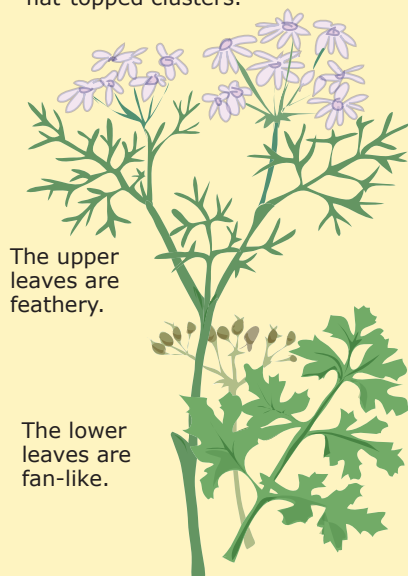
sativum
means "that which is planted."



All of the plants in this family have tiny flowers arranged on stalks that radiate from a central point, like the frame of a parasol or umbrella.

THE CILANTRO PLANT

The tiny white or pink flowers are arranged in flat-topped clusters.



The seeds are in ribbed pods.



GROWING AND HARVESTING CILANTRO AND CORIANDER

Cilantro is easy to grow in almost any well-drained soil. Sow seeds after the last frost date. Begin harvesting when the plant is at least 15 cm high. If the stems are cut at about 2.5 cm above the ground, the plant will continue to grow.



I planted cilantro in the shade so it will stay cooler. That way, it won't produce flowers and seeds so quickly, but will keep producing leaves.

USES

Cilantro is used in Latin American and Southeast Asian salads, soups, and meat dishes. Coriander is used in European, Indian, and Middle Eastern dishes.



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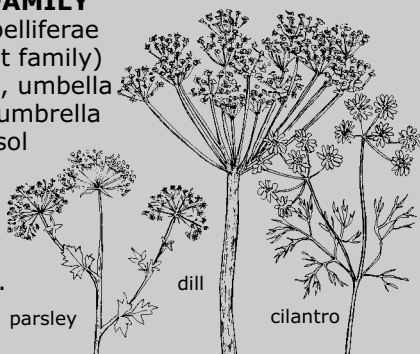


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CLASSIFYING CILANTRO

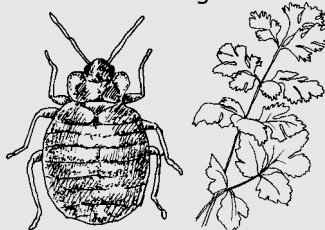
FAMILY

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(Carrot family)
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GENUS

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SPECIES

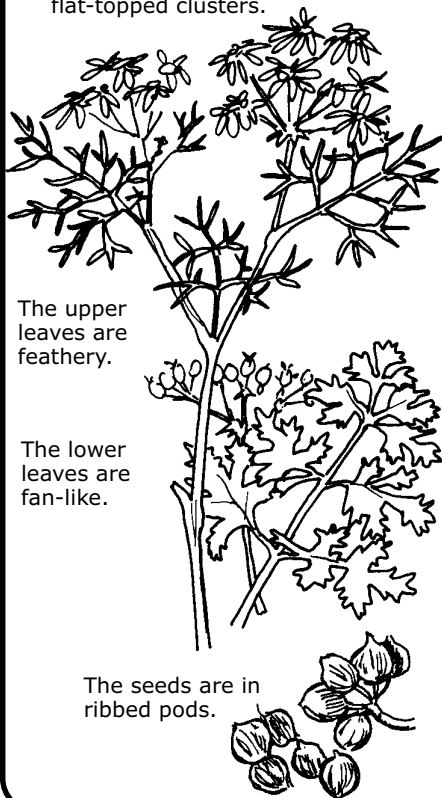
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THE CILANTRO PLANT

The tiny white or pink flowers are arranged in flat-topped clusters.



The upper leaves are feathery.

The lower leaves are fan-like.

The seeds are in ribbed pods.

GROWING AND HARVESTING CILANTRO AND CORIANDER

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USES

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Coriander is one of the spices I use in curries.



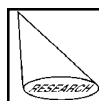
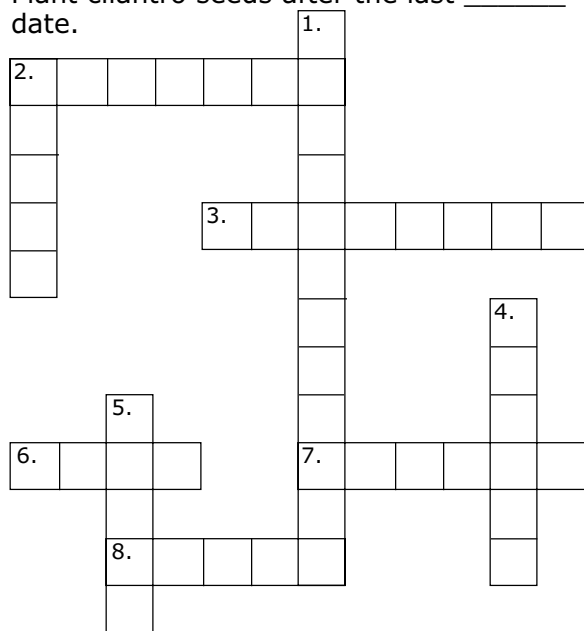
CROSSWORD PUZZLE

Across

- The scientific name for coriander is *Coriandrum* _____.
- Coriander and _____ come from the same plant.
- Cilantro is an _____.
- The seeds of coriander are in _____ pods.
- Coriander is a _____.

Down

- Cilantro belongs to the _____ family.
- Plant cilantro in the _____ so it will not produce flowers and seeds so quickly.
- Coriander is one of the _____ spices in recorded history.
- Plant cilantro seeds after the last _____ date.



SPOTLIGHT ON RESEARCH

How to keep coriander seeds fresh

Coriander contains chemicals called essential oils. These oils give the coriander spice its distinctive taste and smell. They also are extracted for use in perfumes and medicines. High quality seeds are needed for this purpose.

A researcher at the Russian Academy of Sciences in Moscow wanted to find out how storing coriander under different conditions affects the essential oils. He stored some coriander seeds in the dark and some in the light for one year. Then he analyzed the oil composition of the seeds in the two groups. The oil composition of seeds that were stored in the dark changed only slightly. However, those stored in the light changed a great deal. That means, if you want to keep coriander fresher, store it in the dark, not in the light!

Source: Misharina, T.A. (2001). Effect of conditions and duration of storage on composition of essential oil from coriander seeds. *Applied Biochemistry and Microbiology*. 37 (6), 726-32.



QUOTE

"The children were nestled all snug in their beds,
While visions of sugar-plums danced in their heads."

from 'Twas the Night Before Christmas
by Major Henry Livingston Jr.

Sugar-plums are candied coriander, a sweet that was popular in 1822, when this poem was written!

Crossword puzzle answers: Across: sativum; 3. cilantro; 6. herb; ribbed; 8. spice. Down: 1. Umbelliferae; 2. shade; 4. oldest; 5. frost.



CILANTRO CORN RELISH

This is good served with enchiladas, burritos, and grilled meats.

Yield: about 2 cups

Ingredients

- * 4 ears of corn, or one 10-ounce package frozen corn
- * 1 teaspoon ground cumin
- * 1 small red onion, chopped
- * 1/2 cup vinegar
- * 1/4 cup sugar
- * 2 teaspoons fresh oregano, or 1/2 teaspoon dried
- * 1 small chili pepper, seeded and chopped
- * 1/2 teaspoon salt
- * 1 red bell pepper
- * 1/3 cup minced cilantro

Instructions

- Cut the kernels from the ears of corn. You should have about 2 cups.
- Remove the seeds from the red bell pepper and chop.
- Remove the seeds from the chili pepper and chop.
- Add the cumin to a medium saucepan. Toast until you just begin to smell it.
- Add chopped onion, vinegar, sugar, oregano, chili pepper, and salt to the pan, and bring to a boil. Simmer for 5 minutes.
- Add the bell pepper and the corn and simmer for 3 to 4 minutes.
- Put the mixture in a container, cover the container, and refrigerate.
- Just before serving, add minced cilantro.

COLLARDS — Science Page

DID YOU KNOW?

Collards are descended from wild cabbages that once grew on the Atlantic coast of Europe.



CLASSIFYING COLLARDS

Collards belong to the mustard family. Its scientific name is *Brassica oleracea* var. *acephala*. This means collards is a vegetable that is like cabbage, but does not form a compact ball of leaves or "head."

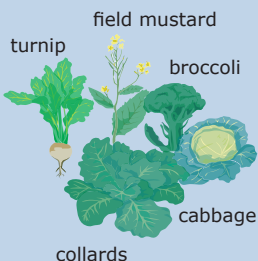
FAMILY
Cruciferae or
Brassicaceae
(mustard family)

This family includes about 350 genera and over 3,000 species of herbs, shrubs, and trees.

GENUS

Brassica

In Latin, this means "like cabbage."



some plants of this genus

SPECIES

oleracea

means "vegetable."



some plants of this species

VARIETY

acephala

means "without a head."



GROWING COLLARDS

Today collards are grown throughout North America. In the north, you can plant collards in the early spring, and harvest them all summer, fall or early winter. South of Virginia, collards survive the winter, and you can harvest year round.



Collards survive freezing temperatures. Frost sweetens the flavor.

THE COLLARD PLANT

Collards are leafy, green vegetables.



The edible leaves and stem grow from a thick, main stem.



The plant takes 60-80 days to mature. It can reach 60 cm if left to grow. That's higher than the knee of an average male adult.

HARVESTING COLLARDS

You can harvest the outer leaves from the bottom of the stalk as soon as the collard plant is about 30 cm tall. Younger leaves will continue to grow for harvesting later on.



USES

You can eat collards raw in salads or cooked as greens. Cooked greens are an important part of traditional cooking in the southern U.S. They are becoming more and more popular in other parts of the country as well.



NUTRITIONAL VALUE OF COLLARDS

Collards are rich in protein, minerals, and vitamins A and C. They contain antioxidants and other substances that may reduce the risk of cancer and heart disease.

1 cup of chopped collards has the same amount of ...



... calcium as 5/6 cup of milk

... vitamin A as 1/2 a large carrot



... vitamin C as 1/2 an orange

... protein as a hot dog

AERIAL PHOTOGRAPHS Science Page

An aerial photograph—or airphoto—is a picture of the Earth taken from above the ground.

Airphotos are valuable tools for studying both natural features, such as forests, waterways, and soil, and human-made features, such as

roads and buildings. You can see how land use and communities change over time by studying a series of airphotos taken of the same place at different times.

Here is an aerial photograph of Prospect Park in Brooklyn, New York, taken in 1989.



HOW TO 'READ' AIRPHOTOS

When you view the Earth from overhead, as if from an airplane, objects look different from normal. These clues will help you recognize features in the airphoto.

Tone: the blackness or whiteness of an object

1. Large black areas are water.
2. The tiny white spots are roofs of houses.
3. Light cement sidewalks border dark asphalt streets.

Texture: how coarse or smooth an area appears

4. Grassy areas have a smooth texture.
5. Forests have a coarse texture.

Size

6. Highways are wider than streets.
7. Museums, factories, churches, schools, stores, and apartment buildings are larger than houses.

Shape

8. The circle at the end of the park is a traffic circle.

Location

9. The white circles in grassy areas are ball fields. Circles at the end of a road are traffic circles.

SCALE

An aerial view close to the ground shows lots of detail. The further away from Earth a photograph is taken, the smaller the features appear on the photo. The scale of an airphoto indicates how much smaller an object in the photo is compared to its actual size. The photo on the right has a larger scale than the photo shown above. Sometimes people confuse large scale and small scale. Remember that features on large scale photos appear large, and features on small scale photos appear small.



The scale of the airphoto above is 1:24,000. This means that one centimeter on the photo is equal to 24,000 centimeters—or 240 meters—on the ground. The airphoto on the left is a section of the above photo, and is shown at a scale of 1:12,000. This larger scale photo shows features in more detail. Look carefully at the large scale airphoto. Can you find this area on the small scale airphoto above?

FOTOGRAFÍAS AÉREAS — Página de ciencias

Una fotografía aérea o “aerofoto” es un retrato de la Tierra tomado desde arriba. Las aerofotos son importantes para el estudio de condiciones naturales como bosques, vías acuáticas y suelo así como las manufacturadas, como caminos y

edificios. Una serie de aerofotos tomadas en el mismo lugar en épocas distintas muestra cómo cambia el uso de la tierra y las comunidades con el tiempo.

Esta foto aérea de Prospect Park, en Brooklyn, Nueva York, fue tomada en 1989.



CÓMO LEER AEROFOTOS

Desde un avión, por ejemplo, los objetos se ven distintos de lo normal. Las siguientes pistas ayudan a reconocer los rasgos que hay en la foto.

Tono: la oscuridad o claridad de un objeto

1. Las áreas oscuras grandes muestran agua.
2. Los puntitos blancos son techos de casas.
3. Las aceras de cemento (claras) bordean calles asfaltadas (oscuras).

Textura: cuán irregular o pareja aparece un área

4. Las áreas de césped tienen textura pareja.
5. Los bosques tienen textura irregular.

Tamaño

6. Las carreteras son más anchas que las calles.
7. Los museos, fábricas, iglesias, escuelas, tiendas y edificios de apartamentos son más grandes que las casas.

Forma

8. El círculo al final del parque es un círculo vial.

Localización

9. Los círculos blancos en áreas verdes son campos de juego. Los círculos al final del camino son círculos viales.

ESCALA

Una vista aérea cercana a la tierra muestra muchos detalles. Mientras más lejos de la Tierra se tome, más pequeños aparecen los rasgos. La escala de una aerofoto indica cuánto más pequeño aparece un objeto comparado con el tamaño real. La foto de la derecha es a escala mayor que la de arriba. A veces la gente confunde la escala grande con la pequeña. Sólo hay que recordar que a escala grande los rasgos se ven grandes y a escala pequeña son pequeños.



La escala de la aerofoto de arriba es 1:24,000. Es decir, un centímetro de la foto es igual a 24,000 centímetros—ó 240 metros— en el terreno. La aerofoto de la derecha es una sección de la otra, a escala de 1:12,000. Esta escala mayor muestra más detalles. Obsérvese la aerofoto a mayor escala cuidadosamente. ¿Dónde se localiza esta área en la foto a escala pequeña de arriba?

ALACHE Science Page

DID YOU KNOW?

Alache is a multi-purpose plant. People use it as a vegetable, an herb, and as medicine. When the plant gets big, farmers cut it to feed their animals.

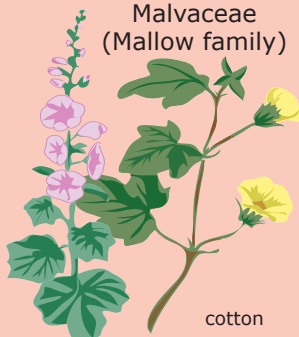


I hope this tea made from alache leaves gets rid of my cough.

CLASSIFYING ALACHE

Alache belongs to the Malvaceae, or Mallow, family. About 1,000 species are in this family, including cotton, hollyhock, and okra.

FAMILY
Malvaceae
(Mallow family)



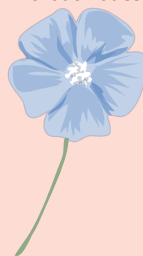
hollyhock

Flowers of plants in this family are large and showy, with five petals.

GENUS

Anoda

In Latin, this means "without nodes."

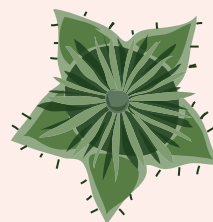


Nodes are places along a stem where leaves are attached. The flower stem of alache has no nodes or leaves attached.

SPECIES

cristada

means "crest" or "ridge."



The seed pod of alache has ridges radiating out from its center.

ORIGINS

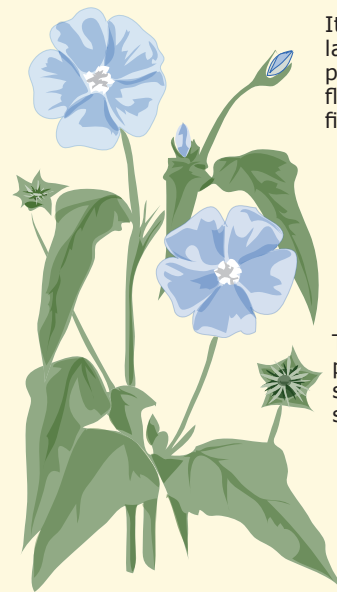
Alache is native to tropical America, north to Arizona and Texas.

For centuries, farmers in Central America have allowed alache to grow freely in their cornfields. Seeds from plants in one growing season sprout and grow in the next rainy season. Farmers gather the plants as needed.



THE ALACHE PLANT

Alache is a soft-stemmed plant, with pointed leaves.



It has white, lavender, or purple-blue flowers with five petals.

The seed pods are shaped like stars.

GROWING AND HARVESTING ALACHE

In most parts of the U.S. you can grow alache as an annual. This means it lasts for only one growing season.

Will alache grow here? I know alache likes sunny and sheltered places like this, but the soil is poor.



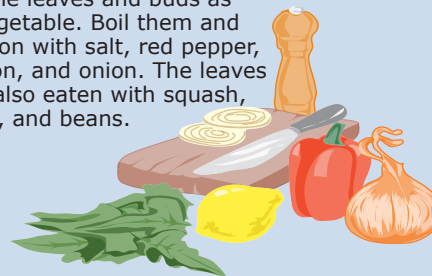
That's true, but it's well-drained. These alache plants will grow to about 1.5 meters.

Harvest the alache leaves and stems when they are young and tender. Cut the stems near the bottom. The plants resprout easily after cutting. Once alache forms seeds, the leaves become too old and tough to eat.

USES IN COOKING

In Latin America, alache is used as a vegetable and cooking herb.

You can prepare young alache leaves and buds as a vegetable. Boil them and season with salt, red pepper, lemon, and onion. The leaves are also eaten with squash, corn, and beans.



ALACHE, ALTEA O ANODA — Página de ciencias

A ENTERARSE

El alache, altea o anoda es una planta de muchos usos— como verdura, hierba y medicina o remedio. Cuando la planta crece, se la dan a los animales.

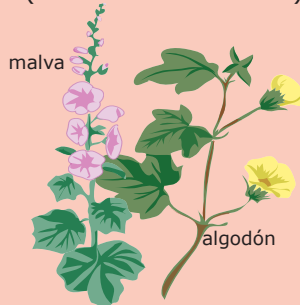


CLASIFICACIÓN DEL ALACHE

El alache pertenece a la familia Malvaceae, de las malvas, que tiene unas 1,000 especies, entre ellas el algodón, la malvarrosa o malva real y el quimbombó o ñajú.

FAMILIA

Malvaceae
(Familia de las malvas)



Las plantas de esta familia tienen flores grandes y llamativas, con cinco pétalos.

GÉNERO

Anoda



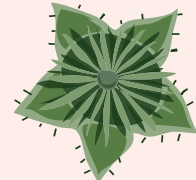
En latín, esto quiere decir "sin nudos".

Los nudos son lugares en el tallo donde están las hojas. Los tallos del alache no tienen ni nudos ni hojas.

ESPECIE

cristada

quiere decir "cresta" o "lóbulo".



La vaina o cápsula de la semilla tiene lóbulos que salen del centro.

ORÍGENES

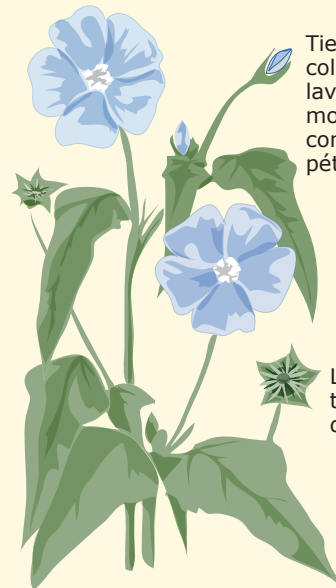
El alache, altea o anoda es originario de América tropical y al norte, hasta Arizona y Texas.

Desde siempre, en Centroamérica dejan que el alache crezca libremente en los maizales o milpas. Las semillas de una temporada nacen y crecen la próxima estación lluviosa. Los agricultores recolectan las plantas cuando las necesitan.



LA PLANTA DE ALACHE

La planta de alache tiene tallo suave y hojas triangulares.



Tiene flores de color blanco, lavanda o morado azulado con cinco pétalos.

Las vainas tienen forma de estrella.

CULTIVO Y COSECHA DEL ALACHE

En muchas partes de EE.UU. el alache es planta anual. Esto quiere decir que dura sólo una estación.

¿Se dará aquí el alache? Yo sé que le gustan los lugares con sol y protección, como éste, pero el suelo es pobre.



Cierto, pero hay buen drenaje. Esas matas van a crecer más o menos un metro y medio.

Las hojas y los tallos de alache se cosechan nuevos y tiernos. Los tallos se cortan cerca de la base y luego retoñan fácilmente. Una vez el alache forma semillas, las hojas están muy hechas y duras para comer.

EN LA COCINA

En Latinoamérica, el alache se emplea como verdura y hierba de condimentar.

Las hojas tiernas y cogollos de alache se pueden comer como verdura, cocidos con sal, pimienta roja, limón y cebolla. Las hojas también se comen con calabacines, maíz y frijoles.



ALFALFA Science Page

DID YOU KNOW?



Alfalfa has deep roots. Believe it or not, miners in Nevada once found alfalfa roots 40 meters (129 ft) down into the soil!

ORIGINS

Alfalfa is native to Asia, Europe, and North Africa. The Medians, who lived in what is today Iraq and Iran, grew alfalfa 3,300 years ago.



Alfalfa is sometimes called "Queen of Forages" because it is the oldest known plant used to feed animals.

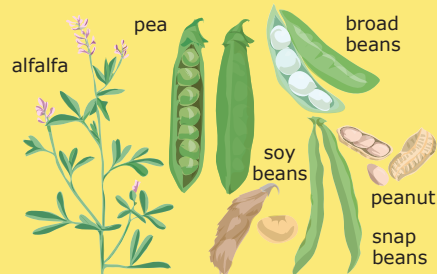
CLASSIFYING ALFALFA

Alfalfa belongs to the legume family.

All legumes have their seeds in pods. Many legumes have root nodules where special bacteria, called Rhizobia, live. These bacteria can take nitrogen from the air and change it into a form that plants can use.



FAMILY Fabaceae (Legume Family)

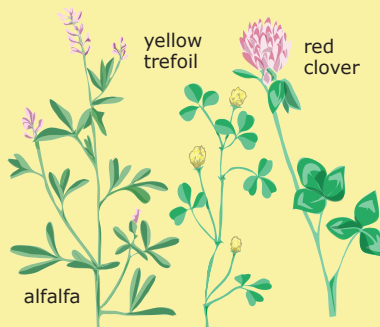


There are about 18,000 species in the legume family, which includes peas, beans, clover, and peanuts.

GENUS

Medicago

In Latin, "medica" means native of Media. Alfalfa was first grown by the Medians.



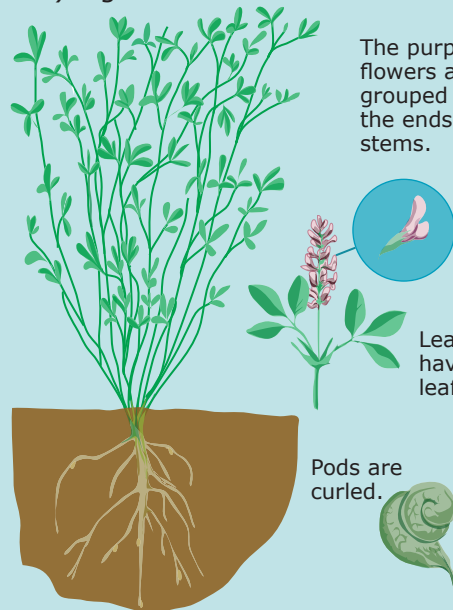
SPECIES *sativa*



In Latin, "sativa" means that which is sown.

THE ALFALFA PLANT

Alfalfa grows to about 1 meter (about 3 ft) high.



The purple flowers are grouped at the ends of stems.

Leaves have three leaflets.

Pods are curled.

Alfalfa has one long taproot with many side branches.

GROWING ALFALFA

If you are not using a section of your garden, you can plant alfalfa to protect and improve your soil.

Sow in spring or summer. Sprinkle 2-3 grams of seeds per square meter (about 1 oz. per 12 sq. yards). Do not allow the alfalfa to grow for more than a year or it will be difficult to dig up. Turn it under and allow it to decay for six weeks before planting crops.

When I turn this alfalfa under, it will add lots of organic matter and nitrogen to my soil.



USES

Alfalfa is not only grown for animal food. Many people eat alfalfa sprouts in salads. Some people even eat the leaves, either cooked or raw.



ALFALFA — Página de ciencias

A ENTERARSE



La alfalfa tiene raíces muy profundas. Aunque parezca increíble, iunos mineros en Nevada encontraron

raíces de alfalfa a 40 metros (129 pies) de profundidad!

ORÍGENES

La alfalfa es natural de Asia, Europa y el norte de África. Los medos, que vivieron donde hoy es Irak e Irán, cultivaron alfalfa hace 3,300 años.



A veces se llama a la alfalfa "reina del forraje" porque se cree que es la primera planta que se empleó para dar de comer a animales.

CLASIFICACIÓN DE LA ALFALFA

La alfalfa pertenece a la familia de las leguminosas.

Todas ellas tienen semillas en vainas. Muchas tienen nódulos donde viven bacterias especiales llamadas Rhizobia. Éstas pueden tomar nitrógeno del aire y darle una forma que las plantas pueden utilizar.



FAMILIA

Fabaceae

(Familia de las leguminosas)



Existen alrededor de 18,000 especies en la familia de las leguminosas, que incluye guisantes, frijoles, trébol y maní o cacahuete.

GÉNERO

Medicago

En latín, "medica" significa originario de Media. Los primeros en cultivar alfalfa fueron los medos.



ESPECIE

sativa

En latín, "sativa" significa "sembrado".



LA PLANTA DE ALFALFA

La alfalfa crece hasta como a 1 metro (unos 3 pies) de alto.



Las flores moradas salen agrupadas en el extremo de los tallos.



Las hojas tienen tres hojillas.

Las vainas son enortijadas.



La alfalfa tiene una larga raíz primaria y muchas secundarias.

CULTIVO DE LA ALFALFA

Si no se está usando una sección del huerto, se puede sembrar alfalfa para proteger y mejorar el suelo.

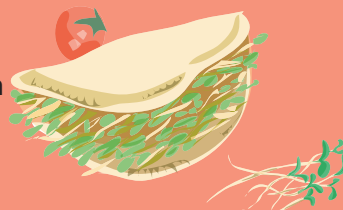
Cuando se invierte esta tierra se le añade mucha materia orgánica y nitrógeno al suelo.

Se debe sembrar en primavera o verano. Se esparcen 2-3 gramos de semillas por metro cuadrado (como 1 oz por 12 yardas cuadradas). No se deja crecer más de un año porque si no, es muy difícil desenterrarla. Hay que invertirla y dejar que se descomponga unas seis semanas antes de hacer nuevos cultivos.



USOS

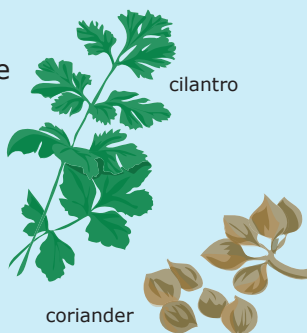
La alfalfa se cultiva no sólo para forraje. Muchas personas comen brotes de alfalfa en ensaladas. Hay quienes comen hasta las hojas, ya sea cocidas o crudas.



CILANTRO AND CORIANDER Science Page

DID YOU KNOW?

The herb cilantro and the spice coriander come from the same plant. Cilantro is the name used for the plant's leaves. Coriander is a spice made from the seeds. The seeds and leaves taste completely different.



ORIGINS

Coriander is native to southern Europe and the Mediterranean. It is one of the oldest spices in recorded history, and was used as long as 7,000 years ago.



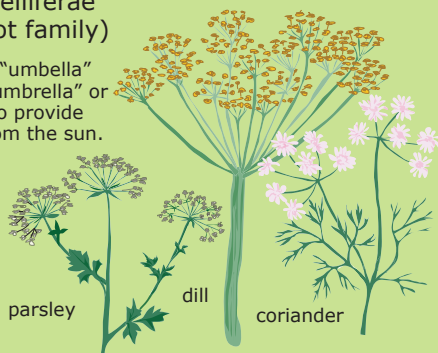
Coriander has been found in ancient Egyptian tombs.

CLASSIFYING CILANTRO

FAMILY

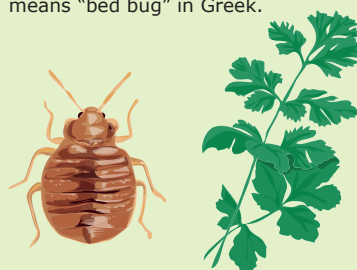
Umbelliferae
(Carrot family)

In Latin, "umbrella" means "umbrella" or parasol to provide shade from the sun.



GENUS

Coriandrum
means "bed bug" in Greek.



Some say the fresh leaves smell like bed bugs.

SPECIES

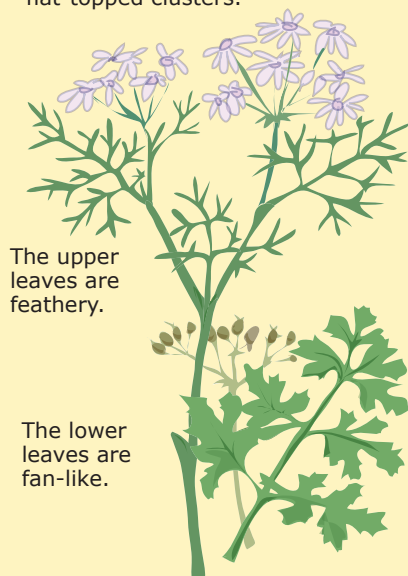
sativum
means "that which is planted."



All of the plants in this family have tiny flowers arranged on stalks that radiate from a central point, like the frame of a parasol or umbrella.

THE CILANTRO PLANT

The tiny white or pink flowers are arranged in flat-topped clusters.



The upper leaves are feathery.

The lower leaves are fan-like.

The seeds are in ribbed pods.



GROWING AND HARVESTING CILANTRO AND CORIANDER

Cilantro is easy to grow in almost any well-drained soil. Sow seeds after the last frost date. Begin harvesting when the plant is at least 15 cm high. If the stems are cut at about 2.5 cm above the ground, the plant will continue to grow.



I planted cilantro in the shade so it will stay cooler. That way, it won't produce flowers and seeds so quickly, but will keep producing leaves.

USES

Cilantro is used in Latin American and Southeast Asian salads, soups, and meat dishes. Coriander is used in European, Indian, and Middle Eastern dishes.



Coriander is one of the spices I use in curries.

CILANTRO O CULANTRO Y CORIANDRO

— Página de ciencias

A ENTERARSE

La hierba cilantro o culantro y la especie coriandro se originan en la misma planta. Cilantro o culantro es el nombre que se da a las hojas. Coriandro es la especia que se hace con las semillas. Las semillas y las hojas tienen sabor completamente distinto.



ORÍGENES

El coriandro es originario del sur de Europa y del Mediterráneo. Es una de las especias más antiguas que aparecen en la historia y se empleaba ya hace 7000 años.



En antiguas tumbas egipcias se ha encontrado coriandro.

CLASIFICACIÓN DEL CILANTRO O CULANTRO

FAMILIA

Umbelliferae
(Familia de la zanahoria)

En latín, umbella significa sombrilla o parasol para dar sombra.



Todas las plantas de esta familia tienen un pedículo con flores pequeñas radiadas a partir de un punto central, como las varillas de un parasol o una sombrilla.

GÉNERO

Coriandrum

en griego significa "chinche".



Hay quienes dicen que las hojas frescas huelen a chinche.

ESPECIE

sativum

quiere decir "que se ha sembrado".



LA PLANTA DE CILANTRO

Las florecitas blancas o rosadas aparecen como un racimo chato por arriba.



Las hojas superiores son plumosas.

Las hojas inferiores se forman como abanico.

Las semillas se encuentran en vainitas acanaladas.



CULTIVO Y COSECHA DEL CILANTRO O CULANTRO Y CORIANDRO

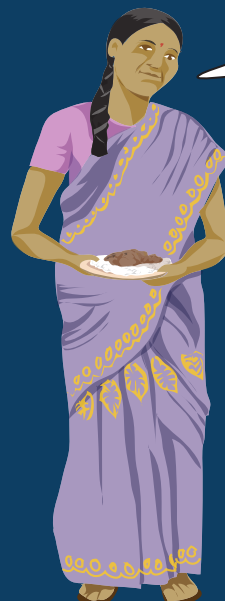
El cilantro crece fácilmente en cualquier suelo con buen drenaje. Las semillas se siembran después de la última fecha de helada. Se empiezan a cosechar cuando la planta tiene por lo menos 15 cm de alto. Si se corta a unos 2.5 cm del suelo, la planta sigue creciendo.



Sembré cilantro a la sombra para que le dé fresco. Así no produce flores ni semillas tan rápido pero sigue dando hojas.

USOS

El cilantro o culantro se usa mucho en ensaladas, sopas y platos de carne en Latinoamérica y el sureste de Asia. El coriandro se usa en platos de Europa, India y del Oriente Medio.



El coriandro es una de las especias que uso para mis platos de curri.

COMMON PURSLANE Science Page

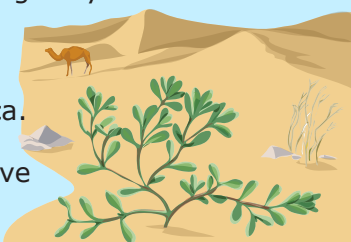
DID YOU KNOW?

Common purslane is a weed in gardens and farm fields throughout much of the world. But for hundreds of years, many people have also used it as a vegetable and a medicine.



ORIGINS

No one knows for sure where common purslane originally came from. Many botanists believe it is native to the desert in North Africa. Its fleshy stems and leaves help it to thrive in dry desert soil.



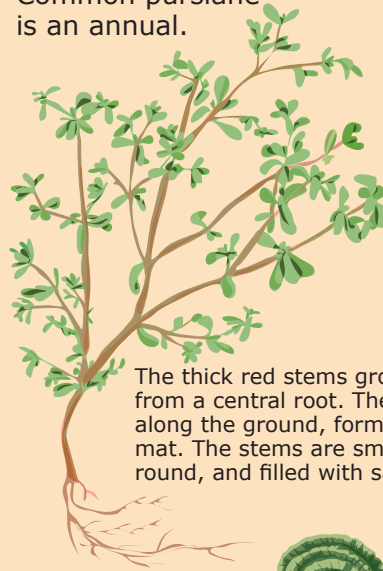
THE COMMON PURSLANE PLANT

Common purslane is an annual.

The small yellow flowers open in the morning sun.



The thick rounded leaves contain sap. They are usually grouped at the ends of branches.



The thick red stems grow out from a central root. They grow along the ground, forming a mat. The stems are smooth, round, and filled with sap.



seed pod

seed



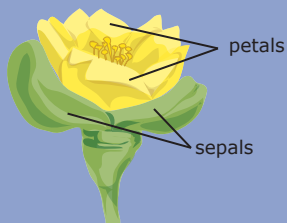
The seeds are in tiny pods. The lids on the pods open when the seeds inside are ripe.

CLASSIFYING COMMON PURSLANE

FAMILY

Portulacaceae
(purslane family)

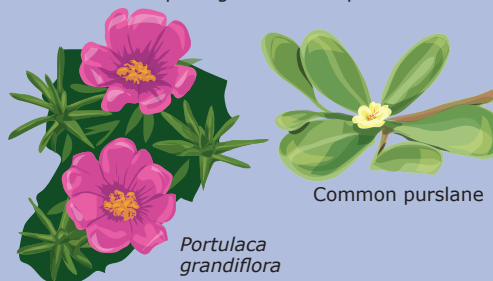
The flowers of the purslane family may have several petals, but only 2 green sepals under the petals.



GENUS

Portulaca

In Latin, this means "little door," which refers to the door-like opening of the seed pods.



Portulaca grandiflora

Common purslane

SPECIES

oleracea

In Latin, this means "edible."



Common purslane can be eaten raw in salads or it can be cooked like spinach. It is very high in Omega-3 fatty acids and vitamins A and C.

FRIEND . . .



I can pull up this purslane and use it in a salad...

. . .OR FOE?

... but I won't leave any cut stems on the ground because they can root and grow.

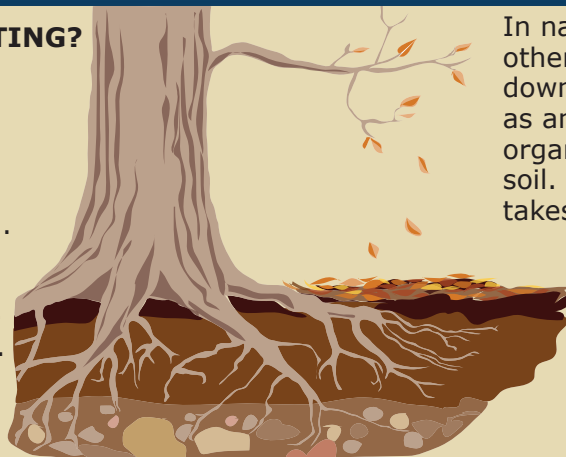


Common purslane plants can quickly take over a farm field or garden. Their leaves and stems are full of stored water, so the plants can survive even the worst dry periods. Each common purslane plant can produce thousands of seeds. Broken bits of stems or leaves can also take root and grow. Within a few weeks of sprouting, a plant can make ripe seeds.

COMPOSTING Science Page

WHAT IS COMPOSTING?

Composting is the controlled decay of plant and animal matter to produce compost—a dark, rich soil-like material. Compost can be added to soil to improve its structure and nutrient content.



In nature, bacteria, fungi, worms, and other soil organisms help to break down dead plants and animals, as well as animal wastes. The decomposed organic material becomes part of the soil. This natural decay process usually takes place very slowly.

Leaves that fall to the forest floor slowly decay to form part of the organic matter in soil.

Composters create ideal growing conditions for compost organisms. This speeds up the natural decay process.

WHAT COMPOST ORGANISMS NEED

1. A balanced diet of compost materials

"Browns" are compost materials that are brown and dry.



"Browns" are high in carbon, which is energy food for microbes.

"Greens" are compost materials that are green and moist.



"Greens" are high in nitrogen, which microbes need to make proteins.

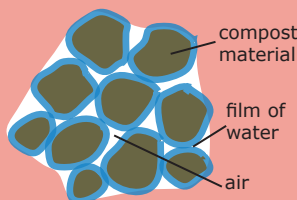


If I add about 3 parts browns to 1 part greens, then the compost organisms will have a balanced diet.

2. Just the right amount of air and water

If there's the right amount of oxygen and moisture, microbes can rapidly grow and multiply. Too much—or too little—water, and microbes will die.

Compost materials should have a thin film of water around them, and lots of pore spaces filled with air.

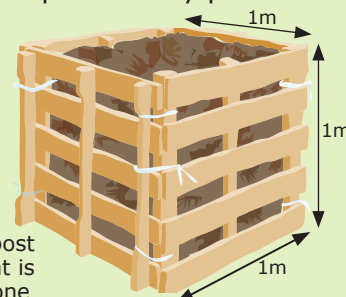


I'm mixing my compost pile so that all the compost organisms get enough air and water.

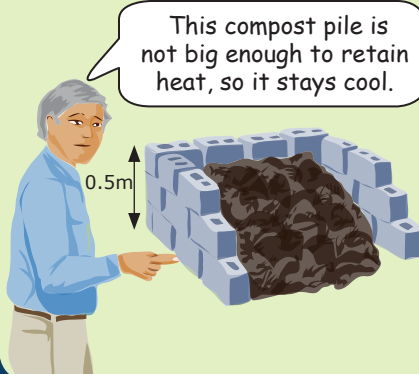


3. The right temperature

Organic materials will eventually decay, even in a cold compost pile. But the decay process is speeded up in a hot compost pile. When bacteria and fungi grow rapidly, they burn a lot of food, and give off a lot of heat. If the compost pile is big enough, the heat will build up inside the pile. Bacteria that grow well at high temperatures take over and speed up the decay process.



A compost pile that is about one cubic meter (1m x 1m x 1m) in size is big enough to hold in heat and warm up.



This compost pile is not big enough to retain heat, so it stays cool.

CONDUCTING AN EXPERIMENT Science Page

MAKE AN OBSERVATION

I spilled a packet of seeds on the ground. They all sprouted, even though I didn't cover them up. I wonder if some seeds sprout better in light than in darkness?



DO BACKGROUND RESEARCH

This article says that some seeds do germinate better in light, and other seeds germinate better in darkness.



ASK QUESTIONS

I wonder if these tomato seeds will germinate better in light or in darkness?



FORM A HYPOTHESIS

I hypothesize that these seeds will germinate better in light.



DESIGN AND CONDUCT AN EXPERIMENT TO TEST YOUR HYPOTHESIS

Replicate treatments



I need two groups of seeds — one in light and the other in the dark. I need more than one seed in each group, because if one doesn't sprout, I won't know if it was because it was a bad seed, or because of the treatment.



Control variables

(A variable is any factor in the experiment that could affect the result.)

In my experiment all variables need to be constant, except for the one I'm testing. So other than keeping them in darkness or light, I'll treat both groups of seeds exactly the same.



TRY AGAIN

All the seeds in this group dried up. I'll have to try again, but this time I'll make sure all the seeds in both groups stay moist.



COLLECT AND ANALYZE DATA



I need to count and record how many seeds in each group sprout.

Does your experiment work?

No

Yes

DRAW CONCLUSIONS

25 out of 30 seeds germinated in the light. Only 10 out of 30 germinated in the dark. My experiment supports my hypothesis.



I wonder if my hypothesis is true for seeds of other kinds of plants. I can do another experiment to find out!

CONTROLLING INSECT PESTS Science Page

You can control insect pests using physical, cultural, biological, and chemical methods.

PHYSICAL CONTROL includes methods such as removing insect pests by hand and using physical barriers or traps to keep insect pests away from plants.

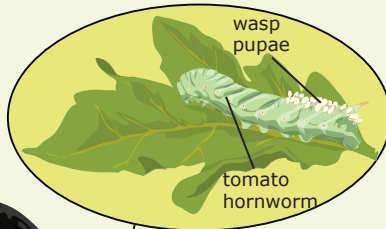


These butterfly larvae are eating all the leaves! I'm picking them off the plants and putting them in a bucket of soapy water.

BIOLOGICAL CONTROL is the use of natural enemies, such as insect predators and parasites, to keep down the number of insect pests. Helpful insects may be released into the garden, or they may be attracted to the garden by certain flowers or herbs.

A parasitic wasp lays eggs inside the body of the tomato hornworm. When the eggs hatch the larvae feed on the inside of the hornworm. Then the larvae emerge and turn into pupae.

Look! A tomato hornworm covered with wasp pupae. I'll leave it in the garden. When the adults emerge, they will attack other hornworms.



Combining a number of methods may be the best way to control insects in your garden.

CULTURAL CONTROL includes carefully choosing what, how, when, and where you plant in order to avoid insect attack.

Last year insect pests destroyed my squash plants. This year insects have not been a problem because of the control methods I've used.

What did you do?

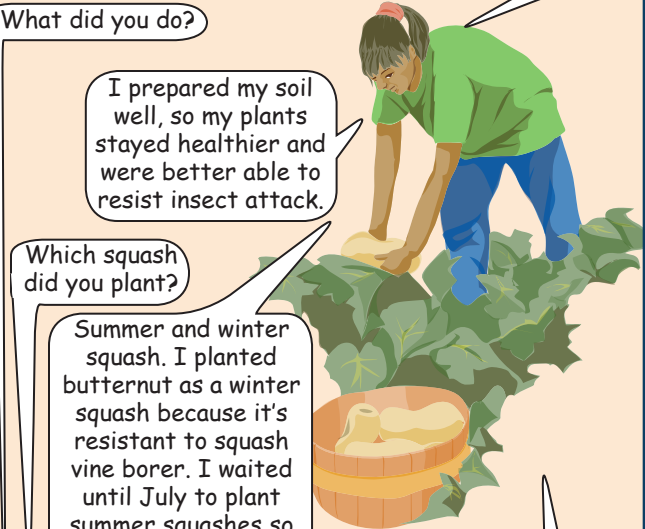
I prepared my soil well, so my plants stayed healthier and were better able to resist insect attack.

Which squash did you plant?

Summer and winter squash. I planted butternut as a winter squash because it's resistant to squash vine borer. I waited until July to plant summer squashes so they matured after the adult borers finished laying their egg.

Where did you plant the crops?

Far from where squash grew last year. That way I avoided the insect pests that over-wintered in the soil.



CHEMICAL CONTROL is the use of pesticides to control insect pests.

No control treatment has worked. So the gardeners may have to use this pesticide. Both the insect pest and my infested crops are listed on this label. The gardeners will read the directions carefully and use only the amount of pesticide that is needed.



CUCURBITS: SQUASH, PUMPKINS, AND GOURDS

Science Page

DID YOU KNOW?

The largest fruits in the plant kingdom are pumpkins. The biggest pumpkin ever grown weighed 606.7 kilograms (about 1,338 lb)!



ORIGINS

Most of the cucurbits are native to the Americas. They were among the first plants to be domesticated in the New World.

Squash is one of the three sisters (corn, beans, and squash) in the Native American cropping system.



CLASSIFYING CUCURBITS

FAMILY

Cucurbitaceae

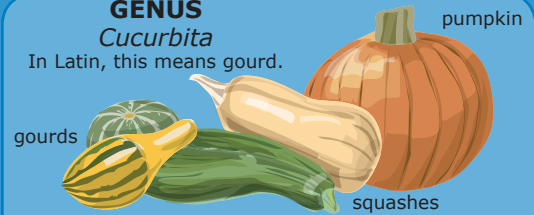
There are about 800 species in this family.



GENUS

Cucurbita

In Latin, this means gourd.



There are 14 species in this genus.

SPECIES

Scientists have grouped cucurbits into different species based on differences in the structure of the flowers and other plant parts. Three species commonly grown in gardens are:

Cucurbita maxima



Cucurbita moshata



Cucurbita pepo



CUCURBIT PLANTS

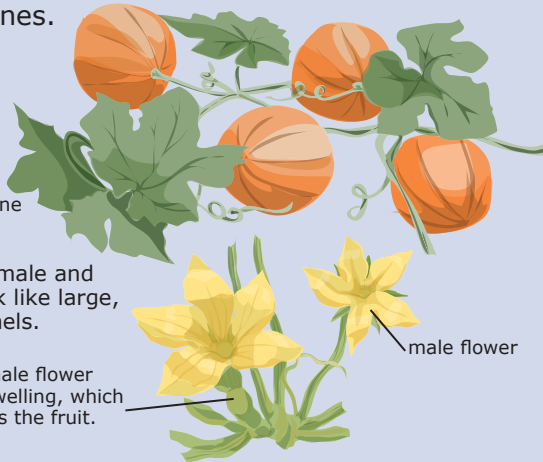
Summer squash, such as zucchini and yellow squash, grows like a bush. Winter squash and pumpkins have long running vines.

Cucurbit plants have large leaves.

pumpkin vine

On a single plant, male and female flowers look like large, yellow, flaring funnels.

The female flower has a swelling, which becomes the fruit.



GROWING AND HARVESTING CUCURBITS

Cucurbits are warm-season crops. Plant in full sun at least one week after the last frost date. Summer squash can grow close together, but the vines of pumpkins and winter squash need more space to grow. Add lots of organic matter to the soil. Cucurbits have deep roots and need lots of water, so water deeply and slowly.

I pick summer squashes when their fruits are young, small, and tender. Pumpkins and winter squash won't be ready until later in the fall when they have a hard shell.



USES

Summer squash can be eaten—rind, seeds, and flesh. Winter squashes must be cooked. They are usually baked or steamed. You can also use them in breads, pies, cakes, cookies, and casseroles.



You can store winter squash and pumpkins in a dry, cool, airy place for winter use.

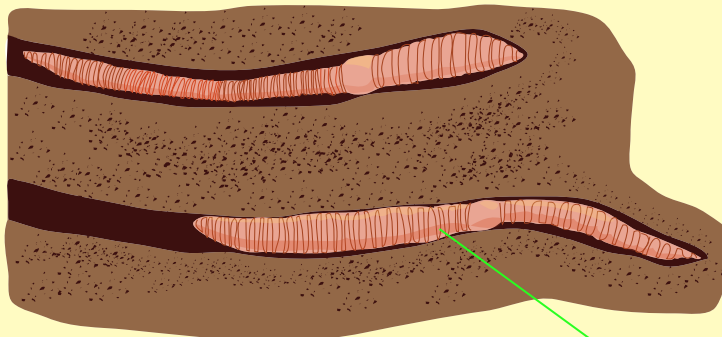
EARTHWORMS Science Page

EARTHWORMS ARE ADAPTED FOR LIVING IN SOIL

MOVING

A worm moves through soil by using special muscles and hydraulics. Hydraulics is the movement of liquids under pressure.

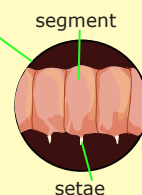
An earthworm is divided into segments. Each is filled with liquid, and each has its own set of muscles. Long muscles run along the sides of each segment, and circular muscles go around each segment.



BREATHING

The earthworm's skin has glands that give off mucus. This mucus helps the earthworm breathe because it keeps the body moist. The earthworm breathes through its thin skin. Oxygen dissolves in the moisture on the earthworm's body, and then passes into the body.

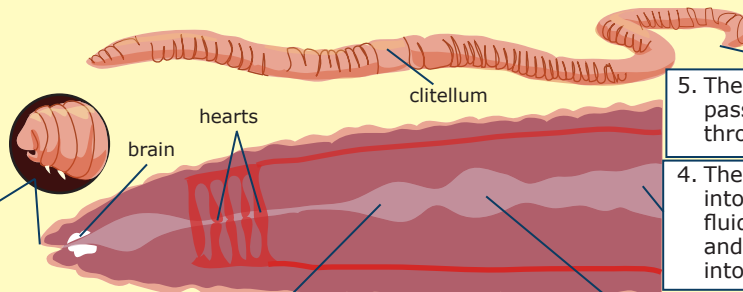
When long muscles tighten—or contract—the segment is squeezed so it gets shorter. The liquid in the segment presses outward, making the segment fatter. When circular muscles tighten, the segment is squeezed around the middle, so it gets thinner. Liquid in the segment is pushed lengthwise, making the segment longer. The tightening of one set of muscles and then the other happens in waves down the segments of the earthworm's body. This helps to pull and push the worm along.



Bristles, called setae, are located on each segment of the earthworm's body. They prevent the earthworm from slipping backwards.

FEEDING

The earthworm is specially adapted for feeding underground.



1. A hard area on the head forces open cracks in the soil. The earthworm can then crawl into the cracks in search of food.

2. When the earthworm swallows small particles of soil and bits of dead plants and animals, muscles push the food to a chamber or sac called a crop. The crop stores food for a short time.

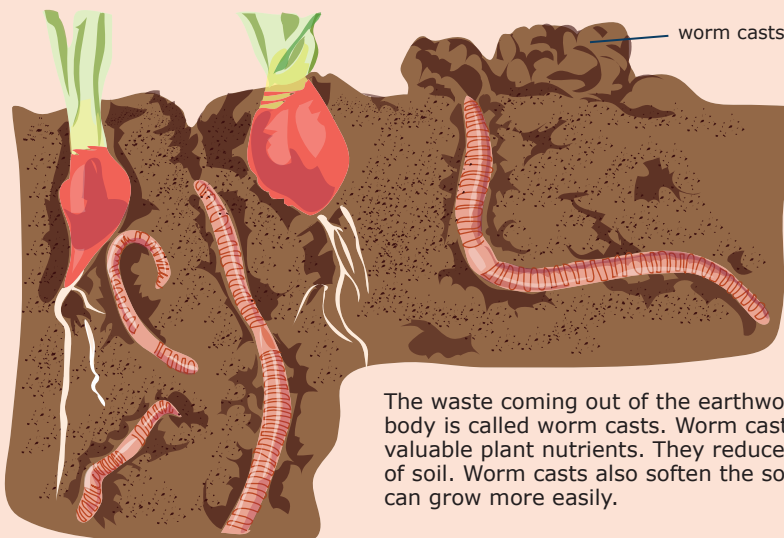
3. Food enters the gizzard, where it is ground up with the help of tiny stones.

5. The waste material passes out of the body through the anus.

4. The ground up food passes into the intestine. Digestive fluids break down the food, and nutrients are absorbed into the body.

EARTHWORMS CULTIVATE AND FERTILIZE SOIL.

As earthworms move through soil, they make tunnels. These tunnels let air reach plant roots, and let water drain through soil. Mucus that earthworms produce helps bind soil particles together, so that the tunnels keep their shape. Earthworms also mix soil layers as they burrow.



The waste coming out of the earthworm's body is called worm casts. Worm casts contain valuable plant nutrients. They reduce the acidity of soil. Worm casts also soften the soil, so roots can grow more easily.

EPAZOTE Science Page

DID YOU KNOW?

Epazote has been used for centuries to flavor foods and to rid people of intestinal worms. The early Mayans were the first to use it. Many Latin Americans still use it today.

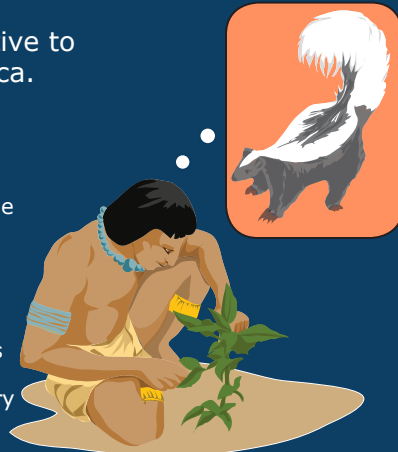


In the U.S., epazote is grown in large fields. Drug companies use the seeds to make medicine. That explains why it is sometimes called "American wormseed."

ORIGINS

Epazote is native to Central America.

Native people in central Mexico speak Nahuatl. The name "epazote" comes from the Nahuatl words "eptl" and "tzotl," which mean "skunk sweat." As you might guess, epazote has a very strong scent!

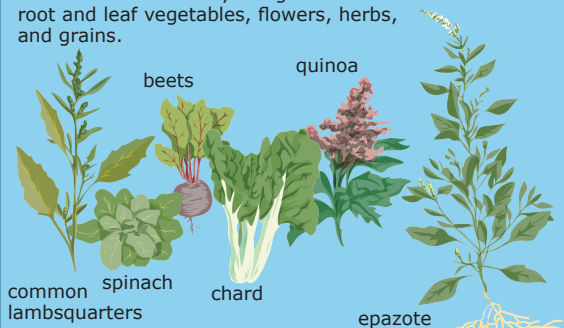


CLASSIFYING EPAZOTE

FAMILY

Chenopodiaceae

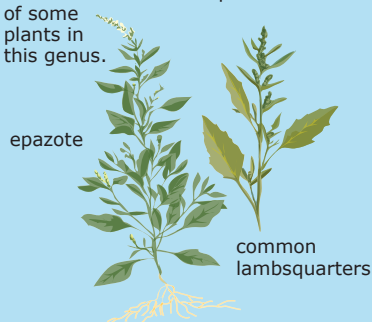
Members of this family are grown as root and leaf vegetables, flowers, herbs, and grains.



GENUS

Chenopodium

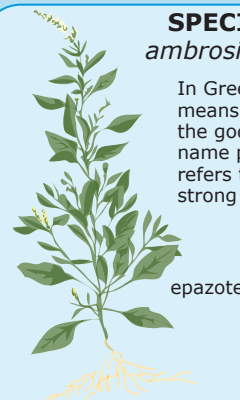
In Greek this means "goose foot." The name refers to the shape of the leaves of some plants in this genus.



SPECIES

ambrosioides

In Greek this means "food of the gods." The name probably refers to its strong scent.



THE EPAZOTE PLANT

The epazote plant can reach 60 to 120 cm high.



The yellow-green flowers are in clusters along the stems.

Epazote has sharp-toothed leaves.

Epazote produces thousands of tiny black seeds in small fruit clusters.

GROWING AND HARVESTING EPAZOTE

Epazote is easy to grow. It grows almost anywhere, but prefers a sandy loam soil and full sun. The plant produces thousands of tiny seeds, and can become a weed in your garden.



Epazote has a strong taste, so I only need one or two sprigs to flavor my rice and beans.

USES

Latin Americans use epazote as both a medicine and as an herb to flavor many different dishes.



I'm glad I planted epazote in my garden. This corn dish with epazote tastes just like my mother used to make when I lived in Mexico.